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Too Big to Study?
Troppo grandi da studiare?

Edited by
Bruno Callegher

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DEGLI STUDI DI TRIESTE
Dipartimento di Studi Umanistici

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SUMMARY

PREFACE

Enormous coin hoards have always been discovered, and very large quantities of coins are also found in archaeological excavations carried out in urban areas. All these great amounts of coins can be dated either to a restricted period or distributed along many centuries. However, these findings put the researchers in front of complicated issues mainly concerning the methodology of their study, which necessarily conditions the results of the numismatic research. We should refer, for example, to a series of important large coin discoveries such as the Misurata's hoard, the Tomares's hoard, the Roman hoard of Frome in Somerset, the Celtic hoard buried near Seaton Down, as well as the well-known Čentur hoard. The modern coin finding of The Big Sky Hoard in Montana, Eisenhower $ is also very interesting. In all these cases it is/was not really easy to examine such large monetary findings. How to deal with them? How many time can we dedicate to this kind of studies? In fact, we have several options: a full study or a partial research, or also a statistical survey and archeometric or georeferenced analysis.

Several colleagues who agreed to discuss this topic met in Trieste between 17th-19th May, 2018 at the Department of Humanistic Studies of the University of Trieste (see the *Appendix* with abstracts of communications). It should be remembered that the conference program was realized under the kind patronage of the International Numismatic Council and the Friuli Venezia Giulia Museum Centre, which we would like to sincerely thank.

The speakers of the first session of the meeting dedicated their studies to the complexity of the argument and the abundance of the material to be analyzed, but also to the potential of large numismatic collections of some museums, such as, for instance, the National Archaeological Museum of Aquileia or the Red Castle of Tripoli (Libya), the historical-numismatic collection of the Kunsthistorisches Museum of Vienna and even a (only) apparently marginal collection of the Museo Histórico Nacional of Parque Lazama in Buenons Aires. Among the biggest archaeological finds of coin hoards, including many thousands of specimens, were examined and discussed especially the case-studies of the treasures of Le

Catillon II (Jersey Museum), The Frome (British Musem), Porte Chaioullet à Troyes (France) (Tetricus I and Tetricus II), Saint Germain-lès-Arpajon (France), Juillac-l'Isle-Jourdain Gers (France), El-Zaudín-Tomares Sevilla (Spain), Misurata (Libya), Saint-Germain-de Varreville (France), Čentur-Maresego (Slovenia), Al-Djem (Tunisia), Reka Devnia (Bulgaria), Dzierżnica (Poland), Haza del Carmen/ Cruz Conde y Jaén (Spain), finally concluding with the Medieval hoard called "Aiello" now preserved at the American Numismatic Society. Such a significant exemplification has allowed to develop and put in evidence different methodologies of research, from the 3rd century B.C. up to Middle Ages, with interesting cases concerning also Islamic coinage at the fringes of the Mediterranean area (Spain) and along the European eastern border, in Poland.

During the third session, the projects still in progress were clearly illustrated by gathering a large amount of numismatic data, in particular, the Coin Hoards of the Roman Empire of the Ashmolean Museum and the Oxford Roman Economy Project of Oxford University, the Database of Roman Coins in the "Barbaricum" and also the great relevance of the Cyrenaica Database for the protection and study of ancient coins that unfortunately have undergone a process of dispersion as consequence of war events.

There are, of course, some statistical and mathematic contributions, essential tools for the study of ancient dies applied, in a specific case-study, to the Roman "victoriatus", but also in more general terms through the implementation of mathematical-statistical methods used in presence of large quantities of coins.

Great coin numbers, different methods, exemplary projects, therefore, have merged in the final debate: "Big is beautiful?", with the consequent question: "Faut-il VRAIMENT étudier les 'mégadépôts' monetaires?".

This is exactly the crucial question that marked the three days of discussion, and this is reflected in the Proceedings, where almost all the contributions made by those who had given their adhesion are collected, some of them in fact were unable to personally intervene during the conference due to sudden difficulties in flight connections.

The present writer has had the opportunity to appreciate the frankness of the discussion, the deep common interest in the projects still underway and believes that the publication of the various reports will contribute to the common research in the study of ancient and medieval currency as a primary source of history and economy.

Finally, I would like to state that a confident serenity always characterized our days in Trieste; for this reason, too, I deeply express my thanks to everyone, with a friendly remembrance.

Bruno Callegher
University of Trieste

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Trieste

Troppo grandi da studiare?
Too big to study?

Seminario internazionale di studio
International workshop-seminar

Trieste, 17-19 maggio 2018
Trieste, 17-19 May 2018

Dipartimento di Studi Umanistici
Università di Trieste
via Lazzaretto Vecchio 8, aula 6 - III piano/floor

Giovedì 17 maggio/Thursday 17th May

15.30-16.00
Academic Authorities
Lucio Cristante
Dean of Department of Humanistic Studies
Michele Pipan
Delegate of Research of the University Trieste
Luca Caburlotto
Polo Museale Friuli Venezia Giulia
Welcome/Saluti

16.00-16.30
Chiara Cecalupo & Axel Alt
(ISMA-CNR, Roma & Museo Histórico Nacional, Buenos Aires Argentina)
Le monete antiche del magazzino del Museo Histórico Nacional di Parque Lazama, Buenos Aires Argentina

16.30-17.00
Andrea Stella
(Post Doc Researcher, Università di Trieste)
Too Big to Study? The numismatic collection in the National Museum of Aquileia

17.00 -17.30
Michele Asolati
(Università di Padova)
Tracce della tesaurizzazione monetaria d'età antica nell'esposizione archeologica al Castello Rosso di Tripoli (Libia)

Coffee break

18.00-18.30
Klaus Vondrovec
(Münzkabinett, Kunsthistorisches Museum, Wien)
Cleaning up 500 years of collecting (The coin cabinet of the Kunsthistorisches Museum in Vienna)

18.30-19.00
Ermanno Arslan
(Accademia dei Lincei, Roma)
Subject to be defined

20.30 Welcome dinner: da Pino - *riva Ottaviano Augusto, 2B - Trieste*

Venerdì 18 maggio/Friday 18th May

9.00-9.30
Neil Maher & Georgia Kelly &Le Quelenec Victoria
(Jersey Museum, Jersey Heritage, Great Britain)
Le Catillon II: conserving the world's largest Iron Age hoard

9.30-10.00
Gaëlle Thévenin
(Laboratoire Orient et Méditerranée – UMR 8167)
A lost Alexander Hoard from Gaza Strip/Palestine

10.00-10.30
Sam Moorhead
(The British Museum, London)
The Frome hoard - how massive hoard changes everything

Coffee break

11.00-11.30
Marie-Laure Le Brazidec
(Chercheur-numismate associé à l'UMR 5140 du CNRS, Montpellier)
Le trésor de la Porte Chaillouet à Troyes (France), plus important dépôt d'imitations de Tétricus I et II: de la fouille à l'étude préliminaire

11.30-12.00
Vincent Drost
Independent researcher
The Saint-Germain-lès-Arpajon hoard and other "big" radiate hoards from France

12.00-12.30
Francis Dieulafait
(HADÈS - Bureau d'investigations archéologiques, Toulouse)
Le trésor de nummi découvert à Juillac (L'Isle-Jourdain, Gers - France) – Une méthodologie d'inventaire

Free Lunch

15.00-15.30
Navarro Anna & Francisca Chaves Tristán
(Museo Archeologico-Università di Sevilla & Universidad Sevilla, Facultad de Geografia e Historia. Dpt. de Arqueologia)
Proyecto y realidad en el tesoro de "El Zaudín" (Tomares, Sevilla). I: Protección y Conservación. II: Estudio

15.30-16.00
Salvatore Garraffo
(CNR, Catania)
Il tesoro di Misurata (Libia): un banco di prova per lo studio e la pubblicazione dei rinvenimenti di grandi dimensioni

16.00-16.30
Pierre-Marie Guihard & Guillaume Blanchet
Centre Michel de Boüard-CRAHAM UMR 6273, Université de Caen Normandie, France
«Pour une approche globale?» Le dépôt de 14528 nummi du IVème siècle de Saint-Germain-de-Varreville (Normandie, France)

16.30-17.00
Antony Hostein
(EPHE – Ecole Pratique des Hautes Etudes – Université PSL Paris)
Les "gros" dépôts monétaires en contexte. L'exemple de la Gaule du Centre-Est (Ier-Ve s. ap. J.-C.)

Coffee break

17.30-18.00
Bruno Callegher & Manuela Montagnari & Andrea Favretto
(Dipartimento di Studi Umanistici - Università di Trieste)
Centur (Maresego) Hoard. Thousands of folles of Tetrarchy around the World: for a potential reconstitution

18.00-18.30
Zakia Loum
(Bardo Museum and Faculty of Humanities, University of Tunis)
Le trésor de Al-Djem

18.30-19.00
Cristian Gazdac
(Ashmolean Museum - University of Oxford)
Small hoard, large hoard? The categories of hoards by size on the Middle and Lower Danube in the light of the "Coin Hoards of the Roman Empire" Project

20.30 Dinner: Ristorante Ai Fiori, *piazza Attilio Hortis, 7 - Trieste*

Sabato 19 maggio/Saturday 19th May

9.00-9.30
Luca Gianazza
(Engineer, Independent Researcher)
Applying Statistics and Computer Science to the study of big coin finds: an engineering approach

9.30-10.00
Aleksander Bursche & Kyrylo Myzgin
(University of Warsaw, Institute of Archaeology)
Big Hoards of Roman coins from Barbaricum and data-bases

10.00-10.30
Alessandro Cattaneo
(Università di Padova)
From reality to virtuality. A Database for the Cyrenaican specimens from numismatic trade

Coffee break

11.00-11.30
Pierluigi Debernardi
(Indipendent Researcher)
Studio dei coni di grandi emissioni: applicazione ai vittoriati

11.30-12.00
Marguerite Spoerri Butcher
(Ashmolean Museum, University of Oxford)
Reka Devnia (Bulgaria): the challenges of creating a digital dataset of 80,000 coins published in 1934.
And: how representative is this hoard?

12.00-12.30
Robert Kool
(Israel Antiquity Authority, Jerusalem)
Too Large to Handle? The Forgotten early Ottoman-period shipwreck hoard of Megadiem on the Carmel Coast.

Free Lunch

15.00-15.30
Dorota Malarczyk
(Numismatic Cabinet, National Museum in Krakow, Poland)
Islamic coins in the early medieval hack-silver hoard Dzierżnica II from Greater Poland

15.30-16.00
Alberto Canto Garcia
(Dpt. Prehistoria y Arqueologia - Campus Cantoblanco, Madrid)
Hallazgos de moneda islámica en al-Andalus: los casos de Haza del Carmen, Cruz Conde y Jaén (Córdoba, España)

16.00-16.30
Andrea Saccocci
(Università di Udine)
Il ripostiglio 'Aiello' di c. 5400 'intrattabili' denari veronesi (secc. XII-XIII)

16.30-17.00
Jean-Marc Doyen
(Laboratoire de recherche Halma – Histoire, Archéologie et Littérature des Mondes Anciens – UMR 8164. CNRS, Université de Lille [SHS], MCC)
«Big is beautiful?» Faut-il VRAIMENT étudier les «mégadépôts» monétaires?

17.00-19.00
Discussion & Conclusion

20.30 Farewell dinner: Il Posto delle Fragole, *close to the "rose garden" on the hillside, via Guglielmo De Pastrovich, 4 - Trieste*

Bus n. 17/ piazza Tommaseo
Terminal bus: S. Cilino

I ripostigli monetali di grandi dimensioni (decine di migliaia di esemplari) pongono lo studioso di fronte a quesiti spesso di non facile risposta. Come affrontarli? Si oscilla, infatti, tra la scelta di uno studio completo, le ricerche per sezioni o una campionatura statistica senza trascurare altri tipi di indagini (archeometria e georeferenziazione).

The study of extremely large coin hoards (that is, hoards including dozens of thousands of items) faces researchers with significant methodological challenges. Besides being studied in their entirety, such large hoards may be analyzed through a variety of methods, including statistical sampling, the study of specific item selections and other approaches such as archaeometry and georeferencing.

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TOO BIG TO STUDY? THE NUMISMATIC COLLECTION IN THE NATIONAL MUSEUM OF AQUILEIA

Abstract

This contribution try to provide for the first time an extensive historical survey of the coin cabinet of the National Museum in Aquileia. Details are given about how and when this collection was formed and the features of its different sections are examined as well. Thanks to the inventory lists, is possible to know that by the end of the First World War more than 60,000 coins were already part of the collection. Since the entire assemblage of the 20th century still needs a detailed survey, the real amount remains undetermined but a total number of 80,000 specimens, or more, is to be expected. For this reason, after Rome itself, Aquileia features the greatest archaeological numismatic collection in Italy and one of the more prominent in the entire Mediterranean area.
Since the collection is up to day largely uninvestigated, a methodological approach is proposed as well to deal with such a large amount of data to be recorded. This work has to be undertaken in the future in order to provide a unique set of data concerning coin finds and to convey to the large public, in the best way, one the most important collections held in the National Museum of Aquileia.

Keywords

Aquileia, numismatic collection, coin finds

Aquileia, the 9th among the most important Roman cities of the Roman Empire according to Ausonius[1], is well renowned since the beginning of the Modern age as a gold mine of archaeological artefacts, especially ancient coins. Ercole Partenopeo, an 18th century erudite once stated that "ad Aquileia si trovano tante monete come fossero state seminate"[2] and Giandomenico Bertoli, founder of the archaeological science in Aquileia, once declared that he used to collect 1,500 coins every year[3]. Such words well highlight the potential of this site as regards coin finds and reflect the importance of the numismatic collection kept in the local National Museum. In fact, after Rome itself this assemblage is the greatest in Italy and one of the most important in the entire Mediterranean area, formed of finds coming almost exclusively from the area of the ancient city, with a very few exceptions. Nevertheless, it still remains largely uninvestigated.

A BRIEF HISTORY

Since the 18th century large private archaeological collections had been formed in Aquileia, featuring a large amount of ancient coins. So far, we have no evidence that pieces coming from these very first gatherings are today hosted in the National Museum. In fact , among the most important ones, the Bertoli numismatic collection was entirely sold by 1759[4], the Zannini collection of coins and gem stones found its way to Wien in 1826[5] and the Zandonati archaeological collection, including 9,000 coins, moved to Trieste in 1870 after the death of its owner[6]. Indeed, the Austrian Government, in that time Aquileia was still part of the Habsburg Empire, made great efforts to secure every local find of coins to the royal cabinet, thanks to a special legislation, from the end of the 18th to the middle of 19th century[7].

The birth of public exhibitions in the second half of the 19th century, after a first attempt at the beginning of the same century[8], marks the very turning point in the de-

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1 Auson. 9, 64-72.

2 Gorini 1984, p. 286.

3 Buora 1993, p. 154.

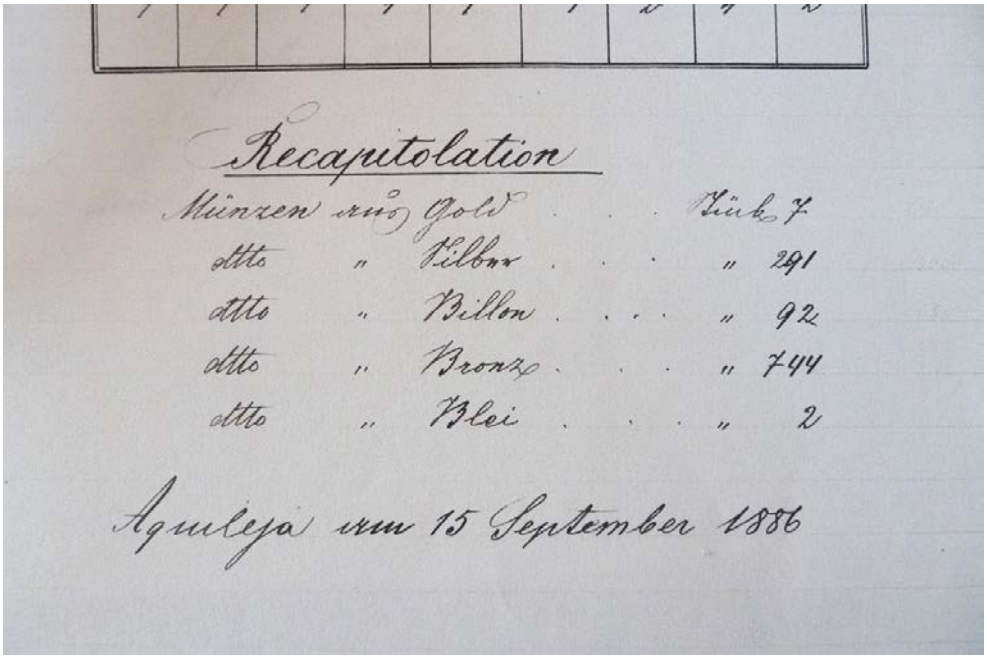
4 Giovannini, Maselli Scotti 2009, pp. 37-40 with further bibliography. On the numismatic collection see Devilla 1992; Buora 1993, pp. 153-159; Devilla 1994.

5 Giovannini 2007, pp. 261-263.

6 On this collection and its owner see Bravar 1993; Casari 2015.

7 Giovannini 2007, pp. 234-235. See Noll 1983 on the antiquities from Aquileia kept nowadays in Wien.

8 For the Museum Eugeniano, the first public museum in Aquileia, founded in 1806 by Leopoldo Zuccolo see Giovannini 2004, cc. 464-466.



Picture 1 – Summary of the numismatic collection belonging to the "Museo Patrio", merged into the Royal Imperial Museum in 1883

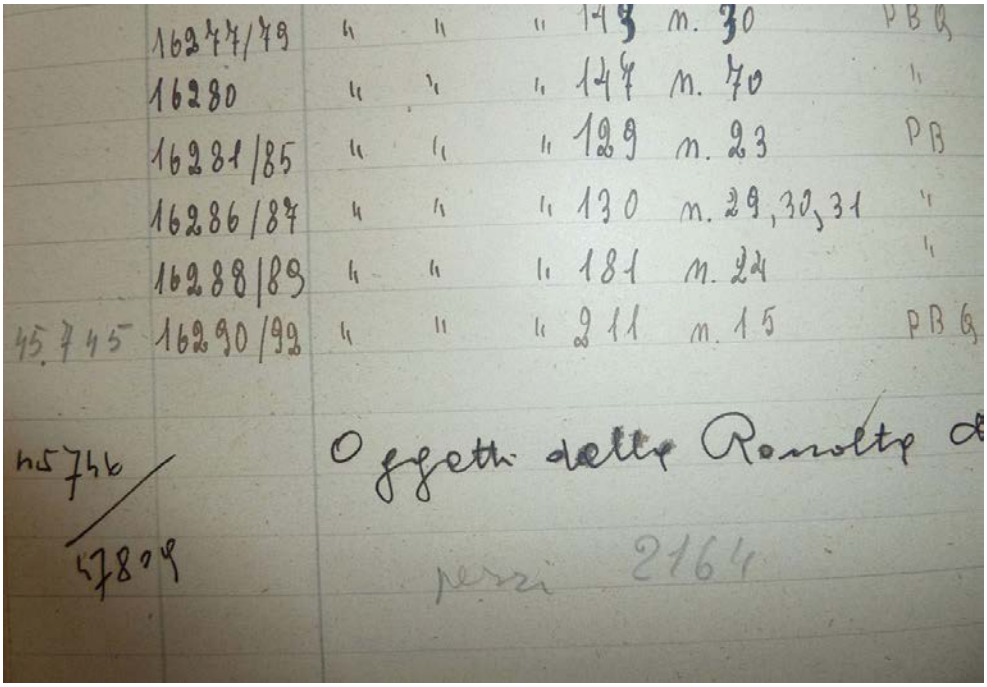
velopment of the present Museum collection, including the numismatic one. After its establishment in 1882, the National Museum, at that time Royal Imperial Museum, became for the first time an institutional gathering point for many archaeological finds which were deliberately collected by local land owners and otherwise sold on the antiquarian market[9]. Beside the foundation of a public exhibition, the institution of a control committee over private archaeological investigations, the Zentral Kommission[10], prevented as well, to some extent, the dispersion of ancient artifacts of local provenance. Before the establishment of the national Museum, a civic exhibition was opened in 1873; this included a numismatic collection of 1,168 pieces[11] afterwards merged into the main institution in 1883 (pic. 1)[12].

[9] Giovannini 2007, p. 233.

[10] Buora, Pollak 2010; Giovannini, Maselli Scotti 2009, p. 42.

[11] The so called "Museo Patrio"; Giovannini 2016. See also Giovannini 2007, pp. 284-302; p. 284 and p. 295 for the numismatic collection.

[12] Giovannini 2004, cc. 467-472; Giovannini 2007, pp. 303-307.



Picture 2 – A section of the new inventory of the 19th century collection issued in 1919/1920. On the left the total amount of 16,292 coins is visible

So, the official birth of the coin cabinet took place under the direction of Enrico Maionica, head of the Museum between 1882 and 1913[13]. Through archaeological excavations and especially acquisitions from private owners he managed to put together 16,292 coins of local provenance, still today part of the coin cabinet (pic. 2)[14].

The first World War constitutes another key moment in the history of the collection for two main reasons[15]. Firstly, a selection of precious small finds, including 1,617 stone gems and coins, was sent to Wien soon after the war declaration in April 1915[16]. The envisaged final destination was the Austrian Archaeological

[13] Giovannini, Maselli Scotti 2009, pp. 42-45.

[14] From 1884 the State Museum had the right of preemption over archaeological artifacts privately excavated; Giovannini 2007, pp. 516-517. In his guide on the Royal Imperial Museum, in which a survey on the numismatic exhibition is present, Maionica dosen't give informations about the collection by that time; Maionica 1911, pp. 95-96.

[15] Giovannini, Maselli Scotti 2009, p. 46; Giovannini 2015a.

[16] Giovannini 2015b, pp. 332-341.

Institute but after the end of the war, Italian authorities managed to find the missing collection in the University of Czernowitz in Romania. In 1920 these materials returned to Aquileia in its entirety as proved by the survey carried out by Celso Costantini, head of the museum from 1919 to 1920, in cooperation with Giovanni Brusin, future director from 1922[17]. The second and most affecting consequence of the first World War on the numismatic collection of Aquileia was the activity of the Italian authorities once they took over the modern town and the archaeological site in 1915. Between June and October 1915 one of the first efforts of Ugo Ojetti, appointed by the Italian government to supervise the antiquities of Aquileia, was an entire new inventory of the museum collection[18]. In this occasion the old numeration related to the so called *Accesionjournal,* the inventory book drawn up by Enrico Maionica during his direction, was completely deleted and replaced by a new one. In this way all data concerning the findspot of all the archaeological artifacts which were part of the Museum collection by that date, including coins, got almost irremediably lost.

The 20th century saw a remarkable increase of the collection thanks to new acquisitions and archaeological investigations[19]. Giovanni Brusin, head of the Museum between 1922 and 1953, undertook large excavations in several sectors of the ancient city such as the Roman forum and the harbour on the river Natissa, today among the most famous archaeological attractions in Aquileia[20]. In his report *Gli Scavi di Aquileia* some sections are devoted to the small finds, including coins, recovered in the different areas investigated[21]. Nevertheless, for the numismatic collection the most prolific time of the 20th century came under the direction of Luisa Bertacchi (1959-1989)[22]. On the one hand, she managed to purchase a significant number of coins in a period in which the introduction of new agricultural techniques (deep ploughing) led to an outstanding abundance of archaeological finds[23]. On the other hand, for the first time ancient artifacts recovered in excavations were systematically collected, as opposed to the past when only precious finds were considered[24]. This new approach, combined with the extensive archaeological investigations carried

[17] An inventory list resulted from this survey whit a section devoted to gold coins is preserved in the archive of the National Museum; Giovannini 2015a, p. 338.

[18] Ojetti 1964, 64, 150; Buora 1999, 46-47, 49-50; Giovannini 2007, p. 537, note 93.

[19] On the coin cabinet in this time see Brusin 1929, 185-189.

[20] On the work of Giovanni Brusin in Aquileia see Burtulo, Fogolari 1977; Argenton 1989; Scrinari 1993.

[21] Brusin 1934.

[22] Gorini 2015.

[23] Bertacchi 1993, 238; Giovannini 2015b, 166-168; Gorini 2015, 201.

[24] Bertacchi 1993, 237.

out between the '60s and '80s[25], led to a significant further growth of the numismatic collection of the National Museum. Eventually Luisa Bertacchi arranged for the first time a scientific numismatic exhibition featuring more than 5,000 specimens[26].

In the 21st century ancient coins are still found in Aquileia in great quantity, mostly thanks to archaeological investigations, both rescue or planned excavations meaning the discovery of several, sometimes hundreds of, coins every year. These new materials are of the greatest importance since they are retrieved according to a scientific methodology, helping us to analyze the monetary circulation and the function of coins in Roman Aquileia under a new light. Nonetheless, the real challenge is still the recording of the great collection kept in the National Museum, a terrific assemblage of coin finds which is still largely unknown to us.

STRUCTURE AND FEATURES

To the best our knowledge, the numismatic collection in Aquileia can be divided into three main sections, each one formed in different times and with different features.

The first one represents the historical collection, the oldest, which was gathered, as seen before, between the second half of the 19th century and 1915. Thanks to the inventory manuscript cited above we know that coins belonging to this section are more than 16,000, including ancient and medieval issues. Many numismatic rarities are featured in here, but the way in which coins have been collected affects the potential of this assemblage in terms of scientific relevance. In fact, many of the specimens surely come from hoards found in Aquileia, but possibly disassembled after the discovery in order to arrange a chronological collection, a habit in many European numismatic collections in the second half of the 19th century[27]. With regards to this last aspect, the issue of the aforementioned new inventory prevents us from knowing the inclusion of these hoards. In general, a thorough analysis of the *Accessionjournal* would be desirable as it would possibly allow us to reconnect some of the most peculiar elements of the collection to the original findspot[28]. In this time coins were also explicitly selected according to the state of preservation. Issues made of poor alloy,

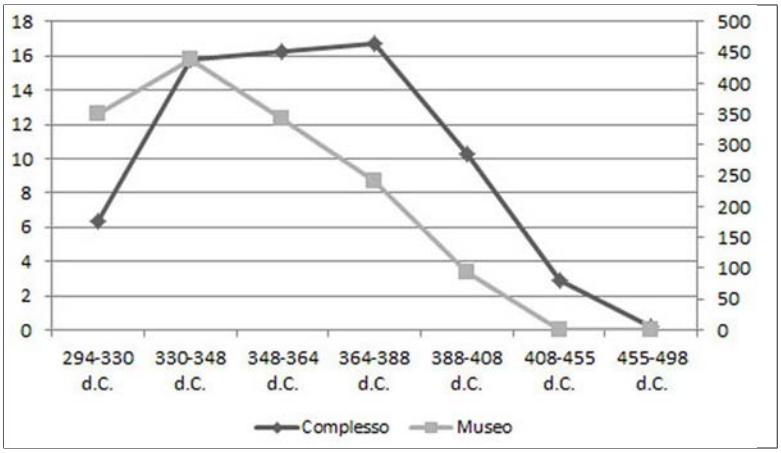
[25] See for instance the excavations on the Roman forum between 1980 and 1989; Bertacchi 1989; Bertacchi 1995.

[26] For the first time coins have been displayed separately from other metallic objects; Bertacchi 1962; see also Giovannini 2015b, p. 163.

[27] See for instance the numismatic cabinet in the Yorkshire Museum, one of the greatest regional collection of coins in England; Drost 2018.

[28] See Giovannini 2009 for the same approach applied to gem finds.

more often subjected to corrosion and so hardly legible, were carefully excluded. In this way the coins belonging to the late Roman period, especially the bronze coins, are clearly underrepresented as demonstrated by the comparison with an alternative sample of the collection (pic. 3)[29].



Picture 3 Chronological distribution of late Roman coins in the 19th century collection (grey) and in a sample from excavations of the second half of the 20th century (black) in comparison. After Stella 2017, 22, pic. 9

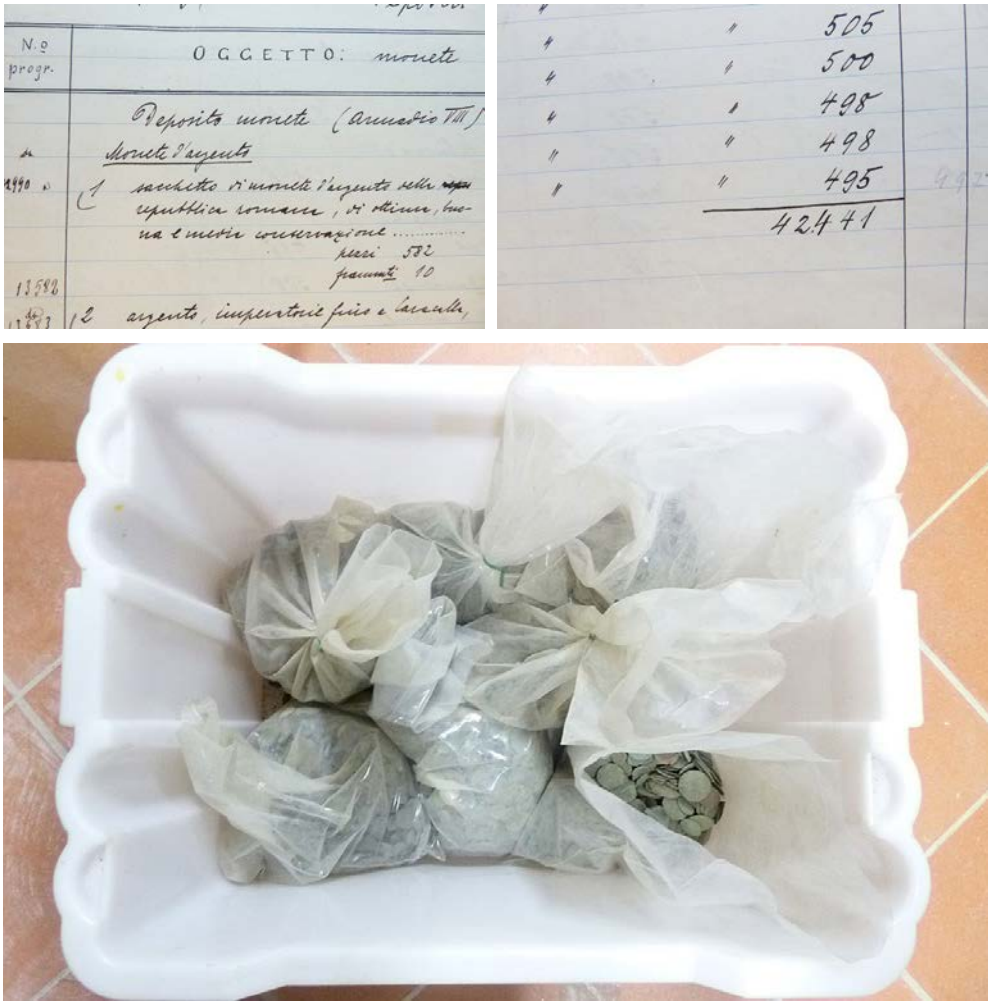
The second group contains coins acquired or retrieved during excavations carried out during or after 1915. This constitutes the most important part of the collection since the findspot is known for most of the specimens. Nevertheless, the total amount is up today undetermined.

A first segment was gathered during the direction of Giovanni Brusin. Coins acquired through purchasing were provided with an inventory number[30], quite the opposite for coin finds from excavations. In this last case, the only link to the findspot is represented by the date of discovery which redirects to the excavation journal drawn by Giuseppe Runcio, field assistant of Giovanni Brusin, where a list of coins found every day is given. Only a small part was listed in the aforementioned work of Brusin "*Gli Scavi di Aquileia*", often lacking important information such as the mint in the case of late Roman coins.

The second and most important part of the 20th century collection is the one formed under the direction of Luisa Bertacchi. As said before, she put together a large assemblage of coins, systematically collecting finds from excavations and thoroughly

[29] Stella 2017, 22-25.

[30] About 1,500 inventory numbers are related to coins acquired by Giovanni Brusin, including the republican and imperial silver *denarii* belonging to a hoard found in 1922; Brusin 1928.



Picture 4a-c – The account list of 42,441 "second choice" silver and bronze coins and their current placement (referred to to bronze only , c20,000 specimens) in one of the National Museum's storehouses

recording the findspot. At the same time, she acquired many stray finds consigned to the Museum by finders. Moreover this section remains still unrecorded in detail and its total amount is so far unknown[31]. Furthermore Luisa Bertacchi mentioned only occasionally and briefly coin finds in her published archaeological reports.

[31] An approximate amount of 9/10,000 coins is inferred from the inventory numbers after a recent systematic survey.

A third segment is represented by a very peculiar assemblage of coins formed by 1959, the first year of Luisa Bertacchi as head of the National Museum. As mentioned before, only starting from this date archaeological artifacts have been thoroughly collected during archaeological investigations. As regards coins, in the past those showing high degree of corrosion, mainly bronze, were simply discarded in favour of the well-preserved specimens, the sole to become part of the collection. Nevertheless, dumped coins have been collected in a large wooden box kept in the Museum's store houses. Later its content has been moved to a plastic case including at least seven large plastic bags filled with coins. The conservation process of a sample of 600 specimens carried out between the '80s and '90s has revealed that many of them needed only an accurate cleaning and are actually in a very good state of preservation. Sometimes also silver coins were recorded after removing corrosion layers. A documentation attesting the existence of a numismatic deposit alongside the official collection arranged during the direction of Enrico Maionica was recently discovered in the Museum's archive. According to the manuscript account this gathering included more than 2,700 silver Roman and Medieval coins alongside 40,000 bronze coins mostly belonging to the Roman age (pic. 4a-c). There are no doubts in connecting it with the massive assemblage mentioned before. Except for the silver issues possibly belonging to hoards, finds included here come surely from archaeological investigations in the ancient urban area and necropolis carried out from the second half of the 19th century and early 20th century up to the First World War[32]. Because of the state of preservation, they were regarded as second choice materials and kept apart from the official collection. As to bronze coins, actually in some cases silver or billon ones, what strikes most is the variety of monetary series featured in this assemblage, seldom represented among finds from the most recent excavations in Aquileia. At first sight, apart from the massive number of Roman imperial bronze coins, several Greek, Celtic and Roman provincial issues as well as early Medieval and Byzantine ones have been detected and much more are expected to be identified after completing the analysis. Even though the provenance is only generically related to the ancient city and finds cannot be divided precisely according to a specific archaeological context (graves, votive deposits, hoards), this sector of the collection is of great importance for the study of the monetary circulation. Given its incredible size and nature this assemblage need surely to be explored in depth in order to fully enhance its potential.

[32] Cfr. "1000 piccoli bronzi frusti" from the excavations of the Roman harbour on the river Natissa; Brusin 1934, 149.

METHODOLOGY

An exhaustive work of recording of the collection is under many aspects a pivotal task to undertake. To do so, a master plan is needed as well as a standard working methodology.

First of all, the massive size of the assemblage corresponds to a massive work. To deal with this, the major groups forming the collection could correspond to the simultaneous effort of three different teams or, in alternative, to three different stages of a common schedule. In the same perspective priority could be assigned to the recording of those coins bearing information about the findspot, i.e. coins from excavations and located purchasings, in order to make available at first the most valuable data to be processed for the study of monetary circulation.

The recording process can lean on the already existing SIGEC WEB database and the standard digital NU (numismatic) data sheet developed by the National Cultural Heritage Office and in use since 2004[33]. Nevertheless, given the importance of the assemblage, both in terms of size and features, the implementation of a new database specifically devoted to the numismatic collection in Aquileia would be desirable and this should be developed according to the standard international numismatic vocabulary provided by the NOMISMA project through the linked open data system [34]. The same framework could be further applied to other important gatherings, one above all gem stones, a very distinctive production in the Roman Aquileia. The development of a devoted database could cope both for scientific and management needs. On the one hand the collection in Aquileia could be more accessible to scholars for special research tasks, on the other one the management for the Museum personnel could be easier.

Besides digital representations, data concerning the collection have to be published also in a traditional way through an editorial project. From 2010 a new series named *Ritrovamenti monetali di età romana nel Friuli Venezia Giulia* (Coin finds of the Roman age in the region of Friuli Venezia Giulia), a side project of the well renowned *Ritrovamenti monetali di età romana del Veneto* (Coin finds of the Roman age in the region of Veneto), has been conceived for the publishing of the ancient coin finds recovered in the territory of the region Friuli Venezia Giulia[35]. Obviously, several volumes will be devoted to the numismatic collection in Aquileia, at least four are needed to cover the first half according to a brief account.

In one case a massive restoration process has to be addressed as well. As seen before, a very large portion of the collection still need conservation work, but the me-

[33] *Scheda NU*.

[34] http://nomisma.org/

[35] *RMRFVG* III-IV.

chanical cleaning of every single specimen is to be ruled out, in particular for reasons of time. A possible approach would imply the use of controlled chemical cleaning in order to make legible, at a reasonable degree, as much coins as possible in the shortest time. Nevertheless, great care must be paid given the very heterogeneous nature of the assemblage made of coins with different size and alloy which request different degrees of cleaning. The advice of a professional conservator is anyway requested.

A last, very crucial issue to discuss is the need of a new arrangement for the coin cabinet. In such a large collection, every single coin should occupy a given position in order to enable its immediate recovery in case of necessity (pictures, conservation or exhibition issues, metal analysis, ecc.). Furthermore, the management would be more simple and intuitive for the Museum personnel with no specific numismatic knowledge. "Topographic data" have to be associated in the future to every single coin recorded, a system already in use in other archaeological collection of coins such as that of the Museum Carnuntinum[36]. A similar approach could be further applied to other important categories of small find, for instance gems, amber artefacts and so on.

In conclusion, what comes to light is that, on the one hand, the numismatic collection of the National Museum in Aquileia amounts to much more than 40,000 coins, as it is usually presumed. Instead, by the First World War more than 60,000 specimens were already part of the coin cabinet. On the other hand, since a large sector still need to be quantified, an actual amount ranging from 80,000 to 100,000 pieces is to be expected. Recording in detail and rearranging such a large and peculiar collection of coins is an undeniable opportunity. The outcomes of undertaking such a work are undisputable, for scientific purposes (study of the monetary circulation and production, output of the local mint, history and economy of the city) and for enhancing communication to the public through new permanent or temporary exhibitions.

[36] "*The Numismatic Project Carnuntum*" presentation held by Cristian Gazdac at the 2nd joint meeting of ECFN and Nomisma.org, 19th-20th April 2013, Petronell-Carnuntum, Austria.

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Eleanor Ghey*

British Museum

COIN HOARDS AND THE TREASURE PROCESS AT THE BRITISH MUSEUM

Abstract

The Department of Coins and Medals in the British Museum deals with a high volume of coin hoards of each year, some of which are very large (for example the Roman hoards from Frome, Somerset and Beau Street, Bath). The introduction of the Treasure Act (1996) and the success of the Portable Antiquities Scheme have played a part in the increasing volume of finds being reported and the development of an efficient system for administering this work. This paper outlines our approach to dealing with these finds, from discovery and conservation to cataloguing. It discusses how this approach has developed and the challenges and opportunities it presents. In particular, there has been progress in approaches to the retrieval and conservation of coin hoards, and in the successful acquisition of coin hoards by local museums.

Keywords

Coin hoard, Roman archaeology, Numismatics museum

* Many individuals are directly involved in the Treasure process at the British Museum, in particular: Richard Abdy, Sam Moorhead, Andrew Brown, Barrie Cook, Gareth Williams, Tom Williams, Ashvini Sivakumar and Henry Flynn in the Department of Coins and Medals, Duncan Hook, Pippa Pearce, Hayley Bullock and their team in the Department of Conservation and Scientific Research, Ian Richardson and the Assistant Treasure Registrars in the Department of Learning and National Partnerships and curators in the Department of Britain, Europe and Prehistory. I would like to thank Sam Moorhead for his comments on the text.

The Department of Coins and Medals at the British Museum handles the majority of coin hoards found in England that are submitted for consideration as Treasure under the Treasure Act. The volume of finds has increased year on year, with a sharp increase following revision to the legislation in 1996. For 2017, for example, some 106 Iron Age and Roman coin hoards have been recorded at the time of writing. These vary in size and degree of preservation a great deal, creating an unpredictable workload and it is not always possible to process larger cases within the optimum time frame of three months[1]. This article provides a brief summary of the Museum's role in the process and the way this has developed in recent years.

BACKGROUND TO THE TREASURE ACT

Until 1997, the medieval law of Treasure Trove applied in England, Wales and Northern Ireland. This stipulated that finds of precious metal objects which had been hidden with the intention of recovery and of which the owners were unknown would be deemed to be the property of the Crown and had to be reported to HM Coroner. In 1997, this law was replaced by the Treasure Act 1996, which defined and extended the criteria for a find to be considered Treasure and in most cases removed the need to establish that the find was hidden with the intention of recovery (DCMS 2002, 5). There is a legal obligation to report finds of Treasure that meet the definition of Treasure under the Act. This has since been subject to revision but in the case of coins, the following definition now applies:

- Finds of two or more coins at least 300 years old, containing at least 10% gold or silver by weight and of the same find
- Finds of ten or more coins at least 300 years old, containing less than 10% gold or silver by weight and of the same find
- Cases that would have been considered as Treasure Trove (precious metal single coins or precious metal coins less than 300 years old, where in both cases there is strong evidence that they were hidden with the intention of recovery)[2].
- Objects found in association with objects that qualify as Treasure (for example hoard containers or single coins buried with hoards of precious metal artefacts)

[1] This is acknowledged in the Treasure Act 1996 paragraph 58.

[2] Recent examples include the Hackney hoard of 80 US gold 20-dollar pieces dating to 1913 buried in a garden in Hackney, London (PAS database: PAS-867115) and the "Piano hoard" of 913 British gold coins dating to 1915 found inside a piano in Shropshire (PAS database: HESH-F5F412).

The Act has had a significant impact on the way the Treasure process is now administered, from discovery to eventual acquisition or disclaim; perhaps the most significant change is the recognition of the rights of the landowner as well as the finder. Usually, each receives 50% of the market value if the Treasure is acquired by a museum. It is not the purpose of this article to cover this process in detail. Instead I wish to focus on the way this process affects work on coin hoards at the British Museum.

The most significant impact of the Treasure Act 1996 on the volume of coin hoards reported is the inclusion of the category of hoards of base metal coins for the first time. This means that the most common types of coin hoards, late third century radiate and fourth century nummus hoards, are now included as potential Treasure. A further important change lies in the criterion that the coins be 'of the same find'. By removing the onus to prove that they were buried with the intention of recovery, deposits made in the same place at temple sites or other *loci* of ritualized deposition may now be considered as Treasure (for example, the Roman riverine deposits at Piercebridge, Darlington currently being studied by Philippa Walton (see Walton 2008 for more details)).

THE PORTABLE ANTIQUITIES SCHEME

Although the Treasure Act is enshrined in law and the British Museum's Portable Antiquities Scheme (PAS) is a voluntary service for the reporting of archaeological objects found by the public, the existence of a network of Finds Liaison Officers in England and Wales has had a significant impact on the reporting of Treasure cases. Finds Liaison Officers act as points of contact for finders and tend to co-ordinate over 90% of Treasure cases in their areas. They also provide advice on the Treasure Act and encourage best practice by local metal-detector users. In recent discoveries of coin hoards (for example see Sam Moorhead on the Frome hoard in this volume) this local presence has proved invaluable. Prompt reporting of a discovery that has been left in situ can allow the location to be accurately recorded and the site to be investigated by archaeologists and protected from further interference until it is removed in a controlled manner. In some cases PAS staff carry out this work, in others they work with local archaeologists from the local authority, commercial units or universities. This is particularly important in the case of finds made on metal detecting rallies, where a discovery may be witnessed by many people and involve more than one finder.

The individual acting as the point of contact for Treasure cases (usually the Finds Liaison Officer (FLO) but local museums and archaeological services also carry out this role), helps the finder complete the necessary paperwork to report the find to the

coroner. An initial record of the find is made on the PAS database (finds.org.uk); the details are not made public at this stage but the record is used in the administration of the case. A report must be prepared on potential Treasure for the coroner summarizing the circumstances of discovery, the contents of the find and advising on whether it can be said to meet the criteria of the Treasure Act. In some cases this is prepared by the FLO (or an archaeologist for cases found on excavation) and then checked and approved by the British Museum curator. Alternatively, and particularly in the case of larger finds, the items are brought to the British Museum for further cleaning and or identification prior to preparation of this report. All finds to be considered under the Treasure process are eventually brought to the British Museum or National Museums and Galleries of Wales or the National Museums of Northern Ireland. The British Museum administers the Treasure Act on behalf of the UK Government[3].

Local and national museums are given the opportunity of acquiring all or part of the find. If there is no interested party the case may be disclaimed and returned to the finder. If a museum wishes to acquire the find, an inquest may be held by the coroner and, once the find is declared Treasure, the find is valued by independent experts and any reward offered to the finder and or landowner is agreed by the Treasure Valuation Committee. The process has had great success in encouraging local acquisition of coin hoards in recent years, despite the financial challenges facing the museum sector[4].

PROCESSING LARGE COIN HOARDS

If coin hoards arriving at the British Museum require cleaning or stabilization they are taken to the Department of Conservation and Scientific Research to be worked on by conservators. Any cleaning will be carried out to the level necessary for the contents to be identified and recorded but not to display standards or in such a manner as to enhance the financial value of the find. In the (ideal) event that a container has been lifted from the ground with its contents intact, investigation and micro-excavation will be carried in the laboratory to ensure that the maximum amount of information is recovered. This may include X-radiography to determine the position of items within the container (demonstrated with spectacular effect in the work carried out on the Beau Street hoard by Southampton University (Ghey 2014; Abdy and Anthony forthcoming)) and sampling of organic remains preserved alongside the

[3] Scotland has different Treasure Trove legislation and their scheme is administered separately from the Treasure Trove Unit at the National Museums of Scotland.

[4] Recent examples include the acquisition of the Wold Newton hoard by the Yorkshire Museum, York and the Boldre hoard by St Barbe Museum and Art Gallery, Lymington, Hampshire.

artefacts. Increasingly, the excavation of hoards in layers has allowed the presence of any internal stratigraphy in the deposit to be observed.

For example, the contents of the 2009 Shrewsbury hoard of 18 radiates and 9297 nummi were removed from the pot in eight layers of approximately 1000 coins by Ellen Van Bork, Pippa Pearce and colleagues (PAS database: HESH-658701 and Ghey 2009). The contents of these layers were then sorted by reverse type and then compared, along with a group of coins found scattered outside the pot. Despite prior disturbance of the context and damage to the pot, the contents were still found to preserve some internal stratigraphy, with coins from AD 317 to 330 spread throughout the pot but coins of AD 330–335 restricted to the upper three layers and external spread, suggesting that they had been added to the pot at a later date. The layers were then combined for cataloguing; this decision weighed up ease of cataloguing against the potential of retrieving additional meaningful information by keeping the coins in separate layers. (The work on the Frome hoard has adopted a different approach; here there was judged to be the potential for further spatial differentiation due to the size of the hoard and the patterning observed in the distribution of the coins of Carausius (Moorhead *ibid*.)).

Curators at the British Museum prepare a summary of the contents of the hoard for the coroner (by emperor for early Roman hoards and by mint, issuing period and / or reverse type for fourth century hoards) and then wherever possible prepare a complete catalogue of the contents. Associated artefacts such as containers and jewellery are studied by colleagues in the Department of Britain, Europe and Prehistory, although local experts may also be consulted, particularly in the case of ceramics. For Roman coin hoards, these documents have until recently been published in the series *Coin Hoards from Roman Britain* (CHRB – see Carson and Burnett 1979 and following 13 volumes) but it is now planned to make them available online, due to the sheer volume of cases. Medieval hoards are published in the series *English Medieval Coin Hoards* (Archibald and Cook 2001; other volumes are in preparation). For smaller cases, details are uploaded onto the PAS database record and made public once the Treasure process has been completed. A summary of the contents of reported Iron Age, Roman and Medieval coin hoards for that year is also published annually in the *British Numismatic Journal*.

The Department of Coins and Medals holds details of coin hoards dating back until at least the 1960s and a recent AHRC-funded British Museum and Leicester University research project has created PAS database records (prefixed by IARCH-) with summary details for these cases. A photographic record is made of smaller hoards or selected coins from larger hoards. Until recently, all Iron Age coin hoards were recorded separately on the Celtic Coin Index (CCI) held at the Institute of Archaeology in Oxford, but details are now also recorded on the PAS database. The CCI records information at the level of the individual coin, including coins in trade

and has been an invaluable resource for reconstructing older and unreported Iron Age hoards (de Jersey 2014).

FUTURE PERSPECTIVES

The last two decades have seen substantial changes in the volume and treatment of coin hoards at the British Museum. This is in large part due to the success of the PAS in raising awareness among finders of the importance of reporting archaeological material and establishing good relationships at the local level, as well as changes to the legal definition of Treasure. There is a high level of public interest in archaeology and certain discoveries have attracted considerable media coverage. A team led by the Treasure Registrar at the British Museum is dedicated to the smooth administration of the Treasure process, which is supported at the level of government and enforced locally through the authority of the Coroner. There is always more work to be done in promoting best practice but, anecdotally, there does seem to be greater awareness of the importance of the archaeological context of finds. Findspot recording has improved greatly with the availability of GPS and it is not uncommon to receive individually plotted coins, allowing a more detailed understanding of the spatial distribution of potential dispersed hoards or separate individual deposits.

This awareness of archaeological context has also brought a new maturity to study of coin finds in the museum and academic context. The availability of large amounts of data on single finds[5] has enabled new syntheses on the background distribution of British coinage (Walton 2012) and artefacts (Brindle 2014), which have in turn been compared with patterns in the hoard record (Bland et al. forthcoming). The emphasis has shifted from the purely numismatic contents of the hoard to the hoard as an archaeological artefact and what this can tell us about the past. It is now more common for a complete hoard to be acquired by a local museum and valued for its contribution to the history of the area, rather than being split up for acquisition of selected coins and sale of the unwanted remainder. Recent funding bids surrounding the acquisition and conservation of large coin hoards have included innovative methods of analysis, display and outreach (for example, the Heritage Lottery Fund allowed the Roman Baths to create a Beau Street hoard roadshow, touring a 3D printed replica of a coin bag to local community centres . They also used the hoard in schools sessions on mathematics and numeracy as well as inspiring art projects for vulnerable adults in partnership with a local charitable trust). It must be hoped that this appetite for information continues in an increasingly constrained funding climate.

[5] Researchers can search for single finds in any part of England and Wales on the PAS database.

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UN TRÉSOR CONSIDÉRABLE ET PERDU : LE TRÉSOR D'ALEXANDRES DE GAZA

Abstract

In June 2013 was discovered the first part of a big hoard in Gaza, composed of hundreds of Alexander tetradrachmas, spread over the sand offshore. Some of these coins were bought by a private collector, who gave us the opportunity to examine a few of them the same year. The second part of this hoard was extracted from the sea in 2017, and divided between different families in Gaza. The total quantity of coins rises about 5000 to 8000 coins, including decadrachmas, most of them sent to international antique dealers, without any chance to recover. Since April, some of these coins appeared on antique dealers' website, while in the same time, the customs of Israël caught a Palestinian from Gaza with some of these coins. These events show that the hoard is going to disappear from the scientific view, without having been studied or even noticed. Questions are numerous about this hoard: how reliable are the informations that were given about this hoard? How to study such a hoard, knowing most of the coins are now send abroad and so, lost for science? In the same time, is that reasonable to voluntarily forget this discovery, in a part of the world where these informations are both rare and crucial? This hoard bring together several difficulties: the large number of coins, the scattering and the sale of the tetradrachmas abroad, the difficulty to access the territory, and finally the documentary watch online, the only way to recover the informations of a small part of the coins. Some of them have been noticed, allowing us to elaborate a date of loss, and a sample of the mint that stroke some of the coins.

Keywords

Gaza, Alexander the great, Tetradrachmas, Decadrachmas, looted hoard, hellenistic hoard

Il peut paraître étrange, dans un recueil de travaux consacré aux trésors monétaires *« Too big to study »*, de publier ici un lot de seulement 43 monnaies. Il s'agit d'un petit échantillon d'un trésor considérable, constitué de plusieurs milliers de monnaies selon des témoignages crédibles[1]. Ce trésor aurait été trouvé répandu sur le fond marin au large de la bande de Gaza, face au site antique de Blakhiyah-Anthédon, de 2013 à 2017 et aussitôt dispersé. La plupart de ces monnaies, toutes des Alexandres (didrachmes, tétradrachmes en grande majorité, décadrachmes), étaient en très mauvais état et auraient été fondues, tandis que celles en bon état, voire exceptionnelles comme les décadrachmes, ont été dispersées sur le marché international[2].

Il était autrefois fréquent que les chercheurs puissent compter sur la coopération des marchands et des collectionneurs pour reconstituer et étudier un trésor monétaire qui apparaissait par lots sur le marché[3]. Le commerce des antiquités était alors beaucoup moins réglementé que de nos jours, aussi marchands et amateurs partageaient-ils l'information de bonne foi, sans craindre d'être accusés de trafic illicite. Dans le contexte archéologique actuel sur le plan international, un tel partage est désormais difficile, car il suscite la remise en question de la légalité de la vente. Dans le cas présent, ce trésor provient de la bande de Gaza, un territoire dont les autorités ne sont pas reconnues par une grande partie de la communauté internationale et où il est très difficile de se rendre.

Les auteurs ont eux-mêmes vu à Gaza quelques monnaies de ce trésor en juillet 2013 ; très corrodées, souvent non nettoyées, ce sont des tétradrachmes aux types d'Alexandre et aux légendes parfois illisibles. Pour le reste, seuls des témoignages de seconde main et des photographies prises rapidement, souvent sans numéro, échelle ni poids, ont été mis à disposition. S'y ajoutent les faits concomitants rapportés par la presse ou publiés en ligne :

– En août 2013, la découverte en mer à Gaza d'une statue grecque de bronze[4].

– En juillet 2017, l'interception de quatre décadrachmes d'Alexandre à la frontière entre Gaza et Israël.

– En septembre 2017, l'apparition sur le marché international d'une quantité anormalement élevée de décadrachmes : 15 nouveaux exemplaires sans aucune origi-

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[1] Sources sur place : Jawdat AL-KHOUDARY, collectionneur privé et entrepreneur local , voir B. GUELPA, 2009 ; Fadel AL-OTOL, archéologue à Gaza et membre des missions archéologiques de l'Ecole Biblique et Archéologique Française de Jérusalem (1995-2013) ; Hayam AL-BETAR, fonctionnaire au Ministère du Tourisme et des Antiquités à Gaza.

[2] Selon J. AL KHOUDARY et F. AL –OTOL, les monnaies très abîmées étaient vendues au poids, possiblement en vue de leur refonte.

[3] Par exemple NASTER 1948.

[4] SCUTO 2013

ne précise ont été mis en vente en l'espace d'un an, de septembre 2017 à septembre 2018, dont 8 par une même maison de vente londonienne.

Il est peu probable que de nouvelles informations émergent. Les monnaies sont aujourd'hui dispersées et intraçables, la statue, pourtant mise en avant en 2013, est portée disparue et peut-être détruite ; quant au site sous-marin de ces découvertes, il a certainement été pillé et bouleversé au cours de 5 ans de recherches clandestines. D'un point de vue scientifique, peu de certitudes côtoient beaucoup d'hypothèses. Ces incertitudes ne doivent pas pour autant remettre en cause l'intérêt scientifique d'une telle découverte. C'est ainsi que malgré l'impossibilité d'entreprendre une étude exhaustive d'un tel trésor, les quelques rares informations disparates dont nous avons pu disposer permettent cependant de proposer des conclusions quant à la date et à la nature de ce trésor exceptionnel hélas perdu.

Apparent rari nantes in gurgite vasto
(Virgile, Énéide I, 118).

1 – LES FAITS

En juin 2013, de nombreux tétradrachmes aux types d'Alexandre sont apparus sur le marché des antiquités à Gaza. Beaucoup se présentaient sous la forme de galets noirâtres dans lesquels étaient pris des fragments de coquillages[5]. En entamant ces galets par nettoyage mécanique, se révélait au centre de la gangue ainsi ôtée une monnaie d'argent, souvent très corrodée, au type d'Alexandre[6]. Il est évident que ces monnaies provenaient du fond marin, au large de Gaza. Les vendeurs en possédaient une grande quantité, quelques-unes en bon état et dont ils demandaient un prix exorbitant, les autres très corrodées qu'ils ne vendaient qu'au poids de l'argent[7]. Le collectionneur Jawdat al-Khoudary a ainsi récupéré une cinquantaine de monnaies non nettoyées et que nous avons pu rapidement examiner[8].

A la fin du mois d'août 2013, une nouvelle découverte est faite à Gaza : une statue grecque de bronze quasi-intacte, haute d'environ 1,70m, mise à la vente pour une somme considérable. Elle aurait été trouvée en mer à peu de distance du rivage, non

5 Voir photo p1 et p2 planche I.

6 Le tétradrachme n° 14 planche 2 a été ôté d'une gangue semblable par nos soins ; il est particulièrement corrodé, malgré tous les soins apportés au cours du nettoyage.

7 Voir photo p4 planche I.

8 Voir photo p3 planche I.

loin de Deir el-Balah selon les rumeurs circulant à Gaza au même moment. Les autorités interviennent mi-septembre ; un photographe inconnu prend à ce moment une série de photos[9]. Aucun communiqué officiel sur cette découverte exceptionnelle ne sera publié et, malgré le bruit que cette découverte a pu faire dans la presse internationale, personne ne sera officiellement autorisé à examiner la statue. En septembre 2014, des informations ont filtré laissant entendre que la statue aurait été détruite ou fortement endommagée par les bombardements, mais aucune photo ni déclaration officielle ne sont venues le confirmer.

En février 2017, est découvert le reste du trésor au large. Ajouté à ce qui avait été découvert précédemment en 2013, le trésor compterait de 4000 à 8000 monnaies d'argent. Fadel al-Otol, archéologue à Gaza, photographie le 2 mars 2017 quelques pièces dont deux décadrachmes[10]. Le 16 juillet, un Palestinien est intercepté au poste frontière d'Erez, avec quatre décadrachmes, dont un des deux photographiés précédemment par Fadel al-Otol[11]. Ces monnaies ont été saisies et conservées depuis par l'*Israel Antiquities Authority*.

A partir de septembre 2017 et jusqu'en septembre 2018, quinze nouveaux décadrachmes d'Alexandre apparaissent sur le marché international des antiquités, dans des catalogues de vente en ligne, sans indication de provenance ni pedigree véria fiable. De ces quinze monnaies, huit étaient mises en vente par la même maison londonienne. Un de leurs collaborateurs possède un neuvième exemplaire dans sa collection personnelle[12].

2 – CONCLUSIONS ET HYPOTHÈSES

Les certitudes sont donc qu'une série de découvertes exceptionnelles a été faite en mer à Gaza en 2013 et 2017 : un trésor d'Alexandres contenant plusieurs milliers de monnaies dont au moins 5 très rares décadrachmes d'une part, et une statue grecque de bronze à taille humaine représentant un éphèbe (ou Apollon ?) d'autre part. Les hypothèses concernent tout d'abord l'endroit où a été découverte la statue, ainsi que l'origine de l'afflux soudain en 2017 de décadrachmes d'Alexandre sur le marché international.

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[9] Le 19 septembre 2013 ; ce sont les seules photos connues de cet objet.

[10] N°32 et 33, planche 3.Quinze exemplaires en sont connus jusqu'en 2013.

[11] Times of Israel, 2017 ; Arutz Sheva, 2017; n° 32. Les quatre décadrachmes interceptés sont les n°s 32, 34, 35 et 36.

[12] C'est du moins ce qu'il publie sur Facebook sans restrictions, avec d'excellentes photos, https://www.facebook.com/photo.php?fbid=1734032369950715&set=pcb.1734030203284265&type=3&theater, consulté le 31.10.2018.

A Gaza, l'origine officielle de la statue de bronze serait un site sous-marin au large de la zone du site de Deir el-Balah. Jawdat Ghrab, pêcheur, présenté comme celui qui a découvert la statue, a maintes fois raconté son histoire à la presse internationale. Le lieu de la découverte serait donc bien connu et complaisamment divulgué sans que cela ait, semble-t-il, entraîné de recherches supplémentaires ni de mesures particulières de protection du site. D'autres sources rapportées par J. al Khoudary et Fadel al-Otol situeraient cette découverte au large du site portuaire d'Anthédon-Blakhiyah, de même que les monnaies[13]. En l'absence de preuves supplémentaires à l'appui de la localisation à Deir el-Balah, il convient de ne l'accepter qu'avec prudence.

Les décadrachmes d'Alexandre étaient jusqu'en 2013 des monnaies rarissimes dont n'étaient connus que treize exemplaires, provenant en majorité de Babylonie : deux du trésor *IGCH* 1749 (Babylone 1849), huit du « 1973 Iraq Hoard » (*CH* VII.188, Babylonie), trois autres sans provenance connue[14]. Lors d'un passage vente publique, le catalogue mentionnait toujours l'origine et le pedigree du décadrachme. En 2015, un nouvel exemplaire sans aucune mention d'origine apparaît, puis un second en 2016. Par la suite, les mises en vente de ces modules spécifiques s'accélèrent : de septembre 2017 à septembre 2018, quatorze nouveaux exemplaires, dont certains très corrodés, tous sans précisions d'origine ni pedigree, apparaissent sur des catalogues de ventes publiques. Parmi ces quatorze nouveaux décadrachmes, huit ont été proposés par la même maison de vente londonienne, celle-là même dont un collaborateur possède encore un autre décadrachme, peut-être le plus bel exemplaire connu[15].

Il semble évident qu'il s'agit de la dispersion d'un trésor mais les commissaires-priseurs n'ont pas communiqué à ce sujet. L'Irak pourrait être la région d'origine de ces monnaies puisque tous les autres exemplaires connus auparavant en proviennent ; or les éléments ici décrits nous permettent de penser que le trésor d'Alexandres de Gaza, découvert de juin 2013 à février 2017, contenait au moins 5 décadrachmes. La probabilité pour que deux trésors comprenant ces monnaies rarissimes aient été trouvés par hasard à peu près au même moment en 2017 est faible : le plus vraisemblable est que ces nouveaux décadrachmes proviennent tous ou presque de Gaza et qu'ils faisaient partie du trésor d'Alexandres.

La concomitance des deux découvertes sous-marines dans la bande de Gaza, le trésor d'Alexandres et la statue de bronze, permet d'envisager qu'elles aient été

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[13] Blakhiyah-Anthédon est un site portuaire datable pour sa partie la plus ancienne, au moins du VIIe siècle avant J.-C. (HUMBERT J. B., 2007 ; HALDIMANN M. –A., 2000 ; THEVENIN G., 2018). La zone eut une activité portuaire ancienne et soutenue.

[14] *IGCH* 1750 (Nippur, vers 1890) aurait aussi contenu au moins 2 décadrachmes, mais on ne sait ce qu'ils sont devenus.

[15] N°56, planche 5.

faites à l'été 2013 dans le même secteur. Il est possible que tout provienne d'une même épave dont la cargaison, éparpillée sur le fond marin, sans doute en grande partie enfouie sous le sable et les sédiments, aurait fait de 2013 à 2017 l'objet de fouilles sous-marines clandestines. D'après les différents états de conservation, il est possible d'envisager un amas de monnaies, dont une partie éparpillées sur le sable ; certaines monnaies auraient été roulées par le mouvement des vagues durant plusieurs siècles (créant le « galet », p1-p3 planche I), tandis que d'autres seraient restées groupées, leur épargnant cette gangue particulière et limitant leur corrosion (p4, planche1 ; les sacs contiennent aussi des monnaies en très bon état). Les seuls témoins de l'existence de la statue, ne permettent pas de la dater plus précisément qu'entre le Ve s. av. J.-C. et le IIe s. ap. J.-C. Dans l'hypothèse d'une épave commune, la date fournie par les monnaies (peu après 320 av. J.-C. voir *infra*) situerait la statue dans le haut de la fourchette. Ce serait cohérent avec sa plinthe de bronze rectangulaire, détail qui semble attesté pour des statues de bronze du Ve s. av. J.-C. jusqu'à l'époque hellénistique[16].

3 – LES MONNAIES DU TRÉSOR

Les seules monnaies de ce trésor que nous avons pu examiner directement sont quelques tétradrachmes extrêmement corrodés, reconnaissables comme des Alexandres mais impossibles à attribuer à un atelier précis[17]. Nous n'avons pu travailler qu'à partir de photographies disparates qui nous ont été communiquées.

Un premier lot de photographies ont été prises en juin 2013 par Manon Saenko et Gaëlle Thévenin. Les monnaies, non nettoyées ou très corrodées, ne sont pas attribuables.

Une deuxième série de quatre monnaies, comportant cette fois-ci des numéros et une échelle mais sans les poids, a été prise en mars 2017 par Fadel al-Otol chez un collectionneur à Gaza.

Un troisième lot de quatre décadrachmes saisis au passage d'Erez par les autorités israéliennes ont été diffusés *via* un article en ligne[18]. Nous ne disposons que de photos non-professionnelles : un exemplaire est photographié de près, avers et

[16] Ainsi le Poséidon de Livadhostro, daté vers 480, repose sur une plinthe rectangulaire en bronze (Athènes, Musée Archéologique National n°11761) ; une plinthe parallélépipédique, très comparable à celle de l'éphèbe de Gaza, se trouve sous les pieds de l'Apoxyomène de Croatie, lequel reproduit un modèle du IVe s. mais que l'on date généralement du Ier s. av. J.-C.

[17] A une exception près, le tétradrachme 14 dont le revers, extrêmement corrodé (et dont nous n'avons plus qu'une photo mal mise au point) laisse voir un pan de la draperie de Zeus pendant sous l'assise du trône, ce qui est une particularité de l'atelier de Sidè.

[18] Deux articles : *Times of Israel* et *Arutz Sheva*, 16 juillet 2017 (consultés le 21/07/2017).

revers, les trois autres n'apparaissent que pour l'avers seulement sur une photo mal éclairée et très peu détaillée.

Un quatrième lot de photos a été réalisé très rapidement par Jawdat al-Khoudary à Gaza en mai 2017, dans des conditions telles qu'elles sont difficiles à exploiter : les photos n'ont pas d'échelles, et aucune information n'a été donnée quant aux poids ; prises à l'aide d'un téléphone portable, elles sont sans ordre et parfois incomplètes. L'association des avers et des revers est impossible sauf lorsque les irrégularités du flan ne laissent pas de doute.

Une cinquième série de sept exemplaires en bon état a été prise, toujours à Gaza, par Fadel al-Otol, avec l'indication des poids ; les images exploitables sont peu détaillées.

De toutes ces photos nous n'avons retenu que celles qui permettent d'attribuer la monnaie à un atelier précis. Celles représentant des monnaies illisibles ou trop corrodées pour être attribuées sans équivoque sont ignorées[19].

Les monnaies sont présentées ici par ateliers, dans l'ordre de leur classement d'après le catalogue de Martin J. Price. Les diamètres précis n'étant pas connus, elles seront reproduites sur les planches à échelle réelle, mais approximative.

Toutes les descriptions s'entendent ainsi :

Avers : Tête d'Héraclès imberbe à droite, coiffée d'une dépouille de lion.

Revers : (légende variable), Zeus assis à gauche sur un trône, vêtu d'un himation sur la partie inférieure du corps, un aigle sur sa main droite tendue devant lui et tenant de la gauche un sceptre vertical ; dans le champ gauche, symbole(s), lettre(s) ou monogramme ; le cas échéant dans le champ inférieur, sous le trône, symbole, lettre(s) ou monogramme.

Provenance des photos : FA : Fadel al-Otol ; GT : Gaëlle Thévenin ; IAA : Israel Antiquities Authority ; JK : Jawdat al-Khoudary.

Amphipolis

01 – Tétradrachme, 332-326. ΑΛΕΞΑΝΔΡΟΥ, proue à g. Price 4. JK

02 – Tétradrachme, 15,86 g, 332-326. ΑΛΕΞΑΝΔΡΟΥ, vase janiforme. Price 6. FA

03 – Tétradrachme, 336-323. ΑΛΕΞΑΝΔΡΟΥ, gouvernail ? Price 11 ? JK

04 – Tétradrachme, 336-323. ΑΛΕΞΑΝΔΡΟΥ, bouclier rond. Price 57. JK

05 – Tétradrachme, 336-323. ΑΛΕΞΑΝΔΡΟΥ, massue au-dessus d'un monogramme. Price 71. JK

[19] Voir planche 1, la photo p4 présente les monnaies réunies dans des sacs après leur extraction sous-marine. Différents états de conservation sont clairement visibles.

06 – Tétradrachme, 16,48 g, 325-323. ΑΛΕΞΑΝΔΡΟΥ, hermès ithyphallique à g. Price 78. FA

07 – Tétradrachme, 16,59 g, 325-323. ΑΛΕΞΑΝΔΡΟΥ, coq à g. Price 79. FA

08 – Tétradrachme, 323-320. ΑΛΕΞΑΝΔΡΟΥ, Athéna Promachos à d. Price 105. JK

09 – Tétradrachme, 325-323/2. ΑΛΕΞΑΝΔΡΟΥ, arc et carquois. Price 106. JK

10 – Tétradrachme, 323-320. ΑΛΕΞΑΝΔΡΟΥ βασιλεως, corne d'abondance ? Price 108 b,c ? FA

11 – Tétradrachme, 323-320. ΑΛΕΞΑΝΔΡΟΥ βασιλεως, Athéna Promachos à d. Price 109. JK

Pella (?)

12 – Tétradrachme, 325-315. ΑΛΕΞΑΝΔΡΟΥ, foudre. Price 232. JK

Sidè (?)

13 – Tétradrachme, 325-320. ΑΛΕΞΑΝΔΡΟΥ ΒΑΣΙΛΕΩΣ, couronne ; sous le trône monogramme δι. Price 2949. Même coin d'avers qu'ANS 1944.100.33223-27. JK

14 – Tétradrachme, 325-320 ? Même description. Price 2949 ? Coin d'avers inconnu. GT

15 – Tétradrachme, 325-320. ΑΛΕΞΑΝΔΡΟΥ ΒΑΣΙΛΕΩΣ, δι ; sous le trône monogramme. Price 2951. JK

16 – Tétradrachme, 325-320. ΒΑΣΙΛΕΩΣ ΑΛΕΞΑΝΔΡΟΥ, [ΦΙ] ; sous le trône λ. Price 2964. JK

Tarse

17 – Tétradrachme, 16,81g, 333-327. ΑΛΕΞΑΝΔΡΟΥ, sous le trône, α. Price 2993. FA

18 – Tétradrachme, 333-327. Price 2993 ? JK

19 – Tétradrachme, 16,39 g, 327-323. ΒΑΣΙΛΕΩΣ ΑΛΕΞΑΝΔΡΟΥ, charrue. Price 3033. Même paire de coins que BNF, Monnaies, Médailles et Antiques, Fonds Général 889. FA

Myriandros

20 – Tétradrachme, 325-323. ΑΛΕΞΑΝΔΡΟΥ, symbole de Tanit au-dessus d'une massue dans une couronne ; sous le trône, monogramme. Price 3230. JK

Tyr ou Aké[20]

21 – Tétradrachme, 330-327. ΑΛΕΞΑΝΔΡΟΥ, foudre. Price 3238. JK

22 – Tétradrachme, 330-327. Price 3238. JK

23 – Tétradrachme, 330-327. ΑΛΕΞΑΝΔΡΟΥ, sous le trône, o. Price 3244. JK

24 – Tétradrachme, 323-321. ΑΛΕΞΑΝΔΡΟΥ, date en caractères phéniciens. Price 3260 ou 3262 (position des jambes de Zeus et forme des pieds du trône). JK

25 – Tétradrachme, 15,32 g, 321-320. ΑΛΕΞΑΝΔΡΟΥ, date en caractères phéniciens. Price 3265. Même coin d'avers que ANS 1944.100.35397-99. FA

Arados

26 – Tétradrachme, 328-320. ΑΛΕΞΑΝΔΡΟΥ à d., ΑΛΕΞΑΝΔΡΟΥ à l'exergue, caducée ; sous le trône monogramme ap. Price 3332. JK

27 – Tétradrachme, 328-320. Price 3332. JK

Sidon

28 – Tétradrachme, 324/3. ΑΛΕΞΑΝΔΡΟΥ, lettre phénicienne ; sous le trône σι. Price 3491. JK

29 – Tétradrachme, 324/3. Price 3491. JK

30 – Tétradrachme. Sidon, 324/3. ΑΛΕΞΑΝΔΡΟΥ, k ; sous le trône σι. Price 3495. JK (monnaie encore collée par l'avers à une autre monnaie)

31 – Tétradrachme, 324/3. Price 3495. JK

Babylone

32 – Décadrachme, 35 mm, 325-323[21]. ΑΛΕΞΑΝΔΡΟΥ ; sous le trône, monogramme et m. Price 3598. FA. Même coin d'avers que ANS 1974.274.1[22]. D2/R11

33 – Décadrachme, 36 mm, 325-323. ΑΛΕΞΑΝΔΡΟΥ ; sous le trône, monogramme, à l'exergue m ? Price 3600 ? FA. Même coin d'avers que *CH* I (1975) fig.6.2. D4/R?

34 – Décadrachme, 325-323. Revers non-connu. IAA. Même coin d'avers que Berlin Münzkabinett 18202989. D3/R?

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[20] Price 1991 attribue ce monnayage à Aké mais Lemaire 1976 proposait de l'attribuer à Tyr.

[21] Mørkholm 1991 p.48 n°30, date ces monnaies de 327/6 av. J.-C.

[22] Cet ex. de l'ANS est du type Price 3598, et non 3600 comme indiqué sur le site *numismatics.org*.

35 – Décadrachme, 325-323. Revers non-connu. IAA. Même coin d'avers que BNF, Fonds Général 664, et BM 1850,0412.1. D1/R?

36 – Décadrachme, 325-323. Revers non-connu. IAA. Même coin d'avers que n°32 et ANS 1974.274.1. D2/R?

37 – Tétradrachme, 325-323. ΑΛΕΞΑΝΔΡΟΥ, m ; sous le trône, monogramme. Price 3602. JK

38 – Didrachme, 7,99 g, 325-323. ΑΛΕΞΑΝΔΡΟΥ ; sous le trône, monogramme et m. Price 3603A. FA

39 – Tétradrachme, 325-323. ΑΛΕΞΑΝΔΡΟΥ, dauphin ; sous le trône, monogramme et m. Price 3613. JK

40 – Tétradrachme, 325-323. ΑΛΕΞΑΝΔΡΟΥ, lion assis à g. ; sous le trône, monogramme et m. Price 3646. JK

41 – Tétradrachme, 325-323. ΑΛΕΞΑΝΔΡΟΥ, symbole incertain ; sous le trône, monogramme et m. JK

42 – Tétradrachme, 325-323. ΑΛΕΞΑΝΔΡΟΥ (sic), symbole incertain ; sous le trône, monogramme et m. JK

43 – Tétradrachme, 323-317. ΑΛΕΞΑΝΔΡΟΥ à d., ΒΑΣΙΛΕΩΣ à l'ex., m ; sous le trône λυ. Price 3692. JK

4 – COMMENTAIRE

La monnaie terminale de cet échantillon de 43 exemplaires attribués est un tétradrachme de Tyr ou Aké, daté de 321-320 (n° 25). La date en caractères phéniciens n'est pas lisible sur la photo faute d'un nettoyage suffisant mais son identification est certaine : il s'agit du type Price 3265, le coin d'avers est le même que celui de plusieurs exemplaires parfaitement lisibles de la collection de l'ANS, et la date basse est confirmée par le type de revers, Zeus aux jambes croisées, type qui n'apparaît pour cet atelier qu'à partir de 321-320. De tous les tétradrachmes de ce trésor dont nous avons la photo, c'est un des moins frayés et tous les plis de la draperie de Zeus sont encore visibles : la monnaie avait probablement peu circulé. Aussi, malgré la faiblesse de l'échantillon (43 monnaies sur plus de 4000), on peut estimer que la date d'émission de ce tétradrachme est proche de la date du naufrage, qu'il faudrait alors situer entre 320 et 315.

Les ateliers les mieux représentés sont ceux de Macédoine (« Amphipolis », « Pella ») et de Babylone. C'est également le cas des autres trésors contemporains de la région, quel que soit leur volume, ce qui reflète la production globale des té-

tradrachmes sous Alexandre et au début de l'époque des diadoques. La comparaison avec les trésors de Demanhur (Égypte, 5951 tétradrachmes), Khirbet el-Kerak (Jordanie, 53 tétradrachmes) et le trésor *CH* VIII 185 (Nord de la côte levantine, 167 tétradrachmes dont 131 attribués), tous datés en gros de la même époque proche de 320[23], donne à notre modeste échantillon de Gaza un profil intermédiaire entre celui des deux trésors de Syrie-Phénicie et celui de l'énorme trésor égyptien. C'est encore plus net quand on compare l'importance relative des grandes régions émettrices au sein de chaque trésor. Le trésor de Gaza contient en proportion moins de monnaies de Macédoine qu'en Égypte mais plus qu'en Syrie, plus de monnaies de Babylone qu'en Égypte mais moins qu'en Syrie, et les tétradrachmes des ateliers de la côte levantine (Myriandros, Arados, Sidon, Tyr ou Aké) y sont particulièrement représentés, dans des proportions comparables au trésor *CH* VIII 185 qui provient sans doute lui aussi de la côte levantine.

	tétradrachmes	% des tétradrachmes	didrachmes	décadrachmes	**total**
Amphipolis	11	**29,72**			**11**
Pella	1	**2,70**			**1**
Side	4	**10,81**			**4**
Tarse	3	**8,10**			**3**
Myriandros	1	**2,70**			**1**
Tyr ou Aké	5	**13,51**			**5**
Arados	2	**5,40**			**2**
Sidon	4	**10,81**			**4**
Babylone	6	**16,21**	1	5	**12**

On peut en conclure que ce trésor de Gaza est sans doute représentatif de la circulation des Alexandres à la frontière de l'Égypte et de la Syrie. Bien qu'il ait été trouvé en mer et ait vraisemblablement été perdu à la suite d'un naufrage, il ne s'agit pas d'un trésor constitué ailleurs et perdu lors d'une escale.

[23] Davesne Lemaire 1996, qui corrige *CH* VIII 185 ; Baramki 1944 = *IGCH* 1510 ; Duyrat 2005 ; Zervos 1980.

Pourcentages des différents ateliers dans les trésors de Demanhur (Égypte), Gaza, Khirbet el-Kerak (Jordanie) et *CH* VIII 185 (Nord de la côte syrienne)				
	Demanhur *IGCH* 1664 (5951 4dr. identifiés)	**Gaza** (37 4dr. identifiés)	**Khirbet el-Kerak** *IGCH* 1510 (53 4dr. identifiés)	***CH* VIII 185** (131 4dr. ident.)
Amphipolis	33,69	**29,72**	13,20	25,19
Pella	1,05	**2,70**	0	0
Side	3,17	**10,81**	1,88	2,29
Tarse	9,22	**8,10**	7,54	6,87
Myriandros	3,47	**2,70**	3,77	9,92
Tyr (Akè)	4,30	**13,51**	7,54	1,52
Arados	6,23	**5,40**	3,77	15,26
Sidon	2,23	**10,81**	5,66	0
Babylone	13,77	**16,21**	49,05	22,90

Pourcentages des grandes régions émettrices d'Alexandres au sein de ces trésors				
	Demanhur	**Gaza**	**Khirbet el-Kerak** *IGCH* 1510	***CH* VIII 185**
Macédoine	35,62	**32,42**	15,08	25,19
Asie Mineure	15,35	**18,91**	9,42	10,68
Chypre	5,73	**0**	1,88	11,44
Syrie-Phénicie	24,94	**32,42**	22,62	29.74
Babylone	13,77	**16,21**	49,05	22.90
Égypte	4,45	**0**	0	0

DÉCADRACHMES D'ALEXANDRE SANS PROVENANCE DÉCLARÉE APPARUS SUR LE MARCHÉ DEPUIS 2015

Les décadrachmes sont classés ici par références dans le catalogue Price. Price 3598 est suivi de 3618A parce que ces deux types partagent les mêmes coins d'avers. Price 3600 vient ensuite, avec 3600 var, qui partagent aussi les mêmes coins d'avers. Pour chaque exemplaire sont indiqués les coins utilisés, D1-4 pour les avers et R1-16 pour les revers[24].

Abréviations des maisons de vente : CNG : Classical Numismatic Group, Inc. (Londres, UK – Lancaster, PA) ; HA : Heritage Auctions (Dallas, TX) ; HD : Hess Divo AG (Zürich, CH) ; NAC : Numismatica Ars Classica AG (Zürich, CH) ; NN : Numismatik Naumann GmbH (Vienne, OE) ; RN : Roma Numismatics Ltd. (Londres, UK). Les photos de chaque exemplaire (44-60) sont celles des catalogues de vente publiés par ces maisons. Les photos du n°56 sont partagées la page Facebook de Salem Alshdaifat le 5.01.2018.

Babylone

44 – Décadrachme, 35 mm, 41,62g. Price 3598. D1/R1. Même paire de coins que l'ex. du British Museum 1850,0412.1. [RN 16.221 (26.09.2018)]

45 – Décadrachme, 35 mm, 41,22g. Price 3598. D1/R10. [HA 3044.31020 (03.02.2016)]

46 – Décadrachme, 33 mm, 40,63g, 12h. Price 3598. D1/R11. [CNG E412.84 (17.01.2018)]

47 – Décadrachme, 38,47g. Price 3598. D2/R6.[NAC 84.600 (20.05.2015)]

48 – Décadrachme, 32 mm, 41,90g, 10h. Price 3598. D2/R10. [RN 15.121 (05.04.2018)]

49 – Décadrachme, 32 mm, 31,51g. Price 3618A. D1/R12. [CNG E410.06 (29.11.2017)]

50 – Décadrachme, 35 mm, 39,61g, 10h. Price 3618A. D2/R12.[HA 3061.32022 (07.01.2018)]

51 – Décadrachme, 33 mm, 39,65g, 1h. Price 3618A. D2/R8. [HD 333.26 (30.11.2017)]

[24] Ces études de coins n'entrent pas dans les limites de cette contribution et seront détaillées dans une autre publication.

52 – Décadrachme, 33 mm, 40,15g, 4h. Price 3618A. D2/R9. [RN 14.112 (21.09.2017)]

53 – Décadrachme, 32 mm, 36,87g, 12h. Price 3600. D4/R14. [HA 3064.30046 (20.04.2018)]

54 – Décadrachme, 33 mm, 39,09g, 5h. Price 3600. D4/R15. [RN 15.120 (05.04.2018)]

55 – Décadrachme, 34 mm, 40,38g. Price 3600 var. D4/R16. [RN 14.111 (21.09.2017)]

56 – Décadrachme, 36 mm, 42,00g, 9h. Price 3600 var. D4/R16. [Coll. part. S. Alshdaifat]

57 – Décadrachme, 35 mm, 36,39g. D1/R? [NN 65.76 (06.05.2018)]

58 – Décadrachme, 32 mm, 26,66g, 11h. D2?/R? [RN E42.122]

59 – Décadrachme, 35 mm, 41,62g, 10h. D4/R?. [RN E-live 1.117 (27.07.2018)]

60 – Décadrachme, 30 mm, 23,27g, 1h. D?/R? [RN E43.103 (03.02.2018)]

La présence à Gaza d'au moins 5 décadrachmes est certaine (n°s 32 à 36), et une photographie semble même en laisser distinguer un 6e, extrêmement usé par le nettoyage[25]. Le trésor devait probablement en comporter d'autres et l'afflux soudain de ces monnaies très rares sur le marché (à partir du 2017/09/21), peu de temps après l'interception de quatre exemplaires au passage d'Erez (le 16 juillet 2017), laisse peu de place au doute. Certains sont en excellent état, d'autres présentent des marques de corrosion ou de nettoyage brutal très comparables à celles constatées sur les monnaies observées ou photographiées à Gaza. Malgré leur rareté et les prix attribués lors des ventes publiques, aucun n'était présenté avec une origine ou un pedigree précis ni, surtout, vérifiable. On obtient un total de 21 exemplaires, peut-être 23 si l'on ajoute les deux décadrachmes vendus dès 2015 et 2016 : le trésor d'Alexandres de Gaza contenait donc probablement plus d'une vingtaine de décadrachmes.

Ces décadrachmes d'Alexandre ont été étudiés par Martin J. Price (Price 1991) sur la base des 12 exemplaires alors connus en 1990 : ceux de Londres, Berlin, Paris et Athènes, auxquels s'ajoutaient les huit exemplaires du trésor de 1973-1989. Il identifiait trois types qui, dans son catalogue, correspondent aux numéros 3598, 3600 et 3618A. Les nouveaux exemplaires permettent d'affiner ce classement et de mettre en évidence un 4e type que l'on appellera 3600 var. (variante).

[25] Voir P4, Planche I, dans le sac situé en haut à gauche, est présente une monnaie particulièrement large, hélas très abîmée. Elle ressemble beaucoup au n°60 qui ne pèse plus que 23,27g.

3598 : ΑΛΕΞΑΝΔΡΟΥ. Zeus aétophore demi-nu assis à g. tenant un sceptre vertical. Sous le trône monogramme et m.

3600 : ΑΛΕΞΑΝΔΡΟΥ. Zeus aétophore demi-nu assis à g. tenant un sceptre vertical. Sous le trône monogramme ; à l'exergue m.

3618A : ΑΛΕΞΑΝΔΡΟΥ. Zeus aétophore demi-nu assis à g. tenant un sceptre vertical. Dans le champ g. une abeille ; sous le trône monogramme et m.

3600 var. : ΑΛΕΞΑΝΔΡΟΥ. Zeus aétophore demi-nu assis à g. tenant un sceptre vertical. Dans le champ à g. m ; sous le trône monogramme.

En réunissant ces nouveaux exemplaires à ceux qui étaient déjà connus, on distingue quatre coins d'avers pour l'ensemble. Les coins d'avers D1 et D2 sont associés indifféremment aux revers Price 3598 et 3618A (identique à 3598 avec l'ajout d'une abeille dans le champ à g.) Le coin d'avers D4 est associé aux revers 3600 et 3600 var. Pour le coin d'avers D3 on ne peut rien dire encore : ce coin n'est connu que pour deux exemplaires, celui de Berlin dont le revers a été autrefois lissé et regravé[26], et notre n°34, saisi à Erez, dont nous n'avons pas la photo du revers.

[26] Berlin Münzkabinett 18202989.

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Site personnel du collectionneur privé possédant certains décadrachmes : https://www.facebook.com/salem.alshdaifat/photos_all; Avec photo publiques du décadrachme n56°,

droit : https://www.facebook.com/photo.php?fbid=1583129931707627&set=pb.100000319058201.-2207520000.1540834957.&type=3&theater

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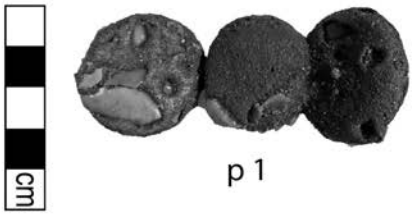
Photographies mobiles, prises le 9 août 2017 à Windsor, Canada.

Planche 1



p 1

p2

p3

p4

Planche 2 1:1

Planche 3 1:1


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Planche 4 1:1

Planche 5 1: 1


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Neil Mahrer (Jersey Heritage), Georgia Kelly (Jersey Heritage),
Victoria Le Quelenec (University of Central Lancashire)

LE CATILLON II: CONSERVING THE WORLD'S LARGEST IRON AGE HOARD

Abstract

In early 2012, two amateur metal detectorists in the British Channel Isle of Jersey discovered the Le Catillon II Iron Age hoard. This contained over sixty-nine thousand coins, eight complete gold torques and numerous other pieces of jewellery. The hoard appears to have been buried around 30-40BCE by the Coriosolitae tribe from the nearby French coast and is the largest Celtic hoard ever discovered. It was excavated intact and transferred to a conservation laboratory on the island. Here it was decided to disassemble the hoard and record its contents at a level of detail never attempted before. A computer controlled six axis metrology arm with a contact probe point head was used to record the position of every coin and other item to a sub centimetre accuracy before removal. A laser scanner was also used to record the entire hoard at various stages of disassembly. In this way, a complete three-dimensional virtual map of the hoard contents was created. Work is now being done to link this map to the object database so that it may be interrogated for distributions of different ages, types, makers of coins etc.

Keywords

Le Catillon II, Hoard; Numismatic and Archaeometry

The Catillon II hoard was discovered in May 2012 by two local metal detectorists, Reg Mead and Richard Miles. On realizing what they'd found, they refilled the hole immediately and contacted Jersey Heritage, the professional museum body on the island. A team of local archaeologists and a conservator was then formed and began the excavation four weeks later. Only a two by two metre hole was dug because at that time it was expected that only a small hoard of several hundred coins, possibly in a pot, would be found. In fact, it soon became apparent that the hoard was much larger. Indeed it wasn't until the end of the second day that all of the hoard's edges were uncovered. It was apparently completely composed of coins fused together by a layer of green corrosion product. Even at this stage it was possible to tell that many of the coins were silver/copper alloy staters and quarter staters made by the Coriosolitae tribe of Celts from the neighbouring French coast in the second half of the first century BCE (Philip De Jersey, Guernsey Museums Archaeologist, conversation with authors, July 2012). The hoard was found to measure approximately 140 x 70 x 15cm in size.

Once the hoard was fully visible its importance became obvious. It was therefore decided to excavate it intact in one block if possible. In order to keep it damp during the excavation period, a thin layer (10-30mm) of earth was left on its top and side surfaces, (fig.1). A layer of earth between 150 and 200mm thick was left beneath the hoard to act both as a supporting base and as a reservoir of water in order to buffer the hoard itself. The entire exposed area of the block was wrapped in Clingfilm at all times when not being worked on.

For the hoard's safe extraction from the trench, the layer beneath the coin block was removed as far as it was believed safe to do so, leaving it the full width of the hoard where it touched the coins but tapering down to a smaller base. Hand tools were then used to dig four evenly-spaced, parallel tunnels, each 120mm in diameter, through the remaining under-hoard earth across its long axis. A metal scaffold structure was constructed to fit closely around the hoard, with four nylon belts fitted through the tunnels underneath it and around the scaffold so that it could all be lifted out by crane, (Fig.2). The belts thus supported the hoard's weight as fully and evenly as possible, while the crane's chains and hooks touched only the metal structure. To prevent the belts compressing the hoard's top edge it was protected by a Plastazote and plywood shield.

Concern remained that the earth/broken shale layer beneath the hoard was very hard and that it might resist the pull of the crane during the lift. To counter this possibility, three people crouched down in the pit beside the hoard to gently push it until the hoard block was felt to move very slightly. It was then known that the solid connection with the pit floor was broken and that the hoard was being held in place only by its weight. With the hoard block lifted about 200mm, a 75mm Plastazote LD45 foam layer, on a specially constructed wood pallet, was placed beneath it and

Figure 1 – The hoard before lifting

Figure 2 – The hoard being tied to the scaffold support before lifting

Figure 3 – The hoard on the back of the truck after lifting

the hoard lowered onto its new support. The hoard block and support were finally lifted by an extending crane onto a flat-bed truck, (Fig.3).

INITIAL LABORATORY EXCAVATION 2012-2014

During this period Jersey Heritage was granted permission to remove overlying earth to fully reveal the hoard surface, and to perform non-invasive research to reveal more about the nature of the hoard.

The guiding principle was to reveal as much as possible about the hoard but not to deliberately remove any part of its structure. In practical terms this meant that all overlying earth was removed and the object was recorded as fully as possible. In addition to photography, a laser scan of its surface was sought but could not be arranged. Instead, a cast was made, using silicon rubber moulds, one for the top surface and five for the edges, with de-ionised water as a release agent and polyurethane foam as a rigid backing. The cast itself was made from epoxy resin and glass fibre. The bulk of it was painted with enamel paints and the exposed gold jewellery surfaces were replicated with gold leaf.

Figure 4 – The hoard after the initial removal the of earth revealed two pieces gold jewellery

The possibility of X-raying the entire structure was discussed with colleagues at Southampton University, but it was too large for available equipment (Graeme Earl and Ian Sinclair, Southampton University, emails to authors, 2012). Limited X-ray fluorescence (XRF) analysis of the coin surfaces and exposed gold and silver jewellery was undertaken by Karl Harrison and Andrew Shortland of Cranfield University.

A number of coins had become separated during the excavation and later earth removal, some of which were treated by manual cleaning and the use of formic acid to reveal their surfaces. Limited microscopic study of organic finds was made by the authors which revealed various plant and animal remains.

During the initial two-year period following excavation it had become clear that the nature of the hoard was more varied than at first thought. Amid the coins on its surface, partially exposed gold torques, silver bracelets, flat gold sheet, glass beads and many other artefacts were identified, (Fig.4). Some consideration had initially been given to preserving the hoard block intact, as it was such an impressive object. In light of the varied finds, however, it was decided that the disassembly of the hoard in order to reveal all of its contents was a more appropriate course.

DISASSEMBLY AND CONSERVATION 2014-17

A full proposal for the conservation of the hoard was presented by Jersey Heritage in early 2014. It was proposed to disassemble the hoard at an object-by-object level, conserving and recording each piece. The step-by-step conservation work would follow conventional best practice, but would operate alongside an innovative method of recording the find. This involved use of a Faro Edge six-axis metrology arm and laser attachment, to record surface laser scans of the hoard and its contents at regular stages of the work. Its physical contact probe head was also used daily to record the position of every single coin and all the other finds on the hoard's surface to fractions of a centimetre in three dimensions. This would allow future researchers to have a virtual model of the hoard as found, in which the coin positions would be linked to their database records of tribe, chronology and so on.

The team was keen that its work should allow the maximum amount of research both during the disassembly phase and for many years to come, so advice was taken on recognition, extraction and preservation of samples of interesting soil, organics or corrosion encountered during the work (Pieta Greaves, Jenni Butterworth, Drakon Heritage & Conservation, conversations with and emails to authors, 2014-17)(Julia

Figure 5 – The glass walled lab showing the public's view of hoard and Faro Edge metrology arm

Tubman, Philippa Pearce, Marilyn Hockey, Eleanor Ghey, British Museum, conversations with and emails to authors, 2012-14). In addition it was planned to remove 1,500 coins which would be left untreated as a research archive, as well as a solid, full height 15 x 15 x 15cm section of the hoard to be left frozen, intact with all earth, organics etc. remaining in place between the coins.

The total budget was £250,000, of which the bulk would be applied to salaries, while £40,000 was allocated for the Faro Edge unit and £20,000 for research. The work was to be carried out by a staff of three professionals: two conservation assistants, both qualified archaeologists, led by the Jersey Heritage Trust Conservator. This team was supported by a wider range of professional advisors and a group of twenty part-time volunteers who did much of the hands-on work. The use of such a volunteer group was initially somewhat controversial but good examples of such expert-led volunteer work had already proved the concept, (Lithgow, Timbrell 2014, 3-14). Georgia Kelly and Victoria Le Quélenec were appointed as the conservation assistants, the latter eventually replaced by Heather Truscott. Olga Finch, the archaeology curator for Jersey Heritage, acted as the archaeology/research advisor, and the two finders, Reg Mead and Richard Miles, acted as principal coin identifiers, their work overseen by Philip De Jersey, Guernsey Museum Service archaeologist.

This second phase of the project commenced in July 2014. The final coins were removed from the hoard in January 2017, and the project concluded in July 2017.

EXCAVATION METHOD

The hoard block was disassembled one coin at a time. The daily work involved a team of two people: one to physically remove the coin and operate the metrology arm that measured the coin position; the other to operate the computer linked to the arm and assign a sequential number to each new coin, and then bag the coin.

The plotting of each coin took only a few seconds. The operator of the metrology arm touched its point probe three times across the coin's centre axis and three more times around the edge of the coin, at 120 degree intervals. Using Geomagic software, the computer generated a numbered disc each time a coin was plotted, correctly positioned in three dimensions.

As the process was repeated, a three dimensional map of the relative coin positions was built up by the software, (Fig. 6). Typically, between 200 and 500 coins would be removed in one day in this way. A separate file was saved of each day's patch of removed coins and these were combined regularly to produce the master model of the entire hoard. The different day models were combined by relating each to a series of fixed points around the whole hoard. These fixed points consisted of 20mm stainless steel spheres on metal rods, inserted into the earth beneath the hoard

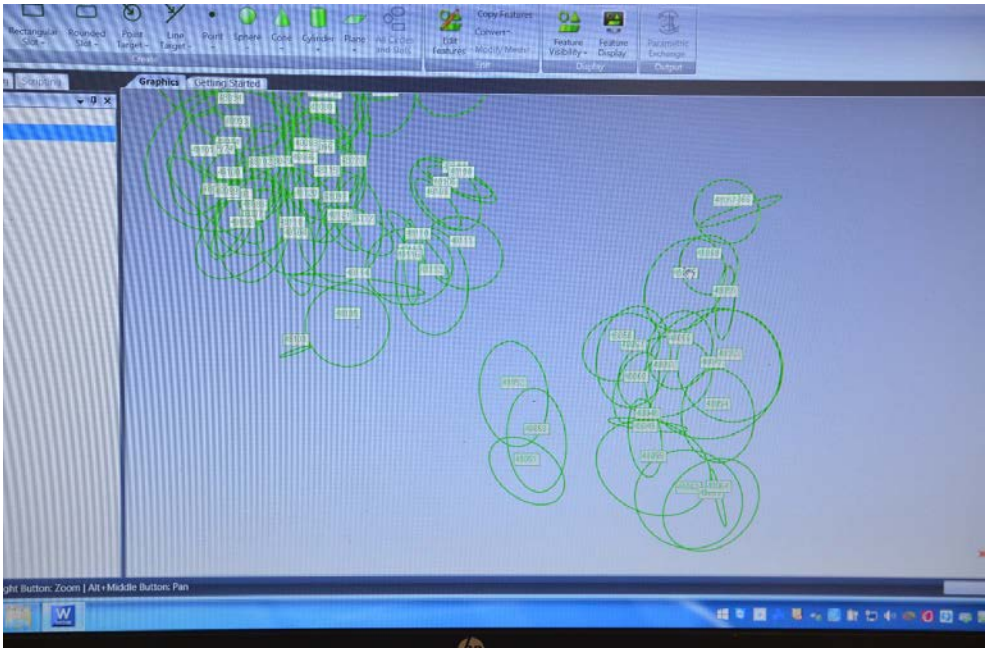

Figure 6 – Screen shot of three dimensional coin map produced each day when removing coins

at equidistant points. At the end of each day's coin removals, the position of these spheres would be plotted by the arm on the same model as the coins.

Other objects found with the hoard had their position recorded in two ways using the metrology arm. Firstly, the point probe would be used in the same way as for the coins. A circular object, such as a torque, would be saved as a disc; a long thin object as a two-dimensional line. Secondly, the laser head would be fitted and once the object was revealed, but still in situ it, would be scanned. In the same way as with each day's coin model, by using the reference spheres around the hoard, these laser scans could be superimposed on others to record the positions of items relative to the whole hoard.

The intention by the end of the project was that these partial laser scans of the in situ objects would be combined with full ones made after their removal, (Fig.7). The complete laser scans of each object would then be placed correctly back into the final three dimensional virtual hoard model.

As a back up to the computerized system, the hoard surface was also divided into a grid of 40 x 22 squares. Each coin and object, in addition to being located

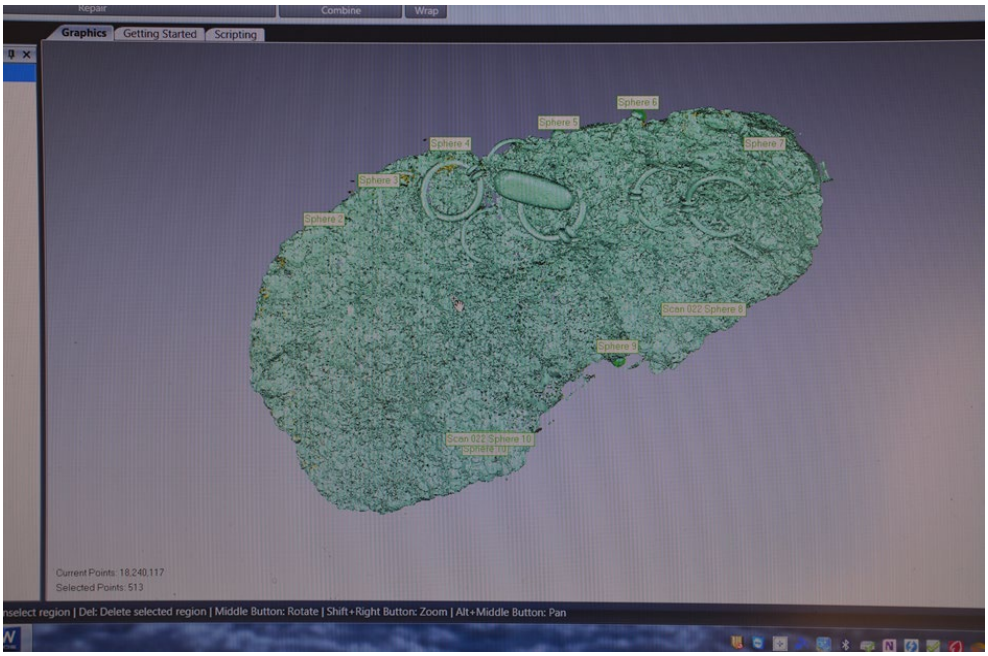

Figure 7 – Laser scan of hoard contents during its disassembly

by the metrology arm, was also given a grid reference such as *M23, top, middle or bottom*. A Melinex (clear polyester) sheet with the hoard outline and grid system on it was laid over the hoard to record this each day, and used to position a plastic square, similar to a painting frame marked with grid references, over the area to be worked on.

The physical separation of the coins proved easier than had been envisaged. The coins were connected to one another only by the fusion of their copper corrosion products. This bond fortunately proved weak and it was always possible to remove a coin one at a time using a metal hand tool, usually a specially blunted knife. Sufficiently robust jewellery and other objects were cleared of all surrounding coins and then the number around their base was reduced. At some point in this process they usually came loose and if not they would be gently manipulated by hand until they did loosen.

It was considered necessary to maintain the original moisture content of the hoard as far as possible in the laboratory. This was partly due to uncertainty as to how the soil would react if dried out – the British Museum had trouble with earth that

Figure 8 – The ultrasonic humidifier keeping the hoard damp

dried rock hard on the Bath hoard (Julia Tubman, British Museum, conversation with authors, 2012). Mainly however it was to avoid drying out the large amount of potentially important organic material in the hoard dating from the time of the burial (Fell 1996, 48-51).

The hoard was kept moist in two ways. At night, or during longer periods when the hoard was not being worked on, it was kept tightly wrapped in layers of Clingfilm. It spent the majority of the 2012-14 period wrapped in this way, kept in a cold store at 4°C. During the following period, when it was being excavated in a publicly viewable open lab, it was kept wrapped in Clingfilm at night but had to be actively moistened when it was on display.

When not being worked on, an ultrasonic humidifier was used to produce a stream of cold, water saturated air that exited from a series of holes in a special device positioned along one long edge of the hoard so that the vapour slowly rolled over its surface, (Fig. 8). During periods of coin removal, when the humidifier equipment had to be removed, the hoard surface was sprayed with hand sprayers. Deionised water was used for both the humidifier and the hand sprayers.

CONSERVATION METHODS

Coins

It was decided early in the project that the sheer number of the coins meant they would be cleaned only enough to allow identification, rather than being polished to display standard. The method of cleaning the bulk of the coins evolved over the first few months of the project, but did not change substantially. It was based upon using formic acid to remove the copper corrosion products from the silver/copper alloy coins. This technique was used by the British Museum team working on coins of a similar alloy from the Bath hoard, and proved to work very well on Jersey's coins (Julia Tubman, British Museum, conversation with authors, 2012). It was necessitated in Jersey, as it was for the Bath hoard, by the sheer number of coins to be treated. The authors had previously cleaned 150 similar coins from a different hoard using hand tools only, at an average rate of one hour per coin. For the present project, it was necessary to treat about 120 per day, or about four minutes per coin.

The conservation process was as follows:

1. The coin was removed from the hoard, kept damp and then sealed in a polythene bag.
2. The coin was removed from the bag and placed in one of the 14 chambers of an ice cube tray. The trays were modified by drilling holes in each chamber to allow them to drain.
3. The coins were cleaned of loose mud using a stiff rotary brush on a bench grinder/polisher.
4. Particularly thick corrosion was manually removed where possible with a blunt hand tool.
5. Nine ice cube trays of coins were placed in 15% formic v/v acid solution overnight.
6. The trays were removed from the acid and rinsed in a first bath of tap water.
7. The coins were brushed, again using the rotary bench brush, to remove remaining earth and corrosion products.
8. They were given six thirty-minute rinses, three in tap water and three in deionised water
9. They were then air-dried, still in the trays, for forty eight hours. During this period any remaining corrosion large enough to prevent the full examination of the coins was removed using a vibrating tip engraving tool under a stereomicroscope.

10. All coins were given a final dry brush with the rotary bench brush.
11. The coins were then placed in numbered, perforated polythene bags and placed in sealed polythene containers with silica gel, to maintain a low humidity.

The recording and tracking of each coin through this process was particularly important. When removed from the hoard, the coin's number was written on its individual polythene bag. Each ice cube tray was marked with a letter, and each chamber within it marked with a number, (Fig. 8). Thus, for example, coin CAT II/H/23564 from location mid B26 was placed in tray E, chamber 5. This was recorded on paper records and on an Excel spreadsheet. Each stage of the treatment was recorded in this way, and the paper records permanently preserved. In case one of the trays was dropped, each was photographed during the treatment process so as to allow each coin to be identified and placed back into the correct chamber. These images were retained, as were paper records of tray layouts.

After the conclusion of the drying process, each coin was transferred to a new polythene bag marked with the individual number and the grid reference. Each coin was then identified to tribe, sub-type, etc. This information along with its weight, images of both sides and details of conservation treatment was then entered as a record on Adlib collection management database software.

Figure 8 – Coins in a converted ice cube tray, individually recorded as I,1-14

Other artefacts

Inorganic artefacts other than coins divided broadly into the following types: gold jewellery and sheet; silver jewellery and wire; silver alloy ingots; and glass beads.

The treatment of gold jewellery had two phases during the project, i.e. with or without chemicals. The first groups of gold torques and other items removed from the hoard were treated as follows:

1. Initial manual cleaning while still damp, consisting mostly of the removal of loose earth by the application of water and soft brushes.
2. The objects were often partly covered in a layer of green copper corrosion products from the coins that had surrounded them in the hoard. Fortunately, the mechanical connection of this material to the underlying gold was generally not strong, and it was mostly removed by use of a pin vice and berberis thorn, (Staffordshire hoard conservation team 2015, 20-21). Occasionally, a vibrating tip engraving tool was used for thicker, more stubborn corrosion and earth. This could be played over the corrosion product with no contact with the gold at all, breaking it up well.
3. The objects were then rinsed in de-ionised water and air-dried.
4. This treatment could only safely remove about 90-95% of the corrosion. Advice was sought and at this stage that it was deemed safe (for future metallurgical research) to use dilute formic acid locally and for short periods (followed by rinsing) to remove the remaining translucent green glaze of corrosion product (Pieta Greaves, Drakon Heritage and Conservation, email to authors 2015).
5. The only material left on the surface was a bright red substance at first thought to possibly be remains of organic material from the hollow torques' interiors, but later confirmed as iron corrosion.

The second phase of the gold cleaning followed the same methodology, but no longer using formic acid. This was suggested during a research conference in the summer of 2016 as there was some concern that, contrary to earlier advice, its use could affect analysis of the alloy composition of the metal surface layers. It is likely that at least some of the material cleaned this way will be treated with the acid at the completion of future analytical work.

Silver artefacts were generally treated in the same way as the gold: mechanical cleaning then the use of formic acid if necessary, although once again the use of the acid ceased after the summer of 2016.

Silver wire was often found in bundles on the coins, usually encased in a block of copper corrosion product. The wire is so thin (0.1 x 0.4mm) and brittle that no

Figure 9 – Leather purse still on coin block. Belt loops on right side

mechanical cleaning was attempted, and the corrosion products were removed with 15% formic acid. The silver alloy ingots had almost no work done on them other than a light manual clean to remove earth, and then air-drying.

Glass beads were usually simply washed in deionised water. Where there were copper corrosion products on their surfaces it was removed with a scalpel, working under a stereomicroscope.

Organic material

A partially surviving leather purse or pouch was found full of coins. It was excavated as a block from the surrounding hoard, slid onto a Correx (corrugated plastic) sheet, (Fig.9). All possible coins were then removed from its exterior. The block was then immersed in 20% polyethylene glycol (PEG) 400 for three days before freeze-drying in a conventional freezer. Untreated, the leather would have shrunk, twisted and hardened on drying, but the PEG permeates and bulks out the leather allowing it to dry safely. Fragments of the purse were kept untreated for analysis.

Figure 10 – A part of the textile bag of jewellery

A very fragmentary textile container full of gold and silver jewellery and metal fragments was found, excavated and removed in a block in the same way as the leather pouch, (Fig. 10). It was freeze-dried as the purse except without any use of PEG on the advice of Elizabeth Goodman of Museum of London Archaeology. At the time of writing, analysis of the textiles and leather has been commenced by Esther Cameron.

SCIENTIFIC ANALYSIS

All of the gold torques, both partial and complete, as well as other items of jewellery have been X-rayed, initially in the Jersey General Hospital and then at higher resolution in the conservation department of the Birmingham Museums Trust. The majority have been analysed at Birmingham with an XRF unit.

Over nine hundred samples of organic material (generally plant fibres and stems) were taken, placed in wet in polythene bags and stored in air-tight containers in a

Figure 11 – A millipede found in the middle of the hoard

refrigerator for future research, (Neal and Watkinson 2001, 25-26). The arthropods among these have been identified to family if not species level by Sally-Ann Spence of Oxford University Museum of Natural History.

RECORDING

The conservation procedure for the individual finds is recorded within a field in the Adlib database record for each item. The entry is standardised for all coins that have gone through the conventional treatment and is a description of the treatment process with no post-treatment description. There is no individual conservation job or day number for each treatment. A medium resolution JPEG image of both sides of the cleaned coin is stored on the same record. The images are taken with a Nikon D80 digital SLR with a 50mm macro lens at f10, 100 ISO.

Conservation records for the non-coin items such as jewellery were initially recorded long-hand on paper. They were then transferred to the same Adlib database as is used for all finds from the hoard. Unlike the coins, these items have individual conservation job numbers, such as 'Cons 1/23.9.2016'. The records consist of a written description of the object's pre-treatment condition; a detailed account of the conservation process including any new discoveries about the object; results of any analyses; and digital images of the item before, during and after treatment, in high resolution.

The Geomagic software used to control the Faro Edge metrology arm and laser scanner records on .wrp files. These are stored and backed up and may be amended and added to, and will be available for research in the future.

FUTURE RESEARCH

A research framework for future work on the hoard was produced in 2016. In addition to specific proposals on metallurgy, numismatics and so forth it was agreed that it was important to return to the find site to continue work there. It is hoped that field walking, geophysical surveying and further excavations would be able to produce a clearer context for the discovery. Sadly, although many institutions both in the UK and Europe have expressed an interest in becoming involved, neither funding for the research nor permission to work on the site again have been procured at the present time. It is hoped that both of these issues will be resolved in the near future

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FROM REALITY TO VIRTUALITY. A DATABASE FOR THE CYRENAICAN SPECIMENS FROM NUMISMATIC TRADE

Abstract

The importance of auction sales catalogues in the study of any ancient coinage is unquestionable and they are of prime interest for numismatists in various ways (e.g., to gather a large body of material; to do an almost complete die-study; etc.). For all these reasons, since first catalogues started to appear frequently in the second half oh the XIX century, a complete examination would require the treatment of a considerable amount of data.

With the CyReNe-Project (Cyrenaican Research Numismatic e-Project) we decided to face this task and to create a database where all the specimens minted in Cyrenaican cities and sold during the years could be collected together. The aim is to make available all these data in a structured and systematic way and, on the other hand, to safeguard this important cultural heritage. Starting from 2011, due to the numerous looting carried out against the archaeological and numismatic heritage in Libya, the presence of Cyrenaican coins on the market has increased enormously; reconstructing the pedigree of a coin is an useful tool to exclude a possible illicit origin.

For these reasons we began to check past sales (more than 6000 auction catalogues and still counting) and their data will be implemented in the database. Incorrect identifications or attribution changes that have occurred throughout the history of the studies, are just some of the problems we are facing in undertaking such a project.

Keywords

Numismatic trade; Auctions catalogues; Database; Cyrenaica

INTRODUCTION

Nowadays, it could be probably said with absolute peace of mind, doing research in numismatics is, in some respects, relatively simpler than it was a few decades ago: easier access to the coins of public collections, even when kept at a great distance, with the possibility of having pictures of them in very high resolution; even more comfortable is the consultation of numismatic literature; and last, but not least, a large quantity of material that over the years has gradually become known, thanks to new discoveries, but especially to the public sales of the antiquarian market.

This last point will be at the centre of this contribution[1], where the importance of numismatic trade will be analysed and where a possible solution for the management of the considerable amount of data coming from this source will be proposed. With the *CyReNe-Project* (*Cyrenaican Research Numismatic e-Project*), in fact, we decided to create a database where all the specimens minted in Cyrenaican cities during Greek and Roman times and sold by auction houses during the years could be collected together and made available to everyone in a structured and systematic way.

THE IMPORTANCE OF NUMISMATIC TRADE

Anyone who wants to undertake a numismatic work on an ancient coinage, has to face an important matter: in fact, unless they have an iconographic point of view, for which only a few carefully chosen pieces will be sufficient, most studies are based on a large amount of material that should have to be collected.

Antiques and ancient coins have always been collector's items of interest to private lovers, both because of their aesthetics and their relative abundance. Ignoring private collector coins and focusing only on public collections would be a valid practical choice, but a scientific nonsense. An exhaustive body of research cannot be limited to museum or archaeological collections of a public nature. Much of the material is in private hands, and it is only accessible to the researcher in very short moments: its passage in a public sale, which is generally the subject of a catalogue and therefore of a description, is sometimes the only opportunity to "capture" the

[1] This paper is a result of the work currently underway on my PhD project at the University of Padua, *"Cyrenaican Bronze Coinage: economic and social perspectives"*, whose aim is to create a catalogue of the whole Cyrenaican bronze coinage, starting from the Greek-Hellenistic period, until the provincial coins of Marcus Aurelius, minted in Rome but for a limited circulation in the North-African region. I would like to thank professor Bruno Callegher, dr. Ella Zulini and all the other organizers of the International Workshop-Seminar held in 2018 in Trieste for the opportunity to present this project in such an interesting congress. Special thanks for help are due also to professor Michele Asolati, for all his advices.

object for research, before its definitive or cyclical disappearance. Precisely for this reason, pieces from the antiquarian market can not and should not be overlooked. The collection of catalogues of the major auction houses thus makes it possible to archive all this material published in public auctions, often with the addition of very well taken photos.

The importance of sales catalogues in this kind of works is consequently unquestionable, since they are of prime interest for numismatists in various ways, especially, as we've said, when there are images of the coins, as it usually happens. First of all, and most important detail, they allow us to gather a large body of material. We have to consider that the first auction catalogue was published in Leiden for the sale of the library of Philips van Marnix van Sint Aldegonde, on 6 July 1599[2], while the first printed one, devoted only to coins, was issued in Amsterdam for the sale of the John Raphael Grill Collection in 1679[3] (Fig. 1): this means that we are now facing more than three centuries of numismatic sales, with a resulting enormous number of coins.

In addition to the quantity, we must also consider the quality of the specimens that are offered for sale: a significant number of them, in fact, has no comparison with museum pieces, and in this way they increase our knowledge on the subject we are dealing with, give us more data for statistical analysis and the frequent presence of a good quality photograph of the coins often allows to discover new dies with the possibility of a more complete die-study[4]. It is also not so unusual that new variants or coin types appear in the market: looking at the Cyrenaica, which is at the centre of our research project, just to give a single example among the many possible cases, we could mention the wonderful gold stater of Cyrene, sold in 2014 by Nomos Ag[5] (Fig. 2).

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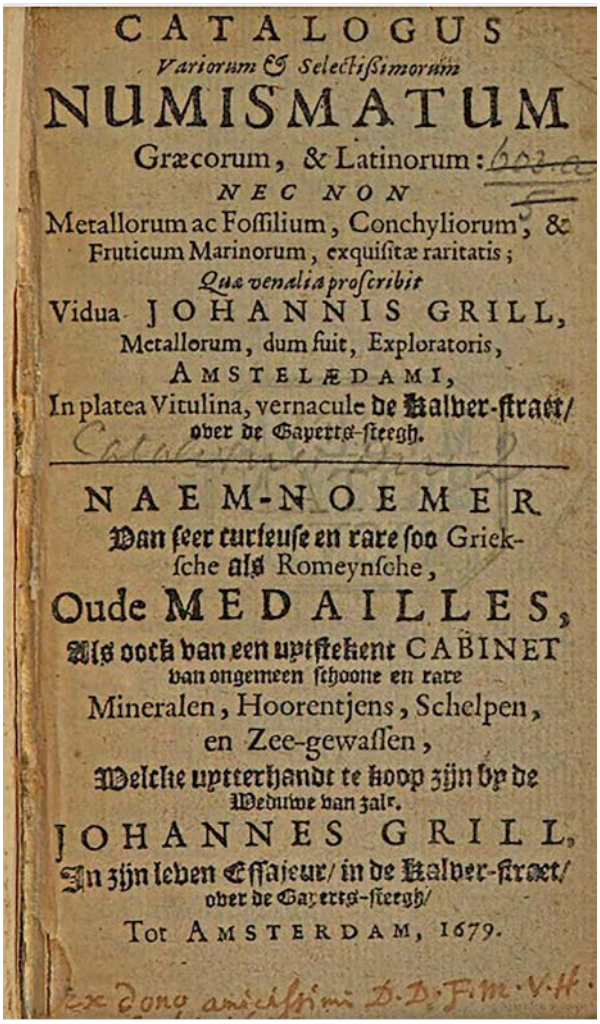
[2] Among the lots there were several numismatic books, but also some ancient coins as well.

[3] Rambach 2010, 37. See: Dekesel 2003, II, 1209 (cat. n. G 145). Clain-Stefanelli, instead, reports that the first known numismatic auction took place as early as 1598 in Leiden, Netherlands, where the collection of a French gentleman was sold in 1598 (Clain-Stefanelli 1965, 21), but it's probably an erroneous information.

[4] Although this is very true for today, when the use of the internet and computer technologies makes it much easier to access a huge amount of data from large and small auction houses, already 30 years ago specimens from numismatic trade were a source of information that could not otherwise be obtained, as we could see in de Callataÿ 1990.

[5] Gold stater, magistrate Pheidon, mint of Cyrene, 312-310 BC: Nomos AG, Auction 9 (21 October 2014), lot n. 197 (from the Battos Collection) = CNG, Triton XIX (5 January 2016), lot n. 2113 (from the Dr. Lawrence A. Adams Collection). This coin is published in Asolati 2016a, fig. 10. The piece is absolutely unique and unpublished in catalogues; the representation on the reverse of the full-length *Apollo Citharoedus* has never been proposed on other Cyrenaican coins, and it recalls the model of the so-called *Apollo Palatine*, attributed to Skopas during his stay in Athens (about 370-360 BC): Asolati 2016a, 315, note 37.



CATALOGUS
Variorum & Selectiſſimorum
NUMISMATUM
Græcorum, & Latinorum:
NEC NON
Metallorum ac Foſſilium, Conchyliorum, & Fruticum Marinorum, exquiſitæ raritatis;
Quæ venalia proſcribit
Vidua JOHANNIS GRILL,
Metallorum, dum fuit, Exploratoris,
AMSTELÆDAMI,
In platea Vitulina, vernacule de Kalver-ſtraet/ over de Gayerts-ſteegh.

NAEM-NOEMER
Van ſeer curieuſe en rare ſoo Griekſche als Romeynſche,
Oude MEDAILLES,
Als ook van een uytſtekent CABINET van ongemeen ſchoone en rare
Mineralen, Hoorentjens, Schelpen, en Zee-gewaſſen,
Welcke uytterhandt te koop zijn by de Weduwe van zalr.
JOHANNES GRILL,
In zijn leven Eſſaieur/ in de Kalver-ſtraet/ over de Gayerts-ſteegh/
Tot AMSTERDAM, 1679.

ex dono amiciſſimi D.D.F.M.V.H.

Figure 1 – Cover of the printed catalogue for the sale of the John Raphael Grill Collection; 1679 (source: Google Books)

Figure 2 – Cyrene, Gold stater, magistrate: Pheidon, 312-310 BC; Nomos AG, Auction 9 (21 October 2014), lot n. 197 (source: CoinArchives) [x1,5]

Finally, we must not forget and underestimate the possibility of recreating, through the various steps in public sales, the pedigree of a coin. It is generally used to indicate a coin's past or present ownership and in numismatics, as in the art world, provenance can be an important factor in determining its authenticity[6]; but in our case, as we will explain better below, pedigrees are also useful to exclude a possible illegal origin of the specimens sold.

For all these reasons, and especially in order to be as complete and exhaustive as possible, many recent important researches have necessarily had to take into account the material coming from the numismatic trade, whether they were specific and very well defined works (as – for example – one of W. Fischer-Bossert's latest paper about two early electrum series from Asia Minor, where specimens from private collections and auction houses' sales account for more than three-quarters of the recorded pieces[7]), but also for projects with a much wider scope, as the Roman Provincial Coinage[8].

THE CYRENE-PROJECT *(CYRENAICAN RESEARCH NUMISMATIC E-PROJECT)*

Current Political Situation in Libya and the theft of the so-called "treasure of Benghazi"

However, when working on Cyrenaican coinage, another factor must be taken into account, which in part also directly affects the antiquarian market.

On 17 February 2011, in the wake of the so-called "Arab Spring" that led to the Tunisian revolution of 2010/2011 and the Egyptian revolution of the same year, Libya experienced a first phase of popular uprising, then resulted in a real civil war between the rebels and loyalist forces to Colonel Mu'ammar Gaddafi, who after months of conflict, was deposed and executed on October 21[9]. Since then, the North African country has fallen into a continuous state of clashes and civil wars that have also led to the destruction and looting of part of the cultural and archaeological heritage of the region[10]. This has been followed by a constant flourishing of illegal

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6 In addition to the fact that a coin that was once part of a famous collection may be more desirable to some collectors.

7 Fischer-Bossert 2016, 6-16.

8 E.g., see *RPC*, III, n. 3477: it's a Nerva's tetradrachm, minted in Antioch, where out of 16 known specimens, 9 come from the antiquarian market (http://rpc.ashmus.ox.ac.uk/coins/3/3477/).

9 On the events that characterized Libya in that period and on the possible causes, see, for example, Idowu and Oladiti 2016 and Hilsum 2012.

10 Numerous sites between Tripolitania and Cyrenaica were damaged during the conflict, like the

trafficking in Libyan cultural goods, which find it very easy to escape to neighbouring countries due to the impossibility of controlling the very long borders (especially towards Egypt) and the lack of surveillance.

The drama of that situation was obvious right from the beginning, so much so that after the first rebellions an international conference was immediately organized, promoted by the Second University of Naples and UNESCO, entitled "For the Preservation of Cultural Heritage in Libya. A Dialogue among Institutions" (Monumental Complex of Belvedere of S. Leucio, Caserta, 1-2 July 2011)[11] and on 21 October 2011, at UNESCO headquarters in Paris, there was a meeting for Libya's Cultural Heritage, with the aim of urgently examining the preservation of cultural heritage in the country[12]. Moreover, ICOM, the International Council of Museums, has recently drawn up a "Red List" of the treasures still present on the Libyan territory in a state of danger, each accompanied by photos and scientific files: statues, mosaics, funerary furnishings, pottery, architectural elements, sarcophagi and, of course, coins[13].

Actually, the numismatic material, which is easy to export illegally and then resold, has been obviously one of the hardest hit[14] and all these facts have had a great influence on the numismatic market, and not only on what is usually called as “black market”, made by clandestine trades that usually leave no, or at least very few, traces; but also on the international numismatic trade, managed by famous auction houses. The graph in Fig. 3, which represents the presence of Cyrenaican coins among the specimens sold by the main international auction firms[15], clearly shows how the number of these pieces has gradually increased since 2011[16]. This has made very

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ancient city of Ghadames, the Rock-Art sites of Tadrart Akakus, and even the archaeological sites of Cyrene, Leptis Magna and Sabratha, which were already UNESCO World Heritage Sites.

[11] The proceedings of the conference were published in 2012 (Ensoli 2012a).

[12] http://whc.unesco.org/en/news/799/

[13] https://icom.museum/en/ressource/emergency-red-list-of-libyan-cultural-objects-at-risk/

[14] As it has already been pointed out several times: see, for example, Asolati 2016b, 11; or Amandry 2016, 287.

[15] Data obtained through the site coinarchives.com for the period 2007-2016.

[16] For the realization of the graph, not all the pieces that have been sold on the market have been taken into consideration, but only those specimens that appeared in an auction for the first time in a specific year and which were not reported a reliable pedigree that would trace them back to historical collections or previous sales. We must also consider that, in recent years, the possibility of creating a sales catalogue with good photographs of the coins has become easier and less expensive than in the past, when certainly many specimens were sold through channels other than those of public sales, for which unfortunately we can not have any trace, and this could have lightly accentuated the increase recorded by the graph in the last period. For all these reasons, this cannot be an absolute figure (this is why we do not show a graduation scale), but nevertheless it illustrates quite well the market trend in

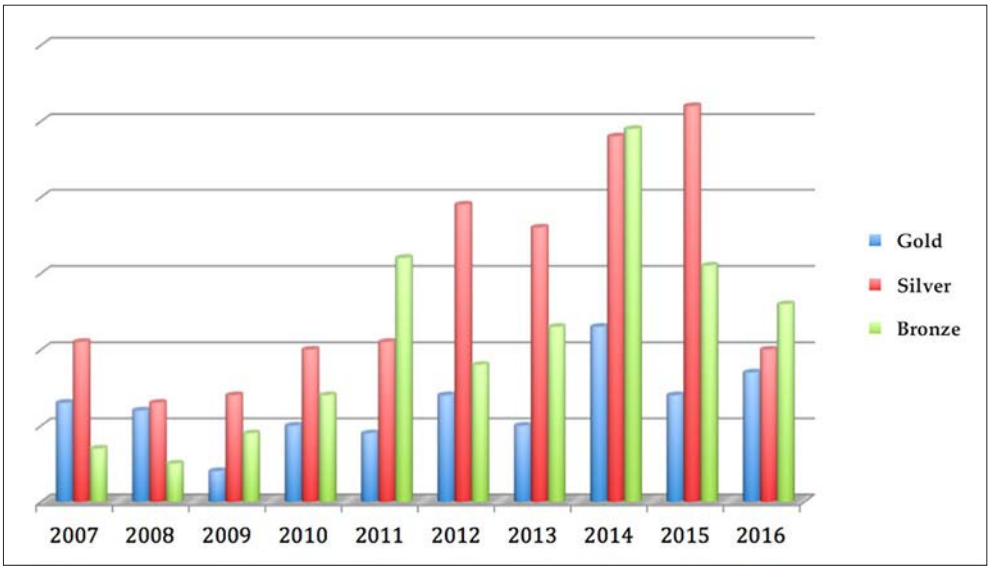

Figure 3 – Number of Cyrenaican coins appeared in sale catalogues of the main auction houses between 2007 and 2016

clear the possibility of scattering of the numismatic Libyan heritage, which, acquired by private collectors, could disappeared and be no longer available.

Beside this fact, however, we also have to deal with a sadly famous affair, whose details are unfortunately better defined today. One of the worst consequences for Cultural Heritage during the Libya's civil war in 2011 was certainly the theft of the so-called "Treasure of Benghazi", a large collection of priceless coins, statues and jewellery, stolen from the vault of the Commercial Bank of the Libyan city in May 2011[17]. It consisted in a group of antiquities excavated in Cyrenaica after the First World War: there were, for example, objects unearthed from the Temple of Artemis in Cyrene, found during the excavation carried out between 1917 and 1922, including a number of gold items, which date to the sixth and fifth centuries BC[18]; materials from the "Palace of Columns" in Ptolemais, an imposing building excavated between 1937 and 1942; a part of the so-called "Benghazi's hoard", with more than one thousand silver coins both Greek and Roman[19]; and above all, the numismatic

this time span and, in our opinion, the obvious relationship with the consequences of the looting carried out during the war.

[17] On these facts, see Ensoli 2012b, Ensoli 2013 and Ensoli 2014.

[18] Ensoli 2012b, figs. 5-13.

[19] On this hoard, see Asolati and Crisafulli 2014 and, recently, Asolati and Crisafulli 2018, 121-133 and 235-256.

Figure 4 – Coins from the so-called "Treasure of Benghazi". On the left, their photos from some past publications; on the right, the same pieces appeared in various auctions catalogues: a) Meliu 1935, pl. I, n. 7 – Roma Numismatics Ltd, E-Sale 21 (31 October 2015), lot n. 510; b) Meliu 1938, 49 – CNG, Electronic Auction 308 (7 August 2013), lot n. 208; c) Pesce 1950, fig. 122 – Hess-Divo AG, Auction 327 (22 October 2014), lot n. 121; d) Pesce 1950, fig. 122 – Hess-Divo AG, Auction 326 (28 May 2014), lot n. 103

Figure 5 – Cyrene, Gold stater, magistrate: Polianthes, 322-313 BC (Naville 1951, n. 99). On the left: Pesce 1950, fig. 122; on the right: Leu Numismatik, Auction 1 (25 October 2017), lot n. 113 (source: CoinArchives)

collection of Angelo Meliu, an Italian numismatist who lived in Cyrenaica for many years between the wars, consisting of over 4000 pieces in gold, silver and bronze, acquired in more than twenty years[20]. It is estimated that more than 8000 coins were stolen overall[21].

Even if some early reports indicated that part of the coins turned up in Egypt[22] and that others have been sold on the black market in Libya[23], we are unfortunately sure that part of them have appeared also in some important international auctions (Fig. 4). One last example emerged in October 2017 in the Auction 1 of the new Leu Numismatik (lot n. 113)[24]: among a group of ten coins, which are part of a "Kyrenaica Collection", there was a gold stater that was certainly one of the stolen pieces of the Treasure of Benghazi (Fig. 5)[25]. In particular, that coin was found during excavations at the Palace of Columns in Ptolemais and was published by G. Pesce in his monograph "Il Palazzo delle Colonne in Tolemaide di Cirenaica" in 1950[26]; moreover it is recorded also in the Carabinieri's "Illegally stolen cultural property Database"[27] and in the one of the Interpol[28]. Luckily this time we were able to point out the fact before the sale and Leu Numismatik, after being informed, rightly decided to withdraw the coin from the auction[29].

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[20] With regards to the Meliu Collection, reference should be made to Asolati 2016a, where the number of specimens included in the collection, based on the inventories that had been drawn up, was significantly increased to about 4300, compared to the 2000 that were initially assumed (Ensoli 2012b, 234).

[21] "*364 gold coins, 2433 silver, 4884 bronze*" in addition to *"306 jewellery and 43 other ancient artefacts*". The numerical detail is that provided by the official document of the Department of Antiquities of Cyrene and Benghazi and reproduced also in Ensoli 2012b, 229 (English translation comes from Bailey 2011).

[22] Meo 2011.

[23] Bailey 2011.

[24] https://leunumismatik.com/en/lot/3/113

[25] Cattaneo and Asolati 2017.

[26] Pesce 1950, fig. 122. The image was then republished in Ensoli 2012a, fig. 17 and in Luni 2014, fig. 7.

[27] http://tpcweb.carabinieri.it/SitoPubblico/getRepertiLibia?numPage=30 (with the number: 103584[297]).

[28] https://www.interpol.int/notice/search/woa/1110710

[29] It is very likely that also the other Cyrenaican specimens sold during the same auction and always belonging to the "Kyrenaica Collection", for none of which it was possible to reconstruct a valid pedigree, could belong to the so-called "Treasure of Benghazi" too; however the lack of certain evidence (only a small part of the specimens of this treasure were photographed in the past and there is no valid and complete documentation establishing the precise composition of the "treasure") has not allowed to extend the veto on the sale to these coins too. Moreover, the quantity and the quality of specimens of Cyrenaican mints that this auction house continues to offer for sale, even though it no longer reports the belonging to the "Kyreneica Collection", we think may arise from the same origin.

The project: data management, sources and some problems

Past numismatic sales, therefore, are of primary importance in the Cyrenaican case: if it's possible to reconstruct the pedigree of a coin and to point out that it was already sold before 2011, this would be an incontrovertible proof that it does not come from the looting of the recent years. This means that, in order to offer as much objectivity and security as possible, almost all past auctions must be verify, dealing with a not insignificant amount of data.

With the *CyReNe-Project (Cyrenaican Research Numismatic e-Project)* we decided to face this task and then make the results available in a way that would be more easily presented to the scientific community and to anyone interested in these results, creating an instrument for a possible control of pieces placed on the market. The idea is to produce a digital database, connected to a web portal that can be accessed from the website of the Department of Cultural Heritage of the University of Padua, available online and freely accessible, where to record all the specimens minted by Cyrenaican cities and sold during the years in auctions and online sales sites[30]. Nowadays, information technology and database are a primary tool of research and communication in almost every field, and numismatics, as shown by recent lines of research, could exploit with enormous advantage the potential that they offered. The database is an instrument that could make available to the scientific community, in a structured and systematic way, a mass of otherwise disordered data, developing the potential offered by digital technologies. On the basis of other projects of "digital numismatics"[31], it aims to create an useful tool with a dual purpose: of study – and consequent enhancement – of the coinage of a region, Cyrenaica, for which nothing of this has ever been done so far; and especially of safeguarding, at least at the level of virtual data, this numismatic heritage, which is now at risk.

The starting point of the project was the research and recording of information and photographs of past Cyrenaican issues on the antiquarian market, for which different sources must be checked. First of all, obviously, printed sale catalogues must be looked at (either auction catalogues or fixed price lists), for which there are all over the world just some specific libraries[32]. This obviously takes a lot of work,

[30] In this moment the project is in its preliminary phase and therefore the database is not yet ready and accessible online. The hope is that it will be available during the next year.

[31] Just to give some examples, we could cite the *Online Coins of the Roman Empire* (http://numismatics.org/ocre/), the *Coinage of the Roman Republic Online* (http://numismatics.org/crro/), the *Roman Provincial Coinage Online* (http://rpc.ashmus.ox.ac.uk/) or the *Corpus Nummorum Thracorum* (https://www.corpus-nummorum.eu/), which are sources of primary interest for scholars worldwide.

[32] At the moment, we have started from the library of the Museum Bottacin in Padua, where we have inspected approximately 6000 catalogues (from 350 different auction houses), which cover a span time from 1830 to modern times. Obviously this was just the beginning of our research, and now,

for which an help could come from archives of clippings from catalogues (the so-called "*photo-files*") that some institutions have collected through the years with an impressive and peerless effort[33]. Nowadays, moreover, we could also take advantage of computer technologies, and in this sense it's not so difficult to find on the internet sale catalogues that have been digitalized and made available to everyone: in Google Books[34], for example, or in the website of some auction houses[35], without to forget the enormous work made by some institutions, like the Heidelberg University[36] or, recently, the Bibliothèque Nationale de France[37], that have digitalized and uploaded thousands of such exemplars. In the end, remaining in the world of internet and computer technologies, we have to mention also commercial databases available on the web, like *CoinArchives*[38] or *acsearch*[39], where are registered the coins sold by the major international auctioneers: they are particularly useful for the sales of the last 20 years (as for upcoming ones), since they began to collect their data with the beginning of the new millennium, even if also some coins sold in the nineties have been recently uploaded[40]. Besides these, also other commercial web-sites[41] should be considered, even with more attention because, in addition to the fact that there are plenty of them, once a coin they show is sold, then it usually disappears from the net and so it's no longer available[42].

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thanks to the willingness and kindness of the owner, we are checking the library of Giulio Bernardi, in Trieste, that with more than 20000 catalogues (auction houses from all over the world) is one of the biggest private libraries of auction catalogues. We feel obliged to give him our heartfelt thanks in this publication too.

[33] We could cite, for example, the photo library of the University of Wien, or the ones of the British Museum, of the American Numismatic Society and of the Frankfurt Museum.

[34] https://books.google.com/

[35] Gorny and Mosch, for example, makes its auction catalogues published from 2011 until today freely available and downloadable from the web (https://www.gmcoinart.de/Downloads.AxCMS#1).

[36] https://digi.ub.uni-heidelberg.de/de/sammlungen/artsales.html

[37] https://gallica.bnf.fr

[38] https://www.coinarchives.com/

[39] https://www.acsearch.info/

[40] To emphasize even more the importance of these instruments, it is necessary to consider the fact that *CoinArchives*, for example, currently archives 1373020 records from 2785 auctions only in its "Ancient Coins" section, and even more extensive is the section about coins of world from the medieval times to the modern era, with over 3,5 million registered specimens (October 2018); these numbers make their data collection much bigger than any other collection known (the ANS collections database, one of the most important ones, contains information on approximately 600000 objects).

[41] *Vcoins* (https://www.vcoins.com), *VAuctions* (https://www.vauctions.com), *Ma-Shops* (https://www.ma-shops.com), *Tantalus Coins* (http://www.tantaluscoins.com) and, obviously, also *eBay* (https://www.ebay.com).

[42] That is obviously a problem that should be not underestimate, since when we start a new work,

At the moment, with more or less 7000 sale catalogues checked plus all the coins found in the commercial databases, approximately 3300 Cyrenaican specimens have been registered, two thirds of them coming from printed sales.

These latter, were certainly the most time-consuming to check, since they require a control of almost every single page[43]. Moreover great attention must always be paid in order to avoid mistakes and to recognize problem cases, like incorrect identifications or attribution changes that have occurred throughout the history of the studies. These faults, however, in our case are luckily not so frequent, since Cyrene is a rather investigated and well-known mint[44]; in any case they are quite rare for specimens from the archaic and classical periods, but increase during the Ptolemaic phase and in the Roman period.

For Ptolemaic specimens, these mistakes have their origin in some inconsistencies in literature, generally due to attempts by scholars to attribute emissions with similar types from the various mints active in the territory under Egyptian control. There are some issues that even Robinson[45] had neglected, not considering the attribution to Cyrenaica proposed by Poole[46] and based on findings, and which are now commonly accepted. These series, have then been ascribed by Svoronos[47] to Cyprus, with a much wider following, as you could see, for example in the case shown in Fig. 6[48]. For this reason particular attention must be paid to the sales of coins also from Cyprus, and, especially when there are no photos, the only way is to look at every single coin checking the Svoronos number, which is the main reference usually used in catalogues for Ptolemaic specimens.

Roman provincial coins, instead, could have incorrect attributions especially concerning series with the type of Ammon's head on the reverse. There are some issues of Trajan, in particular silver drachmas and hemidrachmas dated to the third con-

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firstly we don't have the possibility to recover older materials, and secondly we have to continue checking these sites in order not to lose something more.

[43] Coins from Cyrenaica could be found not only in the Greek section. Just to give some examples, Roman provincial coins could be placed in a separated section or among the Roman ones; Ptolemaic coins are often placed all together, regardless of the mint, but considering only the issuer; etc.

[44] Especially thanks to some major works, such as the catalogue of the British Museum, written by Robinson in 1927 (*BMC*, *Cyrenaica*), Naville's book about Cyrenaican gold coinage (Naville 1951), or the publication by Buttrey on the findings from the extramural sanctuary of Demeter and Persephone at Cyrene (Buttrey 1997).

[45] *BMC*, *Cyrenaica*.

[46] *BMC*, *Ptolemies*.

[47] Svoronos 1904-1908.

[48] For the attribution of this particular coin to Cyrenaica, see instead: *BMC, Ptolemies*, 94, n. 78; Asolati 2011, n. 84

705. **Ptolemy VIII.** 145-116 BC. Æ 43mm (40.65 gm). Uncertain mint in Cyprus. Diademed head of Zeus-Ammon right / Eagle standing right on thunderbolt, Φ before. Svoronos 1641; SNG Copenhagen 651. VF, dark brown surfaces with light earthen encrustation. Rare. ($300)

From the Collection of Marian A. Sinton.

Figure 6 – Classical Numismatic Group, Mail Bid Sale 53 (15 March 2000), lot n. 705

sulate (100 AD)[49], drachmas dated to the sixth consulate (114-116 AD)[50] and bronze issues (*sestertii*, *dupondii* and *asses*) dated to the fifth consulate (103-112 AD)[51], that have also been the subject of debate regarding the mint[52], especially because E.A. Sydenham, in his publication on the coins of *Caesarea* in Cappadocia[53], attributed them to this workshop, following what was proposed by Wroth in the catalogue of coins of the British Museum[54]. Actually, hoards and single finds from archaeological excavations clearly indicate that these coins were used in Cyrenaica while, due to their style, they were probably produced in Rome for an exclusive circulation in the African region[55]. On the other hand, however, there also some coins which the cataloguers assigned to Cyrene on the basis of the presence of Zeus Ammon on them, but that are not Cyrenaican[56]. Others particular Roman Provincial coins, to which a

[49] *RPC*, III, nn. 1-3.

[50] *RPC*, III, n. 10.

[51] *RPC*, III, nn. 4-9; Asolati 2011, nn. 176-178.

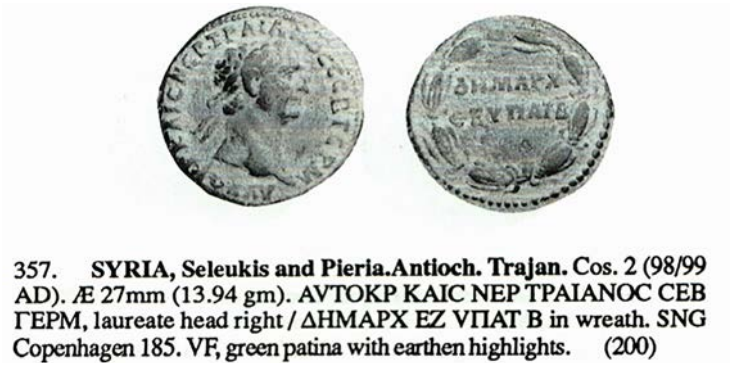
[52] Asolati, Calliari, Conventi and Crisafulli 2009, 317-323.

[53] Sydenham 1933, nn. 176-178, 202 and 232-233.

[54] *BMC, Galatia*…, 53, nn. 54-57; 59 and 112-116.

[55] On this point, see lastly: Amandry 2016. Identical remarks must also be reserved to bronze issues of Hadrian (*RPC*, III, nn. 11-12; Asolati 2011, nn. 179-180) and Marcus Aurelius (Asolati 2011, nn. 181-191), always with Zeus Ammon on the reverse.

[56] Ammon is known as coin type also in other regions, such as Egypt (e.g., *RPC*, III, n. 5071),



357. **SYRIA, Seleukis and Pieria.Antioch. Trajan.** Cos. 2 (98/99 AD). Æ 27mm (13.94 gm). AVTOKP KAIC NEP TPAIANOC CEB ΓEPM, laureate head right / ΔHMAPX EZ VΠAT B in wreath. SNG Copenhagen 185. VF, green patina with earthen highlights. (200)

Figure 7 – Classical Numismatic Group, Auction XVIII (3 December 1991), lot n. 357

lot of attention must be paid, are *asses* and *dupondii* of Trajan with at the reverse the legend "ΔHMAPX / ЄΞ ΥΠAT B" in wreath[57]. In fact their attribution is still being debated: Sydenham assigned them to the mint of *Caesarea* in Cappadocia[58]; McAlee[59] and the *RPC*[60], instead, are inclined to attribute them to Antioch; but, according to findings, as has been already pointed out several times[61], also these coins should be assigned to Cyrenaica. Nevertheless in catalogues, even of the same auction house, these specimens could be classified in different ways, as it's possible to see in Figs. 7-8.

It should also be kept in mind that all these debated series are relevant not only to printed auction catalogues, but they concern also the research on online sales web-sites and on the commercial databases that we have mentioned earlier: in these cases, more targeted and specific investigations must be used in order to obtain all the specimens we are interested in. Our hope is that with the database that we are planning, all this problems could be overcome and the results could be presented in an easier and more accessible way.

Macedonia (e.g., *RPC*, III, nn. 636-640) or Arabia (e.g. *RPC online*, IV, n. 3530).

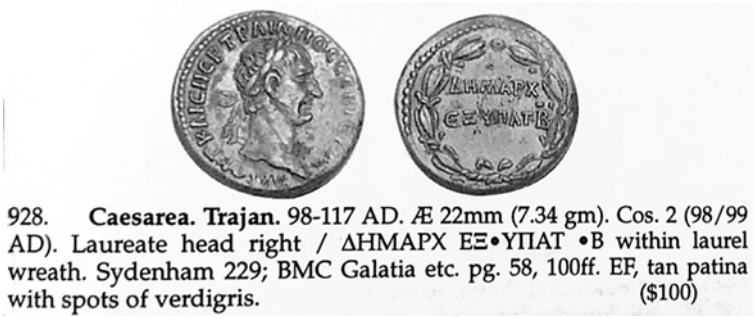
[57] *RPC*, III, nn. 3654-3655; Asolati 2011, nn. 173-175.

[58] Sydenham 1933, nn. 228-229

[59] McAlee 2007, 192-193.

[60] *RPC*, III, 448.

[61] See, for example, Asolati, Calliari, Conventi and Crisafulli 2009; Canovaro, Calliari, Asolati and Breda 2016, 259-261; and, lastly, Asolati and Crisafulli 2018, 66-76. *Contra*: Amandry 2016, 287-289.



928. **Caesarea. Trajan.** 98-117 AD. Æ 22mm (7.34 gm). Cos. 2 (98/99 AD). Laureate head right / ΔHMAPX EΞ•YΠAT •B within laurel wreath. Sydenham 229; BMC Galatia etc. pg. 58, 100ff. EF, tan patina with spots of verdigris. ($100)

Figure 8 – Classical Numismatic Group, Mail Bid Sale 47 (16 September 1999), lot n. 928

For this reason, once the database will be entirely structured, we would like to make it freely available on the web through the use of a so-called web portal, in order to allow the online use of the data to an extended and theoretically unlimited number of users, simply through a common browser for Internet (e.g. Firefox, Chrome, Safari, Internet Explorer). The aim is to provide a tool that can be easy to use and immediate, not only for the scientific community, but also for private collectors, with the intention and hope of encouraging them to report any coins in their possession and thus add new knowledge to what has already been achieved.

CONCLUSIONS: IS NUMISMATIC TRADE TOO BIG TO STUDY?

Dealing with numismatic material from the antiquarian market, we are now facing a problem that F. de Callataÿ pointed already out in 1990, when he wrote:

> *"Le risque existe, en revanche, que d'ici une vingtaine d'années la masse documentaire se soit accrue dans des proportions telles qu'elle soit devenue pratiquement ingérable selon les procédés traditionnels de consultation aujourd'hui en vigueur"*[62].

After about thirty years we have to admit that his concerns have proved to be founded, since the specimens from the antiquarian market have in this moment no comparison in terms of quantity with any other public or private collection. And these

[62] de Callataÿ 1990, 267.

numbers, with the passing of time, are supposed to increase even more. At the same time, unfortunately, no new methods have been developed to speed up this kind of research that requires a lot of time and, sometimes, of money, and for which manual research is often irreplaceable.

However, we must also say that new possibilities are arising: in fact nowadays is easier to get information on coins from all over the world and Internet and computer technologies, especially through the use of digital and online databases, could help to display the data in a better way and moreover with the possibility of updating, which should not be underestimated.

To conclude, numismatic trade is, in some respects, too big to study, but results obtained from this source are nevertheless unquestionable and some of the information that it gives us could not be achieved in another way.

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TRACCE DELLA TESAURIZZAZIONE MONETARIA D'ETÀ ANTICA NELL'ESPOSIZIONE ARCHEOLOGICA AL CASTELLO ROSSO DI TRIPOLI (LIBIA)

Abstract

The article focuses on the numismatic exhibition at the Museum of the Red Castle in Tripoli, which has about 2000 specimens. It was possible to record in detail the ancient part of this exhibition in 2009, before the "Arab Spring". The exhibition certainly includes at least two hoards of sestertii from the II-III century AD and another treasure of nummi from the end of the V century; most of the remaining coins almost certainly come from other Punic and Roman imperial hoards, of which there are possible traces in literature. The study of this material, in addition to recording the charateristics of coin hoarding in Tripolitania between the third century BC and the fifth century AD, literally describes a heritage whose fate is currently unknown.

Keywords

Red Castle Museum (Tripoli), hoarding, coin circulation, Punic Coins, Roman Coins

Il Museo al Castello Rosso di Tripoli è una delle maggiori istituzioni culturali libiche, principalmente con una caratterizzazione archeologica, storica ed etnografica, che ne fa un punto di riferimento non solo per la regione della Tripolitania, ma anche per l'intera Libia[1].

Nel 2008 la struttura e il suo contento sono stati coinvolti in un progetto internazionale di ampia portata, inerente al restauro, alla conservazione e alla valorizzazione del patrimonio archeologico della Libia, il quale però dopo una fase di studio e di progettazione[2] si è interrotto bruscamente.

L'Università di Padova era stata coinvolta nel progetto proprio in relazione al riallestimento degli spazi museali del Castello Rosso dedicati all'archeologia[3] (cfr. figg. 1-2). In quella circostanza si era presentata l'opportunità di riformulare anche l'esposizione numismatica e per tale motivo era stata concessa la possibilità di studiare il materiale numismatico limitatamente a quanto allora in esposizione.

L'analisi, condotta nel 2009 dallo scrivente e da Cristina Crisafulli[4], è stata portata a termine, constatando una gestione "sbrigativa" del materiale esposto, soprattutto per quanto attiene alle relazioni con i dati d'archivio e di gestione inventariale, la quale ha di fatto impedito di mantenere una relazione con le provenienze dei pezzi in esposizione, fatta eccezione per alcuni nuclei, di cui si tratterà tra poco.

Purtroppo, poco più di un anno dopo l'interruzione del progetto, in Libia si è verificata la sequenza di eventi che ha condotto alla cessazione del regime di Gheddafi e alla complicata situazione politica attuale (2019), la quale ha avuto almeno in parte conseguenze infauste sul patrimonio archeologico libico, specie cirenaico, già in una situazione precaria[5], delle quali la più nota forse riguarda il furto del cosiddetto *Tesoro Archeologico della Libia* dalla Banca Commerciale di Bengasi nel 2011[6].

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[1] Manca una guida scientifica sul Museo del Castello Rosso di Tripoli. Alcune indicazioni si possono reperire sulle guide del Touring Club Italiano, per esempio in *Libia: Tripoli, Bengasi, Ghadames, l'Akakus e il Deserto del Fezzan, Leptis, Sabratah, Cirene. Guide del mondo*, Milano 2003, part. pp. 68-73.

[2] Si veda per esempio la presentazione parziale di questi lavori al Marco Polo Venice Workshop *Restoration and Conservation of the Cultural Heritage in the Great Jamahiryia* (Venice, 25-28 May 2009). Il progetto sviluppato da M.P.S. Lld., Edinburgh (UK) aveva visto la collaborazione delle principali Missioni Archeologiche operanti in Libia, oltre che di altri archeologi, architetti e ingegneri italiani e dei funzionari del Ministero per le antichità della Libia.

[3] Questa parte del progetto aveva visto coinvolte con il ruolo di coordinatrici Francesca Ghedini e Paola Zanovello, le quali avevano coinvolto anche altri studiosi dell'allora Dipartimento di Archeologia, quali Monica Salvadori e lo scrivente. La progettazione del nuovo allestimento della sezione archeologica si è avvalsa dell'esperienza dell'Architetto Alessandro Tirri, cui va la nostra gratitudine per averci trasmesso e permesso di pubblicare i modelli di alcune vetrine studiate per l'esposizione numismatica.

[4] Asolati 2012, 283.

[5] Bennet e Barker 2011; di Lernia e Gallinaro 2011.

[6] Si vedano soprattutto Ensoli 2012a, Ensoli 2012b, Ensoli 2013 e Ensoli 2014. Cfr. inoltre il

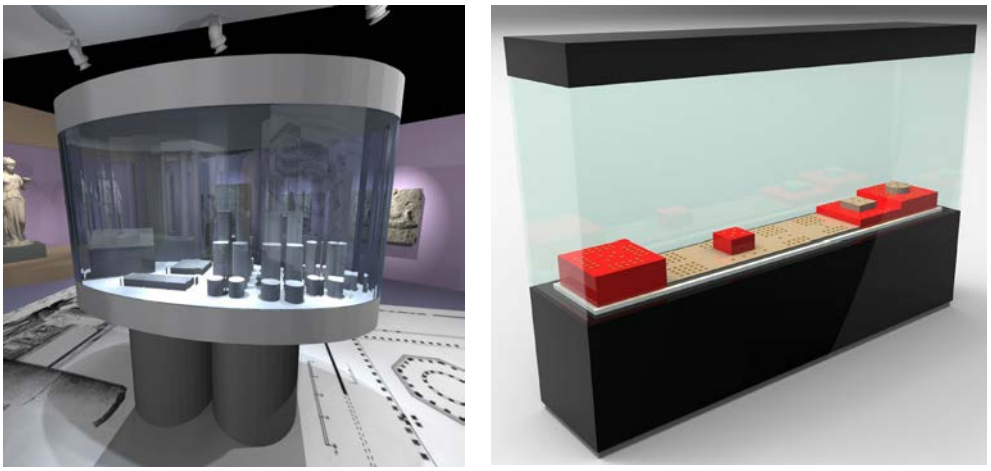

Figure 1-2 – Progetti per le vetrine dedicate alla numismatica dell'allestimento del Museo del Castello Rosso di Tripoli, elaborati dall'Architetto Alessandro Tirri nell'ambito del progetto *Restoration and Conservation of the Cultural Heritage in the Great Jamahiryia*

Questo tuttavia è solo un episodio che fa capo a un fenomeno di dimensioni considerevoli[7], il quale non è dato sapere se e quali conseguenze abbia avuto in Tripolitania e più specificamente sul Museo al Castello Rosso. Da quanto trapelato attraverso le agenzie di stampa internazionali[8], sembrerebbe non vi siano state conseguenze significative, ma di fatto non si avranno certezze fin quando la situazione politica non si sarà stabilizzata. In attesa di questo momento, ci è parso utile presentare in questa sede gli esiti parziali dell'analisi dell'esposizione numismatica di questo museo, non tanto e non solo per il numero di esemplari che è stato possibile studiare e che parzialmente si adatta agli scopi di questo Convegno, ma proprio per le incertezze che in qualche modo riguardano il destino di queste monete e soprattutto per le implicazioni che, come vedremo, tale analisi porta a ipotizzare in riferimento alla tesaurizzazione della moneta d'età antica in Libia e più specificamente in Tripolitania.

In generale, per lo meno fino all'inizio del 2010, le monete erano esposte in due spazi distinti, l'uno aperto al pubblico e l'altro precluso; nel primo, che per comodità chiameremo esposizione principale, il materiale era collocato entro due vetrine angolari disposte sul ballatoio del primo piano, ciascuna delle quali suddivisa in tre

contributo di Alessandro Cattaneo in questi stessi Atti e la bibliografia ivi citata.

[7] Cfr. per esempio Belzic 2017 e i lavori dello stesso autore ivi citati.

[8] https://www.theguardian.com/culture/2011/sep/11/tripoli-museum-antiquity-shattered-gaddafi-image (ultimo accesso marzo 2019).

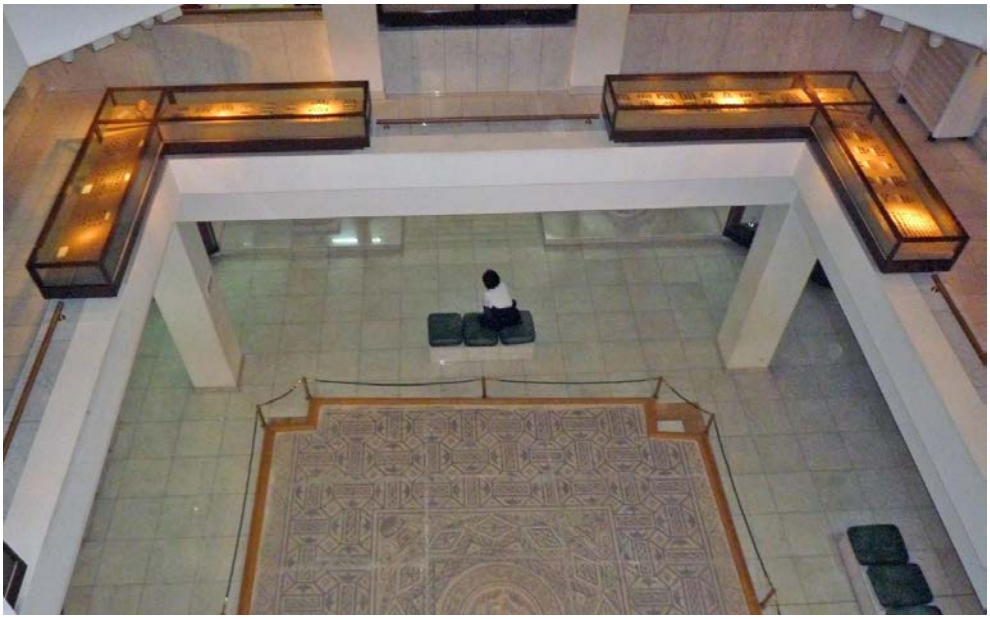

Figura 3 – L'esposizione numismatica principale, lungo il percorso aperto al pubblico, presso il Museo del Castello Rosso di Tripoli (2009), fotografata dal ballatoio del secondo piano: sono visibili le due vetrine angolari, suddivise in tre sezioni ciascuna

sezioni distinte (cfr. fig. 3); il secondo, che chiameremo esposizione secondaria, era suddiviso in due ambienti al secondo piano, ossia in un corridoio che consentiva l'accesso a una stanza: qui trovavano posto rispettivamente tre vetrine a parete e una vetrina centrale.

Nell'esposizione principale erano presenti prima di tutto 865 esemplari, disposti grosso modo secondo criteri seriali e cronologici: a una sezione di monete puniche ne seguiva una di pezzi romani provinciali di produzione locale, una di esemplari romani repubblicani, una di monete romane imperiali seguite da alcuni pezzi vandali assieme a uno bizantino. Il restante spazio era impegnato dal ripostiglio di nummi tardo antichi e vandali da Gargaresh, da un gruzzolo per lo più di sesterzi recuperato presso il mercato tripolino di Al Mushir (104 monete) e da 50 esemplari d'argento almohadi, che a differenza delle monete antiche non è stato concesso di rilevare.

Nel corridoio dell'esposizione secondaria, entro le prime tre vetrine risultava esposto il ripostiglio di sesterzi, dupondi e assi di az Zawiyah (444 monete), mentre la terza vetrina era costipata di monete d'argento almohadi (alcune centinaia) che, come nel caso precedente, non è stato possibile rilevare; analogamente non si è potuto rilevare le monete esposte (alcune decine) nella stanza cui dà adito il corridoio, poiché anche queste erano riconducibili soltanto a serie islamiche.

Complessivamente le monete esposte erano più di 2000, di cui è stato possibile documentare poco più di 1500 pezzi antichi. Oltre a queste, è stato possibile contare ed esaminare cursoriamente altre 587 monete d'età imperiale, per lo più sesterzi, che, stando a quanto riferito, erano parte di un gruppo più ampio da cui era stata tratta anche la maggioranza del materiale imperiale in vetrina nella prima parte della esposizione principale.

L'interesse di questa esposizione sta principalmente nella provenienza locale delle monete, elemento questo che va inteso come più di una semplice ipotesi, considerate le pur scarne informazioni ricevute unitamente alla conservazione non sempre ottimale dei pezzi, alla ripetitività dei tipi, all'assenza di oro e quasi completamente anche d'argento, e ovviamente considerata l'esposizione di gruzzoli da località tripolitane accanto agli altri esemplari senza indicazioni di provenienza; a un tesoro monetale con ogni probabilità andrebbe ricondotto anche l'insieme delle monete almohadi, in vetrina sia a primo sia al secondo piano, stante l'eccellente stato di conservazione: di questa eventualità tuttavia non è stato possibile avere alcuna indicazione.

I tesoretti in parte erano già noti grazie a brevi notizie o a informazioni più dettagliate, mentre il gruzzolo di az Zawiyah non risultava conosciuto. Sul ripostiglio sequestrato nella medina di Tripoli e forse proveniente dalla località di Garian le notizie sono piuttosto confuse o, per lo meno, quanto riportano le due fonti che ne trattano non concordano pienamente tra loro sul numero complessivo di esemplari e sulle componenti e in ogni caso i dati da queste registrati non coincidono con quelli dell'esposizione al Castello Rosso[9] (cfr. figg. 38-50). Riguardo al tesoretto di nummi da Gargaresh era stata diffusa una brevissima nota[10], ma di recente se ne è proposta

[9] La ricostruzione di questo ripostiglio risulta piuttosto problematica, come evidenziato chiaramente in Crisafulli 2016, 331, nota 28. Una parte di questo fu certamente acquisita tramite un sequestro avvenuto nel 1964 presso il mercato di Tripoli; Antonino Di Vita nel 1966 parla di un tesoro, composto di 283 sesterzi da Traiano a Settimio Severo, sequestrato a Tripoli nell'aprile del 1964, la cui edizione sarebbe stata presto curata dal dott. Mahmud Nemsi (Di Vita 1966, 80). Questo nucleo, sulla base del succinto elenco fornito dall'autore, mostra però una distribuzione degli esemplari per autorità del tutto differente rispetto a quella del gruzzolo di 281 sesterzi, compresi sempre da Traiano a Settimio Severo, visto velocemente da Salama presso il Museo di Tripoli il 20 aprile del 1964, caratterizzato dalle stesse circostanze di reperimento (Salama 2004, 38-40): se nel primo resoconto, per esempio, gli esemplari attribuiti ad Antonino Pio risultano 102, nel secondo si riducono a solo 38 unità. Sempre a questo stesso contesto potrebbero essere ricondotti i 104 sesterzi esposti presso il Museo del Castello Rosso: questo terzo nucleo che si distribuisce da Antonino Pio a Settimio Severo, pur mostrando alcune non trascurabili differenze nelle componenti rispetto ai due precedenti, come alcuni tipi non compresi tra quelli descritti da Salama, è accompagnato da una didascalia che reca la data di reperimento 1965 e un'indicazione generica di provenienza dal mercato di Tripoli (v. Asolati 2012, 283). In definitiva, non è escluso che si possa trattare di due (l'uno descritto da Di Vita/Salama e il secondo esposto) oppure persino di tre nuclei distinti, derivanti però dallo stesso ripostiglio, come lascerebbero pensare gli anni e le modalità del reperimento.

[10] Cenni sul gruzzolo in Barik 1965-1967.

una edizione parziale[11]. Quanto al tesoretto rinvenuto nel 1914 presso la località di az Zawiyah, ad ovest di Tripoli, si compone di 444 monete bronzee, prevalentemente sesterzi, comprese tra l'età di Claudio e quella di Didio Giuliano (cfr. figg. 51-52), per quanto illustra il contenuto delle vetrine[12].

Non è possibile soffermarsi ulteriormente su questi nuclei in questa sede, ma quanto detto serve ad inquadrare la natura del materiale esposto con maggiore dettaglio e a supportare l'eventualità che anche le altre monete esposte siano di provenienza locale. Anzi, dall'esame di questo materiale sembra ci si possa spingere oltre, per concludere che una larga parte degli 865 pezzi collocati nelle vetrine del primo piano potrebbero essere stati tratti da differenti nuclei di ripostigli rinvenuti nella zona. Come detto, infatti, per la maggioranza delle serie esposte non si riesce a individuare un preciso criterio espositivo, ma sembra piuttosto che prevalga una tendenza alla ridondanza in conseguenza della disponibilità di nuclei consistenti di materiali ripetitivi.

Scendendo nel dettaglio la prima parte della prima vetrina è occupata da monete puniche e da monete numidiche. Le prime sono riferibili alle coniazioni illustrate nella tabella 1 (cfr. figg. 4-12).

Da questa risalta prima di tutto l'affollamento di alcune emissioni, rappresentate talvolta da decine di pezzi. Tale ricorrenza non è di per sé una prova di una specifica fonte di reperimento; d'altro canto è nota la circolazione in Tripolitania della moneta punica, in particolare a *Sabratha*[13] e a *Leptis Magna*[14], così com'è noto il ritrovamento di ripostigli di bronzi quali quello di Wadi Soffegin, scoperto nel 1964[15]. Quest'ultimo contiene 32 monete puniche di bronzo, una del tipo cavallo stante retrospiciente e le rimanenti con testa di cavallo al rovescio, ma di dimensioni differenti: la maggioranza di queste ultime (26) di dimensioni mm 25/28 (*SNG, Danish*, nn. 192-201), 6 di mm 19/21 (*SNG, Danish*, nn. 144-178). Tutte le categorie sono rappresentate nell'esposizione e, in particolare, le due più numerose nel gruzzolo sono presenti in gran numero anche nelle vetrine.

Anche la presenza di moneta numida in Tripolitania è ben documentata[16], anche in un gruzzolo da Tarhouna, costituito da 176 esemplari bronzei di Massinissa e suc-

[11] Asolati 2012, 283-302.

[12] Asolati 2012, 283: l'esemplare più antico è un dupondio di Claudio I (41-54 d.C.) mentre quelli più recenti sono tre sesterzi di Didio Giuliano (193 d.C.), i quali fissano la data di chiusura del gruzzolo. Oltre a questi imperatori sono rappresentati: Nerone, i Flavi, Antonino Pio, Marco Aurelio, Lucio Vero; mentre tra le Auguste compaiono: Sabina, Faustina I, Faustina II, Lucilla e Crispina.

[13] Garraffo 1984, nn. 1-35.

[14] Joly, Garraffo e Mandruzzato 1992, nn. 1-22.

[15] Indicazioni di massima sul gruzzolo in Di Vita 1966, 80.

[16] Un recente bilancio della diffusione delle monete bronzee di Massinissa e dei suoi immediati

SNG, Danish	Ess.
94-98	2
102-105	5
109-119	5
126-127	3
144-166	11
185 AR	1
193-194	1
197	2
199-201	5
201	3
202-212	9
220-223	1
253-254	4
255-259	4
262-268	2
270-272	2
273-275	1
302-306	2
307-323	10
326-329	3
340-344	9
345-349	1
351 Bill.	1
352 Bill.	1
353-356	2
390-396	2
399-400	2
409-413	9
n.i.	1
TOTALE	104

Tabella 1
Elenco delle monete puniche presenti nell'esposizione numismatica principale presso il Museo del Castello Rosso a Tripoli (2009)

cessori, suddivisi in 175 esemplari con testa laureata e cavallo libero e 1 esemplare con testa diademata e cavallo al passo[17]. La ripetitività dell'esposizione tripolina (cfr. figg. 13-14), con 14 esemplari di cui 2 con testa diademata e cavallo al passo

successori nel Mediterraneo è edito in Visonà 2013 e Visonà 2014. Visonà 2013, 124-125 definisce il quadro delle presenze in Tripolitania.

[17] Alexandropoulos 2007, 150, nota 4 e 169, nota 42: 175 ess. del tipo n. 11 e 1 es. del tipo nn. 22, 25. Cfr. anche Visonà 2013, 125, n. 5.

e 12 con testa laureata e cavallo libero, corrisponde grosso modo alle proporzioni rappresentate nel ripostiglio, ossia con una netta maggioranza di pezzi con cavallo libero. Anche in questo caso, e forse in questo ancora di più, la sovrabbondanza del tipo, la quale esula da reali necessità espositive che non siano quelle di rappresentare la realtà territoriale, sembra rinviare a una particolare disponibilità, forse data proprio da un gruzzolo (o forse più d'uno).

Alle monete numide, segue qualche moneta romana repubblicana (cfr. figg. 15-16) e quindi inizia una lunga sequenza di esemplari romani imperiali, che dall'età augustea conducono fino agli inizi del IV secolo d.C. (cfr. figg. 17-27, 34-37). Anche le caratteristiche di questi materiali danno la netta sensazione che la maggioranza provenga da ripostigli. I pezzi più antichi, costituiti quasi esclusivamente da assi dei tipi e delle autorità più comuni, si presentano piuttosto usurati, ma quasi sempre senza i segni di pesanti corrosioni. A partire dall'età neroniana e poi con quella flavia il sesterzio inizia a comparire con proporzioni sempre più evidenti, finché dall'età adrianea questo diviene pressoché l'unico nominale esposto, con numeri molto consistenti per l'epoca antonina, dei Severi (particolarmente per Settimio Severo e per Severo Alessandro), nonché per l'età di Gordiano III e dei Filippi, con i quali l'usura diminuisce vistosamente; il sesterzio continua a comparire fino all'età di Gallieno, secondo un andamento sintetizzato nel grafico 1; peraltro i sesterzi successivi alla metà del III secolo non sono posti in vetrina assieme agli antoniniani delle stesse autorità emittenti (Valeriano e Gallieno), quasi a voler mantenere una separazione per provenienze. Ai sesterzi, infatti seguono antoniniani e folles dagli anni '50 del III secolo, sui quali torneremo tra poco. Prima preme evidenziare come gran parte delle monete imperiali di bronzo che precedono queste fasi tarde potrebbero essere riferibili a un unico consistente ripostiglio, di assi, dupondi e soprattutto sesterzi, terminante appunto con l'età di Valeriano/Gallieno. Ad avallare questa eventualità sarebbe anche un nucleo di bronzi imperiali conservato nei depositi del Museo e costituito da nominali omologhi a quelli esposti, parzialmente sovrapponibili per autorità emittenti (Grafico 2). Si tratta di oltre 560 pezzi che, stando a quanto riferito nel 2009 da uno degli addetti del Museo stesso, Ramadan Shibani, erano parte di un nucleo più consistente di circa 1200 esemplari, dal quale sarebbero stati tratti molti dei pezzi esposti[18]. Purtroppo non è stato possibile sapere quali e quante monete sarebbero state tratte da tale insieme per destinarle alle vetrine, né da dove provenisse il nucleo, ma, dando credito a quanto riportato e ipotizzando verosimilmente che la maggioranza dei bronzi esposti a partire da Augusto e fino a Gallieno possa essere riferita a questo nucleo, si potrebbe giungere a una somma di circa 1000 esemplari documentabili. Si tratterebbe dunque di un grosso ripostiglio, quasi certamente da rinvenimento tripolino o tripolitano, di cui non si ha altrimenti notizia, ma che si collocherebbe entro un quadro di riferimento nord-africano già sufficientemente documentato e di grande interesse.

[18] Asolati 2012, 283.

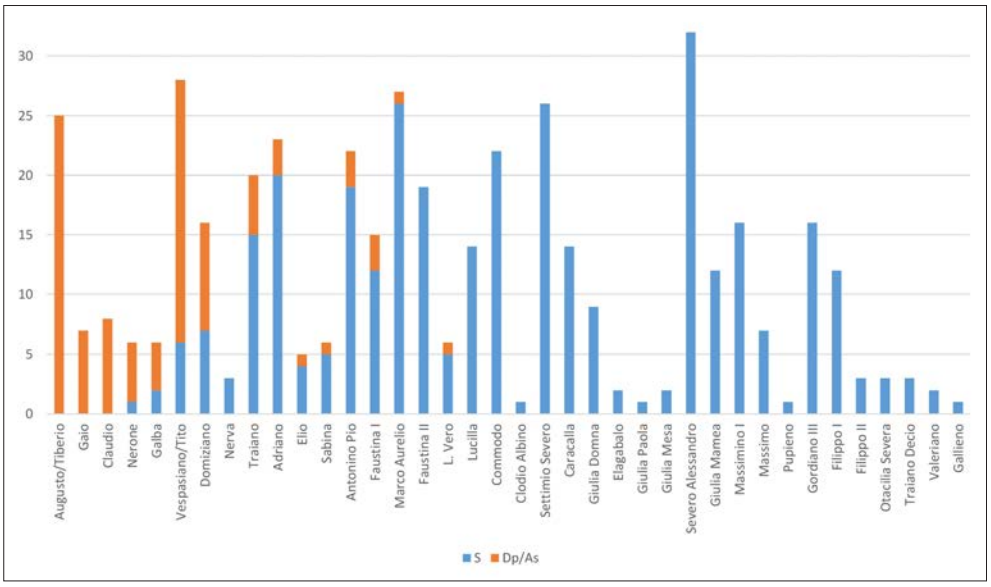

Grafico 1 – Assi, dupondi e sesterzi romani imperiali presenti nell'esposizione numismatica principale presso il Museo del Castello Rosso a Tripoli (2009), esclusi gli antoniniani e le coniazioni di fine III-inizi IV secolo d.C.

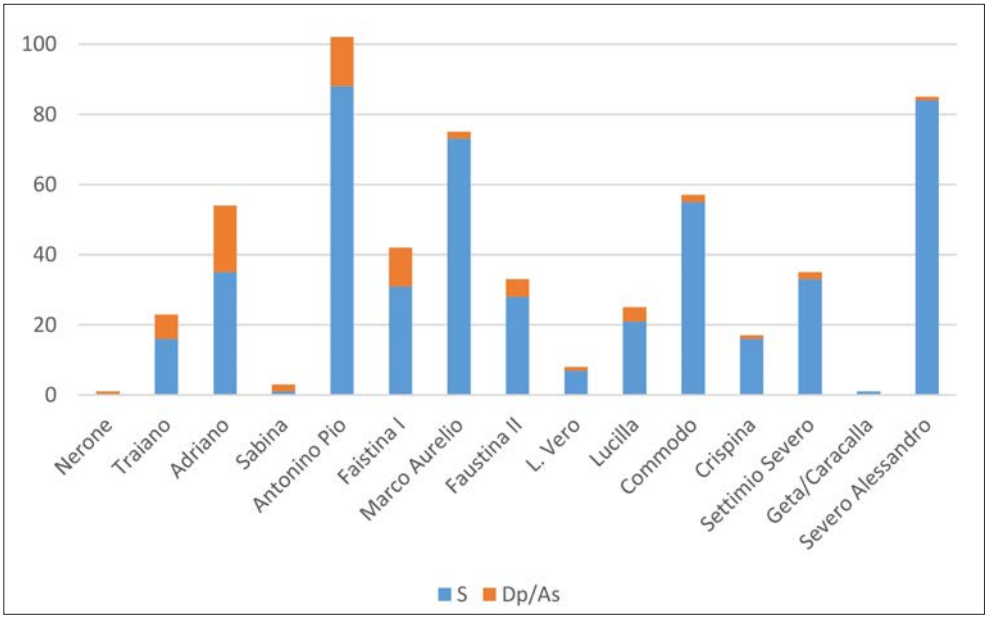

Grafico 2 – Assi, dupondi e sesterzi romani imperiali compresi nel nucleo di monete romane imperiali conservato nei depositi del Museo del Castello Rosso a Tripoli (2009)

L'unico elemento di discontinuità in questa parte dell'esposizione riguarda le monete provinciali di zecche principalmente tripolitane, illustrate nella sezione d'angolo della prima vetrina dell'esposizione principale. Non è chiaro se dei 23 esemplari qui collocati alcuni appartenessero al ripostiglio, anche se alcuni elementi potrebbero indirizzare in questo senso (cfr. figg. 31-33). La conservazione di alcuni di questi esemplari è del tutto assimilabile a quella di alcuni assi di età giulio-claudia, per i quali si può ipotizzare l'appartenenza al gruzzolo; d'altro canto, quest'ultimo sembrerebbe comprendere altre monete provinciali, ossia uno/due bronzi di Traiano[19] (cfr. fig. 29) e un sesterzio di Marco Aurelio[20] (fig. 30) per la Cirenaica e un bronzo di Severo Alessandro della zecca di Alessandria[21] (fig. 28).

A ogni modo, a sostenere ancora più solidamente l'eventualità su illustrata che la gran parte dei bronzi imperiali esposti di I-III secolo facciano parte di un ripostiglio, interviene ancora la modalità con cui sembra sia stato selezionato per l'esposizione il materiale tardo imperiale. In primo luogo questo si data di fatto entro l'inizio degli anni '10 del IV secolo[22]; in secondo luogo è composto in buona parte di folles di grandi dimensioni, ascrivibili per lo più a Diocleziano, Massimiano Erculeo e Massenzio (cfr. fig. 35-37); in terza istanza si dispone della testimonianza di Pierre Salama in riferimento al ripostiglio di Mangub/B, il quale dice nel 1982 che, quando aveva iniziato lo studio di quest'ultimo, "il *était* déjà fractionné, la plus grosse masse se trouvant entreposée dans les réserves du Musée de Tripoli, et les exemplaires les mieux conservés, répartis dans les vitrines et le lédaillers administratifs du même musée"[23]. Dando per scontato che la situazione espositiva del Museo al Castello Rosso non sia mutata significativamente dal 1982 e considerato che il ripostiglio di

[19] Uno del tipo Asolati 2011, n. 173A, in esposizione, e uno del tipo n. 175, in deposito. Sulla presenza di queste monete nel possibile gruzzolo al Museo di Tripoli cfr. Asolati e Crisafulli 2018, 68, con bibliografia precedente.

[20] Del tipo Asolati 2011, n. 183. Sulla presenza di questa moneta nel possibile gruzzolo al Museo di Tripoli cfr. Asolati e Crisafulli 2018, 146, nota 394, con bibliografia precedente. Nel nucleo di oltre 560 monete conservate nel deposito del Museo è presente anche un'emidracma di Traiano per la Cireniaca con al rovescio la testa di Zeus Ammon. Se anche questo pezzo facesse parte del probabile ripostiglio, la somma delle probabili componenti provinciali, in parte di provenienza cirenaica, troverebbe confronto soltanto con il ripostiglio dalla Villa di Leukaktios a Tolemaide, i cui dati essenziali si desumono da Jaworski 2008, 45; Jaworski 2009, 150-152; Jaworski 2011; Jaworski 2016, 300-301; cfr. anche Asolati e Crisafulli 2018, 145. Questa circostanza potrebbe indurre a sospettare una provenienza non tripolitana del gruzzolo conservato al Museo di Tripoli.

[21] *BMCGC, Alexandria*, 218, n. 1710.

[22] In questa sezione sono inserite quattro monete vandale, collocate tra le altre monete tardo antiche e non al termine della sezione stessa.

[23] Salama 1982, 512. Rinvenuto al largo di Bir el Mangub, il ripostiglio si compone di 20313 esemplari, per lo più folles. Parzialmente studiato, se ne conoscono principalmente le componenti inerenti alle emissioni della zecca di Roma e di Ostia. Cfr. anche Salama 1966-1967 e Salama e Callu 1990, 97-98.

Mangub/B, assieme al gruzzolo di Mangub/A[24], sembra si chiuda nei primi anni '10 del IV secolo[25], si potrebbe giungere alla conclusione che tutte le monete illustrate nelle vetrine dopo il sesterzio di Gallieno vadano riferite al ripostiglio di Mangub/B che si componeva originariamente di oltre 20300 esemplari tra folles e frazioni radiate, e plausibilmente antoniniani, databili tra la fine del III e l'inizio del IV secolo. In questo caso si ha più di un'ipotesi che conferma una linea di comportamento volta a semplificare la selezione dei materiali da esporre in base alla disponibilità di corposi gruzzoli.

Traendo dunque le fila di quanto sin qui esposto, si può ragionevolmente giungere a sospettare che l'intera esposizione numismatica del Castello Rosso di Tripoli sia verisimilmente una esemplificazione della tesaurizzazione bronzea tripolitana d'età antica (e non solo), la quale coinvolge nuclei identificabili (az Zawiyah, sequestro Medina, Gargaresh), nuclei riconoscibili con buoni margini di affidabilità (Mangub/B), possibili nuclei riferibili almeno parzialmente a gruzzoli documentati in letteratura (Wadi Soffegin e Tarhouna) e infine nuclei possibili, ma non inquadrabili in riferimento alle circostanze di rinvenimento (possibile ripostiglio di bronzi romani imperiali dal I secolo all'età di Valeriano/Gallieno).

Oltre a darci una prospettiva nuova su alcune fasi della tesaurizzazione imperiale in Tripolitania, il materiale esposto è dunque la rappresentazione di una realtà assai più considerevole che, comprendendo il tesoro di Mangub/B e implicando il suo parallelo Mangub/A, ammonta a decine di migliaia di esemplari e pertanto trova legittimamente luogo in questa sede.

I possibili rischi cui è esposto questo materiale, non soltanto in conseguenza degli avvenimenti del 2011, ma anche della gestione stessa non propriamente attenta ai legami con le provenienze, rendono urgente l'edizione integrale del materiale rilevato al fine di preservare la memoria di quanto esposto e delle implicazioni di carattere territoriale, nonostante le difficoltà evidenti, generate dalle implicazioni individuate sopra. In attesa che ciò accada, va per lo meno tracciato un primo bilancio che fissi gli elementi salienti in una prospettiva di salvaguardia che ci auguriamo rimanga del tutto superflua.

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[24] Salama 1966-1967, Salama e Callu 1990, 97-98, Salama 1982, Di Vita, Polosa e Salama 2009. Rinvenuto nel 1938 al largo di Marsa Mercan (Punta Americana), in un unico blocco che conservava la forma del contenitore originario, il ripostiglio prende in letteratura lo stesso nome del gruzzolo B, stante la breve distanza dal sito di rinvenimento di quest'ultimo. Stimabile in circa 27000 folles e a lungo conservato presso il Museo di Sabratha, di questo nucleo sono stati studiati 2207 (o 2208) pezzi trasportati nel 1964 a Tripoli, mentre il resto è stato rubato nel 1985 dal Museo di Sabratha.

[25] Salama 1982, 512.

Figure 4-12 – Esempi di monete puniche di zecca diverse (Carthago, Sicilia, Sardegna, Italia), dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009)

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Figure 13-14 – Esempi di monete numide di Massinissa e dei suoi successori, dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009)

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Figure 15-16 – Esempi di monete romane repubblicane, dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009)

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Figure 17-27 – Esempi di monete romane imperiali dei secoli I-III d.C., dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009)

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Figure 28-30 – Monete romane provinciali imperiali dei secoli II-III d.C. collocate tra le monete romane imperiali, dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009)

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Figure 31-33 – Esempi di monete romane provinciali di zecche tripolitane (*Sabratha*, *Oea*, *Leptis Magna*), dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009)

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Figure 34-37 – Esempi di monete romane imperiali delle fine del III-inizi IV sec. d.C., dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009), probabilmente pertinenti al ripostiglio di Mangub/B

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Figure 38-50 – Esempi di monete romane imperiali appartenenti al ripostiglio sequestrato presso la Medina di Tripoli nel 1965 (secondo la didascalia che accompagna le monete), dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009)

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Figure 51-52 – La moneta più antica e la moneta più recente del ripostiglio di az Zawiyah, dall'esposizione numismatica del Museo del Castello Rosso di Tripoli (2009)

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Independent Researchers

WHEN QUANTIFICATION MAKES A DIFFERENCE: A PRELIMINARY ATTEMPT TO ARRANGE EARLY *VICTORIATI* BY EXTENSIVE DIE STUDIES

Abstract

In this paper we present the results of ten years of die studies on the Roman silver coinage of the Second Punic War. For the first time a correspondence between coinage production and War costs is attempted. A special focus is placed on the victoriatus. In fact the preliminary results of the ongoing Victoriatus Project point to a much larger size of this denomination than believed so far. This has a direct impact also on the way this coinage has to be regarded and its role during the War, which will be discussed with some detail in the paper.

Keywords

Die-studies, Statistical estimates, Victoriatus, relations Coinage-to-War costs, Second Punic War

INTRODUCTION

"*Victoriatus"* is the name of the drachma produced by Rome during the II Punic War, with some sporadic issues tailing into the beginning of the II Cent. The name derives from its type: Jupiter's head on the obverse; Victory crowning a trophy on the reverse. This type never changed; variations are just in the style and in the addition of symbols/letters, almost always on the reverse. In that respect, it behaves as the quadrigatus and the early denarius coinage with Roma/Dioscuri. This detail alone points to a short life for this denomination.

Discussions about this coinage have been continuing, seemingly forever,[1] but a clear and final picture has not yet been achieved. Michael Crawford, following Rudi Thomsen,[2] reached the conclusion that the victoriatus was in full parallel with the denarius' birth. In fact, he lists the first two largest issues, *RRC* 44/1 and *RRC* 53/1, as part of the earliest denarial series with the types of head of goddess Roma/Dioscuri galloping right. That seems about right, but still some problems are not solved. In fact, the great novelty of the denarial system of having the signs of values specified on all its denominations and related to the unit of account, the *as*, does not show up on the victoriate. In that respect, it behaves like the previous quadrigatus system. Thomsen rejects this view, because quadrigati have their halves[3] and there are several victoriatus issues that bare the same symbols appearing on the denarii, e.g. *RRC* 57, 58, 72, 83, 89, 97, 98, 101, 102, 103, 112, 119, 120, 121, 122, 124, 132, 133, 158, 162, 166 and 168. However, this is not the whole story: *quantification makes the difference*.

In fact, all of that long list of victoriati with symbols is a minor fraction of the overall victoriatus coinage, as we will see in the following. The main and first body of this coinage is separated from the denarius, either by control marks not appearing on the denarius system, or because it is arbitrarily merged with denarial emissions, like *RRC* 44 and 53. In fact, there is no way of linking with certainty the early anonymous denarii and victoriati, either by style (being the types completely different) or by hoards. The two denominations are rarely found together, and, when so, in a way that does not allow any final statement. Therefore, the actual *RRC* arrangement is simply a hypothesis.

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[1] To list just some papers on the subject, from past to present: Mattingly 1957, Marra 2001, Parisot-Sillon 2018.

[2] Crawford 1974, Thomsen 1961.

[3] This is true for incuse-legend quadrigati, which the halves belong to; however, no halves are known for the later quadrigati, with legends in relief.

Another complication to the actual arrangement is the debasement of the victoriatus,[4] with a fineness ranging from about 60% to 80%.

In this paper we try a quantification approach, based on die studies,[5] that possibly shines some new light on this complex topic. Weight and fineness statistics will complement the investigation.

THE MATERIAL

The Victoriatus Project is an ongoing endeavor, started in 2010, which has recently reached its first step, i.e. finishing the die study of the coin images gathered in the first seven years of collection.

In this paper we present the preliminary results based on a sample of about 6150 pieces, which corresponds to the corpus status as of mid-2017. In the meanwhile another 500 coins have become available and ready to enter the corpus. This makes clear the ongoing feature of such projects.

Among the investigated 6,150 pieces, only 930 were possibly produced after the Second Punic War (hereafter, the "War"). Of the approximately 5,220 pieces of Wartime issues, about 3,700 belong to the above-discussed category which cannot be directly related to denarial series. All these details are reported in Tab.1, whose content is the core of this section.

This large sample, the largest ever collected and investigated, comprises all the victoriati available to the authors from public sales and other printed catalogs,[6] private/public collections and hoards, either published or studied in person.[7]

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[4] Mancini 1984, Ager *et alii* 2013, Debernardi et al. 2017, Parisot-Sillon 2018.

[5] Debernardi would like to thank Giovanni Gorini for putting him on the right path of die studies as the only way to progress in the field.

[6] We thank Richard Schaefer who provided us the scans of the victoriati in his Republican Die Project.

[7] P. Debernardi heartily thanks all the collectors, dealers, curators and Institutions who kindly hosted/helped him and therefore made the Victoriatus Project feasible. Hoping this is a complete list (and apologies to anyone omitted): Federico Barello (Bessa hoard and Museo Archeologico di **Torino**), American Numismatic Society (**New York**), Bibliothèque national de France (BnF, **Paris**, Frédérique Duyrat and Dominique Hollard), **Verona** Castelvecchio (Antonella Arzone), Trustee of the British Museum (**London**), Musé Puig (**Perpignan**), Museo Nazionale di **Este** (Caltrano Vicentino hoard), MAN **Napoli** (Canosa, Taranto, Sant'Angelo a Cupolo, Boiano, Cerreto Sannita, Maserà hoards), Museo Archologico P. Orsi (**Siracusa**, Angela Maria Manenti, Serra Orlando, Mandanici, and Morgantina hoards), Museo Archologico Nazionale di **Cividale** (with Giovanni Gorini, Enemonzo hoard), Museo Nazionale **Roma**no (Gabriella Angeli Bufalini, Fano hoard, Patrizia Serafin, Capestrano hoard), MANU **Perugia** (Bevagna hoard), MAP **Paestum** (victoriati hoards form Paestum excavations, Debernardi e Carbone 2018), Michael Thomas (**Poggio Colla** hoard), **Mainz** Museum (Numantia hoard, Jérémie Chameroy), Adriano LaRegina/Simone Boccari (**Pietrabbondante** hoard), Museo

The activity of collecting the material for the project has led to some hoard papers[8] and more will follow.

This work does not address details, which will have to wait for future publications, as the new outcomes related to the die study of this large sample. For the current purposes, the material is divided into seven groups, listed in Tab.1, which also provide a guess for the period of coinage:

1. Sicily: *RRC* 70/1, 67/1 and 71/1.
2. *RRC* 44/1.
3. *RRC* 53/1.
4. South Italy: *RRC* 90, 91, 92, 93, 94, 95 and 96, i.e. all the remaining early series not related to the denarial series.
5. Den.1: the early series related to denarial issues, i.e. *RRC* 72/1, 83/1, 97/1, 98/1, 101/1, 102/1, 103/1, 105/2 and 106/2.
6. Den.2: *RRC* 57/1, 58/1, 89/1, possibly to be dated 209-207BC[9] and *RRC* 112/1. Here ends the list of issues that belong to the War.
7. Den. 3: *RRC* 119/1, 120/1, 121/1, 122/1, 124/1, 132/1, 133/1, 159/1, 162/1, 166/1 and 168/1. These series are spread over some thirty years by Crawford, starting from about the end of the War. However, there is no clear evidence for that arrangement, especially no hoard evidence. *RRC* 166/1 is the only anonymous issue in this group and Crawford did not link it to any denarial series, even if the position near *RRC* 167/1 is clear enough. All these series share the following feature: they are always found together in II Cent. hoards, in some cases as smaller sections of large denarius hoards (like Maserà and Bevagna). Therefore no more precise chronological arrangement is possible on the post war series so far.

For each group Tab.1 provides the data listed in the table legend. Here we provide some additional information and comments. First of all, the sample is formed *only* by coins documented with an image. Sample size indicates the number of images available and processed. Within this sample, two different sub-samples are singled

Archeologico Nazionale di **Firenze** (Fiorenzo Catalli, Pisa hoard), Museo Civico **Bologna** (Paola Giovetti), Museo di **Murcia** (Luis Miquel, S.Catalina hoard), Steve Brinkman, Alberto Campana, Olivier Legrand, Mark Passehl, Edward Bloume-Poulton, Phillip Davis, Alessandro Calciati, Victor England, Richard Schaefer, Kenneth L. Friedman (with his kind assistance also for improving the English), Scott Rottinghaus, Clive Stannard and Andrew Burnett.

[8] Debernardi 2016, Debernardi-Carbone 2018 and Debernardi-Manenti 2018.

[9] Debernardi-Brinkman 2018.

out: coins with a recorded weight (col. 3; in many past and present sales, weights were not always specified) and, for coins that the authors have studied in person, with a recorded specific gravity (SG).

Table 1 – Summary of the victoriati sample investigated in this paper. The material is subdivided into different categories (col. 1), as detailed in the text. Cols. 2-7 (in gray) refer to physical parameters: average weight in cg (col. 2) and corresponding sample size (col. 3); col. 4 reports the average weight of the flans before SSE (see text). Similarly, in col. 5-7 the fineness data are provided. Cols. 8 to 20 refer to the die study and its results. In col. 8-9 *RRC* die estimates are reported, in 10-11 the counted dies from the die study, col. 12 shows the size of the sample, 13-14 the counted singletons, 15-16 the characteristic index (sample/dies), 17-18 the Coverage (1-Singletons/Sample Size), and 19-20 the Esty estimates for the obverse dies. Col. 19 represents the minimum value of the interval of confidence, col. 20 the expected value and col. 21 a tentative time-frame.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Type	W (cg)	W sample	Flan weight (cg)	SG g/cm^3	Ag %	Ag% sample	RRC Obv	RRC Rev	Obv. Dies	Rev. Dies	Image sample	Sing. Obv.	Sing. Rev	Char.Ind.O	Char.Ind.R	Cov Obv	Cov Rev	Minimum Esty	Esty Obv. Estimate	Date BC
Sicily	317	416	331	9,61	76	90	110	137	290	256	638	162	133	2,20	2,49	75	79	353	414	215-12
44/1	319	1091	335	9,57	76	257	200	250	721	751	1148	489	525	1,59	1,53	57	54	1639	1873	214-12
53/1	316	968	333	9,52	75	234	500	600	794	771	1043	569	523	1,31	1,35	45	50	2107	2361	214-12
South It.	310	564	333	9,25	72	100	148	180	250	321	746	121	164	2,98	2,32	84	78	480	670	215-10
Total		3039				681	958	1167	2122	2157	3711	1382	1369	1,7	1,7	63	63	4648	5404	
Den. 1	304	730	330	9,15	71	168	210	262	288	333	1142	91	141	3,97	3,43	92	88	385	497	214-10
Den. 2	295	348	320	9,16	71	127	180	225	269	260	386	182	184	1,43	1,48	53	52	361	543	210-06
Den. 3	282	819	307	9,09	70	302	430	526	302	295	**933**	312	327	3,09	3,16	67	65	843	1249	205 +
Tot. Den.		1897				597	820	1013	859	888	2461	600	325	2,9	2,8	68	65	1590	2289	
Grand Tot.		4936				1278	**1778**	**2180**	**2974**	**3683**	**6172**	1982	1694	2,1	1,7	65	64	**6238**	**7693**	

FINENESS AND WEIGHT STATISTICS

This topic resulted in a branch of the Victoriatus Project, i.e. a new framework that allows an estimate of the fineness of these debased coins with a confidence interval of ±6%, comparable with other approaches proposed in the literature.[10] For the convenience of the interested reader, the method is briefly described in the Appendix; for all details, refer to Debernardi *et al*. 2017. The SG tool ArchimeDe is versatile, easy to use and portable everywhere, so that it allows extensive measurement campaigns, and Tab. 1 proves. As many as 1278 pieces have been SG measured, mainly from large hoards like Enemonzo,[11] Caltrano Vicentino, Fano,[12] Pisa, Canosa, Taranto, Cerreto Sannita, Boiano and Serra Orlando. By this model the loss of weight due to silver surface enrichment[13] (SSE) is obtained[14] and, therefore, the weight of the flans before the "whitening" process. Such weight is reported in col. 4 and where this is referred to as "flan weight". The main physical data of Tab.1 are shown in Fig.1; on the left the weights and on the right the fineness are shown. A slight weight and fineness decay clearly appears. Fineness starts at 77% in the Sicilian series and decreases to 70% in the latest ones. Overall, this is not such a big change over at least two decades. On the same fineness plot, the fineness of the last quadrigati (215BC, relief quadrigati; 214BC, dot quadrigati)[15] is compared in Fig.1 to that of the victoriati. The relief quadrigati have about the same fineness of 80% of the earliest victoriati, namely *RRC* 70/1, and the dot quadrigati of 214BC[16] are lower. On the same plot the average fineness of the Serra Orlando hoard[17] is displayed, showing a slightly higher fineness than the average over the much larger sample of the corpus.

As for the weights, they also decrease from 3.19 to 2.83g; also in this respect the SG analysis reveals its importance. In fact, by accounting for the weight loss related to

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[10] For an ample comparison of the different approaches, see the table of Figure 1 in Parisot-Sillon 2018, where also the SG method is compared to other methods.

[11] Gorini 2005.

[12] Debernardi 2016.

[13] This nomenclature might be somehow misleading; in fact, it is more like a copper surface bleaching, which leaves a surface of almost pure silver. The latter wording makes clearer that something is lost from the coin, and not gained, as "enrichment" might suggest.

[14] Last formula in the Appendix.

[15] Debernardi-Legrand 2015.

[16] See Debernardi-Brinkman 2018 for P.Cornelius Lentulus, praetor in Sicily from 214, as the moneyer of this series.

[17] Debernardi-Manenti 2018.

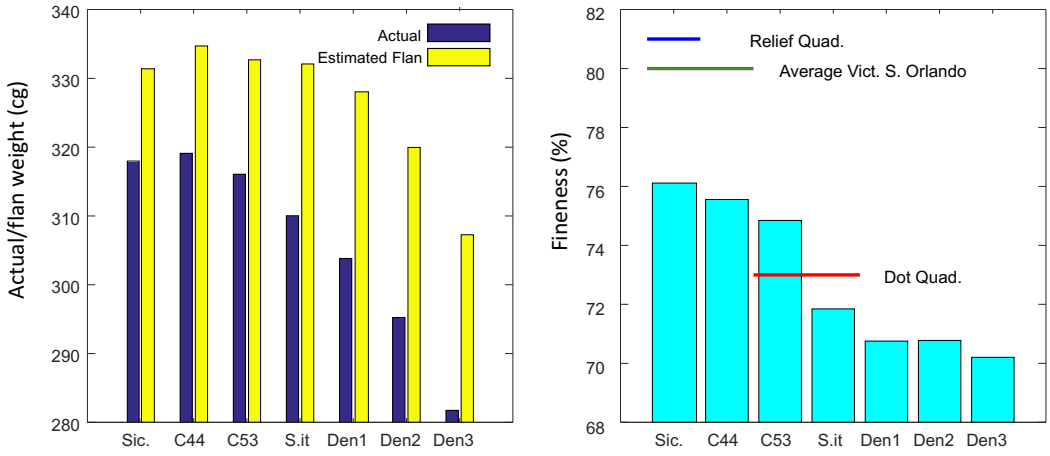

Figure 1 – Visualization of some of the data of Tab. 1 for the seven victoriati groups defined in the text. Left, average actual (blue) and flan (yellow) weights; right fineness. The superimposed lines are not legends, but refer to three fineness values in Debernardi-Manenti 2018, Fig. 8, where the Serra Orlando hoard Sicilian victoriati are compared to different kinds of quadrigati of Sicilian production, from SG measurements taken in the last decade.

the SSE process steps,[18] things looks much clearer, showing an average weight almost perfectly fitting the 3 scruples (3.35g) of a drachm for all the first five groups. A little decay can be recognized only for the two latest groups, 3.20g for the victoriati of the second denarial group and 3.07g for the ones possibly belonging to the period after the War. These data also allow to comment about the common assumption that the victoriatus experienced the same weight reduction as the denarius. This, ideally starting from four scruples (72 pieced per pound of silver) and arriving gradually to 84 pieces (3.86g, at about 205BC), demonstrates a 15% decay, instead of the 9% experienced by the victoriatus (decay from 3.35 to 3.07g). However, by considering actual numbers, i.e. an average denarius weight around 4.25g for the large investigated sample, it clearly appears that the 4 scruple standard (4.50g) was never applied in practice. With the actual weight figures, the same 9% weight reduction is obtained, moving from the start of the system to 10 years later, at about 205BC. Slightly stronger weight reductions in the actual coin weights instead are related to a certain fineness decrease, limited to a maximum of 10% over their whole production period.

[18] Probably the flans were exposed to several oxidations and the copper oxides eliminated by common chemicals, like vinegar. See Debernardi et al. 2017.

DIE COUNT STATISTICS

The second part of the table refers to the die study[19] and reports all the information related to the statistical approach outlined by Warren Esty:[20] Singletons, Counted dies, Sample size. Those quantities, subjected to the Esty formulas, allow us to estimate the number of the actual dies from the subset that appears in the sample.

Even more interesting, from the perspective of this paper, are the histograms of Fig.2, which show how the sample is composed in terms of the defined groups, how the counted dies compare to the *RRC* estimates together with the Esty die estimante and its lower confidence interval. The red bars of Fig.2 make very clear that 80% of all the victoriati were produced before 210BC (up to Den. 1), and, even more importantly, that their dies overwhelmingly exceed *RRC* estimates. To better illustrate this important point, in Fig.2 the important statistical figures for the seven groups are also reported. Since both *RRC* estimates and counted dies by the Victoriatus Project are much lower that the Esty estimates, we think it is more prudent to rely on the lowest Esty estimates.

This topic is very important and it deserves further comments. Some deep investigation has already been carried out on the Esty model,[21] especially regarding its performance for samples highly under-represented like in the present case. To investigate this, it is useful to discuss Fig.3, computed for the Crepvsi surviving sample. In steps of 50, the coins are randomly picked up from the sample and the number of dies of this sub-sample is counted. For a given sub-sample size the experiment is repeated 50 times and every time the dies and singletons are counted and the corresponding *characteristic index (CI)* = number of coins / number of dies is computed together with the estimated number of dies and the corresponding minimum and maximum of the Esty interval of confidence.[22] The estimate lies somewhere in between them and is not shown in the dot-plots of Fig.3[23] because it would cause a too messy plot. As can be seen comparing the left and right plots, the p=2 estimate is closer to the "productive dies", that is those which produced the coinage (continuous black line, the known Crepvsi rev. dies), while p=1 accounts for the whole set of engraved dies, including those that broke immediately (dashed black line, the maximum rev. numeral known).

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[19] For the most challenging Groups, comprising around one thousands coins that cannot be split on stylistic ground, the computer-aided die comparison software presented in Debernardi 2014 has been applied.

[20] Esty 2011.

[21] Debernardi 2014.

[22] Esty 2011.

[23] Each dot represents a given size sub-sample, with its 50-fold statistical repetition.

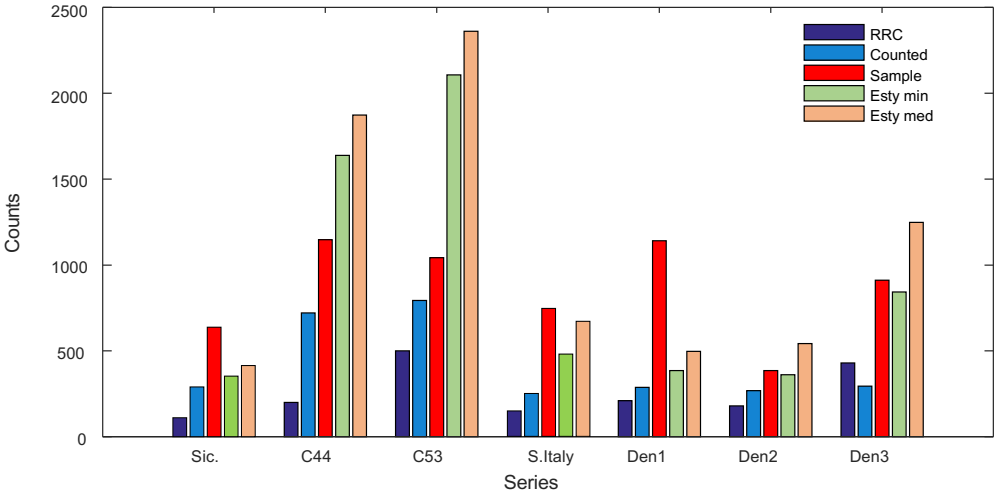

Figure 2 – Visualization of the data of Tab.1 related to the die statistics for the seven victoriati groups defined in the text

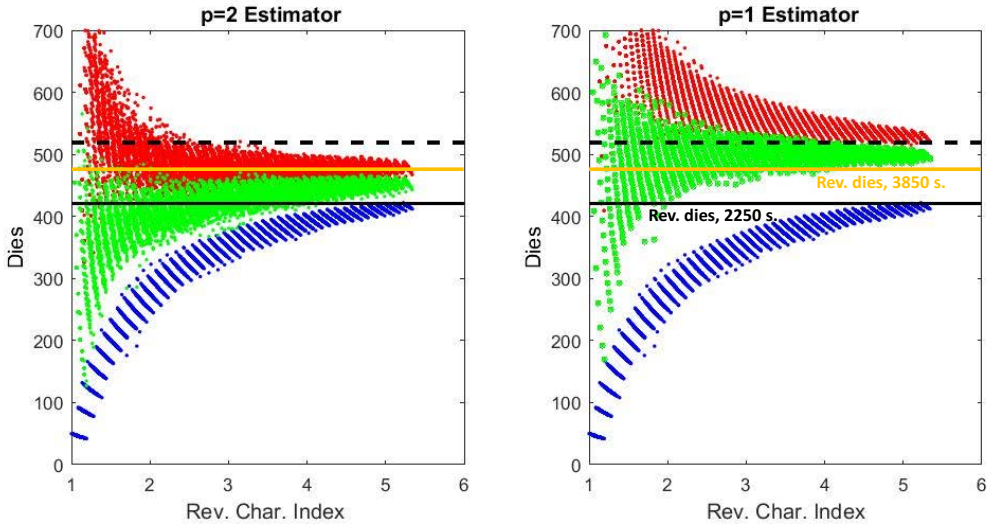

Figure 3 – Monte Carlo approach applied reverse of the Crepvsi sample (see Debernardi 2016) with Esty estimator p=2 (left) and p=1 (right). The graphs show the number of dies vs. the reverse Characteristic Index. Continuous/dashed lines refer to the counted/total number of dies; blue dots to counted dies (corresponding to the maximum numeral 519 engraved on one rev. die), green and red dots to minimum and maximum confidence interval of the Esty model. The orange lines refer to the counted reverse dies in the updated sample by Richard Schaefer (3850 instead of 2250 pieces).

By closer examination of the left plots, one can see that counted dies are not reliable until *CI* is close to 5, which is never achieved[24] for victoriati (see Tab.1 for the *CI* of the different groups). In fact, the largest and uniform issues of *RRC* 44 and 53 display *CI*s at around 1.5 or less, which would result in a die count for the Crepvsi series of about 100 dies, instead of 400. This explains well why the Esty model must be applied to our investigations. The green dots provide an estimate which is fairly good and close enough to the actual values for small or moderate *CI*s. The numerical experiment on Crepvsi also allows us to estimate the maximum error, which from Fig.3 ranges from -20 to +5%. Using the lower confidence extremum is therefore a conservative choice, which should avoid die over-estimates.

By looking at Tab.1 or Fig.2 one can see that not only the die estimates are all higher than *RRC* estimates, but also that the Esty predictions exceed them by a minimum of a factor two, up to a factor of 8 for the series *RRC* 44/1. More importantly, for the first four groups, the ones not related to the denarius and featuring 75% of all the dies, the average underestimate is as large as 4.6. This is the point this paper seeks to underline, investigate and put forward as a stimulus for future research/researchers. In fact, such a large quantitative difference might have an impact on the overall numismatic framework of the War that gave birth to the new silver coinage of the Roman Republic: the denarius.

A NEW FRAMEWORK FOR THE VICTORIATUS

It is not wise to treat a coinage or denomination in an isolated manner, but one must harmonically find it a place in its historical scenario. We can therefore profit from similar projects on the early denarius system and on the quadrigatus, both ongoing.[25]

By an educated guess of the dates of the various groups of quadrigati[26] and denarii, it is possible to estimate their *equivalent denarius dies* per year. The equivalent denarius die concept is essential when dies of different denominations need to be compared on the same graph for quantification purposes. Since the denarius is the star of the Roman Republican Coinage, it is selected as the reference for the conversion. Adopting a denarius of four scruples, which is about correct for the period under analysis, then a quadrigatus is worth 6/4 of a denarius, a victoriatus 3/4,[27] a quinarius 2/4 and a sestertius 1/4.

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[24] In some rare series high *CI* are achieved, but they are statistically insignificant.

[25] Debernardi 2014 and Debernardi-Legrand 2015.

[26] A final work on the quadrigati, with a new catalog, proposal of mints and dates is still in preparation.

[27] Debasement is not taken into account at this preliminary stage of the investigation.

The quadrigati and denarii further split into two large groups: incuse/relief legend quadrigati and early denarii, with splayed/peaked helmet visors. The former denarii were produced up to about 210BC, and the latter, initiated by about 210,[28] produced from then on.

So far we have been dealing with die estimates and how they are temporally distributed in the considered timeframe. To make this exercise relevant, we should relate the die counts to coin production and production to the money needs, in tight connection to the troops fielded during the War. This is a hardly possible task, but we think it is worth trying, at least to access a comparison on the "order of magnitude" level. To attempt this, two other aspects have to be investigated/discussed: die productivity and war costs.

Die productivity

This is a very hot topic, which has been confronted by several researchers; in fact it is a key element in the intersection of numismatics and economics. The problem has been attacked from different sides and perspectives. Ted Buttrey always denied the possibility to infer any useful information from die counts.[29] For those who believe differently two classes of approaches are proposed in the literature:

1. To find special coinages where the need of money, or even better, the quantity of coined silver, is known, or can be reasonably inferred, count the dies, and estimate the productivity[30].
2. To perform archaeo-experiments, trying to reproduce the ancient conditions and to infer the desired information, e.g.: was the striking cold or hot,[31] how long did a die last,[32] what was the production speed,[32] etc.

All the different approaches lead to the range 10,000-20,000, and we therefore chose 15,000 as an educated guess[33] and test this figure in the following on the early coinage of *RRC* 101, produced in winter 211BC by Laevinus in Corcyra.[34] For the present

[28] See Debernardi-Brinksman 2018 for the first peaked visor denarii of the series *RRC* 53/2.

[29] Buttrey 1993, Buttrey 1994, Buttrey 1997.

[30] *RRC,* Marchetti 1999, Callataÿ 2000, Callataÿ 2006, Callataÿ 2011.

[31] Sellwood 1963, Rottinghaus 2011.

[32] Sellwood 1963, Faucher 2009, Faucher 2016.

[33] Sellwood 1963 p.229 (10-16.000), Marchetti 1999, p.109 (14.350), Callataÿ 2011, p.9 (20.000). An investigation by the authors, based on a mix of the two approaches, is currently underway.

[34] Marcus Valerius Laevinus, praetor of Apulia in 215BC (Livy, XXIII, 32) was assigned to Greece in 214BC (Livy, XXIV, 10-11) with a reduced *legio* on 50 *quinqueremes* based in *Brundisium*.

purposes, his military force and costs have to be estimated. That was a sea force and the typical complement of a *quinquereme* was: 20/25 sailors, 200/300 rowers[35] and a number of soldiers in the range of 50-75[36]. A standard crew was composed mainly by *aerarii* (Polybius VI, 19.2) and *socii* as sailors and rowers, while the soldiers were mostly Romans. The rowers got about half pay compared to the sailors,[37] and, when all is included, one reaches a salary ratio between Romans and non-Romans of about 1/3 and 2/3 as a rough estimate.

At that time the Roman year used to be split into 3 periods of 4 months: Spring, Summer and Winter. Correspondingly, the salary was paid in three tranches: in May, September and January.

P. Marchetti[38] computes as 8,000 denarii/year the cost of a standard *quinquereme* crew, which means a cost of 8,000 x 50 ships = 400,000 denarii/year, or 134,000 per four months. The latter should be related to the production of *RRC* 101, overall and approximately, which should correspond to 134,000/15,000 = **8.9 dies**.

RRC 101 is a tiny, very rare coinage, whose die study provided us with the following results:

1) Quinarii: Sample of 15 specimens, 4/3 O/R dies, 1/0 singletons. Esty estimate: 5/4 dies

2) Victoriati: Sample of 9 specimens, 4/6 O/R dies, 1/5 singletons. Esty estimate: 5/19 dies.

The dies for quinarii look reliable, while for victoriati, especially for reverse, the *CI* is very low (1.5). Moreover, the strong unbalance 1 to 4 between obverses and reverses, indicates some anomaly. 8 effective dies for victoriati is therefore used in what follows, by making an average between obverse estimate and the minimum of the confidence interval (11), as discussed previously for low CI statistics.

In terms of denarii, this is equivalent to 2.5 dies for the quinarii and 6 for the victoriati, i.e. 8.5 dies. This figure compares well with the previously computed 8.9 dies to produce the pay of the maritime *legio* at Corcyra in winter 211 and confirms that a productivity of 15,000 pieces per die might not be too far from reality.

Laevinus retained that command until the end of 211BC. It's to the last months of this command, on Corcyra (Livy, XXVI, 24.), that Crawford correctly attributes the production of *RRC* 101, because it features the monogram KOP in Greek letters.

35 Marchetti 1978, p.135 and Polybius I, 26.7.

36 Marchetti 1978, pp.126-128; the range depends on the kind of ship deployment.

37 Marchetti 1978, p.253.

38 Marchetti 1978, pp.250-253.

War costs

As regards the salary of the Roman legion, we also refer to Patrick Marchetti,[39] who computed 54 denarii as the net pay per year of a Roman regular soldier, 108 for a centurion and 162 for a knight. Starting from these data, a total of 250,000 denarii/year for a legion can be estimated.[40] In winter 211-210BC about 50% of the force was dismissed and from that time a different balance of Romans/Allies was implemented.[41] The Roman infantry increased from 4,000 to 5,000 men and the knights from 200 to 300.[42] Instead, the Allies were diminished; the *ala* was decreased to 7000 infantry and 300 knights. This results in an increase from 250,000 to 325,000 denarii/year for the Roman part, and in a decrease to 425,000 for the Allies, for the same total as before, i.e. 750,000 denarii/year. Therefore, for all the period under analysis, the number of denarii/year per legion is set at 50 dies in our simulation. For the Allies Rome paid for their food and equipment, while their mother-cities for their salary.[43]

Considering that no coinage is known in such a quantity that might have served for the Allies' salaries, it has been proposed that those coins are the victoriati.[44] It seems reasonable, also from a logistical/political/psychological perspective, that Rome would have taken charge of the production of an uniform coinage, whose silver was provided by the Allies.

It can be estimated that the Allies contributed on a 2/3 basis from 218 until 211BC.[45] Therefore, every legion needed 750,000/15,000 = 50 dies/year for the period 218-210BC.[46] For 219 the data are mostly unsure; we guess 2 consular legions and 100 ships.

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[39] Marchetti 1978 pp.246-254.

[40] This is a net amount, to be paid to the soldiers, after having subtracted the costs of food and equipment, estimated by Marchetti to amount at 40% of the total pay of 90 denarii/year.

[41] This action might be related to the refusal, on the part of the Latin colonies, to provide men and silver (Livy XXVII, 9), which implied higher costs on the Roman side. Those facts were possibly one of the reasons that resulted in an empty treasury in 210BC, with the consequent resorting to voluntary loans (Livy XXVI, 3) and to the deployment of the *aurum vicesimarium* (Livy XXVII, 10).

[42] Livy, XXVI, 28.

[43] Livy, XXVII, 9.7 and 9.13

[44] Marchetti 1978, also reported by Marra 2001, pp.131-134. Even though not long-lasting, that might have indeed been the original aim of the victoriati.

[45] Livy XXI, 17, confirmed by the analysis of the losses at *Cannae*, and also from the simple logical fact that altogether the Allies were more numerous than the Romans alone.

[46] In the computed need of coinage, only the net salaries were accounted for; if also Allies' food costs are included, then an extra 25% of coinage need would occur. Of course there could have been other costs/overhead (e.g. more general equipment for the legion), but those are not included in the

It also is not completely easy to estimate the fielded Roman force per year. To that end, we rely on DeSanctis, with the following modifications. For the years 214-11, the Laevinus legion accounted for by DeSanctis is subtracted, because it is already included in the navy. Another subtraction accounts for the losses suffered by the Volones[47] in 212 and by the Scipiones[48] in 211.

Regarding the ships, for the years 218, 216, 215, 210 and 206 we have the accounts of Livy; for the remaining years we extrapolated the values.

All the die studies performed so far are assembled in Table 2, where also the details of the costs are given per year. Regarding the distribution of the dies per year, this is in part arbitrary. In fact, for example, incuse quadrigati are difficult to assign to specific years, and that topic is still under investigation.[49] Similar comments holds true for the anonymous victoriati, and refinements could be possible in future. In any case, the subdivisions have been kept in reasonable agreement with the numismatic material. It is quite surprising that the total need, estimated in about 12,800 equivalent dies, compares extremely well with the 13,100 estimated dies, which stems from die counts and statistical projections.

The money need and production of Table 2 are plotted in Fig.4. This is the final and main result of this preliminary/provocative work, which gives us a better visual overview of more than 10 year research and die-counts. As for the coinage need, two estimates are provided: just salaries (Romans + Allies), and salaries +25% overhead for the Allies food cost paid by Rome. In the production, two drops can be noticed in 210 and 206BC. The drop in 210BC is related to the Treasure crisis of that year, while that of 206BC marks the edge of the performed work in the die counting of the denarial series, which will be continued in the next years. Therefore, the only real drop is that of 210BC. It has to be stressed that of Fig.4 only the silver coinage is included; it makes for sure the core value of the War coinage, but also gold (possibly spent on the trade for goods) and bronze (before the denarius, possibly part of the pay for the Romans) could require small revisions in Fig.4. While gold could be easily accounted for, to include bronze is out of reach at the moment. No die study is available so far, and would be in any case much more difficult to perform, due to an overall worse preservation of bronze compared to silver. Moreover, bronze die productivity data are even harder to access than for silver.

present estimate. Overall, those additional costs must be related to the number of deployed legions, and can be accounted as an increased percentage of the need computed here.

47 Livy XXV, 19-20.

48 Livy XXV, 32-36.

49 Legrand-Debernardi, in preparation.

Table 2 – First attempt to quantify the money needed in terms of equivalent denarius dies (col. 4) and the corresponding available coinage, in its various denominations. Meaning of the columns: 1, year BC; 2-3, number of legions-ships according to DeSanctis; 4, equivalent denarius die need; 5-7, incuse quadrigati (proposed dies/year, and total in col. 7); 8-10, 11-13, 14-15 and 16-17 similarly for relief quadrigati,[50] victoriati, early denarii with splayed visors and latest ones with peaked visors.[51] The columns pertaining to different coinages are marked by different colors.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year BC	Leg.	Ships	Dies	1,50	Quadrigati incuse equivalent		1,50	Quadrigati relief equivalent		0,75	Victoriati equivalent		DEN splayed	1	DEN peaked	1	8000	15000	
													from 214	50	from 210	50	Period Need	Period Prod.	Period
219	2	100	120	120	180	720		0											
218	6	220	317	200	300			0				2475							
217	11	220	484	300	450			0						splayed Den. 1					
																	921	930	220-217
216	11	200	657	100	150		330	495	1005										
215	14	200	807			incuse QDG	160	240		1000	750	anon. Vict.					1463	1635	216-215
214	19	200	1057				180	270		1100	825		150						Den. Start
213	21	200	1157						rel. QDG Sic.	1200	900		350	2300		peaked Den. 2	2213	2495	214- 213
212	23	200	1257							800	600	1485	700						
211	23	200	1257							500	375		800						
210	20	180	1096							350	263		300		400		3609	3438	213-210
209	21	180	1146							250	188				1100	4700			
208	21	170	1141							80	60				1200				
207	23	160	1235							120	90	anon. Vict. + Sym			1300				
206	20	150	1080												700				
																	4602	4638	209-206
Tot	235	2580		720			670			5400									
					1080			1005			4050		2300		4700				
Tot. need			12809												13135		12809	13135	

[50] Refer for quadrigati die counts and estimates to DEBERNARDI-LEGRAND 2015

[51] Refer for denarius die counts and estimates to DEBERNARDI 2014

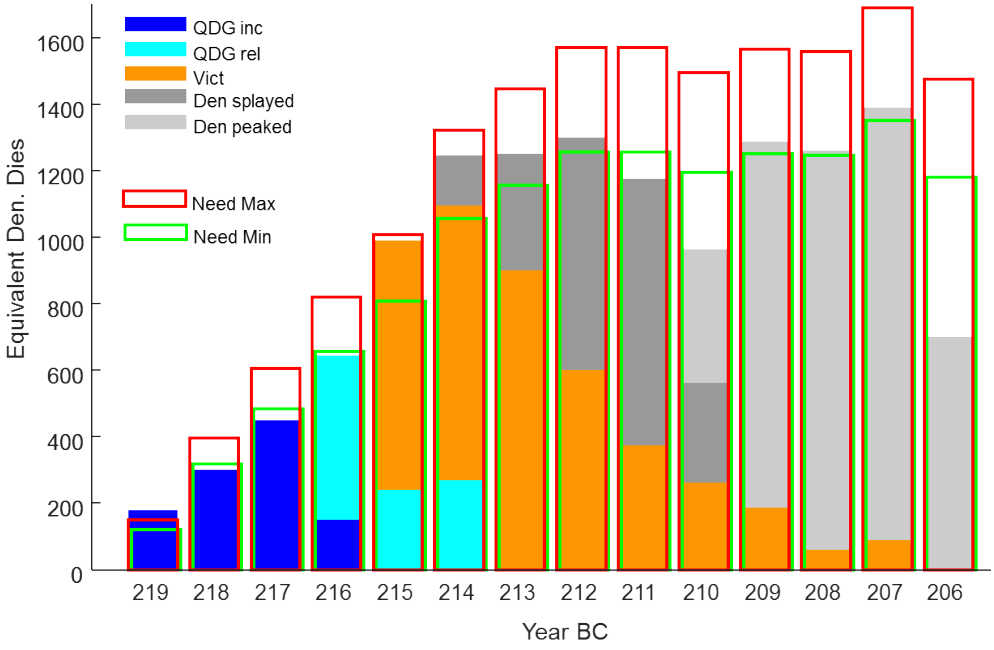

Figure 4 – Histogram of the estimated equivalent *denarius dies* including all the silver denomination produced during the War: quadrigati, victoriati and denarii. These productions are compared to the War costs (including or not the cost of food and equipment for the Allies, indicated with green and red lines respectively), converted into dies as discussed in the text.

CONCLUSIONS AND OUTLOOK

Several comments arise from the overall results reported in Fig.4:

- The quadrigatus seems to have been correctly placed, in the preliminary publication, even though the victoriati dies had not been counted at that time.[52]
- The early denarius system cannot be exactly as described in *RRC*.[53] A start in 211BC strictly together with the victoriatus would leave a four year gap (215-212) for the payment of the army on one side; on the other it would tie together, in one year or so, all the coinage of five years. There are several indications that the peaked visor denarii started in about 210.[54]

[52] Debernardi-Legrand 2015.

[53] See also McCabe 2013, who arrives at similar conclusions starting from the bronze side.

[54] Debernardi-Brinkman 2018. The arrangement of the early denarius stages (splayed visor helmets) is in preparation.

- The victoriatus seems to find its natural place as a *trait d'union* between the quadrigatus and the denarius system. Its production was huge, much larger than any previous coinage that far, quadrigatus included. Only its quantification allows us to regard it in a correct perspective, i.e. not as a complementary coinage to the denarius, but as the main coinage during the first stages of the denarius. This is also confirmed by comparing the fineness of the last quadrigati with the earliest victoriati.
- As the denarius becomes more and more popular, the victoriatus fades and becomes a subsidiary coinage from about 210 onwards; production continued possibly because of the success of this denomination, sought after in several areas/situations.

Previous researchers already have proposed a similar role for the victoriatus, like Marchetti and Coarelli;[55] however here, for the first time, a solid foundation for this idea is provided.

More work and refinement certainly are still needed and they will be the topic of future research and papers. All the involved die studies will be updated due to the continuous increase of the *Corpora*. In combination with an augmented hoard table, larger by 17 hoards compared to the 19 known to RRC, the detailed inner features of the large series *RRC* 44/1 and 53/1 will also be discussed in future, together with the publication of small victoriati series and other features not treated in *RRC*.

[55] Coarelli 2013.

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APPENDIX

ESTIMATING THE FINENESS OF A DEBASED COIN FROM THE BUOYANCY METHOD

In the following, for the convenience of the reader, the main results of the paper Debernardi *et al*. 2017 will be summarized, by focusing on the effect of the blanching process applied to debased coins during the flan production and how that can be accounted for to obtain an estimate of the core fineness of a debased coin. The specific gravity (SG) of a silver coin obviously depends on its metallic composition, consisting of, besides silver itself, copper, but also many other metals, such as tin, zinc, lead, iron, gold, etc., whose inclusion was not intentional but resulted from the limits of ancient metallurgy. However, the sum of these other metals is generally lower than 2%. Hence, for numismatic purposes, it is generally accepted for a silver coin to be treated as composed of a binary silver/copper alloy, at least for freshly prepared flans. During their lifetime, coins get corroded, acquire dirt, etc., which might influence their SG. However, for some coin issues, flans were intentionally treated in order to make them appear to be made of better silver than they actually were; this treatment consisted of different steps. First the flans were allowed to oxidize (copper oxides), then washed with an acid, which attacked the copper (oxides) in the surface, but left the silver unharmed. This washing yielded a layer with a higher, almost pure, silver content, with a thickness ranging from a few μm (micro-meters) up to several hundreds μm, depending on the degree to which the oxidation step was pushed, possibly applied several times.

The so-processed flans were then ready for the striking, which made more compact the copper-depleted layer and sealed the copper-rich core below. The above described process is called surface silver enrichment (SSE[1], Beck 2004). In Fig.A1 an example from a cut coin is reported, which clearly shows the effect of copper depletion in the SSE outer layer and, most importantly, that the surface layer is composed of a quite pure silver phase and voids, corresponding to where the copper grains resided before they had been oxidized and removed.

[1] Beck 2004 = L. Beck, Bosonnet, S., Réveillon, S., Eliot, D. and Pilon, F. (2004) Silver surface enrichment of silver–copper alloys: a limitation for the analysis of ancient silver coins by surface techniques. Nuclear Instruments and Methods in Physics Research B, **226**, 153–162.

To be more quantitative, the SSE layers range around 200-300 μm, the silver increases and the copper decreases close to the surface. This phenomenon is a serious problem for the conventional buoyancy method, which works with the assumption of an AgCu binary alloy. In fact, the voids in the SSE layer strongly lower its SG, even below the copper value.[2] This is the origin of the bad reputation of SG in the numismatic field, where frequently debased silver coins are encountered.

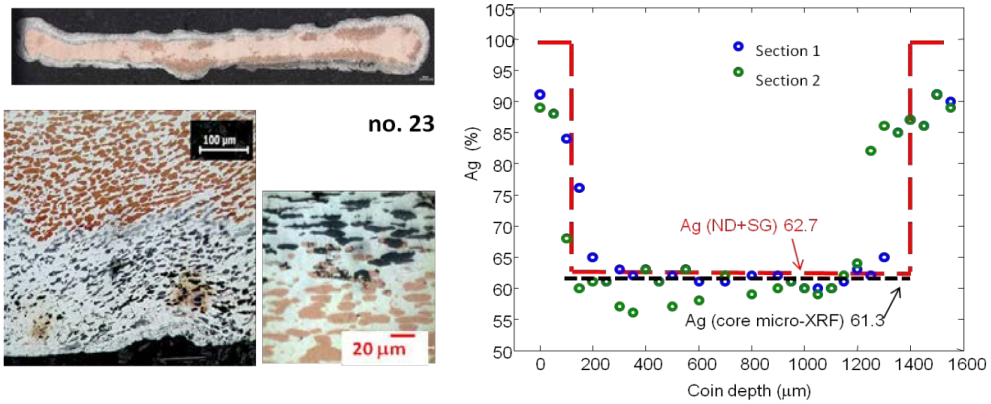


Figure A1 – Left: images of the sectioned victoriatus no. 23 from Corsi 2015.[3] Right: Ag profiles at two positions (blue and green dots) vs. depth of the coin (sample N10 in Ager 2013 and Moreno 2015[4]). The red-dashed line shows the complete depletion model proposed here, while the black line the estimated average from the micro-XRF data

[2] See Angelini 2013 (I. Angelini, F. Barello, E. Barzagli, J. Corsi, P. Debernardi, A. Lo Giudice, Monetazione preromana dell'Italia settentrionale e vittoriati: Analisi per diffrazione neutronica, Quaderni della Soprintendenza archeologica del Piemonte, 28, p. 331-333) and, for example, two victoriati RRC 121/1 at ANS: 1944.100.79317 (SG=8.73) and 1968.116.6 (SG=8.98). They are marked as "plated" in the museum trays, as many others. Lower SG values displays some selected quadrigati at The British Museum: BM 1843,0116.82, SG=8.49; R6350, SG=7.05; BM 2002,0102.161, SG=5.54. P.D. would like to thank Mr. D. Hook for providing these data.

[3] Corsi et al. 2015 = J. Corsi, B. Maróti, A. Re, Zs. Kasztovszky, L. Szentmiklósi, M. Torbágyi, A. Agostino, D. Angelicia and S. Allegrettia, Compositional analysis of a historical collection of Cisalpine Gaul's coins kept at the Hungarian National Museum, J. Anal. At. Spectrom., 30, 730.

[4] Ager 2013: F.J. Ager, A.I. Moreno-Suárez, S. Scrivano, I. Ortega-Feliu, B. Gómez-Tubío, M.A. Respaldiza, Silver surface enrichment in ancient coins studied by micro-pixe, Nuclear Instruments and Methods in Physics Research B 306, p. 241-244, 2013. Moreno 2015: A.I. Moreno-Suárez, F.J. Ager, S. Scrivano, I. Ortega-Feliu, B. Gómez-Tubío, M.A. Respaldiza, First attempt to obtain the bulk composition of ancient silver–copper coins by using XRF and GRT, Nuclear Instruments and Methods in Physics Research B 358, p. 93–97, 2015.

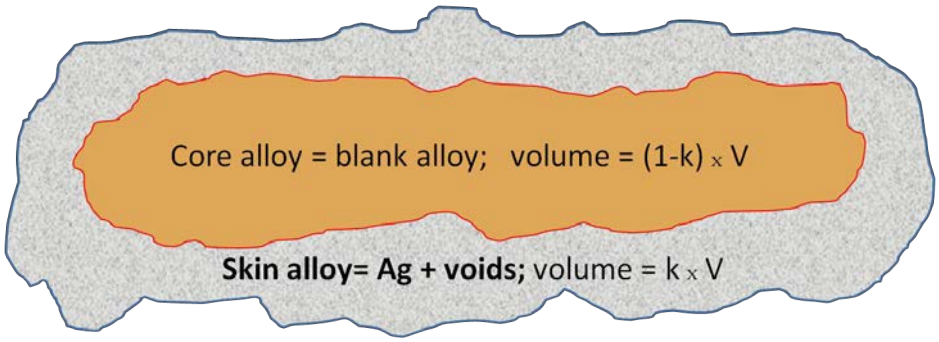


Figure A2[5] **–** Sketch of a debased coin of volume V with SSE volume kxV, emulating the actual coin section in Fig. A1. The image illustrates the adopted "complete depletion" model, meaning that it is assumed that the core is composed of the original flan alloy and the SSE layer by pure silver and voids, whose SG can be taken as being 0. The measured SG is a weighted average of the inner original SG and the outer SG, much lower because it includes the voids

The SG of a debased silver coin may be below that of pure copper (8.95) simply because a debased coin is not made of a homogeneous AgCu alloy. That is true for good silver, while when SSE is employed, it transforms the binary alloy to a more complicated object, as previously discussed. In Fig. A1 a typical silver fineness profile[6] is shown in better detail together with a piece-wise linear approximation (red dashed line).[7] That will be referred as a "complete copper depletion" model, i.e. it is assumed that the coin is composed just by two homogeneous parts:

- the bulk, in the core, whose Ag wt.% content is denoted by x, the fineness of the original blanks
- the fraction k x V of the SSE layer, which is assumed as an alloy of pure silver and voids, i.e. the spaces freed from copper.

The density ϱ=W/V (Weight/Volume, also referred to as "SG") of a coin is a combination of the internal (ϱ_i, the original alloy now present in the core) and external densities (ϱ_e, the Ag-void alloy at the periphery of the coin):

[5] We thank Jan Moens for suggestion such a simplified sketch and for his suggestion that we write this appendix.

[6] See n. 20; we thank Ana Isabel Moreno-Suárez for providing the Ag profile of sample no 2.

[7] Beck et al. 2004; see also fig. 2, left.

$$\boldsymbol{\rho} = (1 - k)\rho_i + k\rho_e$$

where *k* indicates the volume fraction where copper has fully leached out, in the assumed "complete depletion" hypothesis.

For the internal part, the well known binary alloy equation holds for the inverse of the density:

$$\frac{1}{\rho_i} = x(\sigma_1 - \sigma_2) + \sigma_2$$

where *x* is the Ag weight fraction of the inner alloy, σ_1 and σ_2 refer to Ag and Cu respectively (1/10.5 and 1/8.95), while it can be shown that:

$$\rho_e = \rho_i x$$

In this way the SG of a debased coin has been written in terms of the core alloy and the depletion parameter k. The problem of course is, that this model contains now two unknown parameters, while the buoyancy method only yields one value, i.e. the SG of the whole coin, core and SSE layer. This problem can be overcome if there is another measurement, such as neutron diffraction. Such technique is known to provide reliable values for the average silver content, which can be easily computed within the complete depletion model previously described. In this way the problem can be uniquely solved, because it is a simple system of two equations, SG and average fineness, with two unknowns, *x* and *k*. This is what has been carried out in Debernardi 2017. By applying this model to three different silver coin issues, *viz*. a sample of 43 coins, composed of drachms, victoriati and denarii, a relationship between *x* and *k* valid for victoriati (the majority of the sample) was found.

The experimental results and their mathematical modelling are represented in figure A3. As can be seen in Fig. A3(a) there is a clear relation between coin SGs and *k*. This, therefore, suggests the use a mathematical fit of the experimental data (black solid curve), to compute *k* from only the SG measurement, and allows an estimate of the coin's core fineness *x* from the simple SG measure.

The outcomes of such procedure are shown in Fig.A3 (b) and (c), where the results of the SG + neutron measurements (open circles) are compared to those obtained by only the SG measurement, complemented by the *k*-fit of Fig. A3(a). The reliability of the method obviously depends on the 'goodness of fit' between the observed values and the ones resulting from the fit. For the given sample of 43

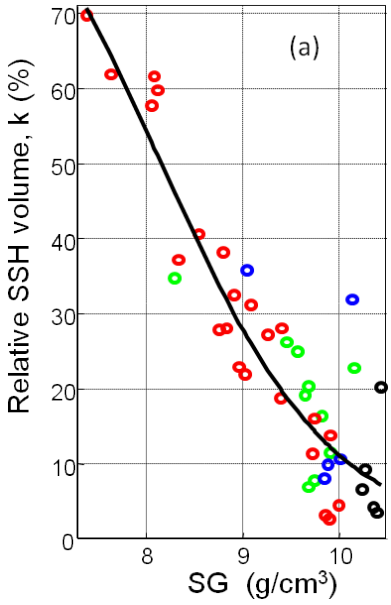
Figure A3 – Model derived data (*k* and core fineness) from experimental ND and SG of a sample of drachms, victoriati (red circles) and five denarii (black circles, from Debernardi 2017):

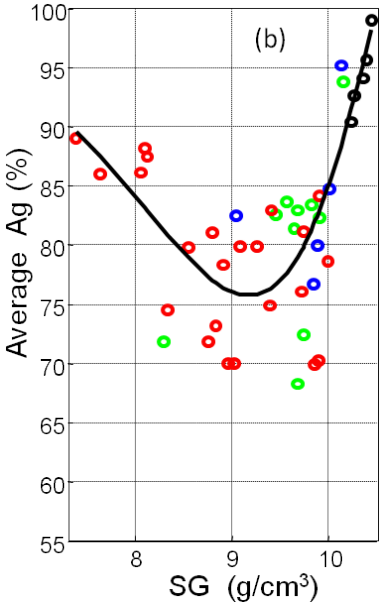
(a) the estimated volume fraction *k* of SSE vs. SG;

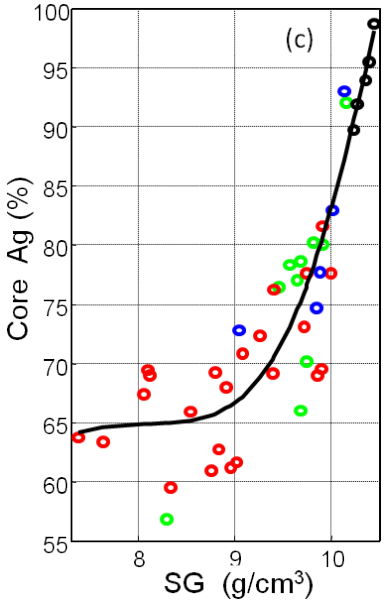
(b) the measure d fine average vs. SG;

(c) the corresponding extrapolated values for the original alloy.

The lines refer to values resulting from fitting *k* vs. SG (see Debernardi 2017).







coins, covering a wide range of SG values, the standard deviation amounts to 5%, with 39 of the 43 specimens laying between ± 6% difference, mostly attributable to the approximation of full depletion and to different oxidation processes that locally modified the density.

It has to be repeated and emphasized that the procedure previously described is valid for any debased coinage, but the direct estimate of the core fineness from only the SG measurement can be safely applied only to victoriati, because the *k*-fitting has been obtained specifically from a large set of those coins.

The presented model also allows an estimate of the weight loss of the cons. This is given by:

$$\frac{\Delta W}{W} = k\,\frac{V}{W}\rho_{Cu}(1-x) = k\,\frac{\rho_{Cu}}{\rho}(1-x)$$

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APPLYING STATISTICS AND COMPUTER SCIENCE TO THE STUDY OF BIG COIN FINDS: AN ENGINEERING APPROACH

Abstract

Any large amount of data raises processing and interpretation issues. Coin finds, particularly hoards made of several thousand pieces, are no exception. In front of a great number of specimens, a comprehensive study, conducted with methods usually applied to small finds, becomes a difficult target to achieve. Statistics, as well as Computer Science, can provide important analysis tools and solutions allowing the researchers to extract relevant information from finds data. This contribution will examine how Statistics and Computer Science can support the work of numismatists. It will present at an introductory level what is still available today and what could become affordable hopefully not too far in the future, going through the major pros and cons. It will be shown how large and articulated amounts of data – from denominations of coins to the mints of origin, from image descriptions to weights and diameters – can be managed and organized in a smart way along with coin images into a structured information system.
The analysis will be carried out under an engineering perspective, always focusing on aspects such as application limits, implementation costs and the effort required in terms of human resources.

Keywords

Coin hoards, Statistics, Computer Science, point estimators, interval estimators, linked data, open data, semantic web, speech recognition software

STUDYING THE BIG COIN FINDS: FIGHTING AGAINST THE WINDMILLS?

A simple calculation highlights the complexities inherent in the study of large monetary finds. Let's assume we want to study the well-known Reka Devnja hoard, and to publish it in full. To do this, we assume that we have all the coins under optimal conditions, considering an eight-hour working day and a 250-day working year.

A count of the 81,096 coins – the surviving part of the hoard[1] – performed at the speed of one coin per second requires no less than 2.82 man-days of work.[2] For the registration of every single coin in a database where the essential characteristics are to be reported (description, legends, weight, module, axis orientation...) together with a photographic reproduction of both sides requires that a great commitment must be taken into account. Assuming to limit the storage time to just 10 minutes per specimen, it follows that the complete acquisition of the hoard requires 1,689.5 man-days, or 6.76 man-years. Finally, the publication of these materials in a book or a series of books according to the publishing standards generally proposed by the major magazines of the sector, such as the *Numismatic Chronicle*, would require no less than 2,700 pages and 4,050 plates.

These numbers could be sufficient to provide concrete evidence of the huge effort required to study one of the largest hoards ever found. New perspectives can however be added by associating the costs that should be sustained for each single man-hour employed for the study operations, expressed now in more prosaically budgetary terms. Estimating a charge of 300 euro per man-day (a conservative estimate, if we consider the operating costs of a large public structure that could support such an initiative) we obtain that the only count of the coins would lead to a cost of 850 euros, whereas their registration in a database over half a million euros. Much, much more difficult is any prediction of the costs associated with any print publication of the hoard without a precise editorial plan.

These data might be questionable, but it is difficult to think that they overestimate the time required for the study the hoard and thus the associated costs. In presenting the classification project of the coins of the Kunsthistorisches Museum in Vienna, Klaus Vondrovec spoke of average processing times of a single coin in the order of one hour. Furthermore, the digitalization of the approximately 108,000 coins composing the Misurata hoard, although it has been proceeding intensively for several

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[1] MOUSHMOV 1930; MOUSHMOV 1934; METCALF 2002; PAUNOV, PROKOPOV 2002, 48-50 n. 75. For a critical summary of the contents, see also the corresponding record on the *Coin hoards of the Roman Empire* portal (http://chre.ashmus.ox.ac.uk/hoard/3406 – URL last visited on February 1st 2019).

[2] Under the assumption that we are not making any mistake which obliges us to repeat the operation more than once.

years, has hitherto covered just about 80% of the specimens, and only a small fraction of them is now available to the public.[3]

In our example we implicitly worked under the assumptions that all the coins of the hoard were available to the scholars for the classification. We have excluded any costs arising from the recovery of materials from the findspot, their cleaning and restoration. We have not considered the risk that the project may undergo changes for a variety of reasons, such as budget reduction or the decision of a scholar to terminate his or her collaboration. All these elements can lead to an increase in the time (and, consequently, an increase of the associated costs) needed to undertake a comprehensive study of the coins. Employees' turnover, particularly, is a major factor, as it deprives the project of experience and familiarity with the mechanisms associated with the management of materials in the daily operations. Provided that the conditions for substitution can still exist, and we should not proceed with one less resource in the work team, obviously, with a slowdown that at this point would become structural.

But above all, there was no assessment of the problems, and therefore once again of the timespan for their resolution, linked to the accuracy of the data. We cannot assume that reading a coin and entering its data into a database are completely error-free operations. We can introduce additional controls (at the price of an additional effort, and therefore of an additional slowdown), but the probability of error can only be reduced to a tolerable value, never to zero.

Besides, we must keep in mind that in several cases (a not-insignificant number) the study of a large monetary find cannot start from the direct observation of the coins, but is only based on previous studies, where similar errors may have profoundly affected the reliability of the data that we now want to re-examine. The case of Reka Devnja's hoard is once more exemplary. Marguerite Spoerri has pointed out how the texts that in the past have presented the coins of this hoard do not propose an exact correspondence between the description of the specimens and their reference to the volumes of the *Description historique des monnaies frappees sous l'Empire Romain* by Henry Cohen. There is therefore a great difficulty, if not a clear impossibility, in reconstructing the exact contents of the hoard, and consequently in using this data effectively to carry out a more in-depth study.

For the Medieval and Modern ages the situation is further complicated by a lower level of knowledge as compared to e.g. the Greek and Roman world. The classification of coins may be more complex due to the greater fragmentation of the monetary context, which translates into a wider heterogeneity of the coins usually present in the hoard. This may require the involvement of very specific skills, often difficult to find, especially concentrated in one single person. In several cases we are also forced to confront a very unsatisfactory bibliography, obsolete or of poor quality, where

[3] GARRAFFO, MAZZA 2015; http://www.tesorodimisurata.it (URL last visited on February 1st 2019).

primary issues such as the determination of the mint of a coin, its dating, when not its very name, cannot be unequivocally clarified.

The problems highlighted here are not restricted to the case of a single monetary hoard, however large, but can also be extended to the study of several finds in which the number of coins appears more manageable. A project aiming only at the minimal inventory of all the finds, like the *Inventory of Greek Coin Hoards* or those volumes of the *Medieval European Coinage* that have chosen to dedicate a specific chapter in the appendices to the monetary finds, must deal with a lot of complexities related to the volumes of data to be processed, their lack of accuracy, their dispersion in publications hard to come by, the obsolescence of the classifications proposed, particularly when not accompanied by illustrations.

Such a scenario may seem bleak and lead us to the conclusion that a complete and scrupulous study of a big hoard, as well as a large set of finds, cannot be considered anything but a chimera: unworkable because of the effort and the prohibitive costs, when not for the difficulty in finding the right skills that such an operation could require. In a context where such a considerable expense would hardly give an economic return, as happens for example in the private industry, where an expense (more precisely, an investment) is made with the aim of making a profit. In the study of a monetary find the costs would remain merely costs, they cannot be regarded as investments.

If we do not want to give up our goal, it becomes necessary to increase operational efficiency. We therefore need to develop methodologies to reduce effort and costs without compromising either data accuracy, nor the validity of the information that can be obtained from them.

Each hoard is unique, but the coins of which is composed are a serial product. And this is reflected in the common elements (i.e., repeated occurrences) not only inside a given hoard, but in different other finds. Going back to the example of Reka Devnja once more, we notice right away how many of the surviving specimens are showing identical characteristics of others. Exploiting repetitiveness to reduce redundancy represents the simplest way to minimize the time needed for the study. Why, for example, in a database should we repeat the entry of inscriptions, descriptions or other data for a given coin, when the same operation has already been performed for another coin completely identical to it?

But we can go further, taking the concept to the extreme up to give rise to a question that in some ways may seem paradoxical: why should we study the hoard as a whole when, because of the repetitiveness of the characteristics of the specimens present in it, we could focus on a subset of his coins only? Of course, the subset must have precise requirements. First, it must "small", so that it can be studied with adequate meticulousness in a reasonable amount of time. It must also be sufficiently "informative" to allow the researcher to extract from it all the considerations that could be derived from the study of the find in its entirety.

Today there are informatic, mathematical and above all methodological solutions (we remind here the concepts of *lean thinking* and *lean production*) which find an increasing application in the most disparate contexts, but not enough in the field of the Numismatics and Human Sciences in general, where the precepts of Digital Humanities are still struggling to find a great diffusion.[4]

In this paper we will try to examine the ways in which Statistics and Computer Science can meet the needs of Numismatics to improve the efficiency of the study of large coin finds without jeopardizing data accuracy and information that can be derived from them. The discussion will be conducted under an engineering perspective, therefore mainly oriented to contextualize tools and solutions made available by Statistics and Computer Science to the area of interest, with the aim of highlighting their potential and limits.

What presented here does not claim to be exhaustive. The discourse is extremely articulated: both Statistics and Computer Science are very vast subjects, with many facets, and their discussion in numismatic terms cannot in any way be contained in the few pages of an essay.

In presenting some concepts, particularly related to Statistics, we will have to implement considerable simplifications, to stress the most important points and offer formulas that can be applied immediately. Anyone wishing to engage in an in-depth examination of problems and theorems has a wide variety of publications at his disposal, in all the languages of the world.

In the section dedicated to Information Technology there will be no explicit reference to specific software. This is a deliberate operation, dictated by the awareness that Computer Science is evolving so rapidly that any indication in this sense would risk becoming meaningless long before any need for a new congress updating the discussions, the results obtained and therefore also the software proposed today. A technology or software that *today* appear to be essential for the development of any application in a specific context could result obsolete *tomorrow*. We therefore prefer to provide general but clear indications on the problems to be addressed rather than on the specific solutions that can be adopted today for their resolution, also in consideration of the fact that (obviously) only a full awareness of the problem can lead to an optimal solution.

[4] An overview of the relationship between Numismatics and Computer Science is provided in WIGG-WOLF 2009 and PETT 2015. The papers are proposing two pictures considerably different. If in the 2009 text the projects discussed mainly concern the implementation of relational databases, in the 2015 edition we can observe a wider diversification of research directions and a wider attention to the sharing of resources through the World Wide Web.

SO, LET'S TALK ABOUT STATISTICS…

Statistics applied to Numismatics is by no means a novelty. For decades we have observed its application in the study of coins, although in most cases with little awareness of its methodologies and its potential. The use of Statistics has mainly occurred in areas such as the search for the number of dies associated with a given issue, or the estimate of production volumes of a single die. We developed models and formulas that today are the basis of all the debates on the quantitative aspects of the monetary production of a mint, but the authors who actively contributed to their realization or their dispute were a very small fraction of the scholar numismatists, while most of the authors who were inclined to their adoption have opted for an uncritical utilization.

But Statistics has found an application – mostly unaware – even more extensive in all those situations in which graphs were drawn, averages were calculated, assessments were made on percentages or numbers of occurrences. All this, in fact, falls mainly in one of the branches of Statistics that goes under the name of *Descriptive Statistics*. Within Descriptive Statistics we can think grouped all the tools and methodologies for the analysis of a set of data aimed at obtaining new quantities that summarize the characteristics of a sample. If I have N coins, each weighing $n_1, n_2, \ldots\ n_N$ grams, when I calculate the arithmetic mean $(n_1 + n_2 + \ \ldots\ + \ n_n) \ / \ N$ I'm summarizing the characteristics of a set of N data in a single quantity, obtaining additional information. Likewise, if I sum up the weights of these coins into tables, for example counting how many of them weigh less than I_1 grams, how many between I_1 and I_2, how many between I_2 and I_3, etc ... I'm processing my data to get indicators that can give me a new summary of the N coins from which I started. The same happens if I count how many of these coins come from the mint Z_1, how many from the mint Z_2, ... Finally, if I decide to plot a graph with the weight distribution that I have previously summarized in a table, or a map showing the mints of origin, I am performing once more operations that fall within the field of Descriptive Statistics.

In the search for effective ways to study "big" monetary finds, the Descriptive Statistics shows relevant limits of use. Processing the data related to N number of coins implies that all these N coins have already been counted, measured, classified… It means that for all of them I have an ideally complete and accurate set of data. But it also means that the hoard has already been examined in its entirety, and therefore a potentially remarkable effort has been already spent on it.

More help can come from a different branch of Statistics, which goes under the name of *Statistical Inference*. It includes the processes of using data analysis to deduce the properties of a population starting from a reduced set of data extracted

from it. If I have a find consisting of N coins, where N is too high a figure to allow the study of the whole set of coins, I could think of extracting only $M \ll N$ coins and make my evaluations on this smaller set of specimens (much more manageable), and from it inferring the properties of the starting set of N coins using the methodologies made available by the Statistical Inference. The effort needed to classify and study M coins is obviously lower than that required to study N (much lower if, $M \ll N$). If from these coins we are able to understand properties that can be extended with a sufficient degree of reliability to the set of N coins from which we started, we get an undoubted advantage from the operation.[5]

To do this, we must ensure that precise conditions are met. Conditions that, however, hardly occur in the context of our interest.

The problem is very effectively summarized by this sentence by Warren W. Esty: *Unfortunately, hoard data are not the ideal "experimental" data treated in statistics texts. Numismatic analyses are often complicated by small sample sizes and non-randomness, which may invalidate statistical conclusions*.[6]

It is unlikely that a hoard can be considered as the result of random sampling of coins in circulation. The coins present in a hoard have not been chosen by lot as balls from an urn, but rather tend to be the result of a precise selection among those available, in turn a subset of those actually in circulation.[7] The fundamental criterion of randomness at the basis of the constitution of the restricted sample is therefore not satisfied, with the result that the considerations that can be inferred could be nothing more than misleading information.

The two limits presented by Esty to the use of hoards in the study of larger coin populations – samples too small, not randomly extracted – may be overcome if the hoard is not the sample taken from population, but rather in itself constitutes the population to be investigated. From this population-hoard of N coins it would be possible to extract a real random sample of M coins, and on this sample apply the methodologies of Statistical Inference to obtain the desired information on the characteristics of a starting data set.

Before proceeding any further with the operation that we have set out to accomplish, it is necessary to introduce a mathematical notation intended to facilitate the presentation of the concepts related to Statistics.

[5] From a certain point of view, in this approach we can recognize the same principle that leads the scholar numismatists to examine the finds – regardless of their numerical consistency – and based on them make considerations (sometimes risky) about the monetary circulation of a given area and/or in a given epoch, or the production volumes of a given mint.

[6] ESTY 2005, 173.

[7] Subset, however, influenced by external factors of different nature – geographic, economic, social – not easily identifiable, nor quantifiable.

Our hoard-population of N coins can be modeled as an array of N independent random variables $\mathcal{H}_N = (X_1, X_2, \ldots X_N)$. Each random variable X_i represents a single coin, or more generally an object belonging to the hoard, and is characterized by a series of specific *qualitative* (e.g., mint, depictions, inscriptions…) and *quantitative* (e.g., weight, axis orientation…) properties.

A sample of M coins randomly extracted from this population may in turn be modeled as an array of M independent random variables $\mathcal{H}'_M = (X'_1, X'_2, \ldots X'_M)$. Also in this case each random variable X'_i represents a coin, characterized by specific qualitative and quantitative properties similar to those observed in the hoard-population. In fact, $\mathcal{H}'_M$ is a subset of $\mathcal{H}_N$ ($\mathcal{H}'_M \subseteq \mathcal{H}_N$), and therefore X'_1 belongs to both $\mathcal{H}'_M$ and $\mathcal{H}_N$.

Assuming that the properties expressed by the coins in the sample $\mathcal{H}'_M$ correspond perfectly to those of the coins belonging to the hoard-population $\mathcal{H}_N$, I would be in a position to study the properties of the set $\mathcal{H}'_M$ and extend them to the set $\mathcal{H}_N$, thus succeeding in understanding the characteristics of the set of N coins simply by analyzing a group of $M \ll N$ coins of identical nature. In mathematical terms, this would be possible if the *probability distribution function* of the M random variables were identical for all the coins in the set $\mathcal{H}_N$ and in the set $\mathcal{H}'_M$.

But, of course, this is an assumption that does not appear to be verified in any real situation. Not all the coins in a hoard, in fact, have identical characteristics. Let's use the example of Reka Devnja hoard once more (N = 81.096 pieces) to evaluate the most immediate consequences of such a situation. More specifically, let's focus on the "types" represented in it by subdividing the coins according to the *Roman Imperial Coinage* (*RIC*). Each "type" will be characterized by properties in whole or in part different from any other "type" (for example, they may or may not share the same metal, the same iconography… but there will be at least one discordant element, the one that precisely leads the *RIC* to introduce two different reference numbers), while all coins belonging to the same "type" will have identical properties (see tables 1.a-b).

The most common type is represented by a *denarius* in the name of Julia Maesa *Augusta* (*RIC* 268), with 547 pieces. This is a number that is anything but small in absolute terms, but which represents only the 0.67 % of the coins in the hoard.

In the Reka Devnja hoard we can recognize over 3,300 distinct types. It means that each type is represented on average with approximately twenty copies. The ten most represented types contribute with just 3,913 specimens, equal to a modest 4.83% of the total. The assumption that it is possible to carry out a random sampling of $M \ll N$ specimens when such a small fraction is representative – even with approximations – of the N coins of the whole hoard looks totally implausible, be-

Table 1 – Most represented "types" in the Reka Devnja hoard (a) and occurrences of the same "type" (b) (*source*: http://chre.ashmus.ox.ac.uk/hoard/3406)

Authority	*Coin*	*Mint and date*	*Reference*	*Number of specimens*
Julia Maesa (*Augusta*)	Denarius	Rome (218/22 CE)	*RIC* 268	**547**
Faustina I (*Diva*)	Denarius	Rome (141 CE)	*RIC* 351a	**498**
Julia Mamaea (*Augusta*)	Denarius	Rome (225/35 CE)	*RIC* 343	**467**
Maximinus I Thrax (*Augustus*)	Denarius	Rome (235/6 CE)	*RIC* 14	**418**
Faustina I (*Diva*)	Denarius	Rome (141 CE)	*RIC* 344a	**390**
Marcus Aurelius (*Caesar*)	Denarius	Rome (145/60 CE)	*RIC* 429a	**338**
Julia Mamaea (*Augusta*)	Denarius	Rome (225/35 CE)	*RIC* 360	**319**
Julia Maesa (*Augusta*)	Denarius	Rome (218/22 CE)	*RIC* 271 or 272	**316**
Faustina II (*Augusta*)	Denarius	Rome (161/75 CE)	*RIC* 677	**311**
Faustina I (*Diva*)	Denarius	Rome (141 CE)	*RIC* 362	**309**
Julia Domna (*Augusta*)	Denarius	Rome (196/211 CE)	*RIC* 574	**300**

types with 200 to 299 specimens each	**28**
types with 100 to 199 specimens each	**146**
types with 10 to 99 specimens each	**1,322**
types with 2 to 9 specimens each	**1,156**
types with 1 specimens each	**689**

cause we would hardly give evidence to all the types represented by very few specimens, which make up the majority of the hoard.

The considerations would have been different if my hoard had been constituted by a much smaller number of types, in the order of few units, each represented with a sufficiently high number of specimens to be adequately present in my sample of $M \ll N$ specimens. But we know how the hoards tend to have a somewhat heterogeneous nature in terms of content, and a multiplicity of types what we should expect to find. We also know how often it is a single specimen out of N to provide the most important contribution for the dating of the complex, or for its precise characterization.

A sample of M coins therefore is unlikely to reflect the starting population constituted by our hoard of N coins if we consider how different the coins composing it can be: different nominals, different weighting standards, different typologies … This would require a proper mathematical model, but such a model may have a huge complexity, and cannot find a practical application unless introducing several simplifications. Otherwise the sample $\mathcal{H}'_M$ should be "very big" so that it is adequately representative of the starting population $\mathcal{H}_N$.

The idea of being able to work on a "small" fraction of the "big" hoard clashes with what just discussed, leading in the first instance to the conclusion that the concepts and methods of Statistical Inference cannot be used for our purpose. Such a statement is not entirely correct.

Thanks to the example of Reka Devnja we are now aware of the limits of application of these methods. An *exhaustive study of all the properties* of a hoard $\mathcal{H}_N$ of N specimens through a subset $\mathcal{H}'_M$ of $M \ll N$ random samples is not feasible due to the heterogeneous nature of the hoards: the variability of the types usually present in the finds is too wide to suppose that $\mathcal{H}'_M$ is characterized by the same properties of $\mathcal{H}_N$, and the probability that a single specimen that can radically change the interpretation of the hoard is not present in $\mathcal{H}'_M$ is too high.

If, however, the variability of occurrences of a *single characteristic*, or at most of a *reduced number of characteristics*, appears to be much smaller than what we observed in the Reka Devnja hoard, it becomes possible to carry out a statistical analysis on a small subset of specimens. Let's consider, for example, the metal a coin is made of, rather than its origin or not from a given mint. With the metal the situation is clear: a quick analysis of the color of the coin easily allows to discriminate between few categories (gold, high-quality silver, low-quality silver, copper / bronze). With mints, the number of options can increase considerably, but if we limit ourselves to the study of the most represented ones we can provide a rough estimate of the distribution of the mints inside the entire hoard. An estimate that, of course, will

always have margins of error, but that can still bring important information for example in case of a preliminary study of a hoard that cannot be managed in its entirety, to be carried out quickly and at reduced costs.

The application of the methods of Statistical Inference in the areas described above (although much reduced with respect to the initial goal) requires starting from a *model*. It is necessary to identify the correct probability distribution function, namely that mathematical function that best represents the probability with which the specific property we want to study shows up. The property modeling must precede any consideration that can generally be labeled as "statistics". It is an operation that has inevitable degrees of subjectivity, but that experience, common sense and precise evidence obtained from other areas can help to carry out successfully.

Qualitative properties (e.g., metal, mint of origin, denomination...), that is to say discrete quantities, can be efficiently modeled through a *multinomial distribution*:

$$f(x_1, \dots, x_m; n, p_1, \dots, p_m) = \mathrm{P}(X_1 = x_1, \ \dots, X_m = x_m) = \\ = \begin{cases} \dfrac{n!}{x_1! \dots x_m!} \cdot p_1^{x_1} \cdot \dots \cdot p_m^{x_m}, \text{when } \displaystyle\sum_{i=1}^{m} x_1 = n \\ 0, \text{otherwise} \end{cases}$$

where p_i expresses the probability that the i-th event between the possible m occurs. In the case of the mints mentioned above, it can be interpreted as the "probability that the coin extracted from the reduced sample of M specimens were minted by the mint i", where i may be Milan, Paris, Lyon… or any other relevant mint for that specific hoard.

With M "big" enough, the factorial term introduces significant complexities. In fact, its calculation requires computational tools far more powerful than a domestic personal computer, or at least the use of a normal approximation.

If the possible options are reduced to only two (e.g., "the coin belongs to the mint Z" and "the coin does NOT belong to the mint Z", $m = 1$) the previous formula is simplified and becomes what we call *binomial distribution*:

$$Bin(n,p)\colon\ f(k,n,p) = \binom{n}{k} p^k (1-p)^{n-k} \text{ for } k = 0,1,2, \dots, n$$

If it were also $n = 1$, i.e. one single occurrence examined at a time and no longer n at the same time, the binomial distribution is further simplified, and we have the so-called *Bernoulli distribution*:

$$Bernoulli(p)\colon\ f(k,p) = p^k (1-p)^{1-k} \text{ for } k \in \{0,1\}$$

Quantitative properties (e.g., weight, module), that is to say continuous quantities, can instead be modeled through a *normal distribution*:

$$N(\mu, \sigma^2): f(x) = \frac{1}{\sqrt{2\pi} \cdot \sigma} \cdot e^{-\left(\frac{x-\mu}{\sigma}\right)^2}$$

under the assumption, however, that all the M coins of the sample have homogeneous characteristics (e.g., coins all based on the same weight standard).

Alternative models, i.e. probability functions different from those proposed here, can naturally find a valid application in the study of monetary finds.[8] The choice of the models we wish to adopt cannot in any way ignore the specific properties that will be analyzed, and above all the consistency of the set of samples/coins that we intend to study. For example, we cannot think of using a normal distribution to model the representation of mints in a sample, whereas a multinomial distribution could be used for the study of quantitative properties if we group continuous measurements – expressible as a group of values potentially infinite – in a finite number of intervals (e.g., expressing the weight of the i-th coin as x_i, we can discretize the weight data by simply counting the number of samples that fall in one of the $K + 2$ intervals $x_i < h_o$, $h_0 \leq x_i < h_1$, …, $h_{K-1} \leq x_i < h_K$, $x_i \geq h_K$ in which I have chosen to divide the set of measured weights).

The adoption of a specific distribution function is not in itself sufficient to consider our operation of modeling complete. We need the parameters that appear in it (e.g., p_i for the multinomial distribution, μ and σ for the normal distribution) to be properly evaluated. And this is precisely what constitutes the most critical part of our research, since these parameters are unknown. Knowing exactly the values assumed by p_i in the distribution of the mints modeled by a multinomial distribution, for example, would mean knowing exactly the percentage of the N coins in my hoard minted by the i-th mint: I would have already carried out the complete study of the N coins of my find, and any use of Statistical Inference for my considerations at this point would be useless.

It is however possible to *estimate* these parameters using *estimators*, that is to say functions of the M random variables $X_1, X_2, \ldots X_M$ representing the M coins of the "small" sample that I want to study.

For our purposes we can simplify the discussion by subdividing the estimators into just two categories: *point estimators* and *interval estimators*. *Point estimators* allow to determine a single value that can be taken as "best estimate" of a parameter θ_i $(1 \leq i \leq k)$ associated with my probability distribution function. *Interval*

[8] Consider for example the uniform probability distribution for the axis orientation (see PARISOT-SILLON, SUSPÈNE, SARAH 2014 for an example of detailed statistical analysis on this aspect).

estimators lead to the determination of a range of "plausible" values for the parameter θ_i $(1 \leq i \leq k)$.

For each distribution function it is possible to define several different point and interval estimators, each with peculiar properties that can make it more indicated than others in some areas of application and not in others. There is no estimator capable of make a "perfect" estimate, i.e. an exact, error-free indication of the quantity that we aim to estimate. As functions of random variables, these estimators are themselves random variables, and therefore linked to a probability distribution function. This means that each estimate is in turn subject to a probability. When we obtain an estimate $\hat{\theta}_i$ of the parameter θ_i, this $\hat{\theta}_i$ does not necessarily represent the exact value of the parameter θ_i, but rather an evaluation that can be intended – depending on the different meanings and the nature of the estimator itself – as "the best possible" , "the most probable" or "sufficiently accurate". Which is the level of uncertainty behind these words, and therefore how "valid" this estimate will be, will depend on the chosen estimator and indirectly on some characteristics of the sample examined, first of all its size M.

It is not the purpose of this paper to examine in detail the properties of the estimators, nor to discuss the different options available for estimating the same parameter. It will be here sufficient to present some examples of punctual and interval estimators for the bernoullian, binomial and normal distributions that can be easily used by the scholars wishing to carry out a statistical study of a hoard or in general of objects that can be modeled by one of these probability distribution functions.

For simplicity, the proposed notation will reflect the one most widely used in literature, where n constitutes the size of the sample under investigation. For consistency with what has been discussed up to now, we must put $n = M$.

POINT ESTIMATORS

- bernoullian and binomial distribution

$$\hat{p} = \frac{1}{n}\sum_{i=1}^{n} X_i = \bar{X}_n$$

- normal distribution

$$\hat{\mu} = \frac{1}{n}\sum_{i=1}^{n} X_i = \bar{X}_n$$

$$\hat{\sigma}^2 = \frac{1}{n}\sum_{i=1}^{n} (X_i - \hat{\mu})^2 = \frac{1}{n}\sum_{i=1}^{n} (X_i - \bar{X}_n)^2$$

INTERVAL ESTIMATORS

To define such a type of estimators, it is always necessary to set a *confidence interval* r (e.g., $r = 0.05$), i.e. our interval of values such that the probability that the quantity we want to estimate falls within it is equal to $1 - r$ (with $r = 0.05$, this probability is equal to 95%).

- binomial distribution

$$p \sim \left[\bar{X}_n - z_{1-\frac{r}{2}} \cdot \sqrt{\frac{\bar{X}_n(1-\bar{X}_n)}{n}}; \bar{X}_n + z_{1-\frac{r}{2}} \cdot \sqrt{\frac{\bar{X}_n(1-\bar{X}_n)}{n}}\right]$$

under the assumptions that $\bar{X}_n$ and $1 - \bar{X}_n$ are not close either to 0 or to 1, $n(1 - \bar{X}_n) > 5$ and $n\bar{X}_n > 5$.

- normal distribution

$$\mu \sim \left[\bar{X}_n - t_{n-1,1-\frac{r}{2}} \cdot \frac{\boldsymbol{S}_n}{\sqrt{n}}; \bar{X}_n + t_{n-1,1-\frac{r}{2}} \cdot \frac{\boldsymbol{S}_n}{\sqrt{n}}\right]$$

$$\sigma^2 \sim \left[(n-1)\frac{\boldsymbol{S}_n^2}{v_{n-1,1-\frac{r}{2}}}; (n-1)\frac{\boldsymbol{S}_n^2}{v_{n-1,\frac{r}{2}}}\right]$$

where

$\bar{X}_n$ is the sample average over n samples

$$\bar{X}_n = \frac{1}{n}\sum_{i=1}^{n} X_i = \frac{1}{n}(X_1 + \cdots + X_n)$$

$\boldsymbol{S}_n^2$ is the sample variance over n samples

$$\boldsymbol{S}_n^2 = \frac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X}_n)^2$$

z_b is the b-th quantile of the normal distribution $N(0,1)$
$t_{a,b}$ is the b-th quantile of the t (Student) distribution with a degrees of freedom
$v_{a,b}$ is the b-th quantile of the χ^2 distribution with a degrees of freedom

For z_b, $t_{a,b}$ and $v_{a,b}$ there are tables that report the values in function of a, b, but there are also calculation tools easily accessible on the Internet or already implemented in the most popular spreadsheets.[9]

Some of these estimators may appear familiar. It is common in numismatic literature to come across estimations of the standard weight of a given coin issue starting from the sample average of the specimens observed in a hoard. The operation is pretty simple, but the associated inference is not necessarily correct, because it may not take into account the weight reduction due to the circulation, the selection of the heaviest pieces among those circulating for hoarding, and all those elements of uncertainty related to the process of minting (let's think about the concept of *remedium in pondere* and the control procedures on the weight of coins made by a mint before issuing a piece). Above all, in many cases there is a tendency to confer undue value on such an operation. By extending the concept, it would be like asserting that "since the sample average of the weights of a set of M coins is equal to μ grams, that specific type has been minted to a standard of μ grams": a totally arbitrary statement for a series of mathematical and numismatic considerations, which does not differ so much from some assertions that sometimes we find proposed in academic journals.

Other estimators, specifically those proposed for an interval estimate, may be a novelty in Numismatics. Reviewing the most important numismatic journals in the last twenty years, for example, I could not find relevant examples of interval estimation of a statistical quantity as part of the study of monetary finds.

To give an idea of the risks associated with the use of estimators, we can perform two simple estimations on a sample extracted from a population whose properties are no longer uncertain but known, and evaluate the differences between the starting point and the results obtained.

A simulation of a hoard of $N = 100{,}000$ coins has been made through a spreadsheet, assigning to each of them a mint of origin among five possible, here indicated for simplicity with the letters A, B, C, D and E (where E can also be seen as "the set of all the *other* mints", for example because they are poorly represented in the hoard to be treated with sufficient accuracy). Specifically, the simulated hoard consisted of 45,051 specimens of the mint A, 24,978 specimens of the mint B, 10,029 specimens of the mint C, 9,979 specimens of the mint D and the remaining 9,963 specimens of the mint E.

The random extraction of a sample of $M = 100$ coins[10] gave the following results:

[9] See the paragraph … *and now about Computer Science* for further details.

[10] The value of M has been chosen deliberately very small, just to give greater evidence of the risks that can be encountered when an estimate is made starting from a sample "too small" compared to N.

- $n_A = 41$ coins of the mint A
- $n_B = 23$ coins of the mint B
- $n_C = 14$ coins of the mint C
- $n_D = 12$ coins of the mint D
- $n_E = 10$ coins of the mint E

We choose to proceed by simplifying the complexities related to the estimators of a multinomial distribution, that is, evaluating each of the mints independently of the others, i.e. taking a reference mint and examining whether a given coin belongs or not to the mint in question. In other words, the presence of coins of the mint A is modeled through a binomial probability distribution function. In the case of the mint A, for example, the sample of $N = 100$ coins is split into two distinct groups: 41 coins belonging to the mint A, 59 coins NOT belonging to the mint A.

Repeating the same procedure for the other mints, we obtain an estimate of the composition of the hoard rather simple and intuitive,[11] equal to:

- $\hat{p}_{A,100} = n_A \,/\, M = 0.41$
- $\hat{p}_{B,100} = n_B \,/\, M = 0.23$
- $\hat{p}_{C,100} = n_C \,/\, M = 0.14$
- $\hat{p}_{D,100} = n_D \,/\, M = 0.12$
- $\hat{p}_{E,100} = n_E \,/\, M = 0.10$

By estimating the composition of the hoard of $N = 100{,}000$ specimens with a confidence interval of 95% (i.e., interval estimation with $r = 0.05$) we obtain:

- 41,000 ± 9,640 coins of the mint A
- 23,000 ± 8,248 coins of the mint B
- 14,000 ± 6,810 coins of the mint C
- 12,000 ± 6,369 coins of the mint D
- 10,000 ± 5,880 coins of the mint E

If we compare these results with the actual composition (known) of the hoard, we would be led to conclude that our estimation, despite the approximations we chose to adopt, was effective. However, if we evaluate the width of the confidence interval in relative and not absolute terms, we can appreciate with more clarity how wide it is, especially for the mints C, D and E, i.e. those represented by a smaller number of specimens:

[11] In the procedure just described, there are evident inaccuracies related to the implicit assumption of independence of the five causal variables. But the choice to operate in this way is once more intended, just to highlight the limits related to similar operations of estimation.

- 41,000 ± 23.5% coins of the mint A
- 23,000 ± 35.9% coins of the mint B
- 14,000 ± 48.6% coins of the mint C
- 12,000 ± 53.1% coins of the mint D
- 10,000 ± 58.8% coins of the mint E

The success of the estimation has had a cost given by a width of the interval of confidence so extensive (the wider, the smaller the representativeness of a mint) to make complex any evaluation of the result from a purely numismatic point of view.

With the second example we move away for a moment from the study of the great monetary finds to examine the risks associated with the estimation of the weight standards at the root of the issue of a specific coin. This is an operation that we frequently find in literature, in many cases conducted from specimens coming from finds. Based on what previously discussed, it presents several critical issues, primarily since the coins in a hoard are not necessarily the result of a random extraction from the circulating coins, but rather a selection of the "best" pieces to be hoarded.

We will work with the *ducatone* in the name of Vincenzo I Gonzaga (1587-1612) issued by the mint of Casale Monferrato (Piedmont, Italy). We know exactly its weight standard: 31.94 grams of theoretical weight, 0.25 grams of *remedium in pondere*. The documents confirm that these characteristics were never modified throughout the years of Vincenzo's government. We also know that the check of the exact correspondence to the weight standard before putting a coin into circulation was carried out on every single specimen: if a given coin was lighter than 31.94 – 0.25 grams or heavier than 31.94 + 0.25 grams, that coin was re-melted.[12]

Unless the (unavoidable) measurement errors made by the mint officers, we can assume that this control mechanism was sufficiently accurate to ensure that all the *ducatoni* put into circulation were within the desired range, i.e. that an erroneous issue of specimens of non-standard weight occurred with probability very close to zero. By adopting a model based on the normal distribution to describe the weight of *ducatoni* leaving the mint, it is intuitive to put $\mu = 31.94$ grams. Since in a normal distribution 99.7% of the events are in the interval given by $\mu \pm 3\sigma$, we can assume $3\sigma = 0.25$ grams (or, equivalently, $\sigma = 0.083$ grams).

We now perform four different random extractions from a set consisting of all the M *ducatoni* today known for which reliable weight data is available. The first time we extract 10 samples, the second 20, the third 50 and the fourth 100. The

[12] The author of this paper is conducting a specific research on this mint and has a large archive of documents and data about over 2,500 coins, including 110 *ducatoni* in the name of Vincenzo I Gonzaga.

calculation of the punctual and interval estimators for the expected weight tolerance leads to results that are summarized in table 2.

Number of samples	Sample average (grams)	Sample variance (grams^2)	Estimated weight (95% confidence)	Estimated tolerance (95% confidence)
10	**31.32**	**0.192893**	**31.00 / 31.63**	**0.09 / 0.64**
20	**30.94**	**1.778489**	**30.32 / 31.56**	**1.03 / 3.79**
50	**30.86**	**2.389776**	**30.42 / 31.30**	**1.67 / 3.71**
100	**30.75**	**2.757318**	**30.42 / 31.08**	**2.13 / 3.72**

Table 2 – Estimated weight standards of the *ducatoni* in the name of Vincenzo I Gonzaga

The estimates are quite unsatisfactory even as the number of specimens in the extracted sample increases: the weight estimate never returns an interval in which the theoretical value falls, while for the tolerance we obtain values so high that they do not provide significant indications.

In the search for a justification for these results we might think of the effects of wear due to circulation: once the coins were out of the mint, they would have been subjected to a progressive decrease in weight due their use, which could also have been noticeably different from coin to coin. This could explain the reasons behind the low estimate of the theoretical weight (every coin suffers from the effects of circulation, therefore its average weight decreases) and an interval for tolerance much wider than what is established by the *remedium in pondere* (the wear differs from coin to coin, thus potentially increasing the variability). But the deviations from the theoretical values appear too large, especially if we consider that the effects of wear must be estimated in the order of few hundredths of a gram even in the worst cases. We must rather attribute this situation to the heavy clipping suffered by a not negligible percentage of the known *ducatoni*, with reductions with respect to the theoretical weight sometimes close to eight grams.[13]

[13] Coin clipping of the *ducatoni* and extent of the reduction in weight are discussed in GIANAZZA 2017.

The clipping has introduced a very significant alteration in the distribution of the weights of the *ducatoni*. It is therefore not possible to look at all the known specimens as a potential "random sample" extracted from the population made up of all the N *ducatoni* issued in the name of Vincenzo I Gonzaga. The sample of M *ducatoni* known today can still be modeled with a normal distribution, but now characterized by parameters μ' and σ' different from μ and σ that characterize the weight standards of the *ducatone*, with $\mu' < \mu$ (due to clipping) and $\sigma' > \sigma$ (due to the weight reduction applied – if applied – in many different ways). Thus, it can have great deal of validity to estimate μ' and σ', but not μ and σ.

The examples just proposed deliberately represent extreme cases and have been chosen precisely because the estimates obtained could lead the scholar numismatists without a robust mathematical-statistical background to improper considerations.

Reducing the study of a hoard of N coins to a sample of $M \ll N$, from a certain point of view, can lead to a considerable gain in terms of time and costs. But from another point of view it introduces additional "costs" due to the "margin of error" of any estimation. The researchers who will have to choose whether to examine the hoard of N coins integrally rather than proceeding through a more limited evaluation of a subset of M samples will always have to keep in mind all the "cost" items, making his decision with a full awareness of all the possible pros and cons.

… AND NOW ABOUT COMPUTER SCIENCE

Statistical Inference leads to partial results, but still allows a first rough evaluation of some of the characteristics of my "big" hoard of N coins. Under the conditions of tolerating a margin of error, it gives a preliminary overview of its content starting from a small sample and – not negligible benefit – a precise quantification of the uncertainty due to the simplification introduced.

By contrast, Descriptive Statistics can be very useful in providing a summary description of the whole find, regardless of its actual size. Speaking of hundreds, thousands or even millions of specimens does not imply any difference about the methodology of the analysis that can be borrowed from Descriptive Statistics. What is essential is to have a complete and accurate set of data, in a format that allows an effective processing with the tools made available by Descriptive Statistics, able to produce a summary of the characteristics of my group of coins. This is diametrically opposed to what has been discussed so far: no longer a random sample of M specimens extracted from the "big" hoard of N coins, but the hoard of N coins as a whole, appropriately described, measured, illustrated.

Storing the whole set of data (including high-resolution photographs) that can be taken from a "big" hoard of N specimens is not a problem. Even considering N in the order of one million pieces, we would remain in the order of Gigabytes, completely manageable with economic storage systems.

The processing of this set of data can be performed with a domestic personal computer, relational databases or spreadsheets can handle all our requests without any problem. Furthermore, these tools usually include advanced statistical functions, such as the most important formulas of both Descriptive and Statistical Inference (e.g., quantiles relative to the normal, Student and chi-squared distributions mentioned above), together with grouping solutions, pivot tables, queries … that can support the researcher in the extraction of desired information without the need to write specific code or to use programming environments certainly more peculiar to Statistics (e.g., R language) but that can require advanced knowledge of coding. Many useful tools have freeware versions and offer what is necessary to carry out in-depth analysis of the "big" hoards at minimal costs.

Having at our disposal a complete set of data, in digital form and organized in a relational database or in a spreadsheet, also allow the use of tools offering an advanced graphic visualization of the data, mostly based on a *drag-and-drop* approach, which make it possible the extraction of desired information and provide an immediate representation on the screen.

We are talking specifically about *data analytics platforms*, developed mainly in the context of Business Intelligence, but which can be applied to datasets of any nature. These tools are basically made up of dynamic dashboards within which it is possible to arrange graphs, maps and tables (usually starting from predefined but highly customizable templates) capable of providing a compact view of the data set that we have chosen to connect, made available in the form of ODBC databases, OLE DB databases, local folders with "open" format files (e.g., CSV) or even web URLs.

We can also take into consideration the dozens and dozens of APIs, plug-ins and widgets available free of charge on the Internet that allow, in a similar way to what done by the data analytic platforms mentioned above, spatial representations and a dynamic processing – sometimes combining these two aspects together – of any data set.

In the world of Numismatics, we can already find examples in this sense, with projects that provide a map view of a data set or of a subset of it extracted through dynamic queries.[14] In all these cases, however, we return to the criticality discussed

[14] We can mention here the project *Coin Hoards of the Roman Empire* (http://chre.ashmus.ox.ac.uk/ – URL last visited on February 1st 2019) presented during this congress, but the panorama is much wider. For example, there are also open source solutions that combine the representation of simple or aggregated data on a map with a web framework based on R language.

at the beginning of this paper: the effort required to catalogue the coins of the find. Working efficiently in the creation of a data set in the appropriate format thus represents the core challenge to be faced in the study of any "big" hoard.

In the example of the digitization of the Reka Devnja hoard proposed at the beginning we assumed a time of acquisition of a single specimen of the order of 10 minutes. With a simple multiplication of this value by the number N of coins constituting the hoard it was possible to evaluate the total effort required to be able to get the data set in the desired format.

An effort expressed in terms of man-hour implicitly indicates the two main directions that can be followed for its reduction: decrease of the time required for each single entry, decrease of the costs associated to each human resource.

A minimization of the time for data entry without compromising completeness and accuracy can only go through an efficiency improvement of the related procedures. How this can be achieved cannot ignore the basic elements of *lean production*, and must therefore go through a reduction of everything that can cause an increase of the processing time of a single sample, from photographic digitization to cataloguing, to the overall management of the coin.

An example of how we can achieve such a goal in a rather economic way comes from the experience made by the author of this paper. An Arduino Uno board, a digital camera with integrated *tethered shooting features*, a weight sensor with an accuracy of one hundredth of a gram and a personal computer on which a *speech recognition system* was installed, were connected to each other. The camera had been mounted on a stand, facing downwards the surface of the weight sensor where the coin was located, in turn placed on a small cube of plexiglass to get rid of shadows.

The speech recognition system allowed to fill in the cells of a spreadsheet translating into text the characteristics of the coin that were said directly in the microphone integrated into the personal computer. Once the desired sentence was completed, a simple keystroke on the personal computer activated a specific macro, which in turn performed a measure of the weight of the coin on the weight sensor, activated the camera and paused, allowing the operator to change the side of the coin. A second keystroke resumed the macro with a new acquisition of the weight and a new camera shot. The two measures of the weight were compared, harmonized appropriately if necessary, and written in the desired cell of the spreadsheet. The two files containing the coin pictures were then renamed based on a unique identifying code created automatically starting from a specific cell of the spreadsheet and stored in a desired folder of the personal computer.

A check of the quality and correctness of the text in the spreadsheet did not highlight significant transcription errors. The speech recognition software used in this test has proven to be very reliable. Situations in which some specific terms (e.g.,

the name of the king "Berengar") were not initially recognized were resolved by adding the word to the vocabulary of the tool. Finally, to increase the accuracy of the weight measurement, a reset mechanism of the weigh sensor was introduced after every single photographic acquisition.

With this system it was possible to reduce the acquisition time of a coin in digital format in the order of two minutes: five times less than the estimate from which we started.

What proposed here is one possible scenario for optimizing the acquisition process. We can imagine several other situations that allow to achieve the same result. A collaborative approach to digitization can lead to an increase in the number of contributors without a corresponding increase in costs for human resources, especially if performed free of charge by volunteers. This is the case of the *Portable Antiquity Scheme* (*PAS*)[15] by the British Museum or of the *Coin Finds* portal developed by the author of this paper,[16] where it is possible to enter the data related to a find and modify or integrate the existing ones. A solution of this nature has clear limits as regards the reliability of the entered data and the intellectual honesty of the contributors, but at least in the case of the *PAS* all this is well compensated by the existence of a centralized structure that manages the contributions and which in turn actively contributes to the archive, albeit at the price of all the costs associated with the structure itself.

A further approach may consist in the reuse of data already available in a digital format, taking advantage of the fact that it is very common to find several specimens with the same characteristics inside a given hoard or already present in other finds. In such a situation, the corresponding records of the hypothetical digital archive of our hoard would contain a series of duplicated data (e.g., issuing authority, mint, inscriptions, descriptions, metal…). Therefore, the development of methodologies that allow to reuse these data, or more generally the data present in other digital archives, would go precisely in the desired direction of a reduction in the acquisition time.

We have seen during this conference an example of such an approach in the presentation of the *Coin Hoards of the Roman Empire* project by the University of Oxford, where the connection with the *Online Coins of the Roman Empire* (*OCRE*) portal[17] managed by the American Numismatic Society allows to fill the records related to the description of a specific coin of the hoard simply starting from the reference number to the *RIC*, thanks to specific APIs made available by *OCRE*

[15] https://finds.org.uk/ (URL last visited on February 1st 2019).
[16] https://www.sibrium.org/CoinFinds/ (URL last visited on February 1st 2019).
[17] http://numismatics.org/ocre/ (URL last visited on February 1st 2019).

itself.[18] Unfortunately, this valuable solution is limited to the field of Roman imperial coins only. For the Roman provincial coins, we can point out a project still managed by the University of Oxford[19] in which, nevertheless, only a part of the data is easily reusable (but not through APIs), while similar solutions regarding other types of coins are not available.

Digital archives like *OCRE*, useable in a simple way through APIs or that make their data available in an "open" format, are certainly very precious resources with a view to reducing the time required to build a complete data set related to a hoard. There are dozens of projects to digitize coins and other items of numismatic interest, but only in a minority of them the archives are accessible to the public. Even less numerous are those in which data are made available in a format that can be easily reused.

This means that, even with an open data portal, it may be necessary to convert them to the desired format. For the most part, we're talking of structured data, based on a *schema* in which each field has a precise meaning. This is the case, for example, of relational databases, where the meaning of the field (i.e., of the data contained in it) is defined by a schema and therefore by the position inside it. On a conceptual level, the migration of data from one database to another must go through an operation of re-mapping data from one schema to another considering the semantics associated with each of these schemas. On a practical level, such an operation may require the development of solutions to adapt the data to the new target schema, for example through specific decoders (parsers) for such models, but at the price of an additional effort.

If we work with non-relational databases, we would not have these needs. The concept of "schema" is replaced here by that of *key-value pairs* (*KVP*). We move from a solution where the meaning of a field is defined by a rigid schema (e.g., the text "Sciscia" will be identified as the "mint of origin of the coin" because in *that* database I decided *that* field, in *that* precise position, will have *that* meaning) to one where the semantic component is a part of the datum itself (e.g., mint:Sciscia).

Data available in an "open" format in the key-value pair format (implicitly present in JSON, RDF and XML formats) can be put into a non-relational, schemaless database without the need to develop a converter because the data will be stored simply as a collection of key-value pairs. This does not mean, however, a zeroing of the effort required for their use. The costs, now, would simply be moved further downstream, during the interrogation phase of the non-relational database (my concept of "mint of origin of the coin" may have been implemented with several keys – "mint", "atelier_monétaire", "zecca" – due to data coming from

[18] http://numismatics.org/ocre/apis (URL last visited on February 1st 2019).
[19] http://rpc.ashmus.ox.ac.uk/ (URL last visited on February 1st 2019).

heterogeneous sources), and may require to write complex queries, not based on SQL (e.g. query on JavaScript).

Any operation of re-use and integration of data should be as simple and quick as possible. In an ideal scenario we should be able to use the data contained in databases of different nature without any need for their pre-processing. This is what I would expect if I were to operate in a semantic web, where precisely the data are linked to one another and simply accessible through their Universal Resource Identifier (URI).[20] Portals such as *Nomisma*[21] by the American Numismatic Society and *Zenon*[22] by the Deutsches Archäologisches Institut are the best-known examples in the numismatic world.[23] These projects are implementing the concept of *ontology* created by sir Tim Berners-Lee[24] and later standardized by the World Wide Web Consortium (W3C).[25] The basic idea is to have a distributed environment in which published documents are associated with metadata that specify their semantic context in a format suitable not only for interrogation, but also for interpretation and – ideally – for their automatic processing.

A situation in which a question like "which are the hoards containing coins of Carausius?" can be put to a search engine in natural language is the best that could be expected from such a solution. But this is clearly possible just if the totality of data is available on the web in the desired format, on accessible and stable machines. A fascinating scenario, very seductive, but strongly influenced once more by the availability of these data (if they were available, we would not be here to question how to speed up the digitization…) and the instability of the World Wide Web in the medium and long term. We constantly must deal with the risks related to the fact that we do not have the full control of the servers storing the data of our interest. We cannot assume that they will be accessible in any moment, and that they will be forever: the possibility that a project ends and that the corresponding portal ceases to exist on the web is anything but negligible, especially if the maintenance of a given web space is linked to the availability of budget and/or of a specific person.

One of the prerequisites of the semantic web is the stability of the resources pointed by the URIs. A server migration from an http:// to an https:// protocol, for example, would require the adaptation of some URIs[26] and changes to the standard, raising at the same time the first serious doubts about the reliability of the semantic

[20] GRUBER, HEATH, MEADOWS, PETT, TOLLE, WIGG-WOLF 2014.
[21] http://nomisma.org/ (URL last visited on February 1st 2019).
[22] https://zenon.dainst.org/ (URL last visited on February 1st 2019).
[23] For a more extensive review, see PETT 2015.
[24] BERNERS-LEE, HENDLER, LASSILA 2001.
[25] https://www.w3.org/standards/semanticweb/ (URL last visited on February 1st 2019).
[26] This is what happened with the linked data published by the British Museum on its web portal.

web. But much more unfavorable situations can occur if a specific object pointed to by a URI is no longer available due to the termination of a project.

To all this we must add potentially critical aspects regarding the quality of the available data and the obsolescence of information systems. Entrusting to automatic processing systems the interpretation of inaccurate data can lead to the extraction of information which in turn is incorrect, and of no practical use. What should I expect from my search for hoards containing coins of Carausius if there are inaccurate attributions of coins to this usurper on the World Wide Web?

Today we have a somewhat paradoxical situation: we can read inscriptions on fragile 4,500-year-old terracotta tablets, but not magnetic or optical disks produced just three or four decades ago. And even when we can access these physical media, we may come across file formats that are no longer usable for a variety of reasons.[27]

The idea of storage systems able to resist unscathed from one generation to the next, is a pure utopia. Any software is designed with a life cycle, with precise development and maintenance plans, and like living creatures they are bound to have an end sooner or later. The hardware or software solutions we can choose to adopt today will not necessarily be usable tomorrow. Projects may end due to lack of funding, or because the main contributors decide to stop their participation. The risk of being at a certain point in the face of the impossibility of reading hard-earned data is therefore very concrete.

To have an example of what we should expect, it is sufficient to look back on what happened in a relatively recent past, leafing through the proceedings of the congress *Monete in rete* held in Bologna in 2003.[28] We will find several projects that have not had the announced developments, or that today are even closed. Some of the proposed software programs are no longer able to run on modern computers, or are no longer of interest. Of course, we will also find several references to the XML format, still widely used, but no traces of technologies that appear to be more

[27] The most famous example in this regard is given by the *BBC Domesday project*, consisting in the digitization of the Domesday Book made on its 900th anniversary. The digitization was carried out between 1984 and 1986, and the data stored on the LV-ROM accessible only through an Acorn BBC Master expanded with a SCSI controller and an additional coprocessor-controlled Philips VP415 "Domesday Player", a specially produced laserdisc player, which already in the early 90s of the 20th century was no longer in use. Consequently, it was not possible to access a set of data digitized data just a few years earlier, and it was necessary to spend a significant additional effort for data recovery and maintenance. After a few years the problem occurred again, as even the new support soon became obsolete. In the numismatic field we can also mention the case of the software *SAXA* by the Italian Ministry of Cultural Heritage, now no longer developed nor accessible by modern computers, with the result that the data of some public collections archived with this software in the 80s-90s of the last century are today unusable.

[28] GIOVETTI, LENZI 2004.

appealing today. Nothing different from what we should expect will happen in another fifteen years for some of the concepts expressed in this paper.

WRAP-UP

As we have just discussed, an exhaustive study of a "big" monetary hoard should preferably not be separated from the investigation of all its coins. Working on a sample of $M \ll N$ specimens with the approach suggested by Statistical Inference introduces relevant simplifications, but at the same time important margins of error that, due to the extremely heterogeneous nature of any monetary find, can deeply influence its interpretation. In situations where, usually, a single specimen changes the dating of the whole monetary complex, or where only a very small fraction of the coins has unedited characteristics, the methods offered by Statistical Inference are not sufficiently accurate to guarantee to be able to detect the cases of greatest interest. They can be used for a preliminary evaluation of the material, but only for macroscopic aspects, that is to say a high-level analysis where the inevitable uncertainties do not alter the interpretation of find.

Being able to deal in a reasonable time within a large amount of data, difficult to manage if we adopt the approach that is generally used for finds of more modest size, is the basis for any subsequent processing, even the most complex.

The "big" quantities involved must not be considered as the evidence that it is impossible to obtain the desired results. They simply remind us that the analysis of such large finds can no longer be conducted with traditional methods. Smart methodologies must be developed instead, to maximize the efficiency of material management, i.e. allowing to increase the amount of data made available in a digital format with the same amount of time spent.

Even if we operate in the most efficient way possible, we should always keep in mind that any study of a "big" hoard is a long-term project: with limited resources – both human and economic – a digitization project can take years, if not decades, to be completed. In doing this, we must always operate with the awareness that IT solutions and therefore archiving and digitalization evolve at the speed of light, towards paths that today may appear clearly set out, but that tomorrow are likely to result nothing more than dead ends. Speech recognition systems, solutions for the automatic weight acquisition, data retrieval APIs, linked databases … are just some of the examples of what can be used to improve productivity. Other solutions, or processes, can still be developed based on the specific needs of a specific research project. In such a scenario, we need to be far-sighted, always keeping the digitized data in a flexible, open and accessible format that can be reused in the future.

We are faced with a very complex situation, constantly changing towards very different and unpredictable directions. However, what is clear is the need for humanists to work in a different way, questioning their certainties and dealing with new technological skills that now can give them a fundamental support in the examination of hoards otherwise “too big to study”.

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REKA DEVNIA (BULGARIA): THE CHALLENGES OF CREATING A DIGITAL DATASET OF 80,000 COINS

Abstract

The hoard of Reka Devnia (Bulgaria) was found in 1929 on the site of ancient Marcianopolis. It comprised more than a 100,000 coins, mainly denarii, with some antoniniani and a minority of provincial silver. Issues range from Republican denarii of Mark Antony (32/31 BC) to antoniniani of Trajan Decius (AD 251). 81,096 coins were transferred to two Bulgarian museums and subsequently published by the Bulgarian numismatist N. A. Mouchmov.
A digital dataset, based on the publication of Mouchmov, has now been made available within the Coin Hoards of the Roman Empire project (http://chre.ashmus.ox.ac.uk/hoard/3406). It gives details of entries at type level, providing references to Cohen, used in the original publication, updated RIC references, and web links to online portals presenting standard typologies of republican, imperial or provincial coinages.
This paper will look at the challenges of such an enterprise, from providing updated references for coin types solely known from the brief descriptions given by Mouchmov, to providing links to online portals such as OCRE.

Keywords

Reka Devnia, Roman coin hoard, linked open data, digital dataset

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Reka Devnia is one of the largest hoards of Roman silver coins ever found whose content has been recorded in detail. As such, its value for statistical evaluation is immense and it is no surprise that this hoard has been extensively used in order to estimate relative coin production over time or investigating coin propaganda by looking at coins as a medium of mass communication[1].

Having an accurate digital dataset of a hoard that seems to be systematically included in any kind of statistical analysis of Roman imperial coinage became one of the priorities of the *Coin Hoards of the Roman Empire* (CHRE) project[2]. Based at the Ashmolean Museum in Oxford, our project aims to collect information about hoards of all coinages in use in the Roman Empire between approximately 30 BC and AD 400. It is co-directed by Prof. Chris Howgego and Prof. Andrew Wilson. Imperial coinage forms the main focus of the project, but Iron Age, Roman republican and provincial coins are also included. The data we collect will provide the foundations for a systematic Empire-wide study of hoarding and is intended to promote the integration of numismatic data into broader research on the Roman economy.

THE HOARD ITSELF

The hoard was found on 10 November 1929, in the village of Reka Devnia (current Devnia, in Bulgaria, ca. 20 km away from Varna) on the site of ancient Marcianopolis (Moesia Inferior). The discovery was completely accidental and attracted immediate attention. Two clay jars were extracted from the ground, in the back yard of a house. However, before the content of the hoard could be handed over to the authorities, some of it was dispersed among the local population and sold to collectors who apparently even came from abroad[3]. The remaining coins were consigned in three bags weighing 289 kg and sent to Varna. There, coins were split up in seven crates. Six of them were sent to the National Museum in Sofia and one stayed in the Museum in Varna. Subsequently, these coins were catalogued and published in 1934 by N. A. Mouchmov, the leading Bulgarian numismatist at that time[4].

Figures about the coins collected by the authorities, given in terms of weight and number of specimens, look relatively precise[5]:

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1 See for example Duncan-Jones 1994 or Noreña 2011.

2 http://chre.ashmus.ox.ac.uk/

3 Mouchmov 1934, p. 1.

4 Mouchmov 1934. In addition to the bibliography quoted here, see now as well Lazarenko 2014 (non vidi).

5 Mouchmov 1930, p. 49 and Mouchmov 1934, p. 6.

– The six crates sent to the museum in Sofia weighed 236 kg and contained 68,783 coins.
– The weight of the crate remaining in Varna approximated 50 kg and 12,261 coins were recorded. It should however be noted that the figure relating to the weight must be wrong, as every single coin would then weigh on average 4 g.

The total number of recorded coins amounts therefore to 81,044 specimens and, according to the figures given by Mouchmov, a weight of ca. 286 kg[6], although this last figure should be treated with caution considering that the weight given for the Varna lot is implausible.

The percentage of lost coins is rather more difficult to estimate, as quite different figures were given at different times:

– The first estimate states that 'approximatively a third of the find' was dispersed among the local population, which implies that 40,000 coins were lost[7].
– A second estimate gives a smaller figure, stating that 'more than 20,000 coins' were dispersed[8].

In any case, the original content of the hoard certainly amounted to more than 100,000 coins.

Chronologically, the hoard covers the period between Mark Antony (32/31 BC) and Trajan Decius, with a *terminus post quem* of AD 251. It has however been argued that the coins dating from the reign of Trajan Decius (3 antoniniani of Trajan Decius, AD 249-51, and one of Herennius Caesar, AD 250-1) could be intrusive and that a more accurate *terminus post quem* would be in the reign of Gordian III (AD 238-244). The reason for this is that coins of Philip the Arab seem to be entirely missing, and that the coins of Gordian III stop in AD 241, with specimens from the fourth issue[9].

All the coins are silver coins, mostly denarii (80,188 specimens), with only a relative small percentage of antoniniani (821 specimens), and an even smaller number of provincial silver issues (Lycian drachms, drachms from Caesarea in Cappadocia, Amisus, Arabia and Edessa: 58 specimens).

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6 This is obviously 3 kg less than the 289 kg mentioned as the total weight of coins originally sent to Varna, Mouchmov 1930, p. 49 (both quotes being on the same page).

7 Mouchmov 1930, p. 49

8 Mouchmov 1934, p. 1.

9 Metcalf 2002, pp. 148-149

FROM THE PAPER PUBLICATION TO ONLINE LINKED DATA

The creation of a digital dataset

N. A. Mouchmov's publication of the Reka Devnia hoard in 1934 was certainly exemplary at the time. The author gives a cursory list of all the coins arranged chronologically by persons and then by reverse inscriptions in alphabetical order, specifies for each entry how many specimens were given to either the museum in Sofia or the one in Varna and gives a bibliographical reference to the second edition of Henri Cohen's *Description historique des monnaies frappées sous l'Empire romain*[10], following *de facto* Cohen's classification. In case of deviations from a standard Cohen description, an explanatory note is given. Only very few coins are illustrated on five plates at the end of the publication.

The first task of anybody wanting to use this body of material for research purposes obviously consists of updating every coin description and converting the Cohen references to the standard modern publications of RIC for Roman imperial, RRC for Roman republican and RPC for Roman provincial coins.

The requirement for this was clearly seen by G. Depeyrot, who in 2004 published a new list of the Reka Devnia hoard with *ad hoc* updated references[11]. In parallel to this, W. E. Metcalf started assembling for his own research purposes information at coin level from more than 150 hoards of Roman denarii, including Reka Devnia and covering roughly the period between Nero and the mid-3rd century AD. This dataset was generously donated by Prof. Metcalf to the *Coin Hoards of the Roman Empire* project and enabled us to create a first digital version of the Reka Devnia hoard in our database. Working with W. E. Metcalf's dataset came with the further advantage that references for each coin type were not only given according to RIC, but included also citations of Cohen.

Once the data had been imported into our database, it was carefully checked against the original publication and any missing coin types inserted[12]. The result, presenting 3,353 type entries, can be seen online at http://chre.ashmus.ox.ac.uk/hoard/3406.

Just as in the original publication, we give a list of number of specimens per coin type. Our data is however presented in a different way, as coins are separated by pe-

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[10] Cohen 1880-92.

[11] Depeyrot 2004.

[12] The data was imported by Dr Jerome Mairat, Oxford, and the author of this contribution checked the entire dataset for accuracy and consistency. Katharina Huber, PhD candidate at the University of Vienna, has to be credited for inserting all the pre-Neronian references, as these were outside of W. E. Metcalf's original research focus.

riod, clearly differentiating republican, imperial and provincial issues. Furthermore, our list is organised by reign, person and then mint and denomination (Fig. 1). These two last types of information did not appear in the original publication, as they were not yet viewed as relevant in numismatic research at the time when Cohen published his classification. Introducing the concept of reign allows a clear distinction between for example coins of Titus Caesar, issued under Vespasian, and coins of Titus as Augustus. We also decided not to give any indication of the disposition of the coins. This level of detail would make more sense if somebody wanted to reconcile the list published by N. A. Mouchmov with the coins that can be securely attributed to Reka Devnia, either in the museum of Sofia or the one in Varna[13].

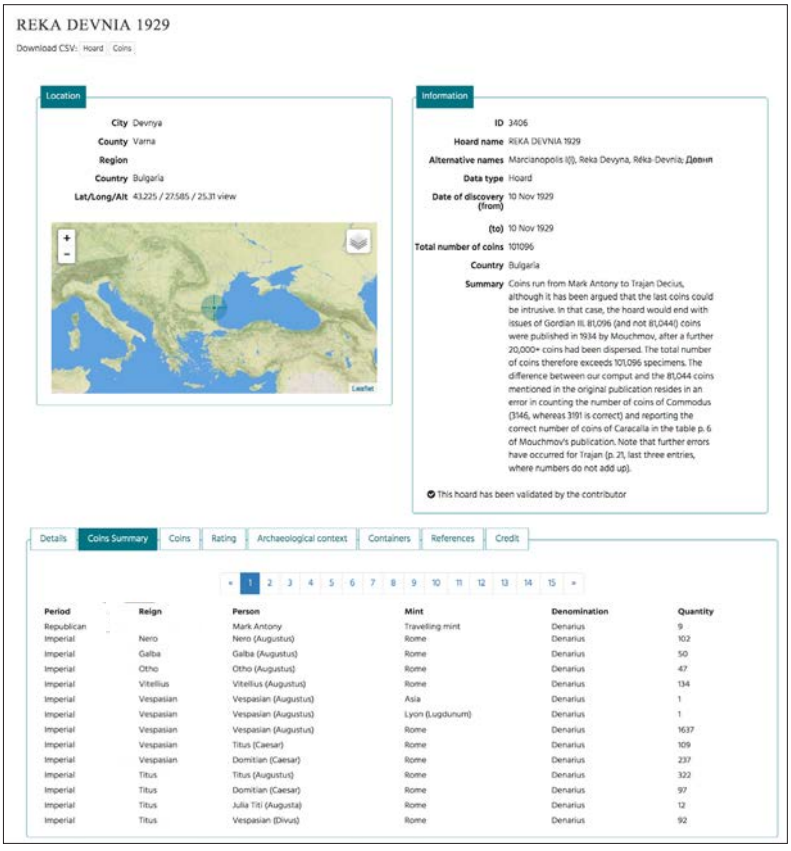

Figure 1 – Reka Devnia, Coins Summary view on http://chre.ashmus.ox.ac.uk/hoard/3406

[13] Thanks to information collected by Varbin Varbanov as part of his doctoral thesis, inventory numbers of coins belonging to Reka Devnia in the Museum in Varna are known, with 12,086 coins recorded. This number is only slightly lower than the 12,261 specimens recorded by N. A. Mouchmov.

The advantages of linked data

For each coin type, several bibliographical references are given including to Cohen, as this was the only way to establish a clear link between our list and the original publication which unfortunately did not have continuous numbering.

Beyond this, coin types are whenever possible also linked to online numismatic portals presenting standard coin typologies: CRRO (http://numismatics.org/crro/) based on M. Crawford's RRC publication for Roman republican coins, OCRE (http://numismatics.org/ocre/) based on RIC for Roman imperial coins and RPC online for provincial coinages (http://rpc.ashmus.ox.ac.uk). This enables us to be part of a world of online linked data, referring the user from one web site to another in order to access a larger range of information connected to his initial query.

Furthermore, OCRE and CRRO are digital corpora with downloadable catalogue entries, in which data is presented according to the principles of the semantic web with stable numismatic identifiers established by the Nomisma.org project. As data on these two portals is machine readable and can be reused by other projects, we have drawn on these resources in order to populate, through an automated and extremely fast process, several of our fields at the level of the coin type, namely date, obverse and reverse inscriptions, as well as obverse and reverse descriptions. This look-up facility allows us to easily present a full description of all coins at type level, ensuring at the same time a high level of data consistency.

THE CHALLENGES

None of the coins described by Mouchmov has been seen since their publication and only 84 specimens, collated on five plates, are illustrated. Our knowledge of the composition of this hoard relies therefore solely on the assumed accuracy of the original publication which has been digitised here[14].

Some inaccuracies pertaining to numbers were noticed. Thus, the total number of coins described, given by Mouchmov as 81,044, is in reality 81,096. The difference comes from an error in counting the coins of Commodus (3,146, whereas 3,191 is correct) and carrying forward the accurate number of coins of Caracalla[15]. Also, for Trajan, quantities of specimens in Sofia and Varna do not add up for three Cohen references[16]:

[14] For an example of a possible misidentification in Mouchmov's list, see Hellings – Spoerri 2016, pp. 63-64, about coins of Nerva (RIC II, 25-33).

[15] Mouchmov 1934, p. 117 counts 5,736 coins of Caracalla, but only 5,729 have been carried forward in the general table 'Liste des empereurs', p. 6.

[16] Mouchmov 1934, p. 21.

Cohen 154: Sofia 4 + Varna 0 = 3 coins

Cohen 156: Sofia 11 + Varna 2 = 17 coins

Cohen 188: Sofia 6 + Varna 1 = 4 coins.

Another challenge consisted of trying to give a precise RIC number to every coin type listed by Mouchmov. Establishing a one to one match between coin descriptions given according to Cohen numbers, including multiple variants not listed in Cohen's publication, and RIC numbers proved a tricky exercise, although admittedly this depends on the degree of accuracy one hopes to achieve. Obverse busts variants matter little if one is only interested in broad typologies of reverse types or number of coins per issuing person. A couple of examples should suffice the demonstrate this.

Three denarii of Vespasian are listed by Mouchmov with the Cohen number 361 (IMP CAESAR VESPAS AVG sa tête laurée à droite. Rs. PON MAX TR P COS V caducée ailé)[17]. This coin type is described in RIC II 1st edition, p. 22 under the number 74, with direct reference to Cohen, but did not receive an entry in RIC II 2nd edition, with the explanatory statement that RIC 74, i.e. Cohen 361, is 'unverified' and might be a 'plated hybrid'[18].

Six denarii of Lucius Verus are described by Mouchmov with a reference to Cohen 21 (IMP CAES L AVREL VERVS AVG sa tête nue à droite. Rs. CONCORD AVG TR P COS II, même type [la Concorde assise à gauche, tenant une patère; sous son siège, une corne d'abondance] de mauvaise fabrique)[19]. All six coins are actually variants of Cohen 21, reading on the obverse IMP L AVREL VERVS AVG. Furthermore, the first ones (4 specimens) have a 'tête nue' (bare head) as described by Cohen, but the fifth is described as 'buste nu' (bare-headed bust) and the sixth as 'buste drapé' (draped bust). This raises the delicate question of knowing what the difference between head and bust implies. Such subtle differentiation did certainly not find its way into RIC III, where the only obverse descriptions for a matching reverse type are 'head r., bare' (RIC III, 444, 446, 447) and 'bust r., laur., dr., cuir.' (RIC III, 445). Furthermore, none of these RIC types offers the required combination between obverse and reverse legends (IMP L AVREL VERVS AVG / CONCORD AVG TR P), as IMP L AVREL VERVS AVG is only listed with a reverse reading CONCORDIA AVG COS II (RIC III, 446).

The potential inability to provide a single RIC reference for each type entry highlights a further problem. Online type portals like CRRO or OCRE give a static typology of their respective coinages. Although taking advantage of the semantic web

[17] Mouchmov 1934, p. 10.

[18] RIC II², p. 363.

[19] Mouchmov 1934, p. 78.

enormously speeds up data entry, in neither of the cases described above have we decided to provide a link with OCRE, as an exact match does not exist. It also obliges us to follow the standard RIC classification, which is a problem for RIC volumes that are clearly outdated.

CONCLUSION

Digitising the 81,096 coins of Reka Devnia and creating 3,353 type entries, freely downloadable as a CSV file at http://chre.ashmus.ox.ac.uk/hoard/3406 was certainly worthwhile.

Starting this exercise with a digital dataset established by another scholar has certainly helped, even if the dataset was not complete and did not have all the information we wanted it to have.

Working in an environment of linked data and using open source downloadable information about coin types in order to supplement the information we already had has enabled us to present the whole dataset with adequate descriptions that would have been impossible to fill in by hand within a reasonable timeframe.

Working with such open source information therefore has obvious advantages. It comes with the downside that it can be rather more difficult to present the most up-to-date state of research in terms of classification, mint attribution or dating of issues.

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THE SAINT-GERMAIN-LÈS-ARPAJON HOARD (ESSONNE, FRANCE): JUST ANOTHER "BIG" RADIATE HOARD?

Abstract

The Saint-Germain-lès-Arpajon hoard, found in 2008 near Paris, is among the biggest Roman coin hoards. The two jars, successively found by workers and by archaeologists, contained nearly 34,000 copper alloy coins of the second half of the 3rd century AD. Although exceptional in size, the hoard belongs to a most common category of coin hoards. As its complete study is drawing to an end, this paper aims at discussing the methodology used and the challenges faced to complete such a long-term task. Is it really worth the effort, as several very big hoards of this kind have already been published? Every coin hoard has its interesting features and the Saint-Germain-lès-Arpajon is unique, as shown by its internal structure. Therefore, it deserves to be thoroughly studied and compared to other treasures for a better understanding of hoarding practices and coin circulation patterns.

Keywords

Coin Hoard, Roman Empire, Gaul, Radiates, Probus, Stratigraphy

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"BIG" RADIATE HOARDS

The Saint-Germain-lès-Arpajon hoard is both usual and extraordinary. Usual because it belongs to the most common category of coin hoards, those made of debased radiates of the second half of the 3rd century. Extraordinary because of its size: 33,965 coins weighing about 100 kg. Without doubt, Saint-Germain-lès-Arpajon is a big hoard. But what is a big hoard? This is of course a very subjective matter and the answer depends on various criteria such as size, intrinsic value, exceptional nature, etc. For instance, a few thousand silver denarii or copper alloy sestertii would form a big hoard whereas the same amount of debased radiates probably would not. In this paper, we arbitrarily chose to consider only hoards of debased radiates of more than 20,000 coins.[1]

This leaves us with a handful of hoards, all originating from Northern Gaul and Britain, where debased radiates and their copies ("barbarous radiates") were circulating massively. Major British hoards were published in the 1980's:[2] first the re-publication of an old find, the Blackmoor hoard (29,802 coins),[3] then the publication of more recent finds such as Cunetio (54,951 coins)[4] and Normanby (47,912 coins).[5] These publications are still reference works. Also very promising is the Frome hoard (52,503 coins), which has not yet been fully published.[6] In France too, massive radiate hoards have been found. The largest of all is the Évreux hoard, found in the late 19th century, which contained more than 100,000 coins.[7] Fortunately, the coins were not dispersed and about 70,000 were cleaned and sorted by emperor. More recently, the Pannecé II hoard (c. 38,000 coins) has been fully catalogued.[8] Despite sustained efforts to study these two hoards, detailed publications have not yet been completed. This shows how challenging dealing with such big hoards is.

As the study of the Saint-Germain-lès-Arpajon hoard is nearing completion, the "Too Big to Study" seminar provided a good opportunity to present the method used

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1 We will leave aside hoards such as Reka Devnia, Dorchester, Éauze, Gibraltar, Komin or La Venera. Although very large, these hoards mostly consist of coins with a higher silver content. Nor will we be dealing with enormous barbarous radiate hoards such as Troyes (see infra or supra).

2 The Irchester hoard, found in 1963 and consisting of c. 42,000 coins up to the reign of Probus, has not been published (see Robertson 2000, 180-1, no. 755).

3 Bland 1982.

4 Besly and Bland 1983.

5 Bland and Burnett 1988.

6 Moorhead et al. 2010 (see also infra or supra).

7 Teitgen et al. 1985.

8 Aubin et al. 2005.

to achieve this long-term work. Is it really worthwhile to study such big hoards? If so, how should it be done?

METHODOLOGY AND CHALLENGES

The circumstances of the find and the reporting time frame – immediate declaration is mandatory in France – have a major impact on the study process. Regarding chance finds, research depends on the civic-mindedness of the finder(s). Paradoxically, the bigger the hoard, the more likely it is to be declared as important discoveries can hardly go unnoticed. The way the Saint-Germain-lès-Arpajon hoard was processed from the moment it was found is a model of its kind. The initial discovery occurred in November 2008. While doing leveling work in the garden of a private house in Arpajon, about 30 km southeast of Paris, two workers hit a pot full of coins (called vessel 2 below). The coins spread out of the broken jar and were collected by the workers and stored in buckets. The find was immediately reported to the authorities. The site was subsequently excavated by archaeologists (Institut de recherches archéologiques preventives). This proved to be most useful as archaeologists found a second pot (called vessel 1 below), almost complete, a few centimeters away from the first one (figure 1). The pot and its contents were blocklifted. Excavation of

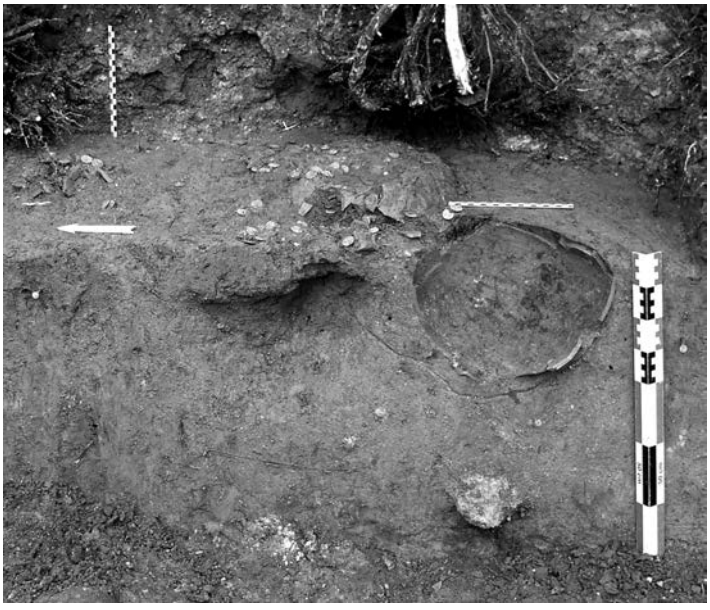

Figure 1 – The two jars right after the discovery

the surrounding area did not reveal any other archaeological remains, even though there was a Roman presence nearby at Arpajon, including a road connecting Paris to Orléans about one kilometer away from the findspot.

A coin hoard has a value but it also has a cost. The cost for studying a hoard (conservation, cataloging, publication, etc.) can even exceed its market value. The study of the Saint-Germain-lès-Arpajon hoard was supervised and supported by two parties, the Département des Monnaies, médailles et antiques de la Bibliothèque nationale de France which carried out conservation work and funded part of the cataloging work through the research program "Trouvailles monétaires", and the Service régional de l'archéologie d'Ile-de-France which managed a "Programme Collectif de Recherche" funded by the Direction régionale des affaires culturelles d'Ile-de-France.

The first work to be performed was dismantling the blocklifted vessel (vessel 1). It was carried out by Florence Moret-Auger using a method traditionally applied to funerary urns. More and more coin hoards are benefiting from such a technique.[9] Coins from the top half of the jar were removed and segregated using four vertical quarters and nine horizontal layers (figure 2). Coins from the bottom half of the jar were too corroded to be removed this way. Neither significant clusters nor organic remains suggested the presence of bags within the pot.

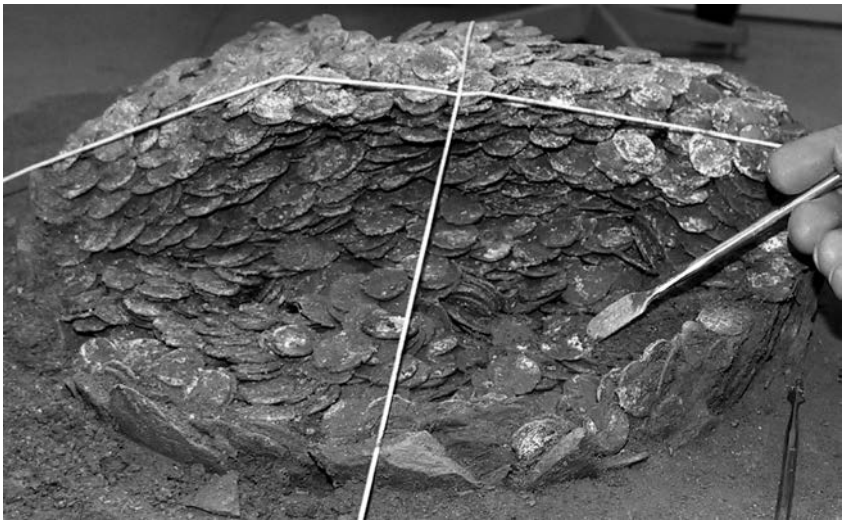

Figure 2 – Vessel 1 being excavated

[9] On internal excavation of Roman coin hoards, see Drost 2018.

As it went to conservation, the hoard took the following form: a large group of loose coins (vessel 2); a big cluster (lower part of vessel 1); 30+ bags singled out in the upper part of vessel 1; and various small groups of coins scattered around the vessels. Conservation work was carried out by Francine N'Diaye and Nathalie Lecerf at the Département des Monnaies, médailles et antiques de la BnF using both chemical and mechanical techniques. The main purpose of the conservation work was to make sure that the coins were in stable condition and to make them legible for study. In the end, nearly all the coins were perfectly identifiable, as less than a hundred, including fragments, could not be attributed to a specific reign. Advanced cleaning of each one of the c. 34,000 coins would not have been justified or needed, as most of the coins in the hoard are extremely common. Remarkable coins went back to conservation afterwards when needed.

The coins were catalogued over a couple of years as they came out of conservation. Cataloging 34,000 coins could hardly be done by a single individual; therefore the task was split among five persons (Vincent Drost, Dominique Hollard, Florence Moret-Auger, Fabien Pilon and Ludovic Trommenschlager). One of the challenges was dealing with multiple groups of coins. Taking internal stratigraphy into account complicates the job for both conservators and numismatists as the task is repetitive and is equivalent to processing a multitude of small hoards. To save time, and for the sake of clarity, the number of groups singled out in the catalogue was restricted to a minimum. Among the nine layers of the upper part of vessel 1, two consistent groups stood out: the seven upper layers on one side; the two lower layers on the other side, which had a similar profile as the cluster in the bottom of vessel 1. In the end, only three groups were singled out in the catalogue: lower part of vessel 1; upper part of vessel 1; vessel 2 as a whole. Once each author had produced his part of the catalogue, the data were brought together and converted onto the spreadsheet used by the BnF to record coin hoards according to the principles of open-linked data. Ten years after the find, a detailed and harmonized description of each coin in the hoard is available for further analysis.

The coins had to be handled one last time for photography. Since most of the coins were extremely common and in mediocre condition, it was neither necessary nor helpful to photograph all of them. Therefore, the decision was made to photograph a selection of representative types as well as coins of special interest.

A coin hoard is not all about the coins. The containers had to be analysed by a ceramologist. Véronique Pissot identified the two vessels as being regional products. Vessel 2 probably originated from a workshop in Paris whereas vessel 1 is similar to products from the "Carnutes area", west of Arpajon. A specialist still has to be found for the few small metallic objects present in vessel 2, which will not be further described here. A carpologist was not needed as fruits or seeds were not present in the vessels.

At this stage, all elements have been gathered for the complete publication of the hoard, which is planned as part of the *Trésors Monétaires* series edited by the Bibliothèque nationale de France. Since a long amount of time will have passed between the time of the find and the publication of this hoard, it is therefore important to let both the academic community and the general public know about its existence while its study and characterization are ongoing.[10]

OUTCOME AND PROSPECTS

General features of the Saint-Germain-lès-Arpajon hoard follow. The study is still in progress and, at this stage, we will be asking questions rather than giving answers. Table 1 shows the distribution by emperor and denomination. The earliest coins are a handful of silver denarii dating back to the 2nd and early 3rd centuries, including broken or plated specimens. Early radiates had been largely removed from circulation by the time of the accumulation of this hoard due to their relatively high silver content. Indeed, radiates prior to the sole reign of Gallienus (AD 260-268) do not exceed 1% of the total. 99% of the coins are debased radiates struck during the period of the so-called Gallic Empire (AD 260-274) by the legitimate emperors and the Gallic usurpers. This includes "barbarous radiates" that mostly copy the debased coinage of Victorinus and Tetricus (8% of the total). The hoard terminates with a handful of reformed radiates, known as *aureliani*, struck after Aurelian's reform in AD 274.

Table 1 – Overall structure of the Saint-Germain-lès-Arpajon hoard (figures are provisional; in tables 1, 2 and 3, barbarous radiates are included among the reigns their prototypes belong to)

Reign	Date	Denarii	Radiates	Aureliani	Total
Hadrian	117-138	1			1
Septimius Severus	193-211	1			1
Julia Domna		2			2
Caracalla	211-218	2			2
Elagabal	218-222	1			1

[10] Apart from the present paper, a preliminary report about this hoard was published in 2011 (Drost et al. 2011). The hoard was also displayed to the public on various events in France (Journées du patrimoine, Journées de l'archéologie, etc.).

Maximinus I	235-238	2			2
Philip I	244-249		3		3
Trajan Decius	249-251		1		1
Herennia Etruscilla			2		2
Trebonian Gallus	251-253		7		7
Volusian			6		6
Valeérian I	253-260		115		115
Gallienus			55		55
Mariniana			1		1
Salonina			118		118
Valerian II			7		7
Divus Valerian II			14		14
Saloninus			6		6
Gallienus	260-268	7	6,074		6,081
Salonina			477		477
Claudius II	268-270		4,666		4,666
Divus Claudius II	c. 270		1,456		1,456
Quintillus	270		361		361
Aurelian	270-275		99		99
Tacitus	275-276			2	2
Probus	276-282			13	13
Postumus	260-269		411		411
Laelian	269		3		3
Marius	269		45		45
Victorinus	269-271	1	4,357		4,358
Divus Victorinus	271		12		12
Tetricus I	271-274		10,607		10,607
Tetricus II			4,945		4,945
Illegible			85		85
Total		17	33,933	15	33,965

The latest coin in the hoard is an *aurelianus* struck in Lyon in late AD 281. Therefore, Saint-Germain-lès-Arpajon belongs to a large group of Gallic hoards terminating during the reign of Probus. It should be noted that the *terminus post quem* of the two containers differ by several years as the latest coins in vessel 2 date to AD 274. Had the archaeologists found only this vessel, and not both, the picture would have been misleading.

At first glance, the overall structure of the Saint-Germain-lès-Arpajon hoard is very similar to those of the other gigantic Gallic and British hoards of the second half of the 3rd century.[11] Indeed, the hoards in table 2 generally hold very few coins prior to 260 and consist of a majority of debased radiates struck by the last Gallic usurpers, Victorinus and Tetricus (AD 269-274). Thanks to the many extant studies of hoards of that period, patterns of coin production and circulation are becoming well-known, although some uncertainties still remain. As usual, such a big hoard inevitably brings to light previously unknown coin types. Among the rarities in the Saint-Germain-lès-Arpajon hoard are, for instance, unlisted variants for Gallienus and Claudius II, a very rare denarius of Victorinus or unusual barbarous radiates.[12] But the hoard did not reveal really outstanding specimens despite the great number of coins. It should be noted that the greatest rarities do not necessarily originate from very large hoards.[13] So, is it really worth studying one more big hoard of this kind? Is it not only too big but also too boring to study?

Table 2 – Comparative structure of the big Gallic and British hoards

				Central Empire		Gallic Empire				
	TPQ	Before 253 (%)	253-260 (%)	260-268 (%)	268-274 (%)	260-269 (%)	269-274 (%)	After 274 (%)	*Qty (legible)*	*Qty (total)*
Cunetio	274	1.9	19.3	26.5	4.5	26.3	21.3	–	*54,928*	*54,951*
Pannecé II (provisional)	274 (?)	0.01	0.5	14.7	12.8	1.3	70.6	–	*37,455*	*37,866*
Évreux	276-82	0.2	22.6		14.0	14.7	48.4	0.05	*68,206*	*100,000+*
Saint-Germain-lès-Arpajon	281	0.08	0.9	19.4	19.4	1.4	58.8	0.04	*33,880*	*33,965*
Normanby	289	0.002	0.2	13.7	15.0	1.5	69.4	0.2	*47,912*	*47,912*
Frome (provisional)	290	–	0.1	14.8	16.5	0.7	63.9	3.9	*43,931*	*52,503*
Blackmoor (1877 inventory)	295-6	0.02	12.9		15.4	1.3	65.4	4.9	*29,786*	*29,802*

[11] Many parallels could also be found among smaller hoards.

[12] For an example of unusual barbarous radiates, see Drost 2017.

[13] A good example of this is that the two known specimens in the name of Domitian II, a short-lived Gallic usurper, originate from medium-sized hoards: the Les Cléons hoard had 1,456 coins (Estiot and Salaün 2004) and the Chalgrove II hoard had 4,957 (Abdy 2004).

Table 3 – Distribution by broad period within the three distinctive groups

	Vessel 1 (lower part)	Vessel 1 (upper part)	Vessel 2
Before 260	2.8%	0.5%	0.3%
260-274 (Central Empire)	75.6%	30.4%	23.1%
260-274 (Gallic Empire)	21.0%	68.9%	76.3%
After 274	0.2%	–	–
Illegible	0.5%	0.1%	0.2%
Quantity	*8,527*	*11,007*	*14,431*

If we look into more details, it appears that at least some of these hoards have specific features. For instance, Cunetio includes an important proportion of silvered radiates struck during the joint reign of Valerian and Gallienus (AD 253-260) and under Postumus (AD 260-269). Similarly, a substantial portion of the Évreux hoard consists of coins of Postumus. Such a peculiarity is likely due to the addition of selected groups of coins to the overall hoard. This is difficult to prove regarding Cunetio as the contents of its two vessels were mixed prior to study.[14] On the other hand, the presence of a cluster almost exclusively holding coins of Postumus has been highlighted in the Évreux hoard.[15] This shows the importance of taking the internal stratigraphy of hoards into account. Analyzing hoards, especially large ones, this way offers new perspectives to hoard analysis.

Here, the internal excavation of vessel 1 proved to be meaningful. It clearly showed that the jar was filled with two different groups of coins (see table 3). The upper part of vessel 1 has a profile similar to that of vessel 2, containing very few coins issued before 260, about three-quarters of radiates and barbarous radiates of the Gallic emperors and no post-reform radiates struck from 274 onwards. The share of the Central Empire is a little higher in the upper part of vessel 1 as compared to vessel 2. This could possibly be the result of pollution from the lower part as the boundary between the two parts is not well defined. On the other hand, in the lower part of vessel 1, the proportions of coins of the Central and Gallic Empires are reversed. Coins in the name of the legitimate emperors amount to three-quarters of the total. The lower part also includes most of the better denarii and radiates struck before 260 and all the later *aureliani* struck after 274. The

[14] Besly and Bland 1983, 14-5 and 18. Evidence suggests the presence of separate groups of coins though.

[15] Teitgen et al. 1985, 57-8.

lower part of vessel 1 also holds less barbarous radiates than the other portions of the hoard.[16]

The Saint-Germain-lès-Arpajon hoard is therefore a two-in-one hoard. Coins that were placed in the bottom of vessel 1 were apparently selected – at least partly – according to their relatively high silver content. This group could be seen as a "savings hoard". Hoarding might have started as soon as the early 260's and ended with the addition of a handful of reformed radiates in the late 270's/early 280's. On the other hand, the debased coins placed on top of vessel 1 and in vessel 2 would have been gathered in the 270's and rather belong to the "emergency hoards" category.

Regarding the deposition, we can postulate the following scenario. First, the two vessels were probably placed empty into the ground, as they were not physically strong enough to hold tens of kilograms of coins unsupported. The top of each vessel was probably cut off to make the filling easier. The coins were apparently poured directly into the vessels, as there was no evidence of subcontainers or bags. Vessel 1 was filled half-way with a group of relatively good quality coins. It was then filled the rest of the way with a group of more debased coins. Finally, the rest of this group of coins was then most likely poured into vessel 2. The Saint-Germain-lès-Arpajon hoard was probably intended as a long term deposit as it would have been difficult to recover the coins loosely placed into the pots. The fact that it is made up of two different groups of coins shows how hazardous it is to compare big hoards without paying attention to their internal structure. Each hoard is unique and tells us in its own way about hoarding practices.

The reasons why these massive but low value hoards were deposited and not recovered have been much debated. No absolute answer seems to emerge.[17] Are these hoards the consequence of the "barbarous invasions" or, more generally, political and military troubles?[18] Are they related to the imperial monetary policy?[19] Or could some of them be considered as ritual deposits?[20] In order to answer these questions,

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[16] The share of copies in the three distinctive groups are the following: vessel 1, lower part: 4.2%; vessel 1, upper part: 8.9%; vessel 2: 11.4%.

[17] For recent summaries of explanations for the numerous coin hoards buried in the second half of the 3rd century, see van Heesch 2017, 399-400 and Bland 2018, 61-2.

[18] The "invasions theory", such as expressed by Blanchet 1900, has been very popular among scholars but has been quite unanimously rejected over the past decades. However, van Heesch 2017 convincingly argues that it should not be systematically denied, at least for some specific periods.

[19] Mattingly and Pearce 1937-9, 188 suggest that debased radiates could have been put aside because of an unfavourable exchange rate with the *aurelianus*. In the same vein, Estiot et al. 1993, 43 demonstrate that the removal of the coinage of the Gallic emperors became effective from AD 282, shortly after the Saint-Germain-lès-Arpajon hoard terminates.

[20] Aitchison 1988. More recently, Moorhead et al. 2010, 36 suggested that the Frome hoard might be a ritual deposit.

it is necessary to study these hoards in a serial way based on thorough studies of individual hoards. Our understanding of this kind of deposit is still very deficient and we cannot afford to skip studying big hoards such as Saint-Germain-lès-Arpajon, no matter how long they take to study.

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IL TESORO DI MISURATA (LIBIA). UN BANCO DI PROVA PER LO STUDIO DI RINVENIMENTI MONETALI DI GRANDI DIMENSIONI

Abstract

The coin treasure discovered in 1981 not far from the city of Misurata (Libia) is a major hoard of folles (108.000 bronze coins with silvered surface) minted between 294 and 333 AD. This paper deals with the research project of this treasure, devoted to study the coins in detail, with the support of a new informative system. Main goal of this system is to store and to handle both historical and material data of coins obtained by means of a set of portable analytical instruments.

We discuss also provisional results of the research. Until now, we have been able to report all the series of the treasure, to catalogue with the informative system about 83.000 items, to detect many unpublished coins, and last but not least, to analyze a relevant number of coins belonging to each series, in order to trace the progress of the composition and to identify the manufacturing and minting techniques.

The research model we follow, with a good cost/benefit balance, is suitable to other projects if sufficient economical resources and qualified personnel will be at disposal.

Keywords

Coin Hoards; DPAA; Folles; Informative Systems; Misurata; NAA Non-destructive analysis; PIXE-alpha Portable Spectrometers; XRF.

Il Tesoro di Misurata (Libia) è uno dei più importanti ritrovamenti di monete tardo-romane in bronzo arricchito di argento effettuati nel secolo scorso. Scoperto casualmente nel Febbraio del 1981 (Fig. 1), ha restituito oltre 108.000 *folles*[1] battuti tra il 294 e il 333 (Figg. 2-3): è conservato presso la Soprintendenza di Leptis Magna (Lebda, El Khoms).

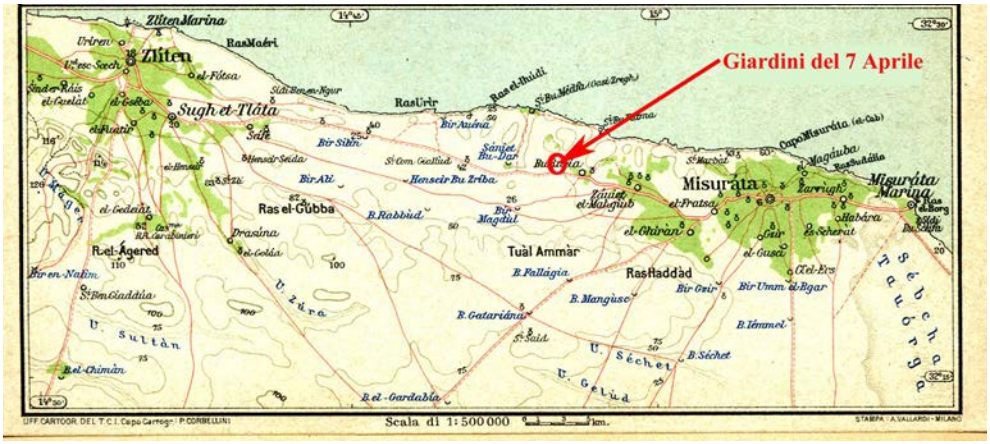

Figura 1 – Carta stradale Zliten-Misurata Marina (da G. Bognetti, *Guida d'Italia del Touring Club Italiano. Possedimenti e colonie: isole egee, Tripolitania, Cirenaica, Eritrea, Somalia*, Milano 1929)

Figura 2 – Un gruppo di *folles* nelle condizioni di rinvenimento

Figura 3 – Un gruppo di *folles* dopo il restauro (coord. Sig. C. Trovato, UniCatania)

[1] Non è possibile precisare l'esatto numero delle monete ritrovate in quanto alcune centinaia di esse furono date nella qualità di premio di ritrovamento.Le monete conservate presso la Soprintendenza di Leptis Magna sono poco più di 108.000: il conteggio sarà ultimato e validato alla fine della catalogazione.

Figura 4
Copertina degli Atti del Congresso sul Tesoro di Misurata svoltosi a Roma nell' Aprile del 2012

La storia, la descrizione e l'interpretazione del ritrovamento sono state ampiamente discusse nel volume degli Atti del Congresso Internazionale svoltosi a Roma nel 2012 e pubblicato nel 2015[2] (Fig. 4).

Nella presente occasione riteniamo opportuno portare alla Vostra attenzione l'approccio progettuale da noi seguito per lo studio di questo Tesoro, ricordandone brevemente i risultati ottenuti, anche allo scopo di rispondere alla legittima domanda che similmente si pone per altri rilevanti rinvenimenti: sono giustificati il restauro e lo studio di un grande Tesoro quale quello di Misurata in una ottica costi/benefici scientifici?

Quando, nella primavera del 1981, il Dipartimento alle Antichità della allora Repubblica Araba Libica Popolare e Socialista mi affidò lo studio del rinvenimento, gli obbiettivi dell'incarico furono limitati ad un esame speditivo delle monete nello stato di ritrovamento, con la previsione del restauro di qualche migliaio di esemplari

[2] S. Garraffo, M. Mazza (a cura di), *Il Tesoro di Misurata (Libia). Produzione e circolazione monetaria nell'età di Costantino il Grande*. Atti del Convegno Internazionale di Studi, Roma, Istituto Nazionale di Studi Romani, 19-20 aprile 2012, Roma-Catania 2015 (successivamente citato come *Tesoro di Misurata*).

scelti a campione, al fine di tracciare un quadro di massima della composizione del Tesoro e di definirne i limiti cronologici.

A causa delle limitate risorse finanziarie e umane a disposizione e, non in ultimo, di alcune crisi internazionali che riguardarono direttamente la Libia tra il 1985 e il 1986, il lavoro procedette a rilento: ciononostante, agli inizi degli anni 90, fu possibile tracciare un quadro provvisorio della composizione e della cronologia del Tesoro, e presentare analiticamente il contenuto di due olle rinvenute integre contenenti quasi esclusivamente i *folles* più antichi, databili dal 294 sino alla riforma di Massenzio del 307, per un totale di circa 4000 esemplari.

D'altro lato, l'esame a campione delle monete più tarde indicava come *terminus ante quem* per la loro datazione la fine del 333, per l'assenza di monetato di Costante[3].

Già a seguito dell'esame speditivo, si accertò che il Tesoro, la cui importanza per la storia della circolazione monetaria in Tripolitania tra Diocleziano e Costantino, sia per le dimensioni, che per l'unicità della sua testimonianza per il periodo in questione, era incontrovertibile, presentava anche un altro aspetto singolare – forse ancora più importante – relativo alla sua composizione: i *folles* più antichi erano presenti in misura percentualmente molto più elevata rispetto a quella degli esemplari più recenti.

D'altra parte, non sembrava possibile rinunciare all'occasione che ci veniva offerta per lo studio del complesso delle emissioni in *Aes* arricchito di argento di età tetrarchica e costantiniana dal punto di vista composizionale e tecnologico. Certamente, nel Tesoro di Misurata, nonostante l'enorme quantità di monete presente, non potevano essere rappresentate tutte le emissioni di *Aes* battute nell'arco del quarantennio 294-333: tuttavia, già la prima ricognizione dimostrò che molte di queste, in particolare quelle più comuni, erano documentate da centinaia, e in qualche caso, migliaia di esemplari, una circostanza cioè ottimale per un valido approccio statisticamente significativo per uno studio archeometrico. La possibilità di effettuare un gran numero di analisi su un numero elevato di materiali conservati nello stesso luogo, con un unico set di strumentazione portatile non distruttiva adoperata dallo stesso team di ricercatori, era irrinunciabile: difatti, i dati composizionali ottenuti a seguito di analisi effettuate da differenti team di ricerca, operanti in luoghi diversi con strumentazioni e/o tecniche differenti, non sono tra loro confrontabili se non con larga approssimazione.

Il complesso delle caratteristiche pressoché 'uniche' del Tesoro ci convinse della appetibilità di un suo studio approfondito. Venimmo pertanto nella determinazione

[3] S. Garraffo, *Notes on coin production, use and circulation in Tripolitania and Crete in late Roman and early Byzantine times*, in C. King, D. G. Wigg (Eds), *Coin finds and coin use in the Roman world. The Thirteenth Oxford Symposium on Coinage and Monetary History*, 25-27.3.1993 (*SFMA* 10), Berlin 1996, 179 sgg.

di mettere insieme una squadra, opportunamente dimensionata, di ricercatori e tecnici per il restauro e lo studio integrale del Tesoro: il presupposto era, ovviamente, la possibilità di ottenere i finanziamenti e il personale di ricerca per tale progetto, in una prospettiva non certo di breve termine. Siffatta *conditio sine qua non* si presentò verso la metà degli anni '90, grazie soprattutto al Consiglio Nazionale delle Ricerche, e precisamente il finanziamento dell'impresa nel seno del Progetto Finalizzato Beni Culturali e la disponibilità dell'Istituto per le Tecnologie Applicate ai Beni Culturali (ITABC) ad assumere la direzione scientifica delle operazioni relative al restauro e allo studio. Sono entrati a far parte della squadra di ricerca, oltre all'ITABC, le Università di Catania e Palermo, l'Istituto per i Beni Archeologici e Monumentali del CNR, i Laboratori del Sud dell'Istituto Nazionale di Fisica Nucleare, e, in progresso di tempo, l'Università di Genova, il British Museum e l'Università di Parigi I Panthéon-Sorbonne. Il Dipartimento per le Antichità di Tripoli ha curato il coordinamento delle attività della Missione, il rilascio dei visti e i premessi per le operazioni di restauro e studio. Oltre che dal CNR, il finanziamento è stato assicurato dal MIUR (ex 40% e FIRB) e dalla UE, mediante progetti di ricerca specifici relativi a singole attività del Progetto.

Il progetto scientifico relativo al Tesoro di Misurata, diretto da chi vi parla, è stato caratterizzato, in modo innovativo, dalla metodologia interdisciplinare che il Progetto Finalizzato Beni Culturali del CNR portò avanti negli anni 1996-2000[4].

I principali risultati attesi erano:

– Restauro del Tesoro (ITABC-CNR, IBAM-CNR, Università di Catania);

– Progettazione e realizzazione di un sistema informativo per la catalogazione e la gestione dei dati storici e composizionali delle monete (IBAM);

– Catalogazione di dettaglio delle monete; documentazione 2D di un numero statisticamente significativo di esemplari; rilievo 3D a campione (ITABC, IBAM, Università di Catania);

– Analisi non distruttiva di almeno 2000/3000 esemplari per stabilire l'andamento del contenuto in argento e per la ricostruzione della tecnologia di fabbricazione delle monete, in particolare per l'arricchimento superficiale in Ag (ITABC, IBAM, LNS-INFN, British Museum, Università di Genova);

– Inquadramento storico del Tesoro nel contesto della circolazione monetaria in Tripolitania in età tardo antica (ITABC, IBAM, Università di Catania, Università Paris I-Panthéon-Sorbonne).

[4] Vedi https://www.beniculturali.it/mibac/multimedia/UfficioStudi/documents/1259271979470_SP_50_1.pdf.

I risultati attesi c.d. secondari della ricerca concernevano:

– Sistemi di codifica per ordinamento di dati, software applicativo, banche dati;
– Progettazione, realizzazione e validazione di nuova strumentazione portatile per analisi non distruttive di metalli e monete;
– Definizione e validazione di protocolli di analisi non distruttive.

Alla data attuale (maggio 2018) i risultati conseguiti sono i seguenti:

– Restauro integrale del Tesoro: trattati oltre 107.000 *folles* (circa un migliaio leggibili lasciati come testimone della loro condizione originale);
– Realizzazione e implementazione di un sistema informativo *ad hoc* (IBAM: dr. A. Nicolosi);
– Catalogazione di dettaglio di 86.000 f*olles* (83.200 con la procedura informatica);
– Definizione e validazione presso LNS-INFN di un protocollo di analisi non distruttive con tecniche PIXE-*alfa*, XRF e Microfascio X, DPAA (*Deep Proton Activation Analysis*) per ottenere:
  1) Caratterizzazione dello strato superficiale (alcuni micron) arricchito in Ag;
  2) Caratterizzazione del substratum (ca 30-40 micron) appena sotto la superficie;
  3) Contenuto totale in Ag.
– Effettuazione di ca. 2000 analisi non distruttive in situ (LNS-INFN: coord. Prof. G. Pappalardo);
– Identificazione delle tecniche di arricchimento in Ag dei *folles* (INFN-LNS – Dip. Chimica Univ. Catania -prof. E. Ciliberto) e relativa sperimentazione);
– Pubblicazioni scientifiche generali e di dettaglio sul Tesoro.

Per quanto sopra, possono essere consultate le relazioni contenute negli Atti del Convegno del 2012 [2015] con le relative bibliografie relative (*Tesoro di Misurata*), oltre a quelle edite in Riviste specializzate (v. sotto); per la parte storica vedi anche gli approfondimenti pubblicati nel 2016[5].

[5] S. Garraffo, *Sull'atipicità del Tesoro di Misurata*, in M. Asolati *et alii* (a cura di), Suadente nummo vetere. *Studi in onore di Giovanni Gorini*, Padova 2016, 287-300; Id., *IMP ALEXANDER PF AVG / VBIQUE VICTOR e il problema dei rapporti con Costantino il Grande*, in L. Sole, S. Tusa (a cura di), *Nomismata. Studi di numismatica antica offerti ad Aldina Cutroni Tusa per il suo novantatreesimo compleanno*, Ragusa 2016, 296-313.

PERIODI TESORO DI MISURATA
I: 294-307; II: 307-313; III: 313-318; IV: 318-324; V: 324-330; VI: 330-333
(*Suadente Nummo Vetere*, [2016], p. 288, tab. A)

Tabella A. Distribuzione dei *nummi* del tesoro di Misurata per periodi e zecche. Esemplari esaminati: 82713.

	PERIODI					
	I (21620) 26,14 %	**II (18376) 22,22 %**	**III (15960) 19,29 %**	**IV (8173) 9,88 %**	**V (10640) 12,87 %**	**VI (7944) 9,60**
Londinium	104	216	179	165	4	------
Treviri	658	401	1121	639	115	11
Lugdunum	566	207	1054	224	14	11
Arelate	------	------	2967	793	441	115
Ticinum	1745	694	986	1091	130	------
Aquileia	1269	652	300	562	------	------
Roma	5098	8962	8607	1015	1157	885
Ostia	------	5650	------	------	------	------
Carthago	9739	713	------	------	------	------
Siscia	774	302	414	1367	489	152
Sirmium	------	------	------	------	77	------
Serdica	12	3	------	------	------	------
Thessalonica	527	147	45	849	1401	400
Heraclea	260	107	29	673	1438	1028
Constantinopolis	------	------	------	------	635	1710
Nicomedia	21	43	85	354	1609	1278
Cyzicus	255	72	72	336	2149	2056
Antiochia	313	45	20	90	730	45
Alexandria	279	162	81	15	251	253

Figura 5 – Distribuzione per Periodi e Zecche delle monete catalogate, pienamente leggibili, del Tesoro

Proiezione della distribuzione cronologica del totale dei *folles* del Tesoro di Misurata.

Periodi	**I**	**II**	**III**	**IV**	**V**	**VI**
Percentuale	**22,40**	**39,44**	**17,18**	**6,56**	**8,17**	**6,25**

Figura 6

Per una adeguata valutazione dei risultati, va precisato che dopo il Febbraio del 2011 non è stato più possibile operare *in situ*, sia per motivi di sicurezza dei componenti del team di ricerca, sia in quanto il Tesoro, a scopo precauzionale, è stato opportunamente occultato. Si tenga comunque presente che tutte le monete sono state esaminate speditivamente subito dopo il restauro del Tesoro e pertanto la data del suo interramento, fissata al 333/334, può essere considerata definitiva.

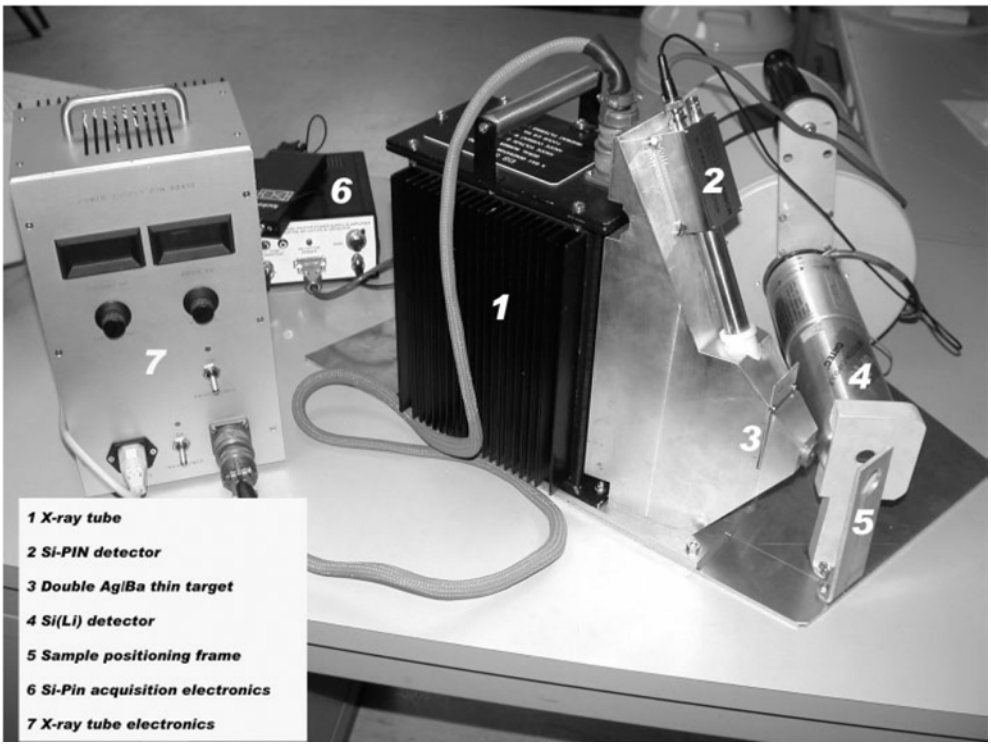

Figura 7 – Spettrometro portatile BSC-XRF dei LNS-INFN (F.P. Romano *et alii*)

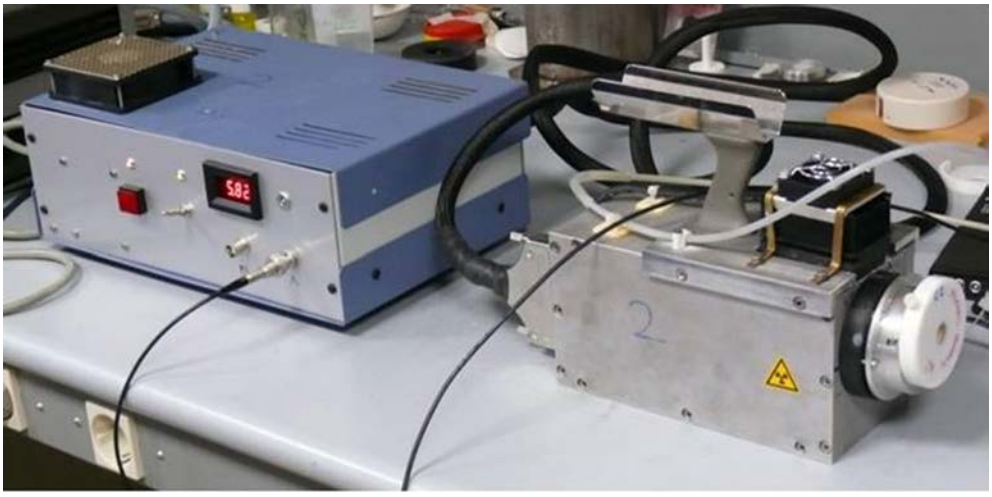

Figura 8 – Nuovo sistema PIXE-alfa LNS-INFN (G. Pappalardo *et alii*)

Figura 9
Spettrometro portatile XRF dell'ITABC-CNR, con fascio primario di elevata energia e intensità (M. Ferretti)

Diversa è invece la situazione per quanto riguarda la distribuzione in percentuale delle varie emissioni di *folles* presenti nel Tesoro. Il quadro riassuntivo oggi definibile sulla base del materiale sinora dettagliatamente catalogato (Fig. 5) subirà infatti un sensibile mutamento in quanto il resto delle monete è formato soprattutto da *folles* databili tra il 294 e il 313, la maggior parte dei quali appartenenti alle serie massenziane battute a 1/48 di libbra dopo il 307 (Fig. 6): è questa, come già notato, la 'atipicità' del Tesoro, che ha costituito il primo motivo del nostro interesse.

La specificità del protocollo di analisi ha reso necessarie la progettazione, la realizzazione e l'ottimizzazione di strumentazione analitica portatile *ad hoc* (Figg. 7-8), la quale, in considerazione degli ottimi risultati ottenuti in occasione della sua sperimentazione, viene attualmente impiegata anche per altri manufatti, sia metallici che ceramici (Fig. 9)[6]. L'alto numero di analisi effettuate, non di rado su ambedue

[6] F.P. Romano *et alii*, *A new portable XRF spectrometer with beam stability control*, "X-Ray Spectrometry" 34, 2005, 135–139. Cfr. Id., *Quantitative non-destructive determination of trace*

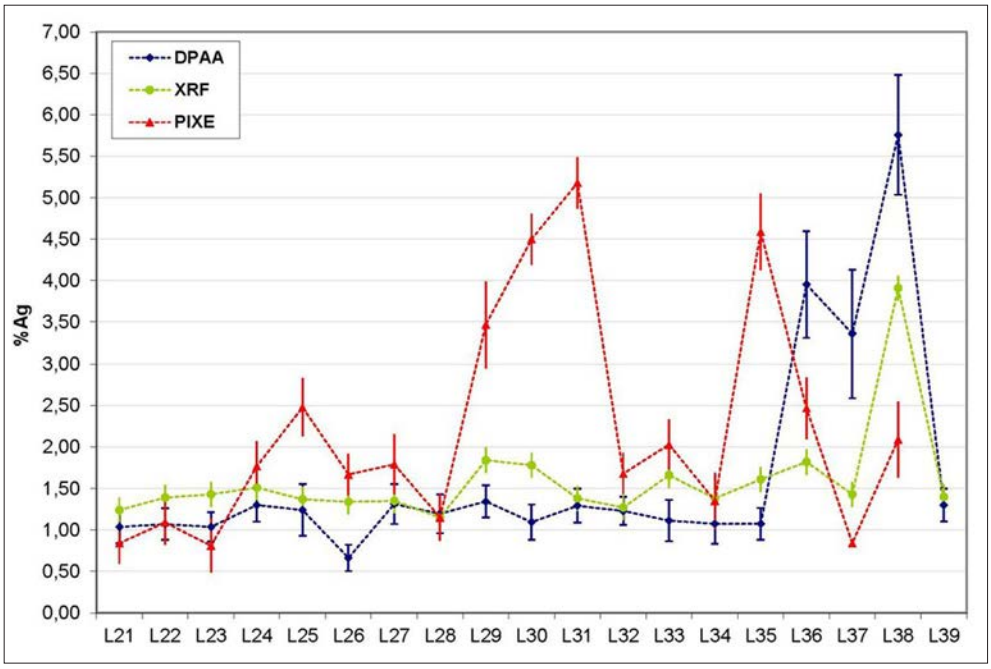

Figura 10 – Determinazione arricchimento di Ag, a varie profondità, di *folles* battuti tra il 308 e il 318 con tecniche PIXE-*alfa*, XRF e DPAA (LNS-INFN, G. Pappalardo *et alii*)

le facce della moneta, con le tecniche PIXE-alfa[7] e XRF[8], integrate con quelle a campione con DPAA[9] e SEM-EDX[10] (Figg. 10-11), ha portato innanzitutto ad un aumento delle nostre conoscenze sulla quantificazione dell'arricchimento in Ag dei

elements in archaeological pottery using a portable beam stability-controlled XRF spectrometer, "X-Ray Spectrometry" 35, 2006, 1-7.

[7] L. Pappalardo *et alii*, *The new PIXE*-alpha *spectrometer for the analysis of Roman* nummi *surfaces*, "X-Ray Spectrometry", 2012, on line. Cfr. Ead., *Analisi PIXE-Alfa delle superfici di* nummi *tardoromani*, in *Tesoro di Misurata*, 206-215.

[8] F.P. Romano *et alii*, *Determinazione non distruttiva del contenuto di mercurio nei* nummi *del Tesoro di Misurata mediante l'utilizzo del sistema portatile BSCXRF del laboratorio LANDIS*, in *Tesoro di Misurata*, 199-206.

[9] Per la tecnica, G. Pappalardo *et alii*, *Effects of the behaviour of the proton-induced isotopes production on the analysis of ancient alloys*, "Nuclear Instruments and Methods in Physics Research" B 266, 2008, 2286–2291; per le analisi, F. Rizzo *et alii*, *Non-destructive determination of the silver content in Roman coins* (nummi)*, dated to 308–311 A.D., by the combined use of PIXE*-alpha*, XRF and DPAA techniques*, "Microchemical Journal" 97, 2011, 286–290.

[10] E. Ciliberto, E. Viscuso, *Le proprietà superficiali dei* nummi *e le tecniche di argentatura*, in *Tesoro di Misurata*, 215-226.

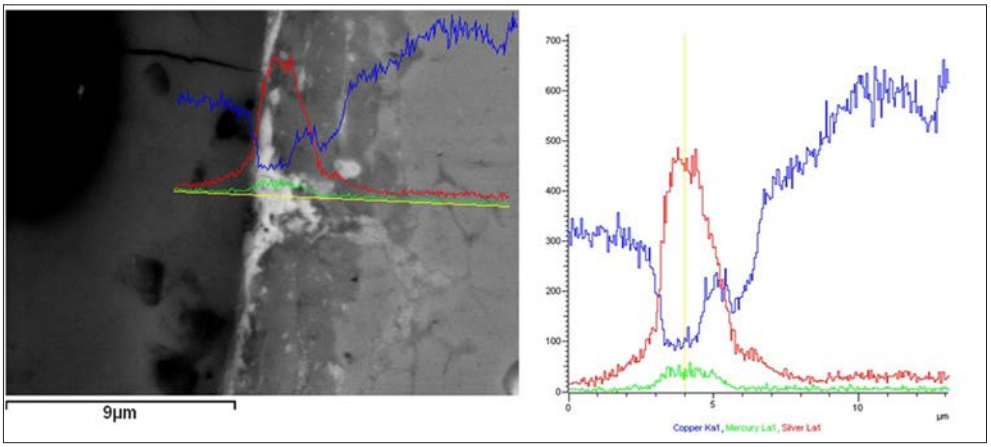

Figura 11 – Immagine SEM ottenuta in elettroni retrodiffusi della parte esterna della sezione di un *follis*. Lo strato bianco si riferisce alla patina di argento. Lungo la linea gialla sono state eseguite le analisi relative agli elementi maggioritari che sono rappresentate nel grafico (concentrazione vs profondità: blu rame, rosso argento, verde mercurio) (UniCatania, E. Ciliberto – E. Viscuso)

folles di Misurata nel corso del quarantennio della loro emissione, confermando il fatto che la generale decrescita del tenore di Ag nel suddetto periodo non è affatto lineare ma rivela diversi interventi specifici, anche di tipo migliorativo. Peraltro, le ricerche più recenti, se da un lato sembrano confermare, almeno per alcune zecche, l'adozione della tecnica ad amalgama (Ag+Hg) per l'arricchimento superficiale dell'Aes[11] a partire dal 314/5 e segnatamente dopo il 330[12] (Figg. 12-13), la escludono invece nel caso delle serie più antiche, dove la presenza di mercurio in superfice non è rilevabile, o è del tutto trascurabile: in relazione a queste ultime sono stati effettuati presso l'ITABC[13] e il Dipartimento di Chimica dell'Università di Catania[14]

[11] C. Vlachou, J. G. McDonnell, R. C. Janaway, *The experimental investigation of silvering in late Roman coinage*, in P. B. Vandiver, M. Goodway, J. L. Mass (Eds.), *Materials Issues in Art and Archaeology VI. Symposium held November 26-30, 2001, Boston, Massachusetts, USA*, «Materials Research Society Proceedings» 712, 2002, II 9.2., 1-9; C. Vlachou-Mogire, B. Stern, J. G. McDonnell, *The application of LA.ICP-MS in the examination of thin plating layers found in late Roman coins*, «Nuclear Instruments and Methods in Physics Research», B 265, 2007, 558-568.

[12] Romano *et alii*, *Determinazione non distruttiva del contenuto di mercurio nei* nummi *del Tesoro di Misurata* cit., 202 sgg.; Pappalardo, *Analisi PIXE-Alfa delle superfici di* nummi *tardoromani* cit., 211 sgg.

[13] M. Ferretti *et alii*, *L'arricchimento superficiale nei* nummi*: studio degli originali e simulazioni sperimentali*, in *Tesoro di Misurata*, 191-198.

[14] E. Ciliberto, E. Viscuso, *Le proprietà superficiali dei* nummi cit., sp. 219 sgg.

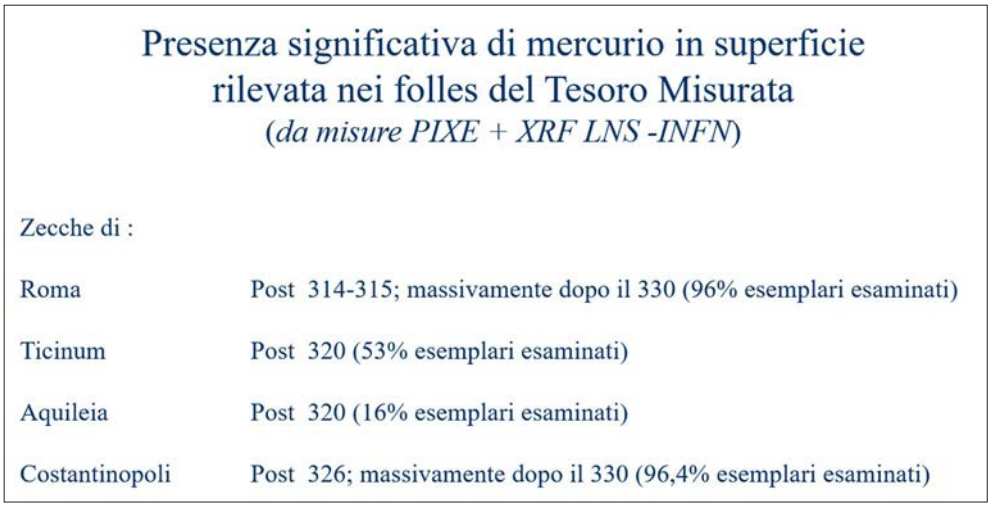

Figura 12 – Report sulla presenza di mercurio in *folles* del Tesoro (LNS-INFN, F. P. Romano *et alii*)

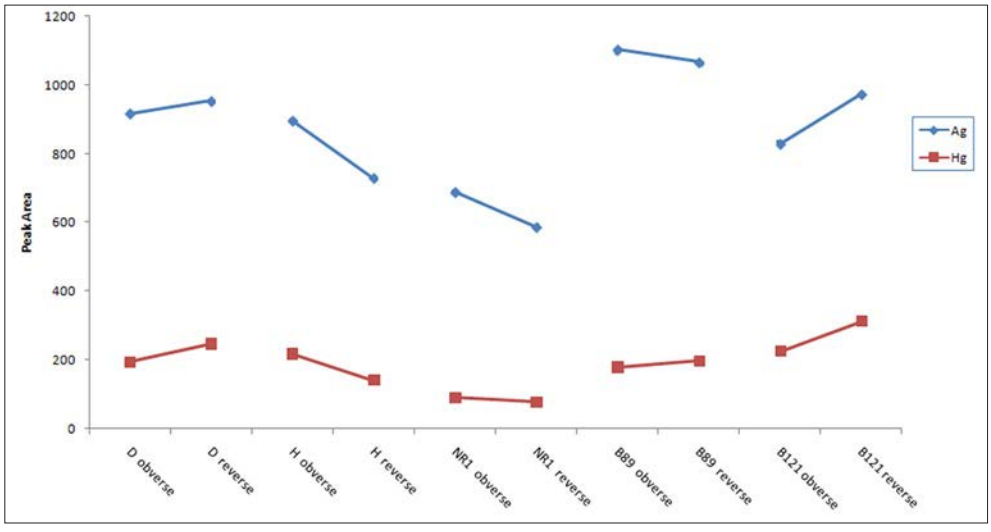

Figura 13 – Variazione della intensità della righe di Ag (blu) e Hg (rosso) sulle due facce di una medesima moneta: una correlazione positiva sembra evidente (LNS-INFN, L. Pappalardo *et alii*)

alcuni esperimenti per ricostruire la tecnologia dell'arricchimento superficiale con la formulazione di diverse ipotesi.

Tutti i dati eterogenei relativi alla descrizioni di dettaglio, alle immagini, alle analisi composizionali chimiche e fisiche, alla georeferenziazione nell'area del ritro-

vamento etc., confluiscono nel sistema informativo *Moneta*, il cui cuore è costituito da un database relazionale progettato secondo il modello *client-server*, e realizzato con *Oracle DB Server* su piattaforma *MS Windows*[15]. Tale scelta, con l'esclusione di soluzioni di livello inferiore, è stata effettuata sia per le particolari e tradizionali robustezza e performance del *DB Server*, che per la garanzia di sicurezza in relazione alle gestione in Internet dei dati. L' applicativo utente è stato realizzato in *Java*, con le tabelle strutturate in modo tale da separare le informazioni alfanumeriche relative alla moneta dalle rispettive immagini fotografiche. Questa soluzione è stata adottata principalmente per non penalizzare i tempi di risposta di una interrogazione del database contenente immagini, le quali sono automaticamente memorizzate in fase di inserimento, oltre che nel formato originale con cui sono state acquisite (TIFF o JPEG), anche in una versione ridimensionata con estensione *.gif*.

Fase preliminare nell'implementazione del database, è stata la creazione di codifiche numeriche in relazione ai campi *Officina*, *Zecca*, *Autorità* e *Biblio* relativi alla descrizione della moneta. Queste codifiche sono inserite in omonime tabelle soprattutto al fine di presentare nel corso delle *queries*, sia a video che a stampa, le serie nella sequenza spazio-temporale secondo il sistema catalografico ormai standard (Fig. 14); vengono altresì velocizzate sia le operazioni di compilazione delle nuove schede, che i tempi di risposta delle interrogazioni del database mediante indicizzazione delle corrispondenti colonne.

Per la compilazione delle caselle di testo dei *form* di *Moneta*, sia nell'applicativo in Java che nella versione Web, si utilizza un font appositamente creato per l'inclusione, nella descrizione, di caratteri particolari e/o elementi figurativi (simboli o altro) presenti nella moneta (Fig. 15). Questo font, realizzato secondo lo standard *Unicode*, è di tipo *searchable*, ovvero utilizzabile anche durante l'interrogazione del database ed è inoltre totalmente compatibile con i principali browser oggi utilizzati.

Al fine di unire ai dati descrittivi delle monete quelli composizionali, ove disponibili, nella struttura del database sono presenti anche tabelle relative ai dati delle analisi fisiche e/o chimiche. Le tabelle, attualmente in numero di sette, sono relative ai dati provenienti dalle analisi con tecniche PIXE-*alpha*, XRF, DPAA, NAA nonché con tecnica ICP-MS (Superficie, Substratum, Bulk) (Fig. 16).

Le analisi statistiche vengono effettuate sia con applicativi della stessa Oracle, che di terze parti (IBM SPSS). Nel caso degli istogrammi ponderali l'asse delle ascisse (peso) è ritmato secondo intervalli di 0,19 g., valore equivalente a 1/144 di *uncia* al fine di tenere nella debita considerazione il sistema metrologico originale.

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[15] A. Nicolosi, *Moneta. Un esempio di database di numismatica antica*, in *Tesoro di Misurata*, 229-232.

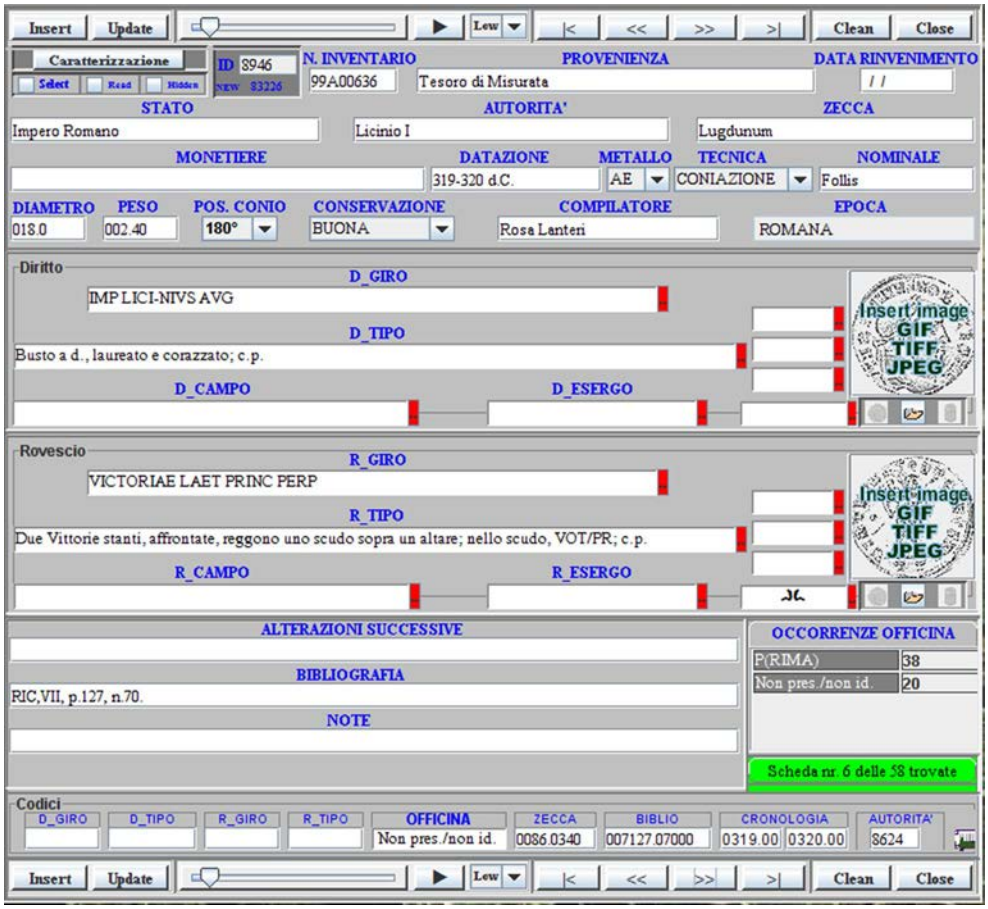

Figura 14 – Esempio di scheda del database *Moneta*. Si noti, in alto a s., il pulsante "Caratterizzazione" per l'immissione dei dati composizionali (cfr. Fig. 16)

Una delle peculiarità di *Moneta* è la possibilità di accedere alle informazioni del database indipendentemente dalla piattaforma software utilizzata sfruttando esclusivamente il protocollo di comunicazione di internet (*TCP-IP*). Questo è consentito dall'utilizzo di un qualunque browser attraverso credenziali di accesso limitate soltanto alla consultazione delle schede, nonché mediante l'esecuzione di un'applicazione sviluppata in linguaggio di programmazione *JAVA* con cui è possibile anche consultare e/o modificare gruppi di schede memorizzate all'interno di un file con estensione *.mon* senza la necessità di essere connessi a Internet. La consistenza e l'integrità delle informazioni memorizzate all'interno del database vengono garantite in fase di reimportazione dello stesso file eventualmente modificato mediante pro-

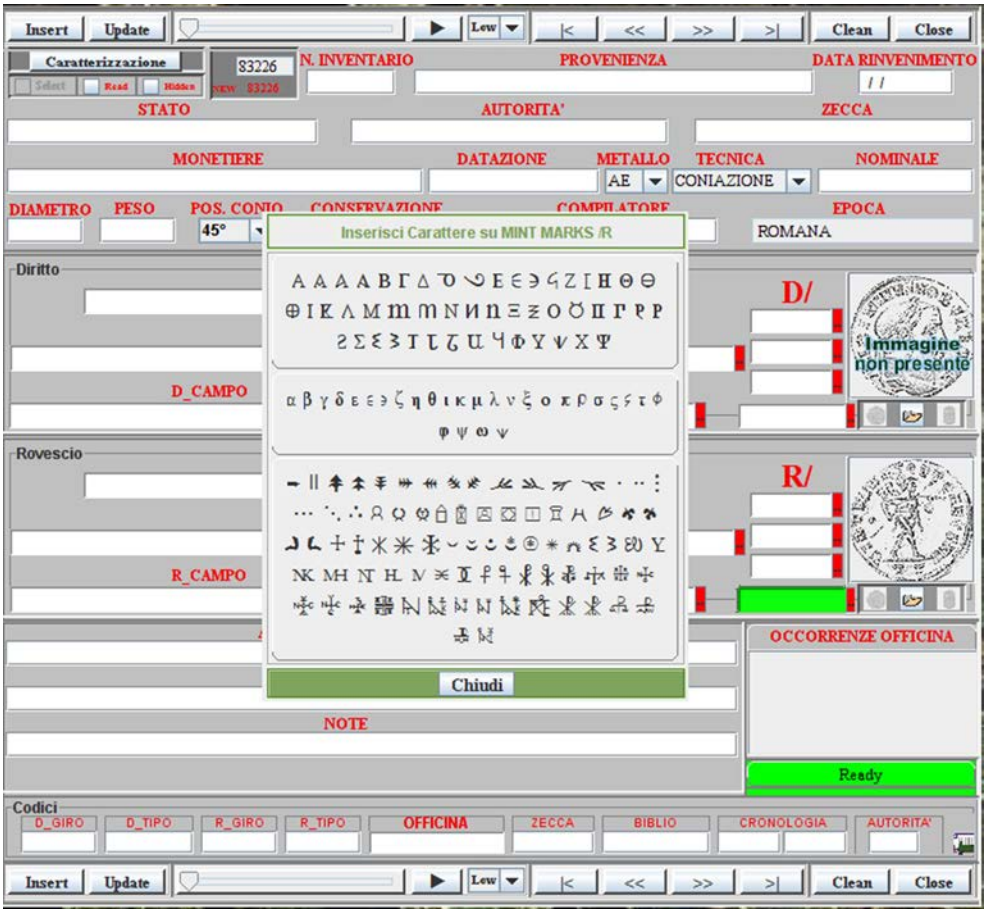

Figura 15 – Maschera immissione dati del database *Moneta* con finestra per l'inserimento di caratteri e simboli speciali

cedure di controllo, opportunamente implementate, che restituiscono come output finale le schede effettivamente aggiornate.

La consultazione pubblica del database, prevista nel sistema, sarà possibile allorché il Dipartimento di Antichità della Repubblica Libica avrà rilasciato le relative autorizzazioni.

Resistendo alla tentazione di soffermarci ancora sui risultati della ricerca sul Tesoro di Misurata, è tempo di dare una risposta al quesito postoci nello spirito di questo Convegno: *valeva la pena di affrontare il restauro e lo studio di un grande Tesoro quale quello di Misurata in un'ottica costi/benefici scientifici?*

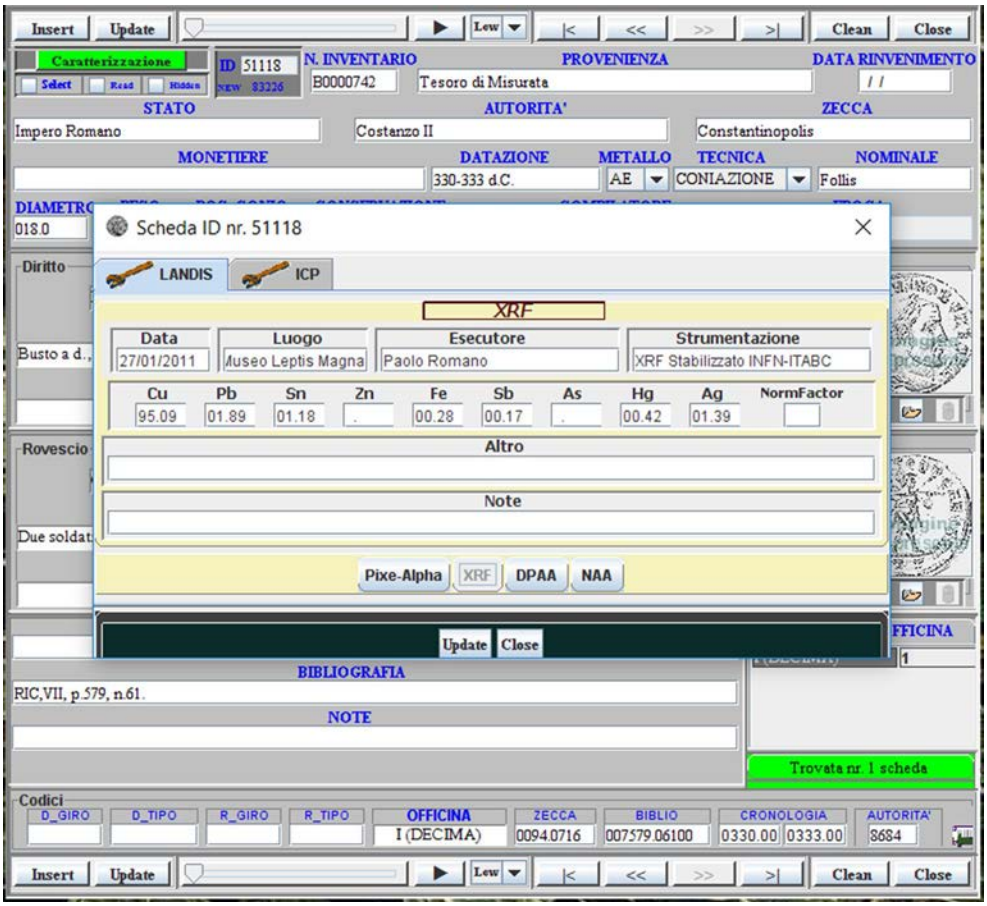

Figura 16 – Esempio di scheda del database *Moneta*
con i dati relativi alla analisi composizionale con tecnica BSC-XRF

La nostra risposta è positiva. Essa è dovuta alla 'unicità' del Tesoro, non solo e non tanto per la sua dimensione, ma soprattutto per la sua 'atipicità', la sua testimonianza di ordine 'storico-economico', e per la possibilità che esso ha offerto, e continua tuttora ad offrire, di studiare a fondo i *folles* tetrarchici e costantiniani sotto l'aspetto chimico-fisico e tecnologico. Questa ricerca è stata possibile oltre che per la determinazione e la fatica pluriennale di un team internazionale di ricercatori e tecnici, soprattutto per le risorse finanziarie messe a disposizione dal CNR, Ente del quale mi onoro di aver fatto parte.

Se, come auspico, il giudizio dei Colleghi su questa impresa sarà positivo anche in questa occasione, mi auguro che questo possa costituire soprattutto per i più

giovani un forte incentivo a intraprendere lo studio di altri importanti rinvenimenti, spesso dimenticati nei magazzini dei musei, ma altrettanto significativi per la ricostruzione della storia e della economia di una determinata regione: è vero tuttavia che oggi non favoriscono una scelta del genere la sempre maggiore scarsità dei fondi di ricerca e la tendenza, per certi aspetti conseguente, a trascurare progetti di ampio respiro a favore di altri di breve termine, che appaiono maggiormente appetibili ai fini di una più rapida carriera accademica.

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EL TESORO DE "EL ZAUDÍN" (TOMARES, SEVILLA). PROYECTO Y REALIDAD

Abstract

The El Zaudín's hoard (Tomares Sevilla) has been in recent years a topic of special interest for scholars, not only of ancient Numismatics, but also for those interested in the History of Roman times, the economy of late antiquity and the evolution of society at the time, without forgetting the possibilities that the use and characteristics of the monetary metal offers for the application of physical methods on coins.

On the other hand, the discovery of such a considerable number of specimens as the case of "El Zaudín", whose total we suppose to reach between 53,000 and 55,000 pieces, is presented as an interesting case to define the study of such voluminous treasures and raise both the possibilities of research to contain an abundance of material, and the problems caused in turn by the high number of coins.

Keywords

El Zaudín's hoard (Tomares Sevilla); Sevilla, Museo Arqueológico; Roman Tetrarchy's coin hoard; Numismatic and Archaeometry

El tesoro de "El Zaudín" (Tomares Sevilla)[1], ha constituido en los últimos años un tema de especial interés para los estudiosos, no sólo de la Numismática antigua, sino para quienes se interesan por la Historia de época romana, la economía del periodo tardo antiguo y la evolución de la sociedad del momento, sin olvidar las posibilidades que el uso y características del metal monetario ofrece para la aplicación de métodos físicos sobre las monedas.

Por otra parte, el hallazgo de una cantidad tan considerable de ejemplares como es el caso de "El Zaudín", cuyo total suponemos que alcance entre 53.000 y 55.000 piezas, se presenta como un interesante caso para definir el estudio de estos tesoros tan voluminosos y plantear, tanto las posibilidades de investigación al contener un abundante material, como los problemas que a su vez ocasiona el elevado número de monedas[2].

EL MUSEO ARQUEOLÓGICO DE SEVILLA. ANTECEDENTES Y CARACTERÍSTICAS DE LA GESTIÓN CULTURAL: EL TESORO DE EL ZAUDÍN, (TOMARES)

Este excepcional hallazgo constituye a su vez, un revulsivo para el papel desarrollado por los museos arqueológicos en Andalucía en los últimos años. El descubrimiento pone a prueba un sistema de gestión sobre el que pesan las recientes circunstancias de crisis económica, y las más preocupantes consecuencias de una crisis de identidad que también ha repercutido sobre estos centros culturales. Los alcances a largo y medio tiempo de la crisis económica reciente son difíciles de valorar, especialmente en la cultura sus efectos han tenido que ver con la pérdida de inversiones tanto públicas como privadas, con la interrupción de algunos programas de protección y prevención. También se han paralizado algunas iniciativas, que amparadas en herramientas internacionales, estaban destinadas a promover la valorización del Patrimonio en su concepción universal[3]. Actualmente en España, los museos se han transformado en instituciones cuya personalidad, en muchos casos, ha quedado a merced de las circunstancias económicas y estrategias políticas (o falta de ellas) recientes[4].

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1 F. Chaves Tristán, "Reflexiones y estado de la cuestión en torno al tesoro de "El Zaudín" (Tomares, Sevilla)" en *AIIN* 63, 2017, 235-268.

2 Equipo de trabajo por parte del MASE: Jefa del Departamento de Conservación e Investigación: C. Sanmartin Montilla; Jefe del Departamento de Difusión: F. Sierra Alonso. Del Dep. Arqueología de la US: E. García Vargas; N. Conejo Delgado; R. Pliego Vázquez; U. López Ruíz.

3 A. Zervaki, "Protection of cultural heritage and the Global Economic crisis", en *The protection of archaeological heritage in times of economic crisis*, ed. E. Korka (Cambridge Scholar Publishing, 2014), 23.

4 Parte de esta introducción fue presentada en una conferencia del encuentro *Museography to*

En Andalucía, los recortes presupuestarios y la dilatación de las asignaciones anuales económicas a los centros[5], junto al menoscabo de las infraestructuras en materia cultural, han repercutido gravemente en el desarrollo y crecimiento de las instituciones museísticas. No podemos olvidar que los museos son, centros de referencia para la construcción de identidades y para albergar la memoria colectiva de la sociedad. Esta situación, ha generado una serie de consecuencias en las que la investigación y, por tanto, la transmisión del conocimiento ha quedado gravemente lesionadas. La "Cultura" practicada en los museos españoles en los últimos años, se ha amparado en la banalidad de múltiples actuaciones carentes de contenido. Por todo ello, los centros museísticos presentan graves desequilibrios, producto de la carencia de visión y de estrategias políticas articuladas ante estas circunstancias de desestructuración económica desde 2008.

Con este marco de actuación, los veteranos museos andaluces, han sobrevivido una vez más, al igual que en su dilatada historia, a circunstancias de bajos presupuestos y a personal insuficiente[6]. Desde que existen los museos, las inversiones han sido exiguas. Estos centros han afrontado en su trayectoria grandes retos prácticamente a "coste cero"[7]. En la mayor parte de los casos, la vocación profesional y la dedicación de los cuerpos facultativos de los museos en Andalucía, constituye el empuje necesario para que estos centros consigan superar las carencias marcadas por la situación económica y por la inexistencia desde 2006 de un programa político de planificación específico para los museos[8].

El tesoro de El Zaudín, ingresa en el Museo Arqueológico de Sevilla (MASE) en Abril de 2016. Esta institución cuenta con una importante trayectoria histórica, desde su creación oficial en 1879[9]. Las circunstancias políticas y de gestión que una, más que centenaria institución como el museo sevillano han vivido, han marcado la

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Debate, celebrado en el Museo Arqueológico de Sevilla el 21 de noviembre de 2017.

[5] La validación de la programación anual de actividades y la liberación del presupuesto para la gestión de los museos, se ha trasladado a los centros en los últimos años entre finales de abril-mayo. Este hecho unido a la desaceleración de los trámites administrativos durante el periodo estival, ocasiona la preocupante disminución del tiempo para gestionar el presupuesto anual.

[6] Existe en el Archivo Histórico del MASE un testimonio que evidencia la carencia de personal para la apertura y vigilancia del centro en un documento de 1916 Archivo del Museo Arqueológico de Sevilla, U.I. 003. "Oficios de salida, 1914-1935".

[7] En los últimos años esta máxima de gestión a “coste cero” ha sido el argumento utilizado por los gestores políticos para paliar la falta de inversión y hacer una llamada a la “imaginación y creatividad” de los profesionales en la búsqueda de alianzas, cooperación y acuerdos con otros agentes de la cultura y la ciencia.n internacional.

[8] Plan de Calidad de los Museos Andaluces, 2003-2006. Este es el último documento de planificación realizado en la Consejería de Cultura, constituyó un estudio importante de análisis y de programación, aunque fue poco desarrollado con posterioridad.

[9] Real Orden de 1879.

evolución de un centro que durante todos estos años ha abierto sus puertas al público y a la investigación, a pesar de la carencia endémica de recursos y personal.

Cuando el conjunto monetal de Tomares es depositado en el MASE, se produjo una alerta mediática de primer orden dadas las características del singular hallazgo. Para la institución y para el órgano de gestión competente (Consejería de Cultura, Junta de Andalucía), este evento supone un desafío de cara al tratamiento de la colección y la respuesta al notorio interés público dada la importancia del hallazgo. Un conjunto de 19 ánforas, de las que 11 aún se conservan en buenas condiciones e incluso 9 permanecen íntegras con las piezas en su interior, y más de 22.500monedas contabilizadas, constituyen el principal objeto de investigación y conservación al que el museo sevillano debe hacer frente desde abril de 2016. En los días siguientes al hallazgo y depósito de los materiales en el MASE, la Consejería de Cultura contrató una intervención arqueológica en el lugar al objeto de recuperar la información contextual del descubrimiento y documentarlo de manera científica[10].

Las primeras actuaciones llevadas a cabo en el museo se orientaron a la limpieza, inventariado, y almacenamiento del conjunto. De forma inmediata, la institución programó la creación de un espacio con un nivel de seguridad apropiado para el almacenaje de una colección que no poseía ni identificación ni registro[11]. Desde el museo se procuró la climatización del espacio de reserva, así como la adquisición de un mobiliario de almacenaje adaptado a las dimensiones de las monedas, también se habilitó un lugar para la investigación de esta colección. Finalizado 2016, el MASE logró reunir las condiciones físicas y ambientales necesarias para desarrollar el estudio del tesoro de El Zaudín.

El museo fue consciente desde el inicio de la necesidad de un proyecto de investigación que involucrara a personal externo a la institución. El papel de los museos en Andalucía y en España en general, se ha visto desvinculado desde los últimos años del siglo XX de una de sus principales funciones: la investigación. Si la legislación tanto autonómica como estatal[12], recogen la investigación como una de las funciones

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[10] Las ánforas y su contenido fueron recogidas de manera precipitada ante la falta de seguridad del lugar y el riesgo de pérdida del conjunto. Es importante destacar la actuación de los Cuerpos y Fuerzas de Seguridad del Estado, en concreto del SEPRONA, cuya respuesta fue inmediata.

La posterior intervención arqueológica ha sido objeto de una publicación que recoge toda la información obtenida en la excavación: J. Vázquez y P. Garrido, *El Tesoro del Zaudín: contextualización arqueológica del conjunto numismático tardoantiguo de Tomares (Sevilla)*, Sevilla: Consejería de Cultura, 2018.

[11] La falta de documentación es una de los mayores riesgos para la seguridad de las colecciones de los museos. Por ello desde el ingreso del conjunto en el Museo se le asignó un número de depósito y se agruparon las monedas en lotes de 200, con cierres precintados en los embalajes y protocolos de acceso rigurosos.

[12] Ley 8/2007 de Museos de Andalucía, Art. 3 y 4. Ley 16/1985 de Patrimonio Histórico Español, Art. 59.

principales de los museos, lo cierto es que en la programación y en el desempeño de las tareas que se desarrollan en estos centros, no se asigna una dotación específica, ni humana ni económica a tal fin.

Sin embargo, el alcance mediático e importancia de la noticia sobre el descubrimiento del tesoro de El Zaudín, propició una excepcional respuesta en la inversión pública, el primer año se dedicaron más de 70.000 euros (no programados en la inversión del museo en 2016) para la dotación de seguridad, climatización y almacenaje del conjunto en la sede del museo sevillano. Desde el inicio del estudio sobre la colección, el museo fue consciente desde de la necesidad de estructurar un equipo de trabajo especializado para el desarrollo de un proyecto de investigación multi y trans disciplinar. La Universidad de Sevilla a través de su Vicerrectorado de Investigación, el CITIUS y un nutrido grupo de los especialistas del Departamento de Arqueología y Prehistoria, se constituyeron desde el inicio en el núcleo externo que, junto al museo sevillano, impulsarían el proyecto de estudio sobre el tesoro de El Zaudín. La colaboración iniciada en abril de 2016, ha sido materializada en un Convenio de colaboración firmado el 26 de enero de 2018 entre la Consejería de Cultura y la Universidad de Sevilla, con vigencia hasta final de 2020. Dicho documento establece la programación del estudio a desarrollar y las fórmulas de colaboración entre ambas instituciones, recogiendo una inversión total de más de 150.000 euros por parte de la US. Por su parte el MASE, se compromete al soporte de personal y logístico del proyecto, además de la puesta a disposición de sus herramientas de divulgación y comunicación (espacios expositivos y producción de muestras itinerantes), lo que junto a las inversiones ya realizadas constituye una importante aportación[13].

Todas estas actuaciones, deben ser encajadas en un centro museístico que está considerado entre los 5 primeros museos arqueológicos nacionales, que desarrolla una carga administrativa y de gestión a escala internacional. La media de consultas de investigación atendidas es aproximadamente de unos 700 expedientes al año, que se suma a la carga de trabajo ocasionada por la gestión de préstamos de una colección valorada a nivel internacional, con movimiento de piezas a museos como el Louvre y el Instituto del Mundo Árabe (Paris), el Metropolitan o el British Museum.

[13] La estimación económica de la aportación del MASE al estudio del conjunto de Tomares es difícil de calcular, los medios humanos, técnicos y el soporte institucional no son fácilmente cuantificables, si bien es cierto que sería necesaria complementar esta inversión con una programación anual extraordinaria de apoyo al proyecto. Entre 2016 y 2017 fueron asignados de forma extraordinaria 18.000 euros para la reproducción gráfica y toma de analíticas, sin embargo en 2018 a pesar de haber solicitado en programación un apoyo a la investigación de este conjunto, el Servicio de Museos no consideró su asignación.

EL PROYECTO DE ESTUDIO DE EL ZAUDÍN: 2016-2019

El programa de tareas programadas en la investigación de este singular conjunto se inició con el estudio de las ánforas, de su tipología y clasificación; el análisis y catalogación de las monedas que se encontraban fuera de los contenedores cerámicos, la restauración-estabilización de las mismas y su documentación gráfica[14].

Para el estudio completo del tesoro contamos afortunadamente con una serie de circunstancias positivas que adquieren una gran importancia y desempeñan un papel especial a la hora de decidir cuál podría ser, en nuestra opinión, el método más adecuado para estudiar esta elevada masa monetaria. Cualquier línea de trabajo acerca de este tesoro tiene a su favor las especiales condiciones de su hallazgo: además de proceder de un lugar conocido, se ha realizado ya una excavación del mismo, el material monetario se ha recuperado en su integridad, las ánforas-contenedores pertenecen a un tipo ya catalogado y de las 19 halladas, 9 permanecen aun intactas y cerradas con su contenido en el interior. Las monedas se conservan en un estado bueno o muy aceptable en su mayoría con lo que las posibilidades, tanto de realizar el trabajo meramente numismático como la aplicación de métodos físicos de análisis metálico, son muy elevadas.

Como punto de partida deberemos considerar a lo largo de nuestro trabajo los pros y los contras, ventajas e inconvenientes, que en nuestra opinión puede revestir su estudio. Por una parte se contempla el análisis selectivo o aleatorio de una serie de bloques de monedas extraídos del total para obtener así un conocimiento teóricamente representativo del conjunto. En segundo lugar, se plantea la más lenta y minuciosa posibilidad de abordar el estudio individualizado de la totalidad de las piezas.

Por el momento se ha realizado un levantamiento fotogramétrico en 3D de las 9 ánforas que permanecen cerradas e intactas a cargo de Luis Campos Paulo[15], previamente estabilizando y limpiando la superficie (Lám. 1). Se ha calculado así su volumen y superficie, aunque por el momento no tenemos a nuestra disposición el

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[14] A. Navarro, "El Museo Arqueológico de Sevilla y el tesoro de Tomares. Del descubrimiento a la planificación", en *El Tesoro de El Zaudín, op. cit*. nota tesoro de Hoxne the British Museum (London, Catherine Johnss publicaciones me administrativo de salida y aseguraciones corresp 9 , 393-406.tesoro de Hoxne the British Museum (London, Catherine Johnss publicaciones me administrativo de salida y aseguraciones corresp

[15] R. R. de Almeida; L. C. Paulo, *Intervención arqueológica y Arqueográfica en la Colección del Zaudín de Tomares* (2018), Memoria técnico-científica inédita depositada en el MASE; véase también: A. Navarro; R. R. de Almeida; N. Conejo Delgado; E. García Vargas; F. Chaves Tristán; R. Pliego Vázquez, "El valor de las cosas menudas". La microexcavación de un ánfora Tejarillo 1 del depósito del Zaudín de Tomares (Sevilla, España)" en *Ex Baetica Amphorae II. Conservas, aceite y vino de la Bética en el Imperio Romano. Veinte años después*. Congreso Internacional. Universidad de Sevilla. 17-20 diciembre 2018 (en prensa).

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sistema que nos permita advertir el exacto contenido de su interior, si bien presumimos que se debe reiterar la masa ya conocida hasta el momento.

En cuanto a las otras 8 ánforas fragmentadas, si bien en algunas su fractura pudo ocurrir en el momento del hallazgo y/o transporte, se constata que las roturas son antiguas, debiéndose al propio peso y a la presión de la masa monetaria de su interior. De ellas, 3 se han reconstruido en forma casi completa (Lám. 2) y 5 solo de manera parcial[16]. Procedente del interior de estos recipientes, en la actualidad se han recogido y contabilizado las 22.474 piezas que se habían salido afuera del interior, pero no siempre es posible asignarlas con seguridad a uno u otro de los contenedores. De éstas ya han sido fotografiados y catalogados definitivamente 2.000 ejemplares.

Por otra parte, hay otras dos ánforas rotas pero conservan aún parte de las monedas adheridas a su interior y deberán tenerse en cuenta de manera especial. Precisamente una de éstas ha servido para plantear un estudio monográfico del que hablaremos

[16] *Ibid*.

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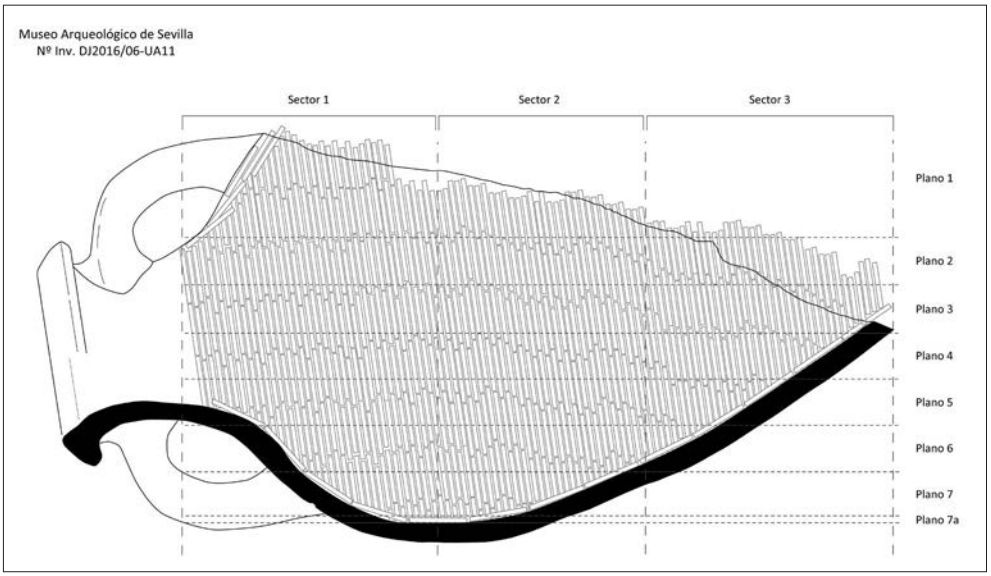
más abajo cuyos datos están aún procesándose y, en una primera impresión, se adivinan interesantes. En ese sentido y como inicio del trabajo, abordamos el contenido del ánfora UA 11, recipiente roto pero que mantenía adheridas a sus paredes la mayoría del material (Lám. 3). El resto de sus piezas, casi en su totalidad, se pudo recoger*in situ* junto al fragmento cerámico desprendido. Alcanzamos así en ella un total de 2.794 monedas contenidas en el ánfora según veremos más abajo.

Como decimos, se ha realizado una intervención arqueológica y arqueográfica del ánfora mencionada (UA 11) que ha llevado a cabo Rui Roberto de Almeida[17]. La intención ha sido acercarnos a conocer cómo se ha realizado la formación del depósito monetario y su tesaurización. Las preguntas iniciales giraban en torno a la acumulación de las piezas, su formación rápida o lenta, y a la posible intervención

[17] *Ibid*.



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de agentes o fenómenos que afectaran al contenido. Asimismo se planteó si en el estado de conservación de las monedas podía haber intervenido el material cerámico del contenedor o viceversa.

Se decidió entonces realizar una excavación con metodología arqueológica a partir de las monedas conservadas en el interior, lo que ha supuesto en bloque un área de 365 cm2, con superficie de 27'5cm por 19cmy potencia de 20cm, considerando la forma piriforme del ánfora. Hay que tener en cuenta que el ánfora debía permanecer tumbada para que no se deshiciese la "masa" monetaria y esto obligó a establecer tres sectores verticales y en ellos proceder a la excavación en 7 planos artificiales (Lám. 4).

Por ello el trabajo de excavación se realizó dividiendo en sectores el contenido de manera que se fueran extrayendo las monedas desde la superficie según la deposición de las mismas, es decir, siguiendo la llegada de la más reciente a la más antigua. La intrusión de elementos orgánicos como raíces o insectos, alteraban a veces la cohesión de las piezas y por tanto la excavación de lo que se han tomado las debidas notas.

En resumen, a lo largo de este proceso se ha georreferenciado cada ejemplar monetario: número de ánfora/sector/plano/moneda, que lleva siempre a localizar los datos cronoestratigráficos y por tanto, la exacta disposición de los ejemplares indivi-

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duales en el conjunto de las monedas acumuladas en el recipiente. Las piezas habían colmatado el ánfora en deposición horizontal, pero sin rellenar el cuello de la misma donde sólo se ha encontrado tierra pero no hay restos de tapón de cierre (Lám. 5).

Extraídas las monedas, todas ellas han sido catalogadas por Noé Conejo Delgado[18] y se está realizando un detenido estudio de las mismas en cuanto a procedencia de las cecas, cronología, etc. para encuadrarlas en su llegada al recipiente y/o su evolución. Adelantamos que todas son *nummi* y sus emisiones abarcan de 294 a 312, conteniendo algunos ejemplares raros o de especial interés. Como hemos señalado *supra*, en la tarea mencionada, la Universidad de Sevilla, a través del Departamento de Arqueología de la misma, aporta en la actualidad personal especializado y medios para el estudio efectivo de las monedas contenidas en el hallazgo de "El Zaudín".

Por tanto, a partir de este conjunto numismático que ha sido reseñado en una base de datos exhaustiva, podremos aproximarnos al proceso de tesaurización y a la relación de este numerario con la producción y líneas de aprovisionamiento de

[18] *Ibid*.

las cecas tetrárquicas. Ciertamente consideramos que el material ya disponible es sólo una muestra, pero posee un número importante de ejemplares contenidos en un mismo recipiente: las monedas extraídas en la excavación del interior del ánfora UA 11 suman 1910y hay otras 878 sueltas que cayeron de su interior. Por tanto, a partir de este conjunto monetario, podremos aproximarnos al proceso de tesaurización, al menos de este contenedor, lo que no es óbice para que se sigan realizando otra serie de estudios con el resto de las monedas aun muy numeroso.

En conjunto, sumando a las piezas de la UA 11, los ejemplares sueltos y ya catalogados, contamos con aproximadamente 4800 ya introducidos en la base de datos. Este material, si bien aun inicial, permitirá iniciar una serie de reflexiones de la llegada de las monedas, procedencia de las cecas, funcionamiento etc. y aconsejar cual puede ser el enfoque más oportuno y científicamente más deseable.

Por otra parte, y no menos importante, se ha contado con la colaboración del personal del Centro de Aceleradores de la Universidad de Sevilla que se están ocupando de minuciosos y variados análisis físico-químicos con referencia al metal monetario de los ejemplares, dirigido por el Prof. Respaldiza y realizado por su equipo[19].

Inicialmente se ha llevado a cabo el análisis rutinario mediante micro fluorescencia de rayos X (micro-XRF) de todas las monedas restauradas y catalogadas hasta ahora, con el fin de conocer la composición química de cada moneda para poder estudiar en detalle la evolución metalúrgica de cada ceca en relación a cada emperador y año de emisión. Para ello se utiliza el equipo de micro-XRF de la marca Fischer del Centro de Investigación, Tecnología e Innovación de la Universidad de Sevilla (CITIUS), un equipo de reciente adquisición (financiado por la Junta de Andalucía a través de los fondos FEDER), especialmente pensado para el análisis de objetos metálicos, que permite el análisis cuantitativo rápido de un elevado número de muestras. A día de hoy se han analizado y cuantificado alrededor de 2.100 monedas pertenecientes a todas las cecas encontradas hasta la fecha en el tesoro, barriendo todos los años y emperadores.

Al mismo tiempo los investigadores de la Universidad de Sevilla han desarrollado un equipo portátil de Transmisión gamma (GRT) para poder obtener un análisis químico de volumen íntegro de cada moneda sin que sean afectados por la corrosión y alteraciones superficiales. Por otro lado el aspecto que se ha tratado es el estudio de las técnicas de plateado superficial de las monedas; para ello se han utilizado varias técnicas de análisis, como la Particle-induced X-rayemission (PIXE) y la Espectrometría de Retrodispersión Rutherford (RBS) con el Acelerador Tandem de 3MV del Centro Nacional de Aceleradores (CNA) de una selección de monedas, así como análisis de microscopia electrónica de barrido (SEM), metalografía y la novedosa técnica Focused ion beam(FIB), llevados a cabos en los laboratorio del

[19] B. Gómez Tubío, S. Scrivano

CITIUS, que permite conocer la estructura y composición del interior de la muestra escarbando una trinchera de decenas de micrómetros (punta de una aguja) en la superficie de la muestra.

CONCLUSIONES

En relación a la pregunta clave de este Congreso, que gira en torno a la conveniencia del estudio de la totalidad o parte de las monedas halladas en un gran tesoro, probablemente al ir avanzando en las líneas que en este artículo exponemos ya en realización, podremos apuntar una idea más clara. Por el momento, creemos que precisamente el estudio de El Zaudín podrá ser muy significativo en cuanto a la respuesta que se aconsejaría proponer.

Tenemos aquí la gran ventaja de poder estudiar conjuntos cerrados en el interior de las ánforas como líneas arriba se ha expuesto, pero también es cierto que esperamos la posibilidad de abarcar un volumen bastante amplio de numerario, deseable la totalidad. Entonces, analizando los resultados y sus variables, sí que podríamos decantarnos en un sentido o en otro, aunque también es razonable considerar que cada tesoro tiene una casuística determinada. De hecho, El Zaudín presenta, por ahora, una aparente homogeneidad ajena a otros como el impresionante de Misurata. Concluimos por tanto que, establecer una norma general para el estudio de "grandes" tesoros, no nos resulta conveniente hasta que no se haya penetrado en el contenido real de cada hallazgo.

Si contemplamos el recorrido realizado para programar el estudio de este tesoro, somos conscientes de la dificultades para la consecución de recursos económicos anuales y suficientes, así como de la complejidad que entraña la planificación detallada del estudio no invasivo de las ánforas cerradas[20], el reto de estabilizar al equipo humano del proyecto, y por último el importante desafío derealizar una investigación de frontera que incorpore una perspectiva global de análisis y en la que se estructuren las distintas disciplinas involucradas en la consecución de este objetivo histórico. Todo ello, son los retos que un proyecto de este tipo debe afrontar con éxito.

Por estos motivos, este hallazgo constituye un importante desafío tanto para el papel que se ha asignado a los museos andaluces en la investigación arqueológica en los últimos años, como para la consolidación de la colaboración interinstitucional para el trabajo de un grupo estable y heterogéneo de profesionales dedicados a un estudio multidisciplinar, en el que las circunstancias económicas y políticas pesan sobremanera.

[20] Estudios que deberían realizarse en instituciones externas al Museo, con el consecuente expediente administrativo de salida y aseguraciones correspondientes.

Sin embargo, el balance de los logros realizados desde 2016, considerando la envergadura del hallazgo y comparándolo con otras investigaciones realizadas en colecciones de esta tipología por otras instituciones como el British Museum, oen el proyecto de estudio del tesoro de Misurata[21] participado por el CNR italiano; nos aporta una óptica optimista en la consecución de los objetivos de investigación.

Siendo pragmáticos, el tesoro de El Zaudín necesitará un tiempo de estudio entre 5 y 10 años para aportar resultados fiables que puedan ser plasmados tanto en la publicación de un catálogo general del total de las monedas que lo componen, como en la realización de una completa interpretación histórica-económica del significado de esta singular tesaurización del Bajo Guadalquivir. No obstante, la publicación y presentación parcial de contenidos tanto al ámbito científico como al público en general, forman parte de la dinámica del proyecto desde su inicio. Prueba de ello es la exposición temporal realizada en el MASE a finales de 2016 que recibió más de 53.000 visitantes, o las publicaciones y comunicaciones en foros científicos de debate presentadas hasta ahora. Esperamos que esta aportación contribuya al mejor conocimiento del estudio del tesoro de El Zaudín y a su proyección internacional.

[21] Podemos citar por ejemplo el caso del tesoro de Hoxne, que fue descubierto en 1990 y en el que se han invertido más de 18 años de trabajo en el British Museum. C. Johns, TheHoxne Late RomanTreasure, *TheTrustees of the British Museum*, London, 2010.

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THOUSANDS OF TETRARCHY FOLLES ALL OVER THE WORLD: AN HYPOTHESIS OF RE-COMPOSITION

Abstract

The Čentur's hoard is well known in the numismatic literature as a result of a long series of finds that have been carried out over more than 20 years, all in the same site. Recently, some researchers have hypothesized that the discovery was unique, happened in the same period, but disclosed over the years mainly for reasons related to the geopolitical situation along the border between Italy and Yugoslavia. With the aim of trying to re-establish the missing part, a free-access database was planned to collect all the reliable and verified information. Some preliminary examples of this project suggest promising results.

Keywords

Čentur's hoard; Roman Tetrarchy's coin hoard; Numismatic and Archaeometry; Numismatic Database

The conference on the treasure of Suk el Kedim (Misurata), Rome 19-20 April 2012, was a crucial moment in the lengthy studies of that find because updates were given on the classification of many thousands of the *folles* and the results of their archaeometric analyses. However, it was the contributions pertaining to the study of treasures of similar size (tens of thousands of coins) with the results of their chemical-physical analyses that triggered an interesting debate of a methodological-practical nature. Indeed, the autoptic examination, identification, classification, archaeometric analyses and transfer of all these data into data bases had involved people in years of work, both in the case of the Libyan treasure and other analogous finds. The results of the measurements of silver plating on the surface of Diocletian nummi or determination of the percentages of mercury in the alloy with the application of BSCXRF and LANDIS systems were particularly significant[1]. Questions were raised, especially in the informal discussions, on the times, ratio between human/financial investments and outcomes of these long and costly researches. Besides, the great treasure of Suk el Kedim had been obtained substantially intact, the context of the find and type of containers was known. The research therefore led to a wide-ranging discussion specifically on numismatic studies, but also on the relationship between study times and methods of big hoards and the results obtained. In other words, could years of study and human/financial investments be justified to acquire new knowledge in this field? Obviously, an answer was impossible because it was affected by many variables, but in general the conviction seemed to prevail that at least for the big treasures from secure archaeological contexts the studies would benefit from the computing, digitalization and new diagnostic technologies applied in archaeometry[2]. As mentioned, it was mainly the intactness of all the components of the find to motivate the study for many years. Just shortly afterwards, came the discovery of the extraordinary (the adjective is no exaggeration) find in April 2016 at El Zaudín (Tomares-Seville) of 19 amphorae containing Tetrarchy folles[3], therefore very similar to Suk el Kedim (Misurata). Archaeological context, chronology of the specimens, quantity (around 600 kg of coins) and the intactness

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[1] Salvatore Garaffo and Mario Mazza (eds.) 2015. *Il tesoro di Misurata (Libia). Produzione e circolazione monetaria nell'età di Costantino il Grande*. Roma.

[2] On this, cf. Ermanno Arslan, *Problemi di documentazione preliminare e finale dei ritrovamenti monetari con grandi numeri. Due esperienze: il ripostiglio di Biassono 1975 e il "deposito" della sinagoga di Cafarnao (Israele)*. In: Garaffo and Mazza (eds.) 2015. *Il tesoro di Misurata (Libia)*, 113-127.

[3] *A spectacular discovery in Spain: The Tomares Hoard* in https://incnews.org/2016/09/13/a-spectacular-discovery-in-spain-the-tomares-hoard/. Francisca Chaves Tristán 2017. Reflexiones y estado de la cuestión en torno al tesoro de "El Zaudín (Tomares-Sevilla)". *Annali dell'Istituto italiano di Numismatica* 63 (2017), 235-268; Ana Navarro, R.R. de Almeida, N. Conejo, E. García Vargas, Francisca Chaves, *El valor de las cosas menudas. La microexcavacion de un ánfora Tejarillo 1 del depósito del Zaudin de Tomares (Sevilla, España)* www.academia.edu/Documents/in/Roman_coin_hoards.

of most of the containers offered another study case that would have required a team, different expertise and rather heavy investments. Since the mid-19th century, enormous treasures with varying chronology have been examined, as in the case of Venera (Verona)[4], to remain geographically between Regio X and the Italiciana Diocese. This type of hoard has also been found in Gaul, then the Galliarum & Viennensis Dioceses, where examples mainly of the mid-3rd – early 4th century are the great treasures of Saint-Jean-d'Ardières (Rhône)[5], Porte Chaillouet à Troyes[6], Saint Germain-lès-Arpajon[7] and, for chronological coherence with Misurata, El Zaudín (Tomares-Seville) and Čentur, the case of L'Isle-Jourdain, Gers[8]. There are also numerous great treasures of Britannia, and these have been censussed and made accessible online with the formidable project Coin Hoards of the Roman Empire[9]. Yet, next to these exceptional finds, the cases of great treasures are not infrequent for which the intactness of the archaeological context and actual composition of the treasure itself (number of examples, type and number of containers, disposal of the coins inside the containers) has been lost or would be problematic to reconstruct. An example of the discrepancy between official reports and other sources is the altering of the size of a 1st century treasure, discovered at Saint-Léonard (Mayenne) in 1863 (first 16 thousand coins, then in 1995, 22,438 coins following a revision of the data)[10], others are those of the Préfecture de Rennes (circa 16 thousand denari from Vespasian to Probus, later graded and in part dispersed)[11], of Chapelle-lès-Luxeuil (uncertainty between 15 thousand and 100 thousand coins)[12].

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[4] Together with the series *Il ripostiglio della Venera: nuovo catalogo illustrato*, in the volumes edited by Sylviane Estiot, Daniel Gricourt, Jean-Baptiste Giard & Jean Guillemain, a summary of the history and bibliography of this find is in Federico Biondani 2004. The discovery and recovery of the Venera hoard: new data from archive sources. *Quaderni della Bassa Veronese* 1 (2004), 17-36.

[5] Vincent Drost 2011/2012. Le trésor d'antoniniens de Sant-Jean-d'Ardières (Rhône) (terminus 252 après J.-C.). *Trésors monétaires* 25 (2011-2012), 1-45.

[6] Marie-Laure Berdeaux-Le Brazidec, Le trésor monétaire de la porte de Chaillouet. *La Vie en Champagne* 29 (2002), 4-7.

[7] Vincent Drost, Florence Moret-Auger & Christian Piozzoli 2011. Le dépôt monétaire de Saint-Germain-lès-Arpajon (Essonne) : premiers résultats. *Bulletin de la Société française de Numismatique* 66, no. 10 (December 2011): 285-94. See also the specific paper in this volume.

[8] Marie-Laure Le Brazidec, Le plus important dépôt d'imitations de Tetricus (271-274). *Archeologia* février 1997, 57.

[9] http://chre.ashmus.ox.ac.uk/

[10] Paul-André Besombes, Jean-Noël Barrandon & Rodolfo Martini 2003/2004. Le dépôt de 22438 monnaies du gué de saint-Léonard (Mayenne). *Trésors monétaires* 21 (2003/2004).

[11] Vincent Drost 2005/2006. Le trésor de la préfecture de Rennes (Ille-et-Vilaine), 1881. *Trésors monétaies* 22 (2005/2006), 171-206.

[12] Daniel Gricourt 1999. La Chapelle-lès-Luxeuil (Haute-Saône). 15518 nummi constantiniens. *Trésors monétaires* 18 (1999).

Čentur (Maresego-Slovenia) is a treasure of this type. As is known, the publishing of that huge number of folles occurred in successive stages, with different methods, especially because the information extended between 1934 and 1962. A period of 28 years cannot do other than raise many questions, create many doubts and render the entire "Čentur treasure" of difficult interpretation. How is it possible that in a site of limited size finds of many thousands of coins from the same period could take place at fairly regular intervals? Were they really different treasures buried far apart from one another? Or should it rather be interpreted as a single treasure, hidden in the same place and at the same time? Who really made the discovery? What verifiable testimonies have the protagonists left us, who were certainly aware at the time that they had discovered one of the most clamorous Tetrarchy hoards of the Italiciana Diocese and of the whole Roman empire? Were archaeological digs of verification planned and conducted or was an unverified oral tradition just accepted, more or less connected to an undemonstrated toponymical interpretation of Čentur as the quarters of a Roman centuria? Or perhaps, *lectio facilior*, the find was just one that came under the control of two families of a tiny village and was then announced gradually (amphora after amphora?) over the years due to the influences cause by the tensions in 1939-1945 and then by the definition of the frontier between Italy and Yugoslavia? What role did some still living protagonists have? For some of these questions it was attempted to give, if not an answer, at least some indication in tune with the objectives of the Roman conference on Misurata[13]. A global approach was chosen for an objective examination of both the bibliography and the new data with the aim of reconstructing the unity of the find, i.e. of the hoard being interpreted as a single great hoard of Tetrarchy folles buried around 310/312.

The input was determined by the study of a part of the first find, that of 1934 (known as Čentur D[14]), conserved at Trieste and the project is funded by the Department of Humanities (FRA 2016[15]), with a focus on the following:

a. identification of the archaeological site;

b. listening to the protagonists;

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[13] Bruno Callegher 2015. *Un milione di denari sulla collina di* Čentur. In: Garaffo and Mazza (eds.) 2015. *Il tesoro di Misurata (Libia)*, 141-161.

[14] Robert Matijašić 1981-1982. The hoard of Roman coins from Centora (Čentur) kept in the Archaeological Museum of Istria in Pola. *Atti del Centro di Ricerche Storiche – Rovigno* 12 (1981-1982) 35-56; information on the Trieste holdings in Bruno Callegher 2015. *Un milione di denari sulla collina di* Čentur cit., 144-146.

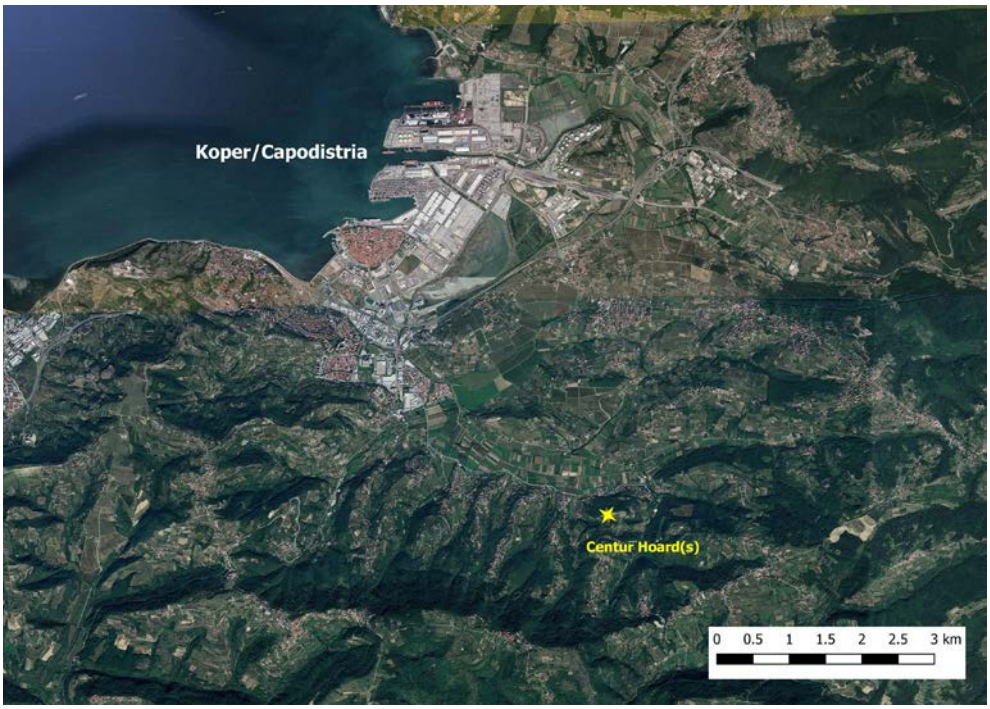
[15] The project has involved Manuela Montagnari, Andrea Favretto and Bruno Callegher of the Department of Humanities and Gianpiero Adami of the Department of Chemical and Pharmaceutical Sciences of the University of Trieste.

c. recovery of the monetary data at public and private bodies;

d. verification method of the data;

e. construction of a data base with controlled access for the progressive input of new acquisitions.

THE ARCHAEOLOGICAL SITE



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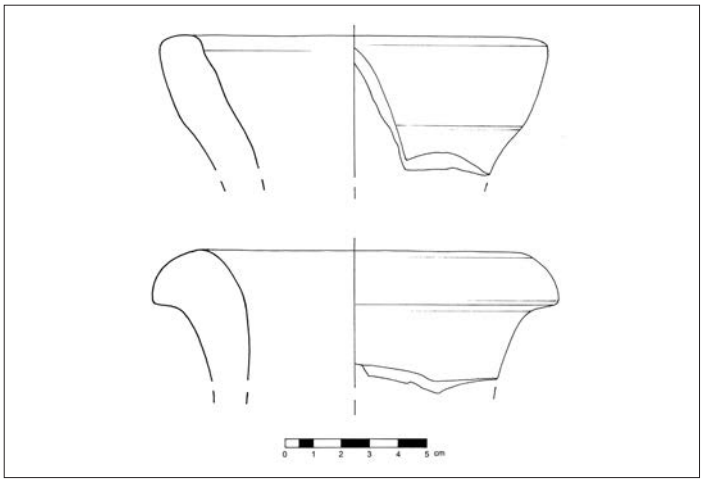
The vagueness of the topographical reference relating to the exact location of the discovery of this Tetrarchy treasure is still today surprising. Yet, the first information was announced in 1937 by the archaeologist Giovanni Brusin (1883-1976)[16], who would certainly not have missed the historical potential of such a find. Some authors, in particular Aleksander Jeločnik (1917-2003), refer to archaeological digs in the

[16] Giovanni Brusin 1937. *Notiziario archeologico (1935-1936). Atti e memorie della Società istriana di archeologia* 47 (1937), 287.



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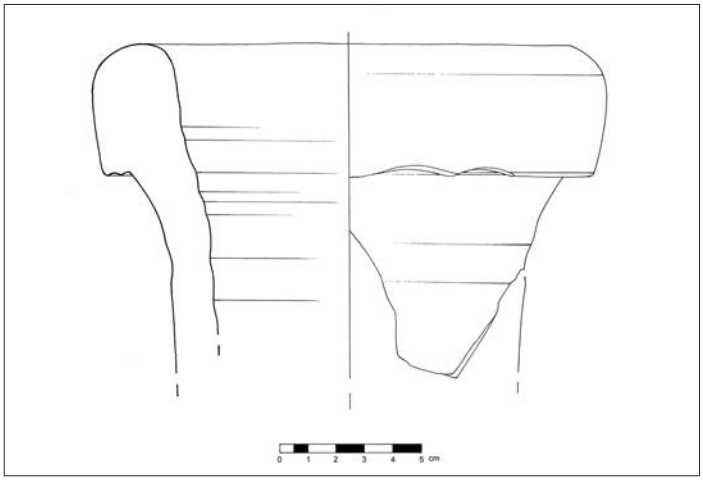

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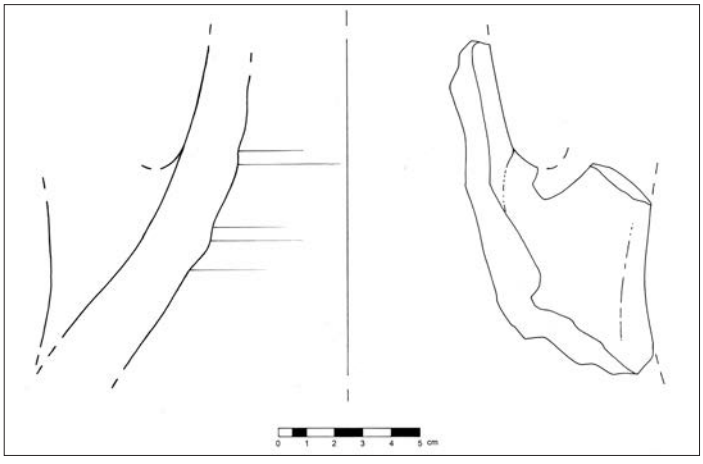

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area, but in a fairly generic way, and today the documentation of investigations conducted by Yugoslavian archaeologists does not exist or has perhaps been lost[17]. The hypothetical location of the find is georeferenced because a recent survey conducted by some inhabitants of the small village in an area today an olive grove and indicated in fig. 1, produced pieces of sesquipedalian bricks, fragments of coarse ceramics and above all, sides and necks of North-African amphorae (figs. 2-4) datable to the early 4th century[18]. It follows that, on an archaeological basis, a frequentation can be hypothesized at a time coherent with that of the hoard (310-312). However, it cannot be proved that these surface finds are associated with those connected to the ancient containers of the coins, indicated in the literature as amphorae without any reliable description of the shape or volume, and now lost. A careful archaeological investigation, a gap that it is hoped can be filled with the publication of the old dig reports (if preserved) or with new surface investigations or at least with a comparison between archaeological finds reported in the bibliography of the site and finds that came to light during ploughing, would provide inescapable elements to establish if the hoards would have been buried together – as at El Zaudín (Tomares-Seville) and Suk el Kedim (Misurata) – and therefore discovered at the same time, or if the places were far apart and thus the reason, at least partly, for the strange succession of news lasting 28 years[19]. The archaeology is thus lacking, and deserves a complete rewriting: for this the contribution of Slovenian archaeologists is awaited, especially as regards the existence of any documents or reports of digs for the years 1934-1962.

THE PROTAGONISTS

To overcome the vagueness of the site (or sites) of the find it was decided to do a survey of any memories or oral tradition of the treasure directly on site, among the inhabitants of Čentur and Mali Čentur and the Babić and Krmac families, who are still today the majority[20]. Of what happened on the little plateau at the time of the so-called "fifth find" that of 1962, when "*a group of foreign illegal treasure-seekers*

[17] Alexander Jeločnikn 1973. Čenturska *zakladna najdba folisov Maksencija in tetrarhije/ The* Čentur *Hoard: folles of Maxentius and of the Tetrarchy*, Ljubljana (Situla 12); referring to the digs of 1962, but without indication of their publication, Peter Kos 1988. *Die Fundmünzen der römischen Zeit in Slowenien*, I, Berlin 1988, 62/1/1-21 records isolated finds from this locality.

[18] The identification and drawings were made on site. I thank Dr. Ella Zulini for the dating of the amphora material.

[19] For the wealth of numismatic information on the content and containers of a monetary treasure, cf. Sylviane Estiot, Vincent Drost & Rodolphe Nicot 2011/2012. Le double trésor de Magny-Cours, Nièvre (*terminus* 3003 de notre ère). *Trésors monétaires* 25 (2011/2012), 47-175.

[20] Bruno Callegher 2015. *Un milione di denari sulla collina di* Čentur cit., 150-151.

discovered with detectors in the same locality a large quantity of coins and deposited them (in three portions each exceeding 2.000 coins) in three places at Koper"[21] only "heard it said" remains and the interviewees had a vague memory. With widespread diffidence they admitted that something important had been found but in the distant past, that news of a treasure was repeated over the years, but they lamented that there was no longer anyone who had known the expert Bogomir Babić, one of the protagonists[22]. The absence of memories was therefore accompanied by some reticence, as if our questions evoked memories or feelings muted by time. It would seem impossible that in a village inhabited by a few dozen people, belonging to only two families, the sensation caused by the find of an enormous monetary treasure could have vanished so completely. The comment by Jeločnik deserves a mention because it suggests another explanation, that of the clandestine treasure-seekers with metal-detectors. Also in this case the intention emerges of "not saying" rather than justifying in a circumstantial way. It appears rather dubious that in 1962, in full geopolitical crisis between Italy and Yugoslavia, when the Treaty of Osimo of 10 November 1975 had not yet been reached that sanctioned the territorial separation that had created the Free Territory of Trieste following the London Memorandum (1954) rendering the frontiers between Italy and the then Yugoslavia definitive, that foreigners (but of which nation?) could cross the frontier with a metal-detector to head for a specific locality: that of the area of the previous discoveries. It is even less plausible that the treasure-seekers with metal-detectors would go straight there and in a short time find a treasure of more than 6 thousand folles then divide it into three parts and take it to Koper to be sold. Three piles of more than 2000 folles each do not fit into a bag and not even a cardboard box! These explanations/reconstructions lack coherence and logic; they are rather an old tale, easy, but lacking in circumstances and verifiable references at a much later date, which instead have the characteristics of an imaginary or adventure story[23].

As the research directly at Čentur and Mali Čentur had confirmed the well-known criticalities, a final attempt was made with the last protagonists of that distant 1962:

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[21] Alexander Jeločnikn 1973. Čenturska cit.

[22] A first visit was in May 2012, but there were others up until 2017 in the company of a Slovenian student with an excellent command of the language and knowledge of the area. It is also surprising that in a village Erpelle/Cosina not far from Čentur wide publicity was given, with a footpath being laid and a highly-visible explanatory signpost to a treasure of Venetian times, much smaller and with less historical significance: cf. Federico Cammarota 2018. Il terzo ripostiglio monetale da Erpelle-Cosina (Herpelje-Kozina): nuovi dati e nuovi documenti. *Atti e Memorie della Società Istriana di Archeologia e Storia Patria* 118 (2018), 203-240.

[23] It is obvious that a denial will be happily accepted based on data, facts, documents and not on memories or "it is said", nor on irrefutable statements like the one accepted in Jeločnikn and mentioned here.

Efrem Pegan (Munich), Giulio Bernardi (Trieste) and Giovanni Paoletti (Trieste). They all well remember the great hoard of Tetrarchy folles of 1962, but provide different reconstructions. On the one hand the two Trieste protagonists claim that well before 1962 there had been a continuous flow of Tetrarchy folles to Trieste in the search for buyers, which continued throughout the 1960s, but the large number of these coins and their repeated supply had made the market value fall while it had aroused numismatic interest. Bernardi and Paoletti also confirm that Efrem Pegan was the point of reference abroad. With him, they had agreed to buy all of the treasure even if it was no longer intact. As is self-evident and logical, their proposal was not for financial gain but rather to avoid the dispersal of the treasure, at least of that defined as the "fifth find". Through personal contacts the two Trieste intermediaries bought some tens of specimens both as confirmation of the seriousness of their proposal and to verify the authenticity of the numismatic material. Yet the project foundered for reasons that remain unexplained, at least if other documents not known today or not accessible do not emerge. This negotiation and its failure led to the spread of information that the proprietors (but who? The Babić or Krmac family?), to avoid trouble with the Yugoslav police, had "destroyed the evidence" i.e. transformed many thousands of folles into copper sulphate, for a weight – and once again the sources diverge – ranging between twenty and two hundred kilogrammes[24]. Beyond an almost certain physical disappearance of most of the last find, that of 1962, a possible overlap/confusion should be pointed out between the discovery in summer 1944 (in the middle of the civil war)[25], reported by Mirabella Roberti in 1952[26] and that of 1962, known as Čentur B[27]; it could even be hypothesized that it was a single discovery announced over the course of the years. However, there is one fact that contributes to rendering complicated both a correct temporal succession and quantity of the finds and that the treasure/s would not have been well known to the competent authorities of the region. Indeed, it contradicts both the confirmation of the more or less mysterious circumstances of the find and the invasion of foreign treasure-seekers equipped with a metal-detector – the incontrovertible fame of this dossier in the Koper area in the early 1950s. In fact, in 1955 how could a local bank have minted a token imitating an Aquileian follis coming from Čentur without permission from the competent authorities and publicizing that find?[28]

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[24] Bruno Callegher 2015. *Un milione di denari sulla collina di* Čentur cit., 149-150. The information is reported without critical analysis and without knowing this article, in https://univerzanaprimorskem.academia.edu/LeilaniStajer.

[25] Čentur A: Alexander Jeločnikn 1973. Čenturska.

[26] Robert Matijašić 1981-1982. *Il ripostiglio di monete romane di Centora (*Čentur*)*, 52.

[27] Alexander Jeločnikn 1973. Čenturska.

[28] The Splošna Banka of Koper issued a silver token (925‰) described thus: D/ Splošna

17/12/2016 Posta :: ringraziamenti

Rispondi Inoltra Elimina

ringraziamenti

Data: 20/11/2016 (13:11:54 CET)
Da: Efrem Marcel Pegan
A: bcallegher@units.it

Hai risposto a questo messaggio il 21/11/2016 10:56:16.

Testo (6 KB)

Gentilissimo professore Bruno Callegher,

Le ringrazio per la Vostra gentile lettera.

Grazie per la Vostra decisione di mandarmi il Vostro articolo. La notizia era per me una bella sorpresa. Già l'immediata decisione di far mi ottener il Vostro articolo mi ha fatto un vero piacere.

Come ringraziamento lunedì Le manderò un libro scritto da me occasionalmente del 75annuario della fondazione della Società numismatica di Slovenia. Come si tratta di storia locale, speziale numismatica ed piuttosto und sviluppo della società numismatica e scritta in sloveno. Ma si trova anche un breve riassunto in tedesco. Il caso di Čentur non è menzionato, ma sono qualcuni altri ripostigli, ed notizie storiche come sviluppo del collezionismo, della società numismatica e di scienza numismatica in Slovenia. Sono parecchi ricordi che con tempo si sfumano e perdono per sempre.

Nel settembre 1962 ho partecipato negli scavi di Čentur assieme con la signora archeologa Mirina Zupančič ed la defunta dottoressa Jacqueline Lallemand della Bibliothèque Royale de Bruxelles.

Ma non era trovato altro come murra die una fortificazione (?) die dimensioni di un campo. Le Anfore erano spostate negli angoli del battimento.

Mentre non so dove si trovano le documentazioni degli scavi, le monete invece hanno fato il giro del mondo. E passato un mezzo secolo ed moltissimi ricordi sono stati vittime del tempo, sono spariti.

Io ho dimenticato moltissime circostanze. In ogni caso tutto che mi potrei ricordare Le faró volontieri sapere. Penso che non sarà qualche cosa di importanza. Quello che ho suo tempo detto al dott. Jeločnik, ed prof. Peter Kos e gia scritto nelle pubblicazioni del Museo di Lubiana.

Io ho tenuto la parola Čentur sempre come diventata di Centuria perché parecchie localitá che avevano un pedigree latino in slavo si hanno transformato in "č". Per esempio le località di oggi: Vič (oggi parte di Lubiana - strada verso Trieste (suo tempo la località extra muros era un vicus), lo steso, la localitá Vičava nelle vicinanze di Ptuj [Poetoviona], era nell'antichità lo stesso un vicus). Per esprimere con altre parole, si tratta di una questione lingvistica. Vostra prima spiegazione "un probabile Sveti ... " dovrebbe essere almeno menzionato nell archivio episcopale. La seconda spiegazioni mi pare piú plausibile, pero non conosco un paragone.

https://wmail4.units.it/imp/dynamic.php?page=message&buid=22633&mailbox=SU5CT1g&token=e9xp2N1SFn3CARseX07MGDb&uniq=1481998263158 1/8

In 2015, publication of the paper reconstructing this intricate find in the proceedings of the conference on Misurata drew the attention of Efrem Marcel Pegan. I had unsuccessfully tried to contact him through a mutual friend Giulio Bernardi, being willing to meet him in Munich. Unexpectedly, I received a letter from Pegan in October 2016 with a request for my paper, which I promptly sent, accompanied by a lengthy list of questions. It was the long awaited occasion to obtain some help with the many doubts that had gradually emerged during the research: the locality and place-name, any archaeological investigations, documentation of the digs, fate of the coins and reliability of the information diffused over the decades. Shortly afterwards I received an extremely courteous reply with a lot of useful data (fig. 5)[29], but also with information or absence of answers that confirmed my perplexities. Crucially, two confirmations and one silence emerged. The first regarded the archaeological component. I learned that the archaeologist Marina Zupančić together with Jacqueline Lallemand (1928-1995), a specialist in money of the second half of the 3rd century[30] had made investigations at Čentur. A search of the archives in the Cabinet des Médailles of Brussels, where the papers of the Belgian scholar are held, did not provide any confirmation. The reference, because unpublished, surprised those who had known and worked with her[31]. The second valuable datum regarded the absence of proof on the existence of a military camp in the locality, but at the same time confirmed the presence of amphorae "in the corners of the beat (sic)" (*rectius*: in the corners of the outer wall, the extent of the site?), news that was confirmed in situ thanks to the help of the above-mentioned inhabitants of the village (cf. figs. 2-4).

No reply, therefore silence, about the transformation of many kilogrammes of folles into copper sulphate. Rather an extremely interesting confirmation: "*While I do not know where the documentation of the digs is, the coins have gone around the world*". The protagonist at that time, on the Yugoslavian side, thus knew about the dispersal of the treasure, or at least of its last part, in the thousand streams of collecting.

BANKA·KOPER·, in the centre: 1955; R/ Reproduction of the cast of a coin of the Aquileia mint from Čentur, described as: Moneta standing l. with scales and cornucopia; SACRA MONETA AVGG ET CAESS NOSTR, exergue: AQΓ, in the field, a d. III. The token is in the medal collection of the Department of Humanities-University of Trieste.

[29] I present the reply in its entirety because it is an important document of purely scientific nature and thus worthy of not remaining in my personal archive. I take the occasion to sincerely thank Dr. Efrem Marcel Pegan.

[30] Johan von Heesch 1995. Bibliographie de Jacqueline Lallemand. Bibliografie van Jacqueline Lallemand. *Revue Belge de Numismatique et de Sigillographie* (141), 1995, 394-403.

[31] I thank Johan van Heesch and Jean-Marc Doyen for this information.

"THE COINS INSTEAD HAVE GONE AROUND THE WORLD" THE NEW DATA

The above confirmation and contacts with those who played some role in 1962 suggested planning a collection of all the data in order to verify the reliability of the two hypotheses: treasures or a single treasure?

One of the new contributions, outcome of the preliminary phase of this research was the discovery in Trieste of a very consistent part [32] of the 1934 find (Čentur D)[33].

Confirmation was later received that the bronze coins of Maxentius published by Picozzi in 1964 were acquired in Trieste, "coming from a find in an unspecified locality of Yugoslavia" and that belonged to the 1962 find and perhaps also that of 1944 (Čentur A and/or Čentur B)[34].

It has been mentioned that during those years some of the protagonists had bought specimens to verify the authenticity of the discovery. Giovanni Paoletti, cited in Pegan's letters made a group of folles available. Giulio Bernardi, who remembers perfectly what happened between 1962 and 1963, has a good number of these Tetrarchy folles. Yet, being in the imperial series of his personal collection, they are not always easily distinguished and only an examination of the patinas will allow a plausible distinction between the folles of Čentur and those collected over the course of many years. A scrutiny of the inventory of the National Archaeological Museum in Aquileia[35] was no less surprising, where nos. 60239-60270 record the arrival of 32 folles of Maxentius, type Cohen VII, p. 171, n. 54, with the generic origin of Istria, but which are traditionally known in the Museum as a "fragment of the Čentur treasure" (figs. 6-7-8). The indication of Cohen is not entirely correct because two folles in this group are of the type AETERNITAS AVG N (RIC VI, p. 403, n. 16) and FIDES MILITVM AVG N (RIC VI, p. 405, n. 45), but they are all issues of Maxentius, also in this case a targeted selection. However, it will be a coming archaeometric analysis of the patinas to confirm their origin.

In Trieste, three new folles from Čentur were reported on 9 January 2014, a gift from Professor Benedetto Lonza da Centora (Maresego) and indicated as a "Babić"

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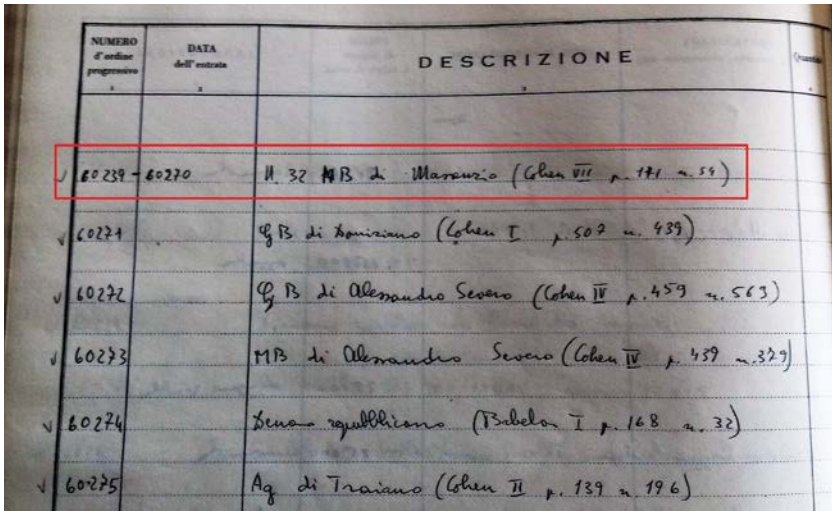
[32] Bruno Callegher 2015. *Un milione di denari sulla collina di* Čentur cit., 144-146.

[33] Robert Matijašić 1981-1982. *Il ripostiglio di monete romane di Centora (*Čentur*)*.

[34] Vittorio Picozzi 1964. Un ripostiglio di folles di Massenzio. *Numismatica. Periodico di cultura e informazione numismatica* 5.3 (1964), 181-198: 181. Cf. http://www.socnumit.org/doc/NSA/1964.3.Num.pdf.

[35] I am grateful to Dr. Antonio Stella for this report. In the inventory, the coins are recorded after 1967-1969, but this slight chronological discrepancy does not conflict with that of the find, instead it confirms it because the time lag between the date of the discovery, the acquisition and that of the addition to the collection through the inventorying is limited to a few years.

6



NUMERO d'ordine progressivo	DATA dell'entrata	DESCRIZIONE
60239 - 60270		Il 32 MB di Marcanzio (Cohen VII p. 171 n. 54)
60271		Gg B di Domiziano (Cohen I p. 509 n. 439)
60272		Gg B di Alessandro Severo (Cohen IV p. 459 n. 563)
60273		MB di Alessandro Severo (Cohen IV p. 459 n. 329)
60274		Denaro repubblicano (Babelon I p. 168 n. 32)
60275		Ag di Traiano (Cohen II p. 139 n. 196)

7

8

find, a direct confirmation that at a distance of many decades, the distinction between the various "hoards" was well known: in this case belonging to the find of 1944.

Another research line could be implemented in the *Münchener Numismatisches Antiquariat* and *Bibliotheca Numismatica* catalogues, so far not consulted in a methodological way because they are not easy to find (figs. 9-10)[36]. The title

[36] The information online (cf. www.sl.wikipedia.org/wiki/Pegan) qualifies Efrem Marcel Pegan as an archaeologist. Yet in the ambits of collecting and the numismatic press he is known for being in the 1950s, firstly a very young external collaborator of the Ljubljana National Museum and in the following decade a member of staff in that museum during the direction of Aleksander Jeločnik, assuming the role of keeper of the numismatic cabinet in 1964 and graduating in archaeology in 1965. From the bibliographical information (Gjuro Krasnov 1985. Slovenski numizmatiki: Pegan, Efrem Marcel, klasični arheolog in numizmatik. *Numizmatični Vestnik* 13 (1985) 127-132 & Ranko Mandić 1986. Dopolnilo numizmatićne bibliografije Dr. Efrema Pegana. *Numizmatični Vestnik* 14 (1986), 201-203 where his articles, reviews, reports and collaborations are listed) it is understood that he not only actively participated in the research/recovery of the Čentur treasure, but also that from the end of the 1960s he personally collaborated in the numismatic trade in both Italy and Switzerland, at the auction house Leu & Co. AG. Indeed, he is still remembered today as a supplier of ancient coins, both Greek and Roman, of great value and rarity. In the same period, probably also in this case at the end of the 1960s, he moved to Munich, where he opened his own numismatic business with Gürsching G., Munich, Germany until 1967-1968, then passed to the Münchener Numismatisches Antiquariat, Diessen, Germany (cf. T.V. Buttrey, M. De Castro, *Numismatic sale catalogues in the Fitzwilliam Museum*, Cambridge, Cambridge 1997, p. 85). As is known, it is very arduous to retrieve entire series of auction house catalogues, the consultation of which is one of the most limiting deficits in numismatic research. In some catalogues accessible through https://www.fitzmuseum.cam.ac.uk/dept/coins/library/salescatalogue/SALECM-N.pdf, edited by Ted Buttrey, the list in Münchener Numismatisches Antiquariat (E. Pegan, G. Gürsching) Diessen, Germany provides the following data: "*continued from GÜRSCHING no [9]; -- seriation taken from PEGAN 76 1-III-2002. Lists: {Small} 1974: no [16], Spring; 1978: no [34], Summer; 1987: no 50, Summer; no [51a], Winter; 1988: no 52, Spring. Lists (lit.): {Small} 1972: Spring; no [10], Summer; [11], Nov; 1973: no [14], Dec; 1973/74: no [15]; 1974: no [17], May; no [19], Dec; 1974/75: no [20]; 1975: no [23]; 1976: 1981: Summer; 1983: Autumn; 1984: Summer; 1987: no [51], Autumn Auctions: {Large general} complete 1-7 1987: no [53], no 1, 20 Nov; 1988: no [54], no 2, 3 May (lit.); no [55], no 3, 7 Oct; no [56], no 4, 10 Oct; 1989: no [57], no 5, 28 Mar; no [58], no 6, 24 May; no [59], no 7, 24 May. – continued as PEGAN no [60]*"; other data in the Pegan listing give the following indications: "*PEGAN, E.M., Gilching, Germany -- continued from Münchener Numismatisches Antiquariat no [59] -- seriation taken from PEGAN 76 1-III-2002 Auctions: {Large} have 60-82 1989: no [60], 30 Nov (lit.); 1990: no [61], 10 May; no [62]; 5 Oct; 1991: no [63], 23 Feb; no [64], 5 Sep; 35 1992: no [65], 14 Feb; no [66], 12 May; no [67], 20 Nov; 1994: no [68], 3 Jun; no [69], 22 Sep; 1995: no [70], 10 Feb; no [70a], 15 Apr; no [71], 14 Jun; no [71a], 31 Aug; no [72], 4 Nov; no [72a], 20 Dec; 1996: no [73], 7 May; no [74], 4 Sep; 2000: no 75, 19 Jun; 2002: no 76, 1 Mar; no 77, 1 Jun; no 78, 23 Nov; 2003: no 79, 5 Apr; no 80, 7 Aug; no 81, 6 Sep; no 82, 20 Dec"*. Of all these catalogues, however, I was able to consult: *Antike Münzen: Auktion IV*, München, Grand Hotels Continental, Montag, 10. Oktober 1988, Auktionator Dr. Efrem M. Pegan; *Münzen: Auktion VII*, München, Mövenpick im Künsterlerhaus, Mittwoch, 24. Mai 1989, Auktionator Dr. Ephrem M. Pegan). Pegan was also active in the buying and selling of books on numismatics (*Bibliotheca numismatica: Auktion III*, München, Grand Hotels Continental, Freitag, 7. Oktober 1988, Auktionator Dr. Efrem M. Pegan; *Bibliotheca numismatica: Auktion VI*, München, Mövenpick im Künstlerhaus, Mittwoch, 24. Mai 1989, Auktionator Dr. Efrem M. Pegan; *Bibliotheca*

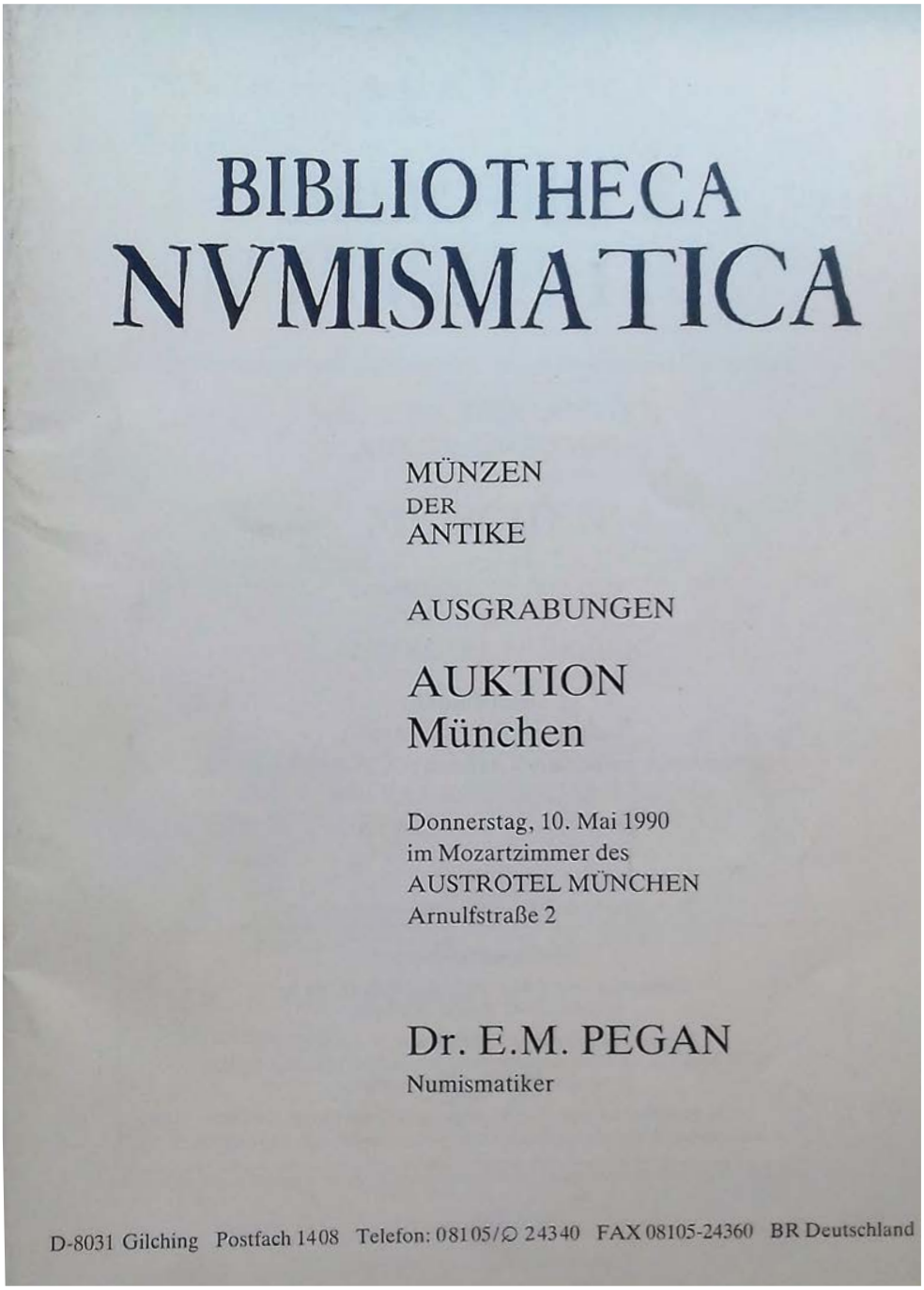
ANTIKE MÜNZEN

AUKTION IV
München

Montag, 10. Oktober 1988
im Dachgartensaal des GRAND HOTELS CONTINENTAL
Max-Joseph-Straße 5

MNA

MÜNCHENER NUMISMATISCHES ANTIQUARIAT GMBH
Leonhardistraße 16 · D-8918 DIESSEN a. Ammersee · Telefon: 0 88 07/ ø 86 06 · BR Deutschland


BIBLIOTHECA
NVMISMATICA
MÜNZEN
DER
ANTIKE
AUSGRABUNGEN
AUKTION
München
Donnerstag, 10. Mai 1990
im Mozartzimmer des
AUSTROTEL MÜNCHEN
Arnulfstraße 2
Dr. E.M. PEGAN
Numismatiker
D-8031 Gilching Postfach 1408 Telefon: 08105/ 24340 FAX 08105-24360 BR Deutschland

pages of some of these catalogues give Efrem Pegan sometimes as owner, sometimes as editor of the catalogue/presentation schedule. In these publications for collectors the series of Tetrarchy folles of the Aquileia, Ticinum, Ostia, Carthage mints is always quite substantial, with types consistent with those of Čentur (FIDES MILITVM, GENIO POPVLI ROMANI, SALVIS AVVG ET CAESS FEL KART, CONSERV(ATOR) VRB(IS) SVAE) (plates nr 1-3) and it cannot be excluded that many of the Tetrarchy folles especially of the Aquileia mint, came from one of the various coin sets of Čentur. On this, however, and it was one of the questions posed in the mentioned email but not dealt with, an answer could be given only by the person directly involved.

Plate nr. 1 – Authorities and Mints

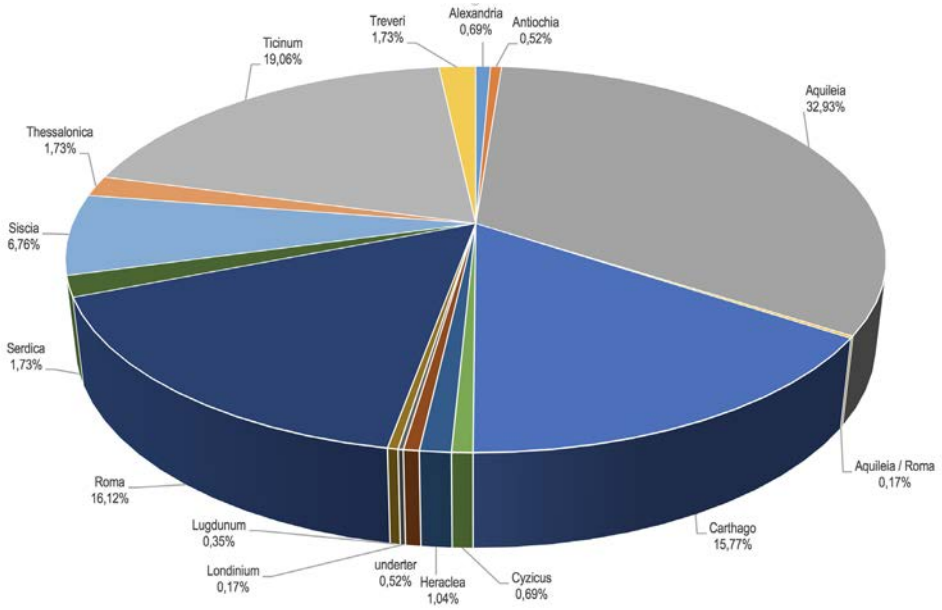
	Ale	Ant	Aq	Aq/Rm	Carth	Cyz	Her	Lon	Lug	Roma	Ser	Sis	The	Tic	Tre	uncert	total
Constantius, Caesar			47		1					3		1		13			65
Diocletian	4	3				4	6				3		10			1	31
Severus			18											1			19
Galerio, Caesar											7						7
Licinius												5					5
Maxentius			115	1	16					35				41			208
Maximianus Herculius			10		74			1	2	55		33		55	10	2	242
total	4	3	190	1	91	4	6	1	2	93	10	39	10	110	10	3	577

numismatica: Bücher über Antike Kunst, Geschichte, Antiken Schmück, Geschnittene Steine; Münzen der Antike, Ausgrabungen: Auktion, München, Austrotel, Donnerstag, 10. Mai 1990; *Bibliotheca numismatica: Antike Münzen*: Auktion, München, Austrotel, Samstag, 23. Februar 1991; *Bibliotheca numismatica: Spezialsammlung Sasanidischer* Münzen: Auktion, München, Austrotel, Donnerstag, 5. September 1991; *Bibliotheca numismatica: Münzen: Medaillen, Archäologie, Geschnittene Steine*: Auktion, München, Austrotel, Freitag, 14. Februar 1992). Many other auction houses made use of his expertize, not least *Numismatica Varesi* of Pavia, for which he edited the valuable catalogue *Biblioteca Domenico Rossi. Cataloghi d'asta e listini di numismatica*, Asta 45, Pavia 2005. A check of the numismatic material in the catalogues might clarify some relationship with the folles of the north Istrian treasure being examined here. Moreover, a catalogue will shortly become available of all the auctions directed by Pegan, edited by Matthias Barth of the Staatliche Münzsammlung München. I sincerely thank Hadrien Rambach for this advance information.

Plate nr. 2 – Mints and typology

	Ale	Ant	Aq	Aq/Rm	Carth	Cyz	Her	Lon	Lug	Roma	Ser	Sis	Thes	Tic	Trev	undeter
GENIO POPVLI ROMANI	4	3	1			2	6	1	2	15	10	12	10	8	10	
FIDES MILITVM			35											7		
CONSERVATORES VRB SVAE										9				5		
CONSERV VRB SVAE			36	1						25				31		
SACRA MONET AVGG ET CAESS NN			9													
SACRA MON AVGG ET CAESS NN																1
SACRA MONET AVGG ET CAESS NOSTR												21		47		2
SACRA MON VRB AVGG ET CAESS NN										43						
SAC MON VRB AVGG ET CAESS NN										1						
PROVIDENTIA DEORVM			9													
VIRTVS AVGG ET CAESS NN			25													
FELIX ADVENT AVGG NN					19											
SALVIS AVGG ET CAESS AVCTA KART					4											
SALVIS AVGG ET CAESS FEL KART					52											
CONSERVATORES KART SVAE					16											
GENIO AVGG ET CAESARVM NN						2										
GENIO AVGVSTI												4				
GENIO CAESARIS												1				
PROVIDENTIA DEORVM QVIES AVGG														2		
IOVI CONSERVAT												1				
VIRTVS CONSTANTINI			5													
VIRTVS AVGG ET CAESS NN														5		
PERPETVA VIRTVS														1		
VIRTVS PERPETVA AVG														1		
MEMORIA DIVI CONSTANTINI			70													
MEMORIA DIVI CONSTANTI														3		
total	4	3	190	1	91	4	6	1	2	93	10	39	10	110	10	3

Plate nr. 3 – Mints



Alexandria	4
Antiochia	3
Aquileia	190
Aquileia / Roma	1
Carthago	91
Cyzicus	4
Heraclea	6
indeterminabile	3

Londinium	1
Lugdunum	2
Roma	93
Serdica	10
Siscia	39
Thessalonica	10
Ticinum	110
Treveri	10

In the early 1970s and during the 1980s, various collectors in Trieste, but also in Veneto and Lombardy, remember the massive availability of folles, of the Aquileia, Ticinum, Rome and Carthage mints, for which an origin was indicated as the "frontiers of Italy". Some of them claim that in the period 1945-1954, during the administration of the Free Territory of Trieste, many soldiers of American, English and other contingents bought the folles that arrived from Istria, a cryptic way of not saying that they came from Čentur. Pegan thus had reason to write that they were dispersed throughout the world.

If these are the new data, how will they be verified and registered, and how can the arrival of information be encouraged also from far away or from collectors willing to share a significant part of their collections? Also in this case the answer is not simple and the reliability of the reports will be checked with a philological-critical method. An example are the 577 folles held in Trieste as part of the 1934 find and then listed in a cursory way prior to their independent publication.

Their origin from Čentur could have been accepted per se, trusting just the testimonies of the current custodians of the collection. However, this is confirmed by another type of documentation, conserved together with the coins. These are fragments of pages or paper documents (newspapers, objects used for the conservation, notes and annotations) that support the reliability of the origin. In fact, this part of the hoard reached Trieste immediately after 1945 at the time of the expulsion of the Italian community from Istria. The coins were in an aluminium tube, a food container, (fig. 11) and in it were thrust pieces of pages ripped from sales catalogues of antiquarian books (figs 12-14). Most especially there were bits of envelopes postmarked with the year; on some pieces of rough paper the number of specimens was noted selected by mint and authority, with counts and corrections due to second thoughts. The decisive fragment (fig. 15) records the total number of coins (**3376**) and their division in two parts, one of which specified as **2163** folles. This tallies with the 3378 counted by Brusin in 1937[37], even if the total differs by two coins. After complex post-war comings and goings between Italy and Yugoslavia, a set of 2195 folles (more than in the original division) went to the Archaeological Museum in Pola. The second set, estimated as around 1180 pieces, appears to have suffered a loss because of these only 577 are held in Trieste as mentioned above, while around 606 are no longer traceable and so probably lost. One of the most interesting aspects of this set is the ochre patina that covers much of the flan. This is not only the same on all the coins, but is comparable with that on the pieces in private collections in Trieste. So, apparently marginal physical elements and documents authenticate the at least partial re-composition of the hoard found in 1934.

An analogous uniform patina is also found on the small Aquileian segment, seemingly selected taking only two things into account: the emperor Maxentius and the mint, Aquileia, with the two mentioned exceptions.

More generally, in the successive reports over the course of around thirty years and from the reconstruction made so far (fig. 16), a more or less common fact emerges: in the various segments of the Čentur "treasures" the number of folles oscillates around 3 thousand. How can the same quantity for each amphora thus not be hypothesized, buried together and then emerging, between fear and the hope of

[37] Giovanni Brusin 1937. *Notiziario archeologico*.


FORMAGGIO
ERBO-GALBANI
ERBORINATO
SOC. AN. EGIDIO GALBANI

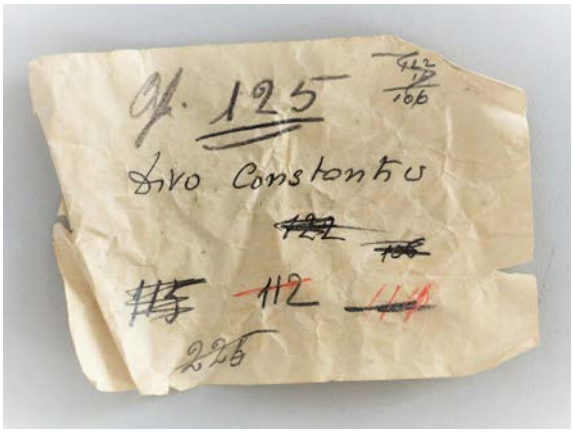
11

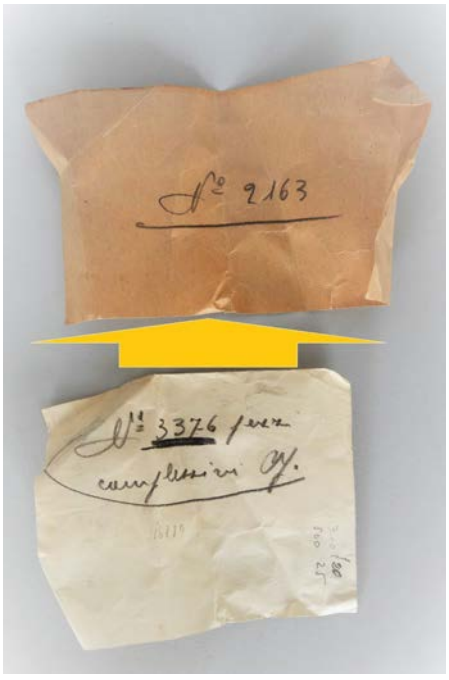
12


TOURING CLUB ITALIANO
MILANO - CORSO ITALIA N. 10
PROGRAMMA D'ABBONAMENTO A
LE VIE D'ITALIA
RIVISTA MENSILE DEL
TOURING CLUB ITALIANO
1937 - ANNO XV E. F.
Nel caso che abbiate già rinnovato l'abbonamento questa circolare non Vi riguarda.
EGREGIO SIGNORE.

13

14

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15

Summary (1935/1962)

Finds	Nr.	Surviving coins	Missed
1935 = Čentur D (Matijašić 1981-1982)-Pola	**3.378**	2.195 + 577 (unpublished) = 2.772	**606**
1938 = Čentur C Jeločnik – Kos	**ca. 3.500**	2.276	**ca. 1.224**
1944 = Čentur A Jeločnik 1973	**ca. 25.000**	5.032	**ca. 20.000**
1950 Disperso	**ca. 3.000**		**ca. 3.000**
1962 = Čentur B + Picozzi	**+ 6.000**	2.042 + 695 = + ca. 500 (unpublished) = 3. 327	**ca. 2.673**
Total	**ca. 40.878**	13.407	**ca. 27.503**

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gains, under the control of two families, Babić and Krmac, at a distance of years as an archaeological-numismatic sequel[38]? Could the number of the pieces contained be explained as a collection of taxes or a sum destined to the payment of soldiers, with a value established by weight and not number? Indeed, if an average weight of folles of the first reform ca. 301 cut to 1/32 of a pound (10.2 g), and those of the weight reduction of ca. 307, in this case with a standard 1/40 of a pound (8.18 g) to the emissions of 309/310 with a weight calculated as 1/48 of a pound (6.52 g) is calculated, a weight is obtained for each amphora of circa 21 kg, equal to around 60/65 pounds (ca 3000 folles x average weight of 7 g)[39]. These values could be compared, even if only hypothetically because the total is not yet known, with that of the 19 amphorae of El Zaudín (Tomares).

[38] In http://chre.ashmus.ox.ac.uk Čentur is listed in the succession of finds as published over the years.

[39] The data are taken from Georges Depeyrot 1992. Le système monétaire de Dioclétien à la fin de l'Empire romain. *Revue Belge de Numismatique et de Sigillographie* 138 (1992), 33-106.

HOW TO ASCERTAIN THE PROVENANCE?

As explained, in the Trieste case the origin of the 577 folles and their pertinence to a precise date derive from incontestable documents (fig. 17). A next confirmatory step will be by archaeometry through soil chemical composition analysis and comparison of this with the coins (μXRF). This diagnostic method compares the data

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of the chemical-compositional analyses of the patina taken from the surface of the flans with those of soil samples taken in the place where the remains of amphorae were found. A similar procedure has already been tested on coins originating from archaeological layers of a dig and others from previous surveys in the same area[40]. In that case, the coins from Monte Cesén, it was possible to establish that only some specimens really came from that territory, while for others the patina was completely incompatible with the soil of the dig.

A SPECIFIC DATABASE

So there will be two criteria of verification of the new data: documentary and archaeometric.

Indeed, the awaited reports of "coins from Čentur dispersed around the world" will be examined on a documentary basis, then subjected to an autoptic examination and a non-invasive sampling of the surface patina, the results of which will be compared with those already known. In this way, an archaeometric data base of the site can be built up over time. For the management of the new data a setup assisted computerized archive will be created. In this all the publications will be consultable in pdf format; in addition, through a preordained pattern, the essential numismatic data of the coins held in a museum (Lubiana, Pola, Aquileia)[41] or in private collections will gradually be inserted. As the research proceeds, it will be mainly the photographic documentation to establish possible coherent relations between the published[42] and unpublished material after a rigorous verification. It will probably be possible to find the identity of the coin in the different groups (from the various amphorae?), compare the statistical data relating to authorities, types, mints in order to render less uncertain a hoard that is one of the most important of the Tetrarchy period and the monetary history of the start of the 4th century at the boundaries of the Italiciana Diocese.

(Bruno Callegher)

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[40] Bruno Callegher et al. 2018. Un deposito votivo sul crinale delle Prealpi Trevigiane-Bellunesi: lo scavo archeologico del Monte Cesén, reperti numismatici e analisi archeometriche. *The Journal of Archaeological Numismatics* 8 (2018), 69-124.

[41] Once the architecture of the system has been designed and the work platform defined, these will be submitted to the colleagues in museums for their direct involvement in the project.

[42] The coin finds of Čentur are summarized in Kos 1988. *Die Fundmünzen* cit., *ad vocem*.

We built a relational database containing all the data related to ancient coins. We chose as DBMS (DataBase Mangement System) “PostgreSQL”, an ”open source object-relational database system with over 30 years of active development” (see https://www.postgresql.org). In order to ease the database creation and management, we used, in addition to PostgreSQL, PgAdmin GUI (Graphical User Interface – https://www.pgadmin.org).

The database structure

As previously written, a relational database about the Centur coin finding was built. Seven tables make up the database. Many relationships connect the Centur DB tables. They are both “one to many” and “many to many” relationships. The first ones are achieved by primary keys (PK) and a join table, the second ones by primary and foreign keys (PK, FK).

The seven tables are as follows:

1. “mint” table contains information about the different mints that minted the coins. The fields of the table are: “cd_mint”, the code of the mint, PK of the table; “denomination”, the name of the mint.

2. “authority” table contains references about the authorities that issued the coins. The fields of the table are: “cd_authority”, the code of the authority, PK of the table; “name”, the name of the authority; “function”, the rank/function of the authority at the time of the coin minting.

3. “coin” table contains information about the coins. The table fields are: “cd_coin”, the code of the coin, PK of the table; “nominale”, the type of the ancient coin; “date”, the mint date of the coin; “front_image”, the front image of the coin (it is a link to a jpg file stored in a server directory); “back_image”, the back image of the coin (it is a link to the jpg file stored in a server directory); “cd_initial_own”, the code of the first owner of the coin, FK field that is connected to the PK of the “initial_owner” following table; “date_initial_own”, the acquisition date of the coin first owner; “cd_final_own”, the code of the current owner of the coin, FK field that is connected to the PK of the “final_owner” following table; “date_final_own”, the acquisition date of the coin current owner; “cd_ric”, the code of the RIC (Roman Imperial Coniage) catalogue that contains the coin reference, FK field that is connected to the PK of the “ric” following table; “page”, the page of the RIC volume that gives the coin reference; “number”, the number of the coin in the RIC volume.

4. “connect_mint_aut_coin” table is a join table that connect “coin”, “mint” and “authority” tables. The table fields are: “cd_coin”, cd_mint” and “cd_authority” that are the three PK fields of “coin”, “mint” and “authority” tables.

5. “ric” table contains information about the RIC volumes that give the coin references. The table fields are: “cd_ric”, the code of the RIC catalogue that contains the coin reference, PK of the table; “volume”, the RIC volume that contains the coin reference; “publisher”, the name of the publisher of the RIC volume; “place”, the editing place of the RIC volume; “year”, the publishing year of the RIC volume.

6. “initial_owner” table contains information about the first owner of the coin. The table fields are: “cd_initial_own”, the code of the first owner of the coin, PK of the table; “name”, the first name of the coin first owner; “surname”, the last name of the coin first owner; “institution”, the name of the Institution the was the first owner of the coin (as an alternative to “name” and “surname”); “nation”, the Country of origin of the first owner of the coin.

7. “final_owner” table contains information about the current owner of the coin. The table fields are: “cd_ owner”, the code of the current owner of the coin, PK of the table; “name”, the first name of the coin current owner; “surname”, the last name of the coin current owner; “institution”, the name of the Institution the is the current owner of the coin (as an alternative to “name” and “surname”); “nation”, the Country of origin of the current owner of the coin.

Fig. 18 shows the relational structure of the Centur database.

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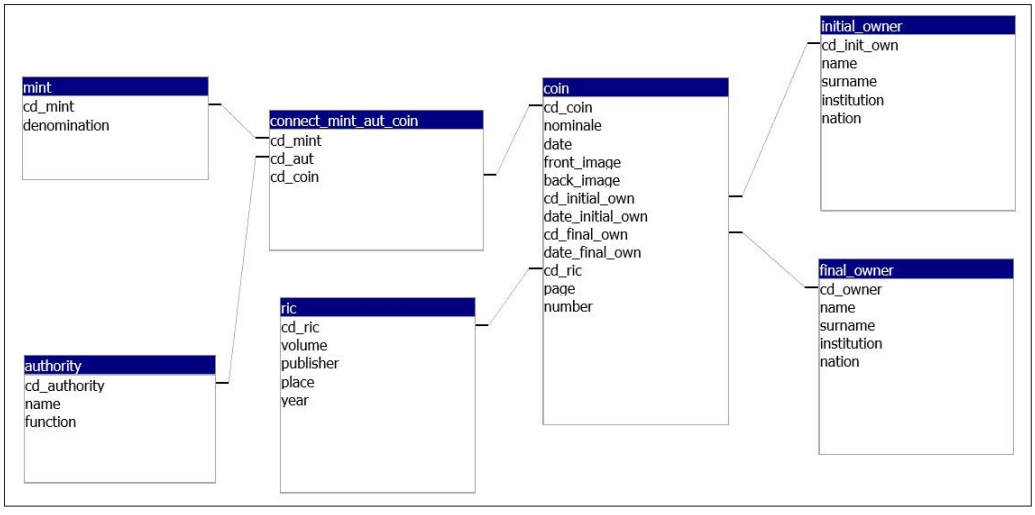

The database management

We planned a client/server architecture to work on our database. The PostgreSQL database will be hosted by a server, available online by a limited number of client (they are the spread owners of the Centur treasure). Of course, the access will be controlled by a logon procedure (with user id and password). The limited number of client machines will use the same application to manage the database.

We used Microsoft Access as front-end to the PostgreSQL database. The reason of our choice is that:

- Ms Access is an efficient and robust software. It is also widespread, being part of the Ms Office Suite.
- The connection driver between Ms Access and PostgreSQL (ODBC – Open Database Connectivity), is well maintained and has frequent updates.
- Ms Access makes available in its environment a user friendly tool to build masks.

We prepared a small number of masks in order to manage the PostgreSQL database (in order to insert, delete, update and view the records of each database table).

The users (the clients in our architecture) will be able to connect to the PostgreSQL database (hosted on the server) and will manage the data using the masks.

(Andrea Favretto)

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LE GROS TRÉSOR DE DIVO CLAUDIO D'EL JEM (TUNISIE) : QUELLE EXPLOITATION SCIENTIFIQUE, HISTORIQUE ET MUSÉOGRAPHIQUE ?

Abstract

One of the rare big treasures of North Africa. The treasure of El Jem constitutes the second important deposit of quantitative point of view after Musurata (120.000), then comes in third place the treasure of Mangub B with a capacity of 20.313 currencies ranging from 296 to 311. Discovered in El Jem in 1973 in a terracotta jar with a flat bottom. It is one of those hoardings of the 3rd quarter of the 3rd century (reign of Valerian-reign of Probus) constituted exclusively of Antoniniani with a large proportion of the coins of consecration of Claude II (nearly 54%). In 2009 and after a trip to El Jem to do the expertise, the report was twofold: a large number of coins scattered between two museums: fraction I at the Museum of El Jem, fraction II at the National Museum of Bardo, a single researcher will take care of the inventory and study to know me; finally the absence of any implementation of a Collective Research Project lack of resources... The company looks very difficult but we have composed with the means to produce a general inventory of currencies. It was in the framework of the seminar "Troppo grown up for the studiati" that we presented the way in which we could count, inventory and the beginnings of the study of this treasure while emphasizing the realities political and economic aspects of a country like Tunisia which often determine the management of its heritage.

Keywords

Tunisia, Africa, big hoards, inventory, museums, antoniniani, 3rd century, Gallien, Divo Claudio

I. LE TRÉSOR : CONTEXTE ET ENQUÊTE PRÉLIMINAIRE

Le trésor d'El Jem fait partie des gros trésors romains en Afrique[1]. Découvert sur la piste d'ouled-Bou-Hellal à El Jem, et à 177,70 m de l'angle sud-ouest des thermes romains, c'est un trésor de 40 416 pièces de monnaies en billon. Cette découverte fortuite s'est produite suite au passage d'un tracteur sur la piste précitée et dont le sol était amolli par la pluie. Un ouvrier de l'INA[2] observe un creux anormal sur le chemin bien plat, il se rapproche et là il aperçoit une quantité importante de pièces de monnaies romaines. Il les ramasse avec son collègue, les place dans une brouette pour les déposer dans l'amphithéâtre d'El Jem. Par ailleurs le vase qui contenait les monnaies était cassé et a été restauré selon les veilles méthodes, à savoir le colmatage avec le plâtre (voir photo). Le vase concerné correspond à une cruche découpée au niveau du col et dont le rebord a été rabattu. Malheureusement le vase n'a pas fait l'objet d'une étude, à l'instar de beaucoup contenants en Afrique dont l'identification et l'enquête ont toujours été négligées[3]. Un premier comptage a été effectué par MM. Jean Claude Golvin et Mabrouk Hamrouni, responsable à El Jem, le 28 octobre 1973, le lendemain de la découverte :

– 40 sacs de 1000 pièces	=	40.000
– 3 sacs de 100 pièces	=	300
– 1 sac de 61 pièces	=	61
– 1 sac de 55 pièces	=	55
Total		40.416 monnaies[4]

Aujourd'hui ce comptage initial n'est plus d'actualité, car suite au vol commis dans les réserves du Musée d'El Jem en 2006, une partie du trésor a disparu, ce qui explique le nombre actuel des monnaies : 19.656 pièces[5] dont 10077 seront exposées

[1] On estime que les gros trésors ou dépôts ont une composition qui varie entre 10 et 60 milles monnaies comme celui de Mangub A et B (Libye) et de très gros trésors entre 70 et 200 milles pièces comme celui de Misurata qui se constitue de 120.000 *nummi*. Voir Salama et Callu, « L'approvisionnement monétaire » 1987, 97-98 ; Depeyrot, « Les très gros trésors de Misurata », 112-117.

[2] Institut National d'Art et d'Archéologie, à partir de 1993 il devient INP (Institut National du Patrimoine).

[3] C'est la même chose en France où le problème a été déjà posé dans les années 80 par P. Jean Trombetta, P. Rigault, Michel Amandry, « Le trésor monétaire de l'écluse de Creil (commune de Saint-Maximin, Oise) », *Revue archéologique de Picardie*, 1985, vol. 1, p. 73.

[4] L'information est recueillie à partir du rapport de Mabrouk Hamrouni rédigé le 29/10/1973 et déposé aux archives du Musée d'El Jem.

[5] 9579 pièces sont conservées dans les réserves du musée d'El Jem.

dans les deux années à venir (2020) dans la nouvelle salle des trésors du Musée National du Bardo après réaménagement et extension[6].

II. GESTION DU TRÉSOR DEPUIS SA DÉCOUVERTE

Dans l'état actuel de la documentation, le trésor n'a fait l'objet d'un inventaire partiel qu'en 1976. En effet le 10 mars 1976, Pierre Salama a effectué l'inventaire de 4000 monnaies[7] dont voici la répartition par règne :

Empereur	Nombre des pièces
Valérien	12
Gallien	847
Salonine	65
Valérien II	5
Salonin	2
Postume	2
Victorin	10
Tetricus I	61
Tetricus II	21
Claude II	774
Divo Claudio, autre ou indéterminé	2.137
Quintille	28
Aurélien	6
Indéterminé	30
Total	4.000

[6] Le transfert de ce fragment de trésor a été effectué le 16/12/2006.

[7] Salama. « Trésor de Fadhiline (Tunisie) Antoniniani réguliers et irréguliers, ateliers italiens et gaulois », *AntAfr*, 43, 2007, p. 137.

Ensuite l'auteur nous donne une seconde répartition de 3.025 monnaies par types dont voici le détail[8] :

Type	Nombre des pièces
AEQVITAS	13
COMES	2
CONCORDIA	41
FIDES MILITVM	57
FORTVNA	13
HILARITAS	45
Instruments de sacrifice	54
LAETITIA	158
PAX	1.094
PRNC	3
SALVS	316
SOL	21
SPES	248
VICTORIA	14
VIRTVS	57
Indéterminés	889
Total	3.025

[8] *Ibid*, n. 3, p. 136

Le petit nombre de monnaies inventoriées par P. Salama (4000 sur 40.416 à l'époque), soit 9% du total du trésor, ne donne pas une idée claire sur la vraie composition du trésor. Par ailleurs, l'inventaire est si partiel et tronqué (absence de toute reproduction photographique) que nous ne pouvons utiliser les données chiffrées pour établir des comparaisons entre le trésor d'El Jem et les autres trésors africains qui ont la même composition et qui ont été vus ou inventoriés par Salama :

Utique (Tunisie) : dépôt de 300 à 400 antoniniani argentés vu par P. Salama chez un marchand à Tunis, le 6 mai 1965.

La Chebba (Tunisie) : trésor d'antoniniani donné par M. Fendri au Musée de Sfax en octobre 1961.

Hr. Trad[9] (Tunisie) : découvert en 1908. Trésor de 3500 pièces « (petits bronzes et quelques antoninianus [*sic*] saucés » selon Dubiez qui a établi l'inventaire de 94 pièces[10].

Ténès (Algérie) : composé de 724 monnaies, conservé au Musée d'Alger et inventorié par P. Salama en 1967.

Borj-Bou-Arreridj (Algérie) : trésor découvert au début du XXe siècle, ancienne collection de Barrot. Le dépôt composé de 240 antoniniani est conservé dans le cabinet des Médailles de Paris et il a été inventorié par P. Salama.

Bir Ouled Khalifa (Algérie) : composé de 1379 pièces et inventorié par P. Salama le 27 août 1969.

Abiar-Maggi (Libye) : dépôt composé de 4040 pièces environ observé par P. Salma le 5 mai 1968.

Rappelons que le trésor de Fadhiline est l'un des rares dépôts du troisième quart du IIIe siècle (voir tableau) qui soit étudié dans son intégralité et publié par P. Salama.

Mes dernières investigations relatives à l'inventaire du trésor, avec mes étudiants, ont donné lieu à cette répartition :

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[9] Il s'agit d'un trésor trouvé à Henchir Trad au sud de la ville Kairouan et à Sousse comme l'avait mentionné P. Salama dans son inventaire. Voir Sahbi Jaouadi, « occupation du sol au sud de la ville de Kairouan durant l'Antiquité : données de la feuille Poivilliers (071) au 1/50000 », *RTA*, 1, 2013, p. 115.

[10] A. Dubiez., Nouvelle trouvaille de monnaies romaines [dans l'Enchir Trade] du IIIe siècle, *Bull. Sousse*, VI, 1908, p. 133 à 137.

Empereur	Nombre des pièces
Valérien	2
Gallien	961
Salonine	62
Valérien II	-
Salonin	16
Postume	-
Victorin	6
Tetricus I-II	82
Claude II	980
Divo Claudio	7.917
Quintille	9
Aurélien	3
Sévérine	1
Probus	2
Indéterminé	36
Total	10.077

Fragment 1 conservé au Bardo

Empereur	Nombre des pièces
Valérien	28
Gallien	3.458
Salonine	100
Valérien II	8
Salonin	1
Postume	5
Victorin	28
Tetricus I-II	274
Claude II	2.849
Divo Claudio	2.732
Quintille	87
Aurélien	9
Sévérine	-
Probus	-
Indéterminé	-
Total	9.579

Fragment 2 conservé à El Jem

Par ailleurs, le trésor a fait l'objet de trois études depuis 2010 : une série monétaire, à savoir les bestiaires de Gallien[11] et deux autres travaux de recherches sur quelques spécificités du trésor comme l'essai d'élucidation de la question des Divo Claudio en Afrique[12] et l'iconographie de certaines pièces[13]. Signalons que pour ce qui est de l'inventaire muséographique et scientifique, nous avons rencontré beaucoup de difficultés liées d'un côté aux contraintes de l'accessibilité aux monnaies pour des raisons

[11] Amira Cherif, *L'émission dite du Bestiaire de Gallien (267-268 ap. J.-C.) : étude numismatique, statistique et historique d'une fraction de trésor (collection Musée du Bardo)*. Mémoire de master dirigé par Zakia Ben Hadj Naceur-Loum, soutenu en 2014.Université de Tunis.

[12] Ben Hadj Naceur-Loum, « Le trésor de DIVO CLAUDIO d'El Jem », dans *L'Africa Romana*, XIX, p. 441-450.

[13] *Ibid*, « L'architecture des autels de consécration sur les monnaies de Claude II » Colloque organisé par l'Institut Supérieur des Sciences Humaines, tenu en novembre, 2011).

de sécurité et de conservation[14] ; de l'autre le manque de moyens explique l'absence de la constitution d'une équipe pour mettre en place un Projet de Recherche sur 3 ou 5 ans, relatif à ce gros trésor. J'ai alors fait des choix méthodologiques en fonction de toutes ces contraintes financières, humaines et logistiques. L'alternative consistait à inventorier avec trois de mes étudiants le lot qu'on devait exposer au Musée National du Bardo, un lot composé de 3000 pièces dont la plupart sont des *Divo Claudio*. Les monnaies concernées ont été enregistrées et référencées une à une dans une base de données (« Virgile »).

Virgile est un projet d'inventaire des collections muséographiques qui a débuté en 2003. Au départ la Division de Développement Muséographique a réservé un espace où a été installé un réseau informatique local constitué d'un serveur de base de données et un ensemble de postes clients qui utilisent une interface web pour la saisie ou l'interrogation de la base. Le projet s'étendit ensuite pour couvrir le Musée National de Carthage, le Musée National du Bardo, le Musée Archéologique d'El Jem, le Musée de Moknine et la Réserve Nationale provisoire des collections ethnographiques de Ksar Saïd.

Ce projet consiste à informatiser les fiches d'inventaire des collections muséales par la saisie du contenu (en Français et en Arabe)[15] des fiches objets manuelles. Ce stockage numérique facilite la gestion de l'information.

La fiche d'inventaire relative à la monnaie est appelée Fiche Objet et comporte des rubriques réparties selon les quatre thèmes suivants :

– **Gestion de l'Objet** : décrit la localisation de l'objet, l'institution propriétaire de l'objet, son mode d'acquisition, son emplacement permanent

– **Description de l'Objet** : décrit la catégorie de l'objet, les matériaux constitutifs, les techniques de construction, le décor, son état,

– **Historique de l'Objet** : décrit la datation de l'objet, la période culturelle, la fabrication et l'utilisation, le site où il a été trouvé et le cadre de découverte,

– **Documentation :** elle renferme la bibliographie de l'objet**.**

[14] Le travail sur ce travail a commencé en 2010 juste avant la révolution tunisienne, et à partir de 2011 jusqu'à 2013 l'accès aux réserves, lieux de conservation des deux fractions de trésor, était quasiment impossible.

[15] En 2012 et avec la nouvelle version Virgile, on a introduit l'arabe dans la saisie de la fiche d'inventaire. Avant cette période tout l'inventaire était uniquement en langue française.

Base de données Virgile nouvelle version (2012)

Les fiches d'inventaire du trésor d'El Jem se présentent ainsi :

Gestion de l' Objet

Numéro d'inventaire **01-03-17-723**

Ancien numéro d'inventaire **_**

Pays **Tunisie**

Localisation **Musée National du Bardo**

Institution Propriétaire **Musée National du Bardo**

Mode d'acquisition **Emprunt du musée d'El Jem**

Date d'acquisition **1974**

Origine **Musée El Jem**

Emplacement permanent **Musée National du Bardo- médaillier-coffre**

Description de l' Objet

Catégorie **Monnaie**

Nom de l'objet **Pièce de monnaie**

Appellation **Antoninien**

Matériaux **Billon**

Techniques **Frappe**

Dimensions **P. 1,93 g ; diam. 19,37mm ; 1h**

Décor **_**

État **Assez bien conservé**

Description de l'objet **A/ DIVO CLAVDIO, tête radiée à dr.**

R/ CONSECRATIO, Aigle

Historique de l' Objet

Période **Romaine**

Datation **270 ap. J.-C.- fin IIIe siècle**

Groupe de fabrication / Fabricant **Atelier monétaire**

Lieu de fabrication **Atelier de Rome**

Fonction **Commerciale-économique**

Utilisation **Quotidienne**

Groupe d'utilisation / Utilisateur **Peuples de l'époque romaine**

Lieu d'utilisation **Empire romain**

Lieu de fouille / collecte **Route de Mechena - El Jem**

Groupe de Fouille / Collecte **Mabrouk El Hamrouni et équipe d'ouvriers au Musée d'El Jem**

Date de Fouille / Collecte **1974**

Commentaire historique **Monnaie de consécration de Claude II. A la mort de Claude, l'atelier de Rome a frappé des quantités astronomiques de ce type de monnaies. Il y a les monnaies officielles qui sont de bonne et assez bonne facture comme la présente monnaie et les frauduleuses. Ces monnaies frauduleuses émises pour le comptes des monétaires de l'atelier officiels Rome, sont nommées "poor fabric" par les anglophones.**

Monnaie faisant partie d'une fraction du trésor El Jem. Déposé au Musée National du Bardo pour inventaire et exposition dans la salle des trésors.

Documentation

Bibliographie ***RIC*, 265**

N° du Cliché **723**

N° Dossier de restauration **_**

Fiche établie le **07/02/2012** **Par : Meriem Marrakchi**

Fiche contrôlée le **: 07/02/2012** **Par : Zakia Loum**

Pour conclure, le trésor d'El Jemest une découverte originale, une première en Tunisie tant par la masse monétaire considérable que par la date d'enfouissement qui s'inscrit dans une conjoncture particulière : celui d'un empire romain en période de transition entre la crise et les réformes monétaires impulsées par Aurélien. Ce dernier a tenté de rétablir un système trimétallique fidèle à celui de Caracalla et émis en 274 un nouvel antoninien, l'*aurelianus*, qui ne s'introduira que faiblement dans les provinces occidentales (absence de monnaies d'Aurélien dans le trésor d'El Jem). Enfin, la réforme de Dioclétien en 294 a permis de bien assurer le bon équilibre du système, avec la création d'une nouvelle pièce de billon argenté : le *nummus*.

Néanmoins, le problème de ce genre de découvertes monétaires demeure la gestion de la masse monétaire et sa mise en valeur. Quel dispositif et quel protocole d'étude faut-il élaborer, notamment quand les moyens et les conditions ne suivent pas ? Et que faire quand les données archéologiques et archéométriques font parfois défaut ? Maintes questions qui se posent quand il s'agit de choisir une méthode d'analyse d'une découverte à l'instar du trésor monétaire d'El Jem. Cependant il est important de souligner que les fiches d'inventaire du trésor, son recollement et son étude préliminaire émanent de ma propre volonté de sauvegarder, conserver un fragment d'histoire d'El Jem que beaucoup de responsables de la gestion des musées jugent « inutile ».

Le trésor d'El Jem et son contenant

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Exemple de divo Claudio dans le trésor d'El Jem

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D'UNE PERSPECTIVE À L'AUTRE. LE DÉPÔT MONÉTAIRE DE *CA* 14500 *NUMMI* CONSTANTINIENS DÉCOUVERT À SAINT-GERMAIN-DE-VARREVILLE (MANCHE, FRANCE)

Abstract

We present here the challenges involved in the study of a 4th century hoard discovered in 2011 in Saint-Germain-de-Varreville (Manche, France). Exceptionally preserved and offering an abundance and an impressive interlacing of circa 14500 coins, the Saint-Germain-de-Varreville hoard appears as a completely original field of study to broaden the scope of numismatists. Our perspective is deliberately open, combining numismatics, archaeology, archaeometry and digital humanities, in order to progress in the writing of a history that would be as attentive to monetary production as to hoarding practices.

Keywords

Numismatics, 4th century, nummi*, archaeology, archaeometry, digital humanities*

> *Quel plaisir prends-tu à enterrer dans un trou creusé en cachette, tremblant de peur, une énorme quantité d'or et d'argent ? « Mais si on l'entamait, on le consommerait jusqu'au dernier petit sou ! » Ah oui ! Mais si tu n'en fais rien, qu'a-t-il de beau ce tas que tu as construit ?*
> (Horace, *Satires*, I, 40)

En 2011, la découverte sur la commune de Saint-Germain-de-Varreville (Manche) d'un dépôt de monnaies du IVe siècle serait un événement somme toute assez ordinaire, tant il est vrai qu'enfouir son argent en terre constituait dans l'Antiquité le plus sûr moyen de le préserver. Le dépôt de Saint-Germain-de-Varreville est exceptionnel par le nombre de monnaies accumulées: un ensemble de ca 14500 *nummi*, qui nous est parvenu intact, comme figé par le temps. De son étude découle un protocole d'analyse mêlant à la fois numismatique, archéologie, archéométrie et humanités numériques. La manière dont nous avons abordé l'étude de ce dépôt – ou ce "tas" de monnaies entrelacées pour paraphraser la citation placée en exergue – est ici présentée, en justifiant les choix qui se sont imposés pour mener une approche aux visées délibérément élargie du contenu.

1. ÉTAT DES LIEUX

1.1. Un imposant dépôt de monnaies du IVe siècle et son environnement archéologique

L'histoire du dépôt monétaire mis au jour sur la commune de Saint-Germain-de-Varreville, dans le département de la Manche (fig. 1), est celle d'une découverte fortuite, réalisée en 2011 à l'occasion de travaux agricoles au lieu-dit la « pièce à Trois Cornières ». Il est particulièrement heureux que ce dépôt nous soit parvenu intact (fig. 2): un millefeuille de monnaies plus ou moins concrétionnées entre elles et contenues dans un gros vase en céramique commune. Tout autant spectaculaire est l'aspect débordant du contenu pour un total estimé de plus de 14500 monnaies centrées sur la première moitié du IVe siècle.

Le terrain où la découverte fut faite est installé au cœur d'une zone de bocage, sur une parcelle légèrement en pente qui domine le lit d'un petit cours d'eau. C'est le domaine des haies, où alternent labours et prairies. En juillet 2013, une opération archéologique a été réalisée sur le lieu même de la découverte, dans le but de préciser

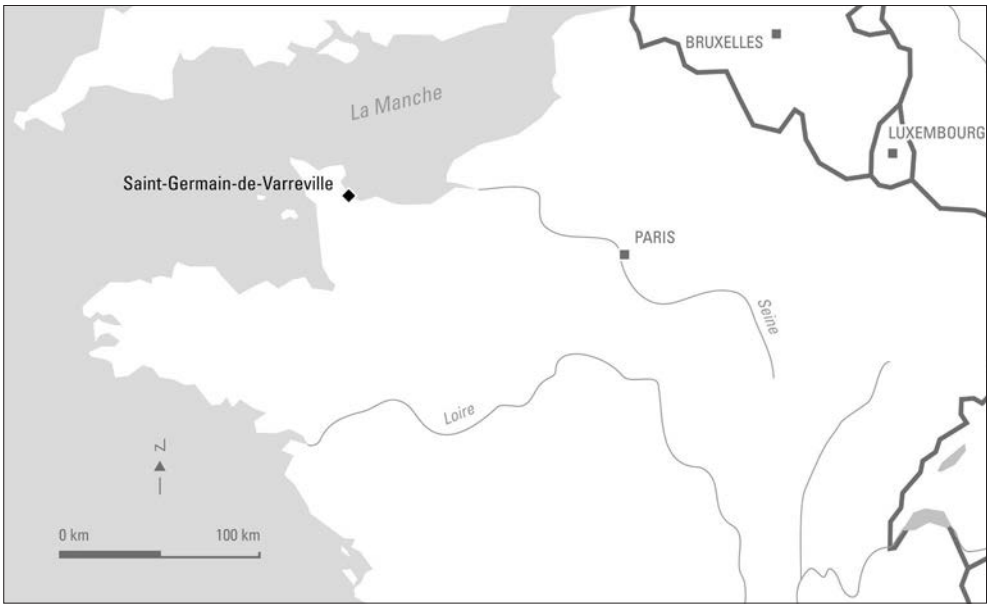

Figure 1 – Localisation du dépôt de monnaies de Saint-Germain-de-Varreville (Manche, France)

Figure 2 – Le dépôt de Saint-Germain-de-Varreville: un ensemble intact de *nummi* du IV^e^ siècle apr. J.-C.

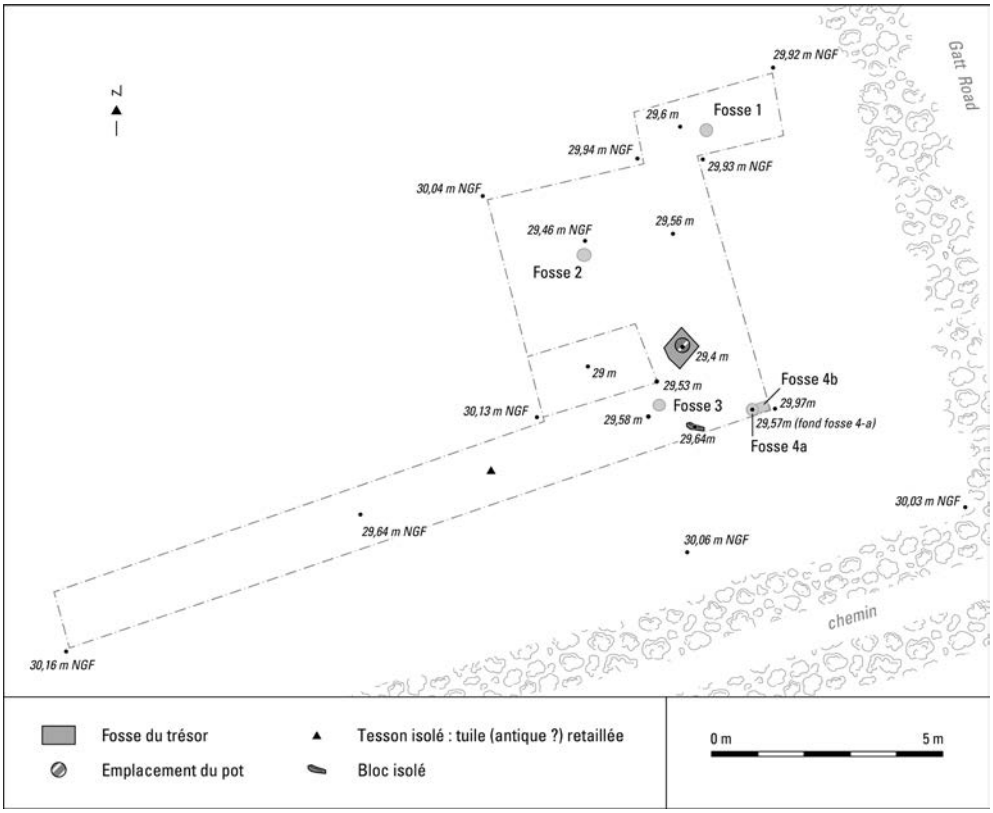

Figure 3 – Le dépôt de Saint-Germain-de-Varreville et son contexte archéologique

son environnement proche dans l'Antiquité[1]. L'emplacement de la cache monétaire a été retrouvé (fig. 3) et se présentait sous la forme d'un trou à peine plus large que le diamètre du vase. La découverte à proximité d'un bouchon formé d'un morceau de tuile retaillée en rond laisse penser que le pot lui-même était obturé. À l'exception de la cachette en tant que telle, aucun autre vestige antique n'a été mis en évidence lors de cette opération, si bien que le dépôt semble avoir été dissimulé dans un endroit volontairement isolé. Mais il faut nuancer. À quelques 250 et 600 mètres du dépôt, des poteries et des matériaux de construction ont été collectés lors de prospections pédestres et attestent la présence d'au moins deux occupations de l'époque romaine[2]. Ces indices de sites autour de la « pièce à Trois Cornières » sont difficiles à caracté-

[1] C. Allinne, *Saint-Germain-de-Varreville (Manche),* « La pièce à Trois Cornières »*: Rapport final d'opération*, Caen: CRAHAM, 2013, p. 5.

[2] Ibid. p. 27-36.

riser précisément, en raison de la faible quantité de mobilier recueilli et de sa grande dissémination sur de très larges surfaces. Quoi qu'il en soit, la découverte de Saint-Germain-de-Varreville contribue opportunément à rappeler le poids de l'héritage du IVe siècle dans la région, que vient éclairer de plus en plus la progression des opérations archéologiques.

Mais, d'un point de vue strictement numismatique, les découvertes monétaires ne doivent pas masquer une autre réalité.

1.2. Une zone de circulation mal connue

À l'échelle de l'actuel département de la Manche, le nombre de dépôts de monnaies, susceptibles d'être situés dans le temps et localisés dans l'espace, représente un ensemble de 30 découvertes, qui permet quelques appréciations générales sur le rythme d'accumulation du matériel[3]. Une première constatation se dégage (tab. 1): le IVe siècle n'est pas l'une de ces périodes majeures qui réunit beaucoup de découvertes. Le total des dépôts comptabilisables s'élève à 4. Cette proportion de 13,33 % est à peine supérieure à celle atteinte par le Ier siècle, tandis que le IIIe siècle fournit plus d'un dépôt sur deux (53,33 %). Il faut par conséquent présumer que les monnaies du IVe siècle n'ont pas pu être thésaurisées dans d'innombrables cachettes que les modernes retrouveraient. De surcroît, les dépôts échappent assez largement à l'investigation. L'on ne dispose en effet d'aucune enquête méthodique digne de ce nom pour apprécier leur contenu exact.

Tableau 1 – Les dépôts de monnaies découverts dans le département de la Manche (France)

	Nbr.	**%**
Ier siècle	3	10,00
IIe siècle	7	23,33
IIIe siècle	16	53,33
IVe siècle	4	13,33
Total	30	99,99

[3] Pour mener cette enquête, nous avons utilisé les dépôts monétaires référencés dans J. Pilet-Lemière, D. Levalet, *Carte archéologique de la Gaule. La Manche, 50*, Paris: Académie des Inscriptions et Belles-Lettres, 1989.

Dans l'état actuel des travaux, les monnaies les plus récentes du dépôt de Saint-Germain-de-Varreville appartiennent à la série des deux Victoires qui s'affrontent (*Victoriae dd auggq nn*). Leur présence permet, de fait, de fixer la fin de la thésaurisation au cours des années 340. En conséquence, Saint-Germain-de-Varreville appartient à un petit groupe de dépôts massifs (tab. 2), dont 3 ont été mis au jour en Bretagne (Thornbury[4], Bishop's Wood[5], Seaton Down[6]), 1 en Gaule Belgique (La Chapelle-lès-Luxeuil[7]) et 1 en Germanie inférieure (Königsforst[8]). Beaucoup d'entre eux demeurent néanmoins mal documentés. Le dépôt de Seaton Down est à ce jour le plus volumineux; il a été l'objet d'un catalogage complet[9].

Tableau 2 – Dénombrement des dépôts de monnaies se terminant par des *nummi* aux deux Victoires qui s'affrontent (*Victoriae dd auggq nn*)

	pre-330 (%)	**330-337**	**337-341**	**341-348**	**Nbr.**
Thornbury (GB)	0,7	98,5	0,8	0,02	11460
Bishop's Wood (GB)	0,5	94,3	5,2	0,02	17548
Seaton Down (GB)	0,6	82,7	16,7	0,01	22525
La Chapelle-lès-Luxeuil (F)	31,1	66,2	2,7	0,01	15518
Saint-Germain-de-Varreville (F)	20,8	69,8	7,62	0,6	6032 (2018)
Königsforst (A)	0,3	26,5	31,4	41,3	3636

[4] R. Abdy, « Coins Hoards 2005 », *Numismatic Chronicle*, 165, 2005, pp. 311-312.

[5] M.E. Bagnall-Oakeley, « A hoard of Roman Coins found at Bishop's Wood, Ross-on-Wye », *Numismatic Chronicle*, 16, 1896, pp. 209-237.

[6] V. Drost, « The Seaton Down hoard (UK, Devon): c. 22,900 Constantinian *nummi* », in M. Caccamo Caltabiano, B. Carroccio, D. Castrizio, M. Puglisi (éd.), *Proceedings of XV International Numismatic Congress: Taormina 2015*, Roma/Messina: Arbor Sapientiae Editore, 2017, pp. 737-741.

[7] D. Gricourt, *La Chapelle-lès-Luxeuil (Haute-Saône), 15 518* nummi *constantiniens*, Paris: BnF, 1999 (*Trésors Monétaires*, XVIII).

[8] A. Geissen, B. Päffgen, G. Quarg, « Die Münzen des Hortfundes aus dem Königsforst », *Bonner Jahrbücher*, 184, 1984, pp. 401-477.

[9] V. Drost, « The Seaton Down hoard (UK, Devon) », cit.

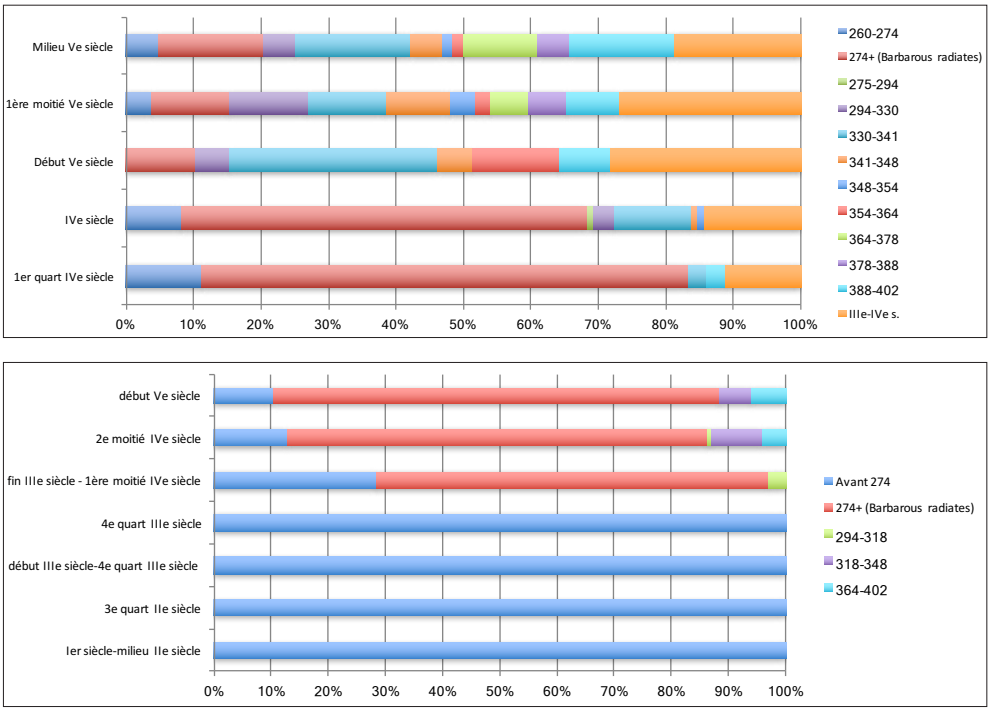

Figure 4 – Évolution du numéraire sur les sites de Rouen et de la *domus* au Grand péristyle de Vieux-la-Romaine d'après les monnaies trouvées en stratigraphie

Par ailleurs, la documentation issue de fouilles archéologiques menées dans l'actuelle Normandie nous apprend que, jusqu'au cours des années 330-340, les imitations radiées (*Barbarous radiates*) encore en circulation ne laissent que peu de place aux monnaies constantiniennes[10] (fig. 4). Sitôt le milieu du IVe siècle franchi, la proportion de monnaies constantiniennes s'accroît alors sensiblement avec la poussée des *nummi* des années 330. L'interrogation qui se profile à l'arrière-plan est donc celle du renouvellement du petit numéraire. Dans un pareil contexte, on mesure sans peine l'intérêt du dépôt de Saint-Germain-de-Varreville pour apporter un nouvel éclairage sur la situation monétaire régionale du moment.

[10] La documentation ici réunie repose sur des ensembles monétaires regroupés selon la stratigraphie, en l'occurrence Rouen (Seine-Maritime) et Vieux-la-Romaine (Calvados): J. Chameroy, *Les fouilles de la cathédrale de Rouen, 1985-1993. Tome 1, Le numéraire antique*, Mont-Saint-Aignan: PURH, 2013 ; G. Blanchet, « Vie et survie du petit numéraire dans le nord de la Gaule: l'exemple des découvertes de la *domus* au grand péristyle de Vieux-la-Romaine (Calvados) », in J. Chameroy, P.-M. Guihard (dir.), *Produire et recycler la monnaie au Bas-Empire / Produktion und Recyclen von Münzen in der Spätantike*, Mainz: RGZM, 2016, pp. 83-96 (Tagungen, Band 29).

2. ENJEUX ET CONTRAINTES DE L'ÉTUDE

2.1. Enjeux de l'étude

Comme toute étude spécialisée, celle pratiquée sur un dépôt de monnaies suit souvent une approche immuable, aux objectifs bien balisés. Ainsi, il est attendu que l'étude classique d'un dépôt puisse, en particulier, déboucher sur une datation de son contenu et parfois sur un examen de la circulation monétaire contemporaine[11].

L'étude du dépôt de Saint-Germain-de-Varreville ne prétend en aucun cas se substituer aux recherches traditionnelles: elle est d'abord conçue pour les compléter, en cherchant à tirer spécifiquement parti du remarquable ensemble que constitue notre dépôt. Exceptionnellement conservé et offrant une abondance et un entrelacement impressionnant de monnaies (fig. 2), il apparaît d'emblée au chercheur comme un terrain d'études tout à fait original pour élargir le champ et les méthodes d'investigation, d'autant que les travaux approfondis relatifs à des dépôts ne sont finalement pas légion.

Il y avait donc ici une double opportunité à saisir, celle de pouvoir améliorer notre connaissance de la situation monétairetardive dans l'actuelle Normandie et d'étendre nos savoir-faire à une étude qui mêle plusieurs approches pour fournir un exemple bien documenté de thésaurisation. Plus que le dépôt en soi, c'est ce qu'il est susceptible de nous apprendre sur les pratiques monétaires et de thésaurisation au cours du IV^e^ siècle qui nous intéresse ici.

2.2. L'exigence du scientifique fait-elle tout ?

Les finalités scientifiques qui sont les nôtres ne seraient faire fi d'un certain nombre de contraintes préalables. Ainsi, l'analyse d'un ensemble qui compte plusieurs milliers de monnaies induit irrémédiablement un allongement des temps et des coûts d'étude ordinaires, suscitant des interrogations quant à nos capacités à traiter et à interpréter les phénomènes observés dans le cadre d'une enquête élargie.

Le contexte de prise en charge du dépôt de Saint-Germain-de-Varreville a été ici essentiel. Confiée au service de numismatique du CRAHAM, l'étude du dépôt a pu être ainsi envisagée dans un cadre spécialement dédié au traitement des découvertes

[11] Les attendus scientifiques sont multiples, cf. entre autres sur le sujet J.-B. Giard, « Préface », *Trésors Monétaires*, I, 1979, pp. 7-10 ou encore G. Aubin, « Les trésors (monétaires) antiques: le mot, les choses et les chercheurs », in F. Baratte, M. Joly, J.-Cl. Béal (dir.), *Autour du trésor de Mâcon. Luxe et quotidien en Gaule romaine*, Mâcon: Institut de recherche du Val de Saône-Mâconnais, 2007, pp. 49-73: pp. 63-69.

monétaires, depuis leur nettoyage jusqu'à leur étude, en passant par leur conservation. La mission de service public qui est la nôtre nous permettait de surcroît d'envisager sous de bons augures la conduite de ce travail. C'était toutefois sans compter sur un contexte professionnel de plus en plus délicat dicté par les réductions budgétaires ou encore par une concurrence disciplinaire. Pour échapper aux risques d'une étude contrainte en temps et en moyens humains et pour éviter que tout ou presque, vu la nature de la découverte, ne soit correctement observé, on s'est rapidement trouvé confronté à la nécessité d'obtenir des financements complémentaires à la hauteur de l'étude projetée. En la matière, les soutiens du Service régional de l'Archéologie, de la Région Normandie et du Musée de Normandie ont apporté un puissant stimulant en permettant le financement régulier de missions contractuelles venant en appui des activités du service de numismatique.

Certes, le croisement de ces divers patronages peut apparaître comme préjudiciable à la portée de l'étude envisagée. Qu'on le veuille ou non, l'exigence du scientifique se trouve en effet de plus en plus contrôlée par des pouvoirs complexes qui sont amenés à définir le cadre, le contenu et les finalités des projets de recherche. D'une certaine façon, les pouvoirs – politiques en particulier – peuvent entraîner une action pressante sur les savoirs, en les « forçant » à se plier à d'autres enjeux et objectifs que ceux dont ils se sont dès le départ dotés, en vue de tenir compte de besoins plus larges (sociaux, politiques, culturels ou encore économiques).

Cela étant dit, il ressort des considérations précédentes que c'est bien l'enrichissement en termes de connaissances qui est le point de départ et le point d'arrivée de notre manière d'aborder l'étude du dépôt de Saint-Germain-de-Varreville. En distinguant, par conséquent, *contraintes* et *connaissances*, les données à faire figurer et les objectifs à atteindre ont été définis en amont, afin de préserver l'intégrité scientifique de l'analyse et de faciliter la compréhension de ses impératifs méthodologiques, tout en permettant de mieux répondre aux attentes des diverses instances de décision.

3. MÉTHODOLOGIE

3.1. La conduite de l'enquête

La perspective que nous avons envisagée repose, concrètement, sur une analyse élargie du dépôt. Elle se décompose en deux étapes. La première consiste en une démarche résolument tournée vers une archéologie du processus d'accumulation[12]. En effet, la date de clôture d'un dépôt ne peut se résumer à la datation de

[12] P.-M. Guihard, C. Allinne, « La fouille du trésor monétaire de Saint-Germain-de-Varreville

l'exemplaire le plus récent: une cache monétaire, c'est aussi un ensemble qui peut fonctionner par ajout graduel de monnaies au fil du temps, comme un compte en banque actuel. Certains travaux ont déjà montré la voie, bien que la micro-fouille d'un dépôt monétaire reste, quoi qu'il en soit, une pratique assez rare en France et en Europe d'une manière générale. On doit en particulier à Christian Cécillon des avancées essentielles en ce domaine. Il fut, en effet, le premier en France à proposer un protocole de démontage pour la fouille d'un dépôt de monnaies du III^e^ siècle découvert à Pannecé au début des années 2000[13]. Dans cette approche largement inspirée des méthodes de fouilles en laboratoire d'ensembles archéologiques (telles que les urnes cinéraires), le démontage minutieux des monnaies a permis de recueillir de précieuses informations quant à la structure interne du dépôt, où les niveaux de vrac semblaient côtoyer des ensembles plus homogènes trahissant la présence d'un contenant aujourd'hui disparu (comme une bourse). C'est aussi la méthode suivie par Thibault Cardon dans son étude d'un dépôt monétaire du XV^e^ siècle découvert à Aizier[14] (Eure). L'analyse pointue de cette structure a montré de manière tout à fait convaincante qu'il s'agissait d'un dépôt scrupuleusement géré. Ainsi, en s'attachant à étudier en profondeur le contenu d'un dépôt, ces différents travaux ont été déterminants pour la compréhension des pratiques de thésaurisation. Au vu de la conservation exceptionnelle du dépôt de Saint-Germain-de-Varreville, il ne tenait qu'à nous de procéder à une micro-fouille spécifique de son contenu. Car il est certain que si l'on avait procédé dans l'urgence nous serions restés, en quelque sorte, au milieu du gué dans nos conclusions.

Identifier les dynamiques de remplissage d'un dépôt aussi complexe que celui de Saint-Germain-de-Varreville exige, par ailleurs, un examen couplé des monnaies et de leur agencement. D'où le parti pris suivi, dans un second temps, pour le traitement des données. D'emblée, se pose la question du degré de précision qu'il est nécessaire de donner à l'enquête numismatique. En somme, jusqu'où doit-on descendre dans le détail lorsque l'on est face à une masse qui compte plusieurs milliers de monnaies ? Ici, le choix d'aborder le processus d'accumulation oblige de toute façon à des précisions, à ne pas négliger des différences, particulièrement des différences entre les espèces, dont l'importance est capitale pour une connaissance approfondie des modalités de thésaurisation. En sorte que l'on ne peut finalement aboutir qu'à une enquête numismatique la plus détaillée possible. Mais n'est-ce pas là aussi l'exi-

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(Manche): stratigraphie d'un pécule de 14528 *nummi* (première moitié du IV^e^ siècle) », *Annales de Normandie*, 63/1, 2013, pp. 3-25.

[13] C. Cécillon, « La micro-fouille du vase B du trésor de Pannecé II (Loire-Atlantique): mode opératoire et résultats », *Bulletin de la Société française de Numismatique*, février 2005, pp. 32-41.

[14] T. Cardon, « Le trésor d'Aizier (Eure): étude archéo-numismatique d'un dépôt monétaire du XV^e^ siècle », *Trésors Monétaires*, XXV, pp. 387-446.

gence du scientifique qui se voit mal amputer sa démonstration en ne livrant qu'une partie des preuves ?

Quoi qu'il en soit, une approche superficielle ou partielle du contenu du dépôt ne serait pas sans risques, comme en ont fait les frais d'autres études par le passé. Particulièrement éloquente est la refonte de l'ouvrage d'Adrien Blanchet[15] initiée par X. Loriot et D. Nony au début des années 1980 sous le patronage de la *Société Française de Numismatique*. Quand Adrien Blanchet avait entrepris de réunir au sein d'un même répertoire tous les trésors de Gaule, il n'était malheureusement parvenu qu'à des notices vagues et imprécises, si bien que de nombreux dépôts n'étaient souvent connus que par un total approximatif ou une suite d'empereurs. Il était alors apparu aux responsables du *Corpus des trésors monétaires antiques de la France* la nécessité d'adopter une approche plus systématique que ne l'avait fait Adrien Blanchet afin de se préserver de fausses évidences[16]. De nouveaux inventaires exhaustifs et plus ou moins détaillés de divers dépôts anciens orientèrent leur démarche et l'enquête fut élargie à un dépouillement poussé de la bibliographie locale et des ressources d'archives. En définitive, l'on ne pourrait que s'inquiéter d'une multiplication d'études incomplètes qui donneraient lieu à la publication de conclusions sans cesse reprises, et, de ce fait, officialisées sans qu'il y ait ne serait-ce que le début d'un commencement de preuve de ce qui a été avancé.

Cependant, aborder l'étude d'un dépôt de monnaies de façon détaillée, c'est aussi rechercher la singularité de l'ensemble et contribuer à l'enrichissement des corpus monétaires : voir, en somme, ce que grâce à lui on peut apprendre de vraiment neuf. P. Bastien ne disait pas autre chose, lorsqu'il écrivait, avec une lucidité qui n'a rien perdu de sa pertinence, « qu'on ne connaît jamais trop de matériel[17] ». Il nous reste à l'évidence encore beaucoup à apprendre sur la monnaie, sa fabrication, ses émissions et son rôle pour négliger l'étude aussi complète que possible de ces documents importants que sont les dépôts de monnaies romaines. On voit bien dès lors qu'elle serait la contribution des *ca* 14000 monnaies de Saint-Germain-de-Varreville pour les études de coins et la chronologie de leurs utilisations, le volume ou encore l'organisation des émissions.

Mais, au préalable, pour « retrouver » cette mémoire, il nous faut la conserver pour la diffuser et la transmettre.

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[15] A. Blanchet, *Les trésors de monnaies romaines et les invasions germaniques en Gaule*, Paris: E. Leroux, 1900.

[16] En 1979, le lancement par la Bibliothèque nationale de France de *Trésors Monétaires* concourt à la même dynamique d'études spécialisées dans la publication détaillée des ensembles monétaires.

[17] P. Bastien, « Numismatique romaine et coopération internationale », *Numismatique romaine, essais, recherches et documents*, XII, 1981, pp. 125-137: p. 132.

3.2. Conserver et enregistrer

Le choix d'une étude détaillée du dépôt implique que l'identification des monnaies doit être rendue possible par l'application de méthodes de conservation adaptées, assurant à la fois l'intelligibilité et la pérennité de notre objet d'étude. Dans une situation idéale, où les contraintes de budget et de temps seraient inexistantes, l'objectif serait de mener une restauration des monnaies aboutissant à un résultat visuel proche de leur état au moment de leur fabrication. Cependant, il faut pouvoir composer avec les ressources disponibles, tout en restant fidèle à nos objectifs. C'est de cette balance, entre exigence et contraintes, que doit naître le compromis entre une restauration aboutie respectant les règles de conservation-restauration, et un état final représentant ce que nous estimons être suffisant pour progresser vers l'étude numismatique. Le bon équilibre entre ces deux aspects se matérialise à travers l'élaboration d'un protocole de traitement bien défini, dont les avantages et les inconvénients ont étè clairement identifiés en amont.

À la base de notre protocole, il y a un diagnostic général, qui permet d'effectuer un constat d'état de la conservation des monnaies. Dans le cas des *nummi* de Saint-Germain-de-Varreville, la corrosion se présente essentiellement sous la forme d'oxydes de cuivre, ce qui a eu pour effet de souder les monnaies entre elles, à des degrés plus ou moins importants selon leur position dans le pot. Parallèlement, le diagnostic demande de porter un intérêt à la composition des monnaies, notamment en vue de l'utilisation de produits chimiques. Le choix du traitement doit ainsi tenir compte d'une part de ces paramètres numismatiques, et, d'autre part des contraintes plus formelles citées plus tôt (principalement le temps et le budget). Leur combinaison nous a ainsi poussés vers l'élaboration d'un traitement de « masse » des monnaies du dépôt, mêlant l'utilisation de produits chimiques et l'intervention d'outils mécaniques. Appuyé par le service de conservation du Musée de Normandie, le protocole se décline en 8 étapes allant du retrait classique des sédiments, à la stabilisation finale de chaque monnaie (tab. 3). Cette mise en œuvre nous permet de procéder au nettoyage d'environ 80 à 120 monnaies par jour – fourchette relative selon le degré de corrosion de monnaies. Ce traitement permet de rendre lisible un grand nombre de monnaies en un temps réduit. Cependant, ce gain de temps ne s'obtient pas sans contrepartie. En effet, certaines émissions bénéficient d'une surface enrichie en argent comme l'ont montré d'autres études[18]. L'orientation du protocole

[18] M. Ferretti, « L'arricchimento superficiale nei *nummi*: studio degli originali e simulazioni sperimentali », in S. Garraffo, M. Mazza (ed.) *Il tesoro di Misurata (Libia). Produzione e circolazione monetaria nell'età di Constantino il Grande*. Roma: Edizioni Del Prisma, 2015, pp. 191-197; F.P. Romano *et al*., « Determinazione non distruttiva del contenuto di mercurio nei nummi del Tesoro di Misurata mediante l'utilizzo del sistema portatile BSCXRF del laboratorio LANDIS », in S. Garraffo, M. Mazza (ed.) *Il tesoro di Misurata (Libia)*, cit., pp. 199-206.

et le fort degré de corrosion ne nous ont pas permis d'opérer un tri préalable, qui aurait donné la possibilité d'isoler ces émissions et aurait ainsi favorisé la mise en valeur de l'argenture. Ce dernier aveu est un rappel à la réalité: nous ne sommes pas restaurateurs et l'objectif principal imposé par le choix d'une étude élargie est bien de rendre lisible les monnaies afin de favoriser l'identification et l'enregistrement des monnaies.

Tableau 3 – Protocole de nettoyage appliqué aux monnaies du dépôt de Saint-Germain-de-Varreville

	Steps	Description	Time
1	State report	Observations	10 minutes
2	Mechanic action(1)	Ultrasonic bath to remove dirt	20 minutes
3	Chemicals	Formic acid bath (5%)	20-30 minutes
4	Rinsing	Purified water	10 minutes
5	Mechanic action(2)	Work under binocular coin by coin	6-8h (5-10 minutes/coin)
6	Termination (1)	Dry (1)	30 minutes
7	Termination (2)	Polish	30-40 minutes
8	Termination (3)	Dry (2)	15 minutes

Tout comme le traitement physico-chimique du dépôt, une réflexion en amont s'est imposée afin de définir la meilleure manière d'enregistrer les données numismatiques. L'originalité du dépôt est son volume et la variété des émissions qui le compose. À cela s'ajoutent les données issues d'une approche archéologique du contenu du dépôt. Il a donc été nécessaire de développer un outil adapté à l'enregistrement des données propres à chaque monnaie (autorité, dates d'émissions, légendes, etc.), tout en nous permettant de ne pas négliger leur localisation et leur agencement dans le pot. En somme, il faut pouvoir s'assurer, après déstructuration du dépôt, qu'un moyen informatique nous permette de pérenniser la manière dont étaient disposées les monnaies. Tel un site archéologique, nous devons être à même de coupler les informations classiques d'identification en numismatique avec le contexte de découverte de chaque monnaie. L'outil d'enregistrement doit alors rendre possible le croisement de ces données, qui devront être préalablement classées selon une arborescence prédéfinie et adaptée au profil du dépôt.

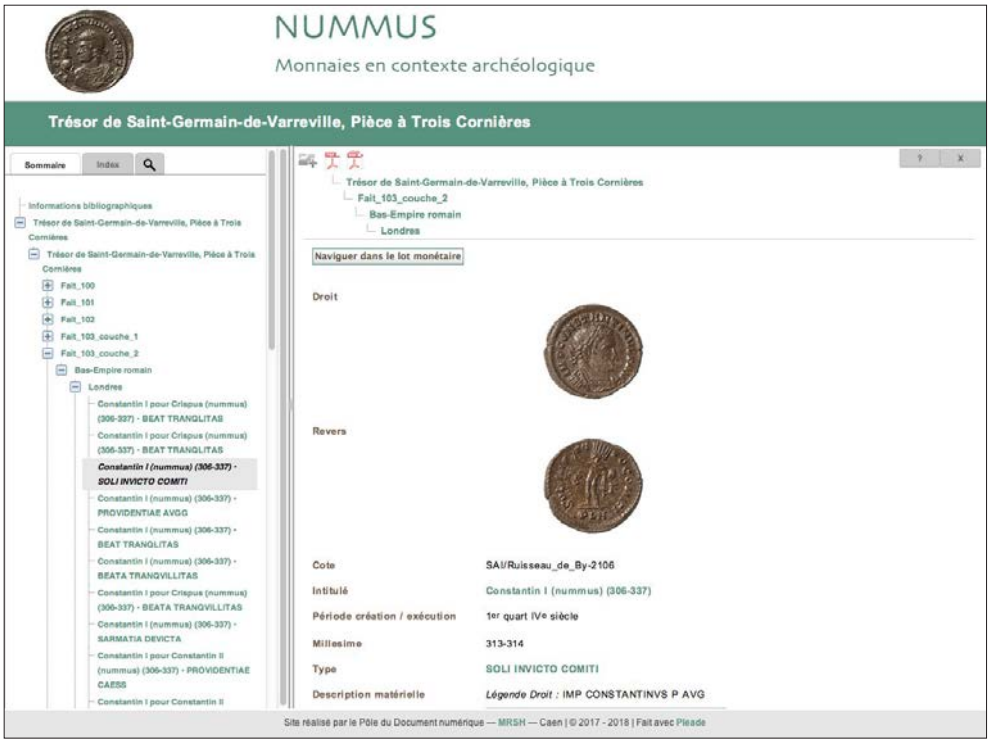

Figure 5 – Exemple de fiche descriptive suivie pour la présentation des monnaies du dépôt

La base de données « Nummus[19] » nous permettait justement d'envisager un enregistrement adapté des monnaies de Saint-Germain-de-Varreville. Encodée en Xml (*eXtensible Markup Language*) et EAD (*Encoded Archival Description*), cette structure de description correspond parfaitement à l'idée d'entrelacement des données précédemment exprimée, puisqu'elle permet techniquement d'enchâsser les étiquettes en arborescence et d'encoder chaque degré d'information hiérarchiquement. Le plan de classement de « Nummus » a été établi selon deux logiques[20]: d'une part, la description des monnaies et, d'autre part l'organisation des données archéologiques. Ainsi, la description du contexte de découverte est placée au cœur du plan de classement. En pratique, ces fichiers commencent par une description du contexte

19 https://www.unicaen.fr/crahm/Nummus/

20 P.-M. Guihard, M. Bisson, « Nummus. Outil de recherche et de diffusion en ligne des données numismatiques en contexte archéologique », in J. Chameroy, P.-M. Guihard, *Circulations monétaires et réseaux d'échanges en Normandie et dans le Nord-Ouest européen (Antiquité-Moyen Âge)*, Caen: Publications du CRAHM, 2012, pp. 229-240.

archéologique de découvertes, puis égrènent les monnaies découvertes sur le site. L'enregistrement des monnaies du dépôt a suivi un cheminement identique (fig. 5): chaque ensemble de monnaies identifié au moment de la fouille en laboratoire du dépôt a été individualisé ; chaque fiche correspond à une monnaie où l'identification et le contexte (situation dans le pot) sont renseignés. Enfin, l'intérêt d'un tel outil est l'exposition des données enregistrées. Les données encodées permettent un archivage pérenne et une exploitation pour la recherche. La consultation des données s'effectue directement au moyen du plan de classement: le lecteur accède aux monnaies, qui sont classées par lieu de trouvaille. La consultation peut également se faire à partir des index comme l'autorité, le métal, ou encore la région de création par exemple. Dans le cas particulier du dépôt, il est alors aisé de déterminer en quelques « clics » quelles sont les monnaies concentrées ensemble (dans un sac par exemple), puisque chaque monnaie est systématiquement associée à son contexte de prélèvement au sein du dépôt. Pour résumer, conserver et enregistrer de manière à la fois précise et systématique l'intégralité des monnaies permet alors de constituer une base documentaire fixe pouvant être soumise à plusieurs niveaux d'investigations.

3.3. L'élargissement de l'enquête

Dans cette voie méthodique, l'enquête a été élargie en 2015 thématiquement dans le cadre d'un projet financé par la Région Normandie et consacré à l'analyse par spectrométrie de fluorescence X portable des monnaies du dépôt.

Interdisciplinaire, ce travail visait à étudier la composition des alliages monétaires, en centrant la réflexion sur les teneurs en éléments traces présents dans l'argent de quelques 700 *nummi* répartis sur la longue durée. Il a impliqué une coordination avec des acteurs issus des sciences expérimentales et des sciences humaines et sociales. Au total, une dizaine de spécialistes ont confronté les données issues de l'analyse archéométrique aux apports historiques et numismatiques. Un thème a retenu spécifiquement l'attention, celui de l'approvisionnement en argent et des pratiques qui entourent finalement la gestion de cet élément important du *nummus* durant la première moitié du IV^{e} siècle. Concrètement, l'enquête a été fort utile, car elle a apporté des informations précises sur la gestion du stock monétaire et des politiques mises en œuvre par l'État dans ce domaine.

Pour résumer, il y a indubitablement, dans notre démarche, des différences d'échelles et de perspectives, que d'aucuns pourraient considérer comme inconciliables. Ce ne serait, nous semble-t-il, qu'un faux problème à dépasser. « Faire de l'histoire », c'est cela: juxtaposer des données très diverses illustrant chacune des aspects distincts qui caractérisent les pratiques monétaires. L'idée est en somme de voir ce que le dépôt de Saint-Germain-de-Varreville peut refléter, à sa manière, des phénomènes du moment.

4. DE L'OBJET AUX PRATIQUES MONÉTAIRES

Il convient maintenant de mettre en pratique les méthodes employées, dans le but de sonder concrètement ce que nous donne à voir le dépôt de Saint-Germain-de-Varreville. C'est ce que nous souhaiterions montrer, en présentant de façon liminaire les premiers résultats qui découlent notamment de l'étude archéo-numismatique du contenu et des analyses archéométriques.

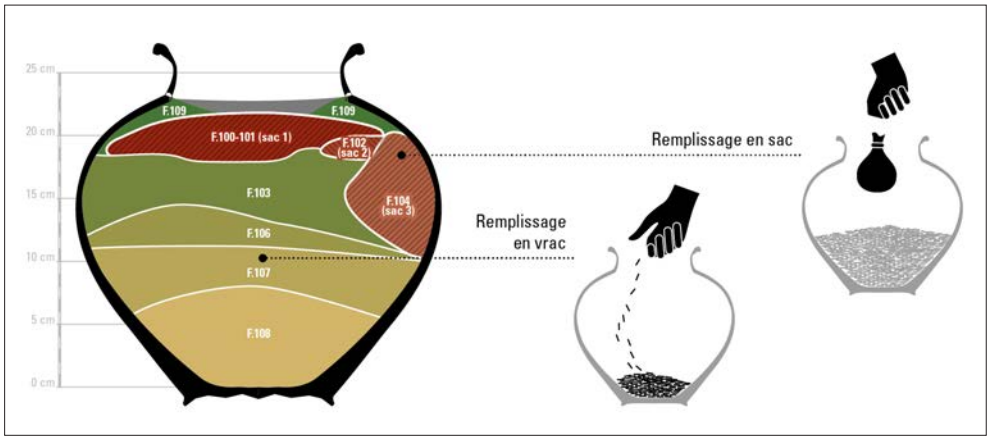

Figure 6 – Stratigraphie et dispositions des monnaies à l'intérieur du pot

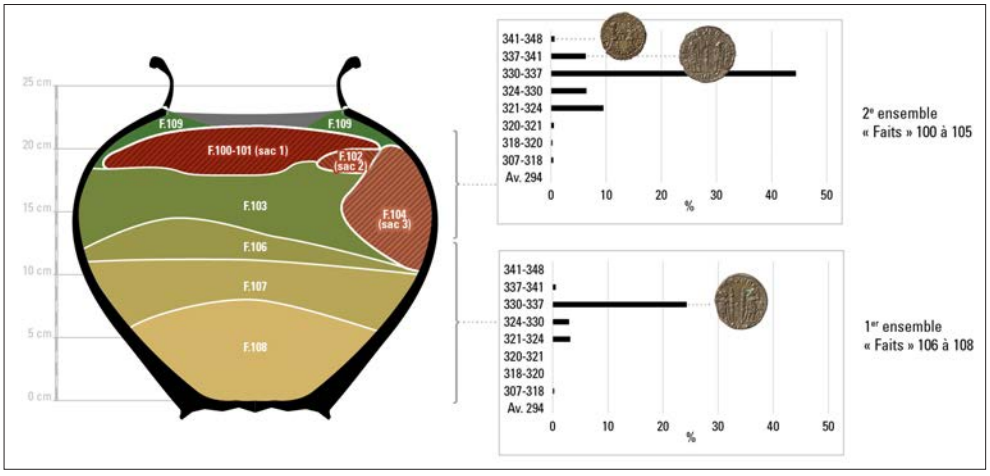

Figure 7 – Le processus de thésaurisation

4.1. Le processus de thésaurisation

Comme nous l'avons souligné, le dépôt a fait l'objet d'une micro-fouille en laboratoire[21], qui a donné lieu à l'identification de plusieurs ensembles monétaires (dénommés "Faits"): ces ensembles ont été numérotés au fur et à mesure de leur enlèvement, du n° 100 (ouverture du pot) au n° 108 (fond du pot). Dans cette approche, la position des monnaies a été déterminante et a révélé deux principales configurations (fig. 6). Ainsi, nous avons constaté que des monnaies disposées à plat cohabitaient avec des ensembles de monnaies inclinées sur la tranche, constituant des groupes de tailles et de formes variables. Ces ensembles particuliers ont été interprétés comme le contenu de sacs (*Faits* 100-101 et surtout 104). L'existence de tels contenants est notamment soutenue par la découverte d'une fine cordelette interprétée comme les restes d'un lacet ayant pu servir à nouer la poche renfermant les monnaies du *Fait* 104. Les autres ensembles mis en évidence dans le vase étaient donc dépourvus d'autres contenants que le pot lui-même. Les pièces y ont été versées « en pluie », formant des tas homogènes au sommet aplani ou légèrement pyramidal. La diversité des ensembles identifiés permet d'envisager que le pot n'a pas été rempli d'un seul coup et aussitôt mis à l'abri, ce que l'étude numismatique a permis de confirmer.

Deux ensembles de monnaies sont particulièrement lisibles (fig. 7).

Ensemble 1.

Les *Faits* 106 à 108, qui semblent résulter d'un versement « en pluie » des monnaies, présentent ainsi un profil très similaire: ils se caractérisent par la place importante faite aux émissions 330-337, qui sont dominées par le revers *Gloria exercitus* (2 enseignes), mais aussi par une proportion non négligeable des émissions 321-324 et 324-330. Autre fait significatif est la faible représentation des émissions 337-341 symbolisées par les *nummi* au revers *Gloria exercitus* (1 enseigne). En effet, les *Faits* 106 à 108 ne comportent que 36 exemplaires (dont 3 imitations) émis au cours de cette période, un nombre particulièrement bas au regard des 1335 *nummi* (dont 206 imitations) des années 330-337. Si les monnaies de la période 337-341 restent faiblement représentées, elles donnent un terminus précis à cet ensemble, soit la réduction pondérale de l'année 336/337 qui fait passer la taille du *nummus* au 1/192e ou au 1/204e de livre tout en remaniant l'iconographie du revers le plus commun *Gloria exercitus*, en ne plaçant plus qu'une seule enseigne entre les deux soldats. Ces mesures monétaires marquent par conséquent le début de notre thésaurisation. Mais en sont-elles pour autant le déclencheur ?

[21] P.-M. Guihard, C. Allinne, « La fouille du trésor monétaire de Saint-Germain-de-Varreville (Manche)… », cit.

Ensemble 2.

Le profil du dépôt change avec les *Faits* 100-101 à 104-105. L'évolution la plus visible concerne la période 337-341, qui se renforce désormais très sensiblement. Cette augmentation n'a pas pour conséquence, en revanche, d'engendrer un affaissement des émissions 330-337: celles-ci se renforcent même légèrement (776 à 871 exemplaires). Quant aux émissions 321-324 et 324-330, leur présence se maintient. Une telle régularité n'est certainement pas un hasard et révèle, peut-être, le souci du thésaurisateur de faire régulièrement entrer un « bon » numéraire dans son pécule, puisque l'année 336/337 marque, comme nous l'avons souligné, une nouvelle réforme qui porte le *nummus* au 1/192e ou au 1/204e de livre.

Mais, surtout, l'ensemble 2 marque l'apparition des *nummi* à la légende *Victoriae dd auggq nn*, qui indiquent incontestablement une évolution dans la thésaurisation. À ce stade de l'analyse, les *nummi* aux deux Victoires sont donc absents des *Faits* (106, 107, 108) situés au fond du pot. La faible proportion des monnaies aux deux Victoires associée à une observation des marques d'émissions permet d'émettre l'hypothèse que la constitution définitive du dépôt doit se situer au début des années 340. Si l'on tient compte des *termini* respectifs des deux ensembles, soit 336/337 pour l'ensemble 1 et 341-344 pour l'ensemble 2, il faut postuler une thésaurisation étalée sur près d'une dizaine d'années. Il sera intéressant, pour nos prochaines investigations, de compléter cette étude par une analyse des liaisons de coins. La réalité d'une thésaurisation qui s'est déployée dans le temps pourrait être en effet confirmée par l'existence de groupes de liaisons de coins relevant de divers *Faits*[22].

4.2. Le stock monétaire

L'importance de l'analyse élémentaire des monnaies n'est plus à démontrer aujourd'hui. L'étude du dépôt de Saint-Germain-de-Varreville est précisément l'occasion de mettre en lumière l'intérêt d'une investigation archéométrique, dont les conclusions ont été présentées ailleurs[23]. En effet, des centaines d'émissions, qui se suivent dans le temps et qui sortent de la quasi-totalité des ateliers frappant monnaie à cette époque, ne peuvent qu'offrir une illustration fidèle de la gestion des stocks métalliques pendant la première moitié du IVe siècle. Dans cette perspective, nous

[22] Dans cette voie, voir S. Estiot, « Le trésor de Saint-Maurice-de-Gourdans-Pollet (Ain), 1 272 antoniniens stratigraphiés », *Trésors Monétaires*, XVI, 1997, pp. 69-127: pp. 87-88.

[23] P.-M. Guihard, G. Blanchet *et al.*, « Appréhender le stock de métal monnayé au IVe siècle après J.-C. Analyses par spectrométrie de fluorescence X portable de *nummi* provenant du trésor de Saint-Germain-de-Varreville (Manche) », *ArchéoSciences*, 42/2, 2018, pp. 45-62.

avons donc tiré parti du volume et de la variété des émissions présentes dans le dépôt afin de porter un regard spécifique sur les modes de production des *nummi* pendant cette période.

Près de 1000 monnaies ont été prélevées de manière aléatoire dans le dépôt. L'importance de notre échantillon a imposé le recours à une méthodologie d'analyse adaptée: nous avons opté pour la fluorescence X portable. Il s'agit d'une méthode rapide, permettant de tirer pleinement parti du large nombre de monnaies sélectionnées. Bien conscients des difficultés qui entourent l'utilisation d'une méthode de surface, notamment en ce qui concerne les alliages cuivreux[24], un protocole d'analyse précis a été mis en place au préalable[25]. Ces investigations archéométriques se situent dans la même veine que les travaux réalisés par I. Bollard et J-N. Barrandon il y a plus de 10 ans[26]. Nous avons fait le choix de ne retenir que 791 monnaies des 1000 prélevées, en écartant les ateliers orientaux et les monnaies identifiées comme irrégulières, dans le but de s'intéresser à la gestion des stocks métalliques dans les ateliers des diocèses de Bretagne et de Gaule.

La représentation des teneurs en or en fonction des teneurs en argent nous permet d'identifier des groupes de monnaies qui auraient été frappés avec un argent similaire ou différent, à travers le temps et les ateliers[27]. En appliquant ce rapport à l'ensemble des monnaies, on peut tout de suite apprécier, la constitution de trois groupes (fig. 8). Seuls les groupes 1 et 2 retiendront ici notre attention. Les monnaies contenant moins de 0,04 % d'or présent dans l'argent se situent dans le groupe 1, tandis que celles qui en contiennent un taux supérieur appartiennent au groupe 2. D'emblée, on observe que le groupe 2 ne rassemble que des *nummi* frappés au début des années 320. On pourrait alors émettre l'hypothèse qu'à partir de cette période, un stock d'argent différent a été utilisé. S'il est encore difficile de considérer ces résultats comme significatifs étant donné le nombre relativement restreint de mon-

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[24] E.T. Hall, « Surface-enrichment of buried metals », *Archaeometry*, 4/1, 1961, pp. 62-66; J. Condamin, M. Picon, « Influence of corrosion and diffusion on the percentage of the silver denarii », *Archaeometry*, 7/1, 1964, pp. 98-105.

[25] P.-M. Guihard, G. Blanchet *et al*., « Appréhender le stock de métal monnayé au IV^e^ siècle après J.-C. … », cit.

[26] I. Bollard, *Les médaillons et les contorniates (IV^e^-V^e^ siècles apr. J.-C.): les apports des analyses métalliques*. Université de Paris IV-Sorbonne, Thèse de doctorat, 2006; I. Bollard, J.-N. Barrandon, « Nouvelle contribution à l'étude du monnayage en bronze du IV^e^ siècle après J.-C. », *Revue Numismatique*, 162, 2006, pp. 277-310.

[27] L'argent, à l'état natif, contient de très petites quantités d'or. La refonte du métal n'affecte pas ces teneurs, faisant de l'or un élément traceur de l'argent. Cf. A. Gordus, « Non-destructive analysis of silver coins: a study of Sasanian and Umayyad coinage », *Bulletin de la Société Française de Numismatique*, juin 1970, pp. 543-544: p. 543; M. Blet-Lemarquand, S. Nieto-Pelletier, G. Sarah, « L'or et l'argent monnayés », in P. Dillmann, L. Bellot-Gurlet (dir.), *Circulation des matériaux et des objets dans les sociétés anciennes*, Paris: éditions des archives contemporaines, 2014, pp. 133-159.

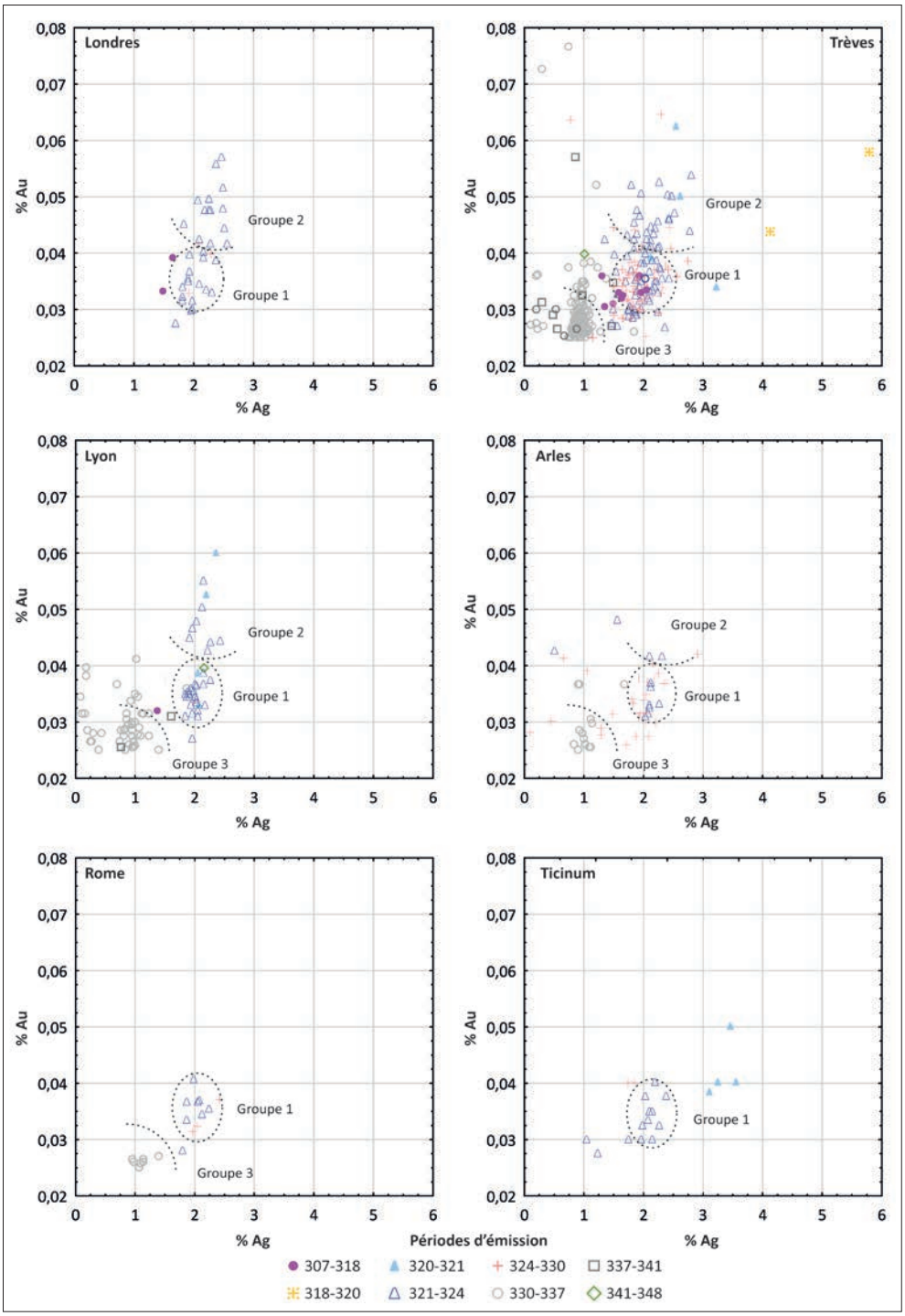

Figure 8 – Représentation des teneurs en or en fonction des teneurs en argent de l'échantillon de monnaies sélectionnées

naies analysées, le fait mérite d'être souligné. Quoiqu'il en soit, on peut imaginer l'utilisation sciemment combinée de deux stocks de métal de la part des ateliers. Le plus difficile serait de l'expliquer. À cet égard, il convient de porter une attention toute particulière au volume des émissions. On sait qu'au début des années 320 la production des ateliers de Londres, Trèves et Lyon gagne en importance, après que les ateliers italiens (Rome, Ticinum et Aquilée) eurent interrompu, ou drastiquement ralenti, leur activité monétaire pendant quelques années – entre 322 et 325 plus exactement. La relation est intéressante et fournit volontiers une raison vraisemblable pour expliquer la différence introduite par le groupe 2: en somme, une augmentation de la production monétaire dans les ateliers qui, en gonflant les besoins, aurait nécessité de se tourner vers de nouvelles sources d'approvisionnement en métal.

CONCLUSION

L'étude du dépôt monétaire de Saint-Germain-de-Varreville n'en est qu'à son début. Mais on peut d'ores et déjà mettre en perspective les enjeux qu'elle mobilise.

À travers sa conservation et son volume, le dépôt offrait incontestablement une originalité qui laissait entrevoir une étude élargie. D'où le parti pris que nous avons adopté, celui d'un parcours fractionné en trois étapes: 1/ celle de la mise en œuvre, depuis la conservation jusqu'à l'enregistrement de l'ensemble des monnaies ; 2/ celle de la connexion entre plusieurs domaines d'étude (l'interdisciplinarité proprement dite) au carrefour de la numismatique, de l'archéologie et de l'archéométrie ; 3/ celle de la mise en perspective enfin pour voir ce que le dépôt peut nous apprendre sur les usages du moment. On ne peut toutefois que l'admettre, ces enjeux représentent l'avant-scène d'une arrière-scène où se mêlent les pratiques scientifiques, les moyens à mobiliser et l'influence des « pouvoirs ». Quoi qu'il en soit, il ne fait aucun doute que le développement d'études détaillées de ce genre a beaucoup à nous apprendre pour progresser dans l'écriture d'une histoire monétaire qui serait tout autant attentive à la production monétaire qu'aux pratiques de thésaurisation, manière de rappeler, en ces temps tournés vers les sciences économiques, que notre matière est d'abord faite d'hommes et de comportements.

Sam Moorhead

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THE FROME HOARD
HOW A MASSIVE FIND CHANGES EVERYTHING

Abstract

The Frome Hoard of 52,503 coins, discovered in 2010, is the second largest Roman coin hoard found in Britain. Not only is it of great numismatic significance, with over 850 pieces of Carausius (AD 286-93), but also it has had an enormous impact on broader archaeological and museological practices. The hoard was discovered by a metal detectorist, Dave Crisp, but he left the pot in the ground for professional excavation. This provided invaluable context for the hoard and enabled numismatists to determine that the hoard was buried in a single event. The sudden arrival of the coins at the British Museum was a catalyst for the Roman Coin and Metals Conservation sections at the British Museum to develop a new way of processing the 80 or so hoards which arrive annually. The apparent ritual significance of the hoard led to much academic and popular debate, resulting in a major Arts and Humanities Research Council research project between Leicester University and the British Museum. The worldwide publicity concerning the hoard enabled a major fund-raising campaign which secured the coins for the Museum of Somerset in Taunton. The high profile of the hoard also resulted in a British Museum video-conferencing activity for school children. Finally, the good practice of Dave Crisp, in calling for professional assistance, has resulted in numerous detectorists leaving hoards in the ground for archaeologists to excavate.

Keywords

Rome, Hoard, Roman, Coin, British Museum, Museum of Somerset, Taunton, Portable Antiquities Scheme, Metal Detecting, Treasure, Archaeology, Conservation, Leicester University, Carausius, siliqua, radiate, ritual, stips, Art Fund, National Heritage Memorial Fund, Museum Education

INTRODUCTION

The Frome Hoard has been one of the most significant find of Roman coins made in Britain in recent decades.[1] It is the second largest coin hoard ever found in Britain (the largest in a single pot) and it has the largest surviving group of coins of Carausius (AD 286-93; about 850 specimens) from any known hoard. In addition, its discovery, subsequent excavation and survey work have provided an enormous amount of contextual data, adding valuable information for discussing the possible reasons behind the seclusion of the coins. Finally, the sheer size of the hoard has forced museum curators and conservators to rethink completely their way of dealing with such finds. As a result, the landscape of hoard processing has changed enormously since the discovery of the Frome Hoard in 2010. In addition, the hoard's discovery has led to a major research project and a bespoke schools' programme at the British Museum.

DISCOVERY OF THE HOARD

The Frome Hoard was discovered by a metal detectorist, Dave Crisp[2], in April 2010 (Image 1). He had been finding late Roman silver *siliquae* from a dispersed hoard[3], scattered across a field in Somerset (south-west England), when he had an 'iffy' signal (Image 2). He would not normally have dug up the object, but thought it might have been a *siliqua* buried on its edge. Sometime later, with his arm fully extended into a hole in the ground, he started to pull out pot sherds and Roman 'radiate' coins. He then made a momentous decision: he decided to leave the hoard in the ground and refill the hole.[4] He contacted Katie Hinds, Finds Liaison Officer (FLO) for the

[1] It is hoped that the hoard will be fully published within a few years. This article is a further interim account, following on from Moorhead, Booth and Bland 2010; undoubtedly, some details will be slightly different in the final publication. The find is recorded on the Portable Antiquities Scheme Database (finds.org.uk) as entry IARCH-ED5662 and SOM-5B9453, and has the official Treasure Number 2010T272. A summary listing appeared in *Numismatic Chronicle* 171 (2011), p. 416, no. 34. For an extensive account of the hoard's discovery by the finder, see Crisp 2012, 138-172. For a shorted account, see *Current Archaeology* 246 (September 2010), 12-19

[2] For more about Dave Crisp's experiences as a detectorist, see Crisp 2012.

[3] Over several years, 144 siliquae, one *miliarensis* and one half-*siliqua* have been found, terminating with the emperor Eugenius (AD 392-4) (see finds.org.uk : IARCH-B9A6B1 for Treasure Cases 2010 T278, 2011 T233, 2012 T732 and 2013 T785). It is quite possible that these coins represent an *addenda* to 111 *siliquae* found on the same farm in 1867, of which 6 survive in the Museum of Somerset, Taunton.

[4] It is possibly pure coincidence, but the author had given a lecture at the Melksham Metal Detecting Club in September 2009, where he spoke to Dave Crisp and two others about the importance of leaving hoards *in situ* for professional excavation, citing the Cunetio Hoard (Besly and Bland

Portable Antiquities Scheme (PAS) in Wiltshire[5] who, realising that the find was in the county of Somerset, contacted her neighbouring FLO in Taunton, Anna Booth.

Image 1 – Dave Crisp visiting the British Museum during the 'emperor count' © Trustees of the British Museum

Image 2 – A very rare half-*siliqua* (c. AD 375-92) from the Frome late Roman silver hoard (13mm diameter). © Museum of Somerset, Taunton

1983) as an example of what happens when this does not occur. Such direct communication with the detectorist community has been essential for disseminating good practice.

[5] For more information on the Portable Antiquities Scheme, visit: finds.org.uk

EXCAVATION OF THE HOARD

Anna Booth, with Steve Minnitt (Head of Museums Services in Somerset), then organised a professional excavation of the site led by local archaeologist Alan Graham (Image 3). Over three days, Alan Graham, Anna Booth, Katie Hinds, Dave Crisp, other archaeologists and members of the landowner's family excavated the hoard (Image 4). Alan determined that the hoard was in a large grey-ware vessel with a black-burnished ware 'dog bowl' place over the top as a lid. The pot was so large and fractured that it was not possible to block-lift in the time available, so it was decided to excavate the coins in ten arbitrary layers (spits) (Figure 1).[6] Several bags of coins (containing up to 1000 pieces) were excavated from each level, resulting in about 60 different bags – ever since, each coin has been kept with its layer and bag number. The ultimate result was a meticulous section drawing of the hoard with the different layers clearly labelled.

Image 3 – Alan Graham excavating the pot © Museum of Somerset, Taunton

[6] Some people have shown how block-lifting could have been achieved, but the funding and equipment were not available in this instance. Furthermore, security and conservation issues meant that the hoard should not stay in the ground for any length of time.

Image 4 – From left to right: Simon Hughes and Naomi Payne (archaeologists with the Somerset Museums Service); Anna Booth (FLO Somerset); Steve Minnitt (Head of Somerset Museums Service); Katie Hinds (FLO Wiltshire); Aaron King (Dave Crisp's grandson); Dave Crisp. © Museum of Somerset, Taunton

Image 5
The excavation of the coins from the pot
© Museum of Somerset, Taunton

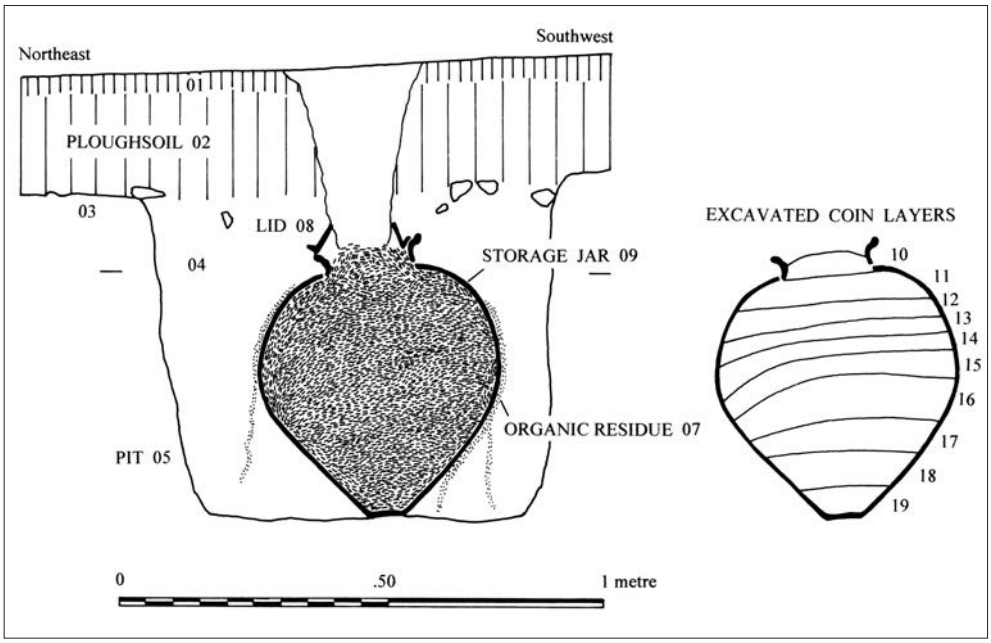

Figure 1 – Section drawing of the Frome Hoard excavation © Alan Graham and Anna Booth

INITIAL CONSERVATION AND PROCESSING OF THE HOARD

The day after the excavations concluded, Roger Bland (then Keeper of Portable Antiquities and Treasure, British Museum) and Sam Moorhead (National Finds Adviser for Iron Age and Roman coins, British Museum) drove down from London to Taunton to collect the coins. The next day a meeting was arranged with the Head of Conservation (David Saunders) and the Senior Metals Conservator (Pippa Pearce MBE). Pippa insisted that the coins should be stabilised as soon as possible so over the next six weeks she and her staff washed the coins in distilled water and dried them in drying cupboards. By the end of this process, we knew that there were 52,503 pieces in the hoard, weighing around 160kg (Image 6). Some of the coins in the lower levels of the pot were corroded together and had to be separated very quickly whilst the coins were still damp. This was another reason for the swift delivery of the coins to the conservators.

As the coins were stabilised, bags were delivered to Sam and Roger who, with Richard Abdy (Curator of Roman coins at the British Museum), conducted an 'emperor' count that took ten weeks. This resulted in a summary of the hoard by emperor and confirmed that the latest emperor represented was Carausius (AD 286-93),

Image 6 – Pippa Pearce with Frome Hoards coins drying in the fume cabinet in the Conservation Department © Trustees of the British Museum

Image 7 – A group of stabilised coins ready for sorting by emperor © The Trustees of the British Museum

Figure 2 – The contents of the Frome Hoard by Emperor after the initial sort (2010)*

Central Empire	Valerian & Gallienus**	253-60	46
	Gallienus (sole reign)	260-8	6,091
	Salonina	260-8	404
	Claudius II	268-70	5,421
	Quintillus	270	333
	Aurelian	270-5	266
	Severina	270-5	13
	Florian	276	10
	Probus	276-82	619
	Carus	282-3	8
	Divus Carus	283	5
	Magnia Urbica	283-5	2
	Numerian	282-4	12
	Carinus	283-5	19
	Diocletian	284-305	38
	Maximian	286-305	22
			14,788
Gallic Empire	Postumus	260-9	257
	Laelian	269	4
	Marius	269	35
	Victorinus	269-71	7,494
	Divus Victorinus	271	14
	Tetricus I	271-4	12,416
	Tetricus II	271-4	5,203
			28,377
British Empire	Carausius***	286-93	**766**
Contemporary Copies			**314**
Illegible			**8,258**
	GRAND TOTAL		**52,503**

* The figures given here are of the initial sort in 2010. Most of the illegible coins have been identified since conservation, but final totals will not be adjusted until the final catalogue has been completed.
** Amongst the illegible coins, there is one of Trebonianus Gallus (AD 251-3).
*** The total for Carausius is presently standing at around 850.

Image 8
Silver denarius of Carausius
from the Frome Hoard
(diameter 22mm, excluding spur)
(Photo by Stephen Dodd)
© The Trustees of the British Museum

giving the hoard a similar *terminus post quem* to the Normanby Hoard, of around c. AD 290 in the middle of the emperor's reign (Image 7 and Figure 2).[7] At this stage, so as to have good quality coins for publicity purposes, a small number of pieces were fully conserved by Pippa and Dr Duygu Çamurcuoğlu, and photographed by Stephen Dodd in the Department of Coins and Medals (Image 8).

PROMOTION AND ACQUISITION OF THE HOARD

On the day that Sam Moorhead and Roger Bland collected the coins from Taunton, it was agreed with Steve Minnitt that the Museum of Somerset would attempt to acquire the hoard. Under the Treasure Act (1996) in England and Wales[8], there need to be two or more silver, or ten or more base metal, coins over 300 years old; with 5 silver *denarii* of Carausius and 52,498 radiates, there was no doubting that the Coroner in Frome would declare the find 'Treasure'. This then enabled the Museum of Somerset to start raising funds to pay the value of the hoard to the finder and landowner (who each received 50% of the official valuation).[9] In this case, the hoard was valued at £ 320,000.

So as to raise such money, there had to be a major fund-raising and publicity campaign. In the first instance, Dan Pett (IT Officer for the PAS Website and Database) built a micro-site for the find, including blogs by Katie Hinds and Anna Booth.[10] The news about the hoard was then broadcast by the Today Programme on BBC *Radio* 4

[7] Bland and Burnett 1988

[8] For more on the Treasure Act (1996), see finds.org.uk/treasure

[9] A market value for the hoard was set by the independent Treasure Valuation Committee which meets regularly at the British Museum.

[10] The microsite is no longer available online, due to subsequent rebuilding of the site. One news story is still available at: https://finds.org.uk/news/index/index/page/10

and launched simultaneously on the BBC News Website[11]. Over the next forty-eight hours numerous television, radio and newspaper organisations carried news of the story with the finder, Dave Crisp, Roger Bland, Richard Abdy and Sam Moorhead dealing with a host of media requests. In addition, the BBC 2 programme *Digging for Britain* filmed various elements of the story in Somerset and at the British Museum, for broadcast in August.[12] There was also a major event in Frome Public Library, where some of the coins were on display to the public, which attracted many media organisations and 2,000 visitors over about 4 hours.

At the same time, a selection of the coins was put on display in the central case in the British Museum's *Money Gallery* and Taunton sponsored an artistic impression of the burying of the hoard by Victor Ambrus (Image 9).[13] Meanwhile, Sam Moorhead, Roger Bland and Anna Booth started to write a short book on the hoard, which was published by the British Museum Press in September 2010, with 50p from every sale going to the Frome Hoard appeal.[14] Sam Moorhead, Roger Bland, Steve Minnitt and Dave Crisp were kept particularly busy with giving talks to encourage fundraising, most notably to the Somerset Branch of the *Art Fund*. The *Art Fund* in London had pledged that they would match every pound raised in Somerset which resulted in £80,000 being donated towards the acquisition target. Other funds came in from a variety of sources; finally, in March 2011, the *National Heritage Memorial Fund* (NHMF) generously made up the short-fall and the hoard was secured for the Museum of Somerset. In addition, the NHMF gave £100,000 to cover the cost of conserving 3/5ths (around 30,000) of the coins in the hoard.

The pot and a selection of coins were placed on display in the Museum of Somerset, Taunton in the autumn of 2011, only 18 months after their discovery (Image 10).[15] The hoard has since been the central piece in an exhibition on hoarding at the British Museum in 2015-6 – *Hoards: the hidden history of ancient Britain* (an integral element of the *Crisis and Continuity Project*, see below) – curated by Eleanor Ghey (Curator of Iron and Roman Coin Hoards, British Museum).[16]

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[11] http://www.bbc.co.uk/news/mobile/10546960. It is important to acknowledge the vital role of the British Museum Press Office under the leadership of Hannah Boulton, Olivia Rickman and Esme Wilson.

[12] http://www.bbc.co.uk/pressoffice/pressreleases/stories/2010/07_july/08/digging.shtml

[13] Victor Ambrus is a famous archaeological illustrator, best known for his work on Channel 4's *Time Team*

[14] Moorhead, Booth and Bland 2010. The book was generously printed in Frome by Butler, Tanner and Dennis at a remarkably reduced rate, making publication possible.

[15] The Frome Hoard pot and 'dog bowl' were conserved and reconstructed by Kathleem Swales (neé Magill) in the Conservation Department at the British Museum.

[16] For an overall account of hoarding in Britain, see Ghey 2015

Image 9 – Reconstruction artwork by Victor Ambrus of the burial of the Frome Hoard © Victor Ambrus

Image 10 – The display of the Frome Hoard in the Museum of Somerset, Taunton, in 2011. Note that the enlarged coin images rather dwarf the pot. © Museum of Somerset, Taunton

CONSERVATION AND STUDY OF THE HOARD

There was a considerable differentiation in the preservation of the coins in the upper part of the pot from those at the bottom. Coins towards the top were much easier to conserve and have come out in excellent condition. Those at the bottom were much more heavily corroded because they had been periodically saturated with water over a long period of time – these included the bulk of the coins of Carausius, pieces which have the greatest numismatic importance.[17] Eleanor Ghey and Sam Moorhead had to go through the entire hoard *again* to choose 30,000 or so coins (as dictated by the £100,000 budget) that most needed conservation. This budget enabled the employment of two curators on fixed term contracts, Bryony Finn and Ana Tam (Image 11). An extra generous donation from Graham Barker enabled Natalie Mitchell to continue working on the hoard for longer, concentrating on important pieces of Carausius.

There was a major debate about the methods of conservation with discussions surrounding the relative merits of manual and chemical cleaning. The outcome was a refined system for conservation which enabled a constant through-put of coins at minimal effort. Most importantly, Pippa Pearce introduced 'Coin Wednesday' in the metals conservation section, which continues to this day, when all metals conservators work on ancient coin finds (Image 12). This also meant that Sam Moorhead and Richard Abdy could visit on a Wednesday and check through the conserved coins to see if any more essential work needed to be done. As a result, there has been a very close relationship between the Roman Coin Section and the Metals Conservation Section which has been of incredible mutual benefit in recent years. Most of the coins were finally conserved by the end of 2013; a few pieces of Carausius have been worked on since. As the conserved coins returned to the Department of Coins and Medals, they had to be re-integrated into the existing archive, another logistical challenge.

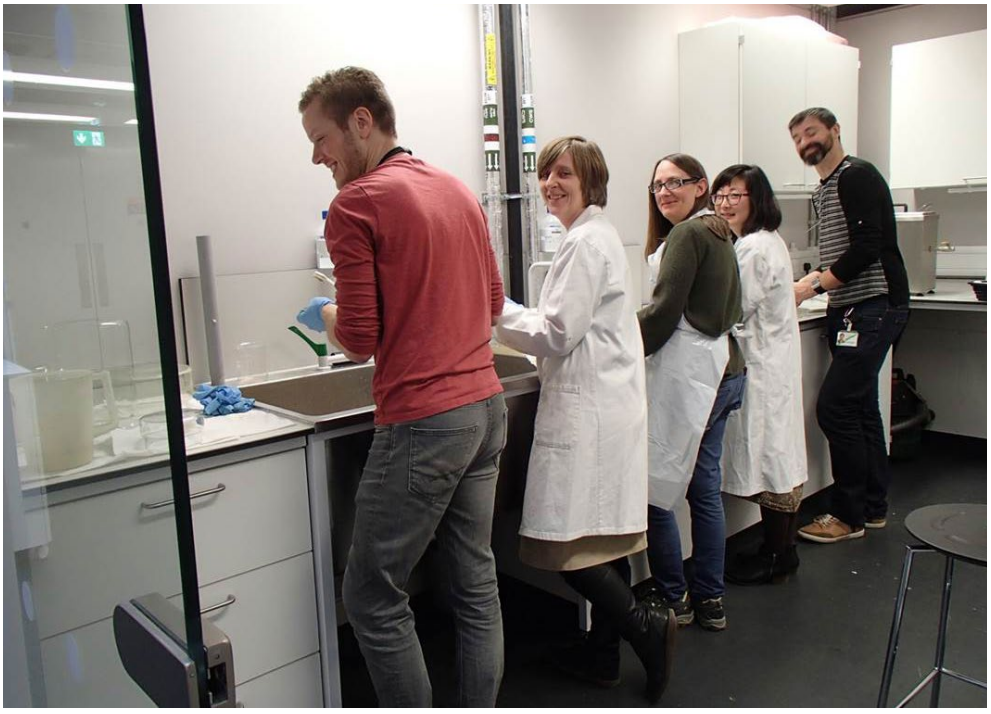
Because the hoard was acquired by the Museum of Somerset in 2011, there has not the urgency to catalogue the coins because they are now always available for study. Furthermore, with up to 80 Roman coin hoards arriving in the British Museum annually, there are many other hoards which urgently need cataloguing because they are not being acquired by any museum.[18] However, over the years, a variety of scholars have helped with the cataloguing of the coins. Richard Abdy and Fernando López Sánchez have worked on the *aureliani* from Aurelian to Diocletian and Maximianus;

[17] The final publication will highlight the importance of the Carausian coins for numismatists, but the author has made some preliminary observations, including the possibility that the C Mint was in fact a mint that travelled with the emperor (Moorhead 2015).

[18] For more information on Roman hoard processing, see Eleanor Ghey's article in this volume.

Image 11
Ana Tam working on a coin from the Frome Hoard
© Trustees of the British Museum

Image 12
'Coin Wednesday' in the Metals Section in the Department of Conservation, British Museum
© Trustees of the British Museum



Vincent Drost, Sam Moorhead's Deputy from 2014 to 2016, catalogued the Gallic Empire pieces. Sam Moorhead's present deputy, Andrew Brown, has just finished Gallienus and is now working on the final emperor, Claudius II. Sam Moorhead has catalogued the Carausian pieces, many of which will be new entries in the author's forthcoming updated edition of *Roman Imperial Coinage* for Carausius and Allectus. It is hoped that during 2019 a final catalogue will be produced and that final publication should occur sometime in 2020.

It should be noted that one effect of the size of Frome Hoard has been to force us at the British Museum to consider the manpower available to process Iron Age and Roman coin hoards, and other coin finds relating to the Portable Antiquities Scheme. From 2010 to 2013, the Museum funded a part-time Project Curator for Roman coin hoards. However, in addition, since 2011, the British Museum has received generous backing from private donors to provide a deputy to Sam Moorhead and Richard Abdy; the position has been held in sequence by Philippa Walton, Vincent Drost and Andrew Brown (presently in post). We are all extremely grateful to the generosity of Richard Beleson and Graham Barker who have made this post possible.[19]

INVESTIGATION / SURVEY OF THE FROME HOARD FIND-SPOT

Immediately after the excavation of the hoard, the Somerset Museums Service commissioned GSB Propsection in Bradford to conduct a geophysical survey of the immediate vicinity of the hoard's find-spot (Image 12). No features of any significance were found. As part of a major Leicester University and British Museum AHRC-funded project – *Crisis or Continuity: Hoarding in Iron Age and Roman Britain with special reference to the 3rd century AD* (see below) – Adrian Chadwick and Adam Rogers returned to the site in 2015 and carried out more geophysical work.[20] They managed to locate the source of a spring and the resulting ancient watercourse that ran past the find-spot. They also located features of an extensive settlement a few hundred metres away. This provides important additional information for a discussion of the hoard's function.

[19] We are very grateful to Clemency Horsell and her colleagues in the Development Department at the British Museum for their assistance with this post. The Museum also funded a part-time Project Curator for Roman coin hoards from 2010-13, also in response to the increased number of finds.

[20] Chadwick 2017. Due to the extreme sensitivity of the site, exact locations and maps are not being published at present.

Image 13 – Geophsysical survey being carried out by GSB Prospection in 2010
© Museum of Somerset, Taunton

WHY WAS THE FROME HOARD BURIED?

The traditional reasons given for Roman coin hoarding tend to fall into two broad categories: emergency hoards buried in times of unrest; savings hoards buried for safe-keeping.[21] In both cases, the implication is that the contents of hoards were viewed in monetary terms and could be of economic use in the future. From very early on, it became clear to Sam Moorhead that neither explanation was satisfactory, for a variety of reasons, and was moving towards a religious or ritual explanation[22]:

a) The hoard was extremely large, but buried in a thin-sided grey-ware vessel which would almost certainly have broken if any attempt was made to move it when full of coins. Therefore, the pot would have needed to be placed in the ground prior to filling. This immediately highlights the great inconvenience that would have been faced if someone needed to recover the coins at a later date.

b) The stratigraphy of the hoard shows that the coins were deposited in a single act, from a series of different containers, rather than having been saved over time. This is apparent because the latest coins, a large group of around 700 Carausian pieces, were found in the middle of the container – one can assume that they represent a single batch of coins from one container deposited about half way through the process of filling the pot. (Figure 3). Had the hoard been put together over a period of time, these Carausian pieces would have been in the upper part of the pot. Furthermore, it does seem that the five silver *denarii* of Carausius were strategically placed amongst the last coins to be placed at the top of the container (see Image 8).

c) As noted in Adrian Chadwick's survey (see above), the hoard was found on high ground, next to an ancient watercourse, just below its source/spring. Prehistorians have often noted watery places as popular spots for votive offerings and coin finds from the Sacred Spring at Bath, Coventina's Well and the River Tees at Piercebridge are clear examples of votive offerings to the gods in the Roman period.[23] The fact that a later *siliqua* hoard (see above) was found in the same area might reinforce the religious importance of the site.[24]

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[21] For the most recent and comprehensive overview of Roman coin hoarding in Britain, see Bland 2018, especially 7ff.

[22] This started with an article in the popular archaeology press – see Moorhead, Bland and Pett 2010

[23] For prehistoric hoarding, see Bradley 1998; for Bath, see Walker 1988; for Coventina's Well, see Allason-Jones and McKay 1985; for Piercebridge, see Walton 2008

[24] It is worthy of note that the *siliqua* hoard has an unusual *terminus post quem* of coins struck by the last pagan Roman emperor Eugenius (AD 392-4).

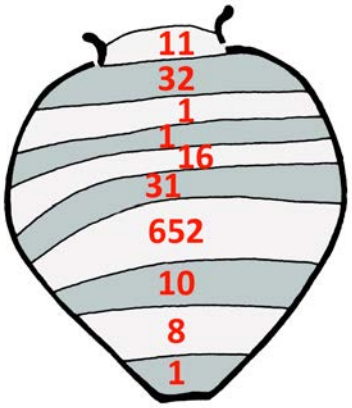

Figure 3
Section drawing of the pot with the numbers of coins of Carausius in each layer – the latest coins of Carausius are all in the central part of the pot; the ones towards the top are from the beginning of his reign
© Alan Johnson, Anna Booth, Roger Bland and *Current Archaeology*

d) It goes without saying that the hoard was not recovered in antiquity. But, if it was intended as a votive offering, then this should come as no surprise.

e) It would be quite normal for an academic to suggest that this hoard represents the savings of a wealthy local landowner. But, as stated above, it is not a very practical way of secluding one's wealth. The presence of one distinct group of Carausian coins in the centre of the pot does strongly suggest that the pot was filled from a series of other containers. Did all these containers have to belong to one person? Could it not have been a group of people, possibly representing a wider community, who contributed their own money? Were these people from the nearby settlement, discovered by the geophysical survey?

f) We know from various ancient writers about the 'stips' (pl. 'stipes') when local communities would make joint offerings of low value coins to the gods.[25] Is it possible that the Frome hoard represented a related or similar tradition? What is interesting is that the 'stips' was specifically associated with a new 'saeculum' as offerings to Dis and Persephone, for example in 249BC when the *Ludi Saeculares* were celebrated, according to a comment by Pseudo-Acro on line 8 of Horace's *Carmen Saeculare*[26]. A number of coins of Carausius, some included in this very hoard, do promote the Secular Games, strongly suggesting that he held such Games in *Britannia* – this would fit in perfectly with Golden Age themes and imagery else-

[25] See for example, see: Varro, *De Lingua Latina* V 182; Suetonius *Augustus* 57; Seneca *De Beneficiis* IV 29 2; Justinian, *Digesta seu Pandectae* 50, 16, 27. I am very grateful to Graham Barker for alerting me to this religious practice.

[26] This is extensively discussed in Forsythe 2012, 60-62

where on his coins (Image 14).[27] This is highly speculative, but we do have to start looking at coin hoards in a different way and the Frome hoard provides enough contextual and internal information to be a catalyst for this debate.

Image 14 – Silver-washed radiate of Carausius (AD 286-93), SAECVLAR(E/I)S AV, Stag walking left. Frome Hoard (22mm diameter) © The Trustees of the British Museum

CRISIS OR CONTINUITY? HOARDING IN IRON AGE AND ROMAN BRITAIN WITH SPECIAL REFERENCE TO THE 3RD CENTURY (LEICESTER UNIVERSITY AND THE BRITISH MUSEUM)

The author's suggestion that the hoard was in fact a votive deposit opened a lively discussion amongst colleagues, other scholars and members of the public across the globe. The result was that the British Museum and Leicester University won an Arts and Humanities Research Council award, beginning in 2013, to study Iron Age and Roman coin hoarding, with an emphasis on the 'reasons' for hoarding[28]. This enabled Adrian Chadwick and Adam Rogers to survey the Frome hoard find-spot and environs further (see above), but also led to extensive investigation of other hoard find-spots across England. This research has certainly highlighted the need to consider ritual motives behind some coin hoards and the results of the research are about to be published.[29] The project has also led to the inclusion of all known Iron Age and Roman coin hoards on the PAS Database by Eleanor Ghey; this means that with the ongoing addition of coin hoards on the database that all British and Welsh hoards

[27] Barker 2015 and 2016; de la Bédoyère 2005

[28] https://www2.le.ac.uk/departments/archaeology/research/previous-research-projects/hoarding-in-iron-age-and-roman-britain

[29] Bland *et al* 2019 forthcoming

will be accessible from this single source in the future.[30] This work also provided the basis for extensive mapping by Katie Robbins, much of which is in the final publication and Bland 2018 (see Figure 4).

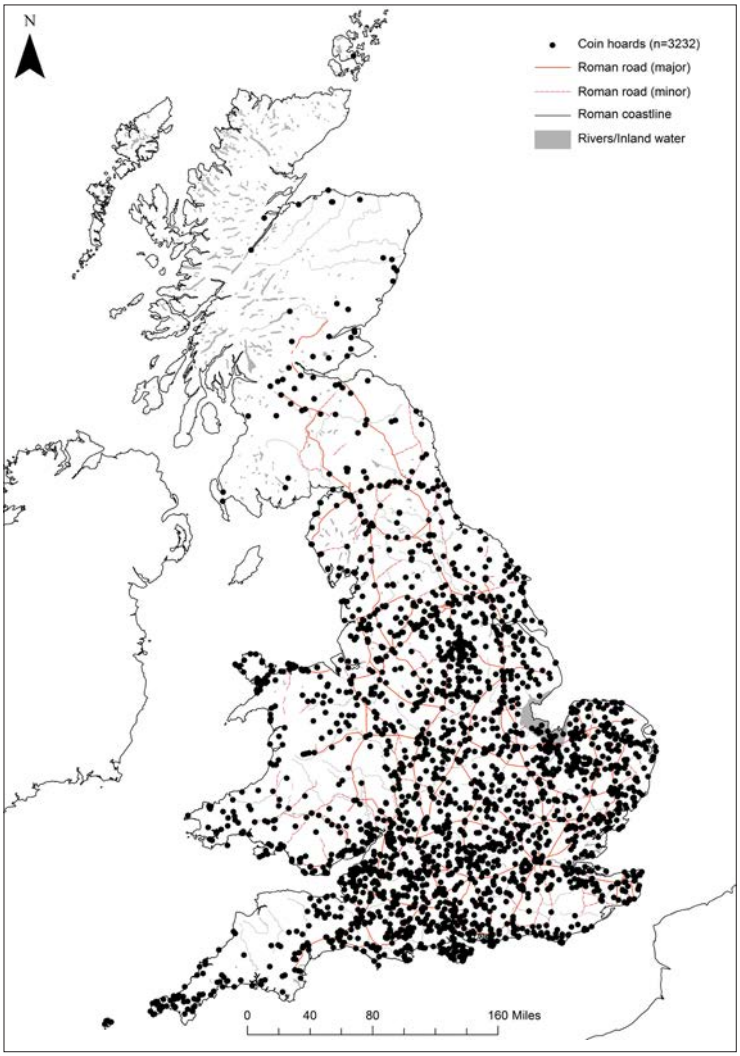

Figure 4 – Map showing all Roman coin hoards in Britain, prepared by Katie Robbins in October 2015, using data provided by Eleanor Ghey
© Trustees of the British Museum and Leicester University

[30] Eleanor Ghey used Robertson 2000, de Jersey 2014 and a host of other sources to create a corpus of all known Iron Age and Roman coin hoards. All historical finds are on the PAS database (finds.org.uk) with a prefix IARCH and will be published to the wider world in 2019.

EDUCATIONAL ACTIVITIES INVOLVING THE FROME HOARD

After the discovery and initial analysis of the hoard, the Learning Department in the British Museum created a Schools' activity around the discovery of the hoard which is still being offered: 'Roman Britain Treasure Challenge'.[31] An audio-visual and digital resource was developed in the Samsung Discovery Centre at the British Museum which enabled primary school children to roleplay, through video-conferencing, the various people involved in the discovery of the Frome Hoard. This has been assessed by Elizabeth Warry, an MA student at UCL.[32] This has enabled the British Museum to educate school children about the concept of Treasure, hoarding, the Romans and how professionals deal with major finds.

THE LEGACY OF THE FROME HOARD

The Frome Hoard has had a major impact on archaeological and museological practices. From a numismatic point of view, the hoard includes a large number of new types and varieties, especially for Carausius, but the importance of the hoard reaches far beyond just the numismatic. From the outset, it has presented a model for publicity and fund-raising which has influenced subsequent campaigns by museums to acquire major hoards, notably the Wold Newton Hoard, acquired by the Yorkshire Museum in 2016.[33] At the British Museum the Frome hoard has been instrumental in shaping a new partnership between the Iron Age and Roman coin curators and the Metals Section in Conservation which facilitates effective processing of thousands of coins every year. The hoard has provided the catalyst for seeking funds to employ an extra member of staff to help with the increasing number of hoards and site-finds which require recording at the British Museum, and on the PAS Database. Furthermore, the hoard has figured in exhibitions in Somerset and at the British Museum. The debate over the reason for the seclusion of the hoard led directly to the AHRC-funded research project between the British Museum and Leicester University – *Crisis or Continuity* – which has resulted in an important monograph, but also the inclusion of all Iron Age and Roman coin hoards on the Portable Antiquities Scheme database. Frome has been the subject of a major schools digital video-conferencing project which is still being run by the British Museum.

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[31] http://www.britishmuseum.org/learning/schools_and_teachers/sessions/roman_britain_treasure.aspx

[32] Wary 2011.

[33] https://www.yorkshiremuseum.org.uk/wold-newton-hoard/

Image 15 – The excavation of the Bourne Valley Hoard by Arwen James, Edwin Wood and Andrew Brown, August 2018

Finally, however, the most important legacy is probably that, since the discovery of, and publicity surrounding, the Frome Hoard, there has been a significant change in the behaviour and understanding of many metal-detectorists. Firstly, in many cases pots of coins are delivered to Finds Liaison Officers or museums with the coins still inside, thus enabling excavation in laboratory conditions. Secondly, a number of detectorists have actually left hoards in the ground for archaeologists to excavate. This is happening increasingly as metal detectorists become aware of the reasons and benefits of professional excavation. As recently as August 19th, 2018, a hoard of coins was found by Tony and Paul Hunt in a pot on a metal-detecting rally in Wiltshire. One of Dave Crisp's friends, Gary Cook, was present and insisted the hoard be left *in situ* for archaeologists to excavate. The next day, three of us from the British Museum (including a metals conservator Hayley Bullok) and three Finds Liaison Officers were able to excavate and lift the pot (Image 15). It went straight back to the British Museum Conservation Department and by the 13th October it was on display in an exhibition in Salisbury and South Wiltshire Museum: *Hoards: A*

Hidden History of Ancient Britain.[34] The spirit of the Frome Hoard very much lives on in the public domain as well as at the British Museum and in broader academic circles.

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[34] Cook 2018. The Bourne Valley Hoard was excavated by Edwin Wood (former FLO for Sussex; Arwen James (FLO for Buckinghamshire), Katie Hinds (FLO for Hampshire) and Andrew Brown, with Sam Moorhead and metals conservator Hayley Bullock in attendance.

https://www.salisburymuseum.org.uk/whats-on/exhibitions/hoards-hidden-history-ancient-britain

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* Note that the Cunetio and Normanby hoards have now been combined in a joint publication: Bland, R., Besly, E. and Burnett, A. with notes by Moorhead, S. 2018 *The Cunetio and Normanby Hoards* (Spink)

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JEAN-MARC DOYEN*

« *BIG IS BEAUTIFUL* » ? FAUT-IL VRAIMENT ÉTUDIER LES « MÉGADÉPÔTS » MONÉTAIRES ?

Abstract

Are thorough studies of monetary 'mega-hoards' scientifically and economically profitable?
After defining the differences between 'large treasures' and statistically 'normal' ones one may wonder what the study of these finds, a thing which is often cumbersome, actually brings to the world of numismatics. Their internal structures often differ little from that of smaller deposits. Moreover, they do not appear to bring any more interesting/ rarer-types than smaller finds, nor scattered individual coins from archaeological sites.
Their interest lies elsewhere.
Larger hoards can contribute to metrological studies, on the origin of the metals and the composition of the alloys used. One must ask the question on the identity (or identities) of the original owners and on the purpose for such an accumulation of coins. A hypothesis of 'speculative manipulation' of money can be put forward. Indeed, a mapping of the 'mega-hoards' of Late Antiquity clearly demonstrates that a trade of currencies existed by sea.
Given the costs, both human and financial, of the studies of these large hoards and the future development of imaging and management of hoards on a large scale, it seems perhaps more appropriate to focus on specific issues; international cooperation within the framework of such hoards should be advanced in order to conserve a consistent approach to their study.

Keywords

Coins hoards, economic & social history, Ancient economy, coin circulation

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En période de crise économique et de restriction du financement de la recherche, on peut légitimement s'interroger sur l'utilité d'étudier les très grands dépôts monétaires. N'est-il finalement pas, scientifiquement parlant, plus « rentable » sur le plan économique d'étudier 100 dépôts de 1000 pièces qu'un seul de 100.000 ? Que nous apportent les grands ensembles ? Comment doivent-ils être traités ? Leur apport potentiel justifie-t-il les efforts humains et financiers qu'ils nécessitent ?

D'une manière générale, les questions qui se posent à l'historien et à l'économiste sont, d'une part : que peut nous apporter l'étude des trésors, quelle qu'en soit la taille et, d'autre part, les très grands trésors – ceux que l'on peut qualifier de « mégadépôts »[1] – sont-ils simplement des trésors « normaux » de taille anormale – ce que j'appellerai l'hypothèse quantitative – ou leur structure interne diffère-t-elle des dépôts « normaux », ce sera hypothèse qualitative ? Ces derniers ont-ils des caractéristiques internes exceptionnelles autres que le nombre d'individus, qui justifieraient l'investissement de la collectivité dans leur étude.

Mon questionnement portera, dans un premier temps, sur la structure interne des grands dépôts. Une approche statistique de la composition de trésors apparemment contemporains, mais de taille différente, montre-t-elle une réaction spécifique du thésauriseur (ou groupe de thésauriseurs) en fonction de la taille de ses « économies » ?

Il nous faut, dès le départ, bien faire la distinction entre un trésor, qui est un fait archéologique, et ce dont il est constitué. Dans le cas qui nous occupe aujourd'hui, ces trésors sont essentiellement constitués de monnaies, auxquelles s'ajoutent éventuellement des bijoux ou du métal non monnayé. Toutefois, il faut se souvenir que ce ne sont évidemment pas les seuls assemblages ayant fait l'objet d'une thésaurisation.

Un trésor est donc avant tout un « fait archéologique », c'est-à-dire un ensemble d'interconnexions. Il est désormais indispensable de le considérer comme un site en soi, et donc de le traiter comme tel. Ainsi, est-il localisable dans l'espace et dans le temps. Son propriétaire est parfois connu, soit à partir des données archéologiques – par exemple le trésor de monnaies d'argent découvert dans la tombe du roi des Francs Childéric mort à Tournai en 481[2] – soit grâce aux documents écrits joints aux monnaies, dans le cas de trésors médiévaux et modernes. Son contenant peut être étudié, et le contexte d'enfouissement de ce dernier peut être déterminé par les relations stratigraphiques qu'il entretient avec les différentes phases de construction de l'édifice ou de la structure dont il provient. L'agencement interne de son contenu peut être mis en évidence par une microfouille rigoureuse. De multiples cas de figure peuvent être évoqués, depuis les monnaies simplement versées dans un trou dans

[1] Néologisme forgé sur le principe du « mégacontexte ». Par mégadépôt, je propose d'entendre les ensembles hors normes correspondant à un nombre de monnaies au moins dix fois supérieur à celui du trésor quantitativement « normal » (compris dans le sens statistique du terme).

[2] Thirion, *Les trésors*, 162-163.

le sol à des dispositions complexes impliquant soit des rouleaux ou des piles de monnaies, soit des sacs scellés portant éventuellement des étiquettes en bois ou dans d'autres matériaux organiques précisant leur contenu. On pense, par exemple, au trésor de Pannecé, en Loire-Atlantique, où un tel dispositif a été mis en évidence[3].

Même pour l'Antiquité, des informations écrites, comme on les connaît au Moyen Âge, auraient pu être jointes aux monnaies : testament, indication de contenu, nom du propriétaire ou de ses héritiers, usage souhaité du total ou d'une partie des monnaies, mais elles n'ont jusqu'à présent pas été découvertes, faute souvent d'avoir été réellement recherchées, alors que les traces de fibres végétales – un compris de papyrus[4] – sont régulièrement découvertes minéralisées par la corrosion.

Le contenu des trésors nous informe parfois sur le thésauriseur et permet, dans certains cas particuliers, de déterminer son statut social, voire même de tracer son ascension dans le cas de fonctionnaires ayant, au cours de leur carrière, bénéficié de largesses impériales. On peut évoquer ici le trésor de Lava (Corse), perdu dans un naufrage vers 273, dont le propriétaire a accumulé des témoins de tous les *donativa* impériaux au cours de la décennie précédente[5], celui de Beaurains (Pas-de-Calais, F)[6], qui s'étale sur un quart de siècle, de 285 à 310, ou encore celui dit « de Partinico » (Sicile).

Selon les auteurs de son étude, « au vu de l'importance croissante des *donativa* perçus, le possesseur du trésor [de Partinico] serait progressivement monté en grade au point de se trouver dans l'entourage de l'empereur et de recevoir en avril 308, le spectaculaire matériel distribué à l'occasion du premier consulat de Maxence »[7].

La cartographie de dépôts présentés comme contemporains est souvent le jeu – éminemment dangereux – de reconstitution de phénomènes politiques : invasions, zones de conflits ou de phénomènes d'origine naturelle tels des séismes ou des épidémies. On a cependant voulu faire dire à la répartition spatiale des dépôts beaucoup plus qu'elle ne pouvait le faire. Quant il ne s'agit pas simplement d'un état de la recherche, plus dense dans certaines régions que dans d'autres, il faut avouer que la relation entre les enfouissements monétaires et la densité démographique est une évidence. Toutefois, le mythe de l'invasion barbare a la vie dure. On sait pourtant que chaque fois que des sources historiques peuvent être convoquées, l'explication militaire directe ne tient pas la route. On connaît bien sûr l'exemple de l'Angleterre d'Olivier Cromwell, à l'époque des guerres civiles de 1642-1651. Les trésors de cette époque se concentrent en dehors des zones de combat et trouvent

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3 Aubin *et al*., " Pannecé II," 26-42.

4 La découverte est récente et a été signalée au cours du colloque par Pierre-Marie Guihard.

5 Estiot, "Lava,".

6 Bastien et Metzger, *Beaurains*.

7 Drost et Gauthier, "Partinico," 164.

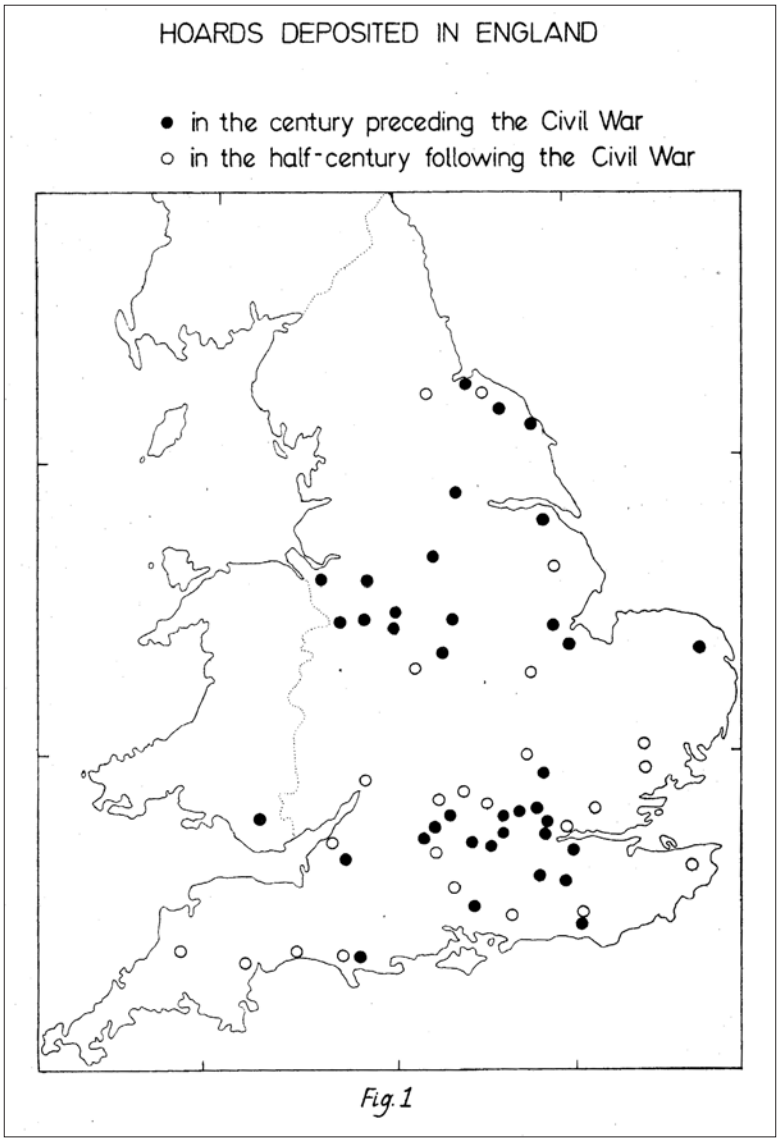

Figure 1 – Les dépôts enfouis en Angleterre au cours du siècle précédant la Guerre civile (en noir) et dans le demi-siècle suivant (en blanc). D'après Kent, "Interpreting," 190, fig. 1.

deux explications l'une politique, à savoir les zones de conscription, l'autre économique : l'impossibilité d'investissements financiers pendant les troubles et les combats qui se trouvent bien loin de là (fig. 1 & 2)[8]. Dans les deux cas, la carto-

[8] Kent, "Interpreting," 192.

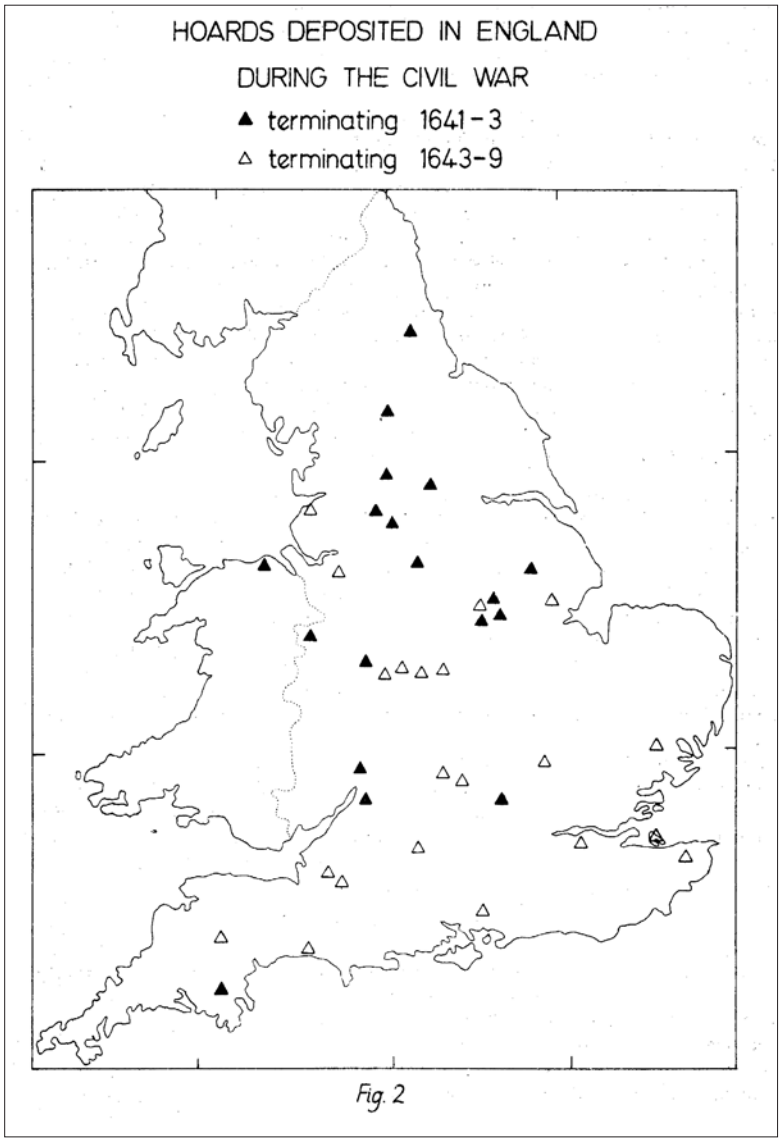

Figure 2 – Les dépôts enfouis en Angleterre durant la Guerre civile : *terminus* en 1641-1643 (triangles noirs), *terminus* en 1643-1649 (triangles blancs). D'après Kent, "Interpreting," 191, fig. 2

graphie des dépôts ne nous livre aucune information directe sur la localisation des opérations militaires.

Jusqu'ici, vous le constaterez, je n'ai pas encore évoqué les monnaies, qui constituent un autre aspect de la thésaurisation. Mon exposé sera divisé en quatre sections : (1) le leurre des grands nombres ; (2) qu'est-ce qu'un « mégadépôt » ? (3) que nous

apportent les « mégadépôts », et (4) faut-il étudier les « mégadépôts » et, dans l'affirmative, comment et pourquoi ?

1. LE LEURRE DES GRANDS NOMBRES.

Sans doute, en numismatique, la quantification a depuis longtemps porté sur les trésors. Cette approche s'insère dans ce que l'on nomme la cliométrie, cette branche des sciences économiques fondée sur la quantification qui émerge dans les années 1970 suite aux travaux de Stanley Engerman et du prix Nobel d'économie Robert Fogel.

On a longtemps pensé que le fait d'augmenter la taille des échantillons permettait d'échapper aux « accidents de parcours », et dès lors passer d'un échantillon à ce que les statisticiens appellent la population. En 1989 déjà, j'abordais cette problématique dans ma synthèse sur la *Chronologie et la politique monétaire des empereurs Valérien et Gallien*. J'écrivais alors :

> Jusqu'à présent, les travaux des économistes qui ont utilisé la monnaie comme « traceur » des modifications de la structure des finances impériales sont partis du postulat de la représentativité des grands échantillons. En augmentant à l'infini ces derniers, il semblait logique de croire qu'on pouvait en quelque sorte « gommer » les irrégularités des dépôts « anormaux ». Le fondement de la réflexion était le suivant : si nous trouvons dans un vaste ensemble de trésors constitués à des moments différents, dix pièces d'un règne et cent d'un autre, de longueur strictement identique, il est légitime de supposer un rapport de 1 à 10 entre les quantités émises[9].

Ce raisonnement, empreint du sceau du bon sens, est bien entendu… faux ! On avait pensé, dans les années 1980, qu'en augmentant à l'infini la taille de l'échantillon, on déboucherait immanquablement sur des certitudes socioéconomiques. Certains numismates ont réuni des métadonnées allant dans ce sens. Le modèle du genre fut à l'époque l'excellent travail de Georges Depeyrot et Dominique Hollard sur la pénurie d'argent métal au III^e^ siècle. Les auteurs avaient ainsi observé qu'en 260, le volume des émissions monétaires semblait tripler brutalement, qu'en 266, il était multiplié par 2,5 et qu'en 270, il était encore doublé par rapport au niveau de base, celui de la période 238-244 (Gordien III). Ils en avaient dès lors déduit que cette évolution, fondée sur l'examen de plus de 226.000 monnaies issues de sites, et de 132.000 venant de trésors, était un reflet fidèle de la production, puisque portant sur plus de 350.000 pièces. Ils concluaient : « l'approche quantitative des émissions monétaires antiques permet de mieux cerner l'évolution des frappes »[10].

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[9] Doyen, *La politique*, vol. 2, 563-64.

[10] Depeyrot et Hollard, "Pénurie," 60.

Cette hypothèse, toutefois, peut être aisément mise à mal, en utilisant d'une part les données relatives au règne de Gordien III, et d'autre part celle de la production milanaise sous Gallien. En effet, nous disposons, d'une part, de l'estimation du nombre total de coins des antoniniens de Gordien III, calculé par William Esty à partir des données de Samuel K. Eddy[11]. Nous avons contrôlé cette estimation à partir de la formule proposée par la suite par Ch. Carcassonne, et nous arrivons à un résultat identique, à savoir l'emploi de 110.000 coins pour un règne de 69 mois, soit 19.130 coins par an.

D'autre part, j'ai montré dans ma synthèse de 1989 que Milan utilisait, entre 260 et 268, environ 32.000 paires de coins. Nous savons, grâce aux chiffres fournis par Georges Depeyrot et Dominique Hollard, que les émissions milanaises représentent 9 % de l'ensemble de la production de la même période, celle de Gallien et de Postume. Le nombre total de coins utilisés dans l'ensemble des ateliers en activité entre 260 et 268 (Empire gaulois compris) se monterait, en supposant un rapport proportionnel, à 368.000 coins pour 98 mois, soit 45.000 coins par an. Le rapport entre les valeurs observées pour Gordien III (≈ 19.000) et celles de Gallien/Postume (≈ 45.000), à longueur égale, celle de douze mois de production, atteint donc 2,36.

Parmi les 358.219 exemplaires (trésors et sites) réunis par Depeyrot et Hollard, Gordien III, attesté par 13.449 antoniniens, présente un total annuel de 2339 pièces. Si le rapport était correctement appliqué, nous devrions avoir 2,36 fois plus de pièces de la période 260-268, soit 5520 exemplaires. Assez mystérieusement, nous en avons… presque 12.000, soit deux fois trop. Pourquoi ? Dans d'autres cas, nous observons exactement le contraire : des quantités importantes de monnaies, dont l'existence est fondée sur la charactéroscopie et la restitution du nombre original de coins, ont disparu, sans que l'on puisse réellement l'expliquer[12]. Comme la constitution des dépôts mis en œuvre s'étale sur plusieurs décennies, l'hypothèse du retrait par l'administration est une hypothèse peu vraisemblable.

Le phénomène est-il généralisé ? Sans aucun doute, à mon sens. À partir d'une étude charactéroscopique portant sur environ 12.000 antoniniens milanais, j'avais montré d'une façon qui me semble indiscutable qu'il n'existe pas de rapport entre la taille d'une émission telle qu'elle peut être reconstruite à partir du nombre de coins, et les témoins qui apparaissent dans les trésors, grands et petits, du moins ceux de la fin du III^{e} s.

Pour des raisons qui nous échappent, il ne semble donc pas y avoir de relation directe entre les quantités frappées et les quantités thésaurisées. Autrement dit, il

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[11] Esty, "Estimation," 302 ; Eddy, *The minting*.

[12] La validité des différentes méthodes statistiques du calcul du nombre original de coins a été mise en question récemment : Moens, "Reliability".

existe dans l'ensemble des dépôts de la partie occidentale du monde romain, à certains moments précis, beaucoup trop de monnaies de séries particulières par rapport à d'autres, dont la charactéroscopie nous prouve pourtant qu'elles furent numériquement plus importantes.

Comment expliquer ces disproportions ? Il est peu vraisemblable d'avancer l'existence de changements technologiques qui auraient permis de doubler ou tripler la productivité de chaque coin. Si l'on écarte ces facteurs techniques, la seule solution logique est d'avancer que, pour des raisons diverses, certaines séries ont bénéficié de la faveur des thésauriseurs, alors que d'autres étaient dédaignées, et ce de manière tout à fait systématique. L'émission du Bestiaire de Gallien, par exemple, semble avoir retenu l'attention des contemporains, peut-être pour des motifs iconographiques. Cette série, émise en 266-267 dans les douze officines que comptait alors la capitale de l'Empire, honore une vingtaine de divinités illustrées par leur animal symbolique, comme le Pégase de Sol, le sanglier ou le lion d'Hercule, la biche de Diane, l'hippocampe de Neptune, etc.[13]. Cette émission, sans équivalent dans l'Antiquité, n'a pas manqué d'attirer l'attention des contemporains. En tout état de cause, leur nombre dans les trésors est disproportionné par rapport au nombre restitué de coins. Leur taux de survie est donc anormal.

Ainsi, totaliser les monnaies des dépôts nous révèle une seule et unique réalité : le comportement du public vis-à-vis de la masse monétaire en circulation. Il est en revanche impossible, à partir de ces chiffres, d'en déduire la politique impériale en la matière, le numéraire immobilisé en grandes quantités ne correspondant pas aux types émis en abondance. En outre, contrairement à ce que le bon sens laisserait supposer, ce ne sont pas forcément les meilleures monnaies qui ont été conservées de manière préférentielle. D'autres critères semblent avoir présidé au choix ou au rejet de certaines séries monétaires. En outre, à côté des trésors dits « de thésaurisation », dont les monnaies ont été choisies avec soin en tant que valeur refuge, apparaît une autre catégorie d'ensembles constitués d'espèces médiocres. De telles accumulations de métal monnayé relèvent d'un autre principe sur lequel je reviendrai.

Pour finir, l'étude de G. Depeyrot et D. Hollard, citée précédemment, montre une autre caractéristique fort intéressante (fig. 3). Malgré les quantités énormes mises en jeu, les trésors ne peuvent servir à mesurer la circulation monétaire. Dans les trésors, en effet, la période la mieux représentée est celle correspondant aux années 266-26 alors que sur les sites c'est la phase 10 (270-274) immédiatement antérieure qui domine, et de loin. Dès lors, parler de circulation monétaire en convoquant les dépôts est une erreur de méthode, mais ce biais, connu depuis longtemps, est trop souvent passé sous silence de nos jours encore.

[13] Wolkow, *Bestiaire*.

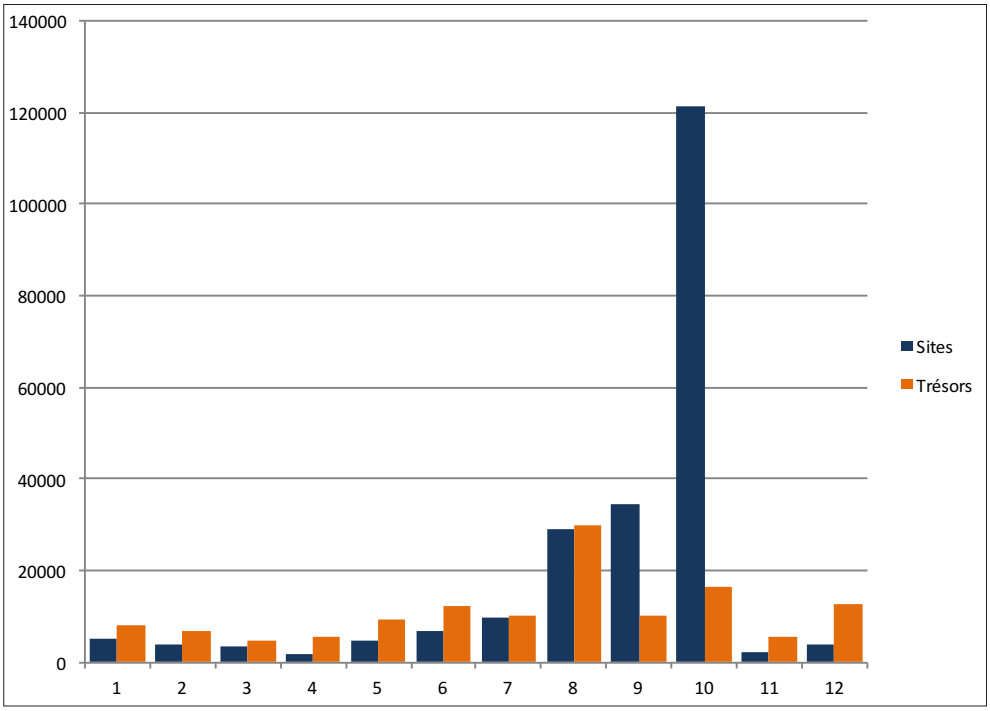

Figure 3 – Les périodes d'émission des monnaies découvertes sur les sites (en bleu) et dans les trésors (en orange) de Grande-Bretagne et de Gaule. Données d'après Depeyrot et Hollard, "Pénurie," 71-72. (Périodes : 1 = 238-244 ; 2 = 244-249 ; 3 = 249-253 ; 4 = 253-256 ; 5 = 256-260 ; 6 = 260-263 ; 7 = 263-266 ; 8 = 266-268 ; 9 = 268-270 ; 10 = 270-274 ; 11 = 274-276 ; 12 = 276-282)

2. QU'EST-CE QU'UN « MÉGADÉPÔT » ?

Le second point que j'aborderai est celui de la définition. Qu'est-ce qu'un « mégadépôt » ?

Il faut rendre ici hommage à l'auteur de la première et monumentale étude portant sur un très grand trésor, celui de La Venèra dont les 46.000 monnaies furent publiées en 1880 sous forme de liste détaillée moins de trois années après sa découverte[14]. Luigi Adriano Milani doit donc être considéré comme le père fondateur de la numismatique des grands nombres.

Mais il convient de s'entendre sur ce que l'on entend par les « très grands trésors », ceux que j'ai précédemment qualifiés de « mégadépôts ». Bien entendu, personne ne niera qu'appartient à cette catégorie le trésor afghan de Mir Zakah, découvert en

[14] Milani, *Venèra*.

1993, qui comprenait 500 kg d'objets en or et 550.000 monnaies, soit 4 tonnes de métal monnayé. Ceux de Rékà Devnia[15], de Misurata[16] ou de la Porte de Chaillouet à Troyes appartiennent incontestablement à la même catégorie. Mais que penser du trésor d'Eauze[17], et ses « seulement » 28.003 monnaies, enfoui à un moment où les dépôts supérieurs à 10.000 unités se comptent par dizaines ? Pour être hors-norme, il faut bien évidemment qu'une norme existe et qu'elle puisse être formalisée.

À ma connaissance, jamais le trésor type – c'est-à-dire la norme – n'a été jusqu'ici défini, à part un bref texte déjà ancien de Richard Reece précisément intitulé *The « normal » hoard*[18]. Et d'ailleurs, existe-t-il une norme ?

Je me suis donc penché, à titre d'exemple, sur les trésors de sesterces du Haut-Empire, grands et petits. J'ai ainsi réuni les données de 375 dépôts allant de 4 à 7500 unités répartis dans la partie occidentale de l'Empire, Afrique du Nord comprise (fig. 4).

Première surprise : sur ces 375 dépôts, 146 comprennent moins de 20 pièces, soit 39 % de l'ensemble, 49 % affichent moins de 50 exemplaires, et 65 % moins de 100. Si norme il y a, ce sont donc les dépôts de moins de 100, voire même de moins de 30 pièces, qui la constituent.

D'autre part, si l'on examine les grands dépôts de sesterces, ceux supérieurs à 2000 unités, ils ne représentent – et c'est logique – que 2,5 % de l'ensemble. Un seul trésor sort du lot, avec 7499 unités. Il représente 250 fois la « norme » et peut dès lors être qualifié de « mégadépôt ». Le même nombre de monnaies, sous forme d'antoniniens par exemple, en ferait un trésor parfaitement banal. Dès lors, le nombre de monnaies n'est pas le premier critère à prendre en compte pour définir la normalité.

Mais, chose plus curieuse encore, la norme évolue selon les régions (fig. 5). Ainsi, les 142 trésors de sesterces venant de France réunissent en moyenne 369 exemplaires. Ceux venant de Grande-Bretagne, 63 dépôts au total, comprennent à peine 80 exemplaires. Entre les deux, les 71 dépôts belges atteignent en moyenne 122 exemplaires. Est-ce à dire que les Romains de Gaule étaient quatre fois plus riches que leurs contemporains d'outre-Manche ? Rien n'est moins sûr : l'état de la documentation est très lacunaire en France, et il est probable que l'archivage des petits dépôts, dont le statut de « trésor » est d'ailleurs souvent mis en doute, est déficient en Gaule[19]. D'autre part, il semble que la thésaurisation du bronze est un pis-aller,

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15 Depeyrot, *Propagande*.

16 Garraffo et Mazza, *Misurata*, et contribution dans ce volume, pp. 185-201.

17 Schaad, *Eauze*.

18 Reece, "The Normal hoard".

19 Même s'ils comportent plusieurs centaines d'exemplaires, les dépôts « funéraires », « votifs » ou « significatifs » ne sont pas repris dans le corps principal du *Corpus des trésors monétaires antiques*

et que chaque fois qu'une alternative existait, la préférence était donnée à l'argent, voire à l'or. Ainsi, le plus gros trésor de sesterces archivé, celui de Guelma, avec ses 7499 unités, ne vaut finalement que 75 *aurei*[20].

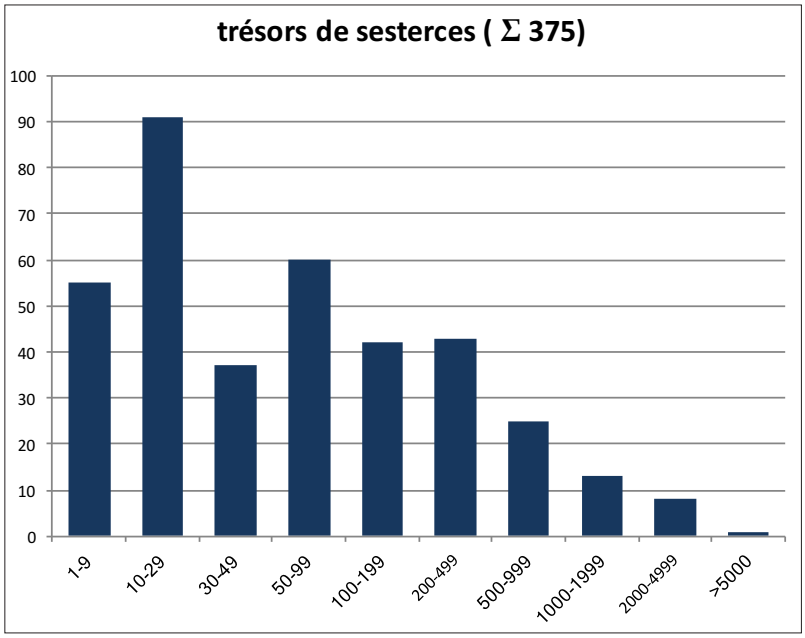

Figure 4 – Composition, en nombre d'exemplaires, des trésor de sesterces (I^er^-III^e^ s.)

Régions	Nombre de dépôts	Valeur moyenne
Grande-Bretagne	63	80
Belgique	71	122
Italie	12	202
France	142	369

Figure 5 – Valeur moyenne, par région, du nombre de pièces dans les trésor de sesterce

de la France publiés entre 1982 et 1997 par la Société française de numismatique.

[20] Turcan, *Guelma*.

3. QUE NOUS APPORTENT LES « MÉGADÉPÔTS » ?

On pourrait supposer que le premier apport des très grands ensembles est de nous livrer le plus grand nombre de monnaies rares. Mais, très curieusement, cela ne semble pas être obligatoirement le cas. Ainsi, les deux empereurs romains nouveaux qui sont apparus au cours du XX^e^ siècle ne viennent pas de trésors remarquables, voire même de trésors tout court : les deux antoniniens de Silbannacus actuellement connus sont deux monnaies de sites : l'un vient de Lorraine, l'autre de la région parisienne[21]. L'usurpateur Domitianus est connu également par deux exemplaires. L'un faisait partie du trésor des Cléons, en Loire-Atlantique, qui contenait seulement 1500 pièces, l'autre de Chalgrove, près d'Oxford, plus important, mais comptant moins de 5000 exemplaires[22]. Le premier figure parmi les « petits » trésors d'antoniniens, le second parmi les trésors normaux, ceux totalisant 3000 ou 4000 unités. Quant à l'antoninien de Proculus, si on accepte son authenticité, son origine est inconnue[23].

La structure interne des petits dépôts est-elle très différente de celle des grands ensembles ? De toute évidence la réponse est non ! Ainsi j'ai repris les données relatives à la production de l'atelier de Rome au cours du règne de Gallien. Six émissions successives ont été distinguées depuis bien longtemps par les numismates. J'ai comparé les décomptes de La Venèra, – presque 5000 exemplaires frappés dans la capitale entre 260 et 268 – avec, comme choix parfaitement aléatoire, le dernier petit trésor publié dans la série française des *Trésors monétaires* et comprenant plus de 200 unités de ce monnayage romain, ceci afin d'obtenir un échantillon à valeur statistique (fig. 6). J'ai ainsi mis à contribution le dépôt breton de Pédernec, totalisant 2266 pièces, dont 216 antoniniens de Gallien frappés à Rome[24]. Comme nous pouvons le constater (fig. 7), rien ne distingue vraiment les deux ensembles, l'un considérable, l'autre minuscule. Et les différences quantitatives ne sont sans doute pas moindres que celles qui apparaîtraient dans deux mégadépôts.

On peut également s'intéresser aux monnaies « rares » de règnes courants. Sont-elles réellement plus nombreuses dans les grands trésors que dans les petits ? La question semble stupide, et encore…

Cette fois, j'ai fait appel au catalogue du trésor d'Eauze, mentionné précédemment, et plus particulièrement aux 13.400 antoniniens émis entre 253 et 260 au cours du règne conjoint de Valérien I^er^ et de Gallien. J'ai relevé les monnaies attestées

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21 Estiot, "Silbannacus".

22 Estiot et Salaün, "Domitianus".

23 Estiot, "Probus". Des doutes ont été émis quant à l'authenticité du second exemplaire, mentionné par S. Estiot dans son addendum.

24 Hollard et Le Floc'h, "Pédernec".

Série	La Venèra	%	Pédernec TM XXII	%
Rome 1	2	0,04	-	-
Rome 2	340	6,9	11	5,1
Rome 3	426	8,6	18	8,3
Rome 4	77	1,6	5	2,3
Rome 5	2295	46,3	99	44,9
Rome 6	1720	34,7	85	39,4
	4958		**216**	

Figure 6 – Les monnaies de Gallien frappée à Rome (260-268) dans les trésors de la Venèra et de Pédernec

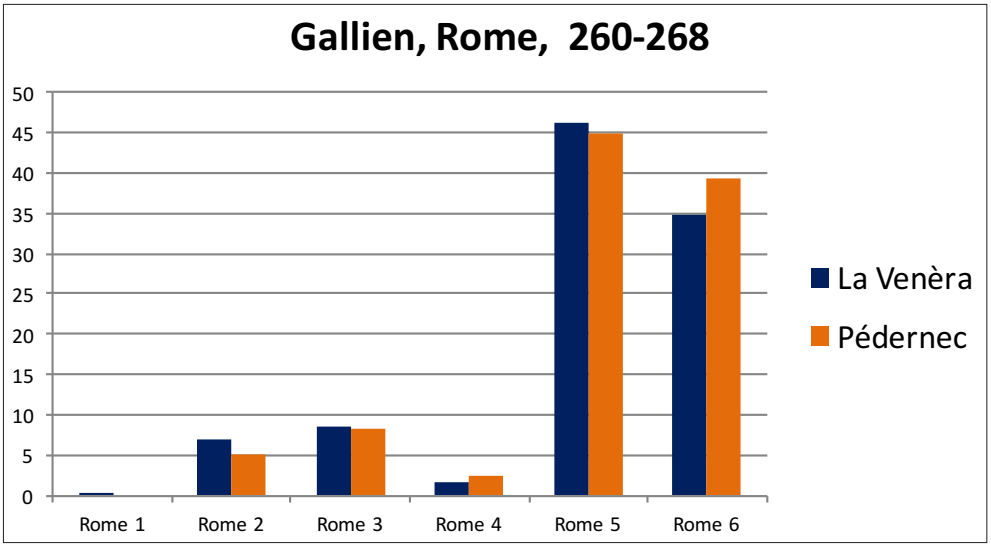

Figure 7 – Répartition des six émissions d'antoniniens de l'atelier de Rome sous Gallien dans les trésors de la Venèra et de Pédernec

par un unique exemplaire, en excluant les hybrides accidentels, les erreurs de gravures comme les fautes d'orthographe, ainsi que les monnaies d'ateliers orientaux, trop peu abondantes pour revêtir une quelconque valeur statistique. Nous découvrons ainsi que 50 monnaies sont attestées à Eauze par un unique exemplaire. Parmi celles-ci, 44 étaient déjà référencées, 6 ne l'étaient pas, ce qui ne signifie nullement

qu'elles étaient inédites. Aucune pièce nouvelle ne figure donc parmi ces 13.400 monnaies. Bien que le trésor d'Eauze soit, de loin, l'ensemble le plus important pour la période concernée – 253-260 – de très nombreux types recensés par Robert Göbl[25] n'apparaissent pourtant pas dans ce catalogue.

Il nous faut dès lors conclure que les très grands dépôts constitués de monnaies appartenant à des séries ayant fait l'objet de recherches approfondies apportent peu d'informations aussi bien au niveau macro-économique qu'en ce qui concerne le corpus des types.

En revanche, on ne peut nier leur apport au niveau de la métrologie. Ceci pour autant que l'état de conservation soit satisfaisant et que le thésauriseur n'a pas privilégié les monnaies lourdes au détriment des légères…

4. FAUT-IL VRAIMENT D'ÉTUDIER LES « MÉGADÉPÔTS » ?

Il faut pour conclure poser la question de savoir s'il est utile d'étudier les « mégadépôts » ? Et dans l'affirmative, comment et pourquoi ?

Puisque la découverte de la pièce rare n'est pas le but ultime du numismate, et que les mégadépôts ne nous documentent pas plus que les petits sur la politique monétaire des pouvoirs émetteurs, que pouvons-nous attendre de l'étude de ces grands ensembles ?

Quatre points me semblent mériter notre attention.

1. Les grands ensembles livrent des séries parfois considérables de monnaies ou groupes de monnaies liées par les coins. La charactéroscopie peut aussi bien porter sur les séries officielles que sur les imitations. Le seul problème, et il est de taille, est la faisabilité.

En consacrant 5 secondes à comparer visuellement chaque face d'une monnaie avec la précédente, le traitement des 180.000 monnaies du trésor de Troyes évoqué plus haut représenterait finalement 4.475.000.000 d'heures de travail[26]. Et ceci pour les droits seulement ! Un ordinateur traitant chaque monnaie en 1/1000^{e} de seconde, y compris la prise de vue et le déplacement physique de la caméra d'une monnaie à l'autre, ce qui est encore inconcevable actuellement, réduirait le traitement à 186 jours pour chaque face.

Certes, il s'agit seulement d'un simple jeu mathématique, puisque les 180.000 pièces n'ont pas besoin d'être comparées entre elles. Mais le jeu en question montre clairement les limites de la méthode. Tant que les logiciels de reconnaissance de

[25] Göbl, *MIR*.

[26] Soit… 2.458.000 années de 52 semaines de 35 heures de travail.

coins – comme existent désormais des logiciels performants de reconnaissance faciale – ne sont pas plus performants, une telle approche est impossible, du moins à grande échelle. Nous devrons donc, pendant un certain temps encore, nous contenter de traiter visuellement quelques centaines d'individus tout au plus.

2. L'approche métallographique se greffe partiellement sur cette analyse characteroscopique. Il serait effectivement intéressant de faire porter les analyses sur la composition métallique de séries précises, et non pas effectuer ce travail de manière aléatoire, comme c'est le cas actuellement. Il conviendrait de se limiter à des séries correspondant à des problématiques bien définies. Par exemple, dans le cas de la numismatique romaine tardive, on pourrait analyser les monnaies sans marques au sein de séries qui normalement en portent, ou encore étudier des séries venant d'ateliers différents, mais portant des marques identiques. Ces priorités devraient être définies au niveau international, par exemple au sein de la Commission internationale de Numismatique qui pourrait réunir un groupe de travail chargé de définir un certain nombre de questions prioritaires au niveau analytique. Les résultats pourraient par exemple figurer dans les actes des congrès organisés par la CIN tous les six ans.

3. Le troisième point de mes conclusions concerne l'approche économique. Il s'agit de répondre à la question que j'ai posée plus tôt, à savoir à quoi correspondent les mégadépôts. Sont-ils des économies exceptionnelles d'un individu ou d'un groupe d'individus ? Le contexte archéologique devient ici prépondérant.

Salvatore Garraffo a estimé à 300 ou 350 *solidi* la valeur en or du monstrueux trésor de Misurata[27], une somme bien dérisoire finalement. On connaît l'importance des ressources en cash de Cicéron. Galba, aux dires de Suétone, ne se déplaçait jamais sans une caisse contenant la somme d'un million de sesterces en or, soit 10.000 *aurei*[28]. D'autre part, la découverte de grandes quantités de monnaies de billon, souvent alors qu'il existe la possibilité de transformer le bronze en argent, l'argent ou le billon en or, monnayé ou non, pose problème.

À partir d'un certain seuil quantitatif, les « mégadépôts » peuvent-ils encore être considérés comme de « grandes économies » ? Il faut alors s'interroger sur le statut même de la monnaie, qui de moyen d'échange devient une simple marchandise. De ce fait, la différence de structure entre les dépôts « normaux » et les « mégadépôts » serait la trace de choix purement spéculatifs. N'oublions pas, en effet, que dans l'Antiquité, la monnaie est également une *merx*, une marchandise. Elle fait l'objet d'un commerce intense à grande échelle, aussi bien en Occident qu'en Orient. On pense par exemple au transfert en Occident de millions d'asses

[27] Garraffo et Mazza, *Misurata*, 63.

[28] Suétone, *Vie de Galba*, VIII, 1.

d'orichalque de Trajan frappés à Rome pour circuler en Syrie. Ces monnaies furent apparemment réintroduites un siècle plus tard dans le nord de la Gaule, où elles circulaient sans doute avec la valeur d'un *dupondius*[29]. Le bénéfice de l'importateur était de 100 %.

L'or monnayé était lui-même une marchandise, soumise à des fluctuations saisonnières, comme l'a montré naguère Jean-Michel Carrié à partir d'un papyrus d'Oxyrhynchos désormais classique[30], qu'il traduit de la manière suivante : « […] tu as bien fait de m'écrire à propos des *solidi* : du coup, je me suis mis en quête et j'ai trouvé la quantité requise auprès de l'Alexandrin, au tarif de 1350 myriades de deniers[31]. Aussi, occupe-toi de m'envoyer demain de la monnaie commune[32], car le bruit court au sujet de la levée d'or des recrues, et tout le monde cherche à se procurer du *solidus*, et le prix de celui-ci monte de jour en jour. Mais envoie en vitesse de la monnaie commune pour que nous finalisions l'achat de *solidi* »[33].

4. Nous abordons ici le quatrième et dernier point de ma conclusion, celui des propriétaires de ces ensembles. Certes, la situation à l'Âge du Fer à Jersey d'où provient le plus grand dépôt de monnaies celtiques connu n'est pas celle de l'Antiquité tardive méditerranéenne. Comme on le sait, les déplacements de sommes importantes sont strictement réglementés dans l'Empire romain, quel qu'en soit le mode de transport. Mais si les *negotiatores* voient leur capacité à emporter avec eux du numéraire limité à la valeur de 1 000 *folles*, les *mercatores* ont le droit de transporter de plus fortes sommes par bateaux. Ce type de commerce, dans lequel la monnaie de bronze est réduite à l'état d'une simple marchandise, est connu de longue date. Michael Fulford a insisté il y a bien longtemps déjà sur la sous-estimation des relations maritimes privées dans la circulation et le trafic de la monnaie. Il est symptomatique de relever que la majorité des plus grands dépôts de l'Antiquité tardive proviennent soit d'épaves (Harlemermeer, Partinico, « Mangub »), soit d'emplacements situés à quelques kilomètres de la mer (Tomares, Misurata, Čentur).

QUE CONCLURE FINALEMENT ?

L'investissement en temps, et donc en argent public, est considérable si l'on veut respecter des normes scientifiques « acceptables ». Mais est-il un « seuil d'accepta-

29 van Heesch, "Hadrien".

30 *P. Oxy.* XLVIII, 3401.

31 Il s'agit ici de deniers de compte.

32 C'est-à-dire de la monnaie de cuivre.

33 Carrié, "Aspects," 187.

bilité » dans l'étude des mégadépôts ? Peut-être est-il plus sage, en attendant le développement des technologies indispensables, de se contenter d'un archivage en ligne sous forme de simple catalogue illustré. La dernière décennie, voire les quelques dernières années ont montré la rapidité de ce développement technologique, avec la possibilité d'une catalographie d'une grande précision.

Ces études ont un coût, assez similaire dans les différents pays qui mènent actuellement des opérations de ce genre (Espagne, France, Grande-Bretagne), de l'ordre du million d'euros. Ceci, bien entendu, sans compter le prix d'achat du dépôt lorsque l'État n'en est pas le propriétaire. Certes, de telles études permettent l'engagement – hélas sous forme de contrats temporaires – de jeunes chercheurs. Ces sommes, pour importantes qu'elles soient, ne sont donc pas « perdues » pour la collectivité.

C'est finalement par cette note pessimiste que je voudrais conclure ces quelques réflexions : s'il faut vraiment étudier les mégadépôts monétaires, jusqu'où pouvons-nous décemment aller ?

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