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News

A first attempt for a quantitative analysis of Etruscan coinage

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Abstract: Following the scheme of the two Recueil quantitatif of Greek coinage by F.de Callataÿ, the author has carried out the study of the dies of a series of coins of Populonia, also proposing an analytical typology for dies, functional to the creation of databases.

Keywords: Etruscan Coinage, Populonia's dies, quantitative analysis, analytical typology

In 1997 and 2003 F. De Callataÿ published two catalogues, one of Greek hellenistic coins and the other of archaic and classical coins[1], that collates data regarding the number of dies, issues of coins, etc. These catalogues are extremely useful to assist in the analysis of monetary issues from a quantitative point of view, with particular reference to the study of dies.

In trying to extend this methodological scheme for certain types of silver coins from Populonia, I had to consider the characteristics of the current low levels of quantitative studies devoted to this coinage.

For these reasons, I have made a slight change to the schema set by De Callataÿ, mainly regarding the reference photos. As well as the bibliographical references to the publications on the etruscan coinage, I also have given the individual works that deal with the identification of dies of the various types of coin[2] and therefore instead of the standard references, I have used acronyms that identify the various dies.

This work has the ambitious aim of starting a typological-analytical study of the Etruscan coinage; an important study to provide databases which will help improve comparisons, tests and mathematical-statistical analysis, which are increasingly widespread in the various sectors of archaeology.

The codings proposed here are of the alphanumeric "open" type; this means that the possible identification of new dies or the partial modification of those proposed here can be carried out without having to remodel the database previously created.

An element that makes difficult, if not impossible, the study of the dies of the entire *corpus* derives from the fact that for many of the coins we have only a few specimens. In fact, 72 types of coin are represented by less than 15 specimens, and for 32 of these we have only a single specimen; for 9 types we have a number of coins ranging from 15 to 50, for 2 types we have, respectively, 60 (*Tinia*) and 76 (*Artvmes*). The coins with *Hercle* do not exceed 200 units and those with *Aplu* pass just short of the number of 300. On the contrary, the 20 units *Metus*, are around 1500.

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[1] DE CALLATAŸ 1997, DE CALLATAŸ 2003.
[2] When it's not indicated, the study of dies is from the Author.

Some quantities are reduced considerably due to the high presence of samples heavily worn and/or otherwise unusable for a study of the dies of origin.

Note the low numbers of dies used for minting, with the exception of the *Metus* X (11 known dies) and *Metus* XX (39 known dies).

A possible theory (all to be proved!), one may assume that only the two *Metus* have been minting for "official" purpose, while the other may be minting for "emergency" or for private use, except for the didrachmas with the face of *Menrva*, to which the reverse with the inscription <PVPLVNA> or even <MI : PVPLUNA: LES :> it would seem to confer an "official status".

Below is a brief guide to reading the cards.

5– didracma (X) Ar
Obv.: *Head of* Metus *facing, hair bond with diadem; below XX*
Rev.: *Blank*

Age of issue: seconda metà del V secolo a. C..
Weight gr (mode): 8,05-8,2
Books: PETRILLO SERAFIN P. 1976 – *Le serie monetarie di Populonia*, pp.105-140, Tavv. X ; VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp. 84-86 ; vol. 1.2, pl. 12-13 .
References to the type of dies : GIANNONI L. 2018 – *Ancora sui conî delle monete populoniesi:le didracme con il volto di Metus e segno X e le monete con polpo da 1(?) unità*, PANORAMA NUMISMATICO, 340, p. 7- 14.

		d	%	n	%
1	XC, XE	2	18,2	2	6,10
2	XD,XF, XG, XH	4	36,4	8	24,20
3	XM	1	9,1	3	9,10
4	XB,XL, XY	3	27,3	12	36,40
...					
8	XA	1	9,1	8	24,20
	Total	11	100,1	33	100,00

Dies Obv.: 11
Dies Rev.: (1)
Caracteroscopic index ($I_c = n/d$):   **3**,0

G. F. CARTER 1983 $D = \mathbf{14,0} \pm 1,63$
W. W. ESTY 1984 $d = \mathbf{93,9\%}$ di D

Notes: .

-   The first line indicates that there are 2 dies (XC and XE) represented by a single coin;
-   The second line indicates that there are 4 dies (XD, XF, XG and XH) represented by 2 coins;
-   The third line indicates that there is only 1 die (XM) represented by 3 coins;
-   The fourth line indicates that there are 3 dies (XB, XL and XY) represented by the 4 coins;
-   The fifth line (...) indicates that there are not dies represented, respectively, by 5, 6 or 7 coins;
-   The sixth line indicates that there is 1 die (XA) represented by 8 coins.

- The fourth and sixth columns (%) indicate the percentage of dies and coins respectively in relation to their total. The weight of the coins were taken into account using the statistical mode, rather than the more commonly used statistical average, because it gives a more realistic coin weight, based on the samples available.

d = number of known dies
n = number of known coins
D = theoretical number of total existing dies[3]
Ic = **n/d** = caracteroscopic index[4]

For convenience of reading, in the Appendix 1 there is every type of identified dies not in scale.

CARDS

1. tetradracma (?) Ar

Obv.: *Chimera crouching left*
Rev.: *Blank*

Age of issue: first half V century BC[5].
Weight gr (mode): 16,4-16,7
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, p. 77 ; vol. 1.2, pl. 10 .
References to the tipe of dies:

		d	%	n	%
1	KM1	1	33,3	1	16,7
2	KM2	1	33,3	2	33,3
3	KM3	1	33,3	3	50,0
	totale	**3**	**99,6**	**6**	**100,00**

Dies Obv.:   3
Dies Rev.:   (1)[6]
Caracteroscopic index (I_c = n/d):   2,0
G. F. CARTER 1983   D = **4,04** ± 1,16
W. W. ESTY 1984   d = **83,3%** di D

Notes: The coins of this series, such as that of the <boar> are commonly defined as <tridracme>, however, the weight modal is perfectly compatible with a multiple of the etruscan drachma (mode = gr 4,2; 4,2 x 4 = 16,8).

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[3] According to the formulas of G. F. CARTER 1983 and W. W. ESTY 1984 (see "coverage").
[4] It is recalled synthetically that the Ic serves to test if the studied sample is reliable: (Ic<2 poorly reliable sample, 2<Ic<4 reliable sample, Ic>4 the sample represents all dies).
[5] The indications relating to the time of issue of this series as well as the subsequent minting are to be understood as hypotheses on which, however, there is not much agreement between scholars except for the Metus X (see card 5) since an exemplar of this series was found in a certain stratigraphic context and dated to the second half of the fifth century BC. C. (DE MARINIS-CASINI, 2018).. while for the Metus XX (see card 10) there is a finding in the excavations of Pontegini (CIAMPOLTRINI, 1996)
[6] Here, as in the following cards, we indicate in brackets the minting of reverse when it is blank and therefore it is impossible to determine whether it was one or more hammer dies.

2. tetradracma (?) Ar

Obv.: *Boar advancing right on rocky ground*
Rev.: *Blank*

Age of issue: first half V century BC
Weight gr (mode): 16,2-16,8
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, p. 78; vol. 1.2, pl. 10 .
References to the tipe of dies:

		d	%	n	%
1		-		-	
2	CG 1, CG 2	2	66,6	4	50,0
...					
4	CG3	1	33,3	4	50,0
	totale	**3**	**100,0**	**8**	**100,00**

Dies Obv.:   3
Dies Rev.:   (1)
Caracteroscopic index ($I_c = n/d$):   2,67
G. F. CARTER 1983   D = **4,04** ± 1,16
W. W. ESTY 1984   d = **100,0%** di D

3. didracma (?) Ag

Obv.: *Sea-lion crouching left*
Rev.: *Blank*

Age of issue: first half V century BC
Weight gr (mode): 10,62
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, p. 79; vol. 1.2, pl. 11 .
References to the tipe of dies:

		d	%	n	%
1	LM 2	1	50,0	1	25,0
...					
3	LM 1	1	50,0	3	75,0
	totale	**2**	**100,0**	**4**	**100,0**

Dies Obv.:   2
Dies Rev.:   (1)
Caracteroscopic index ($I_c = n/d$):   2,00
G. F. CARTER 1983   D = 3,25 ± 1,95
W. W. ESTY 1984   d = 75,0% di D

Notes: it's evident that the results obtained on the basis of only four known specimens go taken with extreme caution.

4. dracma (?) Ar

Obv.: *Head and neck of lion left with raised mane and open jaws.*
Rev.: *Blank*

Age of issue: V century BC.
Weight gr (mode): 3,6-4.0
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp. 81; vol. 1.2, pl. 11 .
References to the tipe of dies:

		d	%	n	%
1		-		-	
2	TCL 1, TCL 3	2	66,6	4	57,14
3	TCL 2	1	33,4	3	42,86
	totale	**3**	**100,0**	**7**	**100,00**

Dies Obv.:   3
Dies Rev.:   (1)
Caracteroscopic index ($I_c = n/d$):   2,33
G. F. CARTER 1983   D = 4,0 ± 1,63
W. W. ESTY 1984   d = 100,0% di D

5. didracma (X) Ar

Obv.: *Head of* Metus *facing, hair bond with diadem; below X*
Rev.: *Blank*

Age of issue: second half V century BC.
Weight gr (mode): 8,05-8,2
Books: PETRILLO SERAFIN P. 1976 – *Le serie monetarie di Populonia,* pp.105-140, Tav. XV [7]; VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp. 84-86 ; vol. 1.2, pl. 12-13 .
References to the tipe of dies: GIANNONI L. 2018 – *Ancora sui conî delle monete populoniesi:le didracme con il volto di Metus e segno X e le monete con polpo da 1(?) unità,* PANORAMA NUMISMATICO, 340, p. 7- 14.

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[7] The coins depicted in the table XV have the following concordances with the typology proposed here: no. 4 = XA; nn. 1,2, 15(?) = XB; n. 7 = XD; n.8 = XE; n. 10 = XG; n. 3 = XH; no. 6 = XL; n. 5 = XM, n. 9 = XY..

		d	%	n	%
1	XC, XE	2	18,2	2	6,10
2	XD,XF, XG, XH	4	36,4	8	24,20
3	XM	1	9,1	3	9,10
4	XB,XL, XY	3	27,3	12	36,40
…					
8	XA	1	9,1	8	24,20
	totale	11	100,1	33	100,00

Dies Obv.: 11
Dies Rev.: (1)
Caracteroscopic index ($I_c = n/d$): 3,0
G. F. CARTER 1983 $D = 14,0 \pm 1,63$
W. W. ESTY 1984 d = 93,9% di D

Notes: for the dating see DE MARINIS-CASINI, 2018.

6. dracma (V) Ar

Obv.: *Head of* Metus *facing, hair bond with diadem; below V*
Rev.: *1) Blank -2) Two tridents with ornaments*

Age of issue: second half V century BC.
Weight gr (mode): 3,4-4,0
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, p. 87 ; vol. 1.2, pl. 13 .
References to the tipe of dies:

		d	%	n	%
1		-		-	
2	MV 2	1	50,0	2	33,30
…					
4	MV 1	1	50,0	4	66,70
	totale	2	100,0	6	100,00

Dies Obv.: 2
Dies Rev.: 1 +(1)
Caracteroscopic index ($I_c = n/d$): 3,0
G. F. CARTER 1983 $D = 2,54 \pm 0,81$
W. W. ESTY 1984 d = 100,0% di D

Notes: The coinage of the reverse type 2) is united only with the coinage of the MV 2.

7. mezza dracma (IIC) Ar

Obv.: *Head of* Metus *facing, hair bond with diadem; below IIC*
Rev.: *Blank*

Age of issue: second half V century BC.
Weight gr (mode): 1,82-1,95
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, p. 88 ; vol. 1.2, pl. 14 .
References to the tipe of dies:

		d	%	n	%
1	M IIC 2	1	50,0	1	12,50
2	M IIC 1	1	50,0	7	87,50
	totale	2	100,0	8	100,00

Dies Obv.:   2
Dies Rev.:   (1)
Caracteroscopic index ($I_c = n/d$):   4,0
G. F. CARTER 1983 $D = 2,33 \pm 0,51$
W. W. ESTY 1984 $d = 87,5\%$ di D

8. dracma (V) Ag

Obv.: *Head of* Turms *left, wearing winged petasus; behind V*
Rev.: *Blank*

Age of issue: second half V century BC.
Weight gr (mode): 3,88-4,08
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, p. 90-91; vol. 1.2, pl. 14.
References to the tipe of dies:

		d	%	n	%
1		-		-	
2	TR 1	1	33,3	2	18,18
3	TR 2	1	33,3	3	27,27
...		-		-	
6	TR 3	1	33,3	6	54,55
	totale	**3**	**99,9**	**11**	**100,00**

Dies Obv.:   3
Dies Rev.:   (1)
Caracteroscopic index ($I_c = n/d$):   3,67
G. F. CARTER 1983 $D = 3,58 \pm 0,68$
W. W. ESTY 1984 $d = 100,0\%$ di D

9. da 20 unità Ar

Obv.: *Octopus emerging from amphora on stand in the shape of a calamary; below XX*
Rev.: *Blank*

Age of issue: IV-III century BC.?
Weight gr (mode): 22,45-22,65
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, p. 67; vol. 1.2, pl. 8; VECCHI I. 2019 – *Una rivalutazione della monetazione di Luca e Populonia e dell'Iitalia centrale,* Atti del Convegno *Le monete degli Etruschi: a 42 anni dal convegno di Napoli*, Populonia 6-7.10.2017, Rassegna di Archeologia, 26, pp. 61-66.
References to the tipe of dies:

		d	%	n	%
1		-		-	
2	APXX 2	1	50,0	2	40,0
3	APXX 1	1	50,0	3	60,0
	totale	**2**	**100,0**	**5**	**100,0**

Dies Obv.: 1
Dies Rev.: (1)
Caracteroscopic index ($I_c = n/d$): 2,5
G. F. CARTER 1983 $D = 2,79 \pm 1,16$
W. W. ESTY 1984 $d = 100,0\%$ di D

10. didracma (XX) Ar

Obv.: *Head of* Metus *facing, hair bond with diadem; below XX*
Rev.: *1) Blank; 2) various signs (see Appendix 1)*

Age of issue: end IV-III century BC.
Weight gr (mode): 8,4
Books: P.PETRILLO SERAFIN, 1976-77 – *Nota in margine al "tesoro di monete antiche rinvenute a Populonia*, pp. 69-106, tavv. VI-XI ; VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp.127-199; vol. 1.2, pl.22-62.
References to the tipe of dies: GIANNONI L. 2019 – *I conî delle monete populoniesi di argento da XX e X unità: proposte per una tipologia*, pp. 155-181.

		d	%	n	%
1	1X||X, 1°XuX°, 3°X.:.X°, 6XX, 7XX, 8XX, 12XX, 17XX, 3X:X, 6X:X, 9X:X, 10X:X, 11X:X, A, B	15	38,4	15	4,14
2	10XX	1	2,6	2	0.55
3	4XX, 11XX,15XX, 16XX, 2X..X	5	12,8	15	4,14
4	5XX, 9XX	2	5,05	8	2,20
5	13XX, 14XX	2	5,05	10	2,76
6	2°X.:.X°	1	2,6	6	1,65
7	2XX	1	2,6	7	1,93
8	5X:X	1	2,6	8	2,21
9	1°X.:.X°, 1X..X	2	5,05	18	4,97
...					
11	1X°X	1	2,6	11	3,04
...					
14	4X:X	1	2,6	14	3,86
...					
16	7X:X	1	2,6	16	4,42
...					
20	1°X:X°, 1XX	2	5,05	40	11,10
...					
24	3XX	1	2,6	24	6,63
...					
26	8X:X	1	2,6	26	7,18
...					
41	2X:X	1	2,6	41	11,32
...					
101	1X:X	1	2,6	101	27,90
totale	**39**		**100,0**	**362**	**100,00**

Dies Obv.:	39
Dies Rev.:	19+(1)
Caracteroscopic index (I_c = n/d):	9,28
G. F. CARTER 1983	D = 39,9 ± 0,70
W. W. ESTY 1984	d = 95,9% di D

11. didracma (XX) Ag

Obv.: *Facing youthful head of* Hercle *wearing lionskin knotted at neck; on either side of neck, X*
Rev.: *1) Blank; 2) Club*

Age of issue: IV-III century BC.
Weight gr (mode): 8,4
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp. 202-208; vol. 1.2, pl. 63-67.
References to the tipe of dies: GIANNONI L. 2017. (G.L.)– *Le didracme populoniesi con il volto di* Hercle*: alcune considerazioni statistiche*, PANORAMA NUMISMATICO, 331, pp. 39-45.

		d	%	n	%
1		-		-	
...		-		-	
53	Db	1	50,0	53	28,50
...					
133	Da	1	50,0	133	71,50
	totale	**2**	**100,0**	**186**	**100,00**

Dies Obv.:   2
Dies Rev.:   1+(1)
Caracteroscopic index (I$_c$ = n/d):   93,0
G. F. CARTER 1983   D = 1,89 ± 0,01
W. W. ESTY 1984   d = 100,0% di D

12.   didracma (XX) Ag

Obv.: *Head of* Menrva *nearly facing, slightly turned to left, wearing earring necklace and three-crested helmet; on either side of neck X*
Rev.: *1) Star of four rays and crescent, around PVPLVNA; 2) Cluster of seven pellets and crescent; around MI : PVPLVNA : LES :*

Age of issue: end III century BC.
Weight gr (mode): 8,4-8,5
Pubblicazioni: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp. 209-211; vol. 1.2, pl. 68.
References to the tipe of dies:

		d	%	n	%
1		-		-	
...		-		-	
14	MN 1	1	100,0	14	100,00
	totale	**1**	**100,0**	**14**	**100,00**

Dies Obv.:   1
Dies Rev.:   2
Caracteroscopic index (I$_c$ = n/d):   14,0
G. F. CARTER 1983   D = 0,99 ± 0,08
W. W. ESTY 1984   d = 100,0% di D

Notes: all 5 coins with the reverse MI : PVPLVNA : LES have the obverse fully unreadable, therefore, the question remains whether such coins may come, or not, by the same die of those with PVPLVNA in reverse.

13. dracma (X) Ag

Obv.: *Laureate head of* Aplu *left; behind X*
Rev.: *1) Blank; 2) club (?)*

Age of issue: IV-III century BC.
Weight gr (mode): 4,2
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp. 213-222; vol. 1.2, pl. 69-76.
References to the tipe of dies: GIANNONI L. 2016 (G.L.) – *Alcune osservazioni sulle monete populoniesi da X unità con* Aplu *laureato e vòlto a destra*, PANORAMA NUMISMATICO, 313, pp. 15-19[8].

		d	%	n	%
1		-		-	
...		-		-	
7	AP1 (ex A)	1	33,3	7	8,64
...		-		-	
35	AP2 (ex B)	1	33,3	35	43,20
...		-		-	
39	AP3 (ex C)	1	33,3	39	48,15
	totale	**3**	**99,9**	**81**	**99,99**

Dies Obv.:	3
Dies Rev.:	1+(1)
Caracteroscopic index ($I_c = n/d$):	27,0
G. F. CARTER 1983	D = 2,89 ± 0,06
W. W. ESTY 1984	d = 100,0% di D

14. dracma (X) Ag

Obv.: *Head of* Artumes *right wearing broad hair band and triple-pendant ear-ring; behind X*
Rev.: *1) Blank; 2) Octopus; 3) Palm-trees; 4) Wheel.*

Age of issue: IV-III century BC..
Weight gr (mode): 4,1-4,2
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp. 228-233 ; vol. 1.2, pl. 78-80.
References to the tipe of dies:

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[8] The initial encoding of the 3 dies, as contained in the article, it was subsequently modified to make it more functional to use a DBase.

		d	%	n	%
1	AT 2	1	25,0	1	1,92
2	AT 4	1	25,0	2	3,85
3	AT 3	1	25,0	3	5,77
...		-	-	-	-
43	AT 1	1	25,0	46	88,46
	totale	**4**	**100,0**	**52**	**100,00**

Dies Obv.: 4
Dies Rev.: (4)
Caracteroscopic index ($I_c = n/d$): 13,00
G. F. CARTER 1983 D = 3,98±0,16
W. W. ESTY 1984 d = 98,1 % di D

15.   da 5 unità (V) Ag

Obv.: *Laureate bearded head of* Tinia *right; behind V*
Rev.: *Blank*

Age of issue: III century BC.
Weight gr (mode): 1.92-2,03
Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, pp. 245-247; vol. 1.2, pl. 84.
References to the tipe of dies:

		d	%	n	%
1		-		-	
...		-		-	
38	TN1	1	100,0	38	100,00
	totale	**1**	**100,0**	**38**	**100,00**

Dies Obv.: 1
Dies Rev.: (1)
Caracteroscopic index ($I_c = n/d$): 38,0
G. F. CARTER 1983 D = 0,96± 0,03
W. W. ESTY 1984 d = 100,0% di D

16.   da 1 unità Ag

Obv.: *Octopus*
Rev.: *Blank*

Age of issue: IV- III century BC.
Wheight gr (mode): 0,87-0,95

Books: VECCHI I. 2002 – *Etruscan coinage*, vol. 1.1, p. 71-73; vol. 1.2, pl. 9; VECCHI I. 2019 – *Una rivalutazione della monetazione di Luca e Populonia e dell'Iitalia centrale,* Atti del Convegno *Le monete degli Etruschi: a 42 anni dal convegno di Napoli*, Populonia 6-7.10.2017, Rassegna di Archeologia, 26, pp. 61-66.

References to the tipe of dies: GIANNONI L. 2018 – *Ancora sui conî delle monete populoniesi: le didracme con il volto di Metus e segno X e le monete con polpo da 1(?) unità,* PANORAMA NUMISMATICO, 340, pp. 7- 14

		d	%	n	%
1	PLP 6	1	16,7	1	3,7
...					
3	PLP 1, PLP 5	2	33,3	6	22,2
...					
6	PLP 2,PLP 4	2	33,3	12	44,4
...					
8	PLP 3	1	16,7	8	29,6
	totale	**6**	**100.0**	**27**	**99,9**

Dies Obv.:   6
Dies Rev.:   (1)
Index "caratteroscopico" ($I_c = n/d$):   4,5
G. F. CARTER 1983   D = 6,81 ± 0,68
W. W. ESTY 1984   d = 96,0% di D

APPENDIX 1

1.   Obverse

Dies of card 1

KM 1   **KM 2**   **KM 3**

Dies of card 2
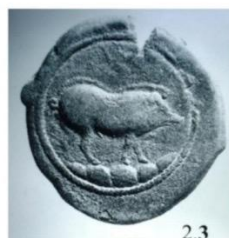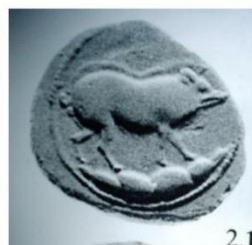
CG 1   **CG 2**   **CG 3**

Dies of card 3

LM 1   **LM 2**

Dies of card 4

TCL 1   **TCL 2**   **TCL 3**

Dies of card 5

| XA | XB | XC | XD |

| XE | XF | XG | XH |

| XL | XM | XY |

Dies of card 6

| MV 1 | MV 2 |

Dies of card 7

| MIIC 1 | MIIC 2 |

Dies of card 8

TR 1   TR 2   TR 3

Dies of card 9

APXX 1   APXX 2

Dies of card 10

1 X X   2 X X   3 X X

4 X X   5 X X   6 X X

7 X X   8 X X   9 X X

Dies of card 10

10 X X   **11 X X**   **12 X X**

13 X X   **14 XX**   **15 XX**

16 XX   **17 XX**

1 X:X   **2 X:X**   **3 X:X**

4 X:X   **5 X:X**   **6 X:X**

7 X:X   **8 X:X**   **9 X:X**

10 X:X   **11 X:X**

Dies of card 10

1 °X.:.X°   2 °X.:.X°   3 °X.:.X°

1 °X:X°   1 °X u X°

1 X°X

1 X . . X   2 X . . X

1 X | | X

A   B

Dies of card 11

Da **Db**

Dies of card 12

MN 1

Dies of card 13

AP 1 **AP 2** **AP 3**

Dies of card 14

AT 1 **AT 2** **AT 3** **AT 4**

Dies of card 15

TN 1

Dies of card 16

PLP 1   PLP 2   PLP 3

PLP 4   PLP 5   PLP 6

2. **Reverse**

Dies of card 6

NN   TR

Dies of card 11

RK   RW   RX   RY   RZ

Dies of card 12

PV   MPL

Dies of card 13

NN   PC

Dies of card 14

NN   PLP   PT   WL

Dies of card 10

nn

1 cr_st_PA   1 trd_cr_st_PA   1 PV_s_c   2 PV_s_c   3 PV_s_c

1 plp   2 plp   3 plp   4 plp   5 plp

1 cdc   1 bst

1 esc   1 Lt_nd   2 Lt_nd   3 Lt_nd

1 cr_s   1 cr_d   1 cr_m

APPENDIX 2

n° card	issue	metal	n° dies obv.	n°coins (5.000) x dies obv.	mode gr	kg
1	Chimera	AG	3	15000	16,55	248,25
2	Boar	AG	3	15000	16,05	240,75
3	Sea monster	AG	2	10000	10,62	106,20
4	Head and neck of lion	AG	2	10000	3,80	38,00
5	Metus X	AG	11	55000	8,13	446,88
6	Metus V	AG	2	10000	3,70	37,00
7	Metus IIV	AG	2	10000	1,89	18,85
8	Turms V	AG	3	15000	3,98	59,70
9	Amphora and octopus XX	AG	2	10000	22,55	225,50
10	Metus XX	AG	39	195000	8,40	1638,00
11	Hercle XX	AG	2	10000	8,40	84,00
12	Menrva XX	AG	1	5000	8,45	42,25
13	Aplu X	AG	3	15000	4,20	63,00
14	Artvmes X	AG	4	20000	4,15	83,00
15	Tinia V	AG	1	5000	1,98	9,88
16	Octopus I	AG	6	30000	0,91	27,30
						3368,55

Tab. 1: Theoretical calculation of the metal used for minting[9]

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[9] In the calculation I assumed a prudential production for minting of obverse equal to 5.000 coins (see CAMPANA, 1987). As far as the weight unit, I have used the value of the mode that comes closest to the theoretical weight.

APPENDIX 3

n° card	issue	Nt	N 5000	N 15000	D	TS 5	TS 15
1	Chimera	6	24350	73050	4,87	4058	12175
2	Boar	8	20200	60600	4,04	2525	7575
3	Sea lion	4	16250	48750	3,25	4063	12188
4	Head and neck of lion	7	20000	60000	4,00	2857	8571
5	Metus X	52	70000	210000	14,00	1346	4038
6	Metus V	7	12500	37500	2,50	1786	5357
7	Metus IIC	9	11650	34950	2,33	1294	3883
8	Turms V	16	17900	53700	3,58	1119	3356
9	Amphora and octopus XX	6	13950	41850	2,79	2325	6975
10	Metus XX	1388	199500	598500	39,90	144	431
11	Hercle XX	195	9450	28350	1,89	48	145
12	Menrva XX	28	4950	14850	0,99	177	530
13	Aplu X	276	14450	43350	2,89	52	157
14	Artvmes X	79	19900	59700	3,98	252	756
15	Tinia V	61	4800	14400	0,96	79	236
16	Octopus I (?)	43	34050	102150	6,81	792	2376

Tab. 2: survival rate[10]

Nt = total number of coins currently known
N 5000 – N 15000 = estimated productivity per die
1/TS 5 – 1/ TS 15 = survival rate

Using part of the data in Appendix 2, the "survival index" of the Populonia's coinage has been calculated, making two hypotheses of productivity of the straight mints: 5,000 and 15,000 coins per die; for example, a survival rate of 144 (or 431 depending on the productivity per die chosen) indicates that one *Metus* XX has come to us every 144 (or 431) initially minted.

It is interesting to note that the survival rate of coins dating back to the V- early IV century B.C. is significantly lower than that of more recent coins. This would suggest perhaps a reuse of silver, if not a recast for new minting that may possibly have been required due to monetary reform, as per the changes from the system of the didrachma of value X (mode = gr 8.12 about) to that of value XX (mode = gr 8.4).

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[10] DE CALLATAŸ 2000.

APPENDIX 4

n° card	issue	metal	n	d	D	n/d	D/d
1	Chimera	AG	6	3	4,87	2,00	1,62
2	Boar	AG	8	3	4,04	2,67	1,35
3	Sea lion	AG	4	2	3,25	2,00	1,63
4	Head and neck of lion	AG	7	3	4,00	2,33	1,33
5	Metus X	AG	33	11	14,00	3,00	1,27
6	Metus V	AG	6	2	2,50	3,00	1,25
7	Metus IIC	AG	8	2	2,33	4,00	1,17
8	Turms V	AG	11	3	3,58	3,67	1,19
9	Amphora and octopus XX	AG	5	2	2,79	2,50	1,40
10	Metus XX	AG	362	39	39,90	9,28	1,02
11	Hercle XX	AG	186	2	1,89	93,00	0,95
12	Menrva XX	AG	14	1	0,99	14,00	0,99
13	Aplu X	AG	81	3	2,89	27,00	0,96
14	Artvmes X	AG	52	4	3,98	13,00	1,00
15	Tinia V	AG	38	1	0,96	38,00	0,96
16	Octopus I (?)	AG	27	6	6,81	4,50	1,14

Tab. 3: Issues[11]

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[11] The index **D/d** points out the ratio among the number of theoretical dies and the number of known dies; if the ratio is ≤ 1, it means a perfect identity, if >1, we can reasonably think that shall be more dies.

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