

**A NUMISMATIC HISTORY OF THE EARLY  
ISLAMIC PRECIOUS METAL COINAGE OF  
NORTH AFRICA AND THE IBERIAN  
PENINSULA**

VOLUME 2



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*Trent Jonson*

*St. Cross College  
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## **TECHNICAL ANALYSES**

As outlined in the Methodology beginning on p. 68, I have conducted three sets of technical analyses to assist in the construction of the numismatic history of the earliest precious metal coinage of North Africa and the Iberian Peninsula: metrological analyses of the weights and diameters of the coins; metallurgical analyses to determine the elemental makeup and gold content of the coins; and an estimation of the number of dies for the various series.

## **METROLOGY**

The metrological investigation of the early Islamic precious metal coinage of North Africa and the Iberian Peninsula consists of the examination of two sets of measurements – the weights and the module (i.e. the diameter). I will concentrate on the weights, followed by a brief discussion of the module.

## **WEIGHTS**

### ***SOLIDI/DINARS***

Grierson, in his investigation of ‘Abd al-Malik’s reforms, suggested two possible reasons for the adoption of the 4.25 g standard (or 4.28 g if we adopt the standard championed by Sears) for the Post-Reform dinar.<sup>251</sup> The first possible reason was that, although the dinar was not of the Byzantine standard of 4.55 g, it might have been the same weight as the solidi in circulation in the region. As Grierson pointed out, the solidi circulating outside of the country were likely to have been lighter (as a result of wear) than those circulating within the Byzantine Empire, as those outside the Empire would not have been subject to recall to the Constantinople mint and reissued. The second explanation, and the one adopted by Grierson, was that the

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251 GRIERSON 1960, p. 248-57.

weight of the Byzantine solidus did not fit the Islamic standards of weight or value, and was thus abandoned.

For North Africa (and later the Iberian Peninsula), we have essentially the same question. Did the early Islamic administration adopt the mint standard of the Byzantine solidi circulating in North Africa at the time of the conquest, or did they follow the mint standard introduced by ‘Abd al-Malik?

There have been several attempts to answer this question. Walker suggested that both the North African and the later Iberian Peninsula solidi followed the weight of the contemporary dinars struck elsewhere in the Caliphate.<sup>252</sup> Balaguer, using a larger number of examples, came to the same conclusion.<sup>253</sup> Other scholars, however, suggest that the North African and/or Iberian Peninsula mints struck solidi and dinars to a different standard. Miles suggested that the Post-Reform dinars struck in the Iberian Peninsula were heavier than those struck in the eastern Umayyad mints, averaging 4.28 g up until 106/724-5.<sup>254</sup> Leuthold argued for a North African standard for the whole of the Umayyad period of 4.28 g, the same as the 4.28 g standard suggested by Sears.<sup>255</sup> Unfortunately we do not know which examples Leuthold used in arriving at his conclusion. Bates also argued, on an “impressionistic basis” (his words), that both the North African and Iberian Peninsula transitional solidi appeared to be heavier than 4.25 g.<sup>256</sup>

Let’s now turn to the metrological evidence for each of the series of solidi/dinars.

Table 75 sets out the metrological data for the solidi and dinars struck in North Africa

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252 WALKER 1956, p. xcvi.

253 Balaguer used 20 Series NA 2 and NA 3 solidi (the 19 examples in Walker and a piece from the collection of L. Villaronga (no. 53 in Balaguer’s catalogue) in her calculations for North Africa. For the Iberian Peninsula solidi, Balaguer used 22 Series IP 2 (Indiction XI) examples and 11 Series IP 3 (98 H) examples. Balaguer did not differentiate the coinage by series because of the small numbers. BALAGUER 1976, p. 105-111. She reconfirmed her findings in BALAGUER 1988, p. 24-5.

254 MILES 1950, p. 87-88.

255 LEUTHOLD 1967, p. 94-5.

256 Bates used the data found in BALAGUER 1976, p. 105-11. See BATES 1992, p. 285-7.

and the Iberian Peninsula from the time of the conquest of the two regions until the end of the Umayyad period.

**Table 75: Metrology of the Solidi and Dinars struck in North Africa and the Iberian Peninsula during the Umayyad Period**

Ser/Ph	No	MEAN	MED	MODE	MAX	MIN	STDV	95% CI	
NA1	13	4.28	4.27	4.33	4.36	4.15	0.06	4.24	4.32
NA2/1	36	4.30	4.30	4.30; 4.32 <sup>257</sup>	4.39	4.22	0.04	4.29	4.31
NA2/2	5	4.29	4.30	4.30	4.32	4.25	0.03	4.26	4.32
IP2 <sup>258</sup>	31	4.26	4.25	4.23	4.93	3.54	0.23	4.18	4.34
NA2/3	5	4.24	4.24	N/A	4.40	4.03	0.14	4.06	4.41
NA3	34	4.23	4.25	4.25; 4.27 <sup>259</sup>	4.59	4.01	0.09	4.20	4.26
IP3	31	4.13	4.13	4.12	4.30	4.02	0.06	4.11	4.15
NA4W	48	4.27	4.27	4.27	4.33	4.18	0.03	4.26	4.28
IP4W	21	4.28	4.28	unclear	4.39	4.16	0.06	4.25	4.31
NA4E	8	4.26	4.27	4.26	4.29	4.23	0.02	4.24	4.28
IP4E	3	4.33	N/A		4.35	4.31	N/A		

### *Series NA 1*

I have recorded the weights of 13 Series NA 1 solidi (c. 79/698 to 84/703-4), too few to give a definitive mint standard. Although the mean and median of this group are quite close, differing by only one hundredth of a gram, the mode is much higher – 4.33 g. The higher mode may be just chance, however, given how few examples are available for study and the overall high variability in the weights, as demonstrated by the relatively high standard deviation of 0.06 g and 95% confidence intervals for the mean of 4.24 g to 4.32 g. This variability can perhaps be most clearly seen in the histogram in Figure 100 below. As Figure 100 also shows a distribution for the Series NA 1 solidi that appears to be skewed to the left, it is also worthwhile considering the percentile method suggested by Sears. Calculating the 90<sup>th</sup> percentile weight also gives a weight of 4.33 g.

In the seventh century in Carthage, the average weight of the Byzantine solidi dropped to 4.36 g under Constans II (641-668) and then 4.30 g under Constantine IV

<sup>257</sup> Two modes of 5 examples each.

<sup>258</sup> Main mint only.

<sup>259</sup> Two modes of 4 examples each.

(668-685), possibly to a mint standard of 23 carats – 4.32 g.<sup>260</sup> Any conclusion regarding the mint standard for Series NA 1 must remain tentative, but the figures above are consistent with the proposition that during this period the Islamic administration struck solidi that conformed to the standard of the Byzantine solidi circulating in the region, similar to what Grierson suggested happened with the Pre-Reform gold in early Islamic Syria.<sup>261</sup>

One further observation can be made regarding the weights of the Series NA 1 solidi. I argue on p. 379 that the examples from Series NA 1 bearing the NONEST obverse legend were most likely the first Islamic solidi struck by the Muslims after the conquest of Carthage. If we divide the Series NA 1 solidi into those examples that bear this legend and those that do not we find that five of the six highest weights are from coins that bear the NONEST legend. Taking this observation further, if we discount the one worn NONEST example with a significantly lower weight of 4.15 g, we then have a mean of 4.31 g,<sup>262</sup> close to the mint standard of 4.32 g for the Byzantine solidi of Carthage prior to the Muslim conquest. The remaining Series NA 1 solidi with different obverse legends, in contrast, have a mean of 4.26 g,<sup>263</sup> further suggesting that the NONEST type were the first Series NA 1 Islamic solidi struck by the Muslims, as the average weights of coins tend to drop over time. This drop in weight is mirrored in the corresponding Series NA 1 semisses and tremisses. For the semisses there are two examples with the NONEST legend, and these are the two heaviest examples of this group. For the tremisses, seven of the 10 heaviest coins again bear the NONEST legend.

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260 The weight standard in the Byzantine mint of Carthage gradually declined in the seventh century. See MORRISON ET. AL 1983, p. 267-87.

261 GRIERSON 1960, p. 248-57.

262 95% confidence intervals for the mean of 4.28 to 4.34 g. and a standard deviation of 0.03.

263 95% confidence intervals for the mean of 4.21 to 4.31 g. and a standard deviation of 0.04.

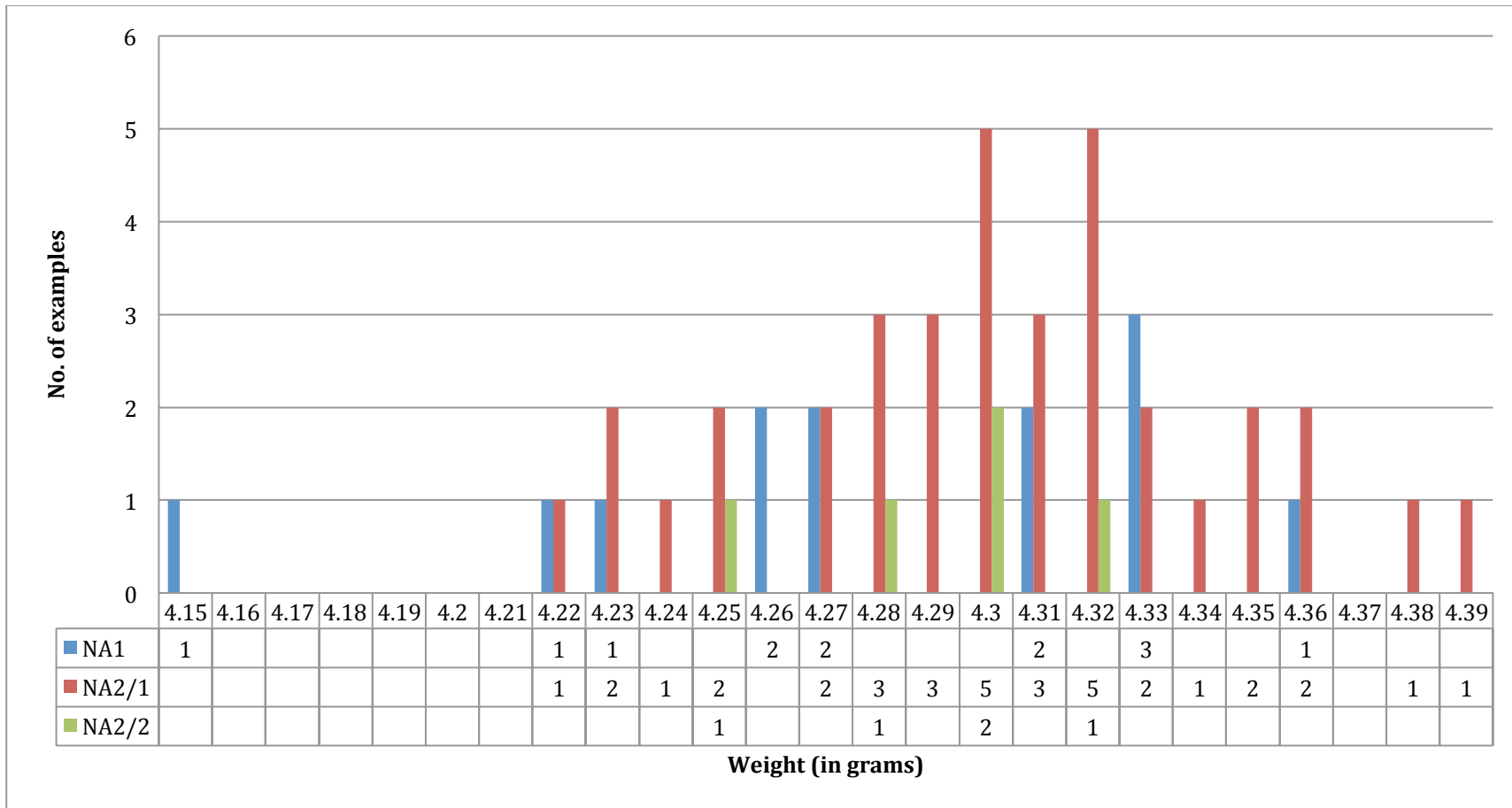


Figure 100: Distribution of the weights of the Islamic solidi struck in North Africa prior to the conquest of the Iberian Peninsula (c. 79/698-99 to 92/710-11).

### ***Series NA 2, Phase 1***

The mint standard for the Series NA 2, Phase 1 solidi, struck between 84/703-4 and 87/705-6, can be discussed with a higher degree of confidence, as I have recorded the weights of 36 examples. Both the mean and median for this group are 4.30 g, with a lower standard deviation than Series NA 1 and 95% confidence intervals for the mean of 4.29 to 4.31 g. The distribution for this sample is nearly symmetrical, demonstrated by the identical mean and median, and similar modes (4.30 and 4.32 g). Given all of these figures, the mint standard for the Series NA 2, Phase 1 solidi appears to be between 4.30 to 4.32 g, again very close to the late seventh-century mint standard of Byzantine Carthage.

### ***Series NA 2, Phase 2***

Unfortunately, we are once again less certain when discussing the weights of Series NA 2, Phase 2 as there are only recorded five examples – three from Indiction VII (89-90/708-9) and two from Indiction  $\Theta$  (91-2/710-11) from this phase. For Indiction  $\Theta$ , the remaining six Indiction  $\Theta$  solidi were most likely struck in the Iberian Peninsula, and will therefore be discussed separately on p. 279.

The five examples that I have placed in Series NA 2, Phase 2 have similar results to the first phase of Series NA 2, with a mean of 4.29 g, a median of 4.30 g, and a mode of 4.32 g. This again supports the suggestion that the mint standard for the solidi struck in North Africa prior to the conquest of the Iberian Peninsula followed the standard of the Byzantine solidi circulating in the region.

### ***Amalgamation of Series NA 1 and Series NA 2, Phases 1 and 2***

The conclusions regarding the mint standard above are reinforced if we look at all of the examples of the solidi struck prior to the Iberian Peninsula conquest as a group.

Figure 101 below amalgamates the weights of the 54 solidi of Series NA 1 and Series

NA 2, Phases 1 and 2. The mean for this group is 4.29, while the mean and the mode are 4.30 (95% confidence intervals for the mean are 4.28 g to 4.30 g). The weights of all but nine of the 54 coins are above 4.25 g, while 30 of the 54, or 56%, are 4.30 g or higher. There can be little doubt that the initial intention of the Islamic mint was to strike solidi to the Byzantine, as opposed to the Damascus, weight standard.

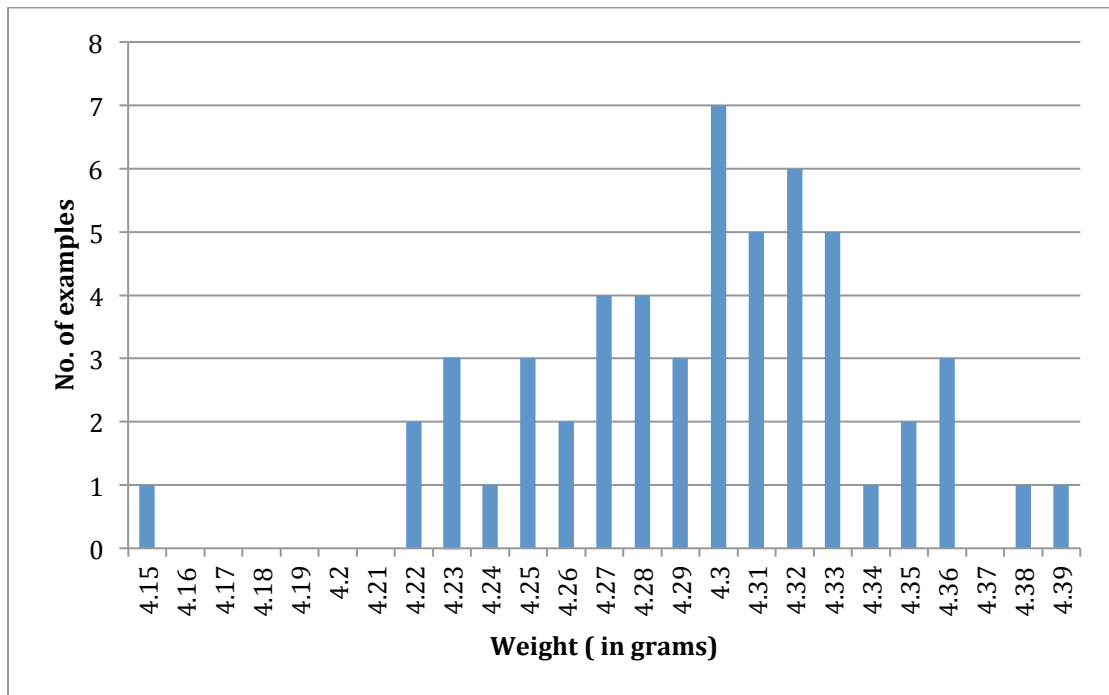


Figure 101: Distribution of weights for the Islamic solidi struck in North Africa prior to the conquest of the Iberian Peninsula (amalgamated).

**Series NA 2, Phase 2 Anomalous Solidi and Series IP 2**

In contrast, the six Indiction Θ Series NA 2, Phase 2 solidi that I suggest were some of the earliest coins struck in the Iberian Peninsula have a mean of 4.25 g, a median of 4.22 g, and a high standard deviation of 0.08. The figures for the anomalous Series NA 2, Phase 2 solidi are similar to the 4.26 g mean and 4.25 g mode for the 31 Series IP 2 examples struck at the main mint in the Iberian Peninsula between Indiction X (92-3/711-12) and Indiction XII (94-5/713-14) (see Figure 102 below). The Series IP 2 examples struck at the main mint also have a high standard deviation – 0.23 g.

Given these figures, nothing definitive can be said about the mint standard. The invasion of the Iberian Peninsula appears to have resulted in a drop in the mint standard after Mūsā b. Nusayr established a new mint in the region, although the variability in the weights of the coinage suggest that the administrators of the mint were less concerned with controlling the weight standard than they had previously in North Africa. This likely reflects the less than ideal conditions associated with the conquest, where a steady and large supply of coinage was more important than precisely controlled weights.

As discussed in the typology beginning on p. 145, there is a large variation in the solidi struck in the Iberian Peninsula in Indictions X (92-3/711-12), XI (93-4/712-13), and XII (94-5/713-14). This variation is mirrored in the weights. I have recorded the weights of 149 Series IP 2 solidi (both main and secondary mints) and, as can be seen in Figure 103 below, the weights vary considerably (Figure 103 includes both those solidi struck at the main Iberian Peninsula mint and those struck at the secondary mints). The mean for this group is 3.83 g and the median is 3.84 g, with no well-defined mode. The standard deviation is extremely high - 0.49 g, with no clear distribution pattern other than the clustering of examples between 4.15 g to 4.31 g. Most of the examples in this cluster are coins that were struck at the main mint. Eight of the Series IP 2 examples are below 3.00 g, 32 are between 3.00 g and 3.49g, and 45 are between 3.50 g to 3.99 g – 57% of the total.

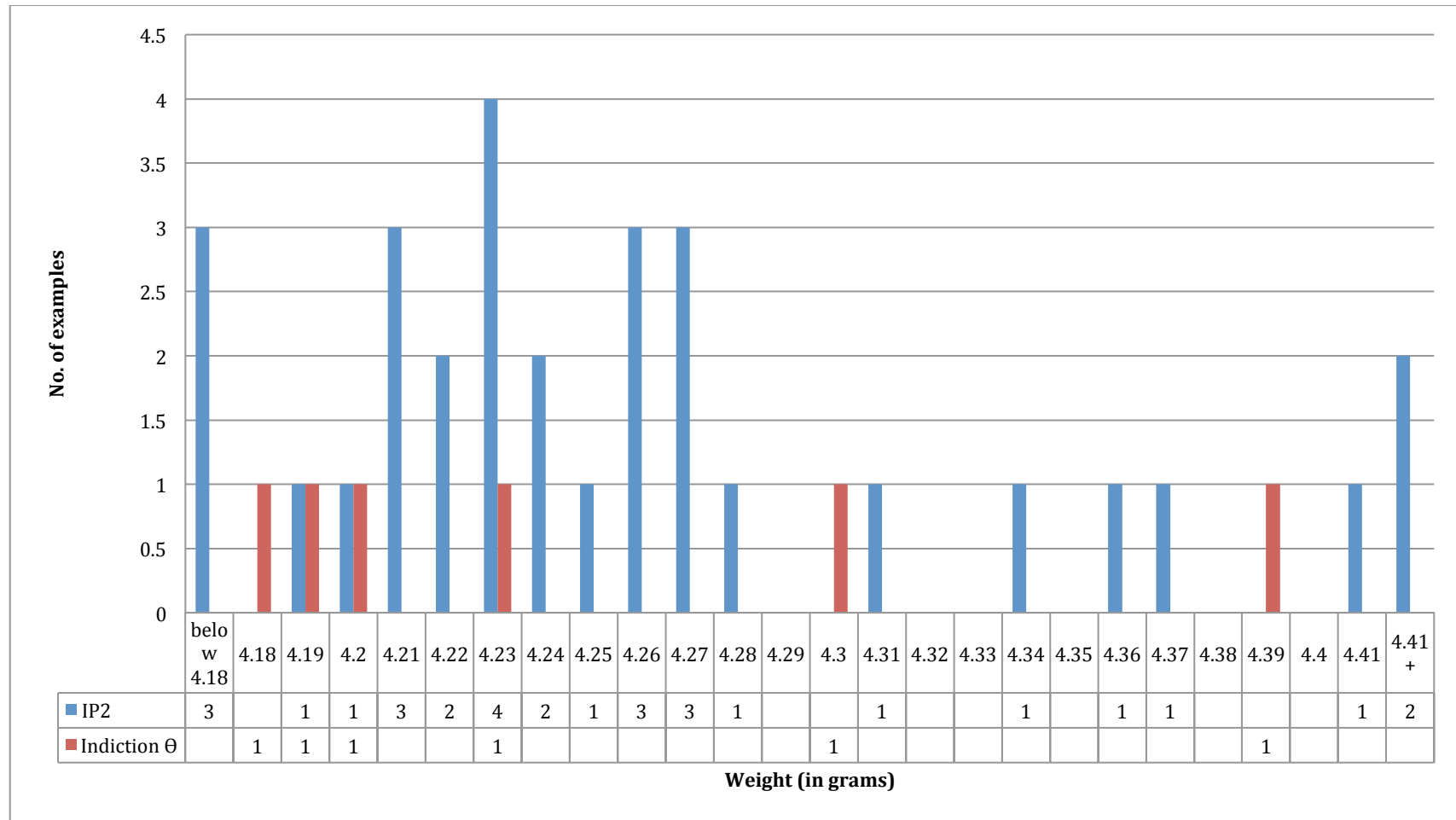


Figure 102: Comparison of the distribution of the weights of the Indiction Θ (91-2/710-11) solidi likely struck in the Iberian Peninsula to the weights of the solidi struck at the main Islamic mint in the Iberian Peninsula from Indiction X (92-3/711-12) to Indiction XII (94-5/713-14).

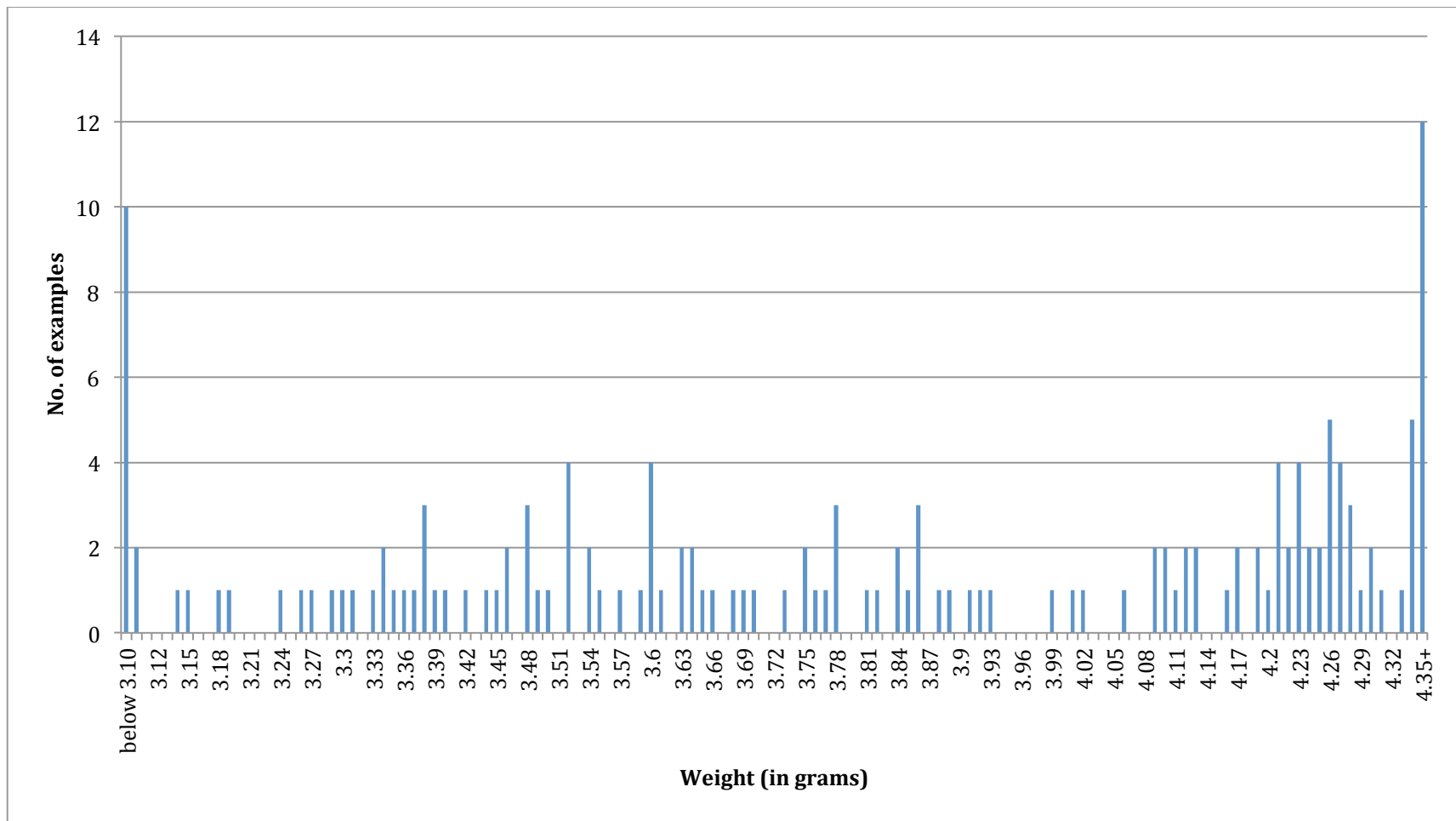


Figure 103: Distribution of the weights of the main and secondary mint Series IP 2 solidi struck in the Iberian Peninsula from Indiction X (92-3/711-12) to Indiction XII (94-5/713-14).

### ***Series NA 2, Phase 3***

There are only five examples of the solidi of Series NA 2, Phase 3. All are dated Indiction XIII (95-6/714-15). Their weights are 4.03 g, 4.21 g, 4.24 g, 4.33 g and 4.40 g. Given the variability in the weights (as demonstrated by a standard deviation of 0.14 g), it is once again difficult to draw any conclusions. The mean and median are both 4.24 g, but the 95% confidence intervals are 4.06 g to 4.41 g. At most, we can say that the transfer of the main Islamic mint from the Iberian Peninsula to North Africa in 95/713-14 did not mean a return to the mint standard for the solidi in place prior to the invasion of the Iberian Peninsula. Instead, it seems that the North African mint continued to strike solidi within a similar weight range as those struck at the main mint of the Iberian Peninsula, but with looser control of the mint standard than prior to the conquest.

### ***Series 3***

The variability in weights for the solidi lessens with the introduction of bilingual solidi in North Africa (Series NA 3) in 97/ 715-16, and one year later in the Iberian Peninsula (Series IP 3), but the standard deviations are still high - 0.09 and 0.06 respectively. Most intriguingly, there is a clear difference in the standards of the two mints. In North Africa, the 34 examples have a mean of 4.23 g and a median of 4.25 g. There is no clear mode, but it appears to be between 4.25 g and 4.27 g, with 95% confidence intervals for the mean of 4.21 g to 4.27 g. Once again, it is difficult to draw any firm conclusions, but it appears that the North African mint was trying to strike solidi to the Damascus weight standard of either 4.25 g or 4.28 g.

The average weights of the 31 Series IP 3 solidi, in contrast, are much lower than those struck in North Africa (this can be clearly seen in Figure 104 below). The mean

and median are both 4.13 g, while the mode is 4.12 g and the 95% confidence intervals are 4.11 to 4.15 g.

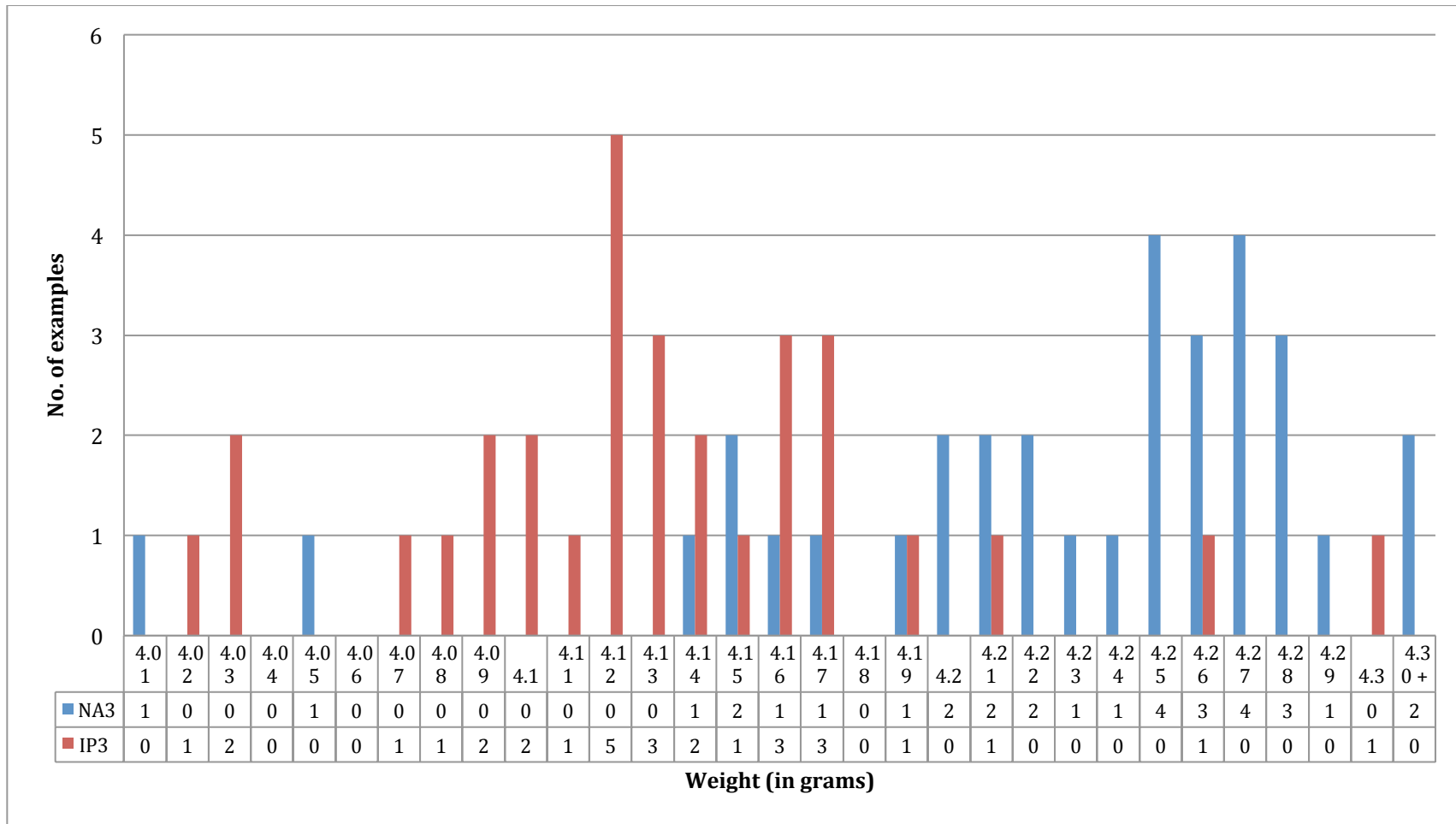


Figure 104: Distribution of the weights of the Series NA 3 (97/715-16 to 99/717-18) and Series IP 3 (98/716-17) bilingual solidi

It is unclear why the Islamic mint in the Iberian Peninsula chose to strike Series IP 3 solidi to a lower mint standard. It may simply be that the Iberian Peninsula mint was less concerned about matching the weights of Series IP 3 to the standard in North Africa or elsewhere, and more concerned with replacing the highly variable Series IP 2 solidi with a more consistent coinage.

#### ***Series 4***

As discussed above, ‘Abd al-Malik introduced in 77/696-7 a weight standard for the Post-Reform dinar of either 4.25 g or 4.28 g. Let us now consider the data for the Series 4, Post-Reform dinars in Table 75 and the histogram and distribution table in Figure 105 below. For both *Ifriqiya* and *al-Andalus* I have divided the dinars into those with Western legends (W - dated 100/718-19 to 110/728-29 for North Africa and 102/720-21 to 108/726-27 for the Iberian Peninsula) and those with Eastern legends (E - dated 114/732-33 to 122/739-40 for North Africa and 114/732-33 to 127/744-45 for the Iberian Peninsula).

The Series NA 4 dinars struck with Western legends have a mean, median and mode of 4.27 g, and 95% confidence intervals of 4.26 g to 4.28 g. This is similar to the mint standard for the Post-Reform dinar suggested by Sears. For the Series NA 4 dinars with Eastern legends, the mean and mode are 4.26 g, while the median is 4.27 g. The averages for the dinars with Eastern legends are thus slightly lower, but all of the examples with Eastern legends except one are 4.26 g or above (see Figure 105 below). We cannot therefore argue that the switch from Eastern to Western legends in 114/732-33 also resulted in a drop in the mint standard in *Ifriqiya*.

Before turning to the Series IP 4 dinars, it is important to look at the small flan dinars (16-17 mm versus 19-20 mm for the larger flan) of *Ifriqiya*, struck in 100/718-19 and 101/719-20 (discussed on p. 226). The 15 small flan examples have a mean of

4.26 g, while the 33 large flan examples (dated 101/729-20 to 110/728-29) have a mean of 4.27 g. It does not seem that that introduction of the larger flan examples resulted in either an increase or drop in the mint standard.

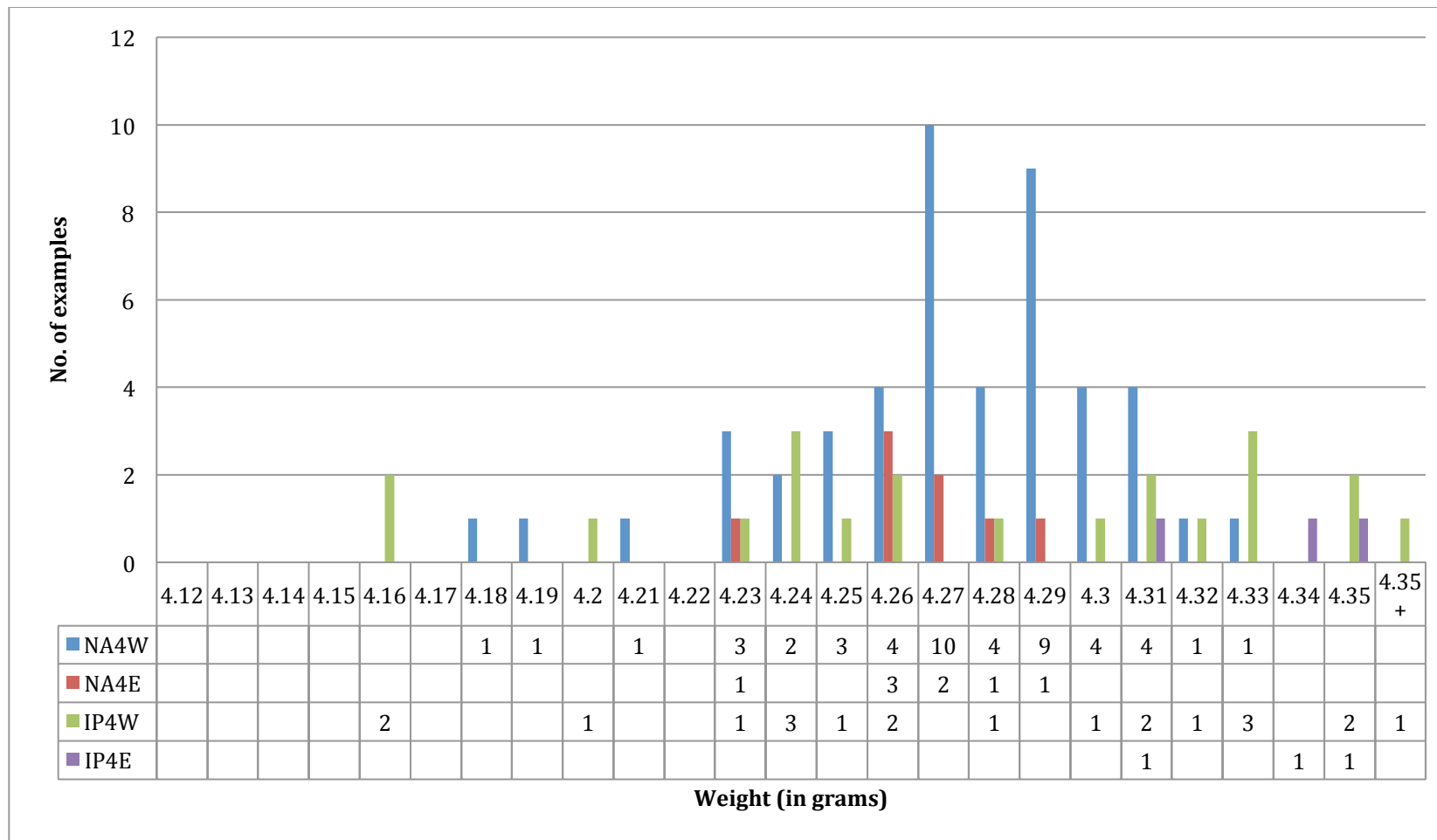


Figure 105: Distribution of the weights of the Series NA 4 and IP 4 dinars.

In *al-Andalus*, the 21 examples with Western legends have a mean of 4.28 g, a median of 4.29 g and an unclear mode. The weights vary considerably more than the Series NA 4 dinars with Western legends, with a standard deviation of 0.06 g versus 0.03 g. This suggests that the *al-Andalus* mint continued to exert less strict control of the mint standard than the *Ifriqiya* mint. All three of the Series IP 4 dinars with Eastern legends are also quite heavy. The dinar dated 114/732-33 has a weight of 4.34 g, the example dated 115/733-34 has a weight of 4.35 g, while the example dated 120/737-38 weighs 4.31 g. A third example dated 127/744-45 but not included in the analysis is even heavier, weighing 4.37 g. However, it has a mount attached.

The metrological data for the *Ifriqiya* and *al-Andalus* mints appears to indicate different mint standards, with the standard of the Iberian Peninsula dinars slightly higher than the standard for the *Ifriqiya* dinars. Again, however, we need to be cautious, as the confidence intervals of the two sets of coinage are very close. Both standards are higher than the Grierson Damascus standard of 4.25 g, although quite close to the alternative Sears Damascus standard of 4.28 g.

### ***SEMISSES/NISF***

Table 76 provides the metrological data for the Islamic semisses and *nisf* struck in North Africa and the Iberian Peninsula during the Umayyad period. Again, for many of the series, we have too few surviving examples to make definitive conclusions.

**Table 76: Metrology of the Semisses and *Nisf* struck in North Africa and the Iberian Peninsula during the Umayyad Period**

Ser./Ph.	No	MEAN	MED	MODE	MAX	MIN	STDV	95% CI	
NA 1	10	2.03	2.02	unclear	2.13	1.95	0.06	1.99	2.07
NA 2/1	18	2.08	2.08	2.09	2.21	1.96	0.06	2.04	2.10
NA 2/2	31	2.04	2.04	2.02	2.10	1.97	0.03	2.03	2.05
NA 2/3	6	1.96	1.97	none	2.06	1.82	0.08	1.89	2.05
IP 3	10	1.91	1.91	unclear	1.94	1.87	0.03	1.89	1.93
IP 4	5	2.15	2.14	unclear	2.16	2.13	0.01	2.14	2.16
NM 4 <sup>264</sup>	57	2.09	2.11	2.12	2.29	1.48 <sup>265</sup>	0.08	2.06	2.10

#### ***Series NA 1***

The weights of the 10 semisses of Series NA 1 have no obvious mode (see Figure 106 below), with a relatively high standard deviation. What is clear is that there does not appear to be any relationship between the Series NA 1 semisses and the semisses struck by the Byzantines in seventh century at Carthage. The eight Byzantine semisses in Wroth and Grierson yield a mean of 2.16 g and a median of 2.13 g,<sup>266</sup> substantially higher than the Series NA 1 examples with their mean and median of 2.03 g and 2.02 g respectively.

#### ***Series NA 1, Phase 1 and Phase 2***

Like the corresponding solidi, the Series NA 2, Phase 1 semisses seem to be slightly heavier than the previously struck Series NA 1 and the later struck Series NA 2, Phase 2 examples. It is only with Series NA 2, Phase 2 that we have a somewhat symmetrical distribution, as the mean and median are both 2.04 g, with a slightly lower mode of 2.02 g.

<sup>264</sup> Calculations exclude the one *nisf* clipped to the weight of a tremissis.

<sup>265</sup> Example with lowest weight clipped to that of a tremissis.

<sup>266</sup> Grierson – 2 semisses of Heraclius (2.13 g) and Constans II (2.12 g); Wroth – 6 semisses of Constans II (2.106 g, 2.203 g, 2.27 g, 2.138 g, 2.23 g) and Constantine IV (2.119 g).

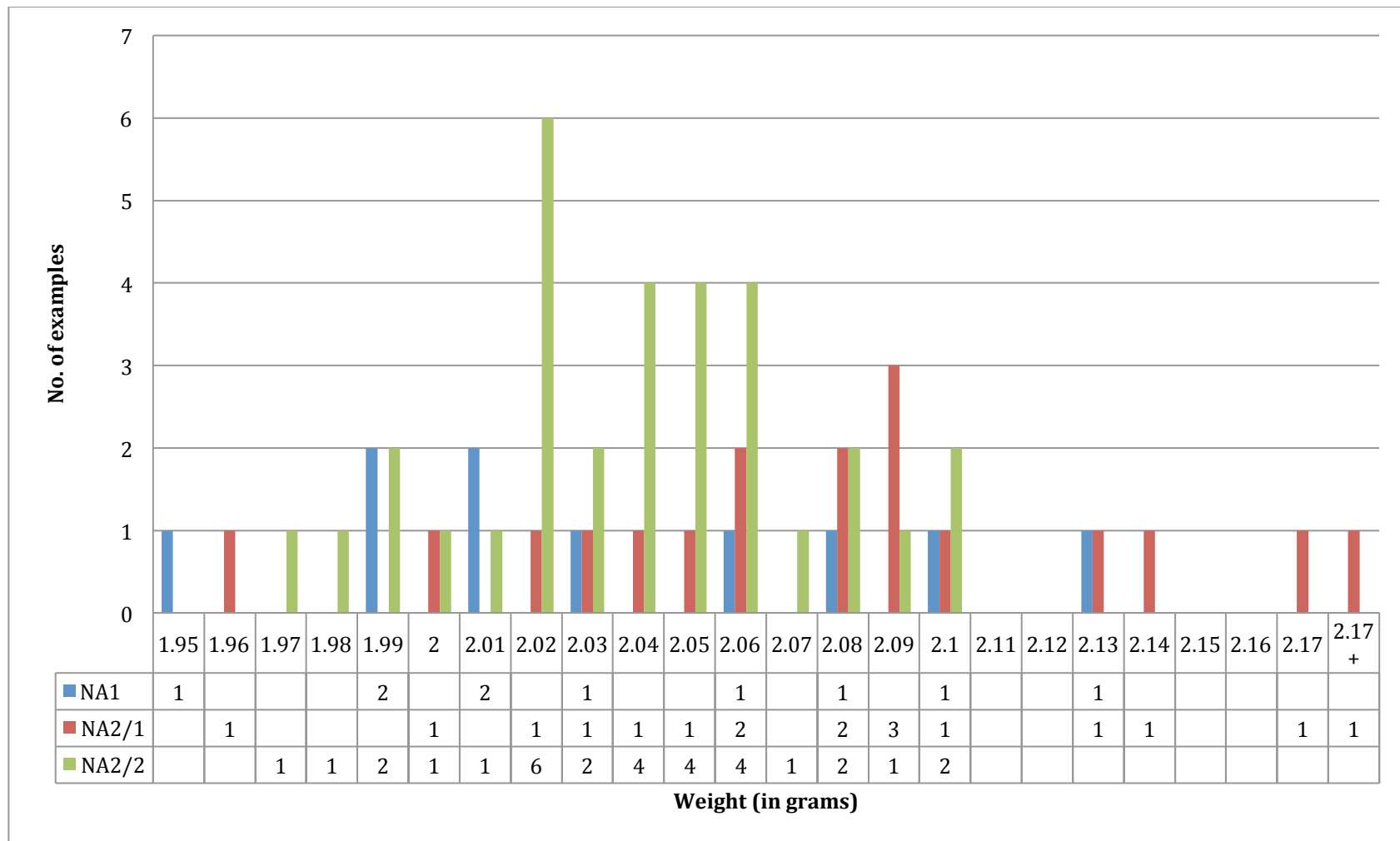


Figure 106: Distribution of weights for the Islamic semisses struck in North Africa prior to the conquest of the Iberian Peninsula.

**Series NA 2, Phase 3 and Series IP 3**

The Muslim conquerors of the Iberian Peninsula only struck solidi in the initial years of the conquest. It is only with the return of the main mint to North Africa in 95/713-14 that semisses were once again struck. The six examples from that year and 96/714-15 clearly show a drop in weight from those struck prior to the conquest, with a mean of 1.96, a median of 1.97 g and no mode. The weights of the Series IP 3 semisses, struck in 98/716-17 are even lower in weight with a mean and median of 1.91 g. The drop in weight for the Series NA 2, Phase 3 and Series IP 3 semisses mirrors the drop in weight of the corresponding solidi.

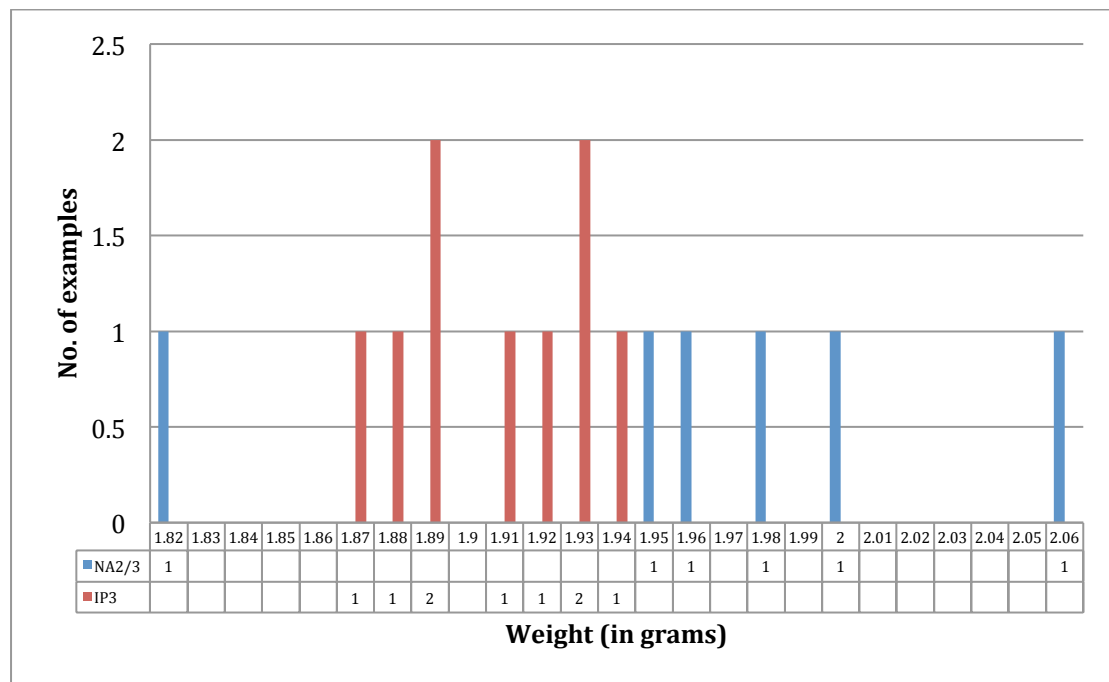


Figure 107: Distribution of weights for the Series NA 2, Phase 3 and Series IP 3 semisses.

**Series NM 4 and Series IP 4**

As I discussed beginning on p. 243, although the Series IP 4 fractionals bear the mint name *al-Andalus*, the attribution of the Series NA 4 fractionals (struck between 91/709-10 and 101/719-20) to *Ifriqiya* is contentious. The mean and median of the Series NM *nisf* are 2.09 g and 2.11 g respectively, only slightly higher than Series NA 2, Phase 1 (see Table 76 above). The 95% confidence intervals are also similar, with

confidence intervals of 2.04 g to 2.10 g for Series NA 2, Phase 1 and confidence intervals of 2.06 g to 2.10 g for Series NM 4. The 90<sup>th</sup> percentile for Series NM 4 (important to calculate as the distribution is skewed to the left) is 2.14 g, however, closer to the mean of the Byzantine semisses of 2.16 g and slightly higher than the Byzantine median of 2.13 g. The averages for the Series IP 4 *nisf* of 102/720-21 are even higher than those of Series NM 4, with a mean of 2.15 g and a median 2.14 g. It is worth repeating, however, that all of the examples from Series IP 4 come from the same obverse and reverse die (see Table 71 on p. 245).

Clipping is a common feature for gold and silver coinage struck throughout the Umayyad Caliphate, and the Series NM 4 *nisf* is no different, with many of the examples clipped. All of the examples with a weight of 2.02 g or lower are clipped (see Figure 108 *Figure 108*), with one example clearly clipped to the weight of a *thulth*. Some of the examples weighing between 2.03 g and 2.06 g may also be clipped, but it is difficult to discern from the images.



*Figure 108: Reverse of clipped Series NM 4 nisf, dated 91/709-10. icaL24, L:4087. Image courtesy of Baldwin's Auctions, Ltd. (1.91 g) (scale x4)*

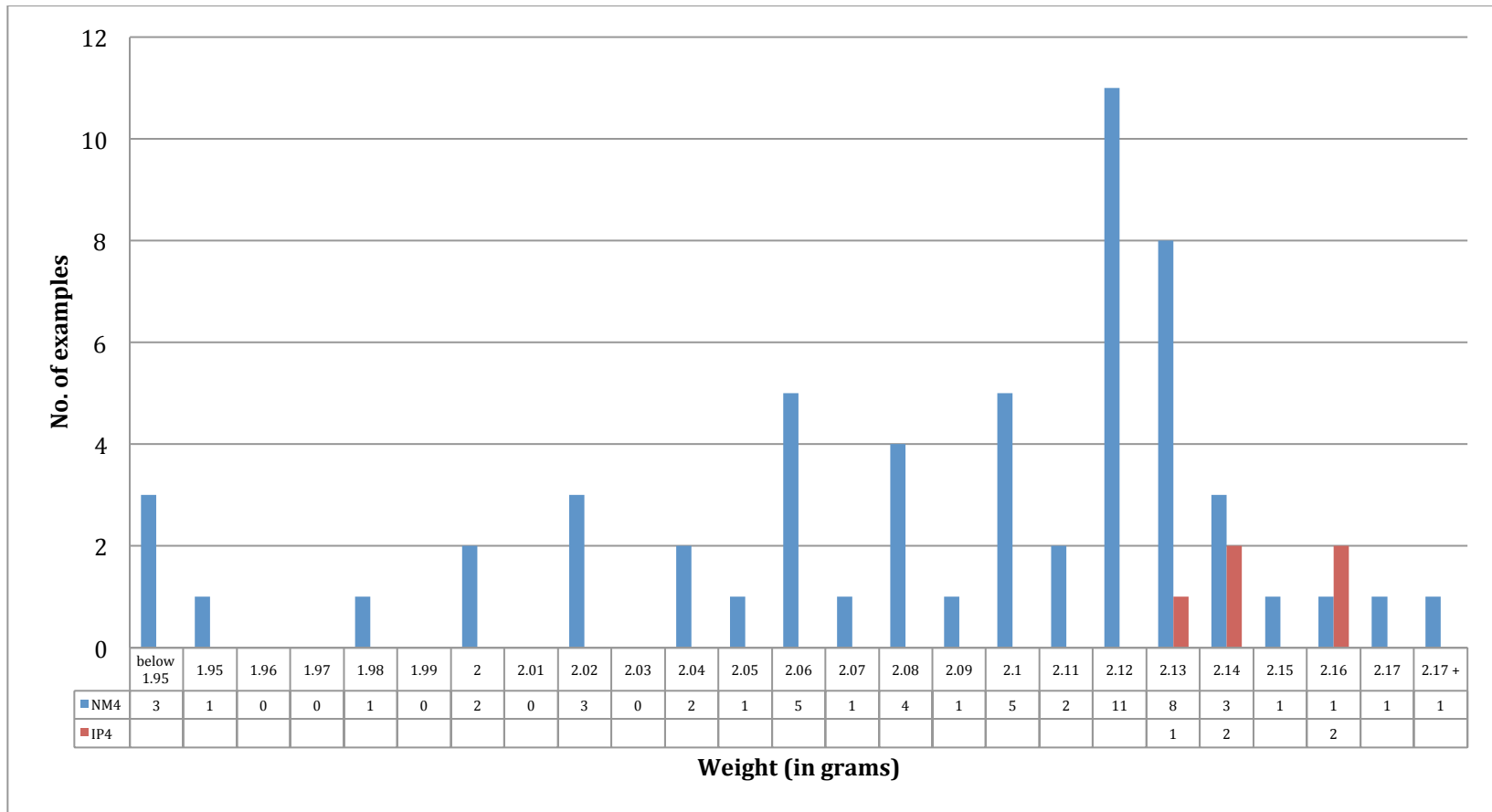


Figure 109: Distribution of weights for the Series NM 4 and Series IP 4 nisf.

### **TREMISSES/ THULTH**

Table 77 provides the metrological data for the Islamic tremisses and *thulth* struck in North Africa and the Iberian Peninsula during the Umayyad period.

**Table 77: Metrological Data of the Tremisses and *Thulth* Struck in North Africa and the Iberian Peninsula During the Umayyad Period**

Ser./Ph.	No.	MEAN	MED	MODE	MAX	MIN	STDV	95% CI	
NA 1	29	1.36	1.36	unclear	1.43	1.31	0.03	1.35	1.37
NA 2/1	45	1.40	1.40	1.40	1.49	1.21	0.05	1.39	1.41
NA 2/2	19	1.35	1.35	1.35	1.41	1.29	0.03	1.34	1.37
NA 2/3	4	1.34	1.33	N/A	1.37	1.31	0.03	1.29	1.39
IP 3	1	1.26			Not Applicable				
IP 4	9 <sup>267</sup>	1.45	1.45	1.46	1.46	1.02 <sup>268</sup>	0.01	1.44	1.46
NM 4 <sup>269</sup>	165	1.38	1.40	1.41	1.47	0.91 <sup>270</sup>	0.05	1.37	1.39

### ***Series NA 1 and Series NA 2, Phases 1 and 2***

The distributions for the tremisses struck in North Africa prior to the conquest of the Iberian Peninsula (Series NA 1, Series NA 2, Phases 1 and 2) all appear to be symmetrical, as demonstrated by their equal means, medians, and modes (see Figure 110).

After the conquest of North Africa, the early Islamic mint appears to have struck Series NA 1 tremisses to a standard of approximately 1.35 g. Like the corresponding semisses, this is significantly lower than the tremisses struck by the Byzantines in Carthage. The 10 Byzantine examples recorded in Wroth and Grierson have a mean and median of 1.45 g and 1.47 g respectively, with 95% confidence intervals for the mean of 1.43 g to 1.47 g.<sup>271</sup> The tremisses struck prior to the invasion of the Iberian Peninsula seem to have followed the same weight trajectory as the earliest semisses, with the Series NA 2, Phase 1 tremisses higher in weight than those struck earlier in

267 Calculations do not include one example clipped to weight of ¼ dinar.

268 Clipped to weight of ¼ dinar.

269 Calculations do not include 10 tremisses clipped to weights of ¼ dinar.

270 Clipped to weight of ¼ dinar.

271 Grierson: Constantine IV (59 bis); Wroth: Constans II (291 to 299).

Series NA 1 and later in Series NA 2, Phase 2. This phenomenon is even more pronounced than for the corresponding semisses and can be clearly seen in Figure 110 below.

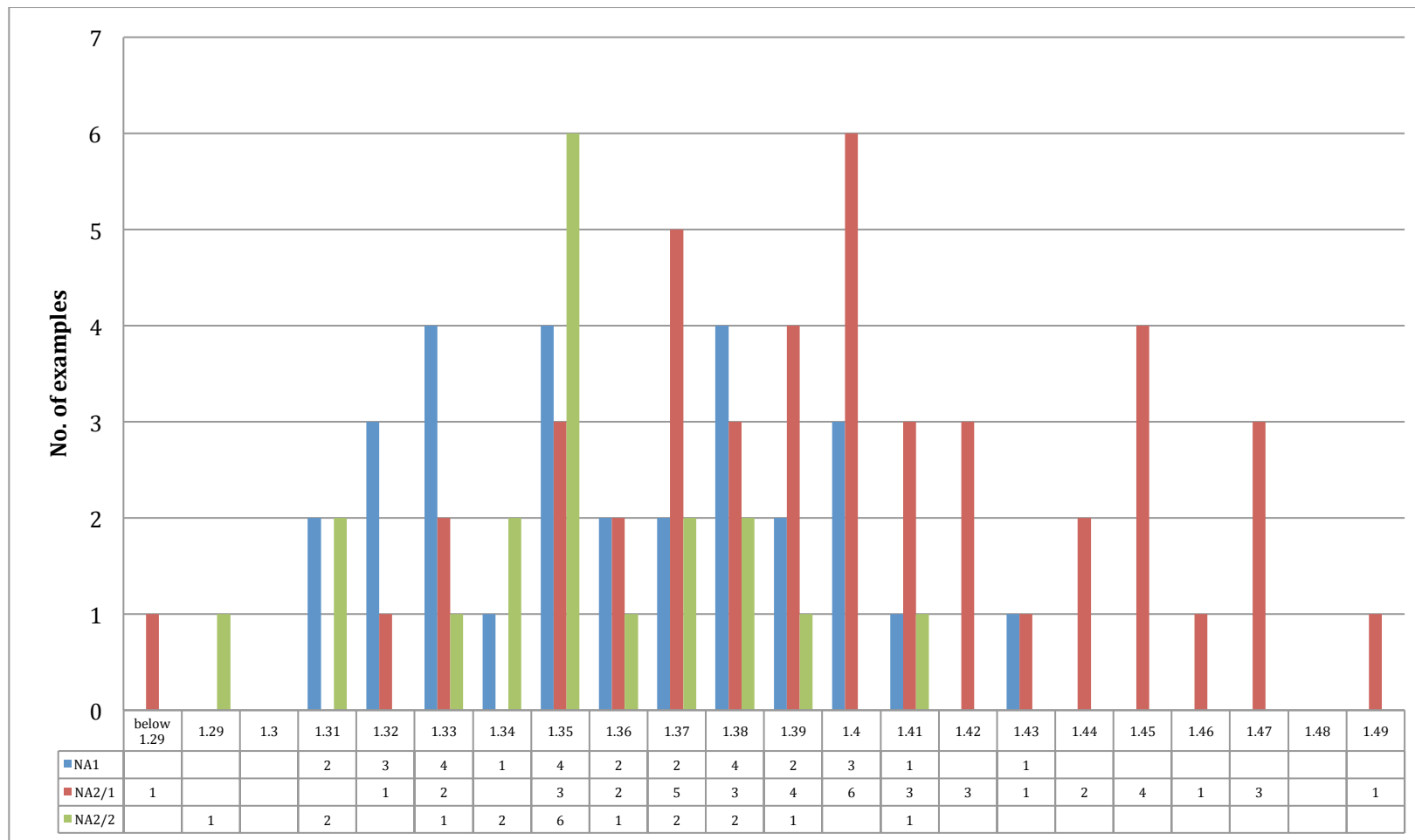


Figure 110: Distribution of the weights of the Islamic tremisses struck prior to the invasion of the Iberian Peninsula.

### ***Series NA 2, Phase 3 and Series IP 3***

The Muslims did not strike any Islamic tremisses in the Iberian Peninsula in the first few years after the invasion. A small number of Series NA 1, Phase 3 tremisses were struck in the years 95/713-14 and 96/714-15 after the return of the main mint to North Africa. These coins appear to be struck to a slightly lower standard than the tremisses struck prior to the Islamic invasion of the Iberian Peninsula. Again, this is similar to the corresponding semisses. We cannot really say anything about the IP 3 tremisses, as we have only one example with a very low weight – 1.26 g.

### ***Series NM4 and Series IP 4***

The mean (1.38 g), median (1.40 g), and mode (1.41 g) for the Series NM 4 *thulth* is similar to the mint standard of the Series NA 2, Phase 1 tremisses (see Table 77). For Series NM 4, the mean is below the median, which in turn is below the mode (see Figure 12), and with a distribution skewed to the left. It is therefore perhaps more appropriate to again look at a percentile. The 90<sup>th</sup> percentile for Series NM 4 is 1.43 g, slightly higher than the mint standard for Series NA 2, Phase 1 and slightly lower than the Byzantine mint standard of 1.43 g to 1.47 g. Series IP 4 appears to have a weight standard of 1.45 g, slightly higher than Series NM 4, although, similar to the IP 4 *nisf*, they were struck from only one obverse and reverse die. The weights of the Series NM 4 and IP 4 Islamic *thulth* are also similar to the weights of the Visigoth tremisses struck in the Iberian Peninsula in the seventh century, which vary between 1.40 g and 1.50 g.<sup>272</sup>

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272 PLIEGO 2007, pp. 201-09.

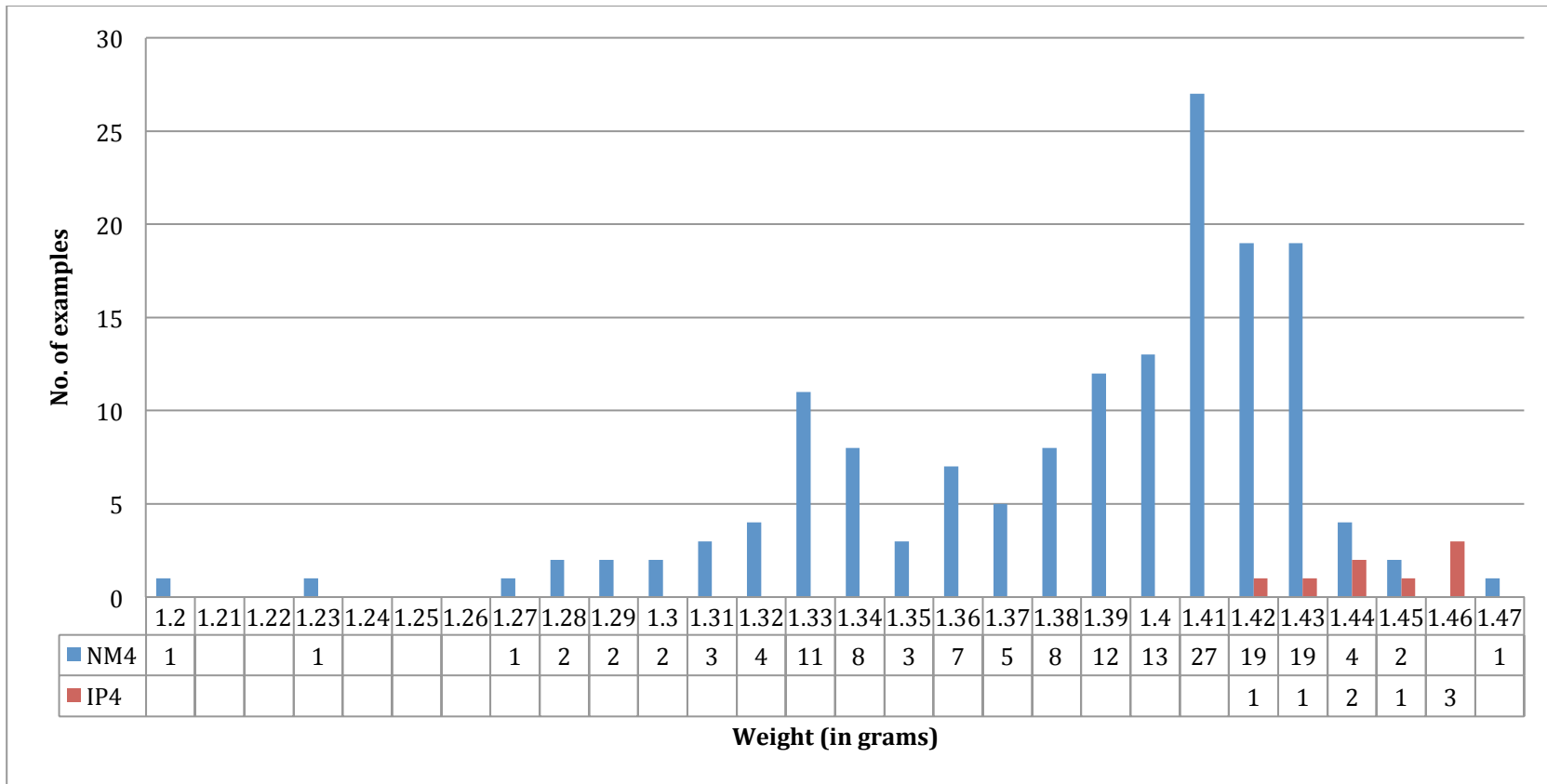


Figure 111: Distribution of weights for the thulth struck without a mint name and the mint name al-Andalus.

The distribution of weights for the Series NA 4 *thulth* in Figure 111 also has a second lower peak of 1.33 g. Many of the *thulth* weighing between 1.36 g and 1.39 g appear to be clipped, and all of the coins below 1.36 are clipped. It should also be noted that 10 examples of the Series NM 4 *thulth* appear to have been clipped to the weight of a one-quarter ( $\frac{1}{4}$ ) dinar, and weigh from 0.91 g to 1.17 g (Figure 112). This suggests that a fourth, lower denomination was in circulation in North Africa.



*Figure 112: Series NM 4 thulth clipped to the weight of a  $\frac{1}{4}$  dinar. ME66, L:471. Image courtesy of Morton & Eden Ltd. (1.02 g) (scale x4)*

***THE RELATIONSHIP BETWEEN THE WEIGHTS OF THE DENOMINATIONS***

Before turning to the mint standards of the dirhams, it is worthwhile investigating the relationship between the actual weights of the gold fractionals and the corresponding solidi/dinars of which they were ostensibly the fractions.

**Table 78: Weights of the Gold Fractionals and Theoretical Weights of Solidi/Dinars**

<b>Series/Phase</b>	<b>Denomination</b>	<b>Mint Standard for the Fractional</b>	<b>Theoretical Standard of Solidi/Dinar</b>
<b>Series NA 1</b>	Sem	2.03	4.06
	Tre	1.36	4.08
<b>Series NA 2, Ph. 1</b>	Sem	2.09	4.18
	Tre	1.40	4.20
<b>Series NA 2, Ph. 2</b>	Sem	2.04	4.08
	Tre	1.35	4.05
<b>Series NA 2, Ph. 3</b>	Sem	1.96	3.92
	Tre	1.34	4.02
<b>Series IP 3</b>	Sem	1.91	3.82
	Tre	Only 1 example	
<b>Series NM 4</b>	Sem	2.13	4.26
	Tre	1.43	4.29
<b>Series IP 4</b>	Sem	2.15	4.30
	Tre	1.45	4.35

In theory, multiplying the mint standards for the gold fractionals by either two or three (depending on the denomination) should give a weight close to the mint standard for the corresponding solidi or dinar. As can be seen from Table 78, there does not appear to be a metrological relationship between the gold fractionals and the solidi for Series 1 through 3. In all cases for these series, the weights of the semisses and tremisses are considerably lower than what might be expected given the mint standards for the solidi. It is only for Series NM 4 that a multiplication of the weights for the gold fractionals yields a figure very close to the actual weights of the corresponding dinars. For Series IP 4, the multiplication of the weights of the gold fractionals yields a number higher than what would be expected, but again it should be emphasized that the two denominations were struck from only one obverse and

reverse die for each of the denominations, and therefore we cannot draw any conclusions from this result.

### ***SUMMARY OF THE METROLOGICAL ANALYSIS OF THE GOLD COINAGE***

**Table 79: Comparison of Mint Standards of the Gold Coinage struck in North Africa and the Iberian Peninsula during the Umayyad Caliphate**

Series/Phase	Denominations		
	Solidus	Semissis	Tremissis
<b>NA 1</b>	4.33	2.03	1.36
<b>NA 2/Ph. 1</b>	4.30	2.09	1.40
<b>NA 2/Ph. 2</b>	4.32	2.04	1.35
<b>Series IP 2 (main)</b>	4.26	N/A	N/A
<b>NA 2/Ph. 3</b>	4.24	1.96	1.34
<b>NA 3</b>	4.23	N/A	N/A
<b>IP 3</b>	4.13	1.91	1.26 <sup>273</sup>
<b>NM 4 fractionals</b>	N/A	2.13	1.43
<b>NA 4</b>	4.27	N/A	N/A
<b>IP 4</b>	4.28	2.15	1.45

Table 79 sets out the theoretical mint standards for the various denominations of gold coinage struck in North Africa and the Iberian Peninsula during the Umayyad Caliphate. Although I have chosen to record precise mint standard weights in Table 79, it should be emphasized that the small number of surviving examples for most of the series and phases means that in most cases we still do not have enough metrological evidence to generate definitive conclusions.

The evidence above suggests that during the period 79/698 to 92/710-11 the Muslim administration of North Africa adopted the Byzantine mint standard for the transitional solidi of approximately 4.30 g to 4.32 g. This standard was abandoned after the invasion of the Iberian Peninsula, as the main Islamic mint appears to have been content to strike solidi whose weight varied considerably, a practice that continued after the return of the main Islamic mint to North Africa in 95/713-14.

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<sup>273</sup> Only one example.

The introduction of Series NA 3, bilingual solidi in 97/715-16 is the first time the North African mint began to strike solidi to the standard of the Post-Reform dinars of Damascus. The Iberian Peninsula mint, however, struck bilingual solidi to a much lower standard. The use of the Damascus mint standard at the North African mint continued with the introduction of Series NA 4, Post-Reform dinars in 100/718-19. This conclusion, of course, relies on the adoption of Sear's standard of 4.28 g, as the majority of the weights of the North African dinars are higher than Grierson's standard of 4.25g.

The mint standards for the Series 1 through 3 gold fractionals do not appear to have had a metrological relationship with either the previously struck Byzantine fractionals or the corresponding Islamic coinage. The only exception to this is the Series NM 4 *nisf* and *thulth*. Again, the weights of these two groups seem to point to a mint standard for the Post-Reform dinar of 4.28 g.

### ***DIRHAMS***

There have been two limited studies of the metrology of the Series IP 4 *al-Andalus* dirhams, and no earlier studies of the Series NA 4 *Ifrīqiya* dirhams. Miles analysed 13 Series IP 4 dirhams, and calculated an average of 2.81 g with a maximum of 2.96 g and a minimum of 2.58 g.<sup>274</sup> Bates examined 20 Series IP 4 dirhams from the American Numismatic Society in a later study and observed that 12 of the 20 examples weighed more than 2.90 g, with no apparent change over time. He suggested, based on these results, that the standard for the Series IP 4 dirhams was similar to that of Damascus, but heavier than the standard of dirhams struck in Iraq and Iran and quite a bit heavier than the contemporary dirhams struck in Egypt (with a weight standard of 2.83 g). For Bates, this suggested that each region had a different

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274 MILES 1950, p. 90.

standard.<sup>275</sup> Unfortunately, Bates did not provide further, detailed information, such as the standards in Damascus and Iraq and Iran that he was using for comparative purposes, nor do we know where he obtained the dataset for the Damascus, Iraq and Iran, or Egyptian dirhams.

Table 80 sets out the metrological data for the Series NA 4 and IP 4 dirhams struck during the Umayyad period. The *Ifriqiya* examples are dated from 97/715-16 to 132/749-50 while the *al-Andalus* coinage is dated from 103/721-22 to 129/746-47. The calculations in Table 80 include clipped dirhams. Evidence of clipping is found on a large number of the examples, but it is difficult to separate out in many cases.

**Table 80: Metrological Data for the Dirhams Struck in *Ifriqiya* and the *al-Andalus* during the Umayyad Period**

Ser.	No	MEAN	MED	MODE	MAX	MIN	STDV	95% CI	
NA 4	340	2.78	2.85	2.85	2.99	1.36	0.21	2.76	2.80
IP 4	343	2.80	2.86	2.92	3.00	1.76	0.18	2.77	2.81

Table 80 reveals similar means and medians for the *Ifriqiya* and *al-Andalus* dirhams, but substantially different modes, although the *al-Andalus* distribution also has a peak at 2.86 g, similar to the mode of the Series NA 4 coinage of 2.85 g. This is somewhat deceptive, however. If we consider Figure 113 below, we can see that the majority of the Series NA 4 dirhams weigh above 2.86 g.

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275 BATES 1992, p. 288.

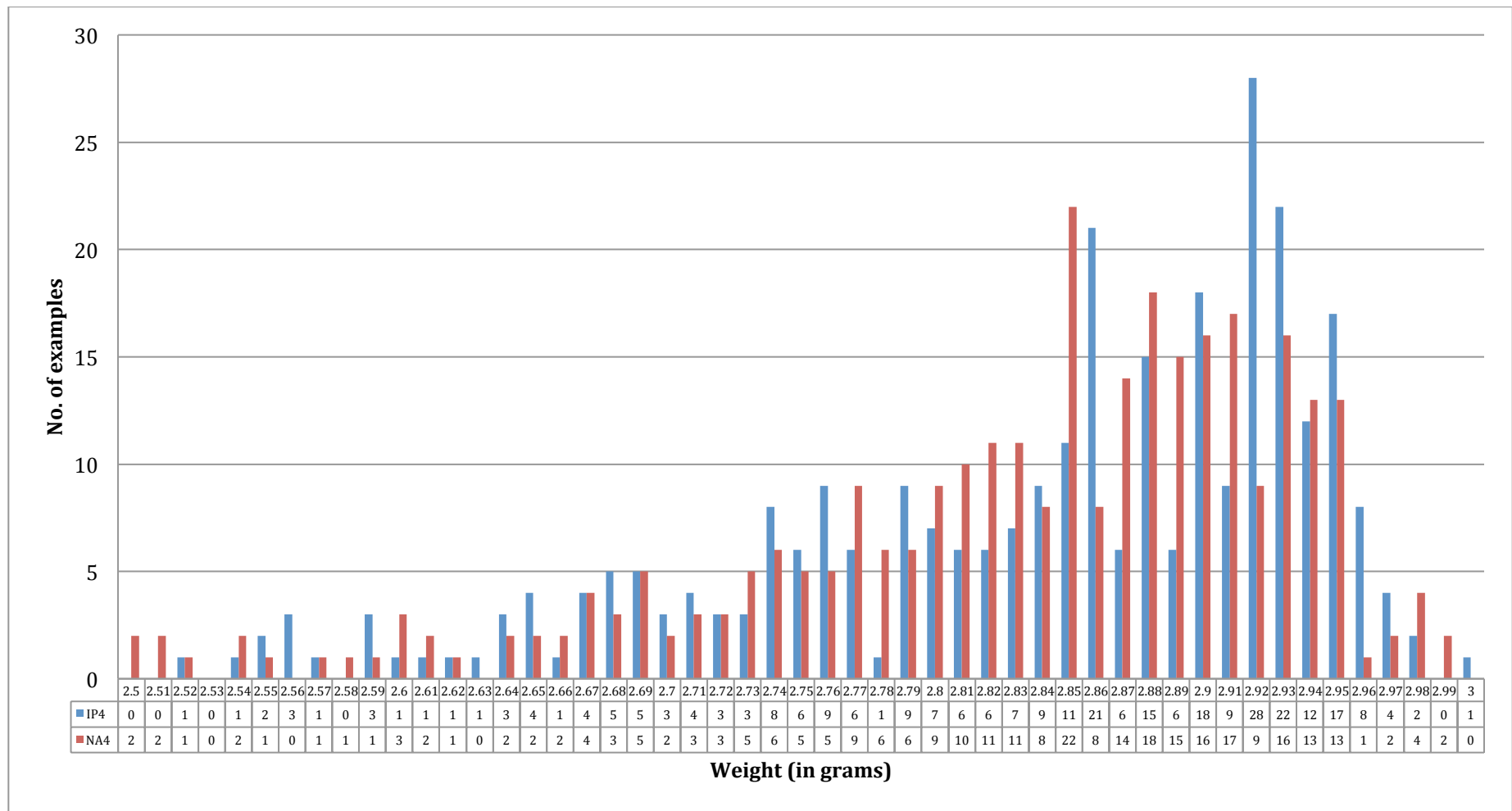


Figure 113: Weights of the North Africa and Iberian Peninsula Dirhams struck during the Umayyad Period.

As the weights of the *Ifriqiya* and *al-Andalus* dirhams skew to the left, it is more appropriate to consider the 97<sup>th</sup> percentile for these two distributions, as opposed to the averages. The 97<sup>th</sup> percentile for the *Ifriqiya* dirhams is 2.95 g, while that of the Iberian Peninsula coinage is 2.96 g. This is very close to the data provided by Sears in his study of the dirhams of Damascus and Wāsiṭ.<sup>276</sup> According to Sears, the dirhams of Damascus dated from 90/708-9 to 131/748-9 were consistently struck to a mint standard of 2.91-2 g. In Wāsiṭ, the dirham mint standard appears initially to have been higher, as the standard for the dirhams struck at this mint between 90/708-9 and 102/720-12 is 2.98 g. For the remainder of the Umayyad period, it drops slightly to between 2.93 and 2.96 g.

I have divided the weights of the dirhams into four periods in order to determine whether the mint standard for the dirhams of *Ifriqiya* and *al-Andalus* remained consistent throughout the Umayyad Caliphate or whether it changed over time (see Table 81 and Table 82 and Figure 114 and Figure 115). I have adopted a chronological division based on major changes in the annulet patterns for the *Ifriqiya* dirhams (see p. 240). I have kept the same chronological division for the *al-Andalus* dirhams, although this division does not reflect as clearly changes in the annulet patterns for that series.

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<sup>276</sup> Sears used 110 Damascus dirhams and 294 Wāsiṭ dirhams in his calculations. The dirhams were primarily from the collections of the British Museum and the American Numismatic Society, supplemented by some private collections. See SEARS 1997, p. 310.

**Table 81: Metrological Data for the Dirhams Struck in *Ifrīqiya***

DATE	No	MEAN	MED	MODE	MAX	MIN	STDV	97 <sup>th</sup> per.
97-105	123	2.77	2.83	2.89	2.95	1.67	0.20	2.93
106-110	44	2.77	2.84	2.85, 2.89	2.95	2.10	0.19	2.93
111-120	147	2.81	2.88	2.92-2.94	2.99	1.68	0.21	2.98
124-132	26	2.71	2.80	2.85	2.93	1.36	0.31	2.91

**Table 82: Metrological Data for the Dirhams Struck in *al-Andalus***

DATE	No	MEAN	MED	MODE	MAX	MIN	STDV	97 <sup>th</sup> per.
103-105	33	2.78	2.86	unclear	3.00	2.38	0.17	2.98
106-110	78	2.80	2.88	2.90, 2.92	2.98	2.07	0.19	2.96
111-120	180	2.80	2.85	2.92	2.97	1.76	0.18	2.96
121-129	43	2.75	2.85	2.85	2.94	2.18	0.19	2.93

The division of the dirhams into the four periods shows the changes that occurred in the mint standard of the two mints over time. In *Ifrīqiya*, between 97/715-16 and 110/728-29, the mint standard appears to have been approximately 2.93 g. In 111/729-30, the weights of the *Ifrīqiya* dirhams appear to have increased, with a mint standard of 2.98 g. This mint standard appears to have been maintained until approximately 120/737-38, when the mint standard dropped significantly, to 2.91 g. This final mint standard is closer to the mode of 2.85 g for the amalgamated weights of the *Ifrīqiya* dirhams (see Figure 113). Given that clear evidence of clipping on the *Ifrīqiya* dirhams can be found on at least some examples of this weight, it suggests that in the later Umayyad period, moneychangers and others attempted to clip the existing dirhams to the later standard.

In *al-Andalus*, the mint appears to have struck dirhams to a consistently high standard of 2.96 g to 2.98 g from 103/721-22 to 120/737-38. Like the *Ifrīqiya* mint, the mint standard for the *al-Andalus* dirhams drops after 120/737-38 to 2.93 g, although this standard is still higher than the standard in *Ifrīqiya*.

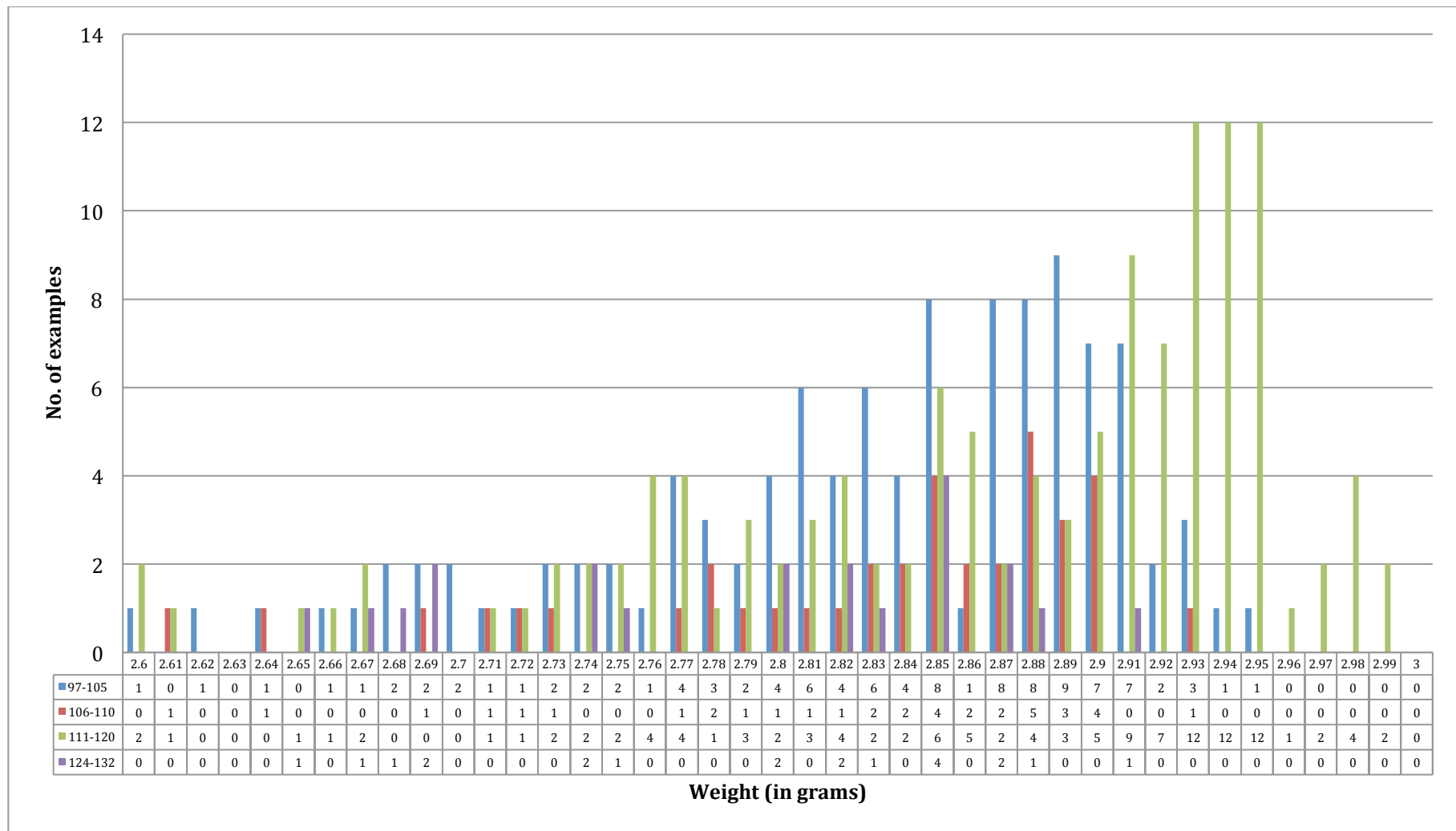


Figure 114: Distribution of weights for the Series NA 4 dirhams struck in Ifrīqiya, divided chronologically.

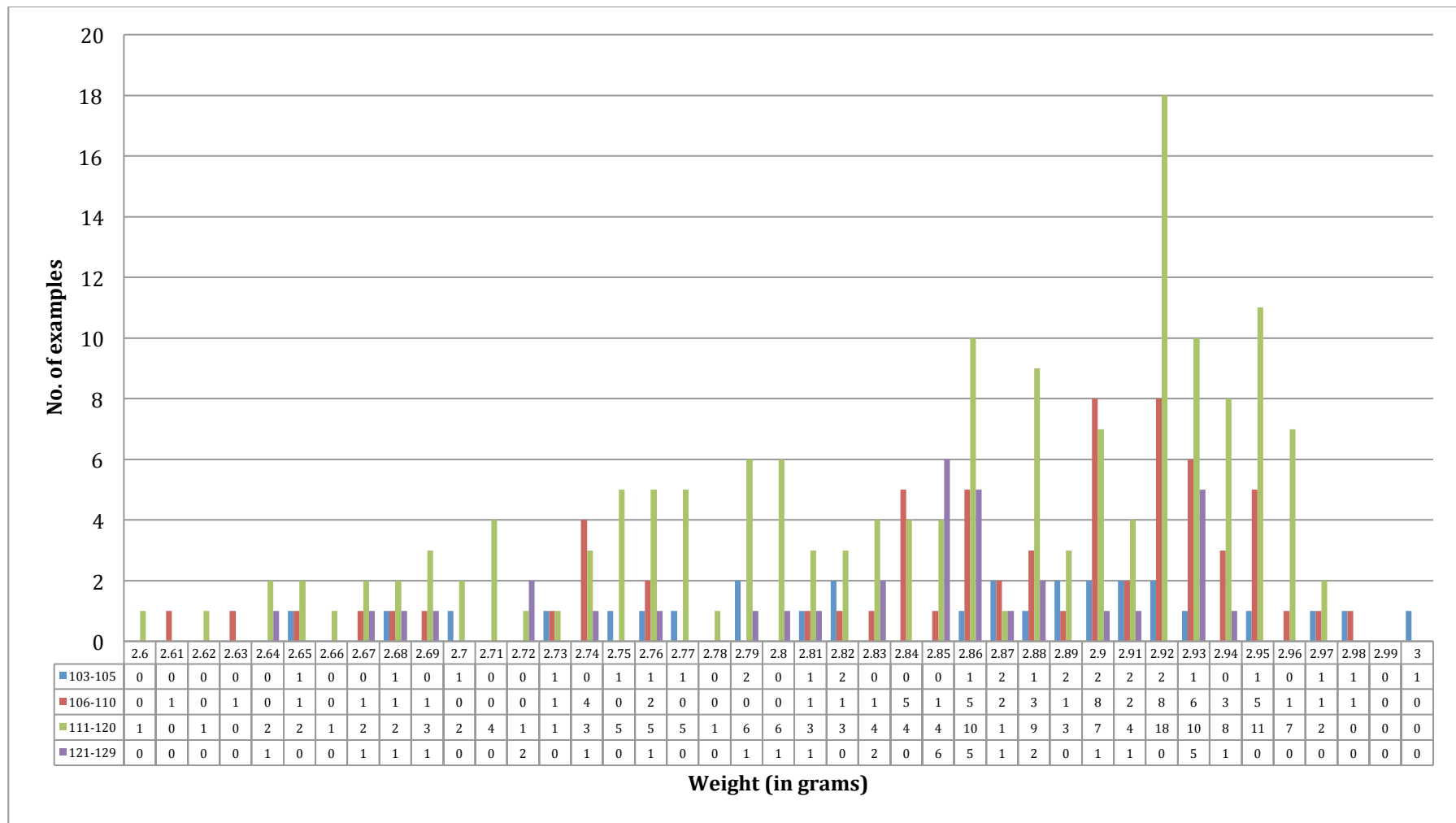


Figure 115: Distribution of weights for the Series IP 4 Dirhams struck in al-Andalus, divided chronologically.

The *Ifrīqiya* dirhams initially appear to have been struck to a mint standard (2.93 g) similar to the mint standard of Damascus (2.91-2 g). This changed in 111/729-30, when the mint standard increased to 2.98 g, a standard that continued until 120/737-38. The standard in *Ifrīqiya* then dropped significantly, to 2.91 g. In *al-Andalus*, dirhams were initially struck to a high mint standard of 2.96 g to 2.98 g. Like the *Ifrīqiya* silver, the mint standard dropped after 120/737-38, although not to the same degree as the *Ifrīqiya* dirhams.

## MODULE

The discussion of the module is restricted to the gold coinage.<sup>277</sup> Table 83 through Table 86 set out the modules of the solidi and fractionals.

**Table 83: Modules of the Islamic solidi of North Africa and the Iberian Peninsula (in millimetres)**

Series/Phase	No.	Min	Max	Average
NA1	9	1.2	1.5	1.33
NA2/Ph1	33	1.12	1.4	1.28
NA2/Ph2	4	1.18	1.27	1.22
IP2	25	1.1	1.42	1.25
NA2/Ph3	4	1.2	1.4	1.28
NA3	29	1.2	1.6	1.36
IP3	26	1.25	1.52	1.39

**Table 84: Modules of the dinars of North Africa and the Iberian Peninsula (in millimetres)**

Series/Phase	No.	Min	Max	Average
NA4W Small Flan	15	1.6	1.7	1.66
NA4W Large Flan	29	1.8	2.0	1.87
N4E	7	2.0	2.16	2.09
IP4W	14	1.8	2.0	1.92
IP4E	3	2.0	2.15	2.05

<sup>277</sup> The module of the silver dirhams, unless clipped, is consistently 27 to 29 mm.

**Table 85: Modules of the semisses/*nisf* of North Africa and the Iberian Peninsula (in millimetres)**

Series/Phase	No.	Min	Max	Average
NA1	10	1.0	1.27	1.11
NA2/Ph1	15	1.0	1.3	1.13
NA2/Ph2	25	0.99	1.27	1.09
NA2/Ph3	7	1.02	1.2	1.14
IP3	8	1.1	1.2	1.17
IP4	5	1.46	1.6	1.55
NM4	39	1.4	1.75	1.51

**Table 86: Modules of the tremisses/*thulth* of North Africa and Iberian Peninsula (in millimetres)**

Series/Phase	No.	Min	Max	Average
NA1	24	0.97	1.30	1.10
NA2/Ph1	44	1.0	1.2	1.08
NA2/Ph2	16	0.9	1.14	0.99
NA2/Ph3	3	1.1	1.14	1.13
IP3	1	N/A		1.02
IP4	7	1.3	1.52	1.42
NM4	112	1.1	1.7	1.45

No particularly informative conclusions can be drawn from the calculations in the tables above. The fractional coinage struck prior to and immediately after the conquest of the Iberian Peninsula (Series NA 1 and Series NA 2, all Phases) appears to have maintained a consistent module, with little difference between the tremisses and semisses. There may have been a slight increase in the module of the semisses with the introduction of Series IP 3, but with so few examples it is once again difficult to draw any conclusions. As one might expect, the module of the Series IP 4 and NM 4 *nisf* and *thulth* are larger than that of the transitional coinage, as the mints abandoned the globular fabric in place since the invasion of North Africa.

The gradual increase in the module of the solidi and dinars can be clearly seen in Table 83 and Table 84. Again, there does not appear to have been any substantive increase or decrease in the module until the introduction of Series NA 3 and IP 3. The next increase in the module occurs with the introduction of the Series NA 4 dinars, although they are still smaller than the dinars struck elsewhere in the

Caliphate. As previously discussed on p. 226, it is only in 101/719-20 that the North African mint adopted the module of the Eastern dinars. A slight increase in the module may have also taken place in both North Africa and the Iberian Peninsula in 114/732-33, corresponding to changes in the legends.

## METALLURGICAL ANALYSIS OF THE GOLD COINAGE

As outlined previously in the Typology, I divide the early Islamic gold coinage of North Africa and the Iberian Peninsula into four series:

	North Africa	Iberian Peninsula
<b>Series 1 – Two Imperial Bust</b>	✓	✗
<b>Series 2 – Latin Epigraphic</b>	✓	✓
<b>Series 3 - Bilingual</b>	✓	✓
<b>Series 4 – Post-Reform</b>	✓	✓

For the purposes of this chapter, however, I will organize the coinage somewhat differently. I divide the coinage into four groups, with each of the groups sharing common metallurgical characteristics, both in the estimated fineness and in their elemental composition. The four groups are:

1. Coinage minted prior to the invasion of the Iberian Peninsula. During this period, the Muslims in North Africa minted two series in three denominations (solidi, semisses, and tremisses) – Series NA 1 and Series NA 2, Phases 1 and 2. The exact dates for the striking of Series NA 1 are unknown, but they are estimated to be 79/698-699 to 84/703-4. Series NA 2, Phase 1 was struck from 84/703-4 to 87/705-6, while Series NA 2, Phase 2 was minted from 89/707-8 to 92/710-11.
2. The second group encompasses the complex Series IP 2 solidi that the Muslims minted after the invasion of the Iberian Peninsula. This coinage was struck from 93/711-12 until at least 95/713-14.<sup>278</sup>
3. The third group includes all of the transitional gold coinage struck after the main Islamic mint returned to North Africa in 95/713-14. In 95/713-14 and 96/714-15 the North African mint once again struck Latin-Epigraphic gold in

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<sup>278</sup> As I have argued elsewhere in this dissertation, the Series IP 2 solidi likely continued to be struck at irregular mints in the Iberian Peninsula after 95/713-14 (with immobilized dates).

three denominations (Series NA 2, Phase 3). In 97/715-16, the mint shifted to the production of bilingual solidi and continued to strike these coins until 99/717-18 (Series NA 3). The year 98/716-17 also saw the striking of Series IP 3 bilingual solidi and a small number of unilingual semisses and tremisses in that year.

4. The fourth group consists of the Post-Reform coinage. The Muslims struck gold coinage with the mint name *Ifrīqiya* from 100/718-19 (Series NA 4) and with the mint name *al-Andalus* from 102/720-21 (Series IP 4). I have also included in this group the *nisf* and *thulth* dinars minted beginning in 91/709-10, prior to the invasion of the Iberian Peninsula (Series NM 4). The Muslims issued Series 4 gold fractionals, all without a mint name except the 102/720-21 *al-Andalus* issue, intermittently up until 103/721-22. Including Series NM 4 in this group does create a chronological disjunction, as they were first struck just prior to the Muslim invasion of the Iberian Peninsula. Their elemental make-up, however, is most similar to that of the other Post-Reform coinage.

The discussion of the metallurgy of the early Islamic coinage of North Africa and the Iberian Peninsula will also necessitate a discussion of the Byzantine and Visigoth coinage struck prior to the Muslim coinage, as the previous monetary systems impacted the metallurgy of the later Muslim coins. The final section of this chapter will examine various questions related to the origin of the alloys used and, where possible, the methods of debasement of the coinage.

## **THE GOLD CONTENT OF THE SEVENTH-CENTURY BYZANTINE COINAGE OF CARTHAGE**

As I mentioned at the outset of this chapter, in order to understand the metallurgy of the early Islamic coinage of North Africa and the Iberian Peninsula it is necessary to first understand the metallurgy of the coinage already circulating in these two regions. For North Africa this means the gold coinage struck at Carthage by the Byzantines in the seventh century.

A forthcoming study of the metallurgy of the Byzantine mint of Carthage provides the most comprehensive analysis of this coinage from the conquest of North Africa by the Byzantines in 533 until the striking of the last Justinian II solidus at the Carthaginian mint in 695.<sup>279</sup> This investigation includes 10 Byzantine coins tested using LA-ICP-MS supplemented by 22 PAA results from previous studies and 76 unpublished SG results from tests conducted by Oddy. Table 87 tabulates the number of Carthaginian examples tested in this study using the LA-ICP-MS and PAA methods from the reign of Heraclius (r. 610-41) to the first reign of Justinian II (r. 685-95). It also includes two Byzantine examples from the mint in Sardinia. As I previously discussed on p. 30, it appears that the Byzantines moved the mint of Carthage (either in whole or in part) to Sardinia just prior to the Muslim capture of Carthage, and it is important to include the Sardinian data in our comparative analysis of the gold content of the coinage of the region. Table 88 sets out the number of examples from the reign of Heraclius whose gold content was tested by Oddy using the SG method.

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<sup>279</sup> JONSON ET AL forthcoming.

**Table 87: Number of Byzantine coins tested using the LA-ICP-MS and PAA Methods<sup>280</sup>**

Emperor	Dates	Solidi	Semisses	Tremisses	Total
<b>Carthage</b>					
<b>Heraclius</b>	610-41	7	0	0	7
<b>Constans II</b>	641-68	3	0	0	3
<b>Constantine IV</b>	668-85	11	0	0	11
<b>Justinian II</b>	685-95	1	0	0	1
<b>Sardinia</b>					
<b>Tiberius III</b>	698-705	0	0	1	1
<b>Leo III</b>	717-41	0	0	1	1
<b>Total</b>		22	0	2	<b>24</b>

**Table 88: Number of Byzantine coins tested using the SG Method**

Emperor	Dates	Solidi	Semisses	Tremisses	Total
<b>Carthage</b>					
<b>Heraclius</b>	610-41	4	0	0	4
<b>Constans II</b>	641-68	41	1	0	42
<b>Constantine IV</b>	668-85	18	0	0	18
<b>Justinian II</b>	685-95	5	0	0	5
<b>Sardinia</b>					
<b>Constans II</b>	641-68	1?	0	0	1
<b>Justinian II</b>	685-95	2	0	0	2
<b>Tiberius III</b>	698-705	3	0	0	3
<b>Justinian II</b>	705-11	0	0	1	1
<b>Total</b>		74	1	1	<b>76</b>

A summary of the results of Oddy's SG tests is given in Table 89 below, followed by a comparison of the SG and LA-ICP-MS/PAA results in Table 90.

**Table 89: Summary of SG results – Byzantine examples**

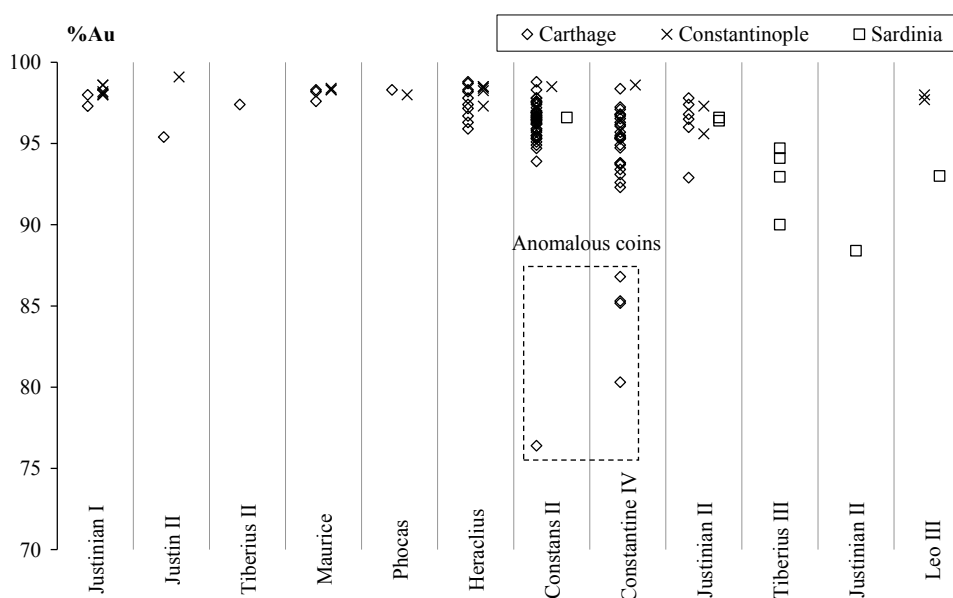
Emperor	No.	Avg. Au%	Min	Max.	Median	STDV
<b>Heraclius</b>	4	96.6	95.9	97.4	96.5	0.6
<b>Constans II</b>	41	96.4	93.9	98.9	96.5	1.0
<b>Constantine IV</b>	15	94.7	92.3	97.1	94.9	1.6
<b>Justinian II</b>	5	96.2	92.9	97.8	96.8	2.0

<sup>280</sup> Table 87 through Table 90 reproduced in part from JONSON ET AL forthcoming.

**Table 90: Comparison of Byzantine SG and LA-ICP-MS/AP results**

Type	SG			LA-ICP-MS/PAA			Diff. <sup>281</sup>
	No.	Avg. Au%	STDV	No.	Avg. Au%	STDV	
<b>Heraclius</b>	4	96.6	0.6	7	97.9	0.8	-1.1
<b>Constans II</b>	41	96.4	1.0	3	97.6	0.7	-1.2
<b>Constantine IV</b>	15	94.7	1.6	10	96.2	1.0	-1.5

As can be seen by the comparison of the results of all three methods in Table 90, the SG and LA-ICP-MS/PAA outcomes for the Carthage mint under Heraclius, Constans II, and Constantine IV are nearly identical, although the LA-ICP-MS results are consistently higher. These results show that during the period 610 to 695 the Carthage mint struck gold coins to a high standard, rarely dropping below 95% Au.



*Figure 116: Gold content of the coinage of the Byzantine mints of Carthage, Constantinople and Sardinia from Justinian I to Leo III. PAA or LA-ICP-MS data (see Morrisson et al. 1985) completed by results obtained using SG by Oddy.<sup>282</sup>*

The comparison of the gold content of the coins struck at the Byzantine mints of Carthage, Constantinople and Sardinia in Figure 116 reinforces the conclusion that the Carthage mint consistently struck gold coinage to a high degree of fineness up until the first Muslim seizure of Carthage in 695, with the exception of the included

<sup>281</sup> Difference between SG and LA-ICP-MS or PAA results. The SG results are the starting point.

<sup>282</sup> Reproduced from JONSON ET AL forthcoming.

anomalies.<sup>283</sup> It is only in Sardinia, where the Byzantines transferred part of the Carthage mint, that we start to see a decline in the fineness of the coinage.

The five anomalous Carthaginian coins in Figure 116, one from the reign of Constans II and four from the reign of Constantine IV, show a lower gold content than the majority of the Carthaginian examples – 76.4% Au for the Constans II example and 80.3 to 86.8% Au for the four Constantine IV coins.<sup>284</sup> Grierson was the first to comment on the attribution of certain coins (four examples, *DOC* Constantine IV Class II, all with the same obverse and reverse die) of Constantine IV, and argued that they were in fact the product of a Berber or, more likely, an Islamic mint.<sup>285</sup> Grierson did not conduct any metallurgical tests on these examples, and he later withdrew his proposed attribution of these coins for stylistic reasons.<sup>286</sup> Oddy also tentatively suggested that some Constantine IV coins may be Islamic imitations, based on the lower results of two of his SG outcomes.<sup>287</sup>

Despite Grierson's retraction of his proposed attribution, Oddy's outcomes, one from *DOC* Constantine IV Class II and three from Class III, combined with the one anomalous Constans II coin (*DOC* Class IVa), all suggest that further research on the attribution of these examples needs to be undertaken. This need becomes even more apparent when we consider that the gold content and elemental make-up of the anomalous Byzantine coins is similar to the Islamic coins struck in North Africa prior to the invasion of the Iberian Peninsula (see p. 339).

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283 Constantinople and Sardinia are included for comparative purposes.

284 One of the Constantine IV examples was tested using both the LA-ICP-MS and PAA methods. Oddy tested the other four using the SG method.

285 GRIERSON 1950, p. 301-5.

286 GRIERSON 1966, p. 520.

287 Oddy's data includes four examples with low gold content, but he only discussed two of them in his paper. ODDY 1988, p. 137.

## THE GOLD CONTENT OF THE VISIGOTH COINAGE OF THE IBERIAN PENINSULA

The Visigoth Kingdom of the Iberian Peninsula also minted gold coinage at multiple mints up to, and during the first few years of the Muslim conquest.<sup>288</sup>

The fluctuation and variability of the gold content of the Visigoth coinage in the seventh century is well known. There have been several published works on the composition of the coinage minted by the Visigoths,<sup>289</sup> with the most important being Marques et al. and Guerra and Roux.<sup>290</sup> Table 91 summarizes the results of these two sets of tests.<sup>291</sup>

**Table 91: Average (Avg) and standard deviation (SD) of gold content as measured by the 250 tremisses tested using XRF by Marques et al. and by PAA on 45 tremisses analysed by Guerra and Roux (without SD=1 coin analysed)<sup>292</sup>**

King	Date	SG		PAA	
		Avg Au %	SD	Avg Au %	SD
Leovigild A	569-586	86.5	0.2		
Leovigild B		84.6	4.1		
Leovigild C		85.7		67.6	
Reccared	586-601	80.4	2.6	75.8	6.2
Liuva II	601-603	79.7	2.9	75.4	
Witteric	603-610	79.6	2.9	76.5	
Gundemar	610-612	77.4	2	73.3	0.4
Sisebut	612-621	74.5	3.3	75.7	9.3
Reccared II	621	74			
Suinthila	621-631	69.1	5	72.0	12.0
Sisenand	631-636	60.8	5.3		
Chintila	636-639	64.9	5.1		
Tulga	639-642	53.4	10.2		
Chindasvinth A	642-653	59.7	4.3		
Chindasvinth B		77.1			
Chindasvinth and	649-653	79.2			
Reccesvinth	649-672	75	4.2		
Wamba	672-680	70.4	3.6		
Ervig	680-687	67.9	4.7	75.5	1.9
Egica	687-702	58.5	5	52.4	11.2
Egica and Wittiza	698-702	48	7.5	40.9	

288 Number of known mints in the last decades of the Visigoth Kingdom: Egica and Wittiza (698-702) – 21; Wittiza (698-710) – 10; Roderic (710-11) - 2; Achila II (710-14) – 4. See MILES 1952 and PLIEGO 2009.

289 METCALF 1988; GRIERSON AND BLACKBURN 1986.

290 MARQUES ET AL. 1995; GUERRA AND ROUX 2002.

291 Reproduced from GUERRA AND ROUX 2002, p. 222.

292 A=Narbonensis; B=Tarraconensis; C=Carthaginensis.

King	Date	SG		PAA	
		Avg Au %	SD	Avg Au %	SD
Wittiza A	698-710	32.5	2.1	42.0	5.5
Wittiza B		47.5	1.1		
Wittiza C		74.5	1.8		
Roderic	710-711	60.6			

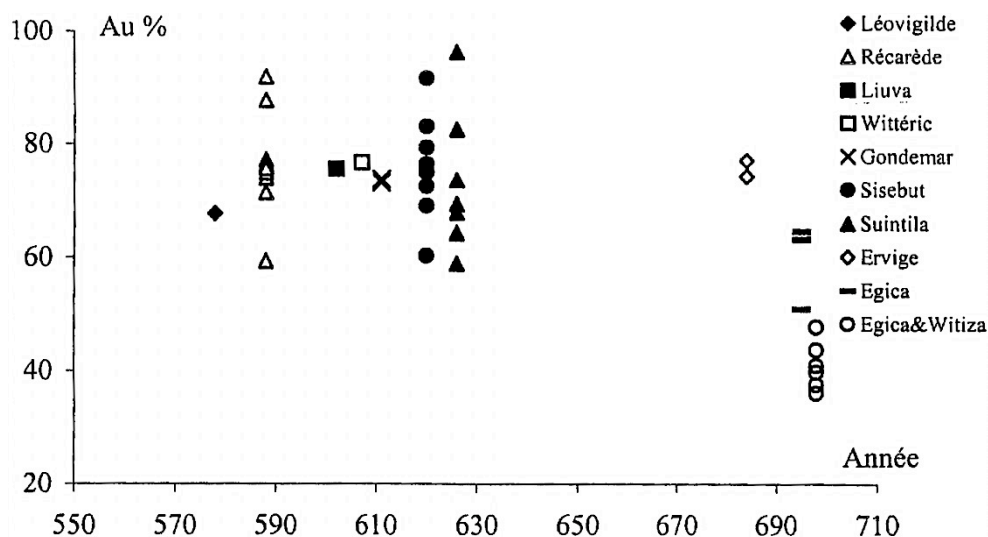


Figure 117: Gold content of tremisses measured using PAA from the reign of Leovigild to Egica and Wittiza.<sup>293</sup>

Table 91 appears to show that a fineness of approximately 85% Au was set under Leovigild, gradually declining to 65% Au under Chintila (from 569-639). This is followed by a significant debasement during the reign of Tulga (639-42). A second period of decline is found between the reigns of Recceswinthe and Wittiza (653-702), when the gold content of the Visigoth tremisses varies between 31% Au and 76% Au (see Figure 117).<sup>294</sup>

<sup>293</sup> Reproduced from GUERRA AND ROUX 2002, p. 223.

<sup>294</sup> GUERRA AND ROUX 2002, p. 221.

## THE ISLAMIC GOLD COINAGE OF NORTH AFRICA AND THE IBERIAN PENINSULA

I conducted SG tests on 234 gold coins struck by the Muslims in North Africa (dated from c. 79/698-699 until 122/739-40) and the Iberian Peninsula (dated from 93/711-12 until 127/744-45).<sup>295</sup> I have combined the results of these tests with the largely unpublished results of SG tests conducted by Oddy (55 results), Bartlett (2 results) and Bates (1 result).<sup>296</sup> A breakdown of the examples tested by type is found in Table 92, while a summary of the estimated gold content for the examples tested by the SG method is provided in Table 93 (full results of SG testing are found in Appendix B beginning on p. 542). The coins in Table 92 that I consider to be anomalies (either issues of an irregular mint or modern fakes) are discussed in a separate chapter beginning on p. 254.

**Table 92: Number of Islamic coins tested using the SG Method**

Series/Phase	Solidi/Dinars	Sem/nisf	Tre/thulth	Total Tested	Corpus <sup>297</sup>	% of Corpus
<b>Ser. NA 1</b>	4	6	19	29	55	53
<b>Ser. NA 2, Ph. 1</b>	29	10	28	67	104	64
<b>Ser. NA 2, Ph. 2</b>	3	17	10	30	59	51
<b>Ser. IP 2</b>	58	N/A	N/A	58	169	34
<b>Ser. NA 2, Ph 3</b>	0	5	3	8	15	53
<b>Ser. NA 3</b>	9	N/A	N/A	9	37	24
<b>Ser. IP 3</b>	16	0	0	16	33	48
<b>Ser. IP 3, frac.</b>	N/A	6	1	7	11	64
<b>Ser. NA 4</b>	16	N/A	N/A	16	55	29
<b>Ser. IP 4</b>	9	3	4	16	42	38
<b>Ser. NM 4</b>	N/A	5	18	23	233	10
<b>Anomalies</b>	4	3	6	13	13	N/A
<b>Total</b>	<b>148</b>	<b>55</b>	<b>88</b>	<b>292</b>	<b>826</b>	

<sup>295</sup> I conducted SG tests at the following collections and auction houses: American Numismatic Society, New York; Ashmolean Museum, Oxford; National Museum, Copenhagen; Münzkabinett, Staatliche Museen, Berlin; Bibliothèque nationale de Paris; the Khalili Collection and Morton & Eden, both in London; the Tonegawa Collection; and Museo Arqueológico Nacional, Madrid.

<sup>296</sup> Oddy conducted his SG tests on the early Islamic coinage of North Africa and the Iberian Peninsula at the British Museum, London; the Fitzwilliam Museum, Cambridge; the Kungliga Myntkabinetet, Stockholm and Baldwin's Auctions, Ltd. Bartlett tested two examples at the Gabinete Numismático de Cataluña, Barcelona. The results of SG tests conducted by Oddy in the Fitzwilliam Museum at Cambridge and the one SG result conducted by Bates were previously published in BALAGUER 1979, p. 225-241.

<sup>297</sup> The figures in this column only include the imaged examples in my database. I have not included the examples without an image, as some of these examples are likely duplicates of the imaged examples.

**Table 93: Summary of SG results – Islamic coins (of all denominations)**

Series/Phase	Date	No.	Avg. Au%	Min	Max.	Median	STDV
<b>Ser. NA 1</b>	c. 79-84	29	87.6	82.3	95.4	87.0	3.3
<b>Ser. NA 2, Ph. 1</b>	84-87	67	86.6	79.4	97.1	86.4	3.5
<b>Ser. NA 2, Ph. 2</b>	89-92	30	84.3	74.8	91.7	84.4	3.4
<b>Ser. IP 2</b>	93-97?	58	41.3	0.0	74.5	40.0	20.1
<b>Ser. NA 2, Ph. 3</b>	95-96	8	51.7	42.3	60.5	52.3	6.5
<b>Ser. NA 3</b>	97-99	9	63.3	52.6	69.5	66.1	6.3
<b>Ser. IP 3</b>	98	16	71.3	60.2	80.6	72.3	5.5
<b>Ser. IP 3, frac.</b>	98	7	82.8	81.4	85.0	82.7	1.4
<b>Ser. NA 4</b>	100-122	16	98.5	94.7	99.5	98.7	1.2
<b>Ser. IP 4</b>	102-106 <sup>298</sup>	15	96.7	94.0	99.9	96.6	1.6
<b>Ser. NM 4</b>	91-103	23	95.7	75.1	99.1	96.6	4.9

I have recorded 826 gold coins with images in my corpus of the early Islamic coinage of North Africa and the Iberian Peninsula and have SG results for 292 of them – 35% of the total. Unfortunately, my testing was limited by the availability of examples in the various collections, so some types are better represented than others. In all cases but one (Series NM 4 – 10%), however, I have fineness results for at least 24% of the known examples.

Forty-nine Islamic coins tested using the SG method have also been tested using either the LA-ICP-MS (A further example, L108bis, was tested by this method but was unavailable for SG testing) or the PAA method (see Appendix B). In addition, eight of the examples tested using SG and LA-ICP-MS were also tested using XRF. Unfortunately, the LA-ICP-MS results for 14 of the examples and the XRF tests of six of the examples are still unpublished, which limits the discussion of those two series. Fortunately, some of the coins tested using the LA-ICP-MS method, but still unpublished, have previously been tested using the PAA method. Table 94 below provides a summary of the results of the published analysis of the 42 coins.

<sup>298</sup> I also tested one *al-Andalus* dinar dated 127/744-55 (SICA 2/339). This coin is attached to a gold mount and I therefore decided not to include its SG results in the calculations above.

**Table 94: Comparison of the Results of the Fineness Testing**

No.	Date	Ser./ Ph.	Wt. (g)	SG	Au%				Diff. <sup>299</sup>	Cu%	Adj. Au% <sup>300</sup>	Diff.
					SG	ICP <sub>301</sub>	PAA	XRF				
<b>NORTH AFRICA</b>												
L95bis	79-84?	1	4.328	17.83	90.0		90.3		-0.3	2.5	91.1	+0.8
L96a		1	1.947	17.66	88.7		88.2		+0.5	2.5	89.9	+1.7
L97		1	1.986	17.13	84.6		84.1		+0.5	3.6	86.2	+2.1
L98		1	1.359	17.97	90.8		88.6		+2.2	2.3	92.0	+3.4
L109	85-86	2/1	4.379	17.36	86.4		88.6		-2.2	3.0	87.8	-0.8
L110		2/1	4.223	18.20	92.6		90.5		+2.1	1.8	93.5	+3.0
L111	86-87	2/1	4.391	17.27	85.8		87.2	91	-1.4	3.3	87.2	0.0
L105	84-7	2/1	1.446	17.16	84.8		90.3	93	-5.5	2.1	85.9	-4.4
L103		2/1	1.381	18.02	91.2		89.4		+1.8	1.0	91.9	+2.5
L107		2/1	1.332	17.26	85.8		87.8		-2.0	2.7	86.9	-0.9
L106		2/1	1.469	17.12	84.5		86.0		-1.5	2.7	85.8	-0.2
L111bis	89-90	2/2	4.250	16.75	81.6		84.9		-3.3	3.2	83.0	-1.9
L100	89-92	2/2	1.313	18.09	91.7		88.2		+3.5	2.2	92.9	+4.7
L99		2/2	1.981	16.89	82.6		85.0		-2.4	2.7	84.0	-1.0
L99bis		2/2	2.047	17.02	83.5		81.3		+2.2	2.2	84.8	+3.5
L102		2/2	1.342	17.76	89.6		90.0		-0.4	2.6	90.6	+0.6
L108bis		2/2	1.336	N/A <sup>302</sup>			87.5		N/A	2.0	N/A	N/A
L101	89-96?	IM <sup>303</sup>	1.209	15.98	74.7		85.2		-10.5	2.3	76.0	-9.2
L100bis	89-96?	IM	1.397	15.32	68.2		75.2		-7.0	7.5	71.8	-3.4
L112	95	2/3	1.945	13.93	53.4		60.3		-6.9	2.6	54.8	-4.5
L113	97	3	4.200	15.32	68.4		65.9		+2.5	1.8	69.6	+3.7
L114	98	3	4.373	14.53	60.4		60.6		-0.2	2.0	61.5	+0.9
1978.51	101	4	4.267	19.24	99.5		98.8		+0.7			
L408bis	101	4	4.272	19.12	98.7		98.7		-0.0			
1966.341	102	4	4.300	19.25	99.5		98.8		+0.7			
L425	103	4	4.267	19.24	99.5		99.6		-0.1			
1978.52	104	4	4.227	19.03	98.1		99.0		-0.9			
L464	114	4	4.234	19.22	99.5		98.9		+0.6			
L465	117	4	4.258	19.06	98.3		98.4		-0.1			
<b>IBERIAN PENINSULA</b>												
L131	93?	2	4.106	11.79	23.7		38.5		-14.8	2.83	24.8	-13.7
L129	93	2	4.383	15.34	68.6		70.4		-1.8	2.8	70.2	-0.2
L128	93?	2	3.856	12.75	38.0		38.0		-0.0	3.3	39.7	-3.3
L135	93?	2	2.393	12.31	31.6		48.9		-17.3	3.4	33.3	-15.6
L130	93?	2	4.265	15.70	72.1		74.4		-2.3	0.45	72.7	-1.7
L133	93?	2	3.047	11.67	21.7		16.3		+5.4	6.5	24.2	+7.9
L134	93?	2	2.695	12.31	31.6		37.1		-5.5	3.0	33.1	-4.0
L132	94?	2	3.364	13.15	43.2		45.5		-2.3	2.9	45.1	-0.4
L127	98?	2	1.909	17.17	85.0		79.6		+5.4	1.3	85.6	+6.0
L136	98	3	4.102	16.68	80.6		87.8		-7.2	1.3	81.7	-6.1
L136bis	98	3	4.119	15.63	71.4		69.9		+1.17	2.23	72.7	+2.8
L426	102	4	4.281	18.74	96.3		99.5		-3.2			
L427	102	4	2.156	18.67	95.7		96.0		-0.3			

299 Difference between SG and LA-ICP-MS or PAA results. The SG results are the starting point.

300 This is the fineness of the coin when adjusted for the presence of Cu, as per the formula on p. 69.

301 ICP=LA-ICP-MS.

302 Non applicable. L108bis was not available for SG testing.

303 IM=Irregular mint.

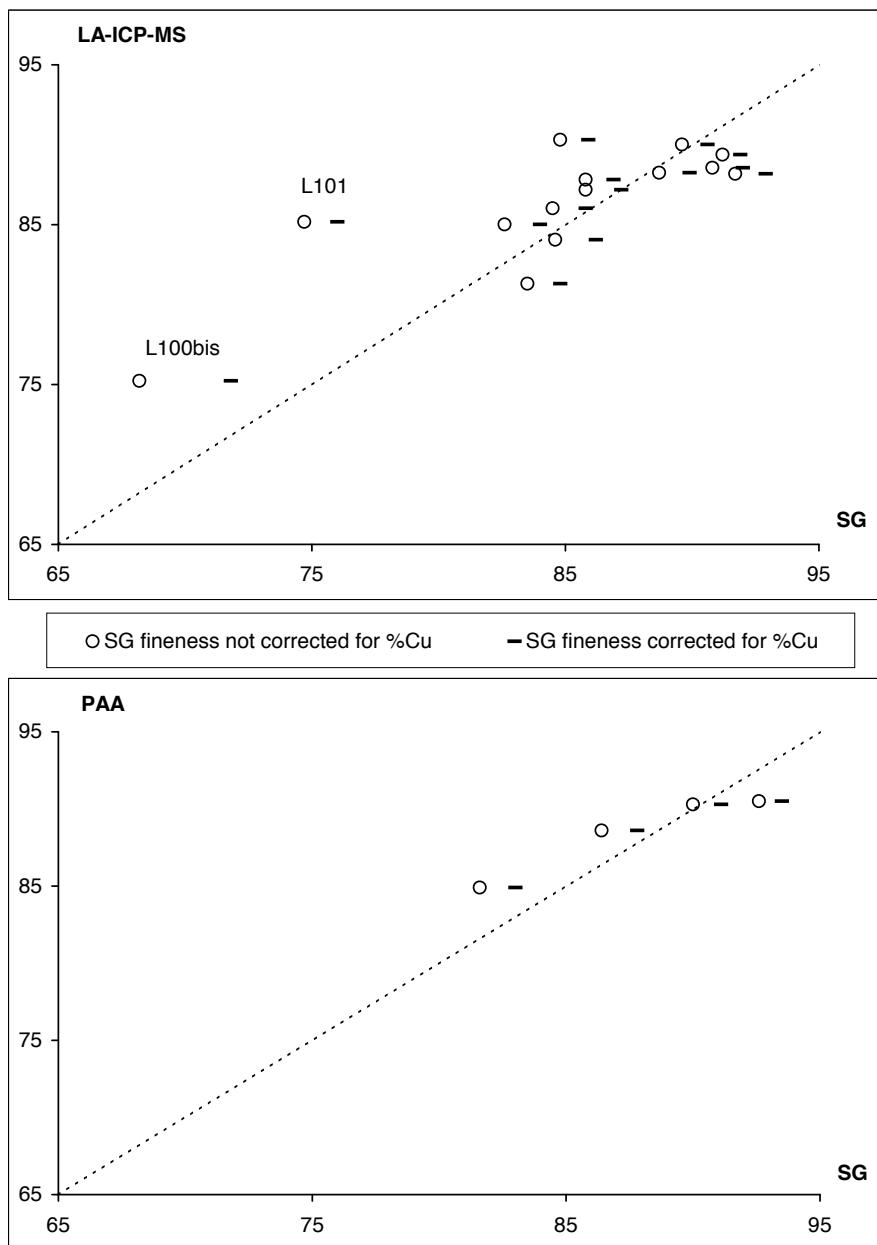


Figure 118: Comparison between SG and LA-ICP-MS or PAA for the gold content of the early Islamic coins of North Africa struck prior to the invasion of the Iberian Peninsula (The data is found in Table 94).<sup>304</sup>

Figure 118 compares the SG and LA-ICP-MS/PAA gold content results for the Islamic coins struck in North Africa prior to the invasion of the Iberian Peninsula. The figure displays a good agreement between the two sets of results for gold content above 80% Au. The calculation of fineness based on the SG results for the 16 examples struck by the Muslims prior to the invasion of the Iberian Peninsula

<sup>304</sup> Reproduced from JONSON ET AL forthcoming.

(ignoring the two examples struck at an irregular mint (L100bis; L101) - see p. 262) varies a maximum of +/- 5% Au when compared to the LA-ICP-MS or PAA results, and in most cases 3% Au or less. As can be seen in Table 94 above, however, as the gold content falls below 80% Au the difference between the fineness as determined by the SG method and that determined by LA-ICP-MS or PAA tends to increase, but only for certain coins.

Previous studies have shown that SG analysis tends to underestimate the gold content of the coin.<sup>305</sup> There are several possible reasons for the discrepancy between the methods.<sup>306</sup> The first possible reason is the experimental error inherent in the three methods, particularly when measuring coins of low weight using the SG method.<sup>307</sup> A second possible reason for the discrepancy is the presence of dirt or other material on the surface of the coin, and can be eliminated by cleaning the specimens prior to testing.<sup>308</sup> A final reason, especially for those examples where the estimation of gold content by the SG method is lower than the estimation of gold content by LA-ICP-MS or PAA, is the presence of copper in the alloy of the coin.

A previous study revealed that the accuracy of SG tests is affected by the presence of copper, which generally lowers the estimation of gold content by this method.<sup>309</sup> This error can be corrected by adjusting the SG results for the presence of copper, when known. For certain of the series,<sup>310</sup> I have chosen to adjust the gold content (as measured by SG) for the presence of copper as follows:

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305 Oddy compared the SG and neutron activation analysis of Merovingian coins. See ODDY 1972, p. 112 and JONSON ET AL forthcoming.

306 Previously summarized in JONSON ET AL forthcoming.

307 The wet weight of the coin tends to vary widely, hence the need for multiple SG measurements.

308 ODDY and BLACKSHAW 1974, p. 87-8.

309 ODDY and HUGHES 1974, p. 81-7.

310 The estimation of the copper content is based on the measurement of the amount of copper by the Centre Ernest-Babelon using the LA-ICP-MS method. For Series IP 2, this is based on the copper content of the unpublished LA-ICP-MS tests.

Series NA 1 – 2.5% Cu  
 Series NA 2, Phases 1, 2 and 3 – 2.5% Cu  
 Series IP 2 – 3.00% Cu<sup>311</sup>  
 Series NA 3 – 1.9% Cu  
 Series IP 3 – 1.8% Cu  
 Series IP 3 Fractionals – 1.3% Cu

I will now compare the adjusted SG fineness results with the results found using the LA-ICP-MS and PAA methods and provide observations on the gold content of each of the series.

***THE MUSLIM GOLD COINAGE OF NORTH AFRICA PRIOR TO THE INVASION OF THE IBERIAN PENINSULA***

The correction of the SG results for the presence of copper for the coinage struck by the Muslims in North Africa prior to the invasion of the Iberian Peninsula results in a small increase in the average gold content, as shown in Table 95 and in Figure 119.

**Table 95: Summary of SG results for coinage of North Africa, adjusted for the presence of Copper<sup>312</sup>**

Series/Phase	No.	Avg. Au%	Min.	Max.
<b>Series NA 1</b>	29	88.8	83.6	96.7
<b>Series NA 2, Phase 1</b>	67	87.8	80.7	98.2
<b>Series NA 2, Phase 2</b>	30	85.6	78.6	92.9

311 I ignored the highest (6.5%) and lowest (0.45%) results from the PAA/LA-ICP-MS tests in order to arrive at an average of 3% Cu for the adjusted SG results.

312 The estimated gold content of the coins was adjusted by the known copper content of each coin. Where the copper content was not directly available, the coin was adjusted by 2.5% copper, the average of the known Cu% (ignoring the Cu% for the two coins that are considered contemporary forgeries).

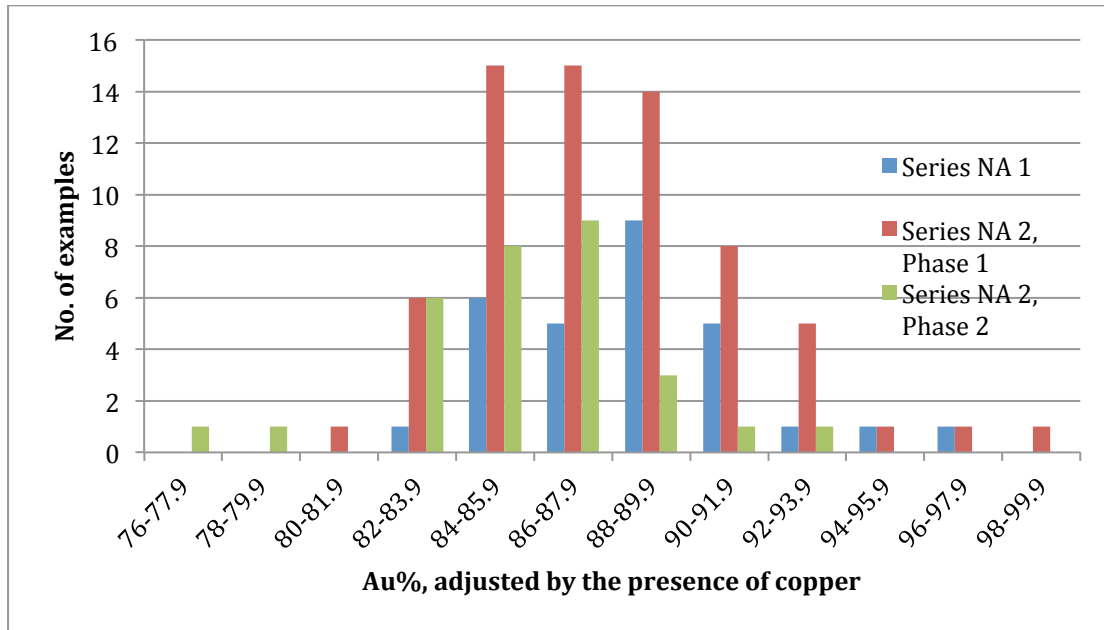


Figure 119: Histogram illustrating the SG results of the Early Islamic Coinage of North Africa struck prior to the invasion of the Iberian Peninsula.

The SG results adjusted for copper can be compared to the average gold content as estimated by the LA-ICP-MS and PAA methods. As shown in Table 96, although differences between the methods for individual coins above 80% Au can vary by as much as +/- 5% (but in most cases 3% or less), when the estimated gold content using the SG method of a large number examples is averaged, the systemic error between the two methods disappears.

**Table 96: Comparison of SG results adjusted for copper and LA-ICP-MS/PAA Results<sup>313</sup>**

Series/Phase	SG			LA-ICP-MS/PAA			Diff.
	No.	Avg. Au%	STDV	No.	Avg. Au%	STDV	
Ser. NA 1	29	88.8	3.3	4	87.9	2.7	- 1.1
Ser. NA 2, Ph. 1	67	87.8	3.5	2	88.5	N/A	+ 0.7
Ser. NA 2, Ph. 2	30	85.6	3.1	6	86.2	3.1	+ 0.6

The results shown in Figure 119, Table 95 and Table 96 suggest that after the Muslim takeover of the region from their Byzantine predecessors, the newly

<sup>313</sup> The average SG Au% results for the coins tested using both methods are:

Series 1-89.8% (STDV of 2.55). Diff -1.9.

Series 2, Phase 1-88.2 (STDV of 3.04). Diff +0.3.

Series 2, Phase 3-87.1 (STDV of 4.40). Diff +0.9.

established Islamic mint continued to strike coins with a relatively high gold content, although lower than the high standard of the Byzantine mint in Carthage (see Figure 116, Table 89 and Table 90 above). Instead of the previous 96% Au of the Byzantine coinage, the Muslim mint averaged only 88% Au up until the end of Series NA 2, Phase 1 (86-7/705-6). The introduction of Series NA 2, Phase 2 coinage in 708-9/89-90 resulted in a slight lowering of the gold content, averaging 85-6% Au. The high standard deviations and substantial differences between the minimum and maximum gold content for each of the Series/Phases suggests that the early Islamic mint in North Africa either struggled with issues of quality control, did not consider the variations in gold content to be an issue, or for some reason chose to deliberately debase the coinage.

***ISLAMIC GOLD COINAGE STRUCK IN THE IBERIAN PENINSULA FROM 93/711-12 TO 97/715-16***

As I described on p. 145, the Muslim invaders of the Iberian Peninsula retained the fabric of the Series NA 2, Phase 2, Latin-Epigraphic coinage struck in North Africa. The two sets of coinage are different in several ways, however. The Iberian Peninsula issues feature a seven, eight, or nine-pointed star in the obverse field and new legends. The other key difference is their fineness, which varies considerably from the coinage struck in North Africa prior to the invasion of the Iberian Peninsula. The fineness is, however, similar to what we find for the Visigoth coinage minted in the last few decades prior to the Muslim conquest (see p. 320 above).

**Table 97: Comparison of SG results adjusted for copper and PAA Results for Series IP 2**

Series	SG			PAA			Diff.
	No.	Avg. Au%	STDV	No.	Avg. Au%	STDV	
Series IP 2	58	42.8	20.3	8	46.1	18.9	-3.3

Table 97 compares the SG results adjusted for copper to the PAA results. The average of the gold content of the eight PAA results is not substantially higher than the SG results (3.3% Au), but the standard deviations of both sets of tests are also quite high, highlighting the variability in the gold content of the Series IP 2 coinage.

Although there is good agreement between the two sets of gold content results for five of the eight coins tested using both methods, the SG results for two of the examples (L131 and L135) are substantially lower than the PAA results. Even adjusted for the presence of copper, the SG results are still 13.7% and 15.6% lower, respectively. The SG result for one example (L133), in contrast, is substantially higher even when adjusted for the presence of copper (+7.9% Au). There is no clear answer as to why each of these coins has such a large discrepancy. The lower or higher SG result may simply be due to an increase in the experimental error of the SG method as the gold content of the examples decrease, although it should be noted that L133 has a very different elemental make up compared to the other coins tested with both methods, with much higher copper, lead, tin and zinc contents. This may contribute to the difference between the two sets of results for this coin, but I found no significant difference in the elemental make up of the other two coins, when compared to other coins of this type. Further advanced testing of the Series IP 2 solidi may help to unravel this mystery.

Despite the uncertainty in the accuracy of certain of the SG results, the calculations provided, combined with that of the LA-ICP-MS/PAA results, still allows us to draw

some conclusions. Most importantly, the results of the gold content testing provides further evidence that one main mint and several secondary mints were striking Series IP 2 solidi in the Iberian Peninsula during the Muslim conquest of the region. As I previously argued on p. 159, Series IP 2 can be divided into the examples struck at a main mint and those struck at secondary mints, operating with various units of the Muslim army. The main mint examples are clearly engraved with coherent legends, and have a weight in all but two cases above 4.15 g (see Table 75 on p. 275 for Series IP 2, main mint metrology). The gold content of the 12 main mint examples that I have tested using the SG method is also higher than most of the secondary mint examples, averaging 67% Au (min: 53.8% Au; max: 74.1% Au).

It should be noted, however, that a small number of Series IP 2, secondary mint coins also have a relatively high gold content. Four of the secondary mint coins (2 of the SIMILIS type, two of the AI type), although having very different reverse fields, exhibit similar marginal legends, epigraphy and a very high weight (4.76 g, 4.38 g, 4.71 g and 4.20 g). The two examples of the SIMILIS type, W 183 (57.7% Au) and W P.47=L129 (70.2% Au), have the same obverse and reverse die, but the two examples of the AI type, HSA 1001.1.13221 (76.2% Au) and MAN 2004.117.10 (65.4% Au) are not die-linked (see *Figure 120* below). As discussed in the typology, I have classified the four coins of these two types as issues of secondary mints. What is unclear is whether they were struck at a secondary mint or whether an ‘official’ mint continued to strike coinage after Mūsā left the peninsula in 95/713-14.



*Figure 120: Above, Series IP 2 solidus of the SIMILIS type. L129. Image courtesy of Bibliothèque nationale de France, Paris. (4.38 g) Below, Series IP 2 solidus of the AI type. MAN 2004.117.10. Image courtesy of Museo Arqueológico Nacional, Madrid. (4.20 g). (Scale x3)*



*Figure 121: Series IP 2 solidus. MAN 1952.23.1. Image courtesy of Museo Arqueológico Nacional, Madrid. (4.30 g). (Scale x3)*

A further example with a high gold content that does not fit in with the coins struck at the main mint in the Iberian Peninsula is MAN 1952.23.1 (Figure 121). This coin also has a good weight (4.30 g) and a high gold content of 64.1% Au. The epigraphy is very different from the main mint examples, however, with more bungling of the legends (note the retrograde reverse field). Again, this coin appears to be the product of a secondary mint.

The remaining Series IP 2 examples have a gold content below 58% and the majority of these coins have a weight below 4.0 g. The epigraphy also is generally

poor and the legends are often bungled or reversed. This variety in the characteristics of the coinage mirrors the large variance in the gold content. The variability in the gold content of this coinage further reinforces the argument that they were struck at one or more secondary mints, travelling with different units of the Muslim army.<sup>314</sup>

***ISLAMIC GOLD COINAGE STRUCK IN NORTH AFRICA AND THE IBERIAN PENINSULA FROM 95/713-14 TO 99/718-19***

As I have outlined above, the evidence suggests that one or more secondary mints struck Series IP 2 coinage at the same time as the main mint. The main Islamic mint, however, ceased striking solidi in the Iberian Peninsula when Mūsā left the region at the end of 95/713-14, and shortly thereafter began to mint new Latin-Epigraphic coinage (Series NA 2, Phase 3) in North Africa. In 97/715-16, the North African mint discontinued the Latin-Epigraphic coinage and instead began to produce Series NA 3, bilingual solidi, which continued for three years. The year 98/716-17 also saw the issuance of Series IP 3 bilingual solidi, alongside undated gold fractionals.

**Table 98: Comparison of SG results adjusted for copper and PAA Results for Series NA2, Phase 3, NA3, IP 3 and IP 3 Fractionals**

Series/Phase	SG			PAA			Diff.
	No.	Avg. Au%	STDV	No.	Avg. Au%	STDV	
Ser. NA 2, Ph. 3	8	53.0	6.4	1	60.3	N/A	-7.3
Ser. NA 3	9	64.4	6.3	2	63.3	N/A	+1.1
Ser. IP 3	16	72.5	5.6	2	83.7	N/A	-11.2
Ser. IP 3 Frac.	7	83.6	1.4	1	79.6	N/A	+4.0

Table 98 compares the SG and PAA results from these series. The small number of examples in each of the categories tested using the PAA method makes any comparison with the SG results difficult and any conclusions therefore tentative.

<sup>314</sup> TĀHĀ 1989, p. 91-102. Although previously discussed in this dissertation, it is once again worth noting the characteristics of mints during this time. They were unlikely to be very large operations, travelling with an army commander. He may have had only a single die engraver in his retinue, or may have recruited a local engraver if circumstances dictated the striking of coinage. Most armies would have had skilled blacksmiths/coppersmiths with them who would have been perfectly capable of carrying out all the minting functions under supervision. Also minting probably took place in short bursts with longish gaps between and the fineness of minted coins would have been heavily dependent on what was in the latest available batch. Finally, low standards of fineness, flan preparation or striking might be signs of the need to produce a lot of coins in a hurry, rather than a completely separate mint.

With this caveat in mind, it is still worthwhile reviewing the data in the table. The difference between the SG results and the one PAA result for Series NA 2, Phase 3 shows a substantial difference of 7.3% Au, although differences between the two methods for the one example tested using both methods, L112, is only 4.5% Au. There is good agreement between the two sets of results for Series NA 3. With the Series IP 3 solidi, however, there is once again a substantial difference of -11.2% Au, but again the differences between the two examples tested using both methods is lower (-6.1% Au for L136; -2.8% Au for L136bis). The difference in the results between the seven Series IP 3 fractionals tested using the SG method and the one PAA result is also only +4.0% Au, but the difference between the example tested using both methods (L127) is higher - +6.0% Au. Again, there is no definite reason for the differences between the SG and PAA results, although I would note that the unpublished results for these series using the LA-ICP-MS method have a substantially smaller discrepancy than the PAA results, when compared to the SG results.

The results indicate that the return of the official mint to North Africa in 95-6/713-15 saw the Muslims continue to strike coinage to a similar fineness as that struck by the main mint when it was in the Iberian Peninsula. Some of the coinage struck at the separate official mint established in 98/716-17 in the Iberian Peninsula is of a higher quality, however. The possible reasons for this are discussed beginning on p. 347 below.

**POST-REFORM GOLD COINAGE STRUCK IN IFRĪQIYA AND AL-ANDALUS**

**Table 99: Comparison of SG results and PAA results for Series NA 4 and Series IP 4**

Series	SG			PAA			Diff.
	No.	Avg. Au%	STDV	No.	Avg. Au%	STDV	
Ser. NA 4	16	98.5	0.7	7	98.9	0.4	-0.4
Ser. IP 4	15	96.7	1.6	2	97.8	N/A	-1.1

Table 99 compares the SG and PAA results of Series NA 4 and Series IP 4. The two sets of results are in good agreement and confirm that the Post-Reform coinage was struck to the highest possible standard at least until 117/735-36 in *Ifrīqiya*, and 106/724-25 in *al-Andalus*. The results for the Series NA 4 and Series IP 4 gold coinage are similar to that of the Caliphal mint in Damascus.

As discussed beginning on p. 246, I argue that the Series NM 4, Post-Reform *nisf* and *thulth* were struck in North Africa beginning in 91/709-10, prior to the invasion of the Iberian Peninsula. The Muslims issued these gold fractionals, all without a mint name except the 102/720-21 *al-Andalus* issue, intermittently up until 103/721-22.

The 21 Series NM 4 examples tested using the SG method have a high gold content, averaging 95.7% Au, slightly lower than the gold content of the Series NA 4 dinars (98-99% Au). Two of the examples tested, however, have a relatively low gold content (KC AV23 – 75% Au; ANS 1924.999.93 – 89.1% Au). Ehrenkretz, in an earlier SG study, tested 17 Series NM 4 examples, and his results also showed more variation in the gold content than the other Post-Reform coinage.<sup>315</sup> The average gold content for the 17 examples he tested is only 91.5% Au, significantly lower than my results. The lowest results of the SG tests of Ehrenkretz’s examples were 89% Au (UM53); 85% Au (UM57); and 65% Au (UM59). Interestingly, the three low gold

<sup>315</sup> The examples tested were from the collections of the Hispanic Society of America and the University of Pennsylvania, both on loan at the time to the American Numismatic Society, as well as some examples from private collections. See EHRENKREUTZ 1959, p. 156.

content examples with the lowest gold content (UM57; UM59 and KC AV23) are all dated 96/714-15, just after Mūsā's return to North Africa from the Iberian Peninsula. The other two low gold content examples are dated 94/712-13 (UM53) and 99/717-18 (ANS 1924.999.93). Re-testing of the examples previously tested by Ehrenkreutz would help to confirm the variability in the gold content of Series NM 4, as well as the publishing of the results of the previously undertaken LA-ICP-MS tests conducted by the Centre Ernest-Babelon. The variability in the gold content of the examples tested, particularly those dated 96/714-15, supports the argument that Series NM 4 was struck in North Africa.

#### **PROVENANCE OF METAL**

LA-ICP-MS and/or PAA allow for the measurement of a wide variety of elements found in a coin. An analysis of these elements can provide important information about both the origin of the alloy of a coin series and, where applicable, the method of debasement.

#### ***ORIGIN OF THE ALLOY USED TO STRIKE THE ISLAMIC COINS IN NORTH AFRICA PRIOR TO THE CONQUEST OF THE IBERIAN PENINSULA***

As I discussed on p. 319, a comprehensive study of the metallurgical aspects of the gold coinage of Byzantine Carthage and the earliest Islamic coins of North Africa (Series NA 1; Series NA 2, Phases 1 and 2) has recently been undertaken.<sup>316</sup> This study included an investigation of the origin of the alloy of the Islamic coins in North Africa prior to the conquest of the Iberian Peninsula, and the below is therefore a summary of this recent analysis.

When an ore is converted to a metal in order to strike coins, it results in the loss of trace elements. Certain of the trace elements, and in particular the platinum group metals, persist within the metal, and can give us information about the provenance of

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<sup>316</sup> JONSON ET AL forthcoming.

the metal.<sup>317</sup> Other diagnostic elements include lead, tin and zinc (see Appendix B).<sup>318</sup>

While comparing the ratios of iridium/gold versus platinum/gold in Byzantine and Arab-Latin solidi and African dinars, Gondonneau et al. concluded that the Byzantine solidi, Arab-Latin coinage and Umayyad dinars were all struck from ore showing the same characteristics.<sup>319</sup> A second assessment of the Byzantine and early Muslim coinage of North Africa went even further, suggesting that the Islamic gold coinage issued in North Africa and Syria was recycled from the Byzantine gold coinage that was present and circulating in the regions prior to and during the first few decades after the Muslim conquest.<sup>320</sup> The most recent analysis of this coinage, using LA-ICP-MS, is in agreement with this observation.<sup>321</sup>

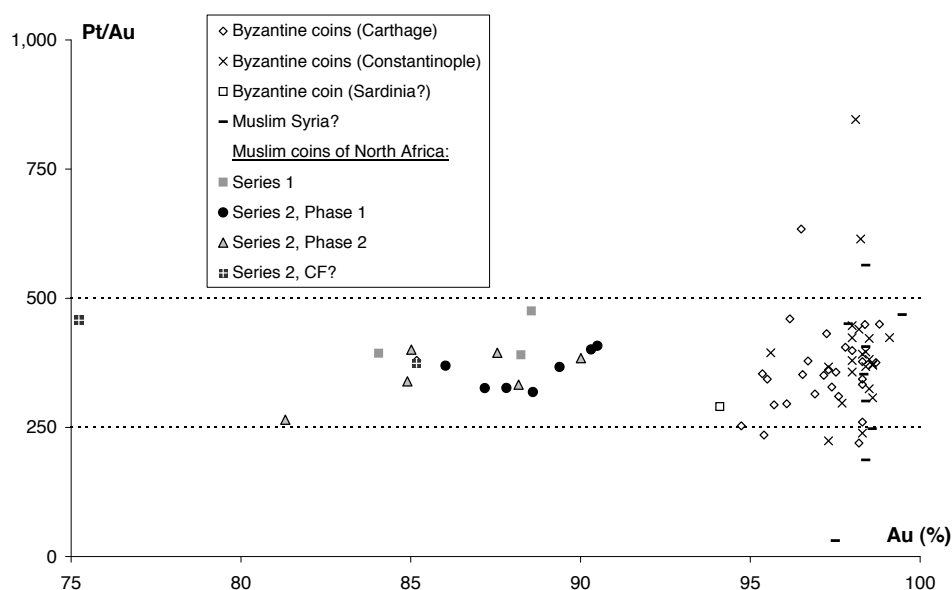


Figure 122: Platinum (ppm) to gold (Pt/Au) ratios versus gold (Au) contents.<sup>322</sup>

317 GONDONNEAU AND GUERRA 2002, p. 574; SCHMIDERER 2008, p. 140; EHSER ET AL. 2011, p. 895-910.

318 JONSON ET AL forthcoming.

319 “les solidi byzantins, arabo-latins et les dinars omeyyades sont frappés avec un or qui présente les mêmes caractéristiques que l’or proto-byzantin”. GONDONNEAU ET AL. 2000, p. 1266.

320 GONDONNEAU AND GUERRA 2002, p. 580-2.

321 JONSON ET AL forthcoming.

322 Reproduced from JONSON ET AL forthcoming.

Figure 122 compares the ratio of platinum to gold to the gold content for the coinage of Byzantine Carthage and Muslim North Africa, with contemporary examples from Muslim Syria and Byzantine Constantinople included for comparative purposes.<sup>323</sup> As Figure 122 reveals, the majority of the Byzantine coinage of Carthage and all of the Islamic North African examples are between 250 and 500 ppm platinum, regardless of the gold content. The similarity in the platinum contents between the two sets of coinage suggests a common source of gold for both the Byzantine and early Islamic coinage of North Africa. The significantly lower Pt/Au ratio for the one Syrian Umayyad coin in Figure 122 can be explained by the addition of gold from a different source.

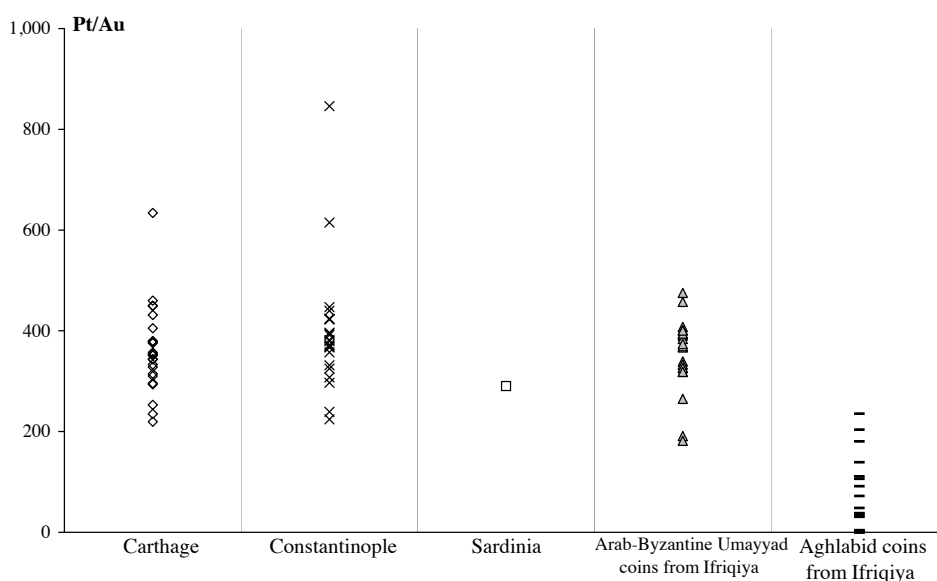


Figure 123: Comparison of platinum (ppm) to gold (Pt/Au) ratios for Byzantine Carthage, Constantinople, and Sardinia, Islamic North Africa, and Aghlabid Ifriqiya.<sup>324</sup>

The same data as Figure 122 is found in Figure 123, but it also includes later Islamic Aghlabid coins struck in North Africa in the ninth century. Once again, the consistency in the platinum content of the Byzantine and Islamic coins can be clearly

<sup>323</sup> The platinum contents are scaled to gold in Figure 122 in order to compare coins that have different gold contents. Pt/Au ratios for Muslim coins attributed to Syria can be found in ROUX 2000 or GONDONNEAU AND GUERRA 2002; JONSON ET AL forthcoming.

<sup>324</sup> Reproduced from JONSON ET AL forthcoming.

seen, although there is more variation in the platinum content of the Byzantine coins of Constantinople. The tighter grouping of the North African coins can be easily explained, however, as a group of gold coins melted down to manufacture new coinage should have the same average value for the Pt/Au ratio as the previous coinage, but the standard deviation should decrease (the extreme values should disappear).<sup>325</sup> The Pt/Au ratio results of the later Aghlabid coinage, in contrast, suggests a change in the gold supply between the eighth and ninth century, corresponding to the access to new sources in Ghana, Mali and Mauritania.<sup>326</sup>

A further observation provides even more evidence for the recycling of the Byzantine coinage by the Islamic mint in North Africa. The Centre Ernest-Babelon identified minute Platinum Group Element (PGE) inclusions at the surface of most of the Islamic coins of North Africa that it analysed. The argument for the re-melting of Byzantine gold coins is therefore reinforced because these latter coins always exhibit this type of inclusion at their surface and because the PGE inclusions resist the melting of gold.<sup>327</sup>

As I have stated, the studies of the Byzantine and early Islamic coinage have all provided similar results, making a strong case that the Islamic workshop recycled the Byzantine gold coinage.<sup>328</sup> This conclusion, however, leaves questions that have only

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325 IBID.

326 Gondonneau and Guerra noted previously that a “change of the Pt/Au under the Aghlabids which certainly corresponds to a change in the ore type around ad 750.” GONDONNEAU AND GUERRA 2002, p. 582.

327 The CEB examined all 10 Byzantine coins of Carthage before performing LA-ICP-MS using a binocular lens and observed Platinum Group Elements (PGE) inclusions on all of the examples. Fifteen Islamic North African coins were also examined using a binocular lens and PGE inclusions could be recognised on twelve of them (See JONSON ET AL Forthcoming). PGE inclusions are tiny particles that show a grey or bluish colour and are mainly made of alloys of iridium, osmium and ruthenium. These inclusions are an indication that the gold comes totally or partially from placer deposits in which the gold and the PGE grains became concentrated as a result of being transported downslope (by gravity or water) and accumulating in lower lying areas. Thanks to the presence of PGE inclusions it can be hypothesized that Byzantine gold came from placer deposits. See OGDEN 1977; MEEKS AND TITE 1980.

328 The recycling of Byzantine gold from sources other than coinage is also a possibility.

recently been discussed.<sup>329</sup> How did the Muslim conquerors of North Africa debase their coinage (as I have pointed out, the earliest Islamic coinage is two carats lower than the Byzantine coinage), and where did the ore used in the debasement come from?

As can be seen in Figure 124, there appears to be a correlation between the silver and copper contents for the Byzantine coins, with a decline in fineness between the Byzantine and Islamic coins due to an increase in both the silver and the copper contents. One of the coins of Constantine IV (BNC 11=A. f. 758) also shows a composition (Au 86.5% Ag 10.9% Cu 2.7%) consistent with the composition of the Series NA 1 coinage. As has been suggested above, this is further evidence that some seventh-century Byzantine Carthaginian coins may in fact be Islamic imitations.<sup>330</sup>

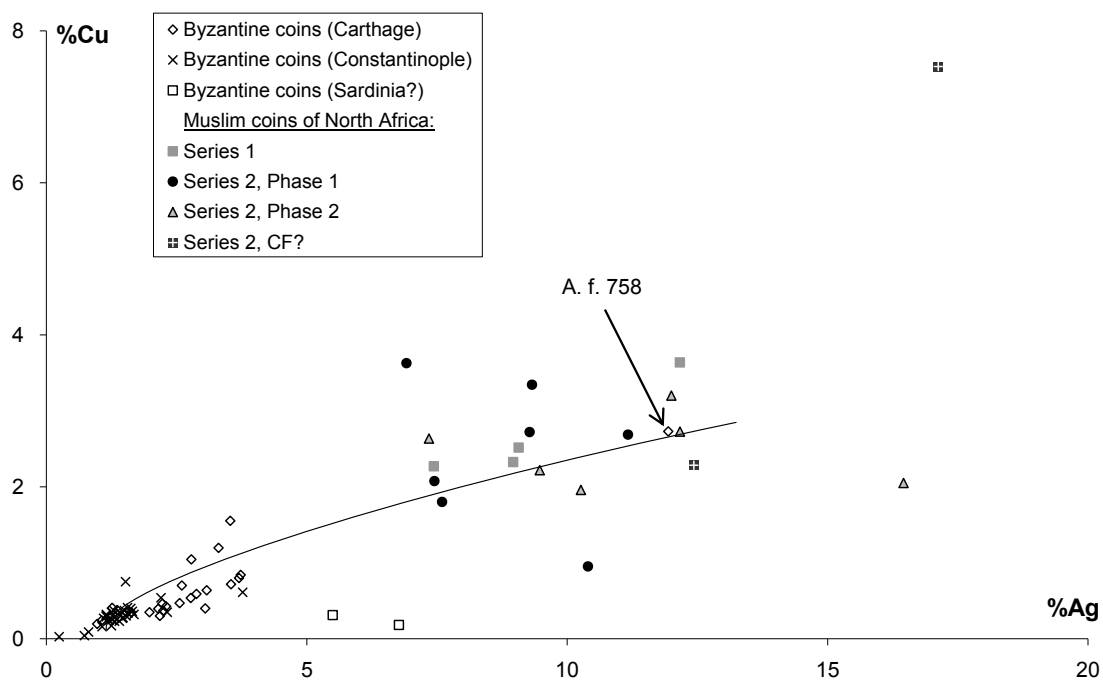


Figure 124: The proportions of copper (Cu) and silver (Ag) for the Byzantine mint of Carthage and Sardinia and the Islamic Mint of North Africa.<sup>331</sup>

329 JONSON ET AL forthcoming.

330 IBID.

331 Reproduced from JONSON ET AL forthcoming.

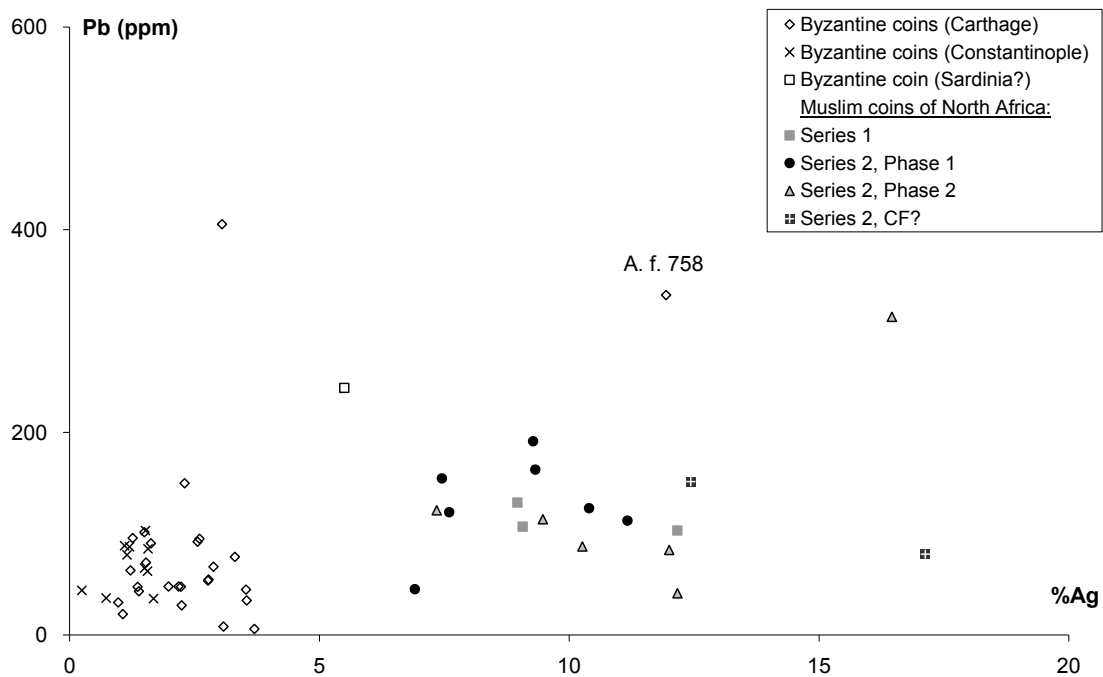


Figure 125: The proportions of lead (Pb, in parts per million) and silver (Ag) for the Byzantine mint of Carthage and the Islamic Mint of North Africa.<sup>332</sup>

Other elements, such as lead, also provide information about the debasement of a coin series. Gondonneau et al. 2000 analysed four “Latin-Arab” coins, and stated that the coins that contain up to about 150 ppm lead are made with non-purified gold (native gold=non-purified gold). Two years later, Gondonneau and Guerra 2002 saw no correlation between silver and lead for the Islamic gold coins, and remarked, “in general the dinars seem to have been made with native gold”.<sup>333</sup>

The most recent study reinforces the earlier work, with no correlation either between silver and lead, although Figure 125 shows a general increase in both silver and lead between the Byzantine and Islamic coins.<sup>334</sup> In this work, the authors compared their data with Morrisson et al’s 1985 findings for the Byzantine gold coins minted in Constantinople in the eleventh century. The earlier study showed that the Byzantines first debased their coinage by adding non-purified gold, followed later by

332 Reproduced from JONSON ET AL forthcoming.

333 GONDONNEAU AND GUERRA 2002, p. 580.

334 JONSON ET AL forthcoming.

the addition of recycled silver coinage.<sup>335</sup> The data in Figure 124 and Figure 125, when compared to the earlier findings in Figure 126 below, show that the silver, lead, and copper content found in the early Islamic coins is consistent with the eleventh-century Byzantine coins struck in Constantinople. The hypothesis that non-purified, native, gold to debase the Islamic coins seems in fact to be credible.

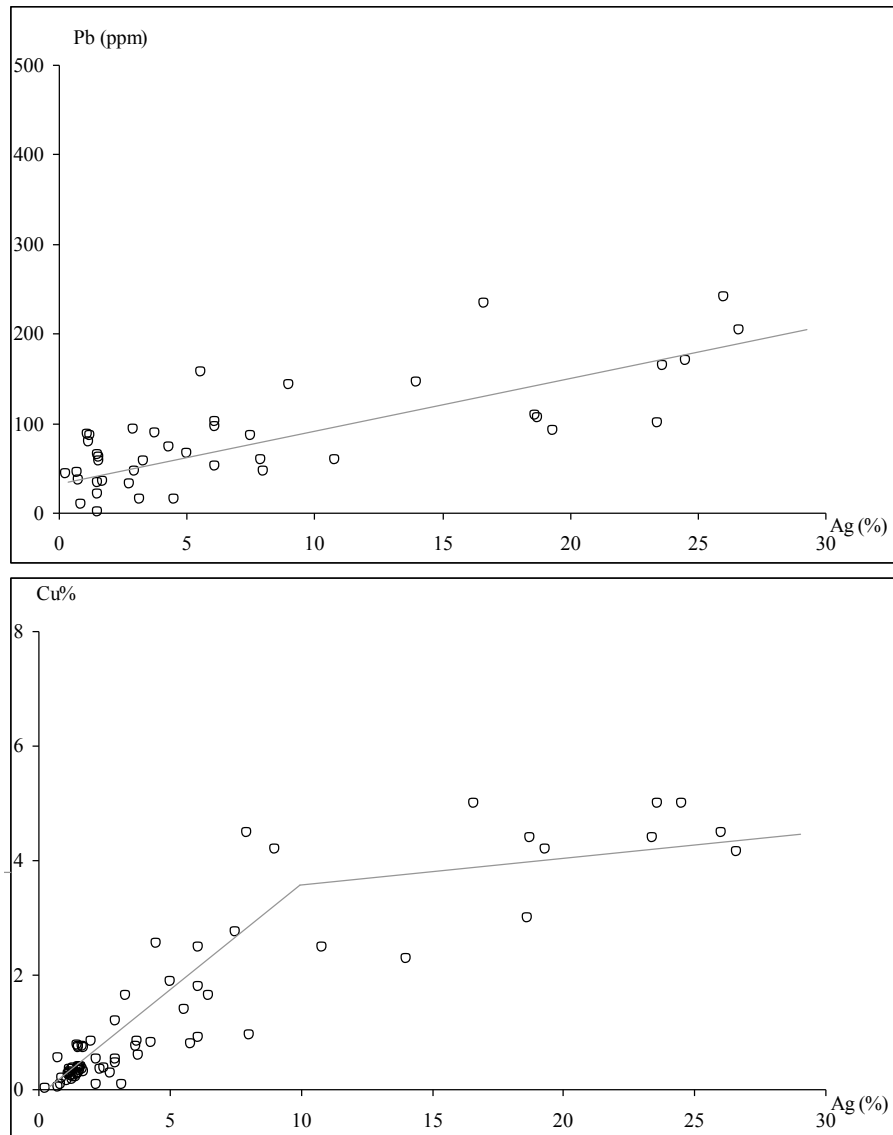


Figure 126: The proportions of lead (Pb, in parts per million), silver (Ag) and copper (Cu) for the Byzantine coins minted in Constantinople before the end of the 11th C.<sup>336</sup>

335 MORRISSON ET AL 1985.

336 Reproduced from JONSON ET AL forthcoming. Data from MORRISSON ET AL 1985.

Unfortunately, the conclusion above does not explain the process that transformed the Byzantine coinage that averaged 96% Au into the early Islamic coinage that averaged 88% Au. The non-purified, native gold that needed to be added to the Byzantine coinage had to have similar platinum, palladium and iridium contents, and moreover its gold/silver (90/10 to 70/30) and silver/copper (4/1) ratios needed to be within a certain range.<sup>337</sup>

It is extremely difficult to identify an ore fingerprint with a similar ratio to those above, and requires the analysis of the elemental makeup of gold from historic mines (many now exhausted) and a knowledge of how the elemental composition of gold objects changed when the gold was converted to a metal suitable for the striking of coins.<sup>338</sup> Even with this knowledge, the elemental composition of the gold ore still needs to be linked to the gold coinage, a difficult task even for those elements that remain constant during the manufacturing process.<sup>339</sup>

The most recently suggested source for the native, non-purified gold that needed to be added to the early Islamic gold of North Africa is the Eastern Egyptian desert.<sup>340</sup> There are good historical and metallurgical reasons for this tentative suggestion, including the loss of control by the Byzantine Empire of gold sources in the Balkans, the Danube and the Caucasus by the early eighth century; the political situation in early Islamic North Africa, with the first two governors (Ḥassān ibn al-Nu‘mān al-Ghassānī and Mūsā b. Nuṣayr) subordinate to the governor of Egypt and possibly having access to gold sources in that province; and the high silver content of the gold

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337 JONSON ET AL forthcoming.

338 A forthcoming paper sums up the methodology of the provenance studies on gold coinages and emphasizes on the limits and difficulties, see BLET-LEMARQUAND ET AL. forthcoming.

339 See the study on Georgian Bronze Age gold artefacts in HAUPTMANN AND KLEIN 2009.

340 JONSON ET AL forthcoming.

in the Eastern Egyptian desert, similar to what would be required for the striking of early Islamic gold coinage.<sup>341</sup>

***ORIGIN OF ALLOY USED TO STRIKE THE ISLAMIC COINS DURING THE CONQUEST OF THE IBERIAN PENINSULA***

As noted above, PAA analysis of 45 Visigoth tremisses has been previously undertaken, and in several publications these results have been compared to a small number of Series IP 2 examples.<sup>342</sup> Unfortunately, the most recent LA-ICP-MS results from the Centre Ernest-Babelon are still unpublished, and the discussion below is therefore a summary of the earlier work.

The previous comparisons of the elemental make-up of the Visigoth and early Islamic coinage of the Iberian Peninsula conclusively show that the Series IP 2 solidi were recycled from the previously struck Visigoth tremisses (likely supplemented by other Visigoth gold objects). The similarity in the elemental make up of the two sets of coinage can be clearly seen through a comparison of the platinum and tin contents in Figure 127 below, with the majority of the early Islamic examples similar to the Visigoth coinage struck at mints in the south of the Iberian Peninsula.

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341 Recent studies carried out by Rosemarie and Dietrich Klemm show that gold from the Eastern Egyptian desert is characterised by a high silver content in the range of 20 to 30% (against 80 to 70% Au), while that of Nubian Sudan has a much lower content. KLEMM AND KLEMM 2013, p. 42, fig. 4.1. Note that the vertical axis should be read Ag wgt % and not Au wgt %.

342 ROUX 2000; GUERRA AND ROUX 2002; and GONDONNEAU AND GUERRA 2002.

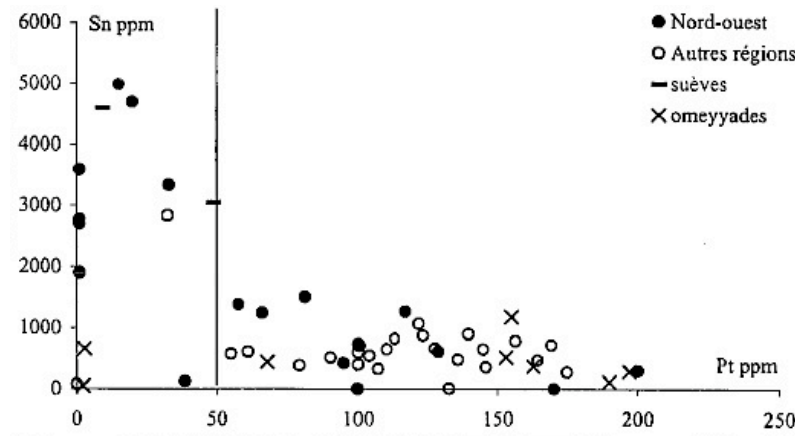


Figure 127: The concentration of platinum (Pt) and tin (Sn) for the northern and southern Visigoth Tremisses and for the first Islamic Coins Struck in the Iberian Peninsula.<sup>343</sup>

The Visigoth coinage (represented by black dots in Figure 127) struck in the Northwest region of the Iberian Peninsula, is characterized by higher levels of tin and palladium, while the currencies in other regions of the Peninsula have higher values of platinum and zinc. Some of the Visigoth coins struck in the north seem to be made from southern gold, and Metcalf has posited that the production of the northern mines could not meet all the monetary needs for the region, and needed to recycle coinage from workshops in the south.<sup>344</sup> The levels of silver and lead also changed as the Islamic mints shifted to the recycling of Visigoth tremisses after the invasion, although the results of the analysis of platinum is inconclusive. The latest Visigoth tremissis analysed (struck in Toledo in 705) does, however, have a similar proportion of platinum as the early Islamic examples.<sup>345</sup>

343 Reproduced from GUERRA AND ROUX 2002, p. 228.

344 GUERRA AND ROUX 2002, p. 225-6.

345 ROUX 2000, p. 45-47.

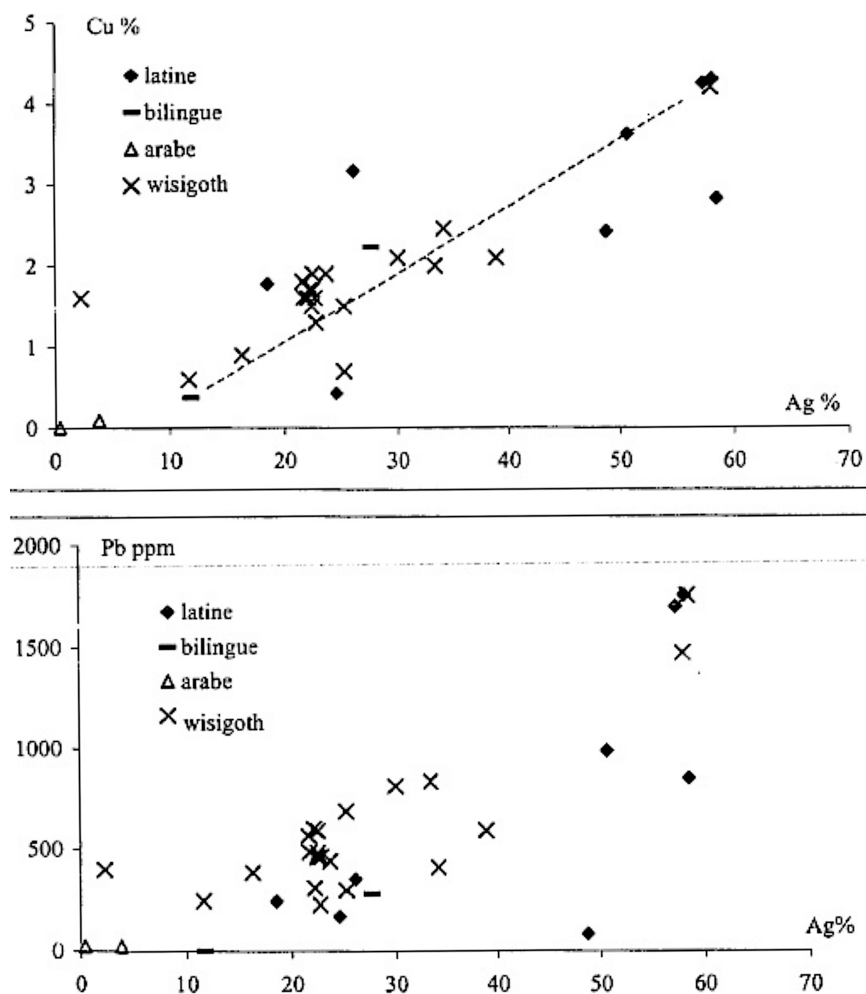


Figure 128: Concentration of silver as a function of copper and lead for the Visigoth tremisses of Baetica and southern Lusitania.<sup>346</sup>

If we consider the data in Figure 128, we can again observe the similarity in the elemental makeup of the earliest Islamic Iberian Peninsula issues and Visigoth coins from areas first conquered by the Muslims: Baetica (Cordoba, Eliberri, Ispalis); and in the south of Lusitania (Emerita, Evora and Tuselvora). For both sets of coinage, there is a close correlation between the lead, silver and copper values. This again suggests that the earliest Islamic coinage of the Iberian Peninsula was recycled from the Visigoth issues.

346 Reproduced from GUERRA AND ROUX 2002, p. 227, fig. 9.

***ORIGIN OF ALLOY USED TO STRIKE THE MUSLIM COINS AFTER THE CONQUEST OF THE IBERIAN PENINSULA***

The main Islamic mint returned to North Africa in 95-96/713-15. The gold content results of the PAA and SG tests appear to indicate that the workshop continued to utilize gold from the Iberian Peninsula to strike the Series NA 2, Phase 3 coinage. An increase in the gold content does appear with the striking of Series NA 3, however, and is even more apparent with the Series IP 3 solidi and fractionals, with the majority of the latter coinage above 80% Au (See Figure 129). Figure 130 below, which plots the palladium/gold versus the platinum/gold ratios, even more clearly demonstrates the similarity between the Series NA 3 and IP 3 examples.

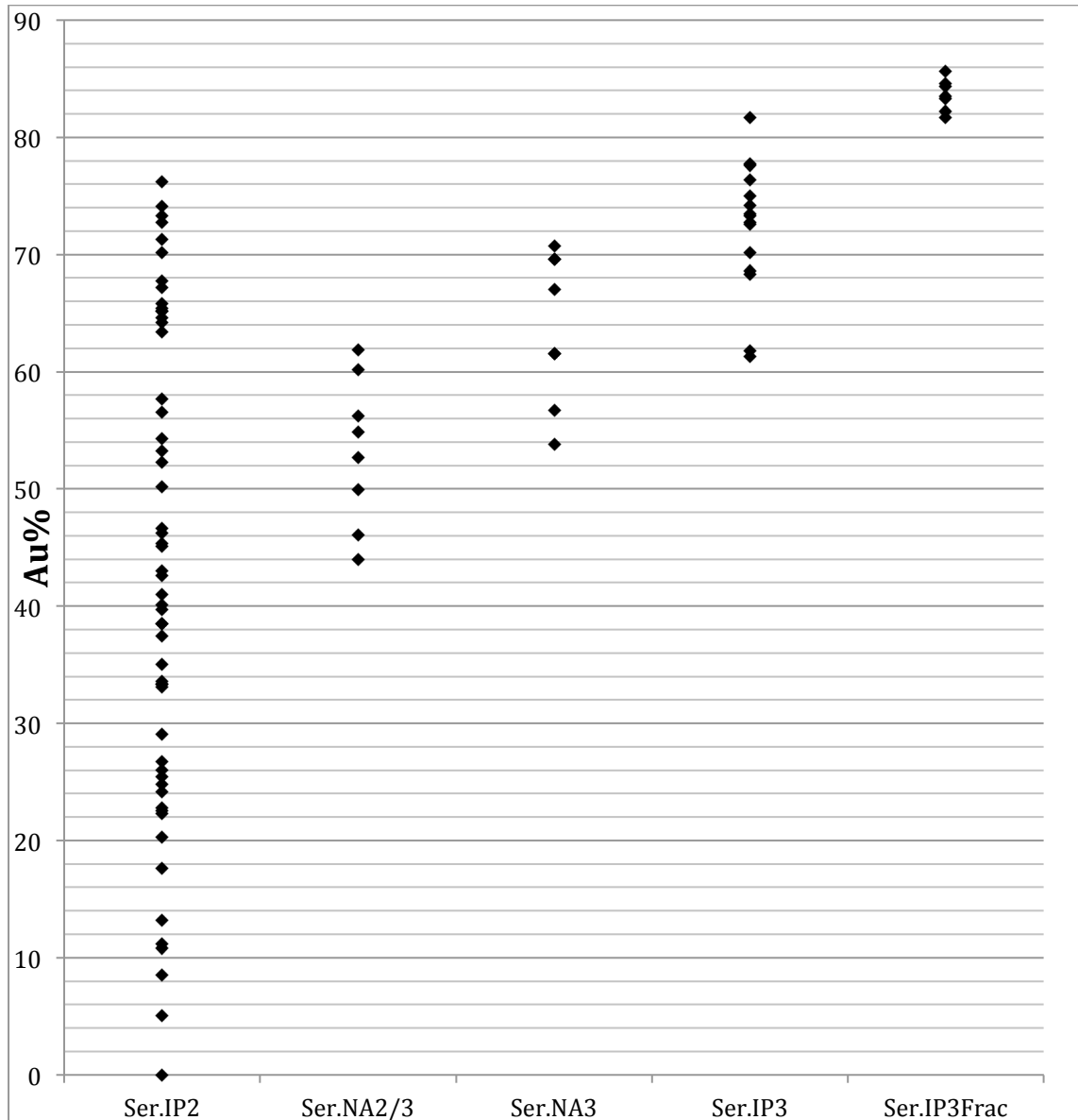


Figure 129: Comparison of gold content of the Series IP 2, Series NA 2, Phase 3 and Series NA 3 and IP 3 Coinage.

This increase in gold content, as well as the elemental similarity of the Series NA 3 and IP 3 coinage, was previously pointed out by Roux, who linked the changes to the stability of the governments in the two regions.<sup>347</sup> A new governor did indeed take over in North Africa in 97/714-15, with the Caliph Sulaymān (r. 96-99/715-717) appointing Muḥammad b. Yazīd al-Qurashī (r. 97/714-100/718) to the post. Muḥammad in turn designated Al-Ḥurr ibn ‘Abd al-Raḥmān al-Thaqafī as governor of

<sup>347</sup> ROUX 2000, p. 41.

the Iberian Peninsula in 98/716, coinciding with the striking of the Series IP 3 solidi and fractionals in that same year.<sup>348</sup> A large amount of booty likely accompanied Mūsā when he returned to North Africa, which would account for the lower gold content of the Series NA 2, Phase 3 coinage relative to the Islamic coinage struck in North Africa prior to the invasion of the Iberian Peninsula. As the mint shifted to the production of the Series NA 3 coinage and, with the setting up of a new mint in the Iberian Peninsula, Series IP 3, both earlier North African and Iberian Peninsular coinage was recycled, with the North African coinage of a higher gold content.

***ORIGIN OF ALLOY USED TO SERIES 4 (POST-REFORM) COINAGE***

The early Islamic, Post-Reform dinars of North Africa, the Iberian Peninsula and the Caliphal mint in Damascus are very similar in their elemental makeup, with a high fineness, and the same very low levels of silver, lead, copper, tin, antimony and arsenic. The only difference appears to be in the platinum, with lower levels in the dinars of the Iberian Peninsula, but it is difficult to draw conclusions from only two examples of this type.<sup>349</sup>

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348 TĀHĀ 1989, p. 187.

349 ROUX 2000, p. 46-50.

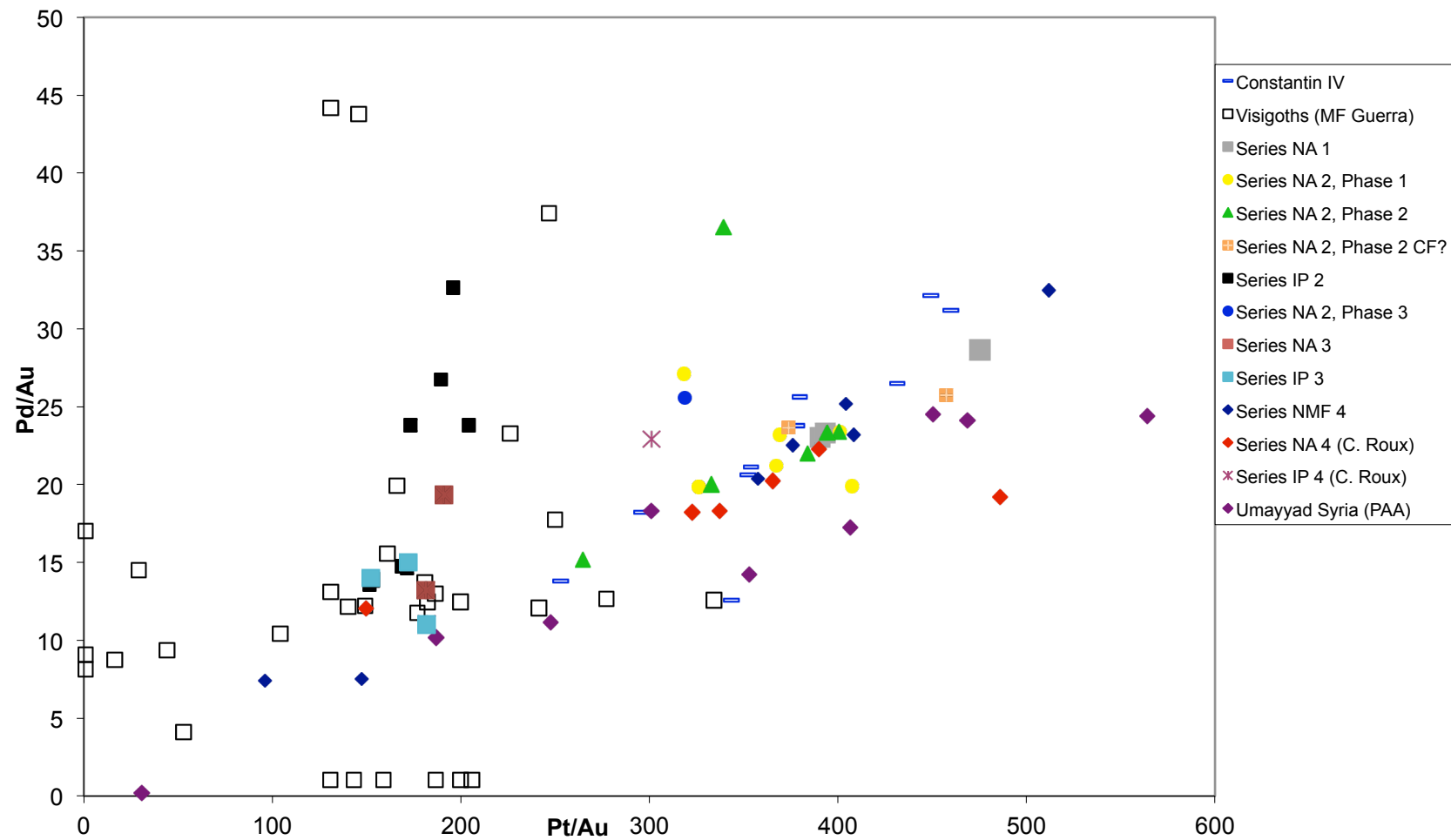


Figure 130: The Pd/Au versus Pt/Au ratios for Series 1 through 4 of the Early Muslim Coinage of North Africa and the Iberian Peninsula. Visigoth, Carthaginian (Constantine IV), and Umayyad Syrian Coinage included for comparative purposes.

Figure 130 plots the palladium/gold and platinum/gold ratios for Series 1 through 4 of the early Islamic coinage of North Africa and the Iberian Peninsula. Visigoth, Carthaginian (Constantine IV), and Umayyad Syrian coinage have been included for comparative purposes. Although it is difficult to draw any firm conclusions based on the figure, there does appear to be a close alignment between the majority of the Series NM 4 fractional dinars and the gold coinage struck in North Africa (including the Byzantine issues).<sup>350</sup> This further bolsters the argument that the Post-Reform gold fractionals without a mint name were struck in North Africa.

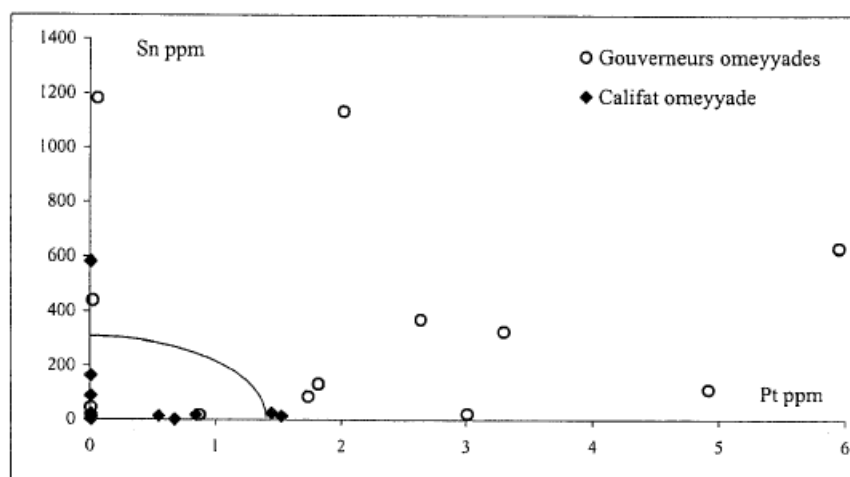


Figure 131: Concentrations of tin (Sn) as a function of platinum (Pt) for the early Islamic coinage of the Iberian Peninsula and that of the Umayyad Caliphate in Iberian Peninsula.<sup>351</sup>

Finally, it should be noted that, like the Aghlabids of North Africa, the Umayyad Emirate/Caliphate of the Iberian Peninsula (139-40/756 - 422/1031) also struck gold sourced from West Africa.<sup>352</sup> Figure 131 clearly shows the difference in the tin and platinum contents of the latter coinage from the early Muslim coinage of the Iberian Peninsula. The differences in the levels of tin and platinum clearly show a change in the ore.

<sup>350</sup> Based on the unpublished analyses of Series NM 4 examples undertaken by the CEB.

<sup>351</sup> GUERRA AND ROUX 2002, fig. 13, p. 229.

<sup>352</sup> GONDONNEAU AND GUERRA 2002; GUERRA 2000 a and b; and GUERRA AND ROUX 2002.

In summary, the analysis of the metallurgy of the Islamic gold coinage of North Africa and the Iberian Peninsula further emphasizes the complexity of the early coinage of the two regions. The evidence above, although not conclusive, suggests that the Muslim conquerors of North Africa may have struck direct imitations of Byzantine solidi prior to introducing the Series NA 1, Two Imperial Bust type, similar to the imitations struck in the central Islamic lands (see p. 22). For both of these types, the Muslim administrators appear to have supplemented the existing gold stock (North African Byzantine solidi) by a possible importation of gold from another source (southern Egypt?) in order to produce coinage with a gold content of 85-8% Au.

The several Islamic mints in the Iberian Peninsula (whether main or secondary), in contrast, recycled the existing Visigoth coinage when striking Series IP 2 solidi. Series IP 2 varied substantially in its gold content (0-75% Au), although the coinage struck at the main Muslim mint appears to have been struck to the highest fineness possible at the time (57-75% Au). The return of the main mint to North Africa saw the Islamic workshop continue recycle Visigoth coinage for Series NA 2, Phase 3. Series NA 3 and IP 3 coinage appears to have recycled both Visigoth and the earlier Muslim coinage of North Africa, as the average fineness begins to increase and with the minting of the Series IP 3 fractionals there once again is an issue averaging over 80% Au. It is only with the introduction of the Series NA and IP 4, Post-Reform dinars that the gold content of the coinage of North Africa and Spain came into alignment with that in the rest of the Umayyad Caliphate.

## **ESTIMATION OF THE NUMBER OF DIES**

As I outlined in the Methodology beginning on p. 76, the estimation of the number of dies used by a mint for the production of a particular issue is plagued by uncertainty. Small sample sizes, the lack of randomness in a sample, and the inability to estimate the number of dies that broke after the mint struck only a few coins can all impact the accuracy of the estimate of the number of dies.

For the early Islamic precious metal coinage of North Africa and the Iberian Peninsula, the estimation of the number of dies is further complicated by specific circumstances in these two mints. First, as previously outlined in the Typology, the early Islamic mints in the two regions frequently used dies in multiple years and to strike multiple denominations. The use of dies for multiple denominations impacts the ability to estimate the number of dies for a particular series by denomination, especially when the overall sample size is small, while the use of dies in multiple years impacts the ability to estimate the number of dies by year.

Secondly, the early Islamic mints in North Africa and the Iberian Peninsula may not have operated continuously. The Republican denarii in Figure 132 below are a good example of coins that were produced in very large numbers and under uniform ‘factory’ conditions – production was probably continuous, all dies would be prepared in the same way, coins would always be struck in the same way, and dies would only be discarded when they wore out. The early North Africa and Iberian Peninsula mints likely did not operate continuously, at least until the striking of the Series 4, Post-Reform silver coinage. Instead, they may have been required to produce small batches of coins (of variable size) as required and dies may sometimes have been destroyed after producing a batch. Also, under these circumstances, individual dies may not have all been hardened in the same way, so that some dies may have lasted

far longer than others, which may contribute to the non-randomness seen in some of the scatter diagrams below.

Finally, unlike the Republican denarii, presumably some or all of the series were withdrawn from circulation fairly soon after they were minted. If a series were produced for say three years and then withdrawn from circulation we might expect coins struck from the later dies to survive in lower numbers as there would have been much less time for their accidental loss. This may explain why the Series NA 1, NONEST type survives in larger numbers than the other Series NA 1 types, as I argue on p. 379 that the NONEST type is the earliest Series NA 1 coinage.

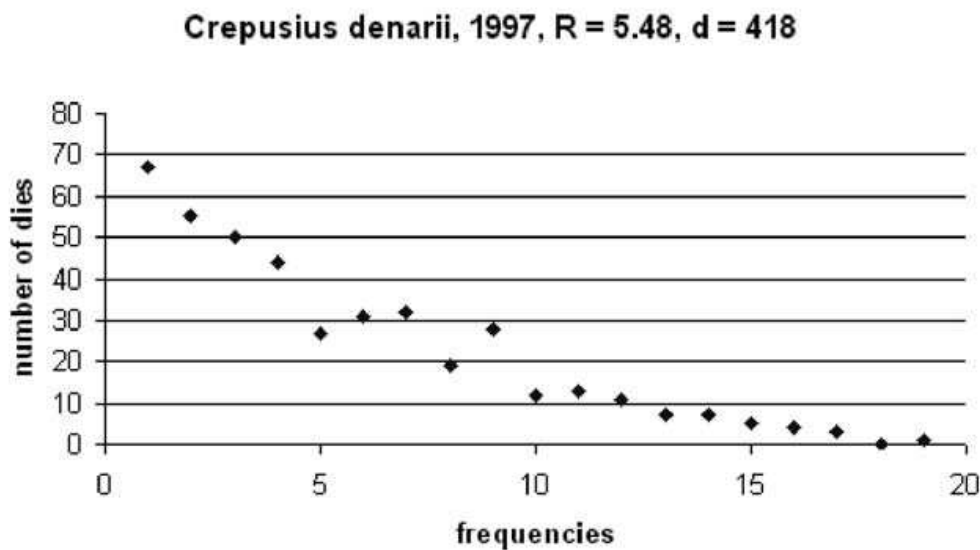
The above factors all influence my approach to the estimation of the number of dies. For Series NA 1 and Series NA 2, Phases 1 and 2, I estimated the number of obverse dies for each group of coins. The use of the obverse dies for these groups means that the data cannot be broken down by denomination but, if the Series/Phases were divided by denomination (i.e. the reverse die), too few examples would be available to make any meaningful suggestions regarding the number of dies used for each group of coins. For Series IP 2, Series NA 3, and Series IP 3, which only consist of solidi, I calculated an estimate for the number of obverse dies for consistency reasons. I have not estimated the number of dies for Series NA 2, Phase 3 or the Series IP 3 fractionals given the small number of examples available, as well as the fact that all of the Series IP 3 fractionals were struck from the same obverse die.

For Series NA 4, Series IP 4 (dinars and dirhams), and Series NM 4 (*nisf* and *thulth*), I estimated the number of dies for the years where I have recorded the largest number of surviving examples.

**Table 100: Estimate of the Number of Obverse Dies and Coverage for Series 1 to 3**

Ser./Ph.	No. of Ex.	No. of Dies	Die Estimate <sup>353</sup>	Confidence Intervals (95%)		C <sup>354</sup>
NA 1	55	23	45	32	63	78%
NA 2, Ph. 1	104	27	34	29	39	95%
NA 2, Ph. 2	59	18	23	19	28	95%
IP 2, main	31	19	62	33	125	53%
IP 2, secondary	126	97	492	307	800	36%
NA 3	36	27	106	55	226	44%
IP 3	32	18	41	24	71	72%

Table 100 shows the calculation of the estimated number of obverse dies for Series 1 through 3, together with the confidence intervals and coverage (C) of the sample of each series.



*Figure 132: Scatter diagram showing an example of a randomly distributed dataset for a large number of examples and dies (No. of examples: 2290; No. of dies: 418)<sup>355</sup>*

<sup>353</sup> Formula (4). ESTY 2011, p. 50

<sup>354</sup> Estimation of Coverage (Formula (3)). ESTY 2011, p. 49.

<sup>355</sup> The denarii are used for comparative purposes because of the large dataset. See ESTY 2011, p. 51, fig. 8.

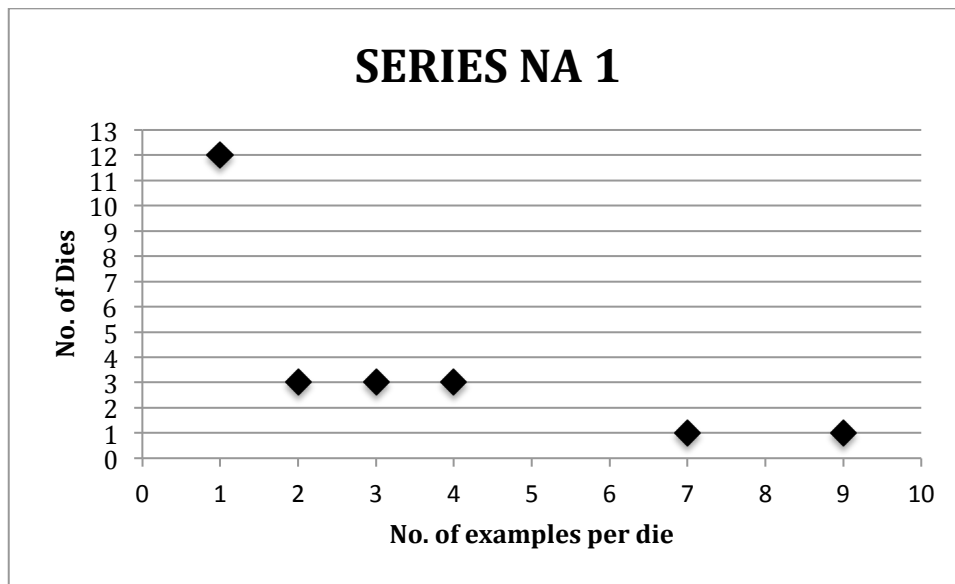


Figure 133: Scatter diagram plotting the number of dies versus the number of examples per die for Series NA 1 (c. 79/698-84/703)

We can see by comparing the scatter diagrams in Figure 132 and Figure 133 that the data for Series NA 1 is what would be expected from a random sample of a population that was produced in a uniform way, although the obverse dies that have seven and nine examples are of some concern. An unusually high number of coins from a single die may indicate that the sample is not random, as the coins may have stayed together ever since they were minted. Random samples may, however, sometimes produce a number of dies represented by far more than the average number of coins.<sup>356</sup> With no find data for Series NA 1 it is impossible to determine whether these coins were found together (which would contribute to a lack of randomness), but the coins from these dies exhibit varying degrees of wear, suggesting that they are random.

The estimated number of dies used to strike Series NA 1 is 45, with confidence intervals of 32 to 63.<sup>357</sup> In other words, a large number of unobserved obverse dies remain to be found, confirmed by the coverage for this series of 78% (i.e. there is a 22% chance that the next coin found would be from a new die). Given that we have

<sup>356</sup> ESTY 2006, p. 362.

<sup>357</sup> Small sample sizes will usually yield wide confidence intervals if the sample is random. See ESTY 2006, p. 362.

no secure dating for the striking of Series NA 1, we cannot estimate the number of dies used per year, although as I discuss beginning on p. 379 the changes to the iconography and large number of legend types suggest that they were struck over a significant period of time.

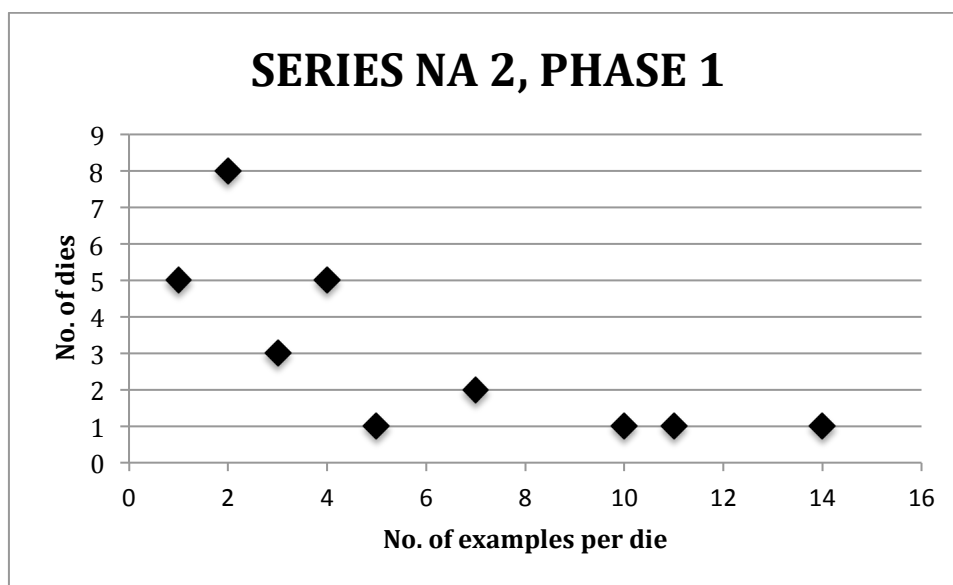


Figure 134: Scatter diagram plotting the number of dies versus the number of examples per die for Series NA 2, Phase 1 (84/703-87/706)

The information provided by the calculations in Table 100 suggests that we can be more secure in our conclusions when discussing the number of obverse dies used to strike Series NA 2, Phase 1. Nearly twice the number of coins as Series NA 1 have survived, and the coverage of the obverse dies is estimated to be 95%, suggesting that only a few obverse dies remain unaccounted for. The shape of the scatter plot in Figure 134, however, is not what we would expect if the sample were random. There is no clear curve as found on Figure 132, and three of the dies have a large number of surviving examples (10, 11, and 14 coins). Like Series NA 1, the lack of find spots for Series NA 2, Phase 1 limits what we can say about the lack of randomness of the sample, other than hypothesizing that a number of the surviving coins may have come from one or two hoards.

The estimation of the number of obverse dies for Series NA 2, Phase 1 is 34, with a lower limit of 29 and an upper limit of 39. This suggests that despite the fact that nearly twice as many examples survive for this group as opposed to Series NA 1, the latter series was a larger issue. As I have already mentioned, however, we do not know over what period Series NA 1 was struck, while the evidence provided by the coins of Series NA 2, Phase 1 (dated solidi, large number of die links between denominations and between years, see p. 112 through p. 130) suggest that Series NA 2, Phase 1 was struck in a short burst at the North Africa mint, likely in order to finance Musa's expeditions from Qayrawān farther west.

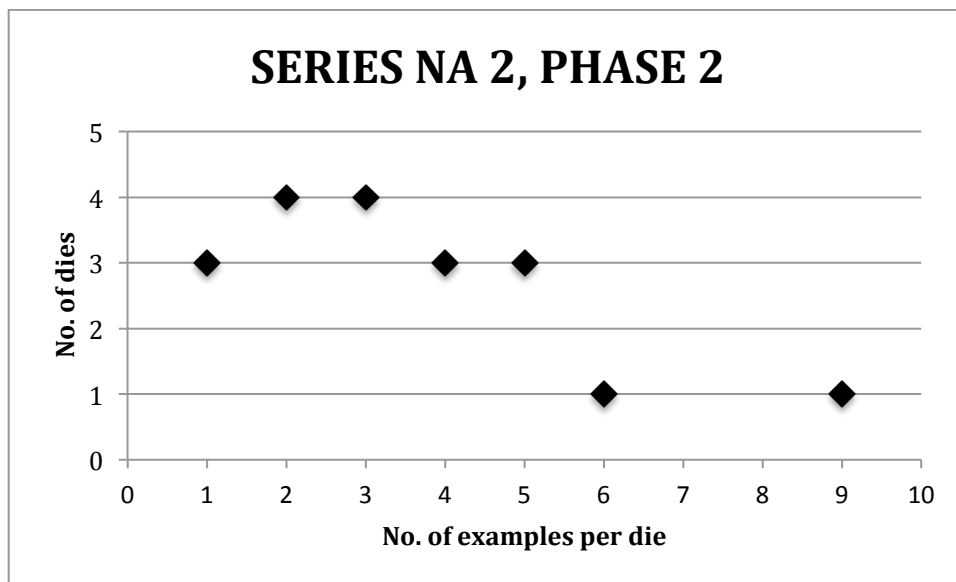


Figure 135: Scatter diagram plotting the number of dies versus the number of examples per die for Series NA 2, Phase 1 (89/707-92/711)

The coverage for the 59 examples of Series NA 2, Phase 2 is the same as that for Phase 1 – 95%. Like Phase 1, this suggests a high degree of confidence when estimating the total number of obverse dies used in this phase (23, with confidence intervals of 19 and 28), but once again the shape of the scatter plot in Figure 135 is not a good geometric curve that we would expect for a totally random sample. This makes it once again difficult to rely on the die estimate calculations with any degree of confidence.

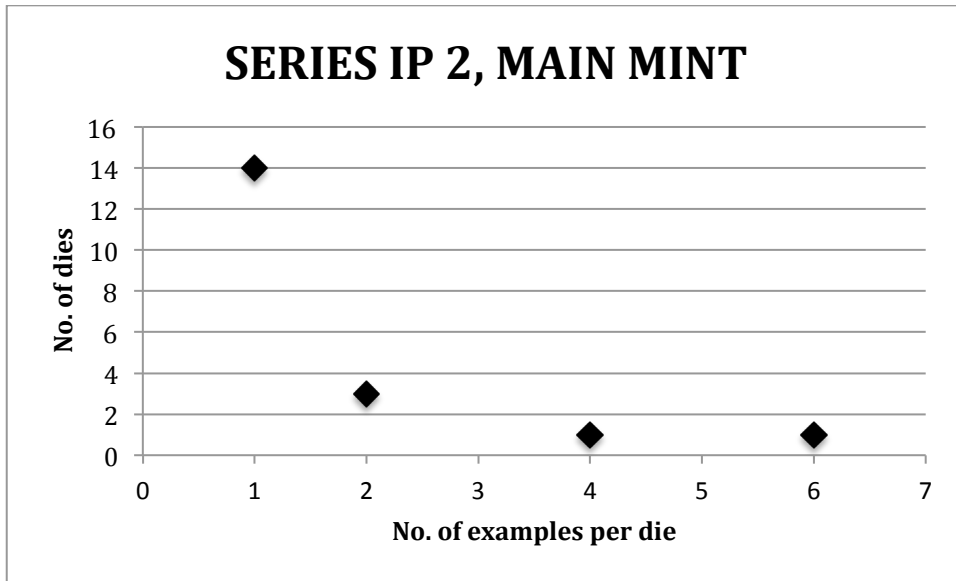


Figure 136: Scatter diagram plotting the number of dies versus the number of examples per die for Series IP 2, main mint (93/711-95/714)

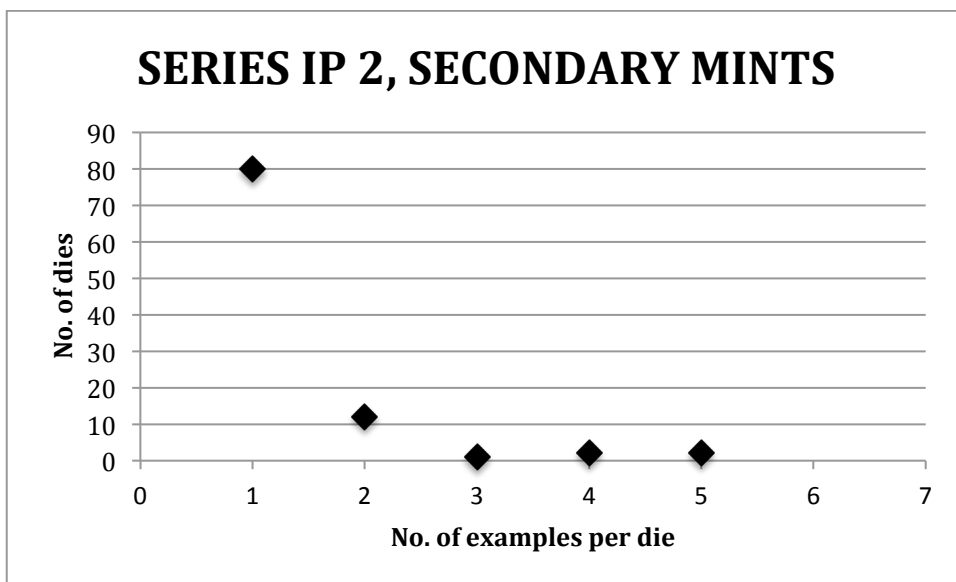


Figure 137: Scatter diagram plotting the number of dies versus the number of examples per die for Series IP 2, secondary mints (93/711-95/714)

The scatter plots for the Series IP 2 main (Figure 136) and secondary mints (Figure 137) appear to be from random samples, giving us some confidence in the calculations of the dies estimates in Table 100. Unfortunately, the number of surviving number of examples from the main mint (31) is quite small, and the coverage is only 53%. This leads to confidence intervals for the estimated number of dies as low as 33 and as high as 125, a huge variation. For the secondary mints,

although we have a larger number of surviving examples (126), the coverage is even lower (36%) than for the main mint, leading to confidence intervals as low as 307 and as high as 800. Even the lower estimate of 307 obverse dies implies that the gap between the known die examples of this series and the number ultimately used is enormous, and/or that dies were only used for a short period of time before being replaced. The estimate of the large number of obverse dies also provides further evidence to suggest that the secondary mints continued production of Series IP 2 solidi (with frozen dates) after the main mint moved to North Africa, filling the monetary needs of the Iberian Peninsula until the introduction of Series IP 3 solidi in 98/716-17.

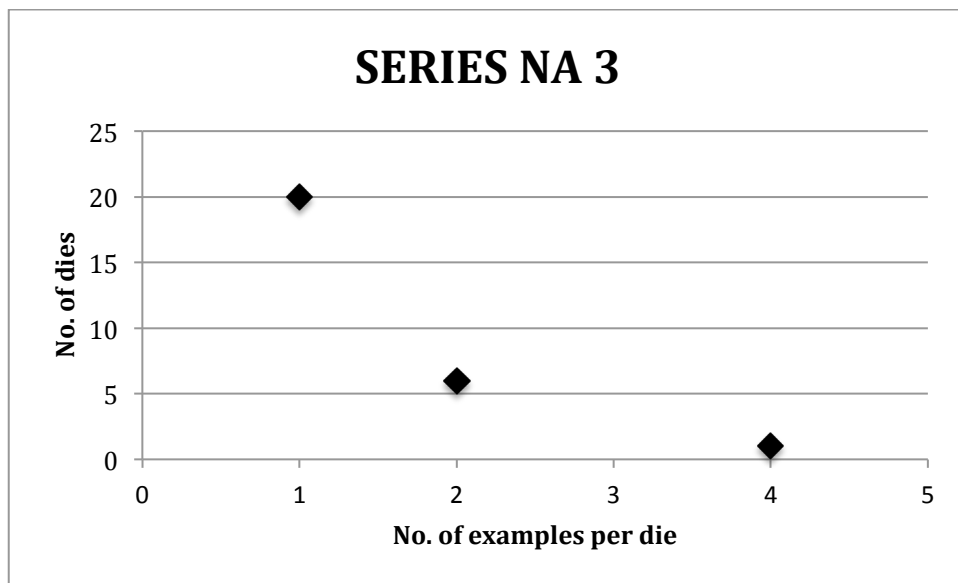


Figure 138: Scatter diagram plotting the number of dies versus the number of examples per die for Series NA 3 (97/715-99/718).

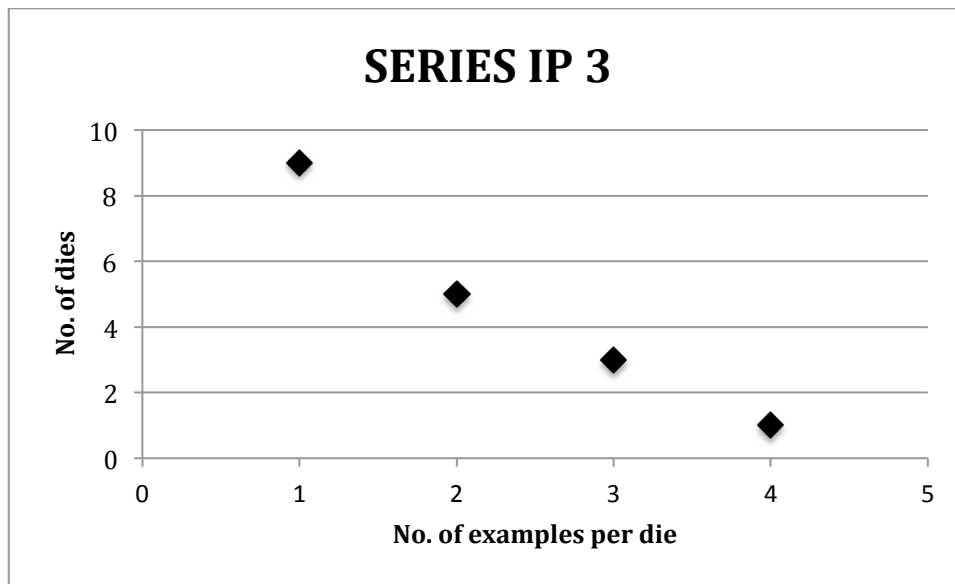


Figure 139: Scatter diagram plotting the number of dies versus the number of examples per die for Series IP 3 (98/716-17).

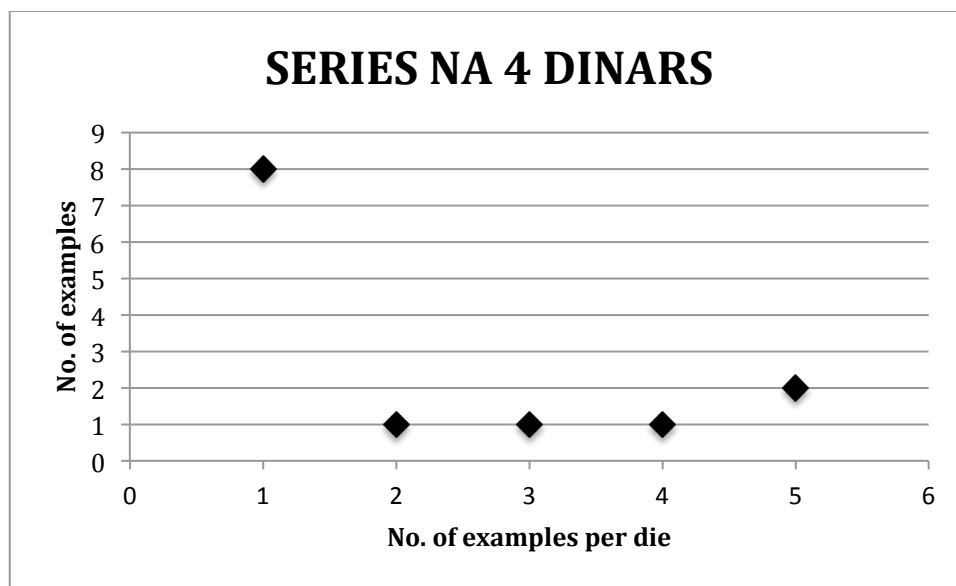
The shape of the obverse die distributions in Figure 138 (Series NA 3) and Figure 139 (Series IP 3) suggests that the datasets for these two series are random, although the small number of examples once again makes it difficult to draw any conclusions in this regard. The low coverage for Series NA 3 (44%) also implies that we cannot discuss the estimate of 106 obverse dies with any degree of confidence, especially when the confidence intervals vary from 55 to 226. At this stage the most that can be suggested is that the Islamic mint in North Africa utilized at least 55 obverse dies in the striking of Series NA 3 between 97/715-16 and 99/717-18, and may have used more than 100, or even 200 dies.

The coverage for Series IP 3 is 72%, significantly higher than Series NA 3. Thus, despite the smaller number of surviving examples the estimate of the number of obverse dies used, 41, can be argued with a higher degree of confidence. Again, however, the confidence intervals are fairly wide (24 to 71), reflecting the small size of the sample.

**Table 101: Estimate of the Number of Dies and Coverage for the Series 4, Post-Reform Coinage**

Series	Den.	Year(s)	No. of Ex.	No. of Dies	Die Estimate <sup>358</sup>	Confidence Intervals		C <sup>359</sup>
NA 4	Dinar	101-2	27	13	30	18	52	70%
IP 4	Dinar	102-3	19	13	42	21	101	53%
NA 4	Dirham	103	45	27	75	45	127	60%
IP 4	Dirham	114	35	17	30	20	46	80%
NM 4	nisf	100	17	6	9	6	15	88%
NM 4	thulth	100	42	19	38	26	57	76%

Table 101 provides an estimate for the number of dies struck in certain years for the Series 4, Post-Reform coinage of North Africa and the Iberian Peninsula. For each of the series, I have chosen to only estimate the year or years where I have recorded the largest number of surviving examples.



*Figure 140: Scatter diagram plotting the number of dies versus the number of examples per die for Series NA 4 dinars (101/719-102/721).*

The scatter plot in Figure 140 plots the reverse dies for the Series NA 4 dinar struck in 101/719-20 and 102/720-21. The plot appears random, although the two dies with five examples each are of some concern. The estimate of the number of

358 Formula (4). ESTY 2011, p. 50

359 Estimation of Coverage (Formula (3)). ESTY 2011, p. 49.

reverse dies for these two years is 30, with confidence intervals of 18 to 52, and an estimate for the coverage of 70%.

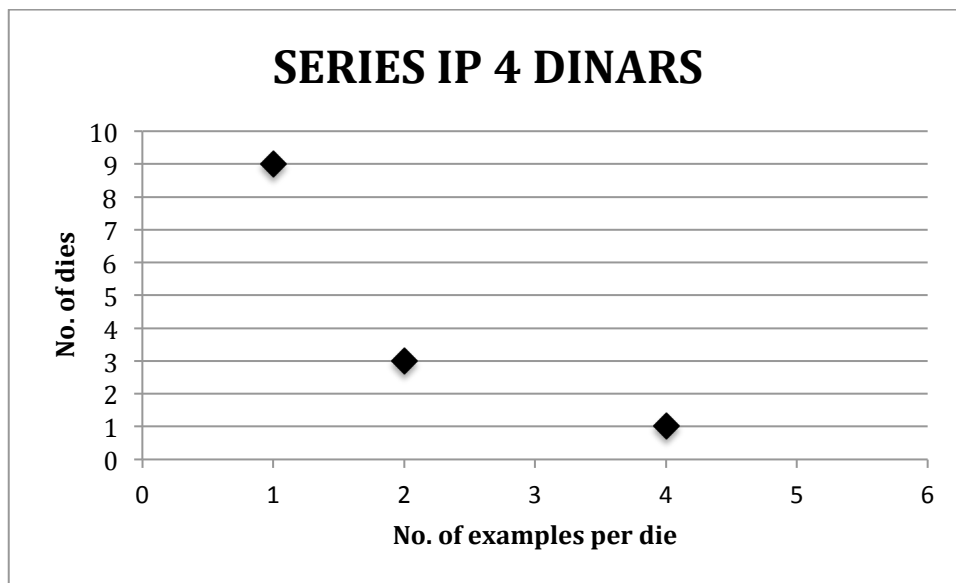


Figure 141: Scatter diagram plotting the number of dies versus the number of examples per die for Series IP 4 dinars (102/720-103/722).

The sample size (19) of the reverse dies for the Series IP 2 dinars struck in 102/720-21 and 103/722-22 is quite small and the coverage estimate of 53% is quite low. This leads to a high variability in the estimate of the number of reverse dies, which vary from as low as 21 and as high as 101. All that can be concluded at this time is that the Islamic mint struck a reasonably large number of dinars during the first two years of production, with most of the production occurring in 102/720-21. Judging by the surviving number of examples from subsequent years (see Table 64 on p. 223), production of Series IP 4 dinars was minimal after the initial burst of production.

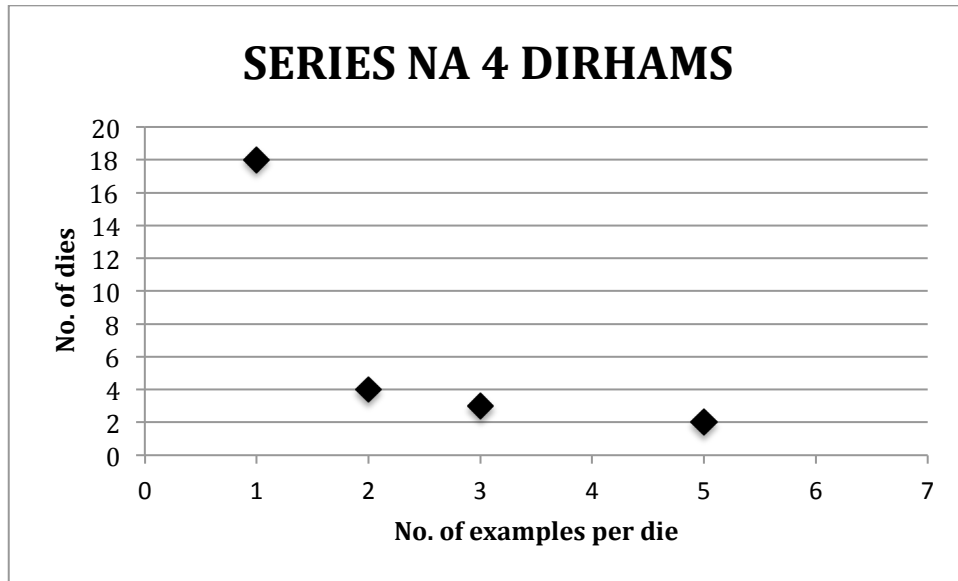


Figure 142: Scatter diagram plotting the number of dies versus the number of examples per die for Series NA 4 dirhams (103/721-22).

As previously shown beginning on p. 231, the early Islamic mints in North Africa and the Iberian Peninsula produced dirhams in nearly every year from their introduction in 97/715-16 and 103/721-22 respectively until the end of the Umayyad Caliphate in 132/749-50. The estimation of the number of obverse dies for each of the years is outside the scope of this dissertation,<sup>360</sup> but I have chosen to estimate the number of dies for the Series NA 4 and Series IP 4 dirhams for the year in which I have recorded the highest number of surviving examples.

The scatter diagram in Figure 142 shows the plot for the 45 Series NA 4 dirhams struck in 103/721-22. Once again, the distribution of scatter diagram suggests that the sample is random. Unfortunately, we also have a low estimate for the coverage of the sample (60%), leading to confidence interval estimates as low as 45 and as high as 127 for the number of reverse dies used in this year.

<sup>360</sup> The date is found on the obverse die for the dirhams, as opposed to the reverse die for the Series 4 dinars, *nisf* and *thulth*.

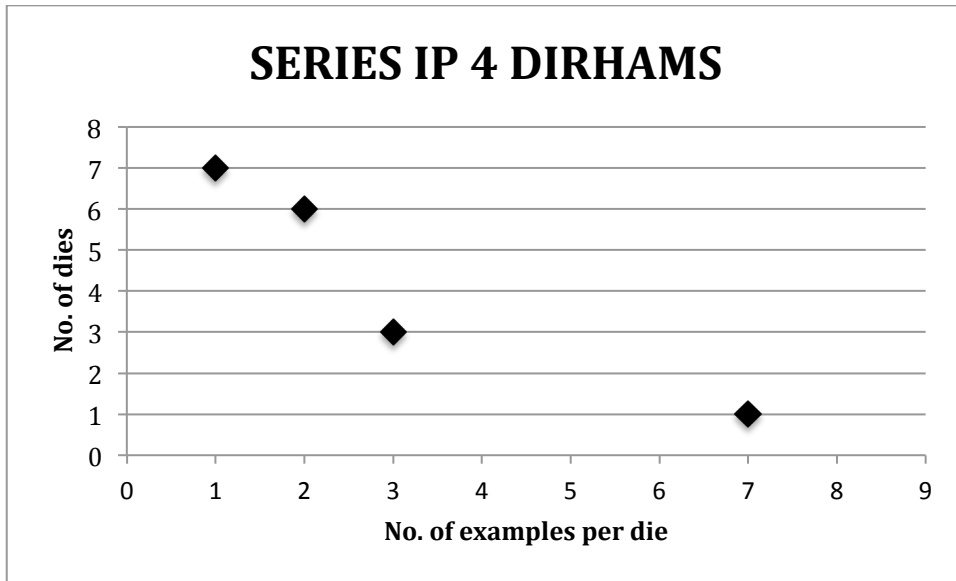


Figure 143: Scatter diagram plotting the number of dies versus the number of examples per die for Series IP 4 dirhams (114/732-33).

The largest number of surviving examples of the Series IP 4 dirhams were struck in 114/732-33. The 17 reverse dies used to strike the 30 coins from this year have a coverage estimate of 80%, considerably higher than the dirham examples struck in 103/721-22 at the North Africa mint. The scatter diagram for these dies in Figure 143 also suggests that the sample is random. The high coverage is reflected in the estimate of the number of reverse dies (30), and the lower gap in the confidence intervals of 20 to 46.

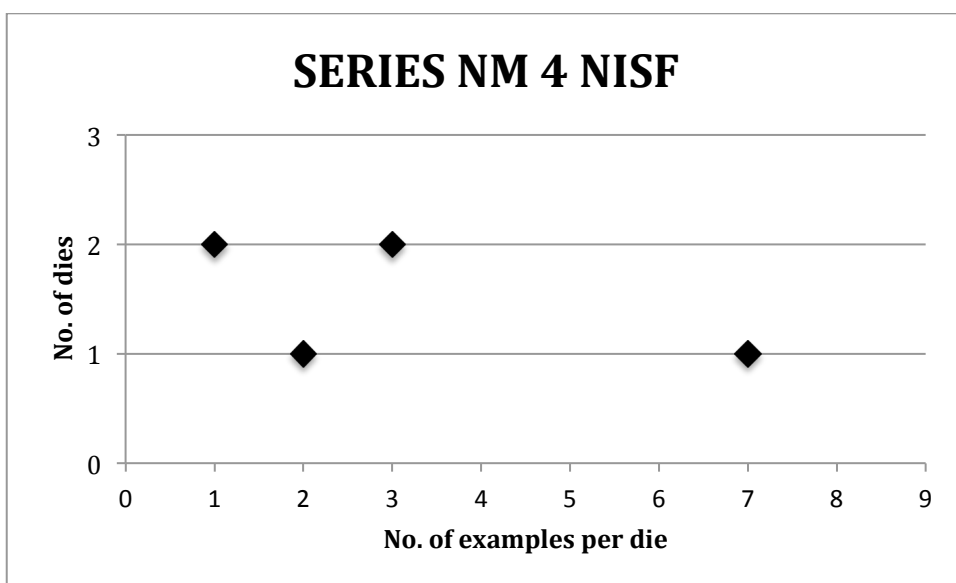


Figure 144: Scatter diagram plotting the number of dies versus the number of examples per die for Series NM 4 nisf (100/718-19).

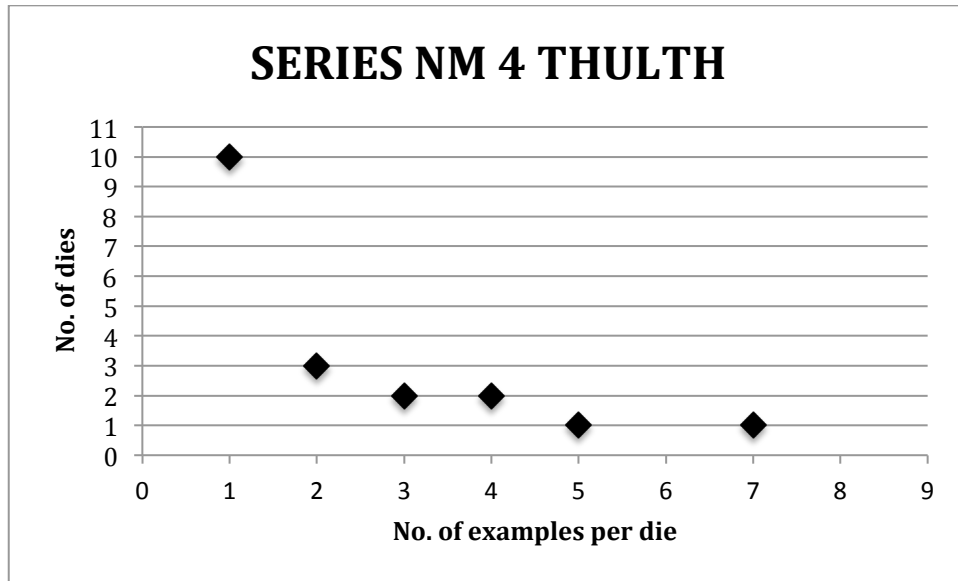


Figure 145: Scatter diagram plotting the number of dies versus the number of examples per die for Series NM 4 thulth (100/718-19).

As previously discussed beginning on p. 243, Series NM 4 *nisf* and *thulth* were struck intermittently from 91/709-10 to 103/721-22. Judging by the number of surviving examples and dies, they were never struck in any great quantity, with the largest number of surviving examples and dies coming from the year 100/718-19, the same year that the North Africa mint began to strike Series NA 4 dinars.

As can be seen in Figure 144 and Figure 145, only the *thulth* sample can be considered random, although it is difficult to ascertain the randomness of the *nisf* with so few surviving examples from that denomination.

The coverage of the Series NM 4 *nisf* is 88%, with an obverse die estimate of 9, and with confidence intervals of 6 to 15. The coverage is lower for the Series NM 4 *thulth* at 76%, but the shape of the scatter plot provides a greater degree of confidence for the estimate of the number of dies for this denomination. The estimated for the number of obverse dies for the *thulth* is 38, a considerable number, with confidence intervals of 26 to 57.

The data, calculations and discussion above for each of the main series of the precious metal coinage struck in North Africa and the Iberian Peninsula shows what is and what is not possible at this time when estimating the number of dies. The difficulties in estimating the number of dies listed at the beginning of this section, especially the small sample sizes and lack of randomness, impacts the ability to provide any conclusions regarding the number of dies. There is some value in comparing the number of dies for each series, however, as this potentially gives us some information regarding the relative outputs for the different series at the two mints.

## **A NUMISMATIC HISTORY OF THE EARLY ISLAMIC PRECIOUS METAL COINAGE OF NORTH AFRICA AND THE IBERIAN PENINSULA**

With the typology constructed and the results of the technical analyses set out, I will now turn to the numismatic history, comparing the results of my analysis of the precious metal coinage of North Africa and the Iberian Peninsula with the historical record, beginning with the first Muslim incursions into North Africa in 22/642 and concluding with the fall of the Umayyad Caliphate in 132/749-50.

The Muslim conquest of North Africa can be divided into four phases: from 22/642 until 41/661; from 41/661 until 55/675; from 55/675 until approximately 73/692-3; and, finally, from 73/693 until 89-90/708-9.

The first phase of the conquest began almost immediately after the capture of Alexandria in 21-22/641-2. ‘Amr b. al-‘Āṣ, the conqueror and first governor of Egypt, led two raids further west. The first expedition was to the Byzantine province of Cyrenaica, and resulted in the capitulation of Barqa and the extraction of tribute from the local population. The second expedition was into Tripolitania, and resulted in the fall of Tripoli, Sabratha and Leptis Magna in 22-3/642-3.<sup>361</sup> No permanent Muslim presence was established in these two regions at this time, however.

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<sup>361</sup> CHRISTIDES 2000, pp. 38-9; GOODCHILD 1967.

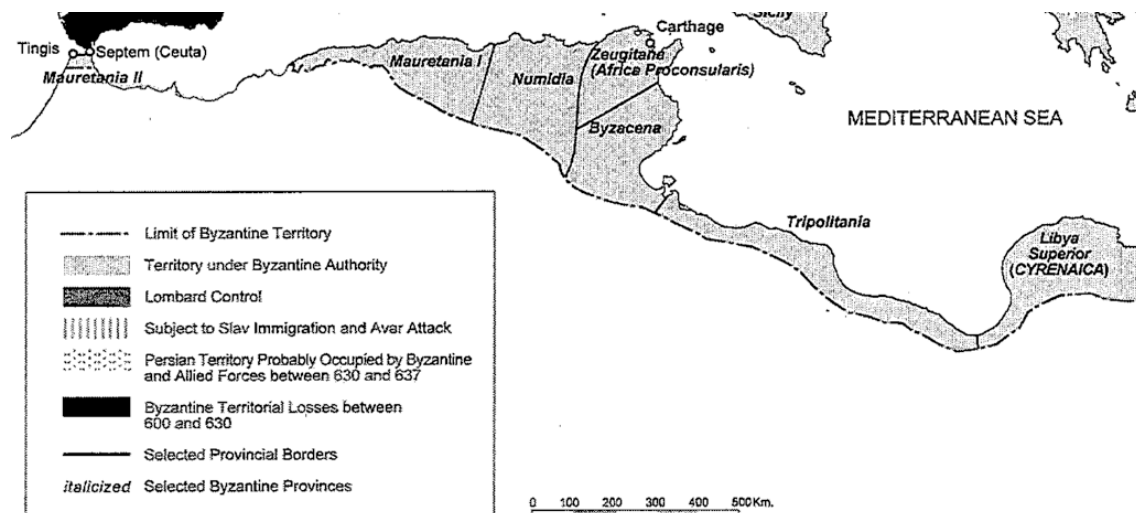


Figure 146: Map of the Byzantine Provinces of North Africa, c. 9-10/630.<sup>362</sup>

‘Amr b. al-‘Āṣ was removed from office in c. 25/645, shortly after the death of the Caliph Umar in 24/644. This dismissal, coupled with the difficulties produced by the inter-Muslim hostilities of the First *Fitna* (36-40/656-661), resulted in the Muslims limiting themselves to sporadic raiding of the Maghreb. The most important of these raids was undertaken by ‘Amr’s replacement, ‘Abd Allāh b. Sa’d b. Abī Sarḥ in 27/647-8, who engaged a large Byzantine force at Sufetula (Sbeitla), defeating the Byzantines and killing the Exarch Gregorius.<sup>363</sup> The Muslims, however, did not attempt to seize any territory at this time, perhaps because the tribute, combined with the booty captured, alleviated any economic need for conquest.<sup>364</sup>

Given that the Muslims to this point had not established any settlements in North Africa and had received substantial booty from multiple raids it is not surprising that we have no North Africa Islamic coinage from this early period. Silver coinage struck by the Byzantines after the defeat at Sbeitla is interesting however, as the Byzantine mint in Carthage placed the word *pax* (peace) on the reverse (Figure 147).

362 KAEGI 2010, p.5

363 KAEGI 2010, p. 11; CHRISTIDES 2000, pp. 41-2.

364 KAEGI 2010, p. 123.



*Figure 147: Half siliqua of Constans II, struck in Carthage in 647. CNGMBS72, L:2062. Image courtesy of Classical Numismatic Group, Inc. (0.42 g) (scale x4)*

It has been suggested that the placement of *pax* on the coinage of Carthage may have acknowledged the conclusion of peace between the Muslims and Byzantines in North Africa following the death of Gregorius.<sup>365</sup> It is more probable, however, that the *pax* coinage acknowledged the re-establishment of relations between the Byzantines in North Africa and the central government in Constantinople after the end of the revolt initiated by Gregorius.<sup>366</sup>

The second phase in the conquest of North Africa began with the confirmation of Mu‘āwiya b. ‘Abī Sufyān as Caliph in 41/661 and continued until 55/675. Although poorly documented, it was during this phase that the Muslims consolidated their control of Tripolitania and incorporated some of the Berber tribes into their numbers.<sup>367</sup> Two major expeditions also occurred during this period. The first expedition was led by Mu‘āwiya b. Ḥudayj al-Sakūnī, who invaded Byzacena (southern Tunisia) in 45/665, and may have established a settlement on Qarn Mountain, a forerunner of Qayrawān.<sup>368</sup> The founding of Qayrawān occurred in 50/670, when the Caliph outfitted a second expedition under the leadership of ‘Uqba

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365 GRIERSON 1966, p. 475 fn.

366 KAEGI 2010, p. 151

367 IBID., p. 109.

368 ABUN-NASR 1987, p. 28; TĀHĀ 1989, p. 59; CHRISTIDES 2000, p.43; KAEGI 2010, p. 220.

ibn Nāfi‘ al-Fihri. ‘Uqba resided at Qayrawān for the next five years, constructing a *dār al-imāra* (governor’s residence) and a congregational mosque.<sup>369</sup>

The third phase of the conquest began in 55/675, and is notable for the lessening of Byzantine authority over Zeugitana and Numidia and the increase in diplomatic exchanges between the Muslims, the Berbers, and the Byzantines. The Caliph Mu‘āwiya appointed Maslama b. Mukhallad al-Anṣārī as governor of Egypt in 55/675, who replaced ‘Uqba as governor of North Africa with his *mawlā* Abū al-Muhājir Dīnār.<sup>370</sup> Abū al-Muhājir founded a new garrison town near Qayrawān, overran much of Zeugitana and raided into Numidia.<sup>371</sup> The most important aspect of Abū al-Muhājir’s tenure as governor appears to have been the diplomatic relations he conducted with both the Byzantines and the Berbers. He signed a treaty with the Byzantine authorities of Carthage in c. 58/678, which may have given the Muslims authority over Byzacena. Abū al-Muhājir also made agreements with Berber tribes in Byzacena and the powerful Berber chieftain Kasīla in the Aures mountains.<sup>372</sup>

In 62/681, the Caliph Yazīd I dismissed Abū al-Muhājir and reinstated ‘Uqba as governor.<sup>373</sup> ‘Uqba conducted further raids into Numidia from Qayrawān in 63/683, possibly as far as the Atlantic Ocean, but he died in battle two years later.<sup>374</sup> The evacuation of Qayrawān by the Muslims followed this setback, which between 65/684 and 69/699 served as the capital of a short-lived Berber kingdom under Kasīla. In 69-70/688-9, ‘Abd al-Malik appointed Zuhayr b. Qays al-Balawī as governor of North Africa who led a new army that defeated Kasīla, driving the Berbers out of Qayrawān.

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369 TĀHĀ 1989, p. 61-2; CHRISTIDES 2000, p. 44;

370 JULIEN ET AL 1970, p. 7; KAEGI 2010, p. 13.

371 TĀHĀ 1989, p. 63.

372 KAEGI 2010, p. 226-7.

373 TĀHĀ 1989, p. 65.

374 KAEGI 2010, p. 237-9.

Zuhayr, in turn, was killed in battle in 71/690.<sup>375</sup> Meanwhile, in Arabia and Greater Syria a Second *Fitna* raged, resulting in a series of four caliphs between the death of Mu‘āwiyā in 61/680 and the ascension of ‘Abd al-Malik in 66/685, and civil war was ongoing until the death of the rival caliph, Ibn al-Zubayr, in 72/692.<sup>376</sup>

The summary above of the first three phases of the Islamic conquest of North Africa suggests that during these decades the need for a distinct coinage in North Africa was minimal. The Muslim governors in Egypt, who maintained overall administrative control of North Africa until at least 86/704-5, received substantial tribute from the region and did not establish a permanent Muslim presence in the Maghreb until 50/670 with the founding of Qayrawān. Even then, the presence was temporary, as the Arabs withdrew from this city after five years.

The end of the Second *Fitna* marked the beginning of the fourth, final phase in the conquest, which ended with the establishment of Muslim control over the whole of North Africa from Cyrenaica to Ṭanja and saw the first striking of Islamic coinage in the region. ‘Abd al-Malik assembled an army under the command of Ḥassān ibn al-Nu‘mān al-Ghassānī after the caliph’s victory in the Second *Fitna*. The Muslim chroniclers differ greatly on the date of Ibn al-Nu‘mān’s arrival in North Africa, with dates of Muḥarram 68/July-August 687, 69/688-9, 73/692-3, 74/693-4, and 78/697-8 all recorded.<sup>377</sup> Given that the rebel leader, Ibn al-Zubayr, was killed in 72/692 the most likely date for the beginning of Ibn al-Nu‘mān’s expedition would appear to be either 73/692-3 or 74/693-4. Ibn al-Nu‘mān’s army first moved against Qayrawān and then proceeded to capture several smaller towns in the region. Christides, citing Theophanes, gives the date that Carthage was first captured as 78/697-8, while Kaegi,

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375 CHRISTIDES 2000, p. 46 ; JULIEN ET AL 1970, pp. 7-11; ABUN-NASR 1987, p. 30.

376 JULIEN ET AL 1970, p. 30.

377 TALBI 2014.

citing Ibn Nājī gives 76/695-6.<sup>378</sup> The fact that the Byzantine mint in Carthage ceased striking coinage in 76/695-6 suggests that the earlier date is more likely (see p. 30).

Pressure from a confederation of Berber tribesmen meant that Ibn al-Nu‘mān had to abandon the area and retreat to Tripolitania. At the same time, the Byzantine emperor Leontius (r. 76/696-79/698) sent a fleet to recapture Carthage, probably in 78/697-8.<sup>379</sup> After receiving further reinforcements from ‘Abd al-Malik, Ibn al-Nu‘mān returned to the region and recaptured Byzantine-occupied Carthage in 79/698. This time he massacred or enslaved many of the remaining inhabitants, and destroyed or dismantled much of the city.<sup>380</sup> He then turned his attention to the Berbers led by al-Kāhina, finally defeating them at sometime prior to 84/703.<sup>381</sup>

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378 CHRISTIDES 2000, p. 47; KAEGI 2010, p. 247.

379 TALBI 2014.

380 Kaegi notes the use of numerous spolia from Carthage in the construction of Tunis. See KAEGI 2010, pp. 248-9. Vitelli states that after the departure of the Byzantines documentary references to the city virtually cease. The only subsequent mention of Carthage either focuses on the ruins, their value as a quarry of precious stone, or the shift to an agricultural mode of production. The ceramic evidence, unsatisfactory as it is, points to Muslim activity in Carthage no earlier than the tenth century. See VITELLI 1981, pp. 40-6.

381 KAEGI 2010, p. 248.

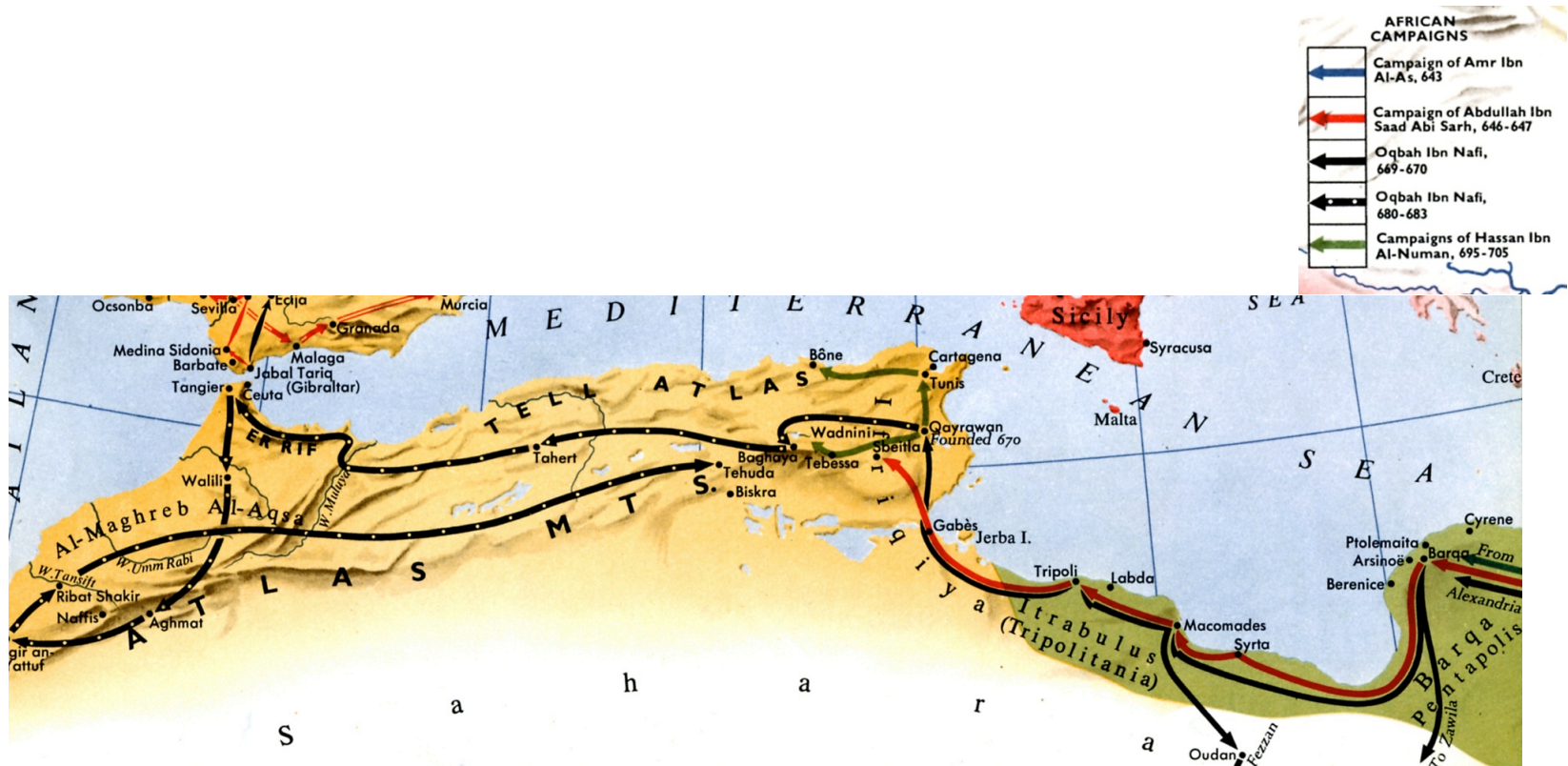


Figure 148: Map of the Islamic Conquest of North Africa.<sup>382</sup>

<sup>382</sup> Wikipedia Commons.

Ibn al-Nu‘mān is notable for several measures undertaken before leaving North Africa. He founded the city of Tunis near Carthage and brought Coptic artisans from Egypt to set up workshops in the city and build a fleet.<sup>383</sup> Realizing their importance in any long-term peace in North Africa, Ibn al-Nu‘mān also offered the defeated Berbers excellent terms, and many of the Berbers converted to Islam and enlisted in the Muslim army. These recruits were given stipends and promised shares equal to the Arabs’ of any booty that might be gained in further campaigns. Ibn al-Nu‘mān also reconstructed the Great Mosque in Qayrawān, organized the *dīwān* and imposed land taxes and *zakāt* on Muslims and the *jizya* tax on Christians and Jews.<sup>384</sup>

## **THE INTRODUCTION OF SERIES NA 1**

The recapture of Carthage by the Muslims under Ibn al-Nu‘mān in 79/698-9 was the critical event that served as an impetus for the creation of an Islamic monetary regime in North Africa. No longer was the Byzantine mint in Carthage supplying coinage for the region, but the capture of the city may have provided the Muslims with the specialists necessary to establish their own North African mint. The defeat of the Byzantines also meant the elimination of tribute from the region and the mass conversion of the Berbers post conquest added substantially to the number of men under arms. In addition, Ibn al-Nu‘mān established an administrative and tax regime (which required a local currency) and this meant that there was both a means and a need to begin striking Islamic coins in North Africa.<sup>385</sup> Finally, the lengthy governorships of Ibn al-Nu‘mān and then Mūsā provided the stability necessary to develop an administrative system. At the same time, however, the constant campaigning of the two governors meant that monetary stability was important, and

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383 ABUN-NASR 1987, p. 31; CHRISTIDES p. 48.

384 TĀHĀ 1989, p. 71; CHRISTIDES 2000, p. 48; DJAIT 1973, pp. 604-5.

385 TĀHĀ 1989, pp. 70-1.

the governors therefore introduced and then modified a coinage that still resembled the Byzantine model. The imperial images on the first Islamic coinage of North Africa were sufficiently familiar to the Christian and Berber populace, helping to ensure that the economy continued to function in these crucial early years, while the new Islamic inscriptions proclaimed the new faith (at least to those few who understood what they abbreviated).

As previously discussed on p. 31, Series NA 1 clearly shows the influence of its Byzantine prototype. The coins of this series retain the globular form of the Byzantine Carthaginian gold emissions, and continue to feature on the obverse the busts of the Emperor and his co-emperor Heraclius Constantine, although they become increasingly stylized (Figure 149). On the reverse, the Muslims modified the cross-potent to a T-bar or globe on pole on steps. The early Islamic mint in North Africa also adopted the mint (weight) standard of Byzantine Carthage for the Series NA 1 solidi of approximately 4.32 g, although the weights of the related semisses and tremisses are lower than their Byzantine counterparts (see p. 301). The gold content also changed, with the Islamic coinage having a significantly lower gold content than the Byzantine coinage (88% Au versus 96% Au), possibly due to the supplementing of gold provided by the recycling of Byzantine coinage (and other objects) with a source in southern Egypt (see discussion beginning on p. 335).



*Figure 149: Series NA 1 solidus, without mint name or date. KC AV1104. Image courtesy of the Khalili Collection. (4.33 g) (scale x4)*

Series NA 1 does not bear a mint name or dates. There are also no recorded find spots for this series. This means that we cannot definitely suggest a mint location, the area of circulation, or the period of minting. Although I have adopted the general term ‘North Africa’ when referring to the mint that struck Series NA 1 (and later Series NA 2 and NA 3), we can speculate on the mint location. Walker suggested that the mint was located in Qayrawān, and I believe that this is the most likely location.<sup>386</sup> It is possible, however, that the North Africa mint was a mobile mint, travelling with the army.

It is most likely that Ibn al-Nu‘mān authorized the Islamic mint in North Africa to begin striking Series NA 1, at some point after 76/695-6, the date that he first seized Carthage. The Muslims may have recruited some of the Byzantine administrators and engravers at this time, but military setbacks pushed the Muslims back to Tripolitania and make it more likely that they first minted Series NA 1 immediately after they recaptured Carthage in 79/698-9.

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386 WALKER 1956, p. xlvihi.

## DATING THE FIRST ISSUE OF SERIES NA 1

Additional numismatic evidence appears to support the date of 79/698-9 as the *terminus post quem* for Series NA 1. In 80/699-700, an unknown mint (possibly Tripoli) struck a *fals* type (the ‘Imperial Bust (IB) *fulūs*) bearing both the name (Ibn al-Nu‘mān and a date.<sup>387</sup> The IB *fulūs* feature legends in Arabic on both the obverse and reverse surrounding imagery derived from Byzantine prototypes (*Figure 150*). The obverse legend frames a crudely drawn bearded and crowned figure, and reads *ft̄ sanati /thamānīn* - in the year 80 (699-700). This is the earliest known Arabic legend found on any of the Islamic coinage of the region, as well as the earliest date. The reverse of this series features a globe on pole on steps framed by a second legend - *bism Allāh hādhā amara bihi al-Nu‘mān* – that translates as “in the name of God, al-Nu‘mān ordered this”.



*Figure 150: Imperial Bust fals, likely struck at the Tripoli mint. W ANS.12=ANS 1916.215.3491. Image courtesy of the American Numismatic Society, New York. (4.16 g) (scale x3)*

Given the chronology of events described above, the reverse legend must refer to Ibn al-Nu‘mān. Walker, however, suggested that Mūsā b. Nusayr replaced Ibn al-Nu‘mān as governor of North Africa in approximately 80/699-700 and, following Walker’s chronology, Mūsā would have been in office when the Muslims struck the

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<sup>387</sup> For a more detailed discussion of the IB *fulūs*, see JONSON forthcoming.

Series NA 1 coinage.<sup>388</sup> This suggestion does not, however, explain the presence of the name ‘al-Nu‘mān’ and the date of 80/699-700 on the IB *fulūs*. Walker sidesteps this problem by suggesting that ‘al-Nu‘mān’ did not refer to the North African governor of that name, but instead Ibn al-Nu‘mān’s son, despite the lack of textual or numismatic evidence (see discussion of Mūsā’s governorship on p. 385). It seems much more likely that the governor Ibn al-Nu‘mān was the issuing authority for the IB coinage, especially given that the iconography of the IB *fulūs* appears to have at least in part been modelled on the Series NA 1 semisses (Figure 151).<sup>389</sup> This means that Series NA 1 preceded the IB *fulūs*, and therefore Ibn al-Nu‘mān, and not Mūsā or Ibn al-Nu‘mān’s son, must have been in office during the introduction of the Imperial Bust *fulūs* in 80/699-700.



Figure 151: Series NA 1 semmissis, without a mint name and undated. W 145. Image courtesy of the Trustees of the British Museum, London. (2.13 g) (scale x4)

Evidence in the form of dies and die links also exists to suggest that the Islamic mint in North Africa ceased striking Series NA 1 with the introduction of Series NA 2, Phase 1 in 84-5/703-4. I previously noted the similarity between the reverse dies of certain of the Series NA 1 and Series NA 2, Phase 1 semisses, although die links do not exist (see p. 213). A die link does exist, however, between one Series NA 1 and

388 WALKER 1956, p. lxii. The above reading of the reverse legend of the IB *fulūs* is found in Walker. The reverse legend could just as easily be read as ‘*bism Allāh hādihā amara-hu bn al-Nu‘mān*’ (in the name of God, Ibn al-Nu‘mān ordered this). This eliminates Walker’s argument entirely.

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one Series NA 2, Phase 1 tremissis (Figure 152). Although not conclusive, it suggests that Series NA 1 was phased out with the introduction of Series NA 2.



Figure 152: On Left: Reverse of Series NA 1 tremissis of the MISERICORDIS type (RD15). PG 8500. Image courtesy of the Fitzwilliam Museum, Cambridge. (1.35 g) On right: Reverse of Series NA 2, Phase 1 tremissis (RD8). W B. 9=Nü65. Image courtesy of Münzkabinett, Staatliche Museen, Berlin. (1.35 g) (scale x4).

### RELATIVE CHRONOLOGY OF SERIES NA 1

The establishment of a *terminus post quem* and a *terminus ante quem* for Series NA 1 still leaves the question of a relative chronology of the Series NA 1 legend types.

Fortunately, both the obverse iconography and the metrology can help in determining the order in which the Islamic mint in North Africa struck the various legend types.

In proposing a chronology for the early Islamic North African coinage, Bates spent the least amount of time discussing the coins of Series NA 1. He confined his observations to the identification of the two primary obverse legends for the solidi of this type. According to Bates, the legend ‘DUSTUSDUSETAVSNONE’, expanding to DeUS TuUS DeUs ET AliUS NON Est, was introduced first, followed by ‘NONESTDESNISIIPSESOLCI(SE or SN)’, which expands to NON EST DeuS NISI IPSE SOLus Cui Socius Non est. Bates further stated that the alternative chronology, with the NONEST type struck prior to the other Series NA 1 coinage, is inconceivable, without giving any reasons for this statement.<sup>390</sup> The analysis of Series NA 1 beginning on p. 90 proves that neither Bates’s readings nor his

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<sup>390</sup> BATES 1995, pp. 12-13.

interpretations of the legends on the coins are correct, and my analysis of Series NA 1 appears to suggest that Bates's proposed chronology is also incorrect.

As previously discussed on p. 92, I divide Series NA 1 into six types based on their obverse legend: NONEST; DEUSINNOMINE; INNOME; DUSTUS; DEUSNON; and MISERICORDIS.

The most important evidence that can be used to construct a relative chronology of the Series NA 1 coinage is the obverse iconography. No one has closely studied the obverse imagery of Series NA 1, the Two Imperial Busts engraved in imitation of the Heraclian *solidi*. This is unfortunate, as the obverse iconography varies substantially amongst the various Series NA 1 types.

The obverse imagery on Series NA 1 appears to become increasingly corrupted over time. It is the obverse of the NONEST type that most closely resembles the Byzantine prototype. If we compare the images in Figure 153, we can see that the Series NA 1 example on the right continues to show a full beard as well as an easily identified *fibula* (clasp) on the *chlamys* (Roman cloak) on the bust of Heraclius.



Figure 153: On left: Obverse of Byzantine Solidus of Carthage, dated 620-1. A. Tkalec AG. October 27, 2011, Lot: 261. Image courtesy of A. Tkalec AG. (4.48 g). On right: Obverse of Series NA 1 tremissis. ANS 1944.100.47328. Image courtesy of the American Numismatic Society, New York. (1.38 g) (scale x3)

The fact that the NONEST type most closely resembles the Byzantine prototype suggests that this type was the first type struck by the Islamic mint in North Africa. In addition, as I previously discussed on p. 276, the weights of the NONEST examples

are also in general the heaviest of Series NA 1, further suggesting the NONEST type was the first Islamic coinage struck in North Africa as it can be assumed that the weights of a coins series will drop due to inflation.

It is more difficult to suggest an order for the introduction of the remaining Series NA 1 types, with the exception of the MISERICORDIS type which I argue below was the last type struck prior to the introduction of Series NA 2, Phase 1. Certain aspects of the obverse iconography would imply that the next two types struck were the DEUSNON (OD9) and DEUSINNOMINE (OD1) types. As can be seen in *Figure 154*, the beard on Heraclius can still be clearly seen, and the *fibula* is still present in the form of a pellet. This conclusion also seems to be reinforced by the fact that the DEUSINNOMINE example in *Figure 154* is reverse die linked to the NONEST type. The other obverse dies of these two types have much more degraded iconography, however, as seen in *Figure 155*. The beards on the two busts are no longer apparent, and the bust of Heraclius Constantine is now larger than that of his father Heraclius.



*Figure 154: On left: Obverse of Series NA 1 tremissis of the DEUSNON type. PG 1483. Image courtesy of the Fitzwilliam Museum, Cambridge. (1.32 g) On right: Obverse and reverse of Series NA 1 tremissis of the DEUSINNOMINE type. W 146. Image courtesy of the Trustees of the British Museum, London. (1.38 g) (scale x4)*



Figure 155: Obverse of Series NA 1 tremissis of the DEUSNON type. W 150. Image courtesy of the Trustees of the British Museum, London. (1.33 g) (scale x4)

It is even more difficult to differentiate the obverse iconography of the INNOME types (Figure 156). Some of the INNOME obverse dies still show a pellet for the *fibula*, although the two busts are even more barbaric than those found on DEUSNON and DEUSINNOMINE dies.



Figure 156: On left: Obverse of Series NA 1 solidus of INNOME type. KC AV1104. Image courtesy of the Khalili Collection. (4.33 g) Middle: Obverse of NA 1 tremissis of the INNOME type. W P.21=L98. Image courtesy of Bibliothèque nationale de France, Paris. (1.36 g) On right: Obverse of Series NA 1 tremissis of the INNOME type. PG8500. Image courtesy of the Fitzwilliam Museum, Cambridge. (1.36 g) (scale x4)

A clue for the ordering of the INNOME type can be found on one reverse die of the INNOME type (RD5) that bears the legend NONESTDSNISISOLUSDS (*non est deus nisi solus deus*). This legend, also found on the reverse dies of the MISERICORDIS type (Figure 157), is found on a few of the Series NA 2, Phase 1 fractionals, and would suggest that the INNOME type and then the MISERICORDIS were the last two Series NA 1 types struck at the early Islamic mint in North Africa prior to the introduction of Series NA 2, Phase 1 in Indiction II (84-5/703-4). The

Series NA 1 examples with unclear legend also have a reverse legend like those found on the Series NA 2, Phase 1 fractionals, further suggesting some overlap in the minting.



*Figure 157: Obverse of Series NA 1 tremissis of the MISERICORDIS type, struck in North Africa and undated. PG8500. Image courtesy of the Fitzwilliam Museum, Cambridge. (1.36 g) (scale x4)*

This leaves the examples of the DUSTUS type. The obverse iconography for this type does not provide us with any evidence one way or another, but the close correlation of the legends of this type with the legends found on the INNOME type suggests that they were struck at the same time as or just before the INNOME coinage.



*Figure 158: Obverse of Series NA 1 tremissis of the DUSTUS type. W 155. Image courtesy of the Trustees of the British Museum. (1.35 g) (scale x4)*

There is always the possibility that the differences in the facial types are simply due to different die-engravers. If we return to the NONEST type (Figure 159), however, we can see that there is also a variation in style within this type, suggesting that multiple engravers were involved in the production of each type, and that the

transition between the facial types and between the inscriptions took place over a substantial period.



Figure 159: Variations in the obverse iconography of the NONEST type.

The above evidence suggests that the Islamic mint in North Africa initially struck the Series NA 1, NONEST type, which bear the often truncated obverse legend NONEST6SNISIPSESOLCSETNONABE[TV] (There is no God but He alone, and he has no partners). For an as yet unknown reason the Muslims abandoned the above legend, although perhaps the mint chose to adopt the newer legends because they were shorter and thus easier to engrave on the dies of a tiny coin. The next two obverse legends may have been *deus in nomine tuo unus* (DEUSINNOMINE type) and *deus non est alius deus non est* (DEUSNON type). These obverse legends were followed by the DUSTUS and the INNOME coinage, which bear the same legends, although the obverse and reverse legends are transposed to differentiate the two types). The obverse and reverse legends on these two types are *in nome tuo deus vivificans et misericordis* and *deus tuus deus ipse deus et alius non est*. Iconographical changes took place at the same time as the changes to the legends, with an increased stylization of the obverse imagery.

The final obverse legend, found on the MISERICORDIS type, is difficult to read on the surviving examples, but is likely *in nomine domini misericordis*. It is only with this type that we see some inscriptional evidence to support the proposed relative

chronology, both on the obverse and the reverse. As I have already noted on p. 213 above, this type is die linked to the Series NA 2, Phase 1 coinage. The obverse legend on this type also appears to be the same as the initial words found on the reverse legend of many of the Series NA 2, Phase 1 examples.

Although the above discussion proposes a relative chronology for the Series NA 1 types, it does not answer the question as to why the early Islamic mint in North Africa chose to use so many different legends. All that can be said at this point is that the period in which Series NA 1 was struck appears to have been one of intense experimentation.

## **THE INTRODUCTION OF SERIES NA 2, PHASE 1**

‘Abd al ‘Azīz b. Marwān, the governor of Egypt and brother of the Caliph, dismissed Ibn al-Nu‘mān, replacing him with his protégé, Mūsā b. Nuṣayr.<sup>391</sup> The reason for Ibn al-Nu‘mān’s dismissal is unclear, but it may have been that a dispute had arisen between Ibn al-Nu‘mān and ‘Abd al ‘Azīz over the status of Barqa and Tripoli, or that there was some concern that Ibn al-Nu‘mān was becoming too independent.<sup>392</sup> Cyrenaica was moved from the control of North Africa to Egypt in 83/702, lending credence to the suggestion that Ibn al-Nu‘mān was exerting too much influence over that region.<sup>393</sup> The latest analysis of the IB *fulūs* bearing the name Ibn al-Nu‘mān (discussed above on p. 377) also places the striking of this coinage at a mint in Tripoli,<sup>394</sup> further bolstering this theory.

The exact date that Mūsā replaced Ibn al-Nu‘mān is also unclear, with sources citing dates anywhere from 71/691 (Dabbāgh) to 85/704 (Maqqarī; Ibn ‘Abd al-

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<sup>391</sup> TĀHĀ 1989, p. 72.

<sup>392</sup> IBID. Djait notes that Cyrenaica moved from North African to Egyptian control in 83/702. See DJAIT 1967, p. 93.

<sup>393</sup> DJAIT 1967, p. 93.

<sup>394</sup> JONSON forthcoming.

Ḥakam suggests 78/697-8).<sup>395</sup> The coinage provides some guidance in answering the question of the date of this transition, as the evidence provided by the Series NA 1 coinage and the IB *fulūs*, as well as the fact that the Islamic mint in North Africa began to strike Series NA 2 in 84/703 all suggest that the most likely time for the transition between the two governors is around this date.

The introduction of a new epigraphic type of gold coinage accompanied the installation of Mūsā as the governor of North Africa – Series NA 2, Phase 1 (beginning in Indiction II (84-5/703-4)). With this series Mūsā did away with the two Imperial busts found on the obverse of Series NA 1, instead ending the marginal legend in the obverse field of the coin (Figure 160). On the reverse, the solidi of Series NA 2 have a marginal legend ending in the field, while the tremisses and semisses retain the globe on pole or T-bar on steps found on the Series NA 1 coinage. Unlike Series NA 1, Series NA 2 also bears both the mint name ‘Africa’ (most frequently abbreviated as AFR), and a date (by Indiction year and only on the solidi). Series NA 2 did, however, retain the same weight standard and gold content as Series NA 1 until the invasion of the Iberian Peninsula.



*Figure 160: Series NA 2, Phase 1 solidus of North Africa, dated Indiction IIII (86-7/705-6). KC AV1113. Image courtesy of the Khalili Collection. (4.28 g) (scale x4)*

<sup>395</sup> CHRISTIDES 2000, pp. 49, 56 fn. 173; TĀHĀ 1989, p. 72.

The Islamic mint struck Series NA 2 coinage in several distinct phases. Phase 1, struck in Indiction years II through IIII (84-7/703-6), has as its primary obverse legend abbreviated variations of *deus eternus*, *deus magnus*, *deus omnium creator* (God the Eternal, God the Great, God the Creator of all). The reverse legend on the solidi of this phase is *in nomine domini misericordis solidus feritus in Africa*, followed by the Indiction date (in the name of the Lord, [of the] Merciful, (this) solidus struck in Africa). Semisses and tremisses bear obverse legends that are similar to the Phase 1 solidi, but the reverse marginal legend varies on the fractionals, and is either a truncated version of the reverse legend found on the Phase 1 solidi, *non est deus nisi solus deus* (there is no God but God alone), or *in nomine domini misericordis unus deus* (in the name of the Lord, [of the] Merciful, God Alone).

The evidence provided by the coinage (multiple die links between years; small variations in the weights) suggests that Series NA 2, Phase 1 was struck in a short period of time, perhaps to finance the continued campaigning in North Africa. No examples are dated Indiction V or VI, a two-year hiatus that likely coincides with Mūsā's campaigns in Numidia, Mauretania Ceasariensis and Mauretania Sitifensis (modern day western Tunisia, Northern Algeria and Northern Morocco).<sup>396</sup> These campaigns culminated in the conquest of Ṭanja in 90/708.<sup>397</sup>

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<sup>396</sup> The most likely dates for this campaign are between 86-7/705-6 and 89-90/708-9. Given the large number of die links and small variations in the weights of Series NA 2, Phase 1 examples it is unlikely that they continued to be struck with immobilized dates in these two years. ABUN-NASR 1987, p. 32. Mūsā also authorized a naval expedition to Sardinia in approximately 86-7/705-6. See KAEGI 2010, p. 254

<sup>397</sup> KENNEDY 1996, p. 5.

## THE INTRODUCTION OF SERIES NA 2, PHASE 2

The Islamic mint in North Africa reopened in Indiction VII (89-90/708-9), once again striking coins in all three denominations of gold (Figure 161).



Figure 161: Series NA 2, Phase 2 semissis, likely struck in Indiction VII (89-90/708-9).<sup>398</sup> *W Cod.2=MAN 2004.117.25. Image courtesy of Museo Arqueológico Nacional, Madrid. (2.02 g) (scale x4)*

The coins of Series NA 2, Phase 2 are similar in fabric to the coins of Series 2, Phase 1, with the solidi having Latin legends in the obverse and reverse margins and the semisses and tremisses continuing to bear on the reverse a globe on pole and T-bar on steps respectively. Series NA 2, Phase 2 differs from Phase 1 in its legends, however, with the obverse of Phase 2 reverting to a Latin variation of the *shahāda* – *non est deus nisi unus cui non est alius similis* – ‘There is no God but one and there is none similar’. The reverse legend on the solidi of Phase 2 are similar to Phase 1, while the reverse legend on the fractionals is either a truncated version of the legend found on the Phase 2 solidi or a repetition of the obverse legend.

## THE INTRODUCTION OF SERIES NM 4 NISF AND THULTH

There are no examples of Phase 2 that can be definitely dated to Indiction VIII (90-91/709-10). This coincides with the introduction of Series NM 4, the *nisf* and *thulth* without a mint name that were struck beginning in 91/709-10 (Figure 162) and

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<sup>398</sup> Dating based on die links.

continue to be minted in the years 92/709-11, 94/712-13, 96-97/714-16, 99-101/717-20, and 103/721-22.



*Figure 162: Series NM 4 nisf, struck without a mint name in 91/709-10. W 203. Image courtesy of the Trustees of the British Museum, London. (2.06 g) (scale x4)*

As I argue beginning on p. 243, the balance of evidence suggests that Series NM 4 was struck in North Africa, likely at a separate workshop from that striking Series NA 2, Phase 2. This fits with the historical record, as Series NM 4 was first struck after the conquest of Ṭanja, prior to the invasion of the Iberian Peninsula, and at the same time as the introduction of Post-Reform *fulūs*. Mūsā may have seen the cessation of hostilities in North Africa as an opportunity to begin the transition from Latin Epigraphic to Post-Reform coinage, while still acknowledging the unique denominational makeup of the North African transitional issues. The introduction of Series NM 4 may have been met with resistance in the marketplace, however, leading to the continuation of Series NA 2, Phase 2 in Indiction Θ (91-2/710-11). Another possible explanation is that Mūsā decided to introduce a Post-Reform issue for trade purposes and/or for remittances to Egypt. The introduction of Series NM 4 would have met this need while respecting the Caliph's monopoly over the issuance of the Post-Reform dinars.

## THE INTRODUCTION OF SERIES IP 2

Mūsā had appointed his deputy, Ṭāriq b. Ziyād, as governor of Ṭanja after the conquest of that area. According to the Muslim sources, Ṭāriq sent a small expedition under Ṭarīf b. Mulūk to the Iberian Peninsula in Ramaḍān 91/ Aug-Sep 710. Ṭarīf undertook several successful raids, which likely encouraged Ṭāriq to undertake a further, larger expedition to the Iberian Peninsula, which landed on Gibraltar in Rajab 92/April 711.<sup>399</sup> Ṭāriq then moved on to the mainland where he engaged the forces of the Visigoth king Roderic in 92/late July 711. After the decisive defeat of the Visigoths, Ṭāriq dispatched an army to Córdoba, with other units taking Málaga and Elvira. Ṭāriq's main army marched to Toledo, wintering there in 93-4/711-12.<sup>400</sup>

News of Ṭāriq's success eventually reached Mūsā, who outfitted a large force that landed at Algeciras in Ramaḍān 93/June-July 712. Mūsā's force next travelled to Carmona and then besieged Seville. After the conquest of Seville, Mūsā moved to Mérida, which fell in Shawwāl 94/July 713. Mūsā also dispatched his son 'Abd al-'Azīz to Murcia, who made a treaty with a Visigoth commander (Theodemir) there, giving him local autonomy in exchange for tribute in Rajab 94/April 713. After the fall of Mérida, Mūsā's force traveled to Toledo where he joined with Ṭāriq in 94-5/712-13.<sup>401</sup>

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399 TĀHĀ 1989, pp. 86-7; CHRISTIDES 2000, pp. 49-50.

400 KENNEDY 1996, p. 11; TĀHĀ 1989, pp. 90-2; COLLINS 1994, p. 31.

401 KENNEDY 1996, p. 12; TĀHĀ 1989, 95-6.



Figure 163: Map of the Islamic conquest of the Iberian Peninsula.<sup>402</sup>

The Islamic mint in North Africa ceased production of Series NA 2, Phase 2 after the issues dated Indiction Θ (91-2/710-11). The termination of the striking of Series NA 2 at this time is undoubtedly related to Mūsā's absence from North Africa during

<sup>402</sup> Wikipedia Commons.

the invasion of the Iberian Peninsula. Less clear is the fate of the North Africa mint personnel. It has been previously suggested that at least some of the personnel from the Islamic mint in North Africa accompanied Mūsā's forces when he invaded the Iberian Peninsula.<sup>403</sup> Answering the question as to whether the mint personnel accompanied Mūsā's expedition in some ways depends on the ordering of the coinage first struck in the Iberian Peninsula, as the equipment for a mint could have easily been transported with the expedition.<sup>404</sup> The substantial differences in the epigraphy, iconography and legends between Series NA 2, Phase 2 and Series IP 2 suggest that this is unlikely. More continuity between the North African and the earliest Islamic coinage of the Iberian Peninsula is found, however, if we adopt the premise that the earliest Islamic coinage of the Iberian Peninsula closely copied the Series NA 2, Phase 2 coinage, dated Indiction Θ (91-2/710-11) and bearing the mint name Africa (see p. 141 for a discussion of the anomalous Indiction Θ examples that I suggest were struck in the Iberian Peninsula and Figure 164 below). Even this coinage, however, has some differences in their legends and epigraphy as compared to the other Series IP 2 coinage.



*Figure 164: Series NA 2, Phase 2 solidus, dated Indiction Θ (91-2/710-11) and likely struck in the Iberian Peninsula. C.13=Ø53. Image courtesy of the National Museum, Copenhagen. (4.30 g) (scale x4)*

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403 BATES 1992, pp. 273-77.

404 IBID., p. 277.

Uncertainty also exists as to whether it was Ṭāriq or Mūsā who first struck Islamic coinage in the Iberian Peninsula. For Balaguer, there was nothing stopping Ṭāriq from issuing Series IP 2 solidi. Balaguer's rationale for this assertion rested on the dating of Mūsā's arrival in the Iberian Peninsula. If the date of Ramaḍān 93/June-July 712 is correct, then Mūsā would have had less than three months to establish himself in the Iberian Peninsula and begin striking coinage.<sup>405</sup> The rarity of the surviving Series IP 2, Indiction X examples (12 coins, see p. 160), however, suggests that Mūsā could easily have established a mint and begun striking the coinage. We cannot even be certain that every one of the 12 Indiction X examples was struck in that year because as I have shown dating is problematic for Series IP 2 (see p. 82 and p. 157). Balaguer's argument also rests on dating provided by the Muslim sources. The primary Latin source, *The Chronicle of 754*, records Mūsā arriving in the Iberian Peninsula in 92-3/711,<sup>406</sup> giving him plenty of time to strike coinage.

The Visigoth kingdom had its own monetary system in place at the time of the Muslim invasion of the Iberian Peninsula, based on the gold tremissis (Figure 165). Multiple mint locations have been recorded for the Visigoth coinage (Figure 166), although by the time of the invasion relatively few appear to have been in operation.<sup>407</sup>

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405 BALAGUER 1976, pp. 47-9.

406 COLLINS 1994, pp. 29-30.

407 Number of known mints in the last decades of the Visigoth Kingdom: Egica and Wittiza (698-702) – 21; Wittiza (698-710) – 10; Roderic (710-11) - 2; Achila II (710-14) – 4. See MILES 1952 and PLIEGO 2009.



Figure 165: Visigoth tremissis struck under Wittiza at Ispali (Seville) and dated 702-10. RN2, L:733. Image courtesy of Roma Numismatics. (1.13 g) (scale x2)

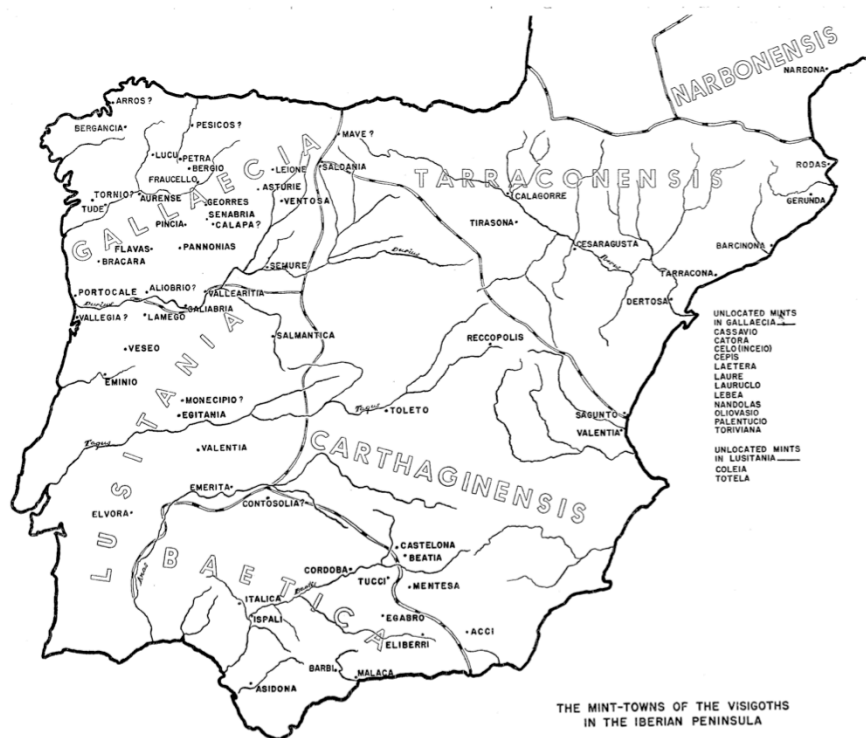


Figure 166: Locations of Visigoth mints.<sup>408</sup>

Unlike in North Africa where the Islamic mint modelled the initial Islamic coinage on the Byzantine coinage already circulating in the region, the Islamic mint(s) in the Iberian Peninsula did not choose to model the initial Islamic emissions for the region on the Visigoth coinage. Instead they struck coinage (Series IP 2) based on the previously issued North Africa Series NA 2, Phase 2 coinage. Most of the surviving Series IP 2 examples bear the Indiction dates X (93-4/712-13) (Figure 167), XI (94-

<sup>408</sup> MILES 1952.

5/713-14) (Figure 168), and XII (93/711-95/714) (Figure 171), although some of the coinage omits the Indiction date (Figure 169) or bears an anomalous Indiction date (Figure 170).



*Figure 167: Series IP 2 solidus, struck in the Iberian Peninsula at a secondary mint and dated Indiction X (92-3/711-12). CNG67, L:843. Image courtesy of Classical Numismatic Group. (3.60 g) (scalex4)*



*Figure 168: Series IP 2 solidus, struck in the Iberian Peninsula at a secondary mint and dated Indiction XI (93-4/712-13). CNG66, L:1695. Image courtesy of the Classical Numismatic Group. (4.28 g) (scalex4)*



*Figure 169: Series IP 2 solidus, struck in the Iberian Peninsula without an Indiction date. W P.47=L129. Image courtesy of Bibliothèque nationale de France, Paris. (4.38 g) (scalex4)*



Figure 170: Series IP 2 solidus, struck in the Iberian Peninsula at a secondary mint with an anomalous Indiction date. *W HAS.8=HSA 1001.1.13221*. Image courtesy of the American Numismatic Society, New York. (4.71 g) (scalex4)

Coins of Series IP 2 are similar in their fabric to Series NA 2, Phase 2, but the Islamic mint(s) in the Iberian Peninsula introduced several innovations. The majority of the Series IP 2 examples bear a seven, eight or nine-pointed star in the obverse field, a feature undoubtedly borrowed from earlier Iberian Peninsula coinage. The legends were also altered. The opening phrase of the reverse legend ‘*in nomine domini*’ was moved from the reverse to the obverse and the word ‘*misericordis*’ was removed from the reverse. This change was likely to accommodate the addition of a *hijri* date in the reverse margin. The Series IP 2 legends are on the obverse *in nomine domini non deus nisi deus solus non* (In the name of the Lord, there (is) no God but God alone), while on the reverse we now find *solidus feritus Spania anno...//Indictione...* ((This) solidus struck in Spania...). The Islamic mints in the Iberian Peninsula only struck solidi, likely supplemented by the existing Visigoth tremisses circulating in the region.

As I discussed on p. 159, the evidence provided by the Series IP 2 solidi supports the suggestion that multiple Islamic mints were in operation in the first few years of the conquest of the Iberian Peninsula. The Arab chronicler Ibn Muzayn states that Mūsā’s army was composed of over 20 units: two under the command of Mūsā, one under his son ‘Abd al-‘Azīz; and others commanded by various generals. Other

sources, while not providing this level of detail, record that Mūsā dispatched units under his sons ‘Abd al-‘Azīz and ‘Abd Allāh to the south and southeast after the fall of Seville.<sup>409</sup> The division of the army into multiple units, some which were operating independently of each other, meant that there would have been a need to establish multiple workshops to strike the Series IP 2 solidi.

The Series IP 2 solidi vary substantially in both their weights and gold content. The weights of the Islamic solidi struck in North Africa prior to the conquest of the Iberian Peninsula adhered quite closely to the Byzantine weight standard of 4.32 g. The Series IP 2 issues, in contrast, weigh anywhere from 2.39 g to 5.38 g, although those struck at the main mint appear to be struck to a standard of approximately 4.26 g. The gold content also varies substantially, from 0% to 75% Au, but those coins issued at the main mint all have a gold content above 54% Au. This is still substantially lower than the 85-88% Au found for the North African gold coinage struck prior to the invasion of the Iberian Peninsula, and was undoubtedly due to the recycling of the inferior Visigoth tremisses and other Visigoth gold objects.

Ṭāriq and Mūsā’s army met and wintered in Toledo in 94/713-14. In the spring of 94/714, their combined forces campaigned in the northeast, conquering Saragossa and nearby regions, and occupying Barcelona, Lérida and Huesca. At this point they may have once again separated into two forces, with Ṭāriq invading the Basque region and Mūsā advancing into Galicia and Asturias. Little is known about these campaigns.<sup>410</sup>

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409 TĀHĀ 1989, pp. 94-7.

410 IBID., pp. 98-9.



*Figure 171: Series IP 2 solidi, struck at the main mint in the Iberian Peninsula and dated Indiction XII (94-5/713-14). W C.14=Ø51. Image courtesy of the National Museum, Copenhagen. (4.24 g) (scale x4)*

Indiction XII (94-5/713-14) is the last date found on the Series IP 2 solidi, although the large number of estimated Series IP 2 dies and the absence of any other known Islamic coinage from this date until the introduction of Series IP 3 in 98/716-17 suggests that Series IP 2 continued to be struck with immobilized dates at one or more secondary mints after the departure of the main Islamic mint.

### **THE INTRODUCTION OF SERIES NA 2, PHASE 3**

Ṭāriq and Mūsā departed the Iberian Peninsula in Dhū al-Ḥijja 95/September 714, with Mūsā appointing his son ‘Abd al-Azīz as governor of the Iberian Peninsula and his son ‘Abd al-Malik as governor in Ṭanja. He later confirmed his third son, ‘Abd Allāh, as governor of North Africa.<sup>411</sup> As can be seen in Figure 172 below, the newly struck Series NA 2, Phase 3 solidi retains the changes that took place on the Series IP 2 main mint solidi struck in Indiction XII (94-5/713-14; Figure 171 above), and have similar weights and gold content (see p. 283 and p. 332).

<sup>411</sup> KENNEDY 1996, p. 12; TĀHĀ 1989, pp. 99-100.



Figure 172: Series NA 2, Phase 3 solidi, struck in North Africa and dated Indiction XIII (95-6/714-15).<sup>412</sup> W B.12=Nü70. Image courtesy of Münzkabinett, Staatliche Museen, Berlin. (4.33 g) (scale x4)

The date for the Series NA 3, Phase 3 solidi supports the Muslim chronicler's dating of Ṭāriq's and Mūsā's departure from the Iberian Peninsula for North Africa. All of the Phase 3 solidi are dated Indiction XIII, which begins in Dhū al-Ḥijja 95/September 714, the same month recorded as the date of their departure from the Iberian Peninsula.

The transfer of the main mint from the Iberian Peninsula to North Africa also saw the re-introduction of transitional Islamic semisses and tremisses (Figure 173). The Islamic mint in North Africa modelled the Phase 3 gold fractionals on the Series NA 2, Phase 2 fractionals struck prior to the invasion of the Iberian Peninsula, adopting again the globe on pole to designate the semisses and the T-bar to designate the tremisses. The legends, in contrast, are those found on the Series NA 2, Phase 3 solidi, minus the Indiction date. The *hijri* dates found on the Phase 3 fractionals are either 95/713-14 or 96/714-15 (or unreadable), but as I argue on p. 193 it is quite possible that the *hijri* date 95 is simply a truncation of 96.

<sup>412</sup> The date of this example is partially off-flan, but can be confirmed through a die link with another Series NA 2, Phase 3 example.



Figure 173: Series NA 2, Phase 3 semmissis struck at the North Africa mint, and dated 95/713-14. W 182. Image courtesy of the Trustees of the British Museum, London. (1.98 g) (scale x4)

It is difficult to assess the number of Series NA 2, Phase 3 coins struck at the Islamic mint in North Africa. There are only a few surviving examples (five solidi and eight fractionals), which would suggest that only a small number were struck. The small number of die links between the surviving examples, however, implies that a large number of dies for this series and phase remain unaccounted for.

Series NM 4, the *nisf* and *thulth* without a mint name continued to be struck in North Africa after the invasion of the Iberian Peninsula, with dates recorded for the years 94/712-13 and 96/714-15 (Figure 174).



Figure 174: Series NM 4 *nisf*, without mint name and date 96/714-15). IcaL20, L: 92. Image courtesy of Baldwin's Auctions, Ltd. (2.11 g) (scale x4)

## THE INTRODUCTION OF SERIES NA 3 AND SERIES NA 4 DIRHAMS

Significant monetary changes occurred in North Africa and the Iberian Peninsula upon the death of the Caliph al-Walīd in Jumādā II 96/February 715. Al-Walīd was succeeded by his brother Sulaymān (r. 96-99/715-717), who dismissed ‘Abd Allāh b. Mūsā as governor of North Africa, replacing him with Muḥammad b. Yazīd (97/715-16-100/718-19).<sup>413</sup> Muḥammad b. Yazīd’s tenure as governor in North Africa coincided with the introduction of both Series NA 3, bilingual solidi (*Figure 175*) and Series NA 4, Post-Reform dirhams (*Figure 176*). Series NA 3 semisses and tremisses were discontinued, perhaps replaced in the monetary system by the dirhams, although small numbers of Series NM 4 *nisf* and *thulth* continued to be struck (dated 97/715-16 and 99/717-18).



*Figure 175: Series NA 3 solidus, struck in North Africa and dated 97/715-16. W 184. Image courtesy of the Trustees of the British Museum, London. (4.27 g) (scale x4)*

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413 TĀHĀ 1989, p. 101.

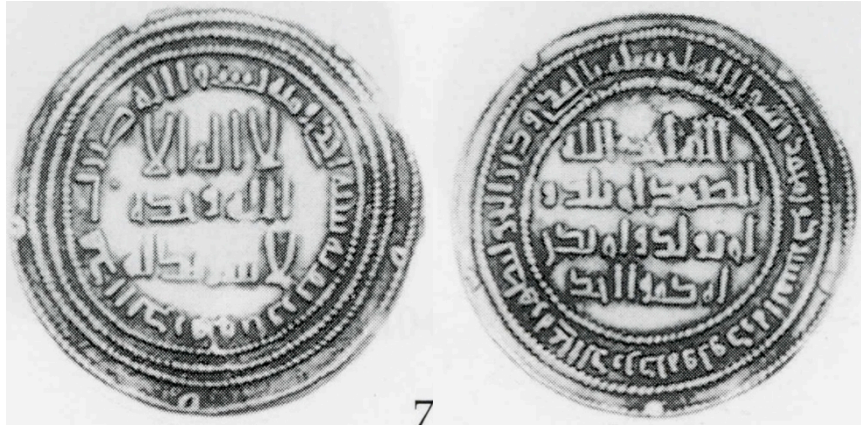


Figure 176: Series NA 4 dirham, struck in Ifrīqiya and dated 97/715-16. S99M, L:71. Image courtesy of Sotheby's. (2.88 g) (scale x2)

Series NA 3 was a significant departure for the North Africa mint from the previously struck Series NA 2, Phase 3 coinage, although the weights and gold content are little different between the two series. The mint introduced Arabic onto the solidi, with the obverse field in all three years that Series NA 3 was struck bearing the first statement of the *shahāda* - *lā ilāha illa Allāh*. The obverse marginal legend dropped the Indication date, and instead exhibits the following legend with little variation: *solidus feritus in Africa anno...*. The reverse field of Series NA 3 bears the second statement of the *shahāda* - *Muḥammad rasūl Allāh*, with the reverse marginal legend continuing to have an abbreviated Latin version of the *shahāda* like that found on Series 2, Phase 3. The increased corruption of the reverse legend, which had begun while the mint was located in the Iberian Peninsula, is now complete, with the reverse marginal legends full of errors and, in most cases, untranslatable. At this point the Arabic obverse and reverse field legends have now replaced the Latin legend as the main religious statement on the coinage.

Just as significant as the Series NA 3 bilingual solidi for the numismatic history of North Africa was the introduction of Series NA 4 dirhams in 97/715-16. This was the first time that the Islamic mint in North Africa struck coinage that did not differ from those struck elsewhere in the Caliphate. The number of surviving examples of

dirhams during Muḥammad b. Yazīd's governorship suggests that they were at first struck in small numbers.

In the Iberian Peninsula, 'Abd al-'Azīz b. Mūsā, had continued to govern from Seville and campaign in the region.<sup>414</sup> His tenure as governor ended with his assassination in 98/717. 'Abd al-'Azīz was succeeded by a governor chosen by the local leaders of the province, Ayyūb b. Ḥabīb al-Lakhmī, but he only held the position for six months.<sup>415</sup> The administration of *al-Andalus* was formally under that of *Ifriqiya*, and therefore Muḥammad b. Yazīd had the authority to designate Al-Ḥurr ibn 'Abd al-Raḥmān al-Thaqafī (98/716-100/718) as governor of *al-Andalus* in 97/716, and order him to reform the tax system. It was al-Ḥurr who must have authorized the striking of the Series IP 3, bilingual solidi and the related fractionals. Little else is known regarding al-Ḥurr's governorship, although it was likely during his governorship that the capital of the province was moved from Seville to Córdoba. He also campaigned in Narbonensis for three years against the last Visigoth king, Ardo (r. 713/95-103/720) and may have signed tax treaties with local populations.<sup>416</sup>



Figure 177: Series IP 3 solidi, struck in *al-Andalus* and dated (98/716-17). MAN 2004.117.15. Image courtesy of Museo Arqueológico Nacional, Madrid. (4.17 g) (scale x4)

414 MARTÍN 2005, p. 17.

415 IBID.

416 TĀHĀ 1989, p. 187; COLLINS 1994, pp. 45-6.



Figure 178: Series IP 3 semmissis, struck in the Iberian Peninsula and undated. MAN 2004.117.17. Image courtesy of Museo Arqueológico Nacional, Madrid. (1.59 g) (scale x4)

The Series IP 3 solidi (Figure 177) and fractionals (Figure 178) struck under Al-Ḥurr are significantly different from both the previously struck Series IP 2 coinage and the contemporary Series NA 3 coinage. The Series IP 3 solidi retain (or reintroduce) the star symbol found on the Series IP 2 solidi in the obverse field. Both of the marginal legends provide the date and mint name, once in Latin (obverse) and again in Arabic (reverse). The only religious reference on the coin is in the reverse field, with *Muḥammad rasūl Allāh*, the same as on the North African examples. The Series IP 3 semisses and tremisses, also bear a star in the obverse field, and adopt the denominational convention found on the Series NA 1 and Series NA 2 fractionals, with a globe on pole on steps or a T-bar on steps in the reverse field. Unlike the Series IP 3 solidi, however, they are unilingual, with Latin mint/date formulas in both the obverse and reverse margins.

### **FIND SPOTS - SERIES 1 THROUGH 3**

In theory, find locations can provide information about a monetary system, especially the circulation patterns of a particular series. In addition, if a large number of finds are located in a specific location it may help pinpoint the site of a mint.

Unfortunately, few find spots are recorded for Series 1 through 3, despite the number of examples now known. In North Africa, we are limited to a single Series

NA 2, Phase 2 (Indiction Θ) solidus found in a Tunisian hoard of Byzantine solidi.<sup>417</sup> The archaeological record is also sparse in southern France, where archaeologists have only unearthed three precious metal coins, all Series NA 3, bilingual solidi. One of these examples, dated 97/ 715-16, was found in Ruscino, an important administrative and military center for the Muslim's occupation of the region. The second example, dated 98/717-18, was found in St Nazaire, a few miles south of Ruscino. Parvérie has suggested that a third example, recorded by Douzens as a bronze bilingual coin dated 97/716-17, is most likely a Series NA 3 solidus.<sup>418</sup> As outlined above, we know that al-Ḥurr, the governor of *al-Andalus*, campaigned in southern France during his tenure, and he may have brought a supply of Series NA 3 solidi when he arrived in *al-Andalus* to assume his post in 98/717-18.

A larger number of finds have been recorded in Spain and Portugal, but still totaling only 20 coins. The map in Figure 179 shows the find locations for 14 of these examples.<sup>419</sup>

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417 MORRISSON 1980, p. 155.

418 PARVÉRIE 2014, pp. 80, 90.

419 The finds in Spain and Portugal were first compiled by Balaguer. See BALAGUER1976a. It appears that Belda used Balaguer's finds in her discussion and in the production of her map. See BELDA 2003.

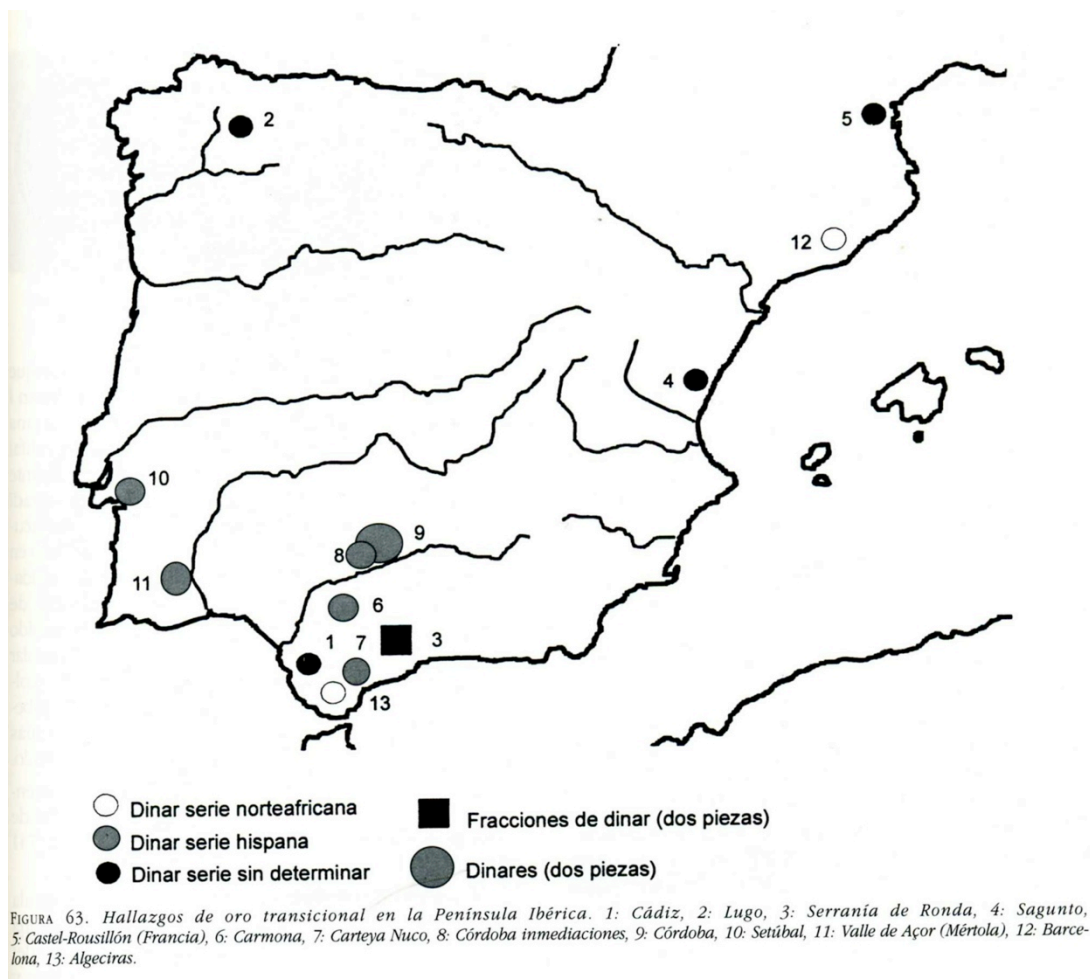


Figure 179: Map of find spots in the Iberian Peninsula of Series 1 to 3 gold coinage.<sup>420</sup>

The fourteen examples recorded in *Figure 177* are as follows:

1. Algeciras (Cádiz) – One Series 2 solidus (4.10 g) with an undetermined date and mint.
2. Lugo – One Series NA 2, Phase 1 semissis (2.05 g).
3. Serranía de Rond (Málaga) – Two Series NA 2 tremisses (1.50 g and 1.45 g) of an undetermined phase. The weights recorded are heavy for tremisses of this series.
4. Sagunto (Valencia) – One Series NA 2 solidus (4.31 g) of an unknown phase.
5. Casel-Rousillón (Ruscino) – discussed above.
6. Carmona (Sevilla) – One Series IP 2 solidus (4.40 g), dated Indiction X.
7. Carteya Nuco (Cádiz) – One Series IP 3 solidus. No weight recorded.
8. Vicinity of Córdoba – One Series IP 2, Indiction X solidus (4.40 g).
9. Córdoba – Two Series IP 2 solidi. One dated Indiction XI • ; the other is the single example of the IASERC type, without an Indiction date.
10. Setubal (Portugal) – One Series IP 3 solidus (4.147 g), dated 98/717-18.
11. Vale de Açor (Portugal) – One Series IP 3 solidus dated 98/717-18 without a weight.
12. Barcelona – One North African Series 1 to 3 (not described).

420 BELDA 2003, p. 105.

13. Cádiz – One Series NA 3 solidus, dated 97/716-17.

Three finds have been recorded in Spain and Portugal in addition to the fourteen examples above – four Series IP 2 solidi found in Ejica (Seville);<sup>421</sup> one Series IP 3 solidus found in Fitero, Navarre (northwest of Zaragoza);<sup>422</sup> and one Series NA 2, Phase 2 semissis found on Mallorca in the Balearic islands.<sup>423</sup>

With so few finds it is difficult to draw any conclusions regarding circulation or mint location(s) in the Iberian Peninsula. The concentration of finds in the south of the Iberian Peninsula makes sense, as this would have been where Muslim activity and settlement was initially concentrated, and it is likely that the finds of Series NA 2 coinage relate to campaigns undertaken by the Muslims during the initial stages of the conquest of the Iberian Peninsula.

#### **THE INTRODUCTION OF SERIES 4 DINARS AND SERIES IP 4 DIRHAMS**

‘Umar II (r. 99/717-101/720) succeeded Sulaymān as caliph, and he quickly appointed Ismā‘īl b. ‘Ubayd Allāh b. Abī al-Muhājir (99/717-101/720) as the new governor of *Ifrīqiya*.<sup>424</sup> Ismā‘īl embarked on a new series of monetary reforms, the purpose of which must have been to align *Ifrīqiya*'s monetary system more closely with that in the rest of the Caliphate, an undertaking that was only partially successful.

Ismā‘īl discontinued the minting of Series NA 3 solidi, ending the use of Latin on the precious metal coinage of *Ifrīqiya*. The persistence of Latin, used for approximately 20 years in *Ifrīqiya* and still in use 23 years after the introduction Post-Reform coinage in Damascus in 77/696-7 may seem puzzling, but less so if we look

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421 PLIEGO 2001.

422 MEDRANO 2004, no. 51.

423 ILISCH AND MATZKE 2005, no. 11.

424 ‘ARAWĪ 1977, p. 94; TĀHĀ, p. 198.

at the persistence of Greek in Egypt. Although we do not have the same type of evidence for North Africa, in Egypt the evidence of the papyri suggests that the systematic use of Arabic (often in bilingual contexts) in official correspondence only began in 91/709, while Arabic-only tax receipts only appeared in 148/765.<sup>425</sup>

Series NA 4, Post-Reform dinars, replaced the Series NA 3 solidi in 100/718-19 (Figure 180). The Islamic mint in *Ifriqiya* adopted the layout of the Post-Reform dinars struck in Damascus, but chose to place the same legends on the dinars as those found on the Series NM 4 *nisf* already being struck in *Ifriqiya* (Figure 181; see also p. 224). The dinars struck in *Ifriqiya* were also initially smaller in diameter (16-17 mm) than those struck in Damascus (20 mm), again reflecting the use of the Series NM 4 *nisf* as a model. Series NA 4 dirhams continued to be struck during the first year of the introduction of the dinar, although still in small numbers. Production of Series NM 4 *nisf* and *thulth* increased in the same year that the *Ifriqiya* mint introduced the dinar, but this increase was temporary, with much smaller numbers struck in 101/719-20. The decrease in the number of Series NM 4 fractionals appears to correspond to an increase in the number of dirhams struck in that year.



Figure 180: Series NA 4 dinar, struck in *Ifriqiya* in 100/718-19. KC A(add)4a. Image courtesy of the Khalili Collection. (4.29 g) (scale x4)

425 PAPAConstantinou 2013.



Figure 181: Series NM 4 nisf, without a mint name and dated 100/718-19. *icaL20, L:102.*  
 Image courtesy of Baldwin's Auctions, Ltd. (2.08 g) (scale x4)

‘Umar II also directly appointed a new governor for *al-Andalus*, al-Samḥ b. Mālik al-Khawlānī (Ramaḍān 100/719-Dhū al-Ḥijja 102/721). ‘Umar II’s instructions to al-Samḥ appear to have been comparable to those provided to the *Ifriqiya* governor Ismā‘īl, as al-Samḥ implemented similar fiscal reforms (division of lands; continued implementation of the tax system). It appears that he also ordered the compilation of some sort of census that described the resources of the province of *al-Andalus*.<sup>426</sup>

The Islamic mint in *al-Andalus* began minting Series IP 4, Post-Reform dinars in 102/720-21 (Figure 182), supplemented for one year by a small number of *nisf* and *thulth* (Figure 183). A large number of dinars appear to have been struck in 102/720-21, but only a few have survived from subsequent years. The Series IP 4 dinars are modelled on the Series NA 4 dinars of this period, with the same Western legends as those found on the Series NM 4 fractionals.

<sup>426</sup> KENNEDY 1996, p. 20; COLLINS 1994, p. 48, 87.



Figure 182: Series IP 4 dinar, struck in *al-Andalus* and dated 102/720-21. L426. Image courtesy of Bibliothèque nationale de France, Paris. (4.28 g) (scale x3)



Figure 183: Series IP 4 nisf, struck in *al-Andalus* and dated 102/720-21. L427. Image courtesy of Bibliothèque nationale de France, Paris. (2.16 g) (scale x3)

Al-Samḥ died in Dhū al-Ḥijja 102/721 during the siege of Toulouse.<sup>427</sup> The local Muslim leaders selected ‘Abd al-Raḥmān ibn ‘Abd Allāh b. al-Ghāfiqi as their new leader, but Bishr b. Ṣafwān, governor of *Ifriqiya*, asserted his authority over the province and replaced al-Ghāfiqi with ‘Anbasa ibn Ṣuḥaym al-Kalbī, who arrived in *al-Andalus* in Ṣafar 103/August 721. It is under ‘Anbasa’s governorship that the Islamic mint in *al-Andalus* first introduced Series IP 4 dirhams, with two known examples dated 103/721-22 (Figure 184).

<sup>427</sup> KENNEDY 1996, p. 20; COLLINS 1994, p. 48, 87.



Figure 184: Series IP 4 dirham, struck in *al-Andalus* and dated 103/721-22. ME28, L:43=ME39, L:432. Image courtesy of Morton & Eden. (3.00 g) (scale x2)

Production of dirhams increased in *al-Andalus* after the first year, but tailed off substantially in the year of ‘Anbasa’s death (107/726), with only two obverse and three reverse dies recorded for that year (11 examples).

In *Ifriqiya*, ‘Umar II’s successor Yazīd II (101/720-105/724), dismissed Ismā‘īl b. Ubayd Allāh and replaced him with Yazīd b. Abī Muslim in 102/720. He lasted only one month as governor before being murdered by his Berber bodyguard. He was replaced by Bishr b. Ṣafwān al-Kalbī, who governed the province until his death in 109/727-28.<sup>428</sup> Under Bishr b. Ṣafwān, the *Ifriqiya* mint ended the production of the no mint fractionals in 103/721-22 and increased production of dirhams until 106/724-25 when, judging by the number of surviving examples and dies, production tailed off sharply. The annulet pattern of the *Ifriqiya* dirhams also changed for the first time under Bishr b. Ṣafwān. Two annulet patterns survive for the year 103/721-22. In 105/723-24, the reverse annulet pattern changed from ‘o o o o’ to ‘oo oo oo oo oo’. In 106/724-25, the annulet pattern ‘oo oo oo oo oo’ was also adopted for the obverse, and this would remain the annulet pattern until 110/728-29.

428 TĀHĀ 1989, p. 199.

Previous scholars have speculated on the status of the *Ifrīqiya* and *al-Andalus* mints during the reign of Yazīd II's successor, Hishām (r. 105/724-125/742). Two pieces of evidence are cited in this debate. The first is a statement in al-Maqrīzī that under Hishām the production of dirhams was discontinued at every mint except Wāṣit. The second is the letter written to Miles by M. Jungleisch, who cited the excavation report of J. de Morgan that reported that new, uncirculated coins bearing the mint names *Ifrīqiya* and *al-Andalus* were found during the excavations of the mint at Wāṣit. Unfortunately, this excavation report has never been recovered.<sup>429</sup> Miles believed that the number of mints was reduced in the central Islamic lands, and that there may have been some centralization in the production of dies, but this did not apply to either the *Ifrīqiya* or *al-Andalus* mints. The monetary evidence supports Miles's assertion. Although not in every case, changes in production and annulet patterns for the dirhams appear to reflect changes in the governorship of the two provinces. The change in annulet pattern and production would probably not have occurred if the minting of the dirhams had been centralized at Wāṣit.

The local leaders in *al-Andalus* selected 'Udhra b. 'Abd Allāh al-Fihri as governor upon the death of 'Anbasa in 107/726.<sup>430</sup> The governor of *Ifrīqiya*, Bishr ibn Safwan, once again opposed this appointment, however. Instead he selected Yaḥyā b. Salāma al-Kalbī, who was sent to *al-Andalus* in Shawwāl 107/ February-March 726 and was in power until Rabī' I 110/July 728. The only surviving *al-Andalus* dinar from the period of Yaḥyā b. Salāma's governorship is dated 108/726-7, and is similar to the dinars previously struck at the mint in *al-Andalus*. This is the last known dinar struck until 114/732-33. The number of dies from the period 107/725-6 to 109/727-8 would also suggest that dirham production was lower, but this is difficult to gauge given the

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<sup>429</sup> MILES 1950, pp. 21-22, fn. 1; see also discussion in MARTÍN 2005, pp. 42-44.

<sup>430</sup> TĀHĀ 1989, p. 189-90. COLLINS 1994, p. 81-3, 87.

small number of surviving examples. The first change in the annulet patterns of the *al-Andalus* dirhams also occurred in 108/726-7, changing on both the obverse and reverse from ‘o o o o’ to ‘oo oo oo oo’. This new annulet pattern continued on the *al-Andalus* dirhams until 111/729-30.

According to the sources, Yaḥyā b. Salāma’s death in 110/728 ushered in a period of political instability in *al-Andalus*, with three more governors appointed by the governor of *Ifriqiya*, ‘Ubayd b. ‘Abd al-Raḥmān al-Sulamī, in rapid succession: Ḥudhayfa b. al-‘Aḥwaṣ al-Ashja’ī (110/728); ‘Uthmān b. Abī Naṣr al-Khath’amī (ruled only four months – 110/728-111/729); and al-Haytān b. ‘Ubayd al-Kinānī (ruled only ten months – Muḥarram 111/April 729-Dhū al-Qi’da 111/January-February 730). The local leaders of *al-Andalus* then nominated Muḥammad b. ‘Abd Allāh al-Ashja’ī, but this selection was quickly overturned by the governor of *Ifriqiya*, who appointed ‘Abd al-Raḥmān al-Ghāfiqī again in Ṣafar 112/March-April 730. The annulet patterns on the *al-Andalus* dirhams temporarily changed in 111/729 (obverse) and then again in 112/730 (reverse) perhaps reflecting the succession of governors. The number of surviving examples and dies also suggests that production was quite low in 112/730.

‘Abd al-Raḥmān al-Ghāfiqī is known for two events during his tenure as governor. The first is his campaigns against the Berbers, who had risen in revolt in the north of *al-Andalus* in 111-112/729 and were not defeated until 113/731.<sup>431</sup> The second major event is ‘Abd al-Raḥmān al-Ghāfiqī’s campaign in France, which ended in his death at the battle of Poitiers in Ramaḍān 114/October 732.<sup>432</sup> During ‘Abd al-Raḥmān al-Ghāfiqī’s governorship dirham production remained high until, 112/730-

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431 KENNEDY 1996, p. 24.

432 KENNEDY 1996, p. 24; TĀHĀ 1989, pp. 190-91. Collins suggests battle of Poitiers took place in late 115/733, or even as late as 116/October of 734. see COLLINS 1994, p. 88-91.

31, when there appears to have been a sharp decrease, coinciding with the revolt during his governorship. Production increased again, however, in 113/731-32 and 114/732-33. The annulet patterns also changed on the *al-Andalus* dirhams during ‘Abd al-Raḥmān al-Ghāfiqī tenure as governor, with the obverse pattern changing in 111/729-30 from ‘oo oo oo oo’ to ‘⊙ ⊙ ⊙ ⊙’. This annulet pattern continued until 116/734-5, and may indicate that ‘Abd al-Raḥmān al-Ghāfiqī assumed the governorship earlier than indicated in the sources.

‘Ubayd b. ‘Abd al-Raḥmān al-Sulamī’s tenure as governor of *Ifriqiya* from 109/727-28 to 114/732-33 also saw several monetary changes. The *Ifriqiya* mint changed the annulet pattern on the dirhams in 110/728-29 from ‘oo oo oo oo oo’ to ‘o o o o’, perhaps due to ‘Ubayd b. ‘Abd al-Raḥmān’s appointment as governor. The Annulet pattern changed again in 111/729-30, however, with ‘⊙ ⊙ ⊙ ⊙’ becoming the obverse and ‘o o o o’ becoming the reverse pattern. This would remain the annulet pattern until 116/734-35. Dirham production continued to be low in 109/727-28 and 110/728-29, but increased from 111/729-30 to 114/732-33. It is during ‘Ubayd b. ‘Abd al-Raḥmān’s tenure that we also have the first surviving dinar since 106/724-25, dated 110/728-29. The dinars of this year, still bearing the Western legends, are the last ones known until 114/732-33.

The year 114/732-33 saw ‘Ubayd b. ‘Abd al-Raḥmān al-Sulamī appointing ‘Abd al-Malik b. Qaṭān al-Fihri as governor of *al-Andalus* upon the death of ‘Abd al-Raḥmān al-Ghāfiqī. He journeyed to *al-Andalus* from *Ifriqiya* in Ramaḍān or Shawwāl 114/October or November 732.<sup>433</sup> In the same year, ‘Ubayd b. ‘Abd al-Raḥmān al-Sulamī was removed as governor of *Ifriqiya* by the Caliph Hishām. The governorship then fell to Ubayd b. ‘Abd al-Raḥmān’s lieutenant, ‘Uqba b. Qudāma

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433 TĀHĀ 1989, pp. 193-4.

until Rabī‘ II 116/May-June 734, when he was replaced by 'Ubayd Allāh b. al-Ḥabḥāb, the former financial controller and then governor of Egypt. 'Ubayd Allah would govern *Ifrīqiya* until Jumādā I 123/March-April 741.<sup>434</sup>

The appointment of ‘Abd al-Malik b. Qaṭān al-Fihri as governor of *al-Andalus* and ‘Uqba b. Qudāma as governor of *Ifrīqiya* in 114/732-33 coincides with a considerable numismatic change in both of the mints. It is in this year that both of the mints finally introduced dinars bearing the same legends as those struck elsewhere in the Caliphate (Figure 185; see also p. 227).



Figure 185: Series NA 4 dinar, struck in *Ifrīqiya* and dated 114/732-33. *icaL22, L:3078*.  
Image courtesy of Baldwin's Auctions, Ltd. (4.27 g) (scale x3)

The Islamic mint in *Ifrīqiya* also began to insert two horizontal pellets at the bottom of the reverse field on the dinars beginning in 114/732-33. This ornamentation is on all of the subsequent dinars (dated 117/735-36, 121/738-39 and 122/739-40) up until the end of the Umayyad Caliphate. In *al-Andalus*, dinars with Eastern legends are found for the years 114/732-33, 115/733-34, 120/737-38, and 127/744-45.

‘Abd al-Malik b. Qaṭān’s tenure as governor of *al-Andalus* also coincided with a rebellion in Catalonia, Aragon and Navarre in 115/733.<sup>435</sup> This rebellion once again

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434 BRETT 1978, p. 517; KHOURY 2012.

appears to be reflected in the numismatic record, with few surviving dirhams in that year. His governorship lasted until Shawwāl 116/November 734. There are also very few surviving dirhams from ‘Uqba b. Qudama’s tenure as governor of *Ifriqiya*, but production appears to have increased once again in 116/734, coinciding with 'Ubayd Allāh b. al-Ḥabḥāb’s assumption of the governorship. The other major numismatic change at this time is the appearance of a diamond shaped pellet introduced on some of the dirhams of *Ifriqiya* in 117/735, and which continues to be found on some the dirhams until 'Ubayd Allah’s removal as governor in 124/742. The obverse, annulet patterns of the *Ifriqiya* dirhams also changed in 116/734, from ‘◎ ◎ ◎ ◎’ to ‘◎ ◎ ◎’.



*Figure 186: Reverse of Series NA 4 dirham showing diamond shaped pellet at the bottom of the reverse field, struck in Ifriqiya in 117/735-36. S00N, L:24. Image courtesy of Sotheby’s. (2.83 g) (scale x2)*

## REVOLTS IN IFRĪQIYA AND AL-ANDALUS

A major Berber revolt began in *Ifriqiya* in 122/740. The revolt appears to have occurred for a number of reasons, including taxation, enslavement of Berber women, and failing to provide Berber soldiers with the appropriate share of booty from campaigns.<sup>436</sup> The rebellion began with the sacking of Ṭanja, under the Berber commander Mayṣara al-Miṭgharī. Mayṣara’s army then marched to al-Sūs, and killed

435 TĀHĀ 1989, pp. 193-4.

436 IBID., p. 199.

that region's sub-governor. These successes led other Berber communities to join in the uprising. The governor of *Ifrīqiya*, 'Ubayd Allāh b. al-Ḥabḥāb, raised an army, but the army was defeated by the Berbers in 123/741. This defeat led to 'Ubayd Allāh b. al-Ḥabḥāb's dismissal in Jumada I 123/March 741.<sup>437</sup> A new Muslim army was raised in Syria under the command of Kulthūm b. 'Iyād al-Qushayrī, who became the new governor of *Ifrīqiya*. The army arrived in *Ifrīqiya* in Ramaḍān 123/August-September 741 and defeated the Berbers, although Kulthūm was killed. Elements of this army, under Kulthūm's lieutenant Balj b. Bishr, retreated to Ceuta, followed shortly thereafter by a Berber force besieging the city. The situation became quite dire, and Balj requested permission to evacuate to *al-Andalus*.<sup>438</sup>

There is ample evidence in the numismatic record to support the sources' record of the above events. There are no surviving *Ifrīqiya* dirhams for the years 121/739 to 123/740-41, and two major dirham hoards (one at Volubilis, the other at Fez) also appear to have been deposited in the area of the revolt during this period.<sup>439</sup>

Political turmoil engulfed *al-Andalus* at the same time as the Berber rebellion in *Ifrīqiya*. 'Uqba b. al-Ḥajjāj al-Salūlī was appointed as the governor of *al-Andalus* in 116/734. 'Uqba is recorded in the sources as one of the greatest of the *al-Andalus* governors, modifying the taxation system and undertaking campaigns in Pamplona, Galicia and Asturias. Under 'Uqba's rule Narbonne in southern France, became an important base, where he established *ribāts* to guard the frontier.<sup>440</sup> 'Uqba's financial policies were opposed by the Berbers, however, who staged a coup. 'Uqba was replaced by 'Abd al-Malik b. Qaṭān al-Fīhrī, who was chosen by the local Muslim leaders of *al-Andalus*, but the Berber rebellion continued. It was at this time that

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437 TĀHĀ 1989, p. 198-202. KENNEDY 1996, pp.23-4.

438 TĀHĀ 1989, pp. 203-5.

439 MARTÍN 2005, p. 54.

440 TĀHĀ 1989, pp. 195-6; COLLINS 1994, p. 94.

‘Abd al-Malik b. Qaṭān finally relented in his opposition to Balj’s army moving to *al-Andalus*. In 124/spring 742, Balj’s army crossed the Strait of Gibraltar and defeated the rebels near Toledo. Relations soon broke down between Balj and ‘Abd al-Malik b. Qaṭān, with Balj’s forces eventually emerging victorious in Shawwāl 124/August 742, but Balj himself was killed.<sup>441</sup>

Production of dirhams in the first year of ‘Uqba’s tenure appears to have been low, but increased somewhat for the next two years before dropping off again in 122//740, and there are no surviving *al-Andalus* dirhams for the year 123/741. The obverse annulet patterns on the dirhams changed in 116/734 from ‘⊙ ⊙ ⊙ ⊙’ to ‘o o o o’ and then changed again in 118/736-3 to ‘oo oo oo oo’. This would remain the obverse annulet pattern until the end of the Umayyad Caliphate, although an additional obverse annulet pattern is found in 120/737-38.

The Caliph Hishām appointed a new governor of *Ifriqiya*, one Ḥanzala b. Ṣafwān in Ṣafar 124/December 741-January 742. Ḥanzala, in turn, sent his cousin Abū al-Khaṭṭār al-Ḥusām b. Ḍirār al-Kalbī to take over as governor of *al-Andalus*. Abū al-Khaṭṭār arrived in *al-Andalus* in Rajab 125/May 743.<sup>442</sup> Abū al-Khaṭṭār deported some of the Syrians to *Ifriqiya*, while settling others in the peninsula. Struggles between the Syrians and the older settlers continued, however, and Abū al-Khaṭṭār was eventually overthrown.<sup>443</sup> The local leaders then chose Thawāba b. Salāmi al-Judhāmī as his replacement in Rajab 127/April 745. Thawāba died in al-Muḥarram 129/October 746, and *al-Andalus* was without a governor for four months.

Eventually ‘Abd al-Raḥmān b. Kathīr al-Lakhmī was selected in 130-31/747.<sup>444</sup>

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441 KENNEDY 1996, pp. 24-5. TĀHĀ 1989, pp. 197, 215-18; COLLINS 1994, pp. 94-110.

442 TĀHĀ 1989, p. 218. COLLINS 1994, p. 110-11.

443 TĀHĀ 1989, pp. 219-20.

444 IBID., p. 221-3.

The appointment of Ḥanzala b. Ṣafwān as governor of *Ifriqiya* resulted in two changes to the dirhams. The first was temporary, and saw the placement of an upward crescent ‘U’ at the bottom of the reverse field, replacing the diamond shaped pellet that had previously been found there during ‘Ubayd Allāh b. al-Ḥabḥāb’s governorship. The ‘U’ is found on only one die in this year, and does not appear on subsequent coinage. The obverse annulet pattern for the *Ifriqiya* dirhams also changed for the last time during the Umayyad Caliphate in 125/742-43, changing from ‘◎ ◎ ◎’ to ‘o o o o o’. The political turmoil in *al-Andalus* is clearly reflected in the numismatic record, with no surviving dirhams dated 126/743-44 and 127/744-45.

There are also no surviving *Ifriqiya* dirhams dated 126/743-44 and 127/744-45, which reflects the period in which ‘Abd al-Raḥmān b. Ḥabīb al-Fihri drove out Hanzala, and assumed the governorship of *Ifriqiya*. ‘Abd al-Raḥmān b. Ḥabīb would remain as governor until 137/755, after the fall of the Umayyad Caliphate.<sup>445</sup> The *Ifriqiya* mint also struck dirhams in the first two years of ‘Abd al-Raḥmān b. Ḥabīb’s governorship that bear an eight-pointed star at the bottom of the obverse field (Figure 187).



Figure 187: Obverse of Series NA 4 dirham, struck in *Ifriqiya* in 128/745-6. W 288a. Image courtesy of the Trustees of the British Museum. (2.80 g) (scale x2)

<sup>445</sup> IBID., p. 223.

A similar period of stability existed in *al-Andalus*, with Yūsuf b. ‘Abd al-Raḥmān al-Fihri chosen as the new governor in Rabī‘ II 129/December 746-January 747, and would continue until 10 Dhū al-Ḥijja 138/14 May 756.<sup>446</sup> Dirhams from this period are found for the years 129/746-47, 131/748-49, 135/752-53 and 136/753-54.<sup>447</sup>

As revealed above, the transitional period for the precious metal coinage of North Africa and the Iberian Peninsula was a lengthy one, with the coinage of the two regions remaining distinct from that found elsewhere in the Umayyad Caliphate until 114/732-33, 37 years after the introduction of Post-Reform coinage in the central Islamic lands. After 114/732-33, we no longer see major differences between the North Africa and Iberian Peninsula dinars and dirhams and those found elsewhere in the caliphate, but the changing annulet patterns on the dirhams and other ornamentation on both the dirhams and the dinars, along with the changing production patterns, all reflect regional or local circumstances.

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446 KENNEDY 1996, p. 27.

447 MARTÍN 2005, p. 41.

## CONCLUSIONS

The results of each stage of my research on the precious metal coinage of North Africa and the Iberian Peninsula revealed numerous significant findings. In many cases, my analysis corrected previous interpretations of specific coins, which are too numerous to recount here. In other cases, such as my argument that the endings of the legends on the Series NA 2, Phase 1 coinage are the result of engraver error (p. 118), or my analysis of the transition of the main mint from the Iberian Peninsula to North Africa in 95-6/714-15 (p. 188), the findings are more far-reaching, but still limited to one or two series.

The need to discuss each series in considerable detail in order to correct earlier errors and introduce new findings meant that I have had to keep comparative analysis of the coinage under study and contemporary Islamic coinage struck elsewhere in the Umayyad Caliphate to a minimum. A comparative approach to the coinage is important, however, as it provides information regarding the context of the precious metal coinage struck in North Africa and the Iberian Peninsula. I will therefore conclude the dissertation by summarizing how the Islamic mints in the two regions altered the coinage in response to internal and external factors and events, and then compare this process to changes that took place during the experimental phase of 'Abd al-Malik's monetary reform, as well as coinage struck in other frontier regions of the Caliphate. I will conclude with some thoughts on the nature of the North African and Iberian Peninsula issues (i.e. was this a local, regional, or Imperial coinage? Can it be defined in another way?), and a brief summary of the opportunities for future research.

## **ADOPTION, ADAPTION, AND INNOVATION**

The Typology described the characteristics of each of the four series of the precious metal coinage of North Africa and the Iberian Peninsula, and outlined the changes that took place in the coinage at various stages in its evolution. In some cases, the Islamic mints adopted features found on the coinage already circulating in the region or in the central Islamic lands; in other cases, the mints had to adapt the characteristics of the coinage to meet particular objectives. The Islamic mints also introduced innovations on the coinage with the placement of legends unlike those found on the contemporary coinage struck elsewhere in the caliphate.

### **ADOPTION**

Although I proposed the tentative suggestion on p. 339 that the Muslim conquerors of North Africa first struck imitations of the solidi of Constans II and Constantine IV before minting Series NA 1, further work needs to be undertaken on this coinage before this suggestion can be confirmed. It would not be surprising to find, however, that the Islamic mint in North Africa struck imitations of Byzantine solidi, because as I have pointed out this was an approach adopted in the central Islamic lands, albeit only for copper (see p. 21).

The introduction of Series NA 1, the earliest confirmed precious metal coinage struck in North Africa, saw the early Islamic mint adopting a conservative approach through the retention of three important characteristics of the Byzantine coinage circulating in the region: the globular fabric; the seventh-century Byzantine mint standard for Carthage of 4.32 g; and the use of the Latin language for the legends. The Islamic mint in North Africa would retain the mint standard for approximately 14 years, up until the invasion of the Iberian Peninsula, while the imitation of the Byzantine globular fabric and use of Latin continued on the subsequent North African

and Iberian Peninsula series (Series 2 and Series 3) up until the introduction of Series 4, Post-Reform dinars in 100/718-19 (for North Africa) and 102/720-21 (for the Iberian Peninsula).

Given the political/administrative/historical circumstances from the time of the introduction of Series NA 1 up until the introduction of Series 4, it is not surprising that the Muslim conquerors of North Africa chose to retain the fabric, language and weights of the Byzantine coinage already circulating in the region. By adopting these characteristics, the Islamic mint kept the three features of the Byzantine coinage that would have been instantly recognizable to the users of the coinage, helping to ensure stability in the marketplace. This stability would have been important for the Muslim administration in the region given that the major military campaigns against the Berbers continued up until 90/708, first under Ibn al-Nu‘mān and later under Mūsā b. Nuṣayr. The previously struck Byzantine coinage also must have continued to circulate in the region, and the retention of these characteristics perhaps would have allowed the Byzantine and Islamic coinage to be used interchangeably.

The introduction of Series 2 by Mūsā b. Nuṣayr in 84-5/703-4 saw the adoption of another important feature borrowed from the Byzantine solidi, the Indiction dating system, found on the solidi of the Series 2 until they were discontinued after 96/714-15. This is the only use of the Indiction dating system on Islamic coinage, although the use of Indiction dating has been found on a Greek inscription engraved by a Christian commemorating the restoration of the baths at Hammat Gader in Syria by ‘Abd Allāh b. Abū Hāshim in 42/662-3,<sup>448</sup> as well as on early bilingual protocols.<sup>449</sup> Although not the Indiction dating system, the use of a dating system on Islamic coinage other than the *hijri* calendar also occurred on the early Arab-Sasanian

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448 GREEN AND TSAFRIR 1982, pp. 94-6.

449 GROHMANN 1932, pp. 45-6; GROHMANN 1952, pp. 115-16.

drachms, which employed variations of the Sasanian regnal calendar for over 50 years.<sup>450</sup>

What is the significance of the introduction of Indiction dating? The adoption of this dating system, as well as the retention of the fabric, mint standards and language of the Byzantine coinage, suggests that Ibn al-Nu‘mān and later Mūsā co-opted Byzantine officials into their administration. These officials, who must have influenced or overseen the workings of the early Islamic mint in North Africa, would not have been familiar with the *hijri* dating system that was already used elsewhere in the Umayyad monetary system. Mūsā’s administration did, however, adopt the *hijri* dating system with the introduction of dated *fulūs* and Series NM 4 *nisf* and *thulth* beginning in 91/709-10, and this may have influenced the placement of *hijri* dates alongside Indiction dates on Series 2 beginning in Indiction X (93-4/712-13).

The early Islamic mint in North Africa also borrowed features from the Post-Reform coinage struck elsewhere in the Umayyad Caliphate. Mūsā’s introduction of Series 2 saw the adoption of an epigraphic coinage, although still in Latin. Later, the appointment from Damascus of Muḥammad b. Yazīd in 97/715-16 as the new governor of North Africa meant further changes to the coinage. The new governor adopted the mint standard of Damascus for the new Series 3, bilingual solidi. Even more significant was his adoption of the bi-metallic monetary system in the rest of the caliphate, introducing Post-Reform dirhams.

## **ADAPTION**

Although the Muslim mint in North Africa initially adopted three important, easily recognizable Byzantine features with the introduction of Series 1, and retained the weight standard for approximately a decade and the fabric and Latin language for a

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450 ALBUM AND GOODWIN 2002, p. 6.

further 10 years, from the earliest period the mint chose to adapt important characteristics of the coinage.

As early as the issuance of the first Islamic solidi under Mu'āwiya (see p. 22), the Muslim overseers of the Caliphal mint had to devise a way to modify the Christian symbolism found on the Byzantine model. The North African mint also faced this issue with the striking of Series 1, modelled on a Byzantine prototype, leading to the removal of the crosses from the obverse, and modification of the cross-potent on the reverse to a globe on pole or T-bar on steps.

As I describe beginning on p. 208, the globe on pole and T-bar on steps became an important feature of the early Islamic semisses and tremisses of North Africa and the Iberian Peninsula, serving as a method to differentiate between the two types of fractionals. This is again an adoption of a feature found on the Byzantine fractionals, but adapted to the Islamic context through the modification of the cross-potent found on the Byzantine coinage. Although the early Islamic mint retained the three Byzantine denominations of solidus, semissis and tremissis, it appears from the striking of Series 1 that the mint altered the denominational makeup from that of the Byzantine coinage through the issuance of more fractionals and less solidi. The reason for this unknown, although this may have been due to the fact that early Islamic copper appears to have been relatively rare (see p. 447 below), with the fractionals perhaps taking the place of the copper in some circumstances.

Like North Africa, there was a distinct coinage already in place prior to the Muslim invasion of the Iberian Peninsula - that of the Visigoth kingdom. Instead of adopting and adapting characteristics of the existing coinage, the Muslim invaders chose to maintain the fabric and style of the Islamic coinage struck in North Africa, likely because of the familiarity of the North African coinage to the members of the

Muslim army. The Islamic mints in the Iberian Peninsula did, however, adapt Series IP 2, placing a star on the obverse of the coins and altering the legends in order to include the *hijri* date.

A final adaption of the early Islamic coinage of the two regions can be seen in the changing gold content of the coinage. The gold content for Series 1 was lowered from the 96% Au standard under the Byzantines to a still relatively high standard of 85-88% Au under the Muslims. The reason for the drop in the gold content is unknown. Perhaps the early Islamic mint did not have access to a large enough supply of Byzantine solidi and plate, necessitating the sourcing of gold with a lower gold content to supplement the recycled Byzantine gold. Alternatively, this may have been a conscious decision at the mint, with the Muslim administration choosing to strike a coinage that was superficially similar to the Byzantine coinage, but saving costs through the lowering of the gold content. Later changes to the gold content after the invasion of the Iberian Peninsula are clearly the result of the recycling of the inferior Visigoth tremisses.

## **INNOVATION**

In striking the Series 1 through 3 transitional coinage, the early Islamic mints in North Africa and the Iberian Peninsula initially adopted and adapted many of the features of the previously struck Byzantine solidi, and later altered the coinage to conform more closely to the coinage and monetary system found elsewhere in the Umayyad Caliphate. The legends found on these coins, in contrast, must be considered an innovation, as these series are the only case where the *shahāda* has been translated into a language other than Arabic and placed on a coinage, the one exception being a

short-lived Sīstāni copper issue with the *shahāda* in Pahlāvī.<sup>451</sup> Unlike the Sīstāni coin, however, the North African and Iberian Peninsula issues were minted for an extended period of time.

Even though the legends are innovative, they still show the early influence of Damascus fiscal policy at the North African mint. This influence can be seen through the placement of a Latin variation of the *shahāda* on Series NA 1 - *non est deus nisi ipse solus socios et non habet* (There is no God but He alone, and he has no partners). This legend was abandoned in favor of shorter legends that were perhaps easier to engrave, but still captured the essential message of the *shahāda*, such as *non est deus nisi solus* (there is no God but God alone); or emphasized the various attributes of God, such as *in nomine domini misericordis* (In the name of the Lord, [of the] Merciful). This latter legend also shows the influence of phrases found on bilingual protocols, and is similar to *bism Allāh al-rahmān al-rahīm*, a legend commonly found on the contemporary surviving papyri.<sup>452</sup> In contrast to the contemporary protocols, however, there is no mention of the Prophet, Muḥammad, until the introduction of Series 3 in 97/715-16, 33 years after the first mention of the Prophet on Islamic coinage and 20 years after the introduction of Post-Reform dinars.<sup>453</sup> This omission may have been because of space restrictions on the coin, or more likely because it was not part of the key message that the Muslim administration wished to put across to the pagan/Christian population.

Other legends, such as *in nomine tuo deus omnipotens* (In thy name, O God, the all-powerful) found on Series 1, or *deus eternus, deus magnus, deus omnium creator*

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451 HEIDEMANN 2010a, p. 169.

452 For example, a bilingual Greek/Arabic text of a protocol dated 86/705 to 96/715. GROHMANN 19934, pp. 10-11; and another dated 98-99/715-16. GROHMANN 1924, pp. 55-60, Plate I.

453 The first recorded instance of the Prophet's name is found on an Arab-Sasanian drachm of Bīshāpūr, dated 66/685-86. See JOHNS 2003, pp. 426-7.

(God the Eternal, God the Great, God the Creator of All), found on Series 2, Phase 1, have no parallels in the early protocols or the contemporary Islamic coinage struck elsewhere (see p. 109). The attributes of God theme eventually gave way (Series NA 2 beginning in 89-90/708-9 (Phase 2)) to new legends that once again were Latin variations of the *shahāda* on the obverse of the coins - *non est deus nisi unus cui non est alius similis* (There is no God but the one to whom no one is similar).

Perhaps just as remarkable as the Latin legends found on Series 1 and Series 2 was the introduction of the bilingual Arabic/Latin legends found on Series NA 3 by Muḥammad b. Yazīd and Series IP 3 by his appointee Al-Ḥurr ibn ‘Abd al-Raḥmān al-Thaqafī. Although surviving protocols of this period continued to be bilingual, it was not the case in the monetary system where the majority of the coinage bore unilingual Arabic legends. It is the bilingual nature rather than the content of the legends themselves that make these legends exceptional, as the obverse and reverse Arabic field legends on Series NA 3 bear the first and second statement of the *shahāda* - *lā ilāha illa Allāh; Muḥammad rasūl Allāh*, found on all of the Post-Reform coinage and also found at the beginning of the surviving administrative documents. The Latin *shahāda*, found on the reverse margin, in contrast, had become corrupted and essentially meaningless. The Series IP 3 solidi, struck in 98/716-17, reintroduced the eight-pointed star in the obverse field that had been dropped from the Series IP 2, main mint solidi in 94-5/713-14, with *Muḥammad rasūl Allāh* in the reverse field. Two mint/date formulas are found on this series, once in Latin and once in Arabic, but no Latin religious legend.

As I outlined on p. 422 above, the use of Latin was not surprising given that it was the language found on the Byzantine issues, although close examination of the early Islamic coins would have quickly revealed that the Islamic religious legends were

different from the legends found on the Byzantine coins. The legends, however, are unique, and were obviously important to the Muslim administration as a symbol of Muslim authority despite the fact that the miniscule Latin legends found on these tiny coins would have been essentially unreadable to all but a few.

### ***THE INTRODUCTION OF SERIES NM 4 NISF AND THULTH – ANOTHER INNOVATION?***

Is it appropriate to consider the Series NM 4 gold fractionals to be another innovation of the early Islamic mint in North Africa? If we adopt the premise that this series was struck in North Africa which, despite my analysis beginning on p. 246 must remain uncertain, then the answer is yes, even though many of the features were adopted or adapted from contemporary issues.

If we consider the characteristics of Series NM 4, we can see that they are a mixture of the characteristics found on early contemporary Islamic issues struck in both North Africa and Damascus. The denominational makeup was likely borrowed not from the Byzantine coinage that had been discontinued 15 years earlier, but from the Series 1 and Series 2 coinage circulating in the region. Similarly, the placement of a large pellet on the *nisf* served to differentiate this denomination from the *thulth*, not unlike the globe on pole on steps found on the Series 1 and Series 2 semisses. The layout of the coinage, with Arabic legends in the field and margin is clearly copied, from the Damascene dinars, as are three of the four legends, albeit in a shortened form. The reverse field, however, bears the legend *bism Allāh al-raḥmān al-raḥīm*, however, which echoes the use of *misericordis* on Series 1 through 3, and significantly different from the legend found on the Eastern coinage - *Allāhu aḥad Allāh al-ṣamad lam yalid wa lam yūlad wa lam yakun lahu kufu'an aḥad*.

Categorizing Series NM 4 as an innovation is thus due to an accumulation of the adaption of characteristics found on contemporary coinage, in order to meet some still

unknown fiscal imperative, although it may have been useful for remittances to Damascus, or perhaps for trade purposes with Egypt.

## **THE NATURE OF THE EARLY ISLAMIC PRECIOUS METAL COINAGE OF NORTH AFRICA AND THE IBERIAN PENINSULA**

The unique nature of the early Islamic coinage of North Africa and the Iberian Peninsula can be further emphasized if we compare it to the experimental phase of ‘Abd al-Malik’s monetary reform and other monetary regimes that developed on the eastern fringes of the Umayyad Caliphate.

### **COMPARATIVE ANALYSIS – CALIPHAL COINAGE**

As I summarized in the Introduction beginning on p. 21, the initial steps in the evolution of Islamic coinage in the central Islamic lands was a slow one. The first issue in gold attributed to Mu‘āwiya was, other than the removal or modification of the Christian symbolism, essentially an imitation of the Byzantine solidi circulating in the region. In the *Mashriq*, the silver Sasanian drachms were also essentially left unchanged, except for the addition of validating words such as *bism Allāh*. Political uncertainty meant that further changes to the coinage had to wait until ‘Abd al-Malik’s victory in the Second *Fitna*, although earlier some of the mints in the *Mashriq* began to introduce further additions on the coinage, such as the introduction of *hijri* dating or the names of governors on the coins.

Changes to Islamic coinage were thus initially slow, with the above changes occurring over a period of decades (c. 41/660 to 72/691-2). It is only with ‘Abd al-Malik’s victory in the Second *Fitna* that a concerted, coordinated effort was undertaken at the Caliphal mint in order to eliminate the economic and political challenges facing the Caliphate. Like Series NA 1, the first experimental issue (the ‘Shahāda’ solidus) struck in Damascus under ‘Abd al-Malik retained the basic

iconography of contemporary Byzantine solidi, removing or modifying the Christian symbolism and replacing the Latin legends with the *shahāda* in Arabic. Both the Shahāda solidus and Series NA 1 are also similar in the fact that they were mintless, dateless, and even modelled on the solidi of the same Byzantine emperor (i.e. Heraclius). The only differences between the two issues is thus the use of Arabic on the Damascus issue versus the use of Latin on Series NA 1, as well as the placement of an additional, still undecipherable Latin legend on the Western Islamic solidi.

The next stage in ‘Abd al-Malik’s experimental initiative took place in 74/693-4 77/696, and saw the introduction of Islamic imagery (i.e. The Standing Caliph coinage), struck in both gold and copper. Experimental issues in silver were also struck in Damascus (e.g. Standing Caliph and Mihrab and ‘Anaza issues) during this period. The use of experimental imagery on the North African issues, in contrast, never took place, likely due to the historical/political circumstances in this region. The second stage (Series 2) in the development of the early Islamic issues of North Africa did not occur until 84/703-4 with the assumption of the governorship by Mūsā, seven years after the introduction of Post-Reform coinage elsewhere in the Caliphate. It is thus understandable that Mūsā would borrow the epigraphic model found on the Post-Reform coinage, and not attempt to develop an independent Islamic iconography like those that were introduced in Damascus.

This is a key point. Changes in North Africa were reactive, with the mint either adopting and/or adapting Byzantine characteristics to ease the use of the Islamic coinage in the region, or introducing features modelled from the Islamic Caliphal coinage, although modifying the features to fit the North African context. The Islamic mint in Damascus, in contrast, was proactively attempting to construct a new, blended (Byzantine and Sasanian) monetary system, whereas in North Africa the

Muslim administration was at this time still more concerned with the smooth operation of the regional marketplace. This difference likely explains why the transition to the Post-Reform coinage took place in such a short period of time (five years), whereas in North Africa and the Iberian Peninsula the evolution of the coinage took place over decades.

It was only in 97/715-16, with the assumption of the governorship of North Africa by Muḥammad b. Yazīd, that we see a proactive attempt under the governor to bring the North African coinage in line with rest of the Caliphate. Muḥammad b. Yazīd, appointed from Damascus, successfully introduced Post-Reform dirhams into the North African economy, although he also continued to strike transitional Series 3, bilingual solidi. The introduction of dirhams was possibly at the behest of the Caliph Sulaymān, who may have sought to integrate more closely the Western monetary systems with those in the rest of the Caliphate. We can be more certain that the final alignment of the North African and Iberian Peninsula coinage, from Series 3 to the Series 4, Post-Reform dinars and dirhams (including mint and gold content standards) was under the direction of the Umayyad Caliph ‘Umar II (r. 99/717-101/720) who directly appointed Ismā‘īl b. ‘Ubayd Allāh b. Abī al-Muhājir (99/717-101/720) as the new governor of *Ifrīqiya*, and al-Samḥ b. Mālik al-Khawlānī (Ramadān 100/719-Dhū al-Ḥijja 102/721) as the governor of *al-Andalus*.<sup>454</sup>

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<sup>454</sup> Ibn ‘Asākir recounts how ‘Umar II dictated the precise legend to be placed on a *fulūs* series struck in Kūfa. See TREADWELL 2008, p. 367.

## COMPARATIVE ANALYSIS – THE EASTERN FRINGES OF THE UMAYYAD CALIPHATE

Like in the West, ‘Abd al-Malik’s monetary reform had a limited impact on the monetary systems developed on the eastern fringes of the Umayyad Caliphate.

In geographically isolated Sīstān, for example, fierce fighting against the Zunbīls and the Kābul-Shāhis combined with internal disputes to keep the region unstable, a circumstance that necessitated at first the maintenance of the Arab-Sasanian drachm as the region’s coinage.<sup>455</sup> A second Sīstāni Arab-Sasanian type, minted between 87/706 and 147/764, featured a more degraded engraving style; increasingly stylized legends and dates; low weight; and a debased alloy (40-70% Ag). None of the coins of this type bear a recognizable name, although most have brief barely legible Arabic or Pahlāvī inscriptions. With this issue we have a coinage struck for the needs of local commerce – varied, anonymous, and crudely struck to a reduced weight standard and inferior purity.<sup>456</sup> Finally, beginning in the late 130s/750s and continuing to about 180/796, the Muslims struck another type in Sīstān. This coinage is slightly lighter than the other types and much more debased (typically 10-40% Ag). The iconographic style is highly schematic, with meaningless squiggles in place of dates. This type frequently has the names of local officials on the obverse, most unidentifiable.

It also appears that the sub-governors in Bust operated relatively independently from their overlords in the Sīstāni capital of Zaranj. The Muslim administrators in Bust began in the 60s/680s to mint coins with the basic iconographical and metrological elements of the Arab-Sasanian drachms, but an inferior engraving style; often-indecipherable dates; and the removal of sun symbols (as the Muslims believed

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<sup>455</sup> SEARS 1997, pp. 18-19.

<sup>456</sup> SEARS 1997, p. 21.

that their opponents to the east, the Zunbīls, worshipped the sun).<sup>457</sup> These issues, minted until 92/711, may have been utilized because of the need for a ready supply of coinage to pay the large number of men under arms, including *ghāzīs* who continuously journeyed to Bust in order to conduct raids on Zunbīl territories.<sup>458</sup>

The numismatic record of Sīstān is complicated further by the fact that the Muslim administration also issued Post-Reform dirhams during the period in which they struck crude and debased Arab-Sasanian drachms (struck from 90/708-9 to 103/721-22 and from 129/746-47 to 130/747-48). The issuance of multiple precious metal currencies in the same region suggests that the Muslims used the different types of coinage for distinct purposes, with the more debased coinage intended for local use and the Post-Reform coinage for fiscal uses, including remittances to the Caliphal capital. The evidence provided by coin hoards appears to confirm this observation, as no hoard yet found contains both dirhams and debased Sīstāni drachms.<sup>459</sup>

In other eastern frontier regions, the local currency deviated as much as, if not more than, in Sīstān. In Balkh, the Arabs struck immobilized Sasanian-style drachms of Hormizd IV (r. 579-590), which were subject to multiple revisions and countermarking. The Muslim rulers in Balkh struck these coins for 100 years without substantive stylistic change.<sup>460</sup> In Bukhārā, the so-called Bukhārkhudā drachms were adapted from the Sasanian coinage of Bahrām V (r. 420 – 438) and feature Pahlāvī, Bukhāran and finally Arabic inscriptions. These issues were struck in Transoxiana (Central Asia) until the early Qarākhānid period and used reportedly as late as the middle of the twelfth century.<sup>461</sup> As in Sīstān, the local currency appears to have co-

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457 BOSWORTH 1968, pp. 34-5.

458 SEARS 1997, pp. 20-1; BOSWORTH 1968, p. 36.

459 ALBUM 1998, p. 13.

460 ILISCH 2008, pp. 169-70.

461 NAYMARK 1999, pp. 1-2.

existed with Umayyad Caliphal currency, as confirmed by finds in Tajikistan.<sup>462</sup> A final example of local coinage struck in the East is found in Sind. The Muslims captured Sind in 93/711-12, long after the introduction of ‘Abd al-Malik’s monetary reforms. Post-Reform dirhams were imported into the region, and even minted in Daibul in 96/713, but only for one year. Instead, the Muslim governors of this region allowed the use of the pre-conquest coinage. Later, in 116/734, the governor ‘Amr b. Muḥammad al-Thaqāfī set up a mint that produced an Arabic version of the small lightweight regional currency, which would endure for over 300 years.<sup>463</sup>

The historical and administrative circumstances in the West during the period 79/698-99 to 99/718-19 were similar to those in the East, with near constant military expeditions in North Africa, and later the Iberian Peninsula, right up until the first introduction of Post-Reform dinars in North Africa in 100/718-19. As I have shown, the initial campaigns continued in North Africa under Ibn al-Nu‘mān after the conquest of Carthage in 79/698-99, necessitating the striking of coinage (Series 1) that adopted many of the characteristics of the Byzantine coinage already circulating in the region.

Unlike in geographically isolated Sīstān, however, where campaigning against the infidel continued for decades, major campaigns against the Berbers in North Africa appear to have ceased with the conquest of Ṭanja in 90/708. The cessation of hostilities in the region was likely the key factor in Mūsā’s introduction of the Series NM 4, Post-Reform *nisf* and *thulth* in 91/709-10. Series NM 4 may have been introduced for the same reasons that the governors of Sīstān introduced Post-Reform dirhams, to meet certain fiscal needs, including remittances to Damascus, or perhaps for trade purposes with Egypt. Although Series NM 4 continued to be struck

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<sup>462</sup> ILISCH 2008, p. 171.

<sup>463</sup> IBID., p. 168.

sporadically and in small numbers up until 103/721-22, the majority of the coinage struck up until the introduction of Post-Reform dinars and dirhams continued to be transitional (i.e. Series 2, Series 3). This is undoubtedly due to the invasion of the Iberian Peninsula in 92-93/710-12, and later the removal of Mūsā from office in 96/714-15.

Would Mūsā have pressed forward with further measures to bring the North African coinage in closer alignment with the Post-Reform coinage struck in the Central Islamic Lands if the invasion of the Iberian Peninsula had not taken place? We can only speculate, but the introduction of a new variation of the *shahāda* on the Series NA 2 (Phase 2) coinage in 89-90/ 707-9, followed by the introduction of Series NM 4 in 91/709-10, suggests that he was moving in that direction. In any case, the North African mint ceased striking Series NA 2, Phase 2 in 91-2/710-11 when Mūsā left the province for his campaign in the Iberian Peninsula, with Mūsā introducing a modified Latin Epigraphic model in the Iberian Peninsula in 92-3/710-12 (Series IP 2) that retained many of the features found on Series NA 2, Phase 2.

The local coinage of Sīstān became increasingly corrupted over time. Corruption of Series IP 2, in the form of unreadable legends, as well as lower weights and lower gold content for many of the surviving examples, also took place. The reasons for the latter corruption was different, however, as the corruption in the legends and weights primarily occurred with the Series IP 2 examples that were struck at secondary mints operating with various units of the army. The main mint coinage retained readable legends and a relatively high weight. The impact of the recycling of debased Visigoth tremisses, in contrast, affected all of the Iberian Peninsula mints in operation at this time, however, and continued to impact the quality of the North African and Iberian

Peninsula Series 2 and later Series 3 issues until the introduction of Post-Reform dinars.

The corruption of the legends and debasement of the coinage that began with the striking of Series IP 2 was also only temporary, unlike in the East. The introduction of Series 3 and Post-Reform dirhams in 97/715-16 in North Africa and the introduction of Series 3 a year later in the Iberian Peninsula appears to have been the result of a concerted attempt to align the coinage of the two regions more closely to that found in the central Islamic lands, although still maintaining some of the characteristics (e.g. globular fabric) of Series 1 and 2. Series NA 3 gave way to Series NA 4, Post-Reform dinars in 100/718-19, which aligned the North African monetary system even more closely with that found elsewhere in the Caliphate. The striking of Post-Reform dinars in the Iberian Peninsula followed later in 102/720-21, with dirhams struck in that province one year later.

The slow adoption of Post-Reform coinage on the eastern frontier appears to be at least partly due to the historical and administrative circumstances of the original Muslim conquest of these regions. In the East between 31/651 to 79/698, central control of the formerly Sasanian mints ceased, and coin types, weight and fineness all varied or became corrupt. Some of the eastern provinces ceased striking coins, while others became prolific for short periods. Overall, production was low in the East compared to the earlier Sasanian issues, although it gradually increased, especially in the period leading up to and during the Second *Fitna*, possibly in response to the monetary needs of the military campaigns, first within Iraq and Iran, and then along the eastern frontier against the Caliphate's external and internal enemies.<sup>464</sup>

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464 SEARS 1997, pp. 377-88.

Umayyad fiscal policy also played a role in the East. ‘Abd al-Malik had quickly removed and re-struck the existing stock of Byzantine solidi circulating in the central Umayyad lands, but this policy was not followed for silver.<sup>465</sup> Instead, Sasanian and Arab-Sasanian drachms continued to circulate in great quantities for decades in the central and eastern lands of the Caliphate alongside the newly minted dirhams.<sup>466</sup> Not only that, but in some mints, such as Bīshāpūr and Zaranj, the Muslims struck Arab-Sasanian drachms and Post-Reform dirhams simultaneously (for a period of five years - 79/698-83/702).<sup>467</sup> The lack of Caliphal control of the outputs of the eastern mints meant that regional governors, particularly on the frontier, had the freedom to strike (or allow to be struck) precious metal issues that met the needs of the local population.

The striking of precious metal coinage in both North Africa and the Iberian Peninsula appears to have been under the tight control of the governors (with the exception of Series IP 2 secondary mint examples), again in contrast to some of the eastern provinces where coinage in some cases bore the names of individuals other than the governors. Initially, bringing the North African and Iberian Peninsula coinage into line with the rest of the caliphate was not as important a priority for the regional governors. Instead the Islamic mints in the two regions designed the initial coinage in order to be acceptable in the local/regional marketplace. At the same time, there was some sort of pressure, either political or religious, to introduce Islamic legends and later the epigraphic format. The North African and Iberian Peninsula coinage also dove-tailed with the Post-Reform coinage relatively quickly when

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465 HEIDEMANN 1998, p. 105.

466 The so-called Bāb Tūmā and Damascus silver hoards, both discovered in Damascus, have terminal dates of 130/747-8 and 131/148-9 respectively. The first hoard is 83% Sasanian and 8% Arab-Sasanian, with only 9% Umayyad Reform dirhams. The Damascus hoard is 33% Sasanian, 3% Arab-Sasanian, with the rest made up of Reform dirhams. See GYSELEN AND KALUS 1983 and AL-‘USH 1972.

467 ALBUM AND GOODWIN 2002, p. 37.

compared to the East, where local coinage continued to be struck for decades, and even centuries. This suggests that the economies of the two Western provinces became aligned with that of the rest of the Caliphate relatively quickly.

### **SERIES 1 THROUGH 3 – A REGIONAL COINAGE**

As discussed above, the results of the research conducted in the development of the Typology revealed a large number of Latin legends on Series 1 through 3, and the use of Latin continued until 99/717-18, twenty-two years after the introduction of Post-Reform coinage in the Eastern Caliphate. This, combined with the results of the metrological and metallurgical investigations; the pattern of production (with bursts of activity at the mints frequently preceding or during military actions); the lack of finds outside of the two regions; use of the Byzantine Indiction dating system; and the small number of dies, all point to Series 1 through 3 being a local coinage, serving the immediate, primarily military, needs of the Muslim administration, and the day to day needs of the regional economy. The decisions made on the fabric, content of the legends, mint standards and even metallurgical content all appear to have been made independently of the Umayyad central government in Damascus, although at times the regional mint incorporated characteristics borrowed from the Caliphal mint.

Unlike the eastern frontier, where the coinage remained immobilized or became increasingly corrupted, the Arabs conquerors in the western Caliphate continued to modify their issues, introducing innovations (e.g. bilingual legends) while still maintaining the basic fabric of the Byzantine coinage on which it was based. Like the governors on the eastern frontier, the governors in the West needed to take into account the economic circumstances in the former Byzantine and Visigoth territories, as well as perhaps the cultural tastes of the peoples that they now governed. They did, however, attempt to incorporate elements found on the Post-Reform coinage

struck elsewhere in the Caliphate, first by placing the *shahāda* on Series 1, introducing a Latin-Epigraphic model in Series 2, and eventually adopting the Muslim mint standard for the dinars with the introduction of Series NA 3.

#### **SERIES 4 DINARS AND DIRHAMS – AN IMPERIAL OR A REGIONAL COINAGE?**

The introduction of Post-Reform dinars and dirhams brought the monetary systems of *Ifrīqiya* and *al-Andalus* in closer alignment with the monetary system found in the rest of the Umayyad Caliphate. The Series 4 dinars in both of the Western provinces were struck to a similar mint standard as that of the Eastern dinars. The Series 4 dirhams were also struck to a standard similar to that in the rest of the caliphate, but it appears to have varied over time, and with a lower weight standard of 2.91 g in *Ifrīqiya* during the last decade of the Umayyad Caliphate. The gold content of the Post-Reform dinars also came into alignment with the high gold content (98% Au) in the rest of the Umayyad Caliphate, and this further illustrates the close relationship between the Eastern and Western monetary regimes.

Despite these similarities, differences remained. Although the legends and layout on the dirhams were identical to dirhams struck elsewhere, the legends on the dinars continued to vary from those found in the East, and appear to have been copied from the Series NM 4 *nisf*. These legends continued until at least 110/728-29 and, in contrast to the mint standards and gold content, highlight the continued independence and regional nature of the mints of *Ifrīqiya* and *al-Andalus* up until this date.

More telling evidence exists to suggest that the *Ifrīqiya* and *al-Andalus* monetary systems remained regional in nature. After their initial year of production, it appears that dinars were always struck in small numbers (typically one or two dies per year struck). Even though many more examples survive, the hoard evidence also suggests

that *Ifrīqiya* and *al-Andalus* dirhams did not circulate in any numbers outside of the region, and that production from the Eastern mints (primarily Wāṣit, but many other mints are represented in the hoards) made up the majority of the dirhams circulating in *Ifrīqiya* and *al-Andalus*.

Evidence to support this hypothesis is found in the analysis of the known hoards in *al-Andalus*, *Ifrīqiya*, elsewhere in the caliphate, and farther afield. In *al-Andalus*, three of the major hoards (Baena (16.88%; tpq=136/753-54); Carmona (20.1%; tpq=135/752-53); and Alicante (28.58%; tpq=124/741-42)<sup>468</sup> have a significant number of *al-Andalus* dirhams; while others have a small number (e.g. Garraf (4%; tpq=128/745-46)); and some have no *al-Andalus* dirhams at all (e.g. Azanuy; tpq=114/732-33). In many cases 20 or more mints are represented, with dirhams struck at the Wāṣit mint usually the most numerous in the *al-Andalus* hoards, the exception being the Alicante hoard, at 7.14%. *Ifrīqiya* dirhams are also found in some of the *al-Andalus* hoards, but never in large numbers.<sup>469</sup>

The hoards in *Ifrīqiya*, show a similar pattern. The Volubilis hoard has dirhams that were produced at 27 different Islamic mints, with the output from *Ifrīqiya* and *al-Andalus* making up only 5.2% of the coins (2.6% each; tpq=125/742-43). The majority of the examples found in this hoard come once again from Wāṣit (43%), with 11% from the Damascus mint. We do not have the same detailed information for the Fez hoard (tpq=119/737), other than to note that the hoard includes examples from 31 mints.<sup>470</sup>

The composition of hoards in the central Islamic lands and farther afield appears to suggest that *al-Andalus* and *Ifrīqiya* dirhams never circulated widely. In the

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468 tpq=terminus post quem.

469 MARTÍN 2005, pp. 45-70.

470 IBID., p.55.

Damascus hoard (tpq=131/748-49), for example, *al-Andalus* dirhams comprise only 1.59% of the coinage, while *Ifriqiya* dirhams make up only 2.77% of the total. There are even fewer examples in the Qamishliyya hoard (*al-Andalus* – 0.42%; *Ifriqiya* – 0.83%; tpq=131/748-49).<sup>471</sup> In addition, previous analyses have shown that *al-Andalus* dirhams are only rarely found in the northern, Eastern and Central European hoards (we do not have similar information on the presence of *Ifriqiya* dirhams in the northern hoards).<sup>472</sup>

It needs to be emphasized that each hoard deposited has a particular historical context, and this can impact the makeup of each hoard. The Volubilis hoard, for example, was deposited in approximately 125/742-3,<sup>473</sup> at the time of the Berber rebellion in North Africa. This was a period when large numbers of Syrian troops were operating in the region, which might skew the makeup of this hoard in favor of coinage from outside North Africa. Despite this caution, the fact that in almost no cases do the *al-Andalus* and *Ifriqiya* dirhams make up a significant portion of the hoard is extraordinary, as these dirhams are as much ‘Caliphal’ issues as any other of the Post-Reform dirhams struck further East. Could it simply be that the production of the mints in Damascus and Wāṣīt was so much higher than that of the two Western provinces that it is only natural that these two mints would dominate the contents of the hoards? Unfortunately, die studies have not yet been conducted for these or other Umayyad mints, but could profitably be conducted in the future.

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471 IBID., pp. 56-62.

472 BARCELÓ 1975b, pp. 5-18; MIKOLAJCZYK 1988, p. 255-63.

473 MARTÍN 2005, pp. 54-5.

## A 'GOVERNOR'S' COINAGE?

The results of the comparison of the numismatic record to the historical record found in the literary sources reveals a close correlation between changes in both the North African and Iberian Peninsula coinage from the time of the Muslim conquest of Carthage in 79/698-99 until the end of the Umayyad Caliphate in 132/749-50. Major changes in the coinage, such as the transition from Series 1 to Series 2, Series 2 to Series 3, and Series 3 to Series 4, accompany changes in the governorship of the two regions. In all cases the governor was appointed by authorities outside of the respective region, with Ḥassān ibn al-Nu'mān (Series 1) appointed from Damascus; Mūsā b. Nuṣayr (Series 2) appointed from Egypt; Muḥammad b. Yazīd (Series NA 3) appointed from Damascus; Al-Ḥurr ibn 'Abd al-Raḥmān al-Thaqafī (Series IP 3) appointed by Muḥammad b. Yazīd from North Africa; and Ismā'īl b. 'Ubayd Allāh b. Abī al-Muhājir (Series NA 4) and al-Samḥ b. Mālik al-Khawlānī (Series IP 4) both appointed from Damascus.

The changing characteristics of the precious metal coinage of North Africa and the Iberian Peninsula under the aegis of successive governors are not unique. The appointment of one governor in Baṣra and another in Kūfa in 41/661-62, for example, saw the striking of two sets of Arab-Sasanian drachms that, although superficially similar, varied substantially in their legends. These two sets of coinage converged, however, with the consolidation of the two prefectures under Ziyād b. Abī Sufyān.<sup>474</sup> Changes in the East were much less dramatic, however, than those found in the transition of between the first three North African/Iberian Peninsula series.

Changes to the coinage after the introduction of Series 4 are, in most cases, more subtle than the changes that accompany the introduction of the earlier series, with the

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<sup>474</sup> ALBUM AND GOODWIN 2002, pp. 9-14.

notable exception of the transition from Western to Eastern legends on the dinars in 114/732-33 with the appointment of ‘Abd al-Malik b. Qatān al-Fihri as governor of *al-Andalus* and ‘Uqba b. Qudāma as governor of *Ifriqiya*.

The annulet patterns on the *Ifriqiya* and *al-Andalus* dirhams also appear to have been changed by financial administrators working for the governors in the two regions, a mechanism imported from other mints in the Caliphate, where it was probably instituted in order to allow coin users to differentiate between individual issues of the anonymous Post-Reform dirhams.<sup>475</sup> Three of the four significant changes to the annulet patterns on the dirhams of *Ifriqiya* coincide with the dates of the changes in governorship recorded in the literary sources - ‘Ubayd b. ‘Abd al-Raḥmān al-Sulamī (110/728-29); ‘Ubayd Allāh b. al-Ḥabḥāb (116/734); and Ḥanzala b. Ṣafwān (124/741-42). The only exception to this is the change in annulet pattern that occurred in 106/724-25, three years into the governorship of Bishr b. Ṣafwān (103/721-22 to 109-110/725-27).

The governorship of *al-Andalus* turned over much more frequently than the governorship of *Ifriqiya*, but the three major changes to the annulet patterns on the *al-Andalus* dirhams again appear to coincide with changes in the governorship. The first change in the annulet pattern occurred shortly after the installation of Yaḥyā b. Salāma al-Kalbī as governor in Shawwāl 107/ February-March 726, with a change in the annulet pattern the following year. The second major change in the annulet pattern appears to have accompanied the appointment of Muḥammad b. ‘Abd Allāh al-Ashja‘ī in 111/729-30, but it is possible that the change accompanied ‘Abd al-Raḥmān al-Ghāfiqī’s appointment as governor, as the new annulet pattern continues throughout his tenure. If this is the case, however, then the historical sources are off

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475 DESHAZO AND BATES 1974.

by one year in the date they record for his assumption of the governorship, which they record as Šafar 112/March-April 730. The final major change in the annulet pattern occurs with the appointment of ‘Uqba b. al-Ḥajjāj al-Salūlī in 116/734, although the obverse annulet patterns varied between ‘o o o o’ and ‘oo oo oo oo’ during his tenure with no clear pattern.

Changes in other ornamentation on the dinars also accompany changes in the governorship, such as the introduction of a star in the obverse field of the dirhams of the *Ifriqiya* mint during the first two years of ‘Abd al-Raḥmān b. Ḥabīb’s governorship (128-129/745-47). The pattern of production in both of the regions, also appears to closely align with political events, including changes in governorship and military actions (e.g. the lack of dirham production at the *Ifriqiya* mint for the years 126/743-44 and 127/744-45, which reflects the period in which ‘Abd al-Raḥmān b. Ḥabīb al-Fihri drove out Hanzala, and assumed the governorship of *Ifriqiya*).

It is clear that the majority of the changes that occurred in the evolution of the early Islamic precious metal coinage of North Africa and the Iberian Peninsula can be linked to the appointment of new governors to the two provinces.

#### ***THE NUMBER OF MINTS STRIKING PRECIOUS METAL COINAGE IN NORTH AFRICA AND THE IBERIAN PENINSULA***

Initially, the Muslim administration in North Africa established one precious metal mint, and this mint struck Series NA 1 and Series NA 2, Phases 1 and 2. A second workshop was established in 91/709-10 with the commencement of the minting of Series NM 4 *nisf* and *thulth*. Whether this was a separate workshop working alongside the workshop that struck Series NA 2, Phase 2, or a different mint entirely is unknown. The Muslim administration ceased striking Series NA 2, Phase 2 in North Africa in 91-2/710-11 (Indiction Θ), followed by the introduction of Series 2 in the Iberian Peninsula in 92-3/710-11 (Indiction X). In contrast with the relatively

centralized control of mintage in North Africa, the Muslim army struck Series IP 2 coinage in a main mint and an unknown number of secondary mints operating with various elements of the army for a three-year period, and a mint or mints may have continued to strike this series with frozen dates in subsequent years. During this initial three-year period Series NM 4 continued to be struck in North Africa, with surviving examples dated 94/712-13. Given the number of anomalous Series NA 2, Phase 2 examples (bungled legends; low gold content, low weights), it is also possible that one or more irregular mints were also established in North Africa shortly after the invasion of the Iberian Peninsula. It is just as likely, however, that the irregular Series NA 2, Phase 2 issues were struck in the Iberian Peninsula.

The main mint returned to North Africa in 95-6/714-15 (Indiction XII), first striking Series NA 2, Phase 3 and then, in 97-99/715-18, Series NA 3 solidi. A separate mint in the Iberian Peninsula struck Series IP 3 for one year, 98/716-17. Series NA 4 dirhams were also introduced in North Africa in 97/715-16, at the same time as Series NA 3. Whether the dirhams were struck at the same workshop as Series NA 3 or in a separate workshop is unknown. It is also possible that the dirhams were struck at the same workshop that had continued to strike Series NM 4 *nisf* and *thulth*, from 91/709-10. By the time of the introduction of Series NA 4 and IP 4 dinars in 100/718-19 and 102/720-21 respectively, it is likely that only one precious metal mint was in operation in each region, and this remained the case until the end of the Umayyad Caliphate.

The close relationship between the coinage and the governors is reflected in the small number of mints striking precious metal coinage in the two vast provinces (the exception being the first three years after the invasion of the Iberian Peninsula).

## LIMITATIONS OF THE ANALYSIS AND OPPORTUNITIES FOR FURTHER RESEARCH

### THE COPPER COINAGE OF NORTH AFRICA AND THE IBERIAN PENINSULA

Given the word limit of the dissertation and the in-depth nature of the analysis of the precious metal coinage, it was necessary to omit from the dissertation my analyses of the copper coinage of North Africa and the Iberian Peninsula. Substantial recent research has been conducted on the copper coinage of the Iberian Peninsula, but would benefit from an update. Little work has been conducted on the North African copper coinage, however, and this should be a focus for future research.

Islamic copper coinage was struck in at least four locations in North Africa during the Umayyad Caliphate: Tripoli/Aṭarabluṣ; an unknown location in North Africa (likely Qayrawān); Tilimsān; and Ṭanja. Like the transitional Islamic copper coinage struck in Greater Syria and Egypt, the earliest Islamic copper issue in North Africa is modelled on Byzantine coinage (see discussion of the Imperial Bust *fulūs* on p. 377). This is the only issue modelled on the Byzantine copper, however, unlike in the Central Islamic lands where Byzantine issues were frequently imitated by the Islamic mints. Other transitional issues were modelled on the Series NA 1 gold coinage (*Figure 188*) or Imperial Roman/neo-Punic copper coinage (*Figure 189*). Post-Reform copper was introduced in North Africa in 91/709-10, but in many cases bear legends found nowhere else in the Umayyad Caliphate, such as *nafaqa fi/sabīl Allāh* (payment in the way of Allah) (*Figure 190*).



*Figure 188: Islamic fals, struck at the main Muslim mint in North Africa, without date. W C.5=Ø57. Image courtesy of the National Museum, Copenhagen. (2.84 g) (scale x3)*



*Figure 189: Early Islamic copper coin of Tilimsān. Image courtesy of the Tonegawa Collection. (1.76 g) (scale x3)*



*Figure 190: Undated early Islamic fals of nafaqa type, likely struck in Ṭanja. Image courtesy of the Tonegawa Collection. (3.52 g) (scale x3)*

All aspects of the copper coinage need to be more fully explored. Why, for example, did the North Africa copper mint chose to model a copper issue on gold Series NA 1, which must have left the mint open to counterfeiting through the gilding of the copper issues? Why did the mints in Tilimsān and Ṭanja use Imperial Roman/neo-Punic models? Does this suggest that these ancient coins were still circulating in the region? Early Islamic copper issues appear to have been relatively rare, especially when compared to the early Islamic copper of Greater Syria and

Egypt. Was copper less necessary because of the fractional gold coinage? What does the pattern of striking tell us about the function of this copper? A comprehensive investigation of the copper coinage of this region would help to answer these and other questions and thus shed more light on the development of North Africa's Islamic monetary system as a whole.

### **IDENTIFYING FURTHER PRECIOUS METAL EXAMPLES**

Although I attempted to gather as many examples of the coinage as possible, I was unsuccessful in obtaining permission to study in person the collections in North Africa. The two major collections in Tunisia (The collections of the National Mint in Tunis and the Bardo Museum) have been published, but visits to regional museums in this country as well as the museums in Morocco, Algeria, Libya and Egypt would undoubtedly turn up further examples. Archival evidence in the museums might also provide further information on coin finds in North Africa, a still significant gap in the archaeological record.

### **THE EARLIEST ISLAMIC COINAGE OF NORTH AFRICA?**

The metallurgical analysis of the gold coinage of Constans II and Constantine IV revealed that some of these coins have a significantly lower gold content than the majority of the seventh century Byzantine gold coinage. A detailed study of this coinage needs to be undertaken, including a die study and further metrological and metallurgical analyses in order to better determine whether some of the examples are in fact Islamic imitations.

### **WAS SERIES NM 4 STRUCK IN NORTH AFRICA?**

There is a need to conduct further research on Series NM 4, the *nisf* and *thulth* without a mint name. The research on this series should focus on the metallurgical

aspects of the examples, because in the absence of find evidence this is the most likely avenue to confirm or deny that Series NM 4 was struck in North Africa. The preliminary step in this analysis should be the retesting of the no mint fractionals housed in the University of Pennsylvania collection in order to confirm Ehrenkreutz's findings. The results of these tests should then be analysed in combination with the SG results found in this dissertation and the unpublished results of the LA-ICP-MS tests conducted by the Centre Ernest-Babelon.

### **FURTHER COMPARATIVE ANALYSIS**

I was also unable to delve deeply into the administrative practices of the two provinces and how those practices impacted the coinage, other than to highlight the changes that took place in the coinage when changes took place in the governorship. I was able to provide some comparisons of the coinage struck in the two provinces to that struck in the rest of the Umayyad Caliphate above, but further analysis would undoubtedly provide more insights through a more detailed comparison of the changes that place in the coinage in the various regions of the caliphate, as well as comparison of the levels of production and circulation patterns.

It is hoped that the development of the typology and construction of a numismatic history for the early Islamic precious metal coinage of North Africa and the Iberian Peninsula, provides a basis for future research into the monetary systems of the two regions, as well as contributing to our understanding of the history of Umayyad Caliphate. The development of the precious metal coinage in these two regions was clearly the result of a particular set of historical and economic circumstances, which led the early mints to develop unique numismatic solutions to their specific needs. Even with the introduction of the Post-Reform coinage, patterns of production and

circulation patterns suggest that this remained a coinage rooted firmly to the needs of the regions.

## APPENDICES

## **APPENDIX A –LIST OF EARLY ISLAMIC PRECIOUS METAL EXAMPLES ANALYZED IN THIS DISSERTATION**

### **ABBREVIATIONS OF SOURCES OF COINS**

#### **A**

##### **Stephen Album Rare Coins**

a114	Fixed Price List 114, 3/1995
a126	Fixed Price List 126, 6/1996
a205	Fixed Price List 205, 10/6/2005
a209	Fixed Price List 209, 11/2005
a215	Fixed Price List 215, 7/2006
a218	Fixed Price List 218, 11/2006
a219	Fixed Price List 219, 12/2006
a221	Fixed Price List 221, 2/2007
a222	Fixed Price List 222, 3/2007
a225	Fixed Price List 225, 6/2007
a237	Fixed Price List 237, 9/2008
a261	Fixed Price List 261, 3/2011
a263	Fixed Price List 263, 8/2011
a269	Fixed Price List 269, 8/2012

AA1	Auction 1, 1/12/2007
AA6	Auction 6, 7/6/2009
AA9	Auction 9, 10/12/2010
AA10	Auction 10, 22-23/4/2011
AA12	Auction 12, 13-14/1/2012
AA13	Auction 13, 18-19/5/2012
AA14	Auction 14, 21-22/9/2012
AA15	Auction 15, 18-19/1/2013
AA16	Auction 16, 17-18/5/2013
AA17	Auction 17, 19-21/9/2013
AA19	Auction 19, 15-17/5/2014

##### **Aureo & Calicó**

AC98J	20/1/1998
AC98M	4/3/1998
AC00O	24-25/10/2000
AC00D	12-20/12/2000
AC01M	6-7/3/2001
AC01Ma	8/5/2001
AC02O	9-30/10/2002
AC02D	16-7/12/2002
AC03M	5/3/2003
AC03Ma	28/5/2003
AC03O	21-22/10, 2003
AC03D	21-22/12, 2003

AC04M	3/3/2004
AC04O	26-7/10/2004
AC04Ju	2/6/2004
AC04J	1/7/2004
AC04O	26-27/10/2004
AC05A	20/4/2005
AC05J	26/1/2005
AC05O	27/10/2005
AC05D	15/12/2005
AC06M	16/3/2006
AC06D	19/12/2006
AC07M	12/3/2007
AC07A	9/4/2007
AC08M	3/3/2008
AC09O	21-2/10/2009
AC10A	29/4/2010
AC12Ma	8/3/2012
AC12M	30/5/2012

**J. G. C. Adler, *Museum cuficum Borgianum Velitris, Pars II; Collectio nova numerum Cuficorum seu Arabicorum veterum: CXVI continens numos plerosque ineditos e Museis Borgiano et Adleriano*, Hafniae, 1792.**

Ad

**H. Al-‘Ajjabi, *Jam‘ ‘al-maskukat al-‘arabiyya bi-Ifriqiya*, Vol. 1, Publications de l’institut National du Patrimoine, Tunis, 1988.**

Ajj

**Asociación Numismática Española, Barcelona**

ANEB75 25-26/11/1975

**American Numismatic Society, New York**

ANS

**I. and C. Artuk, *İstanbul Arkeoloji Müzeleri teşhirdeki İslâmî Sikkeler katalogı*, İstanbul, 1971 (Vol. 1) and 1974 (Vol. 2).**

Art

**Aureo**

AU95M	16/5/1995
AU98D	15/12/1998
AU99A	27/4/1999
AU03A	9/4/2003
AU04M	3/3/2004

## **B**

**Basel Auctiones, A. G.**

Ba71	12-13/6/1971
Ba13	Auktion 13, 23-4/6/1983

**A. M. Balaguer, *Las emisiones transicionales árabe-musulmanas de Hispania*, Asociación Numismática Española, 1976.**

BalEm

**M. A. De Luca, *La monete con leggenda araba della Biblioteca Comunale di Palermo, Biblioteca Comunale di Palermo*, Palermo 1998.**

BCP

**Fenina A., *Numismatique et Histoire de la Monnaie en Tunisie, Tome II Monnaies Islamiques*, Banque central de Tunisie, Collections Monétaires, Tunis, 2007**

BCT

**G. Bernardi, *Arabic Gold Coins Corpus I*, Edizioni Università Trieste, Trieste, 2010.**

Bern

**British Museum, London**

BM

**A.H. Baldwin & Sons Ltd.**

BwFP2 Fixed Price List 2, 6/2001  
BwFP3 Fixed Price List 3, 11/2001  
BwFP5 Fixed Price List 5, 11/2002  
BwFP8 Fixed Price List 8, 9/2004  
BwFP9 Fixed Price List 9, 3/2005

Bw75 June 1975  
Bw14 Auction 14, London, 14/10/1997  
Bw18 Auction 18, London, 12-13/10/1998  
Bw19 Auction 19, London, 4/5/1999  
Bw21 Auction 21, London, 11-12/10/1999  
Bw23 Auction 23, London, 3/05/2000  
Bw26 Auction 26, London, 9/5/2001  
Bw30 Auction 30, 7-8/5/2002  
Bw40 Auction 40, 3/5/2005  
Bw43 Auction 43, 12/10/2005  
Bw49 Auction 49, 25-26/9/2006  
Bw83 Auction 83, London, 24/9/2013

BwNY2 New York Sale II, 2/12/1999  
BwNY27 New York Sale XXVII 4/1/2012  
BwNY30 New York Sale XXX, 9/1/2013

Bw2012 Fall Argentum Auction 2012, 3/11/2012

**J. D. Brèthes *Contribution à l'histoire du Maroc par les recherches numismatiques*, Casablanca, Imprimerie les Annales Marocaines, 1939.**

Br

**Bibliothèque nationale de France, Paris**  
BNF

## C

**Crédit de la Bourse. Numismatique**

CBN95M 23/5/1995  
CBN95N 24/11/1995

**Chaponnière & Firmenich SA**

CF5 Auction 5, 7/12/2013

**CGB**

CGB59 Mail Bid Sale 59, 19/6/2013

**Francisco Codera y Zaidin, *Tratado de Numismática arábigo-española*, Madrid, 1879**

Cod

**A. Colson, *Notice sur les monnaies qui eurent en cours au Rousillon*, Perpignan, 1853.**

Col

**Casa de la moneda, Madrid**

CM

**Museo archaeologicalo, Córdoba**

Cord

**Classical Numismatic Group, Inc.**

CNG66 Mail Bid Sale 66, 19/5/2004  
CNG67 Mail Bid Sale 67, 22/9/2004  
CNG78 Mail Bid Sale 78, 14/5/2008

CNG26 Auction 26, 11/6/1993  
CNG33 Auction 33, 15/5/1995  
CNG34 Auction 34, 6/5/1995  
CNG35 Auction 35, 20/9/1995  
CNG41 Auction 41, 19/3/1997  
CNG47 Auction 47, 11/9/1998  
CNG54 Auction 54, 15/6/2000  
CNG58 Auction 58, 19/9/2001  
CNG69 Auction 69, 8/6/2005  
CNG70 Auction 70, 21/9/2005  
CNG78 Auction 78, 14/5/2008  
CNG81 Auction 81, 20/5/2009  
CNG88 Auction 88, 14/9/2011  
CNG91 Auction 91, 19/9/2012  
CNG94 Auction 94, 18/9/2013

CNG213      Electronic Auction 213, 7/2009  
CNG216      Electronic Auction 216, 08/12/2009

CNGIII      Triton III, 30/11/1999  
CNGVI      Triton VI, 13/01/2003  
CNGIX      Triton IX, 11/1/2006  
CNGXI      Triton VI, 13/1/2003  
CNGXVI     Triton XVI, 9/1/2013  
CNGXVII    Triton XVII, 6/1/2014  
CNGXI      Triton XI, 9/1/2008

CNGNo2     Nomos 2, 17/5/2010

## **D**

**David Collection, Copenhagen**

DC

**L. Ilisch and M. Matzke, *Die Mittelalterlichen Fundmünzen, Siegel und Gewichte von Santeuri, Mallorca, Wenenseitat Tübingen, 2005.***

DMF

## **E**

**Edward Gans Collection, 1947**

EG

**Catálogo de la Colección Numismática Emilio Carles-Tolrá, September 1935**

ECT

## **F**

**A. al-Raḥmān Fahmy, *Fajr al-sikka al-‘arabīya*, Cairo, 1957**

Fahmy

**J. Figanier, *Monedas Árabes*, Tip. da Casa da Moeda, Lisbon, 1949.**

Fig

**Frank Sternberg, Zürich**

FSXII AuctionXII, 17-18/11/1983

## **G**

**J. Gaillard, *Catalogue de monnaies antiques et du moyen âge recueillies en Espagne, dans les îles Baléares, et en Portugal de 1850 a à 1854*, 1854**

Gal

**Giessener Münzhandlung Gorny & Mosch**

GM67           Auktion 67, 5/1994  
GM81           Auktion 81, 3/1997  
GM121          Auktion 121, 10/2/2003  
GM143          Auktion 143, 12/10/2005  
GM148          Auktion 148, 8/3/2006

**H**

**Collection of Ḥamad b. ‘Abd Allāh Āl Thānī, Doha, Qatar**

HAT

**J.D. Bateson and I.G. Campbell, *Byzantine and Early Western Medieval Coins in the Hunter Coin Cabinet, University of Glasgow, Spink, London, 1998***

HCC

**Hess-Divo AG**

HD255          Auction 255, 18-19/9/1984  
HD309          Auction 309, 28/2008  
HD323          Auction 323, 30/5/2013

**Former Hispanic Society of America collection, now housed in the American Numismatic Society, New York**

HSA

**I**

**T. Ibrahim Gaceta Numismatica 89, 6/1988**

Ib

**Islamic Coin Auctions - Arabian Coins and Medals, L.L.C. (Dubai, United Arab Emirates); Baldwin's Auctions Ltd**

icaL1 No. 1 21/03/1999  
icaL2 No. 2 28-29/03/2000  
icaL3 No. 3 10/10/2001  
icaL4 No. 4, 8/5/2002  
icaL5-No. 5. 29/10/2002  
icaL6, No. 6 7/5/2003  
icaL7 No. 7, 14/10/2003  
icaL8, No. 8, 5/5/2004  
icaL9 No. 9, 12/10/2004  
icaL10 No. 10, 20/7/2005  
icaL11 No. 11, 13/7/2006  
icaL12 No. 12, 25/4/2007  
icaL15 No. 15, 17/3/2009  
icaL16 No. 16, 20/10/2009  
icaL17 No. 17, 26/10/2010  
icaL18, No. 18, 26/7/2011  
icaL 19, No. 19, 25/4/2012

icaL20 No. 20, 8/5/2012  
icaL21 No. 21, 17/7/2012  
icaL22, No. 22, 25/6//2012  
icaL23, No. 23, 6/12/2012  
icaL24 No. 24, 9/5/2013  
icaL25 No. 25, 10/12/2013  
icaL26, No. 26, 6/8/2014

**T. Ibrahim Gaceta Numismatica 89, 6/1988**

Ib

**Italo Vecchi Ltd.**

IV5 Nummorum Auctiones 5, 5/3/1997

**J**

**St. James Auctions**

James19 Auction 19, 3/10/2011

**Jena University Collection**

Jena

**Jean Elsen & ses fils s.a.**

JE233 List 233, 1/7/2005

JE35 Auction 35, 2/7/1994  
JE55 Auction 55, 19-21/9/1998  
JE69 Auction 69, 16/3/2002  
JE81 Auction 81, 11/9/2004  
JE82 Auction 82, 11/12/2004  
JE84 Auction 84, 18/6/2005  
JE85 Auction 85, 10/9/2005  
JE88 Auction 88, 10/6/2006  
JE94 Auction 94, 15/12/2007  
JE106 Auction 106, 11/9/2010

**Jose Herrero**

JH98M 28/5/1998  
JH99M 20/5/1999  
JH01O 10/10/2001  
JH03F 13/2/2003  
JH05D 1/12/2005  
JH08M 28/5/2008  
JH10D 16/12/2010  
JH11M 5/5/2011  
JH12D 12-13/12/2012

**Jean Vinchon Numismatique**  
JV9 Sale 9, 18/6/2014

## **K**

**W. Kazan, *Coinage of Islam*, Beirut, 1983**  
COI

**Khalili Collection**  
KC

**Kungliga Myntkabinettet, Stockholm**  
KMK

**Künker Münzauktionen**  
Ku97 Auktion 97, 7/3/2005  
Ku137 Auktion 137, 11/3/2008  
Ku168, Auktion 168, 12/3/2010  
Ku216 Auktion 216, 10/2012

## **L**

**H. Lavoix, *Catalogue des Monnaies musulmanes*, Bibliothèque nationale, Paris, 1887.**  
L

**Numismatik Lanz**  
Lan42 Lanz Sale 42, 23/11/1987

**Bank Leu AG**  
Leu36 Auction 36, 7-8/5/1985  
Leu53 Auction 53, 21-22/10/1991  
Leu56 Auction 56, 20/10/1992  
Leu62 Auction 62, 18/5/1995  
Leu64 Auction 64, 27/3/1996

**Enrico Leuthold, Jr. *Due rare testimonianze numismatiche della prima monetazione musulmana a Cartagine*, Rivista Italiana di Numismatica, 1967.**  
Lh67

## **M**

**Museo Archeológico Nacional, Madrid**  
MAN

**Dimitry Markov Coins and Medals**  
Mar10 Mail Bid Auction 10, 23-24/10/2001

**M. Medrano Marqués, *El asentamiento Visigodo y Musulmán de Tudején-Sanchoabarca (Fitero, Navarra), Saldvie 4, 2004, pp. 261-302.***

MARQ

**Morton & Eden**

ME1 Auction 1, 18/4/2002  
ME3 Auction 3, 21/5/2003  
ME9 Auction 9, 26/5/2004  
ME10 Auction 10, 23-4/11/2004  
ME14 Auction 14, 25-6/5/2005  
ME17 Auction 17, 14/12/2005  
ME18 Auction 18, 7/3/2006  
ME23 Auction 23, 28-9/11/2006  
ME27 Auction 27, 14/6/2007  
ME28 Auction 28, 15/6/2006  
ME35 Auction 35, 11/12/2008  
ME37 Auction 37, 9/7/2009  
ME39 Auction 39, 2/12/2009  
ME42 Auction 42, 20/5/2010  
ME46 Auction 46, 18/11/2010  
ME48 Auction 48, 4/4/2011  
ME49 Auction 49, 9/6/2011  
ME50 Auction 50, 10/6/2011  
ME52, Auction 52, 29/11/2011  
ME54 Auction 54, 23/4/2012  
ME57, Auction 57, 2/7/2012  
ME59 Auction 59, 12/11/2012  
ME63, Auction 63, 22/4/2013  
ME66, Auction 66, 7/11/2013  
ME69, Auction 69, 10/4/2014

**Martí Hervera Subastas Numismáticas**

MH06M 23/3/2006  
MH07M 21/3/2007  
MH12O 25/10/2012  
MH13F 26/2/2013  
MH72 Substata 72, 3/7/2012  
MH75 Substata 75, 26/2/2013

**Marc LaBarbe EURL**

ML 22/6/2014

**Museo Prasa, Torrecampo, Spain**

MP

**Münzen & Medaillen GmbH**

MM13 Auction 13, 9/10/2003

**Monnaies et Médailles S. A. Bâle**

MMB73      Vente Publique 73, 17/11/1998  
MMB76      Vente Publique 76, 19-20/9/1991

**Münzen und Medaillen Ag, Basel**

MuM62      Auktion 62, 9/10/1982  
MuM76      Auktion 76, 19-20/9/1991

**Staatliche Münzsammlung München, Munich**

Mun

**Gabinete Numismático de Cataluña, Barcelona**

MNAC

**N**

**N. D. Nicol, R. el-Nabarawy, J. L. Bacharach, *Catalogue of Islamic Coins, Glass weights, and Medals in the Egyptian National Library, Cairo, Undena Publications, Malibu, 1983.***

Nic

**Noble Numismatics**

No96J      3/5/7/1996

**NF Münzhandlung Schulten & Co. GmbH**

NF      20-22/10/1987

**Numismatic Fine Arts, Inc.**

NFA

**Numismatica Genevensis SA**

NG6      Auction 6, 30/11/2010

NG7 – Auction 7, 27/11/2012

**H. Nützel, *Königliche Museen Zu Berlin. Katalog Der Orientalischen Münzen, Berlin staatl. mus., Berlin, 1902.***

Nü

**O**

**J. Østrup, *Catalogue de monnaies arabes et turques du Cabinet Royal des medailles du Musee National De Copenhague, Levin & Munksgard, Copenhagen, 1938.***

Ø

**Klat Collection**

OHF

## P

### **Dr. Busso Peus, Nachfolger, Frankfurt-am-Main**

- P24 Katalog 24, 26/3/1971  
P276 Katalog 276, 24-6/3/1971  
P343 Katalog 343, 26-28/4/1995  
P357 Katalog 357, 28-30/10/1998  
P367 Katalog 367, 25-26/10/2000  
P369 Katalog 369, 31/10/2001  
P371 Katalog 371, 24-26/4/2002  
P372 Katalog 372, 30/10/2002  
P376 Katalog 376, 29-30/10/2004  
P378 Katalog 378, 28/4/2004  
P380 Katalog 380, 3/11/2004  
P384 Katalog 384, 1/11/2005  
P386 Katalog 386, 26/4/2006  
P388 Katalog 388, 12/11/2006  
P392 Katalog 392, 4/5/2007  
P396 Katalog 396, 5/11/2008  
P401 Katalog 401, 3/11/2012

### **Ponterio & Associates**

- PA141 Sale 141, 12/1/2007  
PA149 Sale 149, 24/4/2009  
PA163<sup>476</sup> Sale 163, 16/11/2011  
PANYINC NYINC sale, 6/1/2012

**M. Parvérie, *Un nouveau solidus bilingue frappé en Ifrîqiya en 98 de l'Hégire*, Cahiers Numismatiques 197, September 2013, pp. 49-55.**

Parv

### **Private Collection**

PC

### **Fitzwilliam Museum, Cambridge**

PG

**R. Pliego, *El dinar epigráfico latino. Una reinterpretación a la luz de nuevos hallazgos*, Numisma 245, pp. 139-54.**

Pliego

## Q

### **Qatar Museum Authority**

---

<sup>476</sup> With Stack's Bowers.

QMA

## R

### **Auctions H. D. Rauch**

Ra96 10/1996

Ra07 11/2007

Ra94 Auction 94, 10-11/4/2014

**M. Abū-l-Faraj al-‘Ush, *Rare Islamic Coins (Additions), in Near Eastern Numismatics, Iconography, Epigraphy and History: Studies in Honor of George M. Miles*, (ed) D. K. Kouymjian, American University of Beirut, Beirut, 1974.**

RICadd

## S

### **Sotheby’s, London**

S78M London Sale, 26/3/1978

S79O London Sale, 4/10/1979

S80O London Sale, 15/10/1980

S81M London Sale, 11/03/1981

S81A London Sale, 29/4/1981

S82A London Sale, 28/4/1982

S82O London Sale, 12/10/1982

S83A London Sale, 20/4/1983

S83O London Sale, 3/10/1986

S84A London Sale, 17/4/1984

S86O London Sale, 3/10/1986

S87A London Sale, 2/10/1987

S87O London Sale, 2/10/1987

S87M London Sale, 28/5/1987

S88S London Sale, 27/9/1988

S89M London Sale, 9/3/1989

S89O London Sale, 9/3/1989

S91O London Sale, 21/10/1991

S92A London Sale, 10/4/1992

S93J London Sale, 12/7/1993

S93D London Sale, 9-10/12/1993

S94A London Sale, 19/4/1994

S94O London Sale, 6-7/10/1994

S95O London Sale, 9/10/1995

S97A London Sale, 24-5/4/97

S98A London Sale, 23-4/4/1998

S98O London Sale, 15-16/10/1998

S99M London Sale, 19/3/1999

S99Ma London Sale, 27/5/1999

S99O London Sale, 14/10/1999

S00M London Sale, 25/5/2000

S00N London Sale, 16-7/11/2000

S01M London Sale, 3/5/2001

**Emile and Sabine Bourgey Numismatique**

SBN84 4-5/10/1984

SBN92 27-29/10/1992

**A. Shams Eshragh, *Silver Coinage of the Caliphs*, Spink, London, 2010.**

SCC

**G. C. Miles, *Some Early Arab Dinars*, The American Numismatic Society Museum Notes, Vol. 3, 1948, pp. 93-114.**

SEAD

**Sheikh Faisal Museum, Doha**

SFM

**Collection of Alan De Shazo**

SHZ

**Sylloge of Islamic Coins in the Ashmolean Museum**

SICA1 Vol 1: The Pre-Reform Coinage of the Early Islamic Period, S. Album and T. Goodwin, Ashmolean Museum, Oxford, 2002.

SICA2 Vol 2: Early Post-Reform Coinage, N. D. Nicol, Ashmolean Museum, Oxford, 2009.

**Smithsonian Collection**

Sm

**Spink Zürich**

Sp18 Auction 18, 18/02/1986

Sp22 Auction 22, 17/03/1987

Sp27 Auction 27, 1/06/1988

Sp31 Auction 31, 20/06/1989

**Spink Taisei Zürich**

Sp34 Auction 34, 19/06/1990

Sp37 Auction 37, 16/09/1991

**Spink London**

Sp133 Auction 133, 25/05/1999

Sp144 Auction 144, 13/07/2000

Sp12026 Auction 12026, 26/9/2012

Sp02J 11-12/7/2002

Sp02M 27/03/2002

Sp00O 5/10/2000

Sp03O 8/10/2003

Sp05M 31/3/2005

Sp99M March 99

SpOnline Sphinx Numismatics Online Store

SPCS2 Coinex Sale 2, 5/10/2000

**J. G. Stickel, *Handbuch zur morgenländischen Münzkunde*, Leipzig 1845.**

St

**Stack's Auctions**

Stk97/D 2/12/1997

Stk09 The Golden Horn Collection, 12/1/2009

**Staatliche Museen, Münzkabinett, Berlin**

StM

**T**

**Tonegawa Collection**

TC

**T. Falk, *Treasures of Islam*, New York, Tabard Press, 1985.**

TOI

**Tim Wilkes**

TWFP5 Fixed Price List 5, Summer 2009

**Forschungsstelle für Islamische Numismatik, University of Tübingen**

Tüb

**V**

**Jesús Vico S. A.**

MJV92 4/3/1992

MJV94 10/3/1994

MJV995 16/3/1995

MJV97 13/3/1997

JJV99 8/7/1999

NJV02 20/11/2002

JV91N 14/11/1991

JV100 Auction 100, 27/3/2003

JV107 Auction 107, 3/3/2005

JV108 Auction 108, 9/6/2005

JV118, Auction 118, 13/11/2008

JV122 Auction 122, 4/3/2010

JV123 Auction 123, 17/6/2010

JV124 Auction 124, 11/11/2010

JV125 Auction 125, 3/3/2011

JV127 Auction 127, 10/11/2011

## W

**J. Walker, *The Coinage of the Arab-Byzantine and Post Reform Umayyad Coins*, London, 1956.**

W

**H. H. ‘Abd al-Wahhab, *Al-nuqūd al-‘Arabīya fī Tūnis*, Tunis, 1968.**

Wa

**Wilkes & Curtis**

WC1 Auction 1, 16/6/2014

## Y

**A. Damali, *Power of Gold, Golds of Power. Yapı Kredi Gold Collection*. Yapı Kredi Publications, Istanbul, 2005.**

YKG

## Z

**Zamana Gallery, *Centuries of Gold: The Coinage of Medieval Islam: Islamic Coins at the Zamana Gallery*, London, 1986.**

Zam

**Zeno Coin Database**

Zeno

SERIES NA 1

*NONEST TYPE - OBVERSE*

Coll. Ref.	Den.	Legend	Die	WT
<b>CNG03, L:1189</b>	Sol	NONEST6SNISIPSESOLCSETNONAB €[TV]	1	4.36
<b>Bern 7-C0001</b>	Sol	..... [əS] ..... [PSE]SOL[CI]SETN[ONAB]	2	4.31
<b>W G.2=PG7646</b>	Tre	NO ..... SETNONAB	2	1.425
<b>W 147</b>	Tre	N ..... NONAB	2	1.395
<b>W 148</b>	Tre	..... əSNIS ..... [AB]	2	1.408
<b>W HSA.1=HSA 1001.1.8142</b>	Sol	N[ONESTə]NISIIPSESESOLCISE[T]	3	4.310
<b>L95bis</b>	Sol	[NONESTəNISI]PSESESOLCISET	3	4.328
<b>ANS 1944.100.47328</b>	Tre	..... [P]SESESOLCISE[ET]	3	1.382
<b>W 143</b>	Sol	NONESTəSNISIIPSESOLCISE[ei]	4	4.325
<b>CGB59, L:453</b>	Sol	... [€]STəSNISIIPSE[SOLC] ...	4	4.15
<b>Mun11</b>	Sem	.... [STə] . [NI]SIIPSESOLCISE ..	4	2.10
<b>W C.2=Ø44</b>	Tre	N ..... PS[€]SOLCISEI	4	1.354
<b>W 149</b>	Tre	[N] ..... SESOLCISE[I]	4	1.379
<b>Bern 12-MC</b>	Tre	NONES[T] ..... ESOLCISEI	4	NW
<b>TOI380</b>	Tre	..... ISIIPSESOLC ....	4	1.39
<b>Ba71, L:946</b>	Tre	..... [SI]IPSESOL[C] ....	4	1.37
<b>S00M, L:285</b>	Tre	NONEST ..... SOLC[I]SE[I]	4	1.34
<b>CNGNo2, L:230</b>	Sol	... [€]STəS[NI]SIIPS[€SO] .....	5	4.26
<b>W 145</b>	Sem	NONESTəNISIIPSESOL[C]S	6	2.131
<b>ML, L:360</b>	Tre	NONESTəNISIIPSESOL[C]S	6	1.40
<b>Lh67T</b>	Tre	NONESTəSNISIIPSES[OLC] .. [ei]	7	1.40
<b>Sp144, L:848</b>	Tre	..... əSNISIIPSES .....	7	NW
<b>Lh67S</b>	Sol	.... ST6SNISIIPSESOL .....	8	4.27

*NONEST TYPE - REVERSE*

Coll. Ref.	Den.	Legend	Field	Die
<b>CNG03, L:1189</b>	Sol	6E6NC[I]PIAS[O]AE[T] . . . . . NO[AV]C[:]SC	G/3	1
<b>Bern 7-C0001</b>	Sol	[ð€ð] . . . . IASMAETOMI[A]ININM	T/4; p r	2
<b>W G.2=PG7646</b>	Tre	. . . . . ASMAETOMNAIN[I] .	T/2	3
<b>W 147</b>	Tre	. . . . . ASMAETOMNAIN . .	T/2	3
<b>W148</b>	Tre	[ð] . . . . . [PI]ASMAETOM[A]ININ	T/2; p r	4
<b>W HSA1=HSA 1001.1.8142</b>	Sol	ðEðNCIP[I]. . . . . [ON]MA	T/3; p r	5
<b>L95bis</b>	Sol	ðEðNCIPI[A]SMA[ET] . . . . . [M]A	T/3; p r	5
<b>ANS 1944.100.47328</b>	Tre	ðEðNCIPA[S] . . . . . MA[I]	T/2	6
<b>W 143</b>	Sol	ðEðNOCIASM[AET]O[M]NAN	T/3; p r	7
<b>CGB59, L:453</b>	Sol	. . . . . [M]AEPOMN[A]I . . .	T/3; p r	8
<b>Mun11</b>	Sem	[ð€] . . . . . [N]A[INI]	G/3	9
<b>W C.2=Ø44</b>	Tre	ðEðN[M]CIASMAEPOMNAIN	T/2	10
<b>W 149</b>	Tre	. . . . . AS[M]AETOM[NA]N	T/2; 2pr	11
<b>Bern 12-MC</b>	Tre	ðEðN[CPI] ASMAET[OMNAIN]	T/2	12
<b>TOI380</b>	Tre	[ð]Eð[NMCI]ASMAEPOMNAIN	T/2	10
<b>Ba71, L:946</b>	Tre	ðEðNMCIASMAEPOMNAIN	T/2	10
<b>S00M, L:285</b>	Tre	[ðEðNM]CIASMAEPOMNAIN	T/2	10
<b>CNGNo2, L:230</b>	Sol	ðEðNOCIASMAETO[MN]AN	T/3; p r	7
<b>W 145</b>	Sem	ðE[ð€] . [C] . PA . . . . . [O]MNAIN[I]	G/3; ??	13
<b>ML, L:360</b>	Tre	. . . . . NAIN[I] .	T/2	3
<b>Lh67T</b>	Tre	ðE . . . . . ETOMN[A]MANSC[I]	T/2	14
<b>Sp144, L:848</b>	Tre	ðE . . . . . ETOMN[A]MANSC[I]	T/2	14
<b>Lh67S</b>	Sol	6E6N[V]B[S]ME[T]OMNNINMA[NO]	T/4	15

**OTHER SERIES NA 1 TYPES – OBVERSE**

<b>Coll. Ref.</b>	<b>Den.</b>	<b>Legend</b>	<b>Die</b>	<b>WT</b>
<b>W 146</b>	Tre	.... INNOMINET[VOVN] ...	1	1.376
<b>HCC</b>	Sol	6EVSINN ..... [T]VOVNVS	2	4.22
<b>Ra96, L:3002=S940, L:223=SBN92, L:837</b>	Sem	INNOME ..... [C]TMI	3	2.058
<b>BwFP2, L:8</b>	Tre	INNO[ME] ..... ECTMI	3	1.32
<b>KC AV0001=Sp31, L:50</b>	Sem	INNOMETVO6SPPIECTMI	3	1.987
<b>PG8672</b>	Tre	INNOMETVO6SPPIECTMI	3	1.394
<b>KC AV1104</b>	Sol	.... [METV]OSPPI[EC] .	4	4.325
<b>W 152</b>	Tre	INNO ..... SPPIECT	5	1.376
<b>W P.21=L98</b>	Tre	..... [6S]SPPIECT	5	1.359
<b>JE69, L:746</b>	Tre	..... [6S]SPPIE ..	5	1.33
<b>BCT 4</b>	Sol	6VSTV[S] . 6V ..... SNONE	6	4.27
<b>W J.5=J35</b>	Sol	6VSTVS ... [SETA]VSNONE	6	4.26
<b>W 144</b>	Sem	6VSTV[S] ..... [A]VSNONE	6	2.076
<b>W C.1=Ø45</b>	Sem	.. [S] .. [S6V]P[S]ETAVSNON[€]	6	2.032
<b>COI 239</b>	Tre	..... PSET6VSNON .	6	1.33
<b>W 151</b>	Tre	6VS[T] ..... [V]SNONE	6	1.309
<b>W C.3=Ø42</b>	Tre	6[VS] ..... AVSNONE	6	1.319
<b>W 155</b>	Tre	..... 6VS•ETAAIVS .	7	1.348
<b>Stk09 L:345=icaL01, L:345</b>	Sem	... [TVSS]6VS•ETA[AIIVS] .	7	2.01
<b>W P.19=L97</b>	Sem	[6VS]TV[S]S6VS•ET[AAIVS] .	7	1.986
<b>Sp144, L:847</b>	Sem	.... V[S]S6VS•ET[AAIVS] .	7	NW
<b>W 150</b>	Tre	.... [C6VS]NETAAIV2 ...	8	1.325
<b>PG1483</b>	Tre	.... [EST]AA[IVS] .....	9	1.320
<b>icaL24, L:4079</b>	Sol	6EVSNONESTAA[IVS]6SN ...	9	4.23
<b>Br329</b>	Sem	[6€] ..... TAAIVS[6S]N	10	2.01
<b>PG8500</b>	Tre	..... [€ . I]CO ..	11	1.360
<b>W P.20=L96</b>	Sem	..... ERICOR6IS	12	1.947
<b>CNG81, L:1227</b>	Tre	..... [C]OR6IS[N]	13	1.37
<b>W 153</b>	Tre	GVS[I] ..... [VE]N	14	1.352
<b>W C.4=Ø43</b>	Tre	GVS[C]TV] ..... N	14	1.308
<b>W 154</b>	Tre	6VS ... V ..... [V]EN	14	1.334
<b>Zeno 65355</b>	Tre	..... V6SNO[N]	15	1.35

*OTHER SERIES NA 1 TYPES - REVERSE*

Coll. Ref.	Den.	Legend	Field	Die
<b>W 146</b>	Tre	∂Ε∂NMCIASMAE[P]OMN[AI]N	T/2	10 <sup>477</sup>
<b>HCC</b>	Sol	6EVSNONESTAXIVS6SN .	T/3	1
<b>Ra96, L:3002=S940, L:223=SBN92, L:837</b>	Sem	..... Ε . [GVSE]TAXIVS .	G/3	2
<b>BwFP2, L: 8</b>	Tre	..... GVSETAXIVS[N]	T/2	3
<b>KC AV0001=Sp31, L:50</b>	Sem	[G]V[ST]VEO[G]VS[Ε] . AXIVS[N]	G/3	2
<b>PG8672</b>	Tre	..... GVSETAXIVS[N]	T/2	3
<b>KC AV1104</b>	Sol	INNOMI[N]CTVO6[S]PPICT <sup>478</sup>	T/3; p b	4
<b>W 152</b>	Tre	..... [T]6SNISISOΛVS[6] .	T/2; p b	5
<b>W P.21=L98</b>	Tre	..... [T]6SNISISOΛVS ..	T/2; p b	5
<b>JE69, L:746</b>	Tre	..... NISISOΛVS6 .	T/2; p b	5
<b>BCT4</b>	Sol	IN .. V . NCTV[O]GSP <sup>479</sup>	T/2; p b	6
<b>W J.5=J54<sup>480</sup></b>	Sol	INNOMICTV ..... CTMIS	T/3; p b	7
<b>W 144</b>	Sem	[I]NNONE•TVO[6]SPPI[ICTMI]	G/3; p b	8
<b>W C.1=Ø45</b>	Sem	INNON ..... PPIECTMI	G/3; p b	8
<b>COI 239</b>	Tre	INNOMINCTVO[ΕPP]	T/2; ps b	9
<b>W 151</b>	Tre	..... INCTVO[Ε] ..	T/2; ps b	9
<b>W C.3=Ø42</b>	Tre	..... 6VSETAXIVS .	T/2	3
<b>W 155</b>	Tre	I[NNNO] ..... [T]VO6SP[NI]•	T/2; rg r	10
<b>Stk09 L:345=icaL01, L:345</b>	Sem	INNOMINCTVO6SO•	G/3; rg r	11
<b>W P.19=L97</b>	Sem	INNOMINCTVO6SO•	G/3; rg r	11
<b>Sp144, L:847</b>	Sem	INNOMINCTVO6SO•	G/3; rg r	11
<b>W 150</b>	Tre	6VSTVE()6VSETAXIVSN	T/2	3
<b>PG1483</b>	Tre	. [ΕV]SINN .....	T/2	12

477 Die linked to RD10 of NON EST Type.

478 Pellet below first N.

479 Pellet below last N.

480 Drawing.

<b>icaL24, L:4079</b>	Sol	6EV SINONIN[ETVO] ..	T/3	13
<b>Br329</b>	Sem	.. NON .....	G/3; p1	14
<b>PG8500</b>	Tre	[NO]NEST6S .....	T/2	15
<b>W P.20=L96</b>	Sem	[NO]N[E]ST6SNISISOΛVS .	G/3; p b	16
<b>CNG81, L:1227</b>	Tre	IN ..... SRCVNS6S	T/2	17
<b>W 153</b>	Tre	[I] ..... 6VSETAΛIVS .	T/2	3
<b>W C.4=Ø43</b>	Tre	.. STVE()[6]VSETAΛIVS .	T/2	3
<b>W 154</b>	Tre	..... 6VSETAΛIVS	T/2	3?
<b>Zeno 65355</b>	Tre	..... [M]ISRCVNS6S	T/2	18

SERIES NA 2, PHASE 1

*ALL DENOMINATIONS - OBVERSE*

Coll. Ref.	Den.	Legend	Field	Die	WT
KC AV1095	Sol	6SETERN[S]6SMAGNSOI	RTERCN	1	4.247
KC AV1091	Tre	6SETER.....[S]OI	RTERCN	1	1.364
KC AV1090	Sol	6SETERNS[6SM]AGNS[T6]SOMN	ICRE[T]R [€]	2	4.301
W C.11=Ø52	Sol	6SETERNS[6]SMAGN6[I]	NICRAR	3	4.320
W Th.3	Tre	6SETE[R].....6SO	NICRETI	4	1.32
CNGIX, L:1797	Sem	6SET[€].....[A]GN6SO	NICRETI	4	2.08
KC AV1096	Sol	6SETERNS[6]SMAGN6SO	NICRETI	4	4.281
QMA	Tre	[6]SETERNS[6S].....	NICRETI	4	NW
AA19, L:145=icaL24, L:4080	Sol	6SETERNS6S....6[S].	NICRETI	4	4.33
PG8541	Tre	[6SETER].....[6SOM]N	CRETRN	5	1.408
Bw19, L:173	Tre	.....[R]NS6SMAGN.....	CRETRN	5	NW
W Cod.11=Cod9 481	Tre	.....RNS6SMAGN.....	CRETRN	5	NW
S98A, L:181	Sol	6SETCRNS6SMAGNS6S	OMNID <sup>482</sup>	6	4.36
KC AV1117	Tre	6SETCRN.....GNS6S	OMNID	6	1.422
KC AV1121	Tre	6SETCRN.....GNS6S	OMNID	6	1.369
W P.34=L103	Tre	6SETC[RNS6SMA]GNS6S	OMNID	6	1.381
KC AV1128	Tre	6SETC[RN]S6SMAGNS6S	OMNID	6	1.391
HD309, L:254	Sem	6SETCRNS6SMAGNS6S	OMNID	6	2.06
KC AV1126	Sol	6SETC[R]NS6SMAGNS6S	OMNID	6	4.318
Bw26, L:1586	Tre	6SETERN[S6S].....SO	[M]NIGR €	7	1.36
W P.39=L109	Sol	6SE[TER]NS6SMAGNS6SO	MNIGRE	7	4.383
KC AV1099	Tre	.....MAGNS6SO	MNIGRE.	8	1.412
KC AV1097	Sol	6SETERNS6SMAGN6SO	MNIGRE[ T]	8	4.346
KC AV1102	Sol	6SETCRNS6SNAGN6[S]ONI	RTERCIII	9	4.281
KC AV1103	Sol	6SETERNS6SMAGNOMSAR	RTERCIN	10	4.321
KC AV1131	Sol	6SETERNS6SMAGNO[MSA]R	RTERCIN	10	4.365
KC AV1098	Sol	6SETERNS6S[MA].....[A]R	RTERCIN	10	4.350
KC AV1100	Sol	6SET[€RNS]6SMAGNOMSAR	RTERCIN	10	4.317
W P.35=L104	Tre	. [S]...[R]NSOSMAGNS[6S]	ONNIΩ	11	1.439
W B.9=Nü65	Tre	OSET[I]RNS[OSMAGNS6]S	ONNIΩ	11	1.353
KC AV1093	Tre	OSETI[RNS].....NS[6]S	ONNIΩ	11	1.398

481 Drawing. It is possible that W Cod.11 and Bw19, L:173 are the same coin.

482 Pellet in reverse C of field of Obverse Die 6.

<b>KC AV1129</b>	Tre	OSETIRN . . . . . S[6]S	ONNIQ	11	1.365
<b>KC AV1094</b>	Tre	OSETIRNS[O] . . . . . S[6]S	ONNIQ	11	1.374
<b>W P.41=L110</b>	Sol	OSETIRNSOSMAGNS[6]S	ONNIQ	11	4.391
<b>Bw19, L:174</b>	Tre	OSETIRNSOS . . . . . N[6]S	ONNIQ	11	1.39
<b>KC AV1092</b>	Sol	OSETIRNSOS[M]A[G]NS[6]S	ONNIQ	11	4.299
<b>icaL18, L:44</b>	Tre	OSETIRNSOSMA . . . . . S	ONNIQ	11	1.33
<b>icaL2, L:19=JE55, L:1606=Ra96, L:3004</b>	Tre	[O]SETIRNS[O]S[M] . . . . . [6S]	ONNIQ	11	1.38
<b>PA141, L:2179</b>	Tre	OSETIR . . . . . [6S]	ONNIQ	11	1.37
<b>ME54, L: 31</b>	Sol	6SE[TCR]NS6SMAGN[OMR]TER	RTERCIN	12	4.30
<b>W B.7=N68</b>	Sem	6SETCRNS6SM . . . . . [R]TER	RTERCIN	12	2.096
<b>SBN92, L:841</b>	Tre	6SETCRNS6SM . . . . . [ER]	RTERCIN	12	1.21
<b>Sp144, L:850</b>	Tre	6SETCRNS6S . . . . . [ER]	RTERCIN	12	NW
<b>KC AV1113</b>	Sol	6SETCRNS6SMAGNOM[RTER]	RTERCIN	12	4.278
<b>KC AV1101</b>	Sol	6SETCRNS6SMAGNOM[R]TER	RTERCIN	12	4.290
<b>PG12474</b>	Sol	6SETCRNS6SMAGNO[MRT]ER	RTERCIN	12	4.253
<b>Sp22, L:17</b>	Tre	6SETCRNS[6SM] . . . . . [R]	RTERCIN	12	1.47
<b>KMK</b>	Sem	6SETC[R]NS6SM . . . . . [ER]	RTERCIN	12	2.081
<b>KC AV1110</b>	Sol	6SETRCN[S6S]MAGNOMRTER	RTERCIN	12	4.289
<b>KC AV1127</b>	Tre	. . . . . MAVGNSASCO .	IMICRA	13	1.404
<b>KC AV1120</b>	Tre	. . . . . S[S]MAVGN[S]ASC[O] .	IMICRA	13	1.470
<b>W C.10=Ø50</b>	Tre	. . . . . [S]SMAVGN[S]ASC[O] .	IMICRA	13	1.447
<b>Bw75</b>	Tre	[6]SETRNSSMA[VG] . . . . .	IMICRA	13	1.404
<b>BCT 6=Wa2</b>	Tre	6S . . . . . MAVGNSASCO[I]	IMICRA	13	1.44
<b>W 172</b>	Sem	[6S] . . . . . [SM]AVGN[S]ASCO[I]	IMICRA	13	2.094
<b>KC AV1118</b>	Tre	6SE . . . . . GNSASCO[I]	IMICRA	13	1.422
<b>W P.33=L106</b>	Tre	6SET[R]. [SSMAV]GNCASCO[I]	IMICRA	13	1.469
<b>W 177</b>	Tre	6SETR . . . . . [A]SCO[I]	IMICRA	13	1.423
<b>W HSA.4=HSA 1001.1.13224</b>	Sem	6SETRN[SS] . . . . . [SCOI]	IMICRA	13	2.089
<b>Bern 25 - MC</b>	Tre	6SETRNSSMAV . . . . . SCO[I]	IMICRA	13	NW
<b>S89M, L:345=Sp22, L:18=Sp27, L:30</b>	Tre	6SETRNSSMAVGN[S]ASCO[I]	IMICRA	13	1.49
<b>Bw75</b>	Sem	6SETRNSSMAVGN[S]ASCO[I]	IMICRA	13	2.13
<b>W B.8=Nü67</b>	Tre	6SET[RNSS] . . . . . ASCO[I]	IMICRA	13	1.426
<b>S82O, L:2</b>	Sem	6S[ETE]RNS[6SMA]GNS6S	OMNICK	14	1.96
<b>W C.8=Ø48</b>	Sem	6SETERNS6SM . . . . . S6S	OMNICK	14	2.064
<b>W HSA.5= HSA 1001.1.8141</b>	Sem	6SE[TER]NS6SMAGNS6S	OMNICK	14	2.018
<b>CGB 2013</b>	Sem	.. [E]TERNS6SMA . . . . .	OMNICK	14	2.03

<b>290648</b>						
<b>Leu53, L:519=</b> <b>S80A, L:1</b>	Tre	62ETERN[S6] . . . . . [M]I	RTCRCIN	15	1.45	
<b>KH AV1109</b>	Sol	62ETERN S6SMAGNO[M]I	RTCRCIN	15	4.287	
<b>W</b> <b>HSA.6=HSA</b> <b>1001.1.8140</b>	Tre	[6] . . . . . MAGNOMI	RTCRCIN	15	1.411	
<b>HSA</b> <b>1001.57.5784</b>	Tre	. . . . [ER]NS6SM . . . . .	[R]TCRCI N	15	1.365	
<b>W 179</b>	Sol	6SETERN SASMAGNOM[S]NS	RTERCIN	16	4.218	
<b>KMK</b>	Tre	6S . . . . . MAGNOMSN[S]	RTERCIN	16	1.391	
<b>W P.40=L111</b>	Sol	6SETENS[A]SMAGNOMRTER[C]	RTERCIN	17	4.225	
<b>W B. 11=Nü69</b>	Sol	6SETCRNS6SMAGNO[ME]NS	RTERCIN	18	4.305	
<b>W 180</b>	Sol	6SETCRN[S6SMAG]NOMENS	RTERCIN	18	4.270	
<b>COI240</b>	Sol	6S[ETERN]S6S[M]AGNONSN I	RTERCIN	19	4.30	
<b>KC AV1112</b>	Sol	6SETCRNS6SMAGNS6SOI	NICRET	20	4.303	
<b>TOI358</b>	Sol	6SETCRNS6SMAGNS6SOI	NICRET	20	4.31	
<b>S87O, L:922</b>	Tre	. . . . . GNSO[M]	NICRET[R ]	21	1.35	
<b>ANS</b> <b>1959.258.1</b>	Sol	6SE[TCRN]S6S[MA]GN6SOM	NICRETR	21	4.271	
<b>KC AV1116</b>	Sol	6SETCRNS6SMAGN6[SOM]	NICRETR	21	4.316	
<b>KC AV1114</b>	Sol	INN[6]NIMISRCVNS6S	VNS6SO	22	4.228	
<b>KC AV1115</b>	Sol	INN6NIMISRCVNS6S	VNS6SO	22	4.327	
<b>A225, L:58794</b>	Sol	INN[6NI]MISRCVNS[6]S	VNS6SO	22	4.24	
<b>Sp34, L:14</b>	Sol	6SETERN S6SMAGN6SOMN	IDRETR	23	4.34	
<b>KH AV1111</b>	Sol	6SETERN S6SMAGN6SOMN	IDRETR	23	4.305	
<b>S99M, L:65</b>	Sem	6SETRNS6SMGNS6SO[1]	.SOMNC	24	2.21	
<b>W P.36=L105</b>	Tre	6SETRNS6SMGNS6SOI	.SOMNC	24	1.446	
<b>BalEm63</b>	Tre	[6S]ETRNS6SMGNS6S . .	.SOMNC	24	1.46	
<b>Ra96, L:3003=</b> <b>SBN92, L:840</b>	Sem	6SETRNS6SMGNS6SOI	.SOMNC	24	2.138	
<b>DC</b> <b>C.217=Sp144,</b> <b>L:849</b>	Sem	6SETR[N]S[6SMGN]S6SOI	.SOMNC	24	2.17	
<b>S89O, L:311</b>	Tre	[6SE]TRNS6SMGNS6S . .	.SOMNC	24	1.45	
<b>MAN</b> <b>2004.117.21</b>	Tre	6SETR[NS] . . . [G]NS6SOI	.SOMNC	24	1.404	
<b>W 170</b>	Sem	62ETRNS6S . . . . . [V]O	HNCRAT	25	2.094	
<b>W P.37=L107</b>	Tre	. . ETRNS6S[E] . . . . .	HNCRAT	25	1.332	
<b>W B.10=Nü66</b>	Tre	62E . . . . . S6SOVO	HNCRAT	25	1.403	
<b>BwFP5, L:6</b>	Tre	62E . . . . . NS6SOVO	HNCRAT	25	1.35	
<b>KH AV1119</b>	Tre	6SETER . . . . . R	RTERCIN	26	1.398	
<b>W 176</b>	Tre	6SETER . . . . . [R]	RTERCIN	26	1.376	
<b>P372, L:1426</b>	Sem	unreadable	ICRETR	27	2.05	
<b>W 171</b>	Sem	. . . [6]NINI6S[OM] . . . . .	ICRETR	27	1.995	

W HSA 3=HSA 1001.1.8139	Sem	unreadable	ICRETR	27	2.043
W P.38=L108	Tre	.... NI6SOM[N] .....	[I]CRETR	27	1.386

**SOLIDI - INDICTION II - REVERSE**

Coll. Ref.	Legend	Obv. Field	Rev. Field	Die
W C.11=Ø52	INN6NIM[I]SRCST[F]E[SN]	NICRAR	RCIN6II	1
KC AV1095	INN[6NI]MISRCSTFES[N]	RTERCN	RCIN6II	1
KC AV1096	INN6NIMIS[R] . . . . R[N]	NICRETI	RCIN6II	2
KC AV1090	[I]NN6NIMISRCSTFERIN[AF]	ICRE[C]R[E]	RCIN6II	3

**SOLIDI - INDICTION III - REVERSE**

Coll. Ref.	Legend	Obv. Field	Rev. Field	Die
KC AV1103	INN6NIMISRCSTFES[FRCI]	RTERCIN	CIN6III	1
KC AV1098	INN6 . . . . RCSTFESFRCI	RTERCIN	CIN6III	1
KC AV1100	INN6NIMISRCSTFESFRCI	RTERCIN	CIN6III	1
KC AV1131	INN6NIMISRCS . . . . [FR]CI	RTERCIN	CIN6III	1
KC AV1101	INN6NIMISRCST[FE]CFRN	RTERCIN	CIN6III	2
KC AV1092	6SETER . . . [SMA]GN6SONIC	ONNIΩ	CIN[6]RII[I]	3
S98A, L:181	INN6NI[M]ISRCSTFERINA[FR]	OMNIΩ	ΩIN6III <sup>483</sup>	4
KC AV1102	..... MISRCSTFER . . .	RTERCIII	RCIN6III	5
KC AV1097	[I]NN6NIM . RCSTFERINI	MNIGRE[T]	RCIN6III	6
W P.39=L109	[I]NN[6N] . . RCS[τ]FERIN .	MNIGRE	RCIN6III	6
KC AV1126	.. N6NIMISRCS[τ]F . . . . .	OMNIΩ	ACIN6III	7
icaL24, L:4080	NN . . . . . STFESNFSN	NICRETI	RCIN6III	8

**SOLIDI - INDICTION IIII - REVERSE**

Coll. Ref.	Legend	Obv. Field	Rev. Field	Die
W B.11=Nü69	INN6NIMISRCSTFESFCR•SF	RTERCIN	CIN6IIII	1
W 180	INN6NIMSRCSTFESFCR•S[F]	RTERCIN	CIN6IIII	1
COI 240	INN6NIMISRCSTFESFNERNFS	RTERCIN	CIN6IIII	2
KC AV1109	INN6NIMISRCSTFESFNERNFS	RTCRCIN	CIN6IIII	2
KC AV1110	INN6NIMISRCSTFESF[R]CS	RTERCIN	CIN6IIII	3
W 179	INN6NIMISRCS . . . . . RCI	RTERCIN	CIN6IIII	4
W P.40=L111	..... SRCSTFES6RCI	RTERCIN	CIN6IIII	4

<sup>483</sup> Pellet in reverse C.

ANS 1959.258.1	INN[6NI]MISRCS[TF]... IN[A]	NICRETR	RCIN6III	5
KC AV1115	INN.....S[TF]ERIN[A]	VNS6SO	RCIN6III	5
a225, no. 58794	INN6NIMISRCS[TF]ERINA	VNS6SO	RCIN6III	5
KC AV1116	INN.....ISRCS[TF]ERINA	NICRETR	RCIN6III	5
KC AV1114	INN[O].....[S[TF]ERINA	VNS6SO	RCIN6III	5
ME54, L:31	.....IMISRCS[TF]ES..	RTERCIN	CIN6III	6
PG12474	INN6NIM.....[N]CI	RTERCIN	CIN6III	7
TOI358	INN6NIMISRCS[LFRIN]AFR	NICRET	CIN6III	8
Sp34, L:14	INN6....RCSLFRINAFR	IDRETR	CIN6III	8
KC AV1111	INN6NIMISRCSLFRINAFR	IDRETR	CIN6III	8
KC AV1112	INN6NIMISRCSLFR[NA]FR	NICRET	CIN6III	8
W P.41=L110	INN6NIM...SLFR[NA]FR	ONNIQ	CIN6III	8
KC AV1113	INN6NIMISRCS[TF]ESFRCN	RTERCIN	CIN6III	9

*SEMISSES - REVERSE*

Coll. Ref.	Legend	Obv. Field	Rev. Field	Die
S820, L:2	INN[6NIMI]SRCVNS6S	OMNICR	G/2	1
W C.8=Ø48	INN6NIM[I]SRCVNS6S	OMNICR	G/2	1
W HSA.5= HSA 1001.1.8141	INN6NIM[I]SRCVNS6S	OMNICR	G/2	1
CGB 2013 290648	I...[NI]MISRCVNS6S	OMNICR	G/2	1
W 170	INN[6NIM]ISRCVNS6S	HNCRAT	G/2	1
Bw75	INN6N[I]...RCVNS6S	IMICRA	G/2	1
W 172	INN6NI[MIS]RCVNS6S	IMICRA	G/2	1
W HSA.4= HSA 1001.1.13224	INN6NIMISRCVNS6S	IMICRA	G/2	1
W HSA.3=HSA 1001.1.8139	INN6NIM.SRCVNS6S	ICRETR	G/2	1?
HD309, L:254	INN[N].....SERIGOR6	OMNIQ	G/3	2
W 171	.....NIMISE[RIGOR6]	ICRETR	G/3	2
P372, L:1426	.....[M]ISERIGO[R6]	ICRETR	G/3	2
W B.7=Nü68	INN6NIMISRCS[R].....	RTERCIN	G/3	3
KMK	INN.....S[R]F[€]SN	RTERCIN	G/3	3
CNGIX, L:1797	[INN].....	NICRETI	G/3	3?
S99M, L:65	INN6INSRCSLFRINAFRC	SOMNE	G/3	4
DC C.217	INN6INSRCSLFRINAFRC	SOMNE	G/3	4
Ra96, L:3003=SBN92, L:840	NONEST6S.....[V]S6S.	SOMNE	G/3 p b	5

*TREMISSES - REVERSE*

Coll. Ref.	Legend	Obv. Field	Rev. Field	Die
PG8541	[IN]N6NIMISR . . . . .	CRETRN	T/2	1
Bw19, L:173	INN6NIMISR . . . S6	CRETRN	T/2	1
W Cod.11	INN6NIM . . . . . S6	CRETRN	T/2	1
QMA	. . . . . MISRCVNS[6]	NICRETI	T/2	1
W Th.3	INN6NI . . . . . S6	NICRETI	T/2	1?
S87O, L:922	. . . . . MISRCVNS[6]	NICRET[R]	T/2	1
KC AV1091	INN6]NIMISRC . . S6]	RTERCN	T/2	1
KC AV1127	[INN6]NINISRCVS6[S]	IMIGRA	T/2	2
KC AV1120	INN6NINISRCVS6S	IMIGRA	T/2	2
S89M, L:345=Sp22, L:18=Sp27, L:30	INN6NINISRCVS6S	IMIGRA	T/2	2
Bern 25-MC	INN6NINISRCVS6S	IMIGRA	T/2	2
W P.33=L106	[I]NN6NINISRCVS6S	IMIGRA	T/2	2
W B.8=Nü67	IN . . . INISRCVS6S	IMIGRA	T/2	2
S89O, L:311	INN6NINISRCVS6S	SOMC	T/2	2
W P.35=L104	INN6NINISRCVS6S	ONNIQ	T/2	2
BalEm63	INN6NIMISRCV . . . .	SOMC	T/2	3
W P.36=L105	INN6NIMISRC[VNS6S]	SOMC	T/2	3
W 177	INN6NIMSRCSLFE[I]N[I]	IMIGRA	T/2 p r?	4
BCT6	INN6NIMSRC[LF]EIN[I]	IMIGRA	T/2	4
W C.10=Ø50	. . . 6NIMSRCSLFERI .	IMIGRA	T/2	5
Bw75	INN6NIMSRC[LF]ERIN	IMIGRA	T/2	5
KC AV1118	INN6NIMSRCSLF[E]RIN	IMIGRA	T/2	5
W B.10=Nü66	INN6NIMISRCVNS	HNCRAT	T/2	6
BwFP5, L:6	. . . 6NIMISRCVNS	HNCRAT	T/2	6
KC AV1128	INN6NIMISRCVNS	OMNIQ	T/2	6
W P.34=L103	. . . . NIMISRCV[N] .	OMNIQ	T/2	6
KC AV1117	INN[6]NIMISRCVNS	OMNIQ	T/2	6
KC AV1121	INN6[N] . . . . . [C]VNS	OMNIQ	T/2	6
KC AV1099	. . . . . NIMISRCVNS	MNICRE	T/2	6
KC AV1094	INN6NIMISRCVNS	ONNIQ	T/2	6
Bw26, L:1586	IN . . . . . SR[C]VNSS	MNICRE	T/2	7
W P.37=L107	. . . . . SNISISOXVS	HNCRAT	T/2	8
W B.9=Nü65	[N] . . . [S] . 6SNISISOXV .	ONNIQ	T/2	8
JE55, L:1606	. . . . [ST]6SNISISOXV .	ONNIQ	T/2	8
KC AV1129	[NONEST]6SNISISOXV[S]	ONNIQ	T/2	8
KC AV1093	.. [N]EST6SNISISO[X] ..	ONNIQ	T/2	8

<b>icaL18, L:44</b>	N . . . . . [N]ISISOλVS	ONNIΩ	T/2	8
<b>Bw19, L:174</b>	. . . . . 6SNISISOλ[VS]	ONNIΩ	T/2	8
<b>PA141, L:2179</b>	. . . . . 6SNISISO[λ] ..	ONNIΩ	T/2	8
<b>W 176</b>	INN6NIMISRCVNS6NS	RTERCIN	T/2	9
<b>KMK</b>	INN6NIMISRCVNS6NS	RTERCIN	T/2	9
<b>SBN92, L:841</b>	INN6NIMISRCVNS6NS	RTERCIN	T/2	9
<b>KC AV 1119</b>	... [6NI]MISRCVNS6NS	RTERCIN	T/2	9
<b>Sp22, L:17</b>	INN6NIMISRCVNS6NS	RTERCIN	T/2	9
<b>Sp144, L:850</b>	INN6NIM[I]SRC .. S6NS	RTERCIN	T/2	9
<b>Cod 8=HSA 1001.1.8140</b>	NN6NIM[S] . . . . .	RTCRCIN	T/2	10
<b>Leu53, L:519</b>	INN6NIMISRCVNS6N . S	RTCRCIN	T/2	11
<b>W HSA.6=HSA 1001.1.8140</b>	IN[N] . . . . . RC[P]NS6[A]NI	RTCRCIN	T/2	12
<b>W P.38=L108</b>	. . . . . CRESP[6N] . . .	[I]CRETR	T/3	13
<b>MAN 2004.117.21</b>	INN6NI[M]ISRCVNS[NS]	SOMC	T/2	14

SERIES NA 2, PHASE 2

*ALL DENOMINATIONS - OBVERSE*

Coll. Ref.	Den.	Legend	Field	Die	WT
PG12477	Sem	. [ESƏSN]SVNS[CV] ...	2IMI[χ]S	1	2.023
DMF11	Sem	NES[əSN]ISVNSCV[NNSA]	2I[M]IKS	1	2.10
MAN 2004.117.26	Sem	.. [SəS]NISVNSCV .....	2IMIKS	1	2.059
W 174	Tre	NN[ES] .....	2IMIKS	2	1.3651
Stk09, L:3457=Lanz42, L:835	Tre	NN .....	2IMIKS	2	1.39
W 178	Sol	NESə2NISP2CPN2AXIP	SIMIK2	3	4.3329
NG6, L:287	Sol	NESəSNIP2CPN2AXIP	SIMIK2	3	4.30
W P.42=L111bis	Sol	NESə2NIP2CPN2AXI	SIMIK2	4	4.250
icaL20, L:53	Sem	NESə2NIP2 .....	SIMIK2	4	2.06
PG12344	Sem	NESə2NI2 .....	SIMIK2	4	2.0498
W Cod.3=HSA 1001.57.5785	Sem	NESə2NIP2 .....	SIMIK2	4	2.040
KMK	Sem	NESə2NIP2[CPN2]AXI	SIMIK2	4	2.0752
S81A, L:1	Sem	NESə2NIP2 .....	SIMIK2	4	NW
KMK	Tre	NESə2NIP2 .....	SIMIK2	4	1.2938
W 173	Tre	NESə2NIP2 .....	SIMIK2	4	1.354
icaL26, L:44=AC090, L:1398	Tre	NESə2NIP2 .....	SIMIK2	4	1.38
W C.12=Ø54	Sol	NESə2NIP2CPN2[CPN2]AXI	SIMIK2	5	4.301
W Cod.5=MAN 2004.117.23	Sem	..... N2CPN2[AXI]	SIMIK2	6	1.9839
MuM62, L:1	Sem	[NES2] .....	SIMIK2	6	2.02
S00N, L:185	Sem	NN[ε]2[ə2] .....	SIMIK2	6	2.04
PG12475	Sem	NESə2NIP2VN2CPN2AXI	SIMIK2	7	1.9930
TOI383= S790, L:1	Sem	NES[2] .....	SIMIK2	7	2.09
COI241	Sem	NESə2NIP2CPN2AXI	SIMIK2	7	2.05
BNFSR28	Sem	[NESə2]NIP2CPN2AXIP	SIMIK2	8	2.017
HSA 1001.57.5786	Sem	NESə2[N] .....	SIMIK2	9	2.029
Jena OMJ 305- B03=St39	Tre	NES2 .....	SIMIK2	9	1.37
COI242	Tre	NES2[ə2NIP2]PN ... [N]2AXI	SIMIK2	9	1.41
W 175	Tre	[NESə2]NISVN2CPN .....	SIMIK2	9	1.3485
S81A, L:2=S790, L:2	Tre	NESə2 ... [PN] .....	SIMIK[2]	9	1.35
W ANS.13=ANS	Sem	NCSə2NIP2 .....	SIMIK2	10	2.003

<b>1917.215.3433</b>					
<b>S80O, L:4=S79A, L:1</b>	Tre	NNC2ə2N . . . . . [χI] .	SIMIX2	10	NW
<b>Bern 25-MC</b>	Tre	[NNC2ə2]NI2PNCPNN2AXIP	SIMIX2	10	NW
<b>ANS 1917.215.3434</b>	Tre	.. 2ə2NISPN2CP] . . .	SIMIX2	11	1.334
<b>AC04M, L:1178</b>	Tre	NNE2ə2NI2PN2CP . . . . .	SIMIX2	11	1.35
<b>W C.9=Ø49</b>	Tre	. . . . . PN2CPNN[C] ..	SIMI[χ]	12	1.380
<b>W P.32=L102</b>	Tre	NNE2 . . . . PN2CPNNCAAI	SIMIX2	12	1.342
<b>AC02D, L:455</b>	Sem	[NNC2ə2NI]2PN2CPNN2AI	SIMIXI2	13	2.06
<b>L108bis</b>	Tre	NNC2ə2NI2PN2 . . . . [2]AI	SIMIXI2	13	1.336
<b>EG</b>	Sem	NNC2ə2N[I]2PN2 . . . . AI	SIMIXI2	13	2.04
<b>Ku97, L:2136=MM13, L:901=JE84, L:986=Ra96, L:3005=P276, L:1062</b>	Tre	NN[C2ə]2NI2P[N]2 . . . . 2AI	SIMIXI2	13	1.35
<b>MJV92, L:222</b>	Sem	NNC2ə2NI2PN2CPNN2AI	SIMIXI2	13	2.10
<b>W Cod.2=MAN 2004.117.25</b>	Sem	NN . . . . . [V]N2CPNN[I2]AXI	SIMIXI2	14	2.0191
<b>W 169</b>	Sem	NNE2[ə2NI2] . . . . NN[I2]AXI	SIMIXI2	14	2.0723
<b>L99bis</b>	Sem	NNE2ə2NI2[PNI] . . . . .	SIMIXI2	14	2.047
<b>CNG41, L:2381</b>	Sem	NN[ε2ə] . . . PN2[C]PN . [I2]AXI	SIMIXI2	14	2.03
<b>L100</b>	Tre	NNE2[ə] . . . . . [N2CP]NN2[A]XIV	SIMIXI2	15	1.313
<b>W Cod. 4=HSA 1001.57.5787</b>	Sem	NN[ε2ə]2NI2PN2CPNN2AXI .	SIMIXI2	15	2.036
<b>PG10549</b>	Tre	NNE2ə2NI2PN2[CP]NN . [AXIV]	SIMIXI2	15	1.360
<b>TC</b>	Tre	. . . . . CPNN2 . . . .	SIMIXI2	15	1.3124
<b>Bern 21-MC</b>	Sem	NNE2ə2NI2P[N] . . . . .	SIMIXI2	16	NW
<b>W P.31=L99</b>	Sem	NNE2 . . . . . [N]2CPNI	SIMIXI2	16	1.981
<b>AC09O, L:1397</b>	Sem	[NNE]2ə2NI2PN2CPN ..	SIMIXI2	16	2.02
<b>W 168</b>	Sem	.. 2ə2NI2P[N] . . . . .	SIMIXI2	16	2.0612
<b>BwNY2, L:409</b>	Sol	NNE2ə2NI2PN2CPNNAI	SIXIM2	17	4.28
<b>W Cod.6=MAN 2004.117.22</b>	Sem	NNE2ə2NI2P[N2]CPNN[AI]	SIXIM2	17	1.9657
<b>W C.7=Ø46</b>	Sem	NNE2ə2NI2PN2[C] . . . .	SIXIM[2]	17	2.017
<b>icaL24, L:4081=S94O, L:224= BN, L:839</b>	Sem	NNE2ə2NI2PN2CPNNAI	SIX[IM]2	17	2.048

Sp12026, L:1	Tre	NN[€]ጊጋጊ . . . . . NNAጸ	SIXIMጊ	17	1.35
MAN 2004.117.24	Sem	NNፎጋጋNIጊጊጊጊ[A]ጸIVጊጊ	SIXIMጊ	18	2.0102

**SOLIDI - REVERSE**

Coll. Ref.	Legend	Obv. Field	Rev. Field	Die
W 178	[INN] . . . . . RCSጸፎFRTNAፎRCAጸ	SIMIAጊ	INፎCIII	1
NG6, L:287	INNፎNIMSRCSጸፎFRTNA[ፎRCAጸ]	SIMIAጊ	INፎCIII	1
W P.42=L111bis	INNፎNIMጊRCጊ[ጸ] . . . . . [ፎF]R	SIMIAጊ	INፎCVII	2
W C.12=Ø54	INNፎNI[MጊRጊጸፎ]ፎRTINAፎRCAጸ	SIMIAጊ	INፎCፀ	3
BwNY2, L:409	INNፎNIMጊRCጊጸፎ . . . . .	SIXIMጊ	INፎCፀ	4

**SEMISSSES - REVERSE**

Coll. Ref.	Legend	Obv. Field	Rev. Field	Die
PG12477	. . . . . RSSጸፎFRT . . . . .	ጊIMIAጸ	G/3	1
DMF 11	INN[ፎ]MIMSRSSጸፎ[FRT] . . . . .	ጊIMIAጸ	G/3	1
MAN 2004.117.26	. . . . . SRSSጸፎፎR[T] . . . . .	ጊIMIAጸ	G/3	1
BNF Seymour de Ricci 28	INNፎNIMጊ[R] . . . . . INAፎRCAጸ	ጊIMIAጸ	G/3; p r?	2
icaL20, L:53	INNፎNIMጊRCጊጸፎፎFRTINAፎፎR[C]	SIMIAጊ	G/3	3
PG12344	INNፎNIMጊRCጊጸፎፎFRTI[NAፎRCAጸ]	SIMIAጊ	G/3	3
KMK	INNፎNIMጊRCጊጸፎፎFRT[INAፎRCAጸ]	SIMIAጊ	G/3	3
S81A, L:1	INNፎNIMጊRCጊጸፎፎFRT[INAፎRCAጸ]	SIMIAጊ	G/3	3
W Cod.3=HSA 1001.57.5785	INNፎNIMጊRCጊጸፎፎFRTINAፎRCAጸ	SIMIAጊ	G/3	3
S00N, L:185	[INNፎ]NIMጊRCጊጸፎፎፎ[R] . . . . .	SIMIAጊ	G/3	3
W ANS.13=ANS 1917.215.3433	INNፎNIMጊRCጊጸፎ . . . . . ፎR	ጊIMIAጸ	G/3	4
W Cod.2=MAN 2004.117.25	INNፎNIMጊRCጊጸፎፎFRTINAፎፎI	SIMIAጊጊ	G/3	5
W 169	INNፎNIMጊR[Cጊ] . . . . . A[ፎF]I	SIMIAጊጊ	G/3	5
L99bis	. . . . . NI[M]ጊRCጊጸፎፎፎ[ፎR] . . . . .	SIMIAጊጊ	G/3	5
W Cod.4=HSA 1001.57.5787	INN[ፎNIMጊ]RCጊጸፎፎፎFRTIN[ፎፎ]	SIMIAጊጊ	G/3	6
MAN 2004.117.24	. . . . . ፎፎFRTIN[ፎፎ]	SIXIMጊጊ	G/3	6?
TOI383= S790, L:1	INN[ፎNIMጊ]RCጊጸፎፎፎFRTINI	SIMIAጊጊ	G/3	7
COI241	. . . . . ጊRCጊጸፎፎፎFRTINI	SIMIAጊጊ	G/3	7
PG12475	I[NN] . . . . . CጊጸፎፎፎFRTINI	SIMIAጊጊ	G/3	7
AC02D, L:455	INNፎNIMጊRCጊጸፎ . . . . .	SIMIAጊጊ	G/3	8
icaL24,	[INNፎ]NIMጊRCጊጸፎፎፎፎ[FRTIN]	SIX[IM]ጊጊ	G/3	8

<b>L:4081=S940, L:224= BN, L:839</b>				
<b>EG</b>	INNƏNIMZRZ .. [FRTIN]	SIMIAI2	G/3	8
<b>MJV92, L:222</b>	..... [ZRCZΛƏ] .....	SIMIAI2	G/3	8?
<b>HSA 1001.57.5786</b>	INNƏNIMZSCZ[E]OFRTINA	SIMIA2	G/3	9
<b>Bern 21-MC</b>	NNEZƏZNI2PN2CP ....	SIMIAI2	G/3	10
<b>W Cod.6=MAN 2004.117.22</b>	[N]E2ƏNI2P[N2] .....	SIXIM2	G/3	10
<b>W C.7=Ø46</b>	NNEZƏZNI2PN2CPIN2A	SIXIM2	G/3	10
<b>W P.31=L99</b>	NNEZƏZNI2P[N]2CPIN2A	SIMIAI2	G/3	10
<b>W 168</b>	NNEZƏZNI2P[N]2CPIN[2A]	SIMIAI2	G/3	10
<b>AC090, L:1397</b>	[NNEZ]ƏZNI2PN . ƏCP ....	SIMIAI2	G/3	10
<b>CNG41, L:2381</b>	[INN6]MIII2RCZΛƏ[FRTIN] ...	SIMIAI2	G/3	11
<b>MuM62, L:1</b>	..... CZΛƏFRTINA ..	SIMIA2	G/3	12
<b>W Cod.5=MAN 2004.117.23</b>	..... 2RCZΛƏFRTI ...	SIMIA2	G/3	12

*TREMISSES - REVERSE*

<b>Coll. Ref.</b>	<b>Legend</b>	<b>Obv Field</b>	<b>Rev. field</b>	<b>Die</b>	
<b>Stk09, L:3457=Lanz42, L:835</b>	[INN]6NIMSRCS[Λ6] .....	ZIMIAS	T/2	1	
<b>W 174</b>	.... [N]IMSRCSΛ6FRT[IN] ..	ZIMIAS	T/2	1	
<b>S800, L:4=S79A, L:1</b>	INNƏNIM[Z]RCZ[ΛƏFRT] ....	SIMIA2	T/2	2	
<b>Bern 25-MC</b>	INNƏNIM[Z]RCZΛƏFRTIN[AF]	SIMIA2	T/2	2	
<b>W 173</b>	INNƏNIM[Z]RCZΛƏFRTINA[F]	SIMIA2	T/2	2	
<b>ANS 1917.215.3434</b>	INNƏNIM[Z]RCZΛƏFRTINA[F]	SIMIA2	T/2	2	
<b>icaL26, L:44=AC090, L:1398</b>	INNƏNIM[ZRCZ] .....	[T]IN[AF]	SIMIA2	T/2	2
<b>AC04M, L:1178</b>	[INNƏ]NIM[ZR]CZ[ΛƏFRTINAF]	SIMIA2	T/2	2	
<b>KMK</b>	..... M2RCZΛƏFRT ...	SIMIA2	T/2	2	
<b>L108bis</b>	INNƏNIMZRC[Z] ... RTIN	SIMIAI2	T/2	3	
<b>Ku97, L:2136=MM13, L:901=JE84, L:986=Ra96, L:3005=P276, L:1062</b>	INNƏNIMZRC[Z] ... RTIN	SIMIAI2	T/2	3	
<b>Sp12026, L:1</b>	... [Ə]NIN2RCZ[RƏ] .....	SIXIM2	T/2	3	
<b>W P.32=L102</b>	INNƏNI .....	RTI	SIMIA2	T/2	4
<b>W C.9=Ø49</b>	INNƏNIMSRZCZΛƏFRTI	SIMIA2	T/2	4	
<b>S81A, L:2=S790, L:2</b>	INN[ƏNIM]2RCZΛƏFRTI	SIMIA2	T/2	4	
<b>Jena OMJ 305-B03=St39</b>	. [NƏ]NIMZRCZ .....	SIMIA2	T/2	4	
<b>COI242</b>	NNEZƏ[ZNI2P]N2CPIN2A	SIMIA2	T/2	5	

W 175	NNEZƏCNİZP . . . . . SΔ	SIMIKZ	T/2	5
PG10549	NNEZƏSN . . . . . Z[Δ]	SIMIKIZ	T/2	5
L100	NNEZƏ[Z]NIZ[P] . . . . . Δ	SIMIKIZ	T/2	5
TC	INNƏMIMZRCZ[R]ƏFRTI[N]	SIMIKIZ	T/2	6

**SERIES 2, PHASE 2 SOLIDI ANOMALIES**

*OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
icaL1, L:32	[ESTƏS]NISVNCVS .. NESNΛKIVS	SIMIKS	1	4.19
Bw14, L:968	[ESTƏ]SNISVNCV[SVI]NESNΛKIVS	SIMIKS	1	4.20
Sp144, L:852	ESTƏSN[ISV] . . . . SNESNΛKIV	SIMIKS	2	4.39
ME10, L:348	ESTƏSNISVNC[VISNES] . . . IV	SIM[I]KS	3	4.18
W C.13= Ø53	ES[T]ƏSNISVNCVISNESN[ΛK]IV	SIMIKS	4	4.298
TC NorthAfrica1	ESTƏSNISVNCV[IS]NESNΛKIV	SIMIKS	5	4.2292

*REVERSE*

Coll. Ref.	Legend	Obv. Field	Rev. Field	Die
icaL1, L:32	INƏNINS[R]MSANFRTINA[F]RC	SIMIKS	INƏCƏ	1
ME10, L:348	INƏN . . . . . NFRTINAFRC	SIMIKS	INƏCƏ	1
TC NorthAfrica1	INƏNINSRMSΛ[NF]RTINAFRC	SIMIKS	INƏCƏ	1
W C.13=Ø53	[INƏNINSRMSANFRTINAFRC]	SIMIKS	INƏCƏ	1
Sp144, L:852	INƏNINSR . . . . . INAFRC	SIMIKS	INƏCƏ	1
Bw14, L:968	INƏNINSRMSANFRTINAFRC	SIMIKS	INƏCƏ	1



*INDICTION XI – MAIN MINT - OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
L130	[INN]ƏNI]NƏN2Ə2222N	8-Point	1	4.265
JH11M, L:255=JH08M, L:209	INNƏNINƏ2N2N . . [ʔ2]N	8-Point	1	4.27
Nü73	[INNƏNI] . . [N2Ə]2222N	8-Point	2	4.232
AC01Ma, L:2252	I[NNƏ] . . [NI]Ə2N[2Ə]2222IN	8-Point	3	4.27
GM67, L: 965	INNƏNINƏSNSƏSSTSNIRS	8-Point	4	4.16
BN84O, L:117	INNƏNIN[Ə2] . . . 2222N	8-Point	5	4.37
PA12J, L:424	INNƏNI[N]Ə2N2Ə2222N	8-Point	6	3.54
ME69,L:4	INNƏNIN[I]ƏSNSƏSSTSN[R]2	8-Point	7	3.76

*INDICTION XI – MAIN MINT - REVERSE*

Coll. Ref.	Legend	Field	Die
L130	SL[Ə]FRTINSPNANN[XC] . NN•	INƏCXI	1
JH11M, L:255=JH08M, L:209	[S]LƏFRTINSPNANNXC[IIIIIN]	INƏCXI	2
Nü73	2L[Ə]FRTIN2PNANN[XC] . . . . NIN	INƏCXI	3
AC01Ma, L:2252	SLƏFRTIN2[PNA]NN[C]XIIIIINR	INƏCXI	4
GM67, L: 965	2LƏFRTIN2PNANNCXIIIIINN	INƏCXI	5
BN84O, L:117	SLƏFRT[IN] . . . . . XCIIIIIN	INƏCXI	2
PA12J, L:424	2[LƏFRT]I[N2]PNANNX . IIININ	I[N]ƏCXI	3
ME69, L:4	2LƏFRTIN2PNANNCXIIIIINN	INƏCXI	5

*INDICTION XI – SECONDARY MINTS - OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
CNG69, L:1925=JE85, L:1807	IIIIITÖRFNXN2202II	8-Point	1	3.38
JE85, L:1808=AC05J, L:225=AC00O, L:302=JV108, L:471=JV104, L:258	IIIIĐIIASSII[6I]ƏST	8-Point	2	3.48
ME39, L:414 <sup>485</sup>	IHHƏHHI . . . I2JSS6SOS .	7-Point	3	4.12
TC 93SPN2	IIIIII[I]IIN2I[TF] . . SS[Ə]II	8-Point	4	3.5452

<sup>485</sup> Formally in the Tonegawa Collection.





<b>L:166</b>				
<b>MH75, L:388</b>	[IIIIð]IIHð[T]RFT22[ð] . . .	8-Point?	57	NW
<b>Pliego3</b>	IIINI . . . . N . H22ð	8-Point	35	3.29
<b>Pliego4</b>	unclear	8-Point	??	2.90
<b>AC04M, L:1179</b>	[I•]HHðHH . . . . ZSSOSSHHð	8-Point	58	3.02
<b>W P.44=L133</b>	I•HHðH . . . . ZSSOSSHHð	8-Point	58	3.047
<b>S94A, L:287</b>	I[•]H[H]. . . . . H . ZSSOSSHHð	8-Point	58	3.70
<b>Pliego1</b>	[I•]HHðHHIS[ç]ðH . ZSSOSSHHð	8-Point	58	4.06
<b>ME69, L: 3</b>	[I•HH]ðHHIS[ç]ðHIZSSOSSHH ð	8-Point	58	3.60
<b>KMK</b>	IHHðHHH.ðHIZSSð . H . ð	8-Point	59	3.2678
<b>AA10, L:253</b>	IHHðHIHIð•SIISð•SSçSHI	8-Point	60	3.82
<b>JV125, L:456</b>	IHHðIIIIIIð•SIISð•STSHI	8-Point	60	NW
<b>JE106, L:1007=JE94, L:1741=JE88, L:1863=JE233, L:969=CNG66, L:1695=JE81, L:698</b>	IHHðHIHIð•SIISð•SSçSHI	8-Point	60	4.28
<b>Sp27, L:32</b>	IHHðIIINIð•SHSð•SSçSNI	8-point	60	3.18
<b>ME54, L:33</b>	[I]HHðHIHIðSHSðSSçSHI	8-Point	61	3.63
<b>TC 93SPN6</b>	. . NðHHSS . ONNIZSSOS . . . .	8-Point	62	2.9458
<b>ECT1027</b>	. . NðHHSS . ONNIZSSOS . . . .	8-Point	62	3.15
<b>BalEm22</b>	INNðHHSS . ONNIZSSOS . . . ð	8-Point	62	3.68
<b>Pliego2</b>	INNðNNSSçONNIZSSOS . ISð	8-Point	62	3.63
<b>TC 93SPN4</b>	NNðNINðNð . 2Nðçç:2	8-Point	63	4.3419
<b>WC1, L:96</b>	IHHð . . . . . IðTSSðSðSð	7-Point	3	4.13
<b>MAN 2004.117.7</b>	[I]NN[I]NðINð2N2ðçççNR2	8-Point	65	4.0857
<b>GNAC37925=BalEm15</b>	IHNðNHINð2H2ðçççHR2	8-Point	65	3.8369
<b>NG7, L:445=icaL20, L:54=HD323, L:351=MH06M, L:324</b>	NNINðINN2N2N2ðççç	7-Point	66	4.12





<b>AC12M, L:1082</b>	... [FR] ..... H .....	IHƏCXI	55
<b>HSA 1001.1.13219</b>	ИИИ .....᠔IS	IX᠔᠒ИИ	56
<b>Bw26, L:1588=BwFP6, L:6=icaL1, L:16=AU95M, L:166</b>	..... [P]NANNX ...	IX᠔᠖NI	57
<b>MH75, L:388</b>	TOH . ПИИИИ . ИI2 .....	IX᠔[R]NI	58
<b>Pliego3</b>	unclear	IX᠔᠖NI	35?
<b>Pliego4</b>	unclear	IX᠔᠖NI	59?
<b>AC04M, L:1179</b>	[᠔]SS᠔FRТИHS[И]H . . XIHH	IHƏCH	60
<b>W P.44=L133</b>	[᠔]SS᠔FR ... СИИИ᠔XIHH	IHƏCH	60
<b>S94A, L:287</b>	[᠔]SS᠔FRТИHSИИИИHXИИИ	IHƏCH	61
<b>Pliego1</b>	[᠔]SS᠔FRТИHSИИИИ᠔XIHH	IHƏCH	60
<b>ME69, L:3</b>	᠔SS᠔FRТИHSИИИИ᠔XIHH	IHƏCH	61
<b>KMK</b>	᠔SS᠔FRТИ[H]СИИИИ᠔XIHH	IHƏCH	61
<b>AA10, L:253</b>	SI᠔[S]RTI[N]SPNΛИИHXИИИ	HIƏCXI	62
<b>JV125, L:456</b>	SI᠔[SRTINS]PN . ИI[HH]IXИИИ	ИИИƏCXI	62
<b>JE106, L:1007=JE94, L:1741=JE88, L:1863=JE233, L:969=CNG66, L:1695=JE81, L:698</b>	SI᠔[S]RTI[N]SPNΛИИHXИИИ	HIƏCXI	62
<b>Sp27, L:32</b>	SI᠔SRTIN[SPN] . ИИHXИИИ	NIƏCXI	62
<b>ME54, L:33</b>	[SI᠔]S . [T]INSPII[ΛI]HHI . ИИИ	[H]IƏCXI	63
<b>TC 93SPN6</b>	[S]S .....H᠔S᠔TXCIH H	IHOС-N	64
<b>ECT1027</b>	[SS᠔F] ... NS .. [H᠔]S᠔[TXCI]HH	IHOС-N	64
<b>BalEm22</b>	..... [NSP . [H᠔]S᠔TXCIHH	IHOС-N	64
<b>Pliego2</b>	SS᠔FRТИNSPHH[H᠔]᠔TXCIHH	IHOС-N	64
<b>TC 93SPN4</b>	SLO•[F] . TINSPNΛIXCIИИИ	INƏCXI[И]	65
<b>WC1, L:96</b>	SLƏFRТИNSИИИИHXИИИИ	IИƏCXI	3
<b>MAN 2004.117.7</b>	ZIƏFRТИN2PNΛANNXCИИИИИИ	IN[᠔] · EXI	66
<b>GNAC37925=BalEm15</b>	SIƏFRТИN2PNΛNHXCИИИИИИ	IN[᠔] · EXI	66
<b>NG7, L:445=icaL20, L:54=HD323, L:351=MH06M, L:324</b>	Z᠔FRТИN2NINIИI2HXИИИИИИ	IN9CXI	67

*INDICTION XI• - MAIN MINT - OBVERSE*

<b>Coll. Ref.</b>	<b>Legend</b>	<b>Field</b>	<b>Die</b>	<b>WT</b>
BalEm14	INNƏNINƏZNGƏZTZNIF[Z]	8-Point	1	4.77
W ANS. 14=ANS 1917.215.3436	I[N]NƏNINƏZNGƏZTZN] ...	8-Point	1	4.264
CNG26, L:710	INNƏNINƏZNGƏZTZNITZ	8-Point	1	4.25
S84A, L:14	..... NƏZNGƏZTZNITZ	8-Point	1	4.21
S92A, L:299=S91O, L:194	INNƏNINƏZNGƏZTZNIFZ	8-Point	1	4.26
CNGXVII, L:908	INNƏNINƏZNGƏ[ZTZN]TZ	8-Point	1	4.31
CM3	[I]NNƏNININƏZNGƏZTZN[RZ]	8-Point	2	4.23
BalEm13	INNƏNINININƏZNGƏZTZN . NZ	8-Point	3	4.22
Sm1981.3028.385	INNƏNINININƏZNGƏZTZNƏN .	8-Point	3	4.355
KC AV327	IN[N] ..... [ə]ZNGƏZTZN	8-Point	4	4.229
TC 94SPN1	INNƏNINININƏZNGƏZ[ZTZ] ...	8-Point	5	4.9335
AC06M, L:17	[INN]ƏNINININƏZNGƏZ .....	8-Point	5	4.26
HSA 1001.1.13220	INNƏNININƏZNGƏZTZN	8-Point	6	4.259
MAN 2004.117.8	INNƏ[NININININ]ƏZTZN	8-Point	6	4.2415
Bern 30-C0002	INNƏNININININININININ . N	8-Point	5	4.22
ME69, L:5	INNƏNININININININININ	8-Point	5	4.23

*INDICTION XI• - MAIN MINT - REVERSE*

<b>Coll. Ref.</b>	<b>Legend</b>	<b>Field</b>	<b>Die</b>
BalEm14	ZLƏ[FRTI]NZNPNANNXCIIININ	INƏCXI•	1
W ANS. 14=ANS 1917.215.3436	ZLƏFRTINZNPNANNXCIIININ	INƏCXI•	1
CNG26, L:710	ZLƏFRTINZNPNANNXCIIININ	INƏCXI•	1
S84A, L:14	ZLƏFRTINZNPNANNXCIIININ	INƏCXI•	1
S92A, L:299=S91O, L:194	ZLƏFRTINZNPNANNXCIIININ	INƏCXI•	1
CNGXVII, L: 908	..... [IN]ZPNANNXCII .....	INƏCXI•	1
CM3	ZLƏFR[TINZNPNANN]XCIIINIP	INƏCXI•	2
BalEm13	ZLƏFRTINZNPNANNXCIIINIP	INƏCXI•	2
Sm1981.3028.385	ZLƏFRTINZNPNANN ..... [N]IP	INƏCXI•	2
KC AV327	ZLƏF[RTI]NZNPNANN]XCNIINP•	INƏCXI•	3
TC 94SPN1	ZLƏFRTINZNPNANNXCIIIN NP[•]	INƏCXI•	3
AC06M, L:17	ZLƏF[RTIN]ZNPNANNXCIIINNP[•]	INƏCXI•	3
HSA 1001.1.13220	[N]IZLƏFRTINZNPNAN[N] .....	INƏCXI•	4
MAN 2004.117.8	[NI]ZLƏFRTINZNPNAN[N] .....	INƏCXI•	4

Bern 30-C0002	[2LƏFRTIN2P]NANNXCIIIIN	INƏCXI• 5
ME69, L:5	2LƏFRTIN2PNANNXCIIIIN	INƏCXI• 5

*INDICTION XI• - SECONDARY MINTS - OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
CNG70, L:1143	[N]IINƏN . . . . 2T22NIG	8-Point	1	4.44
TC 94SPN2	IN9N[I]ИИ[2]ИИHƏH22T[2T]	8-Point	2	3.8383
KC AV 328	2 . 6 . . . SS6S0ИИ6ИИ	8-Point	3	3.643
Stk09, L:3458	S . И . . SS6S0S6ИИИ6ИИ	8-point	4	3.19
HSA 1001.57.4934	[I]NIIƏXIHИHƏ22И[I]ƏNI[τ]2[2]	8-Point	5	3.731
S87M, L:608	2H . . . SSƏ[IIIIIIII]CИИ	8-Point	6	3.40
S82O, L:1	IHH6HI . . . N2JSS6S6S6	7-Point	7	3.99
HSA 1001.57.4933	6I:N . . . . . SSS6S6S6NI6NIII	8-Point	8	3.382
CNG47, L:2091	IN[6]H[H] . . . . . RSN	7-Point	9	4.25
JH05D, L:237= JH03F, L:408=JH01O, L:369=JV107, L:300	[III]N2HH2I[ə]2ə22TNГ[L]2	8-Point	10	3.78
JH98M, L:218	IN6NN . . . . 22[2]CN2N	8-Point	11	3.52
MJV94, L:512	HЬTRCT22ə[NINIII] . . . . .	unclear	12	3.10
AC02D, L:456	ИИIO2OH2H[Hτ] . 2IL2 . . O	8-Point	13	4.02

*INDICTION XI• - SECONDARY MINTS - REVERSE*

Coll. Ref.	Legend	Field	Die
CNG70, L:1143	. . . . IN2PNANN . . . . . N	INƏCXI•	1
TC 94SPN2	2ИФЯТII29ИЛИИHXCIИИИ[.]	ИИƏCXI•	2
KC AV328	SL0F[R] . . . . ИИИ . CИИИ	ИИƏCXI•	3
Stk09, L:3458	2LƏFRTIINSPIИИИИHXCIИИИ	ИИ[ə]XI•	4
HSA 1001.57.4934	R[F]T[N]Iə22ə2ИИИ . . [22ə22]ИИИ	I[H]əCXI•	5
S87M, L:608	. . . [R] . . . [S] . . . I[S]ИИ[XC]ИИИ[N]	INƏCXI•	6
S82O, L:1	2LƏF[Λ]TIH2[P]ИИHXCIИИ[H]	NƏCXI•	7
HSA 1001.57.4933	. . . . . S9NΛNXCИИ:IИ	INƏCXI•	8
CNG 47, L:2091	. . . . [RIN2I]N . N . . . . .	INƏCXI•	9
JH05D, L:237= JH03F, L:408=JH01O, L:369=JV107, L:300	2 . əF[Я]TIN2ИИИ . CИИИ	ИИ[ə]C[X]I•	10
JH98M, L:218	. . . . . H2NP . NINXII . .	•IXC6ИИ	11
MJV94, L:512	. . . . . P[NИИИ]R . . . [H] . . .	•IXC9ИИ	12
AC02D, L:456	2[L]F[Я]TI29ИЛИИHXCIИИ[N]ИИ	ИИƏCXI•	13

*INDICTION XII – MAIN MINT - OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
W B.13=Nü75	INNƏNINIƏZNGZƏZT[NIZI]	ԻՄԸԿ-	1	4.275
W C.14=Ø51	INNƏNINIƏZNGZƏZTIN	ՉԻՄԻԼԻԶ	2	4.244
CM4	INNƏNINIƏZNGZƏZTԸINZI	ՉԻՄԻԼԻԶ	3	4.21
MAN 2004.117.11	.... [N]IƏZNGZƏZTNGZ[T]	ԻՄԸԿ	4	4.4132
Bw30, L:16	INNƏNINIƏZNGZƏZT	ՉԻՄԻԼԻԶ	5	4.21
BwFP5, L:7	INNƏNINIƏZNGZƏZT[Շ]Չ[N]Չ	ՉԻՄԻԼԻԶ	6	4.34
MAN 100B01	INNƏNINIƏZNGZƏZTNGZ	ՉԻՄ[ԻԿ]ԻԶ	6	4.1974

*INDICTION XII – MAIN MINT - REVERSE*

Coll. Ref.	Legend	Field	Die
W B.13=Nü75	ՉԼƏFRTINZPN ..... [N]I	INƏCXII	1
W C.14=Ø51	ՉԼƏFR[TINZP]NANN[I]XZIIIN	INƏCXII	2
CM4	ՉԼƏ ..... [ZP]NANNIXCII	INƏCXII	3
MAN 2004.117.11	ՉԼƏFRTINZPNANNIXCII	INƏCXII	3
Bw30, L:16	ՉԼƏFR .. NZPNAN[N] .. IIII	INƏCXII	4
BwFP5, L:7	ՉԼƏFRTINZPNANNXC[N]II	INƏCXII	5
MAN 100B01	ՉԼƏFRTINZPNANNXNII	INƏCXI	5

*INDICTION XII – SECONDARY MINTS - OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
BalEm 26= MNAC GNC38509	CZƏZHHHHHHHSHTƏS	8-point	1	3.3362
W P.45=L132	CZƏ[Ə]H[I]HHHHHSHTƏS	8-Point	1	3.364
ME63, L:5	... NN... ZƏZƏZTH[PH] .	8-Point	2	4.095
JH99M, L:201	IHH[Չ]THI[Չ]HCZ[H]ƏHZH	8-point	3	NW
JV99N, L:388	IHHƏHHI . Յ . HƏTSS[Շ]SƏS[Ə]	7-point?	4	3.60
MARQ51	HH[N]IZ[F] .. ՈՒՏ . ƏN ..... Տ	9-Point?	5	3.10
TC 94SPN4	IN[N]Ə[NINI]ƏZNGZƏZ[ՉƏ]NI	8-Point	6	4.194
BalEm31	NIAZNƏN . ZNGZNƏIƏZƏZTNGZ	ՉINƏԻԶ	7	4.27

*INDICTION XII – SECONDARY MINTS - REVERSE*

Coll. Ref.	Legend	Field	Die
BalEm 26= MNAC GNC38509	SI[əLF]ILN[ə]IHTIIIXCIIIHI[P]	IHəCXII	1
W P.45=L132	SI[əLF]ILN[ə]IHTIIIXCIIIHI[P]	IHəCXII	1
ME63, L:5	ʒΓə[F]R[T] ..... INN	[I]HəCXII	2
JH99M, L:201	INNəNIMʒRCʒ[χ]əF[RTINAF]	INəCXII	3
JV99N, L:388	ʒIə[F]R[T]IM[Δ]ʒIIMIIIXIIIIHIG	IHəCXII	4
MARQ51	[N]IIIIIDXIIIZ[ɣ]SN . F[R] .....	IHəCXII	5
TC 94SPN4	ʒIəN ... [P] ..... H	IIXəII	6
BalEm31	ʒIə[N]ʒFRTINʒəN ..... ʒN[N]	INəC[†]II	7

*SIMILIS – OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
Fig2	IN[NI]N[ə] . [PN]ʒ[ə]ʒʒʒʒNʒT	8-Point	1	NW
MAN 2004.117.12	I[NNINə] . [P]NʒəʒʒʒʒNʒT	8-Point	1	3.6298
AC04A, L:213	I[N] ..... [ʒH]ʒOʒʒ .. [ʒ]N	8-Point	2	4.37
W 183	IHHIIʒH[ʒə] ... HʒT	7-Point	3	4.7564
W P.47=L129	I .... [ʒHʒə]ʒʒʒʒHʒT	7-Point	3	4.382
BalEm37	IHHIIʒHʒ ..... T	7-Point	3	4.24
Sp34, L:13	[IIIIIIəN] ʒ ... ʒ . ʒʒ . ʒT	8-Point	4	4.45

*SIMILIS – REVERSE*

Coll. Ref.	Legend	Field	Die
Fig2	[N]ʒLəFRTINʒPNNN[A] ...	•ʒI[N]IΛ[ʒ]	1
MAN 2004.117.12	NʒLəFR[TINʒP]..... II	•ʒI[N]I[Λʒ]	1
AC04A, L:213	NʒLəFR[T]IN[ʒ]PNN[A]NXIIII	•ʒIIII[Λ]I[ʒ]	1
W 183	[ʒLəFRNN] .....	[•ʒIN]IΛ	2
W P.47=L129	NʒL[ə]F[R]NNʒINNNXIIII	•ʒINIA	2
BalEm37	unreadable	•ʒINIA	3
Sp34, L:13	ʒLəFRTINʒ[I]PNNNXIIII	ʒNIAI	4

*IAE2RC – OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
COI215=BalEm38	INNƏNINƏ2N2Ə22T2N	8-Point	1	4.25

*IAE2RC – REVERSE*

Coll. Ref.	Legend	Field	Die
COI 215=BalEm 38	I[N]ə[NIIə]E2TƏ2N2Ə2T	IAE2RC	1

*AI - OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
icaL18, L:42	INNINN2N2Ə22T2N2T	8-Point	1	4.89
W HSA. 8=HSA 1001.1.13221	INNINN2N[2ə] .. T2N2T	8-Point	1	4.710
Nü74	I[N]IIN[2ə]2222N2T	8-Point	2	4.43
MAN 2004.117.10	[INN . NI .]2N2Ə22T2N2[T]	8-Point	3	4.2004

*AI - REVERSE*

Coll. Ref.	Legend	Field	Die
icaL18, L:42	N2LƏFRTIN2•[P]NNNXIIII	[I]N9CAI	1
W HSA. 8=HSA 1001.1.13221	N2LƏFRTIN2•[P]NNNXIIII	[I]N9CAI	1
Nü74	[N]2LƏF[R]TIN[2P]NNIN . IIII	NI9CAI	2
MAN 2004.117.10	N[2]LƏFRTI[Δ]NNINIIII	I19CAI	3

SERIES NA 2, PHASE 3

*SOLIDI - OBVERSE*

Coll. Ref.	Legend	Field	Die	WT
Sp22, L:20	INNƏNINƏZN2Z[χ]2ƏNIZ[I]	2IMIKI2	1	4.40
W B.12=Nü70	I[NNƏNI]NƏZN2ZIZ[ə]N[2IAχ]	2IMIKI2	2	4.332
JE69, L:756	I[NN]ƏNINƏZN2ZIZ[ə]N2I[Aχ]	2IMIKI2	2	4.24
AC06D, L:99=AC03D, L:164	2LƏFRTINAFRC[χANVIN]I	2I[N]IA2	3	4.03
Bw26, L:1587	2LƏFRTINAFRCX[əNə]N	2IN[I]KI2	4	4.21

*SEMISSSES AND TREMISSSES - OBVERSE*

Coll. Ref.	Date	Den.	Legend	Field	Die	WT
W B.14=Nü71	95	Tre	2LƏFRTINAFRKANXCV	2IMIKI2	1	1.319
KMK	95	Tre	2LƏFRTINAFR[K]ANXCV	2IMIKI2	1	1.3124
W P.46=L112	95	Sem	2LƏFRTINAFRKANXCV	2[I]MIKI2	1	1.950
W B.15=Nü72	95	Tre	2LƏFRT[INAFRK]ANXCV	2IMIKI2	2	1.344
BNF HS 28	96?	Sem	2LƏFRTINAFRKAN[X]	2INIKI2	3	2.004
W 182	95	Sem	2LƏFRTINA[FRKANXC]VNI	2IMIKI2	4	1.9772
W C.15=Ø47	96	Sem	2LƏFRTINAFRKANXCVI	2IMIKI2	5	1.962
Jena OMJ305-B02=St38	95?	Tre	[2]LƏFRTINAFRKANXN	2I[MIKI2]	6	1.37
KMK	96?	Sem	2LƏFRTINAFRC[A]NVI	SINIKS	7	1.8176
Leu56, L:20=S81M, L:1	96	Sem	2LƏFRTINAFR[K]ANXVI	2MIKI2	8	2.06

*SOLIDI - REVERSE*

Coll. Ref.	Legend	Field	Die
Sp22, L:20	SLƏFRTINAFRC[ANNXI]N	INƏCXIII	1
W B.12=Nü70	2L . . . . . [F]RCANNXC[I]N	INƏCXII .	2
JE69, L:756	2LƏFRTIN . . CANNXCIIN	INƏCXIII	2
AC06D, L:99=AC03D, L:164	INNƏNINƏZN2ZIZNƏZI[N]	I[NƏCXIII]	3
Bw26, L:1587	INNƏNIN[ə2]N2Z[I]2NƏZƏN2	INƏCXIII	4

*SEMISSSES AND TREMISSSES - REVERSE*

Coll. Ref.	Den.	Legend	Field	Die
KMK	Sem	IİƏNINƏZN2ZIZNƏZ	G/3	1
Leu56, L20	Sem	INNƏNIN[ə2N]2ZIZN[ə]2	G/3	2

<b>BNF HS 28</b>	Sem	INNƏNIN[ə]NəZNZZI2[1]	G/3	3
<b>W C.15=Ø47</b>	Sem	INNƏNINəZNZZI2NəZI	G/3	4
<b>W P.46=L112</b>	Sem	INNƏNINəZNZZI2NəZ•	G/3	5
<b>W 182</b>	Sem	[1]NNƏNININ[ə]SN . . . . .	G/3	6
<b>KMK</b>	Tre	INN[ə]NIN[2ə]N[2ZI2N]əI	T/2	1
<b>W B.14=Nü71</b>	Tre	INN[ə]NIN[ə]2N[2ZI2]NəI	T/2	1
<b>Jena OMJ305-B02=St38</b>	Tre	INN[ə]NI[Nə]2NZZI2N[ə]	T/2	2
<b>W B.15=Nü72</b>	Tre	INN[əNI] . . . NZZI2NəI2	T/2	3

SERIES NA 3

97/715-16 - *OBVERSE*

Coll. Ref.	Legend	Die	WT
Col1 <sup>487</sup>	2ΛΔFRTINAFRKANXCVIIN	1	NW
StM 1935.125	2ΛΔFR[T]IN[A]FRK[A]N[X]CVIIN	1	4.203
icaL2, L:20	2ΛΔFRTINAFRKANXCVII[N]	2	4.25
W Cod.9 <sup>488</sup>	2ΛΔFRTINAFRKANXCVIIN	2	NW
Sp144, L:853	2ΛΔFRT[INAF]RKANXCVII	3	4.26
S93J, L:170	2ΛΔFRTINAFRKANXCVI .	4	4.21
W 184	2ΛΔFRTINAFRKANXCVII	4	4.2694
W C.16=Ø55	2ΛΔFRTINAFRKANXCVII	5	4.255
Sp133, L:1=Leu64, L:1.1	2ΛΔFRTINAFRKANXCVII	6	4.27
W P.49=L113	2ΛΔFRITINAFRKANXCVII	7	4.200
BalEm53	2ΛΔFRTINAFRKANXCVHII	8	4.01

98/716-17 - *OBVERSE*

Coll. Ref.	Legend	Die	WT
KC AV0329=Sp31, L:52	2ΛΔFRTINAFRKANXCVIIIN[.]	1	4.256
Parv	2ΛΔFRTINAFRKANXCVIIIN[.]	1	4.15
icaL24, L:4082=S940, L:225=SBN92, L:843	2ΛΔFRTINAFRKANXCVIII	2	4.26
GM121	2[ΛΔFRT]I[N]AFRKANXCVIII	3	4.28
icaL1, L:33	2ΛΔFRTINAFRKANXCVIII	4	4.23
S950, L:1	2ΛΔFRTINAFRKANXCVIII	5	4.22
S990, L:257	2ΛΔFRTINAFRKANXCVIII	6	4.14
SBN84, L:116	2[Λ]ΔFRTINAFRKANXCVIII	6	4.21
S98A, L:182	2ΛΔFRTINAFRKANXCVIII	7	4.24
W P.50=L114	2ΛΔΛFRTINΛFRKANXCVIII	8	4.373
KC ALS0001	2ΛΔFRTIN[A]FRKANXCVIII	9	4.245
Zam48	2ΛΔFRTINAF[RIK]ANXCVIII	10	4.28
BCT8=Wa4	2ΛΔFRTINAFRKANXCVIII	11	4.17
Cod11 <sup>489</sup>	[2]ΛΔFRTINAFR[KA]NXC VIII	12	4.15
S84A, L:5=TOI384	2ΛΔFRTINAFRKNANXCVIII	13	4.25
W 185	2ΛΔFR[TINAF]RKNANXCVIII	13	4.2667
Mun19	2ΛΔFRTINAFRKANXCVIII	13	4.29
AC090, L:1399	2ΛΔFRTINA[FRKAN]XCV[I]II	13	4.27

487 Engraving.

488 Drawing.

489 Drawing.

ME37, L:493 <sup>490</sup>	𐌲𐌳𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌸𐌹𐌹𐌹𐌹	14	4.16
JJV99, L:398	𐌲𐌳𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌸𐌹𐌹𐌹𐌹𐌹	14	NW
AC05D, L:2136	𐌲𐌳𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌸𐌹𐌹𐌹𐌹𐌹	15	4.25
TC	𐌲𐌳𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌸𐌹𐌹𐌹𐌹𐌹	16	4.2215

99/717-18 - *OBVERSE*

Coll. Ref.	Legend	Die	WT
BalGacNum43, 12	𐌲𐌳𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌸𐌹𐌹𐌹𐌹𐌹	1	4.05
ANEB, L:404	𐌲𐌳𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌸𐌹𐌹𐌹𐌹𐌹	1	4.585
S84A, L:16	[𐌲𐌳𐌹]𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌸𐌹𐌹𐌹𐌹𐌹	2	4.19
Br330	𐌲𐌳𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌸𐌹𐌹𐌹𐌹𐌹	3	4.28

97/715-16 - *REVERSE*

Coll. Ref.	Legend	Die
Coll <sup>491</sup>	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹	1
St, 1935/125	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹	1
icaL2, L:20	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹 . . . . . IN𐌹𐌺𐌹	2
W Cod.9 <sup>492</sup>	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹IN𐌹𐌹	3
Sp144, L:853	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹	4
S93J, L:170	I[INN𐌹𐌺𐌹]𐌹𐌺𐌹 . 2 . . [𐌺𐌹]IN𐌹	5
W 184	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹 . . [𐌺𐌹]𐌹𐌹	10
W C.16	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹[𐌺𐌹]	6
Sp133, L:1=Leu64, L:1.1	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹[𐌺]𐌹IN[𐌹]𐌹	7
W P.49=L113	NN𐌹𐌺𐌹INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹	8
BalEm53	INN[𐌹𐌺𐌹𐌹𐌹]𐌹𐌺𐌹𐌹𐌹𐌺𐌹𐌹𐌹	9

98/716-17 - *REVERSE*

Coll. Ref.	Legend	Die
KC AV0329=Sp31, L:52	INN𐌹𐌺𐌹IN𐌹𐌹[𐌹𐌺𐌹𐌹𐌹] . . . [𐌹]𐌹𐌹	1
Parv	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹	2
icaL24, L:4082=S940, L:225=SBN92, L:843	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹	3
GM121	NSS·SM𐌹S𐌹[𐌹𐌹𐌹𐌹𐌹]	4
icaL1, L:33	INN𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹𐌺𐌹𐌹[𐌹𐌹𐌹]	5

490 Formerly in Tonegawa Collection.

491 Engraving.

492 Drawing.

S950, L:1	INN[əNINə]2N22[12N]ə2INə2•	6
S990, L:257	INNəNINə2N2212N[ə]2I[N]ə2•	7
SBN84, L:116	INNəNINə2N2212Nə2[Nə12]	8
S98A, L:182	INNəNINə2N2212Nə[2]I[N]2N	9
W P.50=L114	INNəNINə2N212Nə2INə	10
KC ALS0001	[INNə]NINə2N2212Nə2N[I]	11
Zam48	ИИИОИИИВ . . . . . И	12
BCT8=Wa4	INNəNINə2N2212Nə2IN[ə]Nə2	13
Cod11 <sup>493</sup>	INNəNINə2I12212N2 . INəN	14
S84A, L:5=TOI384	INNəNINə2N2212N[ə]2IN2NI	15
W 185	INNəNINə2N22[I]2[Nə]2IN	16
Mun19	INNə[NINə]2[N]2212Nə2I[N]	16
AC090, L:1399	INNəNINə2N2212[IN]ə[2]I[N]	16
ME37, L:493 <sup>494</sup>	INIəNINə2N2212Nə2IN	17
JJV99, L:398	IN . . NINə2N2212Nə2IN	17
AC05D, L:2136	[INNəNINə]2N2212Nə212N2	18
TC	INNəNINə2N2212Nə2IN	19

99/717-18 - REVERSE

Coll. Ref.	Legend	Die
BalGacNum43, 12	INNəNINə2N2212Nə2IN2	1
ANEB, L: 404	INNəNINə2N2212Nə2IN2	1
S84A, L:16	INNəNINə2N[22] . . . . . 2	2
Br330	INNəNINə2N[22] . . . . . 2	3

493 Drawing.

494 Formerly in Tonegawa Collection.

SERIES IP 3

*SOLIDI*

Coll. Ref.	Obverse Legend	Obv. Die	Rev. Die	WT
BalEm52	ΖΧΘΡΤΙΝΙΑ[ΘΑ]ΙΝΧΙΙΙΝ[Ι]	1	1	4.03
Bw26, L:589	ΖΧΘΡΤΙΝΙΑ[ΘΑ]ΙΝΧΙΙΙΝ[Ι]	1	1	4.12
MAN 1933.45.1	FERITO22OLIIN2PANANXC	2	2	4.2961
CNGIX, L:1804	FERITO22OLIIN2PANANXC	2	3	4.16
PG13217	FERITO22OLIIN2PANANXC	3	1	4.1313
AC090, L:1400	FERITO22OLIIN2PANANXC	3	4	4.09
AC12M, L:100	FERITO22OLIIN2PANANXC	3	1	4.11
PG18967	FERITO22OLIIN2PANANXC	3	4	4.1508
KC AV1089=Sp37, L:25	FERITO22OLIIN2PANANXC	4	5	4.077
W Lis.1=Fig1	FERITO22O[L]IN2P[A]N[A]NXC[V]I	5	6	NW
TCBilingual1	FERITO22O[L]IIN2P[A]N[A]NXCVI	5	6	4.1031
L136bis	FERITO22O[L]IIN2PANANXCVI	5	6	4.119
S950, L:2	FERITO22OLIIN2[A]PNANXC	6	7	4.13
W P.51=L136	FERITO22OLIIN2 . . NANXC	6	7	4.103
W Cod.10=MAN 2004.117.13	FERITO22OLIN2PANANXC	7	1	4.1210
PC=AC01M, L:1137	FERITO22OLIN2PANANXC	7	1	4.07
W J.6=Jena 305- B01=St40	FERI . . . . . IIN2P[A]N[A]N[XC]	8	8	4.09
CM5	FERITO22OLIIN2PAN[A]NXVCI	9	7	4.16
ANS 1994.55.1=S93D, L:49	FERITO22OLIIN2PANANXVCI	9	7	4.122
Nü76	FERITO22OLIIN2PANANX	10	9	4.025
W C.17=Ø59	FERITO22OLIIN2PANANX	11	4	4.165
Bern 35aa-C0004	FERITO22OLIIN2PANANXCV	12	10	4.21
MAN 2004.117.15	FERITO22OLIIN2P[A]N[A]NXC	13	14	4.1691
S93J, L:171	FERITO22OLIIN2PAN[A]NXC	13	4	4.17
TOI385	FERITO22OLIIN2PANANXCV	13	14	4.12
W Mad.2=MAN 2004.117.16	FERITO22OLIIN2P[A]NANXCV	14	11	4.2641
ME37, L:494;	FERITO22OLIIN2PANAN . . CV	15	4	4.13
W Cod.11=MAN 204.117.14	FERITO22OLIIN2PANANXCVN	16	12	4.1633
BalEm47	FERITO22OLIIN2P[A]N[A]NXC	17	3	4.02
Bern 35aa-C0003	FERITO22OLIIN2PANAN	18	7	4.19

ME69, L:6	FERITO22OLIIN2PANAN	18	7	4.14
W C.18=Ø60	FERITO22OLIIN2P[A]N[A]N	18	6	4.136

**SEMISSES - OBVERSE**

Coll. Ref.	Legend	Field	Die	WT
MAN 2004.117.18	[F] . . . O22LIIN2•PANANI	8-Point	1	1.8939
W P.48=L127	F[€]ITO22LIIN2•[PA]N[A]NI	8-Point	1	1.909
MAN 2004.117.19	F[€]ITO22LIIN2•PANANI	8-Point	1	1.9428
BalEm59	FEITO22LIIN2•PANANI	8-Point	1	1.89
ME37, L:492 <sup>495</sup>	FEITO22[L]IIN2•PANANI	8-Point	1	1.92
W HSA.9= HSA 1001.1.13162	FEITO22LIIN2•P[A]NANI	8-Point	1	1.921
HSA 1001.57.4935	FEITO22LIIN2•PANANI	8-Point	1	1.930
AC09O, L:1401=P276, L:1065	FEITO22LIIN2•PANANI	8-Point	1	1.87
AC07M, L:5	FEITO22LIIN2•PANANI	8-Point	1	1.88
TC74	[FERITO22]OL[IIN2]PAN	8-Point	2	1.9304

**TREMISSIS - OBVERSE<sup>496</sup>**

Coll. Ref.	Legend	Field	Die	WT
W Mad 1=MAN 2004.117.20	FEITO22LIIN2•PA[N] . . .	8-Point	1	1.2606

**SEMISSES - REVERSE**

Coll. Ref.	Legend	Field	Die
MAN 2004.117.18	FERITO2 . . . . . PANAN	G/3	1
W P.48=L127	F[€]RITO22[OLIIN2PANAN]NI	G/3	2
MAN 2004.117.19	INNƏNINƏ2N22I2NƏ2INƏ .	G/3	3
BalEm59	FERITO22OIIIN2PANAN	G/3	1
ME37, L:492 <sup>497</sup>	FERITO22O[I]IIN2PANAN	G/3	1
W HSA.9= HSA 1001.1.13162	INNƏNINƏ2N22I2NƏ2I[NƏ2]	G/3	3
HSA 1001.57.4935	FERITO22OIIIN2PANAN	G/3	1
AC09O, L:1401=P276, L:1065	FERITO22OLIIN2PANANI	G/3	2
AC07M, L:5	FERITO22OIIIN2PANAN	G/3	1
TC74	[I]NN[ə]NI[NƏ2]N2[2I2NƏ]	G/3	4

495 Previously in Tonegawa Collection.

496 Obverse die of Series IP 3 tremissis is the same as OD1 of Series IP 3 semisses.

497 Previously in Tonegawa Collection.

*TREMISSIS - REVERSE*

<b>Coll. Ref.</b>	<b>Legend</b>	<b>Field</b>	<b>Die</b>
W Mad 1=MAN 2004.117.20	FERITOZZOLIINZPANI	T/2	1

**SERIES NA 4 DINARS**

100/718-19

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>KC A(add)4a</b>	1	1	4.288
<b>icaL19, L:10=icaL7, L:44</b>	1	1	4.18

101/719-20

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>L408bis</b>	1	1	4.27
<b>icaL19, L:11</b>	1	2	4.21
<b>icaL22, L:3076</b>	1	3	4.26
<b>SICA2, 332</b>	2	3	4.27
<b>SICA2, 333</b>	3	4	4.27
<b>ME37, L:495=icaL2, L:39</b>	3	4	4.27
<b>RICadd 10a</b>	3	4	4.19
<b>Art93</b>	4	5	4.25
<b>KC AV1105</b>	4	5	4.279
<b>S84A, L:17=TOI394</b>	5	5	4.29
<b>icaL24, L:4097</b>	No image	5	4.31
<b>S94O, L:232=a126, L:8=a114, L:8</b>	6	6	4.31
<b>BNF1978.51</b>	6	5	4.267
<b>KC AV1106</b>	7	4	4.281
<b>Bal101</b>	8	7	4.27

102/720-21

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>Wt</b>
<b>ANS 1971.49.199.</b>	1	1	4.299
<b>SICA2, 334=S86O, L:651</b>	1	2	4.32
<b>BNF1966.341</b>	1	2	4.300
<b>KC AV33=Sp31, L:53=Sp27, L:38=Leu36, L:417</b>	1	2	4.298
<b>S94O, L:233=a114, L:9</b>	2	3	4.29
<b>KC AV1108</b>	3	3	4.274
<b>ME54, L:35=Sp37, L:27=Sp34, L:33</b>	4	3	4.25
<b>S97A, L:536</b>	5	4	4.28
<b>CBN95M, L:1054</b>	5	4	4.29
<b>icaL24, L:4099=IV5, L:1235=S01M, L:901=S98O, L:187</b>	5	4	4.31
<b>icaL19, L:13=Bern 44Ca</b>	1	5	4.26
<b>AA17, L:147</b>	6	6	4.28

103/721-22

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>SICA2, 335 AV</b>	1	1	4.29
<b>DC C243</b>	2	2	4.29
<b>Sp000, L:25</b>	2	2	4.26
<b>S83A, L:7=TOI395</b>	2	2	4.30
<b>icaL1, L:52</b>	2	2	4.326
<b>KC AV1107</b>	2	2	4.310
<b>W P.53=L425</b>	3	1	4.267

104/722-23

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>SICA2, 336</b>	1	1	4.23
<b>BNFnoname</b>	1	2	4.227
<b>S93J, L:181</b>	2	3	4.29
<b>S83O, L:124</b>	3	3	4.24

105/723-24

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>SICA2, 337</b>	1	1	4.29
<b>AC00D, L:1315=Sp02J, L:359=S01M, L:902</b>	2	2	4.27
<b>KC AV1125</b>	2	2	4.285

106/724-25

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>Sp27, L:41</b>	1	1	4.25

107/725-26

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>Sp22, L:22=Sp27, L:42</b>	1	1	4.26
<b>BCT37, no. 2103 0029</b>	1	1	4.24
<b>ME69, L:9</b>	1	1	4.27

110/728-29

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ME37, L:496</b>	1	1	4.23

114/732-33

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W P.54=L464</b>	1	1	4.234
<b>icaL19, L:18</b>	2	2	4.26
<b>icaL22, L:3078</b>	3	3	4.27

117/735-36

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W P.55=L465</b>	1	1	4.2578
<b>Ajj4</b>	2	2	4.286

121/738-39

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>Zam83</b>	1	1	4.26

122 /739-40

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W B.16=Nü508</b>	1	1	4.276
<b>icaL19, L:19</b>	1	1	4.27

**SERIES IP 4 DINARS**

102/720-21

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>Fig238</b>	1	1	NW
<b>S81A, L:46</b>	1	1	NW
<b>S80O, L:54=S78M, L:26</b>	1	1	NW
<b>HD323, L:352=icaL19, L:14=icaL1, L:51</b>	1	2	4.30
<b>TC</b>	2	3	4.24
<b>ME3, L:183=AC00O, L:303</b>	2	4	4.16
<b>ME39, L:420</b>	3	5	4.39
<b>W HSA.10=HSA 1001.1.13159</b>	4	5	4.330
<b>L426</b>	5	6	4.281
<b>icaL26, L:85=AC09O, L:1402=P24, L:1088</b>	6	7	4.35
<b>S95O, L:3</b>	7	8	4.31
<b>AC05O, L:103</b>	9	1	4.32
<b>Zam77</b>	9	9	4.33
<b>Sp22, L:2</b>	10	10	4.20
<b>CM6</b>	11	11	4.35
<b>Stk97D, L:7=Sp37, L:26</b>	11	11	4.33

103/721-22

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W HSA. 13=HSA 1001.1.13211</b>	1	1	4.313
<b>S93J, L:180</b>	2	2	4.23
<b>BNF1977.1074</b>	2	2	4.264

104/722-23

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W Mad.3=MAN 104.278</b>	1	1	4.243
<b>KC AV1074=Sp34, L:34</b>	1	1	4.258

106/724-25

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W Mad.4=MAN 104.279</b>	1	1	4.2347
<b>ME69, L:10</b>	2	2	4.25

108/726-27

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>Leu64, L:3.59</b>	1	1	4.16

114/732-33

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>TOI396=S81M, L:76</b>	1	1	4.34

115/733-34

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>S87O, L:928</b>	1	1	4.35

120/737-38

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>Wt</b>
<b>SICA2, 338</b>	1	1	4.31

127/744-45

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>Wt</b>
<b>SICA2, 339</b>	1	1	4.36 <sup>498</sup>

**SERIES IP 4 NISF<sup>499</sup>**

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ME27, L:98</b>	1	1	2.16
<b>W HSA 11=HSA 1001.1.13161</b>	1	1	2.130
<b>L427</b>	1	1	2.156
<b>KC AV34=Sp31, L:3</b>	1	1	2.141
<b>icaL19, L:15</b>	1	1	2.14

**SERIES IP 4 THULTH<sup>500</sup>**

<b>Coll. Ref.</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>icaL19, L:16</b>	1	1	1.46
<b>ME37, L:497</b>	1	1	1.46
<b>Bw. FM42938</b>	1	1	1.46
<b>ANS 1917.215.3437</b>	1	1	1.431
<b>W HSA.12=HSA 1001.1.13212</b>	1	1	1.424
<b>MAN 104.281</b>	1	1	1.4515
<b>MAN 104.280</b>	1	1	1.4400
<b>ME23, L:42</b>	1	1	1.44

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498 Remains of mount can be seen.

499 All dated 102/720-21.

500 All dated 102/720-21.

**SERIES NM 4**

91/709-10 - NISF

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>WT</b>
<b>SICA2, 85=S860 L:649</b>	1	1	2.17
<b>SEAD41</b>	1	2	2.12
<b>BCT13, no. 2103 0005</b>	1	2	2.08
<b>icaL17, L:103</b>	2	3	2.13
<b>W 203</b>	2	4	2.06
<b>S97A, L:526</b>	2	2?	2.16
<b>NG7, L:440=icaL20, L:77</b>	3	1	2.02
<b>icaL24, L:4087=icaL2, L:29</b>	No Image	3	1.91

91/709-10 - THULTH

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>WT</b>
<b>icaL26, L:56=icaL25, L:73=icaL22, L:3064=icaL20, L:78</b>	1	1	1.44
<b>S97A, L:526</b>	2	1	1.43
<b>Ba13, L:909</b>	3	2	1.43
<b>CB95N, L:648</b>	3	2	1.33
<b>W ANS 15=ANS 1911.105.458</b>	3	2	1.414
<b>ANS 1971.49.284</b>	4	3	1.410
<b>icaL24, L:4089=S92A, L:301</b>	4	3	1.38
<b>S79O, L:19</b>	4	3	NW
<b>SEAD42</b>	5	4	1.02
<b>icaL3, L:23</b>	6	5	1.37

92/710-11 - NISF

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>WT</b>
<b>icaL6, L:25</b>	1	1	2.05
<b>ANS 1971.49.287</b>	1	1	2.137
<b>KC AV17=Sp31, L:208</b>	2	2	2.128
<b>Sp34, L:25</b>	3	3	2.12
<b>BCT14, no. 2103 0006</b>	3	3	2.10
<b>icaL25, L:71</b>	3	3	2.04
<b>icaL20, L:79</b>	4	4	2.09
<b>icaL2, L:30</b>	4	4	2.00
<b>SICA2, 94</b>	5	5	2.02
<b>W UM.1=ANS 1002.1.2357=SEAD46</b>	No image	6	2.29

92/710-11 – *THULTH*

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>WT</b>
<b>icaL24, L:4090=S92A, L:302</b>	1	1	1.42
<b>CNG34, L:430</b>	1	1	1.35
<b>L222</b>	2	2	1.418
<b>S800, L:30</b>	2	2	NW
<b>S97A, L:527</b>	3	3	1.41
<b>SICA2 95</b>	4	4	1.33
<b>Bw83, L:5014=icaL23, L:77</b>	4	5	1.40
<b>QMA616</b>	4	2	1.38
<b>Fahmy36</b>	4	4	1.385
<b>icaL8, L:48</b>	5	5	1.39
<b>icaL20, L:80</b>	5	5	1.34
<b>Ku137, L:1644</b>	5	5	1.39
<b>icaL17, L:104</b>	6	6	1.37
<b>icaL2, L:31</b>	7	7	1.36
<b>No96J, L:4020</b>	7	7	NW
<b>SEAD47</b>	No image	8	1.42

94/712-13 - *NISF*

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>WT</b>
<b>icaL20, L:80</b>	1	1	2.13
<b>ANS 1954.116.5</b>	1	1	2.116
<b>icaL24, L:4088=S00M, L:288=icaL2, L:33</b>	2	2	2.12
<b>DC C.488=icaL6, L:26=icaL1, L:43</b>	2	3	2.12
<b>TOI392</b>	2	3	2.13
<b>CF5, L:36</b>	3	4	2.08

94/712-13 - *THULTH*

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>WT</b>
<b>Zeno100752</b>	1	1	1.45
<b>icaL25, L:72</b>	1	1	1.44
<b>icaL21, L:40</b>	1	1	1.38
<b>icaL15, L:68</b>	2	2	1.43
<b>SEAD52</b>	No Image	2	1.43
<b>Fahmy44</b>	2	3	1.275
<b>S890, L:234</b>	3	4	1.35
<b>QMA617</b>	3	2	1.29
<b>SICA2, 109</b>	3	5	1.425
<b>W 208</b>	4	2	1.39
<b>SICA2, 107</b>	4	2	1.39
<b>icaL20, L:82</b>	4	2	1.41
<b>L226</b>	5	4	1.39
<b>S97A, L:529</b>	5	6	1.17

Nü72	6 (Die 1 91)	7	1.32
ANS 1924.999.92	7	8	1.066
SICA2, 108	8 (die 5 92H)	2	1.43
KC AV20	8	2	1.427
icaL25, L:74	8	2	1.40
L227	9	6	1.40
icaL24, L:4091	No image	2	1.40

96/714-15 - *NISF*

Coll. Ref.	Obv. Die	Rev. Die	WT
icaL17, L:122	1	1	2.14
Leu56, L:24	1	1	2.12
S97A, L:530	1	2	2.06
QMA619	1	1	2.08
Sp133, L:11=Leu64, L:3.60	2	3	2.10
icaL20, L:92	2	3	2.11
KC AV23	3	4	1.48
icaL24, L:4092	No Image	4	1.72
Mar10, L:394	4	5	NW
ANS 1924.999.93	5	6	2.124

96/714-15 - *THULTH*

Coll. Ref.	Obv. Die	Rev. Die	WT
SICA2, 122	1	1	1.39
SICA2, 123	2	2	1.34
icaL24, L:4093	No image	2	1.40
SICA2, 124	3	3	1.27
icaL17, L:123	3	4	1.42
icaL18, L:93	3	4	1.41
icaL8, L:52	3	4	1.36
Ku168, L:8123	4	5	1.38
W 211	4	5	1.40
Fahmy50	4	5	1.47
L231	5	2	1.43
Leu56, L:23	5	2	0.98
BwFp8, L:27	5	2	1.38
KC AV24	5	2	1.32
P388, L:1260	5	2	1.41
ANS 1917.215.3400	5	2	1.425
Sp133, L:12=icaL1, L:45	6	5	1.41
S97A, L:530	6	6	1.37
Sp133, L:13	7	3	1.40
icaL20, L:93	7	1	1.39
icaL16, L:79=icaL5, L:52	8	2?	1.28
icaL8, L:51	8	4	1.42

icaL8, L:52	9	2	1.33
JE82, L:800	9	4	1.42
Tueb 2010-3-1=ME42, L:570	10	7	1.39
icaL8, L:50=icaL6, L:30	10	7	1.36

97/715-16 - *NISF*

Coll. Ref.	Obv. Die	Rev. Die	WT
S89O, L:237	1	1	2.02
SMA	1	1	NW

97/715-16 - *THULTH*

Coll. Ref.	Obv. Die	Rev. Die	WT
SICA2, 131	1	1	1.43
icaL20, L:96	2	2	1.06
Nic81	3	1	1.41
QQMA627	2	1	1.37

99/717-18 - *NISF*

Coll. Ref.	Obv. Die	Rev. Die	WT
SICA2, 143	1	1	2.13
ME39, L:418	1	1	2.15
KC AV28	2	2	2.14
icaL20, L:98	2	2	2.13
S97A, L:533	3	3	2.11
Q628	4	3?	2.00
Fahmy59	4	3?	2.099
Fahmy66	3	3	2.060

99/717-18 - *THULTH*

Coll. Ref.	Obv. Die	Rev. Die	WT
SICA2, 145	1	1	1.42
S80O, L:40	1	1	NW
YKG, no.12579	1	1	1.41
ANS 1954.116.6	1	1	1.408
SEAD64	No image	1	1.45
icaL17, L:131	2	2	1.40
L370	2	2	1.34
S89O, L:243	2	2	1.41
Sp133, L:14	2	2	1.43
ME49, L:452	3	3	1.41
ME23, L:41	3	3	1.42
L369	3	2	1.34
David Collection	4	3	1.41

<b>icaL1, L:48</b>	4	2	1.43
<b>W 215</b>	5	4	1.42
<b>S88S, L:37</b>	5	4	1.41
<b>Fahmy68</b>	5	5	1.20
<b>icaL2, L:36</b>	6	1	1.41
<b>S97A, L:533</b>	7	6	1.23
<b>icaL20, L:99</b>	8	3	1.42
<b>YKG, no.12580</b>	8	3	1.35
<b>QMA630</b>	9	7	1.40
<b>icaL24, L:4094</b>	No image	8	1.41

100/718-19 – *NISF*

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>WT</b>
<b>S97A, L:534</b>	1	1	2.13
<b>icaL16, L:100</b>	2	2	2.13
<b>icaL18, L:192</b>	2	2	2.06
<b>icaL24, L:4095</b>	No image	2	2.10
<b>SICA2, 151</b>	3	3	2.04
<b>icaL15, L:82</b>	3	1	1.98
<b>Sp133, L: 15= Leu64, L:3.64</b>	3	3	2.06
<b>S82A, L:13</b>	3	1	NW
<b>S82A, L:211</b>	3	1	NW
<b>S79O, L:28</b>	3	3	NW
<b>icaL20, L:101</b>	3	1	2.12
<b>icaL20, L:102</b>	3	1	2.08
<b>QMA634</b>	3	1	2.12
<b>icaL17, L:135</b>	4	4	2.12
<b>S80O, L:43</b>	5	5	NW
<b>SEAD67</b>	No image	5	2.10
<b>W P. 52=L406</b>	6	6	2.12

100/718-19 – *THULTH*

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>WT</b>
<b>Zeno18434</b>	1	1	1.42
<b>Nü468a</b>	1	2	1.406
<b>ME66, L:471</b>	1	3	1.02
<b>QMA635</b>	1	2	1.39
<b>Fahmy90</b>	1	4	1.38
<b>SICA2, 152</b>	2	5	1.33
<b>icaL1, L:50</b>	2	6	1.36
<b>KC AV30</b>	2	7	1.41
<b>SICA2, 153</b>	3	8	1.06
<b>S97A, L:534</b>	3	9	1.42
<b>SICA2, 154</b>	4	8	1.44

SICA2, 155	5	10	1.42
icaL17, L:138	5	7	1.33
S82O, L:35	5	10	1.41
Sp22, L:171	5	10	1.41
SICA2, 156=S93J, L:178	6	7	1.34
CNG34, L:431	6	10	1.33
BNF1984.1066	6		1.34
icaL20, L:103=icaL5, L:57=Sp03O, L:614	6	7	1.40
Ku168, L:812	6	6	1.43
ANS 1954.116.7	6	7	1.363
icaL15, L:83	7	11	1.01
TWFP5, L:21	7	11	1.33
icaL17, L:136	8	12	1.42
icaL17, L:137	9	11	1.30
Ku216, L:1599	9	13	1.37
icaL8, L:56	9	11	1.39
icaL18, L:194	10	8	1.32
ME49, L:453	11	11	1.30
L407	12	14	1.31
Leu56, L:26;	13	9	1.42
ANS 1977.274.61	13	9	1.432
S87M, L:627	14	11	1.42
Sp02M, L:168	14	5	1.40
SEAD68	14	5	1.41
BwNY27, L:1398=icaL18, L:193	15	15	1.33
W 217	16	16	1.36
YKG12582	16	8	1.39
ANS 1971.49.296;	16	16	1.409
S82A, L:14=Sp34, L:32	17	17	1.4
ME42, L:28=Mum62, L:14	17	18	1.42
AA13, L:316	17	19	1.34
BwFP9, L:56	17	11	1.40

101/719-20 - *NISF*

Coll. Ref.	Obv. Die	Rev. Die	WT
icaL19, L:12	1	1	2.07
QMA644	2	2	1.95

101/719-20 - *THULTH*

Coll. Ref.	Obv. Die	Rev. Die	WT
icaL17, L:142	1	1	1.42
icaL8, L:57	1	1	1.33
icaL20, L:105=icaL6, L:33	1	1	1.44
P396, L:835	1	1	0.91
ANS 1954.116.8	1	1	1.341

<b>ME39, L:419</b>	2	2	1.29
<b>MMB, L:361</b>	2	2	1.41
<b>Fahmy97</b>	2?	3?	1.41
<b>S80O, L:45</b>	3	3	NW
<b>NG7, L:441</b>	3	4	1.33
<b>icaL24, L:4098=Bw83, L:5021</b>	3	3	1.41
<b>Bw26, L:1590</b>	3	5	1.42
<b>QMA646</b>	4	3	1.38

103/721-22 - *THULTH*

<b>Coll. Ref.</b>	<b>Obv. Die</b>	<b>Rev. Die</b>	<b>Wt</b>
<b>icaL17, L:146=Sp31, L:210</b>	1	1	1.43
<b>TOI393=S83A, L:8</b>	1	2	1.43
<b>icaL2, L:41</b>	1	1	1.33
<b>ANS 1973.56.309</b>	1	2	1.425
<b>QMA649</b>	1	2	1.38
<b>Fahmy111</b>	1	2	1.03
<b>W 222</b>	2	3	1.32
<b>icaL8, L:58</b>	2	3	1.41
<b>CB95M, L:658</b>	2	3	1.41
<b>BNF 1681</b>	2	3	1.43
<b>ANS 1973.56.310</b>	2	3	1.430
<b>KC AV36</b>	3	4	1.31
<b>icaL20, L:108</b>	3	4	1.36
<b>icaL24, L:4100</b>	3	4	1.31

**SERIES NA 4 DIRHAMS**

97/715-16

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>S99M, L:71</b>	1	1	2.88
<b>OHF118</b>	2	2	2.79

98/716-17

	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W ANS.18=ANS 1923.150.101</b>	1	1	2.461 <sup>501</sup>
<b>P386, L:996</b>	2	2	2.34
<b>SCC582</b>	3	3	2.84
<b>OHF119</b>	4	4	2.68

99/717-18

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>S00N, L:18</b>	1	1	2.91
<b>ME43, L:43=icaL16, L:96</b>	2	2	2.81

100/718-19

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>icaL17, L:35</b>	1	1	3.21 <sup>502</sup>

101/719-20

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>icaL20, L:107=icaL13, L:56</b>	1	1	2.45
<b>S99M, L:72</b>	1	2	2.91
<b>TuebAA9B1</b>	1	2	2.786
<b>W P. 59=L409</b>	2	3	2.337
<b>BNFnonumber</b>	2	3	2.768
<b>OHF121</b>	2	3	2.80
<b>Leu62, L:24</b>	3	4	2.76
<b>S99O, L:262</b>	4	5	2.94
<b>icaL2, L:71=icaL1, L:71</b>	5	6	2.75
<b>ME27, L:104=S00N, L:19</b>	6	7	2.81
<b>SCC630</b>	7	8	2.85

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501 Mount.

502 Gilt and Mount.

102/720-21

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
ANS 1921.999.149	1	1	2.833
ANS 1991.3.280	2	2	2.189
W 278	2	2	2.12
AA16, L:128	2	2	2.69
OHF124	2	2	2.89
SICA2, 411	3	3	1.67
TuebAA9B2	3	3	2.812
P376, L:1438=P371, L:650	3	4	2.87
Ush 21	3	3	2.91
SICA2, 412	4	5	2.80
L432	5	6	2.693
W 279	6	7	3.030 <sup>503</sup>
Leu62, L:25	7	8	2.39
S97A, L:557	8	6	2.89
icaL20, L:109	8	6	2.88
icaL2, L:72	9	9	2.95
SCC639	9	10	2.81
KC AR155	10	11	2.405
icaL12, L:3052=Bw49, L:1677	11	12	2.45
ME66, L:475	11	13	2.45
P380, L:1014=P376, L:1439	12	14	1.96
SCC638	12	15	2.90
Sp34, L:35=icaL24, L:4137=Sp27, L:39	13	16	2.60

103/721-22

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
AA9, L:8=AC10A, L:282=S94O, L:235	1	1	2.92
W 280	1	1	2.836
Leu62, L:26	1	2	2.85
BwFP3, L:17	1	2	2.90
Sp27, L:88	1	1	2.93
ical16, L:111	2	3	2.88 <sup>504</sup>
icaL2, L:73	2	4	2.89
AA15, L:156=AA13, L:325	2	5	2.82
ANS 1917.216.3536	3	6	2.731
L433.	3	7	2.701
Zeno79365	4	2	NW
a225, L:56109	5	8	2.89
icaL18, L:211	5	8	2.75
MAN 1988.114.22	5	8	2.822

503 Mount.

504 Holed.

icaL8, L:60	5	9	2.89
SICA2, 413	6	10	2.78
KC AR6263	6	11	2.886
icaL17, L:148	7	12	2.64
CNGXI, L:1805.	8	13	2.89
Nü484	9	14	2.539
W 281	10	15	2.934
P367, L:1647	11	16	2.77
Mar10, L:397	11	16	NW
P357, L:1401	12	17	2.93
Bw26, L:1620	13	18	2.83
Sp05M, L:321	14	19	NW
NF89A, L:1045	15	16	2.78
icaL1, L:72	15	20	2.88
Fahmy560	15	21	2.54
FSXIII, L:1192	16	22	NW
AA12, L:83	17	3	2.88
icaL2, L:74	18	23	2.80
CNG35, L:1420	19	24	2.85
MuM76, L:1005	20	25	2.91
OHF1550	20	16	2.89
Sp22, L:23a	21	19	2.91
TuebAA9B3	22	26	2.853
TuebAA9B4	23	27	2.909
OHF129	23	27	2.49
icaL21, L:107	24	28	2.91
icaL23, L:117	24	22	2.83
Nic153	24	28	2.87
icaL21, L:108	25	29	2.83
ME59, L:232	26	30	2.87
icaL24, L:4138	27	22	2.89
MAN 2004.116.21	5	31	2.501

104/722-23

Coll. Ref	OD	RD	WT
L434	1	1	2.720
ANS 1917.215.3435	2	2	2.874
SpOnline Sphinx	2	3	NW
a261, L:99409	3	4	2.81
a269, L:130925	3	5	2.88
a263, L:99408	4	6	2.77
SICA2, 414	5	3?	2.85
KC AV4266	5	3?	2.854
HD255, L:51	5	3	2.85

SICA2, 415	6	7	2.84 <sup>505</sup>
Leu62, L:27	6	8	2.77
icaL18, L:213	7	9	2.80
W 282	8	6	2.770 <sup>506</sup>
icaL24, L:4139	8	6	2.88
Nü485	9	10	2.690 <sup>507</sup>
Leu53, L:521	9	2	2.67
Leu62, L:28	10	11	2.87
AA14, L:142	10	11	2.90
JE35, L:418	11	12	2.73
icaL21, L:110	11	13	2.84
MMB73, L:317	12	13?	2.74
OHF130	12	14	2.88
Sp22, L:23b	13	15	2.84
TuebAA9B5	14	16	2.815
icaL21, L:109=icaL12, L:3053	15	9	2.90
P384, L:1027	16	17	2.87
Sp27, L:40b	16	8?	2.90
BCP7	17	No image	2.66 <sup>508</sup>

105/723-24

Coll. Ref	OD	RD	WT
ANS 1971.316.1519	1	1	2.825
ANS 1973.245.32	2	2	2.808
OHF133	2	2	2.87
Zeno4213	3	1	2.90
icaL24, L:4140	3	1	2.66
SICA2, 416	4	2	2.74
Leu62, L:29	4	2	2.86
W 283	5	2	2.776
L435	6	3	2.818
TuebAA9B6	7	4	2.701
Sp27, L:40(c)	8	5	2.90
ME66, L:476	9	6	2.71
SHZ	9	6	2.92
icaL25, L:135=icaL23, L:121=icaL20, L:113	10	7	2.87
Ush25	11	7	2.68
SCC661	12	8	2.88
SCC662	13	3	2.85
Fahmy561	14	7?	2.62

505 Holed.

506 Holed.

507 Mount.

508 Broken.

106/724-25

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>AA6, L:78=icaL12, L:3060</b>	1	1	2.86
<b>ANS 1977.253.22</b>	2	2	2.853
<b>W B.19=Nü510</b>	2	2	2.778
<b>KC AR169</b>	2	2	2.771
<b>SCC668</b>	2	2	2.81
<b>SICA2, 417=S89O, L:315</b>	3	2	2.89
<b>icaL18, L:237</b>	3	2	2.59
<b>OHF134</b>	3	2	2.64
<b>S00N, L:22</b>	4	3	2.61
<b>OHF135</b>	4	3	2.86
<b>KC AR6264</b>	5	4	2.797
<b>ME59, L:233</b>	6	5	2.69
<b>icaL24, L:4144</b>	6	5	2.83
<b>SCC669</b>	7	6	2.88

107/725-26

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1977.253.23</b>	1	1	2.866
<b>S98O, L:127</b>	2	2	2.83
<b>icaL19, L:42</b>	3	3	2.85
<b>BwXXX, L:404</b>	3	3	2.87
<b>icaL25, L:140</b>	4	2	2.78
<b>OHF136</b>	4	4	2.88

108/726-27

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>icaL9, L:3250</b>	1	1?	2.10
<b>S00M, L:296</b>	1	1	2.90
<b>TuebAA9C1</b>	1	1	2.852
<b>Ush26</b>	2	2	2.89
<b>OHF137</b>	2	3	2.72

109/727-28

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>OHF139=S89O, L:316</b>	1	1	2.90
<b>KC AR6265</b>	2	2	2.726
<b>TuebAA9C2</b>	2	2	2.933
<b>Ajj37</b>	2	2	2.946
<b>ME66, L:477</b>	3	3	2.32
<b>Ush27</b>	4	4	2.90
<b>OHF138</b>	2	3	2.71

110/728-29

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>icaL18, L:242</b>	1	1	2.88
<b>Leu62, L:30</b>	1	1	2.88
<b>Ush29</b>	1	2	2.89
<b>OHF140</b>	1	2	2.84
<b>KC AR6266</b>	2	2	2.835
<b>BwNY30, L:405</b>	2	2	2.48
<b>S00M, L:297</b>	2	2	2.85
<b>ANS 1972.169.482</b>	2	2	2.79
<b>TuebAA9C3</b>	3	3	2.823
<b>SCC685</b>	3	3	2.88
<b>MAN 2004.116.22</b>	4	4	2.122
<b>OHF1588=S00N, L:23</b>	5	5	2.90

111/729-30

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>icaL16, L:136</b>	1	1	2.66
<b>ANS 1958.183.78</b>	2	2	2.926
<b>a221, L:56138</b>	3	3	2.88
<b>SICA2, 419</b>	3	4	2.75
<b>a222, L:56137</b>	4	5	2.86
<b>icaL18, L:245</b>	4	2	2.91
<b>SICA2, 418</b>	5	6	2.83
<b>icaL17, L:164</b>	6	7	2.94
<b>ME42, L:579</b>	7	8	2.26
<b>icaL24, L:4145=icaL3, L:47</b>	7	9	2.57
<b>W 284</b>	8	10	2.921
<b>L467</b>	9	11	2.989
<b>Ush30</b>	9	11	2.92
<b>Leu62, L:31</b>	10	12	2.87
<b>icaL2, L:75</b>	11	13	2.82
<b>TuebAA9C4</b>	12	14	2.878
<b>Ø149</b>	13	15	2.647
<b>Ajj39</b>	13	19	2.927
<b>icaL21, L:123</b>	14	3	2.73
<b>SCC693</b>	15	6	2.81
<b>Ush31</b>	16	16	2.97
<b>SCC694</b>	17	17	2.93
<b>OHF142</b>	18	18	2.90

112/730-31

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1971.316.1520</b>	1	1	2.946
<b>Bale73, L:318</b>	1	2	2.89
<b>a225, L:56139</b>	2	3	2.85
<b>SICA2, 420</b>	3	4	2.82
<b>icaL15, L:91</b>	4	5	2.74
<b>icaL17, L:165</b>	4	5	2.13
<b>icaL18, L:247</b>	4	5	2.55
<b>W 284a</b>	5	6	2.926
<b>L468</b>	6	7	2.907
<b>SCC698</b>	6	6	2.94
<b>Nü511</b>	7	8	2.918
<b>P367, L:1648=P357, L:1402</b>	8	9	2.94
<b>Leu62, L:33</b>	9	10	2.82
<b>BCT39, no. 2103 0031</b>	9?	11	2.93
<b>Leu62, L:34</b>	10	12	2.87
<b>NF, L:1211</b>	11	13	2.60
<b>ME52, L:865</b>	12	14	2.79
<b>Sp22, L:23c</b>	12	3	2.95
<b>AA14, L:148</b>	12	14	2.94
<b>icaL23, L:125</b>	12	15	2.75
<b>KC AR6267</b>	13	16	2.789
<b>L468bis</b>	14	17	2.825 <sup>509</sup>
<b>A13, L:343</b>	15	18	2.85
<b>TuebAA9C5</b>	16	4	2.952
<b>ME59, L:234=icaL4, L:59</b>	17	8	2.71
<b>SCC697</b>	17	8	2.76
<b>icaL24, L:4146=icaL11, L:35</b>	18	19	2.90
<b>AA16, L:132</b>	19	20	2.94
<b>OHF1403</b>	20	21	2.95
<b>Fahmy562</b>	21	0	2.85
<b>Ajj40</b>	22	12	2.953

113/731-32

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1954.119.80</b>	1	1	2.98
<b>NF April 19-21, 1989 lot 1059</b>	1	1	2.51
<b>OHF146=Sp31, L:54</b>	1	1	2.86
<b>a222, L:51984</b>	2	2	2.76
<b>SICA2, 421=NF, L:1214</b>	3	3	2.81
<b>icaL2, L:76</b>	3	4	2.95
<b>SICA2, 422</b>	4	5	2.95

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509 Holed.

icaL18, L:248	5	6	2.76
KC AR6268	5	7	2.451
W 285	6	8	2.952
MAN 2004.116.23	6	9	2.357
icaL4, L:60	7	10	2.94
BCT41, no. 2103 0033	7	10	2.94
AA15, L:160=S97A, L:559=Mar10, L:398	7	10	2.93
TuebAA9C6	8	11	2.942
icaL25, L:143	8	1	2.80
Bw2012, L:89	9	12	2.85
icaL23, L:126	10	12	2.92
MAN 2004.116.23	11	6	2442
SCC702	12	13	2.95

114/732-14

Coll. Ref	OD	RD	WT
ANS 1954.119.81	2.914	1	1
ANS 1944.1.1	2.894 <sup>510</sup>	2	2
icaL2, L:77	2.89	2	2
a209, L:42328	2.77	3	3
AC05A, L:81	2.52	3	4
SICA2, 423	2.92	4	5
icaL18, L:250	2.46	5	6
Leu53, L:522	2.94	5	7
MAN 2004.116.26	2.088	5	7
ME3, L:186	2.93	6	8
KC AR6269	2.888	6	9
W 286	2.88	7	8
AA15, L:161	2.91	7	10
SCC707	2.90	7	11
P367, L:1650	2.79	8	12
P343, L:780	2.86	9	8
Leu62, L:35	2.81h	10	13
CNGIX, L:1808	2.93	11	2
L464	2.590 <sup>511</sup>	12	4
Ajj44	2.897	12	4
AA13, L:344	2.58	13	3
NF L:1214	2.82	13	3
Ush34	2.93	13	3
P386, L:997=P384, L:1029	2.50 <sup>512</sup>	14	3
TuebAA9D1	2.605	15	14
BCT43, no. 2103 0035	2.90	16	15

510 Mount.

511 Holed.

512 Broken.

<b>BCT42, no. 2103 0034</b>	2.95	17	1
<b>icaL24, L:4148=Sp34, L:41</b>	2.76	18	6
<b>MAN 2004.116.25</b>	2.388	19	3
<b>OHF148</b>	2.94	20	16
<b>AA14, L:149</b>	2.95	21	14

115/733-34

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W P.60=L470</b>	1	1	2.795
<b>BCT44, no. 2103 0036</b>	2	2	2.93
<b>OHF150</b>	2	2	2.70

116/734-35

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1973.245.33</b>	1	1	2.255
<b>OHF152</b>	1	1	2.93
<b>WANS.19=ANS 1935.54.45</b>	2	2	2.933
<b>TuebAA9D2</b>	2	3	2.813
<b>icaL16, L:137</b>	3	4	2.67
<b>SICA2, 424=S890, L:116</b>	4	5	2.98
<b>OHF151</b>	5	3	2.88
<b>icaL18, L:253</b>	5	6	2.86
<b>ME59, L:235=ME50, L:866</b>	5	12	2.77
<b>ME27, L:107</b>	6	7	2.98
<b>ME35, L:548</b>	7	8	2.38
<b>S99Ma, L:74</b>	8	2	2.93
<b>AA12, L:87</b>	9	9	2.93
<b>S00M, L:298</b>	10	10	2.95
<b>P388, L:1266</b>	10	10	2.74
<b>Bw49, L:1678</b>	11	1	2.44
<b>Ush35</b>	12	11	2.97

117/735-36

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ME14, L:527=Bw43, L:3035</b>	1	1	2.67
<b>S00N, L:24</b>	1	2	2.83
<b>Ush36</b>	1	2	2.89
<b>ME27, L:108</b>	2	1	2.84
<b>BCT45, no. 2103 0037</b>	2	1	2.92
<b>W 287</b>	3	3	2.976
<b>icaL20, L:123</b>	3	4	2.96
<b>TuebAA9D3</b>	3	5	2.945
<b>S99M, L:75</b>	4	3	2.94
<b>icaL23, L:129=S00M, L:299</b>	5	6	2.77

<b>OHF154</b>	6	7	2.73
<b>Ajj50</b>	7	3	2.965

118/736-37

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1958.183.79</b>	1	1	2.936
<b>SICA2, 425</b>	1	1	2.80
<b>ME27, L:109</b>	1	2	2.77
<b>icaL1, L:74</b>	1	2	2.85
<b>W 288</b>	2	3	2.898
<b>S89O, L:320</b>	2	4	2.91
<b>OHF155=S87O, L:948</b>	3	2	2.92
<b>TuebAA9D4</b>	4	4	2.720
<b>icaL24, L:4149=icaL3, L:48</b>	5	5	2.60
<b>Ush37</b>	6	4	2.91

119/737

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1977.253.24</b>	1	1	2.913
<b>icaL12, L:3061</b>	2	2	2.85
<b>icaL15, L:92</b>	2	3	2.84
<b>icaL9, L:3251</b>	1	4	2.78
<b>TuebAA9D5</b>	3	3	2.906
<b>Ib</b>	4	5	2.99

120/737-38

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>TuebAA9E1</b>	1	1	2.907
<b>TuebAA9D6</b>	2	2	2.877
<b>ME46, L:30</b>	3	3	1.68

124/741-42

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1935.54.46</b>	1	1	2.912
<b>S01M, L:911</b>	2	2	2.80
<b>Sp02M, L:174</b>	2	2	2.67
<b>icaL5, L:73</b>	3	3	2.69
<b>Ajj64</b>	3	3	2.931
<b>TuebAA9E2</b>	4	2	1.356
<b>BCT46, no. 2103 0038</b>	4	4	2.85
<b>Ush38</b>	4	1	2.68

125/742-43

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>icaL6, L:43</b>	1	1	2.74
<b>OHF158</b>	1	1	2.85

128/745-46

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W 288a</b>	1	No image	2.801
<b>OHF1369=S99M, L:76</b>	2	1	2.88
<b>Ush39</b>	2	1	2.85
<b>BNF1965.213</b>	3	2	2.867
<b>AA13, L:349</b>	4	3	2.82
<b>Ajj67</b>	4	3	2.899

129/746-47

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ME35, L:549</b>	1	1	2.74
<b>Ush40</b>	1	1	2.83

130/747-48

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ME3, L:187</b>	1	1	2.50
<b>Sp99M, L:7</b>	1	2	2.49

131/748-49

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>W P.61=L540</b>	1	1	2.649 <sup>513</sup>
<b>OHF159</b>	1	1	2.82

132/749-50

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1972.169.483</b>	1	1	2.692
<b>ANS 1971.316.1521</b>	1	1	2.872
<b>S00M, L:300</b>	1	1	2.75
<b>OHF160</b>	2	2	2.85

**SERIES IP 4 DIRHAMS**

103/721-22

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ME39, L:432=ME28, L:43<sup>514</sup></b>	1	1	3.00
<b>HAT</b>	2	2	2.40

104/722-23

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1952.80.14</b>	1	1	2.908
<b>W 289</b>	1	2	2.43
<b>Bw18, L:473</b>	1	1	2.97
<b>TuebAA2A5</b>	1	3	2.900
<b>BwNYXXX, L:403</b>	1	4	2.75
<b>Bw83, L:5022</b>	1	5	2.81
<b>OHF1589=S00N, L:303</b>	1	4	2.98
<b>TC 104Andalus(1)=S00M, L:303=JV124, L:791</b>	2	6	2.86
<b>OHF1362=icaL1, L:75</b>	2	3	2.68
<b>TC 104 Andalus (2)</b>	3	7	2.82
<b>ME10, L:373</b>	3	7	2.73
<b>Sp00O, L:26</b>	3	3	2.70
<b>Sp05M, L:322</b>	3	5	NW
<b>icaL20, L:112</b>	3	7	2.79
<b>icaL18, L:212</b>	4	8	2.87
<b>ME46, L:433</b>	5	9	2.95
<b>Leu62, Lt36</b>	6	10	2.77
<b>ME39, L:32</b>	7	11	2.87
<b>Ush41</b>	7	11	2.91
<b>icaL2, L:78</b>	8	7	2.38

105/723-24

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1971.316.1522</b>	1	1	2.816
<b>OHF162</b>	1	1	2.93
<b>TC 105Andalus(1)=ME39, L:434=S01M, L:913</b>	2	2	2.76
<b>TC 105Andalus(1)=S00N, L:27</b>	3	1	2.92
<b>TC 105Andalus(2)</b>	4	4	2.90
<b>ME17, L:717</b>	5	5	2.89
<b>Leu62, L:37</b>	5	6	2.88
<b>S97A, L:560</b>	6	1	2.43
<b>GM148, L:4510</b>	7	7	2.65
<b>BNF1986.416</b>	8	6	2.924

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514 Formerly in the Tonegawa Collection.

<b>TuebAA2A6</b>	8	6	2.892
<b>SCC658</b>	9	1	2.79

106/724-25

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1966.126.131</b>	1	1	2.464
<b>W P.62=L471</b>	1	4	2.87
<b>Leu62, L:38</b>	1	5	2.32
<b>CM7</b>	1	6	2.93
<b>Bw83, L:5024</b>	1	1	2.55
<b>SCC666</b>	1	6	2.95
<b>TC 106Andalus(1)=S00N, L:28</b>	2	8	2.90
<b>TC 106Andalus(3)</b>	3	9	2.76
<b>Bw18, L:238</b>	4	10	2.92
<b>P392, L:4650=P388, L:1264</b>	4	10	2.07
<b>AC03Ma, L:93</b>	5	11	2.73
<b>icaL18, L:474</b>	6	10	2.84
<b>ME50, L:898</b>	7	3	2.93
<b>icaL20, L:116</b>	7	3	2.61
<b>OHF163</b>	8	12	2.95
<b>TC 106Andalus(2)</b>	9	2	2.86
<b>ME35, L:550</b>	9	3	2.93
<b>Cord3695-1665</b>	9	3	2.888
<b>TuebAA2B1</b>	9	7	2.934

107/725-26

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1951.185.89</b>	1	1	2.923
<b>ME49, L:463</b>	1	1	2.59
<b>Leu62, L:39</b>	1	1	2.90
<b>BwFP5, L:23</b>	1	1	2.88
<b>S00N, L:29</b>	1	1	2.92
<b>KC AR6270</b>	1	2	2.917
<b>TuebAA2B2</b>	1	2	2.895
<b>icaL23, L:123</b>	1	1	2.46
<b>Ush44</b>	1	1	2.92
<b>OHF165</b>	1	2	2.93
<b>TC 107Andalus=Sp22, L:3(a)</b>	2	2?	2.74

108/726-27

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
TC 108Andalus	1	1	2.92
ME14, L:528	1	3	2.86
ME42, L:580	1	4	2.65
S99Ma, L:77	1	4	2.92
S00M, L:306	1	4	2.95
icaL21, L:121	1	3	2.20
Ush45	1	4?	2.90
OHF1436=S00M, L:307	1	1	2.86
icaL18, L:240	2	5	2.84
ME1, L:392=S00N, L:30	3	2	2.84
ME35, L:551	3	2	2.88
W B.20=Nü512	4	6	2.585 <sup>515</sup>

109/727-28

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
icaL11, L:36=GM143, L:5476	1	1	2.86
TC 109Andalus=S99Ma, L:78	2	2	2.90
icaL12, L:3062	2	2	2.75 <sup>516</sup>
ME1, L:393=S00N, L:31	2	2	2.93
ME35, L:552	2	2	2.74
icaL18, L:475	3	3	2.83
Ush46	3	3	2.91
KC AR6271	4	2	2.533 <sup>517</sup>
SCC679	4	2	2.76
TuebAA2B4	5	4	2.895
OHF 186=Leu62, L:40	6	5	2.68

110/728-29

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
ANS 1952.80.15	1	1	2.953
TC 110Andalus(3)	1	1	2.86
ME46, L:33	1	1	2.91
TC 110Andalus(1)	2	2	2.88
KC AR6272	2	2	2.627
TC 110Andalus(2)	3	3	2.94
icaL16, L:139	3	3	2.87
TuebAA2B5	3	3	2.823
Ush47	3	3	2.98

515 Holed.

516 Holed.

517 Holed.

SCC683	3	1	2.69
OHF1404=P357, L:1403	3	3	2.96
SICA2, 426	4	4	2.85
icaL13, L:60	5	5	2.44
icaL7, L:54	5	5	2.74
ME3, L:188	6	4	2.95
icaL20, L:117	6	4	2.90
ME9, L:436=BwFP9, L:30=Bw8, L:30=a205, L:34303	7	4	2.84
Bw21, L:646	7	6	2.94
S98O, L:128	7	6	2.97
icaL2, L:79	7	4	2.94
icaL24, L:4150	7	4	2.92
icaL1, L:76	8	2	2.90
James19, L:1613	9	7	2.74
Bw49, L:1679=MH07M, L:2314	10	8	2.84
KC AR4267	11	9	2.166
Sp22, L:3b	11	9	2.81
AA14, L:146	12	1	2.67
ME66, L:478	13	10	2.57

111/729-30

Coll. Ref	OD	RD	WT
ANS 1952.80.16	1	1	2.952
TC 111Andalus(2)=JV123, L:355	1	1	2.76
Leu62, L:41	1	2	2.86
TC 111Andalus(1)=Bw21, L:647	2	3	2.90
OHF171	2	3	2.92
TC 111Andalus(3)	3	4	2.86
ME1, L:395	3	4	2.94
AC08M, L:16	3	4	2.85
S01M, L:915=S00N, L:33	3	4	2.95
CM8	3	5	2.86
TC 111Andalus(3)	3	4	2.86
TC 111Andalus(4)	4	6	2.94
SICA2, 427	4	6	2.36
SICA2, 428	4	6	2.92
icaL1, L:77	4	6	2.74
Bw21, L:649	4	6	2.95
OHF1363	4	6	2.73
DC C489	5	7	2.95
W P. 63=L472	6	8	2.915
P367, L:1651=P357, L:1404	7	7	2.77
TuebAA2B6	7	7	2.765
Leu62, L:42	8	9	2.90
NF, lot:1208	8	7	2.43
Bw21, L:648	8	7	2.88

<b>ANS 1988.132.2</b>	8	9	2.713
<b>Ush48</b>	8	10	2.91
<b>OHF172</b>	8	9	2.83
<b>AC07A, L:1177</b>	9	4	2.49
<b>Bw18, L:476</b>	10	11	2.95
<b>CM8</b>	11	12	2.49
<b>SCC690</b>	12	7	2.92

112/730-31

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1951.185.90</b>	1	1	2.922
<b>TC 112</b>	2	2	2.66
<b>icaL16, L:140</b>	3	3	2.34
<b>StM1935/95</b>	3	3	2.931
<b>OHF1590=S00N, L:34=S97A, L:561</b>	3	3	2.93
<b>Ush49</b>	4	4	2.97

113/731-32

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1952.80.17</b>	1	1	2.959
<b>TC 113Andalus(1)</b>	2	2	2.90
<b>TC 113Andalus(2)</b>	3	1	2.94
<b>icaL24, L:4151=icaL2, L:80</b>	4	1	2.93
<b>OHF174</b>	4	1	2.95
<b>SCC700</b>	4	1	2.93
<b>icaL18, L:249</b>	5		2.92
<b>L474</b>	5	3	2.737
<b>W 290</b>	6	4	2.81
<b>Leu62, L:43</b>	7	1	2.80
<b>AC07A, L:1178</b>	7	1	2.32 <sup>518</sup>
<b>Bw21, L:650</b>	7	3	2.94
<b>P392, L:4653</b>	8	1	2.68
<b>AC05D, L:2138</b>	8	1	2.80
<b>Ush50</b>	8?	1	2.97
<b>CM78106</b>	9	5	2.75
<b>AC05O, L:104</b>	10	3	2.90
<b>TC 113Andalus(3)</b>	11	6	2.86

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518 Broken.

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1966.5.21</b>	1	1	2.712 <sup>519</sup>
<b>P371, L:658</b>	1	1	2.79
<b>TC 114Andalus(1)</b>	2	2	2.88
<b>P376, L:1438=AC05A, L:82</b>	2	3	2.77
<b>CM73293</b>	2	2	2.24
<b>TC 114Andalus(2)= JV123, L:356</b>	3	4	2.88
<b>a218, L:45757= Leu62, L:44</b>	3	5	2.82
<b>TC 114Andalus(3)</b>	4	6	2.96
<b>TC 114Andalus(4)</b>	5	7	2.88
<b>OHF175</b>	5	8	2.92
<b>TC 114Andalus(5)</b>	6	9	2.76
<b>S99Ma, L:79</b>	6	9	2.85
<b>StM1935/96</b>	6	9	2.952
<b>SICA2, 429</b>	7	10	2.86
<b>SICA2, 430</b>	8	11	2.68
<b>icaL17, L:160=icaL16, L:141</b>	8	6	2.65
<b>ME27, L:111</b>	8	6	2.77 <sup>520</sup>
<b>icaL20, L:114</b>	8	6	2.79
<b>icaL25, L:144=icaL24, L:4152</b>	8	6	2.69
<b>AU03A, L:1179</b>	8	6	2.62
<b>icaL17, L:159</b>	9	12	2.79
<b>ME3, L:189</b>	10	13	2.37
<b>ME42, L:581</b>	11	14	2.83
<b>P369, L:1485</b>	11	7	2.85
<b>W P. 64. L474</b>	12	12	2.643
<b>Bw18, L:477</b>	12	15	2.02
<b>AA12, L:88=icaL18, L:251</b>	13	1	2.67
<b>TuebAA2C2</b>	13	1	2.907
<b>SCC704</b>	8	11	2.80
<b>icaL1, L:79</b>	14	16	2.86
<b>KC AR6273</b>	15	17	2.49
<b>ME3, L:190</b>	16	10	2.37
<b>icaL23, L:127</b>	16	10	2.75
<b>ANS 1971.316.1524</b>	17	18	2.917

519 Broken.

520 Broken.

115/733-34

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>icaL16, L:142</b>	1	1	2.59
<b>TC 115Andalus</b>	2	2	2.82
<b>W P.65=L475</b>	3	3	2.638
<b>TuebAA2C3</b>	3	3	2.875
<b>Bw40, L:1041</b>	4	1	2.60 <sup>521</sup>

116/734-35

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1935.54.47</b>	1	1	2.917
<b>icaL16, L:143</b>	1	2	2.75
<b>TC 116Andalus(1)</b>	2	3	2.82
<b>ME52, L:869</b>	2	3	2.77
<b>BNF 1969.540</b>	2	3	2.923
<b>TC 116Andalus(2)</b>	3	4	2.92
<b>TC 116Andalus(3)</b>	4	5	2.94
<b>TuebAA2C4</b>	4	5	2.751
<b>a215, L:45758=Leu62, L:45</b>	5	6	2.60
<b>KC AR4268=Sp33, L:3(c)</b>	5	7	2.786
<b>BNF 1969.541</b>	5	8	2.952
<b>P388, L:1267</b>	5	8	2.77
<b>a237, L:63113</b>	6	3	2.94
<b>SICA2, 431= NF 1:1217</b>	7	9	2.81
<b>Fahmy564</b>	7	9?	2.80
<b>icaL16, L:144</b>	8	10	2.67
<b>ME9, L:437</b>	9	11	2.95
<b>ME14, L:529=Bw43, L:3036</b>	10	3	2.71
<b>CM4299</b>	10	3	2.91
<b>ME39, L:435</b>	11	12	2.65
<b>BNF1969.543</b>	11	12	2.890
<b>ANS 1001.57.4947</b>	11	12	2.878
<b>AC02D, L:457</b>	12	13	2.86
<b>JV127, L:394=JV124, L:792</b>	12	13	NW
<b>S97A, L:562</b>	13	3	2.90
<b>icaL24, L:4153=icaL3, L:50</b>	14	14	2.88
<b>OHF176</b>	14	14	2.86
<b>ME23, L:44</b>	15	15	2.92
<b>MMB73, L:301</b>	16	16	2.90
<b>BNF 1969.542</b>	17	6	2.952
<b>Cordoba 3759-1717</b>	18	0	1.925b
<b>P371, L:661</b>	19	1	NW
<b>SCC 714</b>	20	3	2.56

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521 Broken.

117/735-36

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1966.126.132</b>	1	1	2.703
<b>TC 117Andalus(1)</b>	1	1	2.78
<b>TC 117Andalus(2)</b>	2	2	2.80
<b>TC 117Andalus(3)</b>	3	3	2.88
<b>SICA2, 434</b>	4	2	2.79
<b>icaL1, L:80</b>	5	4	2.59
<b>OHF1591=S00N, L:36</b>	5	4?	2.88
<b>TuebAA2C5</b>	6	5	2.896
<b>Cord3720-1690</b>	7	6	2.403 <sup>522</sup>
<b>ANS 1001.57.4948</b>	8	7	2.350
<b>Sp27, L:45</b>	9	6	2.95
<b>JV122, L:508=JH03F, L:409</b>	10	1	NW

118/736-37

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1971.316.1525.</b>	1	1	2.756
<b>MMB76, L:1001</b>	1	1	1.76
<b>ANS 1949.83.3</b>	2	2	2.957
<b>TC 118Andalus(1)</b>	3	3	2.84
<b>P392, L:4654</b>	3	3	2.83
<b>TC 118Andalus(2)</b>	4	4	2.76
<b>TC 118Andalus(3)=S89O, L:321</b>	5	1	2.74
<b>a219, L:45759</b>	6	5	2.69
<b>S97A, L:563</b>	6	5	2.96
<b>SICA2, 433</b>	7	2	2.45
<b>SICA2, 434</b>	8	4	2.71
<b>SCC720</b>	8	4	2.84
<b>icaL15, L:93</b>	9	6	2.72
<b>W 292</b>	10	7	2.93
<b>P372, L:1506</b>	11	8	2.83
<b>Leu62, L:46</b>	12	9	2.87
<b>AC02O, L:2398</b>	13	10	2.92
<b>ME52, L:870</b>	14	2	2.54
<b>icaL2, L:81</b>	15	11	2.75
<b>KC AR6274</b>	16	12	2.80
<b>MMB73, L:302</b>	17	11	2.92
<b>L1683</b>	18	13	2.839
<b>BNF1969.544</b>	19	5	2.927
<b>BNF1970.275</b>	20	4	2.923
<b>CM73294</b>	21	5	2.92

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522 Broken.

<b>JV1122, L:509</b>	22	13	NW
<b>P378, L:1230</b>	23	14	2.43
<b>TuebAA2B1</b>	24	15	2.693
<b>StM1935/95</b>	25	16	2.928
<b>Cord3699-1669.</b>	26	17	2.856
<b>Cord3693-1663</b>	27	9	2.792
<b>icaL24, L:4154</b>	28	18	2.93
<b>OHF183</b>	29	19	2.96

119/737

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1958.183.8</b>	1	1	2.919
<b>TC 119Andalus(1)</b>	2	2	2.76
<b>StM1935/98</b>	2	2	2.946
<b>TC 119Andalus(2)</b>	3	3	2.84
<b>SICA2, 435</b>	4	4	2.73 <sup>523</sup>
<b>ME14, L:530</b>	5	5	2.71
<b>BNF1969.546</b>	5	5	2.92
<b>TuebAA2D1</b>	5	5	2.943
<b>OHF 1593=S00N, L:37</b>	5	5	2.85
<b>W 293</b>	6	6	2.94
<b>S99Ma, L:82</b>	6	6	2.93
<b>S00N, L:38=S00M, L:315</b>	7	7	2.56
<b>S97A, L:564</b>	8	8	2.96
<b>CM77543=icaL1, L:81</b>	9	2	2.91
<b>icaL11, L:37</b>	9	2	2.95
<b>icaL23, L:131</b>	10	7	2.89
<b>icaL24, L:4155=icaL3, L:23</b>	11	9	2.31

120/737-38

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1952.80.18</b>	1	1	2.929
<b>S00M, L:316</b>	1	2	2.81
<b>TC 120Andalus(1)</b>	2	3	2.70
<b>StM1935/99</b>	3	2	2.957
<b>icaL25, L:147</b>	4	1?	2.79 <sup>524</sup>

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523 Holed.

524 Broken.

121/721-22

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>ANS 1949.83.4</b>	1	1	2.927
<b>TC 121Andalus(1)</b>	2	2	2.88
<b>TC 121Andalus(2)</b>	3	3	2.90
<b>TC 121Andalus(3)</b>	4	4	2.93
<b>icaL16, L:145</b>	5	4	2.79
<b>SCC735</b>	5	5	2.42
<b>ME35, L:553=S01M, L:916</b>	6	6	2.55
<b>icaL1, L:82</b>	6	7	2.85
<b>ME48, L:21</b>	7	8	2.44
<b>TuebAA2D2</b>	7	8	2.907
<b>P372, L:1507</b>	8	9	2.80
<b>S99Ma, L:83</b>	9	10	2.67
<b>BNF1969.547</b>	10	11	2.83b
<b>OHF185</b>	10	11	2.72
<b>CM76363</b>	11	1	2.72
<b>JV122, L:510=JV100, L:32</b>	11	1	NW
<b>StM1935/100</b>	12	10	2.944
<b>Cord3696-166</b>	13	9	2.850
<b>Cord3698-166</b>	14	6	2.690

122/739-40

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>TC 122Andalus(1)</b>	1	1	2.86
<b>TC 122Andalus(2)</b>	2	2	2.76
<b>CM73296</b>	2	2	2.52
<b>SCC741</b>	2	2	2.88
<b>Sp00O, L:23</b>	3	3	2.68
<b>icaL1, L:83</b>	3	4	2.93
<b>Cord3718-1688</b>	3?	?	2.337
<b>S99Ma, L:84</b>	4	3	2.87
<b>BNF1969.548</b>	5	5	2.925
<b>Cord3694-1664</b>	6	2	2.849
<b>Cord3691-1661</b>	7	2	2.850
<b>OHF1468</b>	8	6	2.27
<b>Fahmy565</b>	9	7	2.18

124/741-42

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>TC 124Andalus</b>	1	1	2.74
<b>Cord3692-1662</b>	1	1	2.828
<b>SICA2, 436</b>	2	2	2.65
<b>Cord3692-1662</b>	3	3	2.851

125/742-43

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>TC 125Andalus</b>	1	1	2.86

128/745-49

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>BwNY30, L:407</b>	1	1	2.56

129/746-47

<b>Coll. Ref</b>	<b>OD</b>	<b>RD</b>	<b>WT</b>
<b>TC 129Andalus(1)</b>	1	1	2.86
<b>S99Ma, L:85</b>	1	1	2.81
<b>TC 129Andalus(2)</b>	2	2	2.86
<b>W 294</b>	3	3	2.86
<b>Cord3690-1660</b>	4	3?	2.931
<b>MAN 2004.118.38</b>	4	4	2.846

## APPENDIX B – RESULTS OF METALLURGICAL ANALYSIS

### COMBINED RESULTS OF LA-ICP-MS AND PAA TESTING<sup>525</sup>

No.	Den.	Meth.	Au%	Ag%	Cu%	Ir	Pb	Pd	Pt	Sn	Zn
Series NA 1 – Two Imperial Bust type											
L95bis	Sol	PAA	90.3	7.4	2.3						
L97	Sem	ICP	84.1	12.2	3.6	8	103	20	331	138	80
L96a	Sem	ICP	88.2	9.1	2.5	9	107	20	345	76	104
L98	Sem	ICP	88.6	9.0	2.3	12	131	25	421	66	113
Series NA 2, Phase 1 – Latin Epigraphic											
L109	Sol	PAA	88.6	10.4	1.0		125	24	282	85	129
L111	Sol	ICP	87.2	9.3	3.3	10	163	17	284	82	110
L110	Sol	PAA	90.5	7.6	1.8		121	18	369	87	108
L106	Tre	ICP	86.0	11.2	2.7	7	113	20	318	74	76
L103	Tre	ICP	89.4	6.9	3.6	12	45	19	328	31	16
L105	Tre	ICP	90.3	7.5	2.1	10	154	21	362	66	91
L 107	Tre	ICP	87.8	9.3	2.7	8	191	17	287	78	96
Series NA 2, Phase 2 – Latin Epigraphic											
L111bis	Sol	PAA	84.9	12.0	3.2		84	31	288	134	350
L99	Sem	ICP	85.0	12.2	2.7	9	41	20	340	35	76
L99bis	Sem	ICP	81.3	16.5	2.0	5	314	12	215	51	65
L102	Tre	ICP	90.0	7.3	2.6	10	123	20	346	45	69
L100	Tre	ICP	88.2	9.5	2.2	8	114	18	293	30	43
L108bis	Tre	ICP	87.5	10.3	2.0	8	87	20	345	57	113
Series NA 2, Phase 2 – Irregular Mints											
L101	Tre	ICP	85.2	12.4	2.3	8	151	20	318	62	73
L100b	Tre	ICP	75.2	17.1	7.5	10	80	19	344	22	41
Series IP 2 – Latin Epigraphic											
L131	Sol	PAA	38.5	58.5	2.8		850	---	67	87	51
L129	Sol	PAA	70.4	26.2	3.2		351	---	419	632	327
L128	Sol	PAA	38.0	57.3	4.3		1694	---	---	438	1267
L135	Sol	PAA	48.9	48.7	2.4		81	6	43	18	28
L130	Sol	PAA	74.4	24.6	0.4		169	43	366	114	22
L133	Sol	PAA	16.3	73.8	9.2		1999	---	---	1182	2838
L134	Sol	PAA	37.1	58.1	4.3		1751	26	75	1134	986
L132	Sol	PAA	45.5	50.6	3.6		486	71	150	325	371
Series NA 2, Phase 3 – Latin Epigraphic											
L112	Sem	PAA	60.3	37.1	2.6						
Series NA 3 - Bilingual											
L113	Sol	PAA	65.9	31.1	2.8		251	38	152	522	249
L114	Sol	PAA	60.6	37.4	1.9		10	8	110	261	102
Series IP 3 – Bilingual											
L136	Sol	PAA	87.8	11.74	0.38					44	235
L136bis	Sol	PAA	69.9	27.7	2.2		280	30	184	370	231
L127	Sem	PAA	79.5	18.5	1.8		243	21	218	287	262
Series NA 4 – Post-Reform											
1978.51	Dinar	PAA	98.8	1.0	0.0		2	20	361	---	20
L408bis	Dinar	PAA	98.7	1.2	0.1		18	22	385	17	13

525 Some of this Data reproduced JONSON ET AL forthcoming.

No.	Den.	Meth.	Au%	Ag%	Cu%	Ir	Pb	Pd	Pt	Sn	Zn
1966.341	Dinar	PAA	98.8	1.1	0.0		2	---	606	4	16
L425	Dinar	PAA	99.6	0.4	0.0		2	---	---	88	---
1978.52	Dinar	PAA	99.0	0.8	0.2		2	---	481	20	---
L464	Dinar	PAA	98.9	1.0	0.1		54	15	319	34	21
L465	Dinar	PAA	98.4	1.2	0.2		21	18	332	29	34
Series IP 4 – Post Reform											
L426	Dinar	PAA	99.5	0.4	0.0		24	11	181	133	19
L427	<i>nisf</i>	PAA	96.0	3.9	0.1		24	22	289	22	9

## RESULTS OF SPECIFIC GRAVITY TESTING<sup>526</sup>

### *SERIES NA 1*

Coll. Ref.	Tester	Den.	WT	SG	Au%	Adj. Au%
W 143	O	Sol	4.3253	18.63	95.4	96.7
W HSA 1=HSA1001.1.8142	J	Sol	4.310	17.76	89.4	90.6
KC AV1104	J	Sol	4.325	16.94	83.0	84.3
L95bis	J	Sol	4.328	17.83	90.0	91.1 (2.3)
W 145	O	Sem	2.1306	17.65	88.7	89.8
W 144	O	Sem	2.0755	17.06	83.6	85.3
KC AV1	J	Sem	1.987	17.55	87.9	89.0
W C.1=Ø45	J	Sem	2.025	17.25	85.6	86.7
W P.19=L97	J	Sem	1.986	17.13	84.6	86.2 (3.6)
W P.20=L96	J	Sem	1.947	17.66	88.7	89.9 (2.5)
W 148	O	Tre	1.4076	17.93	90.8	91.8
W 147	O	Tre	1.3947	17.82	89.8	91.0
W 149	O	Tre	1.3785	17.58	88.2	89.3
W G.2=PG7646	O	Tre	1.4248	17.31	86.0	87.2
ANS 1944.100.47328	J	Tre	1.382	17.12	84.4	85.7
W 146	O	Tre	1.3761	17.51	87.5	88.7
W 152	O	Tre	1.3759	17.71	89.0	90.2
W 151	O	Tre	1.3092	17.21	85.2	86.4
W 150	O	Tre	1.3252	17.21	85.2	86.4
W 155	O	Tre	1.3481	17.13	84.5	85.8
W 153	O	Tre	1.3521	17.04	83.8	85.1
W 154	O	Tre	1.3342	16.86	82.3	83.6
PG1483	O	Tre	1.3199	17.42	86.8	88.1
PG8500	O	Tre	1.3600	18.25	93.0	94.1
PG8672	O	Tre	1.3942	17.42	86.9	88.1
W C.2=Ø44	J	Tre	1.347	18.52	94.7	95.9
W C.3=Ø42	J	Tre	1.315	17.44	87.0	88.2
W C.4=Ø43	J	Tre	1.306	17.41	86.7	88.0
W P.21=L98	J	Tre	1.359	17.97	90.8	92.0 (2.3)

### *SERIES NA 2, PHASE 1 SOLIDI*

Coll. Ref.	Tester	Year	WT	SG	Au%	Adj. Au%
KC AV1090	J	II	4.301	17.29	86.0	87.1
KC AV1095	J	II	4.247	17.80	89.7	90.9
KC AV1096	J	II	4.284	17.55	88.0	89.0
W C.11=Ø52	J	II	4.320	17.02	83.6	84.9
KC AV1092	J	III?	4.299	17.01	83.5	84.9

526 Abbreviations: Col. No.=Collection Ref.; Denom=Denomination; Sol.=Solidus; Sem=Semissis; Tre=Tremissis; J=Jonson; O=Oddy; Bar=Bartlett; B=Bates; Wt=Weight in grams; SG=Specific Gravity; Adj. Au%=Gold content adjusted for the presence of copper. The measured copper content is in brackets where known.

KC AV1097	J	III	4.346	17.76	89.4	90.6
KC AV1098	J	III	4.350	17.35	86.4	87.5
KC AV1103	J	III	4.321	17.29	86.0	87.1
KC AV1131	J	III	4.355	17.54	87.9	89.0
KC AV1100	J	III	4.317	17.50	87.5	88.7
KC AV1101	J	III	4.290	18.41	94.0	95.2
KC AV1102	J	III	4.281	17.83	90.0	91.1
KC AV1126	J	III	4.316	17.07	84.0	85.3
W P.39=L109	J	III	4.379	17.36	86.4	87.8 (3.0)
KC AV1109	J	III	4.287	16.68	80.9	82.2
W 180	O	III	4.2702	17.67	88.7	89.9
W 179	O	III	4.2178	16.70	81.1	82.3
KC AV1111	J	III	4.305	16.50	79.4	80.7
KC AV1112	J	III	4.303	17.13	84.6	85.8
KC AV1114	J	III	4.228	16.93	82.9	84.2
KC AV1115	J	III	4.327	17.62	88.4	89.6
KC AV1116	J	III	4.317	17.46	87.2	88.4
ANS 1959.258.1	J	III	4.270	17.68	88.9	90.0
KC AV1113	J	III	4.278	17.09	84.2	85.5
KC AV1110	J	III	4.289	17.98	91.0	92.2
PG12474	O	III	4.2525	17.17	84.9	86.1
W P.40=L111	J	III	4.225	17.27	85.7	87.2 (3.3)
W B.11=Nü69	J	III	4.305	17.49	87.4	88.6
W P.41=L110	J	III	4.391	18.20	92.6	93.5 (1.8)

*SERIES NA 2, PHASE 1 FRACTIONALS*

Coll. Ref.	Tester	Den.	WT	SG	Au%	Adj. Au%
W 172	O	Sem	2.0943	17.01	83.5	84.9
Bw75	O	Sem	2.1350	17.46	87.1	88.4
KMK	O	Sem	2.0813	17.35	86.4	87.5
W HSA 4=HSA 1001.1.13224	J	Sem	2.089	17.36	86.4	87.6
W 171	O	Sem	1.9954	17.19	85.1	86.3
W HSA.3=HSA 1001.1.8139	J	Sem	2.043	17.13	84.7	85.8
W 170	O	Sem	2.0939	17.08	84.1	85.4
W HSA 5=HSA 1001.1.8141	J	Sem	2.018	17.28	85.8	87.0
W C.8=Ø48	J	Sem	2.064	17.38	86.5	87.7
W B.7=Nü68	J	Sem	2.096	17.65	89.0	89.8
KC AV1091	J	Tre	1.366	17.47	87.3	88.4
KC AV1093	J	Tre	1.399	18.01	91.2	92.3
KC AV1094	J	Tre	1.375	17.70	89.0	90.2
KC AV1129	J	Tre	1.365	17.69	89.0	90.1
KC AV1117	J	Tre	1.422	16.98	83.2	84.6
KC AV1121	J	Tre	1.368	17.28	85.9	87.0
KC AV1128	J	Tre	1.391	17.79	89.6	90.8
W HSA.6=HSA 1001.1.8140	J	Tre	1.411	17.48	87.3	88.5

<b>HSA 1001.57.5784</b>	J	Tre	1.365	16.70	81.1	82.3
<b>KC AV1118</b>	J	Tre	1.422	17.19	85.2	86.3
<b>KC AV1119</b>	J	Tre	1.399	17.44	87.0	88.2
<b>W 176</b>	O	Tre	1.3757	17.52	87.7	88.8
<b>KMK</b>	O	Tre	1.3905	16.76	81.6	82.8
<b>KC AV1120</b>	J	Tre	1.470	17.14	84.6	85.9
<b>W 177</b>	O	Tre	1.4232	17.23	85.4	86.6
<b>Bw75</b>	O	Tre	1.4036	16.97	83.3	84.5
<b>KC AV1127</b>	J	Tre	1.402	17.05	84.0	85.2
<b>PG8501</b>	O	Tre	1.4083	18.86	97.1	98.2
<b>W C.10=Ø50</b>	J	Tre	1.447	18.16	92.3	93.5
<b>W B.8=Nü67</b>	J	Tre	1.426	17.45	87.1	88.3
<b>W B.9=Nü68</b>	J	Tre	1.365	16.81	82.0	83.2
<b>W P.33=L106</b>	J	Tre	1.469	17.12	84.4	85.8 (2.7)
<b>W P.34=L103</b>	J	Tre	1.381	18.03	91.3	92.0 (1.0)
<b>W P.35=L104</b>	J	Tre	1.439	17.83	89.8	91.1
<b>W P.36=L105</b>	J	Tre	1.446	17.16	84.9	85.9 (2.1)
<b>W P.37=L107</b>	J	Tre	1.332	17.26	85.7	86.9 (2.7)
<b>W P.38=L108</b>	J	Tre	1.384	18.70	96.0	97.1
<b>MAN 2004.117.21</b>	J	Tre	1.4043	16.71	81.2	82.4

**SERIES NA 2, PHASE 2 SOLIDI**

Coll. Ref.	Tester	Year	WT	SG	Au%	Adj. Au%
<b>W 178</b>	O	VII <sup>527</sup>	4.3229	17.13	84.6	85.8
<b>W P.42=L111bis</b>	J	VII	4.250	16.75	81.5	83.0 (3.2)
<b>W C.12=Ø54</b>	J	Θ	4.301	17.26	85.6	86.8

**SERIES NA 2, PHASE 2 FRACTIONALS**

Col. No.	Tester	Den.	WT	SG	Au%	Adj. Au%
<b>KMK</b>	O	Sem	2.0752	17.16	84.8	86.0
<b>W Cod.3=HSA 1001.57.5785</b>	J	Sem	2.040	17.40	86.7	87.9
<b>W Cod.4=HSA 1001.57.5787</b>	J	Sem	2.036	17.07	84.0	85.3
<b>HSA 1001.57.5786</b>	J	Sem	2.029	17.08	84.1	85.4
<b>W 168</b>	O	Sem	2.0612	16.66	80.8	82.0
<b>PG.12477</b>	O	Sem	2.0230	17.46	87.1	88.4
<b>PG 12475</b>	O	Sem	1.9930	17.07	84.0	85.3
<b>PG 12344</b>	O	Sem	2.0498	17.36	86.4	87.6
<b>W ANS.13=ANS 1917.215.3433</b>	J	Sem	2.003	17.38	86.6	87.7
<b>W C.7=Ø46</b>	J	Sem	2.017	17.50	87.5	88.7
<b>W P 31=L99</b>	J	Sem	1.981	16.89	82.6	84.0 (2.7)

527 Engraving error. Date reads Indiction III.

L99bis	J	Sem	2.047	17.02	83.5	84.8 (2.2)
MAN 2004.117.22	J	Sem	1.9657	16.83	82.1	83.4
MAN 2004.117.23	J	Sem	1.9839	16.00	74.8	76.3
MAN 2004.117.24	J	Sem	2.0102	16.85	82.3	83.6
MAN 2004.117.25	J	Sem	2.0191	16.20	76.7	78.1
MAN 2004.117.26	J	Sem	2.0590	17.17	84.9	86.1
W 174	O	Tre	1.3651	17.65	88.6	89.8
W 173	O	Tre	1.3523	17.38	86.5	87.7
W 175	O	Tre	1.3485	17.34	86.4	87.4
KMK	O	Tre	1.2938	17.18	85.0	86.2
PG10549	O	Tre	1.3360	16.76	81.8	82.8
ANS 1917.215.3434	J	Tre	1.334	17.06	84.0	85.3
W C.9=Ø49	J	Tre	1.380	16.99	83.5	84.7
W P.32=L102	J	Tre	1.342	17.76	89.6	90.6 (2.6)
L100	J	Tre	1.313	18.09	91.7	92.9 (2.2)
TC	J	Tre	1.3124	16.85	82.3	83.6

**SERIES IP 2 SOLIDI**

Coll. Ref.	Tester	Date	M/S <sup>528</sup>	Wt	SG	Au%	Adj. Au%
HSA 1001.1.13219	J	XI	S	3.606	10.19	0.0	0.0
HSA 1001.1.15945	J	XI	S	4.476	10.71	4.2	5.1
TC94SPN2	J	XI•	S	3.8383	10.88	7.9	8.5
MAN 2004.117.9	J	XI	S	4.7598	11.00	10.2	10.8
HSA 1001.57.4934	J	XI•	S	3.749	11.02	10.4	11.2
ME63, L:5	J	XII	S	4.095	11.13	12.6	13.2
TC 93SPN6	J	XI	S	2.9458	11.37	16.7	17.6
KC AV328	J	XI•	S	3.643	11.52	19.2	20.3
TC94SPN3	J	XI	S	2.9755	11.64	21.4	22.3
MAN 2004.117.1	J	X	S	3.6359	11.65	21.5	22.5
TC93SPN3	J	XI	S	3.5391	11.67	21.7	22.8
W P.44=L133	J	XI	S	3.047	11.67	21.7	24.2 (6.5)
L131	J	XI	S	4.106	11.79	23.7	24.8 (2.83)
HSA 1001.1.13218	J	XI	S	3.383	11.82	24.1	25.4
TC 93SPN3	J	XI	S	3.8487	11.86	24.8	26.0
KMK	O	XI	S	3.2678	11.90	25.4	26.7
HSA 1001.1.1255	J	XI	S	3.508	12.05	27.7	29.1
ME69, L:3	J	XI	S	3.600	12.23	30.4	31.9
L134	J	XI	S	2.696	12.31	31.6	33.1 (3.00)
L135	J	XI	S	2.393	12.31	31.6	33.3 (3.4)

528 M=main mint; S=secondary mints.

MAN 2004.117.3	J	XI	S	3.6484	12.32	31.8	33.3
MAN 2004.117.4	J	XI	S	3.3324	12.34	32.0	33.6
TC 93SPN2	J	XI	S	3.5452	12.43	33.3	35.0
TC95SPN5	J	XI	S	3.5911	12.60	35.8	37.5
W 181	O	XI	S	3.604	12.67	36.7	38.5
MAN 2004.117.12	J	Similis	S	3.6298	12.67	36.7	38.5
W P.43=L128	J	X	S	3.856	12.75	38.0	39.7 (3.3)
MAN 2004.117.6	J	XI	S	4.3319	12.78	38.3	40.1
TC93SPN5	J	XI	S	4.5761	12.85	39.2	41.0
GNC37926	Bar	XI	S	3.8369	12.96	40.7	42.6
TC93SPN4	J	XI	S	4.3419	12.99	41.1	43.0
W P.45=L132	J	XII	S	3.364	13.15	43.2	45.1 (2.9)
MAN 2004.117.7	J	XI	S	4.857	13.17	43.5	45.4
SICA1, 742	J	XI	S	3.420	13.23	44.2	46.2
GNC38509	Bar	XII	S	3.3362	13.26	44.5	46.6
HSA 1001.57.4932	B	XI	S	3.466	13.54	48.4	50.2
MAN 2004.117.2	J	XI	S	3.8907	13.71	50.6	52.3
MAN 2004.117.5	J	XI	S	3.4358	13.78	51.5	53.2
ME69, L:4	J	XI	M	3.761	13.83	52.2	53.8
W HAS.7=HSA 1001.1.13222	J	XI	S	3.780	13.87	52.5	54.3
HSA 1001.57.4933	J	XI	S	3.382	14.06	54.8	56.5
W 183	O	Similis	S	4.7564	14.16	56.0	57.7
TC 94SPN4	J	XII?	S?	4.1953	14.67	61.7	63.4
KC AV327	J	XI•	M	4.229	14.75	62.5	64.2
MAN 2004.117.8	J	XI•	M	4.2415	14.79	62.9	64.6
W ANS.14=ANS 1917.215.3436	J	XI•	M	4.264	14.84	63.4	65.2
TC94SPN1	J	XI•	M	4.9335	14.84	63.4	65.2
MAN 2004.117.10	J	AI	S	4.2004	14.86	63.6	65.4
ME69, L:5	J	XI•	M	4.231	14.88	63.9	65.6
MAN 1952.23.1	J	XI	S	4.3037	14.90	64.1	65.8
HSA 1001.1.13220	J	XI•	M	4.259	15.04	65.5	67.2
MAN L00B01	J	XII?	M	4.1974	15.08	65.9	67.7
W P.47=L129	J	Similis	S	4.382	15.34	68.6	70.2 (2.8)
MAN 2004.117.11	J	XII	M	4.4132	15.45	69.7	71.3
W C.14==Ø51	J	XII	M	4.244	15.66	71.7	73.3
L130	J	XI	M	4.265	15.70	72.1	72.7 (0.45)
W B.13=Nü75	J	XII	M	4.275	15.74	72.5	74.1
W HSA.8=HSA 1001.1.13221	J	AI	S	4.710	15.97	74.5	76.2

**SERIES NA 2, PHASE 3**

<b>Coll. Ref.</b>	<b>Tester</b>	<b>Year</b>	<b>Den.</b>	<b>WT</b>	<b>SG</b>	<b>Au%</b>	<b>Adj. Au%</b>
<b>W P.46=L112</b>	J	95	Sem	1.945	13.93	53.4	54.8 (2.6)
<b>W B.14=Nü71</b>	J	95	Tre	1.319	13.53	48.0	49.9
<b>W 182</b>	O	95	Sem	1.9772	13.76	51.1	52.7
<b>KMK</b>	O	95	Tre	1.3124	14.05	54.8	56.2
<b>W B.15=Nü72</b>	T	95	Tre	1.344	14.55	60.5	61.9
<b>KMK</b>	O	96	Sem	1.8176	13.08	42.3	44.0
<b>W C.15=Ø47</b>	J	96	Sem	1.962	13.24	44.5	46.1
<b>BNFH.S.28</b>	J	96?	Sem	2.004	14.40	58.8	60.2 (2.4)

**SERIES NA 3 SOLIDI**

<b>Coll. Ref.</b>	<b>Tester</b>	<b>Year</b>	<b>WT</b>	<b>SG</b>	<b>Au%</b>	<b>Adj. Au%</b>
<b>W 184</b>	O	97	4.2694	15.32	68.4	69.6
<b>Bode1935.125</b>	J	97	4.203	14.11	55.5	56.7
<b>W P.49=L113</b>	J	97	4.200	15.32	68.4	69.6 (1.8)
<b>W C.16=Ø55</b>	J	97	4.255	15.30	68.2	69.4
<b>W 185</b>	O	98	4.2667	15.09	66.1	67
<b>KC ALS1</b>	J	98	4.245	15.43	69.5	70.7
<b>KC AV329</b>	J	98	4.255	14.55	60.5	61.6
<b>W P.50=L114</b>	J	98	4.373	14.53	60.4	61.5 (2.0)
<b>TC</b>	J	98	4.2215	13.87	52.6	53.8

**SERIES IP 3 SOLIDI<sup>529</sup>**

<b>Coll. Ref.</b>	<b>Tester</b>	<b>WT</b>	<b>SG</b>	<b>Au%</b>	<b>Adj. Au%</b>
<b>KC AV1089</b>	J	4.077	14.52	60.2	61.3
<b>MAN 1933.45.1</b>	J	4.2961	14.57	60.4	61.8
<b>MAN 2004.117.15</b>	J	4.1691	15.19	67.1	68.3
<b>MAN 2004.117.14</b>	J	4.1633	15.22	67.4	68.6
<b>MAN 2004.117.16</b>	J	4.2641	15.38	69.0	70.2
<b>W C.17=Ø59</b>	J	4.165	15.63	71.4	72.6
<b>L136bis</b>	J	4.119	15.63	71.4	72.7 (2.23)
<b>PG13217</b>	O	4.1313	15.71	72.2	73.3
<b>MAN 2004.117.13</b>	J	4.1210	15.73	72.3	73.5
<b>Nü76</b>	J	4.186	15.80	73.0	74.2
<b>W C.18=Ø60</b>	J	4.138	15.89	73.8	75.0
<b>ME69, L:6</b>	J	4.141	15.95	74.2	75.5
<b>PG18967</b>	O	4.1507	16.05	75.3	76.4
<b>ANS 1994.55.1</b>	J	4.122	16.18	76.5	77.6
<b>TC Bilingual1</b>	J	4.1031	16.19	76.6	77.7
<b>W P.51=L136</b>	J	4.102	16.68	80.6	81.7 (1.3)

529 All dated 98 H.

**SERIES IP 3 FRACTIONALS**

Coll. Ref.	Tester	Den.	WT	SG	Au%	Adj. Au%
HSA 1001.57.4935	J	Sem	1.930	16.68	80.9	81.7
W P.48=L127	J	Sem	1.909	17.17	85.0	85.6 (1.3)
W HSA.9=HSA 1001.1.13162	J	Sem	1.920	16.74	81.4	82.2
MAN 2004.117.18	J	Sem	1.8939	17.04	83.8	84.6
MAN 2004.117.19	J	Sem	1.9428	17.00	83.5	84.3
MAN 2004.117.20	J	Tre	1.2606	16.90	82.7	83.5
TC74	J	Sem	1.9304	16.88	82.5	83.3

**SERIES NA 4 DINARS**

Coll. Ref.	Tester	Year	WT	SG	Au%
KC AVadd4	J	100	4.288	19.24	99.5
KC AV1105	J	101	4.279	18.90	97.3
KC AV1106	J	101	4.281	19.08	98.5
L408bis	J	101	4.270	19.12	98.7
BNF1978.51	J	101	4.267	19.24	99.5
BNF1966.341	J	102	4.300	19.25	99.5
KC AV1108	J	102	4.274	19.18	99.1
ANS 1971.49.199	J	102	4.299	19.25	99.5
W P.53=L425	J	103	4.267	19.24	99.5
KC AV1107	J	103	4.310	18.99	97.8
HSA 1001.1.13211	J	103	4.313	19.05	98.2
BNF1978.52	J	104	4.227	19.03	98.1
KC AV1125	J	105	4.285	19.10	98.6
ME69, L:9	J	107	4.271	18.51	94.7
W P.54=L114	J	114	4.234	19.22	99.5
W P.55=L465	J	117	4.258	19.06	98.3

**SERIES NM 4 FRACTIONALS**

Coll. Ref.	Tester	Year	Den.	WT	SG	Au%
ANS 1971.49.284	J	91	thulth	1.471	18.90	97.3
KC AV17	J	92	nisf	2.128	18.80	96.7
L222	J	92	thulth	1.418	18.65	95.7
KC AV20	J	94	thulth	1.427	18.88	97.2
L226	J	94	thulth	1.394	19.07	98.4
ANS 1924.999.92	J	94	thulth	1.066	19.17	99.1
SICA2, 108	J	94	thulth	1.416	19.16	99.1
SICA2, 109	J	94	thulth	1.413	19.21	99.4
KC AV23	J	96	nisf <sup>530</sup>	1.48	16.02	75.0
KC AV24	J	96	thulth	1.321	18.59	95.2

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530 Clipped to weight of tremissis.

<b>L231</b>	J	96	thulth	1.433	18.69	95.9
<b>KC AV28</b>	J	99	nisf	2.142	18.67	95.8
<b>ANS 1924.999.93</b>	J	99	nisf	2.124	17.72	89.1
<b>L369</b>	J	99	thulth	1.342	18.76	96.4
<b>L370</b>	J	99	thulth	1.341	18.76	96.4
<b>SICA2, 145</b>	J	99	thulth	1.405	18.80	96.7
<b>KC AV30</b>	J	100	thulth	1.412	18.78	96.6
<b>P.52=L406</b>	J	100	nisf	2.123	18.75	96.4
<b>L407</b>	J	100	thulth	1.312	18.67	95.7
<b>BNF1984.1066</b>	J	100	thulth	1.341	18.87	97.1
<b>ANS 1954.116.8</b>	J	101	thulth	1.341	19.10	98.6
<b>ANS 1973.56.310</b>	J	103	thulth	1.430	18.78	96.4
<b>L1681</b>	J	103	thulth	1.432	18.82	96.8

**SERIES IP 4**

<b>Coll. Ref.</b>	<b>Tester</b>	<b>Year</b>	<b>Den.</b>	<b>WT</b>	<b>SG</b>	<b>Au%</b>
<b>W HSA.10=HSA 1001.1.13159</b>	T	102	Dinar	4.330	19.13	98.2
<b>L426</b>	T	102	Dinar	4.281	18.74	96.3
<b>L427</b>	T	102	nisf	2.156	18.67	95.7
<b>W HSA.11=HSA 1001.1.13161</b>	T	102	nisf	2.130	18.82	96.9
<b>KC AV34</b>	T	102	nisf	2.141	19.08	98.5
<b>MAN 104.280</b>	T	102	thulth	1.440	18.74	96.3
<b>MAN 104.281</b>	T	102	thulth	1.4515	18.40	94.0
<b>W HSA.12=HSA 1001.1.13212</b>	T	102	thulth	1.424	18.40	94.0
<b>ANS 1917.215.3437</b>	T	102	thulth	1.431	18.92	97.4
<b>W HAS.13=HSA 1001.1.13211</b>	T	103	Dinar	4.313	19.05	98.3
<b>BNF1972.1074</b>	T	103	Dinar	4.264	18.60	95.3
<b>MAN 104.278</b>	T	104	Dinar	4.2430	18.65	95.8
<b>KC AV104</b>	T	104	Dinar	4.258	18.88	97.2
<b>MAN 104.279</b>	T	106	Dinar	4.2347	19.16	99.0
<b>ME69, L:10</b>	J	107	Dinar	4.251	18.59	95.3
<b>SICA2, 339<sup>531</sup></b>	T	127	Dinar	4.347	18.78	96.6

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531 Remnants of mount.

**ANOMALIES**

<b>Ser/Ph</b>	<b>Coll. Ref.</b>	<b>Tester</b>	<b>Den.</b>	<b>Year</b>	<b>WT</b>	<b>SG</b>	<b>Au%</b>	<b>Adj. Au%</b>
<b>NA 2, Ph.1</b>	KC AV330	J	Sol	III	4.198	16.98	83.3	84.6
<b>NA 2, Ph.1</b>	SICA1, 740	O	Tre	N/A	1.1673	16.76	81.6	82.8
<b>NA 2, Ph.1</b>	KC AV1130	J	Tre	N/A	1.433	16.90	82.7	84.0
<b>NA 2, Ph.2</b>	W HSA.2=HSA 1001.1.8138	J	Sem	N/A	1.989	16.26	77.2	78.6
<b>NA 2, Ph.2</b>	L100bis	J	Tre	N/A	1.397	15.32	68.2	71.8 (7.5)
<b>NA 2, Ph.2</b>	L101	J	Tre	N/A	1.209	15.98	74.7	76.0 (2.3)
<b>NA 2, Ph.2</b>	ME69, L:2	J	Tre	N/A	1.130	12.37	32.5	33.9
<b>NA 2, Ph.2</b>	BM 19.400.801.60	O	Tre	N/A	1.186	17.90	90.5	91.6
<b>NA 3</b>	KMK	O	Sol	98	4.2449	12.62	36.1	38.1
<b>NA 3</b>	StM1928/302	J	Sol	97	4.186	17.84	90.0	N/A
<b>IP 3</b>	BM 1971.0605.1	O	Sol	98	4.0987	12.62	36.1	37.3
<b>IP 3</b>	KC AV1075	J	Sem	N/A	1.942	13.51	47.8	49.2
<b>IP 3</b>	MAN 2004.117.17	J	Sem	N/A	1.5906	14.33	58.1	59.0

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