Ancient Monuments Laboratory
Report 87/89

ANALYSIS OF MEDIEVAL DRESS ACCESSORIES FROM LONDON.

Michael Heyworth BA(Hons) MA MIFA

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Summary

A large number of qualitative analyses were undertaken for a group of medieval dress accessories from various excavations in London. The accessories were mostly dated to the period from the twelth to fifteenth centuries AD. The majority were made of copper alloys, though lead/tin objects and some gold and silver objects were included in the group analysed.

Attempts were made to link the analytical results with variations in object type, and with chronological and spatial variations, however it seems that a wide variety of alloys were used with few significant patterns of usage. The majority of the copper alloys analysed were brass, though gunmetals and bronzes were also present. However the range of alloys between and within object types suggests that any available scrap metal was used in the production of the objects and that there were no particular requirements for pure metals or particular compositions.

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Introduction

A selection of medieval dress accessories recovered from excavations in London were analysed to attempt to reconstruct the pattern of alloy usage in the medieval period for these object types. Very little work has been undertaken on the identification of different alloys in use in this period and it was hoped that a comprehensive analytical survey of the composition of the dress accessories would reveal any patterns in non-ferrous metal usage both chronologically and for different types of object.

The analytical work was undertaken over a period of some four years, initially by Paul and Susan Wilthew and later by Michael Heyworth, and during this time a large number of objects were analysed which form a representative selection of all the major groups of dress accessories. The majority of objects were made of copper alloys, although lead/tin objects and some gold and silver objects were also analysed. It was envisaged at the beginning of the project that a large number of analyses would be involved and it was decided to use X-ray fluorescence, a rapid, non-destructive technique that is readily available in the Ancient Monuments Laboratory. The analytical results obtained were qualitative rather than quantitative but it was felt that they would provide an adequate summary of alloy usage for the dress accessories. Quantitative analysis would have involved much more effort and necessitated some damage to the objects which would have limited the number of analyses possible.

Analytical Method

All the objects were analysed qualitatively by energy dispersive X-ray fluorescence (XRF) using a Link Systems Meca 10-42 machine. The primary radiation source was an X-ray tube with a rhodium target run at 35 keV and the fluorescent x-rays were detected by a Si(Li) detector. The elements recorded were copper (Cu), zinc (Zn), gold (Au), lead (Pb), silver (Ag) and tin (Sn).

Many of the objects consisted of several parts and as far as possible each part was analysed separately. In many cases, however, this was not possible due to the size or shape of the object and consequently some results were ambiguous in that they were an average of more than one alloy. Where inlays or surface coatings were present both the bulk metal and the inlay or coating was identified if possible, but again the results were sometimes inconclusive.

Other than conservation treatment no surface preparation was carried out on the objects and as XRF is a method of surface analysis then the results will have been affected by surface contamination, corrosion and the depletion of elements from the surface that this can produce. The results should nevertheless give a reasonable indication of the alloys used in the production of the objects. This approximation should be better than for the majority of archaeological sites as, in general, the objects were not deeply mineralised because of their relatively benign burial environment.

The XRF data for each element is presented as a ratio to the copper peak to allow easier comparison between analyses. In XRF analysis the peak heights for each element cannot be directly compared between elements as the height bears little relation to the proportion of that element present in the object. Different elements are excited with varying efficiencies by the primary X-rays, eg tin is excited far less than zinc so the peak heights will be a lot lower even when the amounts present are similar. A small selection of objects, of varying composition, were therefore analysed quantitatively with a Link Systems AN10000 energy dispersive X-ray analyser on a scanning electron microscope (SEM) using a 20 keV accelerating voltage and Link Systems ZAF/4 software. The data obtained from these analyses was used to roughly 'calibrate' the qualitative XRF data to obtain a more accurate definition of the alloys in use. The quantitative SEM analyses suggested that a suitable scaling of the element ratios could be applied to make the different elements more comparable. Based on this information the zinc ratio has been left unscaled, the lead ratio has been multiplied by 2.5 and the tin ratio has been multiplied by 12. It is these scaled ratio figures that have been used in preparing the figures.

Data Analysis

The analyses were split into three main groups: copper alloys, lead/tin alloys and other non-ferrous metals (mostly gold and silver). A separate data analysis methodology was devised for each group based on the differing number and level of alloying metals involved.

Copper alloys are mainly copper, with deliberate additions of tin, zinc and/or lead. It is necessary to take into account both the absolute and relative proportions of each alloying element in defining the alloy type (see Appendix 2). Brasses are mainly copper and zinc, bronzes copper and tin, while gunmetals contain significant amounts of both zinc and tin. Alloys containing large amounts of lead are described as "leaded", whilst those containing lower, but still significant amounts of lead are "(leaded)".

The relationship between the zinc and tin contents of the copper alloys analysed is shown in Figure 1; one tends to increase as the other decreases. The majority of the alloys have more zinc than tin indicating that brasses and gunmetals were the alloys most commonly used in the manufacture of these dress accessories. It should be noted however that there are no separate clusters of points corresponding to different alloy names. The arbitrary divisions suggested by Bayley (see Appendix 2) cut through this compositional continuum so that objects of similar intermediate compositions can be described as different alloys, eg brass or gunmetal.

When lead contents are considered then a third dimension is added to the picture which is best represented by using a ternary diagram (Figure 2). In this plot the nearer a point is to a corner the higher the relative amount of that element present. It must be noted that as relative amounts are being plotted then an

alloy containing 5% of both tin and zinc will appear in the same place as an alloy containing 10% of both tin and zinc. The ternary diagram shows that very few of the objects contain a significant amount of lead.

As the XRF data is not fully quantitative, the scatter of points on the ternary diagram is not exactly the same as would be given using fully quantitative percentage data, though the overall distribution is very similar. It is likely that, despite the scaling for different elements, the points are skewed towards the zinc corner of the diagram, hence the mismatch in comparison with Bayley's diagram (see Appendix 2).

The scaled element ratios were used in the assignation of alloy names to the analyses, and both absolute and relative ratio values were taken into consideration. When the individual copper alloy groups are plotted onto ternary diagrams (see Figures 3 to 5) some inconsistencies are apparent. This is mainly due to the ternary diagram only showing relative amounts, but is also a reflection of the arbitrary nature of the division of the compositional continuum into separate alloys. The means of the individual alloy distributions are well separated, but each covers a range of compositions which show some overlap between alloys. However, any overlap is not particularly significant in the description of the overall pattern of alloy types.

The lead/tin alloys are rather simpler to describe as only two elements are involved. A histogram of the lead/tin ratio for the lead/tin alloy dress accessories (Figure 6) shows that it is possible to split the alloys into three main groups. The term pewter is used to describe an alloy containing significant amounts of both metals, and other alloys are simply described as lead or tin, based on the main component of the alloy, although the object may also contain minor levels of other element. The majority of dress accessories can be described as either tin or pewter, there are very few lead alloys that contain an insignificant quantity of tin.

Lead and tin were also used in the coating and soldering of some objects. Tin, or Lead/Tin, coating was often used as a cheap attempt to imitate silver objects, though it was also used on multipart objects made of different alloys to give a uniform appearance to the object. Tin or Lead/Tin coating was found on twelve copper alloy objects of varying types. It was not always possibly to conclusively identify any coating due to the presence of some tin and lead in the alloy and the lack of any surface preparation before an analysis. It is therefore possible that some coatings were not recognised, though all objects were also visually examined for signs of coating prior to analysis. Lead/tin solder was also used on a number of objects to hold together the separate parts; the majority were strap-ends and buckles which were often multi-part objects. Remains of solder was found on some mounts where it had been used to hold the mount onto a backing material.

The other non-ferrous metals identified amongst the accessories analysed were gold and silver which were much less common. Several gold finger rings were analysed quantitatively by Paul Wilthew using the SEM analyser (using a 25 keV accelerating voltage) to assess the fineness of the gold used for their

production. Quantitative results were obtained (using ZAF/PB software set up with pure element standards to process the spectra) for the concentrations of gold, silver and copper (see Table 1 for results normalised to 100%). No surface preparation was carried out before analysis and the results may be subject to error due to contamination or corrosion of the surface. These effects will, if anything, have enhanced the apparent gold content of the metal.

Table 1

Quantitative Analytical Results for Gold Rings

Site Code	Context Number	Accession Number	Area Analysed	Gold %	Silver %	Copper %
BC	79	2035	Hoop	44.0	28.8	27.2
TL	429	605	Hoop	74.7	14.4	10.9
			Bezel	55.3	22.8	21.9
			Collet	59.6	18.7	21.7
TL	1717	2263	Hoop	45.7	27.6	26.7
			Bezel	45.6	28.5	25.9
TL	2656	2266	Hoop	54.2	31.3	14.5
			Bezel	54.6	32.5	12.9

The results suggest that two of the rings (TL 2263 and BC 2035) were of similar composition, about 45% gold debased with about equal amounts of copper and silver. TL 2266 was somewhat purer (about 55% gold) and had been mainly debased with silver although it still contained about 15% copper. Both TL 2263 and TL 2266 were in two parts and in both cases the analytical results were consistent with the two parts being of the same composition.

TL 605 consisted of three parts; the hoop, bezel and collet. The hoop was significantly purer (about 75%) gold than either the bezel or collet. The analyses of the bezel and the collet were not significantly different from each other (55-60% gold, debased with about equal amounts of copper and silver).

Two other gold objects, a finger ring BWB 140 and a mirror case BWB 4499, were analysed qualitatively by EDXRF. Comparison with similar analyses of the finger rings that were also analysed by SEM suggest that both were made of relatively fine gold. BWB 140 is probably about 75-85% gold, whilst the mirror case BWB 4499 is almost pure gold.

None of the silver objects were analysed quantitatively but the seven silver objects analysed by EDXRF were of varying fineness. Comparison with silver objects of known composition have allowed some estimate of fineness to be attached to the silver dress accessories analysed. Three objects were relatively pure silver (ie over 90% silver): a buckle BWB 3711, a brooch BIG 2705 and a brooch pin BWB 714. Two other pins, BWB 2755 and BWB 5294, were heavily debased with a silver content of about 50%, whilst two brooches, BIG 3068 and BWB 714, were even less fine with silver contents of about 40%. In the debased silver objects the main other element present was copper, though they also contained

small levels of zinc which suggests the silver was debased by adding brass to the metal.

Gold and silver were also used to coat the surface of a small number of objects, mostly brooches, buckles and strap-ends which were the most decorative objects. In total nine objects were coated with precious metals, two of these were clearly mercury gilded but mercury was not definitely detected in the other cases though it is likely to have been present. One object, BC 3851, was coated with silver containing some mercury.

Variations through time

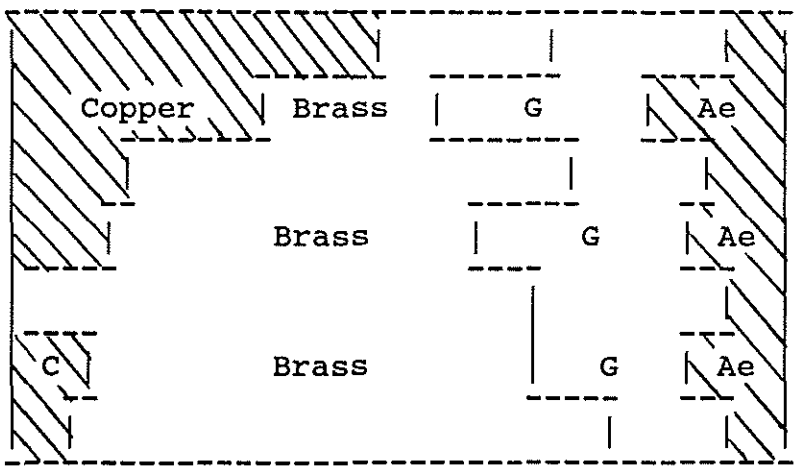
The majority of the objects analysed could be approximately dated by their association with other artefacts, particularly ceramics. It has therefore been possible to investigate any possible change in alloy usage through from the mid twelth century to the mid fifteenth century. The number of analyses of each phase (as defined by ceramic evidence) and the metals represented are as follows:

Phase	No. of Analyses	Copper	Brass	Gun-metal	Bronze	Lead	Tin	Pewter	Gold	Silver
1150 - 1200	24	9	4	5	1	-	-	3	-	1
1200 - 1230	26	5	3	4	4	-	5	4	-	1
1230 - 1260	33	3	11	4	2	-	2	10	-	-
1270 - 1350	147	13	55	40	14	-	8	12	-	-
1330 - 1400	20	-	10	4	1	-	3	1	1	-
1350 - 1400	275	15	125	46	29	2	22	19	3	5
1400 - 1450	113	3	51	12	6	-	27	9	-	-
Unstratified	26	1	7	1	2	1	5	5	1	-
Other	9	2	3	1	-	-	1	1	1	-
Total	649	51	269	117	59	3	73	64	6	7

Element ratios for the copper alloys analysed from each period are shown in Figures 7 to 13 plotted on ternary diagrams. The proportion of the individual copper alloys in each phase is shown below (C = copper, G = gunmetal, Ae = bronze):

Phase	No of Analyses
1150 - 1200	19
1200 - 1230	16
1230 - 1260	20
1270 - 1350	112
1330 - 1380	15
1350 - 1400	215
1400 - 1450	72

Proportion of copper alloys



The larger number of analyses from some phases (particularly 1270 - 1350, 1350 - 1400 and 1400 - 1450) is a reflection of the larger number of objects found in these phase levels. It is clear from these figures that copper and lead/tin alloys were used throughout the period from the twelth to the fifteenth centuries for the manufacture of dress accessories. The small number of objects in some of the earlier phases make any chronological variations difficult to show conclusively but there does seem to be a greater proportion of unalloyed copper objects in the twelth and thirteenth centuries before brass objects become more common in the fourteenth century. There seems to be little evidence of any chronological variation in the use of lead/tin alloys with tin and pewter objects found in all phases.

Variations between/within object types

A number of different object types were included in the analytical programme to investigate whether any alloys were specifically associated with individual objects types. The number of analyses of each object type included and the metals represented are as follows:

Object type	No. of Analyses	Copper	Brass	Gun-metal	Bronze	Lead	Tin	Pewter	Gold	Silver
Bead	3	-	-	-	-	-	3	-	-	-
Bell	27	1	8	1	-	-	15	1	-	-
Brooch	57	3	4	13	4	1	1	27	-	4
Buckle	137	15	45	36	17	-	13	4	-	1
Button	18	-	5	2	5	-	5	1	-	-
Chain	2	1	1	-	-	-	-	-	-	-
Chape	53	-	39	8	6	-	-	-	-	-
Comb	2	-	-	-	2	-	-	-	-	-
Cosmetic Impls	14	5	5	3	1	-	-	-	-	-
Finger Ring	50	2	12	3	2	1	1	15	5	-
Headdress/Wire	14	-	14	-	-	-	-	-	-	-
Mirror Case	9	-	1	1	-	-	-	6	-	1
Mount	116	13	40	19	6	1	30	5	-	-
Needlecase	3	1	1	1	-	-	-	-	-	-
Pin	20	-	13	3	1	-	-	1	-	2
Strap End	147	10	81	27	15	-	5	4	-	-
Total	649	51	269	117	59	3	73	64	6	7

Element ratios for the copper alloys analysed for each of the main object types are shown in Figures 14 to 24 plotted on ternary diagrams.

For some object types there does seem to be correlation with a specific alloy type, eg copper alloy bells are predominantly brass with little or no tin or lead (though the majority of bells were pure tin). There are clusters of a limited range of compositions for copper alloy brooches, buttons and pins. Other object types, particularly buckles, chapes, mounts and strap-ends, are found in a much wider range of copper alloys, often containing significant quantities of tin and less zinc.

However the object types showing a greater variation in composition tend to be those objects which were analysed in greater numbers and it is difficult to go further than to suggest the possible existence of a more restricted pattern of alloy usage for objects that were analysed in smaller numbers (this was due to their infrequent occurrence rather than any sampling bias).

Variations between sites

The objects analysed came from a number of recent waterfront excavations (with one exception) undertaken within London. The sites were Baynard Castle (BC72), Billingsgate (BIG82), Billingsgate Watching Brief (BWB83), Custom House (CUS73), Copthall Avenue (OPT81), Seal House (SH74), Swan Lane (SWA81), Trig Lane (TL74), and Copthall Lane (OPT81) which was located away from the river and revealed evidence for metal production. The analytical data was examined to investigate any possible spatial variation across the area of London. Whilst some of the sites are almost adjoining, eg Seal House and Swan Lane, others are some distance away and may be associated with activities of different social or economic status which could be reflected in alloy usage.

Site code	No. of Analyses	Copper	Brass	Gun-metal	Bronze	Lead	Tin	Pewter	Gold	Silver
BC72	70	1	44	10	8	-	3	-	1	-
BIG82	71	17	16	8	5	-	8	13	-	2
BWB83	290	17	121	54	28	2	29	25	2	5
CUS73	20	-	12	8	-	-	-	-	-	-
OPT81	1	-	-	1	-	-	-	-	-	-
SH74	3	-	-	1	-	-	-	2	-	-
SWA81	181	13	56	30	18	1	32	21	-	-
TL74	37	3	20	5	-	-	1	3	3	-
Total	649	51	269	117	59	3	73	64	6	7

There does not appear, from this tabulation, to be any significant variations in the metals used for dress accessories that are found on the various sites. This fits in with the picture determined from the other tables that there are no significant patterns in metal usage and that the full range of metals were available in all the areas of London covered by these sites throughout the period from the twelth to the fifteenth centuries.

General Discussion

The general picture which emerges from the attempts to correlate the pattern of alloy usage with the archaeological information regarding date, type of object and spatial distribution is that a range of alloys were available and widely used throughout the twelth to fifteenth centuries in London. Very few comparable analyses of similar objects of the same date are available from Britain but those that are published (eg Brownsword 1987) suggest that brass was the most widely used copper alloy which fits well with the analyses of the London dress accessories.

The range of alloys between and within object types suggests that the metalworkers were happy to use any available scrap metal and had no particular requirements for pure metals or particular compositions. This was confirmed by a study of some buckles and strap-ends of composite form which include a forked armature sandwiched between the front and back plates. Whilst these particular objects were not of uniform quality stylistically, they are all very similar technically. The analyses of the objects showed that there were a range of alloys used in their manufacture and that again no specific alloy composition could be associated with these distinctive objects (see Table 2). The range of alloy compositions used in their production reflected the overall pattern in that the majority were brass, though some had increased levels of tin which put them into the gunmetal category and even in some cases could be described as bronze. This pattern of alloy usage is reflected throughout the dress accessories analysed.

References

Bayley, J, 1989 A suggested nomenclature for copper alloys, Ancient Monuments Laboratory Report No 80/89.

Bayley, J, and Butcher, S, 1981 Variations in alloy composition of Roman brooches, in Revue d'Archaeometrie supplement, 29-36.

Brownsword, R, 1987 Technical Aspects of individual brass letters, in J Coales (ed) The earliest English brasses: patronage, style and workshops 1270 - 1350, 169-74, Monumental Brass Society, London.

Acknowledgements

A substantial number of the analyses included in this report were undertaken by Paul and Susan Wilthew. Their preliminary report on the initial stages of the project is available in the AML Report series (No 43/86). That report is now superceded by this final report on the project.

Table 2

Composition of buckles and strap-ends with forked armature

Buckles

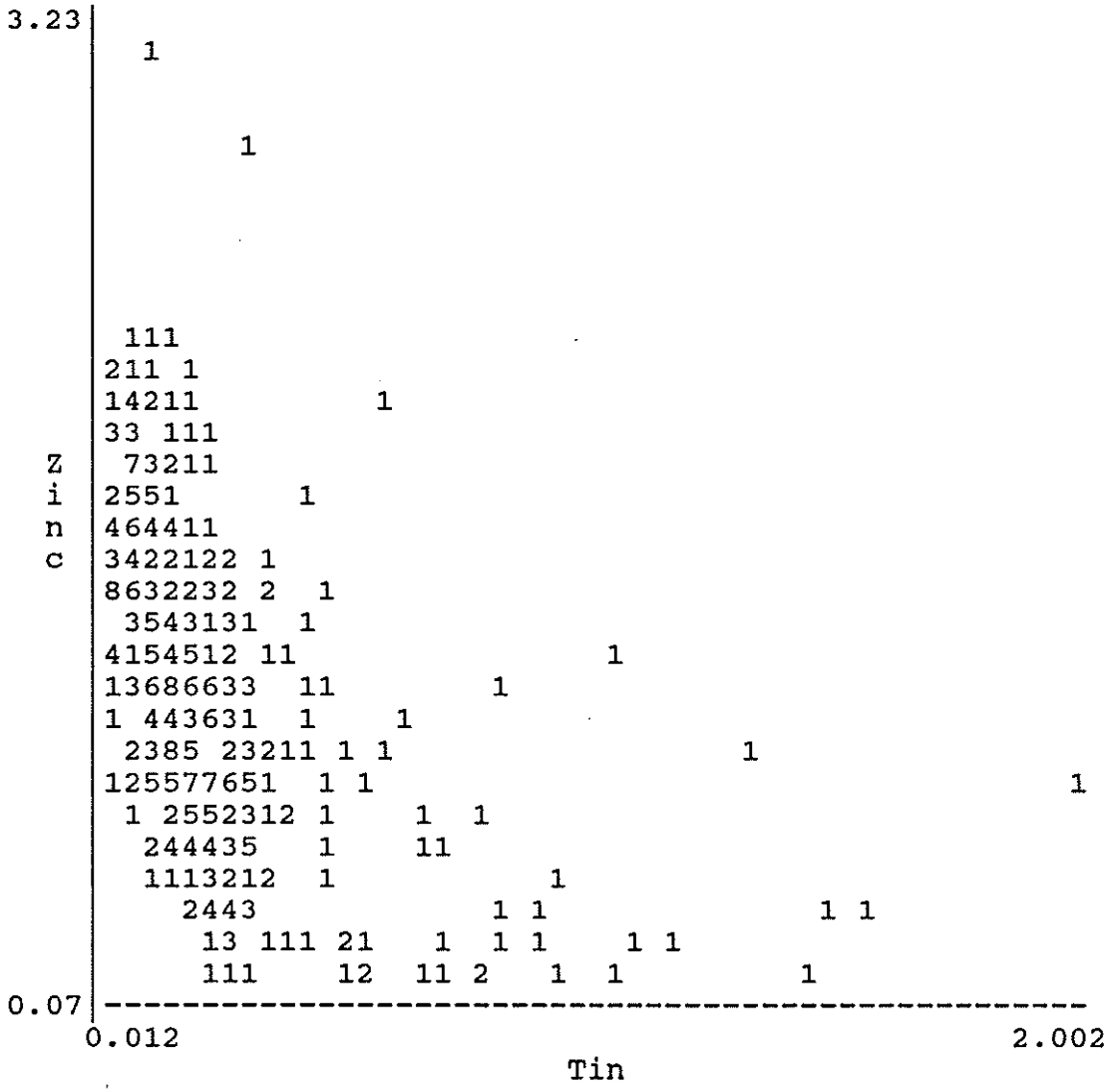
BC72	[150]	<2859>	plate = Bronze, frame = Gunmetal
BWB83	[108]	<1263>	top plate = Brass, bottom plate = Brass, frame = Bronze, loop = Gunmetal
BWB83	[149]	<38>	frame = Bronze, plate = Gunmetal
BWB83	[395]	<3629>	top plate = Brass, middle plate = Brass, bottom plate = Gunmetal, loop = Bronze
SWA81	[2054]	<3886>	top plate = Brass, middle plate = Brass, bottom plate = Gunmetal
SWA81	[2097]	<751>	plate = Gunmetal

Strap-ends

SWA81	[2105]	<1445>	top plate = Brass, bottom plate = Brass, edge = Lead/Tin solder, handle = Gunmetal
BIG82	[75]	<622>	plate = (Leaded) Bronze
BWB83	[291]	<196>	plate = Brass
BC72	[250]	<4172>	top plate = Brass, middle plate = Gunmetal, bottom plate = Brass
BWB83	[361]	<2768>	plate = Brass
SWA81	[2006]	<3971>	plate = Brass
BC72	[150]	<4280>	top plate = (Leaded) Bronze, bottom plate = Bronze, handle = Bronze
BWB83	[338]	<3737>	plate = Brass
BWB83	[309]	<4731>	top plate = Brass, bottom plate = Brass, edge = Lead/Tin solder ?
BWB83	[290]	<2116>	plate = Brass
BWB83	[377]	<377>	top plate = Brass, middle plate = Brass, bottom plate = Gunmetal, edge = Lead/Tin solder ?
BWB83	[309]	<5856>	plate = Brass
BWB83	[387]	<3525>	plate = Gunmetal
TL74	[306]	<248>	plate = Brass
BC72	[83]	<2391>	top plate = Bronze, middle plate = Bronze, bottom plate = Bronze
SWA81	[2112]	<1912>	plate = Brass
BWB83	[274]	<4399>	plate = Brass
BWB83	[110]	<6>	plate = Brass
BWB83	[256]	<654>	plate = Gunmetal
BWB83	[309]	<5857>	plate = Brass
BWB83	[282]	<5855>	plate = Brass
BWB83	[309]	<4726>	top plate = Brass, bottom plate = Brass, edge = Lead/Tin solder ?

Figure 1

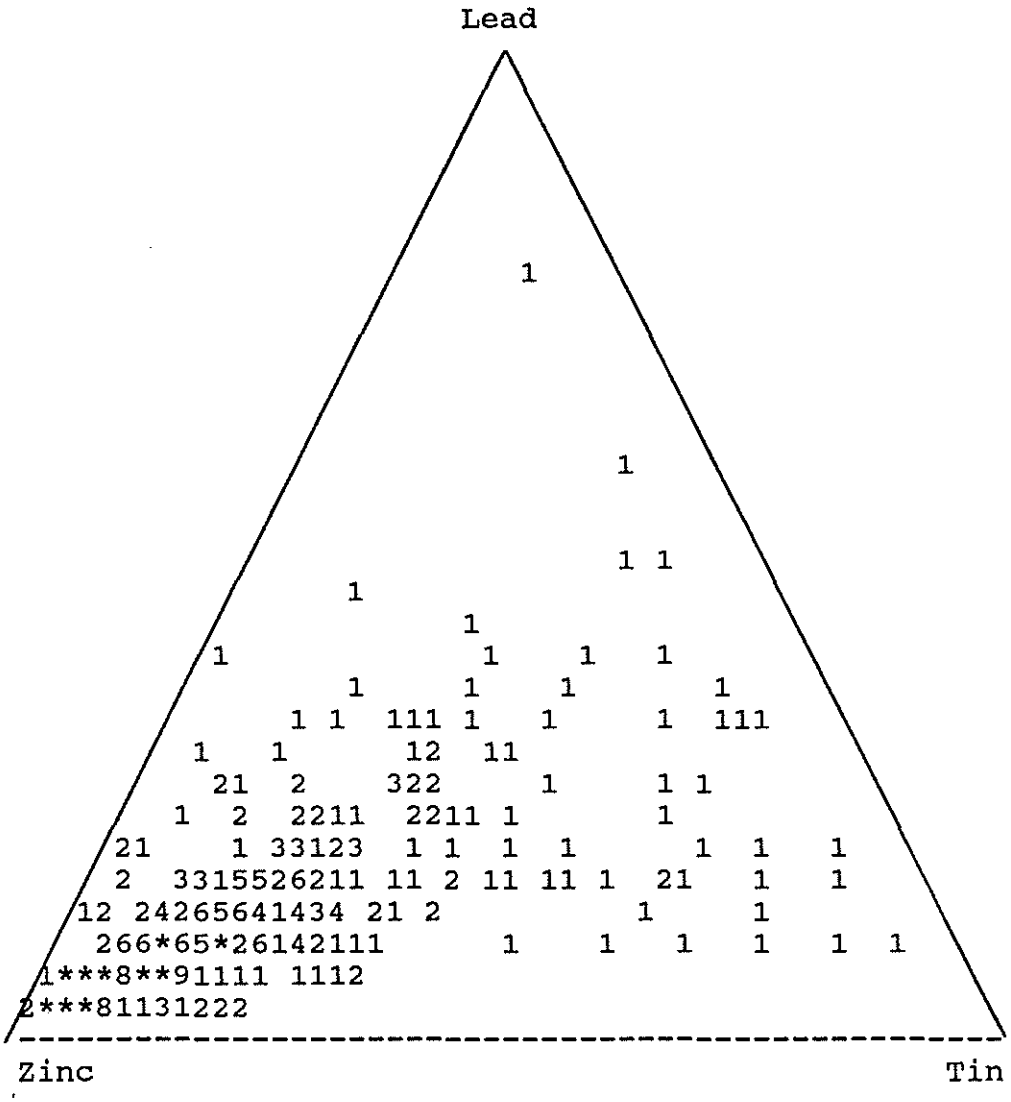
All copper alloys



The figures on the graph represent the number of points within the area covered by that figure.

Figure 2

All copper alloys



The figures on the graph represent the number of points within the area covered by that figure. Where this exceeds single figures (ie more than nine points) then the position on the graph is marked by an asterisk (*).

Figure 3

Brass alloys

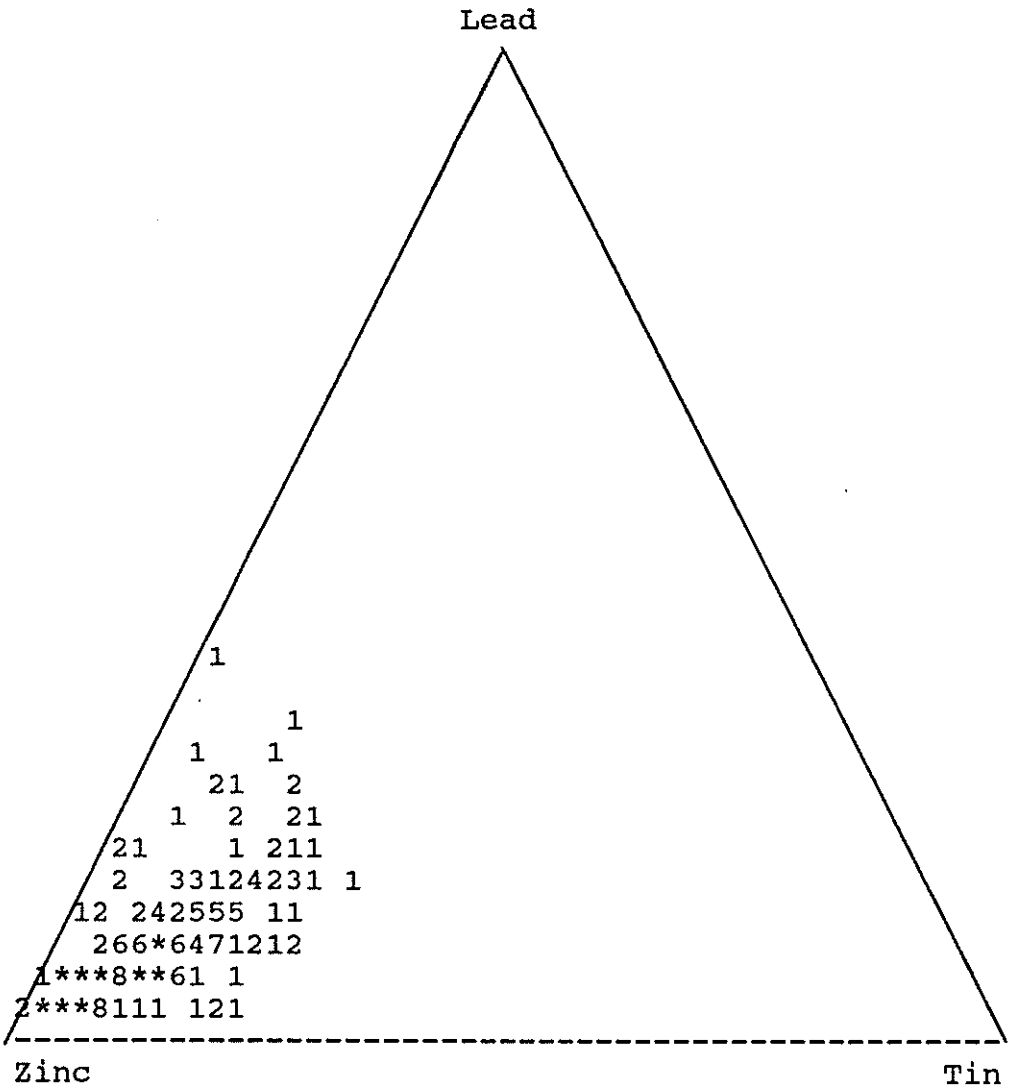


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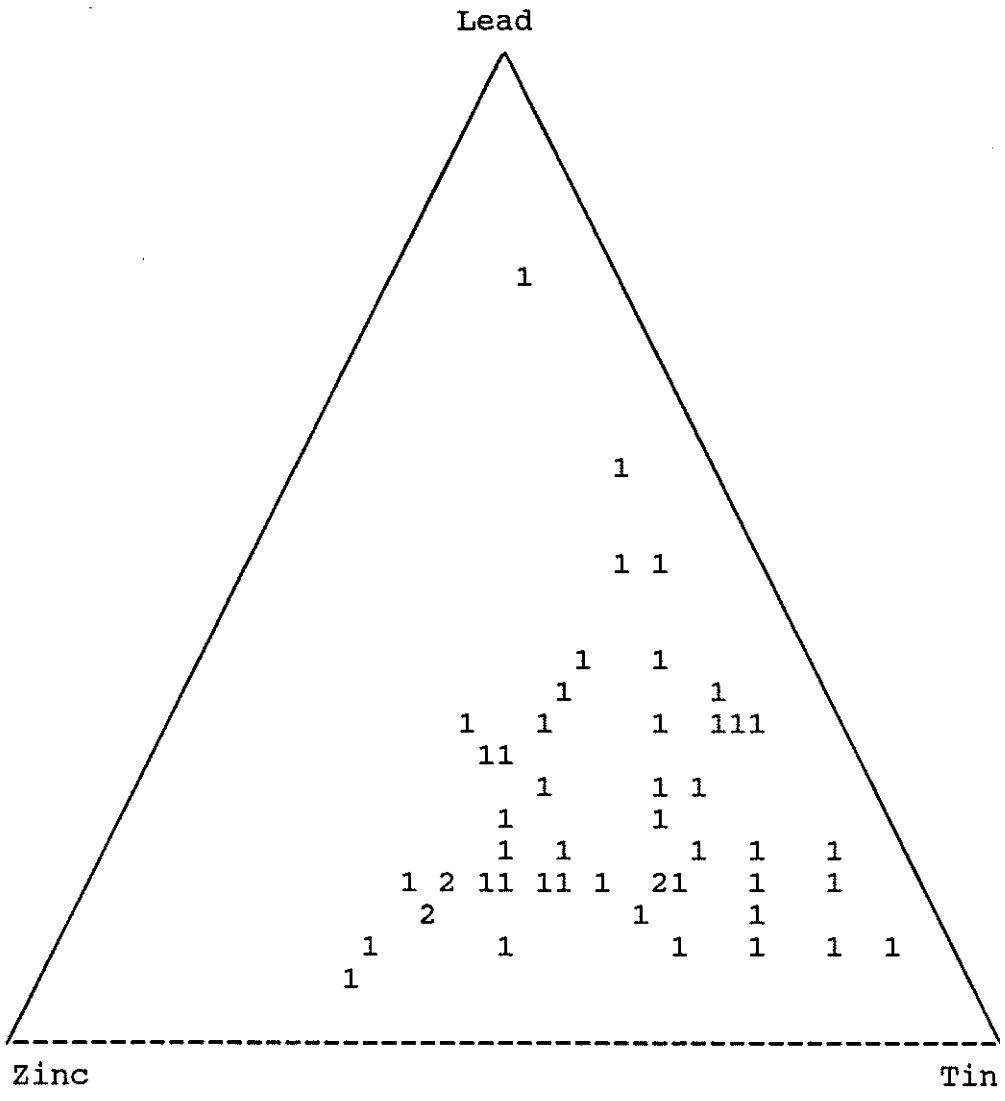
Figure 4

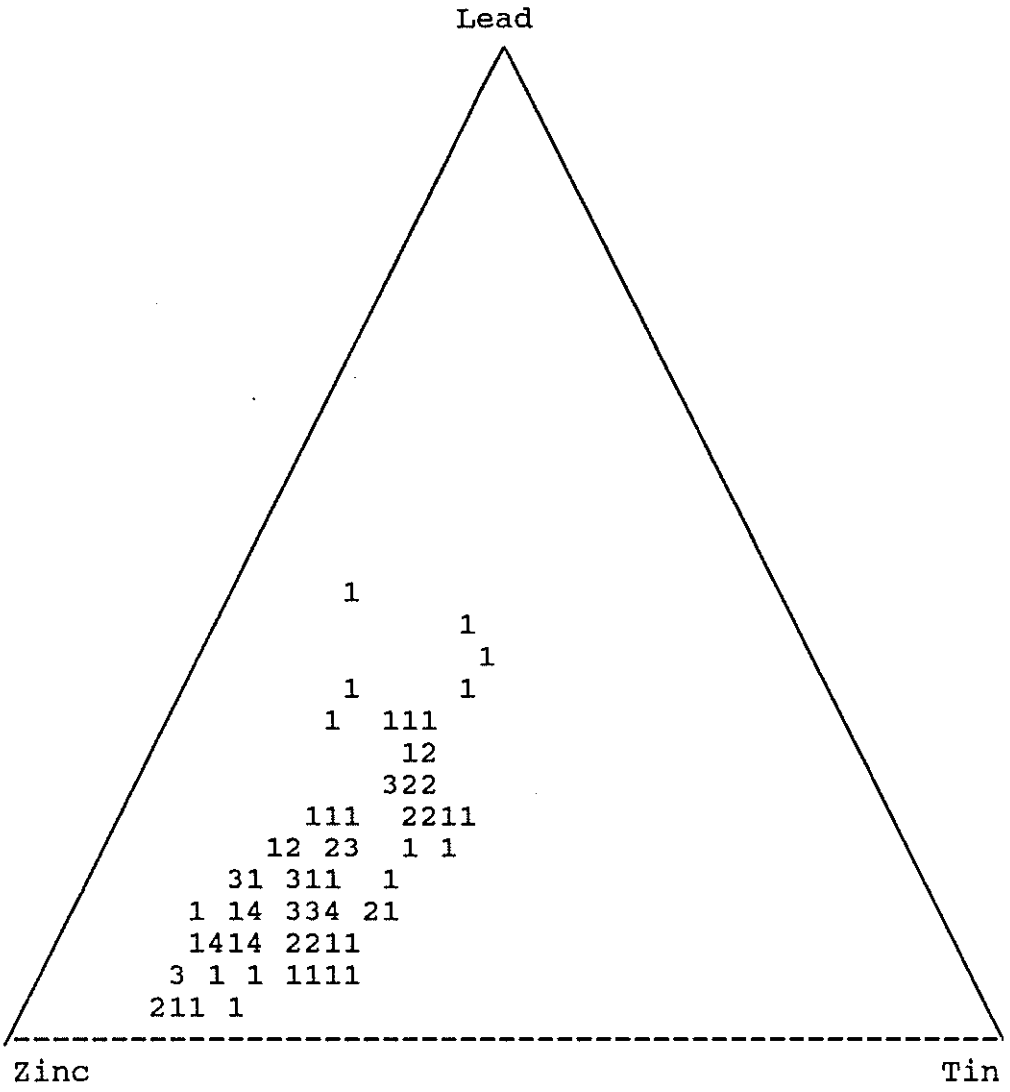
Bronze alloys



The figures on the graph represent the number of points within the area covered by that figure.

Figure 5

Gunmetal alloys



The figures on the graph represent the number of points within the area covered by that figure.

Figure 6

Tin/Lead alloys

Histogram of ratio of Lead divided by Tin

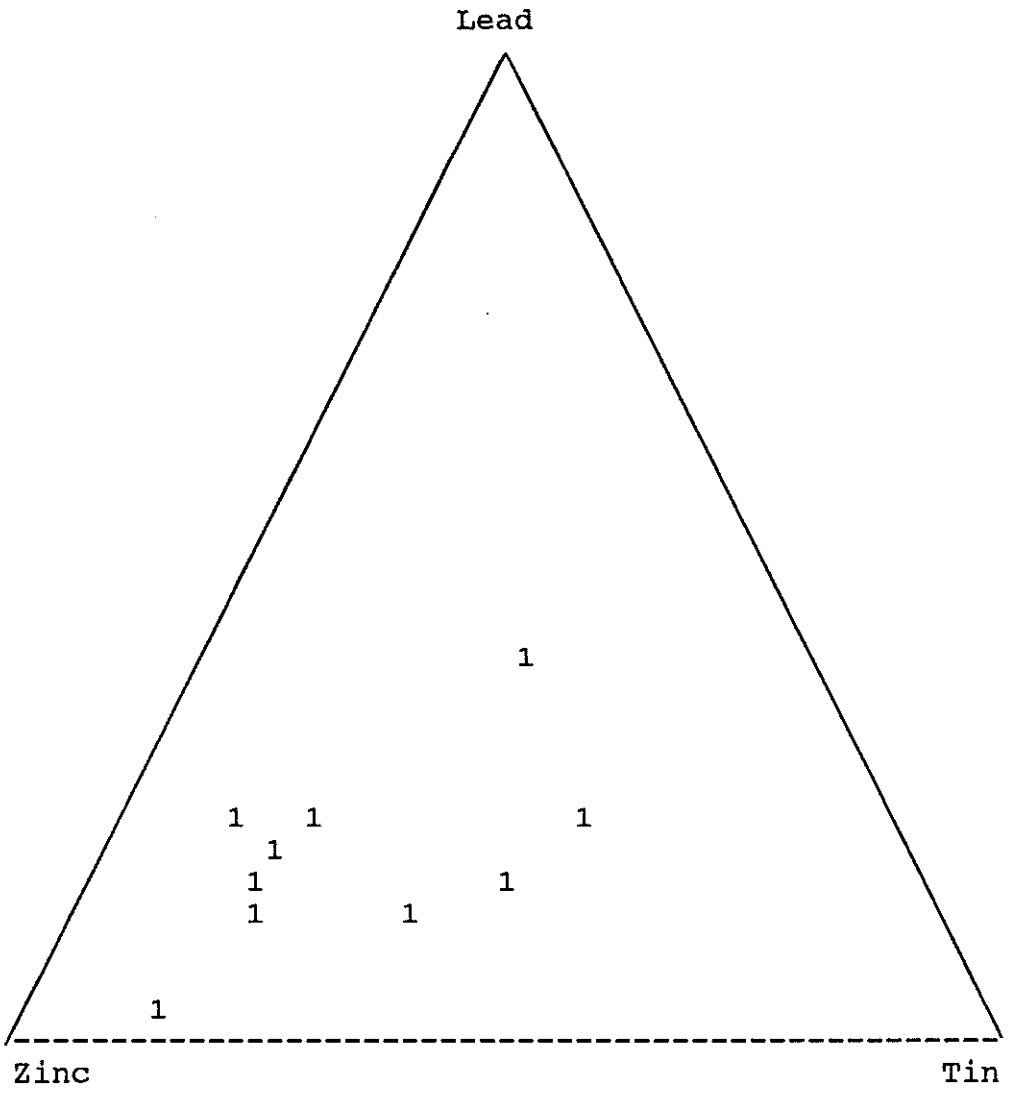
```
Midpt     Freq

0.05    t   67 **************************************************>
0.15    i    5 *****
0.25    n    3 ***
0.35         2 **
0.45    -    1 *
0.55         4 ****
0.65    p    8 ********
0.75    e   13 *************
0.85    w   13 *************
0.95    t    6 ******
1.05    e    5 *****
1.15    r    3 ***
1.25         1 *
1.35         0
1.45         2 **
1.55         0
1.65         1 *
1.75         0
1.85         0
1.95         0
2.05         0
2.15         0
2.25         0
2.35         1 *
2.45         0
2.55         0
2.65         0
2.75         0
2.85         1 *
2.95         0
3.05         0
3.15    -    0
  .          .
  .          .
  .    l     .
  .    e     .
  .    a     .
>9.75   d    3 ***
```

The cluster at the top of the histogram (with low Pb/Sn values) is the tin objects; the major group in the middle the pewter ones, and the three lead objects with very high Pb/Sn values are off scale at the bottom of the figure.

Figure 7

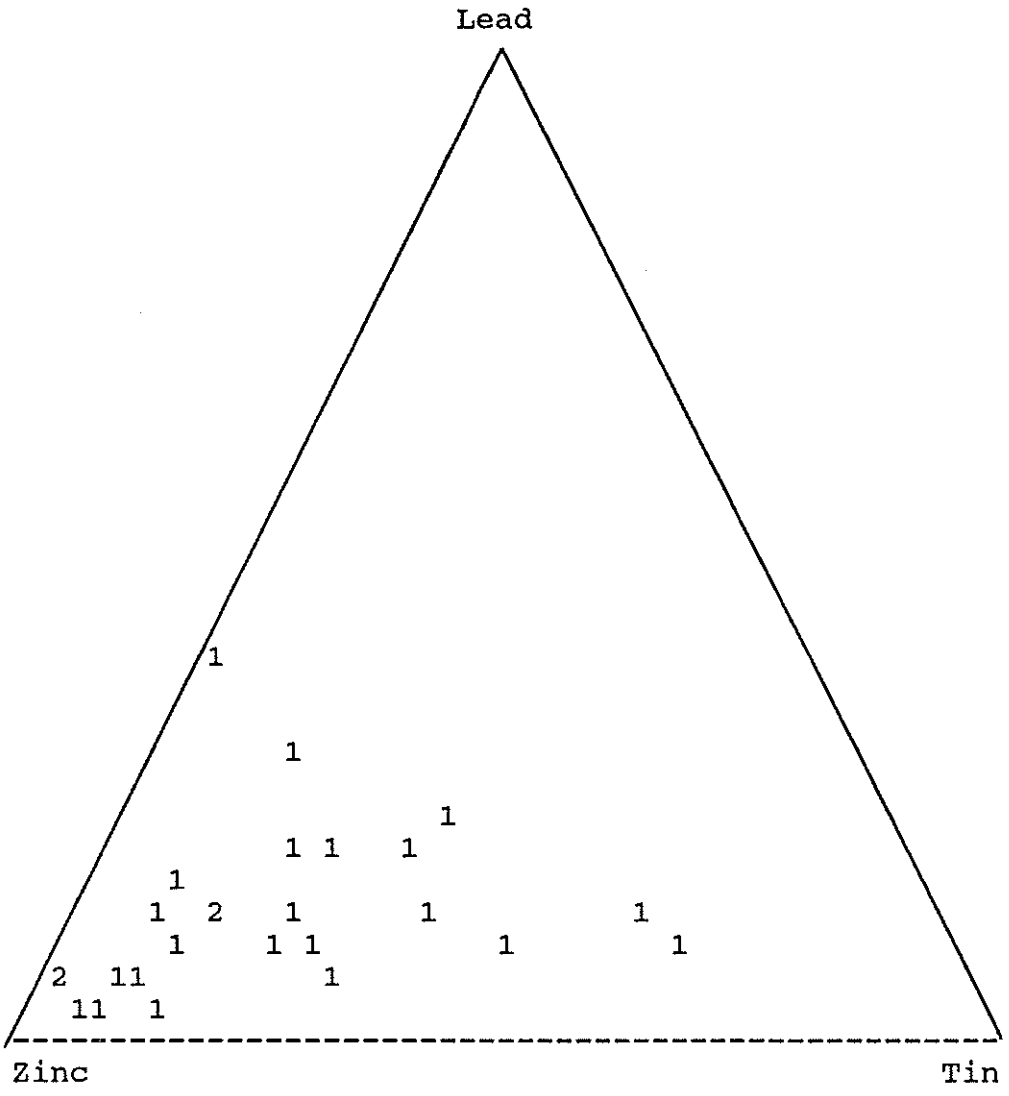
Copper alloys dated 1150 - 1200



The figures on the graph represent the number of points within the area covered by that figure.

Figure 8

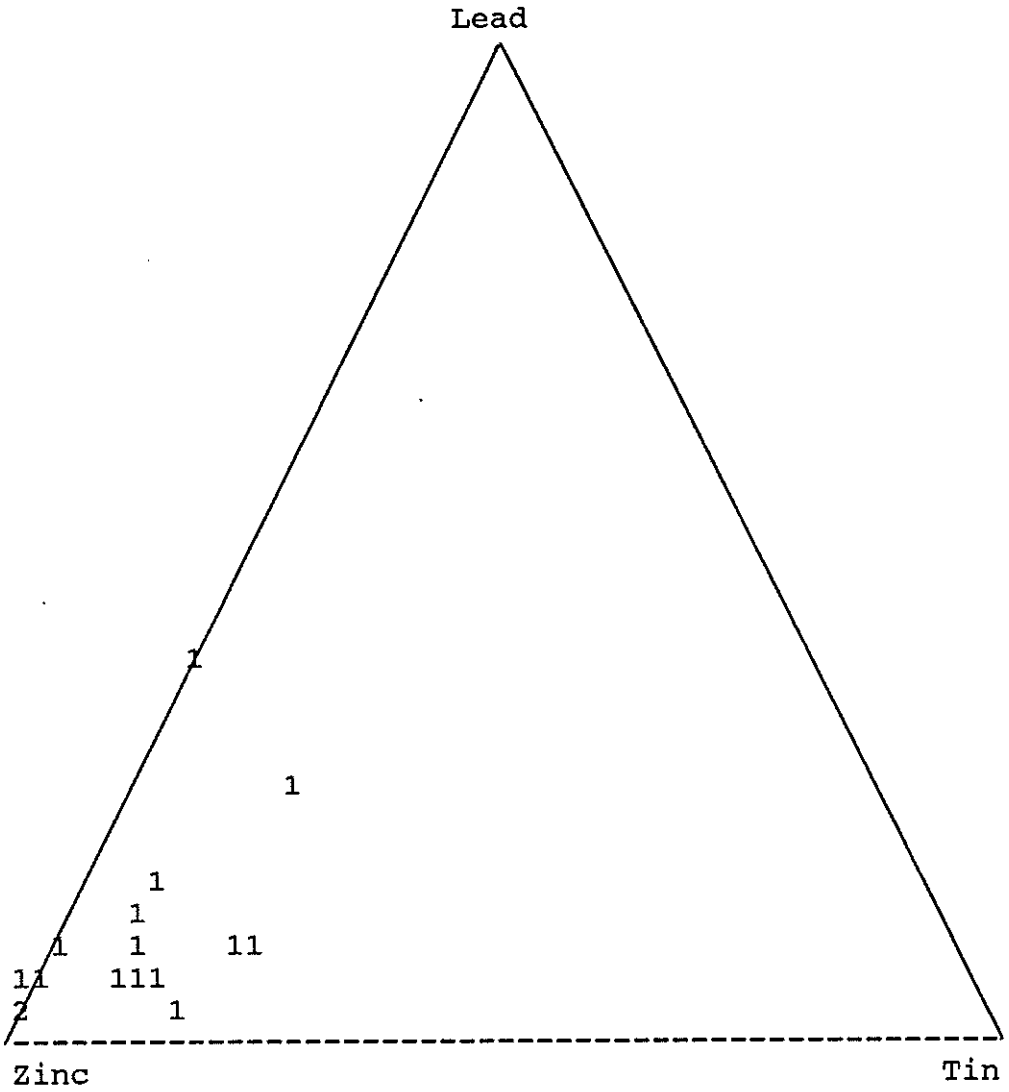
Copper alloys dated 1200 - 1230



The figures on the graph represent the number of points within the area covered by that figure.

Figure 9

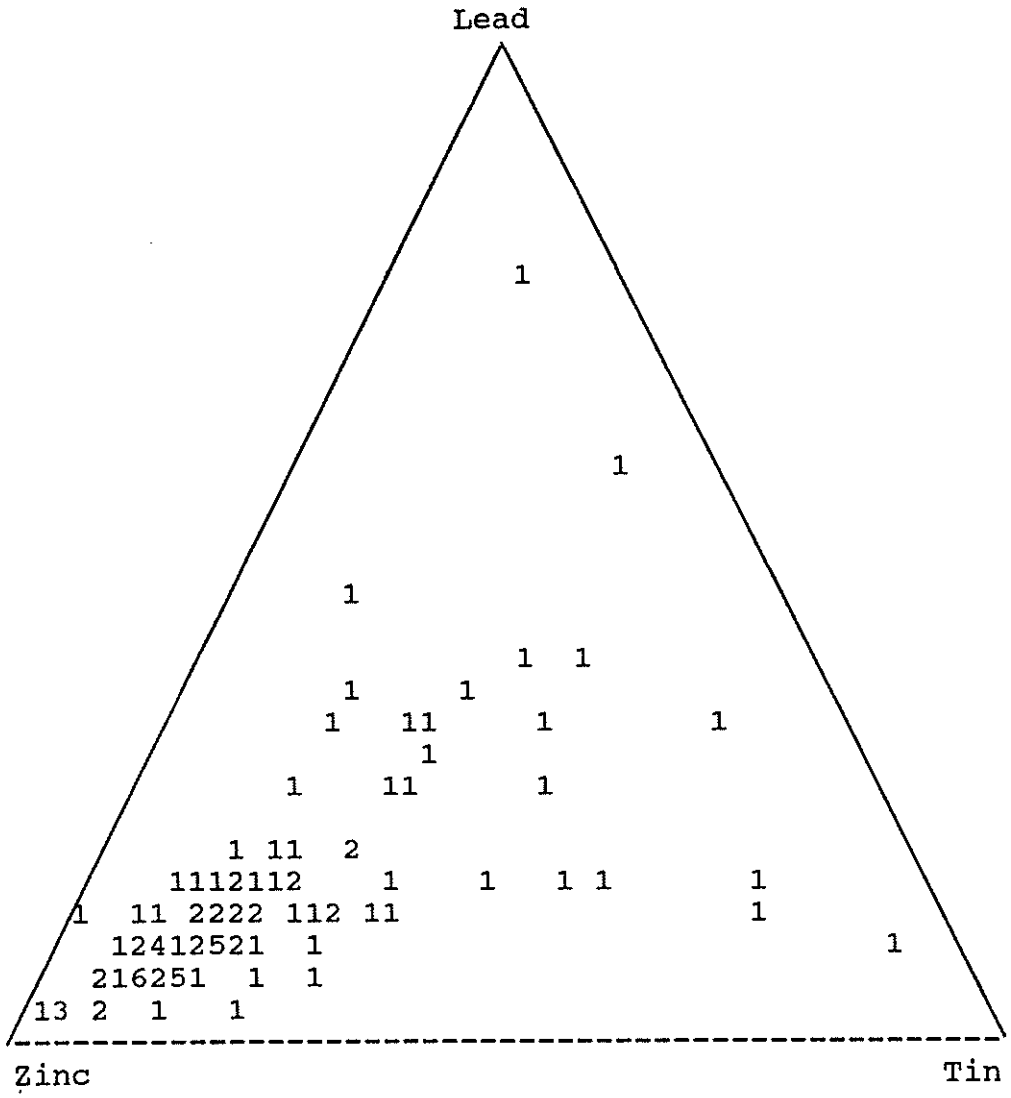
Copper alloys dated 1230 - 1260



The figures on the graph represent the number of points within the area covered by that figure.

Figure 10

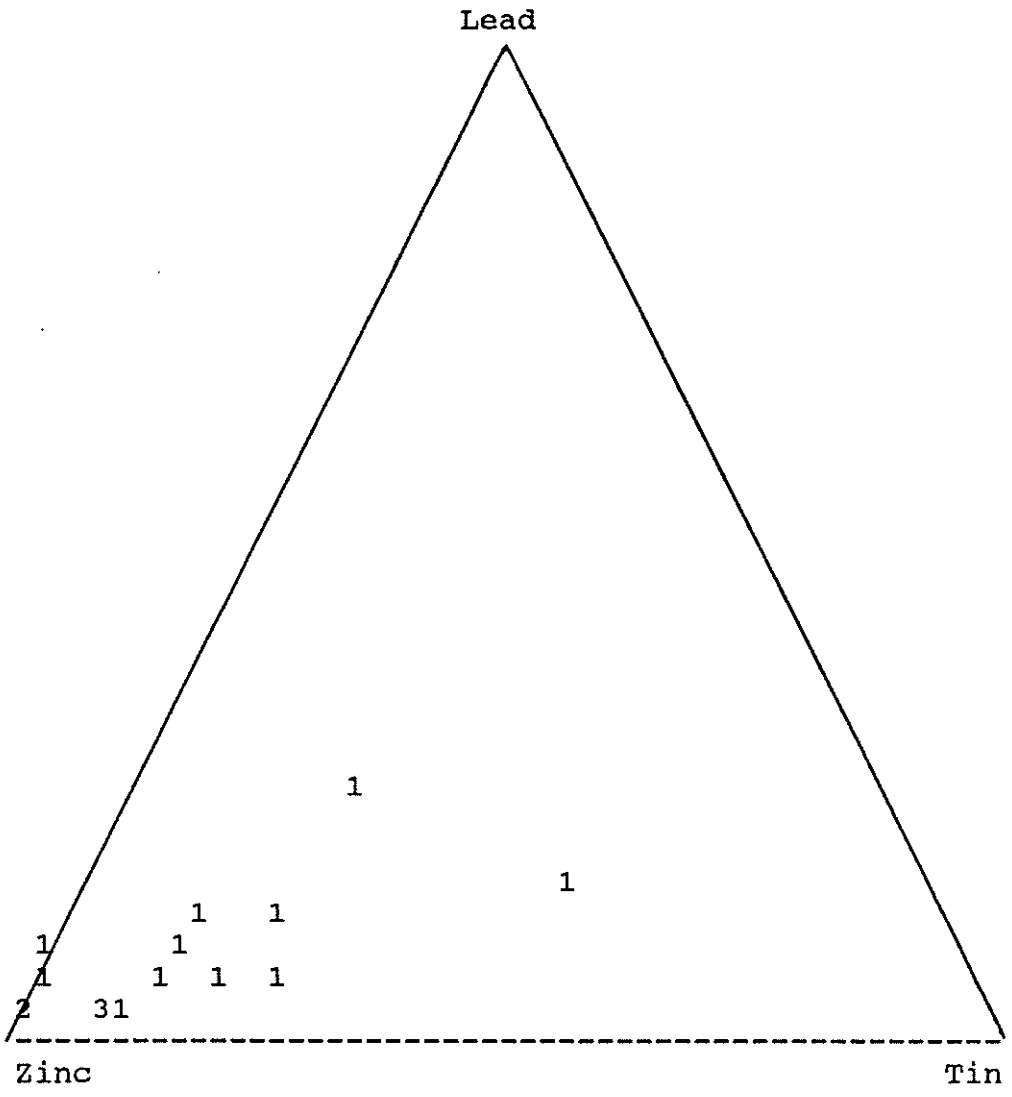
Copper alloys dated 1270 - 1350



The figures on the graph represent the number of points within the area covered by that figure.

Figure 11

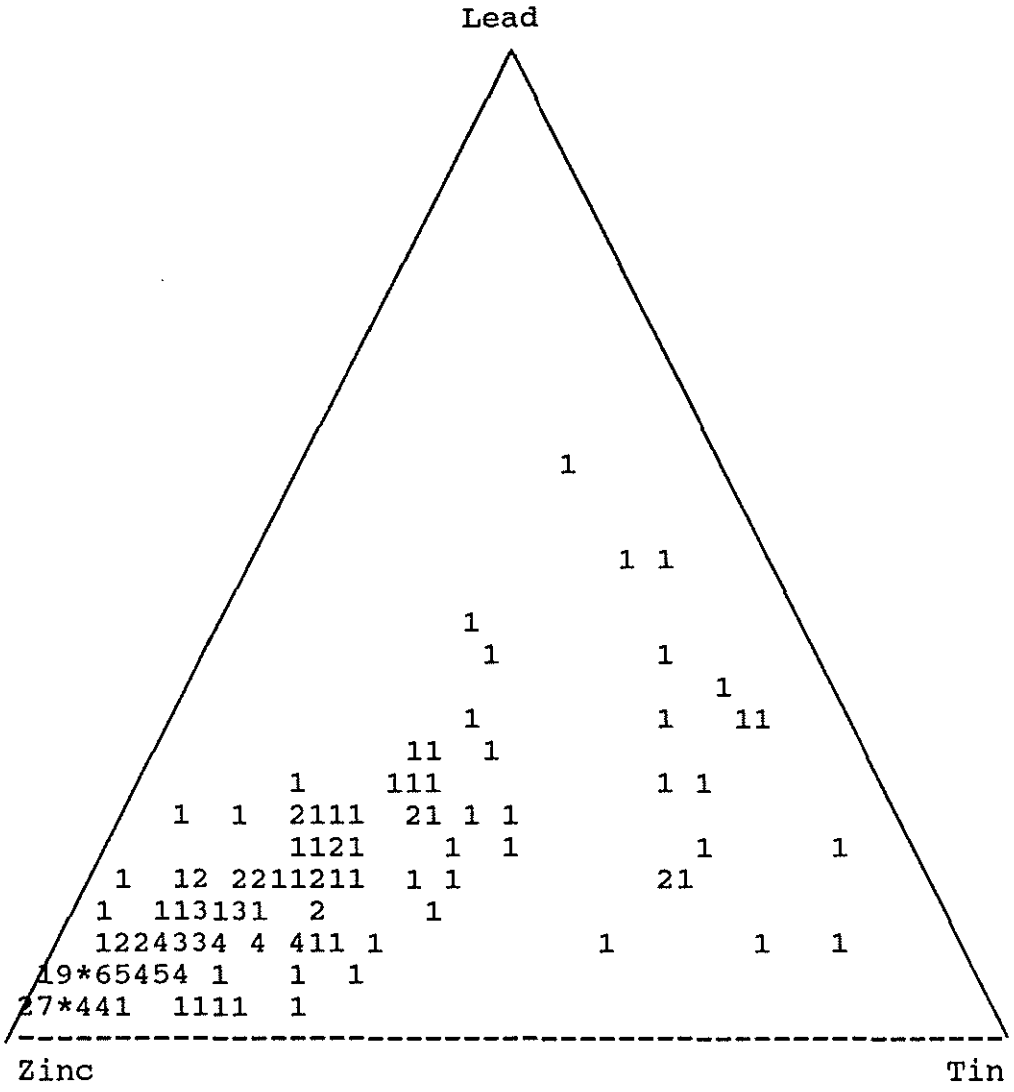
Copper alloys dated 1330 - 1400



The figures on the graph represent the number of points within the area covered by that figure.

Figure 12

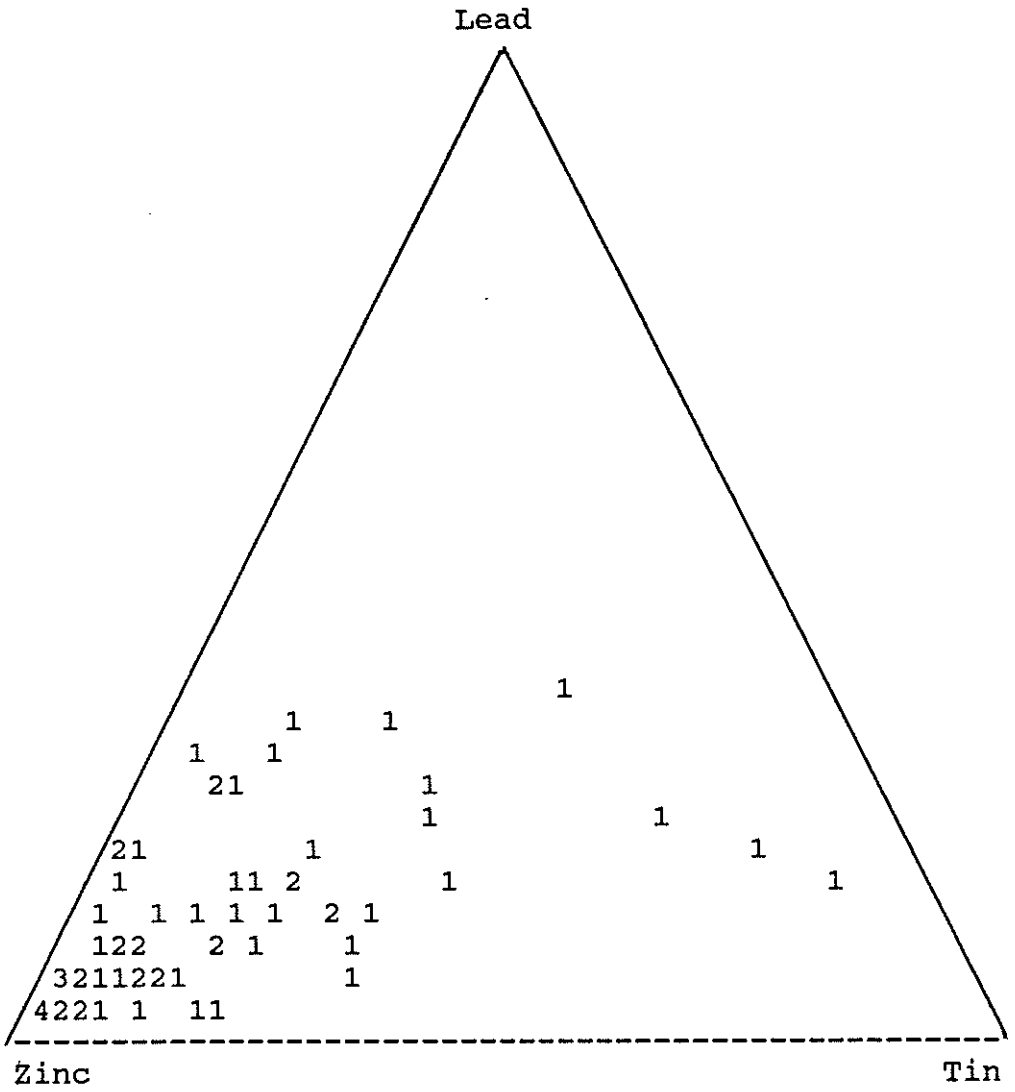
Copper alloys dated 1350 - 1400



The figures on the graph represent the number of points within the area covered by that figure. Where this exceeds single figures (ie more than nine points) then the position on the graph is marked by an asterisk (*).

Figure 13

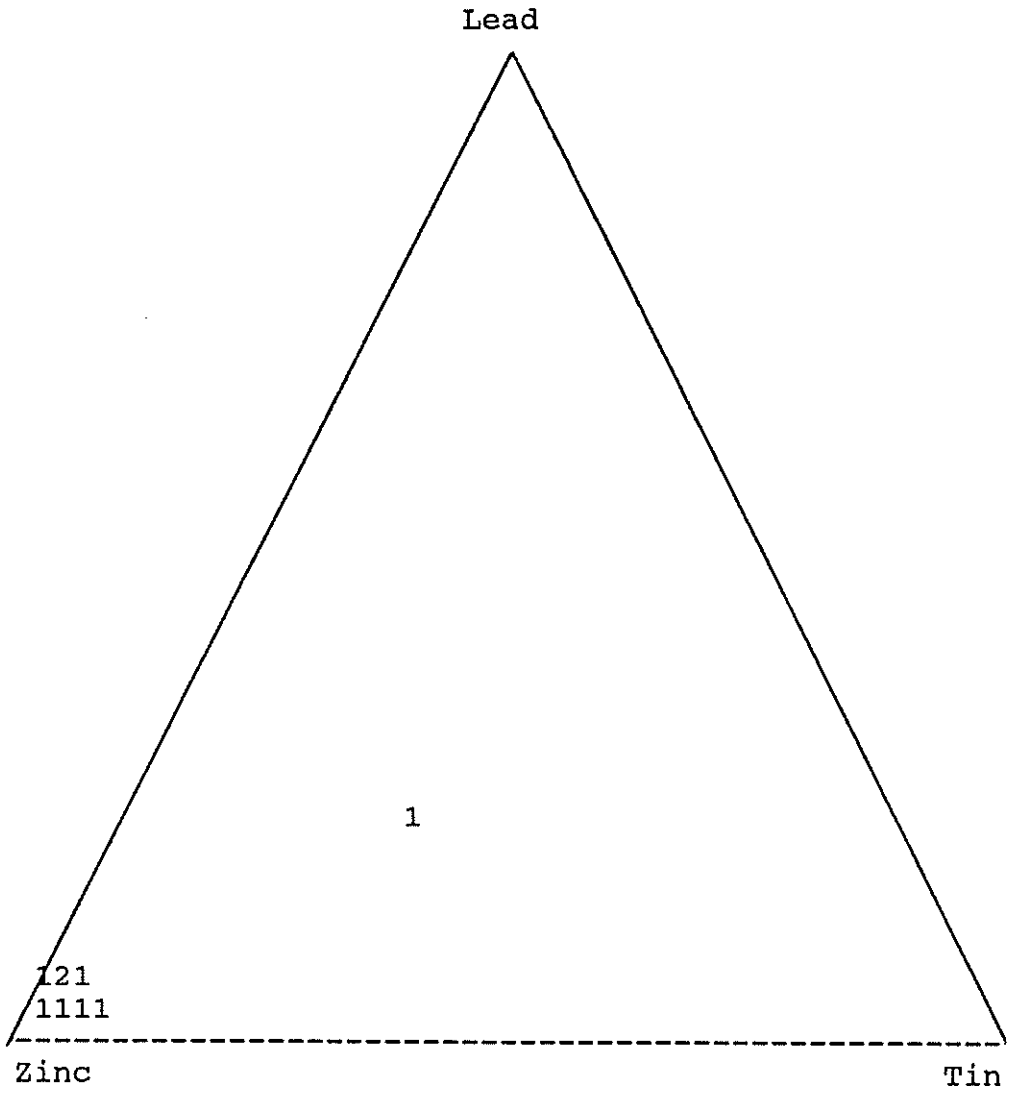
Copper alloys dated 1400 - 1450



The figures on the graph represent the number of points within the area covered by that figure.

Figure 14

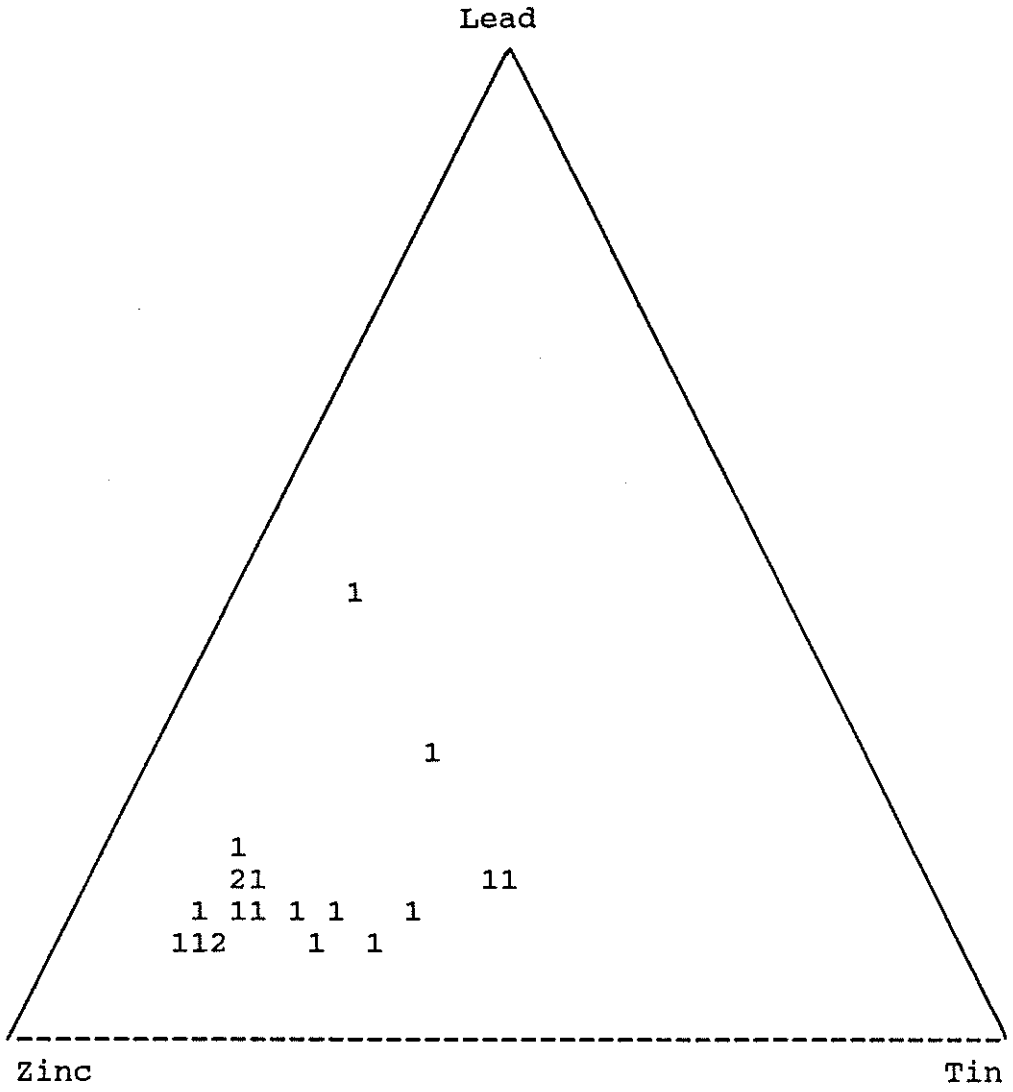
Copper alloys for bells



The figures on the graph represent the number of points within the area covered by that figure.

Figure 15

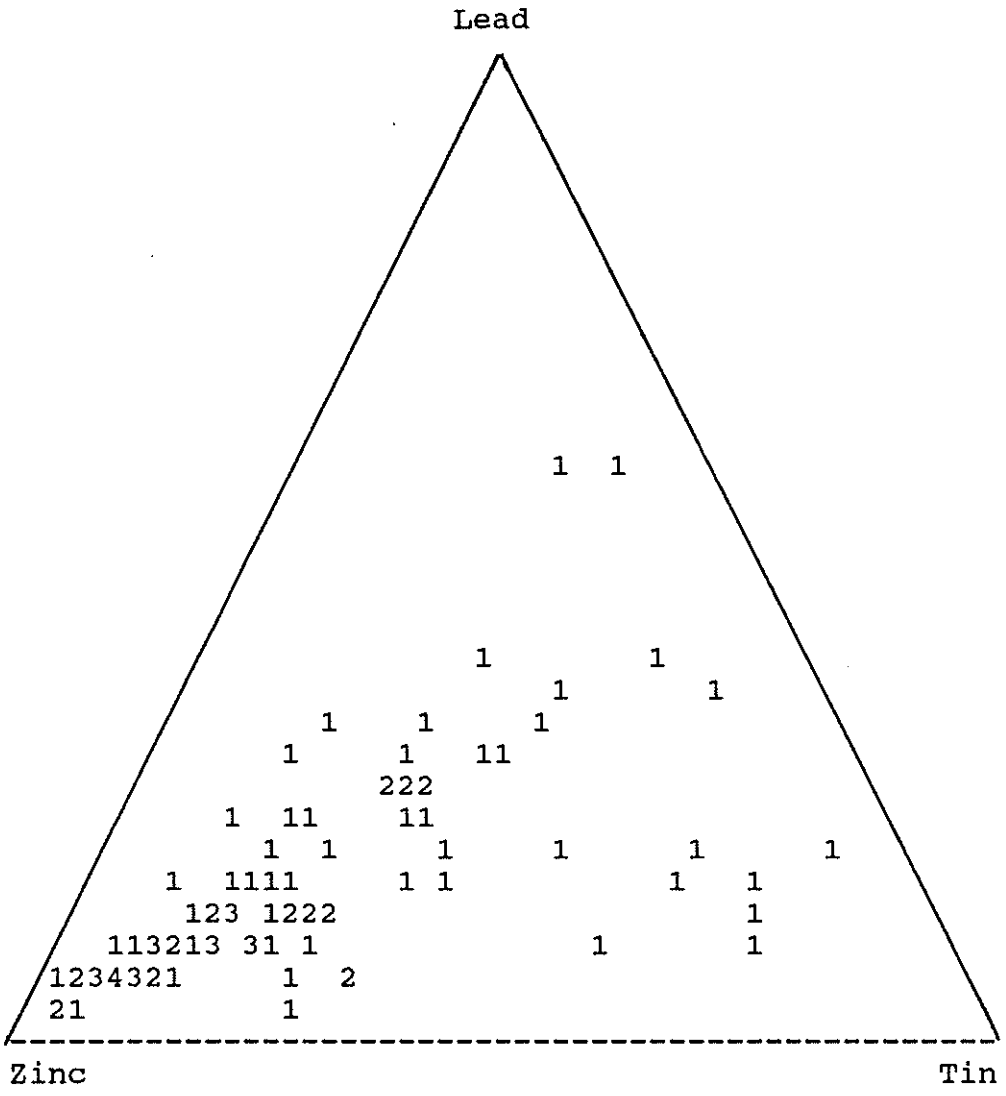
Copper alloys for brooches



The figures on the graph represent the number of points within the area covered by that figure.

Figure 16

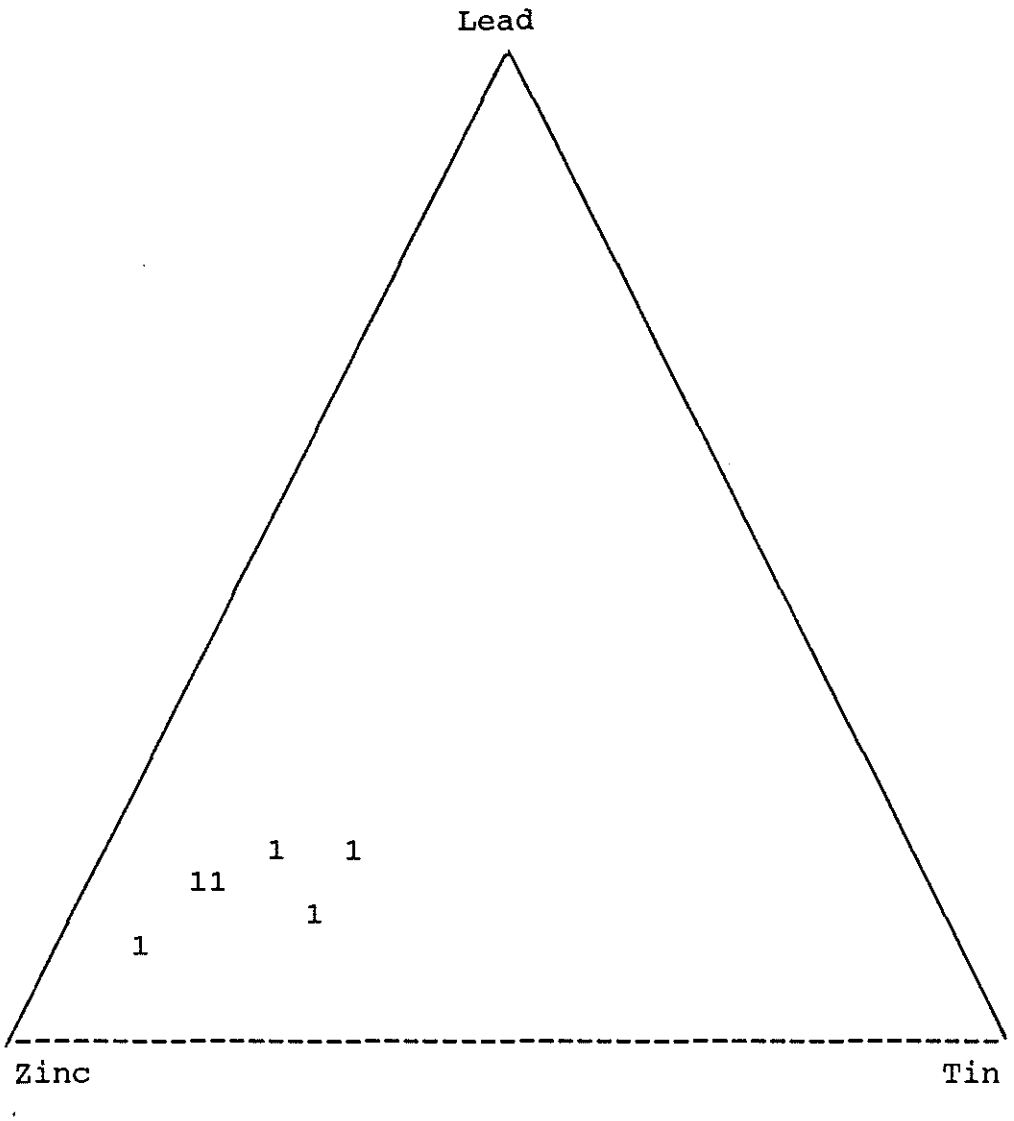
Copper alloys for buckles



The figures on the graph represent the number of points within the area covered by that figure.

Figure 17

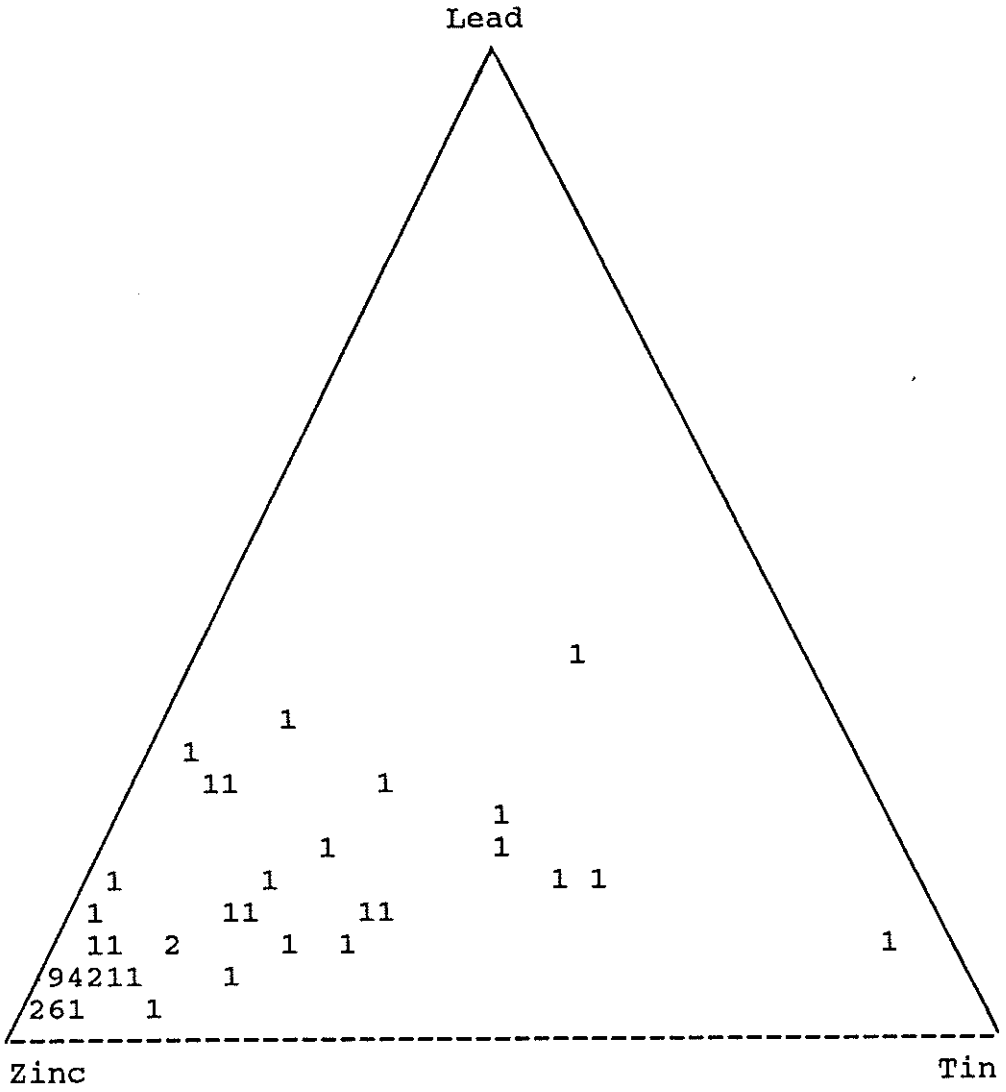
Copper alloys for buttons



The figures on the graph represent the number of points within the area covered by that figure.

Figure 18

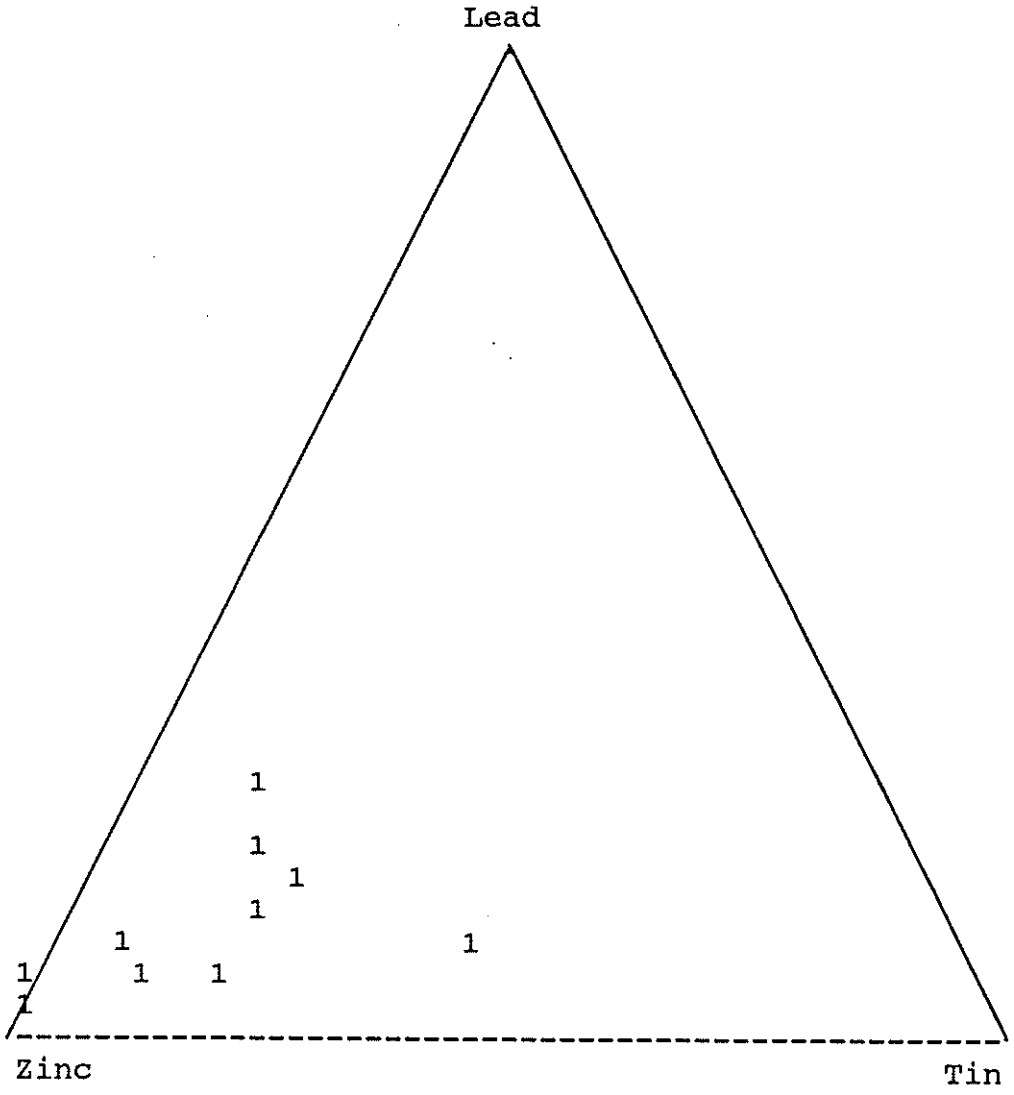
Copper alloys for chapes



The figures on the graph represent the number of points within the area covered by that figure.

Figure 19

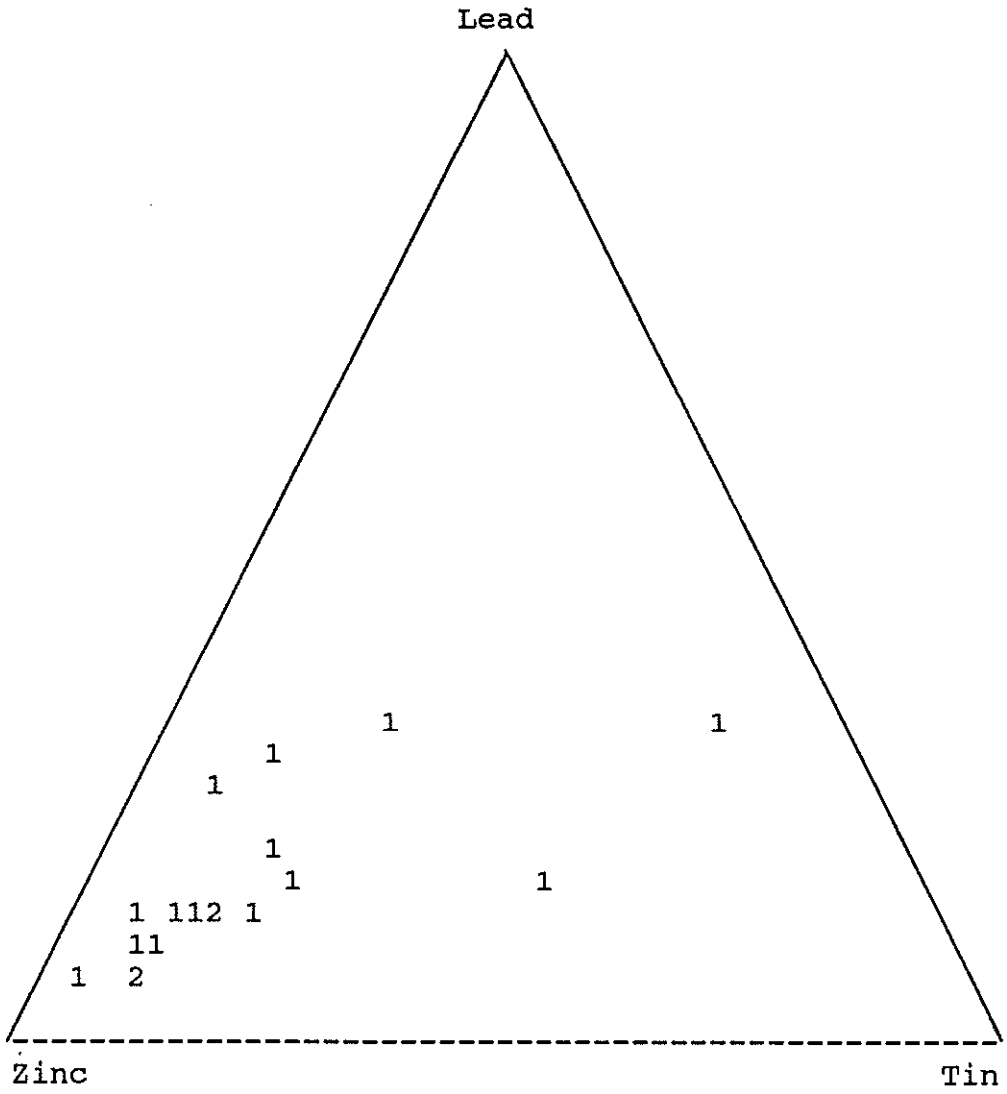
Copper alloys for cosmetic implements



The figures on the graph represent the number of points within the area covered by that figure.

Figure 20

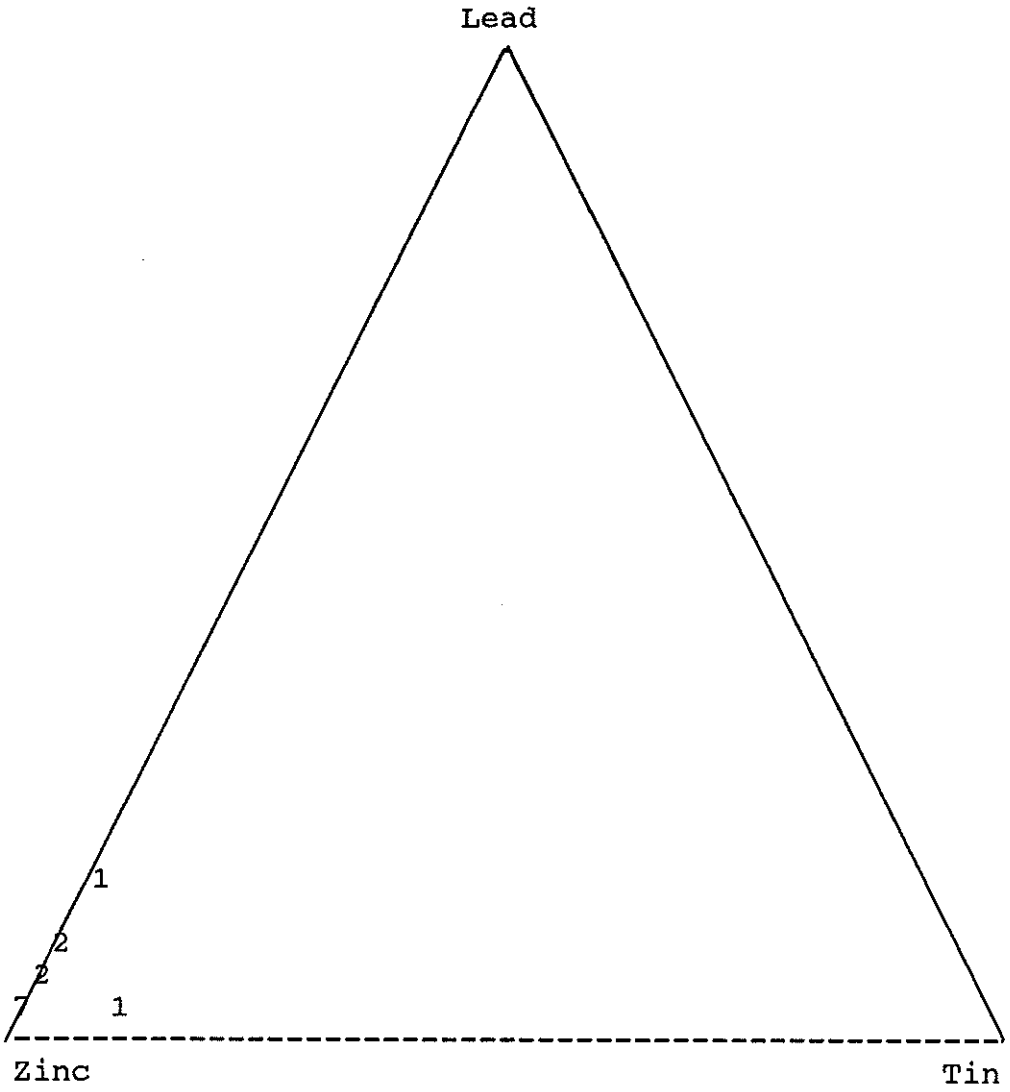
Copper alloys for finger rings



The figures on the graph represent the number of points within the area covered by that figure.

Figure 21

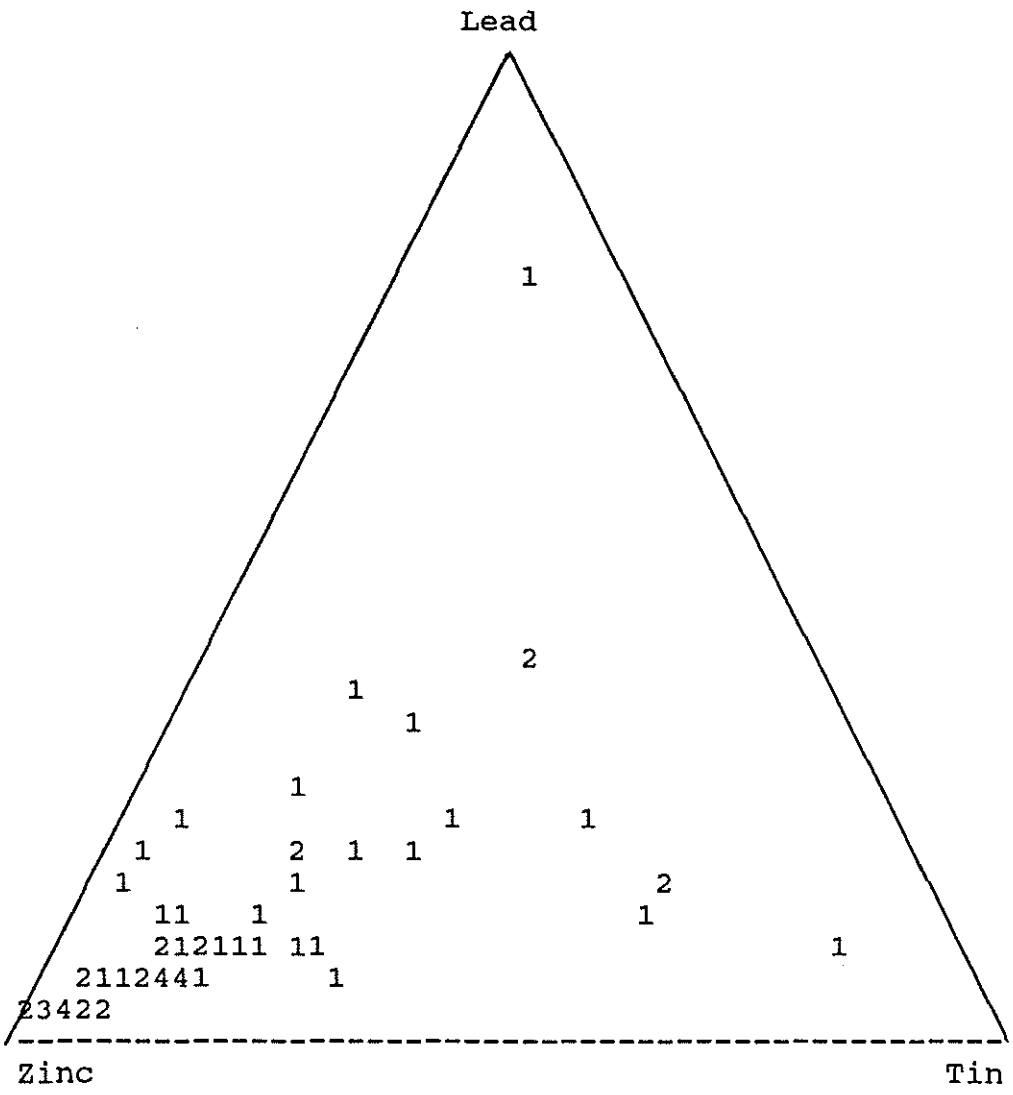
Copper alloys for headdress/wire



The figures on the graph represent the number of points within the area covered by that figure.

Figure 22

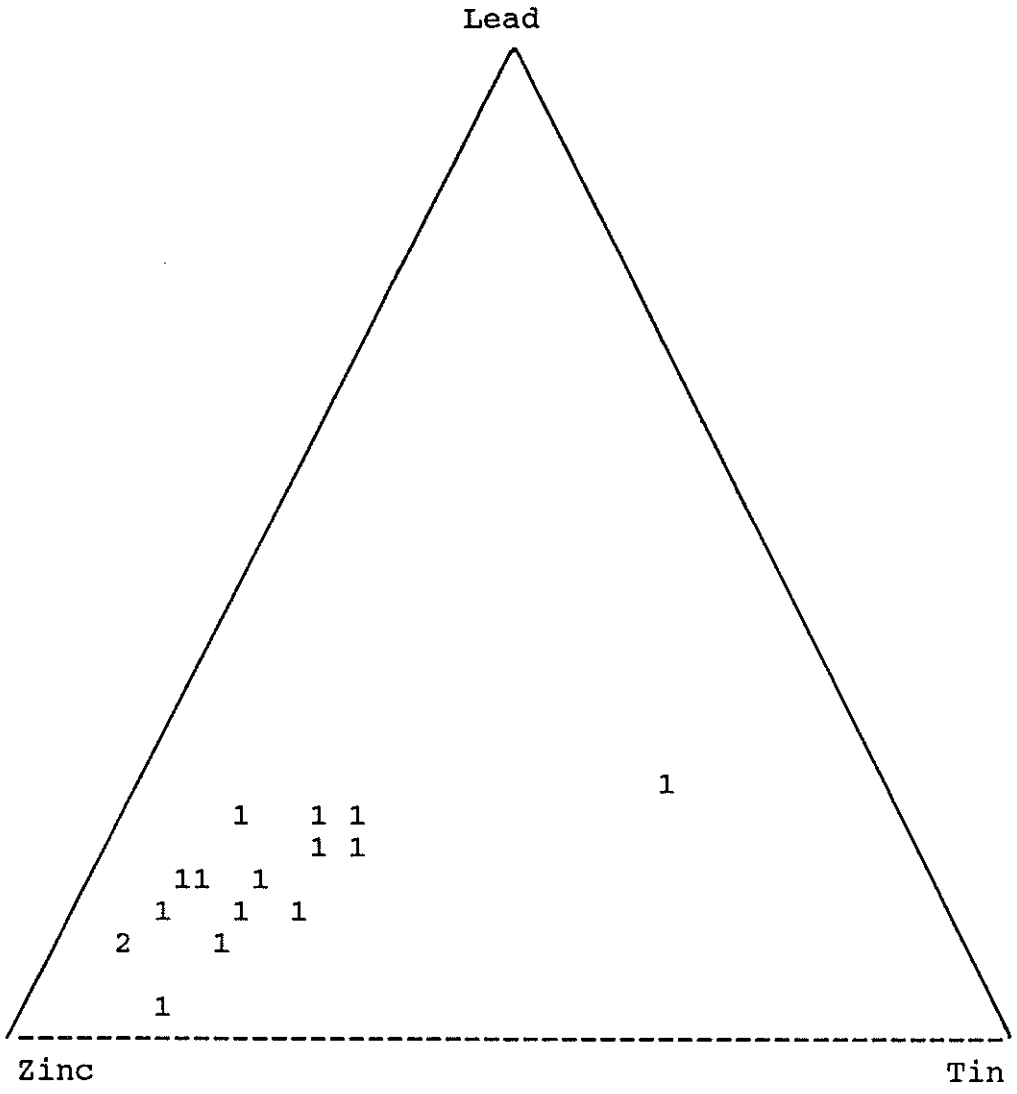
Copper alloys for mounts



The figures on the graph represent the number of points within the area covered by that figure.

Figure 23

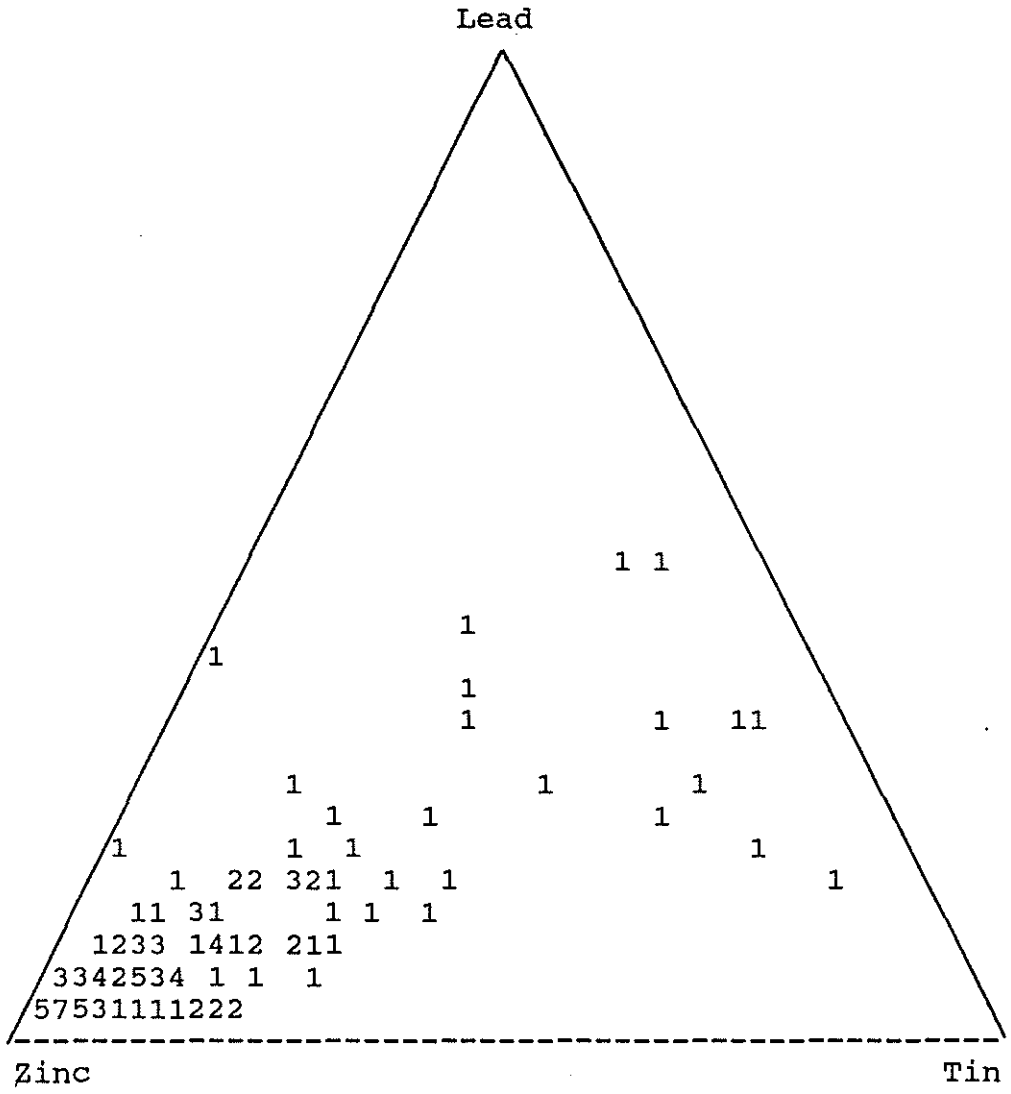
Copper alloys for pins



The figures on the graph represent the number of points within the area covered by that figure.

Figure 24

Copper alloys for strap-ends



The figures on the graph represent the number of points within the area covered by that figure.

Appendix 1

Analytical Results

SWA 2788	bead	back	1400 - 1450	Tin
SWA 2788	bead	front	1400 - 1450	Tin
SWA 3294	bead		1400 - 1450	Tin
BC 4150	bell	exterior	1350 - 1400	Brass
BC 4150	bell	interior	1350 - 1400	Brass
BC 4150	bell	loop	1350 - 1400	Brass
BIG 2118	bell		1270 - 1350	Tin
BIG 2702	bell		1200 - 1230	Tin
BIG 3070	bell	body	1200 - 1230	Tin
BIG 3070	bell	ring	1200 - 1230	Tin
BIG 3400	bell		1200 - 1230	Tin
BWB 1406	bell		1350 - 1400	Gunmetal
BWB 2373	bell		1350 - 1400	Tin
BWB 2717	bell		1350 - 1400	Tin
BWB 3508	bell		1150 - 1350	Copper
BWB 3708	bell		1400 - 1450	Tin
BWB 5077	bell		1350 - 1400	Tin
BWB 5306	bell	left side	1400 - 1450	Brass
BWB 5306	bell	right side	1400 - 1450	Brass
BWB 730	bell		1400 - 1450	Tin
SWA 1016	bell		unstratified	Pewter
SWA 1682	bell	bottom/clapper	1400 - 1450	Tin
SWA 1682	bell	top	1400 - 1450	Tin
SWA 2405	bell		1270 - 1350	Tin
SWA 396	bell	body	1270 - 1350	Tin
SWA 396	bell	ring	1270 - 1350	Tin
SWA 580	bell	bottom	1270 - 1350	Brass
SWA 580	bell	clapper	1270 - 1350	Iron
SWA 580	bell	top & ring	1270 - 1350	Brass
TL 2149	bell		1400 - 1450	Brass
BIG 1938	brooch		1230 - 1260	Pewter
BIG 2053	brooch		1270 - 1350	Copper
BIG 2317	brooch		1230 - 1260	Gunmetal
BIG 2328	brooch		1200 - 1230	Pewter
BIG 2429	brooch		1230 - 1260	Copper
BIG 2475	brooch		1230 - 1260	Pewter
BIG 2705	brooch		1200 - 1230	Silver
BIG 2718	brooch		1230 - 1260	Pewter
BIG 2746	brooch		1150 - 1200	Pewter
BIG 2812	brooch		1150 - 1200	Copper
BIG 3053	brooch		1200 - 1230	Pewter
BIG 3068	brooch	frame	1150 - 1200	Gunmetal
BIG 3068	brooch	pin	1150 - 1200	Silver
BIG 3141	brooch		1230 - 1260	Pewter
BWB 14	brooch		1350 - 1400	Pewter
BWB 1442	brooch	frame	1350 - 1400	Brass
BWB 1442	brooch	pin	1350 - 1400	Brass
BWB 1517	brooch		1270 - 1350	Tin
BWB 1611	brooch		1330 - 1380	Pewter
BWB 2148	brooch		1350 - 1400	Lead
BWB 2734	brooch		1350 - 1400	Bronze with gilding

BWB 335	brooch	frame	1270 - 1350	Gunmetal
BWB 335	brooch	pin	1270 - 1350	Gunmetal
BWB 3593	brooch		1350 - 1400	Pewter
BWB 398	brooch		1270 - 1350	Bronze
BWB 4240	brooch		1350 - 1400	Gunmetal
BWB 4401	brooch		1270 - 1350	Gunmetal
BWB 4417	brooch	frame	1350 - 1400	Pewter
BWB 4417	brooch	pin	1350 - 1400	Pewter
BWB 4555	brooch		1270 - 1350	Pewter
BWB 5098	brooch		unstratified	Pewter
BWB 5803	brooch		1350 - 1400	Pewter
BWB 5804	brooch		1350 - 1400	Bronze
BWB 5806	brooch		1350 - 1400	Pewter
BWB 714	brooch		1350 - 1400	Silver
BWB 714	brooch	pin	1350 - 1400	Silver
SH 17	brooch		1270 - 1350	Gunmetal
SWA 1265	brooch		1270 - 1350	Pewter
SWA 1494	brooch		1400 - 1450	Pewter
SWA 1685	brooch		1270 - 1350	Gunmetal
SWA 1876	brooch		1270 - 1350	Pewter
SWA 2075	brooch		1400 - 1450	Pewter
SWA 2139	brooch		1270 - 1350	Gunmetal
SWA 2141	brooch	frame	1270 - 1350	Gunmetal
SWA 2141	brooch	pin	1270 - 1350	Gunmetal
SWA 2186	brooch		1270 - 1350	Gunmetal
SWA 2273	brooch		unstratified	Pewter
SWA 2354	brooch		1200 - 1230	Pewter
SWA 3377	brooch		1270 - 1350	Pewter
SWA 363	brooch		1150 - 1200	Bronze
SWA 442	brooch		1270 - 1350	Pewter
SWA 542	brooch		1350 - 1400	Pewter
SWA 551	brooch		1270 - 1350	Pewter
SWA 582	brooch		1270 - 1350	Pewter
SWA 682	brooch	frame	1270 - 1350	Brass
SWA 682	brooch	pin	1270 - 1350	Brass
TL 2150	brooch		1270 - 1350	Gunmetal
BC 1511	buckle	frame	1350 - 1400	Gunmetal
BC 1511	buckle	mounts/rivets	1350 - 1400	Iron
BC 2859	buckle	frame	1350 - 1400	Gunmetal
BC 2859	buckle	plate	1350 - 1400	Bronze
BC 4138	buckle	frame	1350 - 1400	Gunmetal
BC 4138	buckle	pin	1350 - 1400	Brass
BC 4174	buckle	end plate	1330 - 1380	Brass
BC 4174	buckle	folding end	1330 - 1380	Brass
BC 4174	buckle	frame	1330 - 1380	Brass
BC 4174	buckle	plate	1330 - 1380	Brass
BC 4304	buckle	frame	1350 - 1400	Gunmetal with Tin coating
BC 4304	buckle	pin	1350 - 1400	Iron
BC 5323	buckle	frame	1350 - 1400	Gunmetal
BIG 2302	buckle	frame	1230 - 1260	Gunmetal
BIG 2313	buckle		1230 - 1260	Gunmetal
BIG 2321	buckle	frame	1230 - 1260	Brass
BIG 2336	buckle	frame	1230 - 1260	Brass
BIG 2336	buckle	pin	1230 - 1260	Brass
BIG 2336	buckle	roller	1230 - 1260	Brass
BIG 2719	buckle		1200 - 1230	Copper
BIG 2827	buckle	frame	1150 - 1200	Copper with gilding?

BIG 2827	buckle	pin	1150 - 1200	Copper
BIG 2827	buckle	pin loop	1150 - 1200	Copper
BIG 2827	buckle	plate	1150 - 1200	Copper
BIG 3077	buckle	back	1150 - 1200	Copper with gilding
BIG 3077	buckle	frame	1150 - 1200	Copper with gilding
BIG 3077	buckle	roller	1150 - 1200	Copper
BWB 1179	buckle	frame	1350 - 1400	Gunmetal
BWB 1179	buckle	plate	1350 - 1400	Brass
BWB 1263	buckle	bottom plate	1330 - 1380	Brass
BWB 1263	buckle	frame	1330 - 1380	Gunmetal
BWB 1263	buckle	top plate	1330 - 1380	Brass
BWB 1417	buckle	frame	1350 - 1400	Gunmetal
BWB 1417	buckle	plate	1350 - 1400	Gunmetal
BWB 1650	buckle	frame	1350 - 1400	Gunmetal
BWB 1650	buckle	plate	1350 - 1400	Brass
BWB 1652	buckle	frame	1350 - 1400	Gunmetal
BWB 1652	buckle	plate	1350 - 1400	Brass
BWB 17	buckle	frame	1330 - 1380	Gunmetal
BWB 17	buckle	plate	1330 - 1380	Bronze
BWB 1916	buckle		1270 - 1350	Brass
BWB 1926	buckle		1400 - 1450	Brass
BWB 1934	buckle	frame	1270 - 1350	Gunmetal
BWB 1938	buckle	frame	1350 - 1400	Brass
BWB 1938	buckle	plate	1350 - 1400	Brass
BWB 2214	buckle	frame	residual	Copper
BWB 2274	buckle	plate	1350 - 1400	Brass
BWB 2274	buckle	repair	1350 - 1400	Bronze
BWB 2308	buckle	bar	1350 - 1400	Iron
BWB 2308	buckle	frame	1350 - 1400	Brass
BWB 2355	buckle	frame	1350 - 1400	Bronze
BWB 2355	buckle	plate	1350 - 1400	Gunmetal
BWB 2678	buckle	frame	1350 - 1400	Tin
BWB 2683	buckle		unphased	Tin
BWB 2689	buckle		1350 - 1400	Bronze
BWB 2718	buckle	frame	1350 - 1400	Brass
BWB 2728	buckle		1350 - 1400	Bronze
BWB 339	buckle	frame	1400 - 1450	Bronze
BWB 339	buckle	frame & bar	1400 - 1450	Gunmetal with Tin coating
BWB 339	buckle	frame & bar	1400 - 1450	Gunmetal
BWB 339	buckle	plate	1400 - 1450	Gunmetal
BWB 3443	buckle	frame	1350 - 1400	Gunmetal with Tin coating
BWB 3443	buckle	plate	1350 - 1400	Gunmetal with Tin coating
BWB 3544	buckle	frame	1350 - 1400	Copper
BWB 3544	buckle	pin	1350 - 1400	Iron
BWB 3629	buckle	bottom plate	1350 - 1400	Brass
BWB 3629	buckle	frame	1350 - 1400	Gunmetal
BWB 3629	buckle	top plate	1350 - 1400	Brass
BWB 3690	buckle	frame	1350 - 1400	Pewter
BWB 3711	buckle		1350 - 1400	Silver
BWB 38	buckle	frame	1350 - 1400	Bronze
BWB 38	buckle	plate	1350 - 1400	Gunmetal
BWB 4006	buckle		1350 - 1400	Tin
BWB 4023	buckle	frame	1350 - 1400	Bronze
BWB 4023	buckle	roller	1350 - 1400	Bronze
BWB 4425	buckle	frame	1350 - 1400	Brass

BWB 4425	buckle	plate	1350 - 1400	Brass
BWB 4431	buckle	frame	1350 - 1400	Gunmetal
BWB 4431	buckle	roller	1350 - 1400	Gunmetal
BWB 4434	buckle	frame	unstratified	Brass
BWB 4434	buckle	plate	unstratified	Brass
BWB 4487	buckle	frame	1350 - 1400	Leaded Gunmetal
BWB 4531	buckle	bar on plate	1270 - 1350	Brass
BWB 4531	buckle	frame	1270 - 1350	Brass
BWB 4531	buckle	plate	1270 - 1350	Brass
BWB 4543	buckle	frame	1350 - 1400	Brass
BWB 4545	buckle	frame	1270 - 1350	Brass
BWB 4557	buckle	frame	1270 - 1350	Tin
BWB 4557	buckle	plate	1270 - 1350	Bronze
BWB 4589	buckle	frame	1270 - 1350	Bronze
BWB 4589	buckle	plate	1270 - 1350	Gunmetal
BWB 5094	buckle		unstratified	Tin
BWB 528	buckle	frame	1350 - 1400	Brass
BWB 528	buckle	plate	1350 - 1400	Brass
BWB 5439	buckle		1350 - 1400	Bronze
BWB 740	buckle	frame	1350 - 1400	Pewter
SWA 1072	buckle		1400 - 1450	Tin
SWA 1094	buckle		1400 - 1450	Tin
SWA 1240	buckle		1270 - 1350	Brass
SWA 1318	buckle	frame	1270 - 1350	Brass
SWA 1493	buckle	frame	1400 - 1450	Brass
SWA 1493	buckle	pin	1400 - 1450	Brass
SWA 2038	buckle	frame	1400 - 1450	Tin
SWA 2038	buckle	pin	1400 - 1450	Tin
SWA 2091	buckle	barrel	1270 - 1350	Brass
SWA 2091	buckle	frame	1270 - 1350	Brass
SWA 2091	buckle	plate	1270 - 1350	Gunmetal
SWA 2113	buckle	frame	1270 - 1350	Copper
SWA 2113	buckle	plate	1270 - 1350	Copper
SWA 2129	buckle	frame	1270 - 1350	Brass with Tin coating
SWA 2129	buckle	plate	1270 - 1350	Brass
SWA 2200	buckle	frame	1270 - 1350	Gunmetal
SWA 2200	buckle	pin	1270 - 1350	Bronze
SWA 2209	buckle		1400 - 1450	Bronze
SWA 2209	buckle	bottom	1400 - 1450	Copper
SWA 2209	buckle	bottom (inside)	1400 - 1450	Lead/Tin solder
SWA 2209	buckle	hook	1400 - 1450	Gunmetal
SWA 2209	buckle	side	1400 - 1450	Brass
SWA 2261	buckle		1270 - 1350	Gunmetal
SWA 2874	buckle		1270 - 1350	Tin
SWA 2874	buckle	bottom of rivets	1270 - 1350	Lead/Tin solder?
SWA 2874	buckle	plate & rivet tops	1270 - 1350	Bronze
SWA 3297	buckle		1400 - 1450	Tin
SWA 3612	buckle	frame/pin	unstratified	Tin
SWA 3612	buckle	plate	unstratified	Tin
SWA 3886	buckle	armature	1350 - 1400	Gunmetal
SWA 3886	buckle	bottom plate	1350 - 1400	Gunmetal
SWA 3886	buckle	top plate	1350 - 1400	Brass
SWA 3935	buckle	frame	1270 - 1350	Copper
SWA 3935	buckle	pin	1270 - 1350	Copper
SWA 751	buckle	frame	1400 - 1450	Gunmetal
SWA 751	buckle	plate	1400 - 1450	Gunmetal
SWA 851	buckle		unstratified	Bronze
TL 1394	buckle		unstratified	Pewter
TL 2140	buckle		1350 - 1400	Gunmetal

TL 2156	buckle		1400 - 1450	Brass
TL 2159	buckle		1400 - 1450	Pewter
BIG 2338	button		1230 - 1260	Tin
BIG 2359	button		1230 - 1260	Bronze with Tin coating
BIG 2508	button		1230 - 1260	Pewter
BIG 2649	button		1230 - 1260	Tin
BIG 3403	button		1200 - 1230	Tin
BIG 5734	button		1230 - 1260	Bronze with Tin coating
BWB 2121	button		1270 - 1350	Tin
BWB 3707	button		1400 - 1450	Bronze with Tin coating
SWA 1312	button	back	1270 - 1350	Brass with Lead/Tin solder
SWA 1312	button	front	1270 - 1350	Brass
SWA 1782	button		1400 - 1450	Tin
SWA 1831	button		1270 - 1350	Bronze with Tin coating
SWA 2167A	button		1270 - 1350	Brass
SWA 2167B	button		1270 - 1350	Bronze with Tin coating
SWA 2740	button		1270 - 1350	Brass
SWA 3073	button		1270 - 1350	Brass
SWA 581	button	back	1270 - 1350	Gunmetal
SWA 581	button	front	1270 - 1350	Gunmetal
SWA 2157	chain		1400 - 1450	Brass
TL 2188	chain		1270 - 1350	Copper
BC 1812	chape		1350 - 1400	Brass
BC 2532 A	chape		1350 - 1400	Brass
BC 2532 B	chape		1350 - 1400	Brass
BC 2532 C	chape		1350 - 1400	Brass
BC 2532 D	chape		1350 - 1400	Brass
BC 2532 E	chape		1350 - 1400	Brass
BC 2532 F	chape		1350 - 1400	Brass
BC 3743	chape		1330 - 1400	Brass
BC 3816	chape		1350 - 1400	Brass
BC 4151	chape		1350 - 1400	Brass
BC 4152	chape		1350 - 1400	Brass
BC 4153	chape		1350 - 1400	Brass
BC 4154	chape		1350 - 1400	Brass
BC 4200	chape		1350 - 1400	Brass
BC 4465	chape		1350 - 1400	Brass
BWB 1410	chape		1350 - 1400	Brass
BWB 1924	chape		1400 - 1450	Brass
BWB 2253	chape		1350 - 1400	Brass
BWB 2269	chape		unphased	Brass
BWB 2339	chape		1350 - 1400	Brass
BWB 2680	chape		1350 - 1400	Brass
BWB 2701	chape		1350 - 1400	Brass
BWB 4454	chape		1400 - 1450	Brass
BWB 4700	chape		1350 - 1400	Brass
BWB 4997	chape		1350 - 1400	Brass
SWA 1098	chape		1400 - 1450	Gunmetal
SWA 1741	chape		unstratified	Brass
SWA 2035	chape		1400 - 1450	Brass
SWA 2236	chape		1400 - 1450	Brass

SWA 3025	chape		1400 - 1450	Brass
SWA 3371	chape		1270 - 1350	Gunmetal
SWA 4989	chape		1400 - 1450	Brass
TL 119	chape		1400 - 1450	Gunmetal
TL 1279	chape		1400 - 1450	Brass
TL 1280	chape		1400 - 1450	Brass
TL 1281	chape		1400 - 1450	Brass
TL 2209	chape		1400 - 1450	Brass
TL 2245	chape		1350 - 1400	Brass
BC 4156	chape ?		1350 - 1400	Gunmetal
BWB 1680	chape ?		1350 - 1400	Brass
BWB 2721	chape ?		1350 - 1400	Gunmetal
BWB 3587	chape ?		1270 - 1350	Bronze
BWB 3732	chape ?		1350 - 1400	Brass
BWB 4633	chape ?		1350 - 1400	Bronze
BWB 5126	chape ?		1350 - 1400	Bronze
SWA 1187	chape ?		1270 - 1350	Gunmetal
SWA 1684	chape ?		1270 - 1350	Bronze
SWA 1893	chape ?		1270 - 1350	Gunmetal
SWA 1967	chape ?		1270 - 1350	Bronze
SWA 625	chape ?		1270 - 1350	Bronze
TL 2203	chape ?		1230 - 1260	Gunmetal
TL 574	chape ?		1230 - 1260	Brass
TL 637	chape ?		1230 - 1260	Brass
BIG 2729	comb	end plate	1200 - 1230	Bronze
BIG 2729	comb	middle plate	1200 - 1230	Bronze
BWB 222	cosmetic implement		1270 - 1350	Copper
BWB 222	cosmetic implement		1270 - 1350	Brass
BWB 2760	cosmetic implement		1350 - 1400	Brass
BWB 2760	cosmetic implement		1350 - 1400	Copper with Lead/Tin solder
BC 2531	cosmetic implement	earpick	1350 - 1400	Brass
BC 2802	cosmetic implement	earpick	1330 - 1400	Gunmetal
BC 4146	cosmetic implement	earpick	1350 - 1400	Copper
SWA 2262	cosmetic implement	toothpick	1200 - 1230	Gunmetal
BIG 2446	cosmetic implement	tweezers	1200 - 1230	Copper
BWB 2675	cosmetic implement	tweezers	1350 - 1400	Gunmetal
BWB 2675	cosmetic implement	tweezers	1350 - 1400	Brass
BWB 3551	cosmetic implement	tweezers	1350 - 1400	Brass
SWA 2504	cosmetic implement	tweezers	1200 - 1230	Bronze
SWA 3379	cosmetic implement	tweezers	1270 - 1350	Copper
BC 2035	finger ring		1350 - 1400	Gold
BC 2035	finger ring		1350 - 1400	Tin with solder?
BIG 2301	finger ring hoop		1230 - 1260	Pewter
BIG 2301	finger ring inlay		1230 - 1260	analysis same as metal
BIG 2828	finger ring		1150 - 1200	Copper
BIG 3037	finger ring		1200 - 1230	Pewter
BIG 3284	finger ring		1150 - 1200	Gunmetal
BIG 3284	finger ring inside bezel		1150 - 1200	analysis same as metal
BIG 3284	finger ring hoop & bezel		1150 - 1200	Gunmetal
BWB 1248	finger ring		1350 - 1400	Pewter
BWB 140	finger ring		before 1350	Gold
BWB 2375	finger ring		1270 - 1350	Brass
BWB 2664	finger ring hoop		1350 - 1400	Brass

BWB 2664	finger ring inside bezel		1350 - 1400	Lead/Tin solder
BWB 2664	finger ring bezel		1350 - 1400	Brass
BWB 2713	finger ring		1350 - 1400	Brass
BWB 2769	finger ring hoop		1350 - 1400	Lead
BWB 3678	finger ring		1350 - 1400	Pewter
BWB 4540	finger ring		1270 - 1350	Pewter
BWB 4732	finger ring		1400 - 1450	Brass
BWB 4912	finger ring		1400 - 1450	Pewter
BWB 5093	finger ring		unstratified	Pewter
BWB 5243	finger ring		1350 - 1400	Pewter
BWB 5810	finger ring		1400 - 1450	Pewter
BWB 5849	finger ring		1350 - 1400	Pewter
BWB 5850	finger ring		1400 - 1450	Pewter
BWB 77	finger ring		1350 - 1400	Pewter
SWA 1997	finger ring		1400 - 1450	Brass
SWA 2025	finger ring		1400 - 1450	Brass
SWA 2092	finger ring		1270 - 1350	Brass
SWA 2092	finger ring back of bezel		1270 - 1350	Lead/Tin solder
SWA 2092	finger ring blue inlay		1270 - 1350	analysis same as metal
SWA 2092	finger ring hoop		1270 - 1350	Brass
SWA 2500	finger ring hoop & bezel		unstratified	Copper
SWA 2500	finger ring yellow deposit		unstratified	analysis same as metal
SWA 2661	finger ring hoop		unstratified	Bronze
SWA 2661	finger ring inlay		unstratified	analysis same as metal
SWA 2887	finger ring		1400 - 1450	Gunmetal
SWA 2926	finger ring		1400 - 1450	Brass
SWA 383	finger ring green 'stone'		unstratified	Glass (+ metal)
SWA 383	finger ring hoop		unstratified	Brass
SWA 383	finger ring bezel		unstratified	Brass
SWA 457	finger ring		1350 - 1400	Pewter
SWA 512	finger ring back of bezel		1270 - 1350	Bronze
SWA 512	finger ring inside bezel		1270 - 1350	analysis same as metal
SWA 522	finger ring		1270 - 1350	Pewter
SWA 624	finger ring		1350 - 1400	Pewter
TL 2263	finger ring		1350 - 1400	Gold
TL 2266	finger ring		1350 - 1400	Gold
TL 605	finger ring		1330 - 1400	Gold
BC 1866	headdress/wire		1350 - 1400	Brass
BC 2062	headdress/wire		1350 - 1400	Iron
BC 2613	headdress/wire		1350 - 1400	Brass
BC 2691	headdress/wire		1350 - 1400	Brass
BC 3851	headdress/wire	straight	1350 - 1400	Brass
BC 3851	headdress/wire	twisted	1350 - 1400	Brass with Silver coating
BC 3989	headdress/wire		1350 - 1400	Brass
BC 3992	headdress/wire		1350 - 1400	Brass
BC 4468	headdress/wire		1350 - 1400	Brass
BC 4500	headdress/wire		1350 - 1400	Brass
BC 4822	headdress/wire		1350 - 1400	Brass
SWA 1696	headdress/wire		1270 - 1350	Brass
SWA 2166	headdress/wire		1400 - 1450	Brass
SWA 4998	headdress/wire		1350 - 1400	Brass
TL 2929	headdress/wire		1400 - 1450	Brass
BIG 2188	mirror case		1270 - 1350	Gunmetal

BIG 2339	mirror case		1230 - 1260	Pewter
BWB 197	mirror case		unphased	Brass
BWB 4499	mirror case		unstratified	Gold with Silver gilding
SH 134	mirror case	back	1230 - 1260	Pewter
SH 134	mirror case	front	1230 - 1260	Pewter
SWA 2123	mirror case	back	1270 - 1350	Pewter
SWA 2123	mirror case	front	1270 - 1350	Pewter
SWA 3445	mirror case		1230 - 1260	Pewter
BC 2716	mount		1350 - 1400	Brass
BC 3591	mount		1350 - 1400	Tin
BC 3620	mount		1330 - 1380	Tin
BC 4135	mount		1350 - 1400	Brass
BIG 153	mount		1230 - 1260	Copper
BIG 2424	mount	front	1200 - 1230	Gunmetal
BIG 2424	mount	rivet	1200 - 1230	Copper
BIG 2445	mount		1200 - 1230	Bronze
BIG 2516	mount	back	1200 - 1230	Brass
BIG 2516	mount	front	1200 - 1230	Brass
BIG 2841	mount		1150 - 1200	Pewter
BIG 2842	mount		1200 - 1230	Copper
BIG 2842	mount	rivet	1200 - 1230	Copper
BIG 2842	mount	rivet	1200 - 1230	Brass
BWB 1397	mount		1350 - 1400	Tin
BWB 1400	mount		1350 - 1400	Gunmetal
BWB 1400	mount		1350 - 1400	Gunmetal
BWB 1425	mount		1350 - 1400	Brass
BWB 1474	mount	back	1350 - 1400	Tin
BWB 1474	mount	front	1350 - 1400	Tin
BWB 1535	mount		1350 - 1400	Brass
BWB 1933	mount		1350 - 1400	Bronze
BWB 1933	mount		1350 - 1400	Bronze
BWB 2127	mount	back	1350 - 1400	Copper
BWB 2127	mount	front	1350 - 1400	Copper
BWB 2238	mount		1350 - 1400	Brass
BWB 23	mount	front	1330 - 1380	Tin
BWB 23	mount	rivet	1330 - 1380	Tin
BWB 2341	mount		1350 - 1400	Brass
BWB 2362	mount	plate	1200 - 1230	Gunmetal
BWB 2362	mount	ring	1200 - 1230	Gunmetal
BWB 2682	mount		1350 - 1400	Copper
BWB 2685	mount	back	1350 - 1400	Brass
BWB 2685	mount	front	1350 - 1400	Brass
BWB 2724	mount		1350 - 1400	Bronze
BWB 2725	mount	back	1350 - 1400	Brass
BWB 2725	mount	front	1350 - 1400	Brass
BWB 288	mount		1270 - 1350	Pewter
BWB 3602	mount		1350 - 1400	Tin
BWB 3605	mount		1350 - 1400	Gunmetal
BWB 3667	mount		1400 - 1450	Brass
BWB 3772	mount	back	1350 - 1400	Brass
BWB 3772	mount	front	1350 - 1400	Brass
BWB 3856	mount		unstratified	Brass
BWB 4021	mount		1350 - 1400	Tin
BWB 4044	mount		1350 - 1400	Tin
BWB 4202	mount	back	1350 - 1400	Gunmetal
BWB 4202	mount	front	1350 - 1400	Gunmetal
BWB 4580	mount	back	1350 - 1400	Copper
BWB 4580	mount	front	1350 - 1400	Copper

BWB 4588	mount	back	1350 - 1400	Brass
BWB 4588	mount	front	1350 - 1400	Brass
BWB 4711	mount		unstratified	Brass
BWB 4717	mount	back	1350 - 1400	Copper
BWB 4717	mount	front	1350 - 1400	Copper
BWB 5027	mount	back	1350 - 1400	Tin
BWB 5027	mount	front	1350 - 1400	Tin
BWB 5157	mount		1350 - 1400	Tin
BWB 5157	mount		1350 - 1400	Tin
BWB 5417	mount		1350 - 1400	Tin
BWB 5417	mount		1350 - 1400	Tin
BWB 5832	mount		1350 - 1400	(Leaded) Bronze + Tin coating
BWB 92	mount		unstratified	Tin
BWB 99	mount		1350 - 1400	Tin
CUS 225	mount	back	1270 - 1350	Brass
CUS 225	mount	front	1270 - 1350	Brass
CUS 300	mount		1270 - 1350	Brass
CUS 300	mount		1270 - 1350	Gunmetal
CUS 300	mount		1270 - 1350	Brass
CUS 300	mount	back	1270 - 1350	Gunmetal with solder?
CUS 300	mount	back	1270 - 1350	Gunmetal with solder?
CUS 300	mount	back	1270 - 1350	Gunmetal with solder?
CUS 300	mount	front	1270 - 1350	Brass
CUS 300	mount	front	1270 - 1350	Brass
CUS 300	mount	front	1270 - 1350	Brass
CUS 859	mount		1270 - 1350	Gunmetal
CUS 859	mount		1270 - 1350	Brass
CUS 859	mount		1270 - 1350	Gunmetal
CUS 859	mount	back	1270 - 1350	Gunmetal
CUS 859	mount	back	1270 - 1350	Brass
CUS 859	mount	back	1270 - 1350	Brass
CUS 859	mount	front	1270 - 1350	Gunmetal
CUS 859	mount	front	1270 - 1350	Brass
CUS 859	mount	front	1270 - 1350	Brass
OPT 94	mount		1270 - 1350	(Leaded)Gunmetal
SWA 1078	mount		1400 - 1450	Tin
SWA 1581	mount	back	1150 - 1200	Gunmetal
SWA 1581	mount	front	1150 - 1200	Gunmetal
SWA 1667	mount		1400 - 1450	Tin
SWA 1789	mount		1400 - 1450	Brass
SWA 2026	mount		1400 - 1450	Tin
SWA 2041	mount		1400 - 1450	Tin
SWA 2068	mount		1400 - 1450	Brass with gilding
SWA 2125	mount		1400 - 1450	Tin
SWA 2977	mount		1400 - 1450	Tin
SWA 3309	mount		unstratified	Lead
SWA 3378	mount		1350 - 1400	Pewter
SWA 3645	mount		1400 - 1450	Tin
SWA 3811	mount		unstratified	Tin
SWA 549	mount		1400 - 1450	Pewter
SWA 757	mount		1350 - 1400	Brass
SWA 758	mount		1400 - 1450	Brass
SWA 807	mount		1400 - 1450	Tin
SWA 814	mount		1400 - 1450	Tin
SWA 814	mount		1400 - 1450	Tin

SWA 814	mount		1350 - 1400	Tin
SWA 9	mount		1270 - 1350	Leaded Bronze
SWA 925	mount		1270 - 1350	Brass
TL 1184	mount		1400 - 1450	Pewter
TL 153	mount		1230 - 1260	Copper
TL 1874	mount		1400 - 1450	Brass
TL 2703	mount	back	1400 - 1450	Lead/Tin solder
TL 2703	mount	front	1400 - 1450	Brass
TL 559	mount		1350 - 1400	Copper
TL 562	mount	back	1350 - 1400	Lead/Tin solder
TL 562	mount	front	1350 - 1400	Brass
BWB 1911	needlecase		1270 - 1350	Brass
BWB 367	needlecase		1350 - 1400	Copper
BWB 5927	needlecase		1350 - 1400	Gunmetal
BC 2930	pin		unphased	Brass
BC 2930	pin	head	unphased	Gunmetal
BC 3769	pin		1350 - 1400	Brass
BC 3769	pin	head	1350 - 1400	Brass
BIG 2733	pin		1150 - 1200	Brass
BIG 2867	pin		1150 - 1200	Brass
BIG 3259	pin		1150 - 1200	Brass
BIG 3259	pin	head	1150 - 1200	Pewter
BIG 3405	pin		1150 - 1200	Brass
BWB 2755	pin		1350 - 1400	Silver
BWB 4568	pin		1350 - 1400	Bronze
BWB 5294	pin	bent small pin	1350 - 1400	Brass
BWB 5294	pin	large pin	1350 - 1400	Silver
BWB 5294	pin	straight small pin	1350 - 1400	Brass
BWB 5294	pin	v. bent small pin	1350 - 1400	Gunmetal
SWA 444	pin	head	1270 - 1350	Brass with Tin coating
TL 120 A	pin		1400 - 1450	Brass
TL 120 A	pin	head	1400 - 1450	Brass
TL 120 B	pin		1400 - 1450	Brass
TL 120 B	pin	head	1400 - 1450	Gunmetal
BC 2391	strap-end	bottom plate	1350 - 1400	Bronze
BC 2391	strap-end	middle plate	1350 - 1400	Bronze with ? Lead/Tin solder
BC 2391	strap-end	top plate	1350 - 1400	Bronze
BC 2878	strap-end		1330 - 1400	Brass
BC 4172	strap-end	bottom plate	1330 - 1380	Brass
BC 4172	strap-end	middle plate	1330 - 1380	Gunmetal
BC 4172	strap-end	top plate	1330 - 1380	Brass
BC 4280	strap-end	bottom plate	1350 - 1400	Bronze
BC 4280	strap-end	interior	1350 - 1400	Bronze
BC 4280	strap-end	side	1350 - 1400	Bronze
BC 4280	strap-end	top plate	1350 - 1400	(Leaded) Bronze
BC 4284	strap-end		1350 - 1400	Brass
BC 4471	strap-end		1350 - 1400	Brass
BC 4859	strap-end		1350 - 1400	Gunmetal
BIG 2305	strap-end	bottom plate	1230 - 1260	Brass
BIG 2305	strap-end	mid-end plate	1230 - 1260	Brass
BIG 2305	strap-end	mid-front plate	1230 - 1260	Brass
BIG 2305	strap-end	top plate	1230 - 1260	Brass
BIG 2315	strap-end		1400 - 1450	Brass
BWB 113	strap-end		1400 - 1450	Brass
BWB 1139	strap-end	bottom plate	1270 - 1350	Brass

BWB 1139	strap-end	middle plate	1270 - 1350	Gunmetal
BWB 1139	strap-end	top plate	1270 - 1350	Brass
BWB 1163	strap-end		1350 - 1400	Brass
BWB 1203	strap-end		1270 - 1350	Brass
BWB 1597	strap-end		1350 - 1400	Gunmetal
BWB 1646	strap-end		1350 - 1400	Gunmetal
BWB 196	strap-end		1350 - 1400	Brass
BWB 2110	strap-end		1270 - 1350	Gunmetal
BWB 2116	strap-end		1270 - 1350	Brass
BWB 2133	strap-end		1270 - 1350	Brass
BWB 2210	strap-end		1350 - 1400	Brass
BWB 2270	strap-end		1350 - 1400	Gunmetal
BWB 2288	strap-end	bottom plate	1350 - 1400	Bronze
BWB 2288	strap-end	right edge	1350 - 1400	Lead/Tin solder?
BWB 2288	strap-end	top plate	1350 - 1400	Bronze
BWB 2351	strap-end		unphased	Pewter
BWB 2370	strap-end	bottom plate	1270 - 1350	Gunmetal
BWB 2370	strap-end	right edge	1270 - 1350	Gunmetal
BWB 2370	strap-end	top plate	1270 - 1350	Gunmetal
BWB 2733	strap-end	bottom plate	1350 - 1400	Brass
BWB 2733	strap-end	left edge	1350 - 1400	Lead/Tin solder?
BWB 2733	strap-end	top plate	1350 - 1400	Brass
BWB 2738	strap-end		1350 - 1400	Brass
BWB 2768	strap-end		1350 - 1400	Brass
BWB 28	strap-end		1350 - 1400	Brass
BWB 320	strap-end		1350 - 1400	Gunmetal
BWB 3214	strap-end		1270 - 1350	Brass
BWB 3247	strap-end		1400 - 1450	Brass
BWB 3525	strap-end		1350 - 1400	Gunmetal
BWB 3668	strap-end		1350 - 1400	Gunmetal
BWB 3716	strap-end		1350 - 1400	Copper
BWB 3737	strap-end		1350 - 1400	Brass
BWB 377	strap-end	bottom plate	1350 - 1400	Gunmetal
BWB 377	strap-end	left edge	1350 - 1400	Gunmetal
BWB 377	strap-end	middle plate	1350 - 1400	Gunmetal
BWB 377	strap-end	top plate	1350 - 1400	Gunmetal
BWB 3987	strap-end		1350 - 1400	Brass
BWB 3994	strap-end	bottom plate	1350 - 1400	Brass
BWB 3994	strap-end	left rivet	1350 - 1400	Copper
BWB 3994	strap-end	right rivet	1350 - 1400	Copper
BWB 3994	strap-end	top plate	1350 - 1400	Brass
BWB 3997	strap-end	bottom plate	1350 - 1400	Brass
BWB 3997	strap-end	frame	1350 - 1400	Brass
BWB 3997	strap-end	top plate	1350 - 1400	Brass
BWB 4000	strap-end		1350 - 1400	Leaded Bronze + Lead/Tin solder?
BWB 4001	strap-end	bottom	1350 - 1400	Brass
BWB 4001	strap-end	top	1350 - 1400	Brass
BWB 4042	strap-end		1350 - 1400	Tin
BWB 41	strap-end		unstratified	Gunmetal
BWB 4113	strap-end	bottom	1350 - 1400	Brass
BWB 4113	strap-end	top	1350 - 1400	Brass
BWB 4113	strap-end	washer	1350 - 1400	Brass
BWB 4186	strap-end		1350 - 1400	Brass
BWB 4197	strap-end		1350 - 1400	Brass
BWB 4210	strap-end		1350 - 1400	Pewter
BWB 4399	strap-end		1270 - 1350	Brass
BWB 4436	strap-end		1350 - 1400	Pewter
BWB 4574	strap-end		1270 - 1350	Brass
BWB 4606	strap-end		1350 - 1400	Brass

BWB 4719	strap-end		1400 - 1450	Brass
BWB 4726	strap-end	bottom plate	1400 - 1450	Brass
BWB 4726	strap-end	left edge	1400 - 1450	Lead/Tin solder
BWB 4726	strap-end	top plate	1400 - 1450	Brass
BWB 4731	strap-end	bottom plate	1400 - 1450	Brass
BWB 4731	strap-end	left edge	1400 - 1450	Lead/Tin solder
BWB 4731	strap-end	top plate	1400 - 1450	Brass
BWB 4991	strap-end	frame	1350 - 1400	Brass
BWB 4991	strap-end	plate	1350 - 1400	Brass
BWB 5124	strap-end		1350 - 1400	Brass
BWB 5169	strap-end		1350 - 1400	Brass
BWB 5197	strap-end		1350 - 1400	Brass
BWB 5281	strap-end		1350 - 1400	Brass
BWB 5282	strap-end		1350 - 1400	Bronze
BWB 5823	strap-end		1350 - 1400	Brass
BWB 5853	strap-end		1350 - 1400	Brass
BWB 5855	strap-end		1350 - 1400	Brass
BWB 5856	strap-end		1400 - 1450	Brass
BWB 5857	strap-end		1400 - 1450	Brass
BWB 5898	strap-end		1400 - 1450	Copper
BWB 5901	strap-end		1350 - 1400	Brass
BWB 5918	strap-end		1350 - 1400	Gunmetal
BWB 5937	strap-end		1350 - 1400	Brass
BWB 6	strap-end		1350 - 1400	Brass
BWB 654	strap-end		1350 - 1400	Gunmetal
SWA 1167	strap-end		1400 - 1450	Tin
SWA 1202	strap-end	bottom plate	1400 - 1450	Bronze
SWA 1202	strap-end	middle plate	1400 - 1450	Bronze
SWA 1202	strap-end	top plate	1400 - 1450	Bronze
SWA 1259	strap-end		1270 - 1350	Brass
SWA 1445	strap-end	bottom plate	1400 - 1450	Brass
SWA 1445	strap-end	handle	1400 - 1450	Gunmetal
SWA 1445	strap-end	handle - r. edge	1400 - 1450	Lead/Tin solder
SWA 1445	strap-end	top plate	1400 - 1450	Brass
SWA 1904	strap-end		1270 - 1350	Gunmetal
SWA 1912	strap-end		1400 - 1450	Brass
SWA 2027	strap-end		1400 - 1450	Gunmetal
SWA 2106	strap-end	hook	1270 - 1350	Copper
SWA 2106	strap-end	hook	1270 - 1350	Copper
SWA 2106	strap-end	hook	1270 - 1350	Copper with Hg gilding
SWA 2106	strap-end	rivets	1270 - 1350	Brass
SWA 2106	strap-end	rivets/washers	1270 - 1350	Brass
SWA 2108	strap-end		1270 - 1350	Gunmetal
SWA 2280	strap-end		1230 - 1260	Brass
SWA 2971	strap-end		1400 - 1450	Brass
SWA 3023	strap-end		1400 - 1450	Brass
SWA 3023	strap-end		1400 - 1450	Brass with Hg gilding
SWA 3263	strap-end		1270 - 1350	Gunmetal
SWA 3266	strap-end		1270 - 1350	Brass
SWA 3308	strap-end		1270 - 1350	Gunmetal
SWA 3373	strap-end	bottom plate	1270 - 1350	Brass
SWA 3373	strap-end	top plate	1270 - 1350	Brass
SWA 3380	strap-end		1270 - 1350	Copper
SWA 3380	strap-end		1270 - 1350	Copper
SWA 3404	strap-end		1400 - 1450	Tin
SWA 3405	strap-end		1400 - 1450	Pewter
SWA 3769	strap-end	bottom plate	1270 - 1350	Bronze
SWA 3769	strap-end	top plate	1270 - 1350	Gunmetal

Appendix 2

Copper alloy analyses can most easily be displayed graphically by means of a ternary diagram, which has been used effectively in the study of Roman brooches (Bayley and Butcher 1981). This plots the relative proportions of the three alloying elements: zinc, lead and tin. The nearer a point representing a particular object is to a corner of the diagram, the higher the proportion of that element present. This method assumes that the copper content of the alloys shown on the diagram is roughly similar, usually in the range 75-85%. Figure 22 is a ternary diagram with the alloy names marked on to make clear the relative compositions using alloy names defined by Bayley (1989):

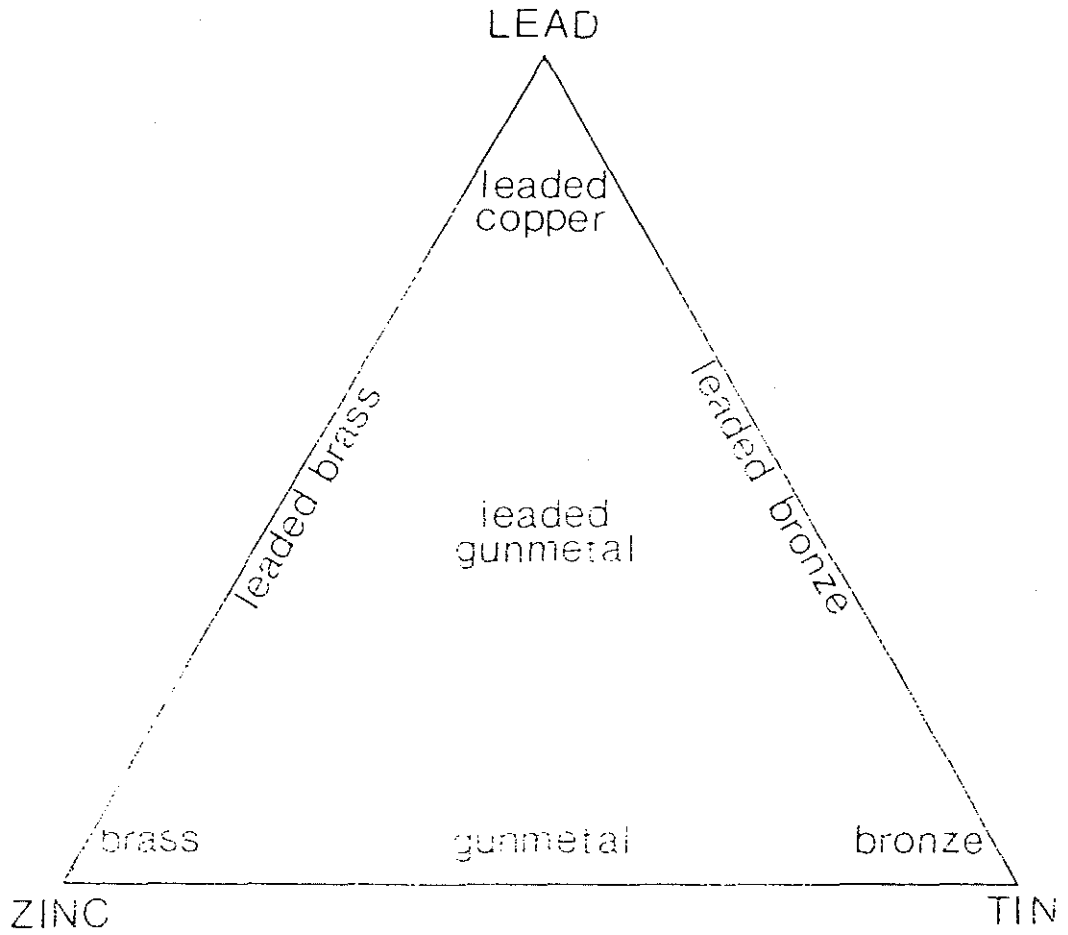


Figure 22

Ternary diagram showing the names given alloys of copper with zinc, lead and tin.

There are no fixed divisions between the individual alloy names, but it is usually necessary to define groups based on the data plotted (see Bayley 1989). Where separate alloy groups are not visible then it may be necessary to arbitrarily divide the points into groups.

SWA 3971	strap-end		1400 - 1450	Brass
SWA 629	strap-end		1270 - 1350	Brass
SWA 653	strap-end		1400 - 1450	Tin
SWA 941	strap-end		1400 - 1450	Copper
TL 2398	strap-end	body	1350 - 1400	Brass
TL 2398	strap-end	studs	1350 - 1400	Brass
TL 248	strap-end		1350 - 1400	Brass
TL 273	strap-end		1350 - 1400	Brass
TL 610	strap-end		1400 - 1450	Tin