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► To cite this version:

Caroline Carrier. The die study database of the SILVER ERC project: a tool for quantification studies. XVI International Numismatic Congress (INC 2022), INC, Sep 2022, Varsavie, Poland. <hal-04571791>

HAL Id: hal-04571791

<https://hal.science/hal-04571791v1>

Submitted on 19 Oct 2024

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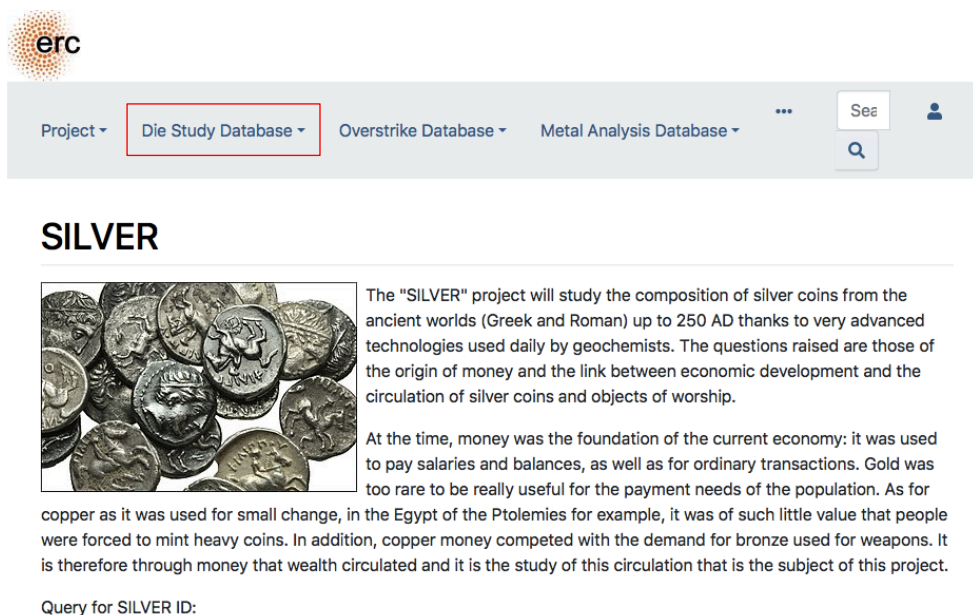
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The die study database of the SILVER ERC project: a tool for quantification studies

Caroline Carrier

Communication at the *International Numismatic Congress*, Warsaw, September 14th, 2022


This communication presents the die study database made as part of the SILVER project. The goal of this project is to study the movement of silver in Antiquity, mainly in Greece from the Archaic period to the Roman period in providing new data about ancient coins. It's supervised by Francis Albarède who is geologist at the École Normale Supérieure de Lyon and I am in charge of the two numismatic databases under the supervision of François de Callataÿ.



erc

Project ▾ Die Study Database ▾ Overstrike Database ▾ Metal Analysis Database ▾ ... See

SILVER



The "SILVER" project will study the composition of silver coins from the ancient worlds (Greek and Roman) up to 250 AD thanks to very advanced technologies used daily by geochemists. The questions raised are those of the origin of money and the link between economic development and the circulation of silver coins and objects of worship.

At the time, money was the foundation of the current economy: it was used to pay salaries and balances, as well as for ordinary transactions. Gold was too rare to be really useful for the payment needs of the population. As for copper as it was used for small change, in the Egypt of the Ptolemies for example, it was of such little value that people were forced to mint heavy coins. In addition, copper money competed with the demand for bronze used for weapons. It is therefore through money that wealth circulated and it is the study of this circulation that is the subject of this project.

Query for SILVER ID:



(Fig. 1)

This is a view of the future web site that should be online in the coming months (Fig. 1). It will be composed of 3 databases:

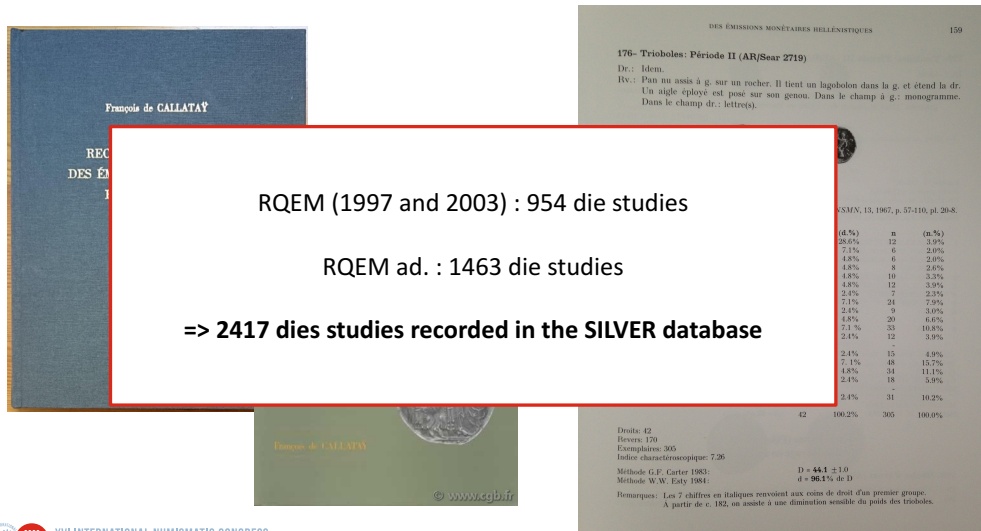
- one with the results of metal analysis made during the project, mainly the lead isotopes.
- another with overstruck coins
- the last one is about die studies.

This database is a software extended version of the books *Recueils quantitatifs des émissions monétaires* published by François de Callataÿ in 1997 and 2003. The 1st book is about the Hellenistic period and the 2nd about the Archaic and Classical periods. Each book gathers the quantitative data of nearly 300 coin series. Here, a coin series is defined as a group of coins struck by the same authority, in the same denomination, during the same period. This notion is not clear in numismatics, there are different definitions and we believe that this one is the more useful for quantitative studies.

So, the first step in creating the SILVER database was to copy the data from the 2 books into spreadsheets. For each die study, all the data were included and some fields added, mainly to

allow for interoperability with other existing numismatic databases and the ontology Nomisma for concepts, names and places.


The main advantages of the database over the books, in addition to the possibilities to find data easily, are that the coins from the Roman period are included and that even the small series have their own pages. In the books, the most important series are described and the small series composed by only a few coins are mentioned in the notes. For the database, I recorded all the series studied, even those for which only 1 or 2 coins are known. In the 2 books, there are 950 die studies in total and I have added 1040 further studies (Fig. 2). Of course, it implies a great deal of standardization of the data.



(Fig. 2)

Here is an example of what will appear online for each series (Fig. 3):

RQEM ad. 106 - Damascus, Syria, silver, tetradrachm, c. 333-325 BC



Frequency	Number of obverse dies (o)	% (o)	Number of coins (n)	% (n)	Die(s) name(s)
1	1	1,7	1	0,2	059
2	3	5,1	6	1,2	033,057,058
3	6	10,2	18	3,7	010,019,...
...					
25	1	1,7	25	5,1	06
31	1	1,7	31	6,3	055
Total	59	100%	493	100%	

Description
 Obverse Head of Heracles right, wearing Nemean lion skin headdress. Border of dots.
 Reverse ΑΛΕΞΑΝΔΡΟΥ (Greek). Zeus seated on throne left, holding eagle and scepter. Under the throne, ΔΑ (and globules or leaf). In field, monogram and X or ram protome.

Mint and issuing power
 Mint [Damascus](#)
 Ancient region [Syria \(Coele-Syria\)](#)
 Modern country [Syria](#)
 Authority [Alexander III the Great \(Argead king, 336-323 BC\)](#)

Dating
 From [333 BC to 325 BC](#)
[Hellenistic period](#)

Physical description
 Metal: [silver](#)
 Denomination: [tetradrachm](#)
 Standard: [Attic](#)
 Mode weights: [17-17,30](#)

References
 Die study reference [Glenn 2018, p. 91-12](#)
 RQEM reference [RQEM ad. 106](#)
 Coin series reference [Price 1991, no. 3197-3215](#)
 Coin series reference - PELLA: <http://numismatics.org/pella/id/price.3197>
 Coin series reference - PELLA: <http://numismatics.org/pella/id/price.3198> ...

Die(s) shared with others series

Quantification
 Number of obverse dies (o) **59**
 Number of reverse dies (r) **257**
 Number of coins (n) **493**
 Coins per obverse die (n/o) **8,4**
 Coins per reverse die (n/r)
 Reverse per obverse ratio (r/o) **4,4**
 Carter 1983 (O) **60,9**
 Esty 2011 d = **100%** of O
 Coins made at productivity of 20,000 **1218000**
 Survival rate at 20,000 **2471**
 Productivity at survival rate 1/10000 **80952,381**
 Productivity at survival rate 1/5000 **40476,19**

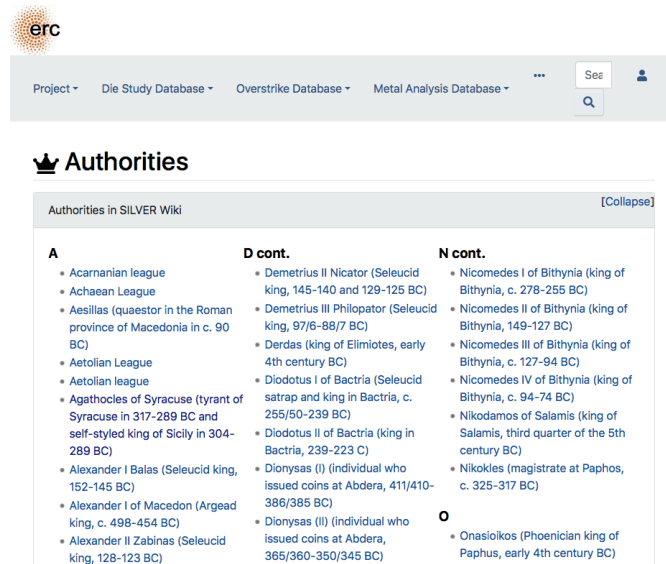
List of dies

Obverse	Reverse
1	1
...	...
59	257

Remarks
 After S. Glenn "metal captured from the Persian king was struck into coinage as quickly as possible" (p. 105) explaining the datation ca. 330 BC; the weight's mode is estimated with the catalogue's data.

(Fig. 3)

- Each title begins by a unique combination of the letters RQEM as a reference to the books and a number (here its RQEM additional number 1006) ; If different studies are about the same series (it's rare but it happens), each of them is recorded under a specific number ; then the title is composed of mint, region, metal, denomination, and dating
- Bellow, an illustration with the mention of its source
- The description which may include many elements when several combinations of types make a series
- Then authorities with links to Nomisma and Stoa.Pleiades for places
- Dating
- Physical information such as metal, denomination, mass, diameter, axis
- Bellow, references to the die study and to the variety of the series; they are books or portals like PELLA or SCO that are online typologies of Macedonian and Seleucid coins; here the series correspond to 19 varieties in the book of Martin Price about Alexanders coins, so 19 varieties on PELLA ; I have only provided 2 of them here
- Then, this board shows the obverse die distribution. For each series, we can see the number of obverse dies known by X coins; here, we can see in the second line that 1 obverse die is known by 1 coin; it's 1,7 % of the obverse dies, 1 coin and 0,2 % of the coins. In the entire database, the range of frequency is from 1 to 192. In the last column are the names of the dies and we will have the possibility to click on each die name to access to its own page
- The next field is for the dies which are common to other series when there are some
- This is a field with various quantification data including original number of obverse die estimates by Carter, Esty, an estimate of minted coins and estimates of the survival rate.
- Then, the list of dies; each of them will have its own page and museums who have their catalogues online with the names of the dies will be able to include them in the portal. This data does not appear yet in most online catalogues, but we are preparing this possibility for the coming years.
- Finally, a comment field



(Fig. 4)

To query this die study database, it will be possible to search these different fields with a form, a map or the list of authorities as this one (Fig. 4).

In addition to the database, we will have a literature section with the die studies references as on the web site FINA dedicated to numismatic correspondence. So, each book or article will have its own page with links to the online version when there is one and each author will be recorded on a specific page too.

When the Silver database will be online, it will allow for quantitative studies by period, by king or even by large region for example. This is the purpose of this first step of the project.

The better asset of this database is that it will be possible to cross the data about the dies with the overstrikes and metal analysis to have a better understanding of the coinages studied and the movement of silver. For example, it will be possible to do a search by mint or authority such as king throughout the entire site and to see the relevant die studies, metal analysis and overstruck coins recorded on the site.

For now, I have only recorded Greek coinages but it would be interesting to use the web site to include others such as the Republican coins. It would be easy to add the quantitative data available on RRDP because the varieties recorded by Micheal Crawford correspond to series as I defined this term a few minutes ago. So, our two websites complete each other's and Lucia, Liv and I would like to associate our data in order to have another and more complete database. We could have the data of Greek and Roman coins in the same database and it would make possible new studies in Ancient economy and studies about coin circulation in the Mediterranean scale.

To give an example, I recorded a series from RRDP studied by Jeremy Haag (Fig. 5). We can use exactly the same form as for SILVER. An interesting point here is that the Carter formula doesn't work for this series: it gives 136 dies as an estimate but the dies are numbered on these coins and there is a number 150. So, if we had more examples like this, it will help us rethink our estimation methods. We can also discuss which Esty formulas using.

RQEM ad. X - Rome, Italy, silver, denarius serratus, c. 81 BC



New York, ANS, 2002.46.294

Description

Obverse C·MARI·C·F·CAPIT (Latin). Bust of Ceres right, draped; around, inscription and control mark. Border of dots.
Reverse Ploughman with yoke of oxen left; above, control mark. Border of dots.

Mint and issuing power

Mint Rome
Ancient region Italy
Modern country Italy
Authority C. Marius Capito (Roman Republican Moneyer, c. 81 BC)

Dating

From 81 BC to 81 BC
Roman Republican period

Physical description

Metal silver
Denomination denarius serratus
Standard Roman Republican silver denarius
Mode weights 3,8
Diameter 19-20
Axis 7

References

Die study reference Haag 2021
RQEM reference RQEM ad. X
Coin series reference Crawford 1974, no. 378
Coin series reference - CRRO <http://numismatics.org/crro/id/rrc-378.1a>
Coin series reference - CRRO <http://numismatics.org/crro/id/rrc-378.1b>
Coin series reference - CRRO <http://numismatics.org/crro/id/rrc-378.1c>

Distribution

Frequency	Number of obverse dies (o)	% (o)	Number of coins (n)	% (n)	Die(s) name(s)
1	5	3,7	5	0,3	O42a, O60a, O70a, O121a, O144a
2	10	7,4	20	1,3	...
3	6	4,4	18	1,2	...
...					
26	1	0,7	26	1,7	...
32	1	0,7	32	2,1	...
Total	136	100%	1500	100%	

Die(s) shared with others series

Quantification

Number of obverse dies (o) 136
Number of reverse dies (r) 136
Number of coins (n) 1500
Coins per obverse die (n/o) 11.03
Coins per reverse die (n/r) 11.03
Reverse per obverse ratio (r/o) 1
Carter 1983 (O) 137
Esty 2011 150 ie. o = 99.7% of O
Coins made at productivity of 20,000 2 740 000
Survival rate at 20,000 1827
Productivity at survival rate 1/10000 109 489
Productivity at survival rate 1/5000 54 744.5

List of dies

Obverse	Reverse
1	1
...	...
136	136

Remarks

RRC 378.1a, 1b and 1c have specific dies. It is not known if control number XXV (25) represents the terminus of RRC 378.1a or the start of RRC 378.1b. At present, there are 16 unaccounted dies assuming there were originally 152 distinct control numbers within the RRC 378 series. The estimates with Carter and Esty formulas would be wrong. Plated coins are known with the same types and legends: they are forgeries with small deviations from the official series (see RQEM ad. Y).

(Fig. 5)

Moreover, I wonder if it would be relevant to use the SILVER form for others coinages struck before mechanisation after Antiquity to have a better understanding of the quantification of Greek coins for which we lack data.