
**FIRMALAMPEN: AN ABUNDANTLY-PRODUCED LAMP-TYPE ALMOST
NEVER USED?
SOCIO-ECONOMIC ELEMENTS TO DEFINE A NEW FRAMEWORK TO STUDY
THESE PECULIAR LIGHTING DEVICES**

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Abstract: Firmalampen, produced in enormous quantities in the Northern provinces of the Roman Empire, bear with them still many mysteries to be solved. The most important of these concerns the very few individuals which have ever been used, if compared to the immense corpora of this type, gathered from Britannia to all the provinces situated along the Rhine and the Danube limes. This fact is not only in contrast with the quantities unearthed, but also with the incredible technological progress brought by a Firmalampe. By placing the wick on its channel, its lighting power doubles, being then comparable to the cumulative light provided by two contemporary "discus-lamps". This article aims to offer a new framework and new hypothesis for further studies, by examining diverse elements: locations and delocalizations of the workshops, supply chains leading to the most remote newly conquered areas, military and civilian logistic needs and tastes. Last but not least, a list of specific contexts where the majority of the lamps of this type are found with traces of use will give further clues, for the Firmalampen as well as for another poorly aesthetic and merely utilitarian type, which seem to have the same fate: the much less studied Imperial Vogelkopflampen. The latter type has also been created and manufactured massively during almost three centuries, with a specific "industrial design" elaborated to suit other specific needs: package easiness and possibility to fix them on a wall with a simple nail thanks to their vertical, pierced handle.

Rezumat: Firmalampen, opaițe aparținând unui tip produs în cantități enorme în provinciile nordice ale Imperiului roman, sunt în continuare înconjurată de multe mistere. Cel mai important privește faptul că foarte puține piese au fost folosite vreodată, prin comparație cu imensul corpus de opaițe aparținând acestui tip, adunate din Britannia până în provinciile de limes situate de-a lungul Rinului și Dunării. Această situație nu contrastează doar cu marile cantități descoperite, ci și cu incredibilul progres tehnologic adus de Firmalampe. Prin plasarea fitilului pe canal se dubla puterea sa de iluminare, fiind comparabilă cu lumina cumulată produsă de două opaițe cu disc contemporane. Acest articol încearcă să ofere un nou cadru și o nouă ipoteză pentru viitoare studii prin analizarea diferitelor elemente: localizarea

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și delocalizarea unor ateliere, lanțuri de aprovizionare ce duc spre cele mai îndepărtate teritorii nou cucerite, nevoi logistice și gusturi militare și civile. Nu în ultimul rând, o listă cu contextele specifice de descoperire pentru acest tip de opaiț va oferi noi indicii, atât pentru Firmalampen, cât și pentru un alt tip de opaiț fără calități estetice, cu scop în principal utilitar, ce pare să fi împărțit aceeași soartă: mult mai puțin studiatele Vogelkopflampen de perioadă imperială. Acest din urmă tip a fost de asemenea creat și produs în mod masiv de-a lungul a aproape trei secole, cu un „design industrial” specific, elaborat pentru a se potrivi altor nevoi specifice: ușurința cu care puteau fi purtate și posibilitatea de a le fixa pe perete cu un simplu cui grație toartei verticale, perforate.

Keywords: Roman Empire; Firmalampen; workshops; production; supply roads; military logistics; contexts of use; Vogelkopflampen.

Cuvinte cheie: Imperiul Roman; Firmalampen; ateliere; producție; căi de aprovizionare; logistică militară; contextul folosirii; Vogelkopflampen.

INTRODUCTION

Firmalampen from the northern provinces of the Roman Empire, from Britannia to Dalmatia and from Tarraconensis to Moesia, have been the subject of innumerable monographic studies. Until recently, most of these researches have been focused on the epigraphic aspect of this specific type, i.e. the study of the – almost – compulsory presence of the “trademark” in relief on their base, the very element which gave them their name in German. Nowadays, the neologism *Firmalampen* is used in all languages with the exception of English, where the preference is to group all the lamps of Loeschcke types IX and X under the denomination of *Factory Lamps*.

The archaeological interest of the studies of the marks has been to follow, for each known workshop, the location of its original factory, the diffusion of its first products, its relocation and/or the birth of “legitimate” subsidiaries in competition with the appearance of “illegitimate” workshops practicing the technique of over-molding or simply imitating the mark, according to a method defined by William V. Harris² and recently perfected, for Central and Northern Italian workshops, by Silvia Marini.³

However, almost no question has been raised, hence no hypothesis proposed, on the very scarce quantity of used lamps belonging to this type among the immense quantities of *Firmalampen* found. The contrast between this apparent “underuse” is even more impressive in the Lower Danube region, where they have been imported and then produced on an amazing scale and during the longest timeframe within all the Empire: from the second half of the 1st to the 4th century AD, a never-witnessed long-lasting quantitative “floruit” for a specific Roman Imperial lamp standard type with a canonical shape.

² Harris 1980.

³ Marini 2019.

The aim of our paper, based on a selection of the most intensively researched areas and cities in this vast geographical region, is to point out technical specificities and macro- and micro-economical trends, while not forgetting the social and cultural specificities, civilian as well as military, within each of the different regions approached, in an effort to offer hypotheses for further research, which will either entrench or refute these ideas.

**ADVANTAGES OF FIRMALAMPEN:
A TECHNOLOGICAL REVOLUTION IN LIGHTING POWER AND A CUSTOM-
TAILORED TOOL FOR THE QUARTERMASTER**

As early as 2003 Christian-Heinrich Wunderlich⁴ proposed the idea, accepted today by most lychnologists that the creators of the *Firmalampe* understood the fundamental physical and chemical laws behind wick performance and the lighting power of its flame. Fortis, Strobilius and their competitors, all based in the Regio VIII Aemilia and in the territory of Mutina (Modena) in particular, were in fact the inventors of a technique, known as the double air-fed wick, for which Ami Argand would obtain a patent 1700 years later.

As a matter of fact, if the wick is set as is the norm, with its end drawn out only slightly out of the wick-hole, the lamp will light like any other oil-lamp (Fig. 1a). The power of the flame grows if the user pulls the wick up above the raised-rim of nozzle (Fig. 1b). But if the wick is laid back into the nozzle channel, the flame, supplied with oxygen from inside and from outside, will double its power. Wunderlich's laboratory analyses have demonstrated that, if used in this way, a *Firmalampe* will illuminate twice as much as a conventional lamp, while consuming, obviously, twice as much fuel (Fig. 1c).

Firmalampen were also designed for medium- to long-distance trading, being far less fragile than all other contemporary competing types, the standard lamps with adorned discus. With a thicker reservoir and nozzle walls, the *Firmalampen* are much more robust. In addition, they can be easily stockpiled thanks to a flat bottom and upper part, the fulcrum being a high vertical rim around the discus and nozzle, to which one should add the raised lug. Without the handle, the packing of these lamps is easier and their transport less risky.

It is thus clear that this type, and its various subtypes, was a lychnological cornerstone for quick-to-produce, transport-resistant lamps even for the long-distance trade, hence perfectly suitable for being sent to newly conquered areas, primarily to meet the demand of a huge Roman military force dislocated there.

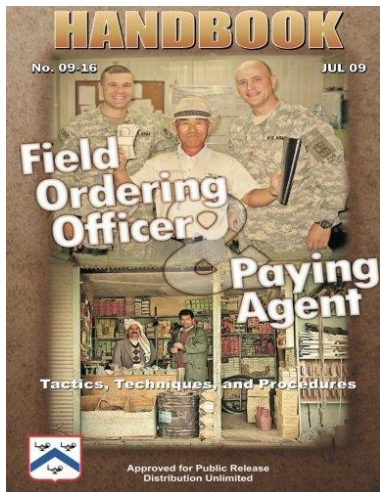
⁴ Wunderlich 2006.



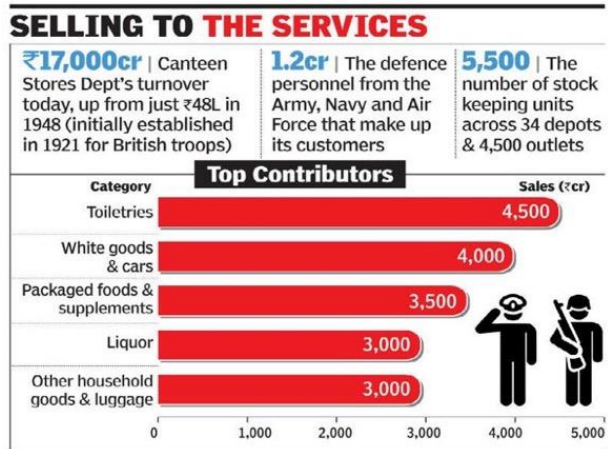
Fig. 1. Three ways of use of the *Firmalampen* (© C.-H. Wunderlich). Method A. *Firmalampe* used in the conventional way (© Kunsthistorisches Museum Wien, *Firmalampe*, Inv.-No. ANSA V 791c); Method B. *Firmalampe* used with wick pulled up, extending above the nozzle-rim (© Musée départemental Arles antique /Laurent Chrzanovski / Arles-Rhône 3 excavations); Method C. *Firmalampe* used with wick laid back on the nozzle channel (Korač 2018).

Indeed, the logistical needs of a well-organized army, ageless by all standards, were most likely at the root of this invention. Quartermasters anywhere and anytime expect supplies to reach them promptly and reliably, minimizing losses due to a long and arduous transport chain. The success of this peculiar type is also to be understood in terms of common quartermastering operations, the same in Roman times as nowadays. When abroad, quartermasters are obliged to purchase “household items” from local traders and/or producers. Imagine the superintendents and all the bookkeepers of a *Castra Legionis* having to write down, after the name of the trader and the amount paid, immense inventory lists of lamps purchased according, for instance, to the discus decorations! The marks on *Firmalampen*, are hence a perfect asset: they allow intendants to write down short inventory lists, imaginably like this “*LVCERNAE EMISSAE MMM FORTIS, MCCC STROBILI, CCCL CASSI*”, that is, “bought lamps: 3000 FORTIS, 1300 STROBILI, 350 CASSI”.

It is exactly what we find in the tables of the “*US army guide no. 09-16*” concerning US troops abroad, defining the rules for buying supplies and goods on local markets and companies by a “*field ordering officer & paying agent*” after approval by the commander. Many descriptions to be found in the guidelines are very near if not identical to what may have happened in major Roman units and the legion’s headquarters (Fig. 2).



a



b

Fig. 2. The cover of the 09-16 US Army Handbook detailing processes for ensuring smooth purchase of local goods for the supply of units (left), and the amount of household supplies bought by the “Canteen Stores” of the Indian Armed Forces.

**DISADVANTAGES OF *FIRMALAMPEN*:
CRUDENESS UNSUITED TO THE TASTES OF MILITARY AND CIVILIAN
ROMANIZED ELITES**

For most of the Romanized transalpine elites, as well as for the soldiers of several legionary headquarters, a lamp type so crude and “inelegant” must have been shocking at a time when the standard Imperial discus-lamp types had just about reached a golden age of iconographic diversity and masterful rendering.

This “disdain” for the “tasteless” newcomers is reminiscent of the sarcastic comments made by a Parisian visiting America at the end of the 19th century.⁵ Accustomed to the European luxurious candle-holders and to the kerosene lamps with their flame shining through colored glass lampshades, he writes: “*I went up to my room ... with a horrible kerosene lamp which I blew out mistrustfully and was utterly unable to light up again. Besides, no candle. In the hotel where I stayed in New York, the rooms are lit by gas, which is both unhealthy and inconvenient. Perhaps this is the place to note how much the idea of comfort varies from one people to another. Americans find that we have a very low notion of it, and for many things I am prepared to return this compliment to them*”.

Firmalampen appear to have been rejected offhand by the major civil and military centers, as suggested by the number of such lamps unearthed at Magdalensberg or Vindonissa (Windisch, Switzerland). Quantities in these two early transalpine sites speak for themselves: in the future capital of Noricum, there are only eight among the 1455 lamps (0.55%) recorded in the 1970s⁶, while at Vindonissa, founded in AD 15 to serve as a *Castrum Legionis* to three consecutive legions (first the Legio XIII Gemina, then the Legio XXI Rapax and finally the Legio XI Claudia) before being abandoned in AD 101, the most recent research estimates the total at 150⁷ (hence 2.15% of all lamps found), doubling the number (77 objects then) that Siegfried Loeschcke studied more than a century ago when creating the typology that bears his name based on the complete Vindonissa lamp assemblage.⁸ The statistics from recently published lamp corpora representing two important cities active in the Mediterranean trade system confirm this view. At Glanum, in *Gallia Narbonensis*, we find 12 such lamps among 495 specimens⁹ (2.42%), while at Ampurias, in *Hispania Tarraconensis*, there are only 23 *Firmalampen* among 782 contemporary lamps catalogued (2.94%) (the complete corpus extends to much later periods).¹⁰ These numbers are significant because these two

⁵ Bouchor 1892, 51-55.

⁶ Farka 1977.

⁷ Hartmann 1991.

⁸ Loeschcke 1919.

⁹ Bémont 2002, 229-230 (nos 457-466).

¹⁰ Genover, Fusté 2006, 36 and nos E697-E720.

trade centers are located in regions that were important transit points at the beginning of the fluvial and road supply routes leading to areas where *Firmalampen* are widely attested, that is, central and northern France for Glanum, northeastern Spain for Ampurias, two regions to which we will come back later.

One should also note feeble attempts to raise the visual attractiveness of *Firmalampen* by rendering ornamental relief elements on their discuses, mainly one or two comedy masks, heads of satyrs or – on Gallic productions – heads of Dionysos and of Jupiter-Amon. These, however, did little to overcome the lack of popularity of the type. In regions where *Firmalampen* were found in massive quantities, some local potters also tried to enhance the aesthetic side of their products by adorning them with popular themes, like a naïve rendering of Victoria known from lamp moulds discovered in a workshop in *Asturica Augusta* (Astorga)¹¹ (Fig. 3).



Fig. 3. Typical masks adorning *Firmalampen* signed STROBILI (left) and FORTIS (centre): © Musée d'Art et d'Histoire, Geneva, inv. 005589 and inv. 014381; sample produced from an original mould found at Astorga adorned with Victoria holding a laurel wreath (right) (Amaré Tafalla, García Marcos 1994, pl. 4, 281).

A unique “high-class” design on a *Firmalampen*, the work of a skilled potter whose workshop was discovered near Emona (Ljubljana), consists of an elegant pair of swans in relief, arranged around a vertical, pierced handle (Fig. 4).¹² This eclectic production is associated with the mark CASSI, while the same potter produced standard *Firmalampen* bearing many other marks belonging to workshops located in Modena.

¹¹ Amaré Tafalla, García Marcos 1994.

¹² Istenič *et alii* 2003; Istenič *et alii* 2004.

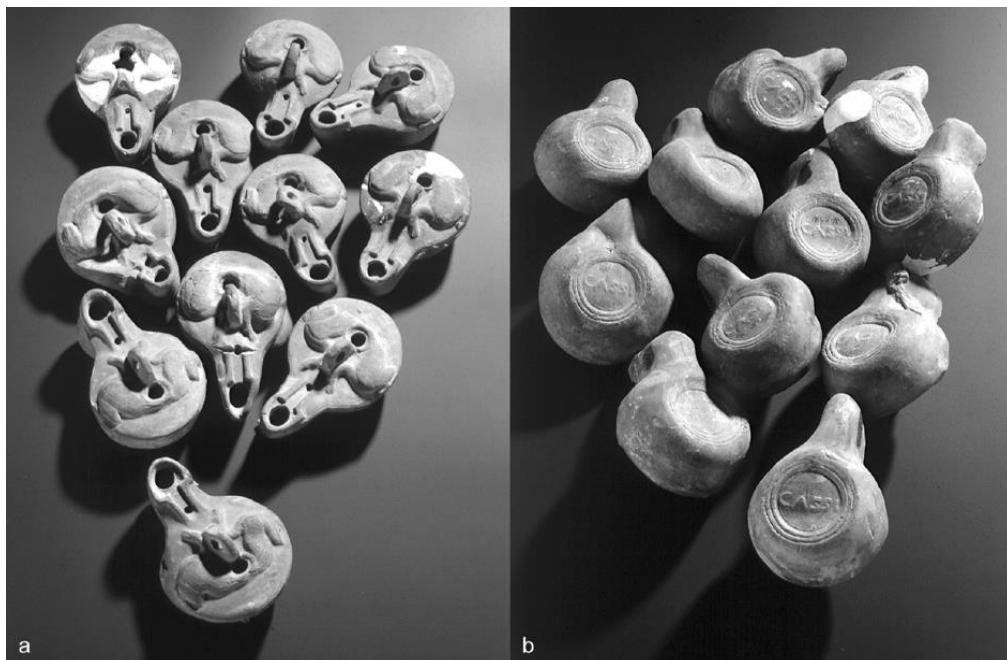


Fig. 4. The “double swan” *Firmalampen* made in Emona (Istenič *et alii* 2004, fig. 3a–b, 316).

At the same time and in almost all the “*Firmalampen*-invaded” territories, from the Rhine limes to the Danube limes, one observes the production of very carefully-made plastic lamps adopting the typical *Firmalampen* nozzle of the Loeschke X type (Fig. 5). These lamps, invented in Italy, are rendered in the shape of a gladiator’s helmet¹³ or in the more simple form of a pine cone.¹⁴ Moulds for their production have been found in several Rhine valley workshops and, as far as the Danube limes is concerned, at Aquincum, Vimincacium and Durostorum, just to name the most pertinent known examples.

¹³ For this specific shape and a complete discussion and bibliography, see the recent Bogdanovič, Vujovič 2015.

¹⁴ Cathala 1993.



Fig. 5. Plastic lamps with *Firmalampen* nozzles: a. gladiator-helmet shaped lamp (© Museum of Bologna); b. pine-cone shaped lamp discovered in Britain, recently sold on auction (© Harlan J. Berk LTD, Chicago).

NEW DEFINITION OF WHERE AND WHEN *FIRMALAMPEN* WERE INVENTED

The axiom for many years was to place the invention and production of the *Firmalampen* in the *Regio VIII Aemilia* and the *Regio X Venetia et Histria*, dating the first sets around 50 or even after 70 AD depending on the researcher, an outdated theory still present even in some of the newest research. Discoveries and context studies in the past ten years have indicated that the territory of Modena may have been where these lamps were first created, and as early as the reign of Tiberius as Donato Labate proved in one of his recent papers.¹⁵ Recent excavations at *extra muros* production areas at Mutina (Fig. 6 and Fig. 7),¹⁶ as well as on sites within the territory of the *municipium*¹⁷ duly followed by exhaustive publications, prove this new chronology as well as the presence of all the lamp-makers known to belong to the "inventor group" of this type (Fig. 8).

¹⁵ Labate 2017a, 224.

¹⁶ Donati, Cenerini 2013; Mongardi 2014, 182 sq; Labate 2016; Labate, Malnati 2017 (all with extensive further bibliography).

¹⁷ Labate 2017a, with extensive further bibliography.

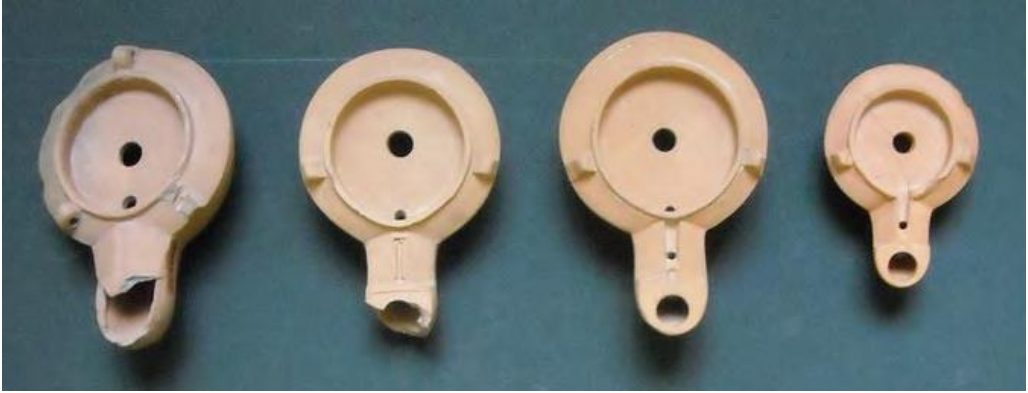


Fig. 6. Modena: small selection of *Firmalampen* from recent excavations at Viale Reiter, in the center of a workshop area active in the first half of the 1st century AD (Labate 2016, 27, fig. 56).



a



b

Fig. 7. The most sensational discovery made in Modena: a stamp for setting the mark on the bottom of the lower part of *Firmalampe* mould, suggesting that archetypes could have very well been made beforehand and the marks added later (photo: courtesy of Donato Labate; drawing from Mongardi 2014, n. 1, p. 27).

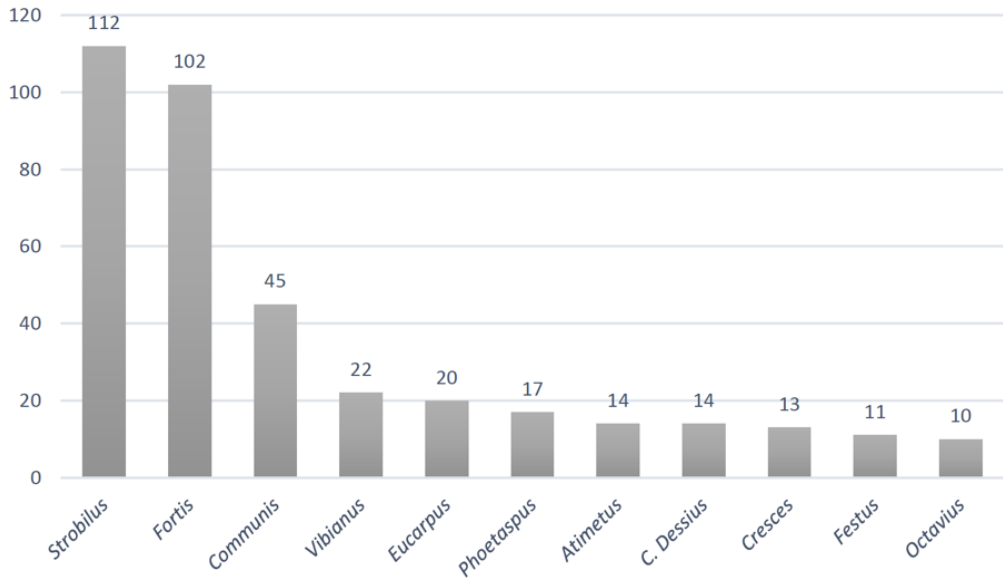


Fig. 8. Modena and its territory: quantities of each potter's mark on *Firmalampen* found in recent excavations (Mongardi 2014, 207, fig. 1).

Chemical analyses of the clay have confirmed the birthplace as well as spread of specialized factories in other neighboring regions. A very recent study of material which has actually prompted a more accurate definition of *Firmalampen* subtypes and marks, the group from Aquileia studied by Ezio Buchi,¹⁸ delivered the following results: of 92 *Firmalampen* ascribed to the 1st century AD, 55 were made in Modena and 37 in Aquileia and its region.¹⁹ These numbers confirm an early creation of this lamp type in workshops located in the *Regio X Venetia et Histria* and a blossoming of production in the second half of the 1st century AD. Added to the workshops in and near Aquileia and its wider region are the high-skilled lamp-makers in the eastern part of *Regio X* as well as the southernmost part of Pannonia: the ceramic production centers in the *suburbia* of *Emona* (Ljubljana) and, respectively, in *Poetovio* (Ptuj), where, judging by the recorded quantities of excavated *Firmalampen*, the producers aimed to meet the regional demand, while competing with the Modena factories for markets to the east and north, up the Danube.

Supported by the results of chemical analyses clearly showing the domination of Mutina-made lamps in samples from the 1st century AD, we can now abandon the old

¹⁸ Buchi 1975.

¹⁹ Schneider, Daszkiewicz 2011.

axiom about the contemporaneous invention and production of *Firmalampen* in workshops located in *Aemilia* as well as in *Venetia et Histria*.

RECENT DATA FOR A RETHINKING OF THE *FIRMALAMPEN* EXPORT CHAIN AND THE ESTABLISHMENT OF PRODUCTION “BRANCHES”

From the beginning of the 2nd century Cisalpine Italy suffered deep economic stagnation followed by impoverishment, a process well observed in many cities. If consider the *Regio XI Transpadana* one century after its peak development under Augustus, there are almost no new public buildings being constructed, the rich suburbs have turned into necropolises or small handicraft areas, and both burial and habitation contexts yield truly humble contents.²⁰ Cities become depopulated and pauperized, contrary to the countryside where the *vici* and *villae* will blossom, progressively transforming the landscape into the well-known system of huge *latifundia* before the end of the 3rd century AD.

The impoverishment is observed also in the lychnological assemblage; suffice it to look at the finds from *Mediolanum* (Milan) in the *Regio XI Transpadana*, among which *Firmalampen* are the very few if compared to imported lamps, mainly the central Italian Imperial standard discus-types²¹. In the more prosperous times of the 1st century AD, *Firmalampen* had been in concurrence with the Loeschcke I and IV types of medium and high quality, whereas from the early 2nd century AD they appeared in association with much simpler local lamps, the *Tiegellampen*,²² widespread throughout the region of Lombardy. Later, lamps found in excavated contexts start to be rare, before the blossoming period due to the re-birth of the city, which became one of the Capitals of the Roman Empire, within the context of Diocletian's and Maximilian's reforms.

The decline of macroregional demand must have seriously impacted the potential of factories like the Modena ones, producing a vast range of products in addition to the *Firmalampen*. From the middle and increasingly toward the end of the 1st century AD, many of the Mutina workshops opened “branches” in locations nearer to their customers while continuing the production at home. Many workshops also chose to close up and migrate to wealthier areas on the southern Mediterranean coast.

²⁰ Chrzanovski 2016.

²¹ Grassi 2005.

²² Grassi 2003.

AMAZING EXAMPLES: FAUSTUS, PHOETASPUS, STROBILIUS

Two of the original “inventors” of *Firmalampen*, Faustus and Phoetaspus, migrated very early in search of more promising horizons. Faustus established his production in the Levant, probably first in Cyprus and then mainly in Alexandria, operating there from the beginning of the second half of the 1st century AD (Fig. 9). Phoetaspus also made Alexandria his new headquarters at the end of the century (Fig. 10). Both of the potters (and their followers) abandoned *Firmalampen* production in favour of more attractive products for the local markets: Faustus excelled in very finely adorned Loeschcke IV lamps while creating also his own Egyptian variant of late Loeschcke I, called the “Faustus-type” by Hayes.²³



Fig. 9. A typical Egyptian motif, the grasshopper, on a “Faustus-type” lamp signed by this potter, made and found in Alexandria (© Bouvier collection; Chrzanovski 2020, 199, n. 172).

In turn, Phoetaspus produced the standard Roman Loeschcke IV, V and VIII types, but he is also credited with inventing an Alexandrian-specific type of the Loeschcke V lamp with small nozzle recalling in shape an earlier Loeschcke I form. His workshop became one of the most prolific producers of these redesigned lamps.²⁴

The most interesting case is certainly that of Strobilius. This lamp-maker was supposedly active the village of Magreta (near Modena), but recent researches showed there are no evidences on this fact²⁵, in addition to the proofs that Magreta has been abandoned by its lamp-makers – massively producing *Herzblattlampen* - already at the

²³ Hayes 1980, 94-95.

²⁴ cf. Chrzanovski 2020, 59-60 for an extensive list of references.

²⁵ See Parra1983; Labate 2009.

beginning of the 1st c. AD²⁶, all potters of this site choosing to re-settle their manufactures in the city's suburbs Strobilius's workshop, settled since the beginning in *Mutina's suburbia*, reached a peak of productivity during the Flavian period. *Firmalampen* bearing his mark are found from Iberia to Gaul and along the limes from the Rhine to the Danube, either produced by "counterfeiting" local factories or made by possible "branches" starting from the early 2nd century AD. Archaeological discoveries have demonstrated that *liberti* or members of Strobilius's family established workshops in southern Gaul and in Egypt at the time that the Modena headquarters were in full bloom. These new production centers opted for adapting to the local markets. In Egypt, for example, they turned to making new shapes, created *ad hoc* and duly appreciated by the local clientele, while in southern Gaul, the workshop(s) established by Strobilius produced *Firmalampen* for export to northern Gaul, the Swiss plateau and the Rhine area.



Fig. 10. Three Alexandrian-made lamps bearing the mark PHOETASP/I, the last being an illustration of a type created by this workshop (© Bouvier collection; Chrzanovski 2020, 205, n. 195; 244, n. 313; 251, n. 339).

However, a consistent part of the Strobilius "branch" production was focused on the small-sized Loeschcke V lamp (Fig. 11), a locally-created and much-beloved type that is

²⁶ Again, all our gratitude goes to Donato Labate for proof-reading our text and offering us this precious clarification, as all almost all lamp catalogues still mention Magreta as Strobilius's headquarters as well as a *Firmalampen* production center due to a single erratic lamp signed Strobilius, an oven waste found in 1875, never reaching any museum afterwards.

found in huge quantities in settlements in the southeastern part of the lower Rhône valley. It is worth emphasizing that the Strobilius factory is the only one to apply its mark on this type of lamps (competitors leave this shape without a signature) and it does so in relief in a region where the few other workshops known to sign their lamps incised the signature by hand or, very rarely, impressed the mark on the base.

As for the two previous lamp-makers, creating or adopting locally-flavoured shapes and continuing to set their mark on the bases when local competitors do not sign their products at all attest to a strong pride in a renowned lamp-making brand.



Fig. 11. Two typical southern Gallic small-sized Loeschcke V lamps produced by Strobilius 9 (© Arles-Rhône 3 excavations, Musée départemental Arles antique / Laurent Chrzanowski).

“OFFICIAL” BRANCHES AND COUNTERFEITING PRODUCERS EVERYWHERE: WHEN AND HOW?

The first fully operative network of “delocalized factories” massively producing *Firmalampen* is attested from the mid 1st century AD (the delocalization process completed by AD 70–80) in northeastern Spain, southern Gaul, Lyon, the Rhine valley region, the upper and middle Danube limes, and in the production-oriented *suburbia* of centers located on the “amber road”. These manufacturers (legitimate or not) would now compete with the original “*Mutina fecit*” lamps at least until AD 100. The phenomenon has been demonstrated by the results of recent chemical analyses:

- at Vindonissa, in the *Firmalampen* group, poorly appreciated to be sure, lamps made in Modena competed with those made in Lyon and in Trier;²⁷

²⁷ Schneider, Wirz 1991.

- at Emona, local *Firmalampen* competed with lamps made in Modena and with some lamps made in the same *Regio X Venetia et Histria*, further west, near Aquileia;²⁸
- at Poetovio, lamps made in Modena competed with those made *in situ*, those imported from nearby Emona and also those from other production centers in the *Regio X Venetia et Histria*;²⁹
- at Aquincum and Intercisa, Modena lamps competed with those made in Poetovio and in Carnuntum as well as, slightly later, with locally-made products.³⁰

In the west, skilled lamp manufacturers appeared in Spain before or around 50 AD. The producers from rich Baetica proved their excellence by producing discus-lamps of all types, while the northeastern centers produced mainly *Firmalampen* for the armies as well as the local population acquainted with this type. Among the best investigated sites is Astorga, probably the most representative case for the present study. *Asturica Augusta*, founded around 14 BC as the headquarters of the *Legio X Gemina*, has yielded an immense and well-studied corpus of lamps, in which *Firmalampen*, first imported from Modena and then increasingly produced on a mass scale by the local workshops, represent 54% of the lamp assemblage.³¹

Southern Gaul, which seems not to have appreciated the advantages of *Firmalampen*, just as Lyon where they are found mainly in the necropolises, produced them on a massive scale, intended for export to the sites on the Swiss plateau and on the Rhine limes, as well as to northern Gaul and Britannia. In northern Gaul, *Firmalampen* constitute more than 90% of the 100 lamps excavated in the necropolis of a small *vicus* known as “Villa d'Ancy” (Limé, Aisne), located on one of the main commercial routes leading to Boulogne, and from there to Dover, the main sea route for goods destined for Britannia.³² Once there, imported and progressively locally-made *Firmalampen* are massively present in Roman forts and *castra*, in rural settlements, but also at London and Colchester, two of the four centers where moulds attesting to their production have been excavated.³³

²⁸ Istenic *et alii* 2003.

²⁹ Daszkiewicz, Schneider 1999; Istenič *et alii* 2004.

³⁰ Schneider *et alii* 2009.

³¹ Morillo Cerdán 1999, Vol. 1, 131-144; Morillo Cerdán 2003, 121-141.

³² Bémont 2001.

³³ Eckardt 2002, who studied all the intact lamps discovered in Britannia and preserved in museums. The numbers are slightly in favour of the Roman discus-lamps with around 730 artifacts versus ca. 550 *Firmalampen*.

Coming back to the continent, to the Rhine valley and its immediate surroundings, we find three huge centers which show a disregard for the “crude” *Firmlampe*, while splurging in a discus-lamp production to the extent that the diversity of scenes recorded from excavations has served to build reference repertoires: Mainz (*Mogontiacum*)³⁴, Cologne (*Colonia Claudia Ara Agrippinensium*)³⁵ and, of course, Trier (*Augusta Treverorum*).³⁶ However, in the same way as noted for Gaul, these three cities with the huge ceramic production their suburbs produced, at least from AD 50, not only well-made and richly adorned discus-lamps of all the standard Imperial forms, but also an amazing quantity of *Firmalampen* for the supply of all nearby military units as well as for medium- to long- range export. The exhaustive catalogues of discus-lamps found at Trier and Cologne do not include the *Firmalampen* category, but one may rely on data from a brief note on quantities in the **Landesmuseum Trier**, quoting 1350 lamps of this type compared to 778 lamps of other standard Imperial types³⁷ (63.44%), while the catalogue of the **Landesmuseum Mainz** lychnological corpus cites 231 *Firmalampen* out of a total of 607 lamps (38.06%).

This first wave of *Firmalampen* manufacturers was quickly followed in all the Danube limes area by the establishment of huge factories and ceramic production suburbs, e.g., Carnuntum,³⁸ Brigetio,³⁹ Aquincum,⁴⁰ Singidunum,⁴¹ Viminacium⁴² and Durostorum.⁴³ This “second wave” of lamp factories, the exact founding date of which has yet to be refined site by site, reached fully operational status before AD 110, as suggested by the finds from Durostorum (Silistra), where the *Legio XI Claudia* took up quarters during the first decade of the 2nd century AD, implying a quick development of the enormous ceramic-producing area located in its *canabae*.

The beginning of the 2nd century AD saw the development of *Firmalampen* factories also wherever there was a local demand and a need for military supplies to justify it. This is the case if the site at **Nied** (Fig. 12), today a district of Frankfurt-am-Main. This incredibly well preserved factory area, exemplarily (alas posthumously) published by Ingeborg Huld-Zetsche,⁴⁴ was established around AD 115, witnessing

³⁴ Kirsch 2002.

³⁵ Cahn 2009.

³⁶ Goethert-Polaschek 1985.

³⁷ Werner 1997.

³⁸ Alram-Stern 1989.

³⁹ Bónis 1977; Fényes 2002; Fényes 2003.

⁴⁰ Szentléleky 1959; Vámos 2002.

⁴¹ Крунић 2011.

⁴² Korač 2018.

⁴³ Elefterescu 2016.

⁴⁴ Huld-Zetsche 2014, 58-91 (nos 20-232).

the need to enhance the production of lamps made in the “ceramic neighbourhood” of *Mogontiacum* (Mainz), despite the very short distance between the two sites (less than 40 km). Active at least until AD 160, the Nied factories delivered some 250 lamps, among which 213 are *Firmalampen*.

Even more unique is a small pottery kiln producing ceramics and *Firmalampen*,⁴⁵ located near the city of **Višegrad** overlooking the “Pannonian *Barbaricum*”, where excavations have uncovered only a very small military fort and civilian settlement. The site did not become strategically important before the 4th century AD when a huge fortress known as *Pone Navata* was constructed here.



Fig. 12. The cover illustration of Ingeborg Huld-Zetsche’s book on lamps from Nied (© Schnell&Schneider).

QUANTITIES OF *FIRMALAMPEN* FROM ITALY TO THE DANUBE: STATISTICS FROM SELECTED SITES

Concerning the **transit roads leading to Raetia and Noricum**, studies of lamps from Valcamonica and the Trento Region attest to the trade in goods, even if, in their bulk,

⁴⁵ Borusz 2017, including the lamp found but not illustrated in Borusz 2014.

they were intended to reach much more distant markets: **Valcamonica**⁴⁶ delivered no less than 43 *Firmalampen* out of the 69 lamps studied (62.32%), while 94 *Firmalampen* can be found among the 185 lamps (50.91%) coming from all the sites of the Trentino-Alto Adige Region, but mainly from the excavations led in the regional capital and now in the Regional Museum of **Trento**.⁴⁷ The difference between the two valleys is in their different situation: Valcamonica is a secondary valley without any major settlement, while Trentino leads to the Brenner pass and has as a fulcrum the city of Tridentum (Trento), a very early *castrum* raised to the rank of *municipium* already around AD 40, hence inhabited by a totally Roman, wealthy and “fashion-addicted” population, which would have hardly been open to an appreciation of such a crude version of lamp. It is the same situation as in the case of a very early *castrum* and future capital of Noricum, the reference site of **Magdalensberg**, where only 0.55% of the lamps are *Firmalampen*.⁴⁸

Following the road to the Danube, we find the first site on our voyage toward the Danube, **Aquileia**, represented by two extensive lamp catalogues, published respectively in 1975 and 1988. The first one discusses 1602 *Firmalampen*,⁴⁹ a quantity to be compared with the 1209 Roman discus lamps, which are the subject of the second study⁵⁰, giving a proportion of 56.99%. Thus, there can be no doubt that Aquileia was a huge *Firmalampen*-producing center.

Further east on the Amber Road, **Emona** (Ljubljana)⁵¹ has delivered huge quantities of discus-lamps as well as *Firmalampen*. A complete catalogue has yet to be published, but despite this we can place the Emona among the prolific *Firmalampen*-producing centers.

Arriving in Pannonia, we find the same situation in **Poetovio** as in Emona: a catalogue from 1896 was dedicated only to the lamps preserved in the museum of Graz, but there is no newer publication referring to the finds from Slovenia.⁵² We have seen above, however, that Poetovio was also a notorious *Firmalampen*-producing center.

Not far from Poetovio is the highly interesting site of **Salla** (today Zalalövő in southwestern Hungary, on the border with Slovenia). This mid-sized *castrum* became a civil settlement before being elevated to the rank of *municipium* under Hadrian. The percentage of *Firmalampen* there shoots up to more than 80%, dated between the

⁴⁶ Panazza 1984, 55-91 (nos 18-62).

⁴⁷ Gualandi Genito 1986, 257-360 (nos 103-196).

⁴⁸ Farka 1977.

⁴⁹ Buchi 1975.

⁵⁰ Di Filippo Balestrazzi 1988.

⁵¹ See Perko *et alii* 2012 for a complete bibliography.

⁵² Fischbach 1896; see Perko *et alii* 2012, 33, 52-55 for a complete bibliography.

beginning of the 2nd and the beginning of the 4th century,⁵³ that is, directly after it had shed its military role. The statistics refer to a corpus of 370 lamps coming from excavations carried out between 1973 and 1987.

Further north, in hinterland Hungary, a recently published selection of lamps, unearthed in nearby *villae* and rural settlements and gathered in the City Museum of **Veszprém**,⁵⁴ shows a clear dominance of *Firmalampen*, almost 80% of the lamps presented, but the sample in this case is too small to be useful for statistical purposes.

Reaching the Danube, **Lauriacum** in Austrian territory delivered a percentage of 95.64% *Firmalampen*: 329 out of a corpus of 344 collected in 1965.⁵⁵

Vindobona (Vienna) has the most recent and fullest catalogue: 509 out of the 748 lamps ever found in excavations in the city are *Firmalampen*,⁵⁶ that is, 68.05% of all the lighting devices.

These numbers are in contrast to those from the nearby *castrum* of **Carnuntum**, where *Firmalampen* were evidently less appreciated.⁵⁷ Excavations have unearthed 270 *Firmalampen*, 42.06% of the published corpus composed of 642 imperial lamps even if the *canabae* of the city are known to have hosted a very active *Firmalampen*-production center, which exported its products as far as Aquincum.

In Slovakia, not far from Carnuntum, excavations mainly in the necropolis around the auxiliary fort of **Gerulata** (town of Rusovce, close to the Austrian–Hungarian border, at the extreme south of the small part of Cis-Danubian Slovak territory) have uncovered 164 *Firmalampen*, making for 78.47% of a total, fragments included, of 209 mouldmade Imperial lamps⁵⁸.

There are few exhaustive museum or site lamp corpora from Hungary, but the statistics for **Pannonia** as a whole are nevertheless interesting, considering the enormous corpus of lamps studied almost a century ago by Dora Iványi. This publication covers a territory comprising, in addition to Hungary, parts of Croatia and Slovenia. Even considering the fact that Iványi studied only selected intact lamps from the main museums of his time, the final numbers are statistically significant in view of the size of his sample and prove to correlate with quantities recorded in the newest corpora: no less than 3349 *Firmalampen* out of a total recorded sample of 4618 intact specimens,⁵⁹ giving a proportion of more than 72.52%.

⁵³ Pongracz 1990.

⁵⁴ Palágyi 2002.

⁵⁵ Deringer 1965.

⁵⁶ Sakl-Oberthaler 2019.

⁵⁷ Alram-Stern 1989, nos 131-403, discussion 36-44.

⁵⁸ Frecer 2014, 109-225 (nos 41-204).

⁵⁹ Iványi 1935, 15-19, 121-318 (nos 1262-4614).

Much more recent studies include publications of finds from the lamp-producing ceramic centers of **Brigetio**⁶⁰ (including a catalogue dedicated to *Firmalampen*⁶¹) and **Aquincum**, and, going south along the Danube, a recent catalogue of intact lamps from **Intercisa**⁶² shows an even higher statistics: 79.56% of the lamps studied are *Firmalampen* (358 out of 450).

Crossing the border, the most important ancient sites located in Serbia show a different story: at **Sirmium**,⁶³ 79 *Firmalampen* out of a total of 140 moulded imperial lamps (56.43%); at **Singidunum**,⁶⁴ 204 out of 350 moulded lamps dated from the 1st to the 3rd centuries AD (58.28%); at **Viminacium**,⁶⁵ 3020 out of a total of 8104 moulded Imperial lamps (37.27%), despite the fact that the *suburbia* there had hosted a large ceramic (and *Firmalampen*) production area.

Very few sites on the northern side of the Danube, facing Serbia and Bulgaria, have been published. These are the major centers of **Drobeta**, **Dierna**⁶⁶ and **Sucidava**, which in addition to having their own workshops, also imported goods from across the great river, both for themselves and for the military units present in their territory. There are no recent publications from these sites, following in the wake of a brief study by Cloșca Băluță,⁶⁷ which referred to all the military sites on the left bank of the Danube and which is to be read in correlation with Maria Cicikova's earlier study⁶⁸ of sites on the left bank. There is, however, a recent catalogue of a selection of intact lamps found in **Sucidava**,⁶⁹ with 30 *Firmalampen* among 92 contemporary lamps (32.61%), and a study of 10 fragments of *Firmalampen* discovered in Sucidava territory.⁷⁰ Above all, there are two very well published minor sites: the small **fort of Slaveni**⁷¹ on the river Olt, which produced 30 lamps, six of which were *Firmalampen*, and the **statio of Cioroiul Nou**⁷² (province of Dolj), which yielded seven *Firmalampen* out of 19 mouldmade lamps. Neither should one forget the *municipium of Romula*⁷³

⁶⁰ Fényes 2003.

⁶¹ Fényes 2002.

⁶² Újlaki Pongrácz 2006.

⁶³ Rubright 1973, 60-64 (nos 64-142).

⁶⁴ Крунић 2011, 88-168 (nos 74-277).

⁶⁵ Korać 2018.

⁶⁶ See Timoc 2008.

⁶⁷ Băluță 1986.

⁶⁸ Čičikova 1974.

⁶⁹ Gherghe, Cojoc 2011.

⁷⁰ Gherghe, Cojoc 2012.

⁷¹ Tudor *et alii* 2011, 181-185, Pl. 34-39 (nos 155-184); Bondoc 2012.

⁷² Bondoc 2008.

⁷³ Negru, Bădescu 2005, 119, 254, nn. 7-14; Negru *et alii* 2008.

locate further west, the lamps from which were the subject of two brief studies; eight of the 14 moulded lamps were *Firmalampen*, showing the evident superiority of this type to other contemporary lamp types.

Returning to the southern bank of the big Danube, in Bulgarian territory, the figures are only approximate for the area up to Novae: based on intact lamps coming mainly from important sites like Oescus, Ratiaria, and Montana, preserved in provincial museums in **northwestern Bulgaria**,⁷⁴ we observe only 74 *Firmalampen* out of the more than 500 mouldmade lamps dating from the 1st to the 3rd centuries recorded in a recently published regional corpus.

At **Novae** (Svishtov), the powerful headquarters of the *Legio I Italica*, the corpus discovered during excavations in the western sector of Novae, directed by Prof. Piotr Dyczek,⁷⁵ contained 38 examples of *Firmalampen*, sufficiently preserved to be studied. This constituted less than 10% of the total number of lamps dated to the interval before the destruction of the fortress in AD 250 and its immediate if very different reconstruction after that. Added to this number are the 63 *Firmalampen* inventoried from Bulgarian excavations in the eastern sector of Novae at the end of the 1980s,⁷⁶ the few specimens discovered during later Bulgarian fieldwork in sector X of the military camp,⁷⁷ the eight fragmentary specimens from the excavations of the University of Poznan⁷⁸ and, finally, *extra muros*, two specimens of very poor quality, never used, recently discovered in a pit just alongside the Mithraeum.⁷⁹ These numbers do not include the enormous quantities of unpublished lamps observed in the deposits of different missions and those preserved at the local museum. The total then for *Firmalampen* from Novae, both published and still under study, is to be set around 6% and it is worth noting that the bulk of this are original AD 80-100 Italian imports. This may be an anomaly considering that the excavations have been focused, with rare exceptions, on the central part of the settlement with the fortress, while the necropolis is not known and regular investigations of the *canabae*, carried out by Agnieszka Tomas, have only just started.⁸⁰

⁷⁴ Торбов 2014.

⁷⁵ Data from the 1953–2013 excavation; a complete catalogue, now in the last phase of redaction, will be published by the author in early 2021.

⁷⁶ Čičikova 1987, 164-170 (nos 111-173).

⁷⁷ Генчева 2002, 44-45.

⁷⁸ Stawoska-Jundzill 2008, 106-108.

⁷⁹ Vladkova 2018, nos 10-11 and pl. 7.

⁸⁰ See Tomas 2017.

Further to the east, the excavation of **Sexaginta Prista**⁸¹ (Ruse) has not yielded enough lamps for any conclusions to be drawn, but the results from the site of **Durostorum**, more specifically from the *canabae* surrounding the military fortress, situated partly in Romanian territory today, are impressive. Out of 1400 lamps discovered, 617 are *Firmalampen* (44.07%) and 352 are sufficiently well preserved to read the workshop mark while the remaining 265 are in their majority fragments without preserved base – anepigraphic *Firmalampen* being very rare⁸², discussed in detail and references in Dan Elefterescu’s latest article on the subject.⁸³ **Durostorum** is also the only Moesian production center producing a huge range of plastic lamps of different shapes,⁸⁴ including the pine-cone shaped ones with a *Firmalampen* nozzle.

Continuing east toward the river’s delta, one observes a massive quantitative decrease of this type of lamp in the recorded material. In **Dobrogea**, *Firmalampen* constituted 19 out of 34 Imperial moulded lamps found during a small-scale excavation at **Troesmis**⁸⁵ and only 14 out of 117 Imperial moulded lamps in the corpus from **Noviodunum**.⁸⁶

Nevertheless, the presence of the lower part of a mould and an intact copy of a *Firmalampe* in the huge ceramic and lamp-producing center of **Pavlikeni**,⁸⁷ combined with evidence for a previously unknown producer of *Firmalampen*, a certain **A. Filuminus**, who chose to establish his workshop in **Dobrogea**⁸⁸ is an important indication that, in *Novae* as well as *Dobrogea*, lamps belonging to this type were made in workshops focusing their lamp production on other types. Moreover, it shows, at least in the present stage of research, that *Firmalampen* were being produced even in regions where they seem not to have been appreciated to any great extent.

In the Black Sea littoral, *Firmalampen* prove to be extremely rare, at least based on the published evidence. There are only three *Firmalampen* among the 534 Imperial Roman lamps forming the complete corpus of the Museum of **Constanța**,⁸⁹ published in the late 1970s, and the number is very near to that from a recent exhaustive catalogue of the lamps of the Museum of **Varna**:⁹⁰ 10 *Firmalampen* out of 364

⁸¹ Roussef 2016.

⁸² Again, all our gratitude goes to Dan Elefterescu for proof-reading our text and offering us this precious clarification

⁸³ Elefterescu 2016, with references concerning the rich lychological bibliography of the site.

⁸⁴ Elefterescu 2017.

⁸⁵ Topoleanu 2016.

⁸⁶ Baumann 2009, 220-226 (nos 1-13bis).

⁸⁷ Владкова 2011.

⁸⁸ Topoleanu 2010.

⁸⁹ Иконому 1967, Type XII, 62.

⁹⁰ Кузманов, Минчев 2018.

contemporary Roman Imperial lamps (the catalogue covers 993 lamps dated from the Classical period to the early Byzantine period). On the Black sea area, only Chersonesos delivered a tiny but consistent corpus, possibly linked to the Roman military base situated nearby⁹¹.

It is essential here to emphasize the fact that the present study does not consider the specific case of the lychnological economy of **trans-Carpathian Dacia and Banat (Dacia Ripensis)** after the Roman conquest of these territories completed during Trajan's reign. As a matter of fact, the late Romanization of an enormous area where lighting traditions were different opened an entire new market for *Firmalampen*. Customers in these areas were easily seduced to adopt new lighting techniques and devices brought by the legions. In addition, local middle to large-sized ceramic and lamp workshops started to produce *Firmalampen* very early, alongside another form that also provides a higher lighting power: the well appreciated lamps with multiple nozzles. Dacia is thus a paradise for students of *Firmalampen* with thousands upon thousands of such lamps published or awaiting publication in museum deposits as well as hundreds discovered every year during rescue and regular excavations. For an in-depth approach to this province, see foremost the works of Doina Benea (for Western Dacia⁹²), Dorin Alicu (for Sarmizegetusa⁹³), Cristian-Aurel Roman (for Dacia Porolissensis⁹⁴) and added to this are the vast repertoires of marks studied by Nicolae Gostar for all of Dacia⁹⁵ and by Cloșca L. Băluță for Apulum,⁹⁶ in addition to the already cited researches of Elefterescu⁹⁷ and Topoleanu.⁹⁸

Concerning regions included in the present study, one should mention two small articles on the trade between **Dacia** and **Pannonia**⁹⁹ as well as between Dacia and **Upper Moesia**,¹⁰⁰ two regions from where a certain quantity of lamps were imported.

⁹¹ Хршановский, Журавлев 1997, with all prior bibliography. For a more recent Russian and Ukrainian bibliography on *Firmalampen*, see Bukina, Ilyina 2010.

⁹² See *inter alia* Benea 2008.

⁹³ See *inter alia* Alicu 1994.

⁹⁴ See *inter alia* Roman 2006.

⁹⁵ Gostar 1961.

⁹⁶ Băluță 2003.

⁹⁷ Elefterescu 2016.

⁹⁸ Topoleanu 2010.

⁹⁹ Regep-Vlascici 2004.

¹⁰⁰ Regep-Vlascici 2005.

SO MANY LAMPS, SO FEW USED... A SEALED CONTEXT TO LEARN FROM

A working hypothesis to help understand why so few of these lamps show evidence of use was developed based on a study of the corpus of lamps from the Trinquetaille harbour dump covering the Arles-Rhône 3 shipwreck (AR3). The excavation of this underwater site has given invaluable testimony (Fig. 13) to the everyday life and nightlife of workers in this sector of the port of Arelate, precisely dated between AD 70 and 120. More than 7000 fragments of oil lamps, of which 3200 have been studied, have demonstrated an immense richness of types and more than 20 research problems requiring new study approaches.¹⁰¹

Table 1. Percentages calculated from exact number data provided by corpora of lamps from the mentioned sites / areas.

Glanum	12 out of 495	2.42%
Ampurias	23 out of 782	2.94%
Magdalensberg	8 out of 1465	0.55%
Vindonissa	150 out of 7000	2.14%
Trier	1350 out of 2128	63.44%
Mogontiacum	231 out of 607	38.06%
Valcamonica	43 out of 69	62.32%
Trentino region	94 out of 185	50.81%
Aquileia	1602 out of 2811	56.99%
Lauriacum	329 out of 344	95.64%
Carnuntum	270 out of 642	42.06%
Vindobona	509 out of 748	68.05%
Gerulata	164 out of 209	78.47%
Pannonia	3349 out of 4618	72.52%
Intercisa	358 out of 450	79.56%
Sirmium	79 out of 140	56.43%
Singidunum	204 out of 350	58.29%
Viminacium	3020 out of 8104	37.27%
Sucidava	30 out of 92	32.61%
Durostorum	617 out of 1400	44.07%

Firmalampen represented only 5 to 6% in the AR3 lamp corpus but, more importantly, more than 80% of this set showed combustion traces, mostly on the nozzle channel. The double lighting power of these lamps must have greatly seduced night workers.

¹⁰¹ For instance, the corpus of discus lamps is so rich in ornamental motifs (361 in total, hence a repertoire bigger than the reference ones based on lamps from Trier, Cologne, Ampurias etc.) that an abbreviated version (without geometric and vegetal patterns) has already been published in English in this journal (Chrzanovski, Djaoui 2018).

For the sake of comparison, the percentage of lamps showing distinct signs of use does not reach ever more than 20–25% in the other groups of lamps belonging to contemporary standard types (Fig. 14a). Moreover, in both *intra muros* and necropolis contexts at Arles, *Firmalampen* did not represent more than 2% in urban contexts and up to a maximum of 10% in some funeral areas. The only exception known is, again, a workers' area: the remains of a crafts area destroyed when building the circus. The unpublished material from this site provided numerous lamps, among which nearly 50% are *Firmalampen*, the bulk of them showing traces of use.

Confirmation of a preference for *Firmalampen* shown by night workers at Arles at a site like Novae comes from the *valetudinarium* where almost all the *Firmalampen* with visible traces of use were found at the fortress site. A military hospital is obviously a unit which was required to be operative day and night (Fig. 14b).



Fig. 13. The results of one day of excavation during the AR3 rescue mission (© Rémi Bénali/MdAa).

SO MANY LAMPS, SO FEW USED... HYPOTHESIS 1: THE *CASTRÀ LEGIONIS* WERE NOT THE FINAL DESTINATION...

As far as the limes is concerned, the presence of so many *Firmalampen* cannot be explained without entering into military logic (involving the contemporary sociological comparisons above): the regular presence of a potter's mark, whether

“original” or imitated, so appreciated by the quartermasters at the end of the chain. Moreover, far from being depleted along the way from Italy to the limes on the Danube, the supplies of these lamps produced by the powerful workshops of Modena were, stop by stop, enlarged to include the products of workshops situated in the centers along the Amber Route. Thus, one should consider the impressive numbers of lamps recently found at sites like **Salla**, **Carnuntum**, **Singidunum**, **Viminacium** and the production of workshops at **Emona**, **Poetovio**, **Brigetio**, **Aquincum** and of course **Durostorum** from the point of view of the “final” destination. Indeed, ensuring that the needed quantities were gathered in the major *castra* demanded a massive production of *Firmalampen* in the *canabae* of these camps in workshops that appear to have used, as observed at **Emona**, **Poeovio**, **Brigetio**, and **Durostorum** to cite just a few workshop sites, the same marks as can be found on *Mutina*-made originals, this presumably to gain favour with the local quartermasters as described above.



Fig. 14. Two *Firmalampen* bearing the mark FORTIS and showing heavy use: (a–b) Gallic-made lamp found in the Arles harbour rubbish dump (© Musée départemental Arles Antique, inv. AR3.2007.16 / L. Chrzanovski); (c–d) Danube-made lamp from Novae, found in the *valetudinarium* (© University of Warsaw, Inv. UW 183 / 93; Shvishtov Museum, Inv. 1738 / L. Chrzanovski).

This specific logic can certainly explain the overwhelming dominance, at most sites, of the FORTIS mark, on lamps produced throughout almost all the limes provinces, sometimes up to the early 4th century AD. No matter how many “official” branches Fortis and his successors were able to set up, the only justification for the known quantities of lamps with this mark is the identification (and maybe also the symbolism of the patronymic) appreciated by the military intendance (Table 2).

Table 2. Percentage of lamps with the FORTIS mark and rank of the mark among others, from the smallest to the highest.

Mutina area	23%	2 nd ; the first is STROBILIUS with 25% (only 2% more)
Lauriacum	10.5%	2 nd ; the first is by far CRESCES with 40.7%
Durostorum	20%	1 st
Salla	21%	1 st
Aquileia	25.9%	1 st
Emona	28.6%	1 st
Poetovio	30.2%	1 st
Vindobona	40.5%	1 st
Gerulata	40.6%	1 st
Sirmium	50%	1 st
Viminacium	52%	1 st

Also attested beside the original Italian marks are the brands of newly established local factories. On the lower Danube, these are the well-known *Ianuarius* and *Ariminus*, and the newly discovered *Fiuminus*.

... BUT THEY WERE CENTRAL BUYERS OF LAMPS FOR REDISTRIBUTION TO A NETWORK OF FIELD UNITS

It may be conjectured that once gathered, counted, and stockpiled by the legion quartermaster at headquarters, the lamps would be ready for the next stage in the logistic chain, meaning redistribution, together with ceramics and other goods, to specific units and forts where they would at last be used, a vital link in our study. Indeed, these dislocated units and their cantonments are the only ones to deliver clear and convincing data on a massive use of the *Firmalampen* found (Table 3), as the pioneering research on the lighting of legionary barracks has demonstrated for Dacia¹⁰² (Fig. 15a). Its authors focused on the buildings and related lighting devices of three auxiliary forts (**Buciumi**, **Arcobadara [Ilișua]**, **Feldioara**) and the legionary fortress of **Potaissa (Turda)** (Fig. 15b). It has demonstrated from a functional

¹⁰² Petruț *et alii* 2014.

perspective the absolute predominance of *Firmalampen* over other types of lamps, as evidenced by the published inventory.

Table 3. Percentage of lamps found in the Dacian military outposts studied.

Loeschcke I	2 specimens
Loeschcke I similis	2 specimens
Loeschcke VIII	20 specimens
Loeschcke VII similis	1 specimen
Round wheel-made lamps	8 specimens
Loeschcke XXI bronze lamps	2 specimens
FIRMALAMPEN	114 specimens

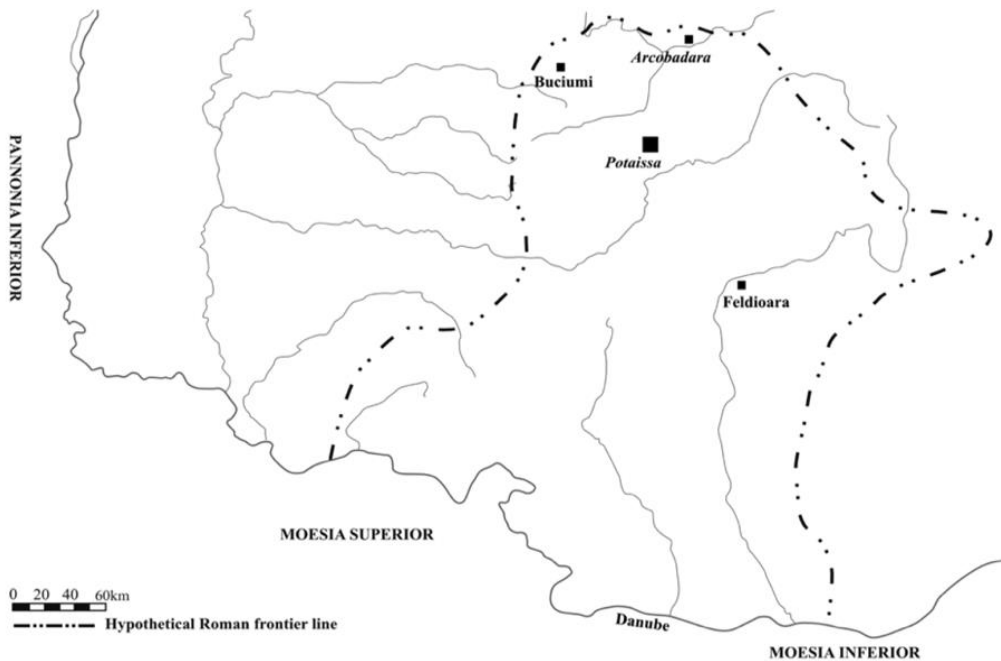


Fig. 15. Map of sites where innovative research on the lighting of Roman cantonments has been carried out (Petruț *et alii* 2014, Fig. 5).

Looking at the eastern Danube area today within the borders of Serbia, an exception compared to the “terra incognita” in all the other Danube regions, several small military sites have been excavated there and publications abound,¹⁰³ confirming the

¹⁰³ See the richness of materials on exhibition dedicated to these minor sites in Špehar 2010.

demonstration made on the forts situated in Dacia. A recent exhaustive volume devoted to the fort of **Saldum**,¹⁰⁴ located not far from Viminacium, presents five volute lamps to 10 Italian *Firmalampen* for the period of the foundation and first phases of the citadel (second half of the 1st to mid 2nd century AD),¹⁰⁵ demonstrating once again the preponderance of this type among the used lamps in small and middle-sized military cantonments (Fig. 17).

In this sense, the barracks inside the *castra legionis* were certainly places where *Firmalampen* would have been used. However, buildings of this kind have rarely been explored and when they have, they have been demonstrated to be the object of frequent rebuilding and refurbishment, especially in the large camps. Thus, even when excavated, they do not yield much material. Consequently, barracks are another missing element from the present argument.

Finally, it is within the extra-mural ever-active areas: harbours and manufacture-dedicated neighbourhoods (following the unique example of Arles) that we should search for the actual and active users of this peculiar lamp type.



Fig. 16. Lighting a *contubernium*, artistic reconstruction (Petruț *et alii* 2014, Fig. 12).

Rural settlements would have also been large consumers of this type of lamp. To give one example among many, in the rich coastal part of Slovenia, where discus lamps

¹⁰⁴ Jeremič 2009, with an exhaustive bibliography of all known and published sites on the Danube *limes* in Serbia.

¹⁰⁵ Jeremič 2009, 128-130 (nos. 367-376).

were so popular, *Firmalampen* represent more than half of all the lighting devices unearthed at the *villa rustica* near Školarice.¹⁰⁶



a



b

Fig. 17. Reconstruction of a small Roman fortified observation tower excavated near Višegrad (© Magyar Nemzeti Múzeum Mátyás Király Múzeuma /3D rendering made by Pazirik Informatic kft. (<https://pazirik.hu/en/>)).

¹⁰⁶ Žerjal 2019.

To a much lesser extent, *Firmalampen* could have been exported together with other Roman lamps to the *Barbaricum*.¹⁰⁷ However, the group of lamps from the 1st and 2nd centuries recorded in territories beyond the northeastern borders of the Empire speaks for itself: singular finds, lamps were seldom part of commercial transactions in this region which were strongly focused on an exchange of attractive and vital goods for both sides.

SO MANY LAMPS, SO FEW USED... HYPOTHESIS 2: WELL APPRECIATED FUNERARY OFFERINGS ...

In many cases, again in rural areas located near *Firmalampen* production centers, cemeteries sometimes reveal a different facies than urban sites, where this type was absolutely not popular. An interesting example comes from southern Gaul, where the necropolis of a small *vicus* discovered at **Vernègues**¹⁰⁸ near Salon-de-Provence yielded 45% *Firmalampen* among the lamps coming from the excavated tombs.

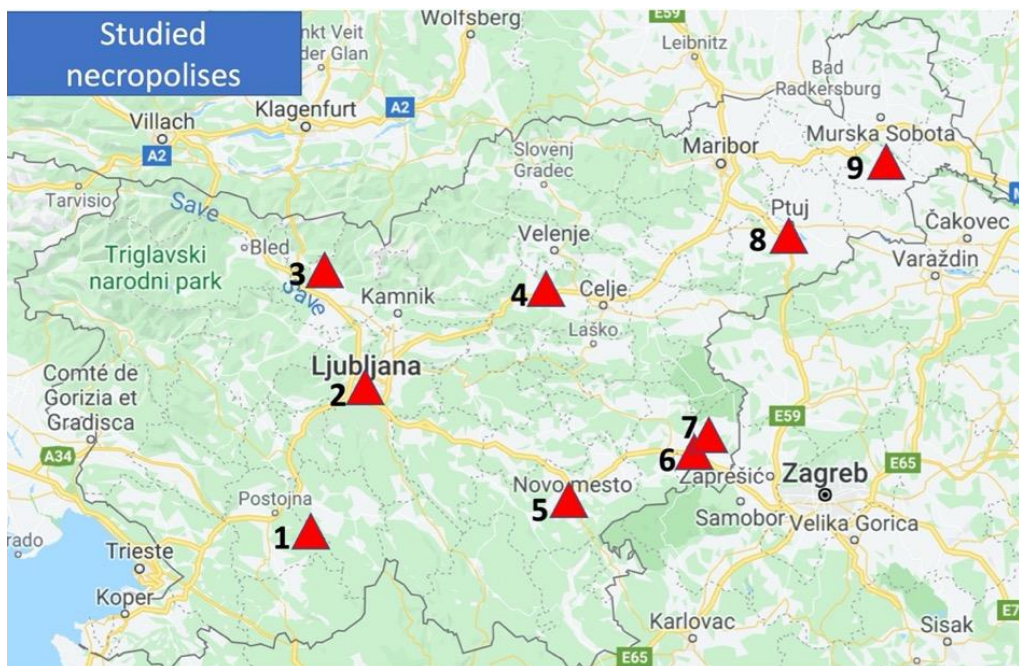


Fig. 18. Necropolises studied in Slovenian territory.

¹⁰⁷ cf. Modrzewska-Pianetti 1990; Hegewisch 2010; Istvanovits, Pinty 2011.

¹⁰⁸ Chapon *et alii* 2004.

Of interest as a case study for *Firmalampen* used in provincial burial grounds is the well-managed research in Slovenia.¹⁰⁹ Site by site, the percentage shares of *Firmalampen* from funerary contexts are as illustrated (Fig. 18 and Table 4).

Running from 50–55% to as much as 95% of the contemporary lighting devices, the percentages show the place of this type among grave offerings, even in rich tombs, like the Northern necropolis of **Poetovio** (66%),¹¹⁰ compared to two other necropolises in the same city, which revealed a differentiated appreciation for the type, that is, “only” 50% in the Eastern necropolis and 85% in the Western necropolis. One reason for this is the presumed cheaper price of this model compared to others, particularly since, as also in the case of votive offerings, neither the lamp type nor its discus decoration had any bearing (with just a few exceptions) in a funerary context.

Table 4. Percentages of *Firmalampen* among recorded contemporary clay lamps.

1	Cernika	55%
2	Emona	55%
3	Bobovek	95%
4	Sempeter	80%
5	Novo Mesto	65%
6	Doljenska	70%
7	Drnovo	50%
8a	Poetovio: Western necropolis	85%
8b	Poetovio: Northern necropolis	66%
8c	Poetovio: Eastern necropolis	50%
9	Pristava	75%

The custom along the Rhine and Danube *limes* was to offer an unlit lamp and a coin, alone or with other objects depending on a family's affluence, for the use of the dearly beloved in the afterlife, hence the popularity of *Firmalampen* in the graves. This is well attested in the countless recent studies of funerary sites, among which one could cite, for instance, a recently investigated small necropolis located at **Budaörs** in the western suburbs of the urban area of Budapest, where this type constitutes the bulk of the few lighting devices that were found,¹¹¹ or another recently excavated cemetery and votive area called “Kod Bresta” in the **Viminacium suburbia**, where *Firmalampen* constituted 35% of the enormous lamp corpus.¹¹²

¹⁰⁹ Perko *et alii* 2012.

¹¹⁰ Plesničar-Gec 1972.

¹¹¹ Delbó 2016, with a complete bibliography on Roman necropolises in Hungary.

¹¹² Tapavički-Ilić, Vojvoda, 2019.

**SO MANY LAMPS, SO FEW USED... POTTERS LEAVING MUTINA, A FACT:
ROMA TERRA INCOGNITA**

Proof of the usefulness of *Firmalampen*, for packaging and transport, as well as lighting power, could be found also at destinations never studied exhaustively: the industrial *suburbia* of **Rome** and **Ostia** as well as those of the huge cities around **Naples**. Enormous quantities of *Firmalampen* lie, unpublished, in all the archaeological deposits. For instance, the Belgian mission digging the site of the Temple of the *Fabri Navales* at **Ostia**, during a brief annual season, discovered no less than six *Firmalampen* and 16 *Vogelkopflampen*.¹¹³ The number is considerable considering that Mussolini's order to reveal "all of Ostia" resulted in a massive destruction of contexts from Imperial Roman times and an absolutely mixed stratigraphy. These peculiar conditions are well known to the author through his personal experience as founder and first director of the international mission at the "**Schola del Traiano**", a building facing the *Fabri Navales*. Under the direction of Prof. Thomas Morard, the *Schola* excavations produced a huge corpus of mostly Republican and early Imperial lamps as soon as undisturbed layers were reached, yielding mainly Republican and early Imperial lamps, as well as some late antique lamps, soon to be published by Lucie Motta.¹¹⁴

**"EXPEDITION LAMPS" MADE FOR ROME BY THE BEST CENTRAL ITALIAN
AND AFRICAN LAMP-MAKERS: A POSSIBLE CAUSE FOR THE EXILE AND
DECLINE OF THE MUTINA WORKSHOPS**

Laurent Wilmet's paper on the other rejected type, the "expedition lamps" (or Imperial *Vogelkopflampen*), brings to mind a close link with the *Firmalampen*. The *Vogelkopflampen* were another technical invention, their shape allowing them to be stockpiled side by side and upside to downside (Fig. 19). They also had a very useful, pierced vertical handle that allowed it to be nailed to a wall exactly as needed by someone doing work at night. These *Vogelkopflampen*, object of an exhaustive study by Carlo Pavolini, were produced mainly by the extremely prolific lamp industries in Central Italy and Africa, and the bulk of them bear impressed marks of producers.¹¹⁵

The logic is the same, except that it concerns sea trade and not military logistics. Traders as well as ship owners and captains were apt to choose light and easy-to-carry lamp packages to complete their ship's principal load. In the impressive trade system connecting central Italy and Africa, marks were a "must" from at least 60 AD to the late 3rd century AD. Peaking production in the beginning of the 2nd century,

¹¹³ Wilmet 2008, with further bibliography concerning Rome and Ostia; see also Chrzanovski 2000.

¹¹⁴ Motta 2019.

¹¹⁵ Pavolini 1980.

continuing through the early 3rd century AD, might well have been the reason for the decline of Mutina lamp production. As a matter of fact, the early decades of the 2nd century AD correspond to the time when the substantial network of *Firmalampen* industries developed far away from *Aemilia*. The concurrence between two functional but aesthetically lacking lamp shapes and the success, at Rome and in Campania, of the central Italian-born type, must have resulted in a considerable shrinking of the market for the *Aemilia*-based *Firmalampen* factories.



Fig. 19. Imperial *Vogelkopflampen*: designed to be packed together (© Chaman Multimédia, Samuel Crettenand, Musée d'Art et d'Histoire, Genève).

Even if the published quantitative evidence for *Vogelkopflampen* is still very poor, and the number of known used specimens just a dozen, the number and the reputation of producers signing lamps of this type speak for themselves. These factories are among the most prolific central Italian and African producers of lamps of all standard types, as well as exporters of their products throughout the western Mediterranean - the Italian based Oppi family, including the prolific Caius Oppius Restitutus, as well as Lucius Munatius Adiectus, and, for the African based, Caius Iunius Draconis and Caius Iunius Alexis, just to quote a few of the owners of the *officinae* producing this very type.

Having launched a utilitarian type of lamp, these producers amassed a combined industrial and trade power that left the competition behind, regardless of lamp type or production area, even competition as strong apparently as *Mutina* with its *Firmalampen*. "Loosing" Rome's market, or at least a substantial part of it, is probably an even stronger key factor than the progressive *limes* lamp-making

autarchy, motivating first the closing or relocation of some workshops and from the 2nd century AD, a slow but unstoppable decline of the Mutina and of Aemilia-based lamp factories.

CONCLUSION

The study is based on data from a very differentiated set of lamp corpora presenting finds from diverse contexts and sometimes very old excavations, a key factor for Pannonia considering that many of the lamps were discovered in the end of the 19th and early 20th centuries. The fact that many lamps came from burial contexts also contributed to the lesser numbers of relevant lamps in the published catalogues. In addition, depositional conditions at many archaeological sites were responsible for extensive surface erosion, especially in the case of mediocre local copies, often resulting in loss of slip as well as all traces of combustion. The original *Firmalampen*, made with a perfectly mastered technique, do not need slip to be impermeable, hence their surface is burnt directly, preserving better any trace of use.

Even so, the main reason for so many unused lamps being found derives from the nature of the context and this in particular motivated the present preliminary study. At Arles, the immense rubbish dump in the harbour implies by default non-stop activity: a multi-modal transit harbour where goods from sea and river vessels, alongside with goods brought by road, had to be unloaded, stocked, counted, and charged again while sailors enjoyed a moment of rest. Until rubbish pits are found near the *castra* and other sites on the Rhine and Danube limes, as well as in the other centers mentioned here, the results will never match the detail offered by the AR3 research. And, as at Arles with the Rhône, why dig a rubbish pit if all the refuse can be thrown daily into the Danube ...

The example of Imperial *Vogelkopflampen* is certainly the best proof in favour of our proposal: with such a huge production for almost exclusive central Italian use, a mere few dozens have actually been published and only a couple show signs of being used: Pavolini studied huge unpublished corpora to make his typology and his material came, besides important Museums deposits, mostly from rubbish dumps and workshop waste, at Alba Fucens, Rome (Janiculum), Ostia ("Terme del Nuotatore"¹¹⁶ and old finds) as well as Paestum and the necropolis of the Caesarea Gate at Tipasa to see original African-made lamps. Four sites and lamps from mostly undated contexts for a type produced on such a huge scale...

¹¹⁶ An enormous ceramic garbage pit, where one can find, among the lamps, a clear dominance of Loeschke type VIII (68%), but with the presence of a few *Firmalampen* (5.4%, only 3% being original ones) and a more consistent group of *Vogelkopflampen* (12.6%), exhaustively published later (Anselmino Balducci 1994).

It is to be hoped that the approach proposed here will prompt more research on the use of *Firmalampen* and the quantification of used versus unused specimens. Knowing the technological progress that these specific lighting devices embody, let them be seen through a different eye than that of the epigraphist. Marks are certainly interesting and vital, but to establish the spread of a mark independently of the producer is not in keeping with Harris's concept, perfectly working for the products of the Western Mediterranean area, where signed lamps made by their original factory and its branches are easy to distinguish from the over-moulded "counterfeited" productions bearing their mark. As a matter of fact, there are way too many moulds and extremely well-done lamps perpetuating for three centuries single marks going back to the original *Mutina* producers, so that in the end we find ourselves in a situation unlike that of the well-known phenomena studied for the central Italian and African industries and their branches from the 1st to the 3rd centuries AD, or, slightly later, for the Corinthian lamp-makers migrating to Athens and then to other more dynamic places, like Tomis.

As far as *Firmalampen* are concerned, the relocation of the main workshops and the opening of official branches, the products of which coincided with 'unofficial' copied lamps made by local competitors, would have been plausible only during the initial period of the establishment of some of the earliest workshops in the Rhine valley and in Slovenia, while it is much more difficult to make this hypothesis for later conquered areas.

Nevertheless, in view of the lesser studied case of the Imperial *Vogelkopflampen*, which are well dated thanks to the huge number of different signatures of very well-known and geo-chronologically framed workshops, the *Firmalampen* deserve a new approach to understand their socio-economic framework and contexts of use, region by region, at least after AD 100, when they blossomed in all the northern provinces of the Empire.

**POST-SCRIPTUM: "MADE IN" MUTINA AND BYLLIS:
TWO RARE CITIES WITH LAMP-MAKERS PROUD OF THEIR ORIGIN**

During the very rich exchanges we had with Donato Labate, before and mainly after the submission of our text to the redaction of Peuce, we came to the discussion of the extremely rare "local pride" of completing the mark with the place of manufacture, "*MVTINA FECIT*", a phenomenon previously known only – but without any private name – on the base of a 2nd c. AD lamp of Loeschcke VIII discovered at Lilybaeum

(Marsala, North-Western Sicily), bearing the incised inscription LYLIBEO AVGVSTA LVCERN/ARIA, an *unicum* still object of numerous discussions¹¹⁷.

In the same "*pride of their city*" spirit among potters, Donato Labate gifted us another of his texts, an inventory of all lamp-makers, mostly producing Firmalampen, being proud of the "*Made in Modena*" label¹¹⁸, reproduced in semi-complete or abbreviated forms (Fig. 20).



Fig. 20. "*Motina Fecit*": The base of a Firmalampe, a Loeschcke III handle-ornament and the list of lamps found by Donato Labate, from Mutina to the Swiss plateau, bearing the city's abbreviation (from Labate 2017a).

This discussion led us to remember that something identical existed... in Albania. As a matter of fact, in the powerful city of Billys (nowadays Hekal), two local Firmalampen makers which ovens have been unearthed marked their products with BYLLIS/FORTIS and FELIX BILLIS¹¹⁹ (Fig. 21), their lamps being attested not only in their home city, but also at *Apollonia* and at the neighboring *Nymphaeum* (Fier, located

¹¹⁷ Gabrici 1941, 294-296; see a complete debate on the meaning of the Lilybaeum inscription within a recent research dedicated to lamp-makers signing their productions with a clear pride of practicing their profession, inscribing "*lucernarius*" before or after their name (Forti 2011, 117 for the Sicilian artefact).

¹¹⁸ Labate 2017b.

¹¹⁹ Skënder 1988.

11 km. from Apollonia)¹²⁰, all three sites being in the actual province of Fier, in South-Western Albania.

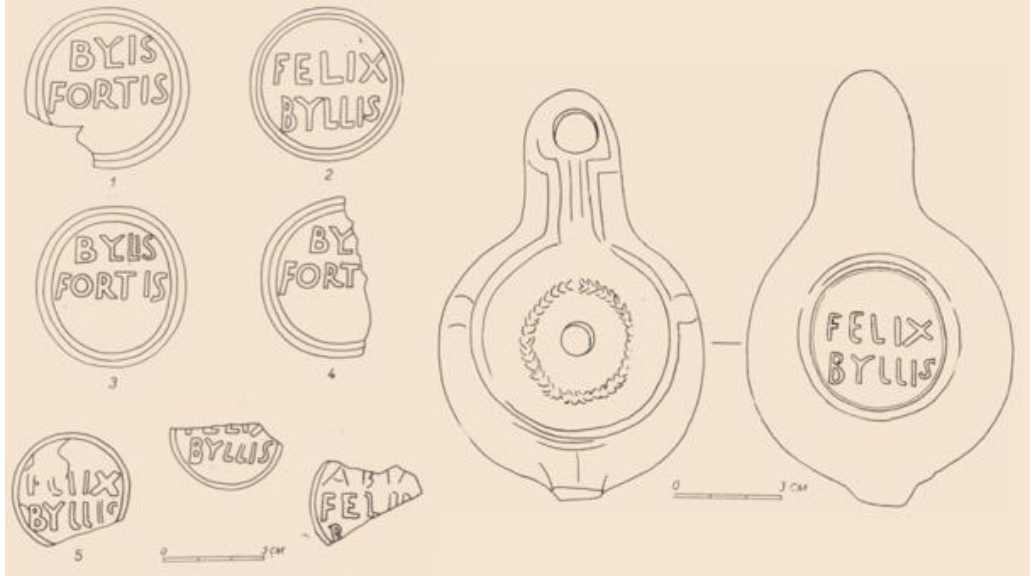


Fig. 22. "Byllis Fecit": a selection of the *Firmalampen* found at Byllis and bearing the city's name (from Skënder 1988, 217-218, Fig. 3-4).

This motivated us to explore a very poorly known area (Illyria), where we discovered that *Firmalampen* were imported and widely copied at Scodra¹²¹, while – still lacking of data on Montenegro – we can observe that in the actual territory of Bosnia Herzegovina, *Firmalampen* represent more than 80% of the Roman Imperial lamps dated from the 1st to the 4th century AD¹²², while no important military garrisons are witnessed in the region at that time: we have hence another area within the rare group of regions where customers did not rejected this type, but, on the contrary, appreciated it.

¹²⁰ Shehi 2015, 273, with a discussion on Felix, a very rare name on lamps.

¹²¹ Hoxha 1999, 263-268.

¹²² Within the lychological corpus recently gathered from all Bosnian museum collections, *Firmalampen* count 209 individuals versus only 53 Roman Imperial discus-lamps belonging almost exclusively to Loeschke's types I, IV and VIII) - see the chapter on *Firmalampen* in Busuladžić 2007, 56-68 and nn. 88-297, 126-179.

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