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# The Adjustment al marco of the Weight of Roman Republican Denarii Blanks by Gouging

Clive Stannard

A method commonly used in the Roman Republic for adjusting the weight of denarius blanks appears to have gone unnoticed until now, in spite of the very clear signs it left on the coins themselves. In fact, many denarii have a gash across their surfaces as if a large bit of metal had been gouged away. The result is so gross that one's natural tendency is to ascribe it to casual damage.

Some years ago, I saw part of a hoard in which there was a large proportion of such coins, which were otherwise in perfect condition: from seeing them together, it struck me this could not be casual damage; a glance at them under a lens showed they had been gouged before striking; and I realized I had stumbled on evidence of the mint's procedure for adjusting the weight of blanks. In the case of more modern coinage, of course, weights were, until recently, often adjusted by drawing a file across the face of a blank [1]. Once understood, the phenomenon is easily recognizable: a sliver of metal has been removed from the face of the blank with a scorper - presumably an iron rod cut through at an angle - the blank having been placed flat on a work-bench, up against a strip of wood or some such to stop it moving. Almost invariably, clear lunate *judder* or *chatter* marks lie across the passage of the blade, always belly forwards and horns backwards; they are very characteristic and serve to distinguish gouging from casual damage. The judders result from the tapping of the hammer; they are usually undercut, and so fold over themselves and show up even when the gouge has itself been quite obliterated in striking; at the least, the points of the horns have usually closed. The area that corresponds to the gouge on the other face of the coin is very frequently weak, especially when the gouge mark is deep. The surface of the gouge is sometimes grainy because of lateral compression during striking. Because of these signs, it is probable that one can still identify the great majority of gouged blanks even though they were struck into coin, and sometimes worn in circulation, which makes a statistical analysis of the phenomenon possible.

On plates **1** and **2** is a representative selection of gouged denarii. The deepest gouges are as in illustrations 12, 13 and 18: in such cases, there are only minimal judders, and the other face of the coin is invariably weak. Shallower but clear gouges can be seen on 10 (with a fine set of

deeply undercut judders across Saturn's head), on 5 (again, with clear judders), and, less conspicuously, on 16 (where the gouge runs from Apollo's wreath to his ear, with a judder across the wreath, and another at the temple). There are less evident gouges on 15 (but two deep judders), and 6, where the judder across the letter **Q** is unconnected with the remains of the gouge across the galley. Number 14 is unusually without a judder, but the surface of the cut is grainy. The gouge is almost gone on 9 (except where it crosses the horse's body), but there is a closed judder running from the rider's head to the base of the horse's tail, and a more open one on the horse. On 7, though no gouge remains, a single large judder runs from Mars' eye-brow, across the lobe of his ear, and down his neck. The gouges on 4 could easily go unnoticed, but it is, in fact, the only twice-gouged coin I have seen: a pair of judders lies across the visor of the helmet, with the lower extending into the pupil of Roma's eye; the second, less evident pair lies at another angle, with a judder running vertically from under the eye across the lips and chin, and a second, closed judder in the field in front of the face from the base of the nose down. Number 17 shows how long a gouge can be: there is a judder above the roll in Liberty's hair, another on the neck, and the gouge runs quite off the flan, which I have seen on no other specimen.

To study the incidence of gouging, I worked my way through the cabinets of the American Numismatic Society, and the Ashmolean and British Museums; I sampled the Royal Danish cabinet; Charles Hersh looked through his collection for me; and I kept an eye on the trade. Apart from many Republican denarii, two Greek silver pieces and a gold coin of Constantine the Great have turned up, but the incidence of gouging outside the Republic is much lower [2].

Appendix 1 catalogues all the gouged pieces encountered; appendix 2 gives the number of gouged Republican coins per issue in the collections I studied systematically [3]. Gouged issues run from *RRC 274/1 to 443/1, from 123 to 49-48 BC*. There are 207 issues [4] in this period, of which 72, or 35%, are gouged, and it is clear that the list is far from complete, because 38 of these 72 issues are represented by a single coin only, and because, in a number of cases, only part of a moneyer's issues have yet been shown to be gouged, which is unlikely. I suspect that virtually all the issues of this period were gouged, and earlier and later pieces may yet turn up; unfortunately, an attempt to identify with any degree of certainty, by negative inference, those issues which were not gouged - if there were any - may require a sample so large as to be impractical, or impossible.

In these museums, the percentage of gouged coins in individual issues already known to be gouged varies from nothing to 13.04%. Within these issues, 2.53% of all the museums' coins are gouged; on the basis of the sample, I do not feel able to suggest whether one issue is more heavily gouged than another, but the practice does appear to start suddenly in 123 BC and rather peter out towards the end of the period.



There seems to be little pattern in the evidence within individual issues. As appendix 1 shows, apart from 290/1, nos.4 and 5, no two gouged pieces share a die with the same control-marks,[5] so it is unlikely that gouged blanks were struck together; nor, from their control-marks, do they seem to fall, say, into the early or late part of an issue. Serrated and plain blanks are gouged indifferently [6]. Clearly different broad and narrow blanks occur towards the end of the 2nd century BC (353/1, for example, uses both, broad blanks for 353/1a-d, and narrow blanks for 353/1e and 2 [7]); both are gouged. In most issues, the blanks were cast; I have not seen gouged coins of issues where the blanks were cut out of sheets of metal (such as 441/1), or where the blanks were hammered down from some more dumpy shape (which is common in the 40s BC). Gouging is not restricted to the mint of Rome, as both Narbo (282/2) and Caesar's mobile mint (443/1) occur.

Was adjustment *al peso* or *al marco*? In the first case, adjustment is intended to bring each coin within a certain stipulated weight of the standard, within the *remedy*, or *tolerances*, in the language of the Middle Ages; in the latter case, weight and tale are only matched by batch, with the aim of getting a fixed number of blanks from a fixed weight of metal, without too much attention paid to the weights of individual blanks.

For the three non-Republican pieces, the evidence is thin. The Lycian stater is overstruck: coins with this overtype are on a standard about 0.5 g lighter than the undertype, [8] which was gouged to reduce its weight to the new standard; everything argues for adjustment *al peso* in specific circumstances. The Paeonian tetradrachm now lies within the normal range for the emission, and the blank must once have been considerably heavier than required; we can say little more.

The Constantinian gold piece (*RIC* Antioch 126) is of an aberrantly low weight for an aureus (4.35 g against a standard of about 5.30 g). Sutherland, in *RIC*, knew of a single specimen of this coin, in Budapest, which was apparently of aureus weight, and noted that it shared its reverse die with a unique coin of Constantius (*RIC* Antioch 11) struck ca. 299-302 as part of a group of 'small, non-currency medallions to mark the victory over the Persians'; these were not on the aureus standard; most weigh 6.6 g, but no.11 weighs 4.46 g, much the same weight as our gouged piece [9]. Can it be that this *medallic standard* was revived for Constantine's piece, and an aureus blank adjusted accordingly? Another possibility, which A.Walker has suggested to me, is that 'the coin is not an aureus at all but, rather, a solidus struck using an old aureus reverse die and a blank prepared on the old aureus standard' and gouged to correct its weight, but this does not address the fact of the similar weight of Constantius' much earlier piece. In either case, *RIC* is probably wrong and the Budapest specimen of no.126 will prove to be light.

If we do accept the Rome specimen of no.126 as an aureus, then it is clear that it cannot have been effectively adjusted *al peso* to this weight; because of the relative accuracy achieved in

the weights of Roman gold [10], it is unlikely that gold can have been adjusted *al marco* by so gross a procedure as gouging. I suggest that a batch of blanks, whose weight had been adjusted *al peso*, was found to be slightly overweight, and that the excess was therefore recovered by gouging a few blanks.

In the Roman Republic, the situation is far clearer. The mean weight of the gouged pieces in appendix 1 is 3.86 g, with a standard deviation of 0.11 g; the sample includes a high proportion of worn coins; they were tarrified at 84 to the Roman pound, which would give a pound of about 324.5 g, which is quite acceptable. The present weight of these coins therefore shows that the blanks were considerably heavier before gouging. Their distribution is given in Fig. 1. To compare gouged and ungouged pieces, I constructed distributions for two large samples: all the coins in the Cosa hoard [11] (Fig. 2) and in the American Numismatic Society [12] (Fig. 3) in issues known to be gouged [13]. To smooth irregularities in the samples, and make it easier to identify the mode, I used averaged histograms [14]. I also calculated mean ( $\bar{x}$ ), standard deviation ( $s$ ), skewness ( $b_1$ ) and kurtosis ( $b_2$ ) [15] for each sample, which gave the following figures.

Sample	N	$\bar{x}$	$s$	$b_1$	$b_2$
Gouged pieces	166	3.86 g	0.11 g	-1.14	8.21
Cosa hoard	997	3.88 g	0.14 g	-0.79	5.63
ANS	707	3.83 g	0.15 g	-1.61	7.39

These samples are irregular, and cannot be statistically argued to come from normally distributed, or gaussian, populations: they are negatively skewed, and the high kurtosis suggests bunching around the mean [16]. This type of distribution is very characteristic of Roman precious metal emissions. Guey and Carcassonne have published similar data for nine samples of Republican denarii [17]: in seven, skew is outside the normal range, as is kurtosis in eight.

The Cosa hoard is particularly important because the coins are in perfect condition [18]; we may discount wear as a factor modifying the distribution; the mean is high (3.88 g) and would give a full pound of about 326 g. The ANS sample is interesting precisely because, though it is worn (the mean has fallen to 3.83 g), it nonetheless preserves the mode at 3.90 g, that is, it still has the same mode as the Cosa hoard sample. It appears that, when a sample contains even a relatively small proportion of unworn coins, the worn pieces will only cause the absolute heights of the bin containing the mode and the other bins to fall in proportion to their original numbers (assuming that which coins are worn is random), thereby retaining the mode despite wear.

All the evidence points to this type of distribution being the result of weight adjustment *al marco*: the fact that the gouged coins have a mean equal to, or slightly less than the mean of

the ungouged pieces (3.86 to 3.88 g); and the negative skew resulting from the higher leg of the original distribution having been reduced [19]. In practical terms, the mint will have cast batches of blanks just slightly heavy, resulting in a gaussian distribution, with the mean and mode coinciding at about 3.90 g. A tale of blanks - presumably a multiple of pounds - will then have been slightly heavy: to recover silver, and bring the tale to the correct overall weight, a few heavier pieces will have been sorted out by eye, gouged, and tossed back, until the correct balance resulted. (Fig. 4 is a model of the process.) This strategy was adopted because casting the blanks slightly light would have resulted in a more laborious type of adjustment, by first segregating a tale of blanks, and trying to raise the weight by removing, substituting, and melting particularly light pieces.

How much metal was removed by gouging? In the Cosa hoard sample, the difference between mean and mode, multiplied by the number of coins (  $(3.90 - 3.88) \times 997$  ), gives a weight of 19.94 g recovered from an original overall weight of 3,888.3 g, equivalent to the weight of about five denarii a thousand. If we assume, on the basis of the observed distributions, that the average weight of blanks sorted out for gouging was about 4.25 g, then an average weight of about 0.37 g per coin (  $4.25 - 3.88$  ) was cut away. We can then estimate the number of blanks gouged at  $19.94/0.37$ , or 53, or about 5.3%.

Of course, my calculations enjoy a spurious precision, but I have no doubt they approximate to reality. There are three independent pieces of supporting evidence: in the first place, appendix 2 shows that, *grosso modo*, the ratio of gouged to ungouged coins in the samples that have come down to us is similar [20]; in the second place, the amount of metal we know to have been taken off the Lycian piece (a larger coin) corresponds quite well with our analysis; and, in the third place, the Roman bronze samples that have been analysed appear to have undoubtedly gaussian distributions, which means that adjustment *al marco* was not practised in such cases, and proves the opposition of these categories.

Guey and Carcassonne have statistically analysed a number of large samples of Republican cast libral bronze [21], grouped by denomination: not one of the six samples was skewed; only one showed abnormal kurtosis. To be able to compare this with struck bronze, I analysed the quadrantes from the Tiber published by King [22], making a single sample of the reigns of Augustus, Gaius and Claudius, for the standard does not appear to have changed in the period. The following figures clearly indicate a gaussian distribution [23]:

Sample	N	x	s	b <sub>1</sub>	b <sub>2</sub>
Tiber quadrantes	670	2.41 g	0.47 g	-0.01	3.08

These emissions were not adjusted, either because they were fiduciary (in which case the state was making a profit, which it was not considered necessary to fix precisely beforehand) or because the intrinsic value was too low to justify the extra labour.

Within the mint, the practice of adjustment *al marco* probably meant that batches of adjusted blanks were moved intact (perhaps in sealed and resealed boxes or bags) through striking, and even as far as disbursement, for only in this way could audit controls be set up to limit fraud, especially through mint officials sorting and substituting coins, and giving true tale and false weight to their profit. The complex systems of control-marks common in the late 2nd and early 1st centuries BC may have been intended to facilitate this accounting: it is interesting that they begin with 268/1b in 126 BC, only three years before the first evidence of gouging.

The wide range of weights that characterizes adjustment *al marco* does not seem to have signified in circulation; it did not result in heavy coins being picked out for melting or hoarding. The Cosa hoard sample is a witness: although largely a savings hoard, there is no sign that its owner had successfully picked out heavier pieces, as the mean is at the theoretical standard, and weights range widely. Moreover, the willingness to accept gouged denarii with what looked like a chunk of metal missing must be related to the fact that Republican denarii do not ever seem to have been clipped, or had silver removed fraudulently, which is most surprising, given the frequency of plating, and the ceaseless struggle against it to which the test-marks on the coins testify: I have even catalogued two cases of gouged coins which had been tested. Clipping arrives with the thinner coins of the late empire: did it bring finer tolerances and, perhaps, adjustment *al peso* with it?

Unfortunately, what we have learned about the maintenance of weight standards in the Republican mint cannot necessarily be applied to other series but, no doubt, close statistical analysis will isolate other methods of adjustment in other precious metal series. Numismatic metrology has been deficient in accepting the wide range of individual coin weights in ancient coinage without asking how this was managed to prevent loss to the state, by ensuring that tale and weight matched, and to prevent fraud.

## References and Notes

1. A description of the manufacture of Dutch ducat blanks in 1974 is given in Courtney Coffing, 'Traditions live on at the Utrecht Mint', *Coin World* (3 December 1975), p.60: 'Meticulous care and attention to exact weight tolerances call for striking only 10 of a 100-kilogram order for gold. The remaining 90 kilogrammes are remelted and new attempts made. Tolerances must range between 3.491 and 3.487 grams, a variance out of the 6/1000 of a gram limit calls for rejection. Two men work to salvage as many blanks as possible. If a blank weighs light it is remelted. If it is slightly heavy, it is tossed into one of four boxes, numbered one to four, calling for one, two, three or four passes of a file over the flat surface of a blank. Such removal of gold will bring the blank into acceptable tolerance levels, it is hoped. If too much gold is removed in the filing operation, it is rejected when again weighed. If too heavy, it is filed again'. A file allows more precision

than a gouge: perhaps the ancients preferred a gouge because it was easier to recover the metal removed.

2. I owe debts of gratitude to many people, to Anne Kromann at the Royal Danish Cabinet, William Metcalf at the ANS, Michael Metcalf at the Ashmolean, Andrew Burnett at the British Museum, Charles Hersch, Michel Amandry at the Bibliothèque Nationale for having looked through some issues for me, and Georges Depeyrot for having found the first non-Republican piece; to Alan Walker at Bank Leu, Italo Vecchi at the Schweizerische Kreditanstalt in Berne, Vincenzo Filonardi of Baranowsky Harlan Berk, and Dennis Kroh of Empire Coins, and to many collectors, especially Francesco Rocchi, Geremia Bisceglia and Franco Mancini, for having found specimens for me, lent me coins, or sent photographs; and to Michael Crawford, David Sellwood, and Sara Sorda for their interest and suggestions.
3. Denarii only, for I saw no gouged quinarii; plated, broken, or otherwise impaired coins excluded; the three issues in Paris examined for me by M.Amandry are included.
4. For facility, Crawford's sub-types are grouped into major types, as in appendix 2: I refer to each such grouping as an 'issue'.
5. In 307/1a-d, nos.2 and 3 in fact belong to different series of control-marks; the shared control-mark, **L**, is coincidental.
6. On the basis of the many coins I have seen in this study, I am convinced that serration was achieved by setting the blank on edge on a bench and chopping it lightly with a heavy knife, rotating it between blows; provided the knife strikes near its centre of gravity, there is little strain on the hands; the process is very rapid. The manufacture of blanks was by far the most time-consuming procedure in the mint, and, in relative terms, neither serration nor gouging need have been very laborious.
7. There is a clear hiatus in this issue, in the form of blank used, the style of engraving, and the types, that does not correlate with the replacement of the legend, **MN.FONTEI C.F**, by **EX A.P**: is it evidence for workshops?
8. I thank Jeffrey Spier for this information.
9. *RIC* p.599ff.; see also p.608 and p.614, n.2.
10. See, for example, R.Duncan-Jones, 'Weight-loss as an index of coin-wear in currency of the Roman Principate', in G.Depeyrot and T.Hackens (eds.), *Rhythmes de la production*

*monétaire, de l'antiquité à nos jours* (Actes du Colloque International organisé à Paris, 10-12 janvier 1986), (Louvain-la-Neuve 1987), p.124, which analyses the accuracy of adjustment in hoards of the 1st and 2nd centuries AD: 'the figures show clearly that gold has a very low ceiling for excess weight, whereas silver strikings can in extreme cases be one-seventh or even one-quarter overweight.'

11. T.V.Buttrey, 'Cosa: the coins', *Memoires of the American Academy in Rome*, 34 (1980). I regret that I have not been able to see the Cosa hoard and isolate the gouged pieces.
12. From a print-out of the computer catalogue dated 18 October 1986. Not all pieces had been weighed, but I can detect no bias in which were or were not, except that more of the earlier than of the later pieces were. W.Metcalf informs me that the list is unlikely to contain plated coins, as these had been segregated for study. I have excluded all the gouged pieces, which I had earlier recorded. I should like to stress the importance of designing programmes which allow the automatic exclusion of false, plated, broken, heavily corroded, or otherwise impaired coins. Ideally, a piece's condition should also be recorded, by some agreed scale, so that a function to allow for loss of weight in circulation can be attempted: it would be of no use in considering the weight of individual coins, but could be of value for large samples, such as I have been dealing with.
13. I also began to draw up a distribution on the basis of *BMCRR*, but the material is subject to very obvious rounding-off error, at, for example, 60, 60.5 and 61 grains.
14. By the method proposed in Stephen N.Cope, 'The statistical analysis of coin weights by computer and a rationalized method for producing histograms', *NC* 140 (1980), 178-84; to average the data, the count for each specimen was distributed into a range of 0.01 g bins as follows: 1/4 into its actual bin, 3/16 into each of the adjacent bins, 1/8 into the next, and 1/16 into the next.

15. Skewness,  $b_1 = \frac{\sum(x-\bar{x})^3}{n}/s^3$

measures whether one tail of a frequency distribution, around the mean, differs from the other; for the normal distribution, this ratio is 0; negative skew means that the upper tail is less than the lower; positive, that the lower is less than the upper.

Kurtosis,  $b_2 = \frac{\sum(x-\bar{x})^4}{n}/s^4$

measures the relative importance of the tails to the centre of a distribution around the mean; for the normal distribution, this ratio is 3, and higher values indicate the grouping of values around the mean, and abnormally large tails.

16. 'Dans le cas d'une distribution unimodale, la valeur de b croît en général avec la concentration des valeurs autour de la moyenne'; Ch.Carcassonne, 'Quelques méthodes statistiques utilisées en numismatique', *PACT* 5 (1981), p.39.
17. From *BMCRR*, grouped into Sydenham's series; as well as six samples of cast libral bronze, and 18 of aurei between 47 BC and Trajan's death; *Propos de statistique*, in *les 'Dévaluations' à Rome* (Actes du Colloque de Rome, 13-15 novembre 1975), Rome, 1978, pp.55-78.
18. T.V.Buttrey, loc.cit., p.81: 'Not only are there coins in quantity, but their condition is, in general, superb. Literally hundreds are fresh from the dies or show only the most minute trace of wear in circulation'; p.86, 'It can hardly be doubted that this hoard was not put together on a single occasion from random material. Rather, the coins were accumulated in serial batches, composed largely but not exclusively of recent strikings, creating a monetary *pousse-café*'.
19. I hesitate to argue too sanguinely from the high kurtosis, the precise significance of which is not yet clear. 'L'appatissement est loin d'être un fait constant; il est néanmoins assez fréquent dans les échantillons monétaires ici analysés. Mais la discription de ces faits commence à peine. Quand elle sera moins fragmentaire il aura lieu de rechercher les causes d'une distortion qui (sauf erreur) n'a guère attiré jusqu'ici l'attention des numismates'; J.Guey and Ch.Carcassonne, op.cit., pp.59-60.
20. The large number of gouged coins suggests that gouging was the sole technique of adjustment used in these samples.
21. From Haeblerlin; loc.cit., pp.69 and 76.
22. C.E.King, 'Quadrantes from the River Tiber', *NC* 135 (1975), 82-5.
23. Which also shows that the unqualified attribution of negative skew to wear is simplistic: Tiber coins tend to have been rather severely corroded, though with wide individual variation; nonetheless, there is no sign of a distortion in the distribution, bearing out D.M.Metcalf's observation that 'the empirical evidence is that wear can displace the histogram along the horizontal axis to a distance of several standard deviations before the theoretically expected flattening and negative asymmetry become at all noticeable', 'What has been achieved through the application of statistics to numismatics', in *PACT* 5 (1981), p.13.

## APPENDIX 1

## CATALOGUE OF GOUGED PIECES

Pieces illustrated are marked with a star

## 1. Greek

	<i>date</i>	<i>grammes</i>
* <b>LYCIA</b> , stater ( <b>plI,1</b> )	ca. 460	8.69
J. Spier in I. Carradice, ed., <i>Coinage and Administration in the Athenian and Persian Empires</i> , pl.VI, no.5; boar/trisceles over-struck on boar/turtle (the latter Babelon, <i>Traité II</i> , nos.137-141, pl.92,2-6; <i>BMC Lycia</i> , 4, nos.17-21); the undertype is itself always struck over other coins		
* <b>AUDOLEON, KING OF PAEONIA</b> , tetradrachm ( <b>plI,2</b> )	ca.315-286	
SNG Den 1382; BMC 4; Schweizerische Kreditanstalt, Auktion 7, April 1987, no.187		

## 2. The Roman Republic

<i>Crawford</i>		<i>date</i>	<i>mint</i>	<i>grammes</i>
274/1	<b>C-CATO</b>	123	Rome	
1.	trade			
275/1	<b>M-FAN C-F</b>	123	Rome	
1.	private collection			3.83
* 2.	private collection ( <b>plI,4</b> )	the only twice-gouged coin recorded		3.95
281/1	<b>M-FOVRI M-F PHILI</b>	119	Rome	
1.	trade			
282/2 <i>serratus</i>	<b>L-LIC, CN·DOM &amp; Associates</b>	118	Narbo	
1.	trade			
287/1	<b>Anon.</b>	115 or 114	Rome	
1.	BM Italy 562			3.89
289/1	<b>M-CIPI M-F</b>	115 or 114	Rome	
1.	ANS 1966-286-1			3.86
2.	ANS 1944-100-582			3.92
290/1	<b>C-FONT</b>	114 or 113	Rome	
* 1.	Danish 555/1a ( <b>plI,5</b> )	obv. control-mark <b>B</b>		3.78
2.	Ashmolean bought from General Fagan on 7/4/1933	obv. control-mark <b>I</b>		3.89
3.	Ashmolean New College	obv. control-mark <b>T</b>		3.85
4.	BM Italy 610	obv. control-mark <b>P</b>		3.82
5.	BM 1923 11.2.3	obv. control-mark <b>P</b>		3.85
291/1	<b>MN-AEMILIO LEP</b>	114 or 113	Rome	
1.	ANS 1965.100.3			3.82
293/1	<b>L-PHILIPPVS</b>	113 or 112	Rome	
1.	ANS 1944.100.601			3.89
296/1a-1	<b>CN-BLASIO CN-F</b>	112 or 111	Rome	
1.	Ashmolean Ashmole 17	1h		3.93



<i>Crawford</i>		<i>date</i>	<i>mint</i>	<i>grammes</i>
297/1a-b	<b>TI-Q</b>	112 or 111	Rome	
1.	Ashmolean	1a, obv. control-mark <b>B</b>		3.63
2.	Ashmolean New College	1a, obv. control-mark <b>C</b>		3.68
3.	BM Italy 573	1a, obv. control-mark <b>H</b>		3.90
4.	Hersh			3.78
299/1a-b	<b>AP-CL, T-MAL or T-MANL, Q-VR</b>	111 or 110	Roma	
1.	trade			
303/1	<b>MN-AQVIL</b>	109 or 108	Rome	
1.	Private collection			
305/1	<b>Q-LVTATI CERCO Q</b>	109 or 108	Rome	
* 1.	ANS 1941.131.106 ( <b>plI,6</b> )			3.96
2.	Hersh			3.94
307/1a-d	<b>MN-FONTEI</b>	108 or 107	Rome	
1.	Danish 566/15a	1b, control-mark <b>F</b>		3.80
2.	Ashmolean, given by E.H.North on 18 May 1960	1b, control-mark <b>L</b>		3.94
3.	Ashmolean, Godwyn ms., num.4, p.32	1a, control-mark <b>L</b>		3.83
316/1	<b>L-THORIVS BALBVS</b>	105	Rome	
1.	Danish 598/17	rev. control-mark <b>R</b>		3.82
2.	BM Rome 1618	rev. control-mark <b>C</b>		3.98
317/3a-b	<b>L-SATVRN</b>	104	Rome	
1.	BM Rome 1544	3b, rev. control-mark <b>Z</b>		3.89
2.	BM Rome 1496	3a, rev. control-mark <b>W</b>		3.90
3.	Hersh	3a		3.93
4.	Hersh	3a		3.95
5.	Hersh	3a		3.88
318/1a-b	<b>C-COIL CALD</b>	104	Rome	
1.	BM 1949 3.4.21	1a, rev. control-mark <b>V</b>		3.96
2.	ANS 1944.100.674	1a, control-mark <b>G</b>		3.89
3.	ANS 1905.57.8	1a, rev. control-mark <b>M</b>		3.87
4.	Hersh	1a		3.95
320/1	<b>L-IVLI L-F CAESAR</b>	103	Rome	
1.	BM Rome 1423	control-marks <b>L/I</b>		3.83
* 2.	BM Rome 1409 ( <b>plI,7</b> )	control-marks <b>D/D</b>		3.83
321/1	<b>L-CASSI CAEICIAN</b>	102	Rome	
1.	Ashmolean Bouchier 1930, 67	control-marks <b>D/S</b>		3.90
2.	BM Rome 1741	control-marks <b>H/O</b>		3.89
* 3.	BM Rome R 1725 ff ( <b>plI,8</b> )	control-marks <b>K/M</b>		3.95
4.	Hersh			3.87
322/1a-b	<b>C-FABI C-F</b>	102	Rome	
1.	ANS 1941.131.117	1b, rev. control-mark <b>M</b>		3.89
323/1	<b>L-IVLI</b>	101	Rome	
1.	BM Rome 1678			3.90
325/1a-b	<b>L-SENTI C-F</b>	101	Rome	
1.	Ashmolean Bouchier 1930, 261	1a, rev. control-mark <b>L</b>		3.80

<i>Crawford</i>			<i>date</i>	<i>mint</i>	<i>grammes</i>
326/1	C-FVNDAN Q		101	Rome	
1.	BM Rome 1688	obv. control-mark I			3.74
329/1a-d	LENT·MAR·F		100	Rome	
1.	Danish 604a/34a	1b, control-marks M/M			3.91
2.	BM Rome 1722	1b, control-marks Ψ/Ψ			3.92
334/1	L·POMPON MOLO		797	Rome	
1.	trade				
335/1a-c & 2	C·MALL, A·ALBINVS S·F, L·METEL		796	Rome	
1.	Zehnacker, <i>Moneta</i> , illustration 614	2			
335/3a-g	C·MALL, A·ALBINVS S·F, L·METEL		796	Rome	
1.	BM Italy 704	3f			3.87
335/9	C·MALL, A·ALBINVS S·F, L·METEL		796	Roma	
1.	Ashmolean Griffith 1921				3.57
336/1a-c	C·ALLI BALA		92	Roma	
1.	Hersh	1c			3.85
340/1	L·PISO L·F L·N FRVGI		90	Roma	
1.	Ashmolean Evans 1941	control-marks €/LXIII			3.71
2.	Ashmolean Keble Stainer B 43	control-marks †/AB			3.86
3.	BM Rome 1939	control-marks CXVII/IIII			3.87
4.	BM Rome 1893	control-marks H/→			3.78
* 5.	BM Rome 2099 (pI,9)	control-marks -/I			3.89
6.	BM Rome 2090	control-marks ME/O·			3.87
7.	BM 1949 4.3.143	control-marks XVIII/XXIII			3.85
8.	ANS 1896.7.59	control-marks SS/LVII			3.83
9.	Hersh				3.87
342/4a-b & 5a-b	C·VIBIVS C·F PANSA		90	Rome	
1.	Hersh	4b			3.91
2.	Hersh	5b			4.17
3.	Hersh	5b			4.01
4.	Boulogne-sur-Mer	5b, 3.72 g, not used in statistics			
344/1a-c	L·TITVRI L·F SABINVS		89	Rome	
1.	trade				3.85
344/2a-c	L·TITVRI L·F SABINVS		89	Rome	
1.	trade				
2.	private collection	2b			3.90
346/2a-c	C·CENSORIN		88	Rome	
1.	BM Rome 2406	rev. control-marks fly above, I below			3.95
349/1	L·C·MEMIES L·F GAL		87	Rome	
1.	Ashmolean Christ Church 138	obv. control-mark :: : †			3.91
* 2.	private collection (pII,10)	obv. control-mark V			3.89
350A/1a-e & 2	GAR, OGVL, VER & Anon.		86	Rome	
1.	Ashmolean bought from	2			3.51
	A. Walker on 19.11.1938				
2.	ANS 1001.57.189	2			3.92

<i>Crawford</i>		<i>date</i>	<i>mint</i>	<i>grammes</i>
352/1a-c	<b>L·IVLI BVR SIO</b>	85	Rome	
1.	Ashmolean Bodley 58	1a, obv. control-mark illegible		4.16
2.	BM Rome 2592	1c, broken, 3.59 g, control-marks <i>stilus</i> (?) / RV		
3.	BM 1938 10.7.271	1a, heavily damaged, 3.07 g, obv. control-mark caps of the Dioscuri		
4.	BM Rome 2503	1a, obv. control-mark <i>tessera</i>		3.95
5.	Boulogne-sur-Mer	1c, 3.40 g, control-mark ⌘, not used in statistics		
353/1a-d & 2	<b>MN·FONTEI</b>	85	Rome	
* 1.	trade (PLII,11)	1d		3.83
356/1a-d	<b>P·FOVRIVS CRASSIPES AED·CVR</b>	84	Rome	
1.	St. Omer	1c, 3.99 g, not used in statistics		
* 2.	private collection (pLII,12)	1a		3.83
357/1a-b	<b>C·NORBANVS</b>	83	Rome	
1.	BM Rome 2774	1b, obv. control-mark XXXVII		3.98
363/1a-d	<b>L·CENSOR</b>	82	Rome	
1.	BM Rome 2661	1a, control-marks trident/⌘		3.71
364/1a-e <i>serratus</i>	<b>Q·ANTO BALB PR</b>	83-82	Rome	
1.	BM Rome 2756	1d, rev. control-mark F		3.96
372/1 <i>serratus</i>	<b>A·POST A·F S·N ALBIN</b>	81	Rome	
1.	Ashmolean Radcliffe 158			3.69
2.	Ashmolean Bodley 87			3.71
3.	BM Rome 2836			3.94
372/2 <i>serratus</i>	<b>A·POST A·F S·N ALBIN</b>	81	Rome	
1.	ANS 1896.7.75			3.90
2.	Ashmolean New College	edge filed all round, 3.78 g		
3.	BM 1964 12.3.206			3.99
4.	trade			4.01
5.	Hersh			4.06
377/1 <i>serratus</i>	<b>L·VOL L·F STRABO</b>	81	Rome	
1.	Ashmolean Douce	obv. control-mark F		3.93
378/1a-c <i>serratus</i>	<b>C·MARI C·F CAPIT</b>	81	Rome	
1.	trade	1c, control-marks LII/vine-leaf		3.95
2.	trade	1c, control-marks CVII/hammer		3.90
3.	Danish 744a/22	1c, control-marks XXXII/fly		3.82
4.	Danish 744a/11a	1c, control-marks CXIII/pelta		3.90
5.	Danish 744a/4g	1c, control-marks LXXXVIII/flabellum		3.93
6.	Danish 744a/14b	1c, control-marks CXXXVII/antelope's head		3.68
7.	Ashmolean Christ Church 171	1b, control-marks XXVI/lizard		3.89
8.	BM Rome 2883	1c, control-marks CXXXII/shield		3.86
9.	BM 1950 10.6.318	1c, control-marks LXXXIII/foot		3.85
10.	Hersh			3.88
379/1	<b>L·PROCILI·F</b>	80	Rome	
1.	trade			
379/2 <i>serratus</i>	<b>L·PROCILI·F</b>	80	Rome	
1.	private collection			3.25

<i>Crawford</i>		<i>date</i>	<i>mint</i>	<i>grammes</i>
380/1 <i>serratus</i>	<b>C-POBLICI Q-F</b>	80	Rome	
1.	ANS 1955.59.2	control-marks C/C		3.84
2.	Danish 768/14	control-marks B/B		3.89
3.	Ashmolean Douce	control-marks H/H		3.96
4.	Ashmolean Evans bequest 1941	control-marks S/S		3.80
5.	BM Rome 2914	control-marks T/T		4.01
6.	Hersh			3.84
382/1a-b <i>serratus</i>	<b>C-NAE BALB</b>	79	Rome	
1.	ANS 1975.226.6	1b, rev. control-mark XXXVII (...)		3.82
2.	Danish 769/5b	1b, rev. control-mark XIII		4.13
3.	Danish 769/12bb	1b, rev. control-mark CXVII		3.80
4.	Danish 769/13aa	1b, rev. control-mark CXXXX		3.52
5.	BM Rome 2969	1b, rev. control-mark CLXXXVII		3.92
6.	BM Rome 2963	1b, rev. control-mark CL		3.85
7.	BM Rome 2958	1b, rev. control-mark CXXVI		3.91
8.	BM Rome 2955	1b, rev. control-mark CXXVIII		3.73
9.	BM Rome 2951	1b, rev. control-mark LXXXXV		3.69
10.	BM Rome 2929	1b, rev. control-mark VIII		3.88
11.	BM 1949 4.3.81	1a, obv. control-mark N		3.83
12.	BM Rome 2918	1b, rev. control-mark H		3.88
13.	Hersh			4.08
383/1 <i>serratus</i>	<b>TI-CLAUD TI-F AP-N</b>	79	Rome	
1.	trade	rev. control-mark CXV		3.85
2.	trade	rev. control-mark CXXIII		3.97
3.	trade	rev. control-mark CXXXVIII		3.78
4.	trade	rev. control-mark CX(...)I		3.90
5.	ANS 1001.1.25544	rev. control-mark XV		3.84
6.	trade	rev. control-mark LII		
7.	private collection	rev. control-mark CXXXV		3.93
8.	trade	rev. control-mark CXXXVI		3.72
9.	Danish 770a/27	rev. control-mark A·LXXXXIII		4.08
10.	BM Rome 3132	rev. control-mark A·LII		3.75
11.	BM Rome 3120	rev. control-mark A·XVIII		3.78
12.	trade	rev. control-mark IIII		3.93
13.	Hersh			3.95
14.	trade	rev. control-mark C(...)		3.88
384/1 <i>serratus</i>	<b>L-PAPI</b>	79	Rome	
1.	ANS 1944.100.1938	control-marks RRC Pl.LXVI, set 11		3.95
2.	ANS 1948.19.157	control-marks RRC Pl. LXVII, set 121		3.89
3.	BM Rome 3074	control-marks RRC Pl. LXVI, set 98		3.83
* 4.	BM Rome 3011 (pl.II,13)	control-marks RRC Pl. LXVI, set 35		3.85
5.	BM Rome 3034	control-marks RRC Pl. LXVI, set 58		3.89
6.	BM Rome 3008	control-marks RRC Pl. LXVI, set 32		3.83
7.	Hersh			3.77
8.	Hersh			3.86
9.	Hersh			3.89
10.	Hersh			4.10
385/1	<b>M-VOLTEI M-F</b>	78	Rome	
1.	Boulogne-sur-Mer	3.72 g, not used in statistics		
385/4	<b>M-VOLTEI M-F</b>	78	Rome	
1.	BM Rome 3187	control-marks tongs/IA		3.82
2.	Hersh			4.00
3.	Hersh			3.81
4.	Hersh			3.84

<i>Crawford</i>			<i>date</i>	<i>mint</i>	<i>grammes</i>
385/5	<b>M-VOLTEI M-F</b>		78	Rome	
1.	Hersh				3.87
386/1	<b>L-CASSI Q-F</b>				
1.	SNR 1978, pl.45, no.9				3.95
387/1	<b>L.RVTILI FLAC</b>		77	Rome	
1.	ANS 1941.131.195				3.91
2.	BM 1929 7.9.5				3.88
388/1a-b	<b>P-SATRIENVS</b>		77	Rome	
1.	Danish 781a/5	obv. control-mark (...)XV			3.85
2.	Danish 781a/92	obv. control-mark LXXXV			3.81
3.	Ashmolean Douce	obv. control-mark XIII			3.81
* 4.	Ashmolean Christ Church 204 (pl.II,14)	obv. control-mark (...)XXX, test-marked			
5.	BM Rome 3210	obv. control-mark XI			3.64
6.	BM Rome 3224	obv. control-mark (...)XXXXIII			3.72
390/2	<b>L-LVCRETI TRIO</b>		76	Rome	
* 1.	Danish 784/10 (pl.II,15)	obv. control-mark LVI			3.67
2.	BM Rome 3258	obv. control-mark XXXXV			3.83
391/2	<b>C-EGNATIVS CN-F CN-N MAXSVMVS</b>		75	Rome	
1.	ANS 1954.18.34	rev. control-mark XX1			3.78
391/3	<b>C-EGNATIVS CN-F CN-N MAXSVMVS</b>		75	Rome	
1.	ANS 1937.158.137				3.64
394/1a-b	<b>C-POSTVMI AT or TA</b>		74	Rome	
1.	trade	1a			3.95
2.	Ashmolean Queen's College	1a			3.80
3.	Ashmolean Godwyn Ms.4, p.56	1a			3.74
4.	Ashmolean Cole bequest 1971	1a			3.90
403/1	<b>KALENI, CORDI</b>		70	Rome	
1.	St. Omer	3.96 g, not used in statistics			
410/2-10	<b>Q-POMPONI MVSA</b>		66	Rome	
* 1.	Ashmolean Christ Church (pl. II,16)	4, test-marked			4.04
412/1	<b>L-ROSCI FABATI</b>		64	Rome	
1.	ANS 1982.50.7	control-marks not in RRC, helmet/helmet			3.93
2.	Hersh	heavily corroded			3.77
3.	Bank Leu, List 19 of Dec. 1984, no. 96	control-marks RRC, pl.LXVIII, set 29			
414/1	<b>L-FVRI CN-F BROCCHI</b>		63	Rome	
1.	BM Rome 3897				3.88
422/1a-b	<b>M-SCAVR, P-HYPSAEVS AED-CVR</b>		58	Rome	
1.	BM Rome 3876				3.82
2.	BM Rome 3882				3.88
426/3	<b>FAVSTVS</b>		56	Rome	
1.	St. Omer	3.82, not used in statistics			
428/2	<b>Q-CASSIVS</b>		55	Rome	
1.	Ashmolean Evans 1941				3.95

<i>Crawford</i>			<i>date</i>	<i>mint</i>	<i>grammes</i>
433/1		<b>BRVTVS</b>	54	Rome	
* 1	trade (pl.II,17)				3.95
443/1		<b>CAESAR</b>	49-48	Mint moving with Caesar	3.80
* 1.	Harlan Berk, 38th Bid or Buy Sale, 18 Aug. 1985, no. 181 (pl.II,18)				

### 3. The Roman Empire

			<i>date</i>	<i>mint</i>	<i>grammes</i>
*	<b>CONSTANTINE I, Aureus (?)</b> (pl.I,3) RIC 126; National Museum, Rome	310-311 AD	Antioch	4.35	

## APPENDIX 2

## THE PROPORTIONS OF GOUGED REPUBLICAN DENARII IN MUSEUM HOLDINGS

Gougéd issues are marked with a star

<i>Crawford</i>		<i>date</i>	<i>ANS</i> seen/gougéd	<i>BM</i> seen/gougéd	<i>Ashmolean</i> seen/gougéd	<i>Paris</i> seen/gougéd	<i>total</i> seen/gougéd	<i>% gougéd</i>
221/1	AN RVF	144		3			3	
222/1	Anon.	143						
223/1	C-CVR TRIGE	141						
224/1	L-IVLI	141	6				6	
225/1	L-ATILI NOM	141	1				1	
226/1a-b	C-TITINI	141	2				2	
227/1a-d	M-AVF RVF	140	2				2	
228/1-2	C-VAL C-F FLAC	140	10				10	
229/1a-b	M-AVRELI COTA	139	3				3	
230/1	A-SPVRI	139	5				5	
231/1	C-RENI	138	16				16	
232/1	CN-GELI	138	8				8	
233/1	P-PAETVS	138	5				5	
234/1	TI-VETVR	137	9	7			16	
235/1a-c	SEX-POM	137	12				12	
236/1a-f	M-BAEBI Q-F TAMPIL	137	11				11	
237/1a-b	CN-LVCR TRIO	136	9				9	
238/1	L-ANTES GRAGVL	136	18				18	
239/1	C-SERVEILI M-F	136	9	9			18	
240/1a-b	C-CVR F TRIG	135	3				3	
241/1a-b	L-TREBANI	135	6				6	
242/1	C-AVG	135	9				9	
243/1	TI-MINVC I C-F AVGVRINI	134	8	2			10	
244/1	C-ABVRI GEM	134	6				6	
245/1	C-MARCI MN-F	134	11	6			17	
246/1	C-NVMTORI	133						
247/1	P-CALP	133	3				3	
248/1	L-MINVCIV	133	7				7	
249/1	P-MAE ANT M-F	132	11				11	
250/1	M-ABVRI M-F GEM	132	10	6			16	
252/1	L-POST ALB	131	6	5	8		19	
253/1	L-OPEIMI	131	5	3	3		11	
254/1	M-OPEIMI	131	6	3	3		12	
255/1	M-ACILIVS M-F	130	6	2	3		11	
256/1	Q-METE	130	9	3	4		16	
257/1	M-VARGV	130	8	3	4		15	
258/1	SEX-IVLI CAISAR	129	2	3	2		7	
259/1	Q-PILIPVS	129	5	3	2		10	
260/1	T-CLOVLI	128	7	4	4		15	
261/1	CN-DOMIT	128	12	1	4		17	
262/1	Anon. with elephant's head	128	8	4	2		14	
263/1a-b	M-METELLVS Q-F	127	8	3	7		18	
264/1	C-SERVEILI	127	5	2	6		13	
265/1	Q-MAX	127	8	2	4		14	
266/1	C-CASSI	126	4	3	4		11	
267/1	T-Q	126	6	3	3		12	
268/1a-b	N-FABI PICTOR	126	4	8	4		16	
269/1	C-METELLVS	125	4	6	2		12	
270/1	M-PORC LAECA	125	6	3	5		14	
271/1	MN-ACILI BALBVS	125	3	3	2		8	
273/1	Q-FABI LABEO	124	14	6	12		32	
* 274/1	C-CATO	123	11	3	8		22	
* 275/1	M-FAN C-F	123	7	4	5		16	
276/1	M-CARBO	122	8	3	5		16	
277/1	Q-MINV RVF	122	8	3	6		17	
278/1	C-PLVTI	121	11	7	4		22	
279/1	CARBO	121	8	5	5		18	
280/1	M-TVLLI	120	8	7	5		20	
* 281/1	M-FOVRI L-F PHILI	119	20	8	17		45	
* 282/1-5	L-LIC, CN-DOM & Associates	118	27	14	19		60	
283/1a-b	Q-MAR, C-F, L-R	118 or 117	3	4	6		13	
284/1a-b	M-CALID, Q-MET, CN-FOVL	117 or 116	12	7	13		32	
285/1-2	CN-DOMI, Q-CVRTI, M-SILA	116 or 115	13	11	15		39	
286/1	M-SERGI SILVS Q	116 or 115	18	7	14		39	
* 287/1	Anon.	115 or 114	7	5	1	10	22	1 4.55
288/1	CETEGVS							
* 239/1	M-CIPI M-F	115 or 114	11	2	8	10	29	2 6.90
* 290/1	C-FONT	114 or 113	17	23	2	16	56	4 7.14
* 291/1	MN-AEMILIO LEP	114 or 113	14	1	7	9	30	1 3.33
292/1	P-NERVA	113 or 112	7	3	9		19	
* 293/1	L-PHILPPVS	113 or 112	9	1	3	9	21	1 4.76
294/1	T-DEIDI	113 or 112	7	2	2		11	
295/1	L-TORQVA Q	113 or 112	6	2	5		13	
* 296/1a-1	CN-BLASIO CN-F	112 or 111	16	17	13	1	46	1 2.17

Crawford		date	ANS seen/gouged	BM seen/gouged	Ashmolean seen/gouged	Paris seen/gouged	total seen/gouged	% gouged			
* 297/1a-b	TI-Q	112 or 111	13	23	1	14	2	50	3	6.00	
298/1	L-CAESI	112 or 111	10	6		9		25			
* 299/1a-b	AP-CL, T-MAL or T-MANL, Q-VR	111 or 110	13	9		12		34			
300/1	C-PVLCHER	110 or 109	9	3		9		21			
301/1	P-LAECA	110 or 109	8	5		6		19			
302/1	L-FLAMINI CILO	109 or 108	10	7		6		23			
* 303/1	MN-AQVIL	109 or 108	5	2		3		10			
304/1	L-MEMMI	109 or 103	12	3		10		25			
* 305/1	Q-LVTATI CERCO Q	109 or 108	14	8		10		32	1	3.13	
306/1	L-VALERI FLACCI	108 or 107	8	3		11		22			
* 307/1a-d	MN-FONTEI	108 or 107	10	26		7	2	43	2	4.65	
308/1a-b	M-HERENNI	108 or 107	18	63		22		103			
309/1	A-MANLI Q-F SER	118-107	1	3		2		6			
310/1	CN-CORNEL L-F SISENA	118-107	2	1		1		4			
311/1a-c	L-SCIP ASIAG	106	18	59		15		92			
312/1	C-SVLPICI C-F	106	9	19		10		38			
313/1a-c	L-MEMMI GAL	106	10	32		8		50			
314/1a-d	L-COT	105	6	19		8		33			
* 316/1	L-THORIVS BALBVS	105	31	28	1	20		79	1	1.27	
317/1	L-SATVRN	104		3		18		21			
317/2			1	3				4			
* 317/3a-b			21	78	2	2		101	2	1.98	
* 318/1a-b	C-COIL CALD	104	15	2	69	1	9	93	3	3.23	
319/1	Q-THERM M-F	103	11	6		12		29			
* 320/1	L-IVLI L-F CAESAR	103	14	33	2	13		60	2	3.33	
* 321/1	L-CASSI CAECIAN	102	13	16	2	8	1	37	3	8.11	
* 322/1a-b	C-FABI C-F	102	15	1	38		12	65	1	1.54	
* 323/1	L-IVLI	101	6	6	1	2		14	1	7.14	
324/1	M-LVCILI RVF	101	9	3		9		21			
* 325/1a-b	L-SENTI C-F	101	10	20		4	1	34	1	2.94	
* 326/1	C-FVNDAN Q	101	5	15	1	5		25	1	4.00	
327/1	M-SERVEILI C-F	100	5	13		5		23			
328/1	P-SERVILI M-F RVLLI	100	10	4		7		21			
* 329/1a-d	LENT-MAR-F	100	6	29	1	6		41	1	2.44	
330/1	PISO, CAEPIO Q	100	6	4		7		17			
* 334/1	L-POMPON MOLO	797	4	6		7		17			
* 335/1a & 2	C-MALL, A-ALBINVS S-F, L-METEL	796	15	12		7		34			
* 335/3a-g			11	11	1	6		28	1	3.57	
* 335/9			6	5		4	1	15	1	6.67	
335/10a-b			5	6		6		17			
* 336/1a-c	C-ALLI BALA	92	12	38		9		59			
337/1a-b	D-SILANVS L-F	91	3	3		4		10			
337/2a-f			11	13		6		30			
337/3			29	94		17		140			
* 340/1	L-PISO L-F L-N FRVGI	90	118	1	348	5	36	2	502	8	1.59
341/1	Q-TITI	90	11	5		5		21			
341/2			14	5		5		24			
341/1	C-VIBIVS C-F PANSA	90	2	1				3			
342/2			1	2		1		4			
342/3a-b			1	6		2		9			
* 342/4a-b & 5a-b			39	81		22		142			
342/6a			1	1				2			
343/1a-c	M-CATO	89	7	7		3		17			
* 344/1a-c	L-TITVR L-F SABINVS	89	20	7		7		34			
* 344/2a-c			17	5		9		31			
344/3			13	33		8		54			
345/1	CN-LENTVL	88	13	5		5		23			
346/1a-i	C-CENSORIN	88	14	31		6		51			
* 346/2a-c			12	26	1	6		44	1	2.27	
348/1	L-RVBRI DOSSENI	87	7	6		7		20			
348/2			5	4		4		13			
348/3			3	6		2		11			
* 349/1	L-C-MEMIES L-F GAL	87	5	19		6	1	30	1	3.33	
* 350A/1a & 2	GAR, OGV L, VER & anon.	86	26	1	22	8	1	56	2	3.57	
351/1	M-FAN, L-CRIT AED-PL	86	5	5		3		13			
* 352/1a-c	L-IVLI BVRSIO	85	29	130	3	22	1	181	4	2.21	
* 353/1a-b & 2	MN-FONTEI	85	23	7		16		46			
354/1	C-LICINIVS L-F MACER	84	14	3		8		25			
* 356/1a-d	P-FOVRIVS CRASSIPES AED CVR	84	10	2		6		18			
* 357/1a-b	C-NORBANVS	83	12	79	1	15		106	1	0.94	
358/1	LATERENS	83									
359/2	L-SVLLA IMPER ITERVM	84-83	4	3		4		11			
360/1a-b	P-CREPVSI, C-LIMENTAN & L-CENSORIN	82	9	25		6		40			
361/1a-c	P-CREPVSI	82	32	60		21		113			
362/1	C-MAMIL LIMETANVS	82	15	13		8		36			
* 363/1a-d	L-CENSOR	82	14	8	1	10		32	1	3.13	
* 364/1a-c	Q-ANTO BALB PR	83-82	39	50	1	19		108	1	0.93	
365/1a-c	C-VAL FLA IMPERAT	82	11	25		11		47			
366/1a-c, 2a-b & 3 a-c	C-ANNIVS T-F T-N PRO-COS	82-81	25	34		12		71			



Crawford		date	ANS seen/gouged	BM seen/gouged	Ashmolean seen/gouged	Paris seen/gouged	total seen/gouged	% gouged
366/4			7	8	4		19	
367/1, 3 & 5	L.SVLLA IMPE, L.MANLI PROQ	82	16	11	8		35	
369/1	M-METELLVS Q-F	82-80	3	2	4		9	
370/1a-b	C-SERVEILI	82-80	3	3			6	
371/1	Q-MAX	82-80	3	1			4	
* 372/1	A-POST A-F S-N ALBIN	81	10	4	1	9 2	23	13.04
* 372/2		12	1	6	1	12 1	30	10.00
374/1	Q-C-M-P-1 or IMPER	81	10	4	5		19	
374/2			9	5	5		19	
375/2	Q	81	6	3	3		12	
376/1	EX S-C	81	1	3	2		6	
* 377/1	L-VOL L-F STRABO	81	2	5	2	1	9	11.11
* 378/1a-c	C-MARI C-F CAPIT	81	17	57	2	22 1	96	3.13
* 379/1	L-PROCILI F	80	7	3	9		19	
* 379/2			6	2	3		11	
* 380/1	C-POBLICI Q-F	80	12	1	21	1 16 2	49	8.16
* 382/1a-b	C-NAE BALB	79	24	1	89	8 21	405	12 2.96
* 383/1	TI-CLAVD TI-F AP-N	79	20	1	61	2 18	99	3 3.03
* 384/1	L-PAPI	79	26	2	124	4 30	290	8 470 2.98
* 385/1	M- VOLTEI M-F	78	7	5	9		21	
385/2			9	3	6		18	
385/3			5	20	10		35	
* 385/4			10	29	1	8	47	1 2.13
* 385/5				1			1	
* 386/1	L-CASSI Q-F	78	6		11		17	
* 387/1	L-RVTILI FLAC	77	9	1	5	1 8	22	2 9.09
* 388/1a-b	P-SATRIENVS	77	15	32	2	15 2	193	5 2.59
389/1	L-RVSTI	76	8	3	7		18	
390/1	L-LVCRETI TRIO	76	3	2	3		8	
* 390/2			10	27	1	8	45	1 2.22
391/1a-b	C-EGNATIVS CN-F CN-N MAXSVMVS	75	1	2	1		4	
* 391/2			3	1	8	4	15	1 6.67
* 391/3			5	1	9	5	19	1 5.26
392/1a-b	L-FARSVLEI MENSOR	75	11	20	14		45	
393/1a-b	CN-LEN Q, then LENT CVR-DEN-FL	76-75	19	9	10		38	
* 394/1a-b	C-POSTVMI AT or TA	74	12	4	11	3	27	3 11.11
395/1	L-COSSVTI C-F SABVLA	74	5	11	5		21	
396/1a-b	L-PLAETORI L-F Q	74	3	7	2		12	
397/1	P-LENT P-F L-N Q	74	2	1	1		4	
398/1	Q-POMPONI RVFVS	73	2	4	2		8	
399/1a-b	Q-CREPEREI M-F ROCVS	72	4	11	3		18	
400/1a-b	L-AXSIVS L-F NASO	71	3	10	4		17	
401/1	MN-AQVIL MN-F MN-N	71	12	6	10		28	
* 403/ 1	KALENI, CORDI	70	7	6	11		24	
404/1	T-VETIIVS SABINVS	70	4	6	6		16	
405/1a-b	M-PLAETORIVS CEST	69	2	6	2		10	
405/2			3	8	5		16	
405/3a-b			3	11	3		17	
405/4a-c			3	9	4		16	
405/5			12	23	8		43	
406/1	P-GALB AED-CVR	69	6	4	8		18	
407/1	C-HOSIDI C-F GETA III VIR	68	4	1	3		8	
407/2			11	8	10		29	
408/1a-b	C-PISO L-F FRVGI	67	65	165	35		265	
409/1	M-PLAETORIVS M-F CESTIANVS AED-CVR	67	9	7	6		22	
409/2			10	22	7		39	
410/1	Q-POMPONI MVSA	66	7	3	5		15	
* 410/2-10			46	25	27	1	98	1 1.02
411/1a-b	L-TORQVAT	65	4	5	1		10	
* 412/1	L-ROCCI FABATI	64	26	1	115	22	163	1 0.61
413/1	L-CASSI LONGIN	63	11	10	13		34	
* 414/1	L-FVRI CN-F BROCCHI	63	11	7	1	11	29	1 3.45
415/1	PAVLLVS LEPIDVS	62	10	5	11		26	
416/1a-c	LIBO	62	19	6	10		35	
417/1a-b	PAVLLVS LEPIDVS, LIBO	62	6	3	3		12	
418/1	M-PISO M-F FRVGI	61	1	2	1		4	
418/2a-b			3	3	2		8	
419/1a-e	M-LEPIDVS	61	8	9	4		21	
419/2			3	2	3		8	
419/3a-b			2	3	1		6	
420/1a-b	P-YPSAE	60	7	4	2		13	
420/2a-d			8	6	6		20	
421/1	SVFENAS	59	10	5	6		21	
* 422/1a-b	M-SCAVR, P-HYPSAEVS AED-CVR	58	20	20	2	15	55	2 3.64
423/1	C-SERVEIL C-F	57	9	5	6		20	
424/1	C-CONSIDI NONIANI	57	6	3	4		13	
425/1	PHILIPPVS	56	19	7	17		43	
426/1	FAVSTVS	56	4	2	5		13	
426/2			4	4			8	
* 426/3			6	4	4		14	

<i>Crawford</i>		<i>date</i>	<i>ANS</i> seen/gouged	<i>BM</i> seen/gouged	<i>Ashmolean</i> seen/gouged	<i>Paris</i> seen/gouged	<i>total</i> seen/gouged	<i>% gouged</i>
426/4a-b			6	6	7		19	
427/1	C MEMMI C F	56	6	3	7		16	
427/2			8	2	7		17	
428/1	Q-CASSIVS	55	7	2	7		16	
* 428/2			5	3	7	1	15	1 6.67
428/3			7	2	7		16	
429/1	P-FONTEIVS P-F CAPITO	55	8	6	8		22	
429/2a-b			8		9		17	
430/1	P-CRASSVS M-F	55	7	6	4		17	
431/1	A-PLAVTIVS AED-CVR	55	8	11	7		26	
432/1			5	3	8		16	
* 433/1	BRVTVS	54	12	3	8		23	
433/2			13	4	11		28	
434/1	Q-POMPEI RVFI	54	3	1	1		5	
434/2			9	6	6		21	
435/1	MESSAL F	53	1	2	3		6	
436/1	L-VINICI	52	3	4	2		9	
437/1a-b	CALDVS IIIVIR	51	6	4	5		15	
437/2a-b, 3a-b & 4a-b			8	4	5		17	
438/1	SER-SVLP	51	3	2	2		7	
439/1	MARCELLINVS	50	5	2	4		11	
440/1	Q-SICINIVS IIIVIR	49	6	1	6		13	
441/1	NERI Q-VRB	49	3	1	6		10	
442/1a-b	MN-ACILIVS IIIVIR	49	22	5	16		43	
* 443/1	CAESAR	49-48		7			7	
444/1a-c	Q-SICINIVS IIIVIR, C-COPONIVS PR	49						
445/1a-b	L-LENTVLVS, C-MARC COS in part with Q	49						
445/2				2			2	
445/3a-b				3			3	
446/1	MAGN-PROCOS with CN-PISO PROQ	49		2			2	
447/1a-b	MAGN-PROCOS with VARRO PROQ	49		4			4	
448/1a-b	L-HOSTILIVS SASERNA	48		5			5	
448/2a-b				2			2	
448/3				3			3	
449/1a-c	C-VIBIVS C-F CN PANS A	48		6			6	
449/2				2			2	
449/3a-b				3			3	
449/4				3			3	
450/1a-b	ALBINVS BRVTI-F	48		2			2	
450/2				7			7	
450/3a-c				2			2	
451/1	ALBINVS BRVTI-F, C PANS A	48		2			2	
452/2	CAESAR	13 July 48-47		1			1	
452/4				1			1	
452/5				1			1	
453/1a-e	L-PLAVTIVS PLANCVS	47		9			9	
454/1.2	A-LICINIVS NERVA IIIVIR	47		6			6	
455/1a-b	C-ANTIVS C-F RESTIO	47		3			3	
455/2a-b				1			1	
457/1	A-ALLIENVS PRO-COS	47						
458/1	CAESAR	47-46						
459/1	Q-METEL-PIVS SCIPIO IMP	47-46		3			3	
460/2	Q-METEL-PIVS SCIPIO IMP with P-CRASSVS IVN-LEG-PROPR	47-46		2			2	
460/3				2			2	
460/4				2			2	
461/1	Q-METEL-SCIPIO IMP with EPIVVS LEG-F-C	47-46		5			5	
462/1a-c	M-CATO PROPR	47-46		4			4	
463/1a	MN-CORDIVS RVFVS IIIVIR	46		4			4	
463/2				2			2	
463/3				3			3	
464/1	T-CARISIVS IIIVIR	46		5			5	
464/2				4			4	
464/3a-c				6			6	
464/4				2			2	
464/5				4			4	
465/1a-b & 2a-b	C-CONSIDIVS PAETVS	46		7			7	
465/3				2			2	
465/4				3			3	
465/5				2			2	
467/1a-b	COS-TERT-DICT-ITER-AVGVR PONT-MAX	46		7			7	
468/1	CAESAR	46-45		5			5	
468/2				3			3	
469/1a-e	CN-MAGNVS IMP, M-POBLICI-LEG-PROPR	46-45		5			5	
470/1a-d	CN-MAGNVS IMP-F, M-MINAT-SABIN-PR(O)Q	46-45		7			7	
472/1	L-PAPIVS CELSVS IIIVIR	45		5			5	
472/2				2			2	
473/1	PALIKANVS	45		3			3	
473/2a-d				2			2	

<i>Crawford</i>		<i>date</i>	<i>ANS</i> seen/gouged	<i>BM</i> seen/gouged	<i>Ashmolean</i> seen/gouged	<i>Paris</i> seen/gouged	<i>total</i> seen/gouged	<i>% gouged</i>					
474/1a-b	L-VALERIVS ACISCVLVS	45		6			6						
474/2a-c				4			4						
474/3a-b				1			1						
474/4				4			4						
474/5				2			2						
477/1a-b	SEX-MAGNVS PIVS IMP	45-44		2			2						
477/2				1			1						
477/3a-b													
480/1	L-AEMILIVS BVCA IIIVIR, M-METTIVS, P-SEPVLLIVS	44		1			1						
480/2a-c				2			2						
480/3				7			7						
480/4				2			2						
480/5a-b				2			2						
480/6				2			2						
480/7a-b				3			3						
480/8													
480/9				3			3						
480/10													
480/11				1			1						
480/12													
480/13													
480/14				4			4						
480/15				1			1						
480/16				2			2						
480/17				8			8						
480/18				1			1						
480/19				3			3						
480/20													
480/21				3			3						
480/22				4			4						
482/1	CAESAR IMP	44											
483/1	Q-NASIDIVS	44-43											
483/2													
484/1	C-ANTONIVS M-F PROCOS	43											
485/1	L-FLAMINIVS CHILO IIIVIR	43		4			4						
485/2				3			3						
486/1	P-ACCOLEIVS LARISCOLVS	43		5			5						
487/1	PETILLIVS CAPITOLINVS	43		3			3						
487/2a-c				7			7						
TOTAL FOR GOUGED ISSUES ONLY			1088	20	2023	55	784	29	692	12	4587	116	2.53
TOTAL FOR ALL ISSUES LISTED			2523	20	3700	55	1734	29	692	12	8649	116	1.34

# ADDENDUM, AUGUST 1992

## 1. Greek

		<i>date</i>	<i>grammes</i>
* VELIA, LUCANIA, Didrachm (addendum, 19)		ca. 390-275/250	7.56
SNG ANS 1292; not in G. Libero Mangieri, <i>Velia e la sua Monetazione</i> , but for the obverse cf. his 122 (with the same symbol retrograde), and for the reverse his 120. Both obverse and reverse of this piece have been gouged. There is no sign of overstriking. Libero Mangieri gives the standard of the emission as 7.54 g; the average of his nos. 107-141 is 7.45 g.			

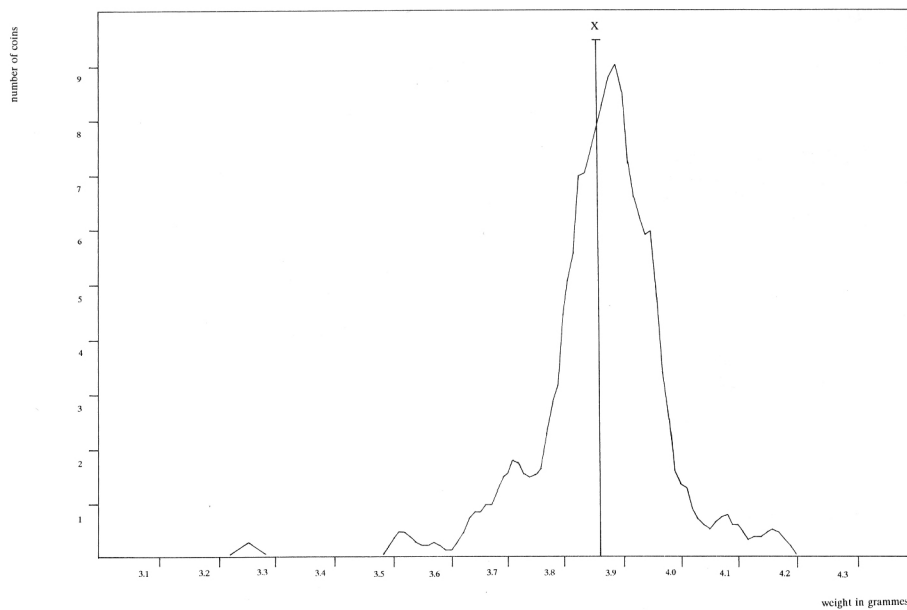
## 2. The Roman Republic

<i>Crawford</i>			<i>date</i>	<i>mint</i>	<i>grammes</i>
260/1	T-CLOVLI		128	Rome	
* 1.	trade (addendum, 20)	this is now the earliest recorded gouged Republican issue			3.89
312/1	C-SVLPLICI C-F		106	Rome	
1.	private collection				3.93
314/1	L-COT		105	Rome	
1.	private collection				3.91
328/1a	P-SERVILI M-F RVLLI		100	Rome	
1.					
341/1	Q-TITI		90	Rome	
1					

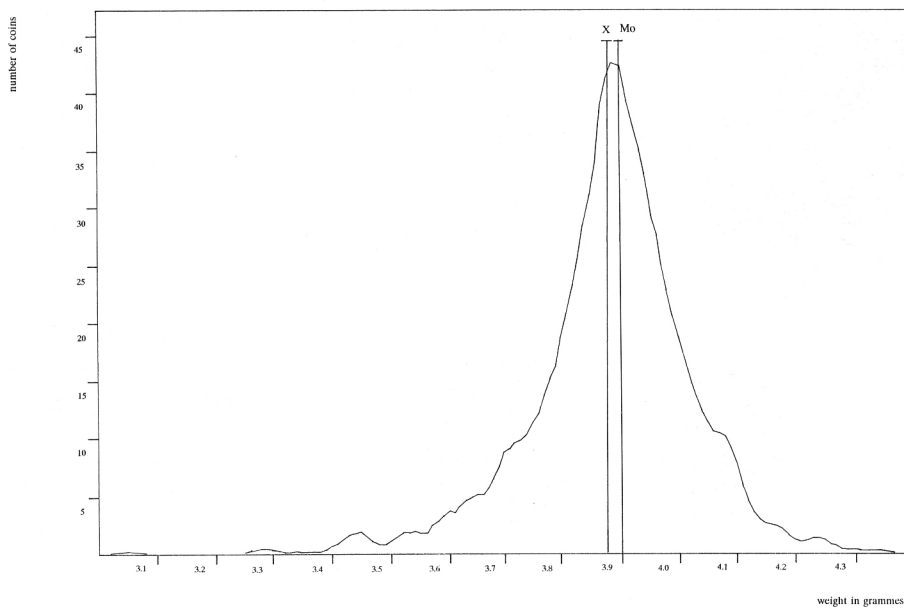


20





**Fig. 1. Averaged histogram of the gouged coins in appendix 1**



**Fig. 2. Averaged histogram of the gouged issues in the Cosa hoard**

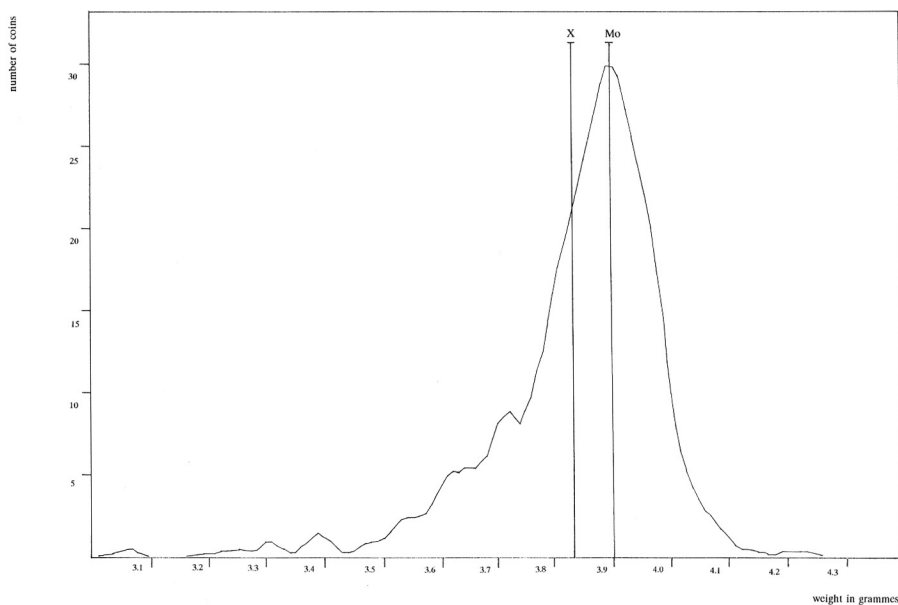


Fig. 3. Averaged histogram of the gouged issues in the ANS

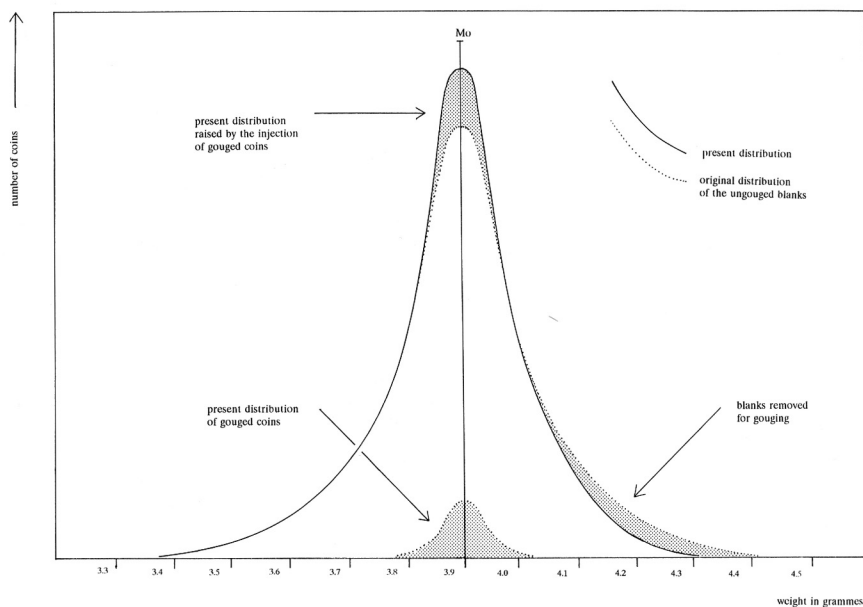


Fig. 4. Model of a denarius population with weight adjusted *al marco*



1  
(X C.2)



3



2



4



5



6



7



8



9





10



11



12



13



14



15



16



17



18

