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Sadržaj

Contents

Izvorni znanstveni radovi

Original scientific papers

Prethodno priopćenje

Preliminary report

The assortment of ceramic building materials from the pottery workshop of *Sextus Me(u)tillius Maximus* at Crikvenica (Croatia)

Asortiman građevinske keramike iz keramičarske radionice Sexta Me(u)tillia Maxima *u Crikvenici (Hrvatska)*

Izvorni znanstveni rad
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*Roman building materials, especially brick and tiles (*tegulae *and* imbex*) marked a new era in the architecture of Roman Dalmatia. While imported materials seem to still form the bulk of the evidence, recently identified and definitely located local productions provide the possibility to place these products within a technological and economical framework. The in-depth analysis of the array of ceramic building materials (CBM) of the workshop of* Sextus Me(u)tillius Maximus *in Crikvenica (north-eastern Adriatic) evidences their forming methods and production technology, while some distribution aspects and their role within the rural economy indicate their relevance within the regional CBM market. This paper will highlight such aspects and place them within a wider debate on the onset of production, the organisation of rural property, and the transmission of technology and knowledge through the adoption of "Roman style" architectural solutions.*

Key words: Roman ceramic building materials, workhop, north-eastern Adriatic, province of Dalmatia

*Rimska građevinska keramika, posebno ona za krovne pokrove (*tegulae *i* imbex*), ali i druge konstrukcije (opeke), obilježila je novu eru u arhitekturi rimske Dalmacije. Iako je i dalje u znatnoj količini prisutan uvozni materijal, nedavno locirane i utvrđene lokalne radionice omogućavaju smještanje njihovih proizvoda u tehnološke i gospodarske okvire. Detaljnom analizom asortimana građevinske keramike (nadalje GK) radionice* Sexta Me(u)tillia Maxima *utvrđene u Crikvenici (sjeveroistočni Jadran), moguće je razlučiti metode oblikovanja i proizvodnu tehnologiju, dok njihova distribucija i uloga unutar ruralnoga gospodarstva govore o važnosti ovih proizvoda za regionalno tržište GK. U ovome ćemo se radu posebno osvrnuti na potonje aspekte smještajući ih unutar šire rasprave o pokretanju proizvodnje, organizaciji ruralnih posjeda i prijenosu znanja i tehnologija kroz prihvaćanje „rimskih" arhitektonskih rješenja.*

Ključne riječi: rimska građevinske keramika, radionica, sjeveroistočni Jadran, provincija Dalmacija

INTRODUCTION[1]

The production of Hellenistic and Roman pottery and ceramics in the eastern Adriatic, in the latter period relative to the province of *Dalmatia*, has been supposed on the basis of indirect evidence such as brick stamps, finds of overfired shreds or other wasters and similar (Katić 2000; Kirigin et al. 2002; Čargo, Miše 2010; Lipovac Vrkljan et al. 2018). Another approach, that of typology and distribution analysis, lately supported by archaeometric analysis, has also been applied to suggest the existence of a Hellenistic and subsequently Roman pottery industry (Šegvić et al. 2012; Miše 2015; Šegvić et al. 2016; Ugarković, Šegvić 2018; Zubin Ferri 2018; Lipovac Vrkljan, Konestra 2018a). The remains of kilns, on the other hand, have been either destroyed or merely mentioned in excavation reports even when seemingly present (e.g. the islands of Pag and Vis: Gluščević 1989; Čargo, Miše 2010; Lipovac Vrkljan et al. 2018). The possible production sites suggested by the aforementioned evidence indicated that the pottery production centres were in or around the largest Dalmatian cities, most notably *Salona*, or in the context of military camps (Zaninović 1985: 70; Miletić 2011: 267), and within the former Greek colonies on the central Dalmatian islands (Vis, Hvar) (Katić 2000; Kirigin et al. 2002; Čargo, Miše 2010; Šegvić et al. 2012; 2016), while the production within rural complexes has been identified only recently (Konestra, Lipovac Vrkljan 2018: 133; Lipovac Vrkljan et al. 2018) (Fig. 1).

As a sign of the definitive adaptation to Roman architectural and economic models, Roman ceramic building materials (CBM) arrived in Dalmatia as early as the mid-1st cent. BC as the products of the numerous *figlinae* of the western Adriatic shores and their hinterland, such as the omnipresent *Pansiana* (Matijašić 1989: 61–71; Mardešić 2006: 101–105; Pedišić, Podrug 2008: 88–94; Pellicioni 2012; Konestra, Lipovac Vrkljan 2018: Fig. 3). From that period onwards, the distribution of Italic products spread significantly, while the supposed local productions (not only of CBM but also of household pottery) used to be interpreted as a means to fulfil particular urban or military needs (Wilkes 1979; Pedišić, Podrug 2008: 87–88, 100, 102; Miletić 2011: 267; Borzić 2014: 292). Similarly, Roman CBM have spawned scientific interest only through epigraphy, while comprehensive studies of local or regional CBM typologies are still lacking.

Only the discovery (first hinted at in 1983 and systematically investigated since 2004) (Starac 1991; Lipovac Vrkljan 2009; 2011; 2016a) of the pottery production centre located in Crikvenica / *Ad Turres* (north-eastern Adriatic, Kvarner Gulf) (Fig. 2) made it possible to review the models of production and distribution of both pottery and CBM, at least in the northern part of the province, the ancient region of

1 This paper stems from the work carried out within *RED – Roman economy in Dalmatia: production, distribution and demand in the light of pottery workshops*, a project financed by the Croatian Science Foundation (HRZZ, IP-11-2013-3973) and carried out between 2014 and 2018. An earlier version of this research was presented at the *International Conference on Roman Brick and Tile. Past, present and future of the study of Roman ceramic building materials*, Ghent 2015, under the title "Brick and tiles of *Sextus Metillius Maximus*: a pottery workshop at Crikvenica (Croatia) and its assortment of ceramic building materials". The authors would like to thank the colleagues from the conference for their useful comments and insights, and the reviewers for their suggestions and advice.

UVOD[1]

Helenistička i rimska keramičarska proizvodnja, potonja u okvirima provincije Dalmacije, uobičajeno se do sada pretpostavljala na temelju niza indirektnih pokazatelja kao što su pečati na tegulama, nalazi prepečenih ulomaka ili drugoga proizvodnog otpada i sl. (Katić 2000; Kirigin et al. 2002; Čargo, Miše 2010; Lipovac Vrkljan et al. 2018). U posljednje vrijeme, pri iznošenju pretpostavki o postojanju helenističke, a potom i rimske keramičarske proizvodnje, primjenjuju se, uz analize tipologije i distribucije, rezultati arheometrijskih analiza (Šegvić et al. 2012; Miše 2015; Šegvić et al. 2016; Ugarković, Šegvić 2018; Zubin Ferri 2018; Lipovac Vrkljan, Konestra 2018a). Ostaci peći, čak i kada se navode, danas su uglavnom uništeni ili su tek spomenuti u izvještajima s pojedinih istraživanja (npr. otoci Pag i Vis: Gluščević 1989; Čargo, Miše 2010; Lipovac Vrkljan et al. 2018). Lokacija mogućih proizvodnih lokaliteta predloženih navedenim istraživanjima smještala je potencijalna proizvodna središta unutar ili u okolicu većih dalmatinskih gradova, prvenstveno Salonu, u kontekst vojnih logora (Zaninović 1985: 70; Miletić 2011: 267) te unutar areala grčkih otočnih kolonija srednje Dalmacije (Vis, Hvar) (Katić 2000; Kirigin et al. 2002; Čargo, Miše 2010; Šegvić et al. 2012; 2016), dok je tek nedavno utvrđena proizvodnja u sklopu ruralnih posjeda (Konestra, Lipovac Vrkljan 2018: 133; Lipovac Vrkljan et al. 2018) (sl. 1).

Kao znak definitivne prilagodbe rimskoj arhitekturi, ali i ekonomskim modelima, rimska građevinska keramika (nadalje GK) pojavljuje se u Dalmaciji već od sredine 1. st. pr. Kr. i to proizvodima brojnih *figlina* zapadnih obala Jadrana i njihova zaleđa, kao što je sveprisutna *Pansiana* (Matijašić 1989: 61–71; Mardešić 2006: 101–105; Pedišić, Podrug 2008: 88–94; Pellicioni 2012; Konestra, Lipovac Vrkljan 2018: Fig. 3). Od toga je razdoblja distribucija italskih proizvoda znatno proširena, dok je pretpostavljena lokalna proizvodnja (ne samo GK već i kućanske keramike) do sada interpretirana tek u svojstvu osiguravanja pojedinih urbanih ili vojnih potreba (Wilkes 1979; Pedišić, Podrug 2008: 87–88, 100, 102; Miletić 2011: 267; Borzić 2014: 292). Rimska GK dosad je potaknula dublji interes tek svojim epigrafskim sadržajem, dok još uvijek nedostaju sveobuhvatne studije regionalnih ili lokalnih tipologija.

Nalaz (prvi put naslućen 1983. godine, a potom sustavno istraživan od 2004. godine) (Starac 1991; Lipovac Vrkljan 2009; 2011; 2016a) keramičarskoga proizvodnog središta u Crikvenici / *Ad Turres* (sjeveroistočni Jadrana, Kvarnerski zaljev) (sl. 2), omogućava pregled proizvodnih i distribucijskih modela keramike i GK barem u sjevernome dijelu provincije, odnosno antičkoj Liburniji (Lipovac Vrkljan, Konestra

1 Rad je nastao u sklopu projekta *RED – Rimska ekonomija u Dalmaciji: proizvodnja, distribucija i potražnja u svijetlu keramičarskih radionica* Hrvatske zaklade za znanost (HRZZ, IP-11-2013-3973), koji se provodio od 2014. do 2018. godine. Ranija verzija istraživanja predstavljena je na znanstvenome skupu *International Conference on Roman Brick and Tile. Past, present and future of the study of Roman ceramic building materials*, Ghent 2015, s predavanjem: "Brick and tiles of *Sextus Metillius Maximus*: a pottery workshop at Crikvenica (Croatia) and its assortment of ceramic building materials". Autori zahvaljuju kolegama koji su nam tom prigodom pružili niz korisnih komentara i informacija, kao i recenzentima na nizu opaski i savjeta za poboljšanje rada.

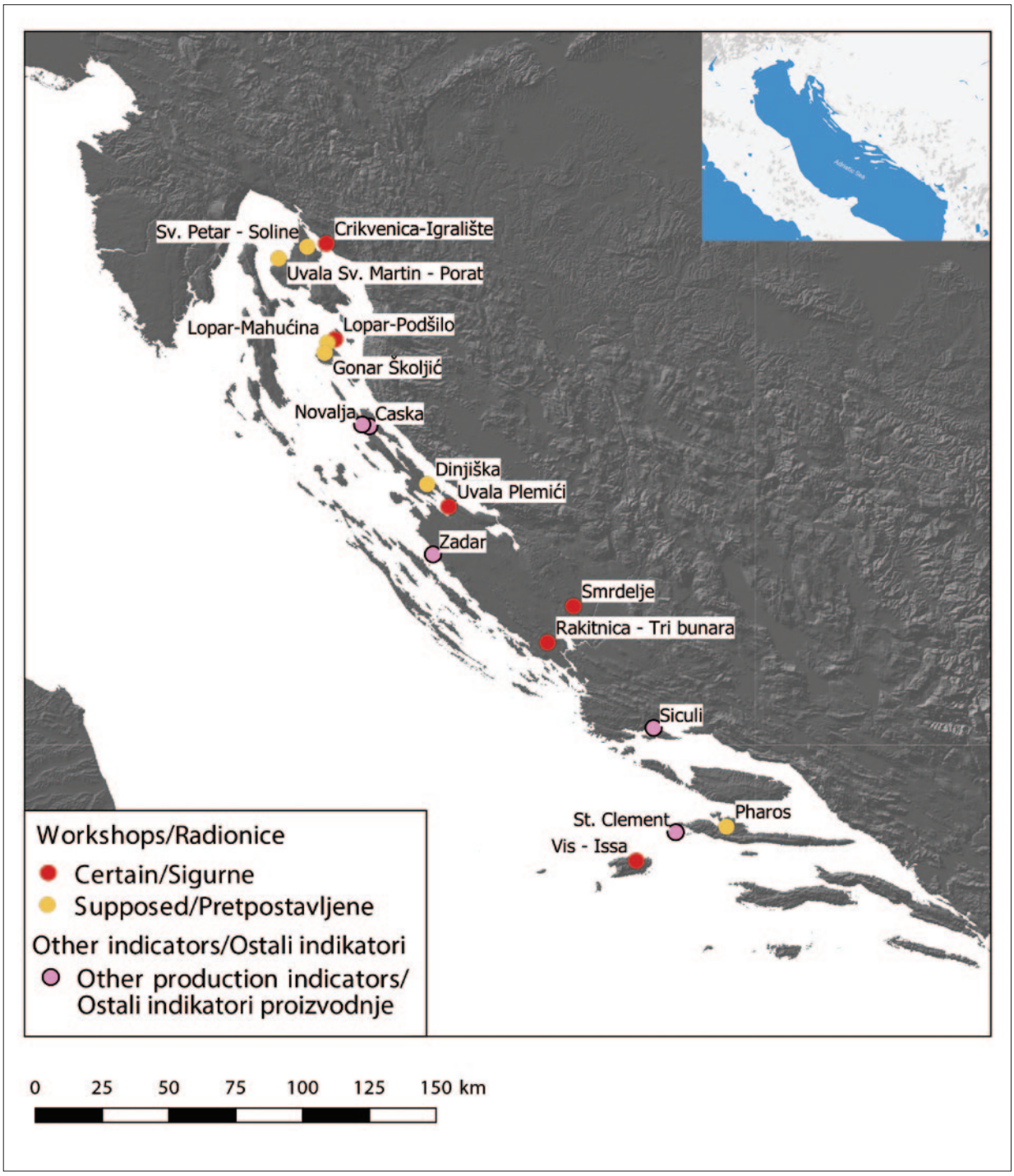

Fig. 1 Pottery workshops on the eastern Adriatic (adapted by A. Konestra after: Lipovac Vrkljan et al. 2018: Fig. 1)
Sl. 1 Keramičarske radionice istočnoga Jadrana (izmijenila A. Konestra prema: Lipovac Vrkljan et al. 2018: Fig. 1)

Liburnia (Lipovac Vrkljan, Konestra 2018a).[2] This paper will analyse the typology, production methods, and distribution of CBM to tackle aspects such as the organisation of crafts and their role in the economy of the province.

2018a).[2] U ovome ćemo radu, polazeći od analiza tipologije, metoda oblikovanja i distribucije GK, usmjeriti naš interes na organizaciju obrta i ulogu ovih proizvoda unutar gospodarstva provincije.

2 After the discovery of the *figlina* of Crikvenica, apparently isolated pottery kilns were unearthed in Vodice (Brajković 2011) and Lopar on the Island of Rab; the latter was recently connected to a rural residential and productive complex (Lipovac Vrkljan, Šiljeg 2012; Welc 2018; Konestra et al. 2019). There may be another pottery workshop at the site in Plemići Cove near Ljubač in the Zadar area, where a preliminary survey was done recently (Ilkić 2013; Parica, Ilkić 2017; 2018; Welc 2018).

2 Nakon nalaza crikveničke *figline*, naizgled izolirane peći pronađene su kod Vodica (Brajković 2011) i u Loparu na otoku Rabu, no potonju je danas moguće povezati uz ruralni rezidencijalni i proizvodni kompleks (Lipovac Vrkljan, Šiljeg 2012; Welc 2018; Konestra et al. 2019). Još je jedna radionica pretpostavljena na temelju recentnih preliminarnih istraživanja na lokalitetu u uvali Plemići kod Ljubča, nedaleko Zadra (Ilkić 2013; Parica, Ilkić 2017; 2018; Welc 2018).

THE SETTING AND ORGANISATION OF THE POTTERY AND CERAMICS PRODUCTION CENTRE IN CRIKVENICA

Crikvenica is located in the Kvarner Gulf, the northernmost large bay on the eastern Adriatic. Along with its hinterland, Crikvenica is to be identified with the ancient *Ad Turres* from Peutinger's Map and other sources (Suić 2003: 428–431, 447–448; Starac 2000: 84) (Fig. 2). In antiquity, the area from the border with the *X regio Venetia et Histria* to the river Krka in the south was not only a part of the province of *Dalmatia*, but also belonged to a region identified as *Liburnia*, legally organised as the *conventus Liburnorum* seated in *Scardona* (Demicheli 2015: 96).

Maritime and road connections of *Ad Turres* were insured by its position on the mouth of the Dubračina stream, in Antiqutiy probably forming a deeper cove, and in the vicinity of a gorge connecting it to the Vinodol valley, where the main road *Aquileia – Salona – Dyrrachium* passed (Lipovac Vrkljan, Starac 2014: 93–102) (Fig. 2). This position, so close to the fertile and resource-rich Vinodol valley, must have been carefully chosen for establishing a pottery workshop. The hinterland closest to Crikvenica is characterised by woodlands, pastures, agricultural lands, and Slani Potok, one of the largest clay pits of the region (Konestra, Lipovac Vrkljan 2018: 25–28, Figs. 9–11), while the complex itself is situated within the clayey alluvial valley of the Dubračina (Benac et al. 1992: 40).

In addition to the geomorphological data, brick stamps from the *figlina*, mentioning a *saltus* and its owner *Sextus Me(u)tillius Maximus*, indicate that the production facilities were located on a property devoted to forest and pasture exploitation, and to a lesser degree to agricultural activities (Soricelli 2004: 97–107; Volpe 2008; Lipovac Vrkljan, Konestra 2018a: 27 with earlier bibliography). Such a choice of position, showing awareness of its natural and communication possibilities, indicates a planned investment of an Italic individual. As for who this person was, the readings of MT^LL give rise to two options (*infra* and Fig. 5). If *Metillii* is chosen, the family could be linked with Roman aristocracy and similar properties in southern Italy (Di Giuseppe 2007: 172; 2008: 389–390; 2010: 176–178; Silvestrini 1994: 90–91), although the known evidence on the *Metilii* indicates the spelling with one L. On the other hand, a recent interpretation of the reading of the stamp suggests that it should rather be transliterated as *Mutillius*, a family linked to the Aquileian urban and senatorial milieu, which was present in both *Liburnian* and the wider north Adriatic epigraphic evidence, with members known to have been involved in the wine business (Pietruszka, Wypijewski 2016: 285). Moreover, the recent finds of Crikvenica type 1 amphorae at Aquileia (Gaddi, Maggi 2017: 278; Maggi 2018) and the attested presence of an Aquileian urban magistrate in the Kvarner area, at Ilovik island, possibly in relation to the large Roman estate on the nearby St. Peter Island (Kurilić, Serventi 2015: 238–241), make the latter possibility even more plausible. Either way, *Sextus Me(u)tillius Maximus* does not appear in other epigraphic sources.

The planned nature of the setup of the *figlina* is evident from its spatial organisation (for its spatial organisation see: Pallecchi 2008: 327–328; Hasaki 2011: 12–24), as the layout uncovered during the investigations of the site indicates

LOKACIJA I ORGANIZACIJA CRIKVENIČKOGA KERAMIČARSKOG PROIZVODNOG SREDIŠTA

Crikvenica se nalazi u Kvarnerskome zaljevu, najsjevernijem zaljevu istočnoga Jadrana, a zajedeno sa svojim zaleđem moguće ju je identificirati s antičkim *Ad Turresom* s Peutingerove karte te drugih izvora (Suić 2003: 428–431, 447–448; Starac 2000: 84) (sl. 2). U antici, iako dijelom provincije Dalmacije, područje od granice s *X regio Venetia et Histria* do rijeke Krke na jugu tvorilo je regiju *Liburniu*, pravno organiziranu u *conventus Liburnorum* sa sjedištem u Skardoni (Demicheli 2015: 96).

Ad Turres bio je dobro povezan kako morskim, tako i cestovnim komunikacijama s obzirom na svoj smještaj na ušću rijeke Dubračine, odnosno po svemu sudeći u prošlosti znatno dublje uvale i uz kanjon kojim je omogućen prolaz prema Vinodolu i glavnoj prometnici *Aquileia – Salona – Dyrrachium* koja je njime vjerojatno prolazila (Lipovac Vrkljan, Starac 2014: 93–102) (sl. 2). Blizina plodnoga i resursima bogatoga Vindola govori u prilog pomnome odabiru položaja za smještanje keramičarske radionice. Šume, pašnjaci, poljoprivredna zemljišta i jedno od većih gliništa u priobalju Liburnije (Slani potok) karakteriziraju neposredno zaleđe Crikvenice (Konestra, Lipovac Vrkljan 2018: 25–28, Figs. 9–11), dok je sam proizvodni kompleks smješten u glinovitoj plavnoj dolini Dubračine (Benac et al. 1992: 40).

Uz geomorfološka odličja, i pečati na tegulama ove radionice koji spominju *saltus* i njegova vlasnika *Sexta Me(u)tillia Maxima*, indikativni su za smještanje proizvodnje na posjedu koji primarno iskorištava šume i pašnjake, a u manjoj se mjeri bavi poljoprivrednim aktivnostima (Soricelli 2004: 97–107; Volpe 2008; Lipovac Vrkljan, Konestra 2018a: 27 s ranijom literaturom). Izbor položaja, koji uvažava kako prirodne tako i prometne mogućnosti, govori u prilog planskoga ulaganja osobe po svemu sudeći italskoga porijekla. O tome tko je ona doista bila moguće je iznijeti dvije pretpostavke koje se temelje na čitanju MT^LL (*infra* i sl. 5). Ukoliko se opredijelimo za *Metillii*, tada je obitelj moguće povezati s rimskom aristokracijom i sličnim posjedima u južnoj Italiji (Di Giuseppe 2007: 172; 2008: 389–390; 2010: 176–178; Silvestrini 1994: 90–91), iako do sada zabilježeni natpisi indiciraju na isključivo pisanje *Metilii* s jednim slovom L. S druge strane, recentna (re)interpretacija pečata predložila je transliteraciju *Mutillius*, koja odgovara obitelji povezanoj s Akvilejskim gradskim i senatorskim krugom, a prisutna je u epigrafskome korpusu Liburnije i gornjega Jadrana, dok su njezini pripadnici poznati kao poduzetnici vinom (Pietruszka, Wypijewski 2016: 285). Nedavni nalazi amfore Crikvenica tip 1 u Akvileji (Gaddi, Maggi 2017: 278; Maggi 2018) i potvrđena prisutnost akvilejskoga gradskog magistrata na kvarnerskome području, preciznije na otoku Iloviku, no uz moguću poveznicu s velikim rimskim kompleksom na otoku sv. Petar (Kurilić, Serventi 2015: 238–241), čine potonju pretpostavku tim vjerojatniju. Kako bilo, *Sextus Me(u)tillius Maximus* nije poznat iz drugih epigrafskih izvora.

Planski karakter utemeljenja *figline* razvidan je u njezinoj prostornoj organizaciji (vidi Pallecchi 2008: 327–328; Hasaki

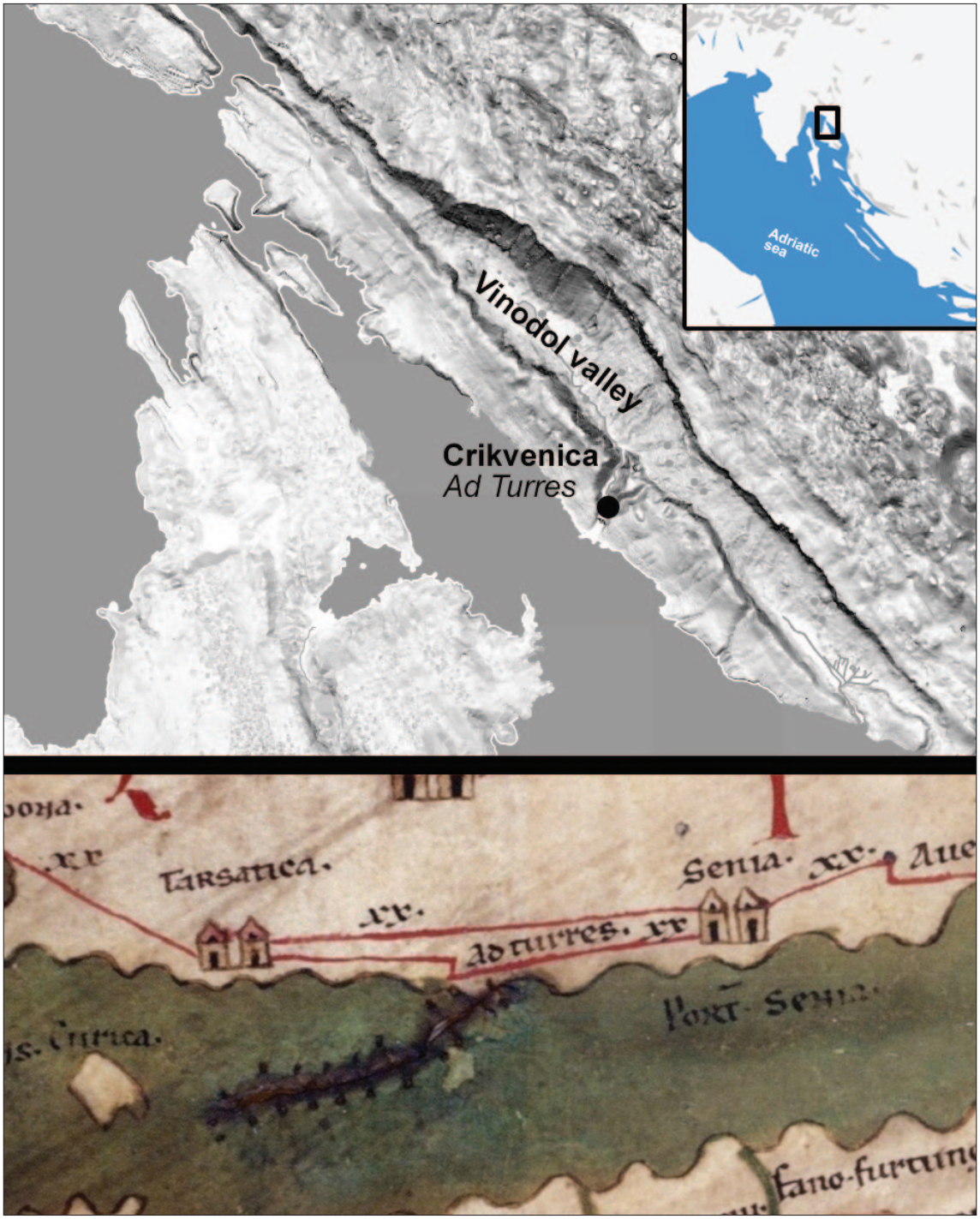

Fig. 2 DEM of the Crikvenica area with the location of the *figlina* (dot), the Vinodol valley, the ancient coastline and basic hydrography (DEM base: http://geoportal.dgu.hr/). At the bottom, a section of the *Tabula Peutingeriana* showing *Ad Turres* on the road between *Tarsatica* and *Senia* (http://www.euratlas.net/) (made by: A. Konestra)

Sl. 2 DMR područja Crikvenice s položajem figline (krug), Vinodola, antičke obalne linije i osnovne hidrografije (DMR podloga: http://geoportal.dgu.hr/). Dolje: isječak Tabule Peutingeriane s prikazom Ad Turresa na cesti između Tarsatice i Senie (http://www.euratlas.net/) (izradila: A. Konestra)

the existence of both open-air and covered spaces, as well as the presence of some major production features: clay basins, pottery kilns, rooms of various dimensions, and ample open spaces (courtyards) (Fig. 3). The existence and layout of these facilities imply an elaborate workflow organisation and suggest a complex pottery production technology with the division of activities and labour (Peña, McCallum

2011: 12–24 za prostornu organizaciju *figlina*), čiji raster obuhvaća otvorene i zatvorene prostore te nekoliko značajnih proizvodnih elemenata: bazene za glinu, keramičarske peći, prostorije različitih dimenzija i prostrane otvorene prostore – dvorišta (sl. 3). Postojanje i oblikovanje navedenih objekata implicira razrađenu organizaciju tijeka rada i kompleksnu tehnologiju proizvodnje s podjelom aktivnosti i rada (Peña,

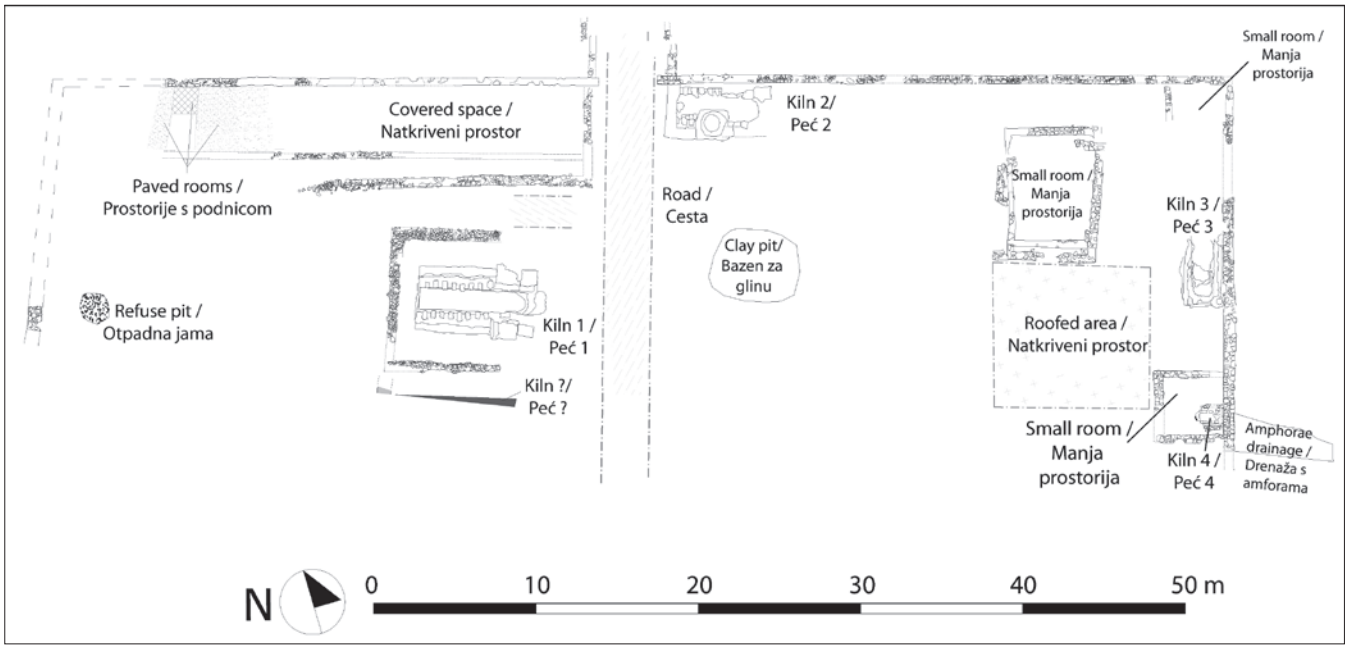

Fig. 3 Crikvenica–Igralište: simplified site layout with major structures (Archive of the Institute of Archaeology, elaboration: A. Konestra)
Sl. 3 Crikvenica – Igralište pojednostavljeni tlocrt s važnijim strukturama (Arhiva Insitituta za arheologiju, doradila: A. Konestra)

2009: 69–72, 75–76). The cohesion of these facilities within a production centre is indicated by the fencing wall which encompasses the site on at least three sides. The aforementioned connection with the major communication routes is once again evident from the workshop features, which include a road exiting the complex and heading north towards Vinodol and in all probability harbour structures on the coast to the south of the complex (Lipovac Vrkljan 2009: 310; 2016a: 42–46; for such features in *figlinae* see Pallecchi 2007: 182) (Fig. 4).

The dating of the complex, broadly provided by ^{14}C dates, spans the period from the second half of the 1st cent. BC to the 3rd cent. AD, but the typology of the produced pottery helps narrow its largest output to the time frame between the 1st cent. AD and the mid-2nd cent. AD.

Pottery and CBM production

Even a quick review of the four kilns uncovered on the site of the workshop clearly shows that they were used to fire different classes of objects; even though they belong to the same type, Cuomo di Caprio IIb (Cuomo di Caprio 2007: 508–525), their dimensions vary from *c.* 1.5 x 1.5 m of the smallest kiln (Kiln 4; Fig. 3) to 7 x 4 m of the largest (Kiln 1; Fig. 3). Some indication of the actual purpose of each kiln is given only by the smallest one (Kiln 4; Fig. 3), which was discovered filled with pyramidal loom-weights (Ožanić Roguljić 2016: 63). Whether the mixed pottery infill of Kiln 3 (Fig. 3) could be interpreted as its last firing is doubtful (Lipovac Vrkljan, Šiljeg 2008: 90–91; 2009: 108–109), just as the shreds of CBM fused with lumps of fired clay that were uncovered in the largest kiln (Kiln 1; Fig. 3) could indicate its collapsed structure rather than its last firing (Lipovac Vrkljan, Šiljeg 2008: 89). The probable existence of further, probably large kilns, is indicated by the stratigraphy of the southern profile of the excavation zone, and by the geophysical prospecting carried out to the south of it (Welc et al. 2016). Nevertheless,

McCallum 2009: 69–72, 75–76). Na koheziju svih sadržaja unutar jednoga proizvodnog središta indicira ogradni zid koji zatvara kompleks s triju strana. Ranije spomenuta povezanost s glavnim komunikacijskim pravcima također je razvidna iz radioničkih objekata koji uključuju cestu koja se izlazeći iz kompleksa proteže prema sjeveru i Vinodolu, kao i pretpostavljeno pristanište smješteno na obali, južno od radionice (Lipovac Vrkljan 2009: 310; 2016a: 42–46; za slična rješenja unutar *figlina* vidi Pallecchi 2007: 182) (sl. 4).

Dataciju kompleksa ^{14}C datumi smještaju u široko razdoblje od druge polovice 1 st. pr. Kr. do 3. st. po. Kr., no prema tipologiji proizvedene keramike najveći zamah proizvodnje moguće je pretpostaviti unutar 1. st. i polovice 2. st. po. Kr.

Proizvodnja keramike i GK

Već preliminarnim pregledom četiriju peći koje su otkrivene na lokalitetu radionice razvidno je da su one korištene za pečenje različitih klasa predmeta, jer iako sve pripadaju istome, Cuomo di Caprio IIb tipu (Cuomo di Caprio 2007: 508–525), njihove dimenzije variraju od 1,5 x 1,5 m najmanje (peć 4; sl. 3) do 7 x 4 m najveće peći (peć 1; sl. 3). Jedino je u slučaju najmanje peći (peć 4; sl. 3) moguće pretpostaviti namjenu, s obzirom da je njezina zapuna bila sastavljena isključivo od piramidalnih utega za tkalački stan (Ožanić Roguljić 2016: 63). Upitno je u kojoj je mjeri heterogenu zapunu peći 3 (sl. 3) moguće promatrati kao posljednje u njoj pečene proizvode (Lipovac Vrkljan, Šiljeg 2008: 90–91; 2009: 108–109), dok je u slučaju ulomaka GK slijepljenih s grumenjem amorfne pečene gline koji su pronađeni u najvećoj peći (peć 1; sl. 3) izglednije smatrati ih ostatkom njene porušene strukture nego posljednjega pečenja (Lipovac Vrkljan, Šiljeg 2008: 89). Uz ove, postojanje dodatnih, vjerojatno većih peći, moguće je pretpostaviti prema stratigra-

Fig. 4 Lower cutaways on *tegulae* from Crikvenica: 1 square; 2 oblique (photo: A. Konestra, G. Lipovac Vrkljan)
Sl. 4 Donji utor na tegulama iz Crikvenice: 1 kvadratni; 2 ukošeni (snimile: A. Konestra, G. Lipovac Vrkljan)

only the largest kiln(s) could have provided enough space for firing CBM, *tegulae* in particular.

Such data is backed by the analysis of 50 tons of pottery and CBM waste collected on the site so far. The analysis of the typology extrapolated from the pottery wasters within Kiln 3 identified around one hundred types of common ware and tableware including some specific products such as incense burners, strainers, and shapes of double interpretation (Ožanić Roguljić 2011; 2012; 2014; 2016). A similarly wide range of types has been noted for amphorae as well, as proven by the 11 types identified so far (Lipovac Vrkljan 2011; 2016b: 57; Lipovac Vrkljan, Ožanić Roguljić 2013: 257). An important product of the *figlina* is the pyramidal loom-weight, which is additional proof of wool and textile production in the *Liburnian* and wider *Dalmatian* area that was hinted at in ancient sources (Ožanić Roguljić 2016: 63; Konestra, Lipovac Vrkljan 2018: 128).

The CBM produced at the *figlina* of *Sextus Me(u)tillius Maximus* show a similar diversification, which will be now analysed.

CBM typology

The production of six main types of CBM has been confirmed in Crikvenica so far (Lipovac Vrkljan 2016c: 66–67). Some types present several variants identified on the basis of their dimensions and/or morphological features. CBM spans materials from roofing to materials for thermal structures/heated rooms. The rare finds of types of brick, a material rarely used in the architecture of ancient *Dalmatia* (Kilić-Matić 2004: 91–109), can be seen as a product meant for internal usage within the *figlina*, rather than for commercial output. All CBM shapes vary slightly due to the processes of drying and firing, but also due to the nature of the assemblage (waste material), therefore only approximate dimensions will be given for each type and variant.

The fabric(s) of CBM from Crikvenica is basically very

fiji južnoga profila iskopa te prema rezultatima geofizičkih mjerenja koja su provedena južnije (Welc et al. 2016). Ipak, samo je najveća peć mogla osigurati dovoljno prostora za pečenje GK, posebno tegula.

Uz ove podatke valja pridodati rezultate analize više od 50 tona keramičkoga otpada koji je do sada prikupljen na lokalitetu. Tipološkom analizom odbačenih predmeta pronađenih unutar peći 3 utvrđeno je više od stotinu tipova kućanskoga i stolnoga posuđa te specifičnih oblika kao što su kadionice, cjediljke i pojedini oblici dvojake interpretacije (Ožanić Roguljić 2011; 2012; 2014; 2016). Slična tipološka raznolikost primijećena je i kod amfora koje se javljaju s 11 do sada identificiranih tipova (Lipovac Vrkljan 2011; 2016b: 57; Lipovac Vrkljan, Ožanić Roguljić 2013: 257). Važan proizvod radionice piramidalni su utezi za tkalački stan koji su dodatna potvrda liburnske i šire dalmatinske proizvodnje vune i tekstila koje su ranije pretpostavljene na temelju spomena u antičkim izvorima (Ožanić Roguljić 2016: 63; Konestra, Lipovac Vrkljan 2018: 128).

GK proizvedena u *figlini Sexta Me(u)tillia Maxima* pokazuje jednaku diversifikaciju, koja će biti predmetom detaljnije analize.

Tipologija GK

Do sada je unutar crikveničke radionice utvrđena proizvodnja šest osnovnih tipova GK (Lipovac Vrkljan 2016c: 66–67). Pojedini se tipovi javljaju u nekoliko varijanti identificiranih na temelju dimenzija i/ili morfoloških značajki. GK javlja se u rasponu od materijala za krovne pokrove do elemenata potrebnih za termalne strukture/grijane prostore. Rijetke nalaze većih opeka, materijala koji se tek iznimno javlja u arhitekturi rimske Dalmacije (Kilić-Matić 2004: 91–109), radije bismo interpretirali kao proizvod namijenjen korištenju unutar *figline* nego za daljnju komercijalizaciju. U

similar to that used for the manufacture of the rest of the assemblage, within which eight fabrics were identified (Ožanić Roguljić 2018: 38, Fig. 1). Among these, Fabrics 3, 4, and 6 were used for the manufacture of CBM, but there are often larger calcite inclusions within larger types (such as *tegulae*). Also, a certain variability results from the level of (over)firing, often recognised in the dumps of the *figlina*. Thus the colour varies from the orange of well fired examples to darker red, pinkish, and very pale brown (visible in the examples in Pl. 3–4).

Roofing tiles

Both *tegulae* and *imbrices* were produced in Crikvenica, but no intact examples of *tegulae* have been found on the site. The standard dimensions of *tegulae*, as assumed on the basis of an intact specimen from the Čikat – Pločice underwater site, are 60 x 45 cm, while their shape is slightly trapezoidal (Radić Rossi 2011: 20–21). Two variants have been identified on the basis of the shape of the lower cutaways: variant 1 has a square cutaway, while variant 2 has an oblique one (Fig. 4). In both cases the cutaways were made by blocks during the shaping in the former and are not knife cut (Shepherd 2006: 169–170; 2007: 60, Fig. 6; Warry 2006: 22). Flange thickness varies throughout the length of the tile, from 1.7 cm to 4 cm. Flange shape varies more substantially, but the profile is always rounded. The recorded variations are probably partly due to the fact that the *tegulae* recovered on the site are wasters, often with major shaping mistakes. In most cases there is a finger-groove next to the flange.

Different markings are present on the upper side of the *tegulae*, which are finely levigated in most cases, while the lower side is left rough, which indicates sanding. Purposely applied markings include "signatures" made with the fingers and brick stamps, both applied on wet clay. Such "signatures" include single to quadruple semicircular concentric markings, two vertically set irregular U-shaped markings, and wavy lines (Pl. 1: 4; 2: 3). The first two sets are always applied above the lower edge of the tile, while the latter is found in different positions and might have been made with a stick or another tool rather than with the fingers (Pl. 1: 6). Also, a set of single semicircular marks seems to have been made with a tool as well (Pl. 4: 3). The function of these markings is still unclear, and their use as artisans' signatures and marks made to check dryness have both been proposed, though without a definitive answer (Shepherd 2006: 172–175 with earlier bibliography; for a different mark type see also Lazar 2006: 32). Just as noted for certain examples from the Vingone workshop at Scandicci (Shepherd 2006: 174, Fig. 149), finger marks cutting the previously applied stamps are present in Crikvenica, but cases showing the opposite have also been found here (Pl. 4: 4–5).

The two-row rectangular stamp found only on some of the products were probably applied using a two-part stamp, which is indicated by the frequent finds of oblique, upside-down or inverted rows where the lower row appears above the upper one (Fig. 5; Pl. 3: 11). While the frame of the stamp is produced by the margins of the dies, with no other decorative feature, the letters and signs are in relief, rendered in a regular *capitala* font.

svim oblicima GK javljaju se manja odstupanja nastala uslijed procesa sušenja i s obzirom na prirodu nalaza (otpadni materijal), stoga će se u nastavku iznijeti prosječne dimenzije tipova i varijanti.

Keramička struktura crikveničke GK vrlo je slična ostatku asortimana u kojem je izolirano osam različitih struktura (Ožanić Roguljić 2018: 38, Fig. 1). GK javlja se u strukturama 3, 4 i 6, međutim unutar oblika većih dimenzija (na primjer tegula) često se izdvajaju veće inkluzije kalcita. Također, određenu razlikovnost valja pripisati i razini (pre)pečenja koja unutar radioničkoga otpada često varira, stoga i sama boja varira od narančaste pravilno pečenih ulomaka do tamnije crvene, ružičaste i svjetlo smeđe (usporedi na primjerima na T. 3–4).

Elementi krovnoga pokrova

Crikvenička radionica proizvodila je kako *tegulae*, tako i *imbrices*, no niti jedna tegula na lokalitetu nije pronađena cjelovita. Njihova standardna dimenzija, pretpostavljena na temelju cjelovitoga primjerka s podmorskog lokaliteta Čikat – Pločice, iznosi 60 x 45 cm, dok je njihov oblik lagano trapezoidni (Radić Rossi 2011: 20–21). Na temelju oblikovanja donjega utora naznačene su dvije varijante: ona s kvadratnim (varijanta 1) te ona s ukošenim utorom (varijanta 2) (sl. 4). U oba je slučaja utor izrađen pomoću kalupa tijekom oblikovanja tegule, odnosno nije naknadno izrezan nožem (Shepherd 2006: 169–170; 2007: 60, Fig. 6; Warry 2006: 22). Debljina krilca varira duž njihove dužine, i to od 1,7 cm do 4 cm, dok su kod njihova oblikovanja zamjećenja znatnija odstupanja, iako se uočava nastojanje zadržavanja zaobljenoga profila. Naznačene razlikovnosti valja dijelom pripisati činjenici što su tegule s lokaliteta mahom proizvodni otpad, pa se često uočavaju i znatne oblikovne greške. U većini slučajeva bazu krilca prati utor učinjen prstom.

Na gornjoj površini tegula, koja je obično zaglađena, pojavljuju se različite oznake, dok je donja površina najčešće gruba, što upućuje na korištenje pijeska pri oblikovanju. Namjerne oznake uključuju „potpise" oblikovane prstima i pečate, u oba slučaju utisnute u mokru glinu. „Potpisi" uključuju polukružne koncentrične oznake koje se javljaju u jednostrukoj pa sve do četverostruke varijante, dvostruke nasuprotne oznake u obliku slova U i valovite linije (T. 1: 4; 2: 3). U prva dva slučaja oznake se nalaze iznad donjega ruba tegule, dok se potonje nalaze na različitim položajima te su vjerojatno oblikovane štapićem ili nekim drugim alatom izglednije nego prstima (T. 1: 6). Uz njih, grupa jednostrukih polukružnih oznaka također je vjerojatno izrađena alatkom (T. 4: 3). Funkcija opisanih oznaka nije posve razjašnjena, pa se najčešće interpretiraju kao oznake keramičara ili tragovi nastali testiranjem suhoće predmeta, no definitivnoga odgovara za sada nema (Shepherd 2006: 172–175 s ranijom literaturom; za različite oznake vidi i Lazar 2006: 32). U Crikvenici, kao što je primijećeno i u radionici Vingone u Scandicci (Shepherd 2006: 174, Fig. 149), oznake utisnute prstima ponekad se nalaze iznad pečata, no u našem je slučaju primijećena i obrnuta situacija (T. 4: 4–5).

Četvrtasti dvoredni pečat, utvrđen na samo dijelu asortimana, po svoj je prilici utiskivan uz pomoć dvodijelnoga pečatnika na što upućuju česti nalaz ukošenih, naopako okrenutih ili invertiranih redova gdje se donji red javlja

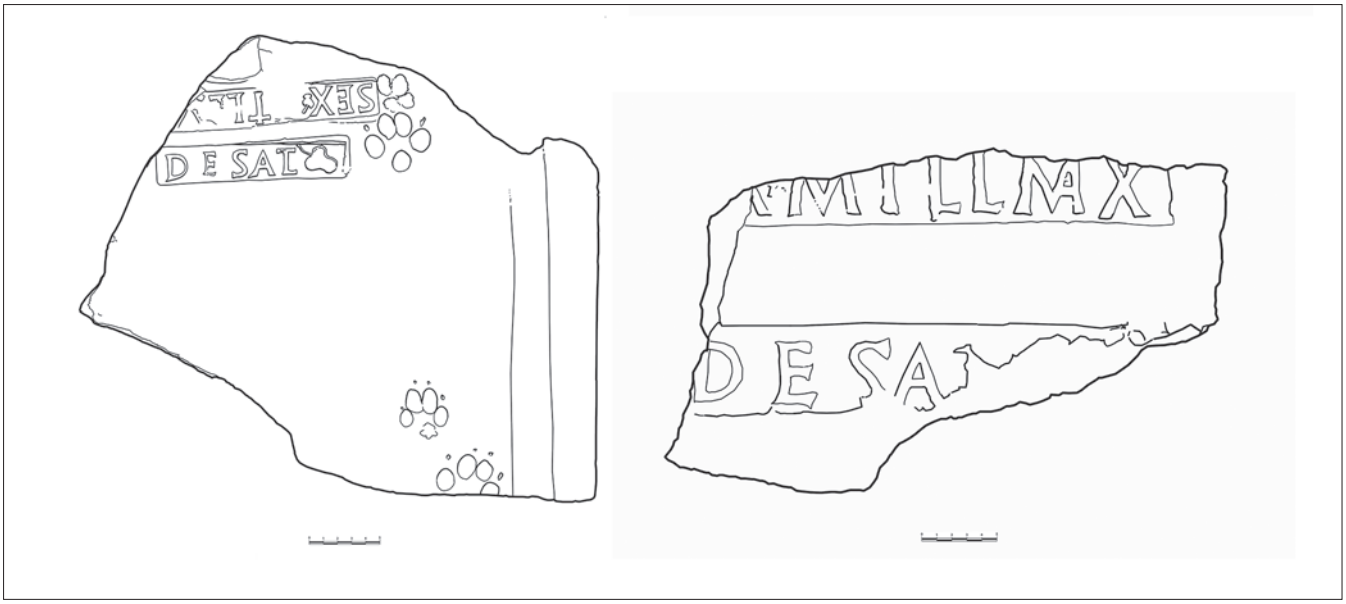

Fig. 5 Tiles with stamps of *Sex. Me(u)tillius Maximus* (drawings: M. Gregl)
Sl. 5 *Tegule s pečatom* Sex. Me(u)tillius Maximus *(crteži: M. Gregl)*

The stamp bears the following text:
DE SAL^T
SEX•MT^LL M^AX *hedera distinguens*
Transliterated as:
De saltu
Sexti Me(u)tilli Maximi

The *imbrices*, clearly shaped to match the *tegulae*, come in a single trapezoidal type. These are the dimensions of the single intact example from the *figlina* site: length: 51.5 cm, width (upper and lower): 15 cm to 19.5 cm, thickness: 1.6–2 cm[3]. As for their shaping, the rough lower side indicates the placement of the former, while the smoothed upper surface was the one to undergo the shaping process. Striations running the length of the *imbrices* are sometimes found on these objects, indicating levigation, possibly with wet hands, as proposed for some analogies (cf. Shepherd 2006: 182–183, Fig. 165). Both longitudinal and horizontal edges appear thickened (Pl. 2: 1).

The presence of only two types of tiles which differ in the lower cutaway shape, and one type of *imbrex* which fits them indicates a standardized array of roofing CBM produced by the pottery workshop at Crikvenica, as these two products need to be complementary when used for roof covering.

CBM used for heating systems

The pottery workshop at Crikvenica produced a whole array of materials necessary for setting up a thermal or heated complex. Box-flue tiles (*tubuli*) and rounded bricks for building the *pilae* (*suspensurae*) were produced purposefully for this particular usage; we can add to this array of products also *spicae* tiles and perhaps smaller square bricks that could have been used in such complexes, but also in other structures. *Suspensurae* are rarely found whole at Crik-

3 The *imbrices* produced at Crikvenica have been uncovered on the cape Margarina – Susak island shipwreck. They measure 56 x 16/20 cm (Radić Rossi 2011: 23).

iznad gornjega (sl. 5; T. 3: 11). Okvir pečata oblikovan je rubom pečatnika i ne sadrži dekorativne elemente, dok su znakovi i slova ispisana pravilnom kapitalom, u reljefu.

Tekst pečata glasi:
DE SAL^T
SEX•MT^LL M^AX *hedera distinguens*
Transliterirano:
De saltu
Sexti Me(u)tilli Maximi

Oblik imbreksa razvidno je prilagođen kako bi odgovarao tegulama te se ovi predmeti javljaju samo s jednim trapezoidnim tipom. Dimenzije jedinoga cjelovitog primjerka pronađenoga unutar radionice jesu: dužina: 51,5 cm; širina (gornja i donja): 15 cm do 19,5 cm; debljina: 1,6–2 cm.[3] Donja, gruba strana upućuje na postupak oblikovanja i položaj kalupa, dok je gornja zaglađena strana očigledno prolazila proces oblikovanja. Ponekad se javljaju crte koje se naziru cijelom dužinom imbreksa i upućuju na zaglađivanje, moguće mokrim rukama, kao što je predloženo za pojedine analogije (usp. Shepherd 2006: 182–183, Fig. 165). Rubovi predmeta uvijek su zadebljani (T. 2: 1).

Javljanje svega dvaju tipova tegula koje se razlikuju samo po donjem utoru te jednoga tipa imbreksa koji im dimenzijama i oblikom odgovara, upućuje na standardizirani asortiman krovne GK proizvedene u Crikvenici, što je ključno kod izrade krovnoga pokrova gdje ovi predmeti moraju biti komplementarni.

GK za sustave grijanja

Keramičarska radionica u Crikvenici proizvodila je cijeli asortiman građevinskoga materijala potrebnoga za izradu termalnih ili grijanih sklopova. Šuplje četvrtaste opeke

3 Imbreksi crikveničke proizvodnje pronađeni su na brodolomu kod rta Margarina – Susak. Njihove su dimenzije 56 x 16/20 cm (Radić Rossi 2011: 23).

venica, but their dimensions could be reconstructed on the basis of fragmentary pieces, measuring 19.5 cm in diameter and between 5 and 6 cm in thickness (Pl. 2: 4).

Tubuli are present with one hollow rectangular type only, which measures 30.5 cm in height, 18 cm in longer side width, and 12 cm in shorter side width (Pl. 2: 2). Its wall thickness varies between 1.3 cm and 2 cm. Its shortest sides have rectangular openings (6 x 2 cm), vents meant to allow for horizontal air flow, while the longer sides always have incised keying, probably to facilitate the sticking of mortar. The inside of the box-flue tiles is sanded, while the cross-section is shaped as a rounded rectangle both on the inside and the outside, providing some clues as to the shape of their former.

Bricks and floor tiles

The bricks produced at Crikvenica come in two main shapes: *bipedalis* and smaller square bricks (their dimensions do not match those of either *pedalis* or *bessalis*). The former are a rare find within pottery production centres, and the find of such bricks on the kiln's furnace-chamber floor is indicative of their usage within the *figlina* itself, and they were most probably never or rarely marketed. In fact, early Roman architecture in *Dalmatia* relied heavily on the local limestone (Kilić-Matić 2004: 91–109), used to build *opus incertum* or *opus isodomum* masonry, which almost never included bricks. *Bipedalis* bricks have signatures shaped as a double semicircle placed on the shorter edge of the brick (Fig. 6: 2).

The smaller square bricks were produced in larger quantities, with only one type measuring 25 x 25 cm with a thickness of 5 cm (Fig. 6: 1). The supposed usage for the construction of hypocaust floors is given by the 2nd phase of the thermal complex in *Tarsatica;* even though it was dated to the 3rd cent., it exemplifies the usage of these square bricks as the uppermost and lowermost element in the *pilae* (Matejčić 2013: 44), otherwise built with rounded *suspensurae* (Pl. 2: 5), although they could have been used to build the whole height of the *pilae* as well (see also Shepherd 2006: 188–189; Lazar 2006: 33). A cross-shaped mark with four grooves was sometimes applied to the bricks of this type (Pl. 4: 1).

Rectangular floor tiles, *spicae*, present a somewhat wider range of types, subdivided on the basis of the dimensions of their shorter side (Pl. 2: 3a–d):

– Type 1: 6.5–7 cm,
– Type 2: 7–8 cm,
– Type 3: 8–9 cm,
– Type 4: 9–9.5 cm.

The dimensions of the longer sides are not consistent and can vary between 11 and 13 cm. *Spicae* thickness is also variable (from 1.6 cm to 2 cm), but the most common dimensions amount to 1.7 cm, 1.8 cm, and 2 cm. Type 2 and 3 are the most common, with the length of the longer side measuring 12–12.5 cm.

It is hard to say at this point whether this typological diversity results from a specific time frame of production or from the supposed purpose of each type, as no analysis of *opus spicatum* floors has been carried out in the region so far. In any case, such variability seems to be common throughout the Empire (McComish 2015: 15).

– tubuli – i one kružne (*suspensura*) ciljano su proizvođene za ovu namjenu, uz koju bismo mogli povezati i *spicae* te manje četvrtaste opeke koje su se međutim mogle koristiti i unutar drukčijih struktura. Crikveničke suspenzure rijetko nalazimo cjelovite, no dimenzije je moguće rekonstruirati i na temelju ulomka, pa im promjer iznosi 19,5 cm, a debljina varira između 5 i 6 cm (T. 2: 6).

Šuplje se opeke javljaju s jednim četvrtastim tipom dimenzija: visina: 30,5 cm, širina duže strane: 18 cm; širina kraće strane: 12 cm (T. 2: 2). Debljina stijenki varira između 1,3 i 2 cm. Na kraćim se stranama nalazi otvor (6 x 2 cm) koji omogućava horizontalnu cirkulaciju zraka, dok se na dužim stranama nalaze urezi koji tvore romboidni uzorak, vjerojatno u funkciji boljega prianjanja zidne žbuke/morta. Unutrašnjost tubula gruba je, vjerojatno uslijed korištenja pijeska, dok su unutarnji i vanjski rubovi mahom zaobljeni, što upućuje na oblik kalupa koji je korišten pri oblikovanju.

Opeke i podne pločice

Crikveničke se opeke dijele na dva osnovna tipa: *bipedalis* i manje kvadratne opeke (čije dimenzije ne odgovaraju ni *pedalis* niti *bessalis* standardu). Prvi je tip rijetki nalaz u keramičarskim radionicama, dok njihov nalaza na podnoj površini komore za sagorijevanje unutar peći upućuje na njihovo korištenje u samoj radionici, pa je njihov plasman na tržište izostao ili je pak bio rijedak. Naime, ranorimsku arhitekturu Dalmacije obilježava korištenje lokalnoga vapnenca (Kilić-Matić 2004: 91–109) slaganoga u *opus incertum* ili *opus isodomum* tehnike unutar kojih se opeke gotovo nikada ne koriste. Na *bipedalisima* javljaju se oznake u obliku dvostrukoga polukruga smještenoga uz rub opeke (sl. 6: 2).

Manje kvadratne opeke proizvodile su se u većim količinama sa samo jednim tipom koji mjeri 25 x 25 cm, a debljina mu iznosi 5 cm (sl. 6: 1). Mogućnost njihova korištenja kod izgradnje podova hipokausta razvidna je na primjeru 2. faze tarsatičkoga termalnog sklopa koja, iako datira u 3. st. po. Kr., pruža uvid u njihovo korištenje kao prvi i posljednji element *pila* (Matejčić 2013: 44) dok ostale elemente čine kružne *suspensurae* (T. 2: 5), iako su poznati i primjeri gdje su kvadratne opeke korištene kroz cijelu visinu *pila* (vidi Shepherd 2006: 188–189; Lazar 2006: 33). Na ovim se opekama ponekad nalaze križne oznake s krakovima sastavljenima od četiri utisnute linije (T. 4: 1).

Četvrtaste podne pločice, *spicae*, nalazimo u nešto širem tipološkom rasponu definiranom na temelju dimenzija njihove kraće strane (T. 2: 3a-d):

– Tip 1: 6,5–7 cm,
– Tip 2: 7–8 cm,
– Tip 3: 8–9 cm,
– Tip 4: 9–9,5 cm.

Dimenzije duže strane znatno variraju između 11 i 13 cm kao i debljina (1,6–2 cm) koja se međutim najčešće javlja s 1,7, zatim 1,8 i 2 cm. Najčešći su tipovi 2 i 3, s duljom stranom koja mjeri 12–12,5 cm.

Vrlo je teško pretpostaviti u kojoj mjeri tipološka raznolikost spika ovisi o kronologiji proizvodnje ili namjeni korištenja, poglavito jer regionalno *opus spicatum* podnice do sada nisu podrobnije analizirane. Međutim, slična tipološka raznolikost bila je tipična duž Carstva (McComish 2015: 15).

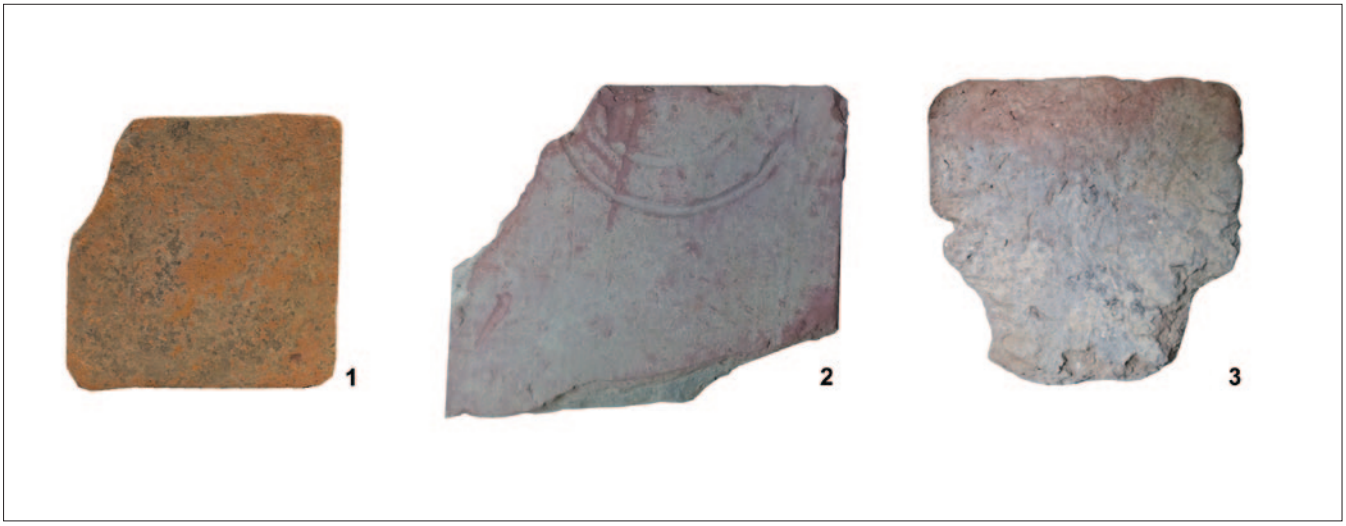

Fig. 6 1–2 bricks from the figlina; 3 kiln oven floor brick (photo: A. Konestra, G. Lipovac Vrkljan; made by: A. Konestra)
Sl. 6 1–2 opeke iz figline; 3 rešetka peći (snimile: A. Konestra, G. Lipovac Vrkljan; izradila: A. Konestra)

Bricks for pottery kiln structure – kiln oven floor

While the use of *bipedalis* bricks has been documented within the *figlina* structures, they may also have been marketed, although no examples have been found so far within the area of distribution of the products from Crikvenica. On the other hand, the bricks with vent-holes utilised for the construction of the kiln oven floors were purposefully produced for internal usage within the workshop. In fact, this type of brick with standardized dimensions (45 x 27 cm, 6 cm thick, indent radius: 4 cm) has been recovered from the infill of the largest kiln (Fig. 6: 3).

The analysis of the oven floor brick structure showed the presence of chaff and sand inclusions within the clay matrix. This information was applied during the fabrication of these elements for the needs of the pottery kiln replica constructed at Crikvenica (Lipovac Vrkljan et al. 2014: 46–47) in order to test the technology of chaff addition as a means to reduce over firing.

Types present with one example

A peculiar fragment of a round *tubulus* discovered in the waste of *figlina* could be interpreted as a vaulting tube, either used in kilns or in architectural vaulting (Pl. 1: 7). The fragment consists of the nozzle and a part of the body of the tube, while both the surface and the break show traces of irregular exposure to fire and overfiring. The surface of the tube is smooth and the shape is regular, pointing to a wheel-thrown shaping process. There are very shallow ribs on the lower end of the tube fragment. Because of the fragmentary state of the object, it is impossible to define precisely its total dimensions and original shape. Since the fragment consists of the nozzle and the upper part of the tube amounting to *c.* 10 cm, it seems plausible that its original length was at least 15 cm. Whether the tube was in fact hollow on both ends remains doubtful, as it might have had a flat or hollow base at the other end. When the fragment from Crikvenica is compared to vaulting tubes of various origins (Arslan 1965: Figs. 74–81; Lancaster 2012: Fig. 9; Royal, Tusa 2012: 44, Fig. 12) – especially its assumed di-

Opeke korištene unutar strukture peći – rešetka

Iako su *bipedalis* opeke poglavito korištene unutar radionice, njihov plasman na tržište nije moguće posve isključiti, iako do sada niti jedan primjer nije utvrđen na području distribucije crikveničke keramike. S druge strane, opeke s polukružnim urezima korištene za izradu rešetaka peći namjenski su se proizvodile za interno korištenje u radionici. Naime, ove opeke standardiziranih dimenzija (45 x 27 cm; 6 cm debljine; radius ureza: 4 cm) pronađene su unutar zapune velike peći (sl. 6: 3).

Analiza opeka rešetke ukazala je na dodavanje pljeve i primjesa pijeska u keramičku smjesu. Ovaj je podatak korišten pri izradi ovih elemenata za gradnju replike keramičarske peći u Crikvenici (Lipovac Vrkljan et al. 2014: 46–47) s ciljem testiranja tehnologije dodavanja pljeve u svrhu reguliranja termalnih značajki.

Tipovi prisutni s jednim primjerkom

Karakteristični ulomak kružnoga tubula koji je pronađen unutar radioničkoga otpada mogao bi se pripisati tubulima za izradu svodova koji su korišteni ili kod izrade peći ili u arhitekturi (T. 1: 7). Ulomak se odnosi na rub i tijelo tubula, a na površini i u presjeku vidljivi su neravnomjerni tragovi izlaganja vatri te je mjestimice i prepečen. Površina je glatka i oblik je pravilan, što upućuje na izradu na kolu. Na donjem dijelu predmeta prisutna su plitka rebra. S obzirom na fragmentarnu sačuvanost nemoguće je odrediti točne dimenzije i izvoran oblik, no s obzirom da sačuvani dio iznosi oko 10 cm, cjeloviti je predmet zasigurno dosezao najmanje 15 cm. Također je upitno je li tubul bio šuplji s obje strane, s obzirom da je s donje strane (nasuprot kljuna) mogao imati ravnu ili pak šuplju bazu. Prema analogijama s tubulima različitoga porijekla (Arslan 1965: Figs. 74–81; Lancaster 2012: Fig. 9; Royal, Tusa 2012: 44, Fig. 12), a posebno s obzirom na pretpostavljene dimenzije, oblik kljuna i ramena, korištenje u građevinske svrhe čini se izglednije nego za svođenje peći. Naime, *ollae* s ponekad šupljim, ravnim dnom, koje su

mensions and the shape of the nozzle and shoulder – its usage as a construction element for vaults does seem more likely than its use in kiln vaulting. In fact, the *ollea* with sometimes hollow flat bases, utilised for the building of kiln vaulting, are more often belly-shaped, with short everted rims instead of nozzles (Laubenheimer 1990: 68–70, Figs. 40–41; Cipriano, Mazzocchin 2011: Fig. 8; Lancaster 2012: Fig. 12; Cipriano, Sandrini 2014: 169, Figs. 8–9).

The development of nozzle tubes and a more massive use of vaulting tubes date from the second half of the 2nd and the 3rd cent. AD onwards (Lancaster 2012: 154), chronologically fitting within the last phase of the *figlina*. Nevertheless, such CBM are very rare on the eastern Adriatic, with two examples from Istria (Vrsar and Pula: Arslan 1965: 48; Lancaster 2016: cat. entry), while the only known examples in *Dalmatia* are from Žirje (Gunjača 1985: 158; Wilson 1992: 128; Lancaster 2016: cat. entry), all of later date. A *uniqum* so far, the vaulting tube fragment from Crikvenica has yet to be fully understood, as there are no vaulted structures anywhere on or near the site, apart from maybe the kilns. There is also a plausible possibility that the piece belongs to the chronologically later, post-*figlina* phase of the late 3rd and the 4th cent. AD, as two graves of that time were excavated on the site (Šiljeg et al. 2013: 123–126; Ožanić Roguljić, Konestra 2016). Nevertheless, such attribution still fails to explain the presence of a so-far single vaulting tube on the site.

se koristile za izradu svodova peći češće su trbušastije, bez kljuna i s kratkim izvijenim rubom (Laubenheimer 1990: 68–70, Figs. 40–41; Cipriano, Mazzocchin 2011: Fig. 8; Lancaster 2012: Fig. 12; Cipriano, Sandrini 2014: 169, Figs. 8–9).

Razvoj tubula s kljunom i masivnije korištenje tubula za izradu svodova datira od druge polovice 2. do 3. st. po. Kr. (Lancaster 2012: 154), što bi se kronološki poklapalo s posljednjom fazom rada radionice. Međutim, ova vrsta GK rijetka je na istočnome Jadranu gdje se javlja s tek dva primjerka u Istri (Vrsar i Pula: Arslan 1965: 48; Lancaster 2016: cat. entry) i svega jednim u Dalmaciji, sa Žirja (Gunjača 1985: 158; Wilson 1992: 128; Lancaster 2016: cat. entry), a svi su znatno kasnije datacije. S obzirom da je crikvenički ulomak za sada jedinstven, njegovu pojavu nije moguće posve razjasniti jer na lokalitetu i u njegovoj okolici, osim peći, nisu ustanovljene druge svođene strukture. Moguće je da on pripada kasnijoj, post-radioničkoj fazi lokaliteta koja se smješta u kasno 3 i 4. st. i kojoj pripadaju dva istražena groba (Šiljeg et al. 2013: 123–126; Ožanić Roguljić, Konestra 2016). No niti to ne objašnjava pojavu za sada samo jednoga tubula za gradnju svodova.

Fragmentarni primjerci kružnih cijevi različitih dimenzija također su utvrđeni u radioničkome otpadu te su moguće korišteni unutar sustava odvodnje (sl. 7: 2). Također su u radionici korištene i veće kružne opeke znatno većega promjera od *suspensura*, a utvrđena su dva slučaja gdje, zajedno s

Fig. 7 1 CBM used for flooring/hearth (?); 2 ceramic tube/pipe *in situ*; 3 wall structure built with *tegulae (photo: B. Šiljeg, G. Lipovac Vrkljan; made by: A. Konestra)*

Sl. 7 1 GK korištena kao podnica/ognjište (?); 2 keramička cijev in situ; *3 zidne strukture građene tegulama (snimili: B. Šiljeg, G. Lipovac Vrkljan; izradila: A. Konestra)*

Fragmentary examples of two circular tubes of different dimensions have also been identified in the waste of the *figlina*, probably pertinent to a drainage system in use within the complex (Fig. 7: 2). Similarly, two cases have been identified where circular bricks with larger diameters than those of the *suspensurae* were used with the *bipedalis* and square bricks as flooring in two of the *figlina*'s rooms. Possibly they were used as bases for hearths or are to be interpreted as bases for pillars (see Stoppioni 2011: 105–106, Fig. 1), although their placement within the rooms and their fragmentation in the case of Crikvenica do not support this interpretation (Fig. 7: 1).

SHAPING OF CBM – INTERPRETING VARIANTS AND MISTAKES

From the production standpoint, even though variants have been detected within certain CBM groups, a fairly standardised assemblage seems to emerge, fulfilling the necessity of these objects as building materials (Matijašić 1989: 62; Flohr 2016: 14; Swift 2017: 15–16), as well as a dual practice within production which might point us to why the observed variability occurred. In fact, all CBM types were formed within wooden frames (formers) and with tools (e.g. scrapers, threads) which, in certain cases, left traces on the finished object and/or are discernible from their shape (cf. Shepherd 2006: 56–58; 2007: 169–170). Thus, a first step in the production of CBM was the making of the former or frame (certainly repeated multiple times within the period of the workshop's activity) and a second one was its use within the manufacture of the objects (Murphy 2017: 114–115), which was meant to ensure standardized products in the first place (cf. Kotsonas 2014: 9, 12). Within these processes, the chances of introducing variations are plentiful, and most probably depend on the actors of production rather than on market requirements. In fact, as the formers had to be changed due to deterioration, and the need for more formers could arise because of an increase in production, it is in this aspect of production that variants arose and not within the technology of production itself. Another "moment" of introducing variation is the drying itself, when differences in dimensions could emerge (Matijašić 1989: 62), depending on the clay mixture, external factors, and the length of exposure, thus also on the knowledge and experience of the potter. Whether changes such as those detected in the lower cutaways of the *tegulae* (Fig. 4) could point to an intentional technological innovation in former design or product optimization due to market requirements, as suggested for certain regions of the Empire (Mills 2013: 454, 465–467), remains to be fully understood. In some occasions the differences in the cutaway have been noted on the *tegulae* produced within the same workshop but of different dimensions (Shepherd 2006: 169), which is, in our case, difficult to propose due to the lack of intact examples.

Furthermore, finds of objects interpreted as potter's tools within the workshop assemblage, which include metal point tools (repurposed pins, *styli*, etc.), provided, among others, a clue as to how the crisscrossed pattern on the *tubuli* might have been made (Lipovac Vrkljan, Konestra 2018b: 607–608) (Pl. 2: 2). The detected pattern, although replicated and thus viewed as the ideal model, is often executed in a different manner, pointing to the use of multiple *bipedalis* i četvrtastim opekama, tvore podnice radioničkih prostorija. Moguće je da su služile kao podnice ognjišta ili baze stupova (usp. Stoppioni 2011: 105–106, Fig. 1), međutim razmještaj unutar prostorija i njihova rascjepkanost ne govore u prilog potonjoj interpretaciji (sl. 7: 1).

OBLIKOVANJE GK – INTERPRETACIJA VARIJANTI I GREŠAKA

Sa stajališta proizvodnje, iako su unutar pojedinih grupa GK utvrđene varijante, cjelokupni asortiman uglavnom je standardiziran, čime zadovoljava potrebe korištenja u građevinske svrhe (Matijašić 1989: 62; Flohr 2016: 14; Swift 2017: 15–16), pri tome ukazujući na dvojaku proizvodnu praksu kojom bi se mogla objasniti zamijećena varijabilnost. Naime, svi tipovi GK oblikovani su pomoću drvenoga kalupa i alatki (npr. gladilica, konca) koji su ponekad ostavili tragove na gotovim proizvodima ili ih je moguće razlučiti iz samoga oblika predmeta (usp. Shepherd 2006: 56–58; 2007: 169–170). Stoga je prvi korak u proizvodnji GK bila izrada kalupa (što je zasigurno ponavljano više puta unutar perioda djelovanja radionice) koji su potom korišteni za oblikovanje predmeta (Murphy 2017: 114–115), osiguravajući tako standardizaciju proizvoda (usp. Kotsonas 2014: 9, 12). Međutim, u tome procesu brojne su mogućnosti varijanti i po svoj su prilici ovisile o sudionicima u proizvodnji, više nego o zahtjevima tržišta. S obzirom da je kalupe periodički trebalo mijenjati uslijed oštećivanja ili se mogla pojaviti potreba za izradom dodatnih kalupa zbog pojačane proizvodnje, nastanak varijanti trebalo bi potražiti u tome procesu, a ne u promjenama u tehnologiji proizvodnje. Dodatni „moment" u kojem su mogle nastati varijante jest sušenje i tada se one očituju posebno u dimenzijama (Matijašić 1989: 62), s obzirom da ishod uvelike ovisi o glinenoj smjesi, vanjskim faktorima i vremenu sušenja, ali i o znanju i iskustvu keramičara. U kojoj su mjeri varijante donjih utora tegula (sl. 4) odraz namjerne tehnološke inovacije u izradi kalupa, odnosno optimizacije proizvoda zbog tržišne potražnje, što je predloženo za pojedine regije Carstva (Mills 2013: 454, 465–467), za sada nije moguće razjasniti. U pojedinim su slučajevima razlike donjih utora na tegulama iz istoga proizvodnog središta utvrđene na tegulama različitih dimenzija (Shepherd 2006: 169), no zbog nedostatka cjelovitih primjeraka u našem slučaju to nije moguće provjeriti.

Nalazi predmeta koji su interpretirani kao keramičarske alatke, među kojima se javljaju i metalna zašiljene alatke (reupotrebljene igle, stilusi i sl.), upućuju na mogući način izrade romboidnih ureza na tubulima (Lipovac Vrkljan, Konestra 2018b: 607–608) (T. 2: 2). Utvrđeni uzorak romba ponavlja se, stoga ga je moguće smatrati idealnim modelom, međutim često je izveden na različite načine upućujući na korištenje različitih alatki, ali i različite aktere (keramičare) koji su izvodili ovu radnju. Ti su urezi, mogli bismo reći, neka vrsta osobnoga, nenamjernoga potpisa koji upućuje na prilagodljivost i improvizaciju unutar proizvodnoga procesa (Murphy 2017: 115). Prilagodljivost i improvizacija dodatno su uočljive kod niza operacija za koje su korištene ruke kao što je zaglađivanje ili utiskivanje utora ispod krilca tegula (T. 2: 1; 3: 1).

Pažljivom analizom metoda oblikovanja i izrade moguće je detektirati više aktera ili više generacija keramičara uklju-

tools and to multiple actors (potters) executing this operation. They are, one might say, a kind of personal, unintentional signature, indicating both versatility and improvisation within the manufacturing process (Murphy 2017: 115). Improvisation and versatility are additionally visible in the use of hands for several operations, such as levigation or the incision of the groove below the *tegulae* flange (Pl. 2: 1; 3: 1).

Through careful analysis of the methods of production, we might detect multiple actors, or multiple generations of potters, involved in a standardized production process, hinting at the complexity of the manufacturing process (Bottazzi 2010: 124) and the transmission of craft skills (Hosfield 2009: 2). The current impossibility to chronologically frame these variations in a precise way hinders further interpretations of these processes, but they do seem to point towards a conservatism in product technology (Hosfield 2009: 9–10) and the consequent production of objects that will fulfil the expected level of standardization from the standpoint of user experience (Swift 2017: 15–16) and the market (Wilson 2006: 228).

On the other hand, the analysis of the discarded objects and involuntary marks allows us to single out several stages within the CBM *chaîne opératoire*, i.e. to identify the passages where such mistakes could occur (cf. Roux 2019: 220), as well as certain choices within production. One such passage is the extraction of the product from the mould, which could leave marks on the object when done improperly, such as Pl. 3: 2. Involuntary markings on *tegulae*, and more seldom on bricks, consist of animal paw marks and shoe sole impressions present on a fragment of brick and a *tegula* (Pl. 3: 1, 3–11), a typical occurrence in Roman pottery workshops and on this kind of material (cf. for ex. Lazar 2006: 37–38; Muscolino 2018). The animals identified by the paw marks so far are dogs, birds, mice and sheep/goats.[4] The presence of dogs in the workshop is evidenced through faunal remains as well (Miculinić 2018: 84). Apart from giving us a glimpse into the fauna populating the workshop, they indicate that both bricks and *tegulae* were laid flat to dry (Cram, Fulford 1979: 208), but also that such "damaged" products were still fired, just like those where the stamped tile is impressed in ways other than the canonical (cf. Lazar 2006: 35). These objects, as it can be noticed in the distributed examples analysed so far, were not commercialised but rather used or discarded in the *figlina*. Similarly, the mass of variously overfired CBM (indicating another moment in the *chaîne opératoire* when discards could be generated) remained exclusively within the workshop.

DISTRIBUTION

On the one hand, Roman CBM indicate new building techniques, which, although present in the Hellenistic settlements of central Dalmatia (Faber 1983: Pl. 37: 12; Kirigin, Popović 1988: 179; Kirigin et al. 2002: 249), were not used by the indigenous populations of the eastern Adriatic and represent an innovation in both production technology and building techniques (Flohr 2016: 20). On the other hand, they represent a new industry and a new potential commercial product, thus becoming one of the generators of novel economic trends within the region (Lipovac Vrkljan, Konestra 2018a: 23–25).

4 The authors would like to thank Kazimir Miculinić for the identification of paw marks.

čenih u standardizirani proizvodni proces, što upućuje na njegovu kompleksnost (Bottazzi 2010: 124) i transfer vještina (Hosfield 2009: 2). Trenutna nemogućnost preciznije kronološke atribucije pojedinih varijanti onemogućava daljnje interpretacije ovih procesa, no oni ipak upućuju na konzervativnost proizvodne tehnologije (Hosfield 2009: 9–10) i posljedičnu proizvodnju predmeta koji su s aspekta korisničkoga iskustva (Swift 2017: 15–16) i tržišta (Wilson 2006: 228) posve zadovoljavali očekivanu razinu standardizacije.

S druge strane, analiza odbačenih predmeta i pojedinih specifičnih obilježja omogućila je izdvajanje nekoliko faza u operativnome lancu (*chaîne opératoire*) GK, odnosno identifikaciju aktivnosti tijekom kojih je moglo doći do pojedine greške (usp. Roux 2019: 220), kao i uočavanje određenih odabira unutar proizvodnje. Jedna od tih aktivnosti jest vađenje predmeta iz kalupa što, ukoliko se ne izvede pažljivo, može na predmetu ostaviti trag kao na T. 3: 2. Nenamjerni tragovi na tegulama i rješe na opekama uključuju otiske životinjskih šapa te otiske obuće (T. 3: 1, 3–11), što je dosta česta pojava u keramičarskim radionicama i na ovoj vrsti materijala (npr. Lazar 2006: 37–38; Muscolino 2018). Do sada identificirane životinje jesu pas, ptice, miš i ovca/koza.[4] Prisutnost pasa unutar radionice utvrđena je i zooarheološkom analizom (Miculinić 2018: 84). Osim što nam ovi podaci govore o fauni koje je obitavala u radionici, oni indiciraju i na to da su se i opeke i tegule sušile ravno položene na tlo (Cram, Fulford 1979: 208) te da su i tako „oštećeni" proizvodi svejedno pečeni, kao i oni s pogrešno utisnutim pečatima (usp. Lazar 2006: 35). Prema podacima iz analiziranih primjeraka pronađenih u distribuciji, takvi proizvodi nisu bili komercijalizirani, već su korišteni ili odbačeni unutar *figline*. Slično je i s velikom količinom prepečene GK (koja nam ukazuje na još jedan trenutak u operativnome lancu kada se mogao generirati otpad), a koja se mahom zadržala u radionici.

DISTRIBUCIJA

Rimska je GK, s jedne strane, indikator novih građevinskih tehnika koje, iako su bile prisutne u helenističkim naseljima srednje Dalmacije (Faber 1983: Pl. 37: 12; Kirigin, Popović 1988: 179; Kirigin et al. 2002: 249), nisu koristili autohtoni stanovnici istočnoga Jadrana, pa stoga predstavljaju inovaciju kako u proizvodnoj tehnologiji, tako i u onoj građevinskoj (Flohr 2016: 20). S druge strane GK predstavlja i novu „industriju" kao i novi potencijalni trgovački proizvod, čime ona postaje generator novih gospodarskih trendova u regiji (Lipovac Vrkljan, Konestra 2018a: 23–25).

Masovniji izvoz italskih dobara na istočni Jadran započeo je već u 4. st. pr. Kr. s proizvodima transportiranima u amforama, po svoj prilici vinom (grčko-italske amfore) (Kirigin et al. 2006), s kojim dolazi i stolno posuđe potrebno za njegovu konzumaciju (različite, najčešće južno italske proizvodnje) (Miše, Šešelj 2008; Miše 2013; 2015). Negdje kroz 1. st. pr. Kr. uočava se prijelaz na rimski repertoar, kada na obalnome tržištu Dalmacije prevladavaju Lamboglia 2 amfore i pojavljuju se prvi primjerci keramike tankih stijenki koju slijedi italska *sigillata* (Makjanić 1987; Brusić 1999: 18–31; Ugarković, Konestra 2018: 85; Borzić, Eterović Borzić 2015:

4 Autori zahvaljuju Kazimiru Miculiniću na identifikaciji otisaka šapa.

A more substantial export of goods from Italy to the eastern Adriatic started in the 4th cent. BC already, with amphorae-borne commodities, in all probability wine (Greco-Italic amphorae) (Kirigin et al. 2006), accompanied by the tableware necessary to consume it (various productions, mainly from south Italy) (Miše, Šešelj 2008; Miše 2013; 2015). The shift to a more Roman repertoire occurred sometimes in the 1st cent. BC, when Lamboglia 2 amphorae took over and the first thin-walled ware followed by Italian *sigillata* made their way to the markets of the Dalmatian coast (Makjanić 1987; Brusić 1999: 18–31; Ugarković, Konestra 2018: 85; Borzić, Eterović Borzić 2015: 48–50). It is in this atmosphere of massive commercial activities throughout and across the Adriatic that the first Roman *tegulae* were marketed in the area of the future province of *Dalmatia*, first with the earliest products of *Vibo Pansa* dated *ante*-43 BC (Matijašić 1989: 66; Pellicioni 2012: 50) and then followed by more and more examples as the *figlina Pansiana* passed to imperial ownership and other producers established their CBM production centres. In fact, numerous other Upper-Adriatic and mid-Adriatic production centres exploited the new markets on the eastern coast, including that of ancient *Liburnia* (Matijašić 1989: 64–66; Konestra, Lipovac Vrkljan 2018: Fig. 3). Several tile fragments of the *Pansiana* production, two belonging to the Claudian period (Righini 1998: 48, 14b, 14b/g), were even found in the workshop at Crikvenica itself (Pl. 4: 6–7). Nevertheless, the analysis of the distribution of the CBM of *Sextus Me(u)tillius Maximus* points to the conclusion that it too managed to find a place on the markets of this region (Fig. 8). Its distribution, mainly reconstructed through stamp finds, encompasses both coastal and insular parts of *Liburnia*. One example of a stamped *tegula* from the workshop at Crikvenica has been found at an underwater site, and while all the data on its provenance is lost, the Čikat – Pločice site (off cape Madona on the island of Lošinj) is assumed to be its findspot, as a recent survey recovered a *tegula* with archaeometric features matching those of the *figlina* at Crikvenica (Radić Rossi 2011: 20–22; Zubin Ferri 2018; Zubin Ferri et al. 2019). Another underwater site with a *tegulae* cargo with matching dimensions is the one off cape Margarina on Susak Island (Radić Rossi 2011: 22–23). The cape Margarina site can be considered a shipwreck, as the vessel sunk with its tile cargo, while the site off cape Madona is of doubtful interpretation (Radić Rossi 2011: 21–23).

All the distribution data proves that the CBM from Crikvenica travelled primarily by sea, covering the entire area of the northern part of the province of *Dalmatia*. While the densest finds have been recorded in the areas closest to the *figlina* (Selce, Jadranovo – Lokvišća, Sv. Petar Soline and Cickini on Krk Island, and *Tarsatica*), the finds from Ugljan Island (opposite Zadar) prove that this CBM did in fact reach the southernmost areas of *Liburnia*. It is interesting to compare the distribution pattern of this CBM to those in other regions of the Empire, as elsewhere it seems possible to ascertain a regionalism in the distribution of CBM and plain ware, along with a *cabotage* system of navigation (Menchelli 2003: 171). This is explained in some cases by the overall low value of this merchandise, roof tiles in particular, so much so that certain authors view them only as ballast, secondary or "returning" cargo, while others stress that CBM could travel even longer distances as the main cargo (Menchelli 2003: 169 *contra* Thébert 2000: 355–356; Wilson 2006: 228–229; 48–50). U toj atmosferi masovnih komercijalnih aktivnosti uzduž i poprijeko Jadrana na području buduće provincije Dalmacije započinje komercijalizacija prvih rimskih tegula, i to s ranim proizvodima *Viba Panse* datiranima *ante*-43. god. pr. Kr. (Matijašić 1989: 66; Pellicioni 2012: 50), nakon kojih će uslijediti, s njenim prelaskom u carsku vlast, sve više primjeraka proizvoda *figline Pansiana*, ali i drugih proizvođača koji tada uspostavljaju svoje radionice. Brojni su proizvodni centri srednjega i gornjega Jadrana iskoristili nova tržišta istočne obale, uključujući i ono antičke *Liburnie* (Matijašić 1989: 64–66; Konestra, Lipovac Vrkljan 2018: Fig. 3). Nekoliko ulomaka tegule proizvodnje *Pansiana*, dva Klaudijevskoga razdoblja (Righini 1998: 48, 14b, 14b/g), pronađeni su unutar same radionice u Crikvenici (T. 4: 6–7). Ipak, analiza distribucije GK *Sexta Me(u)tillia Maxima* upućuje na to da je i ona uspijevala naći svoje mjesto na tržištu ove regije (sl. 8). Distribucija, uglavnom rekonstruirana na temelju pečata, obuhvaća obalni i otočni dio Liburnije. Jedan je primjerak pečatirane crikveničke tegule pronađen na podmorskome lokalitetu, pa iako su podaci o njegovome nalazu izgubljeni, pretpostavlja se da potječe s lokaliteta Čikat – Pločice (kod rta Madona na otoku Lošinju) gdje je nedavnim pregledom prikupljen uzorak tegule koja arheometrijski odgovara proizvodima crikveničke radionice (Radić Rossi 2011: 20–22; Zubin Ferri 2018; Zubin Ferri et al. 2019). Još jedan podvodni lokalitet čiji teret tegula dimenzijama odgovara crikveničkima onaj je kod rta Margarina na Susku (Radić Rossi 2011: 22–23). Dok je lokalitet kod rta Madona upitne tipologije, onaj kod rta Margarina može se smatrati brodom potopljenim zajedno s teretom kojega je prevozio (Radić Rossi 2011: 21–23).

Podaci o distribuciji upućuju na to da je crikvenička GK prvenstveno putovala morem pokrivajući cijeli sjeverni dio provincije Dalmacije. Dok je najveća koncentracija registrirana u neposrednoj blizini *figline* (Selce, Jadranovo – Lokvišća, sv. Petar Soline i Cickini na otoku Krku, *Tarsatica*), nalazi s otoka Ugljana (nasuprot Zadra) potvrđuju da je GK ipak dospijevala i do južnih dijelova Liburnije. Zanimljivo je usporediti distribucijski obrazac s onima drugih regija Carstva gdje je zamijećena regionalnost u distribuciji kako ove, tako i kućanske keramike, uz što je povezana i plovidba kabotažom (Menchelli 2003: 171). To je ponekad objašnjeno vrlo niskom vrijednosti ove robe, posebno tegula, čak do te mjere da pojedini autori smatraju kako su one putovale kao balast, sekundarni ili „povratni" teret, dok drugi, međutim, upozoravaju da je GK ipak mogla putovati kao primarni teret i to na duže relacije (Menchelli 2003: 169 *contra* Thébert 2000: 355–356; Wilson 2006: 228–229; posljednje o ovoj raspravi u Gianfrotta 2015: 111–113 i Lancaster 2015: 240 s ondje citiranom literaturom), što ju smješta u važne trgovačke proizvode koji su mogli doseći i razmjerno visoku cijenu (Mills 2003: 453; za istočni Jadran vidi: Matijašić 1989: 62). U slučaju Crikvenice pojedine je podatke moguće iščitati na temelju brodoloma kod rta Margarina na Susuku na kojem je prisutna isključivo GK (Radić Rossi 2011: 22–23), što bi, uz ostale podatke o distribuciji, moglo upućivati na to da je regionalna pomorska trgovina kratkih relacija ipak mogla biti unosna. Istim su se rutama kretali i drugi proizvodi *figline*, kao amfore, koje su prisutne na istome području, ali i u unutrašnjosti i južno sve do kanala sv. Ante kod Šibenika

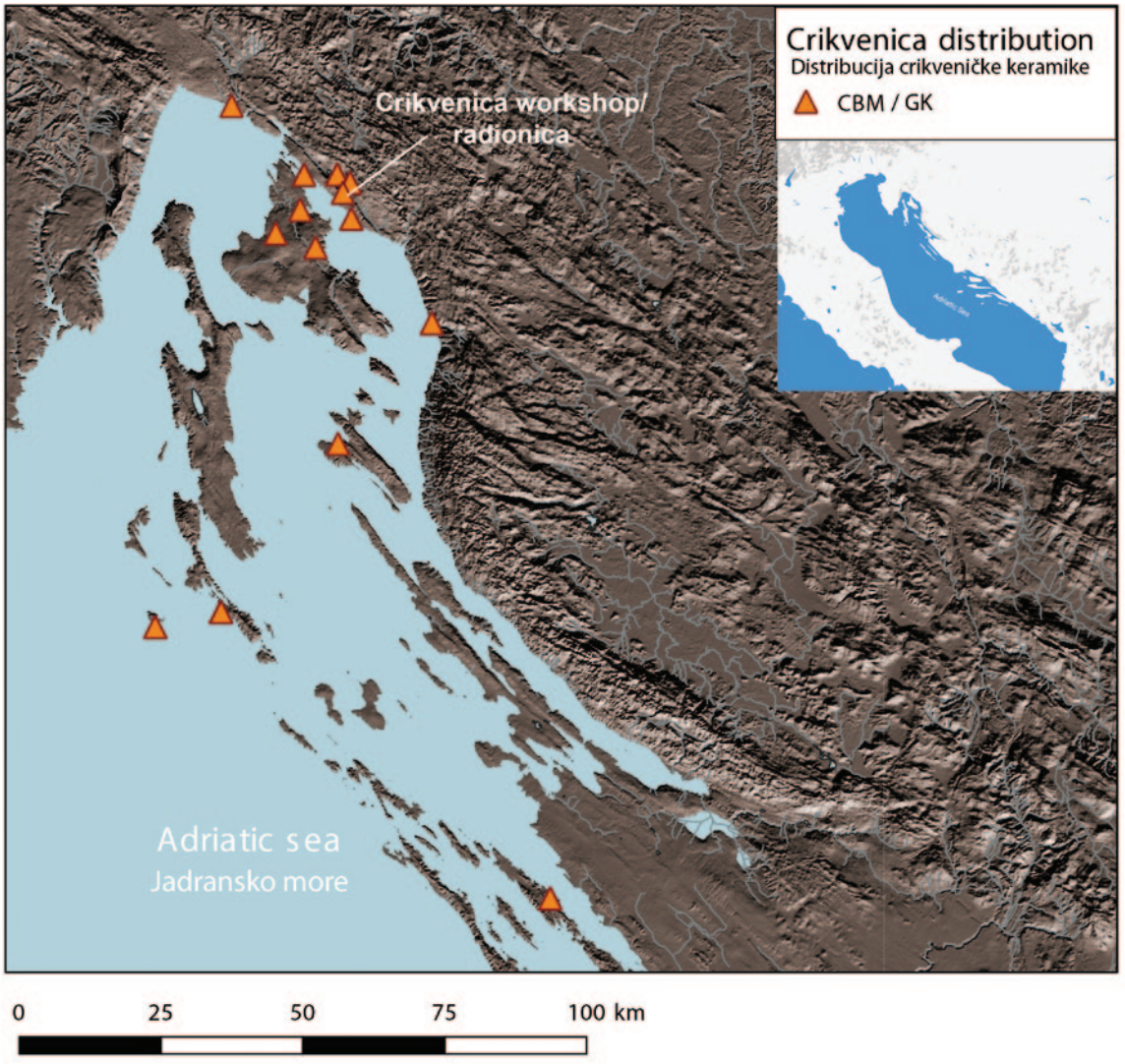

Fig. 8 Distribution of CBM produced at *Sex. Me(u)tillius Maximus figlina* in today's Crikvenica (base: EU-DEM/EU-Hydro) (made by: A. Konestra)

Sl. 8 Distribucija GK proizvedene u figlini Sex. Me(u)tilliusa Maxima *u današnjoj Crikvenici (podloga: EU-DEM/EU-Hydro) (izradila: A. Konestra)*

lastly, on the debate Gianfrotta 2015: 111–113 and Lancaster 2015: 240 with the bibliography therein), seeing them as important objects of trade which could reach a substantial market price (Mills 2003: 453; for the eastern Adriatic see: Matijašić 1989: 62). In the case of Crikvenica some data is provided by the shipwreck ascertained at cape Margarina on Susak Island, where there is apparently only CBM (Radić Rossi 2011: 22–23), indicating, along with other distribution evidence, that regional, short-distance seaborne trade of these products could be lucrative. The same routes were travelled by other products of the *figlina*, such as amphorae, present in the same areas but also in the hinterland, and as south as Šibenik – St. Anthony channel (Radić Rossi 2011: 24; Lipovac Vrkljan, Ožanić Roguljić 2013; Borzić et al. 2018) – but for CBM we might propose a more direct (producer to consumer) bulk purchase of entire batches necessary for single building projects, and thus with all probability a different organisation of their marketing (Darvill, McWhirr 1984: 240–241; Mills 2013: 462). Additionally, as proposed for other regions where the association of CBM production and *saltus*-type estates has been ascertained (Bottazzi 2010: (Radić Rossi 2011: 24; Lipovac Vrkljan, Ožanić Roguljić 2013; Borzić et al. 2018), no za GK predložili bismo direktniji model prodaje (po obrascu proizvođač – kupac) cijelih serija predmeta potrebnih za jedan građevinski projekt, a slijedom toga i drukčiju organizaciju njihove komercijalizacije (Darvill, McWhirr 1984: 240–241; Mills 2013: 462). Osim toga, kao što je predloženo za druge regije gdje je proizvodnja GK potvrđena u kontekstu posjeda tipa *saltus* (Bottazzi 2010: 124), drvna građa potrebna za izgradnju mogla se plasirati na tržište zajedno s GK, pa iako je ona arheološki uglavnom nevidljiva, ovu mogućnosti ne bi trebalo zanemariti.

ZAKLJUČAK

Uspostava keramičarske radionice u Crikvenici koincidira s razdobljem stabilnije prisutnosti Rima na sjeveroistočnome Jadranu. Druga polovica 1. st. pr. Kr. u antičkoj Liburniji karakterizirana je mirnom integracijom u Carstvo. Tada ovo područje služi kao početna točka daljnjega napredovanja rimske vojske, kako južno na teritorije Delmata tako i sjeveroistočno u Panoniju (Starac 2000: 10–18; Borzić 2007: 171–176 s ranijom literaturom). U tome razdoblju pojedini

124), we should not ignore the possibility that the wood needed for construction might have been commercialised alongside CBM while remaining archaeologically invisible.

CONCLUSION

The setting up of the pottery workshop at Crikvenica coincides with a time of a more stable presence of Rome in the north-eastern Adriatic. The second half of the 1st cent. BC in ancient *Liburnia* is marked by peaceful integration within the Empire, when this area served as the starting point for further advances of the Roman armies, both to the south in the territories of the *Delmatae* and to the north-east, in *Pannonia* (Starac 2000: 10–18; Borzić 2007: 171–176 with earlier bibliography). At that time some of the towns of northern *Liburnia* witnessed a phase of intense construction; we can suppose that a certain number of rural sites can be dated to this period as well (Begović, Schrunk 2003: 96–97). New building techniques, production technology, and the commercial product itself, were probably brought to the region of *Liburnia* very early, before the more permanent settling of the military in its southern part and the onset of military production, as testified by the early *Pansiana*, so while CBM adoption in the north-eastern and Adriatic Italy has been linked to colonial foundation and military personnel/activities, in our case their spread could have rather accompanied civilian movements of people and objects (cf. Bonetto 2015: 100; Lancaster 2015: 244; Shepherd 2015: 129). However, the modalities of this transmission of technology and knowledge within ceramic production, but also architecture, are still to be elucidated in more detail, although a foreign workforce or at least foreign production management have already been put forward for the *figlina* at Crikvenica (Lipovac Vrkljan, Konestra 2018b: 609). In any case, the onset of regional production should be associated with the organisation of rural areas through property acquisition;[5] in the northern part of *Liburnia*, this process was not associated with colonial assignation but possibly with the municipal organisation of pre-existing proto-urban settlements (cf. Bottazzi 2010: 117). Perhaps the creation of the *saltus* as an extra-urban territory located between two *municipia* (i.e. *Tarsatica* and *Senia*, both *municipia* of Augustan date, Starac 2000: 77–78, 84–85) could be regarded in this light (for such a meaning of the term see Soricelli 2004: 110–111).

The pottery and particularly the CBM of *Sextus Me(u)tillius Maximus* have been recorded at a variety of site types, such as urban centres (*Tarsatica, Senia*) and rural estates or settlements (Selce, Jadranovo – Lokvišća, Sv. Petar Soline and Cickini – Island of Krk, Kampor – Island of Rab, Preko – Island of Ugljan) (Lipovac Vrkljan, Ožanić Roguljić 2013: 259–260; Borzić et al. 2018). They add a local element to the generally Italic assemblages of the 1st–2nd cent. AD sites in the area (e.g. Konestra 2015), fulfilling various demand loci and thus demand levels (Darvill, MacWhir 1984: 242), showing that the investment in the *figlina* was planned in accordance with the market needs and the production possibilities of its environs. The vast array of types of CBM might also indicate a direct request from the buyer to the producer, and also a local or regional sourcing of specific shapes,

5 If the assumed production of *tegulae* and amphorae within the property in Caska (island of Pag) (Kurilić 2016; Grisonić 2017), at some point associated with the *Calpurnii*, should be proven with more direct data, a similar scenario might emerge.

gradovi sjeverne Liburnije bilježe fazu intenzivne gradnje, a možemo pretpostaviti da bi i dio ruralnih lokaliteta trebalo datirati u ovo razdoblje (Begović, Schrunk 2003: 96–97). Nove tehnike gradnje, proizvodna tehnologija i sam komercijalni proizvod u Liburniju vjerojatno dolaze vrlo rano, tj. prije uspostave trajnijega boravka vojske u njezinome južnom dijelu i uz nju povezane vojne proizvodnje GK, o čemu svjedoče rane *Pansiane*. Ako je u sjeveroistočnoj i Jadranskoj Italiji preuzimanje GK povezivo s kolonijalnim dedukcijama i vojnim osobljem/aktivnostima, u ovome slučaju opredjeljujemo se za kretanje ljudi/civila i predmeta (usp. Bonetto 2015: 100; Lancaster 2015: 244; Shepherd 2015: 129). Modalitete transmisije tehnologije i znanja u keramičarskoj proizvodnji, ali i arhitekturi, potrebno je detaljnije razjasniti. Međutim, strana radna snaga ili makar strani proizvodni *management* već su ranije predloženi za crikvenički *figlinu* (Lipovac Vrkljan, Konestra 2018b: 609). U svakome slučaju, uspostavu regionalne proizvodnje valja povezati s organizacijom ruralnih prostora kroz vlasničke akvizicije,[5] proces koji u sjevernoj Liburniji nije povezan s kolonijalnom dedukcijom već moguće s municipalnom organizacijom postojećih protourbanih naselja (usp. Bottazzi 2010: 117). Moguće je da bi u tome svijetlu trebalo promatrati uspostavu *saltusa* kao izvangradskoga teritorija smještenog između dvaju municipija (tj. Tarsatike i Senije, oba municipiji od Augustova doba, Starac 2000: 77–78, 84–85; za takvo tumačenje termina vidi: Soricelli 2004: 110–111).

Keramika, a posebno GK *Sexta Me(u)tillia Maxima* utvrđena je na različitim lokalitetima, od urbanih središta (*Tarsatica, Senia*) do ruralnih posjeda i naselja (Selce, Jadranovo – Lokvišća, sv. Petar Soline i Cickini – otok Krk, Kampor – otok Rab, Preko – otok Ugljan) (Lipovac Vrkljan, Ožanić Roguljić 2013: 259–260; Borzić et al. 2018). Ona unosi lokalni element u generalno italske keramičke kontekste s regionalnih lokaliteta 1.–2. st. po. Kr. (npr. Konestra 2015) zadovoljavajući različite tipologije lokaliteta, pa time i različite razine potražnje (Darvill, MacWhir 1984: 242) ukazujući kako je investicija u *figlinu* bila planirana prema potrebama tržišta i proizvodnim mogućnostima krajolika u kojem se smjestila. Velika tipološka raznolikost GK mogla bi indicirati i na neposredne zahtjeve naručitelja prema proizvođaču, pa time i lokalnu ili regionalnu nabavku određenih oblika, npr. *spicae*, *suspensurae*, i sl. (usp. Darvill, McWhirr 1984: 240–241). Iako su tegule, posredstvom pečata, za sada najbolji indikator trgovine GK iz Crikvenice, arheometrijske analize drugih tipova mogle bi potvrditi još širu distribuciju, posebice povezanu uz gradnju grijanih podova ili termalnih sklopova u urbanim i ruralnim lokalitetima u regiji.

Nastanak niza keramičarskih radionica koje su proizvodile GK i keramiku te s većim područjem gravitiranja, u Britaniji je povezano s nešto kasnijim valom izgradnje *villa* (Mills 2013: 467), no u slučaju Crikvenice radije bismo ga povezali s gradnjom struktura „u rimskome stilu" duž regije kako u urbanim, tako i ruralnim kontekstima.

Da li su amfore namijenjene transportu poljoprivrednih

5 Ukoliko će se pretpostavljena proizvodnja tegula i amfora unutar posjeda u Caskoj (otok Pag) (Kurilić 2016; Grisonić 2017), u jednome trenutku povezanog s *Calpurniima*, uspjeti dokazati direktnijim podacima, moguće je očekivati sličan scenarij.

such as *spicae*, *suspensurae,* and similar (cf. Darvill, McWhirr 1984: 240–241). Because of their stamps, tiles are the best indicator of the marketing of CBM from Crikvenica so far, but archaeometric analyses of other types might prove an even wider distribution, particularly in connection with the construction of heated floors or thermal complexes in both urban and rural sites of the region.

The emergence of an array of pottery manufactures producing both CBM and pottery and having a large catchment area has been linked in Britain with a wave of villa building of a later date (Mills 2013: 467), but in the case of Crikvenica, we can rather associate it with an early building of "Roman style" structures throughout the region, in both urban and rural contexts.

It remains to be seen whether the CBM or the amphorae meant to store agricultural produce were the starting point of the enterprise (Lipovac Vrkljan, Konestra 2018a: 23), although with all probability it was the need to market agricultural products that gave rise to the production of amphorae, while the needs of the estate might have prompted CBM production (cf. Kompare 2015; Lancaster 2015: 239, 244). In fact, further data is provided by the *figlina* itself, within which a regionally novel use of CBM was detected. While its fencing wall and other structures within the workshop were built with canonical limestone/lime mortar walls, there are certain instances of structures built with *tegulae* or with a mixed stone-*tegulae* opus bound with mortar (Fig. 7: 3), both typical for the rural architecture of the Po valley, i.e. in clayey and humid environments (Bachetta 2003: 64–65, 97, Figs. 33, 71–72). Moreover, as mentioned, the same CBM are used within the kiln structure and to lay floors, indicating self-consumption of at least one part of the products. Unfortunately, we can only guess whether the *spicatum* floor of the nearby residential and productive complex in Selce, associated with the possible extent of the *saltus*, was in fact built with tiles produced at Crikvenica (Lipovac Vrkljan, Konestra 2018a: Fig. 10).

It is, then, possible that the favourable position of the *saltus* allowed ceramics to become a *fructus* within its economic output, travelling along the same regional routes as its primary products – wine (?), fish products (?), and others, packed inside its 11 types of amphorae (Lipovac Vrkljan, Konestra 2018a: 28–30). In fact, significantly, distribution patterns show the same market for all products, including pottery.

As the first excavated Roman pottery workshop within the province, Crikvenica provides a production and marketing model which might be identified elsewhere in the region as suggested by several tile-stamps circulating in restricted areas of the eastern Adriatic (Pedišić, Podrug 2007: 100–106; Konestra, Lipovac Vrkljan 2018: 132), finds of other *figlinae* of a more complex type (e.g. Plemići cove – Ražanac), and dedicated CBM kilns (e.g. Podšilo cove – Rab Island) (Lipovac Vrkljan, Konestra 2018a; Welc 2018). Nevertheless, such a diverse set of CBM products is so far unique to *Sextus*' complex, as the production array of other regional *figlinae*, where it can be reconstructed, seems to be limited to *tegulae* and *imbrices*. This raises the question as to how the supply of non-roofing CBM was organised and whether Italic imports fulfilled most of the needs for these as well.

proizvoda ili GK bili poduzetnički pokretač, bit će potrebno bolje razjasniti (Lipovac Vrkljan, Konestra 2018a: 23), iako je vjerojatnije da je potreba za prodajom poljoprivrednih proizvoda potaknula pokretanje proizvodnje amfora, dok su potrebe posjeda vjerojatno utjecale na početak proizvodnje GK (usp. Kompare 2015; Lancaster 2015: 239, 244). Naime, unutar same radionice detektirani su dodatni podaci u vidu regionalno inovativnoga korištenja GK. Dok su ogradni zid radionice i neke strukture unutar nje građene uobičajenim vapnenačkim blokovima vezanima vapnenom žbukom, pojavljaju se i pojedine strukture građene tegulama ili opusom koji miješa kamen i tegule vezane žbukom (sl. 7: 3), što je tipično građevno rješenje u dolini Pada, odnosno u glinovitim i vlažnim područjima (Bachetta 2003: 64–65, 97, Figs. 33, 71–72). Nadalje, GK korištena je, kao što je već spomenuto, kod gradnje peći i polaganje podnica ukazujući na samopotrošnju jednoga dijela proizvoda. Možemo na žalost samo nagađati je li *spicatum* podnica otkrivena u nedalekom rezidencijalnom i proizvodnom sklopu u Selcu, a kojega je moguće smjestiti u obuhvat *saltusa*, građena opekama iz proizvodnoga središta u Crikvenici (Lipovac Vrkljan, Konestra 2018a: Fig. 10).

Moguće je, stoga, da je povoljan položaj *saltusa* omogućio da i keramika postane *fructus* unutar njegove proizvodnje te njezino kretanje istim regionalnim rutama kao i njegovi primarni proizvodi – vino (?), riblje prerađevine (?) i drugo, pakirani u 11 tipova amfora (Lipovac Vrkljan, Konestra 2018a: 28–30). Naime, indikativno, obrasci distribucije jednaki su za sve proizvode, uključujući keramiku.

Kao prva istražena rimske keramičarska radionica u provinciji, Crikvenica nam pruža uvid u proizvodni i komercijalni model kojega bismo mogli detektirati i drugdje u regiji, o čemu svjedoče pojedini pečati koji cirkuliraju unutar ograničenih zona istočnoga Jadrana (Pedišić, Podrug 2007: 100–106; Konestra, Lipovac Vrkljan 2018: 132), nalazi drugih radionica kompleksne organizacije (npr. uvala Plemići – Ražanac) ili peći namijenjenih za GK (npr. uvala Podšilo – otok Rab) (Lipovac Vrkljan, Konestra 2018a; Welc 2018). Ipak, raznoliki spektar proizvoda GK za sada je jedinstven za Sekstov kompleks, dok je kod ostalih centara gdje ga je moguće rekonstruirati on ograničen na tegule i imbrekse. Postavlja se stoga pitanje kako se odvijala opskrba ostale GK i jesu li italski importi i u tim slučajevima zadovoljavali većinu tržišne potražnje.

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BIBLIOGRAPHY / LITERATURA

Arslan, E. A. 1965, Osservazioni sull'impiego e la diffusione delle volte sottili in tubi fittili, *Bollettino d'Arte*, Vol. I–II, 45–52.

Begović, V., Schrunk, I. 2003, Roman Villas of Istria and Dalmatia, Part II: Typology of Villas, *Prilozi Instituta za arheologiju u Zagrebu*, Vol. 20, 95–112.

Brajković, T. 2011, Lokalitet Rakitnica – Tri bunara u vodičkom zaleđu, in: *Roman ceramic and Glass Manufactures. Production and Trade in the Adriatic Region, Proceedings of the 1st International Archaeological colloquium*, Crikvenica, 23–24 October 2008, Lipovac Vrkljan G., Radić Rossi I., Šiljeg B. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 95–101.

Benac, Č., Arbanas, Ž., Jardas, B. 1992, The morphogenesis and the evolution of the river mouth in the Kvarner Area, in: *Geomorphology and sea and the meeting of the geomorphological commision of the carpatho-balcan countries,* Proceedings of the international symposium Mali Lošinj, 22–26 September 1992, Bognar A. (ed.), Geografski odjel PMF-a Sveučilišta u Zagrebu, Zagreb, 37–46.

Bonetto, J. 2015, Diffusione ed uso del mattone cotto nella Cisalpina romana tra ellenizzazione e romanizzazione, in: *Il laterizio nei cantieri imperiali. Rome e il Mediterraneo*, Atti del I workshop "Laterizio", Roma, 27–28 novembre 2014, Bukowiecki E., Volpe R., Wulf-Rheidt U. (eds.), Archeologia dell'Architettura, Vol. 20, 105–113.

Borzić, I. 2007, Geografski položaj Burnuma na razmeđi liburnskoga i delmatskoga područja, in: *Simpozij rijeka Krka i Nacionalni park "Krka", Prirodna i kulturna baština, zaštita i održivi razvoj*, Šibenik 2005., Zbornik radova, Marguš D. (ed.), Javna ustanova Nacionalni park Krka, Šibenik, 163–179.

Borzić, I. 2014, Ceramic cooking ware of Legio XI from the Burnum amphitheatre site, in: *Roman pottery and Glass Manufactures. Production and Trade in the Adriatic Region, Proceedings of the 2nd International Archaeological colloquium*, Crikvenica, 28–29 October 2011, Lipovac Vrkljan G., Šiljeg B., Ožanić Roguljić I., Konestra A. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 287–300.

Borzić, I., Eterović Borzić, A. 2015, *Terra sigillata* iz rimske Aserije – prilog poznavanju keramičarskog importa u Liburniji / *Terra sigillate* from Roman Asseria – a contribution to understanding pottery import in Liburnia, *Asseria*, Vol. 13, 11–88.

Borzić, I., Čelhar, M., Zaro, G., Glavaš, V. 2018, New finds of Crikvenica 1-type amphorae in the area of southern *Liburnia*, in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 50–56.

Brusić, Z. 1999, *Hellenistic and Roman Relief Pottery in Liburnia (North-East Adriatic, Croatia)*, British Archaeological Reports International Series 817, Archaeopress, Oxford.

Bottazzi, G. 2010, La Tavola di Veleia e la produzione laterizia nell'economia appenninica, in: *La produzione laterizia nell'area appenninica della Regio Octava Aemilia,* Atti della Giornata di Studi San Marino, Museo di Stato, 22 Novembre 2008, Bottazzi G., Bigi P. (eds), Musei di Stato, San Marino, 116–130.

Cipriano, S., Mazzocchin, S. 2011, Un quartiere artigianale a Patavium: le fornaci e le produzioni ceramiche, in: *Roman ceramic and Glass Manufactures. Production and Trade in the Adriatic Region, Proceedings of the 1st International Archaeological colloquium*, Crikvenica, 23–24 October 2008, Lipovac Vrkljan G., Radić Rossi I., Šiljeg B. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 193–203.

Cipriano, S., Sandrini, G. M. 2014, Dallo scavo al museo: la fornace per la ceramica da Altino, in: *Roman pottery and Glass Manufactures. Production and Trade in the Adriatic Region, Proceedings of the 2nd International Archaeological colloquium*, Crikvenica, 28–29 October 2011, Lipovac Vrkljan G., Šiljeg B., Ožanić Roguljić I., Konestra A. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 163–172.

Cram, L., Fulford, M. 1979, Silchester tile making – the faunal environment, in: *Roman Brick and Tile. Studies in Manufacture, Distribution and Use in the Western Empire*, McWhirr A. (ed.), British Archaeological Reports International Series 68, BAR Publishing, Oxford, 201–209.

Cuomo di Caprio, N. 2007, *Ceramica in archeologia 2. Antiche tecniche di lavorazione e moderni metodi di indagine, Nuova edizione ampliata*, "L'Erma" di Bretschneider, Roma.

Čargo, B., Miše, M. 2010, Lončarska proizvodnja u Isi / Pottery Production in Issa, *Vjesnik za arheologiju i povijest dalmatinsku*, Vol. 103, 7–40.

Darvill, T., MacWhir, A. 1984, Brick and Tile Production in Roman Britain: Models of Economic Organisation, *World Archaeology*, Vol. 15(3), 239–261. https://doi.org/10.1080/00438243.1984.9979904

Demicheli, D. 2015, Conventus Liburnorum, conventus Scardonitanus Sicut homines, et lapides sua fata habent, *Vjesnik za arheologiju i povijest Dalmatinsku*, Vol. 108, 91–108.

Di Giuseppe, H. 2007, Proprietari e produttori nell'alta valle del Bradano, *Facta, A journal of Roman Material Culture studies*, Vol. 1, 157–182.

Di Giuseppe, H. 2008, La villa romana di S. Pietro di Tolve (PZ). Dalla proprietà senatoria a quella imperiale, in: *Felicitas Temporum, Dalla terra alle genti, La Basilicata settentrionale tra archeologia e storia*, Russo A., Di Giuseppe, H. (eds.), Museo Archeologico Nazionale, Lavello, 355–391.

Di Giuseppe, H. 2010, Produrre in villa. Complessi artigianali di epoca imperiale nella Lucania nord-orientale, *Rei Cretariae Romanae Favtores Acta*, Vol. 41, 173–180.

Faber, A. 1983, The fortifications of Epetion (Stobreč near Split*), Prinosi Odjela za arheologiju*, Vol. 1, 17–37.

Flohr, M. 2016, Innovation and Society in the Roman World, *Oxford Handbooks Online*, 1–35, doi: 10.1093/oxfordhb/9780199935390.013.85

Gaddi, D., Maggi, P. 2017, Anfore italiche, in: *Materiali per Aquileia. Lo scavo di Canale Anfora (2004–2005)*, Maggi P., Maselli Scotti F., Pesavento Mattioli S., Zulini E. (eds.), Editreg, Trieste, 263–328.

Gianfrotta, P. A. 2015, Laterizi e navi annonarie, in: *Opus Doliare Tiberinum*, Atti delle Giornate di studio, Viterbo, 25–26 ottobre 2012, Daidalos 15, Spanu M. (ed.), Università degli studi della Tuscia, Viterbo, 111–133.

Gluščević, S. 1989, Antička keramika s otoka Paga, in: *Arheološka istraživanja na otocima Krku, Rabu i Pagu i u Hrvatskom primorju*, Znanstveni skup, Krk, 24.–27. 09. 1985, Izdanja Hrvatskog arheološkog društva 13, Rapanić Ž. (ed.), Hrvatsko arheološko društvo, Zagreb, 73–85.

Grisonić, M. 2017, Amphorae from Caska in the Augusto-Tiberian period: imports and local productions?, in: *Adriamphorae. Amphorae as a resource for the reconstruction of economic development in the Adriatic region in Antiquity: local production,* Proceedings of the workshop, Zagreb, 21st April 2016, Lipovac Vrkljan G., Radić Rossi I., Konestra A. (eds.), Institut za arheologiju, Zagreb, 68–79.

Hasaki, E. 2011, Crafting Spaces: Archaeological, Ethnographic and Ethnoarchaeological Studies on Spatial Organization in Pottery Workshops in Greece and Tunisia, in: *Pottery in the Archaeological Record: Greece and Beyond*, Lawall M. L., Lund J. (eds.), Aarhus University Press, Aarhus, 12–24.

Ilkić, M. 2013, Uvala Plemići između Rtine i Ljupča, in: *50 godina Odjela za arheologiju Sveučilišta u Zadru*, Exhibition catalogue, Uglešić A., Fadić I. (eds.), Sveučilište u Zadru, Zadar, 52–53.

Katić, M. 2000, Uvod u proučavanje keramičkih radionica Farosa, *Opuscula archaeologica*, Vol. 23–24 (1999–2000), 49–58.

Kilić-Matić, A. 2004, Prilog proučavanju tehnika i struktura gradnje rimskih vila rustika na obali rimske provincije Dalmacije, *Opuscula archaeologica*, Vol. 28, 91–109.

Kirigin, B., Hayes, J., Leach, P. 2002, Local pottery production at Pharos, in: *Proceedings of the International Conference "Greek influence along the East Adriatic Coast"*, Split, 24–26 September 1998, Cambi N., Čače S., Kirigin B. (eds.), Književni krug Split, Split, 241–260.

Kirigin, B., Katunarić, T., Šešelj L. 2006, Preliminary notes on some economic and social aspects of amphorae and fine ware pottery from Central Dalmatia, 4th – 1st BC, in: *Proceedings of the International Conference Rimini e l'Adriatico nell'età delle guerre puniche*, Bologna, Italy, 25–27 March 2004, Archeologia dell'Adriatico 2, Lenzi F. (ed.), Ante Quem, Bologna, 191–225.

Kirigin, B., Popović, P. 1988, Maslinovik. A Greek tower in the Chora of Pharos, A Preliminary report, in: *Recent Developments in Yugoslav Archaeology*, Chapman J. C., Bintliff J. L., Gaffney V., Slapšak B. (eds.), British Archaeological Reports International Series 431, BAR Publishing, Oxford, 177–189.

Kompare, T. 2015, Tegole romane in Istria nord-occidentale: prodotto

complementare di figline anforarie?, in: *Il laterizio nei cantieri imperiali. Rome e il Mediterraneo*, Atti del I workshop "Laterizio", Roma, 27–28 novembre 2014, Bukowiecki E., Volpe R., Wulf-Rheidt U. (eds.), Archeologia dell'Architettura, Vol. 20, 114–119.

Konestra, A. 2015, Pottery from the Forum of *Municipium Flavium Fulfinum* (Krk Island, Croatia) – research between 2007 and 2013, *Prilozi Instituta za arheologiju u Zagrebu*, Vol. 32, 147–214.

Konestra, A., Lipovac Vrkljan, G. 2018, Pottery workshops in the coastal area of Roman Dalmatia: landscape, spatial organization, ownership, in: *New Discoveries Between the Alps and the Black Sea. Results from the Roman Sites in the Period Between 2005 and 2015, In memoriam Iva Mikl Curk*, Proceedings of the 1st International Archaeological Conference, Ptuj, 8–9 October 2015, Janežič M., Nadbath B., Mulh T., Žižek I. (eds.), Zavod za varstvo kulturne dediščine Slovenije, Ljubljana, 127–141.

Konestra, A., Welc, F., Dugonjić, A., Androić Gračanin, P., Rabiega, K., Solecki, R., Nowacki, B. 2019, Research within the "Archaeological topography of the Island of Rab" project at Lopar in 2018: new data on Prehistoric and late Antique sites, *Annales Instituti Archaeologici*, Vol. XV, 187–194.

Kotsonas, A. 2014, Standardization, variation, and the study of ceramics in the Mediterranean and beyond, in: *Understanding standardization and variation in Mediterranean ceramics: mid 2nd to late 1st millennium BC*, Kotsonas A. (ed.), BABesch Supplements, Vol. 25, Peeters, Leuven, 7–23.

Kurilić, A. 2016, Roman tile stamped [C]AESAR III COS, in: *'Voci concordi'. Scritti per Claudio Zaccaria*, Mainardis F. (ed.), Antichità Altoadriatiche 85, Edireg, Trieste, 377–386.

Kurilić, A., Serventi, Z. 2015, Natpis Gaja Kornelija s Ilovika i Cornelii u Liburniji/ The Inscription of Gaius Corneli us from Ilovik and the Cornelii in Liburnia, *Opuscula archaeologica*, Vol. 37–38 (2013–2014), 219–247.

Lancaster, L. C. 2012, Ash Mortar And Vaulting Tubes: Agricultural Production And The Building Industry In North Africa, in: *Arqueología de la Construcción III, Los procesos constructivos en el mundo romano: la economía de las obras*, École Normale Supérieure, París, 10–11 de diciembre de 2009, Camporeale S., Dessales H., Pizzo A. (eds), Consejo Superior de Investigaciones Científicas, Instituto de Arqueología de Mérida, Madrid–Mérida, 145–290.

Lancaster, L. C. 2015, Bricks and tile, innovations, and the transmission of technical knowledge", in: *Il laterizio nei cantieri imperiali. Rome e il Mediterraneo*, Atti del I workshop "Laterizio", Roma, 27–28 novembre 2014, Bukowiecki E., Volpe R., Wulf-Rheidt U. (eds.), Archeologia dell'Architettura, Vol. 20, 238–245.

Lancaster, L. C. 2016, *Innovative Vaulting in the Architecture of the Roman Empire*, Cambridge University Press, New York.

Laubenheimer, F. 1990, *Sallèles-d'Aude – Un complexe de potiers gallo-romains: le quartier artisanal*, Documents d'Archéologie Française 26, Maison des sciences de l'homme, Paris.

Lazar, I. 2006, *Ilovica pri Vranskem*, Zavod za varstvo kulturne dediščine Slovenije, Ljubljana.

Lipovac Vrkljan, G. 2009, L'officina ceramica di Crikvenica, in: *Olio e pesce in epoca Romana. Produzione e commercio nelle regioni dell'alto Adriatico*, Atti del convegno, Padova, 16 febbraio 2007, Pesavento Mattioli S., Carre M.-B. (eds.), Edizioni Quasar, Roma, 309–315.

Lipovac Vrkljan, G. 2011, Local pottery workshop of Sextus Metilius Maximus in Crikvenica – Crikvenica flat-bottomed amphorae, in: *Roman ceramic and Glass Manufactures. Production and Trade in the Adriatic Region, Proceedings of the 1st International Archaeological colloquium*, Crikvenica, 23–24 October 2008, Lipovac Vrkljan G., Radić Rossi I., Šiljeg B. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 3–18.

Lipovac Vrkljan, G. 2016a, Osnutak i djelovanje keramičarske radionice, in: *845˚C Ad Turres*, Katalog izložbe, Konestra A., Rosić T. (eds.), Muzej Grada Crikvenice, Crikvenica, 40–51.

Lipovac Vrkljan, G. 2016b, Proizvodi radionice. Amfore, in: *845˚C Ad Turres*, Katalog izložbe, Konestra A., Rosić T. (eds.), Muzej Grada Crikvenice, Crikvenica, 52–58.

Lipovac Vrkljan, G. 2016c, Proizvodi radionice. Rimska građevinska keramika, in: *845˚C Ad Turres,* Katalog izložbe, Konestra A., Rosić T. (eds.), Muzej Grada Crikvenice, Crikvenica, 65–69.

Lipovac Vrkljan, G., Šiljeg, B. 2008, Exploration of the Igralište site in Crikvenica in 2007, *Annales Instituti Archaeologici*, Vol. IV, 88–92.

Lipovac Vrkljan, G., Šiljeg, B. 2009, Crikvenica "Igralište" – Results of the Third Year of Systematic Excavations of the Local Roman Pottery Workshop, *Annales Instituti Archaeologici*, Vol. V, 108–112.

Lipovac Vrkljan, G., Šiljeg, B. 2012, Contribution to the ancient topography of the island of Rab – Roman ceramist's kiln in Lopar, *Senjski zborniki*, Vol. 39, 5–33.

Lipovac Vrkljan, G., Ožanić Roguljić, I. 2013, Distribucija crikveničke keramike kao prilog poznavanju rimskog gospodarstva, *Senjski zbornik*, Vol. 40, 255–270.

Lipovac Vrkljan, G., Jurić, I., Rosić, T., Novosel, I., Kuzmić Z. 2014, A replica of a Roman pottery kiln in Crikvenica, in: *Roman pottery and Glass Manufactures. Production and Trade in the Adriatic Region, Proceedings of the 2nd International Archaeological colloquium*, Crikvenica, 28–29 October 2011, Lipovac Vrkljan G., Šiljeg B., Ožanić Roguljić I., Konestra A. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 41–58.

Lipovac Vrkljan, G., Starac, R. 2014, Ancient microtopography of the Hrvatsko Primorje. Adding to the existing knowledge of the archaeological landscape of Vinodol based on the Crikvenica pottery finds, in: *Roman pottery and Glass Manufactures. Production and Trade in the Adriatic Region, Proceedings of the 2nd International Archaeological colloquium*, Crikvenica, 28–29 October 2011, Lipovac Vrkljan G., Šiljeg B., Ožanić Roguljić I., Konestra A. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 93–105.

Lipovac Vrkljan, G., Konestra, A. 2018a, Approaching the Roman economy of the province of Dalmatia through pottery production – the Liburnia case study, in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 14–36.

Lipovac Vrkljan, G., Konestra, A. 2018b. Potter's tools from the workshop of Sextus Metilius Maximus (Crikvenica, Croatia): an approach to the reconstruction of the production technology, *Rei Cretariae Romanae Favtorvm Acta*, Vol. 45, 603–610.

Lipovac Vrkljan, G., Konestra, A., Ugarković, M. 2018, Eastern Adriatic Hellenistic and Roman pottery and ceramics production sites, in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 2–6.

Makjanić, R. 1987, Plain italian sigillata on the northeast Adriatic coast and at Sisak, *Rei Cretariae Romanae Favtores Acta*, Vol. XXV/XXVI, 225–239

Maggi, P. 2018, Crikvenica amphorae from Canale Anfora: first evidence of Liburnian wine at Aquileia, in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 57–61.

Mardešić, J. 2006, Tegule s pečatima iz starog fonda arheološke zbirke u Vidu kod Metkovića, *Vjesnik za arheologiju i povijest dalmatinsku*, Vol. 99, 99–112.

Matejčić, R. 2013, *Kako čitati grad. Rijeka jučer, danas, sutra*, Naklada Kvarner, Rijeka.

Matijašić, R. 1989, Rimske krovne opeke s radioničkim žigovima na području sjeverne Liburnije, in: *Arheološka istraživanja na otocima Krku, Rabu i Pagu i u Hrvatskom primorju,* Znanstveni skup, Krk, 24.–27. 09. 1985, Rapanić Ž. (ed.), Izdanja Hrvatskog arheološkog društva 13, Hrvatsko arheološko društvo, Zagreb, 61–71.

McComish, J. M. 2015, *A guide to ceramic building materials*, York Archaeological Trust, York (http://www.yorkarchaeology.co.uk/wp-content/uploads/2015/08/A-guide-to-ceramic-building-material.pdf, 28.04.2016.)

Miculinić, K. 2018, Animal exploitation at the Roman site of Crikvenica – Igralište, in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 81–88.

Miletić, Ž. 2011, Production of tegulae in Burnum in the context of building activities, in: *Roman ceramic and Glass Manufactures. Production and Trade in the Adriatic Region. Proceedings of the 1st International Archaeological colloquium*, Crikvenica, 23–24 October 2008, Lipovac Vrkljan G., Radić Rossi I., Šiljeg B. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 263–277.

Mills, P. 2013, The Supply and Distribution of Ceramic Building Material in Roman Britain, *Late Antique Archaeology*, Vol. 10(1), 451–469. doi: 10.1163/22134522-12340039

Miše, M, Šešelj L. 2008, Late Hellenistic and Early Roman Fine Pottery from sanctuaries of Diomedes in Dalmatia, *Rei Cretariae Romanae Fautores Acta*, Vol. 40, 113–119.

Miše, M. 2013, Prilog proučavanju isejske keramike tipa Gnathia / A contribution to the study of Gnathia ware from Issa, *Vjesnik za arheologiju i povijest dalmatinsku*, Vol. 106, 99–130.

Miše, M. 2015, *Gnathia and Related Hellenistic ware on the East Adriatic*, Archaeopress, Oxford.

Muscolino, F. 2018, Bolli e impronte su laterizi, in: *Amoenissimis...Aedificiis. Gli scavi di piazza Marconi a Cremona. Volume II - I materiali,* Arslan Pitcher L., Arslan, E. A., Blockley P., Volonté M. (eds.), SAP Società Archeologica, Mantova, 349–352.

Ožanić Roguljić, I. 2011, Terra sigillata and thin-walled pottery from the site of Crikvenica – "Igralište", in: *Roman ceramic and Glass Manufactures. Production and Trade in the Adriatic Region*, *Proceedings of the 1st International Archaeological colloquium*, Crikvenica, 23–24 October 2008, Lipovac Vrkljan G., Radić Rossi I., Šiljeg B. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 31–38.

Ožanić Roguljić, I. 2012, Pottery from the workshop of Sextus Metilius Maximus (Crikvenica-Igralište/Ad Turres, Northern Dalmatia), *Rei Cretariae Romanae Favtores Acta*, Vol. 42, 125–132.

Ožanić Roguljić, I. 2014, Vessels with perforated grids from Crikvenica, in: *Roman pottery and Glass Manufactures. Production and Trade in the Adriatic Region*, *Proceedings of the 2nd International Archaeological colloquium*, Crikvenica, 28–29 October 2011, Lipovac Vrkljan G., Šiljeg B., Ožanić Roguljić I., Konestra A. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 279–286.

Ožanić Roguljić, I. 2016, Proizvodi radionice. Keramičko posuđe, in: *845˚C Ad Turres*, Katalog izložbe, Konestra A., Rosić T. (eds.), Muzej Grada Crikvenice, Crikvenica, 59–64.

Ožanić Roguljić, I. 2018, Overview of the capacity of pottery vessels from the workshop of Sextus Metillius Maximus (Crikvenica), in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 37–43.

Ožanić Roguljić, I., Konestra, A. 2016, Illuminating the Way: Later Roman Factory Lamp from a Grave Context in Crikvenica, in: *Roman and Late Antique Lamps: Production and Distribution, Contacts on the Mediterranean*, Proceedings of the international round table, Zagreb 2nd February 2015, Lipovac Vrkljan G., Ožanić Roguljić I., Ugarković M. (eds.), E-ZIA 1, Institut za arheologiju, Zagreb, 128–136.

Pietruszka, W., Wypijewski, I. 2016, Sextus Mutillius Maximus: In search of the Owner of a Liburnian *saltus*, *Zeitschrift für Papyrologie und Epigraphik*, Vol. 198, 283–286.

Pallecchi, S. 2007, Le fornaci da anfore di Giancola (Brindisi) in età repubblicana. Un caso di studio, in: *Le fornaci e le anfore di Albinia. Primi dati su produzioni e scambi dalla costa tirrenica al mondo gallico*, Atti del seminario internazionale Ravenna, 6–7 maggio 2006, Vitali D. (ed.), Università di Bologna, Bologna, 181–188.

Pallecchi, S. 2008, Le fornaci romane di Albinia: identificazione delle unità funzionali e prima ricostruzione delle linee di produzione, in: *Materiali per Populonia* 7, Acconcia V., Rizzitelli C. (eds.), Edizioni ETS, Pisa, 323–388.

Parica, M., Ilkić, M. 2017, Podmorski arheološki nalazi u okolici Ljupča, in: *Župa Ljubač – zrcalo povijesnih i geografskih mijena u sjeverozapadnom dijelu Ravnih Kotara*, Faričić J., Lenkić J. (eds.), Sveučilište u Zadru, Župa sv. Martina u Ljupču, 98–112.

Parica, M., Ilkić, M. 2018, Harbour installations in the context of the pottery workshop in Plemići Bay, in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 71–75.

Pedišić, I., Podrug, E. 2008, Antički opekarski pečati iz fundusa muzeja grada Šibenika, *Opuscula archaeologica*, Vol. 31, 81–142.

Pellicioni, M. T. 2012, *La Pansiana in Adriatico. Tegole romane per navigare tra le sponde,* Ed. Arstudio, Ferrara.

Peña, J. T., McCallum M. 2009, The Production and Distribution of Pottery at Pompeii: A Review of the Evidence. Part 1 Production, *American Journal of Archaeology*, Vol. 113(1), 57–79.

Radić Rossi, I. 2011, Ship's cargoes of roof tiles and products of Sextus Metilius Maximus' workshop on the Adriatic seabed, in: *Roman ceramic and Glass Manufactures. Production and Trade in the Adriatic Region, Proceedings of the 1st International Archaeological colloquium*, Crikvenica, 23–24 October 2008, Lipovac Vrkljan G., Radić Rossi I., Šiljeg B. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 19–30.

Roux, V. 2019, *Ceramics and Society: A Technological Approach to Archaeological Assemblages*, Springer, Cham.

Royal, J. G., Tusa, S. 2012, The Levanzo I Wreck, Sicily: a 4th-century AD merchantman in the service of the annona?, *The International Journal of Nautical Archaeology*, Vol. 41(1), 26–55. https://doi.org/10.1111/j.1095-9270.2011.00334.x

Shepherd, E. J. 2006, Laterizi da compertura e da costruzione, in: *Le fornaci del Vingone a Scandicci. Un impianto produttivo di età romana nella valle dell'Arno*, Shepherd E. J., Capecchi G., de Marinis G., Mosca F., Patera A. (eds.), Rassegna di Archeologia 22/B, All'Insegna del Giglio, Firenze, 165–200.

Shepherd, E. J. 2007, Considerazioni sulla tipologia e diffusione dei laterizi da copertura nell'Italia tardo-repubblicana, *Bullettino della Commissione Archeologica Comunale di Romai*, Vol. CVIII, 55–88.

Silvestrini, M. 2004, Le gentes di Ordona romana, in: *A trent'anni dall'inizio degli scavi archaeologici del Centre belge de recherches archeologiques en Italie centrale et meridionale (1962–1992)*, Russi A. (ed.), Gerni editori, San Sevolo, 63–121.

Soricelli, G. 2004, Saltus, in: *Economia, amministrazione e fiscalità nel mondo romano. Ricerche lessicali*, Documenti e studi 36, Storchi Marino A. (ed.), Edipuglia, Bari, 97–123.

Starac, A. 2000, *Rimsko vladanje u Histriji i Liburniji. II. Liburnija*, Arheološki muzej Istre, Pula.

Starac, R. 1991. Antička keramika s lokaliteta Igralište u Crikvenici, *Vinodolski zbornik*, Vol. 6, 221–234.

Stoppioni, M. L. 2011, Fornaci romane in Romagna; i ritrovamenti più recenti, in: *Roman ceramic and Glass Manufactures. Production and Trade in the Adriatic Region*, *Proceedings of the 1st International Archaeological colloquium*, Crikvenica, 23–24 October 2008, Lipovac Vrkljan G., Radić Rossi I., Šiljeg B. (eds.), Institut za arheologiju, Muzej grada Crikvenice, Crikvenica–Zagreb, 104–113.

Suić, M. 2003, *Antički grad na istočnom Jadranu*, Institut za arheologiju, Golden Marketing – Tehnička knjiga, Zagreb.

Swift, E. 2017, *Roman Artefacts and Society: Design, Behaviour, and Experience*, Oxford University Press, Oxford.

Šegvić, B., Šešelj, L., Slovenec, D., Lugović, B., Ferreiro Mählmann, R. 2012, Composition, Technology of Manufacture, and Circulation of Hellenistic Pottery from the Eastern Adriatic: A Case Study of Three Archaeological Sites along the Dalmatian Coast, Croatia, *Geoarchaeology: An International Journal*, Vol. 27(1), 63–87. https://doi.org/10.1002/gea.21379

Šegvić, B., Ugarković, M., Süssenberger, A., Moscariello, A. 2016, Compositional properties and provenance of Hellenistic pottery from the necropolis of Issa with evidences on the cross-Adriatic and the Mediterranean-scale trade, *Mediterranean Archaeology and Archaeometry*, Vol. 16(1), 23–25. doi: 10.5281/zenodo.44773

Šiljeg, B., Lipovac Vrkljan, G., Ožanić Roguljić, I., Konestra, A. 2013, Crikvenica – *Ad turres* , Results of Systematic Archaeological Excavations of the Roman Pottery Workshop at the Igralište Site in 2012, *Annales Instituti Archaeologici*, Vol. IX, 121–130.

Thébert, Y. 2000, Transport à grande distance et magasinage de briques dans l'Empire romain. Quelques remarques sur les relations entre production et consummation, in: *Brique antique et médiévale: production et commercialisation d'un matériau*, Boucheron P., Thebert Y., Broise H. (eds.), Collection de l'École française de Rome 272, Ecole française de Rome, Rome, 341–356.

Ugarković, M., Konestra, A. 2018, Hellenistic and Roman fine-wares from Soline bay on St. Clement island near Hvar, in: *Praetoria Longe Lateque Lucentia. Zbornik radova posvećen Vlasti Begović povodom 65. obljetnice života*, Ugarković M. (ed.), Zbornik Instituta za arheologiju 8, Institut za arheologiju, Zagreb, 71–106.

Ugarković, M., Šegvić, B. 2018, The role of archaeometry in the study of production and dispersal of Hellenistic pottery in Dalmatia, with new evidence on the chemistry of grey-ware tableware, in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljanm G., Konestra A. (eds.), Archaeopress, Oxford, 89–106.

Volpe, G. 2008, Il *Saltus Carminianensis*: Una grande proprietà imperiale e una diocesi rurale nella Apulia tardoantica, *Boletín Arkeolan*, Vol. 15(2007–2008), 127–141.

Warry, P. 2006, *Tegulae. Manufacture, typology and use in Roman Britain*, British Archaeological Reports British Series 417, Archaeopress, Oxford.

Welc, F., Lipovac Vrkljan, G., Konestra, A., Rosić, T. 2016, Remote sensing

of a Roman pottery workshop. Report on a geophysical survey carried out in Crikvenica (Ancient *Ad Turres*, Croatia), *Studia Quaternaria*, Vol. 34(2), 119–130. doi: 10.1515/squa-2017-0010

Welc, F. 2018, Geoarchaeology of pottery workshop sites in Roman *Dalmatia*, in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 62–70.

Wilkes, J. J. 1979, Importation and Manufacture of Stamped Bricks and Tiles in the Roman Province of Dalmatia, in: *Roman Brick and Tile. Studies in Manufacture, Distribution and Use in the Western Empire*, British Archaeological Reports International Series 68, Mc Whirr A. (ed.), Archaeopress, Oxford, 65–72.

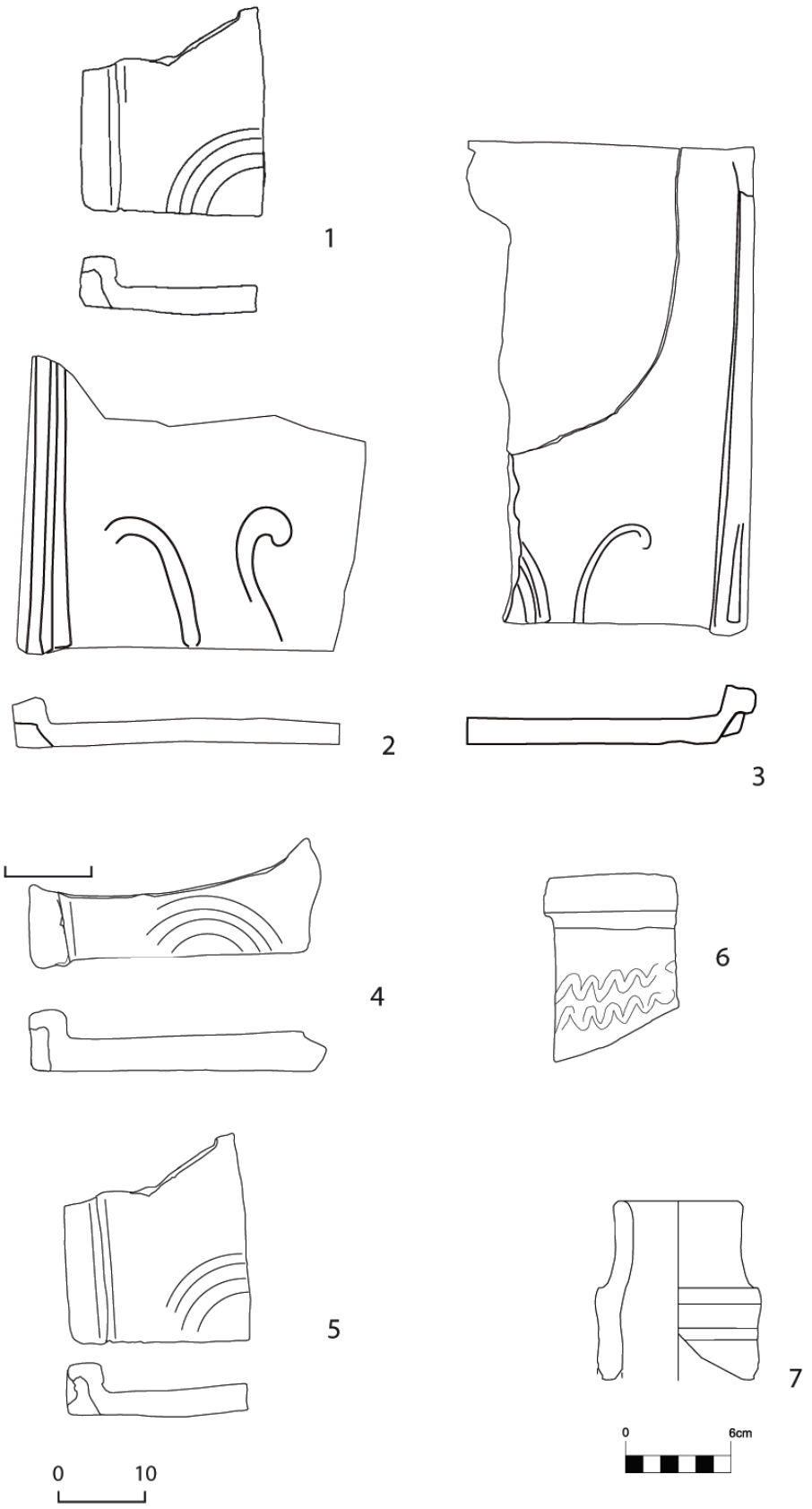
Wilson, A. 2006, The Economic Impact of Technological Advances in the Roman Construction Industry, in: *Innovazione tecnica e progresso economico nel mondo romano,* Atti degli Incontri capresi di storia dell'economia antica, Capri 13–16 aprile 2003, Lo Cascio E. (ed.), Edipuglia, Bari, 225–236.

Zaninović, M. 1985, *Prata Legionis* u Kosovu polju kraj Knina s osvrtom na teritorij Tilurija, *Opuscula archaeologica*, Vol. 10, 63–79.

Zubin Ferri, T. 2018, Archaeometric characterisation of pottery and ceramics from Dalmatian Roman pottery workshops and possible clay raw material by multivariate statistical analysis in: *Pottery Production, Landscape and Economy of Roman Dalmatia. Interdisciplinary approaches*, Lipovac Vrkljan G., Konestra A. (eds.), Archaeopress, Oxford, 107–112.

Zubin Ferri, T., Rončević, S., Lipovac Vrkljan, G., Konestra, A. 2019, Post-depositional alterations of terrestrial and marine finds of Roman ceramics from Crikvenica production centre (NE Adriatic, Croatia) – A contribution towards chemometric classification, *Journal of Cultural Heritage,* Vol. 43, 12–25. doi: 10.1016/j.culher.2019.10.005

T. 1



Pl. 1 1–6 Signatures on tiles from the Crikvenica *figlina*; 7 vaulting tube (drawings and elaboration: A. Konestra)
T. 1 1–6 Oznake na tegulama crikveničke figline; 7 tubul za izradu svoda (crteži i obrada: A. Konestra)

Pl. 2 CBM from the Crikvenica figlina: 1 *imbrex*; 2 box-flue tile; 3a–d four types of *spicae*; 4 *suspensura*; 5 the heated floor of the thermal complex at *Tarsatica* (Rijeka) (1–4 photo: A. Konestra, G. Lipovac Vrkljan; 5 after: Matejčić 2013: 44; made by: A. Konestra)

T. 2 *GK iz crikveničke radionice: 1* imbrex*; 2 šuplja opeka – tubul; 3a–d četiri tipa* spicae*; 4* suspensura*; 5 hipokaust termalnoga sklopa u Tarsatici (Rijeka) (1–4 snimile: A. Konestra, G. Lipovac Vrkljan; 5 prema: Matejčić 2013: 44; izradila: A. Konestra)*

Pl. 3 1–2 Impression of a shoe sole on a *tegula* flange and an involuntary finger groove on its outer surface (SF 3429); 3 Shoe sole impression on a brick (SF 1418); 4–10 Paw marks (SF 1810; 1682; 1324; 1916; 1658; 2248: 272); 11 Paw marks, inverted tile stamp, and a possible finger impression within the groove under the flange (MGC 182) (images are not in scale) (1–10 photo: A. Konestra, G. Lipovac Vrkljan; 11 photo: M. Gregl; made by: A. Konestra)

T. 3 *1–2 Otisak obuće na krilcu tegule i neželjeni trag prsta s njezine vanjske strane (PN 3429); 3 otisak obuće na opeci (PN 1418); 4–10 otisci šapa (PN 1810; 1682; 1324; 1916; 1658; 2248: 272); 11 otisci šape, obrnuti pečat i mogući otisak prsta unutar utora ispod krilca tegule (MGC 182) (ilustracije nisu u mjerilu) (1–10 snimile: A. Konestra, G. Lipovac Vrkljan; 11 snimio: M. Gregl; izradila: A. Konestra)*

Pl. 4 1 example of cross pattern on bricks; 2 particular ellipsoid signature; 3 signature possibly executed with a tool; 4 stamp applied above signature; 5 stamp below signature; 6–7 *Pansiana* stamps (SF 400; 1131) (photo: A. Konestra, G. Lipovac; made by: A. Konestra)

T. 4 *1 primjer križnog uzorka na opeci; 2 posebna elipsasta oznaka; 3 oznaka moguće učinjena alatkom; 4 pečat apliciran iznad oznake; 5 pečat ispod oznake; 6–7* Pansiana *pečati (PN 400; 1131) (snimile: A. Konestra, G. Lipovac; izradila: A. Konestra)*