

The wreck of the Dutch East Indiaman *Campen* on the Needles rocks, Isle of Wight, 1627—Part 2*

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Lead ingots

Introduction

This survey concerns 103 lead ingots recovered from the site of the *Campen*. Much of the grouping of these ingots had to be carried out from drawings, photographs and catalogued measurements rather than directly from the collection of ingots themselves. Unfortunately during the preparatory stages of the survey the ingots were destroyed in a fire, thus rendering impossible any further cross checks of measurements and drawings.

The report begins with a description of the process of recording of ingots on site and the means of their recovery from the sea bed. This is followed by the collection of the basic data relating to the ingots and the analysis of the whole into groups based on the information thus far amassed. The report is concluded with a discussion by Lynn Willies on both the history of lead in 17th century and any additional knowledge added to that history by this survey.

Recovery

It will be seen from the site plan (Fig. 9 of Part 1) that the ingots were not scattered at random but lay in a compact arrangement aligned with an east–westerly attitude, and appeared stacked to some extent. The bulk of the ingots up to 10 m² with single ingots up to 10 m distant. The weight of the ingots makes it unlikely that they would have moved significantly over the years, and this formation may hold a clue to the position of the wreck in its final resting place, if from historical evidence it could be determined how ingots were generally stowed in the hold of a 17th century Dutch East Indiaman. To

establish the number of ingots on the site, a procedure was set up whereby white plastic numbered tags were affixed by small nails to each ingot on the seabed, which at a latter stage, provided a means of monitoring the recovery of the ingots. This numbering initially indicated some 60 ingots; however, during excavation a further quantity of ingots were exposed beneath those immediately visible.

Lifting of the ingots was relatively easy compared with those from the *Kennemerland* 1664 (Price *et al.*, 1980). Their average weight of 62 kg enabled them to be recovered using a single lifting bag, although it proved difficult to remove them from the water into an inflatable boat. Initial recoveries, however, were carried out using this method, after which the scale of the task warranted the use of a local fishing boat equipped with a derrick and winch, thus enabling divers to attach a rope strop to each ingot and then winch them on board.

The original intention was to raise each ingot singly, paying due regard to its numbered position on site. Unfortunately underwater conditions and the existence of additional ingots which became apparent during excavation dictated that this was impractical, and it was decided that the ingots would be lifted regardless of their numbered position. Having lifted all the visible ingots and transported them to temporary storage facilities ashore, the detailed cataloguing work was carried out at a later date (Fig. 1).

Recording

Recording of the ingots was carried out following the methods used on surveys of ingots recovered from the *Hollandia* 1743 (Cowan *et al.*, 1975; Willies, 1980) and the *Kennemerland*,

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Figure 1. Cataloguing lead ingots.

1664 (Price *et al.*, 1980). Due to limited resources in terms of time, manpower and physical storage space, numbers were assigned sequentially to the ingots for the purpose of the catalogue and do not relate to their previously numbered positions on the seabed.

Most ingots had after 350 years under water, suffered some damage either during the initial wrecking or erosion by sea action, though generally they were in remarkably good condition and damage was only slight. Marine growth proved a problem in some instances and its removal with a wire brush had to be carefully executed so as not to disfigure any hidden marks, which may have lain underneath. After cleaning, each ingot was in turn drawn and photographed and any peculiar characteristics noted. The ingots were measured along their greatest length and breadth on the flat surface and the maximum depth to the nearest half cm. Weighing of the ingots was facilitated by the use of a tripod, and a chain block and tackle, from which was hung a set of scales. The ingots were weighed to the nearest 0.5 kg, any further accuracy being pointless, due to any possible damage. Samples of approximately 10 g weight for a metallurgical analysis were removed from the underside of each ingot using a small chisel.

It is hoped that from this comparisons may be eventually made with lead from known sources, in order to determine the origin of the *Campan* ingots.

Ingot form

All the ingots appear to have been open cast, probably in clay or loam, giving a boat shaped asymmetrical form, with a rounded underside and a flat upper surface on which marks had been scored or stamped, either immediately after casting or at a later date. One interesting feature of this collection of ingots which has not been recorded before in similar studies of material from other sources, is the addition of a cut in either side of the ingot (Fig. 2). In each case these *flèches* are opposite each other and situated toward the heavier end of the ingot. The only ingots which had no cuts appeared to be more symmetrical in form without a heavier end (groups 8 and 10). The purpose of these *flèches* would seem to be that of facilitating ease of handling. A rope with an 'eye' would be passed over the heavier end and slipped into the cuts, the standing part would then be additionally secured with a half hitch toward the other end of the ingot. The ingot could then be easily and safely moved without fear of dropping as

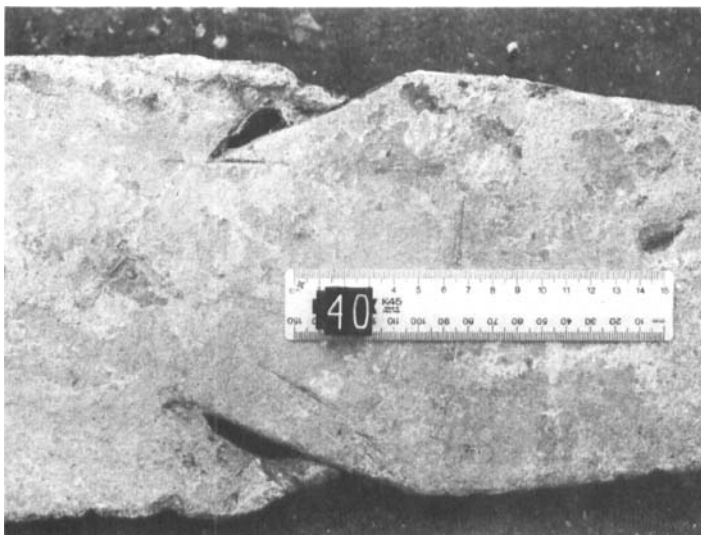


Figure 2. Ingot with cuts in sides.



Figure 3. Photograph showing possible purpose of cuts in sides to assist in handling ingots.

could possibly happen if a sling was used. Alternatively a grommet of rope may have been slipped over each ingot into the cuts and left there during transportation (Fig. 3). Evidence of these theories is supported by remains of rope found on occasion in these cuts. As work progressed over the two days taken to weigh and measure the ingots it became apparent that although the bulk of ingots were very similar, they could be categorized into well defined groups. Two forms (groups 8 and 10) stand out as markedly different from the rest.

Table 1. *Ingot groupings, weights and dimensions from the Campen*

Ingot	Weight (kg)	Dimensions L × B × D (m ³)	Marks
<i>Group 1</i>			
4	59.0	0.730 × 0.180 × 0.070	
12	56.5	0.750 × 0.190 × 0.070	3(AD)
21	58.0	0.755 × 0.190 × 0.060	2(AD)
37	61.0	0.750 × 0.190 × 0.065	3(AD)
41	59.5	0.740 × 0.180 × 0.065	2(AD)
46	57.0	0.740 × 0.190 × 0.060	1(AD)
53	61.0	0.745 × 0.190 × 0.070	3(AD)
65	59.5	0.740 × 0.180 × 0.065	
66	63.0	0.740 × 0.190 × 0.065	3(AD) X142
80	60.0	0.745 × 0.180 × 0.060	1(AD)
81	63.0	0.750 × 0.190 × 0.065	2(AD)
93	59.0	0.755 × 0.190 × 0.060	2(AD)
<i>Group 2</i>			
3	48.0	0.740 × 0.160 × 0.070	
39	54.0	0.740 × 0.165 × 0.080	4(AD)
48	48.0	0.745 × 0.160 × 0.070	
90	55.0	0.745 × 0.160 × 0.070	3(AD)
<i>Group 3</i>			
1	62.0	0.830 × 0.200 × 0.060	4(AD)
8	59.0	0.850 × 0.190 × 0.070	3(AD)
16	63.0	0.830 × 0.195 × 0.065	4(AD)
18	64.0	0.830 × 0.195 × 0.065	4(AD)
19	62.0	0.830 × 0.200 × 0.060	4(AD)
20	61.5	0.840 × 0.200 × 0.060	2(AD)
28	61.0	0.840 × 0.200 × 0.070	3(AD)
32	59.5	0.830 × 0.200 × 0.065	3(AD)
33	60.0	0.810 × 0.195 × 0.060	3(AD)
40	52.0	0.810 × 0.190 × 0.060	3(AD)
45	61.0	0.840 × 0.200 × 0.065	3(AD)
50	61.0	0.835 × 0.195 × 0.070	4(AD)
58	56.0	0.820 × 0.195 × 0.060	2(AD) X11
70	63.5	0.810 × 0.175 × 0.075	5(AD)
74	61.0	0.835 × 0.190 × 0.060	3(AD) 1221X
76	58.5	0.825 × 0.185 × 0.065	4(AD)
91	62.0	0.815 × 0.190 × 0.060	3(AD)
102	64.0	0.860 × 0.200 × 0.060	

Table 1. *Continued*

Ingot	Weight (kg)	Dimensions L × B × D (m ³)	Marks
<i>Group 4</i>			
17	67.0	0.850 × 0.180 × 0.075	3(AD)
44	65.0	0.835 × 0.180 × 0.080	3(AD)
61	61.0	0.790 × 0.185 × 0.060	Broken in two
63	67.0	0.850 × 0.185 × 0.075	1(AD)
68	65.0	0.860 × 0.180 × 0.080	1(AD)
95	66.0	0.870 × 0.185 × 0.065	
<i>Group 5</i>			
26	67.0	0.980 × 0.210 × 0.060	3(AD)
30	68.0	0.975 × 0.210 × 0.060	3(AD)
35	61.5	0.950 × 0.200 × 0.060	3(AD)
38	61.0	0.960 × 0.210 × 0.060	3(AD)
77	70.0	0.960 × 0.210 × 0.060	3(AD) 84X
88	61.5	0.960 × 0.195 × 0.055	2(AD)
92	71.0	0.970 × 0.215 × 0.055	3(AD)
98	61.0	0.970 × 0.210 × 0.055	
101	60.0	0.920 × 0.210 × 0.060	
<i>Group 6</i>			
6	63.5	0.812 × 0.230 × 0.080	4(AD)
11	57.5	0.780 × 0.225 × 0.060	
36	65.0	0.820 × 0.235 × 0.070	5(AD)
43	61.5	0.760 × 0.230 × 0.070	4(AD)
57	57.5	0.770 × 0.220 × 0.070	
78	61.0	0.770 × 0.230 × 0.060	2(AD)
83	59.5	0.775 × 0.220 × 0.065	3(AD)
85	63.5	0.750 × 0.220 × 0.075	3(AD)
87	53.5	0.775 × 0.220 × 0.065	2(AD)
<i>Group 7</i>			
22	62.0	0.690 × 0.220 × 0.075	3(AD)
24	59.5	0.680 × 0.210 × 0.070	
25	65.0	0.700 × 0.215 × 0.080	1(AD)
51	59.0	0.690 × 0.215 × 0.070	3(AD)
54	61.0	0.690 × 0.215 × 0.075	3(AD)
55	58.5	0.690 × 0.210 × 0.070	3(AD)
67	59.0	0.680 × 0.215 × 0.065	
69	56.0	0.690 × 0.220 × 0.060	
72	62.5	0.710 × 0.215 × 0.060	3(AD)
73	64.0	0.675 × 0.210 × 0.075	2(AD)
75	65.5	0.690 × 0.220 × 0.080	3(AD)
79	61.5	0.680 × 0.215 × 0.070	
86	63.0	0.690 × 0.220 × 0.065	4(AD)
89	55.5	0.675 × 0.210 × 0.060	2(AD)
<i>Group 8</i>			
5	63.5	0.780 × 0.160 × 0.100	
15	58.0	0.820 × 0.150 × 0.080	3(AD)
27	69.0	0.820 × 0.165 × 0.100	4(AD)
29	67.0	0.810 × 0.160 × 0.100	3(AD)
34	68.0	0.820 × 0.155 × 0.100	3(AD)
42	62.0	0.800 × 0.150 × 0.100	2(AD)
59	63.0	0.795 × 0.160 × 0.090	3(AD)
64	70.0	0.810 × 0.160 × 0.100	3(AD)
82	58.0	0.790 × 0.165 × 0.095	2(AD)
94	59.5	0.800 × 0.140 × 0.095	
103	68.0	0.820 × 0.160 × 0.100	3(AD) 121

Table 1. *Continued*

Ingot	Weight (kg)	Dimensions L × B × D (m ³)	Marks
<i>Group 9</i>			
47	65.5	0.850 × 0.185 × 0.075	
97	64.5	0.840 × 0.175 × 0.070	
<i>Group 10</i>			
2	65.0	0.700 × 0.200 × 0.080	2(B)
7	71.5	0.700 × 0.200 × 0.080	4(B)
9	64.0	0.700 × 0.200 × 0.080	4(B)
10	62.5	0.690 × 0.210 × 0.080	3(B)
13	70.0	0.690 × 0.215 × 0.090	4(B)
23	67.5	0.690 × 0.210 × 0.080	3(B)
31	69.5	0.710 × 0.195 × 0.080	4(B)
49	68.0	0.720 × 0.200 × 0.080	3(B)
52	69.5	0.700 × 0.210 × 0.080	3(B)
56	63.5	0.690 × 0.195 × 0.075	4(B)
60	66.5	0.680 × 0.210 × 0.080	3(B)
62	69.0	0.690 × 0.210 × 0.075	5(B) X169
71	70.5	0.680 × 0.210 × 0.070	3(B)
84	59.5	0.680 × 0.200 × 0.070	1(B)
96	70.5	0.690 × 0.210 × 0.075	6(B) X199
99	61.0	0.695 × 0.190 × 0.075	
100	63.0	0.700 × 0.200 × 0.075	4(B) X164
<i>Unclassified</i>			
14	53.0	0.750 × 0.160 × 0.070	1(AD)

Group analysis

Grouping of the ingots (Table 1) was not undertaken until cataloguing had been completed. Once all the basic data had been collected it was then possible to subdivide the ingots into groups based on similar form, dimensions and weight. This classification highlighted a close correlation between ingot form and marks.

Group 1 Comprising twelve ingots, this group (Fig. 4) has a comparatively low mean weight of 59.7 kg. Whilst the length of the ingots varied from 0.730 m to 0.750 m the breadth varied only by 1 cm from 0.180 m to 0.190 m, the depth from 0.060 m to 0.070 m. The standard deviation of the groups weight was only 1.97 kg. The general form was of an ingot with one square end and the other slightly rounded, but of similar width to the square end. The underside of each ingot was wide and flat and they were quite stable when laid on a flat surface, the depth of each ingot was regular along its length and tapered toward each end. All twelve ingots bore a formation of three marks across the ingot with two more at right angles to form a

box divided into two halves (Fig. 5). An exception was ingot 46 which had been marked with two box impressions. The marks appeared to have been struck individually with a chisel the width of which would have been about 8 cm. This gave an overall box image as described above, but due to the method of stamping, each box was irregular in form but had been centrally positioned on the flat upper surface of each ingot. Each ingot had the cuts for lifting as described earlier (Fig. 2), and with the exception of ingots 4 and 65, each bore the regular stamped mark AD (Fig. 6) which also appears on ingot groups 2; 3; 4; 5; 6; 7 and 8. Ingot 53 had at its heavier end a hole 2 cm in diameter (Fig. 7) centrally positioned, which appeared to have been made with a threaded instrument, the purpose of which is unknown.

Group 2 The four ingots of this group (Fig. 4) were the same length as those of group 1, but were deeper (0.070 m–0.080 m) and rather narrow (0.160 m–0.165 m) giving a very small ingot. The mean weight was only 51.25 kg. Although there were only four ingots in the group, the standard deviation in their weights was large, being 3.27 kg. On further analysis it was noted that two of the ingots weighed 54 kg, the other two only 45 kg. All four ingots were almost identical in dimension and form, yet exhibited a wide variance in weight; this may have been due to a less pure form of lead being used in manufacture, which will become evident from the metallurgical analysis of samples; or alternatively the ingots may have been adulterated with the addition of stones or similar material to add bulk but to decrease the actual lead content. A distinct possibility is the inclusion of internal casting pipes, and slag from the smelting process. Only two of the four ingots showed the AD mark. Another mark which appeared on this group of ingots, was of two marks struck with a chisel to form an irregular T at the heavier end of the ingot.

Group 3 This group (Fig. 4) consisted of eighteen ingots with a mean weight of 60.61 kg. As might be expected with a comparatively large group the dimensions varied somewhat, having lengths of between 0.810 m and 0.860 m; breadths of 0.175 m to 0.200 m; and depths of 0.060 m to 0.075 m. The standard deviation in weight, however, was only 2.8 kg and there was no obvious subdivision of this group. Further-

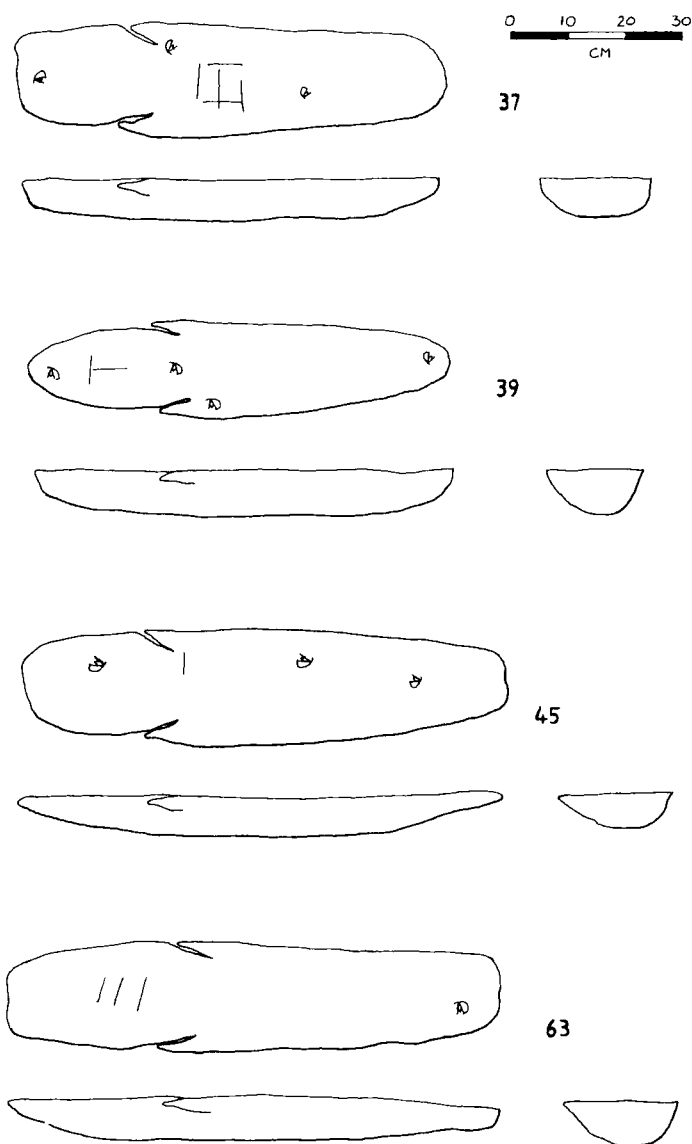


Figure 4. Ingot groups: 1 (no. 37), 2 (no. 39), 3 (no. 45), 4 (no. 3).

more, each ingot had been struck with a chisel forming a single mark between the cuts either side of the ingot, and with the exception of one ingot which had suffered damage to its upper surface, showed the mark AD struck from 2 to 4 times. Four ingots in this group also bore evidence of being struck with a square pointed instrument, in one instance as many as 20 times. *Group 4* The six ingots in this group (Fig. 4) formed a collection with a mean weight of

66 kg. The standard deviation was very small at only 0.89 kg. These calculations have ignored ingot 61 because it had been found broken in two on the seabed and was possibly incomplete. The breakage had occurred between the two cuts on either side of the ingot. Ingot 68 also showed signs of breaking across this weak point. Only four ingots bore the stamp AD and with the exception of ingot 61, which was badly worn, each ingot carried three parallel marks



Figure 5. Marks on ingot.



Figure 6. AD stamp on ingot.



Figure 7. Hole in ingot 53.

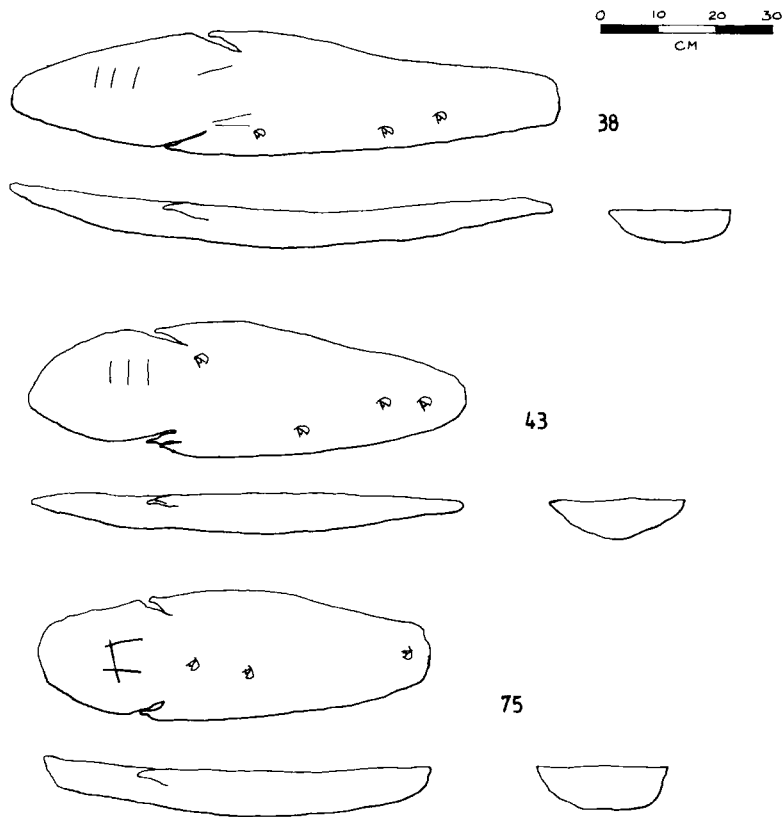


Figure 8. Ingot groups: 5 (no. 36), 6 (no. 43), 7 (no. 76).

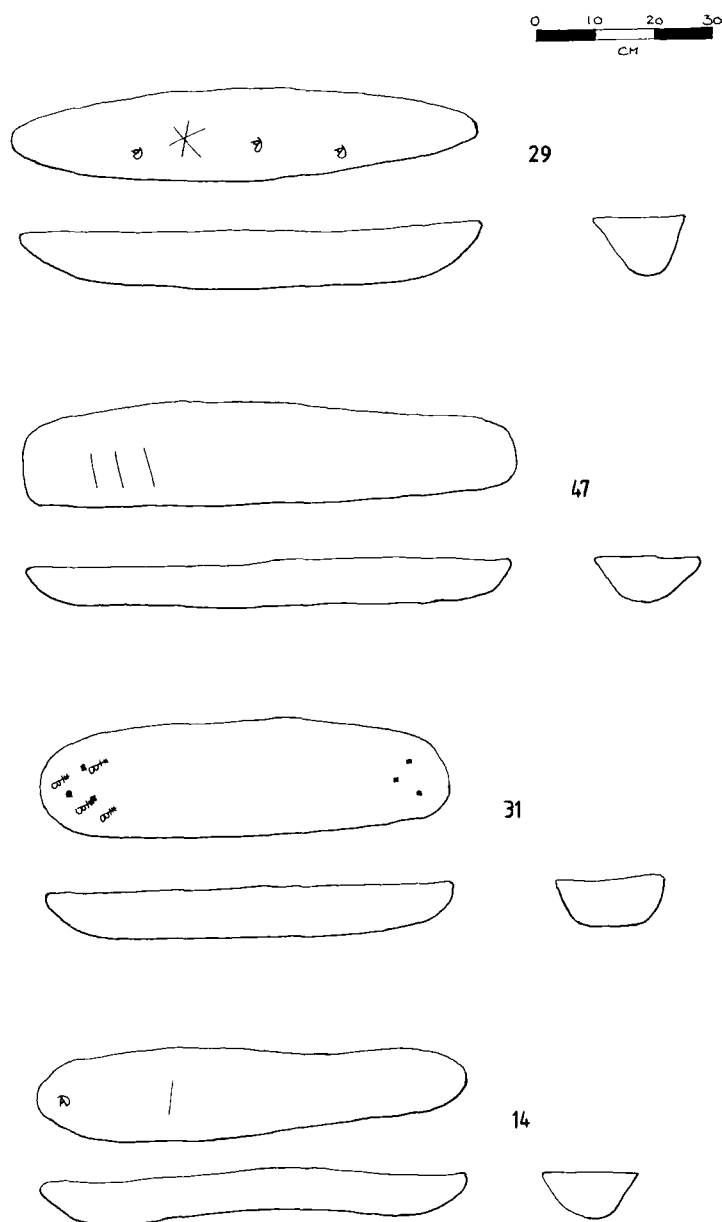


Figure 9. Ingot groups: 8 (no. 29), 9 (no. 47), 10 (no. 31), unstamped (no. 14).

struck with a chisel at the heavier end. It is interesting to note that ingot 68 had been struck at the lighter end.

Group 5 Characterized by their length, 0.920 m to 0.980 m, the nine ingots in this group (Fig. 8) were also the shallowest in depth of the whole collection, being only 0.055 m to 0.060 m. Their width varied from 0.195 m to 0.210 m, which

gave an ingot with a mean weight of 64.5 kg. The standard deviation in weight is 4.1 kg, which can be accounted for in the range of lengths. The overall shape was of an ingot asymmetrical with one end broad and pointed and tapering from the centre to a narrow square end. Six of the ingots had been struck with the AD stamp 3 times.

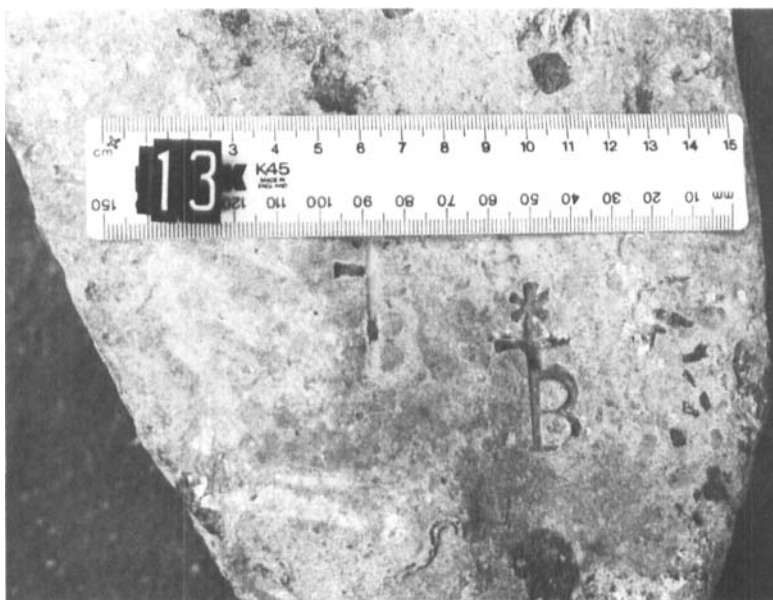


Figure 10. Stamp on ingot of group 10.

Group 6 Of a similar form (Fig. 8) to group 5, these ingots were shorter (0.760 m–0.820 m) and hence were lighter on average, their mean weight being 60.27 kg with a standard deviation of 3.4 kg. They were the broadest group of all ingots varying from 0.220 m to 0.235 m, their depth ranging from 0.060 m to 0.080 m. These wide tolerances account for the large variation in weight. Also, as with group 5, these ingots were struck with three parallel lines at the heavy end, and all but two had been stamped AD at least twice.

Group 7 This group of fourteen ingots were distinct in form (Fig. 8) being short, 0.675 m to 0.710 m; 0.210 m to 0.220 m broad and consistent in depth along their length, the depth ranging from 0.060 m to 0.080 m. Their average weight was 60.85 kg with a standard deviation of 2.96 kg. All ingots save four, which had suffered damage to the upper surface, were marked with two parallel chisel cuts with one other approximately perpendicular intersecting the other two. Eight ingots had been stamped AD, the remaining six had been worn smooth, and therefore had possibly lost their marks.

Group 8 These eleven ingots were remarkably different in form (Fig. 9) being cigar shaped, narrow and deep, almost triangular in section. Their lengths varied from 0.780 m to 0.820 m;

their breadths 0.140 m to 0.165 m and depths from 0.080 m to 0.100 m. This form made them difficult to handle and impossible to store with their flat surface uppermost. These were heavy ingots with a mean weight of 64.18 kg, and a standard deviation of 4.2 kg. All ingots had been struck with a chisel to form a 6 point star constructed with three lines, and with the exception of two ingots all had been stamped AD. The most notable feature of these ingots other than their distinctive shape, was the fact that there were no cuts into the sides of the ingot.

Group 9 These two ingots (Fig. 9) have the same dimensions, weight and form as those of group 4, and the same three parallel chisel marks. However, they have been categorized as a separate group because they had no cuts into the side, nor were they stamped AD.

Group 10 Again a distinctive shape and different in form (Fig. 9), having rounded ends without the cuts in the side. These seventeen ingots were noticeably symmetrical. The lengths of these fairly short ingots ranged from 0.680 m to 0.720 m; their breadth from 0.190 m to 0.215 m and their depth from 0.070 to 0.090 m. This gave a squat heavy ingot, with the highest mean weight of all the groups of 66.5 kg with a standard deviation of 3.6 kg. One outstanding feature of this group of ingots is the complete

absence of the familiar stamp AD which has been replaced by a stamp of a B crowned with a cross and star (Fig. 10). In each case the stamps were struck at one end of the ingot with the star pointing inwards. Ingot 96 had stamps at both ends following this pattern. In addition at each end of the ingots, three square holes had been punched in a triangular formation.

Unclassified Ingot 14 (Fig. 9) although having the same dimensions as those of group 2 and a similar weight of 53 kg was not categorized with these other four ingots, because it had no cuts in the side, and a single chisel mark rather than two forming a T. It is possible that this ingot could be sub-divided with group 2.

Historical background of lead ingots

Three major characteristics can be used to classify and compare ingots: weight, form and markings. A fourth feature, trace elements and isotope ratios is feasible, but the necessary groundwork remains to be done. For this last purpose samples have been taken, and can be made available for study. For the former, very little data is available, or, at least easily available, in archival form, and that available is fragmentary. So far only one major consignment of lead ingots has been reasonably assigned to its

provenance (from *Hollandia*: see Willies, 1980: 53–61). For the time being the ingots from *Campen* join those from the *Kennemerland* (Price *et al.*, 1980) and those from St Bartholomew's Ledge, Scillies (in preparation), as sources of information which eventually may allow a more definite conclusion.

Lead was an extremely common item of commerce in the 17th century, produced in most of the (geologically) older mountain areas of Europe: Britain was however a major producer, and since much of the trade was handled by the Dutch, there are reasonable grounds for expecting the *Campen* ingots to be British. The main production areas included the South West, and the Mendips, with Bristol handling the latter. Lead from North Wales formed a fair proportion of Chester's trade, whilst that from the Peak and mid-Pennines found its way to Hull. Further north, lead travelled east from the Pennines to Stockton or Newcastle. Relative trading proportions of these areas, and of Scottish producers is not known, though Derbyshire's Peak must certainly be amongst the most productive.

The most definite historical evidence concerns ingot weights (Table 2), though even here, only certain areas have yielded data, and it is

Table 2. *Ingot weights*

Place*	Cwt in fother	lb in cwt	lb in fother	lb in piece	kg in fother	kg in piece
London	19½	112	2184	136.5	991.54	61.97
Birmingham	20	112	2240	140	1016.96	63.56
Hull	19½	120	2340	146.25	1062.36	66.39
Newcastle	21	112	2352	147	1067.81	66.74
Liverpool and Chester	20	120	2400	150	1089.6	68.1
Thorne, Bawtry, Gainsborough and Stockwith	21½	112	2408	150.5	1093.23	68.33
Grassington	20	123	2460	123	1116.84	55.84
Stockton	22	112	2464	154	1118.66	69.92
Worskop	22½	112	2520	157.5	1144.08	71.5
Wirksworth and Derby	22½	120	2700	168.75	1225.8	76.6
High Peak 'Mill'	23½	120	2820	176.25	1280.28	80.02

*2 pieces = 1 pig; 8 pigs = 1 fother, except at Grassington where there appears to have been 20 pieces to the fother.

Sources: Ryl. Bag. 8/3/89; SCL. Bag. 477; Farey, J., 1811: 390–91.

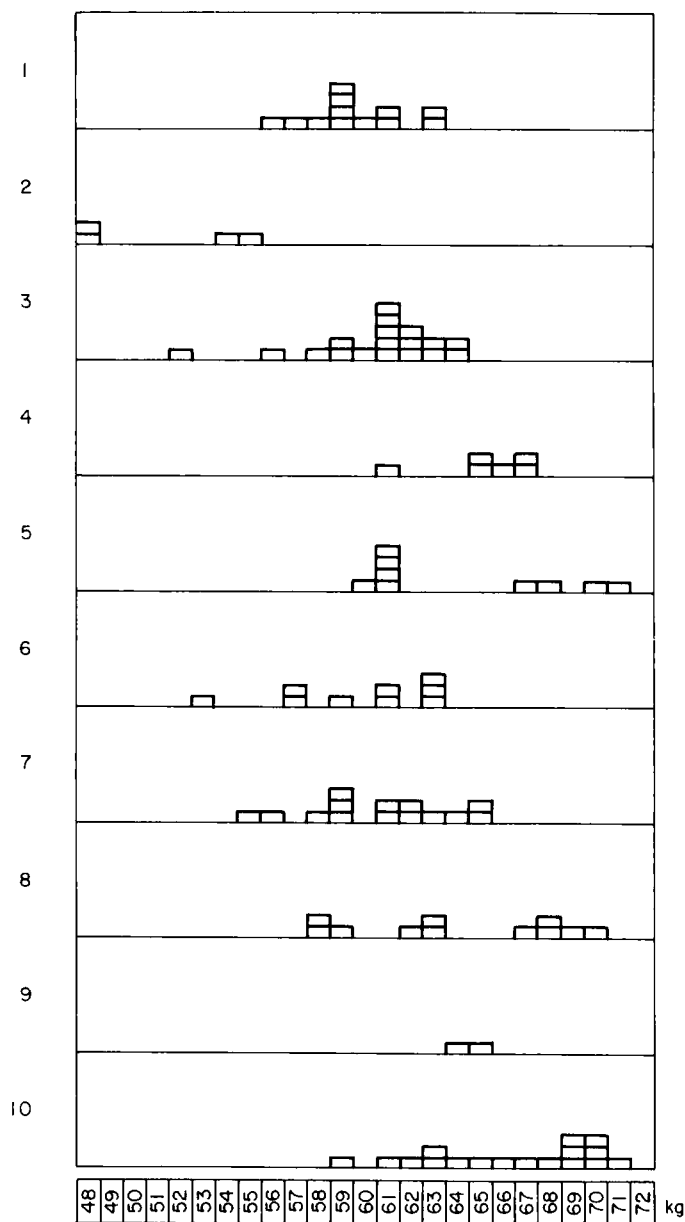


Figure 11. Bar chart showing ingot weights within groups.

not known whether weights generally derive from the producer or from the anticipated market, though those from *Hollandia* conformed to the production area. The unit of weight used was the fother or fodder, of eight great pigs, or sixteen small, these last known also as 'pieces'. Moulds were sometimes hung from scales, in which case ingot weights should be fairly close,

but in other cases, and especially those so far examined, including *Campan*, the spread of weights around a mean suggests volume, the filling of one or more moulds, as the more usual criteria. Since the lead was ordered by the pig, but paid for by the weighed fother, a skewed distribution, with an 'overweight' arithmetic mean can be expected, and was found for the

Hollandia. In ascribing ingots to a suspected value, it should be remembered that a difference in thickness of a centimetre amounts to about ten kilogrammes, whilst features such as internal contraction pipes can cause considerable variation. In the case of the *Campen* ingots, grouped as above, there appear to be two peaks; the first, fairly distinctive around 61 kg, the second, less so, around 67–70 kg with an overall average of about 62.3 kg. Variation is considerable, both within and across the groups (Fig.

11), and some of the more notable variations may indicate mal-grouping rather than original limitations. The closest weight is therefore the London piece of 61.97 kg (136½ lb) for the smaller, with perhaps Chester or Stockton (68.1 kg and 69.92 kg) for the latter, based on the possibly erroneous assumption that Stockwith (68.33 kg) received Peak lead based on producer weights. It is thus not possible to ascribe provenance on the basis of weight.

Form or shape of ingots from different wreck

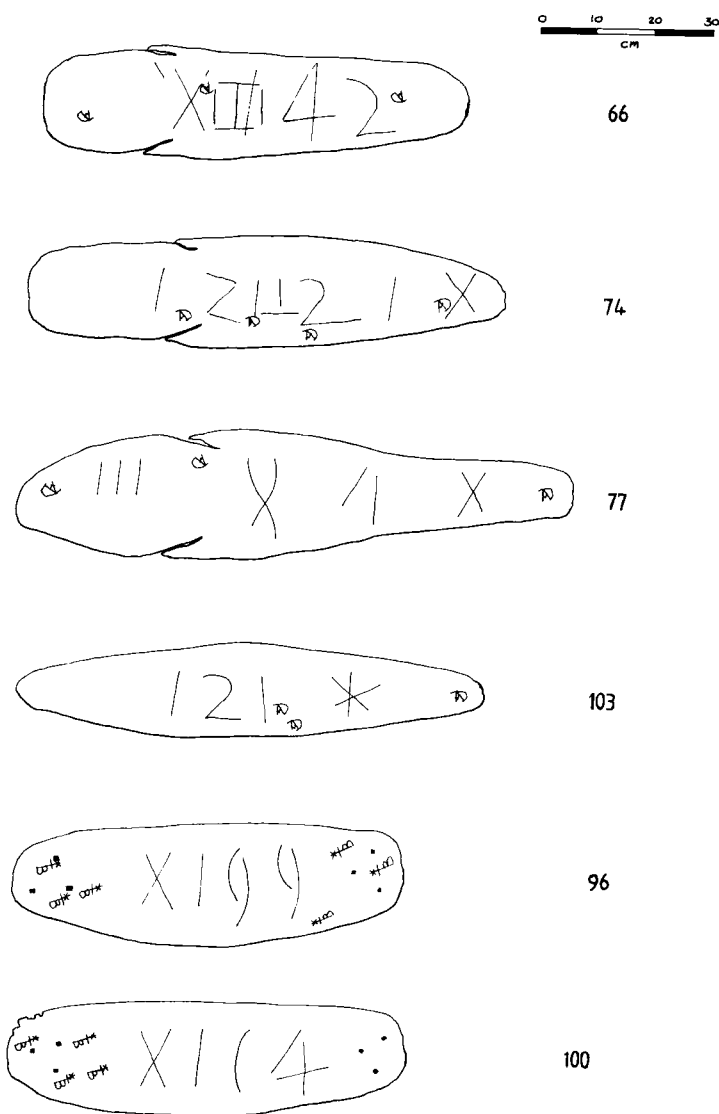


Figure 12. Ingot groups: 1 (no. 66), 3 (no. 74), 5 (no. 77), 8 (no. 103), 10 (no. 96), 10 (no. 100).

sites also varies widely, from highly regular subrectangular sections or half-round, produced in clearly reusable moulds, to those which appear to have been cast in a roughly formed loam or clay mould using the hand or a scraper as tool. No reliable evidence of regional variations in form is available for any area but the Derbyshire Peak before the 19th century, but the most striking feature of the *Campen* ingots is the postcasting use of what we have termed *flèches* to assist in handling. This convenience is for ease of production obviously best suited to a broad shallow section—and was perhaps not more popular (no other instance has yet been found), since this form of ingot is amongst the most difficult to stack. The use of *flèches* in all but a very few instances accompanies the AD mark, perhaps suggesting both were applied at the same stage. In other respects there is nothing obvious about the ingot form to ascribe unity of provenance to the whole batch, though general similarities in appearance of some groups—the same mode of irregularity perhaps—suggests the same area of production, also emphasized by the marks. Other features such as a possible ‘pouring bump’, created by pouring into a poorly consolidated mould, and the irregularity, suggest moulds formed in clay or loam for most of the ingots, though possibly not groups 8, 9 and 10, with a deeper form. Cooling hollows (deeper for deeper ingots) and pouring bumps (ingot 53) are not diagnostic, except perhaps for temperature; comment, indeed experiment, is invited.

Marks on ingots were commonly applied at the smelting mill, though the universality of this is unknown, and lead merchanting marks are also highly probable: many ingots previously recorded have multiple markings. In this respect the homogeneity of marks is conspicuous—with the stamps AD on the bulk of ingots across the groups, and B* restricted to group 10. Rectangular punch holes appear mainly on group 2, but their presence on other groups suggests marking at a later stage in the merchanting, as also the ‘scratch’ markings. The scratch marks take the form of identifiable letters and numbers which occur irrespective of groups (Fig. 12). On ingot 66 (Fig. 5) the lighter scratch markings appear to deform, and thus post date both the AD and more heavily scored double rectangular

mark. For the first a blunt pointed tool seems to have been used, for the latter a broad bladed chisel. Such punch or scratch marks are not typologically very useful, in comparison with the more expensive marking tool, but have significance possibly as batch identification references at a post-smelter, i.e. merchanting stage.

The group analysis has shown there to be a close correlation between ingot shape and the chiselled marking leading to the assumption that these markings were likely to be an indication of the smelter, or the first post-smelting stage. Though an AD mark of a similar type was found on an ingot on *Hollandia*, it was there and then (c. 1740), enclosed in a ‘box’. The B* is otherwise unknown.

Note on the export of lead

Quantities of lead were requisitioned annually for transportation to the East Indies. The amounts fluctuated considerably and were probably composite orders for both use by the company in its building projects and for trading purposes. Its secondary purpose was for trimming the vessels. This dual role of the heavy cargoes was described as kintledge by the English East India Company. Contemporary sources show the following annual exports for the Dutch East India Company (KA 10061, 1634–1664):

Year	Total weight
1634	570000 lbs
1635	600000 lbs
1637/38	300000 lbs

David and Diane Whiting
 110 Northampton Road,
 Brixworth, Northants, UK
Lynn Willies
 Peak District Mining Museum,
 Matlock Bath,
 Derbyshire, UK

The *Campen*'s treasure

Following the stranding of the vessel, all but two chests of the ‘treasure’ were saved, which are known to have contained silver [ARA KA 453 (VOC 315)]. Unfortunately, no record survives to indicate the value of these chests,

their weight, or contents. Hence it is impossible to make any assumptions, except that it is reasonably certain the chests contained specie and not bullion, supported by the evidence of excavation. Documents relating to the coinage on board for company trade by the autumn fleet, which included the *Campen*, note only that the Directorate of the VOC decided that the ships should carry some extra gold. The Amsterdam chamber undertook to convey this to Texel as soon as it was available (VOC 147, Res, Heeren XVII, 5 August 1627). Some weeks later, the chamber decided to send Reales [either as well as, or instead of the gold(?)] 'if the fleet had not already sailed' (VOC Res, Heeren XVII, 23 September 1627). The quantity and type of coin carried and subsequently lost in the wreck therefore remains a speculation.

Evidence relating to the recovery of silver coin by Jacob Johnson, outlined earlier in the history of the wreck, suggests that 2365 Reales of 8 were salvaged (CSP Dom DXXVII, p. 250). This is the sum total quoted by Van Ommeren in his petition to the Privy Council, which conflicts by only five coins with instructions given by the Duke of Buckingham to Johnson to relinquish 2360 Reales to Captain John Mason.

The most significant detail of this documentation relates to the description of the coin recovered by Johnson, said to be 'Reales of eight, Spanish coyne'. Since the earliest days of trade with the East, the Dutch had used Spanish/American silver Reales, but during the war of independence of the Seven United Provinces of the Netherlands against Spain, Reales were in short supply from about 1622. Hence the Dutch resorted to the export of Leeuwendaalders, or Lion daalders, the first autonomous coin struck by the States, first minted in 1575.

It is unlikely that Johnson would have described these Leeuwendaalders as 'Reales of eight, Spanish coyne', since they bore no reference to the king of Spain or the Spanish court. We must therefore assume that Johnson found only Spanish/American 'cobs' or Macuquina of 8, 4, 2 and 1 Reale, and somehow missed the chest or chests of Lion daalders, which in fact represent the earliest inclusion of this coin in a consignment dispatched to the East Indies by the VOC. During excavation of the *Campen* site, some 8000 coins have been recovered,

many of which still have to be cleaned and catalogued, but in the first 3500, the following denominations were recorded:

Leeuwendaalders	2977
Half Leeuwendaalders	313
Spanish/American 8 Reales	74
Spanish/American 4 Reales	68
Spanish/American 2 Reales	65
Spanish/American 1 Reales	1

In percentage terms, this means that of the 3500 coins sampled, 94% were of the United Provinces, and only 6% Reales. If Jacob Johnson's recoveries were in fact 100% Reales, then there would appear to be three possible explanations:

- that both of the chests 'lost' in the wreck contained only Lion daalders, and that the Reales were 'private' trade money carried by either passengers or crew
- that one chest contained only Reales, the other daalders;
- that the contents of both chests were a mixture of both types of coin.

It is unlikely that (b) is the real answer, since this would place a totally unbalanced amount of coin in the two chests, i.e. approximately 2575 Reales in one, and 8000 daalders in the other, (c) would appear to be the obvious answer, but if this were so, Johnson would have picked up a proportionate number of daalders as well as the 2365 Reales, which would appear not to be the case, unless both types of coins were lumped together simply as 'Spanish coyne' with a total value in Reales, and not the actual number of coins recovered. It is just possible that all the Reales were 'private' money (a), and that in 1628, when Johnson was working on the wreck, and later, that the 'lost' chests containing only daalders were still intact, buried beneath the mass of wreckage of a broken ship in shallow water; the question therefore remains unanswered.

The major source of silver in earlier times (800 AD) was the enormous silver mines opened up by the Arabs in central Asia. From these poured literally millions, if not hundreds of millions of silver coins each year, a trade which drew the Vikings eastward to establish themselves as the main distributors of Asian silver in Western Europe. When this source became depleted, the European countries looked for silver elsewhere, in many cases finding it on their

own doorsteps, but it was the Spanish colonies in the New World that furnished the bulk of Western silver. The earliest minting of a silver Reale, half Reale and quarter Reale, was in the reign of Ferdinand and Isabella at the old Segovia mint (Casa Vieja) sometime between 1475 and 1497. Much coveted by the Chinese in particular who, by long experience over the 16th and 17th centuries had found the Reale to have a consistent and reliable silver content, the Dutch therefore purchased large quantities of Reales out of sheer convenience, in order to pursue trade in the Far East, a situation which was only interrupted either by war or a shortage of the coin.^[1]

When large silver coins were first struck from metal mined at Joachimsthal (30 miles north of Berlin, in East Germany) in the 15th century, they were known as *thalers*, a contraction of *Joachimsthaler*, which in Dutch became *daalder*, and later in the United States *dollar*. In the Dutch series there are several issues known as *daalders*, being *Rijksdaalders*, *Statendaalders*, *Filipsdaalders*, *Uniedaalders* and *Leeuwendaalders*, the latter term being reserved for a particular type of coinage instituted by decree of August 1575. The Lion daalder was supposed to weigh 27.68 grammes of 750 fineness silver, with a diameter of 40 to 42 mm, but it has been noted with the coins from the *Campen* that they can vary from 39 mm to 43 mm. Many of these coins were subject to clipping, and it is seldom



Figure 13. Obverse of a Lion daalder coin.



Figure 14. Obverse of a half Leeuwendaalder coin.

that collectors see a *Leeuwendaalder* of full weight and size, except in the case of the *Campen* coins in which there are very few clipped; it is obvious that these were uncirculated. Originally valued at 32 stivers (three stivers above the intrinsic value, known as the 'reserve') which was intended for furthering the cause of the war against Spain, it was later increased to 40, and then in 1659, to 42 stivers. Politically it was a most important coin, as for the first time it bore no mention of the king, Philip II of Spain. Earlier coins and some later lesser denominations did include Philip's name and titles in their inscriptions, some with his head but with the Dutch arms instead of those of Philip of the Spanish court.

The Lion daalder showed the independence of the United Provinces, both as withstanding the might of their Spanish oppressors and as indicating their strength through union. The obverse (Fig. 13) of a Lion daalder, and that of a half Lion daalder (Fig. 14) shows a knight in armour, body turned to the left but with the head usually turned to the right. The right hand is grasping the cords from which the shield of arms is slung, which depicts the Dutch rampant lion, which later included a bundle of arrows and a sword. The surrounding inscription varies only slightly in wording or abbreviation throughout the many issues and mints, the usual style being:

MO(neta) ARG(entea) PRO(vinciarum) CONFOE
(deratarum) BELG(icarum)

followed by an abbreviation of the issuing province, thus:

HOL(land), ZEL(and), TRA(iection) (or Utrecht), WESTF or WEST F(riesland), GEL(derland), FRI or FR(iesland), TRS or TRAN(S)(isulania) (or Overijssel).

This inscription means: 'the silver coinage of the Provinces of the Dutch Confederation (the Latin *Belgium* meaning the Netherlands as a whole and not merely the country which we know by that name today). The reverse (Fig. 15) and (Fig. 16) has a large rampant lion, filling nearly the whole area, with just a beaded border containing the motto: CONFIDENS D(omi)NO NON MOVETVR, i.e.: 'Who trusts in the Lord does not waver'.

Following the decree of 1575, two types of Lion daalders were struck by the province of Holland, at Dordrecht; the first, either undated or dated, on the obverse 1575 or 1576, has the knight's head facing left, while the other is the more usual type, with the head to the right, with various dates from 1576 to 1605, on the obverse. Later issues of the second type, from 1606, carry the date on the reverse. The obverse inscription up to 1605 is MO(neta) NO(va) ARG(entea) ORDIN(um) HOLL(andia), i.e.: 'new silver coinage of Holland'.

The northern part of what is now the province of North Holland was then known at



Figure 15. Reverse of a Leeuwendaalder coin.



Figure 16. Reverse of a half Leeuwendaalder coin.

West Friesland, but was not a separate province. However, it struck its own Lion daalders at Hoorn, Enkhuizen and Medemblik, in similar style to those of Holland, from 1588. The issuing periods for the other provinces were, Utrecht, 1589 to 1647; Overijssel, 1585 to 1701 (with local issues struck at, and bearing the names of Kampen, Deventer and Zwolle); Gelderland, 1589 to 1699 (with local issues from Nijmegen and Zutphen); Friesland, 1589 to 1653 (including an undated issue), and Zeeland, 1589 to 1658 (Fig. 17).

The coins of Overijssel are designated with an abbreviation of its Latin form, TRANSISULANIA, which shown as TRS or TRAN(S), but sometimes with only TRA, which can be confused with those of Utrecht, also marked TRA (but more often as TRAI). Great care is therefore necessary in order to catalogue correctly these coins, particularly since a wide variety of mint marks were used as well as inscription variations. The Zeeland issues up to 1599 show, both on obverse and reverse, the provincial arms of a demi-lion rampant above wavy bars, representing the sea, but later issues have the normal Dutch lion in both cases. Many of the early Lion daalders of all the other provinces have after the name of the province, VA(LOR) HOL, indicating that the coins were struck to the approved standards of those of Holland.^[2]

Coin recovery and treatment

Whilst loose coins still continue to be found in the overburden of chalk and pebbles following



Figure 17. Map showing original seven Province boundaries in the Netherlands.

gales, and particularly after winter storms at the commencement of a new season, in general they are buried deep in concretion. In the early stages of excavation of the wreck site, there were many areas showing visible signs of coin, which were easily recovered using hammers and

chisels. As these areas were worked out, and it became necessary to enter beds of concretion 'blind' so to speak, knowing that coin was likely to be present, but unaware of their exact location, the physical damage to coin that resulted became unacceptable.

A new technique was therefore adopted whereby one member of each team underwater always had an underwater metal detector available, and the advantages of time saved in searching for coin and artefacts in general in the concretion, plus an immediate reduction in the level of physical damage were obvious. It was possible to have one diver, familiar and skilled

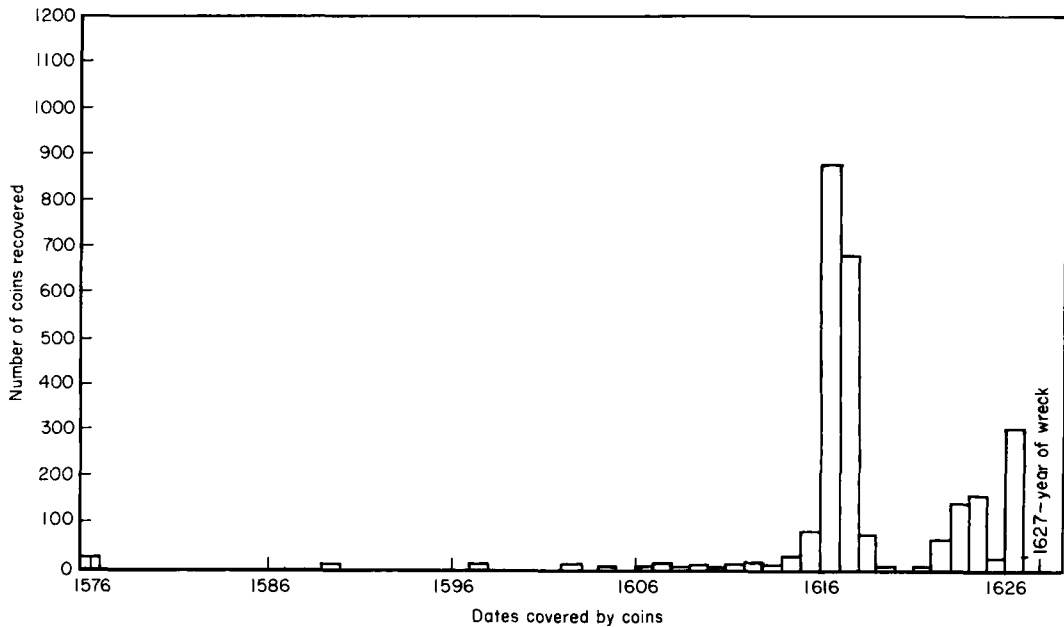


Figure 18. Graph showing the years represented in the *Campen*'s treasure.

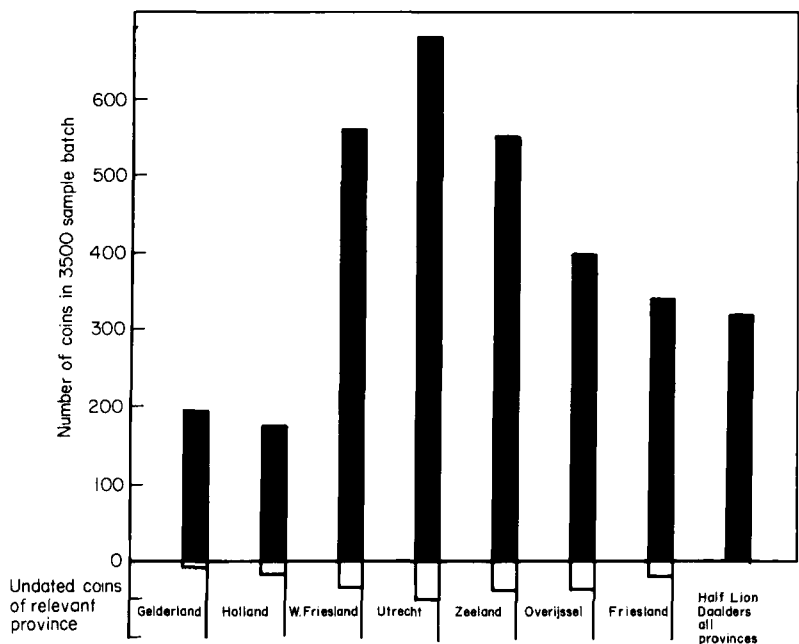


Figure 19. Graph indicating the number of coins in a sample of 3500 Lion daalders compared to their mint marks.



Figure 20. Some 900 coins, mixed Lion daalders and half daalders, uncleaned, with iron cannon shot (photo: R. Larn).

in the use of a particular detector, to make a continuous circuit of the site, indicating to as many as six or eight other divers equipped with hand tools, the exact position of 'hot' spots. In this way it was possible to progress quickly through the site in a controlled manner, with the assurance that nothing was missed. Since the depth of concretion was seldom more than 30 cm, it became the policy to excavate through the concretion to the chalk bed rock, which, being of a totally different colour, made the task very much easier, even when the underwater visibility was reduced to as little as 10 cm. Huge lumps of concretion were then collected together on the seabed, and raised at the end of each dive, to be broken open on the surface, allowing almost every fragment of the wreck to be recovered.

Pulse induction metal detectors were employed solely, and the 'Aquapulse' model was found to be particularly useful, since its 'wand' like ferrite rod probe, measuring some 25 mm in diameter, and 300 mm long, was capable of being thrust beneath rocks or deep into sand, greatly increasing its effective detection range by getting closer to the metallic objects. When used for example in a vertical position directly over a 'hot' spot, the ferrite rod probe was capable of detecting the position of a coin exactly to as close as 10 mm.

On recovery, the diving log indicated the number of whole Lion daalders, half daalders, Reales or coin fragments, since a great many broken and erroded coins were found. Coins were then kept wet until the cleaning process could commence, which consisted of a combination of chemical, electrolytic and ultrasonic methods. In the early stages, the group paid to have every coin and fragment cleaned professionally by a qualified conservationist, but as the numbers of coin rose, as many as 900 over two days on one occasion, so the work load in cleaning and the cost, necessitated a revision of this policy. Over the past two years, one member of the group has undertaken the preliminary cleaning of the coins, using a 10% solution of hydrochloric acid to remove accretions, so that after thorough washing in fresh water, the coins can be graded. Those that are considered to be of 'fine' numismatic condition or above are then professionally cleaned, before being returned for full recording; those that are of only 'very good' standard or below, are then cleaned by the member.

From the outset, when NUAG was formed, it was agreed that every single coin would be photographed, after being given a unique number in a catalogue, and then its details recorded in full. This is very time consuming, but relatively cheap to perform, with the result that

there now exists a complete archival record of every coin, with accompanying black and white negatives of coins in groups of six, showing both obverse and reverse in two frames of 35 mm film. This record is possibly the most comprehensive study of the 'treasure' from a Dutch East Indiaman maintained to date, and will eventually be made available for study. Certainly, it has revealed variations in inscriptions, mottos, mint marks and coin dies, plus many unique examples of individual coins that do not appear in the standard catalogues of coins of the United Provinces.^[3]

R. Larn

Notes

- [1] Information supplied by R. Cowan.
- [2] Purves, Alec A. *Coins*, November 1972, 12.
- [3] Delmonte, A. *The Silver Benelux*. Amsterdam: Schulman, 1967.

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