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Shifting Byzantine Networks
New Light on Chalcis (Euripos/ Negroponte) as a Centre of Production and Trade in Greece

Joanita Vroom
Leiden University

Abstract This paper aims to reconstruct the network of a production zone in the city of Chalcis (central Greece) by which certain glazed tablewares and amphorae were distributed within and outside the eastern Mediterranean basin between the 10th and the 13th centuries.

Keywords Material culture networks. Production site. Trade hub. Ceramic finds. Distribution patterns.

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1 Introduction

Ceramic finds of the Byzantine period, though omnipresent in most cities and rural settlements in the eastern Mediterranean, have seldom been studied to their full potential. If these 'later' wares – that is 'later' in the eyes of classical archaeologists – were studied at all, their value to yield valuable information about activities of production, trade, consumption, and cultural interaction in the Byzantine world remained often unexplored. Nevertheless, the relevance of pottery as a source of information and thus as an object of study is clear: it is not only the most common, durable, omnipresent, and most mobile category of material evidence, but also an indicator of broader patterns of economic, social, and cultural interaction, ranging from trade patterns to the diffusion of eating habits. Indeed, pottery reflects as an information carrier how ordinary people lived in the past. Even when found in many broken pieces, as is often the case with Byzantine pottery, it offers possibilities for statistical research in ceramic production, distribution, and consumption on multiple scales. In fact, visual mapping of the distribution of Byzantine pottery, which more or less forms the basis of the network approach in archaeology, has been around for some time.

The schematic mapping of sites with the help of Byzantine ceramics started already in 1930 with David Talbot Rice's seminal volume on *Byzantine Glazed Pottery*, but it really took off since the 1990s with more systematic approaches of distribution visualisation based on larger amounts of published data (e.g. Talbot Rice 1930, 80-1; François 1997; 2012; 2017; Vroom 2017; 2018; 2021). More recently, efforts have been made to introduce new interactive digital tools for mapping Byzantine ceramics by using network analysis for specific case studies in southern Italy and southern Greece (Arthur, Imperiale, Muci 2018; Yangaki 2018). These attempts ranged from 'affiliation networks' of sites based on selected eighth-century artefacts and amphorae within Byzantine territories to digital maps of imported pottery finds (specifically tableware and amphorae) in the Peloponnese and Crete between the fourth and fifteenth centuries. In this last case study, the emphasis was not so much on local ceramic finds, but rather on how both regions were in interaction with other parts of the Mediterranean over time.[1]

Despite these innovative digital applications, one needs to keep in mind that they are basically theoretical geographical networks and not necessarily 'historical' networks as far as these can ever be reconstructed on the basis of archaeological finds, which are much

1 Yangaki 2018, figs 8-11 show for instance that the major sites in Crete are connected to each other.

more riddled with uncertainties than digitisation can digest.[2] Every computer can surely create wonderful visual networks, but the question remains if the epistemological gap between these models and archaeological argumentations, even those based on well-dated and well-quantified material evidence, can be bridged. In every case a model or a theoretical conception is imposed on archaeological data (among which pottery finds), caution is advised.

Digital network models do not seem to consider the fundamental question: what happens when pottery types move from their production site to alternative contexts across economic, political, and cultural boundaries. In fact, to limit the question to my own field of research, is it possible at all to trace how and which Byzantine ceramic products were moving to which rural site, urban centre or harbour along local, regional, interregional or intra-regional (long-distance) networks over land and sea? Which dated archaeological evidence has been found for such terrestrial and maritime networks? And more specific: can the movement of certain Byzantine pottery types be adequately documented from their production site to other contexts? In short, is it possible to shed any light on the problem in which quantities these products were transported, by whom and via which networks?

It is my aim to search for answers to some of these questions by presenting in this paper a preliminary overview of the distribution of Byzantine ceramics (ranging in date between c. tenth to thirteenth centuries) from one apparent production site within the Byzantine Empire. This production site is the recently excavated workshop or group of workshops[3] at Chalcis (in the past known as Euripos, Negroponte, Eğriboz and currently as Chalkida) in central Greece.[4] First, it is my intention to discuss the local/regional networks of pottery distribution in the city itself and in the immediate hinterland of Chalcis. Thereafter, the focus will be on the interregional and intra-regional exchange networks of the Chalcis pottery within the Byzantine Empire and beyond. I will argue that the Chalcis products can be used to reconstruct the network of a production site by which certain glazed tablewares and amphorae were distributed within and

2 Given the fact that two nodes are needed to reconstruct networks, such as the node regarding the location of the find-spot and the other one related to the pottery's place of origin.

3 Although we do not know yet whether it concerns here one workshop or more, I will in general refer to the 'Chalcis' workshop' from now on.

4 Over time the town has had various names: the name Chalcis is preserved from Antiquity and derives from the Greek word '*chalkis*' (copper, bronze), while in Byzantine times it was known as 'Euripos'. Afterwards, it functioned as a Venetian hub under the name of 'Negroponte' (Italian for 'black bridge'). And thereafter, the name became 'Eğriboz' during the Ottoman domination, and 'Chalkida' in recent times; cf. Koder 1973; Koder, Hild 1976. I prefer to use the name of Chalcis in this paper.

outside the eastern Mediterranean basin between the tenth and the thirteenth centuries.[5] Thus, the story is told from the perspective of a production zone in a city, which happened to be a vital port within Byzantium at the same time.

It is my objective to present the case study of Chalcis in the perspective of a larger personal network by using evidence from various archaeological projects in the Mediterranean in which I was involved in studying Byzantine material culture. These projects include excavations, survey projects as well as collaborations. Several of these projects took place in coastal urban sites, which were functioning as harbours or anchorages in Byzantine times, while others occurred in sites in the immediate surroundings of Chalcis. In the perspective of my goal to present new material data and different approaches based on this archaeological evidence, I will discuss first the connections of Byzantine ceramic finds in the hinterland of one production site before zooming out to larger terrestrial and maritime exchange networks.

2 Chalcis. The Industrial Zone and Its Products

Pottery finds from Chalcis during Byzantine and 'Frankish' times are particularly interesting because this city was not only an important production site of various pottery types, but also a crucial harbour and trade hub during Middle Byzantine times and into the Late Byzantine/Frankish era.[6] Since the sixth century, the city served as a fortress for the protection of central Greece. After 1204 it came gradually under Venetian control until it became a Venetian colony in 1390. In 1470, after a long siege, it passed to the Ottomans, who made it the seat of the Admiral of the Archipelago (Aegean islands).

During the Byzantine period, the ancient city of Chalcis was relocated to the west, in the area next to the Euripus Strait, in order to better serve the strategic and maritime interests of the Byzantine Empire. The town at the bridge over the Euripos, called '*Kastro*' (Castle), was surrounded by a full circuit of defence walls, until these were completely razed for modern urban development around the beginning of the twentieth century. Before that, the fortification walls defined the centre of the town's life. The '*Proasteion*' or '*bourgo*' (suburb), as it was called in the written sources, was situated outside the enceinte and extended over a wide area east of the castle (Koder 1973).

5 The focus in this paper is mostly on glazed tablewares and amphorae from the production site in Chalcis, because these can be better recognised in ceramic networks.

6 As the chief town of the island it is situated on the Euripus Strait at its narrowest point, where it is connected to the mainland by a bridge. As such, Chalkis is located in a strategic position, as it could control the Euripus Strait.

In this area outside the fortification walls of the Medieval town, a rescue excavation took place in 2007 at Orionos Street 10.[7] The excavated area had a total extent of some 100 square meters and was situated on a small elevation next to the old road. Architectural remains of the Byzantine period were recovered here, as well as huge quantities of broken pottery and other finds. These included fragments of glazed tablewares, of unglazed coarse wares, of storage and transport vessels, fragments of tile, mortar, and brick, vitrified masses of clay, copper and iron masses, slag, as well as animal bones, sea shells and even a few human bones.[8]

Between 2013 and 2016, all the finds were sorted out, recorded, documented, entered in a database, drawn and photographed by me and a small team of students.[9] In total, we counted over 66,000 fragments of diagnostic pottery fragments of glazed and unglazed varieties.[10] Of these, amphorae accounted for the largest group (with 37%) (Vroom, Tzavella, Vaxevanis forthcoming a-b). Looking at the ratio between glazed and unglazed pottery in general, there was more unglazed pottery found (c. 75%).[11] Furthermore, I would like to mention that over 700 fragments of over-fired pottery types were recorded so far. These included wasters of various pottery types (ranging from unglazed products to vitrified fragments or even completely distorted pieces), kiln furniture, tripod stilts, kiln separators and part of a potter's wheel.

The excavations at Orionos Street in Chalcis revealed a substantial workshop area with cross-craft interaction, among which the manufacture of metal, glass, bone, as well as unglazed and glazed ceramics. These included various types of the so-called 'Middle Byzantine Production Group' (shortened to 'MBP'), such as Slip-painted Ware, Green and Brown Painted Ware, (Painted) Fine Sgraffito Ware, In-

7 The excavation at Orionos Street 10 was carried out by Giannis Vaxevanis, and started in May 2007 at the owner's request to construct a modern building, and the excavation was completed in September of the same year. The excavated plot was 120 meters far from Frizi Street, where the northern part of the Medieval city wall has been recovered.

8 Large quantities of a diverse composition of land and sea animal species and various types of sea shells (among which the murex) were recovered at Orionos Street, of which the last ones are referring to the use of purple dye in the Byzantine silk industry.

9 In order to process the enormous quantities of finds, the previous ephor Dr. Kalamara and her staff invited me in 2011 to study the excavated material from Orionos Street 10. Consequently, we came with the idea to organise summer schools for students between the years 2013-16 in collaboration with the Ephorate of Chalkida and the Netherlands Institute at Athens (NIA).

10 Apart from counting, we were also weighing the fragments of various types for quantification purposes.

11 This is expected, because unglazed pottery is more common, easier to produce, and thus cheaper than glazed ceramics.

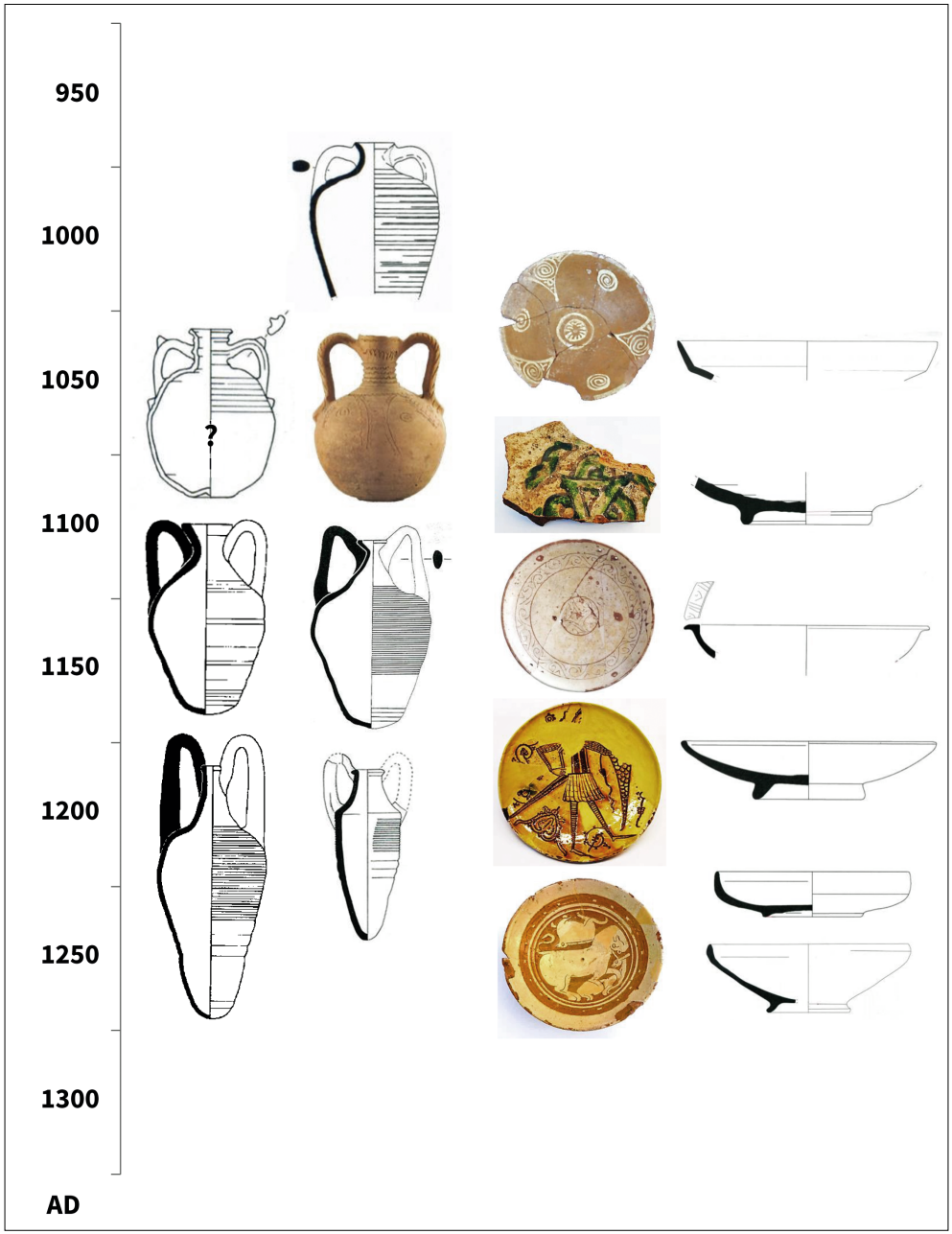


Figure 1 Chronological overview of main Byzantine amphora types (left) and glazed ceramic types (right) which were locally produced at the Orionos Street workshop in Chalcis, central Greece (J. Vroom; after Günsenin 1990, fig. 3; Vroom 2014, 80-5, 90-3, 96-8; Todorova 2018, fig. 3.5)

cised Sgraffito Ware and Champlevé Ware **[fig. 1 right]**.[12] This is a group of glazed tablewares with similar characteristics (such as fabric, vessel form, surface treatment, use of lead glazes), but with various decoration techniques, which co-existed or followed each other in the period from circa the late eleventh/early twelfth to the mid thirteenth century.[13] The excavation yielded in particular many examples of Incised Sgraffito Ware and Champlevé Ware of the late twelfth to mid thirteenth century. Among the motifs depicted on these wares were human beings (such as fully equipped warriors with swords, spears and banners) as well as animals (birds, fishes, but most of all a hare in a gouged tondo). These finds are clear indications of large-scale standardised pottery production, in which the motifs on the wares were imitating luxurious metal vessels or textile designs.[14]

The evidence shows that the Chalcis workshop also produced unglazed coarse wares and plain wares. These included cooking jars and jugs, basins, pithoi, as well as plain jugs of a finer fabric with a gouged decoration on the exterior surface.[15] Furthermore, we were able to distinguish local production of several amphora types at the Orionos Street plot, ranging from a small unglazed incised jar to the so-called Günsenin 2(A), 3, (transitional) 1-3 and 20 amphorae **[fig. 1 left]**.[16] Of these produced containers the most well-known is the Günsenin 3 or Saraçhane 61 amphora.[17] This amphora is a pear-shaped vessel with a rounded base, a long conical neck and two long heavy handles rising high above the rim. Generally, it can be dated to the twelfth-thirteenth centuries. Until now, c. 8,500 fragments of this amphora type have been diagnosed in the Orionos Street finds, among which many wasters, overfired pieces and kiln tools related to its production.[18]

12 Some early thirteenth-century vessels of Incised Sgraffito Ware and Champlevé Ware were previously described by A.H.S. Megaw (1975) as 'Aegean Ware' (referring to an Aegean provenance), although this term is no longer used; cf. François 2018.

13 The term Middle Byzantine Pottery group was firstly suggested by Guy Sanders, and later taken over by other scholars: cf. Waksman et al. 2014, 380, note 6.

14 Some dishes of these decorated glazed tablewares from the Orionos Street workshop were recorded in 3D by my project assistant Vasiliki Lagari.

15 With the help of experimental archaeology, we tried to reconstruct some of these cooking pots at Leiden University (NL). It was the intention to look into cooking techniques, cooking practices and eating habits in Medieval Chalkis. These consumption patterns were of course dependent on the availability of local foodstuffs.

16 Günsenin 2018, 98-102, figs. 6, 8, 9; 116, fig. 31; see also Vroom 2014a, 95-9; Todorova 2018, fig. 3, no. 5; Waksman et al. 2018a; Mozorova et al. 2020.

17 Günsenin 1990, 28-30; 2018, 100-2, fig. 9; Hayes 1992, 76, fig. 26.0, no. 11; see also Vroom 2003, 153-5, figs. 6.7 and 6.41; Vroom 2014a, 97-9.

18 It has been assumed by A. Vionis (2008, 38, fig. 17) that a waster of the Günsenin 3 amphora was retrieved during the Tanagra Survey on the basis of one over-fired handle fragment. However, this remains doubtful, because it concerns here a single sur-

To date, we were able to distinguish two phases of pottery production at the Orionos Street plot. The upper excavation layers yielded pottery (among which the MBP group) which belonged to the later phase of use (c. twelfth-thirteenth centuries), while the lower excavation layers contained finds which belonged to an earlier phase (c. tenth-eleventh centuries) (Vroom, Tzavella, Vaxevanis forthcoming).

Various samples of the local products (both glazed tablewares and amphorae) from this workshop and from other excavated parts in Chalcis were selected for petrographic and for chemical analyses (Waksman et al. 2014; 2018a; 2018b; Panagopoulou et al. 2021). The results indicate that the Chalcis finds form a uniform chemical group, which strongly suggests a common origin of the clay and also long-lasting production by a workshop or group of workshops operating in a well-defined geographical area (Waksman et al. 2014, 416-18). In addition, examination of samples of glazed tablewares by optical microscopy, SEM and WRF showed that the lead glazes had a similar small amount of alkali (Panagopoulou et al. forthcoming).

In short, the combination of the typo-chronological archaeological diagnoses of the finds and the archaeometrical data lead to the conclusion that the potters of the Chalcis workshop used an identical clay for the entire range of pottery types they produced. The locally manufactured amphorae and coarse wares as well as the glazed tablewares all have the same fabric: hard, fairly fine to semi-coarse, containing lime and quartz and large amounts of organics such as straw in the handles. The clay must have originated from a single geological source, probably from the clay-rich Vasiliko area in the nearby Lelantine Plain.[19]

This fertile plain is situated to the east of the workshop, between the ancient cities of Chalcis and Eretria. Substantial and extensive sourcing of clay in the past has created huge depressions of reused clay beds in the landscape.[20] Until recently, these beds were still exploited by traditional potters operating in the Varethousa area in modern Chalkida (Jones 1986, 144-6, 867-88; see also Matson 1972). Thus, clay was cheap, nearby and readily available for the Byzantine potters of the Orionos Street workshop. Furthermore, the Lelantine Plain was known during Byzantine times for its agricultural production, especially for olive oil and the famous Euboean wine which was popular

face find that could have been over-fired due to a secondary wild fire. The same can be said about similar production claims by him for the Günsenin 2 amphora on the basis of thin evidence; cf. Vionis 2017a, 359; 2017b, 168.

19 The plain is presumably named after the Lelantos River, now the Lilas River, which runs through it.

20 Sourcing of the clay already took place from the Bronze Age onwards, as is shown by the chemical composition of samples from the site of Lefkandi showing low contents of aluminium, iron and potassium; cf. Jones 1986, 144.

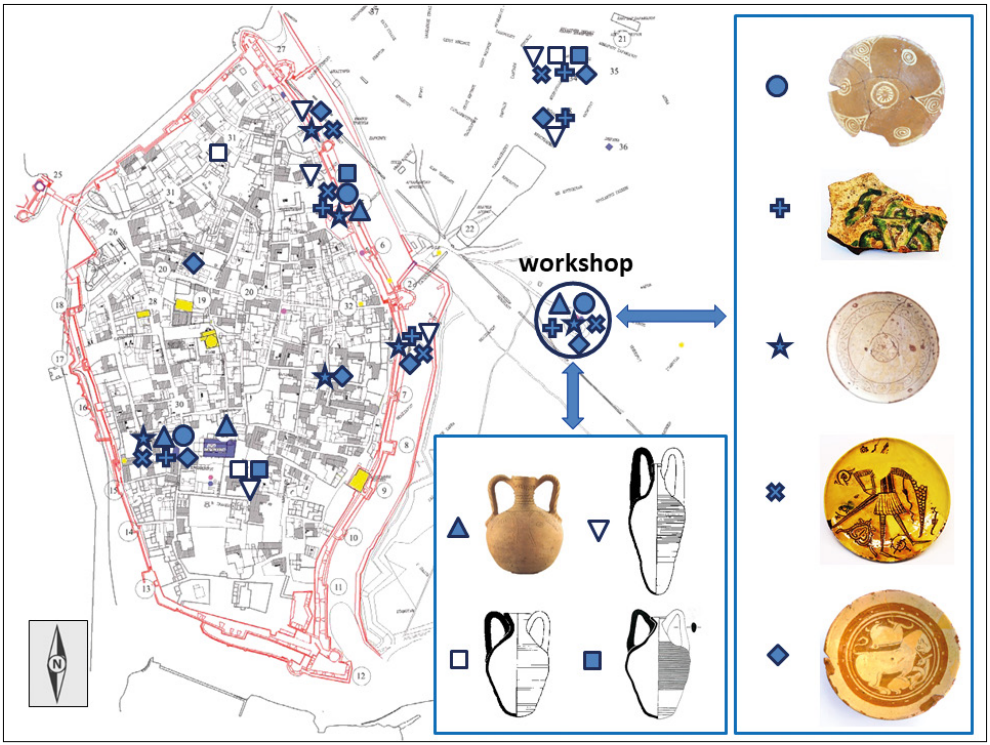


Figure 2 Finds of five selected glazed tableware types and of four selected amphora types of Byzantine date from the Orionos Street workshop as found in the city of Chalcis (J. Vroom; map after Kontogiannis 2012, fig. 1)

and praised in Constantinople.[21] So, it made sense to transport these commodities in locally made ceramic containers. In fact, the plain offered a remarkable combination of agricultural surplus and the availability of good clay deposits in the vicinity of an important harbour.[22]

To date, excavations in the present-day city of Chalcis have revealed the presence of five groups of glazed tablewares and four amphora types of Middle Byzantine date which were all produced by the Orionos Street workshop **[fig. 2]**. However, hardly any large-scale ex-

21 For residue analysis of amphorae from Chalkis and Thebes, see Pecci, Garnier, Waksman 2020 showing the transport of fermented substances, such as (red) wine or its derivatives and perhaps plant oils.

22 Traditional potters were operating in a nearby area at Chalkis in the late nineteenth-early twentieth century. They used the transport of their products by small sailing ships, which primarily operated during the warm months of the year from about April to October. The vessels were either directly loaded in these boats at the shore below the pottery workshops or at the harbour's quay; cf. Matson 1972.

cavations have taken place in this urban area, as most archaeological activity consisted of rescue excavations. Even when taking this into account, it is clear that the ceramic finds, which were excavated both inside and outside the Medieval city walls, include a large part of the repertoire of the Orionos Street production site (this holds especially true for the excavations at Agia Varavara Square, Frizi Street and in the Bailo House; see Kontogiannis 2012; Waksman et al. 2018b; Kontogiannis et al. 2020). This shows that the potters of the Orionos Street workshop produced for the local market of their own home town, and in any case not exclusively for markets further away.

3 The Chalcis Workshop and Its Hinterland

The primary distribution zone for the Chalcis workshop to be found directly outside the city itself was the countryside surrounding the urban area, the hinterland of Chalcis. This hinterland was not limited to the Island of Euboea, but extended also into mainland Greece. From the end of the ninth century the nearby city of Thebes was declared the capital of the Theme of Hellas (the administrative and military province of the Byzantine Empire, encompassing Attica, Euboea, Boeotia, and other areas of central Greece), and Chalcis became the naval station of the Theme's fleet and its port authorities. Thus, the city thrived as one of the most important harbours that connected southern Greece with Boeotia and from there via land and maritime routes with mainland Greece, Thessaloniki and finally Constantinople. Due to the arrival of the *strategos*, Chalcis and Thebes experienced a period of reorganisation from the ninth century onwards, which resulted for instance in the creation of suburbs.[23] Both cities undoubtedly increased in size and wealth; thus demand (including demand for pottery) became more differentiated and trickled down the socio-economic scale to all segments of the population (Laiou 2012, 140).

In the last few decades, several surface survey projects have been taken place in the hinterland of Chalcis and Thebes, among which the Boeotia Project (around the ancient cities of Askra, Thespies and Hyettos), the Eastern Phokis Survey (around the excavations of a sanctuary near Kalapodi), the Thisbe Basin Survey, the Plataia-Survey, the Tanagra Project, the Skourta Plain Project and the Mazi Archaeological Project (MAP) **[fig. 3a]**.[24] Unfortunately, some of these pro-

23 This is shown by various coin finds and hoards. One of the earliest Byzantine coins at Chalkis includes a coin of Emperor Basil I (r. 867-886).

24 See, in general, Bintliff et al. 2007 (Boeotia Survey); Armstrong 1989; 1996 (Eastern Phokis); Gregory 1984; 1986; Dunn 2006 (Thisbe-Kastorion); Konecny 1998 (Plataia); Vionis 2008; 2013 (Tanagra); Munn, Zimmerman Munn 1990 (Skourta); Kondyli, Craft 2020 (Mazi).

jects have not or not yet published their Middle Byzantine ceramic finds (Thisbe, Mazi, Skourta) while others have not quantified their material in an adequate statistical way (Eastern Phokis, Tanagra).

In fact, from the perspective of information on Byzantine pottery, only two projects can be considered as informative: the Boeotia Survey and the Plataia Survey. In these projects the quantification, diagnosis and dating of the Byzantine pottery was undertaken in a more systematic way by the author.[25] This means that there is data on Byzantine pottery available for further research from the mainland south-west of Chalcis, but hardly anything from the city's north-eastern surroundings. However, this hitherto neglected area will be covered in the coming years by a new fieldwork project named 'Beyond Medieval Chalkida: Landscape and Socio-economic Transformations in the Hinterland of Medieval Chalkida' (HMC).[26]

On the basis of the currently available data on Byzantine pottery, it is possible to get a first overview of regional and sub-regional distribution of Middle Byzantine ceramics from the Chalcis workshop. For a perspective on the micro-zone, I have selected five glazed tableware types with a distinct decoration style (Slip-painted Ware, Green and Brown Painted Ware, Fine Sgraffito Ware, Incised Sgraffito Ware and Champlevé Ware) as well as two amphora types (the small Unglazed Incised Ware jar, and the Günsenin 3 amphora). These wares are very well represented in the survey material and thus form a solid body of information **[figs 3b-c]**. In particular, the two amphora types were well represented in the Boeotian countryside, with a clear dominance of Günsenin 3 amphorae which are of a later date than the Unglazed Incised jars **[fig. 3c]**. As far as the spread of the glazed tablewares in the hinterland of Chalcis in Boeotia is concerned, it is clear that there is a fair representation of all the selected types, except for Champlevé Ware (the latest product in the production series), which is quite scarce **[fig. 3b]**.

As an experiment, affiliation network graphs were created of the six selected wares of the Chalcis workshop in relation to their presence on sites in Boeotia **[figs 4a-b]**. The results look quite like networks, but are similarly confusing and difficult to read. The drawbacks of affiliation network graphs are perhaps the most clear here:

25 Vroom 2003 (Boeotia Survey); personal observation (Plataia-Survey). One needs to keep in mind, though, that my pottery recordings for both projects took place until the year 2003. It is possible that more sherds were sampled afterwards.

26 This new fieldwork will take place between 2020-25 as a collaboration of Leiden University (NL), the Ephorate of Antiquities of Euboea at Chalkida, the Netherlands Institute at Athens (NIA) and the Hellenic Society for Near Eastern Studies (HSNES) at Chalkida. Its project leaders are the Author (Leiden University) in collaboration with Dr. A. Kostarelli (Ephorate of Antiquities at Chalkida), Dr. K. Politis and Dr. A. Blackler (HSNES); cf. Blackler 2020.

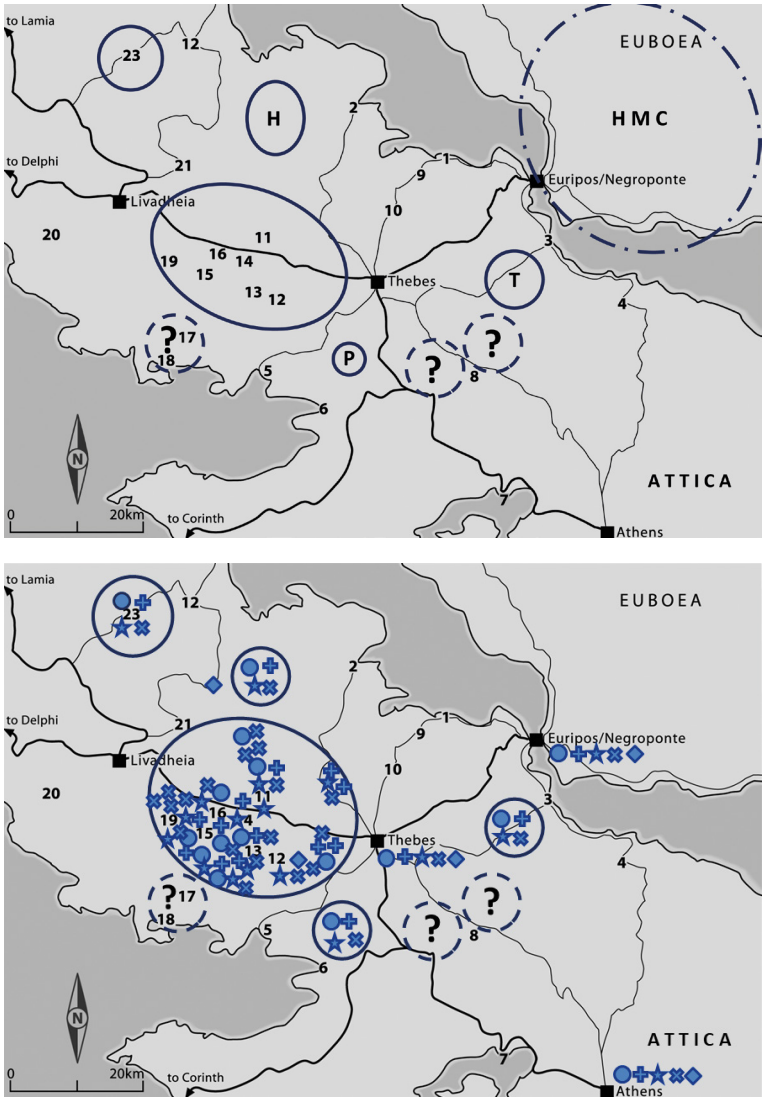


Figure 3a Map showing various survey projects, most important places and routes in the hinterland of Chalcis. H = Hyettos Survey; HMC = Hinterland of Medieval Chalkida Project; P = Plataia- Survey; T = Tanagra Project. Numbers refer to: 1. Anthedon; 2. Larymna; 3. Aulis; 4. Oropos; 5. Livadostro; 6. Aigosthena; 7. Eleusis; 8. Panakton; 9. Loukisia; 10. Mouriki; 11. Haliartos; 12. Thespiae and Leondari; 13. Panaghia; 14. Mazi; 15. Evangilistria; 16. Petra; 17. Thisbe and Domvrena; 18. Vathy; 19. Koroneia; 20. Osios Loukas; 21. Orchomenos; 22. Atalanti; 23. Kalapodi; 24. Kaparelli (J. Vroom; map after Vroom 2003, fig. 8.1)

Figure 3b Selection of five glazed tableware types (Slip-painted Ware, Green and Brown Painted Ware, Fine Sgraffito Ware, Incised Sgraffito Ware, Champlevé Ware) that were mostly represented on most important places and in surveyed areas in Chalcis' hinterland (J. Vroom; map after Vroom 2003, fig. 8.1)

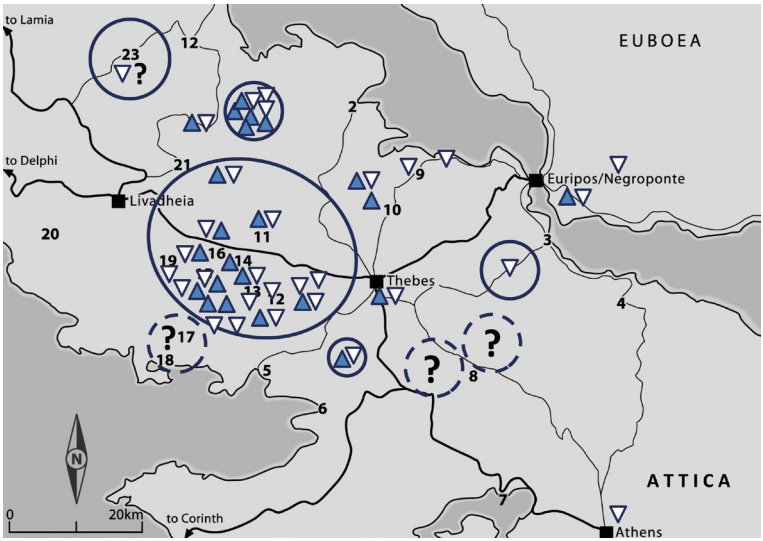
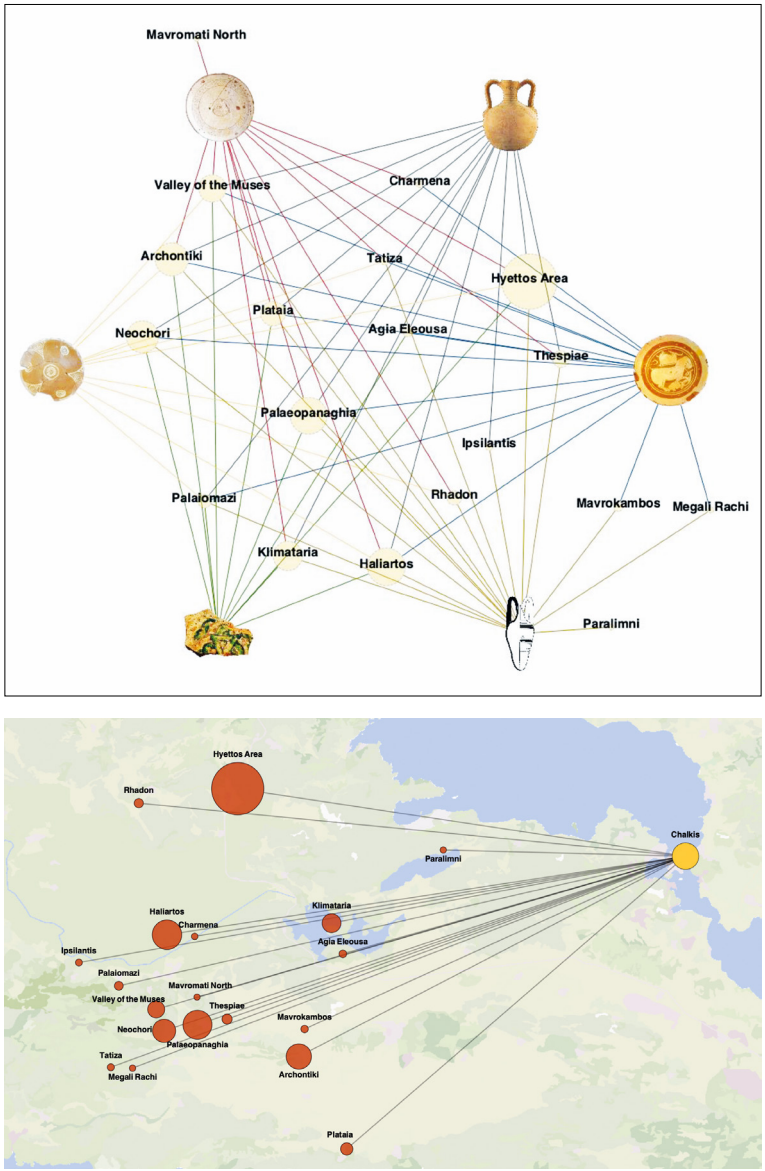


Figure 3c Selection of two amphora types (Unglazed Incised Ware jar, Günsenin 3 amphora) that were mostly represented on most important places and surveyed areas in Chalcis' hinterland (J. Vroom; map after Vroom 2003, fig. 8.1)

the digital graphs suggest reciprocal relationships while they do not show quantification of the data. Without getting lost in methodological details, the major question that digital network graphs should always be asked is: what do they actually mean and why do they have this form? In other words, caveats for creating and interpreting network visualisations need to be taken into account (see also Leidwanger et al. 2018; Yangaki 2018, 1104, 1107).

Still, it is obviously worthwhile to explore ways to visualise pottery distribution in the past, as this can help to understand the circulation of this omnipresent product. An interesting and fruitful approach has for instance been offered by Michael McCormick. With the aim to detect regional and sub-regional micro-systems of ceramic distribution, he presented in his article "Byzantium on the Move" micro-zones of locally made Byzantine wares from two autonomous production centres in Galilee and Judaea (McCormick 2002, 14-16). He was able to recognise micro-zones of different densities around his two case studies, among which distribution zones within a radius of 15 km, 40 km and 100 km from their central points (McCormick 2002, 15, fig. 1.1).

This approach might also help us to better understand the distribution of the Chalcis pottery at various regional levels. For the micro-regional level of the direct hinterland, the distribution of the six selected ceramic groups (four glazed tableware types and two amphora types mentioned above) can be visualised in various zones.



Figures 4a-b Affiliation network graph and geographical network map of five glazed tableware types (Slip-painted Ware, Green and Brown Painted Ware, Fine Sgraffito Ware, Incised Sgraffito Ware) and of two amphora types (Unglazed Incised Ware jar and Günsenin 3 amphora) in relation to sites in Chalcis' hinterland (J. Vroom; T. Kodzhabasheva)

For the distances of the concentric circles, I have chosen microzones of 15 km (the first circle: a three hours' walk on foot), of 30 km (the second circle: circa half a day's walk on foot) and of 50 km (the third circle: circa 1 day travel on foot) from Chalcis' production site. In addition, I have selected 30 sites in Boeotia with Byzantine pottery finds, as published in my book *After Antiquity* (Vroom 2003, 136-7, tables 6.1-6.2). According to the classification of site function by the Boeotia Project, these included rural habitation sites (RUR), habitation sites with a Medieval/Post-Medieval tower (TOW), urban sites with fortification walls ('CITY') and special purpose sites containing for instance Medieval/Post-Medieval churches and monasteries (SP) (Vroom 2003, 87-134). Furthermore, it was possible to add the city of Plataia to this visualisation (due to a sufficient quantification of the finds), but unfortunately not Thebes as an important consumption centre in Boeotia (as it lacks solid quantified data on Byzantine finds so far).[27]

The maps show that the six selected ceramic groups from the Chalcis' workshop were omnipresent and evenly distributed across the landscape, both in rural sites in lowland areas as on hilltops in Boeotia **[figs 5a-f]**. Interestingly enough, there were not so many Chalcis products found in urban centres (Askra, Thespies and Hyettos), but rather in rural sites with special features.[28] It is evident that during Byzantine times the countryside in this part of central Greece used various types of glazed tablewares adorned with elaborate painted and incised decorations, and certainly not exclusively unglazed (or perhaps wooden) dishes. Although Athens was another substantial manufacture centre of glazed ceramics in this part of central Greece, its products were quite different in fabric, glaze and decoration from the Chalcis pottery, and were almost absent in the survey samples.[29]

One may notice that the two selected amphora types (the Unglazed Incised jar and the Günsenin 3 amphora) show a similar distribution pattern as common utility objects in hamlets and towns in the hinterland of Chalcis **[figs 5e-f]**. The amphorae found on the smaller sites could have been used for the regional transport of goods, such as wine or oil, and afterwards they could have been recycled for secondary use as a storage vessel for foodstuffs (the re-use of these containers as beehives has also been suggested [Hayes 1992, 76]). Or perhaps they were brought empty to the Boeotian rural sites in or-

27 To date, Byzantine pottery finds from excavated plots at Thebes are seldom well-quantified and published from this city; see recently Liard, Kondyli, Kiriatzi 2019.

28 This may raise questions about the survey techniques used: does this for instance imply that the Boeotian cities perhaps were not well surveyed? Or is maybe the division in site functions not satisfying?

29 Vroom personal observation; cf. Panagopoulou et al. 2021.

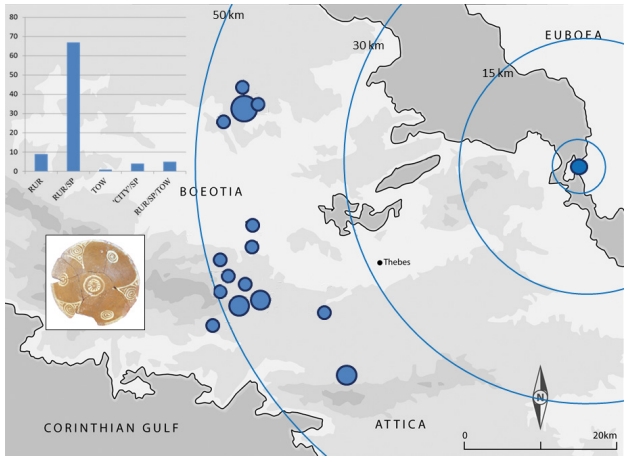


Figure 5a
Map with micro zones (of 15, 30 and 50 km) and graph of the total amounts of finds of Slip-painted Ware on various sites in Chalcis' hinterland (J. Vroom; map after Vroom 2003, fig. 5.1a)

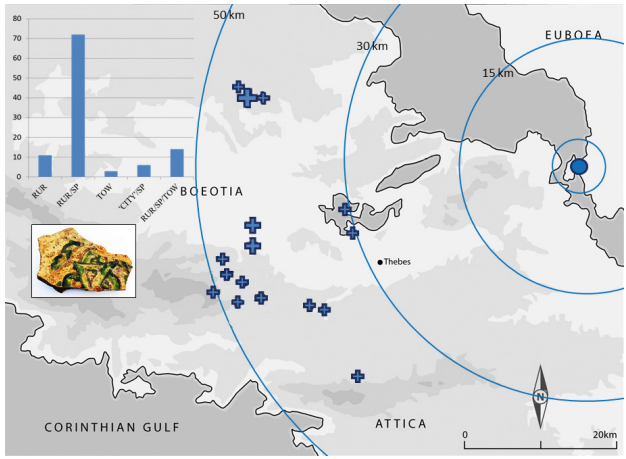


Figure 5b
Map with micro zones (of 15, 30 and 50 km) and graph of the total amounts of finds of Green and Brown Painted Ware on various sites in Chalcis' hinterland (J. Vroom; map after Vroom 2003, fig. 5.1a)

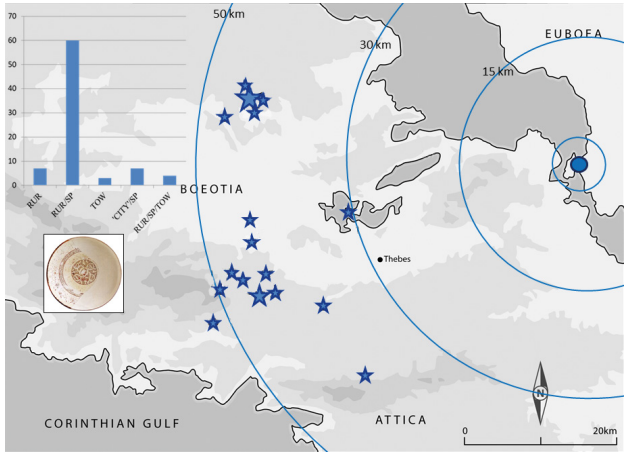


Figure 5c
Map with micro zones (of 15, 30 and 50 km) and graph of the total amounts of finds of Fine Sgraffito Ware on various sites in Chalcis' hinterland (J. Vroom; map after Vroom 2003, fig. 5.1a)

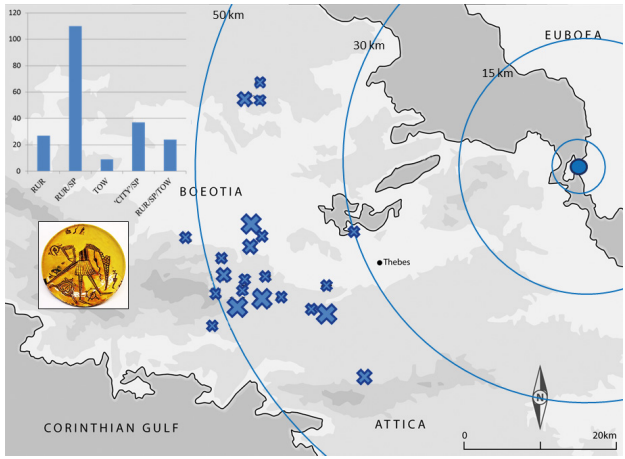


Figure 5d
Map with micro zones (of 15, 30 and 50 km) and graph of the total amounts of finds of Incised Sgraffito Ware on various sites in Chalcis' hinterland (J. Vroom; map after Vroom 2003, fig. 5.1a)

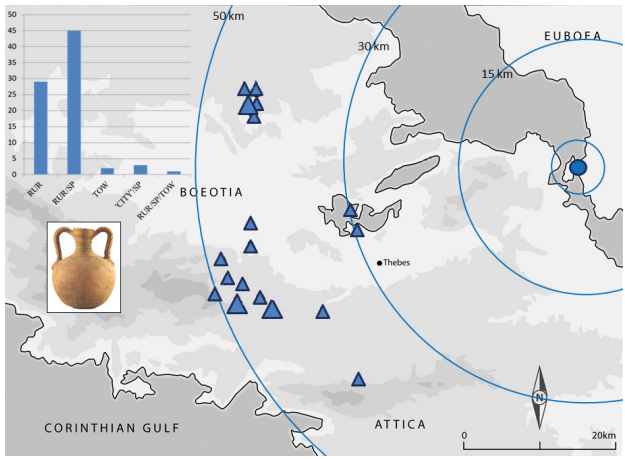


Figure 5e
Map with micro zones (of 15, 30 and 50 km) and graph of the total amounts of finds of the Unglazed Incised jar on various sites in Chalcis' hinterland (J. Vroom; map after Vroom 2003, fig. 5.1a)

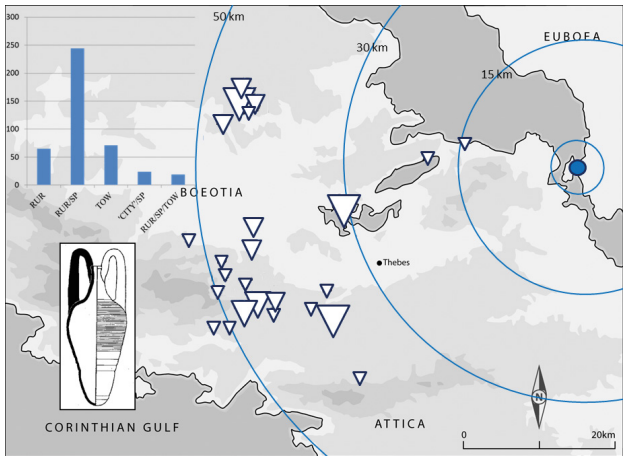


Figure 5f
Map with micro zones (of 15, 30 and 50 km) and graph of the total amounts of finds of the Günsenin 3 amphora on various sites in Chalcis' hinterland (J. Vroom; map after Vroom 2003, fig. 5.1a)

der to be refilled with local agricultural products for transport to other regions.[30]

The visualisation clearly indicates that prior to the thirteenth century not much pottery from the Chalcis workshop was found at tower sites, while typical thirteenth-century products (such as Incised Sgraffito Ware and Günsenin 3 amphorae) were not only found in much larger quantities at tower sites, but also circulated more at tower sites and urban centres in the Boeotian hinterland of Chalcis **[figs 5d, 5f]**.[31] This is surely an indication of the use of these structures during the Frankish occupation of Greece after 1204.

In general, the Boeotian countryside appears to have been densely inhabited, and was thus a good and large outlet for the affordable Chalcis products. The increasing distribution and quantity of Byzantine pottery in the hinterland of the workshop, which becomes particularly discernible from the eleventh century onwards, may be taken as signs of a growing appreciation and demand for these specialised, locally manufactured items. The production in Chalcis surely responded to this growing demand with a further differentiation of types (Laiou 2012, 142-3).

Most of the wares produced between the tenth and thirteenth century in Chalcis seem to have been sold in the hinterland micro-zone within the second and third circles of 30 and 50 km (or a half day to one day of travel on foot from Chalcis). This suggests distribution through a permanent market (probably at Thebes, since it was an administrative centre) from where these products were acquired. Undoubtedly, the low-lying Boeotian sites could benefit from a road system, which would enable the transport of the ceramic products on donkeys and mules (Vroom 2003, 147-257).

30 Boeotia was famed for its production of wine, oil, honey and above all silk textiles made at Thebes.

31 That is to say, next to the usual main presence of these wares on special purpose sites in Boeotia.

4 The Chalcis Workshop and the Byzantine Empire

The archaeological evidence clearly proves that some main types of the Chalcis pottery made between the tenth and thirteenth centuries found their way beyond the micro-zone of the direct hinterland to the wider Aegean and Mediterranean area under control of the Byzantine Empire. Although the Chalcis workshop functioned as the key production centre for its hinterland, for wider interregional distribution it had to compete with other contemporary pottery workshops in the western Aegean which produced similar-looking Byzantine glazed tablewares. The most important of these were based at Corinth, Thessaloniki, Sparta, Larissa and Argos (and perhaps at Heraklion on Crete; see **[fig. 6]**) (see, for their markets, Bakirtzis 2007; Papanikola-Bakirtzi 2012).[32] The competition between these city-orientated production centres may be visualised by a site catchment analysis with a concentric circle representing c. 50 km (one day on foot). These circles make it quite evident that especially Chalcis and Athens were in direct competition with each other in central Greece, followed by Corinth, Argos and Sparta in the Peloponnese.[33]

Nevertheless, recent archaeometrical analyses have certainly proved that the Chalcis workshop was the main and most far-reaching provider of Middle Byzantine to Late Byzantine/Frankish ceramic products around the eastern Mediterranean and beyond (Waksman et al. 2014, 414). This is for instance shown by the matching of the Chalcis chemical group with samples from nearby shipwreck cargoes as well as with samples from various sites in the Aegean, Black Sea and the eastern Mediterranean (Waksman et al. 2014; 2018a; 2018b).

In the perspective of the wider commercial contacts of the Chalcis products, it is quite interesting to map the distribution of Byzantine glazed tablewares which found their way to various regions in the Byzantine Empire through maritime routes starting from the port on the Euripus Strait **[figs 7a-e]**. The visualisation makes it clear, for instance, that on a regional scale the main circulation of Slip-painted Ware was in the western Aegean (in central Greece and on the Peloponnese), while the interregional distribution extended to sites in the western Black Sea region, western Turkey and to a much lesser degree to sites in eastern Turkey, Cyprus, Ukraine and Italy **[fig. 7a]**. A similar distribution pattern can be seen with respect to Green and Brown Painted Ware, with the map showing a quite dense concentration of finds in the Aegean with an additional diffusion in a north-western direction; that is to say, to sites in the western Black Sea region **[fig. 7b]**.

32 The suggestion of Heraklion was made by N. Poulou (personal communication).

33 According to Angeliki Laiou (2012, 141), there existed an "industrial triangle with very active trade between Thebes, Athens, Corinth and Euripos".

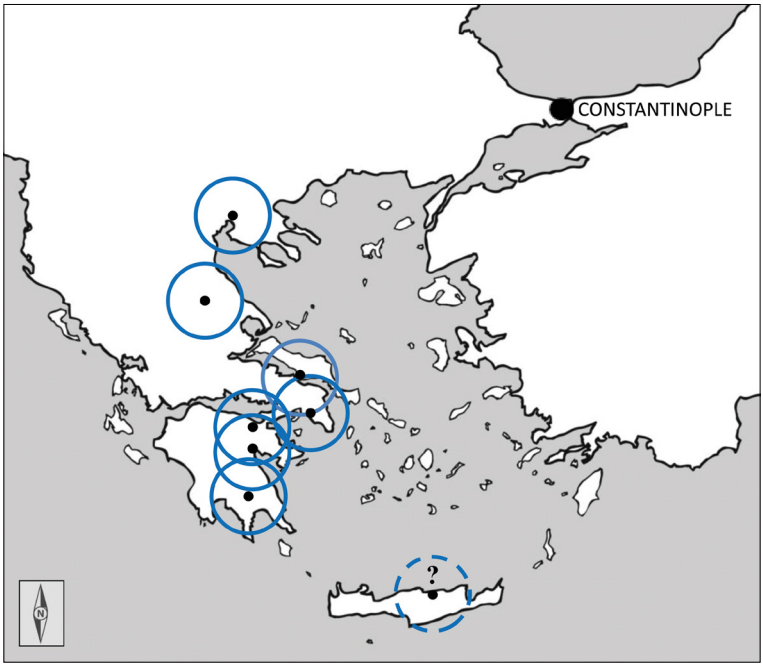


Figure 6 Map of pottery workshops and their encircled catchment areas producing similar looking Byzantine glazed tablewares as the Chalcis products in the Aegean (J. Vroom)

The circulation of Fine Sgraffito Ware from Chalcis (especially a variant decorated with spiral designs in a tondo) appears to have been even more widespread. Apart from the usual clusters in the Aegean and western Black Sea, one can clearly see on the distribution map that this pottery type found its way to south-eastern Turkey, Sicily, southern and northern Italy (often as *bacini* in church façades), as well as to Ukraine, Russia and even to eastern Sweden **[fig. 7c]**. The visualisation unmistakably demonstrates that the 'network' of Fine Sgraffito Ware extended much further to the North and to the western Mediterranean than the other wares from Chalcis.

Finds of Incised Sgraffito Ware from the Orionos Street workshop, on the other hand, were mainly recovered in the Aegean and the Black Sea, with a more or less even dispersal in the western Mediterranean (stretching all the way to sites in southern France). The distribution shows a remarkable cluster of this late twelfth-early thirteenth-century tableware in the Near East, specifically in the Crusader States in modern Syria, Israel and Palestine **[fig. 7d]**. In addition, finds of Incised Sgraffito Ware from Chalcis with a distinctive warrior motif were particularly recovered at sites in the western and eastern Aegean (shown in yellow dots in **[fig. 7d]**).

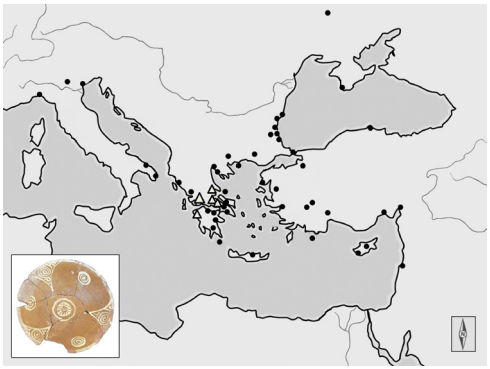


Figure 7a Distribution map of Slip-painted Ware in the Mediterranean and in the Black Sea region (J. Vroom)

Figure 7b Distribution map of Green and Brown Painted Ware in the Mediterranean and in the Black Sea region (J. Vroom)

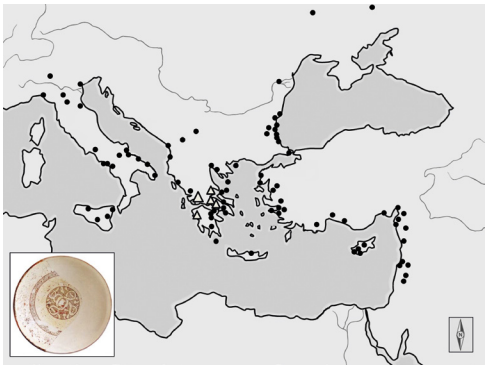


Figure 7c Distribution map of Fine Sgraffito Ware in the Mediterranean and in the Black Sea region (J. Vroom)

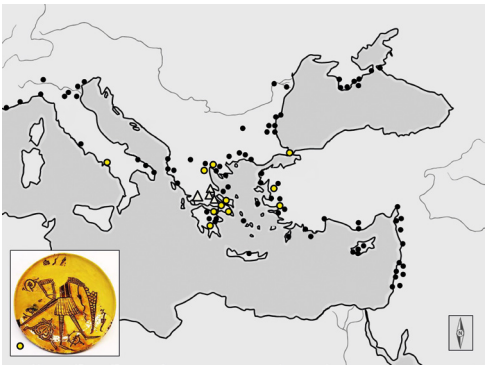


Figure 7d Distribution map of Incised Sgraffito Ware in the Mediterranean and in the Black Sea region; yellow dots refer to finds of the warrior motif (J. Vroom)

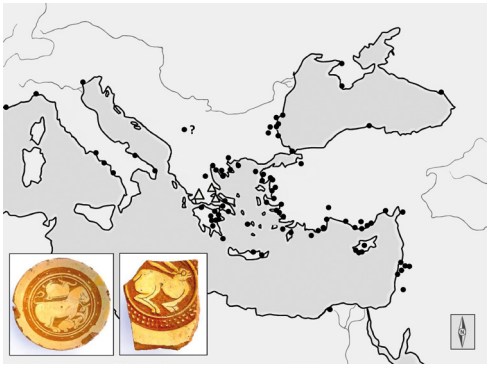


Figure 7e Distribution map of Champlevé Ware in the Mediterranean and the Black Sea region (J. Vroom)

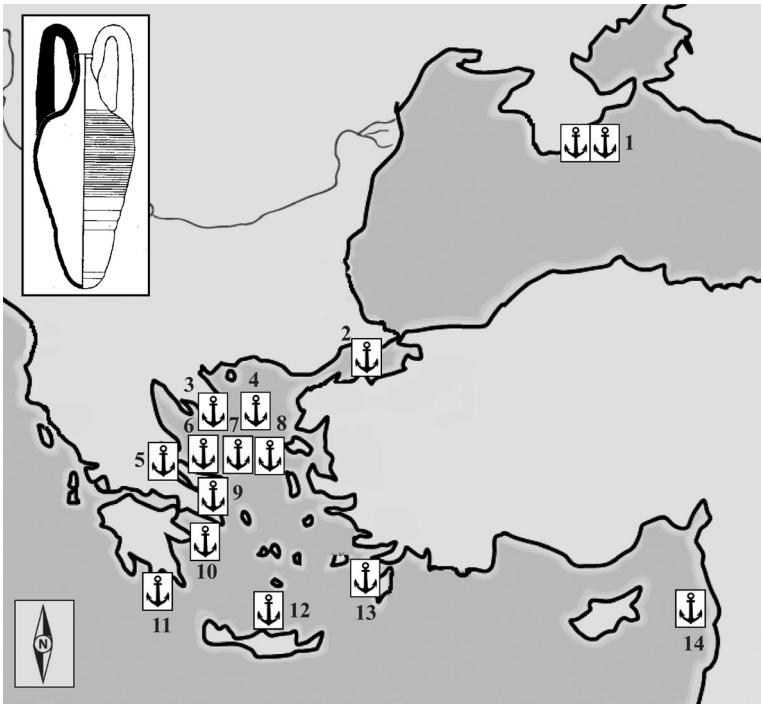


Figure 8a Distribution map of finds of the Günsenin 3 amphora on shipwrecks in the eastern Mediterranean and in the Black Sea region. Shipwrecks found at: 1. Novy Svet (2 shipwrecks); 2. Çamaltı Burnu I; 3. Glafki; 4. Kyra Panagia/Pelagonissos (2 shipwrecks); 5. Pagasitikos Gulf (8 shipwrecks); 6. Sporades C; 7.Sporades B; 8. Skopelos; 9. Portolafia; 10. Aegina; 11. Tainaron; 12. Dhia B=C 13. Rhodes; 14. Tartus (J. Vroom)

Finally, as far as the circulation of Champlevé Ware from Chalcis on an interregional level is concerned, the map shows only a moderate amount of clusters of finds in the Black Sea and in Italy, but alternatively a substantial presence in Israel and even in Egypt **[fig. 7e]**.

These distribution maps show that Byzantine glazed tablewares with similar-looking shapes and decorative styles were mainly found in harbours and coastal urban centres. This may very well reflect not only a unified common cultural and economic demand for these products, but also shared consumption needs, tastes and aesthetics.

Multiple examples of identical-looking depictions on glazed wares have already been recognised among the workshop waste from Orionos Street. Various elements of these reoccurring motifs were often exact copies of each other (as in the case of incised designs of warriors, birds, and fishes). All this suggests that a select number of potters/artisans manufactured these vessels in mass production. The increase in demand for this decorated pottery may have been influenced by interregional contacts. Surely, pottery from the Islamic

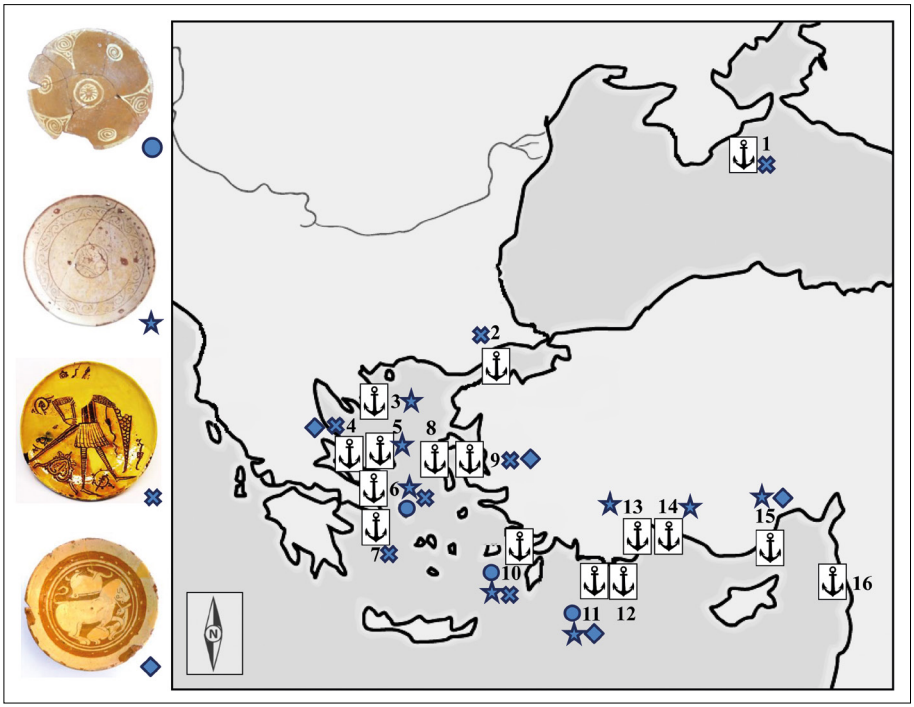


Figure 8b Distribution map of finds of four glazed tableware types on shipwrecks in the eastern Mediterranean and in the Black Sea region. Shipwrecks found at: 1. Novy Svet; 2. Çamaltı Burnu I; 3. Glafki; 4. Pelagonissos-Alonessos; 5. Skopelos; 6. Kavalliani; 7. Thorikos; 8. Beşadlar; 9. Near Izmir; 10. Tavşan adası; 11. Kastellorizo; 12. Kumluca; 13. Adrasan bay; 14. Near Antalya; 15. Silifke; 16. Near Tyre (J. Vroom)

world had influenced the designs and the production technology of these ceramics. Still, although these decorated luxury wares fan out from Chalcis in all directions, one has to keep in mind that the quantities found on most sites were often not large.

The distribution maps acquire even more meaning when we turn to finds of Günsenin 3 amphorae on various shipwrecks in the Aegean, Black Sea and the Near East **[fig. 8a]**. In fact, these ceramic containers seem to appear on nearly every shipwreck discovered in the western Aegean, with a substantial cluster in the southern Euboean channel, in the Pagasetic Gulf and around the northern Sporades. The wrecks clearly show that these Günsenin 3 amphorae were transported in considerable quantities on an interregional scale from the port of Chalcis along various maritime routes, most probably through cabotage and tramping by merchant ships of c. 15 meters in length. The finds of these amphorae thus seem to mark the main sea lanes of trade during the twelfth and thirteenth centuries which linked Chalcis to the western Aegean in general, to the cap-

ital of the Empire, Constantinople, and to the Black Sea region, as well as to the Near East.

The same phenomenon is evident in shipwrecked vessels carrying glazed ceramics as objects of interregional and intraregional trade. Several twelfth- and thirteenth-century wrecks with significant quantities of Slip-painted Ware, Fine Sgraffito Ware, Incised Sgraffito Ware and Champlevé Ware (of a more or less homogeneous character, most of which appear to come from Chalcis) were recovered in the Aegean and off the southern coast of Turkey, for instance at Pelagonissos-Alonissos, Skopelos, Kavalliani, Izmir, Kastellorizo and Adrasan **[fig. 8b]** (see in general, Vroom 2016; Waksman et al. 2018b; Koutsouflakis 2020).[34] These cargoes can be used as excellent indicators of the maritime routes used by merchant ships leaving from Chalcis to other parts in the Mediterranean. It has even been suggested that merchant ships loaded with cargo were sailing together from Chalcis following the same sea-lanes in a convoy (similar to the state-supervised *muda* system practiced by the Venetians) to Thessaloniki, Constantinople and eventually to the Black Sea (Koutsouflakis 2020, 454-6).

However, one should not forget that pottery was usually not the main product circulating on these maritime trade routes. Ceramics (particularly amphorae filled with foodstuffs) were often used on ships as supplementary cargo or even as saleable ballast; the heavy containers provided the boat with stability, while at the same time being capable of being sold for profit (Vroom 2016, 157). As additional cargo, pottery can be a guide for the circulation of more valuable commodities. Indeed, it seems possible to link the distribution of certain pottery types to trade routes of perishable goods, such as silk textiles, dyestuff, (flavoured) wine, oil, cheese or *garum*.[35]

All in all, the archaeological data clearly indicate that main centres of exchange for the wares from Chalcis were along the coasts of the western Aegean and the western Peloponnese and the Black Sea. The pottery finds show that Chalcis was a commercial hub at a central, strategic location in an organised naval network that functioned within the Byzantine Empire. Indeed, in its heyday Chalcis seems to have controlled the major sea routes leading from Italy (Venice) to Constantinople (Vroom 2021).

34 The so-called Novy Svet shipwreck in the Black Sea carried in general late thirteenth-century ceramics; cf. Vroom 2016, 176, tab. 2.

35 The recovery of cheese in a goat pelt is a rare find from a twelfth-century shipwreck at Rhodes; cf. Koutsouflakis 2020, 466.

5 The Chalcis Workshop and Its Wider Spheres of Distribution

When one tries to get an overall picture of the circulation of glazed tablewares from Chalcis on an interregional and long-distance scale, so micro-, intermediate- and macro-level within and beyond the boundaries of the Byzantine Empire, one is confronted with a complex mosaic of finds, zones of distribution and possible networks. In order to gain a relevant understanding of the data, I have selected five glazed pottery types and five amphora types of Byzantine date produced in the Chalcis workshop and visualised the circulation of these ceramics in the Aegean and beyond in smaller and larger 'spheres' **[figs 9a-b]**. The term 'sphere' or 'interaction sphere' (as used by some archaeologists) refers to "a complex network of interaction at different scales and periods" (Mikcic, Geok Yian 2017, 810). Consequently, spheres can depict areas of distribution as well as relationships between micro-, intermediate- and macro-levels of distribution over time.[36]

Starting with the circulation of five types of glazed tableware, which were produced in the Orionos Street workshop at Chalcis (or perhaps also at another main production centre in the western Aegean, as these wares are sometimes difficult to pinpoint to one production site), I managed to define spheres for each of the five wares **[fig. 9a]**. The first sphere is of Slip-painted Ware (c. late eleventh-twelfth century) and it is already encompassing a substantial distribution area, including its core-area (the Aegean) as well as Apulia, northern Italy, the Balkans, Cyprus and the western Black Sea region while moving north to Chersonnesos (Crimea) and Kiev. The second sphere is of Green and Brown Painted Ware (c. second half of the twelfth-begin thirteenth century) and it follows a similar pattern. The third sphere is of Fine Sgraffito Ware (c. mid twelfth-mid thirteenth century) and it looks very different, with large areas of distribution to the West (including Sicily and the Italian peninsula) and to the North (via sites situated along the Russian rivers to Lund in south-eastern Sweden). The fourth sphere is of Incised Sgraffito Ware (c. second half twelfth-mid thirteenth century) and the fifth sphere is of Champlevé Ware (c. late twelfth-mid thirteenth century). Both are remarkable, as these Chalcis wares by now totally miss the connection with the region in the far North, while they expand even more than the others in the western and eastern parts of the Mediterranean (stretching their distribution area all the way from southern France to the Near East and Egypt).

In addition, I have also selected five amphora types that were definitely produced in the Orionos Street workshop at Chalcis, and de-

36 As such, spheres can perhaps be understood as archaeologically more 'realistic' visualisations of layers of networks that change over time.

Figure 9a Map of interaction spheres of ceramic exchange of five glazed tableware types in the Mediterranean, the Black Sea region and beyond. Date sphere 1: ca. late 11th-12th c.; sphere 2: ca. 2nd half 12th-begin 13th c.; sphere 3: ca. mid 12th-early 13th c.; sphere 4: ca. 2nd half 12th-early 13th c.; sphere 5: ca. late 12th-mid 13th c. (J. Vroom)

lineated five interaction spheres on the basis of their distribution **[fig. 9b]**. The first sphere is defined by the Unglazed Incised Ware jar, and this product seems to have been made for a limited interregional distribution in the tenth-eleventh centuries. Until now, this type has been found in the Aegean area (including cities as Thessaloniki, Athens, and Ephesus) and much further in the lands of the Rus' north of the Black Sea (where it has for example been recovered at Kiev and Sarkel). These last finds clearly suggest the development of an exchange system from Chalcis to the distant North beyond the boundaries of the Byzantine Empire. The second and third spheres

Figure 9b Map of interaction spheres of ceramic exchange of five amphora types in the Mediterranean, the Black Sea region and beyond. Date sphere 1: ca. 10th-11th c.; sphere 2: ca. (late 10th) 11th-early 12th c.; sphere 3: ca. end 11th-early 12th c.; sphere 4: ca. 12th-13th c.; sphere 5: ca. mid 12th-late 13th c. (J. Vroom)

are of two other amphora types made at Chalcis, among which the so-called Günsenin 2 amphora (c. late tenth/eleventh-second half of twelfth century) and the Günsenin 1-3 amphora (c. late eleventh-early twelfth century). These spheres show a similar pattern with containers moving beyond the Aegean in distant northern directions, often along the Russian rivers, from the late tenth/eleventh into the twelfth century.

The fourth sphere is of the Günsenin 3 amphora, and it looks very different, showing some expansion towards the central Mediterranean, but a quite substantial expansion towards more northern ar-

eas far beyond the boundaries of the Byzantine Empire, including sites in Belarus', northern Russia and eastern Sweden (among which Novgorod, Lund and Sigtuna). The Günsenin 3 amphora produced in Chalcis thus appears to have been distributed over a remarkable wide area between the (mid) twelfth and thirteenth centuries.

The fifth sphere is of the small carrot-shaped Günsenin 20 amphora and it is interesting as well. This amphora type of only 33 cm height was produced in Chalcis from c. the mid twelfth to the late thirteenth centuries, and its sphere seems to indicate a retraction of distribution of Chalcidian wares from the far North, with only Kiev being its most northern destination, while the container had a markedly more substantial spread towards the western and eastern parts of the Mediterranean (ranging from Marseilles to Acre). The Günsenin 20 was the latest amphora product of the Orionos Street workshop, and its circulation seems to be related to other distribution mechanisms in the thirteenth century.

In short, the visualisation in spheres seems to indicate that some pottery types produced at Chalcis (among which Fine Sgraffito Ware and the Günsenin 3 amphora) circulated on an intraregional scale within and outside the Byzantine Empire. Both wares were recovered together as mixed cargo on shipwrecks in the western Aegean (at Glafki and Pelagonissos) and along the southern Turkish coast (in Adrasan Bay and near Antalya). Indeed, they were not only circulating in the Aegean and in the Black Sea, but were also transported to other parts in the Mediterranean, ranging from southern France and Italy in the West to Israel and Syria in the East, from Cyprus to Russia and even to Sweden in the North, showing their widespread long-distance distribution.

Consumers for these wares were particularly based in large coastal towns and ports, including those on the western Black Sea coast (especially in the eleventh and twelfth centuries), which were perhaps functioning as emporia trading with inland goods. In addition, Constantinople clearly functioned as the nodal point within this outward-going circulation of all the amphora types manufactured at Chalcis (Vroom 2016; 2017; 2021).

To understand the geographical and chronological evolution and the commercial implications of the spheres of distribution discussed here, one may link the fate of the Chalcis pottery workshop to wider political events and conditions. I will mention only a few important developments which occurred during the centuries the workshop functioned. In the case of spheres 3 (tablewares) and 4 (amphorae) the growing northern exchange of Byzantium with the Rus' in Kiev and with Viking mercenaries and traders was obviously of great importance. These northern connections appear to have suddenly stopped after the devastating invasions of the Mongols in eastern Europe between 1220 and 1240. After this abrupt ending of commer-

cial links of Chalcis with the North, sphere 5 (tablewares, amphorae) seems to show the gradual effects of the Fourth Crusade after 1204 and the creation of Crusader States in Greek lands and their contacts by Italian merchants with those in the Near East. This development, in combination with the trade agreements between the Byzantine Empire and the maritime states of Venice and Genua, resulted for Chalcis in a substantial growth of maritime traffic to Italy, to southern France, to the Crusader States and to Egypt; in short, to more western and eastern parts of the Mediterranean during the thirteenth century.

6 Conclusion

This discussion of a hitherto unknown Byzantine industrial zone outside the fortified city of Chalcis in central Greece allows us to draw several conclusions. The most important is perhaps that between the tenth and the thirteenth century the site had a remarkable diverse capacity of production and impressive growing and changing connections of local, regional, interregional, and long-distance distribution of locally made glazed tablewares as well as various types of amphorae. Shipwrecks found near Euboea and in the Pagasetic Gulf provide evidence that these ceramic containers were at least occasionally used to transport agricultural products from the rich hinterland of Chalcis. The production site was evidently situated near the southern harbour of Chalcis, where the pots and their contents could be directly loaded for maritime commerce on small merchant ships.

The importance of the Orionos Street workshop in Chalcis as a production centre is clearly illustrated by the mosaic character of its diverse networks with its various geographical and commercial interlocking and expanding layers. The primary network was local and based in the direct hinterland of the workshop, and seems to indicate that from the eleventh century onwards rural sites near Chalcis developed a demand for more luxurious but affordable glazed tablewares and two amphora types.

Nevertheless, the archaeological evidence makes it quite clear that the pottery production in Chalcis was not meant exclusively for the local market with a few outliers, not even initially. Over time, there were evidently small shifts in the local patterns of pottery distribution between the Boeotian sites, but the production of Champlevé Ware in Chalcis was from the beginning clearly for the interregional long-distance trade (*Fernhandel*), as this glazed ceramic type was hardly circulated in the local network. The archaeological evidence thus indicates that the Chalcis workshop networks functioned in complex and interrelated ways. For example, it shows the circulation of the Chalcis pottery in the Aegean and the Black Sea, with

even wider extensions to Scandinavia and the Near East. The production site at Chalcis clearly had contacts with Constantinople, with Viking mercenaries and/or traders, and eventually with the Crusader States during the twelfth and thirteenth centuries.

The archaeological record also shows that the material culture followed political and economic ups and downs, whereby the fate of Byzantine products, including the pottery produced in Chalcis, can be linked to historical events. From the eleventh century onwards it is evident that the production and distribution of the Chalcis workshop increased and developed an autonomous network. This was not only based on a well-defined market for its products in prosperous urban centres and rural sites in the nearby countryside, but also on earlier connections with the Black Sea region. The degree of mobility of the Chalcis pottery is once more an indication of the cohesion of the Byzantine Empire.

It is clear that there occurred major shifts in these distribution networks in the early thirteenth century, with the arrival of the Crusaders in Greek lands in 1204 as the crucial turning point. After 1204, Chalcis became part of the Italian sphere of influence and its products became part of the Venetian maritime networks in the Mediterranean. This had a huge impact on the distribution network of the Chalcis pottery, which then became essentially Mediterranean-based, with a larger spread towards sites in the eastern and western parts of this commercial region. In fact, all evidence suggests that the Crusaders brought their own networks and placed these on top and over the existing networks of Chalcis. However, this change meant by no means an impoverishment of the hinterland of Chalcis, the Boeotian countryside, during the Crusader period. In fact, it seems that for the production site in Chalcis and its wider region the observation made by Angeliki Laiou holds true, namely that

> while local, regional and interregional trade have unique characteristics and respond to different kinds and levels of demand, they meet at several points, and the existence of one exerts varying multidimensional and multidirectional influences on the other. (Laiou 2012, 146)

When we shift our perspective from the archaeological record to archaeological theory, and try to use the rich data of the Chalcis pottery workshop for a production place network analysis, unfortunately there seems to be no crystal-clear answers to be found. Digital network analysis by means of grouping materials on the basis of similarity appears quite appealing, but it raises as many questions as it seemingly provides answers. In essence, every computer can make awe-inspiring visual networks, but never provides answers to our questions on what the stripes between pottery types and find-spots

on maps actually mean in an archaeological, historical, economic and sociocultural sense.

All theoretical caveats notwithstanding, digital network analysis does suggest a reciprocal relationship between the dots on the map; at least it suggests that there is more to the line between the dots than is dreamt of in our imagination. The computer is obviously a wonderful tool, and it has tremendously helped the advancement of archaeology, but it cannot provide argumentative structures. To put it bluntly, digital lines do not make a network, but broken pieces of pottery do. So networks do not speak for themselves, they must be spoken for. The basis for any archaeological network analysis remains well-dated and well-quantified material, or in this case: pottery, and mostly fragments of pottery. These can be ceramic finds in well stratified layers, or small pieces found on the surface in surveyed settlements. And here is the rub: the data for any theory or network are dependent on solid dating, diagnosis and quantification, and also on solid survey methods – and to formulate it mildly, in archaeology the understanding of 'solid' is a matter of permanent debate.

In short, the fascinating data of the Chalcis production centre convince me that the use of 'spheres' to visualise the distribution patterns of pottery over regions and over time is perhaps more adequate for archaeological research than the use of rigid networks. To my archaeological mind, spheres seem to capture in more convincing and fluid ways the realities of the development and extension of exchange systems and the flow of material resources in different varieties, various densities and ever-changing zones within and beyond the Byzantine world.

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