

ASPECTS OF
THE EARLIEST COPPER METALLURGY IN THE
NORTHERN SUB-ALPINE AREA IN ITS
CULTURAL SETTING

VOLUME II

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Ph.D. AT THE UNIVERSITY OF EDINBURGH.

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3. FLAT AXE, CHEVROUX. MUSEUM LAUSANNE, INV. NO. 9845 II.
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5. FLAT AXE, MONDSEE. UNIV. VIENNA, INV. NO. 6558.
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7. FLAT DAGGER, ONNENS. MUSEUM LAUSANNE, INV. NO. -.
8. DAGGERS, VERSOIX. MUSEUM GENEVA, INV. NO. B5801 & 9147.
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11. DAGGER, ESTAVAYER. MUSEUM GENEVA, INV. NO. B5247.
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14. TANGED DAGGER, WIEN-APERN. MUSEUM ASPARN a.d. ZAYA,
INV. NO. 14853.
PHOTOGRAPH BY COURTESY OF MUSEUM ASPARN a.d. ZAYA.
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OF MUSEUM LINZ.
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32. SPIRAL ARMRING, STOLLHOF. MUSEUM VIENNA, INV. NO. 13797.
33. AXE WITH CIRCULAR CROSS SECTION, SPITZ, DANUBE.
MUSEUM VIENNA, INV. NO. 45829.

FU = Exact find site unknown.

Unless otherwise stated all plates are the authors own photographs.

LIST OF PRINT-OUTS

(IN POCKET AT BACK OF VOLUME II)

PRINT-OUT A : DENDROGRAM OF COPPER CLUSTERS 1-10.

PRINT-OUT B : DENDROGRAM OF BRONZE CLUSTERS A-F,
WHERE TIN WAS MASKED BEFORE CLUSTERING.

PRINT-OUT C : DENDROGRAM OF BRONZE CLUSTERS a-f.

PRINT-OUT D : RESULTS OF DISCRIMINANT ANALYSIS ON COPPER CLUSTERS.

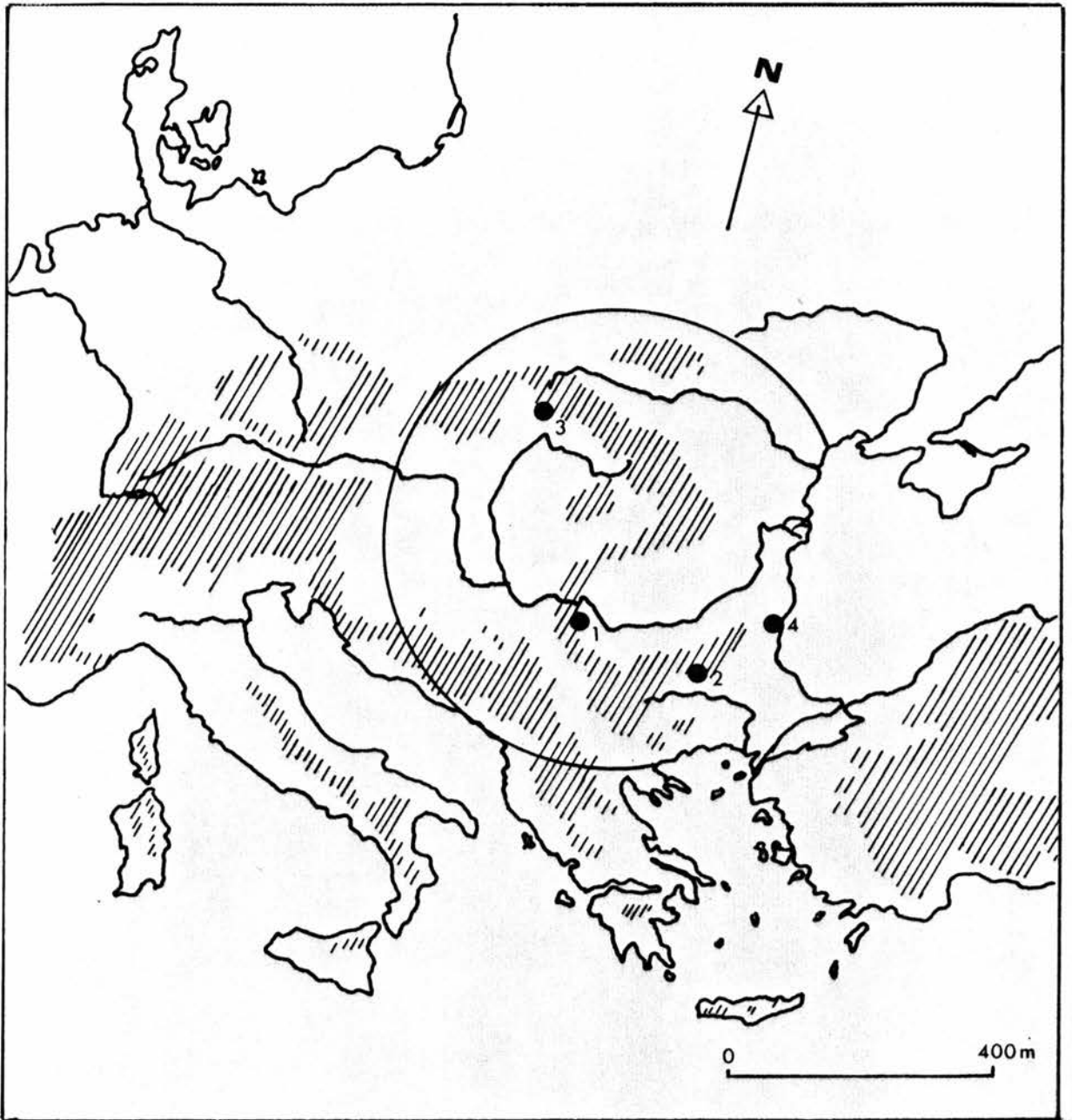


Fig.1. The earliest south east European copper-using horizon with some of the important sites : 1 = Rudna Glava, 2 = Aibuna, 3 = Vel'ké Raškovce, 4 = Varna. The isochron is covering roughly the area in which the earliest European copper artifacts have been found.

Cortaillo

culture.

Figs. 2-6



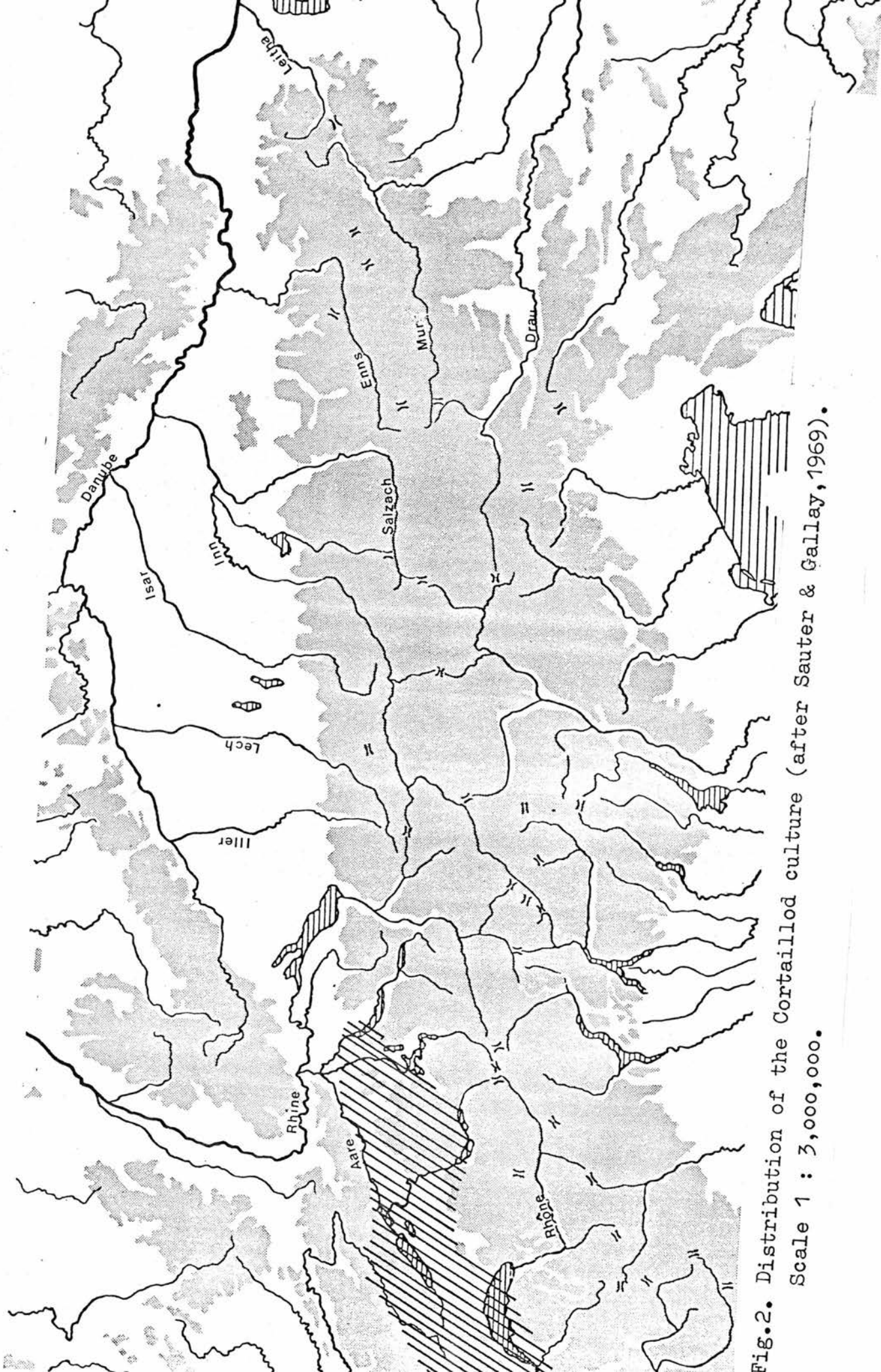


Fig.2. Distribution of the Cortaillod culture (after Sauter & Gallay, 1969).
Scale 1 : 3,000,000.

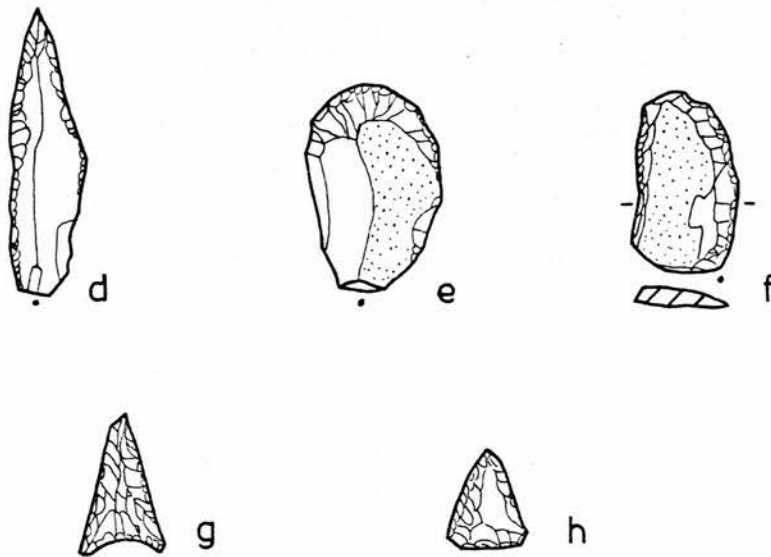
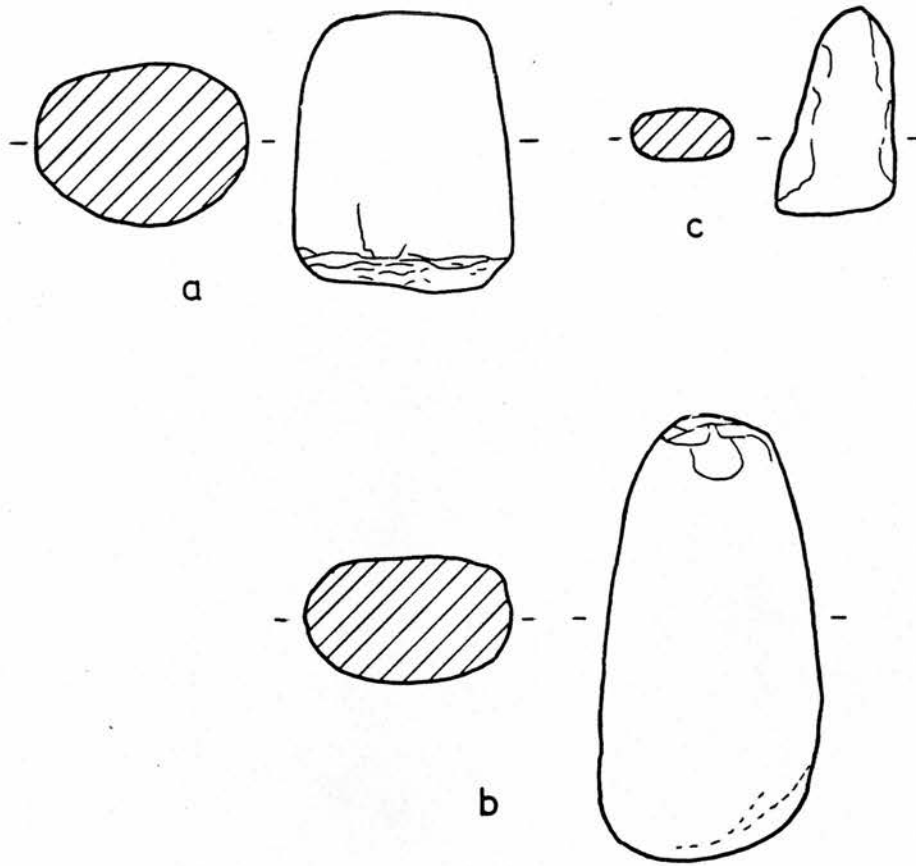


Fig. 3. Stone (a-c) and flint (d-h) artifacts.
Scale 1:2.

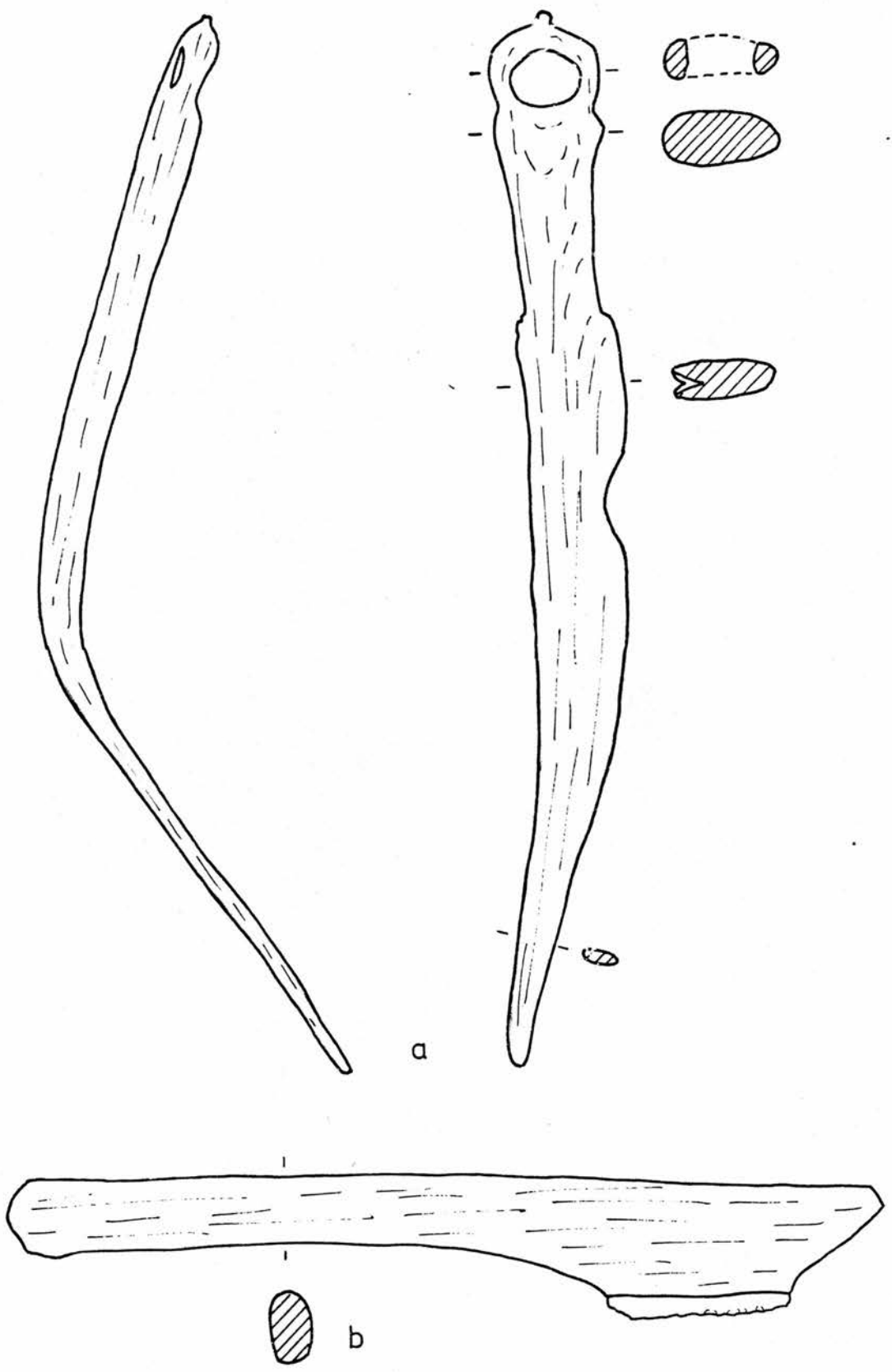


Fig. 4 A. Wood artifacts.

Scale 1:2.

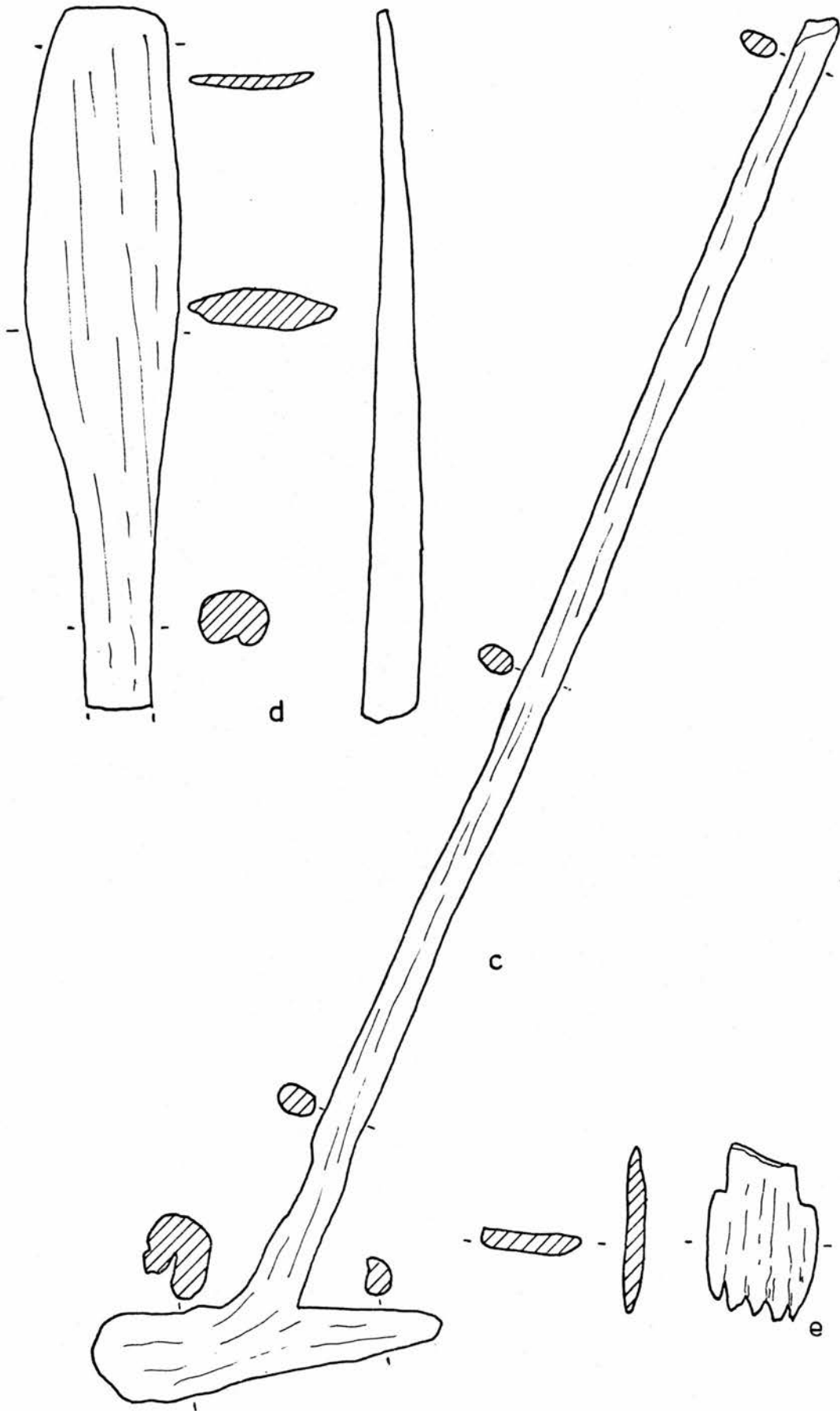


Fig.4B. Wood artifacts (continued).

Scale 1:5 (c), 1:3 (d), 1:2 (e).

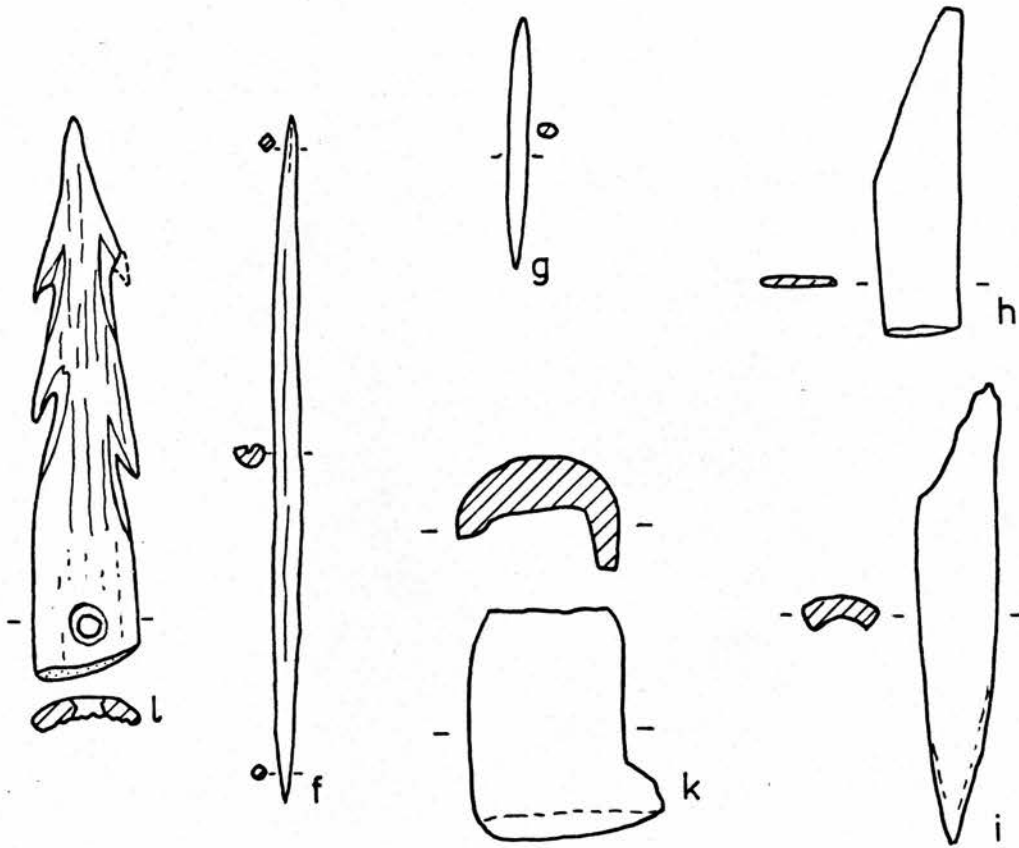


Fig.4C. Bone and antler-artifacts,

Scale 1:2.

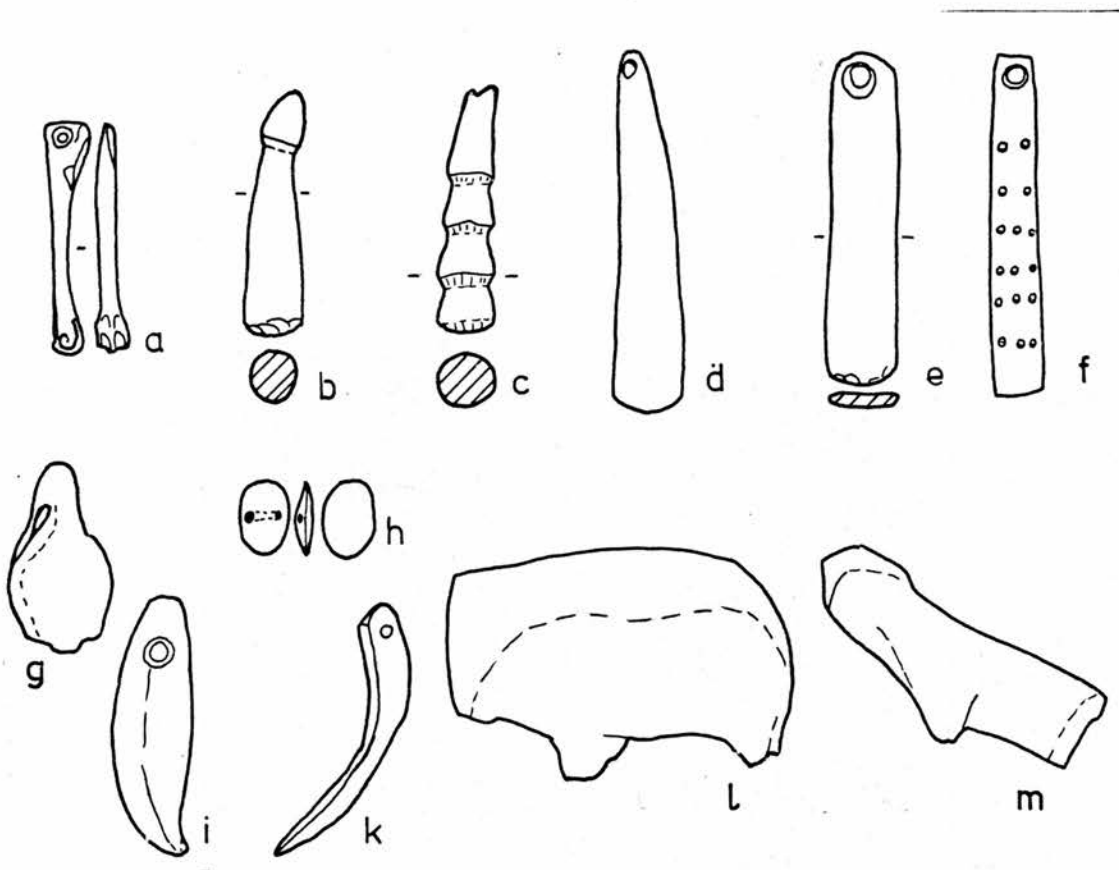


Fig.5. Ornaments. Scale 1:2 (a-g,i,k), 1:3 (h), 1:1 (l,m).

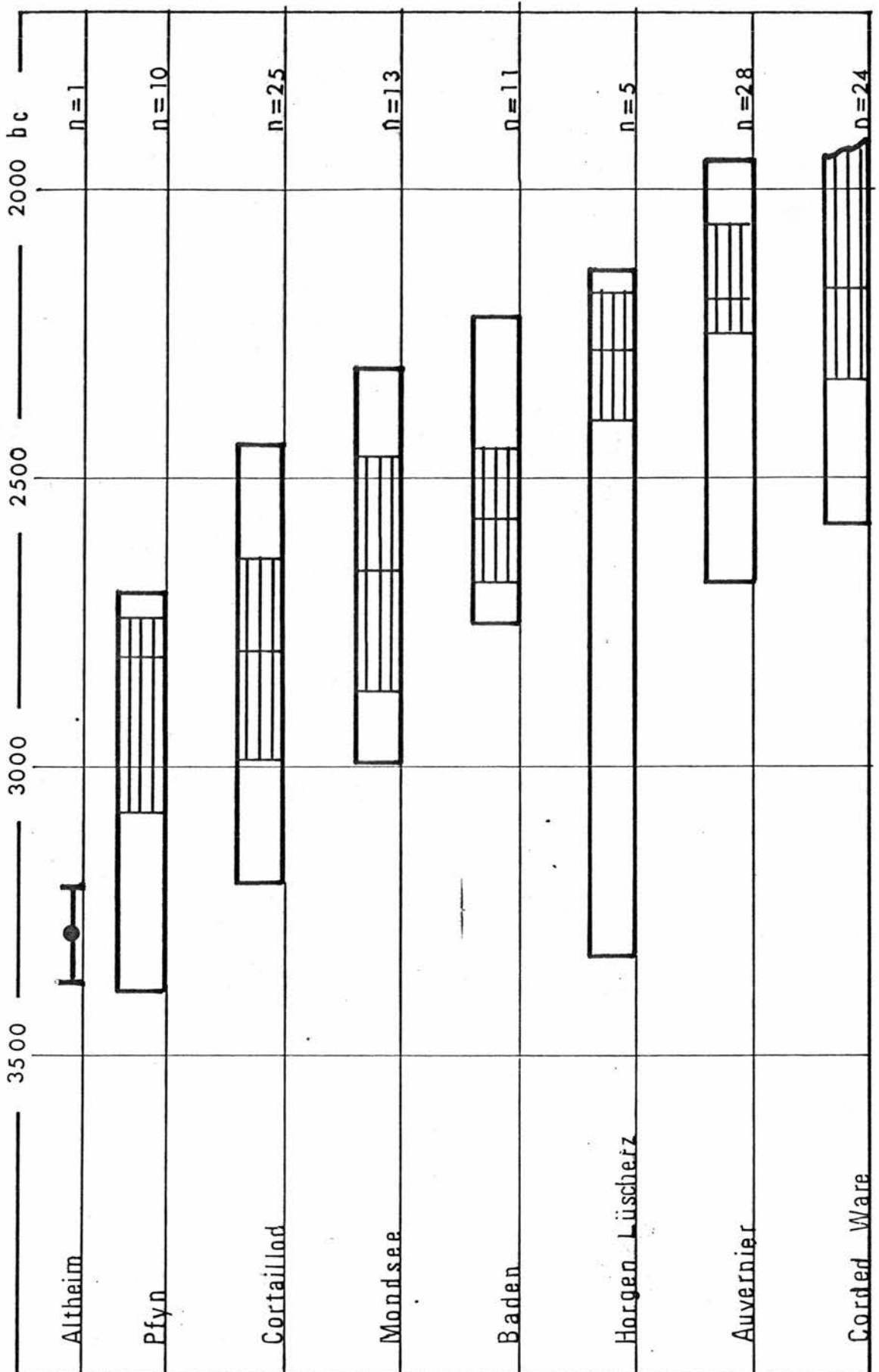


Fig.6. Interquartile ranges (horizontal hatching) of uncorrected ^{14}C dates of early copper-using, northern alpine cultures.

For individual dates see App. I.



Pfyn

culture.

Figs. 7 - 10

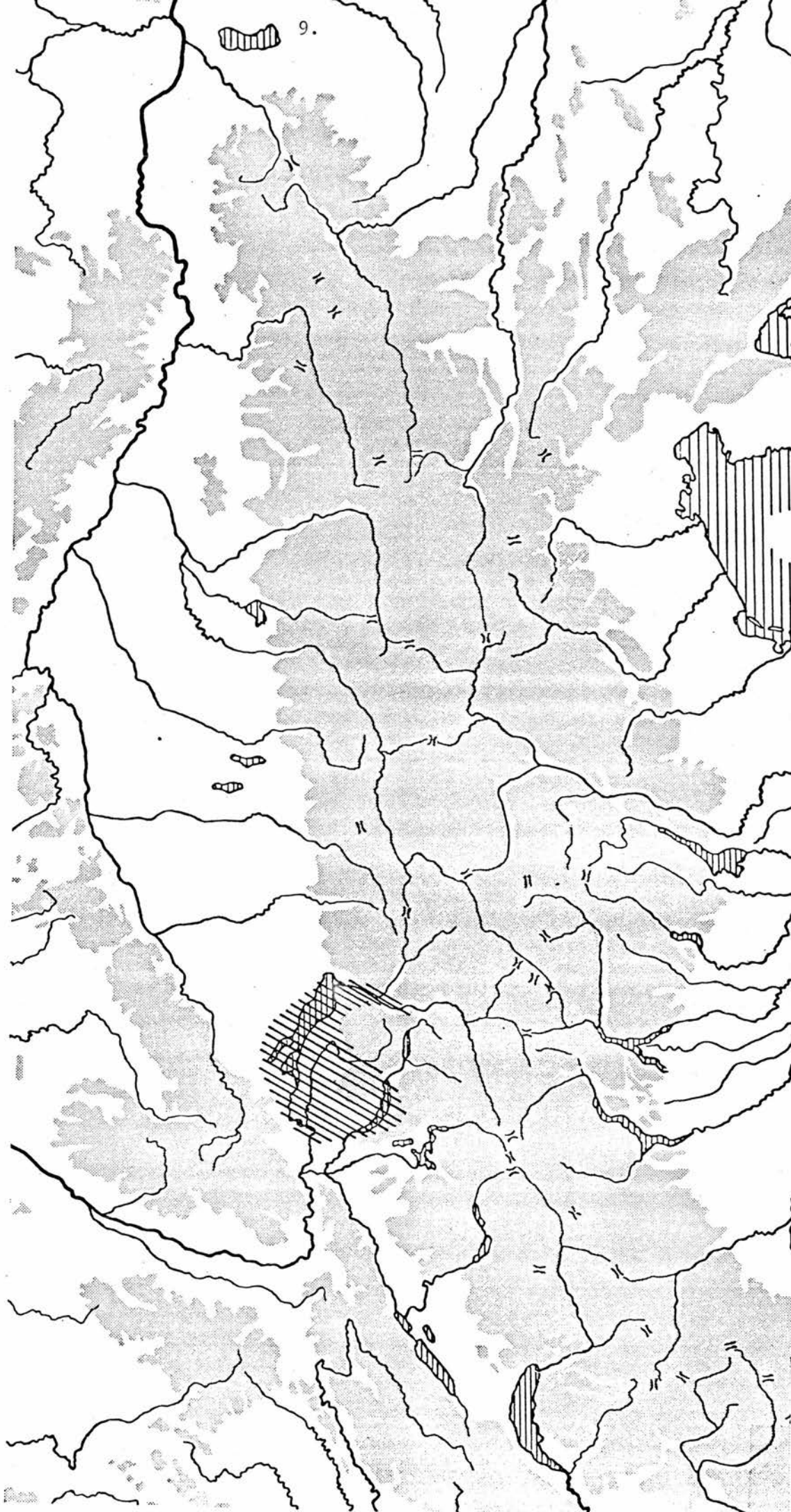


Fig.7. Distribution of the Pfyn culture (after Winiger, 1971). Scale 1:3,000,000.

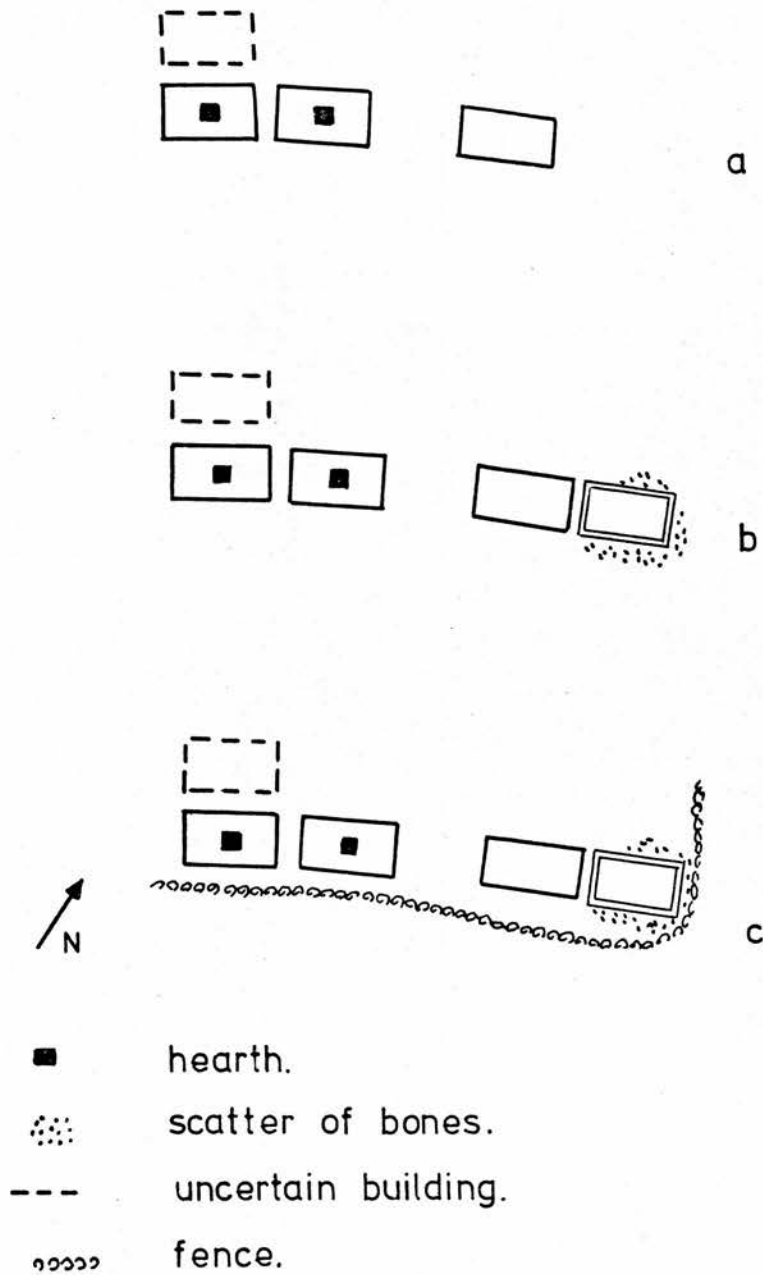


Fig. 8. Houses at Thayngen-Weier I. a = at the beginning of the occupation; b = 17 years later; c = a further 13 years later.

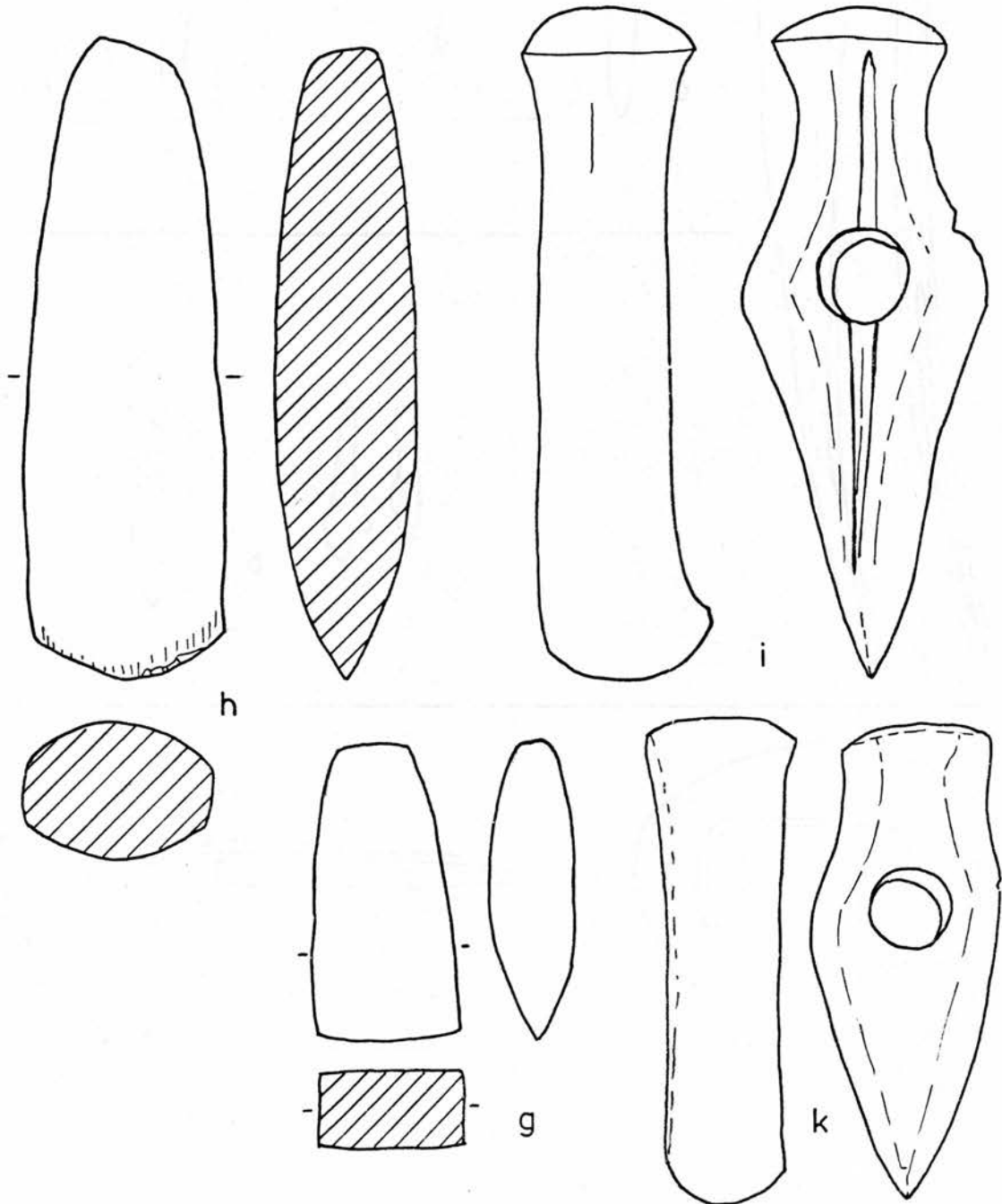
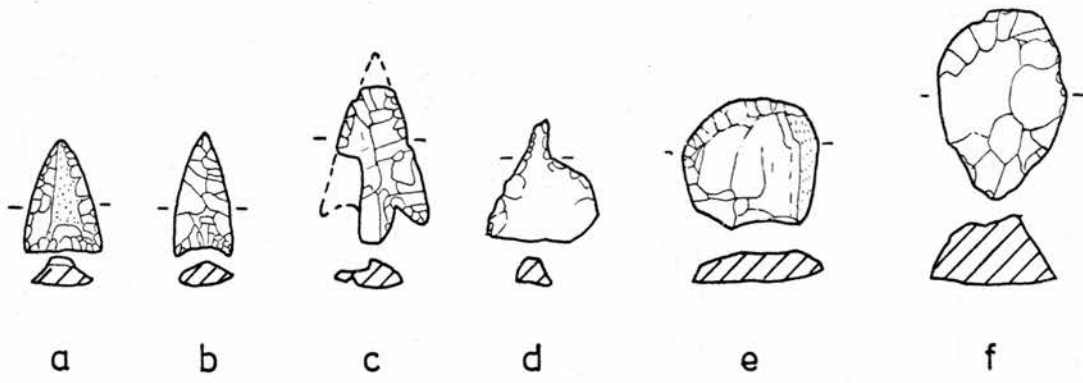


Fig. 9. Flint (a-f) and stone (g-k) artifacts. Scale 1:2.

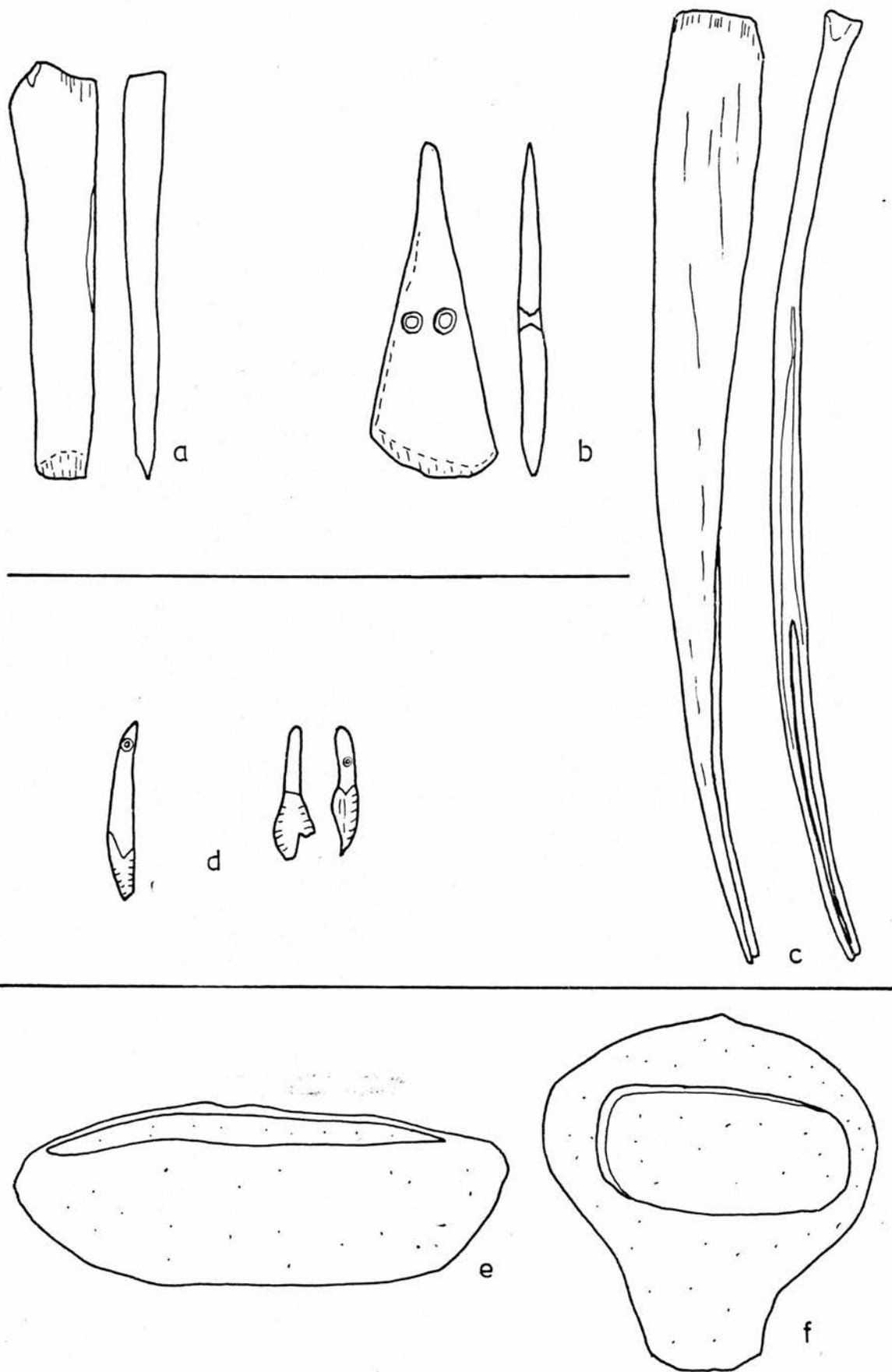


Fig. 10. Bone artifacts (a-c); ornament (d); crucible (e,f).
Scale 1:2.



Altheim

culture.

Figs. 11 - 17

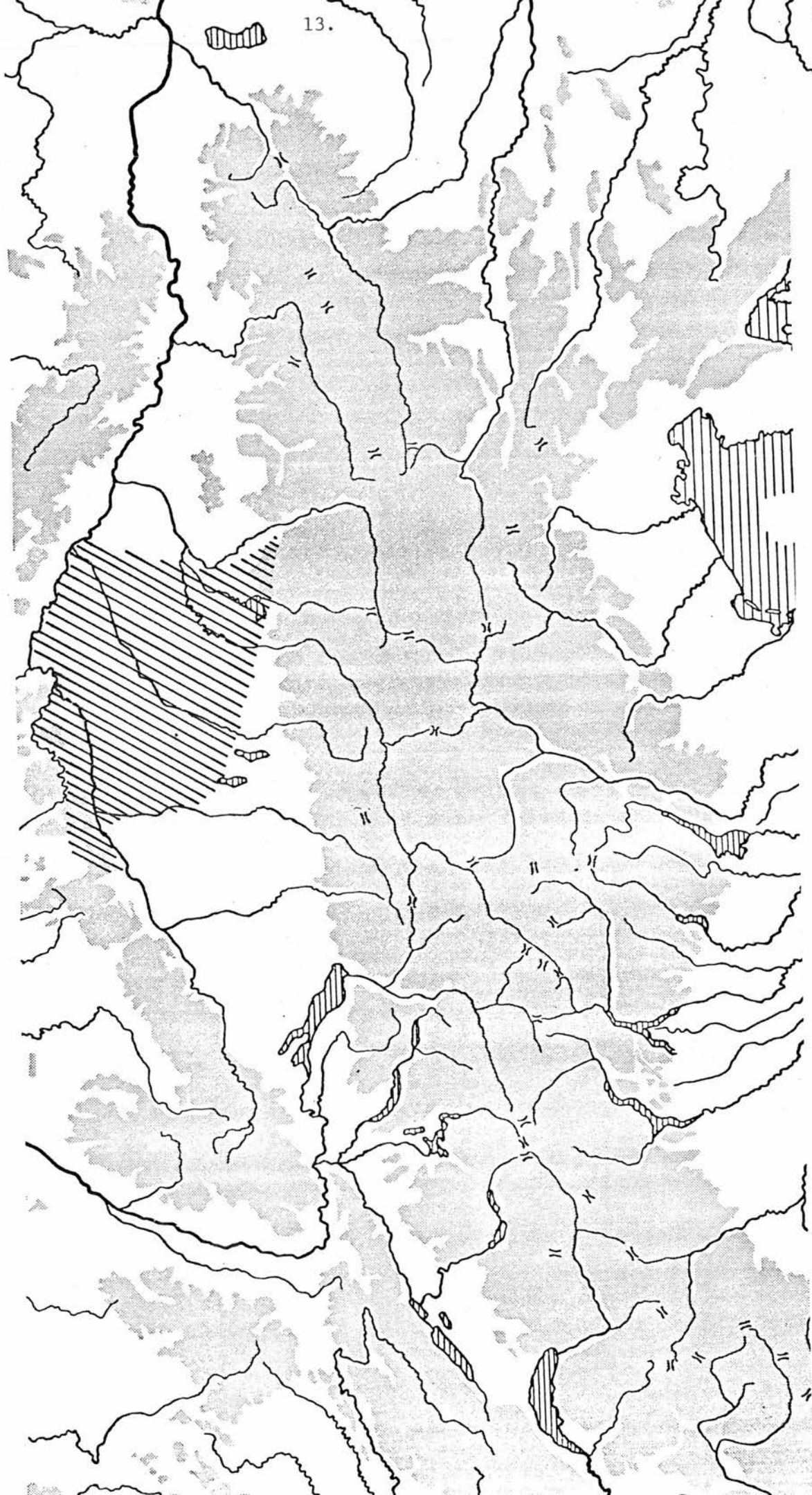


Fig. 11. Distribution of the Altheim culture (after Driehaus, 1960). Scale 1 : 3,000,000.

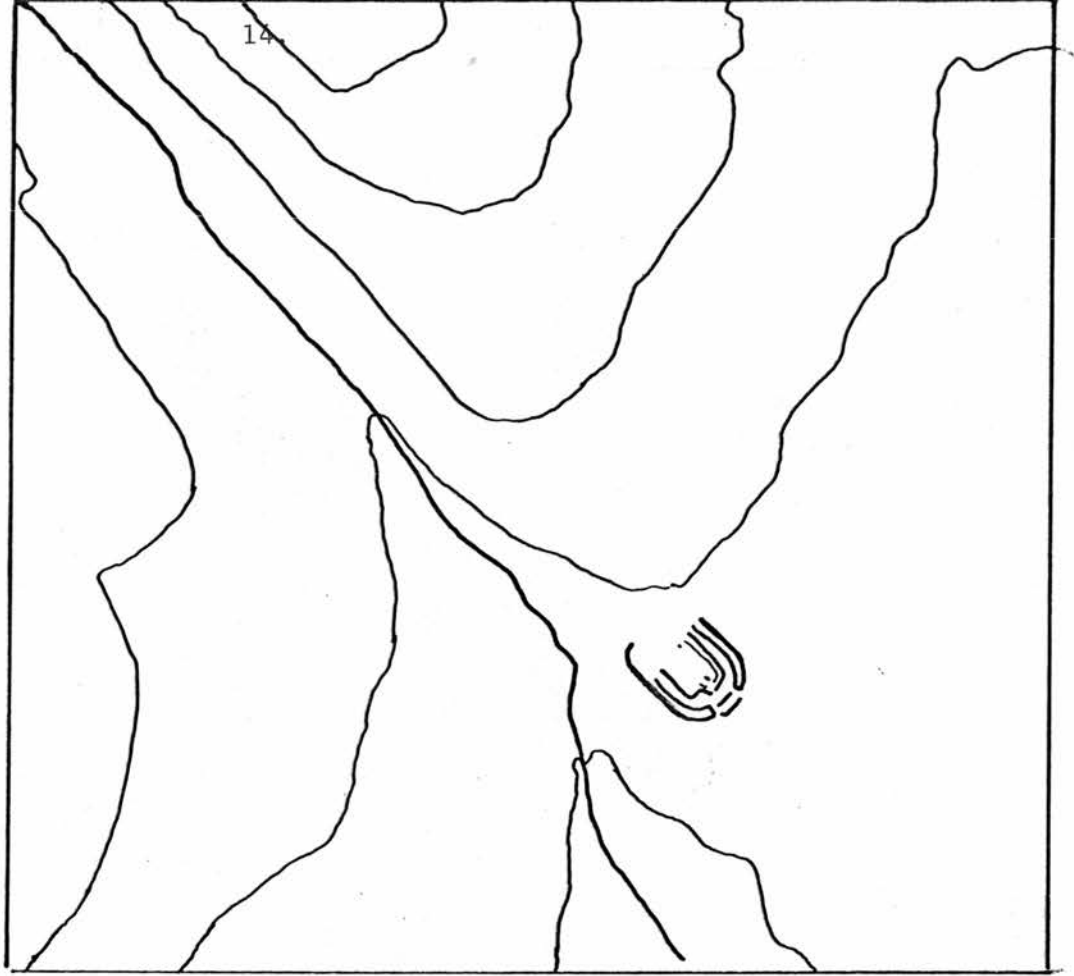
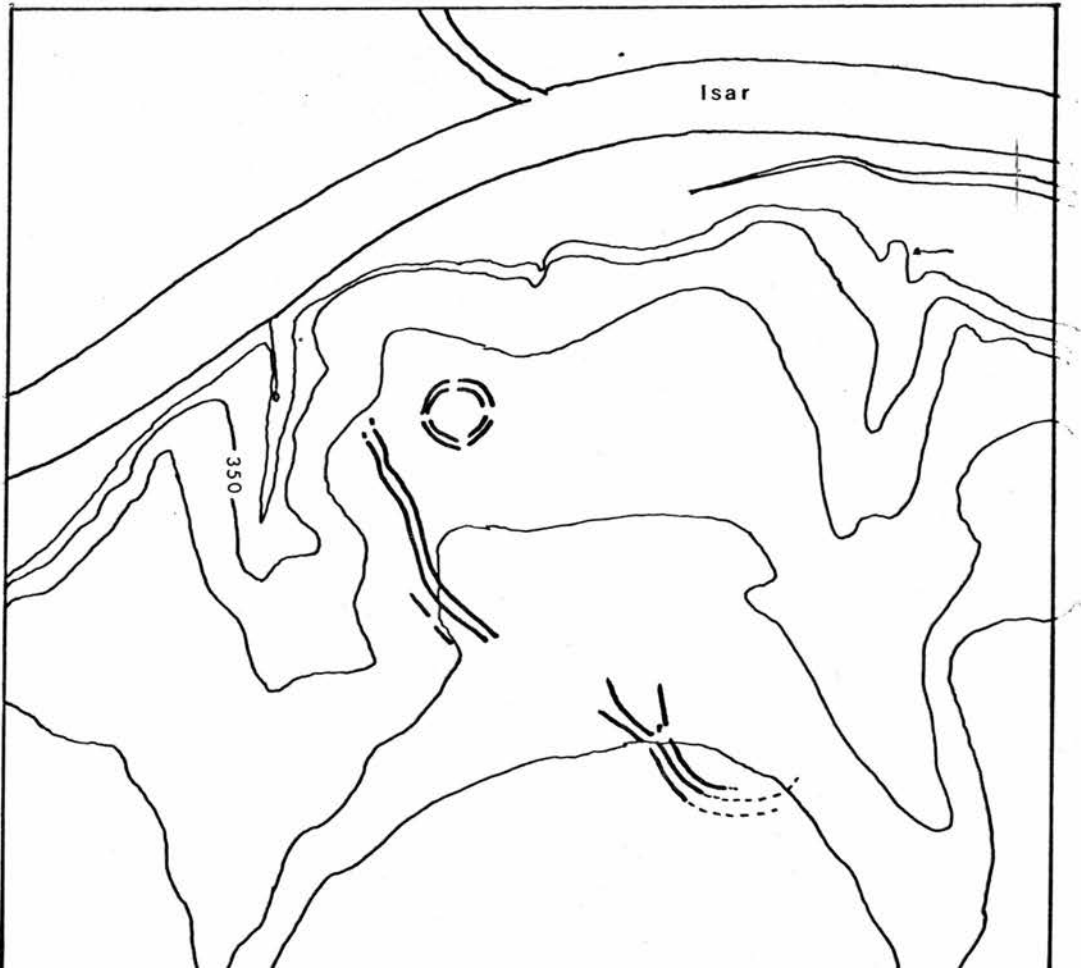


Fig.12. Plan of Holzen/Altheim (top) and Kothingeichdorf (below) after Maier, 1962.



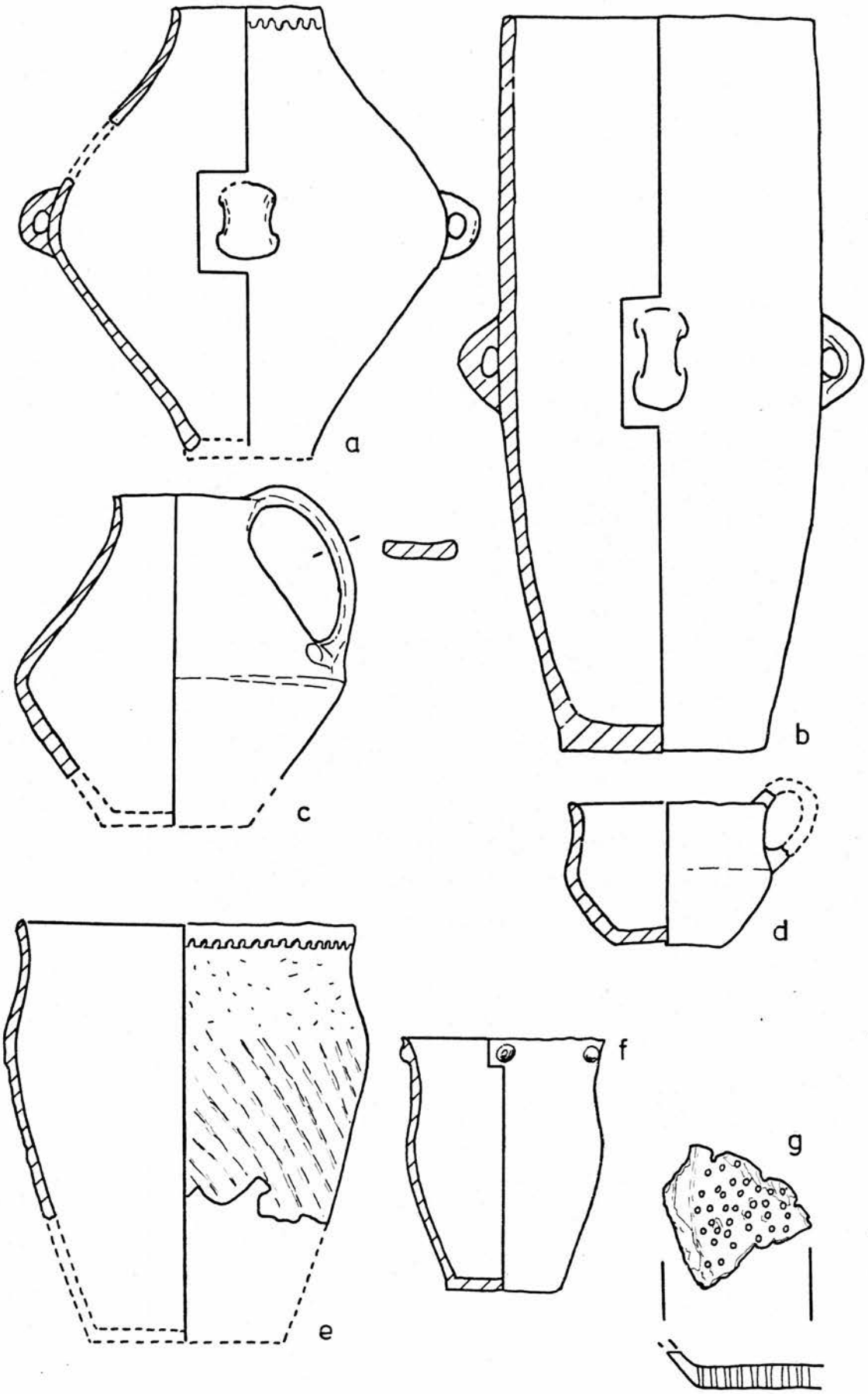
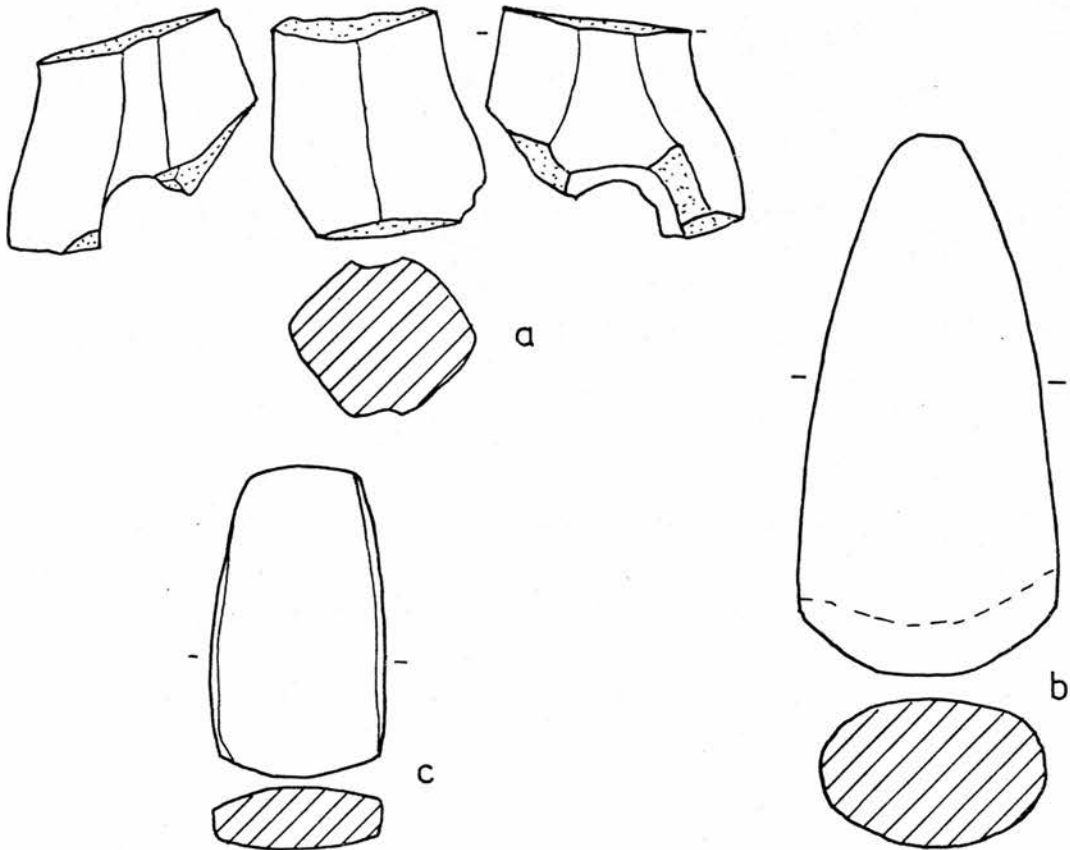
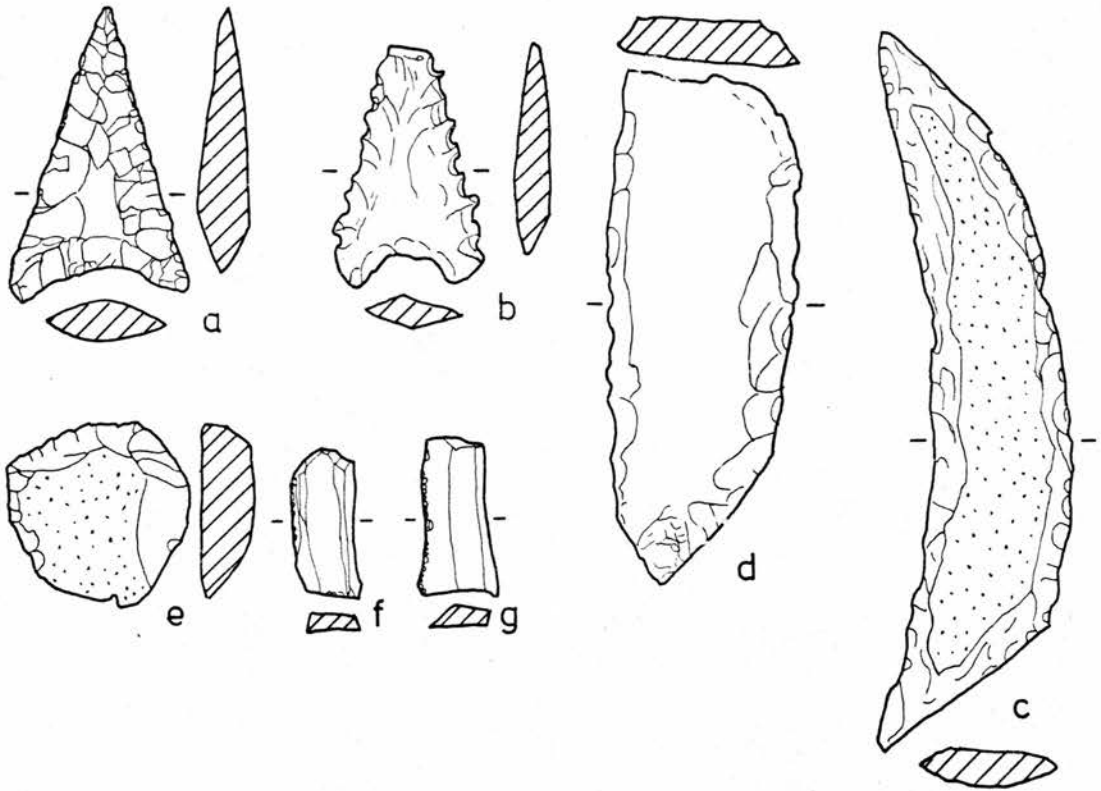
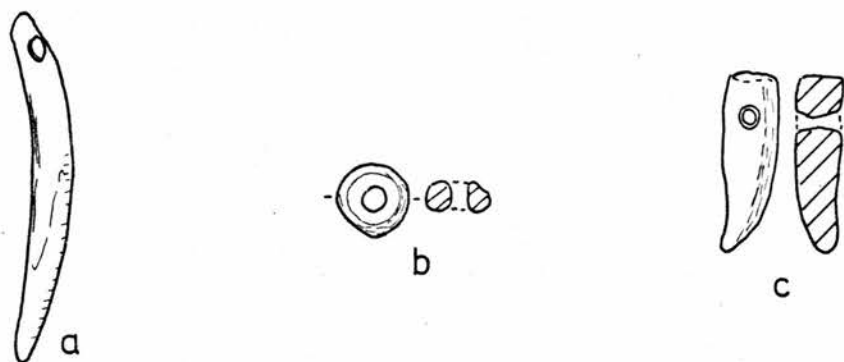
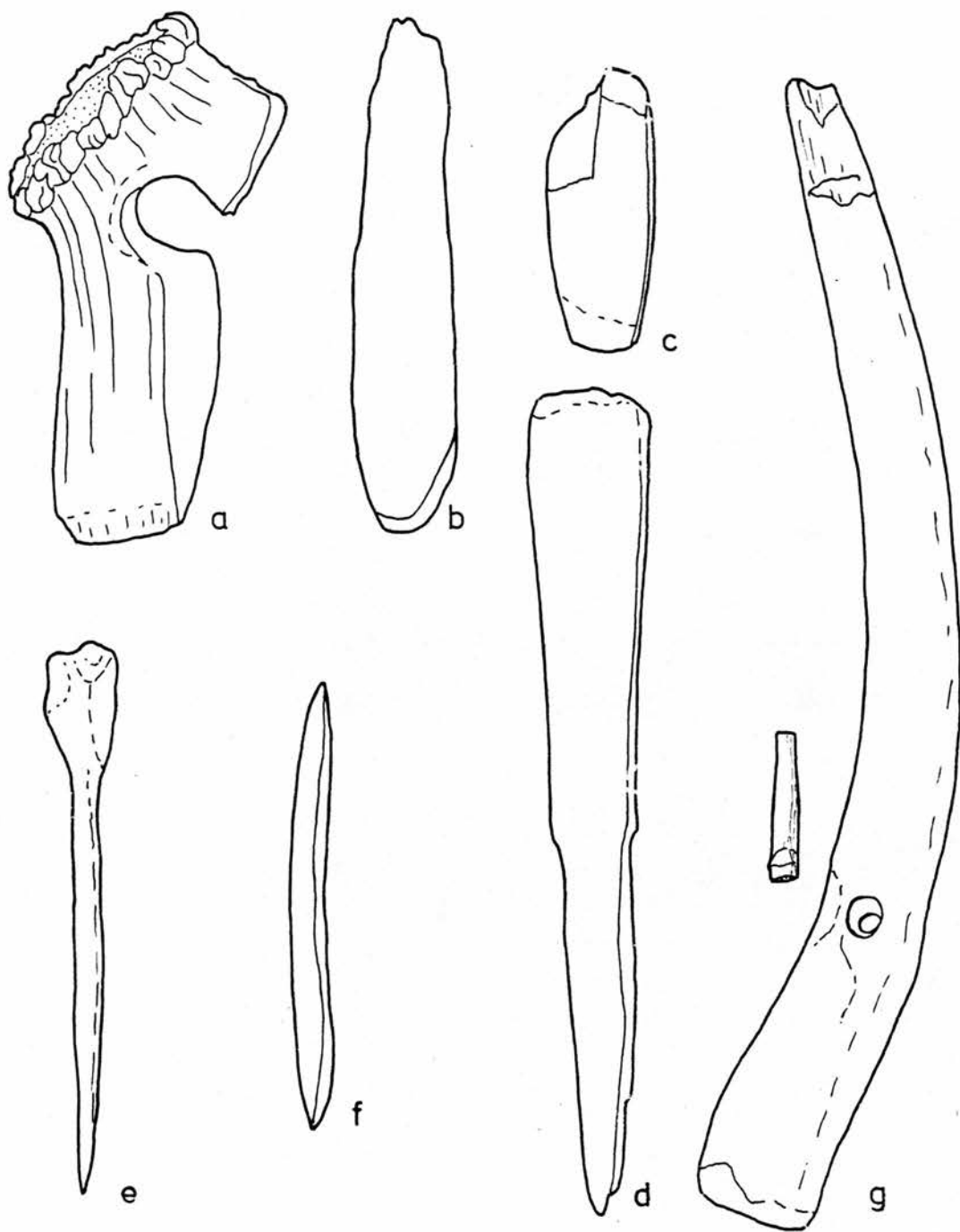


Fig. 13. Pottery. Scale 1:5 (a, b, e, f); 1:3 (c, d, g).



Top: Fig. 14. Flint artifacts. Scale 1:1 (a, b); 2:3 (c-g).
 Bottom: Fig. 15. Stone artifacts. Scale 2:3 (a); 1:2 (b, c).



Top: Fig. 16. Artifacts of bone and antler. Scale 1:2 (a, e);
2:3 (b-d, f, g).
Bottom: Fig. 17. Ornaments. Scale 2:3 (a); 1:2 (b-c).

Mondsee
culture.
Figs.18-24

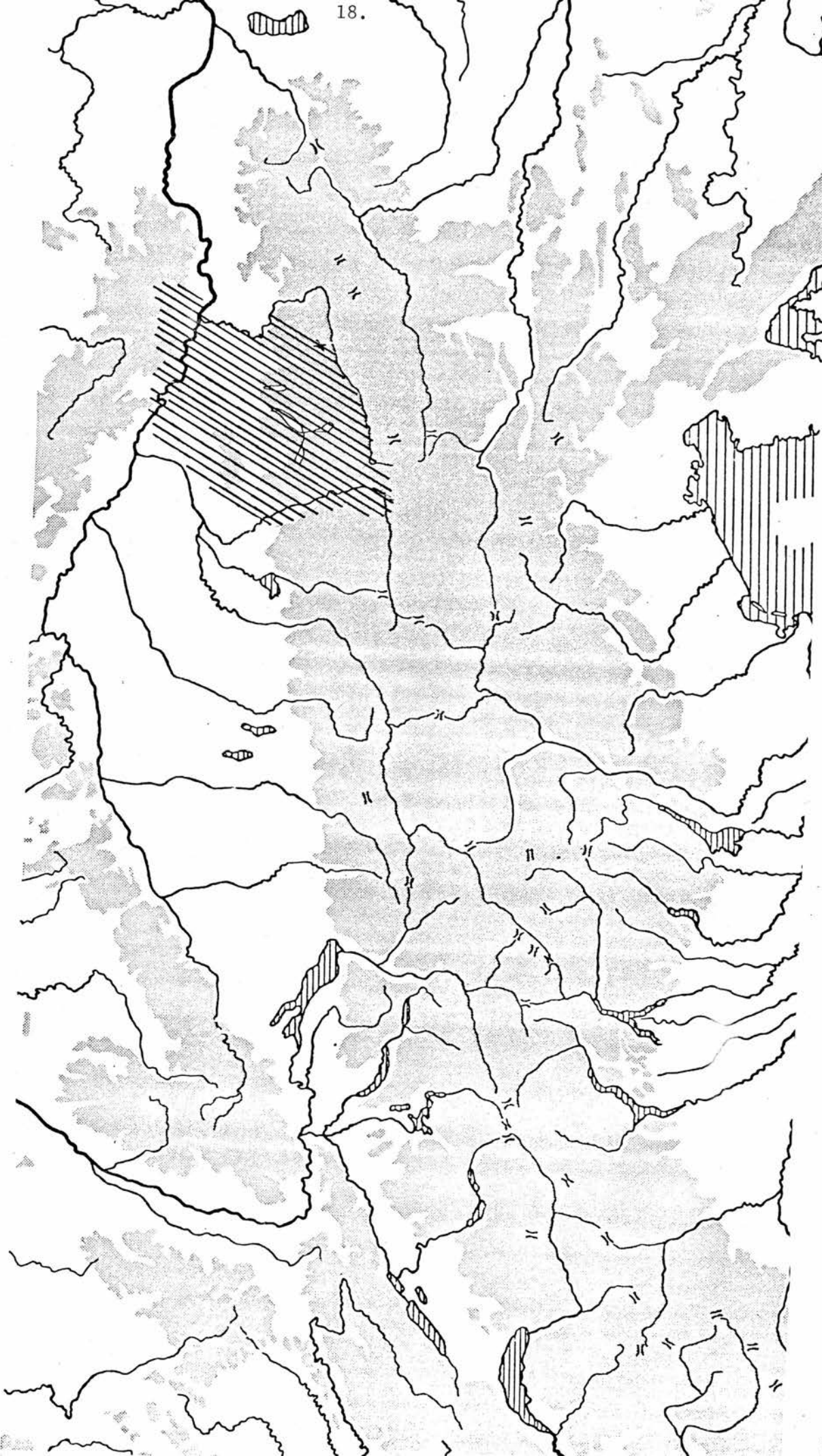


Fig. 18. Distribution of the Mondsee culture (after Willvonseder, 1968). Scale 1 : 3,000,000.

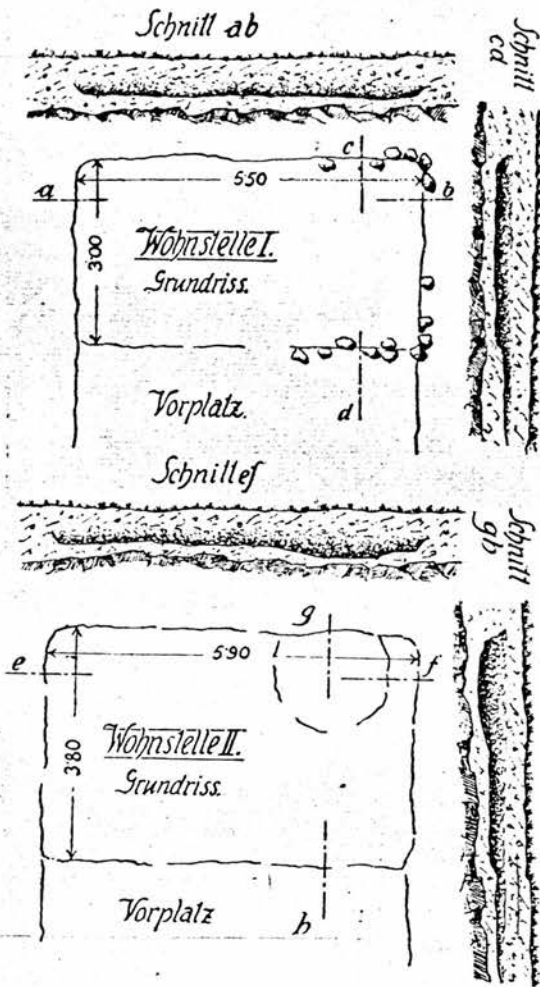


Fig. 19. Plan of huts on the Grillberg, Austria (after Hell, 1919).

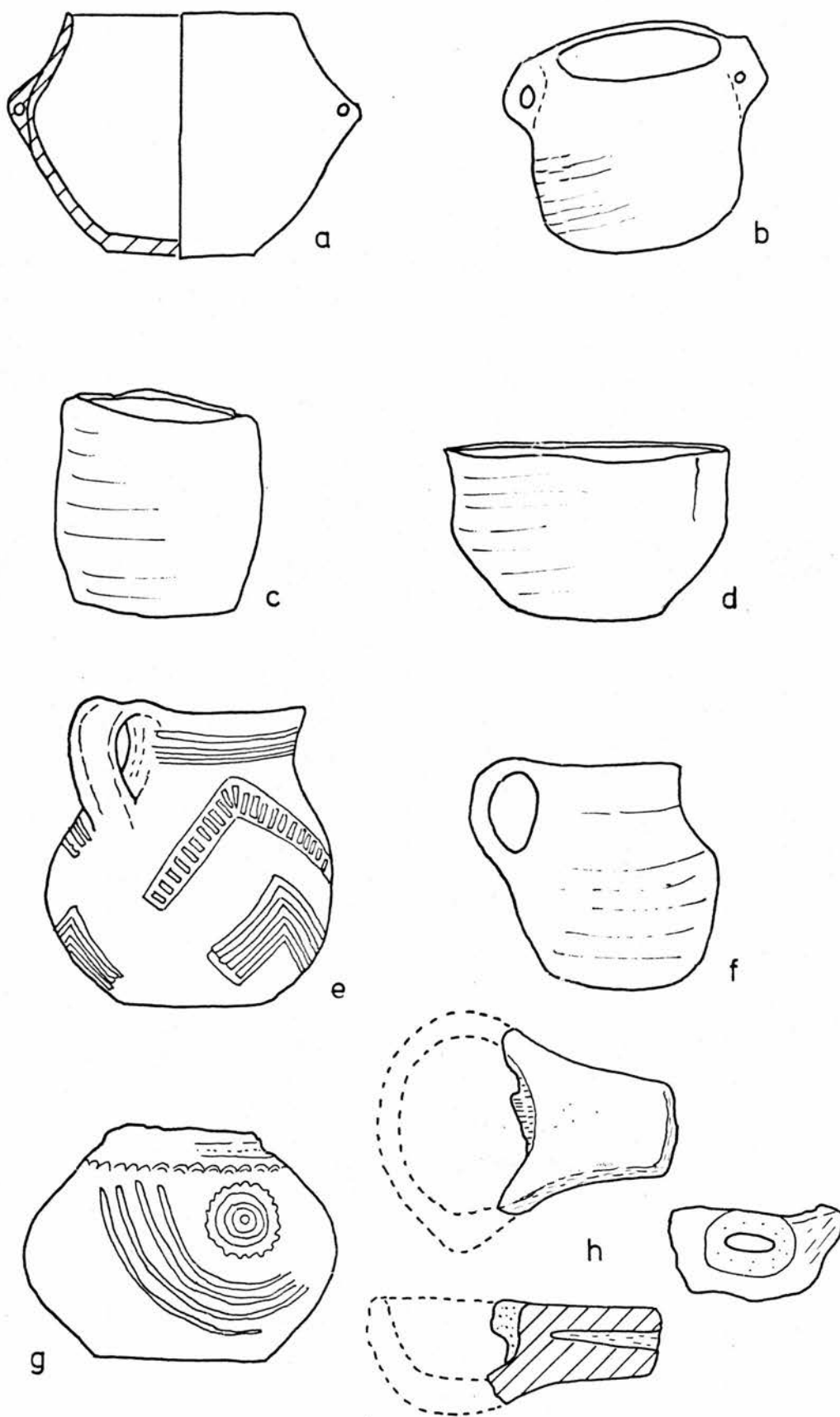


Fig. 20. Pottery. Scale 1:4 (a d, f, h); 2:3 (b e g); 1:2 (c).

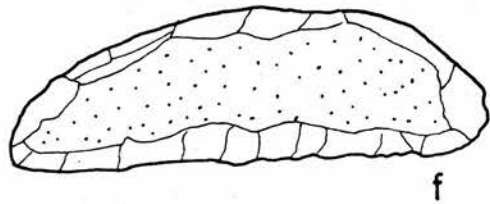
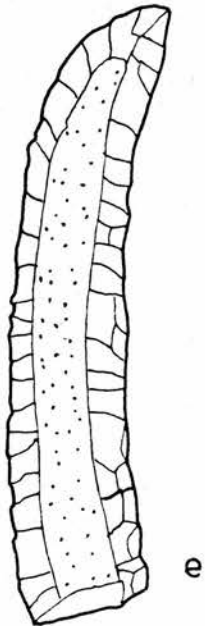
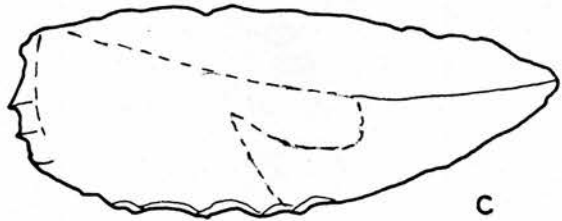
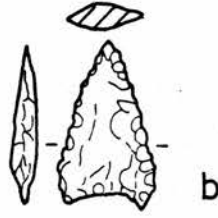
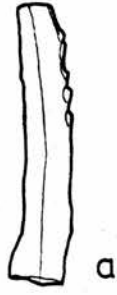


Fig. 21. Flint artifacts. Scale 2:3 (a-c, e); 1:2 (d, f).

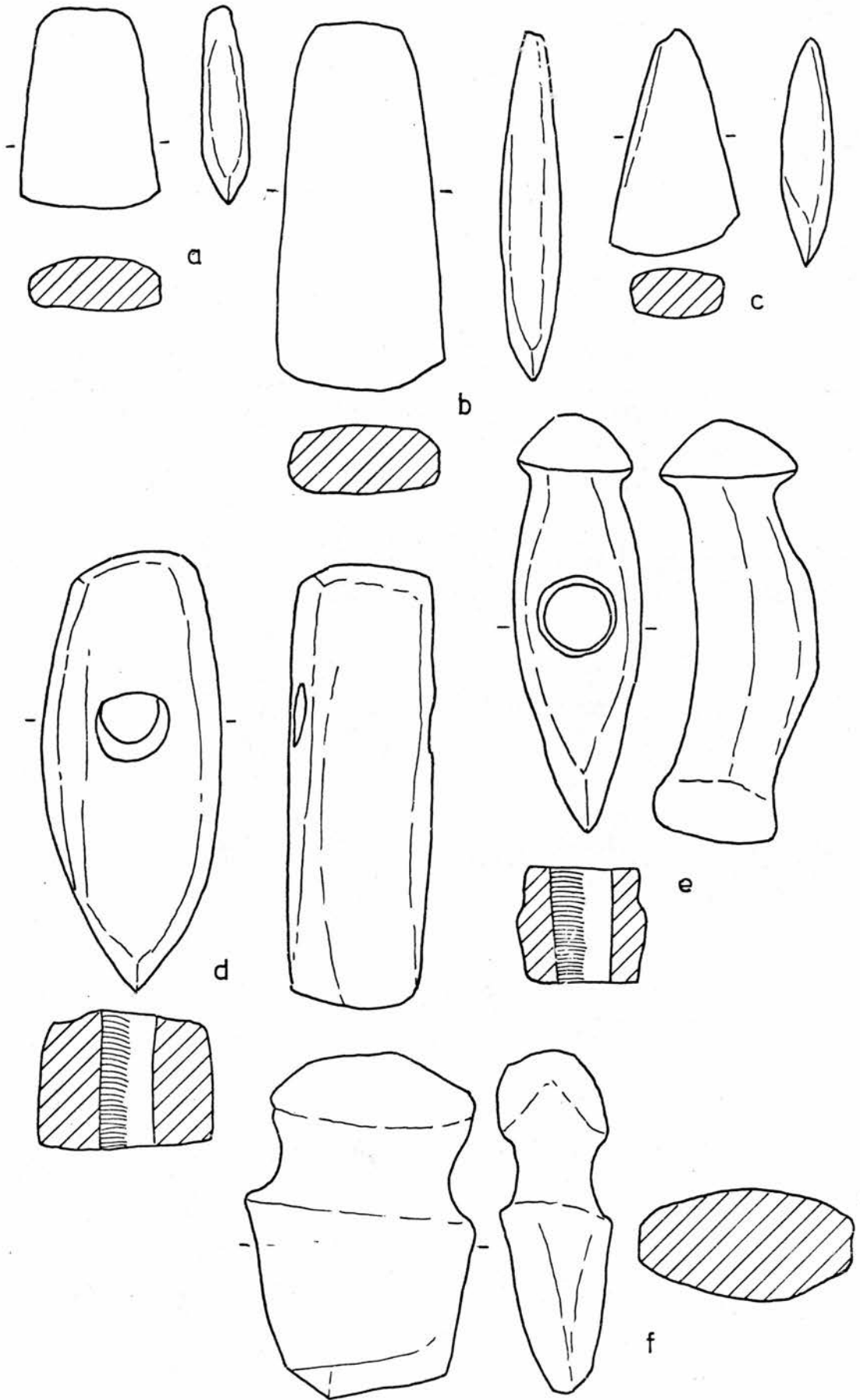
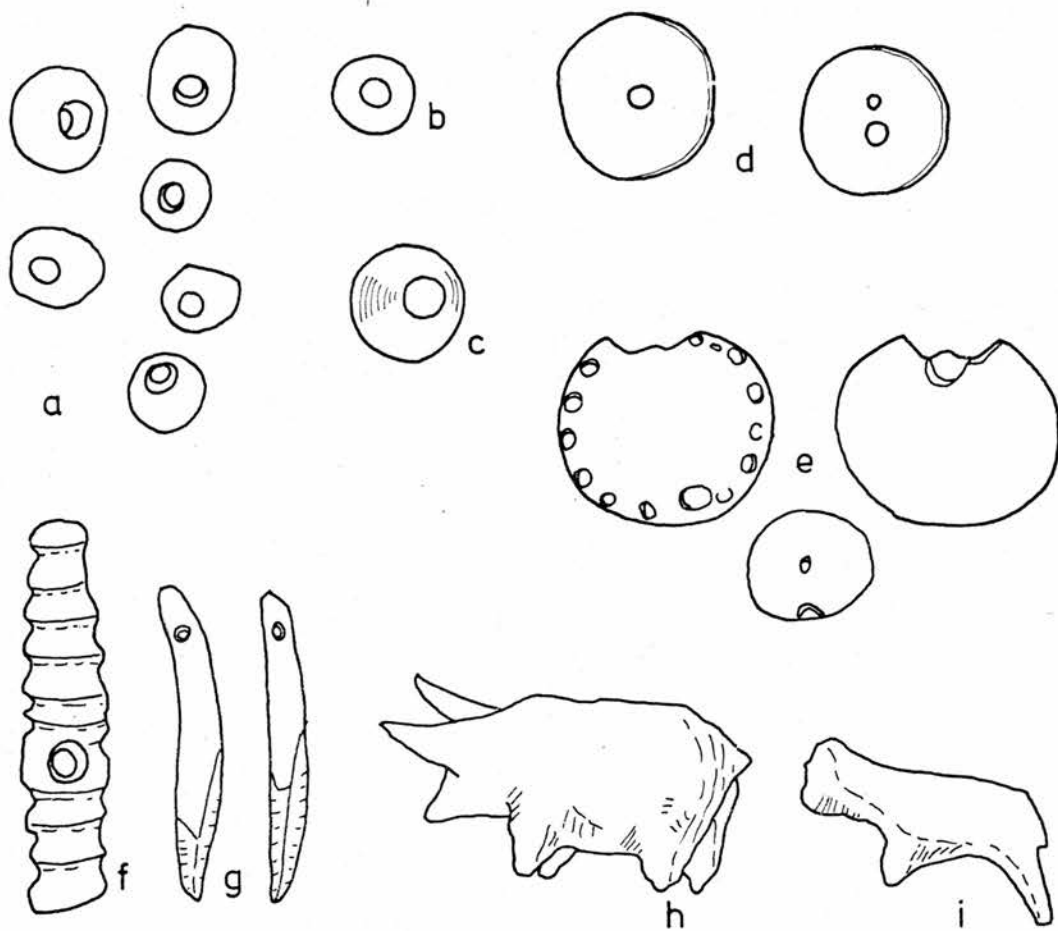
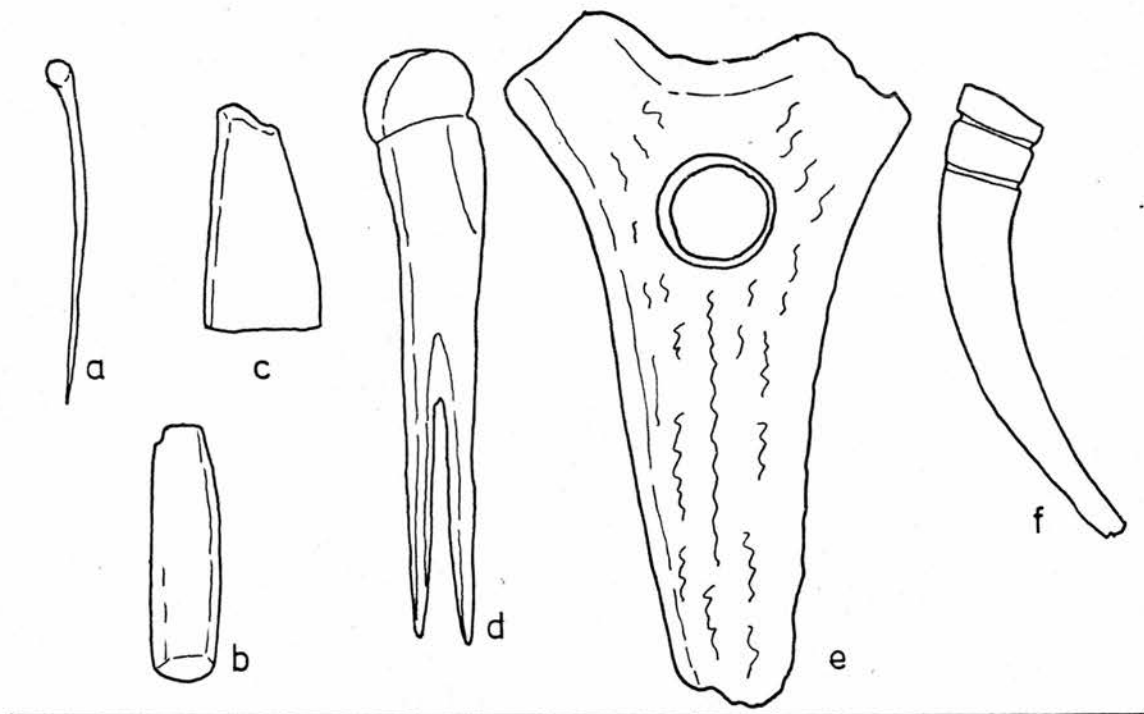


Fig. 22. Stone artifacts, after Reitinger (1968).



Top: Fig. 23. Artifacts of bone and antler. Scale 2:3 (a-c);
1:2 (d-f).

Bottom: Fig. 24. Ornaments. Scale 2:3 (a,d,e,g); 1:1 (b,c,e,f);
i,k after Reitingen. (1968).

Boleraz and
Baden Ossarn cultures.

Figs. 25-27

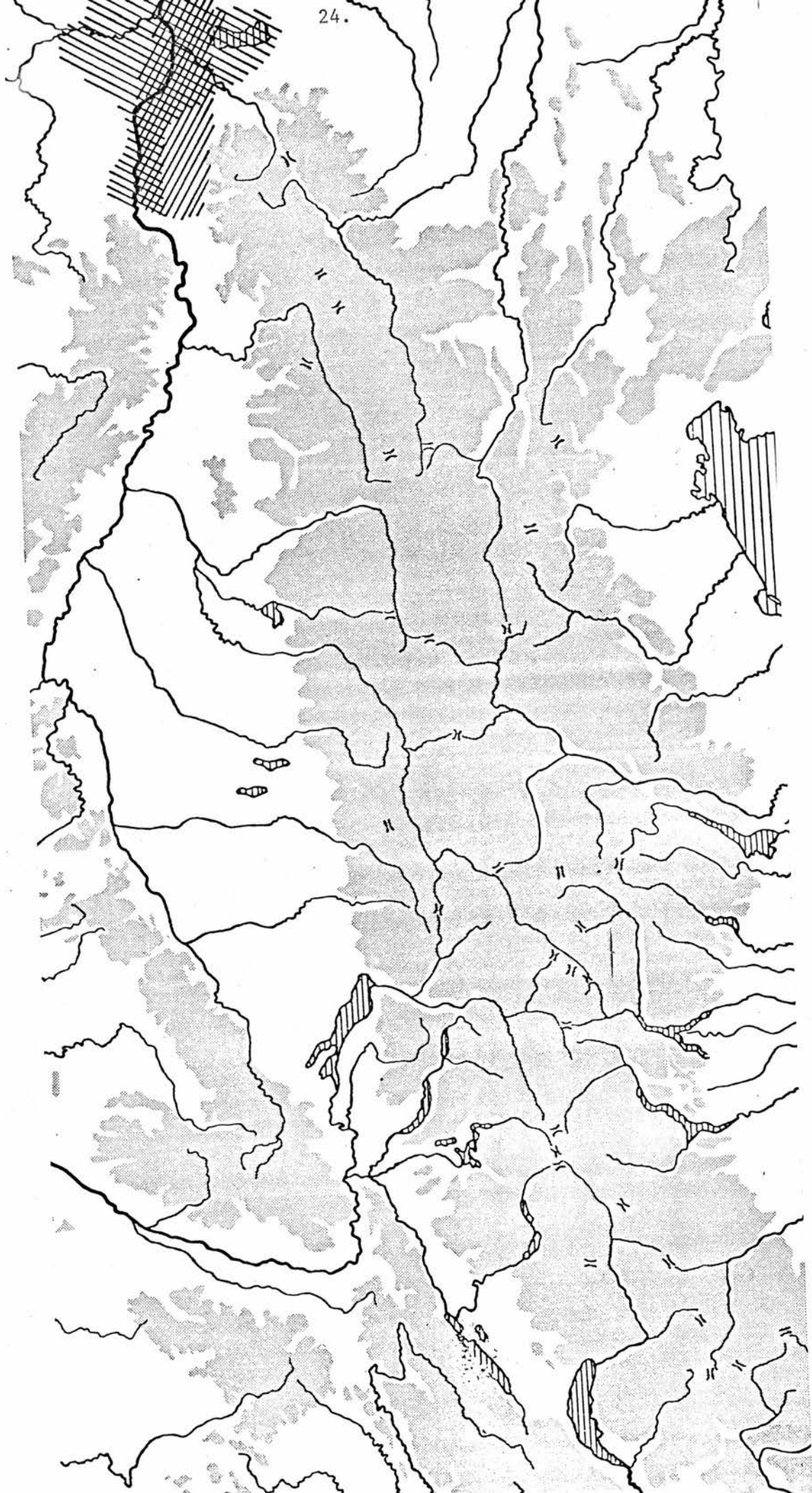


Fig.25. Distribution of the Baden Boleráz (//////) and Baden Ossarn (||||) cultures (after Ruttkay, 1973 & 1975). Scale 1 : 3,000,000.

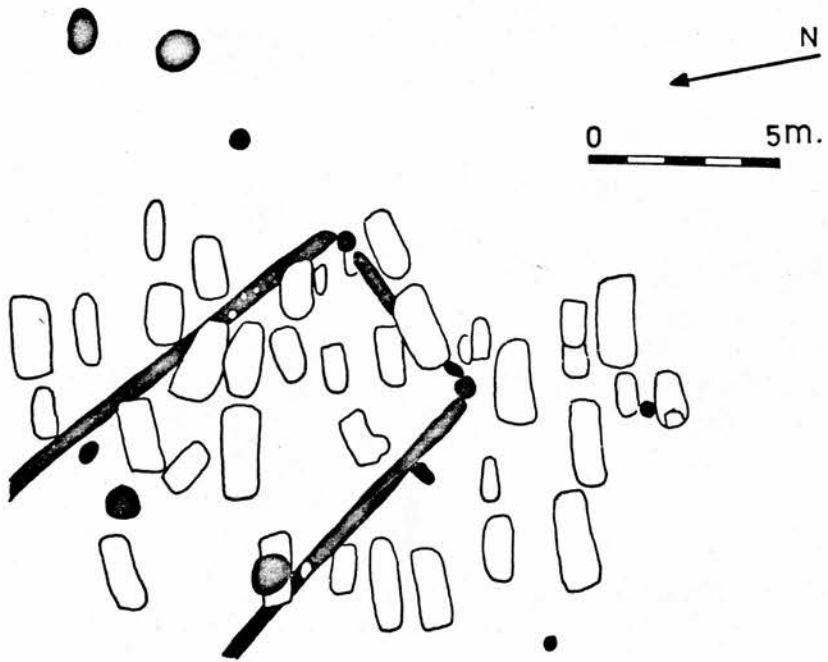


Fig. 26. Ossarn house plan at Pottenbrunn.

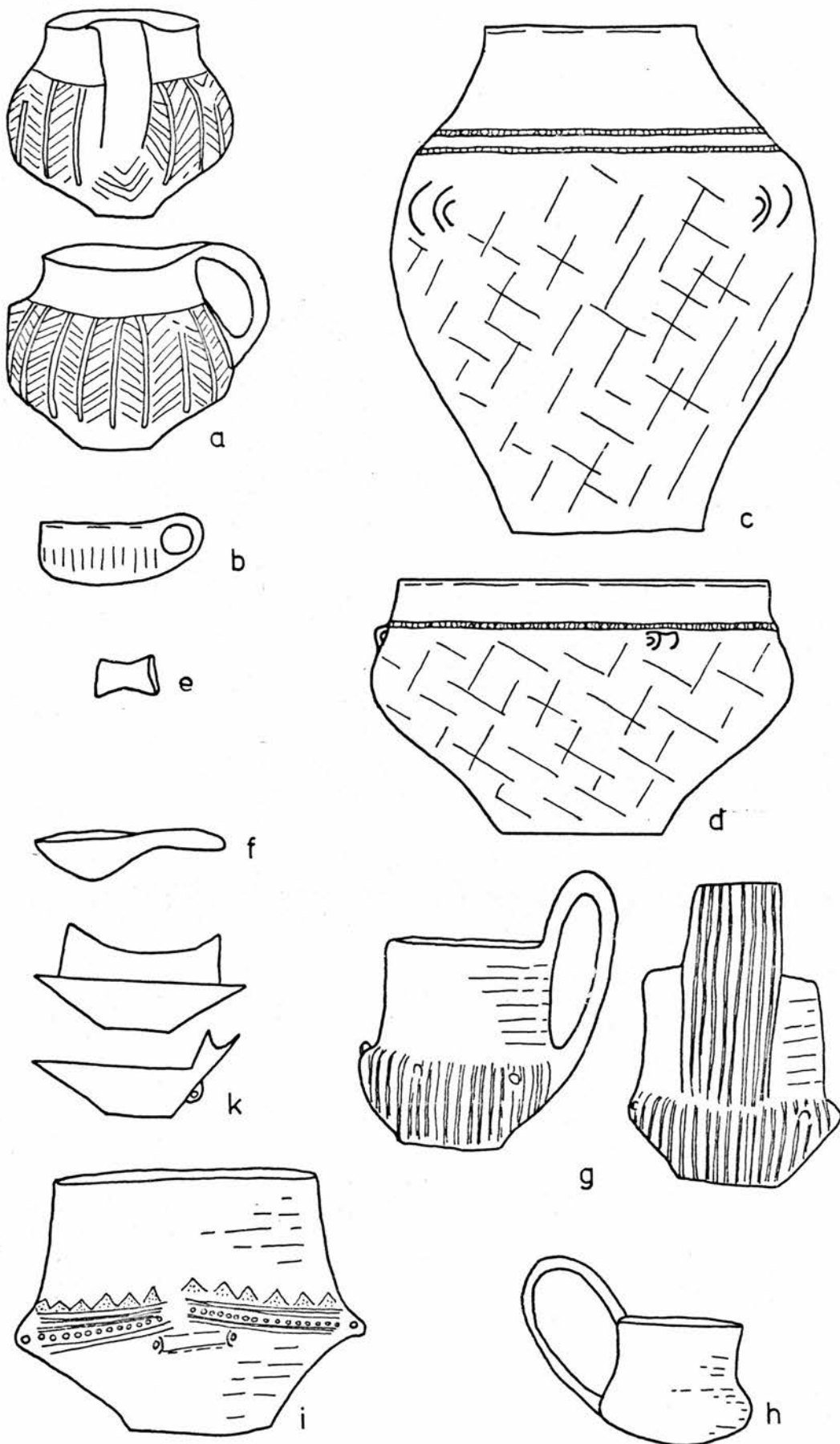


Fig. 27. Boleraç (a-f) and Ossarn pottery (g-k).
Scale 1:2 (a-i) ; 1:3 (k).

Horgen
culture.
Figs. 28-33

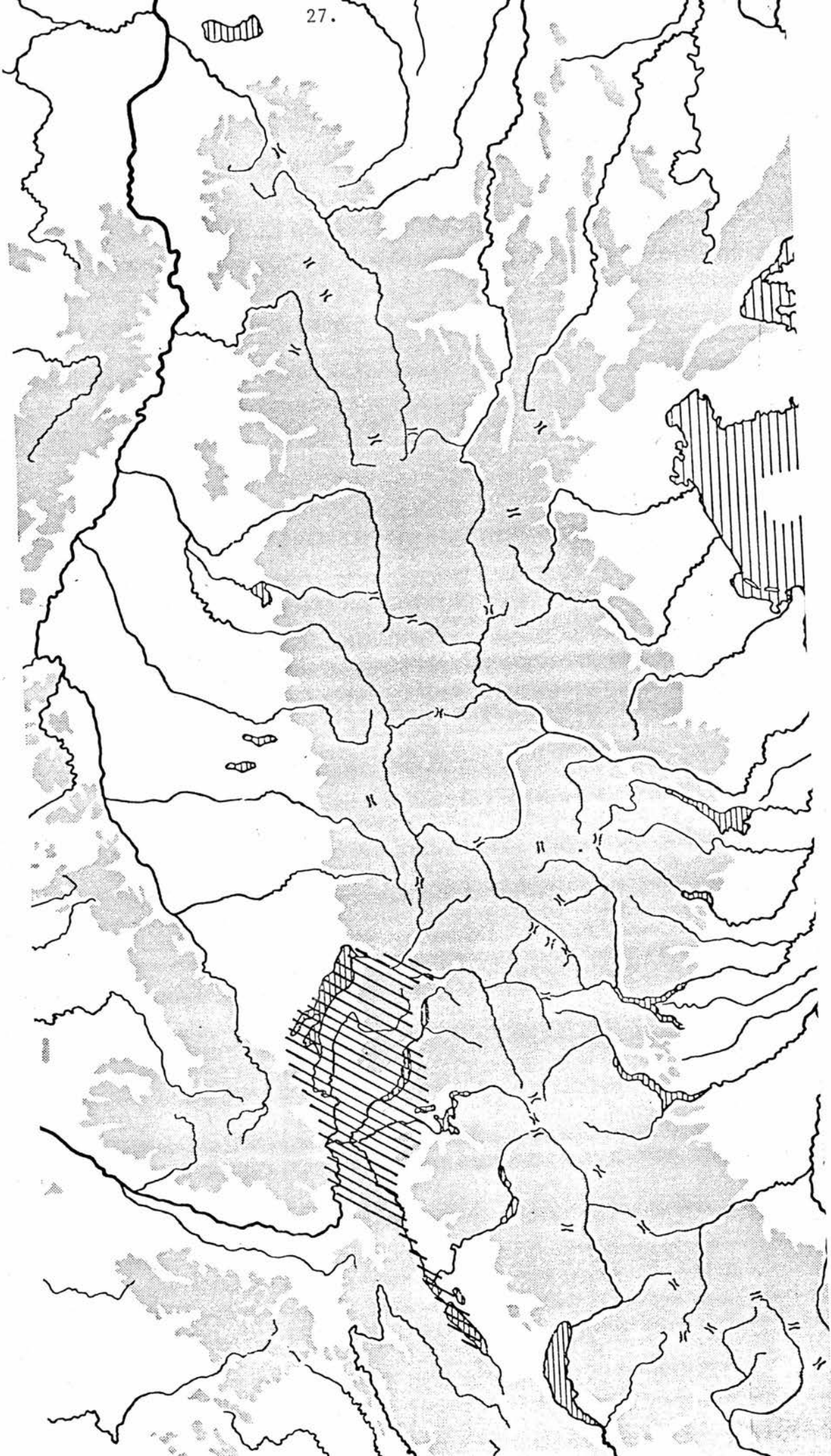


Fig.28. Distribution of the Horgen culture (after Itten, 1970). Scale 1:3,000,000.

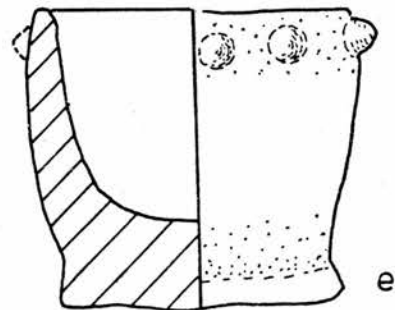
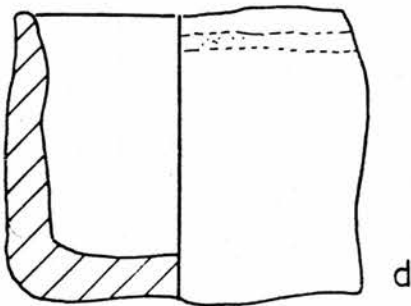
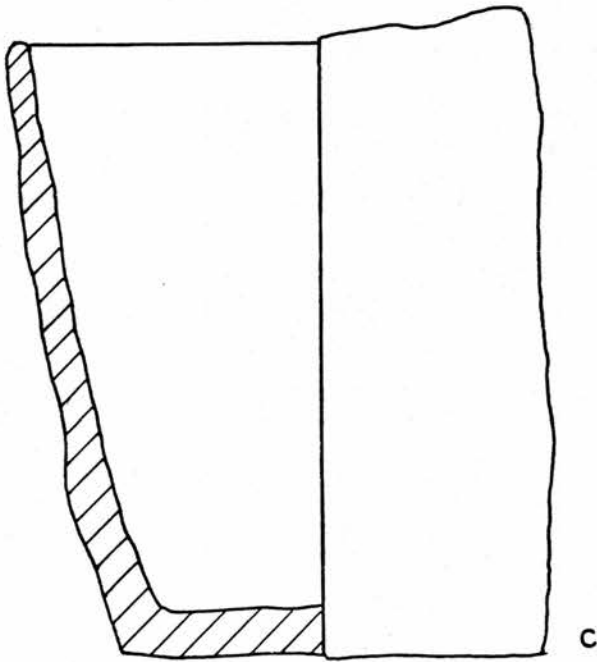
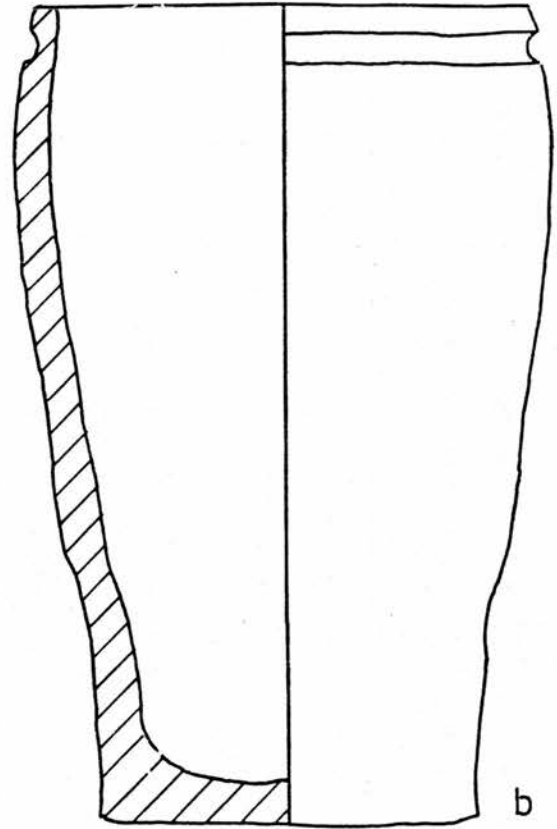
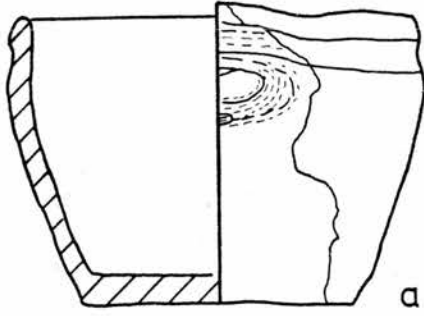
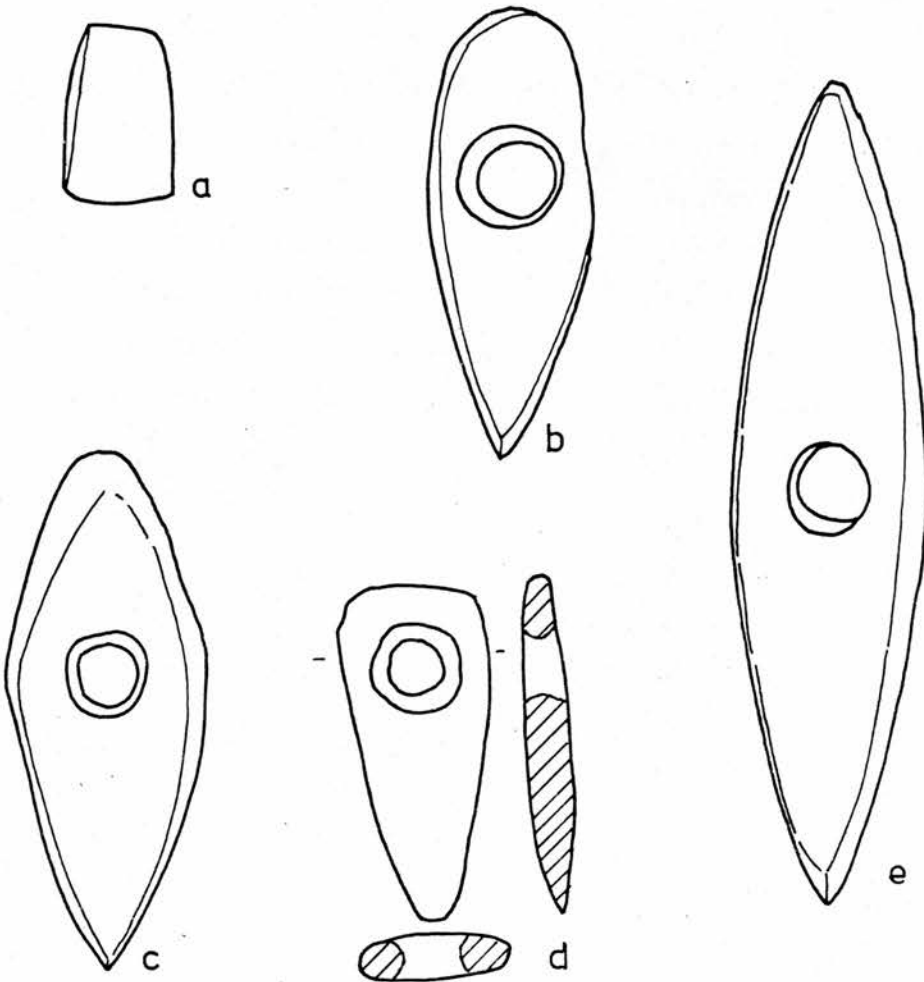
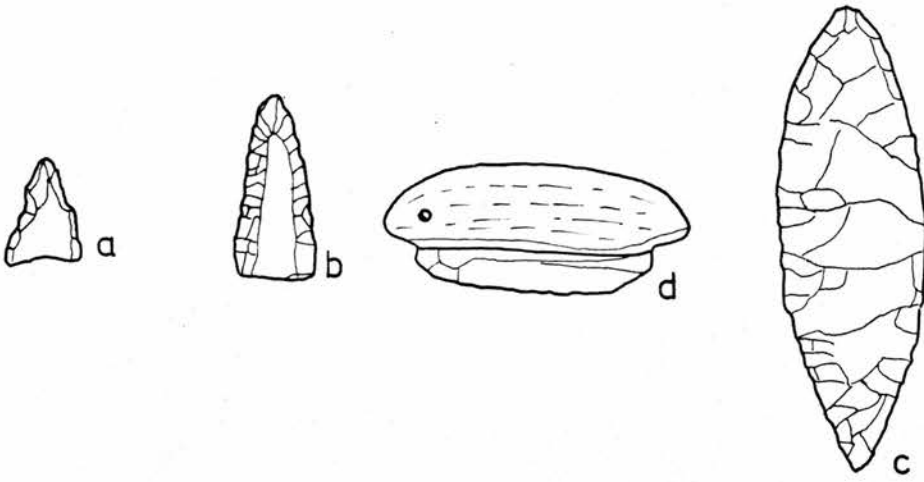
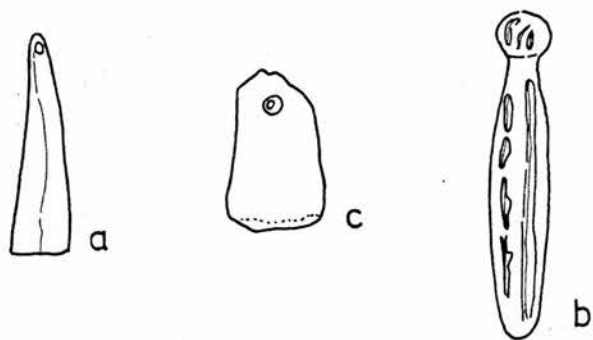
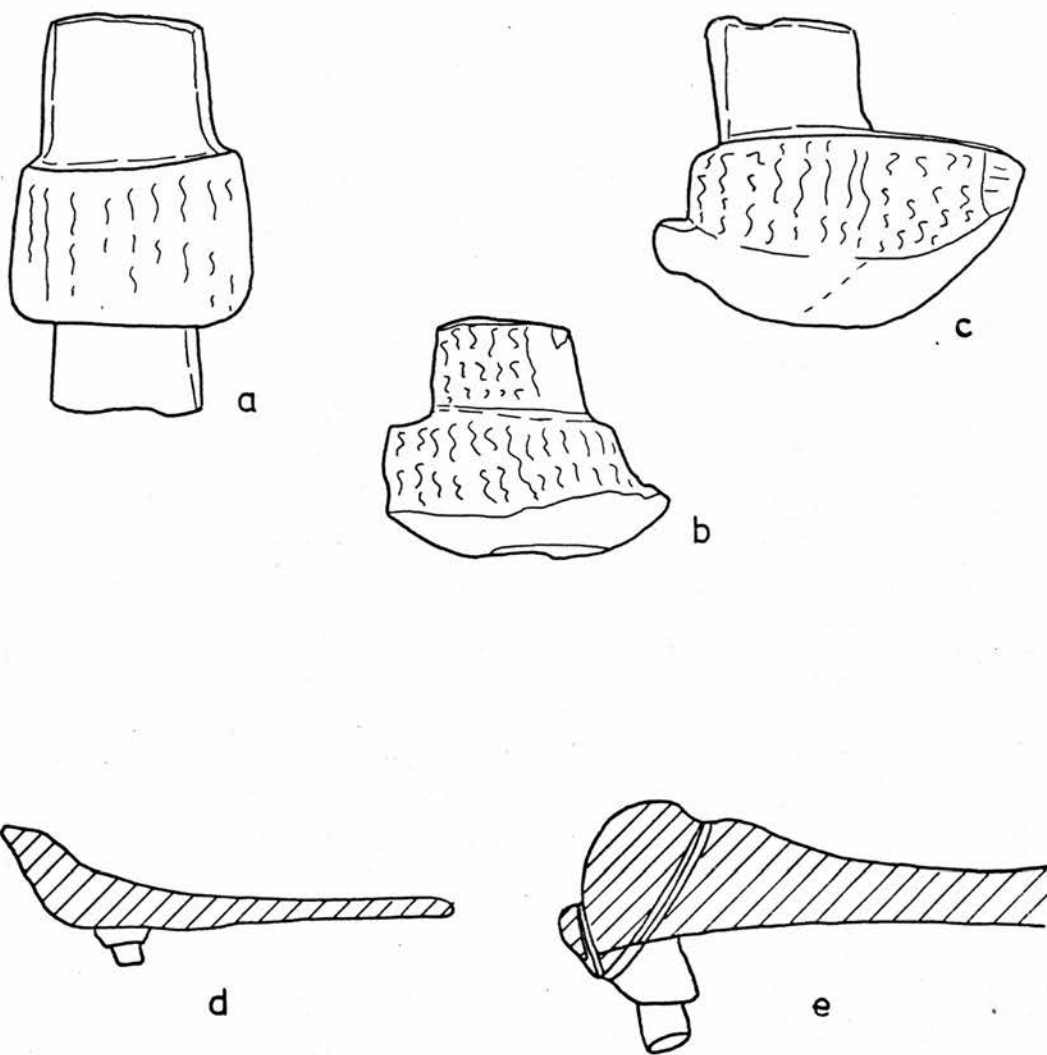


Fig.29. Pottery. Scale 1:4 (a-c); 1:2 (d,e).



Top: Fig. 30. Flint artifacts. Scale 1:2.

Bottom: Fig. 31. Stone artifacts. Scale 1:2 (a-c, e); 1:3 (d).



Top: Fig. 32. Antler artifacts. Scale 1:2 (a-c), d, e after Schwab (1971).

Bottom: Fig. 33. Ornaments. Scale 1:2.

Lüscherz
culture.

Figs. 34-38



Fig. 34. Distribution of the Lüscherz culture (after Strahm, 1966). Scale 1 : 3,000,000.

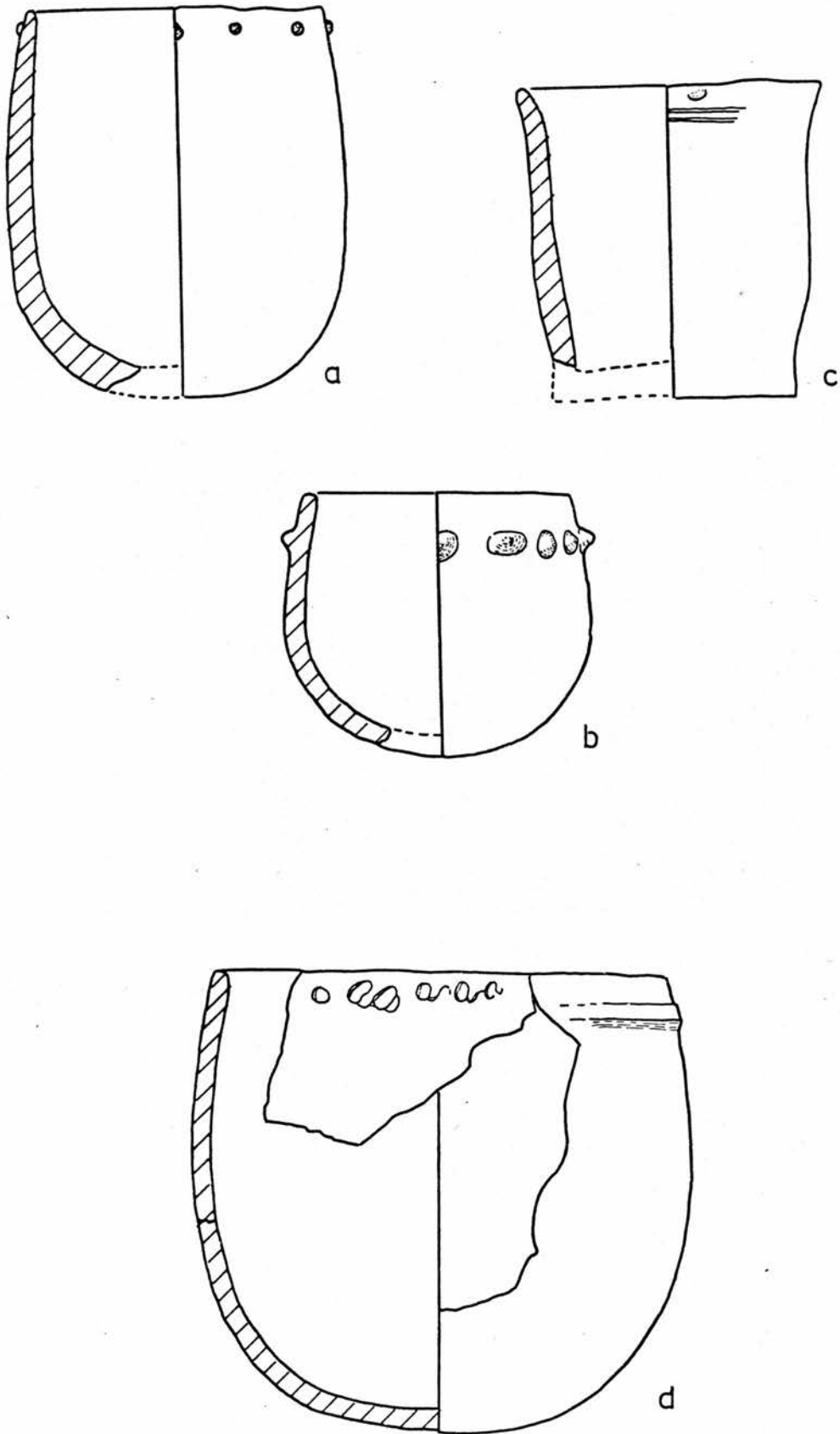
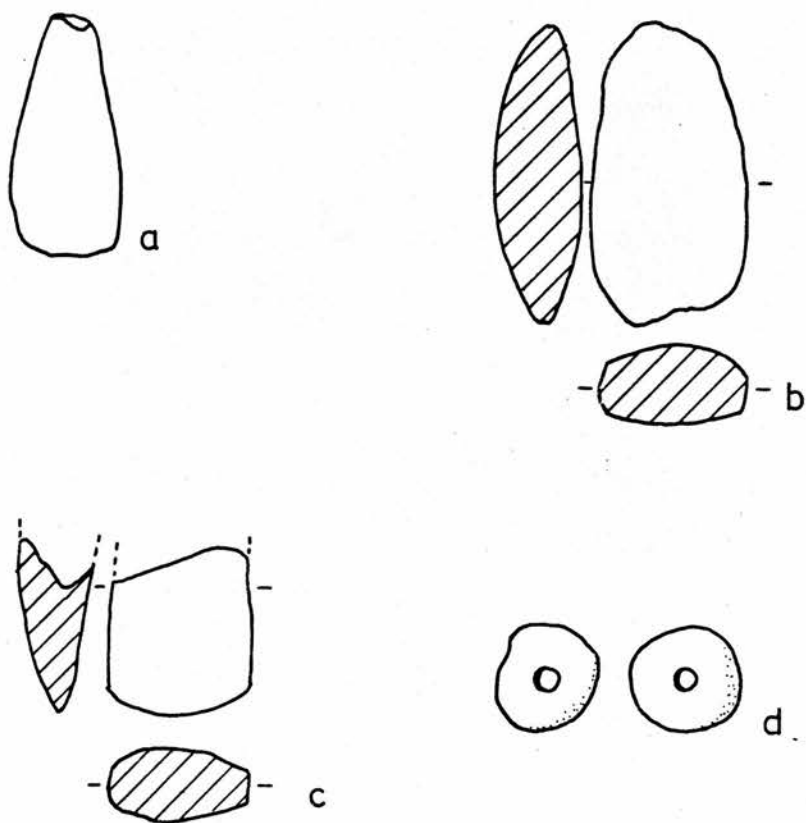
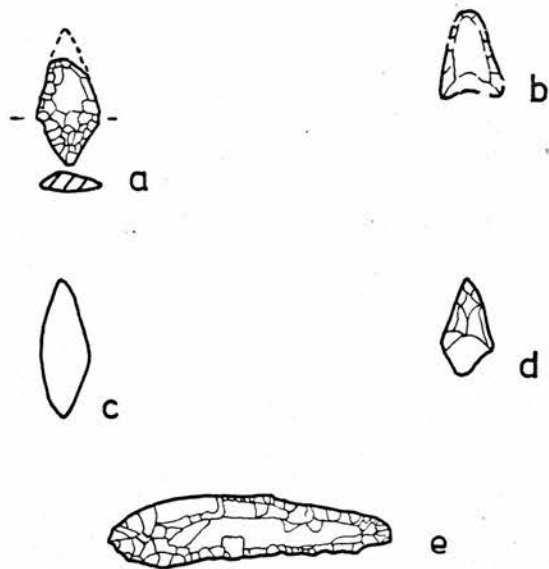


Fig. 35. Pottery. Scale 1:4 (a,c); 1:3 (b,d).



Top: Fig. 36. Flint artifacts. Scale 1:3.

Bottom: Fig. 37. Stone artifacts. Scale 1:3.

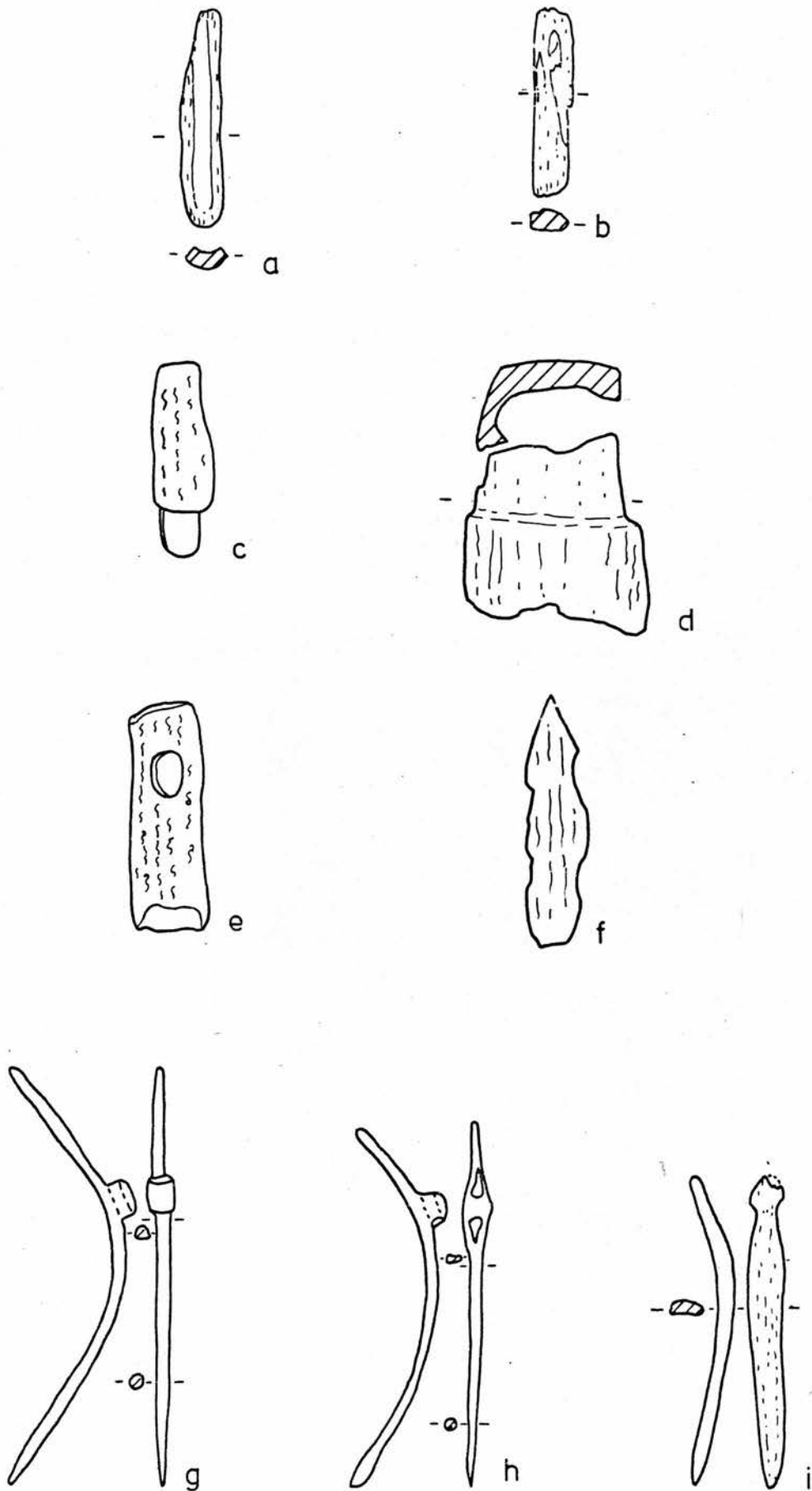


Fig.38. Artifacts of bone and antler. Scale 1:3.

Auvernier
culture.

Figs.39-44

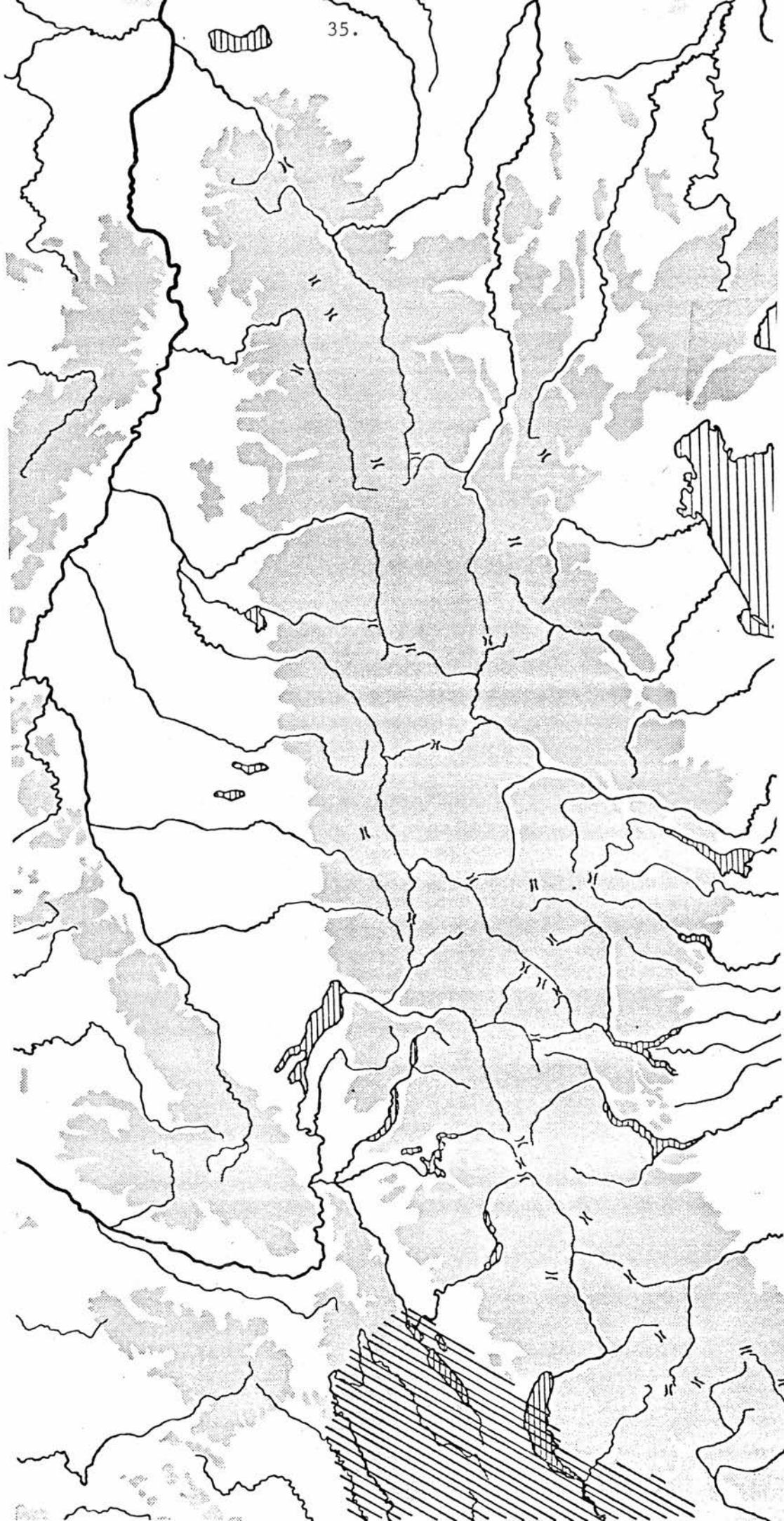


Fig. 39. Distribution of the Saône-Rhône culture complex, including the Auvernier culture (after Strahm, 1975). Scale 1 : 3,000,000.

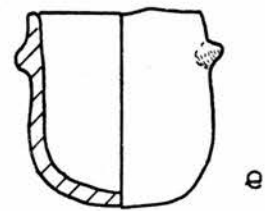
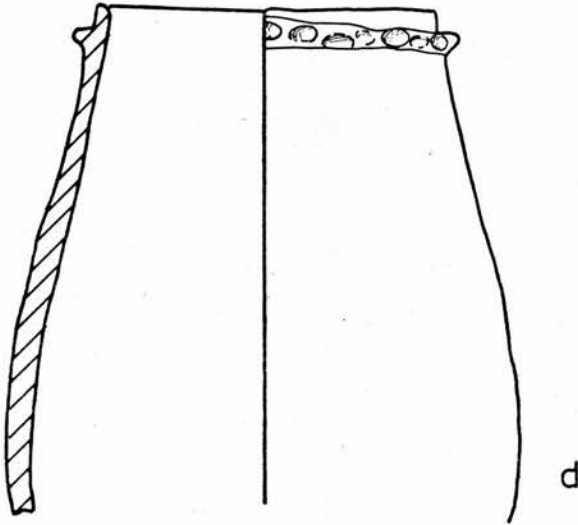
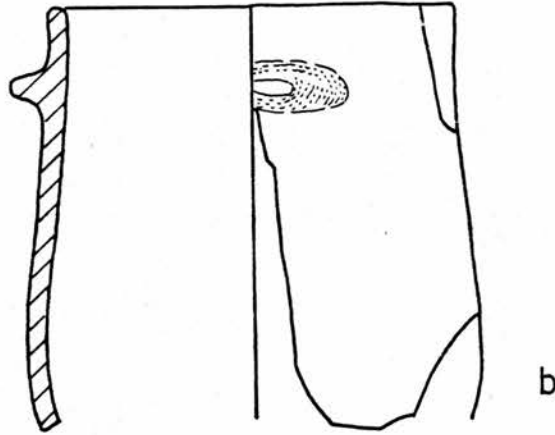
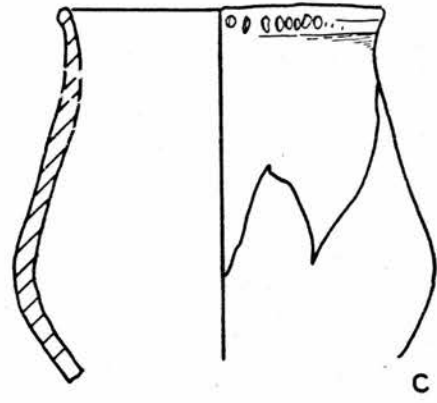
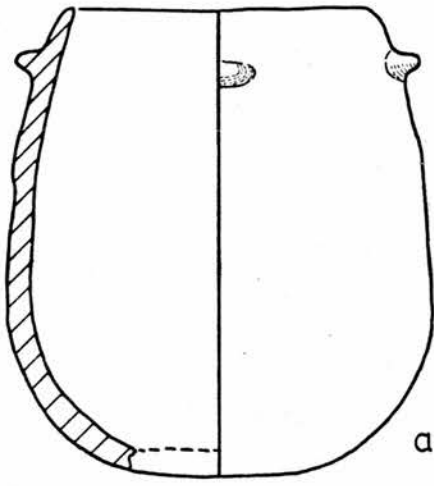


Fig. 40. Pottery. Scale 1:5.

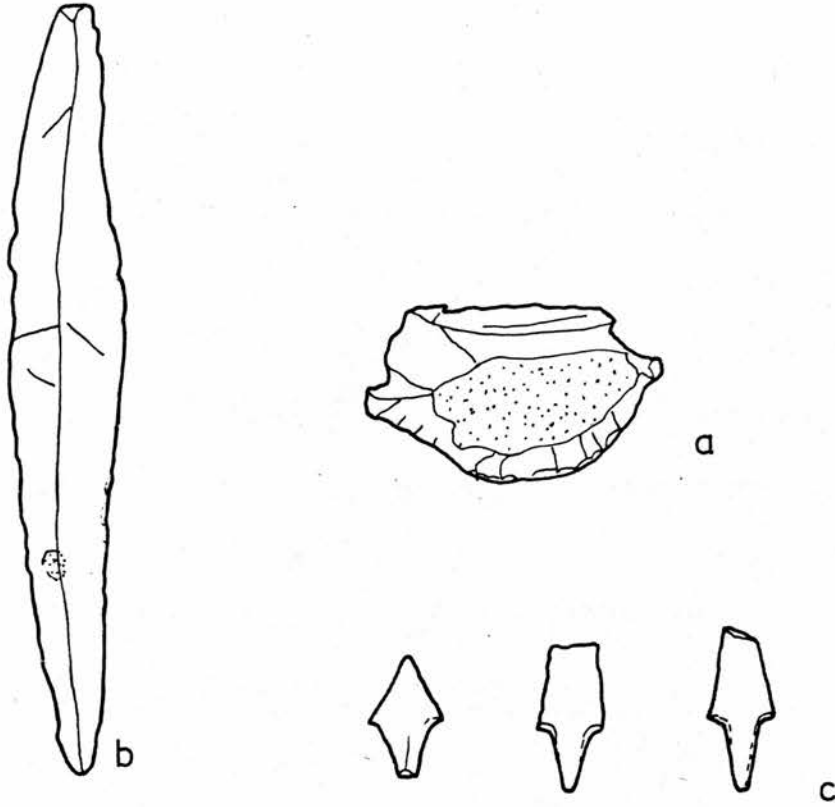
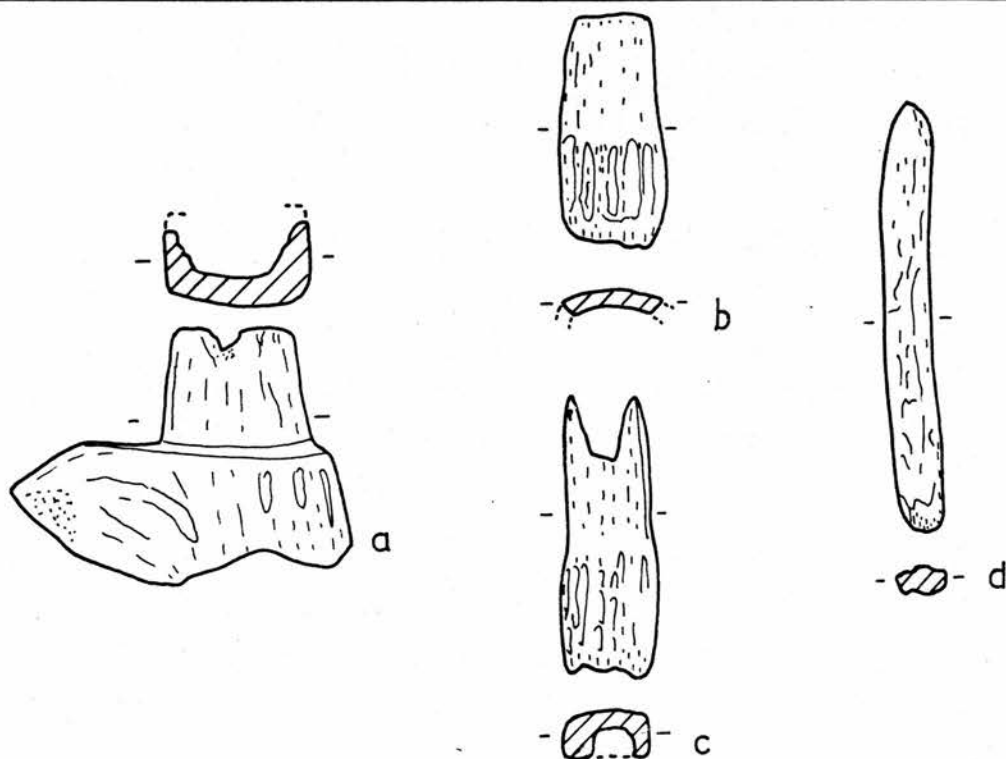
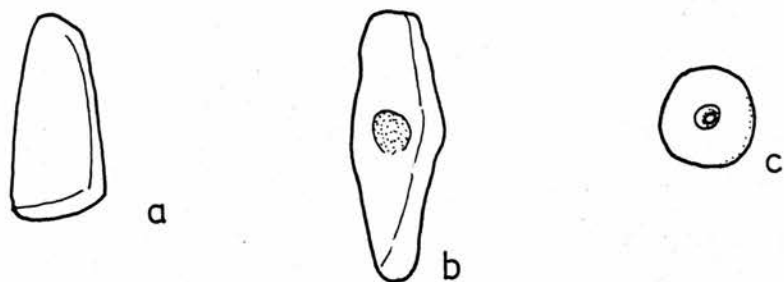


Fig. 41. Flint artifacts. Scale 1:2.



F

Top: Fig. 42. Stone artifacts. Scale 1:3.

Bottom: Fig. 43. Antler artifacts. Scale 1:2.

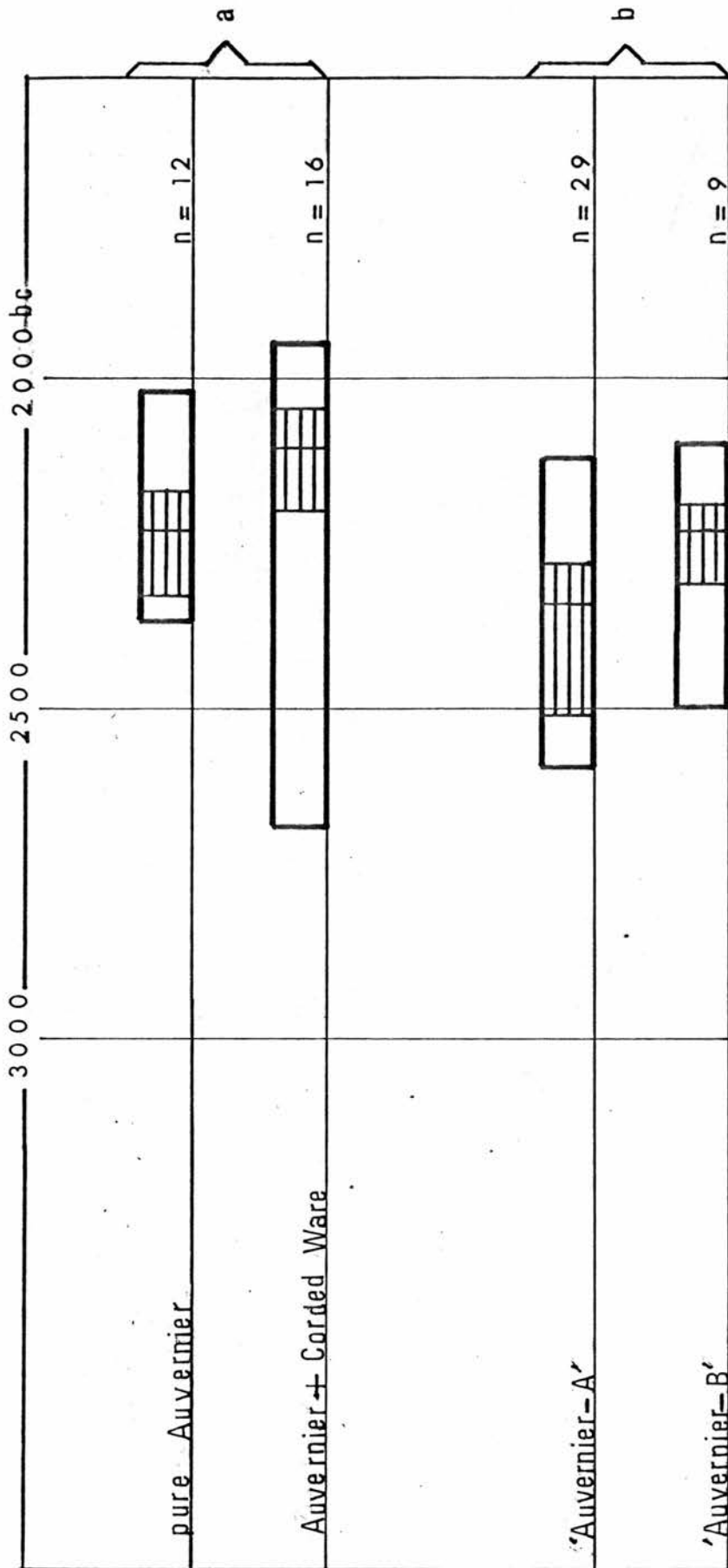


Fig. 44a. Interquartile ranges (horizontal hatching) of uncorrected ^{14}C dates for pure Auvernier and Auvernier/Corded Ware culture. For individual dates cf. App. I.

b. Interquartile ranges of the Auvernier culture at Yverdon. The age determinations are based on a ^{14}C half-life of 5730 years and the dates are corrected for isotopic fractionation. Paper given at the 9. International Radiocarbon Conference, Los Angeles, 1976 (Beer, Giertz, Möll, Oeschger, Riesen and Strahm).



Corded Ware
cultures.

Figs. 45-53

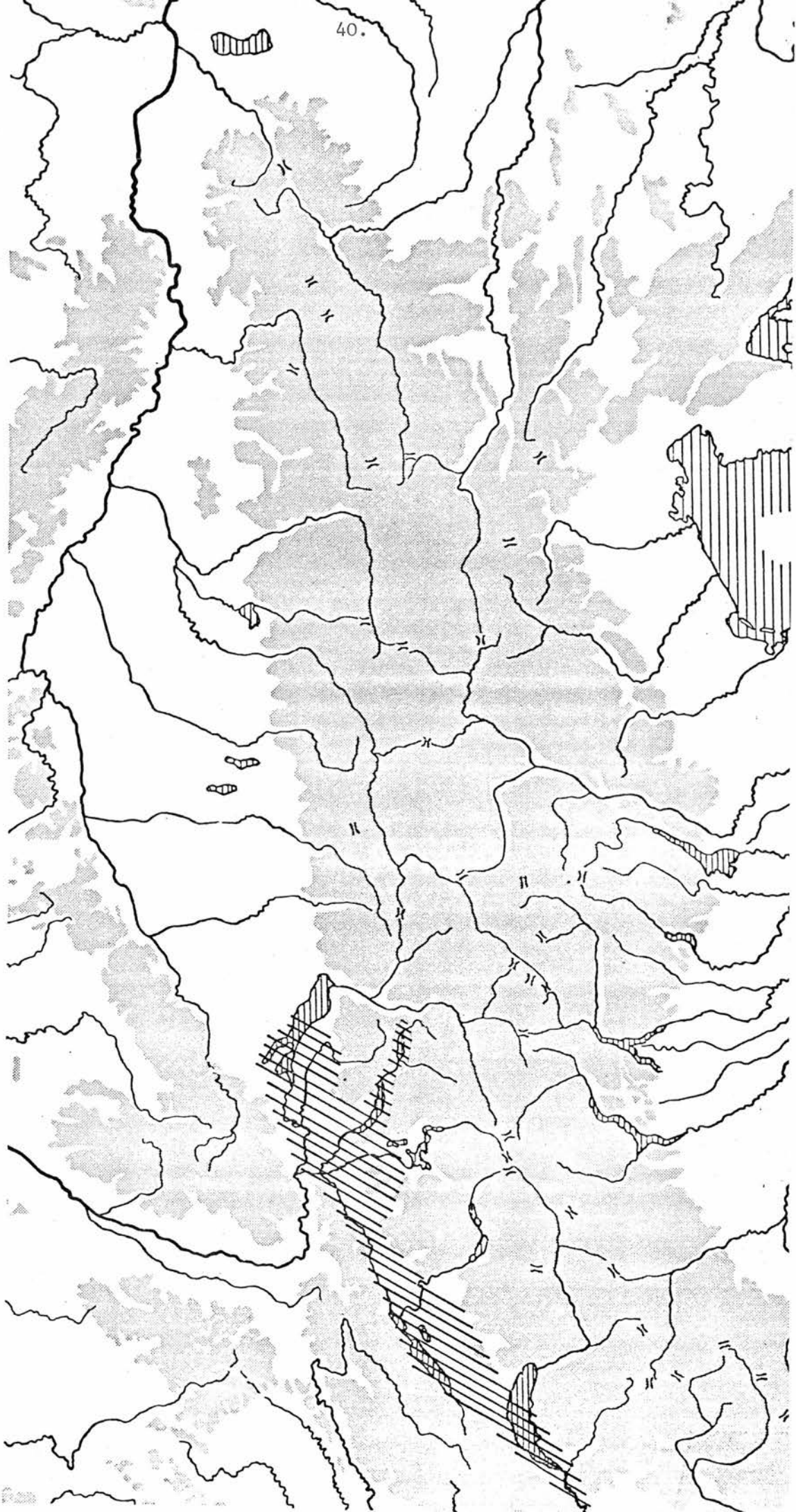


Fig.45. Distribution of the Corded Ware culture (after Strahm, 1971). Scale 1 : 3,000,000.

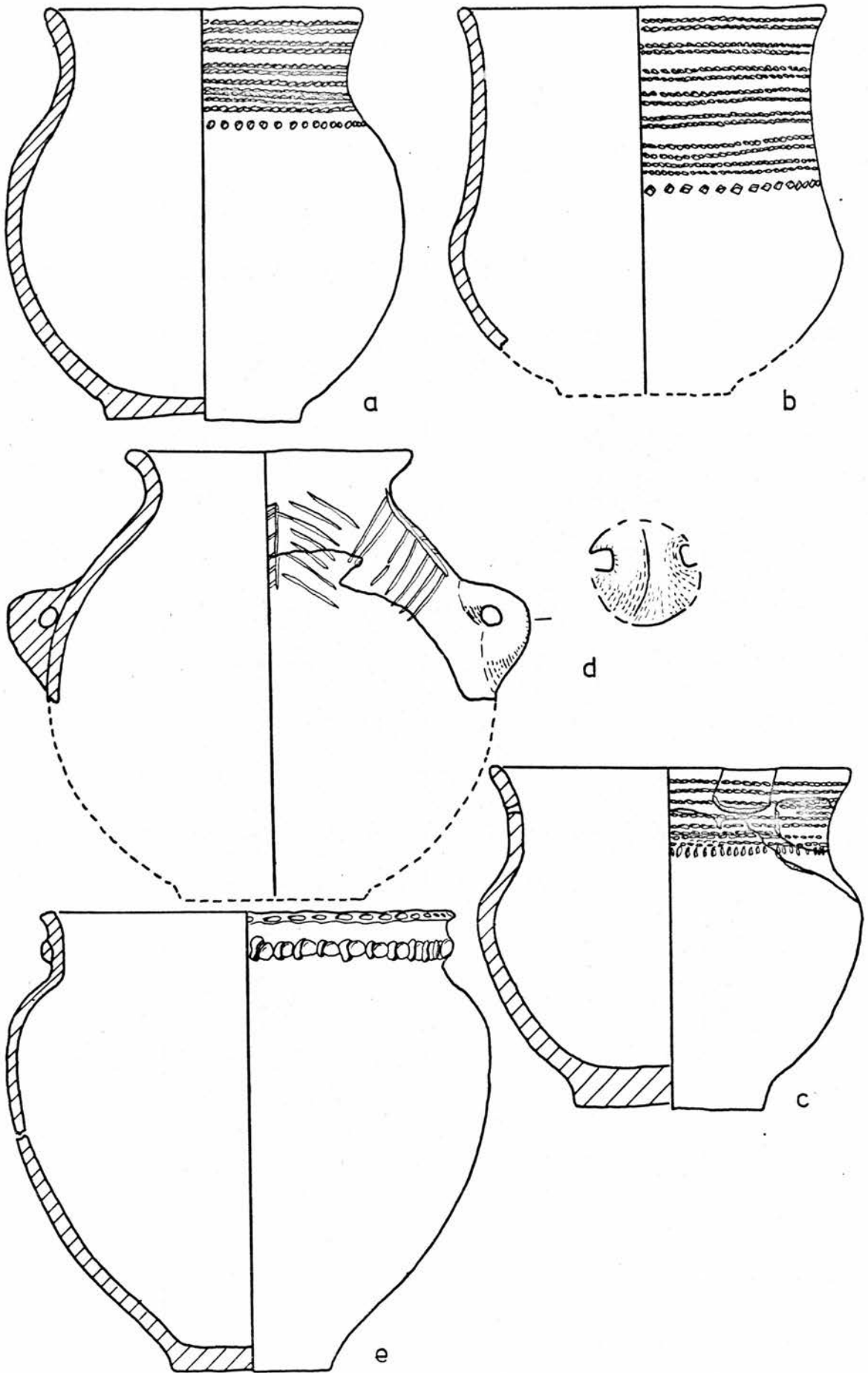
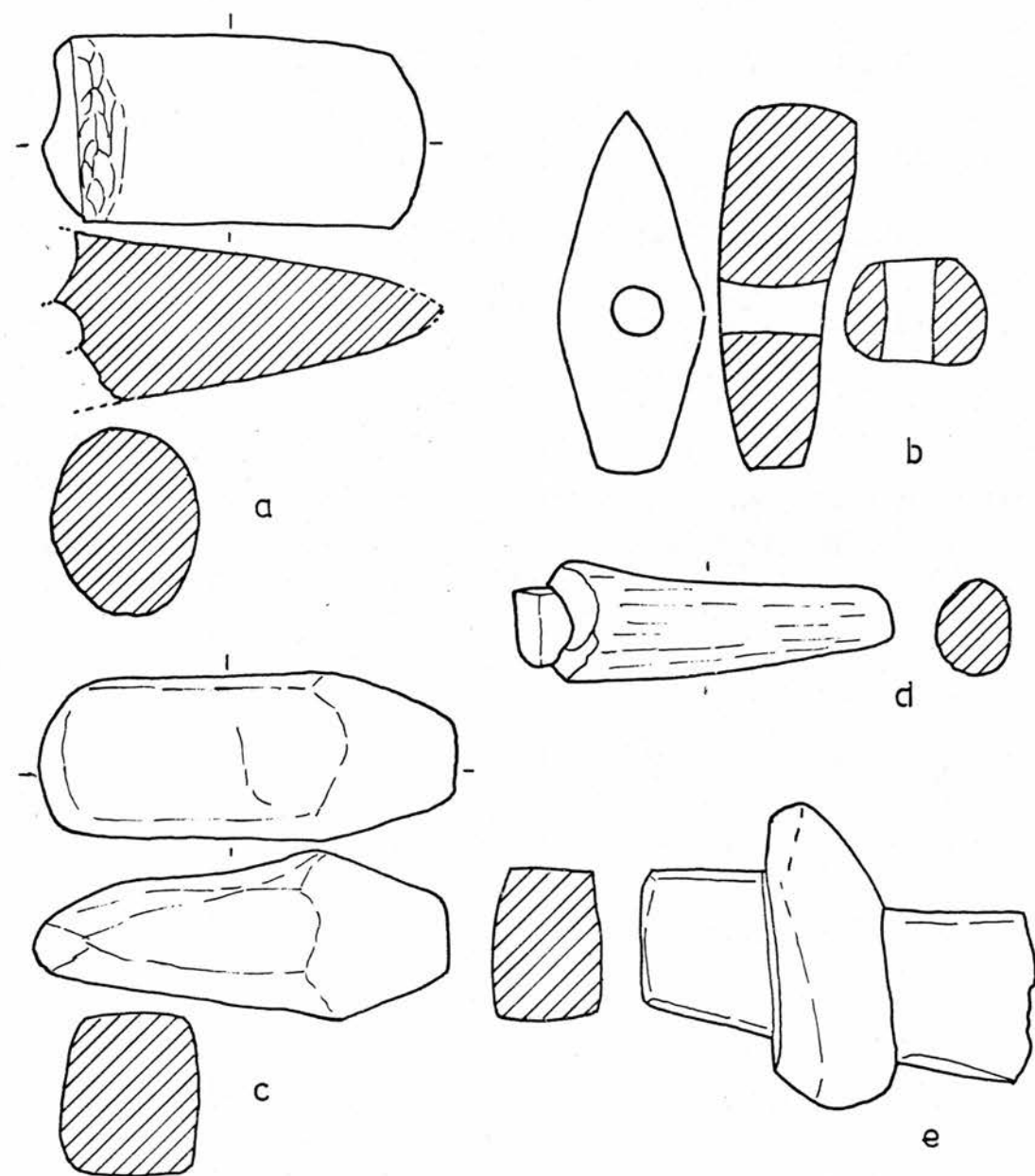
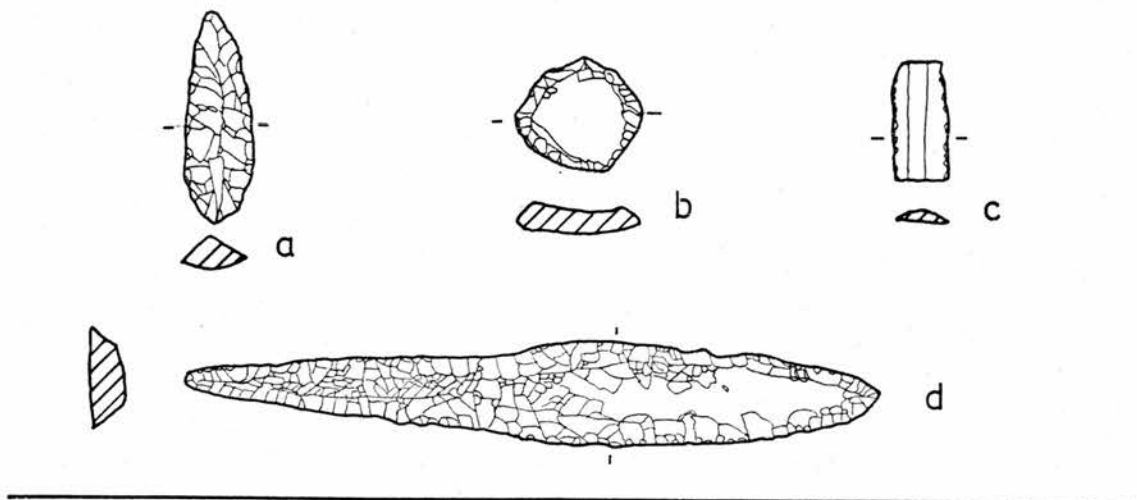
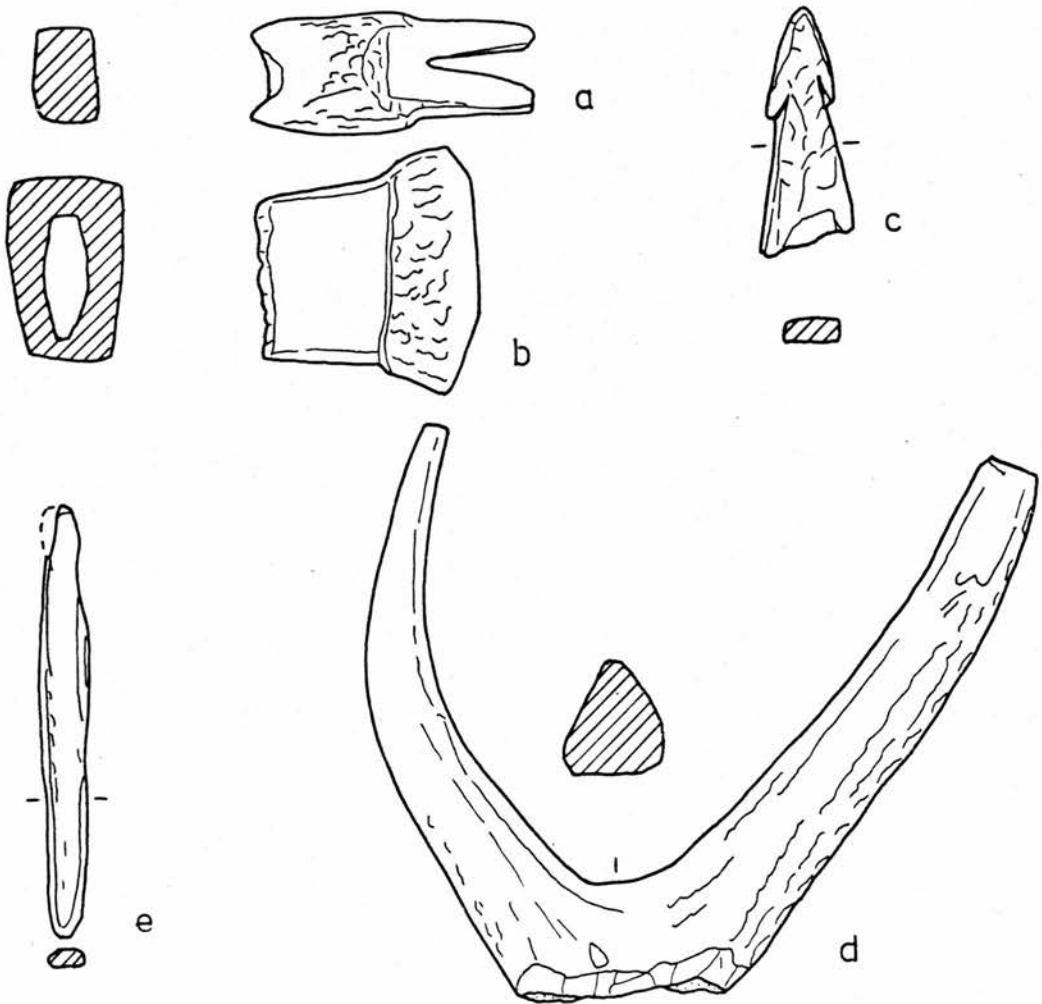
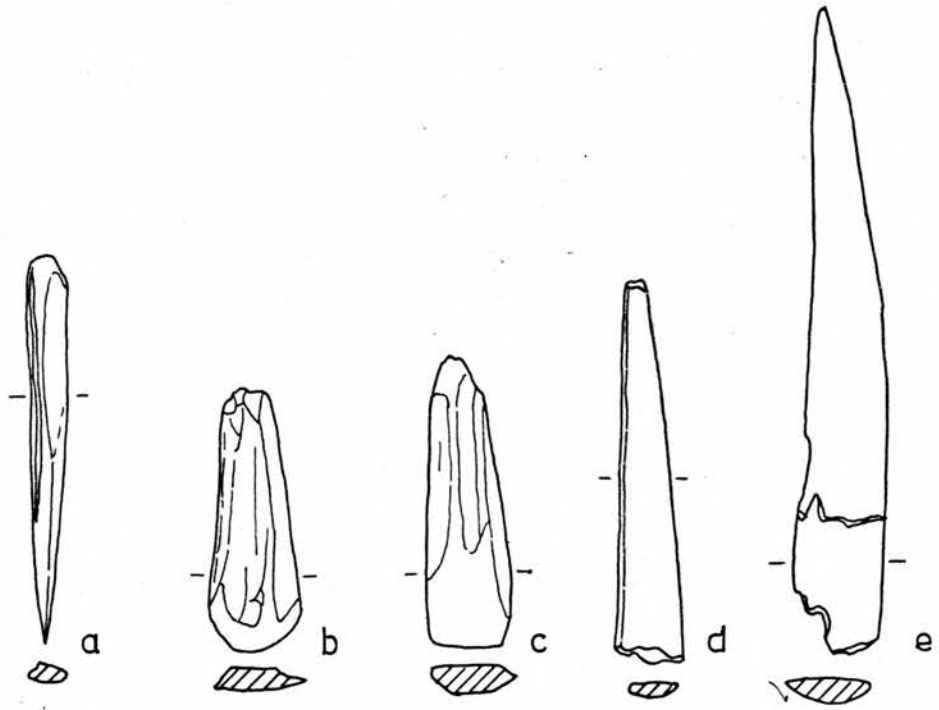


Fig.46. Pottery. Scale 1:2 (a-d); 1:4 (e).



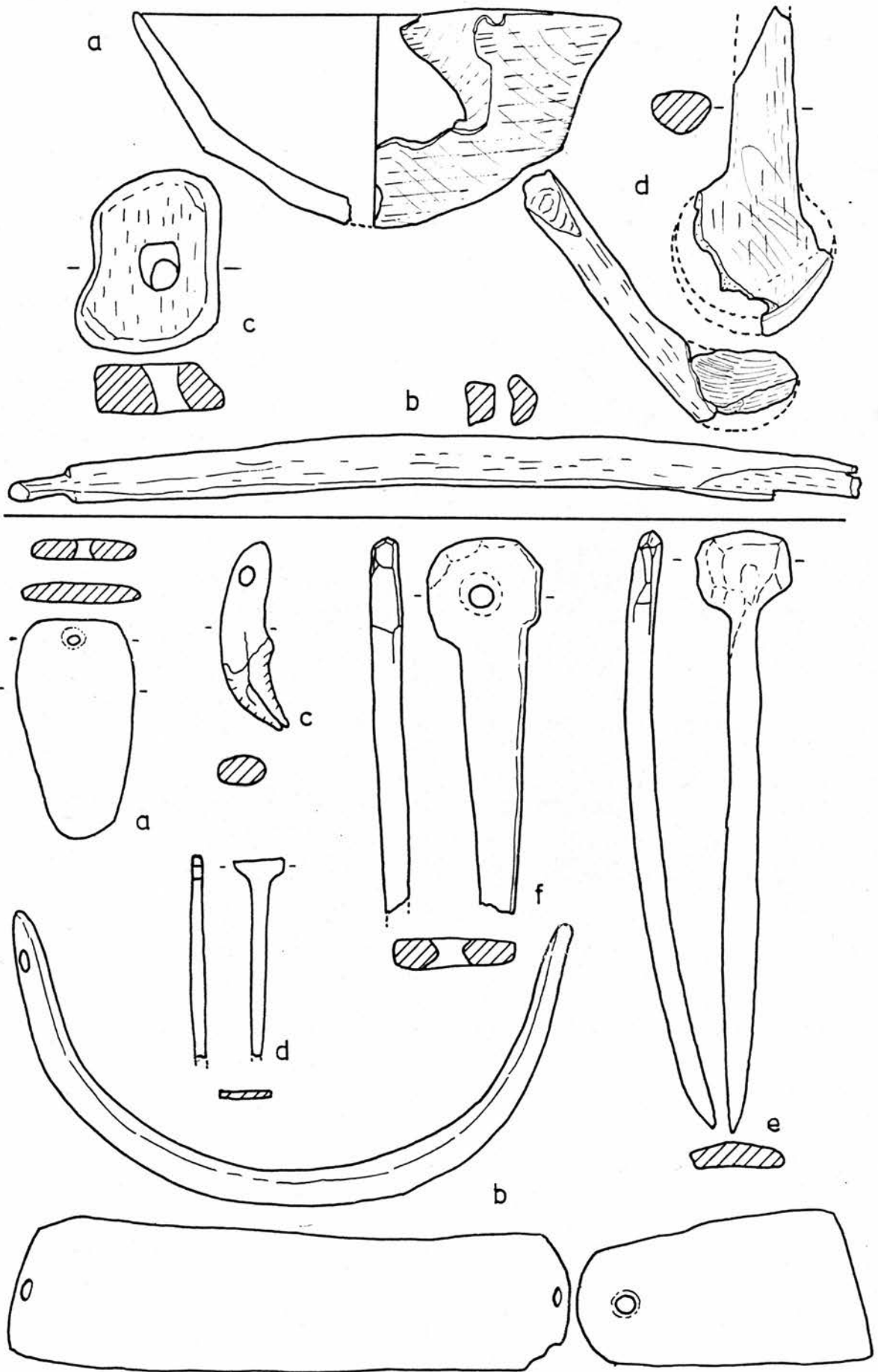
Top: Fig. 47. Flint artifacts. Scale 1:2.

Bottom: Fig. 48. Stone artifacts. Scale 1:2 (a, c-e); 1:3 (b).



Top: Fig.49. Bone artifacts. Scale 1:2.

Bottom: Fig.50. Antler artifacts. Scale 1:2.



Top: Fig. 51. Wood artifacts. Scale 1:2.

Bottom: Fig. 52. Ornaments. Scale 1:1.

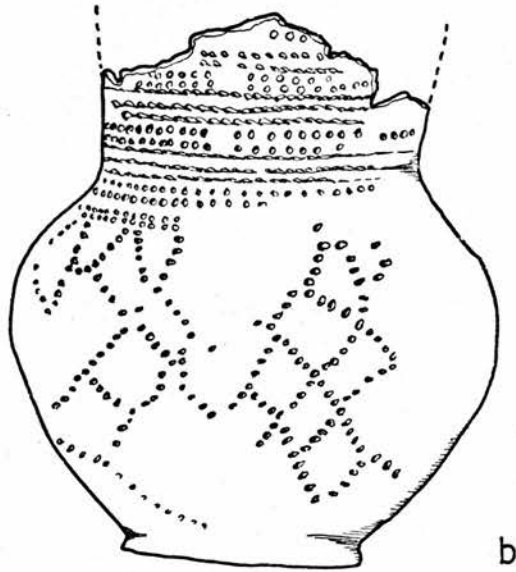
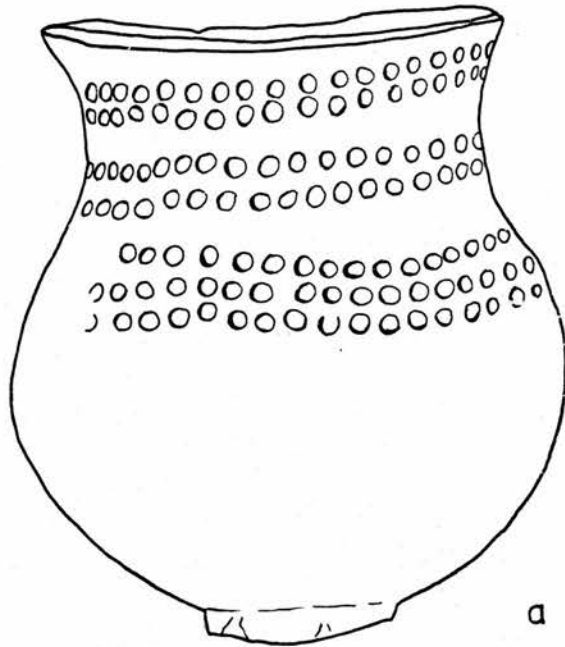


Fig. 53. Pottery of Bavarian and Austrian Corded Ware culture.
Scale 1:2.

Illustrations to Chapter III:

Metalfinds.



Fig.54. Distribution of the first copper-using horizon in the northern alpine area.
Scale 1 : 3,000,000.



Fig.55. Distribution of the third copper-using horizon in the northern alpine area.
Scale 1 : 3,000,000.

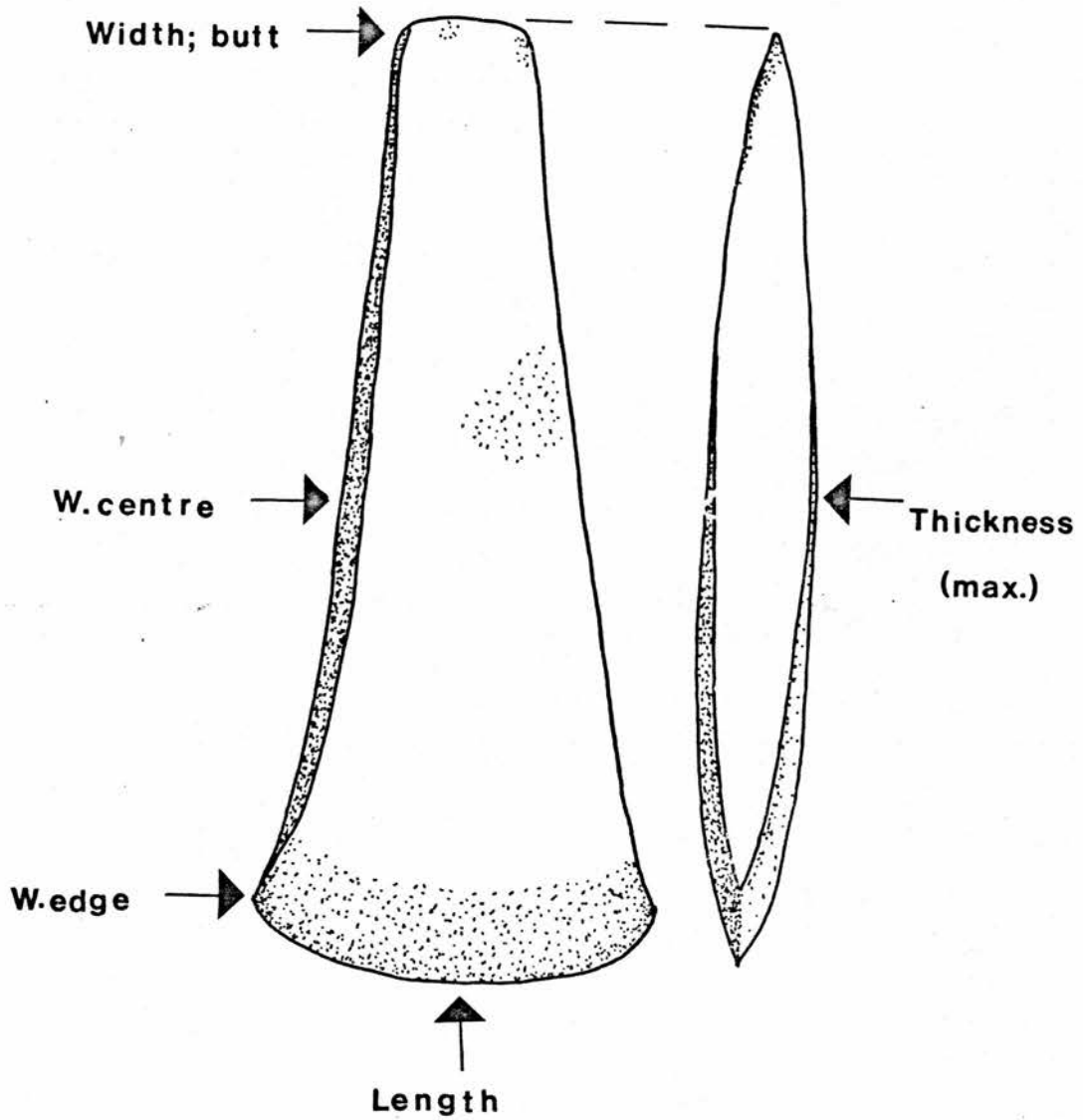


Fig. 56. Drawing indicating where measurements for discriminant analysis were taken.

CLUSTERING ON 'HARD CORE' OF 28 SWISS FLAT AXES.

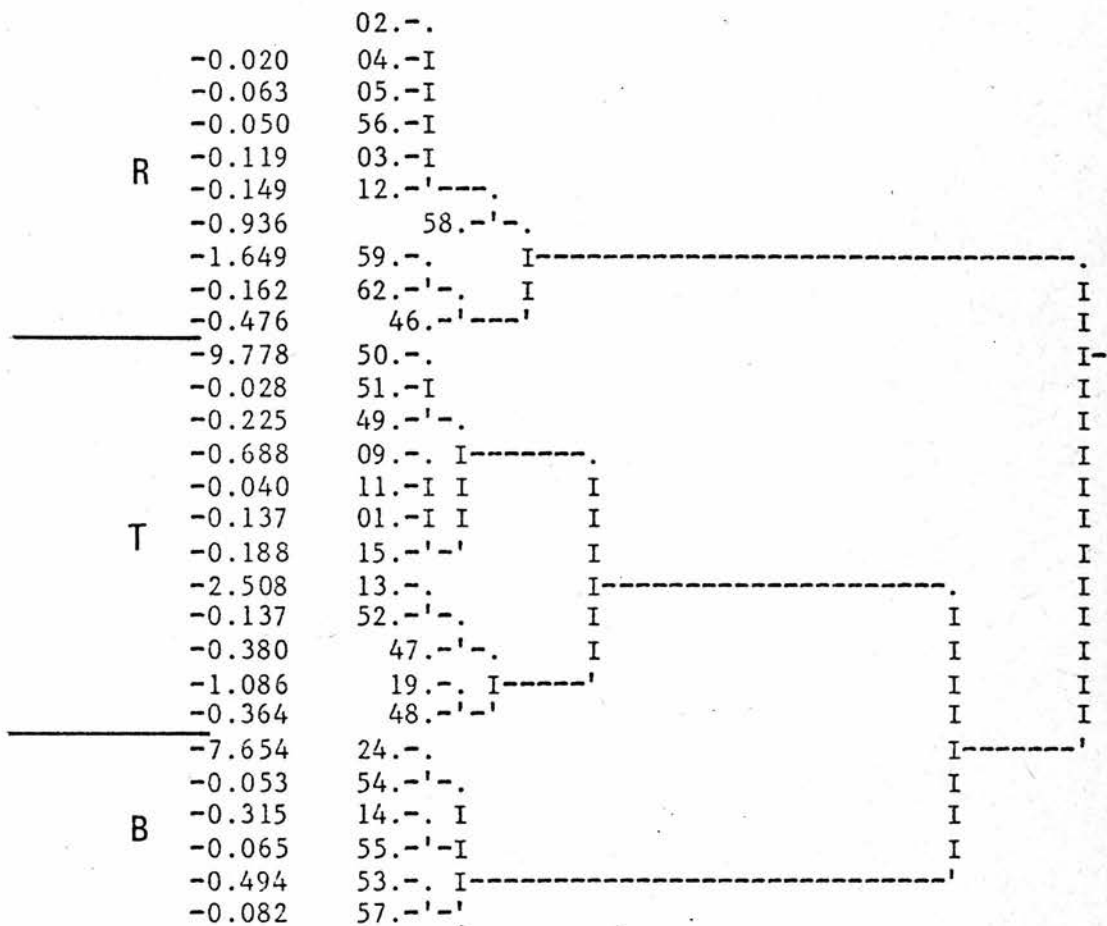


FIG.57 CLUSTERING BY 'NATURE'S GROUPS' ON MATRIX TYPE 7 (PEARSON PRODUCT-MOMENT CORRELATION COEFFICIENT).

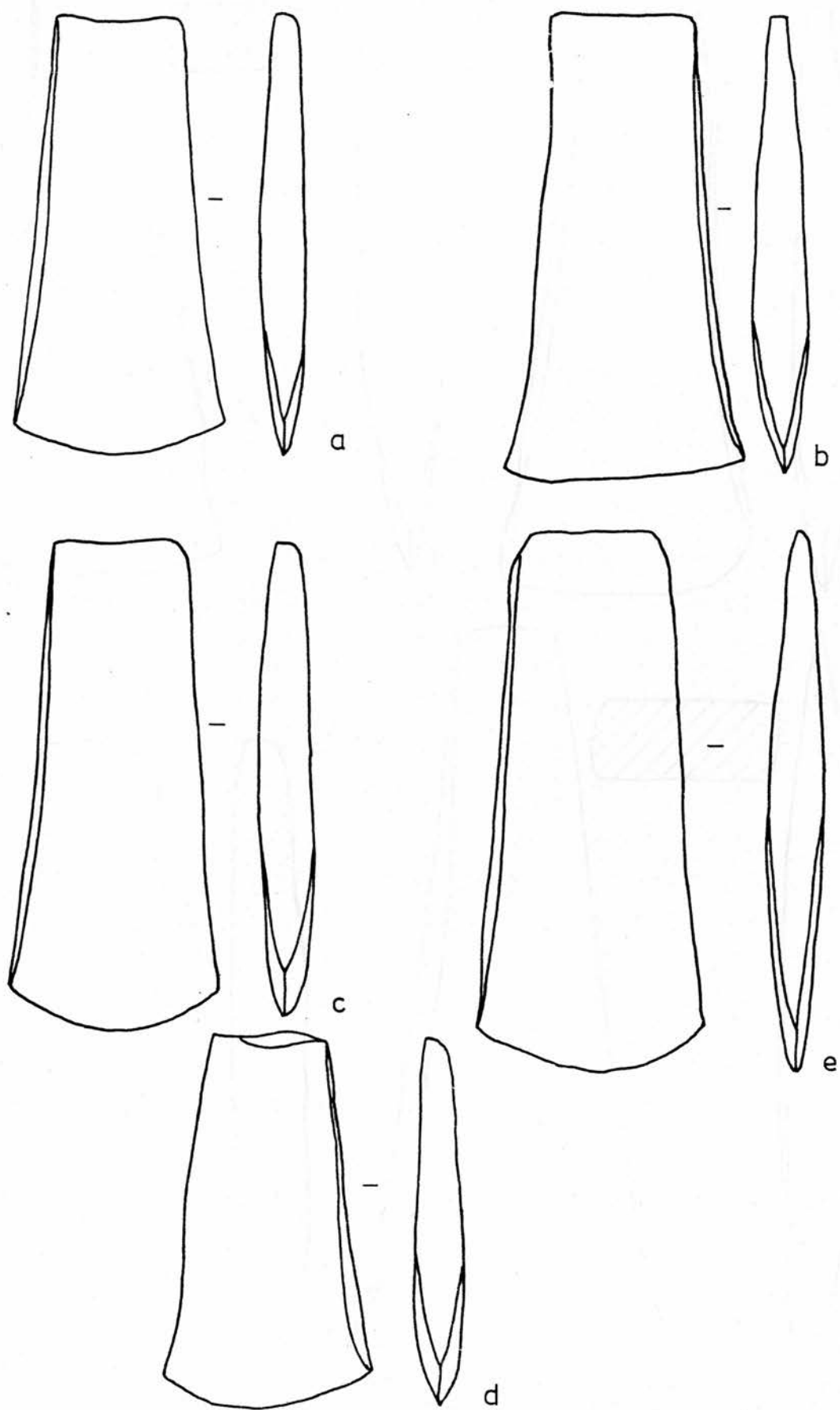


Fig. 58. Flat axes of type Robenhausen.

a: Metzikon-Robenhausen; b & c: Zürich Wollishofen; d: Zürich Bauschanze; e: Risch-Schwarzbach.

Scale 1:1

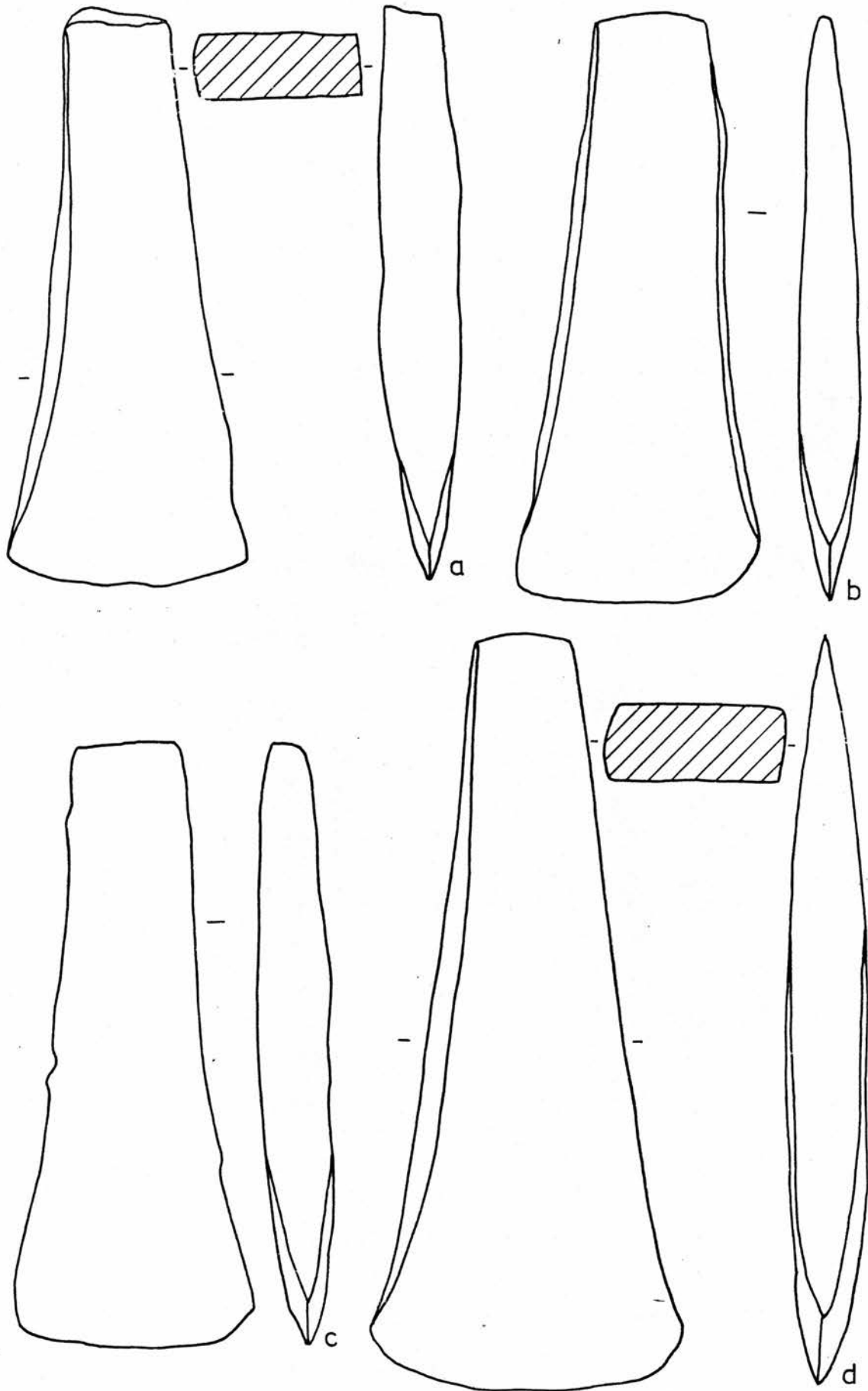


Fig. 59. Flat axes of type Thayngen.

a: Cham-St. Andreas; b: Dietikon; c: Limmatt; d: Mönchaltdorf.

Scale 1:1.

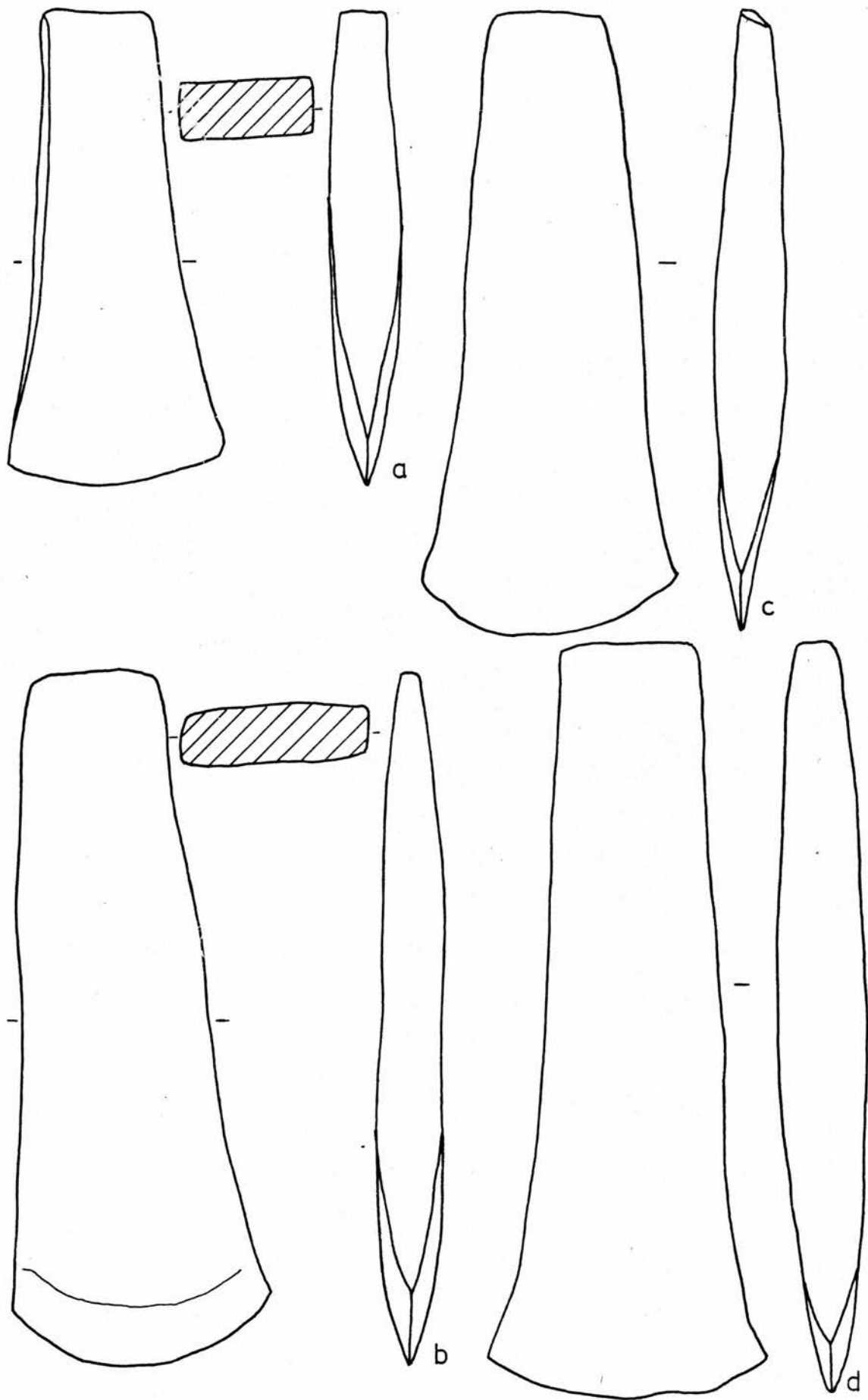


Fig. 60. Flat axes of type Thayngen.

a: Hitzkirch; b: Vinelz; c: Auvernier; d: Etolzwil 4.

Scale 1:1.

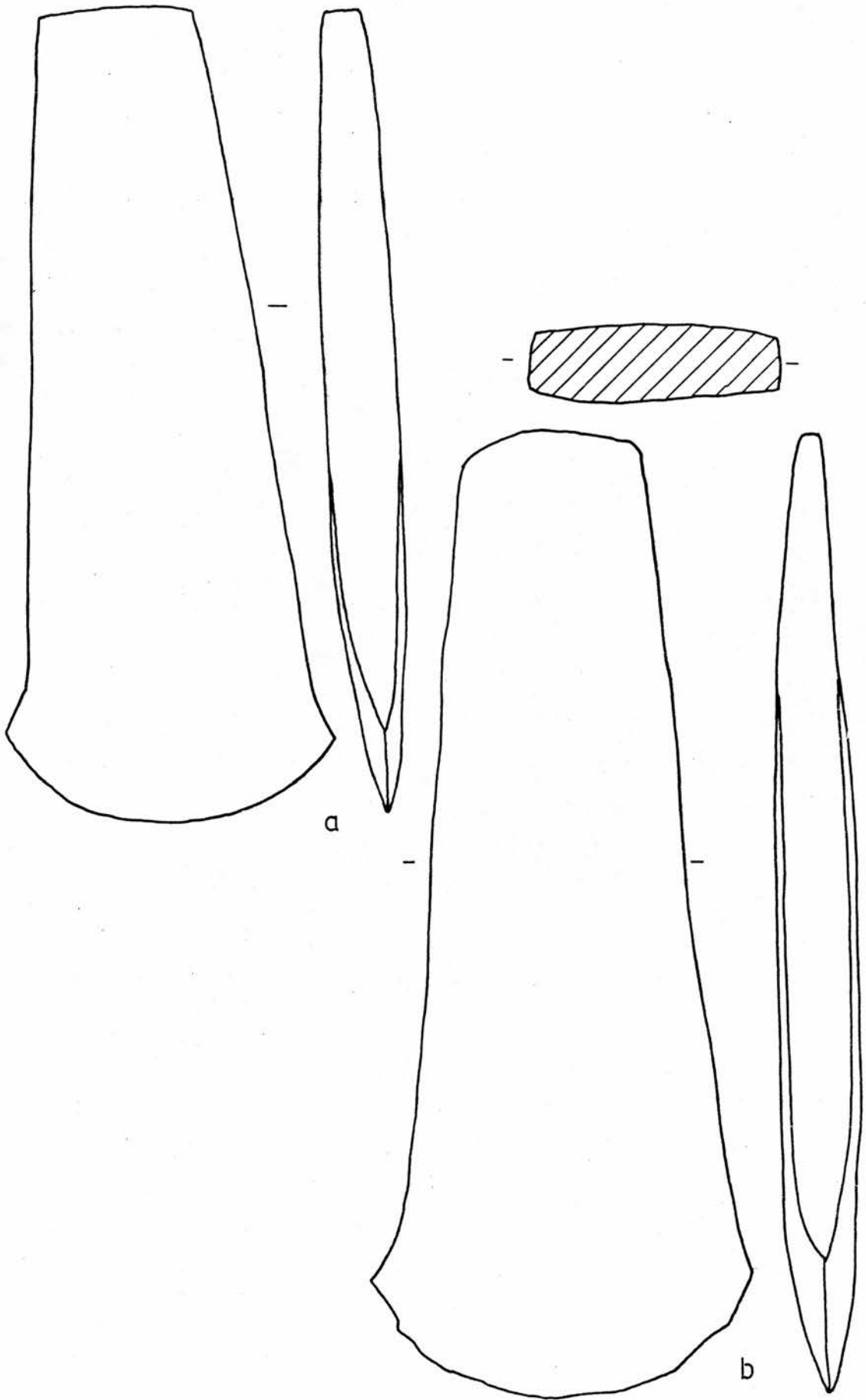


Fig. 61 A. Flat axes of type Bevaix.

a: Freytal; b: Vallenend.

Scale 1:1

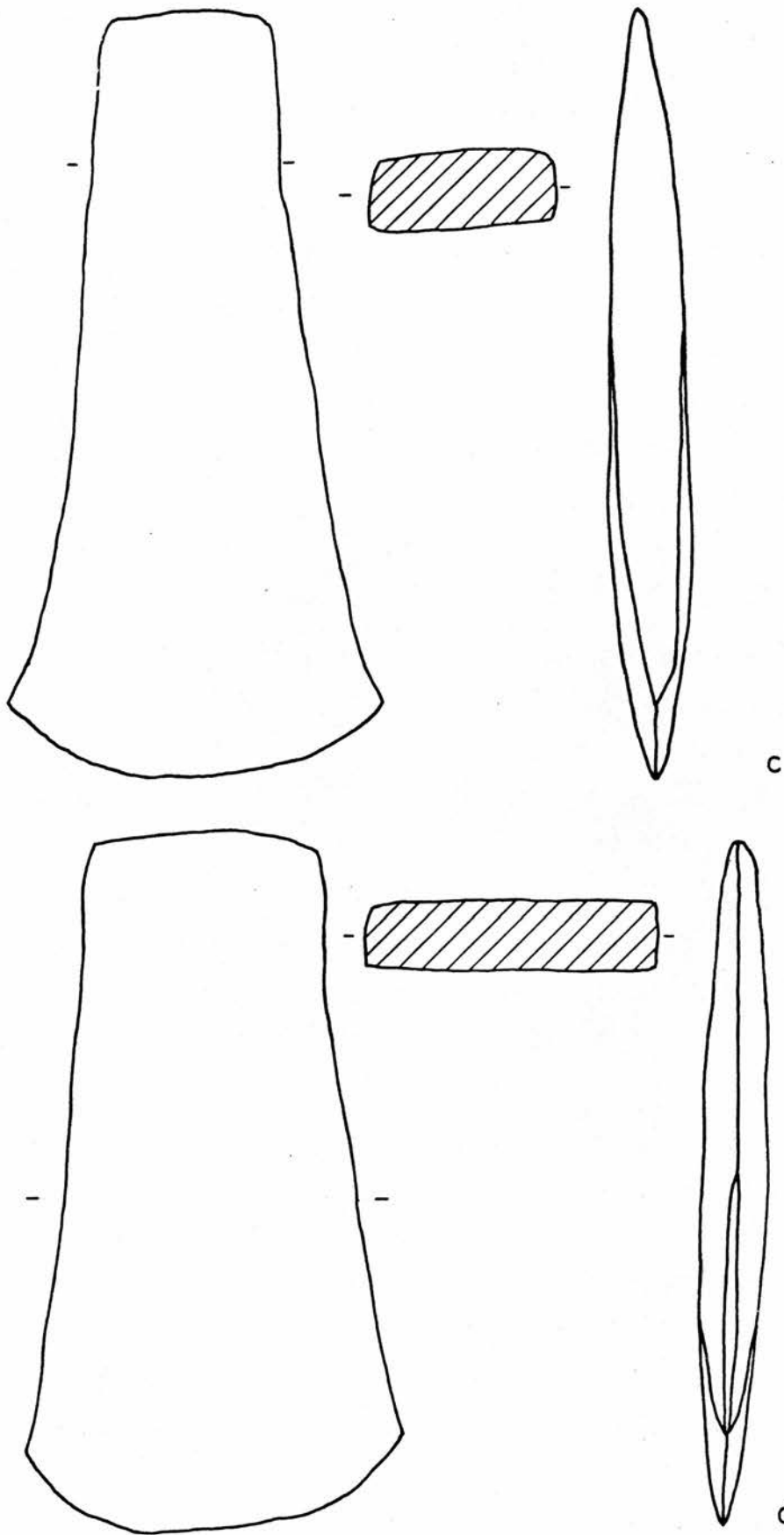


Fig. 61 B. Flat axes of type Bevaix.

c: F.U., Lake Neuchâtel; d: Eschenz. Scale 1:1.

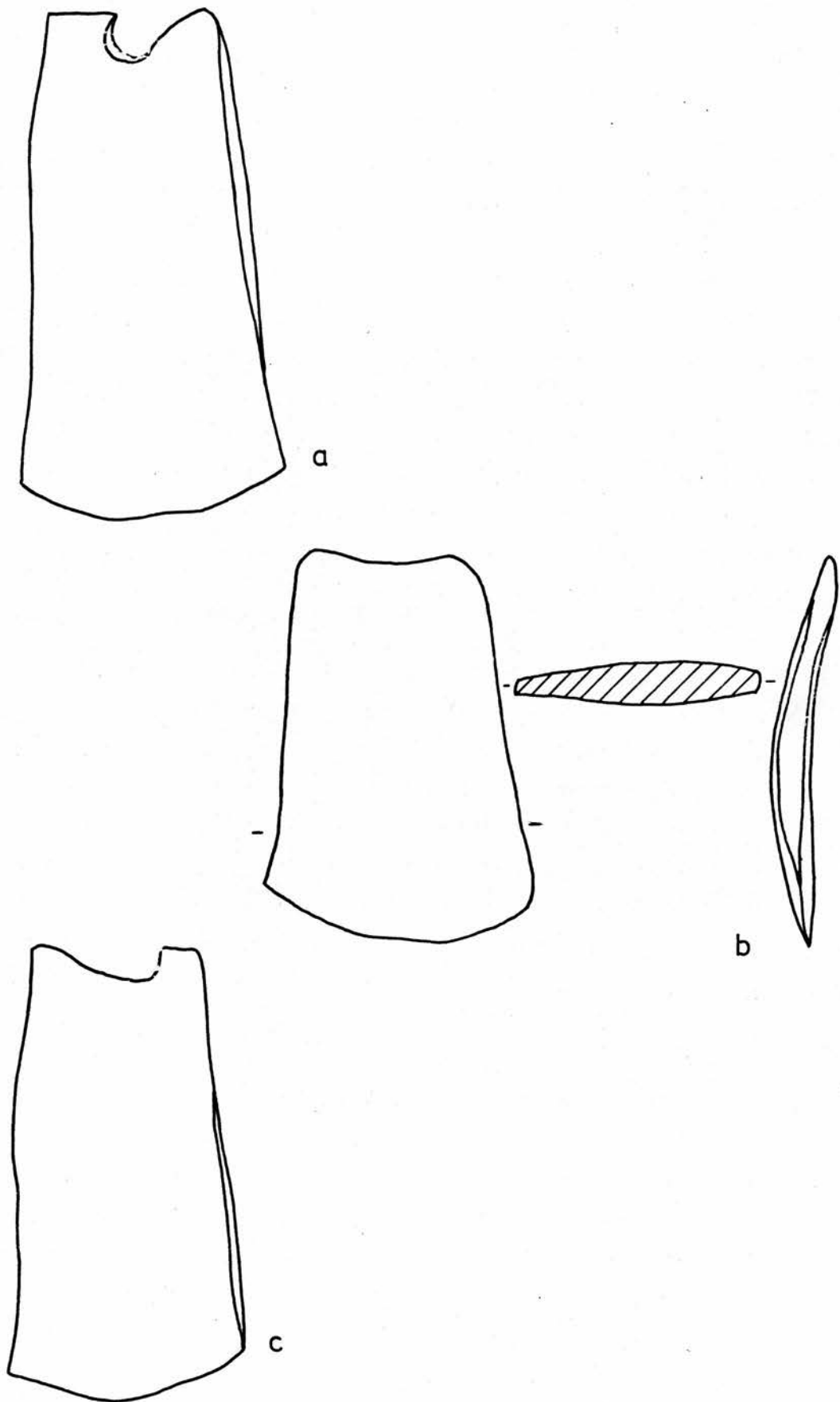


Fig. 62. Flat axes, subgroup Bevaix/Robenhausen.

a: St. Blaise; b: Estavayer; c: Prefargier. Scale 1:1.

CLUSTERING ON ALL SWISS AXES WITH 5 ATTRIBUTES.

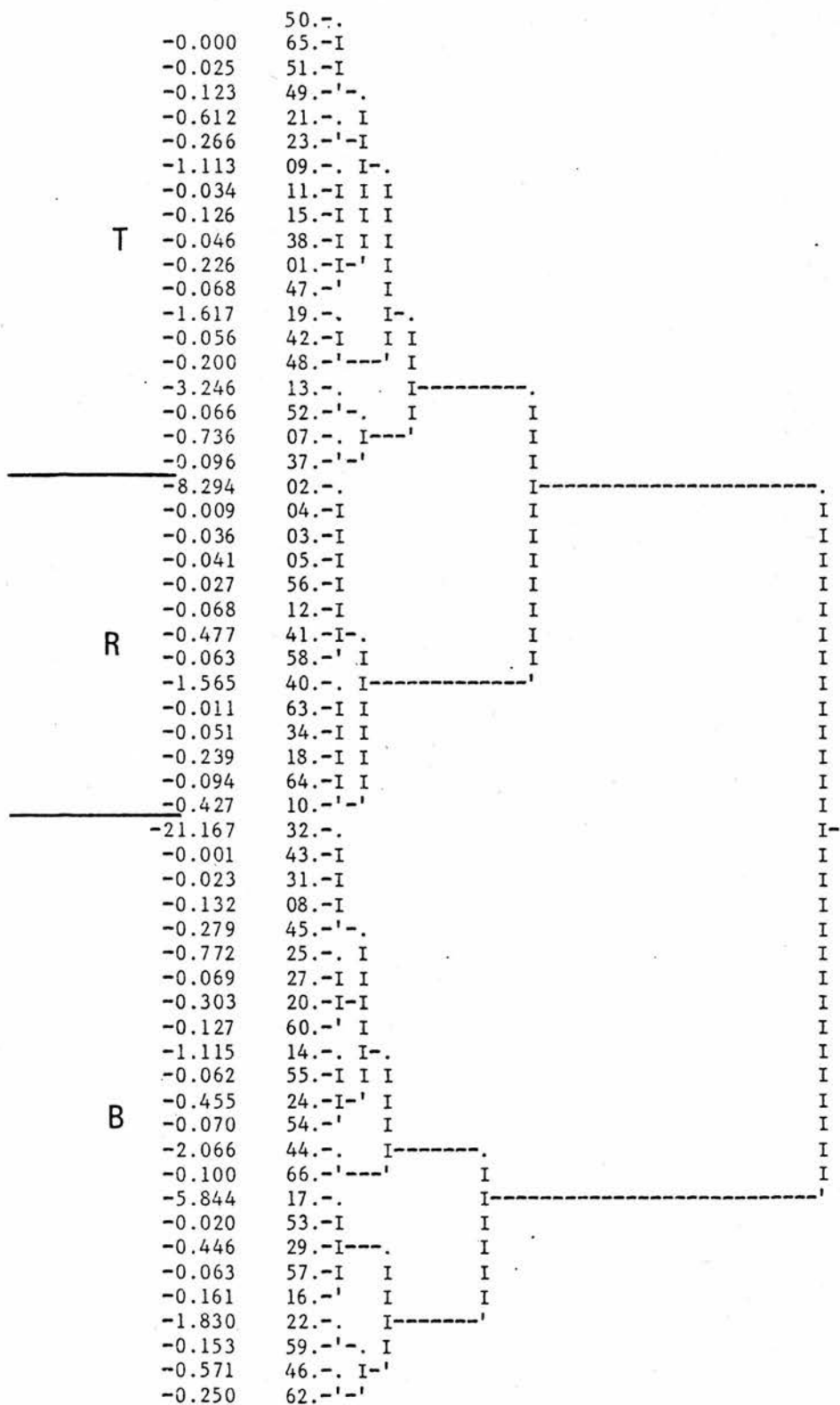


FIG.63 CLUSTERING BY 'NATURE'S GROUPS' ON MATRIX TYPE 7.

CLUSTERING ON ALL AUSTRIAN AXES WITH 5 ATTRIBUTES.

		A15-.		
	-0.008	A37-I		
	-0.055	A10-I		
	-0.014	A52-I		
	-0.031	A23-I		
	-0.233	A22-I		
	-0.039	A46-I		
D	-0.406	A06-I-.		
	-0.011	A17-I I		
	-0.056	A33-I I		
	-0.149	A28-I I		
	-0.123	A54-' I		
	-0.726	A36-. I-.		
	-0.035	A57-'-' I		
	-2.048	A01-. I-----.		
	-0.312	A18-'-----'	I	
	-5.079	A16-.	I-----	.
	-0.021	A47-I	I	I
	-0.460	A02-I-.	I	I
	-0.112	A14-I I	I	I
	-0.133	A25-' I	I	I
	-1.009	A19-. I-----I	I	I
E	-0.046	A29-I I	I	I
	-0.194	A04-'-'	I	I
	-4.617	A03-.	I	I
	-0.103	A21-I	I	I
	-0.118	A44-'-.	I	I
	-1.202	A24-. I-----'	I	I
	-0.152	A56-I I	I	I
	-0.467	A05-'-'	I	I
	-19.483	A49-.	I-----	I-
	-0.013	A51-I	I	I
	-0.268	A40-I-.	I	I
F	-0.050	A55-I I	I	I
	-0.199	A50-' I	I	I
	-0.885	A07-. I-----.	I	I
	-0.166	A41-I I	I	I
	-0.236	A48-'-'	I	I
	-5.754	A09-.	I-----	I'
	-0.015	A27-I	I	
	-0.033	A26-'-.	I	
	-0.507	A35-. I	I	
G	-0.027	A45-'-I	I	
	-1.091	A08-. I-----'	I	
	-0.018	A42-I I		
	-0.078	A43-I I		
	-0.155	A34-I-'		
	-0.030	A53-'		

FIG.64 CLUSTERING BY 'NATURE'S GROUPS' ON MATRIX TYPE 7.

CLUSTERING ON T & R SWISS & HALF OF AUSTRIAN AXES

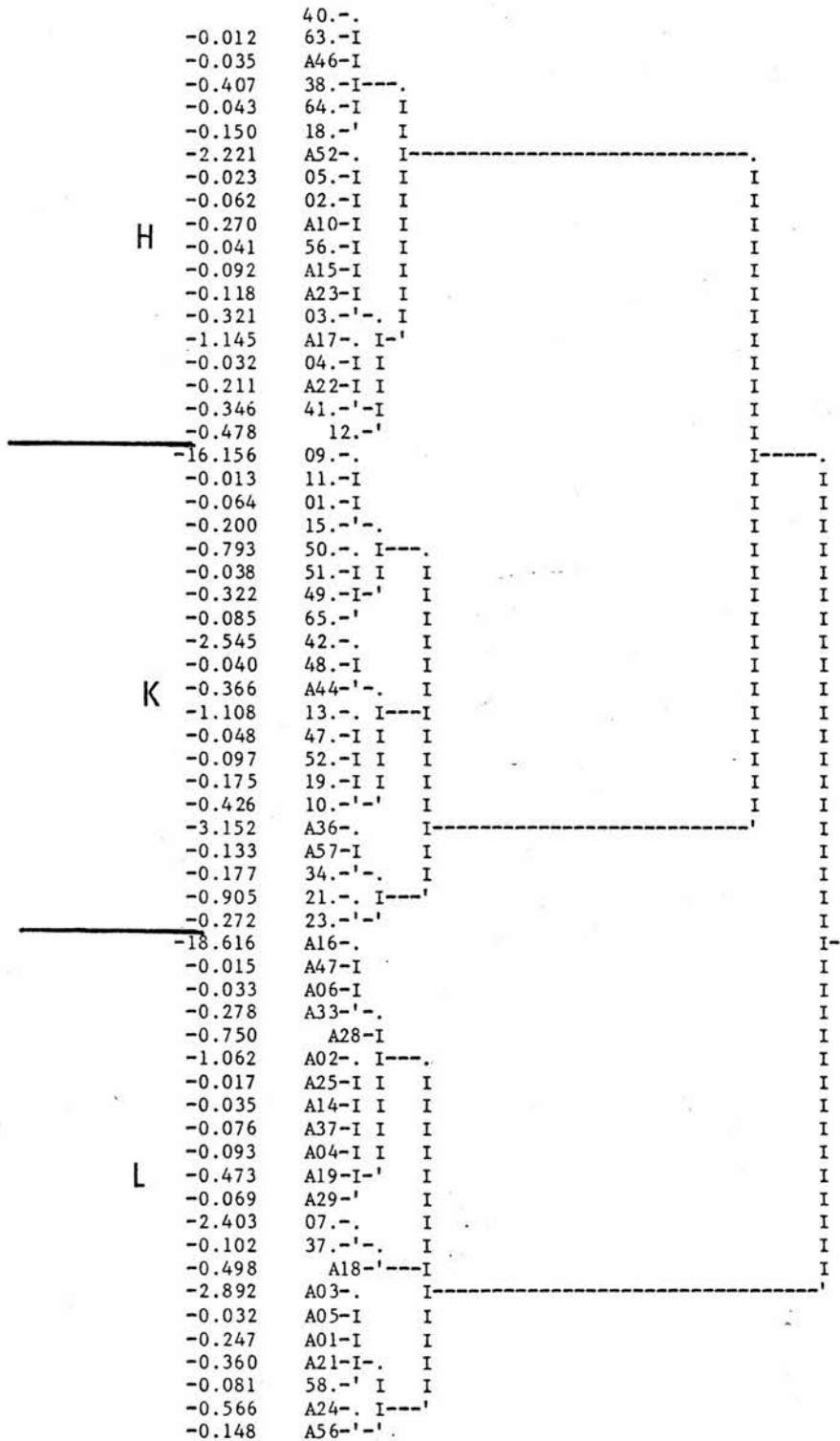


FIG. 65 CLUSTERING ON UPPER HALF OF AUSTRIAN DENDROGRAM (CF. FIG. 64) AND FLAT AXES OF TYPE ROSENHAUSEN AND THAYNGEN FROM SWITZERLAND. CLUSTERING BY 'NATURE'S GROUPS' ON MATRIX TYPE 7.

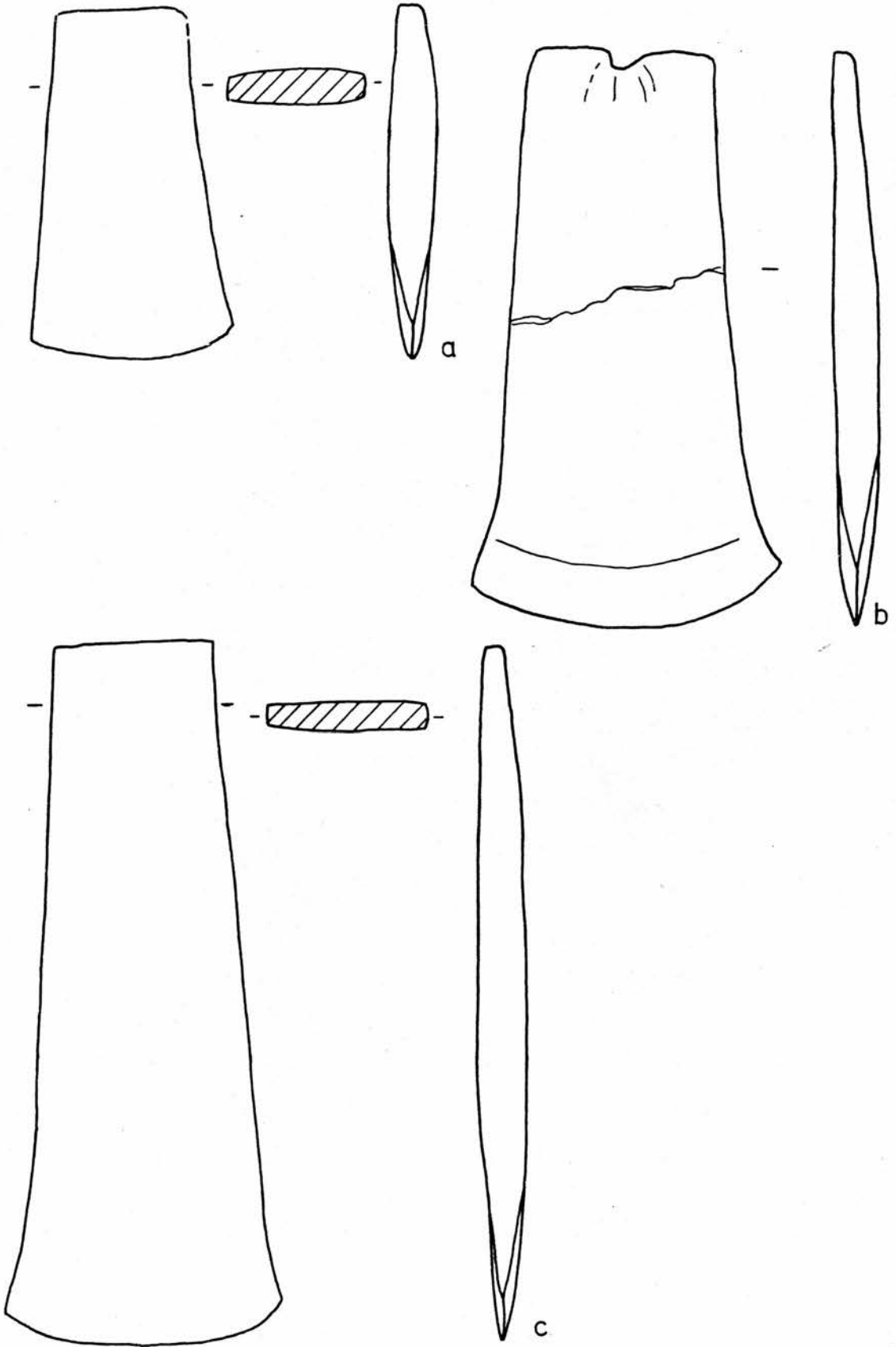


Fig. 66. Austrian flat axes.

a: Pölsbals; b: & c: Attersee.

Scale 1:1.

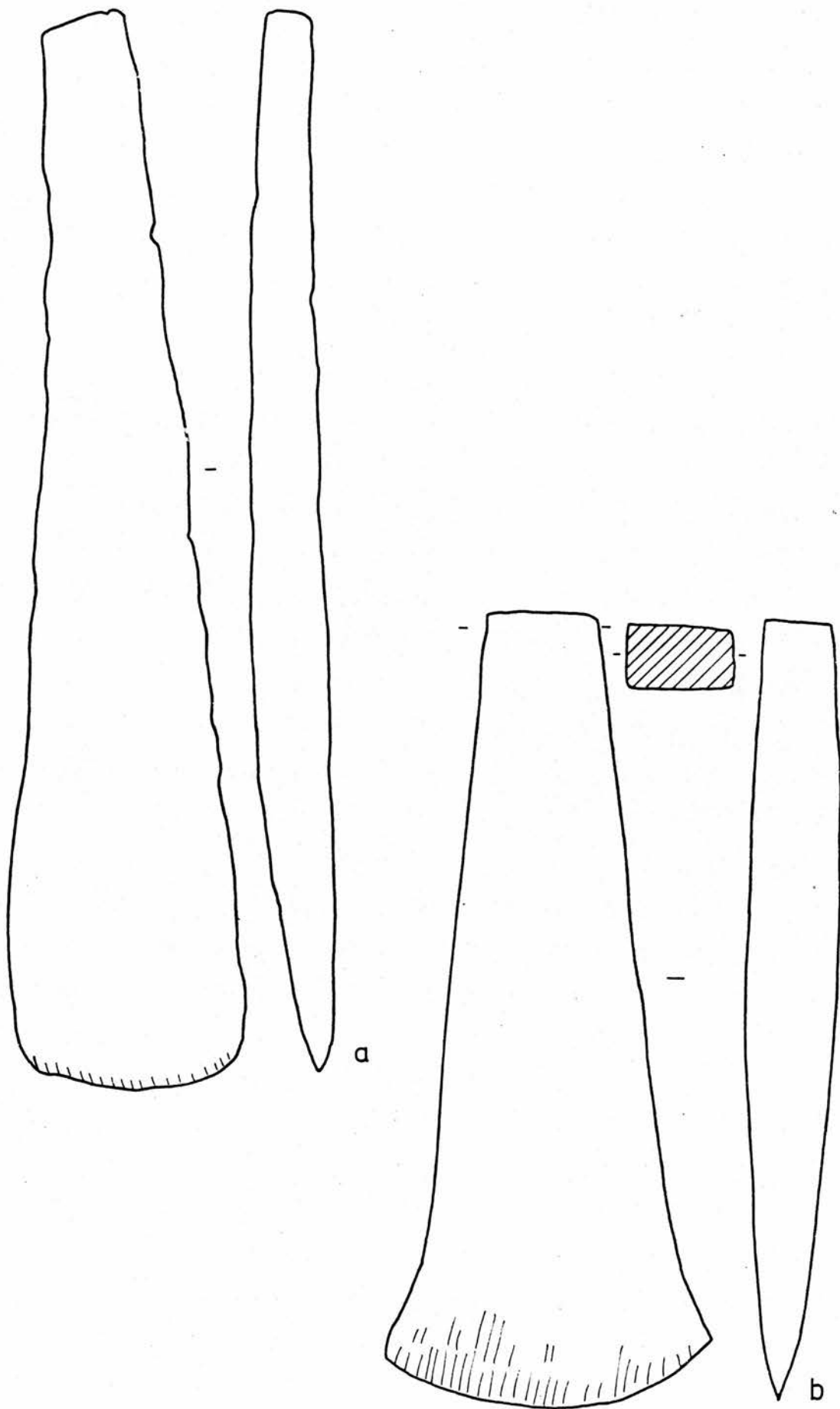


Fig. 67. Austrian flat axes.

a: Linz St. Peter; b: Hartberg.

Scale 1:1.

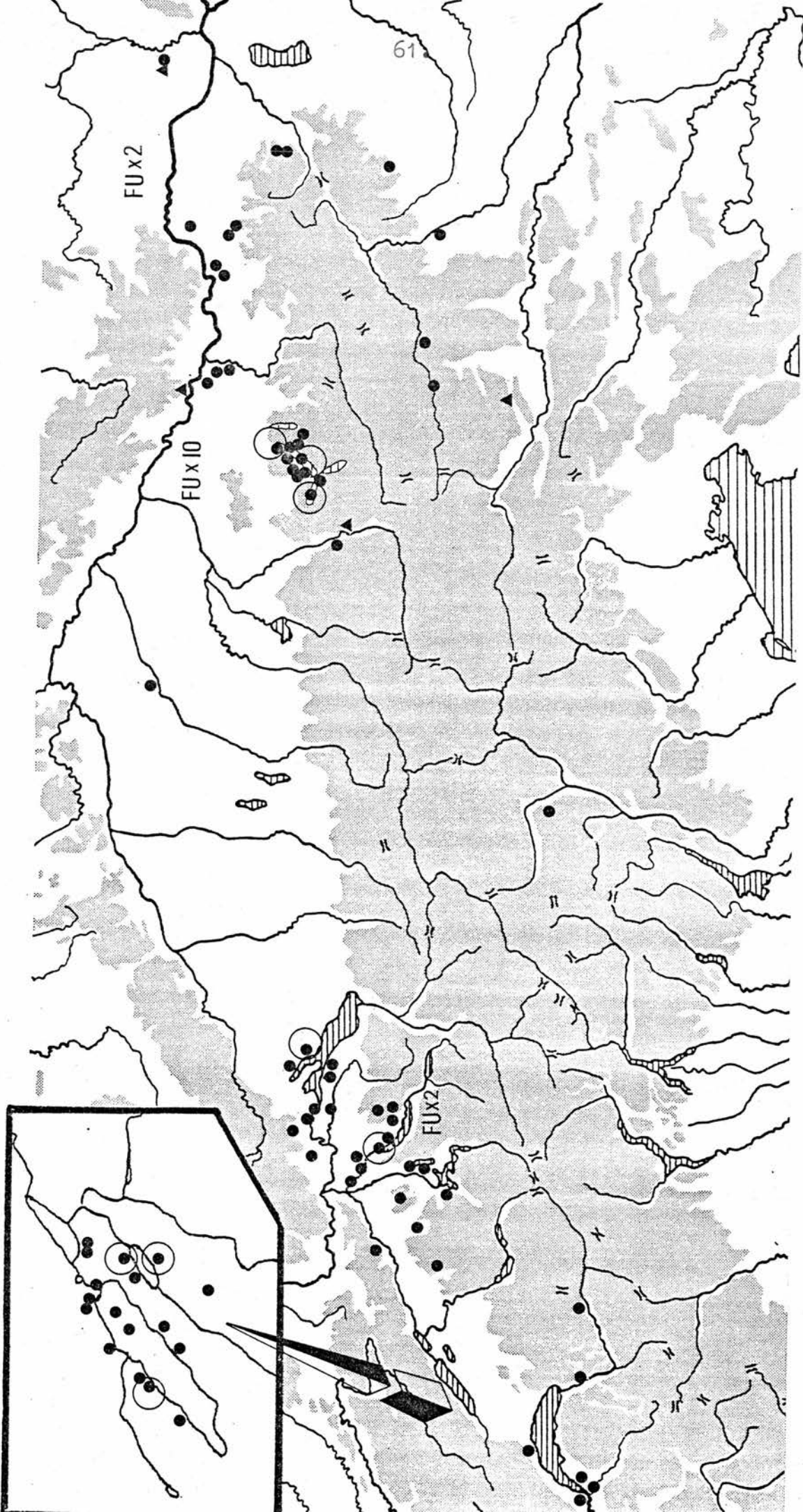


Fig.68. Distribution of flat axes (●; cf.App. II,IVa) and axe hammers (▲; cf.Ap IVb). Encircled symbols denote more than 20 objects of the same type found on a single site. Scale 1 : 3,000,000. FU = exact site unknown.

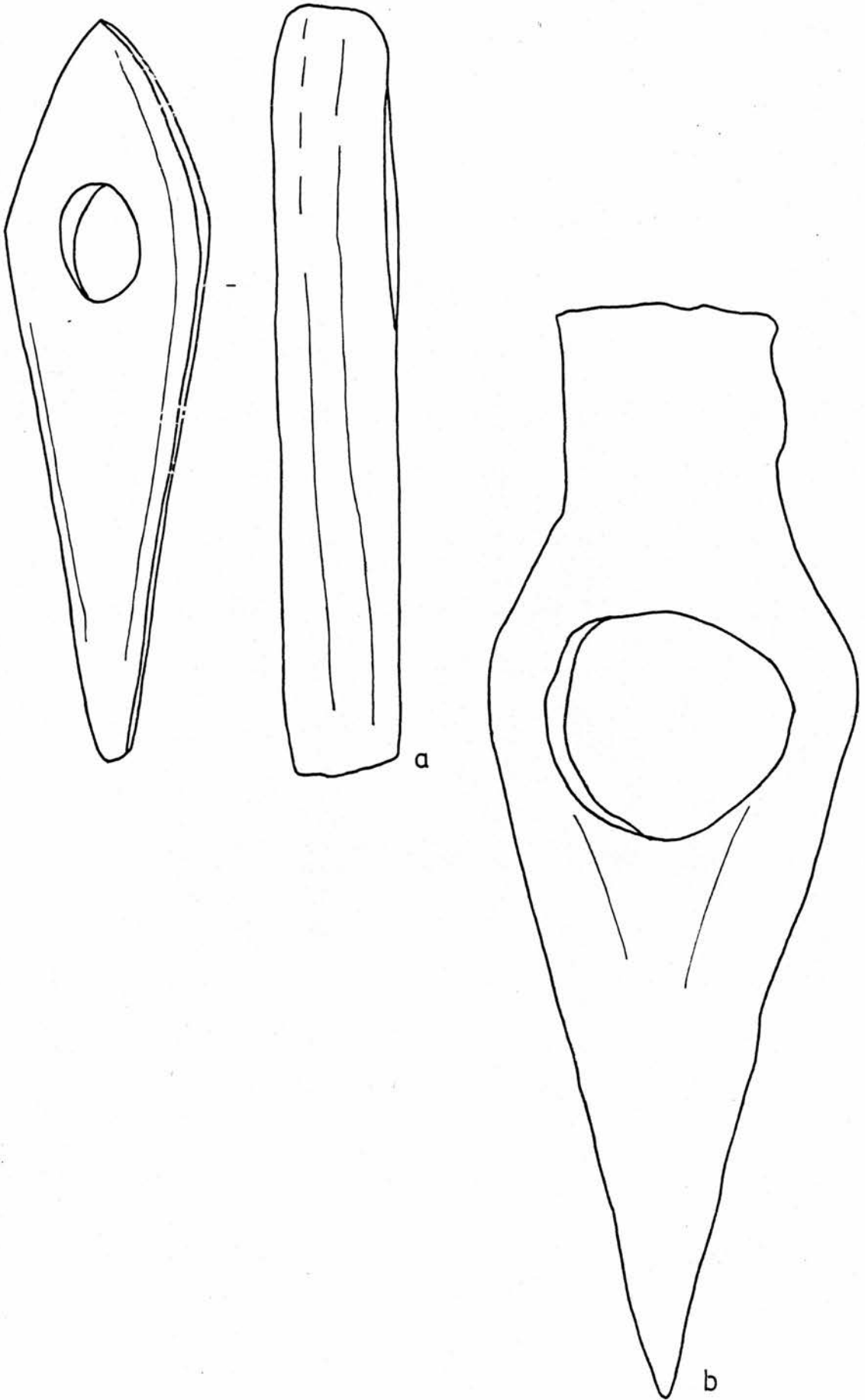


Fig. 69. Axe hammers.

a: Zwerndorf; b: Linz St. Peter.

Scale 1:1.

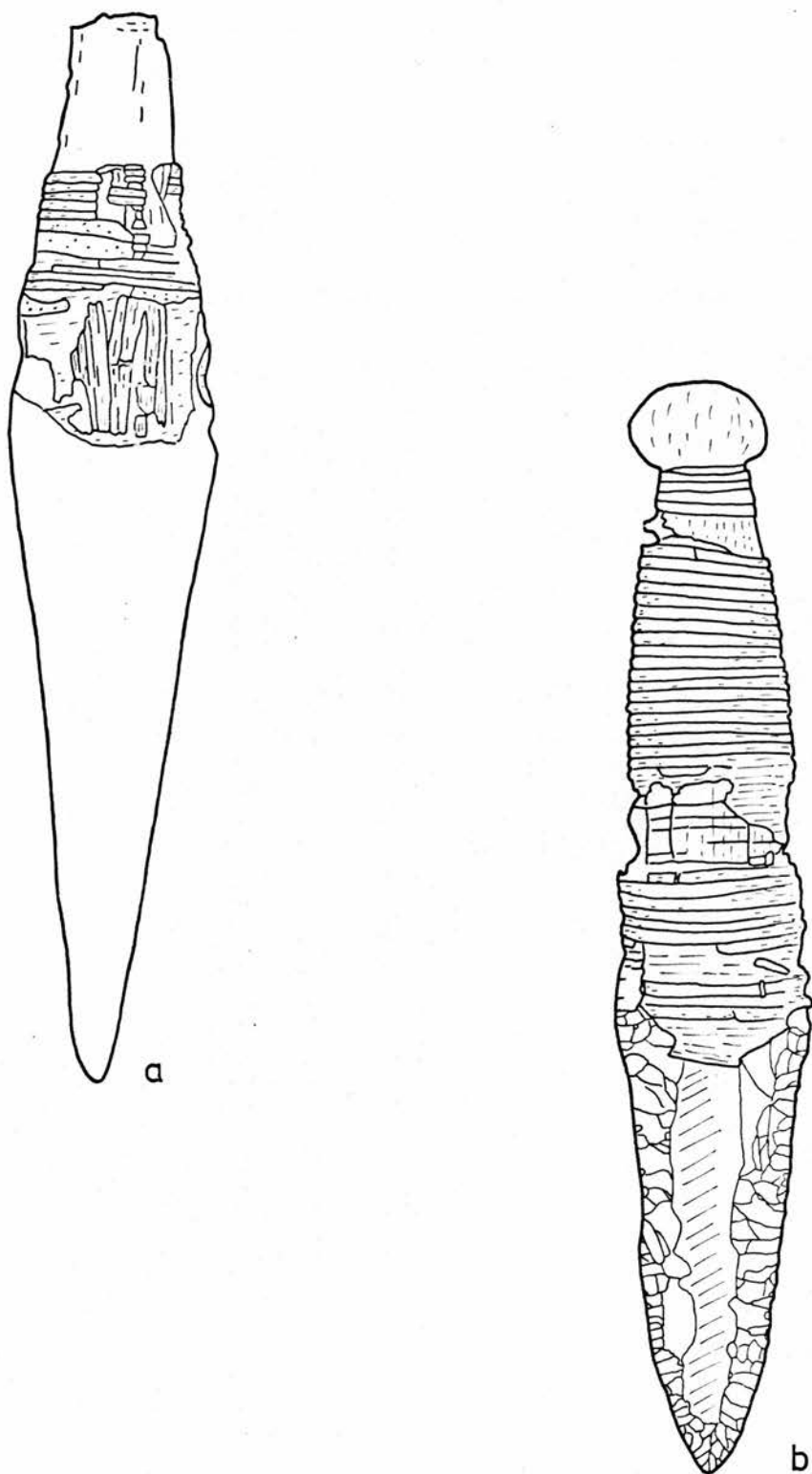


Fig.70. Hafting of tanged daggers of copper (a) and flint (b).
a: St. Blaise; b: Vinelz. Scale 3:4.

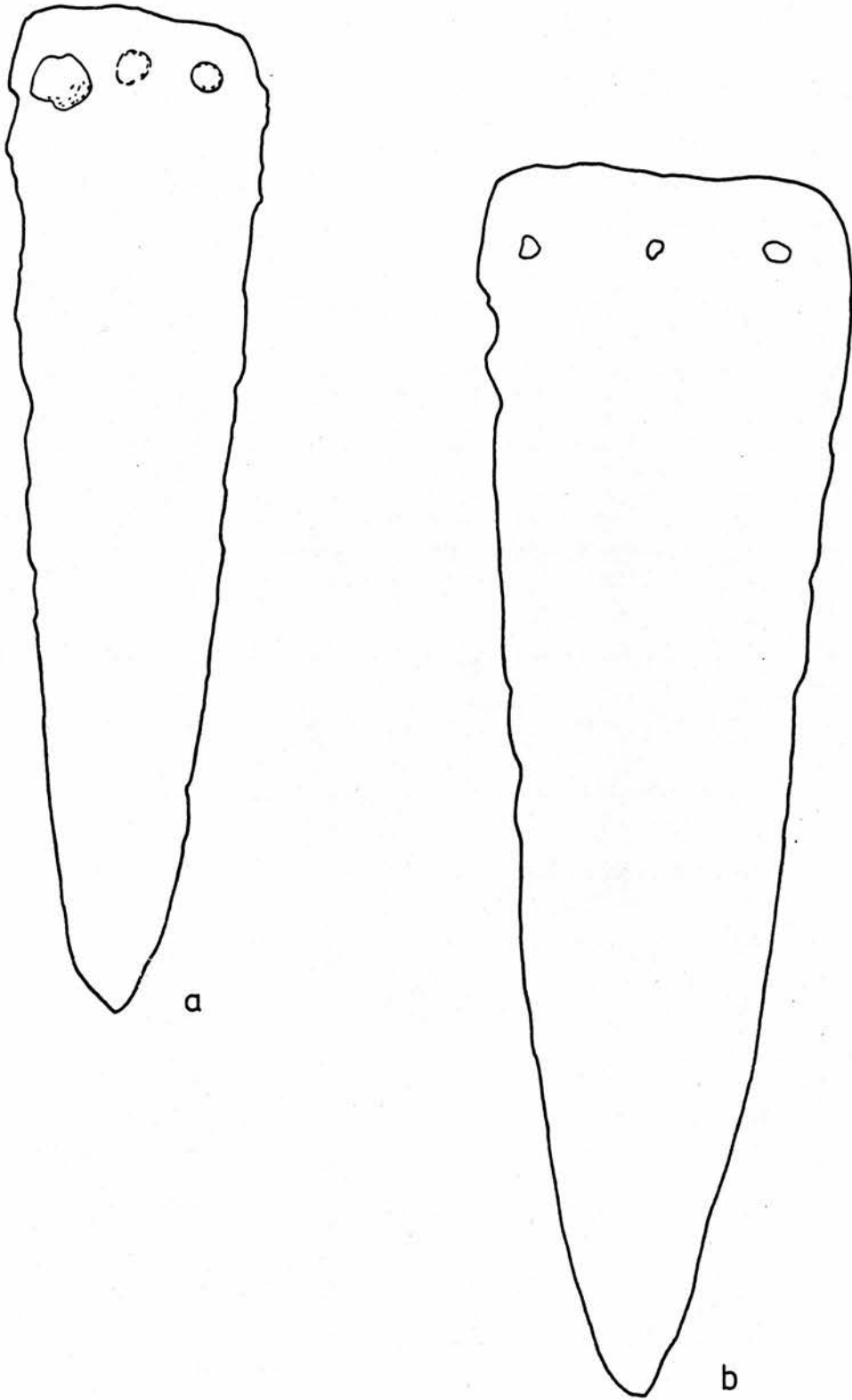


Fig. 71. Large flat daggers.

a: Yvonand, La Peupleraie; b: Vinelz.

Scale 1:1.

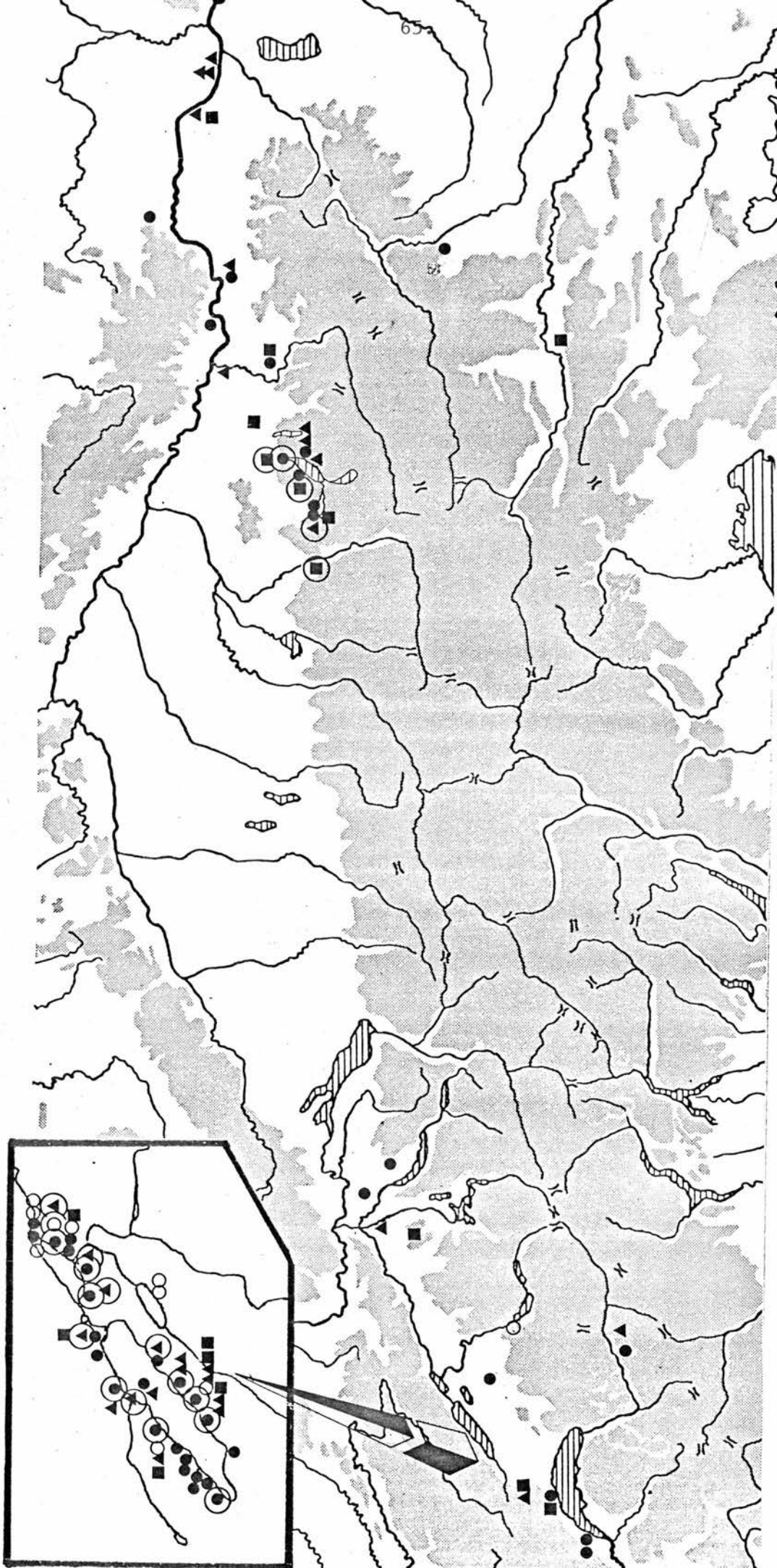


Fig.72. Distribution of flat daggers (●; cf. App. VIIa-g), midribbed ^{or tanged} daggers (▲; cf. App. VIIa-d), knives (■; cf. App. VIIIa-b) and daggers of uncertain type (○; cf. App. VIh). Encircled symbols denote more than 2 finds of the same type found on a single site. Scale 1 : 3,000,000.

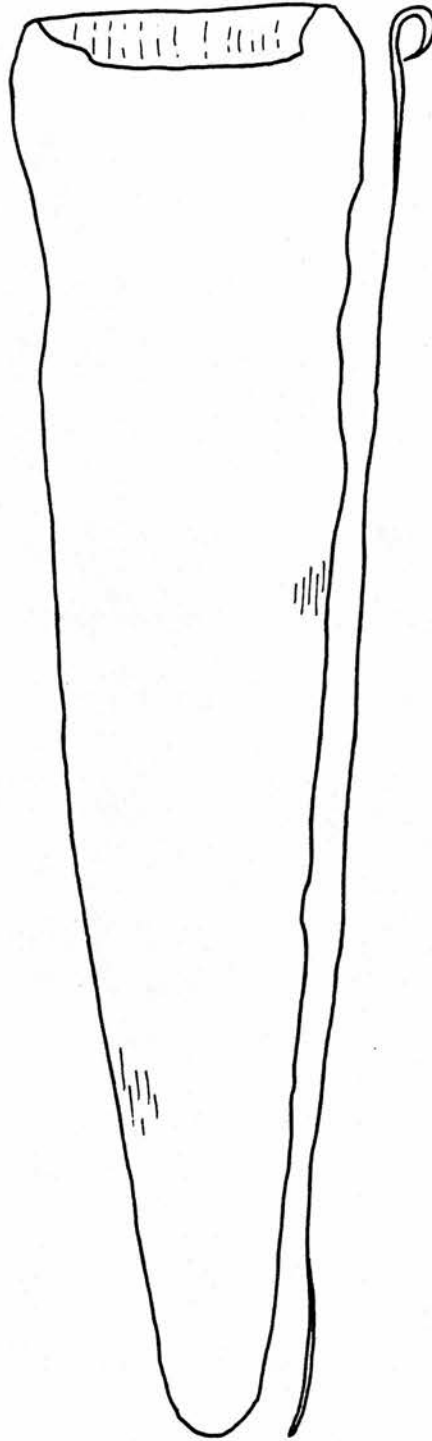


Fig. 73. Large flat dagger.
Sutz Lettrigen.

Scale 1:1.

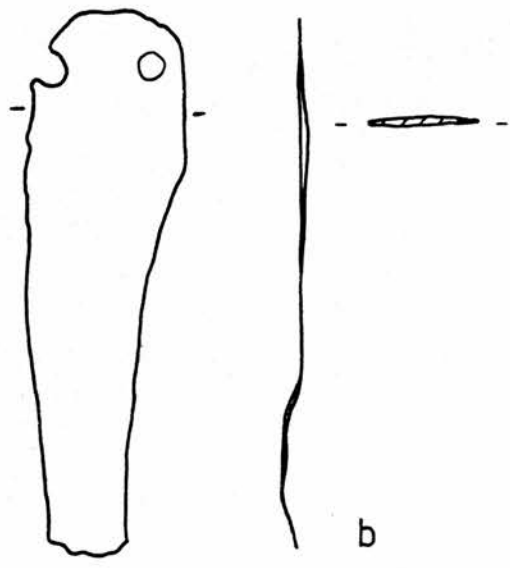
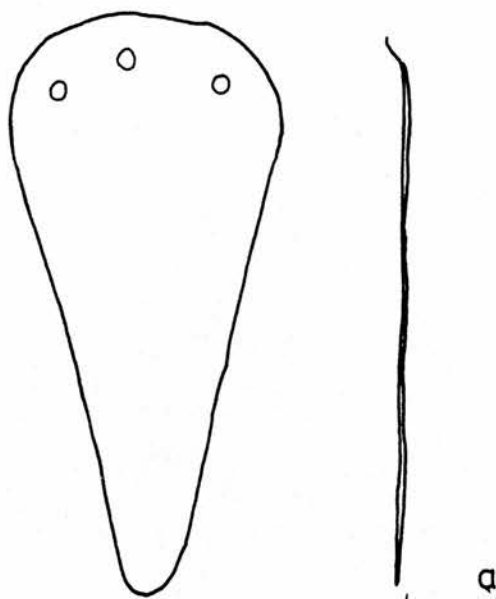


Fig. 74. Flat daggers.

a: Attersee; b: Seewalchen.

Scale 1:1.

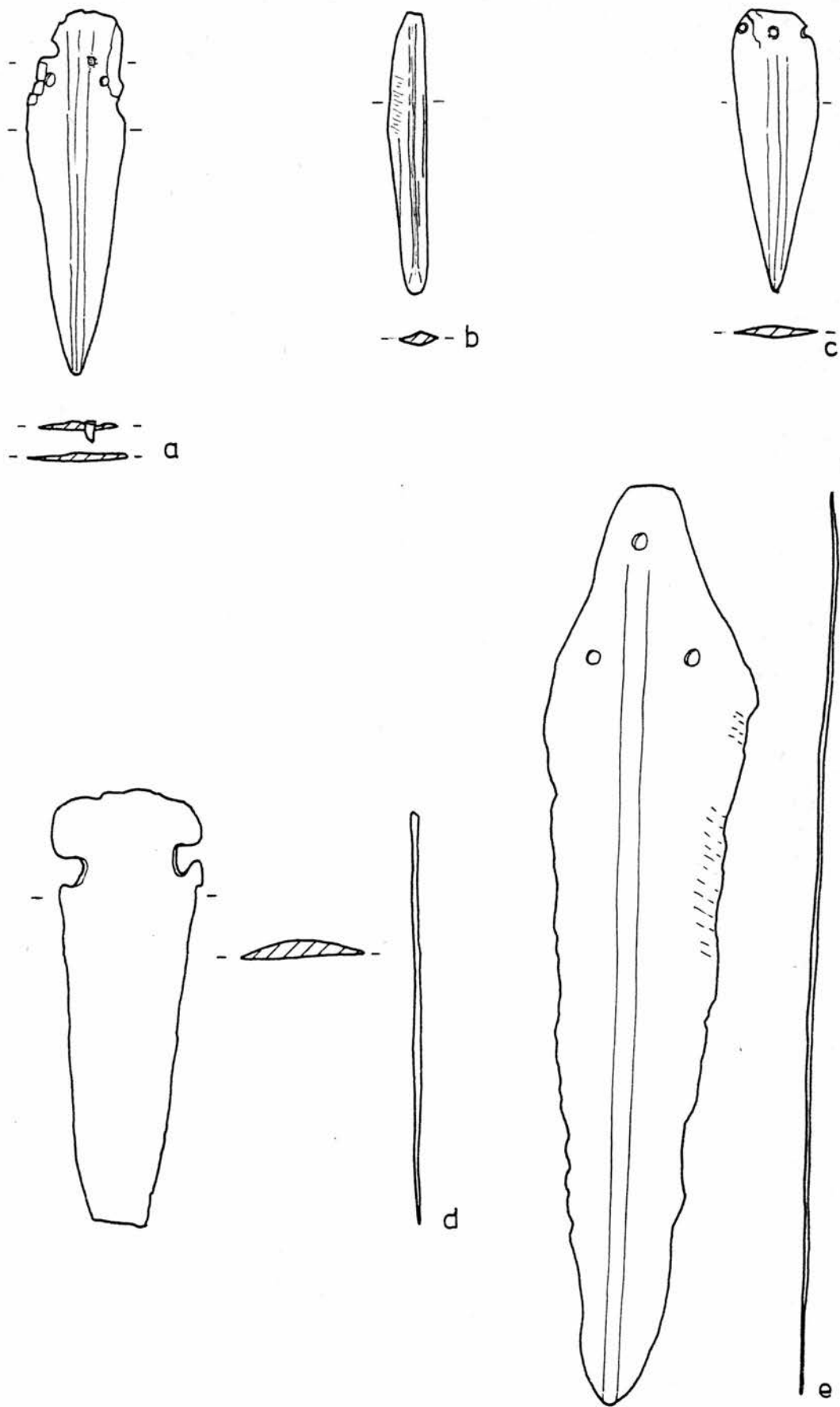


Fig. 75. Daggers with midrib or thickened middle.
 a - c : Vinelz (Scale 1 : 2);
 d & e : Weyeregg (Scale 1 : 1).

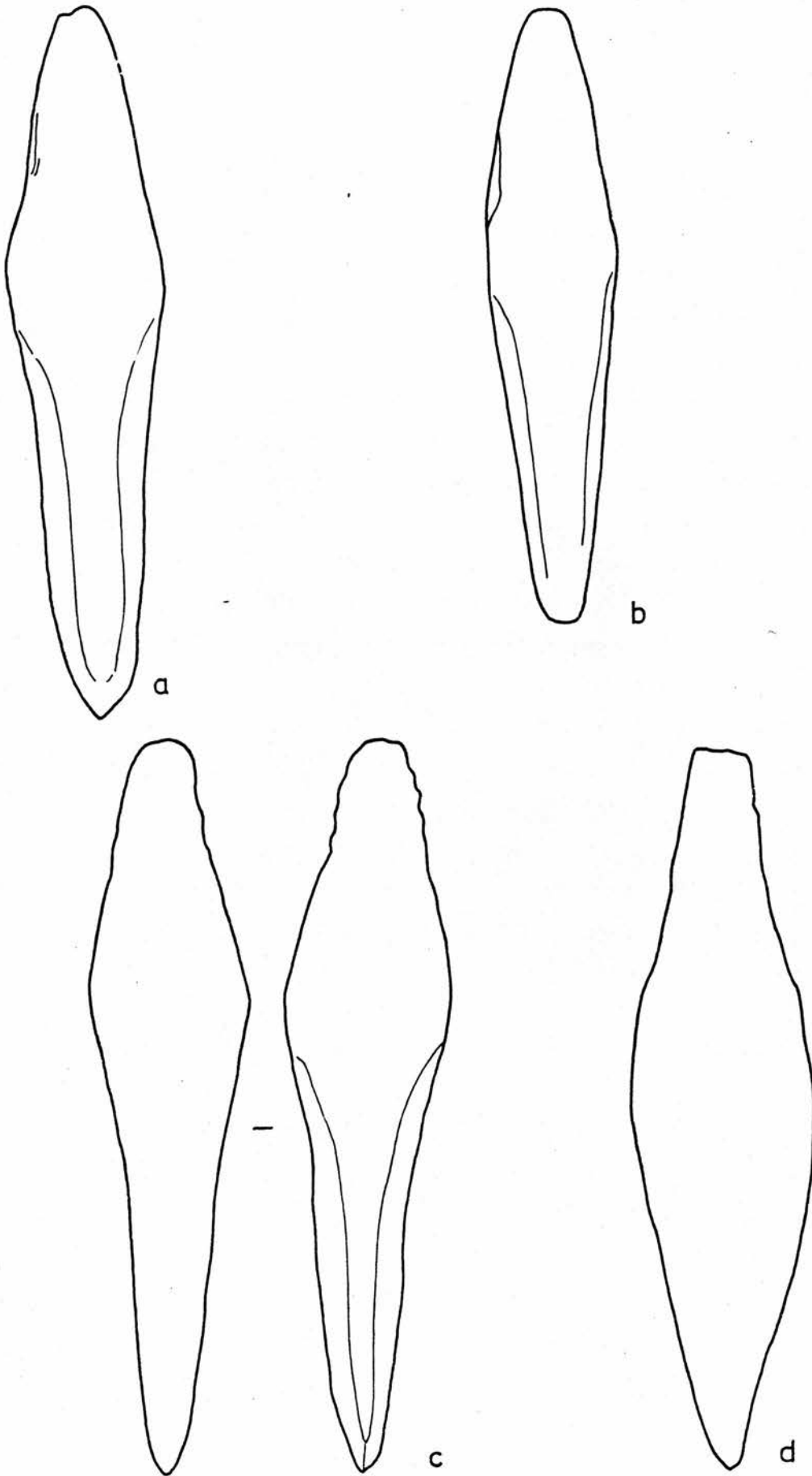


Fig.76. Tanged daggers.

a: Lüscherz; b: Colombier; c & d: St. Blaise. Scale 1:1.

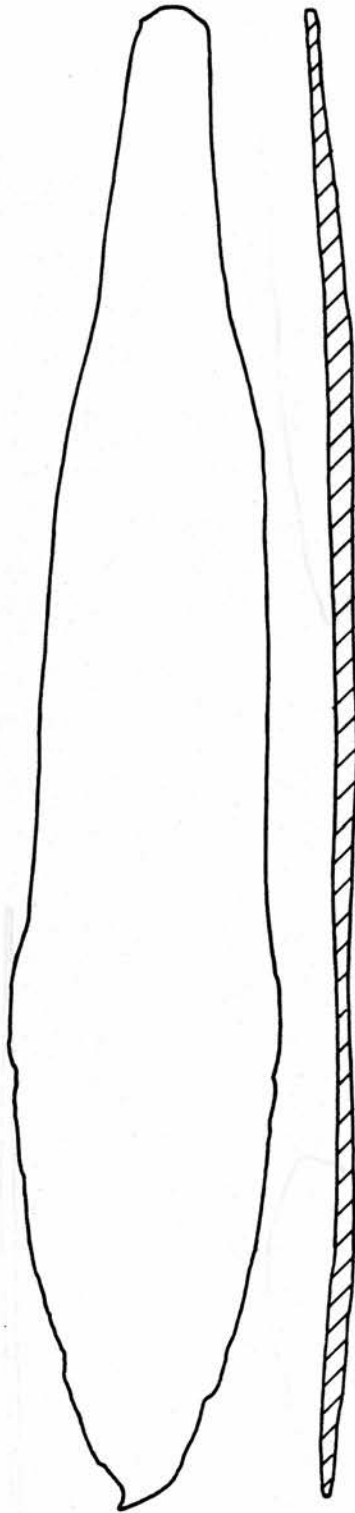


Fig. 77. Tanged dagger.

Wien XXII-Aspern (= Esching/Donau).

Scale 1:1

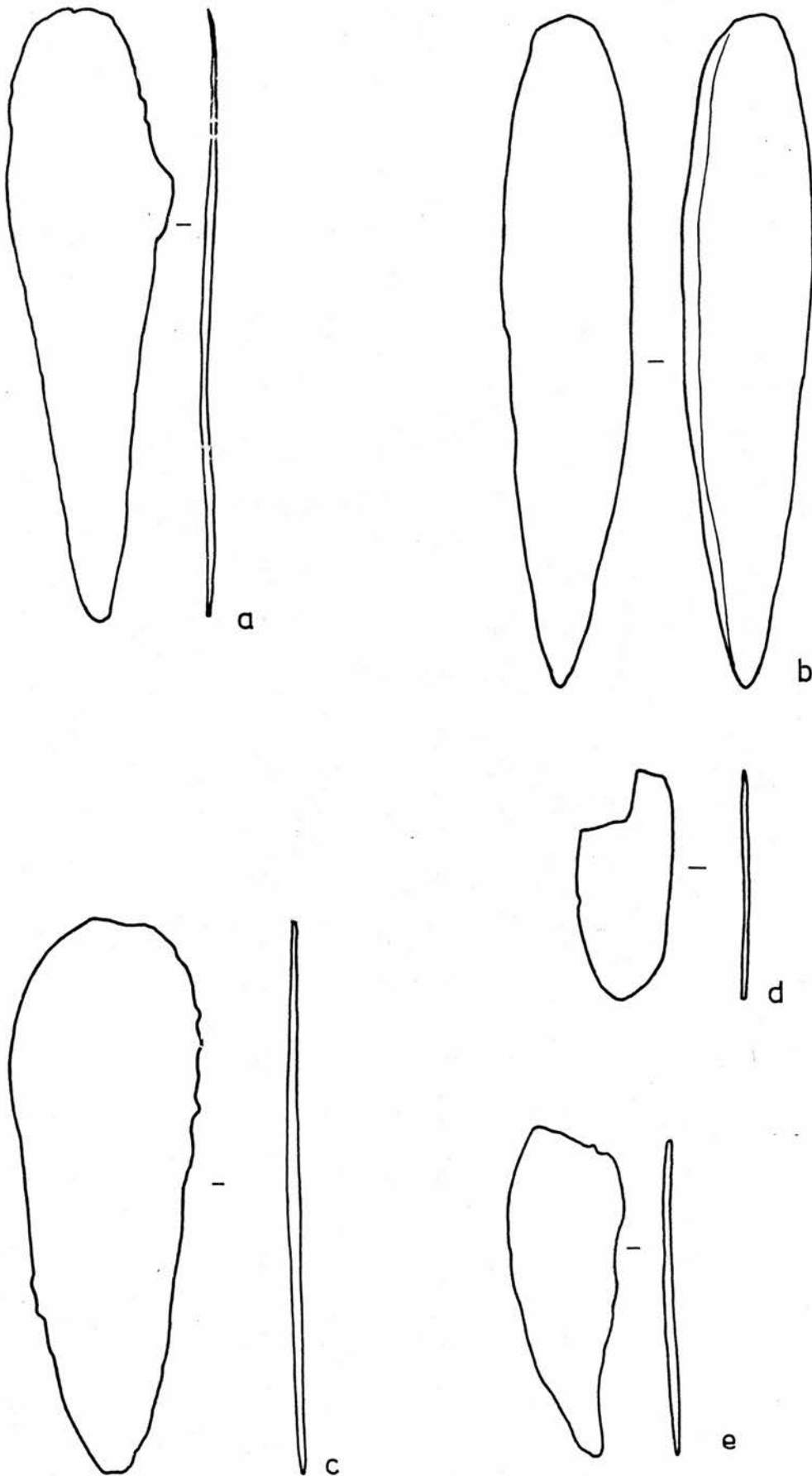


Fig. 73. Knives.

a: Honrus; b: St. B aise; c: Erlenhölzli; d & e: Secwalchen.

Scale 1:1.

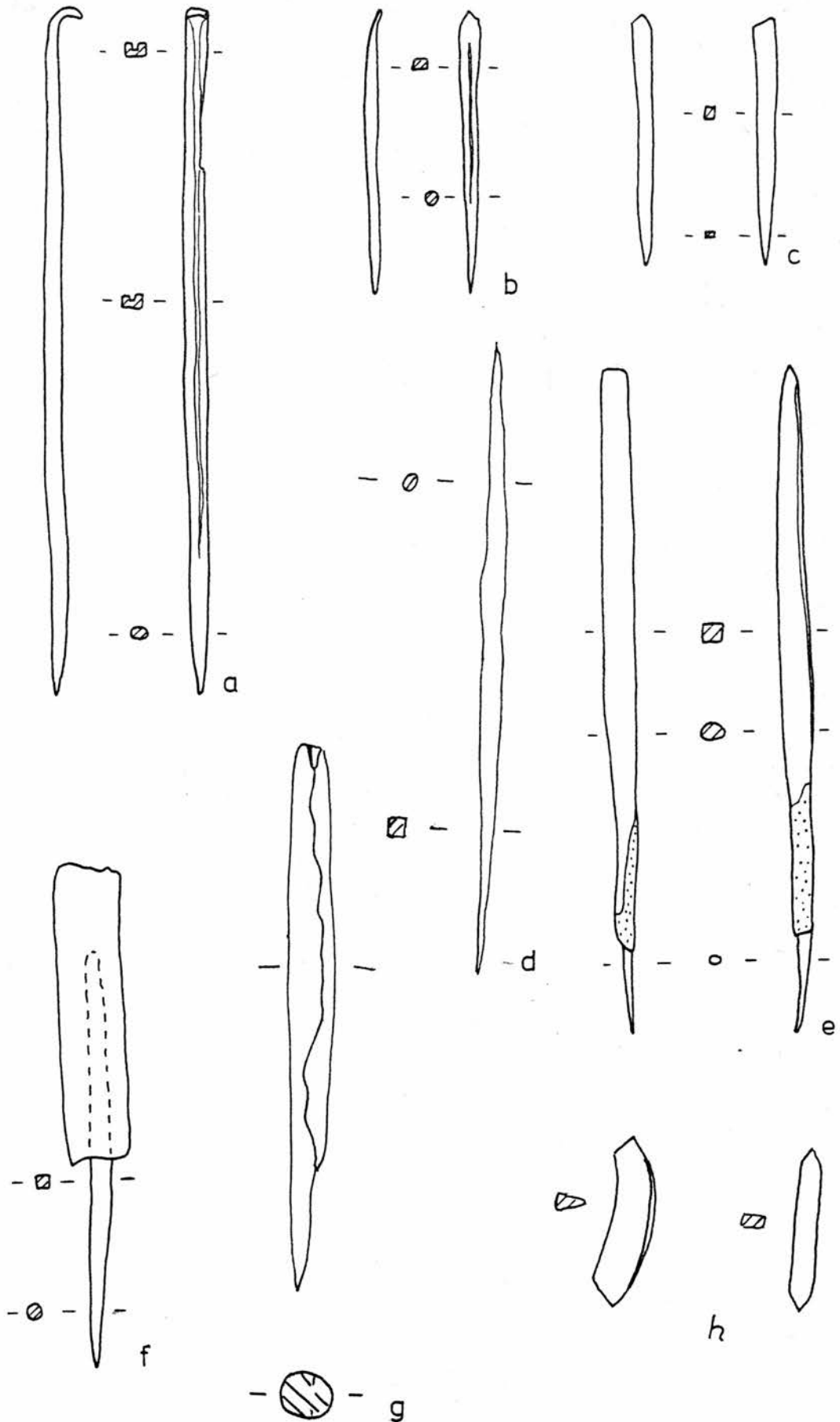


Fig.79. Pins and awls.

a & b:Yvonand-Geilinger; c & e:Seewalchen;
 d,f,g : Vinelz; h: Munich. Scale 1:1.

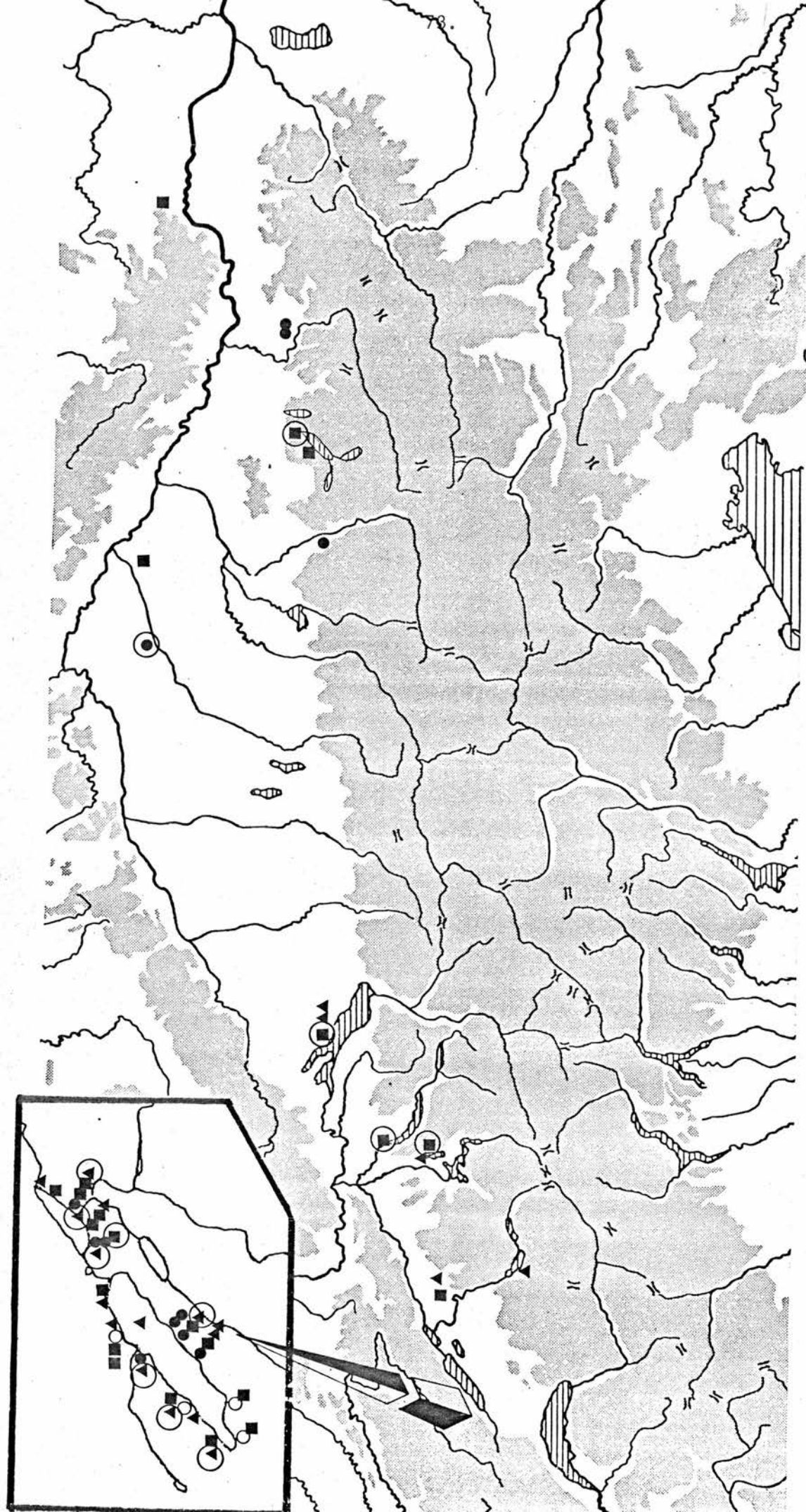


Fig.80. Distribution of Rollennadeln (●; cf. App. IXa), awls with round shafts (▲; cf. App. IXb), awls with square shafts and pointed ends (■; cf. App. IXc) and chisels (▲; cf. App. X). Encircled symbols denote more than 2 finds of the same type on the same site. Scale 1 : 3,000,000.

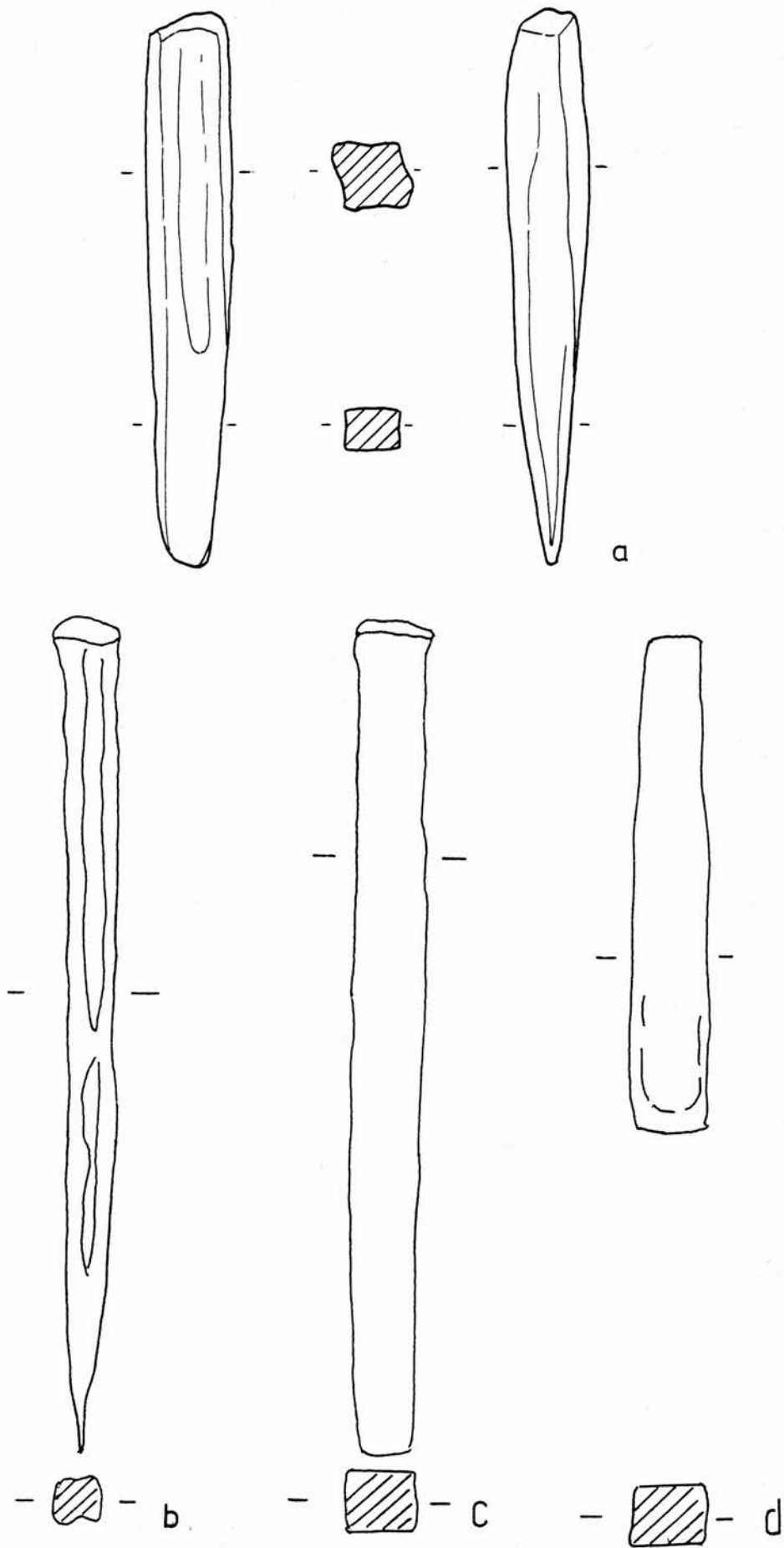


Fig. 81. Chisels.

a : Burgäschisee-Süd; b - d : Vinelz Scale 1 : 1

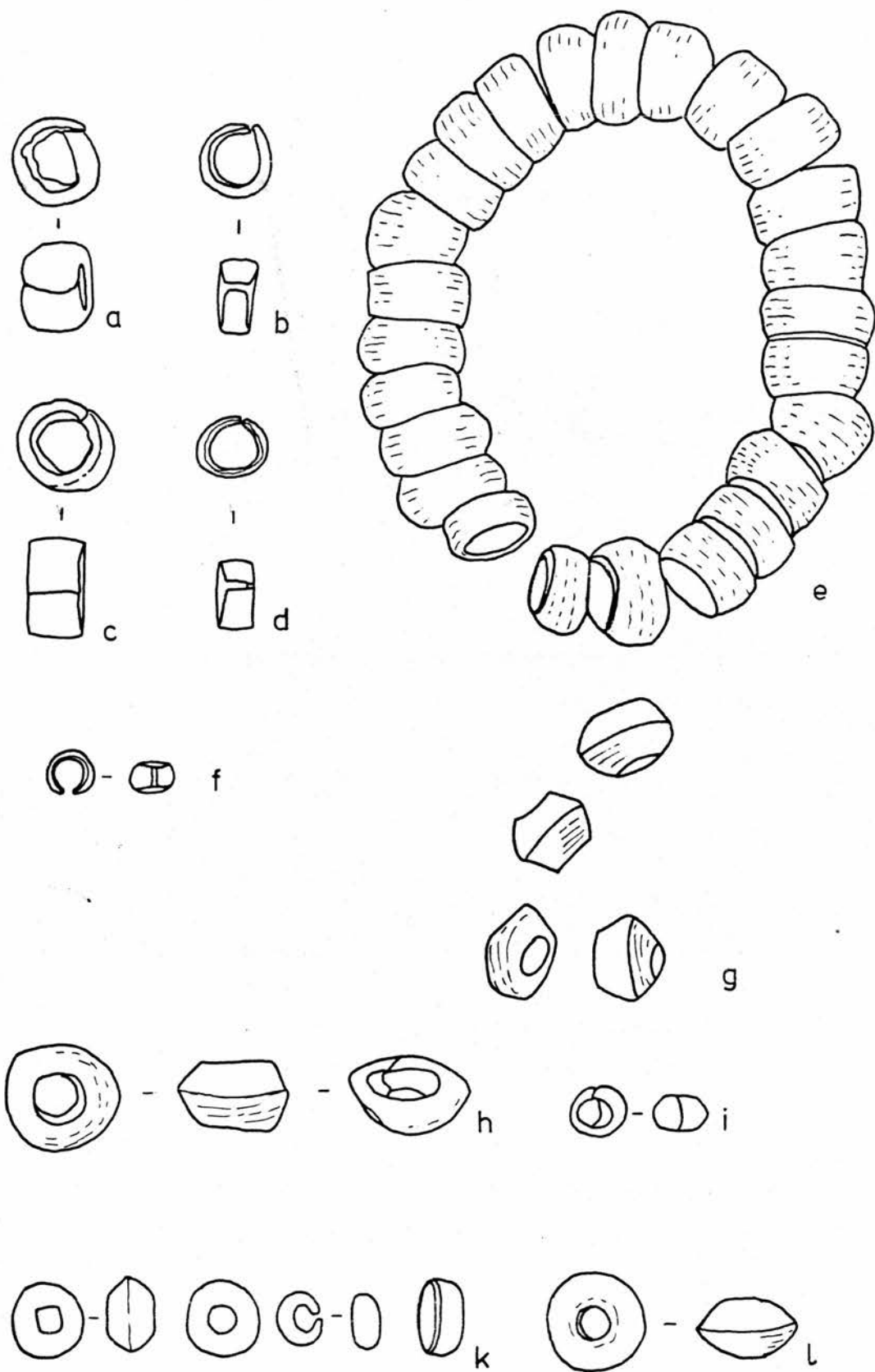


Fig. 62. Ringbeads (a-f) and biconical beads (g-l).

a-d: Gerolfingen-Tauffellen; f, h, i: Estavayer; g: Vinelz;
 k: Font; l: St. Blaise, e: Préfargier. Scale 1:1.

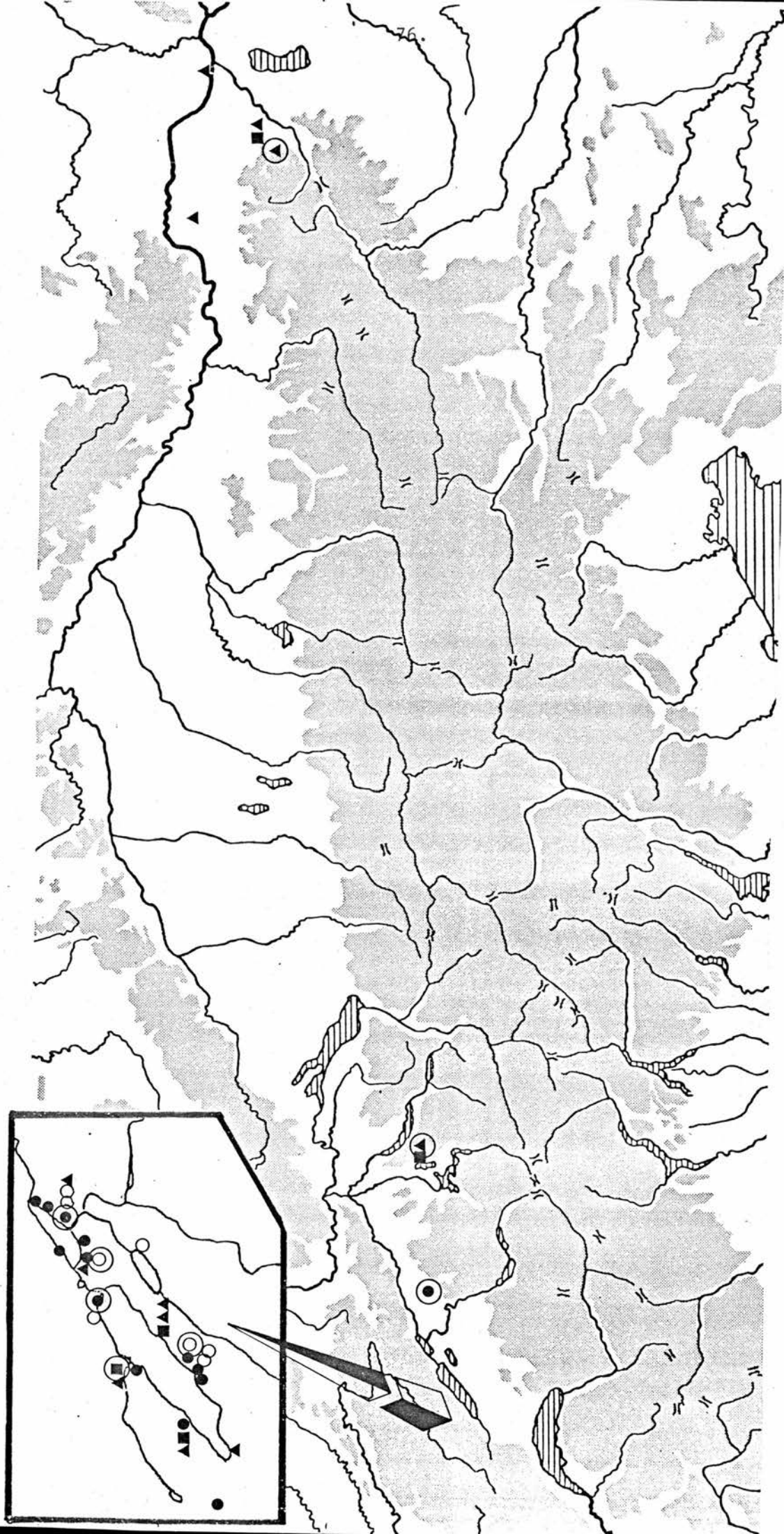


Fig. 83. Distribution of ringbeads (●) and biconical beads (○; cf. App. XI), of tubes of sheet copper (■; cf. Ap. XII) and spiral cylinders (▲; cf. App. XIII). Encircled symbols denote more than 2 finds of the same type found on a single site. Scale 1 : 3,000,000.

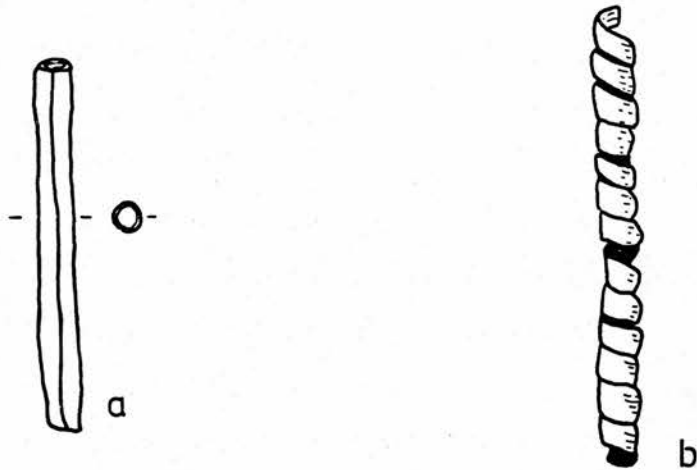
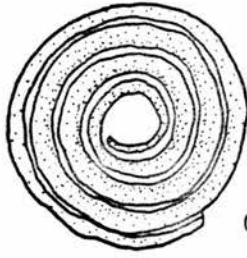
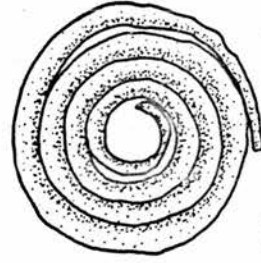


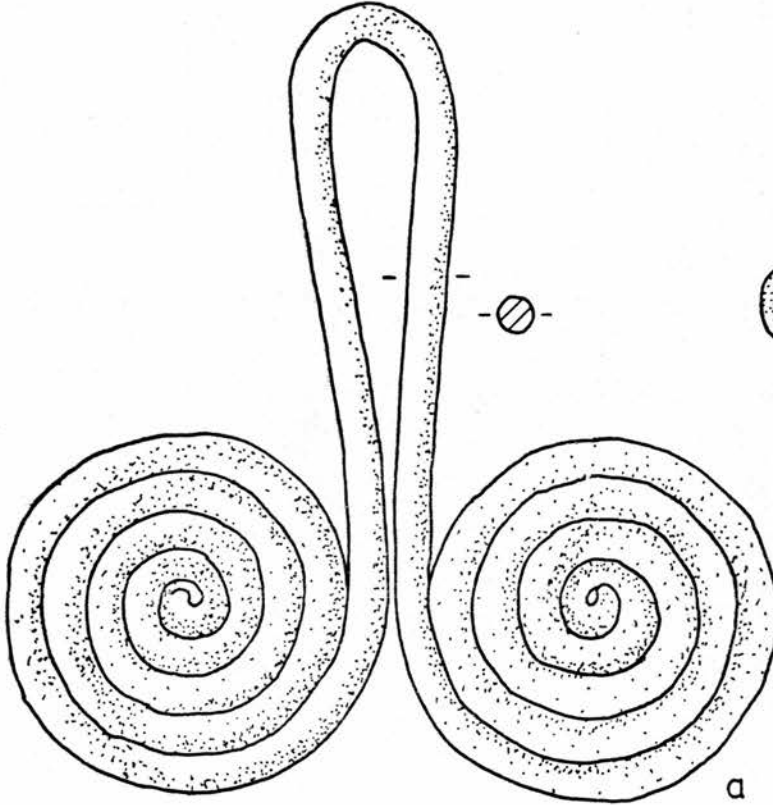
Fig. 84. Tube of sheet copper (a) and spiral cylinder (b).
Vinelz Scale 1:1



a



b



a



b

Top : Fig. 85. Single spiral.

a: Vinet; b: Lüscherz.

Scale 1:1

Bottom: Fig. 86. Spectacle spirals.

a: Font; b: Batavayer.

Scale 1:1

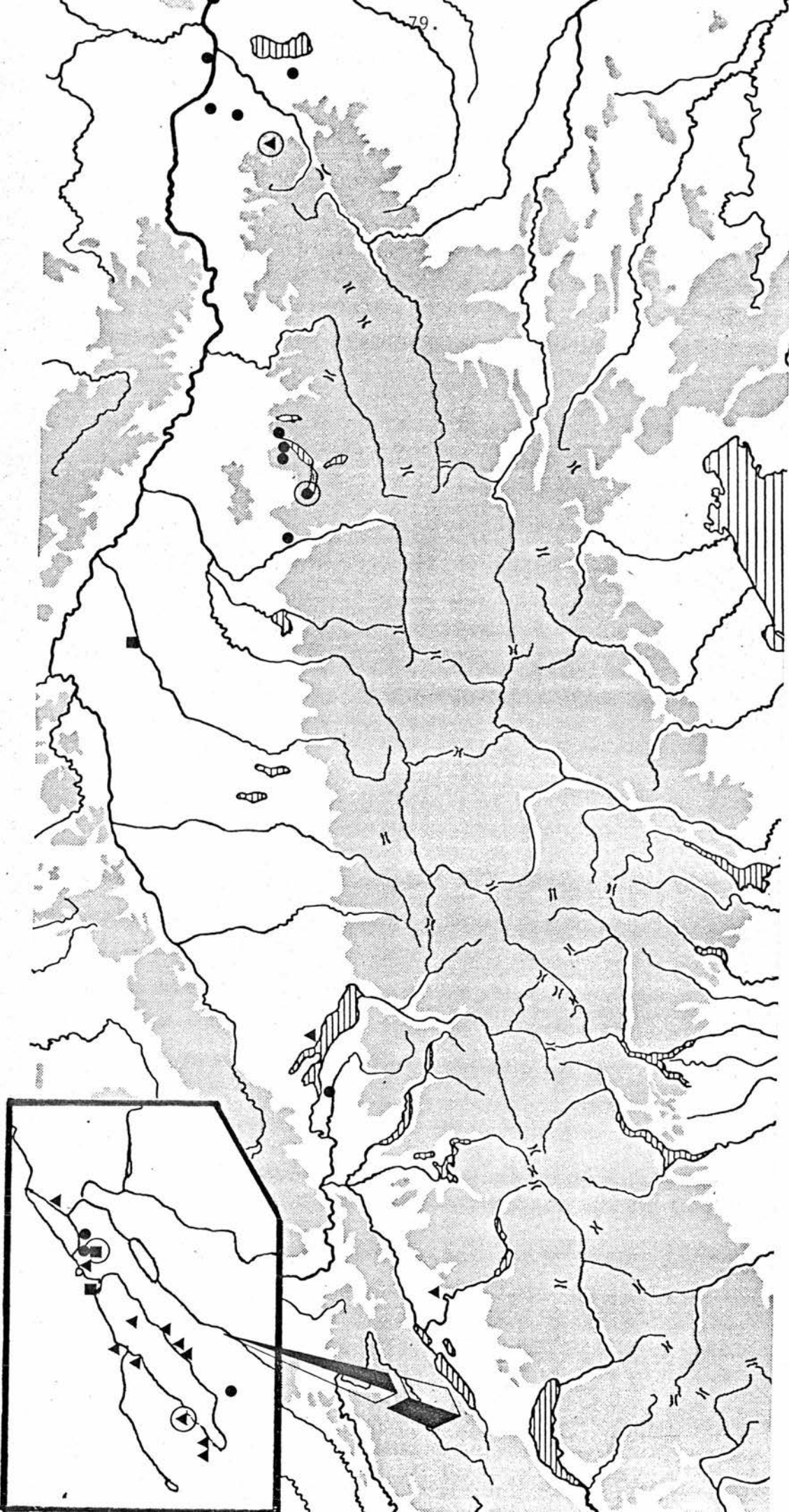


Fig.87. Distribution of single spirals (●; cf. App. XIV), spectacle spirals (▲; cf. App. XV) and pendants (■; cf. App. XVI). Encircled symbols denote more than 2 finds of the same type found on a single site. Scale 1 : 3,000,000.

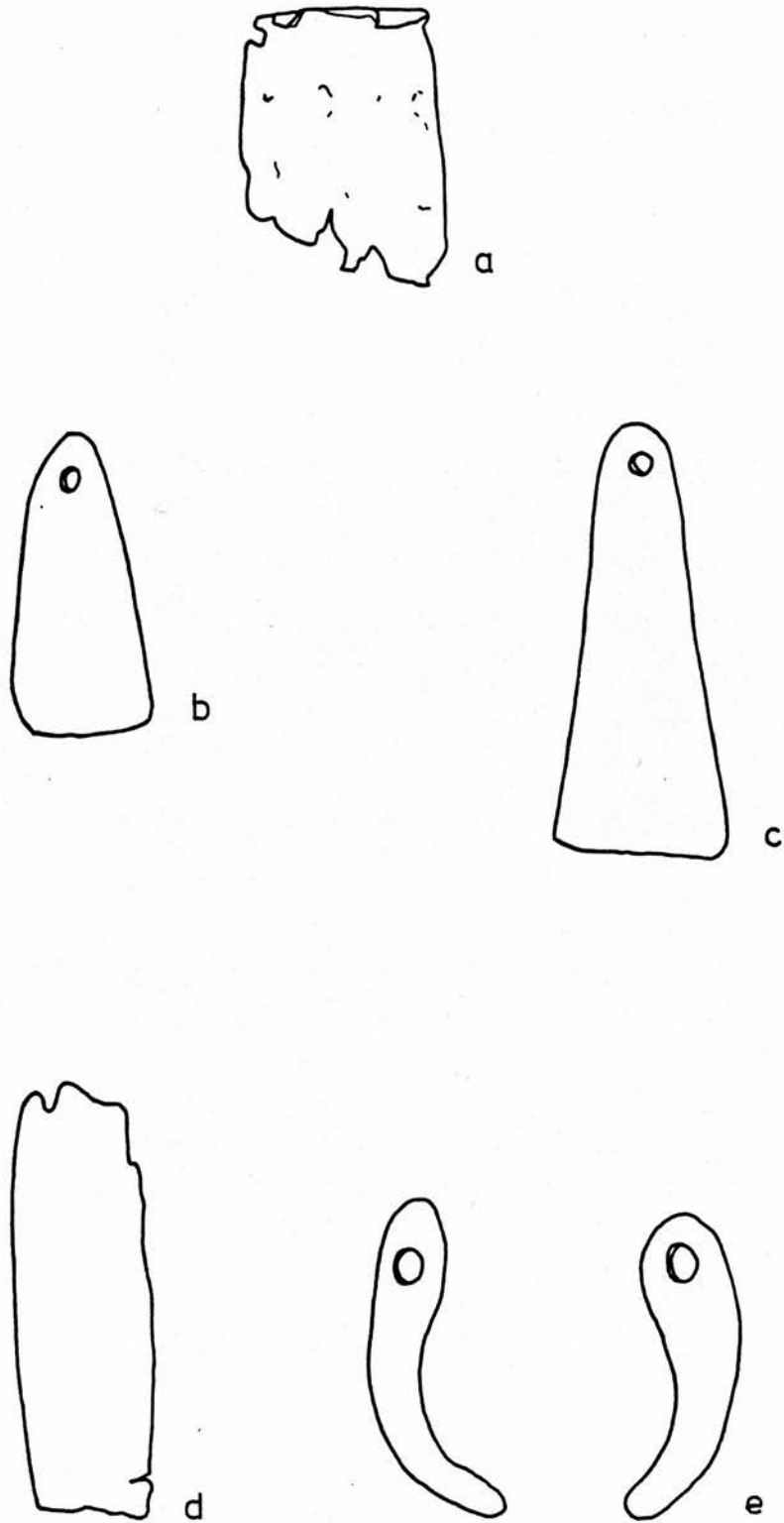


Fig. 88. Pendants.

a: Altheim; b-d: Vinelz; e: St. Blaise.

Scale 1:1.

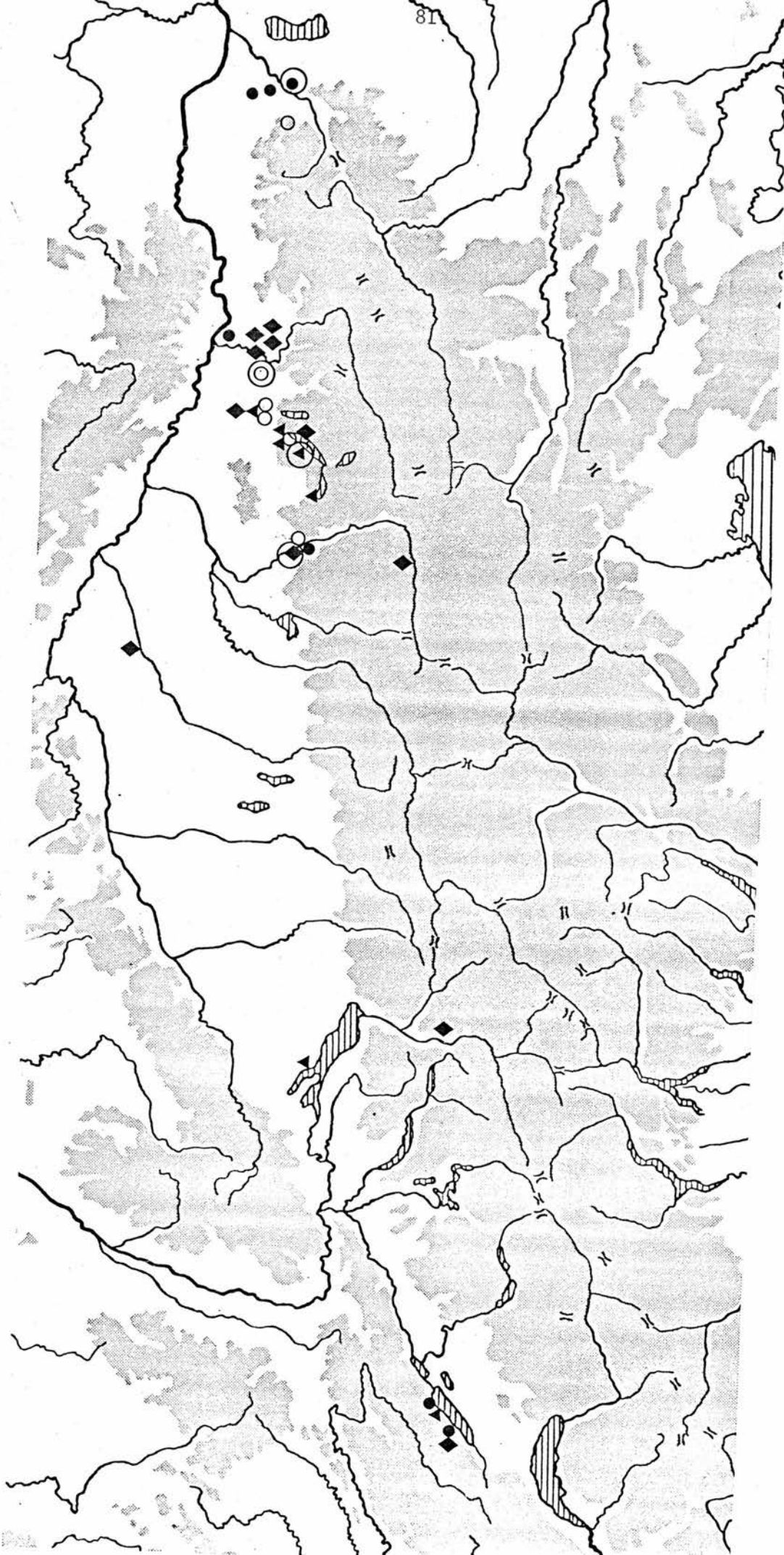
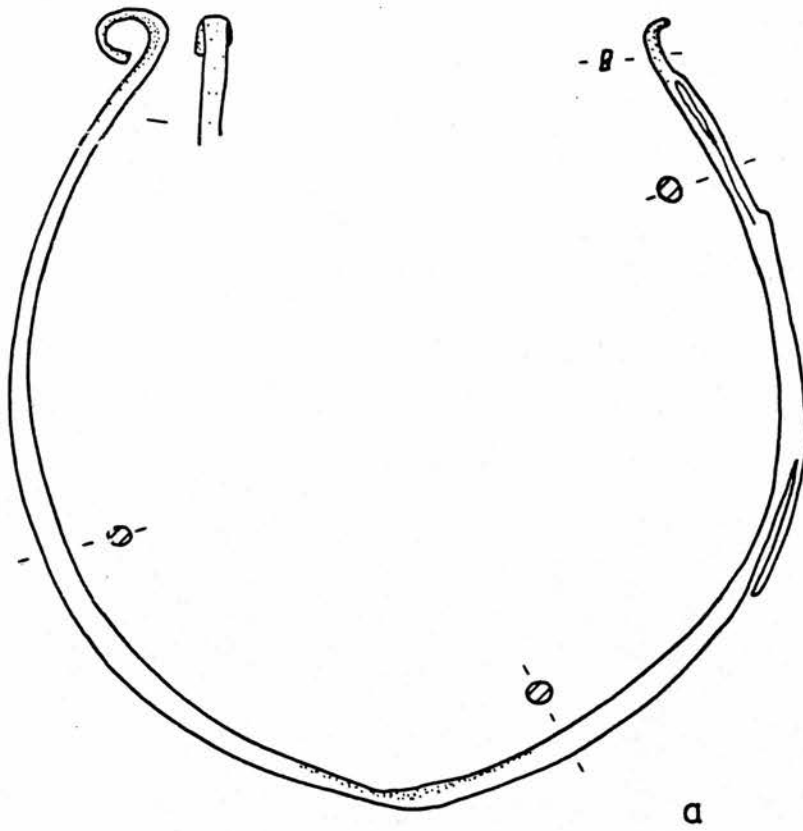
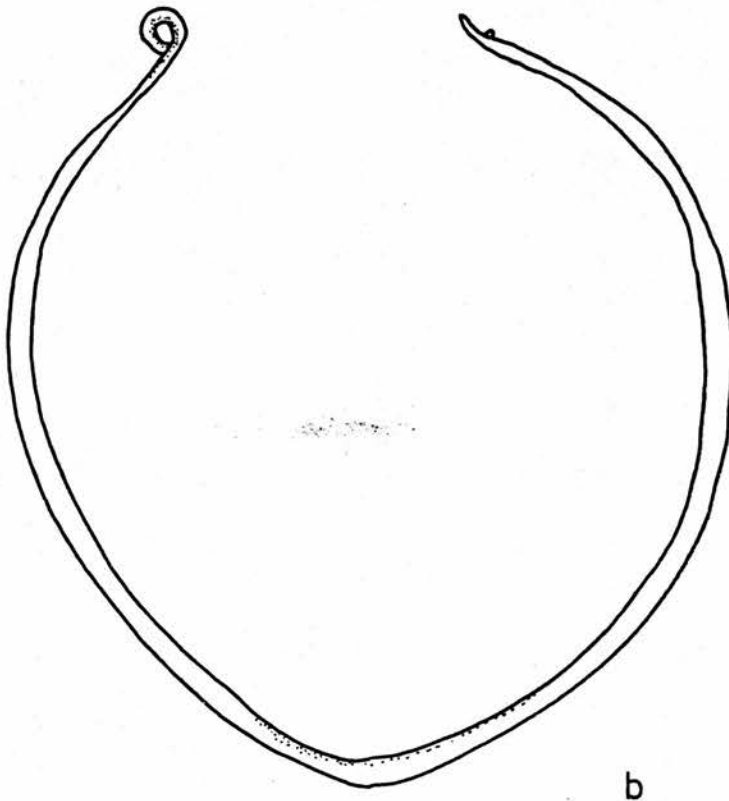


Fig. 89. Distribution of Ösenhalsringe (●; cf. App. XVII), sickles (○; cf. App. XVIII), fish hooks (▲; cf. App. XIXa) and unidentified copper pieces (◆; cf. App. XIXb). Encircled symbols denote more than 2 finds of the same type found on a single site. Scale 1 : 3,000,000.



a



b

Fig. 90. Ösenringe.

a: B den-Königshöhle; b: Lichtenwörth.

Scale 1:1

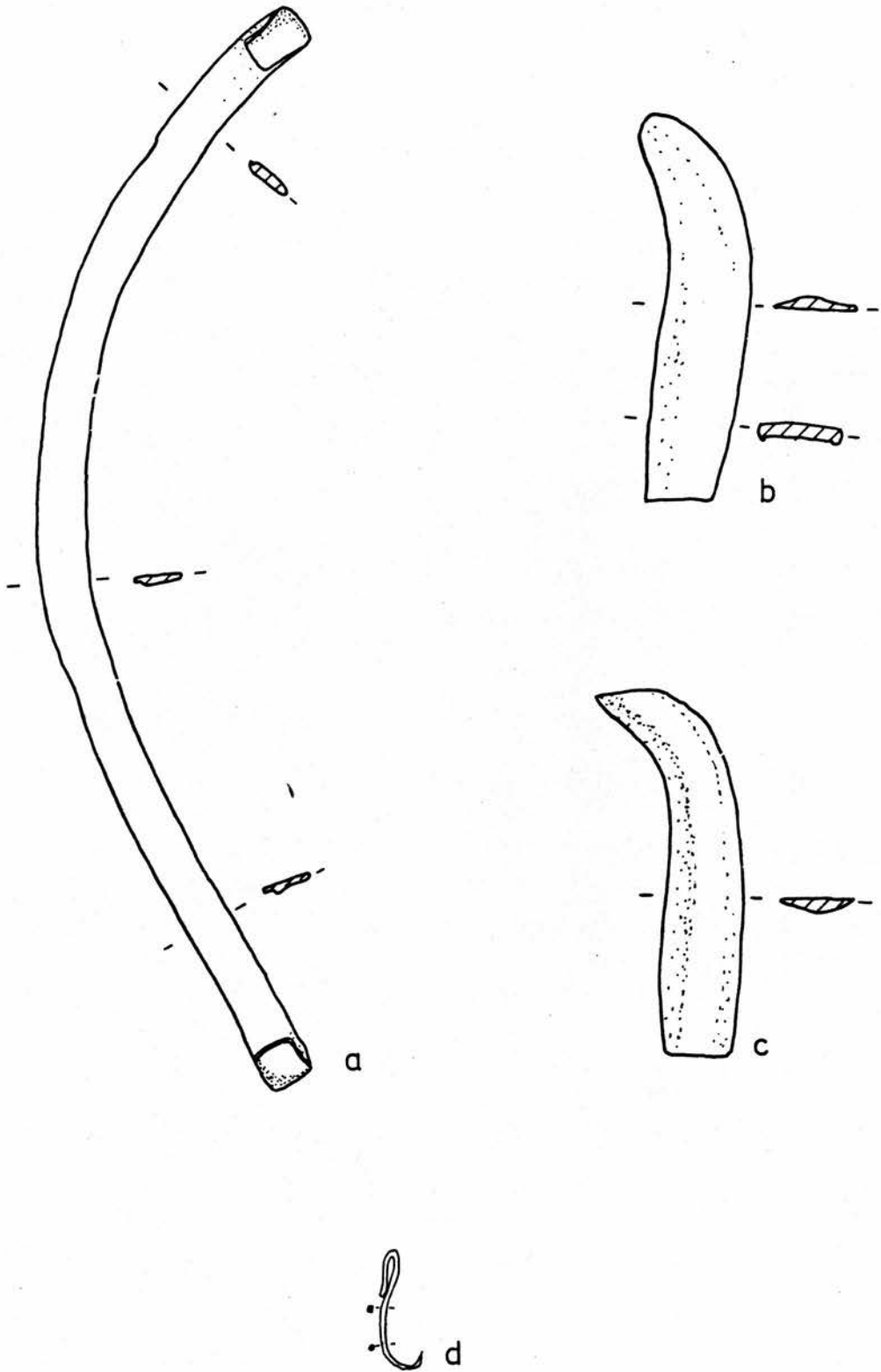


Fig. 91. Ósenband, sickle and fish hook.

a: Neuchâtel; b & d: Paura; c: Michel Dorf. Scale 1:1.

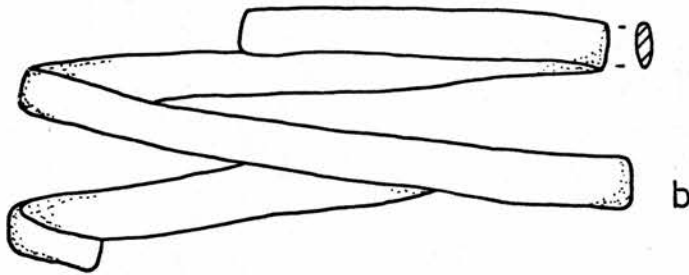
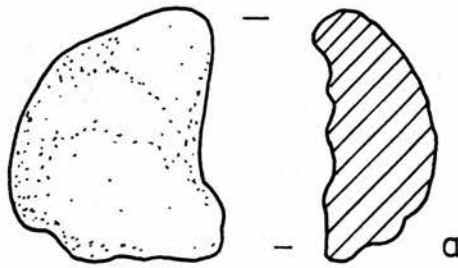


Fig.92. Bun ingot and spiral armring.

a: Freinberg, Linz; b: Lichtenwörth.

Scale 1:1

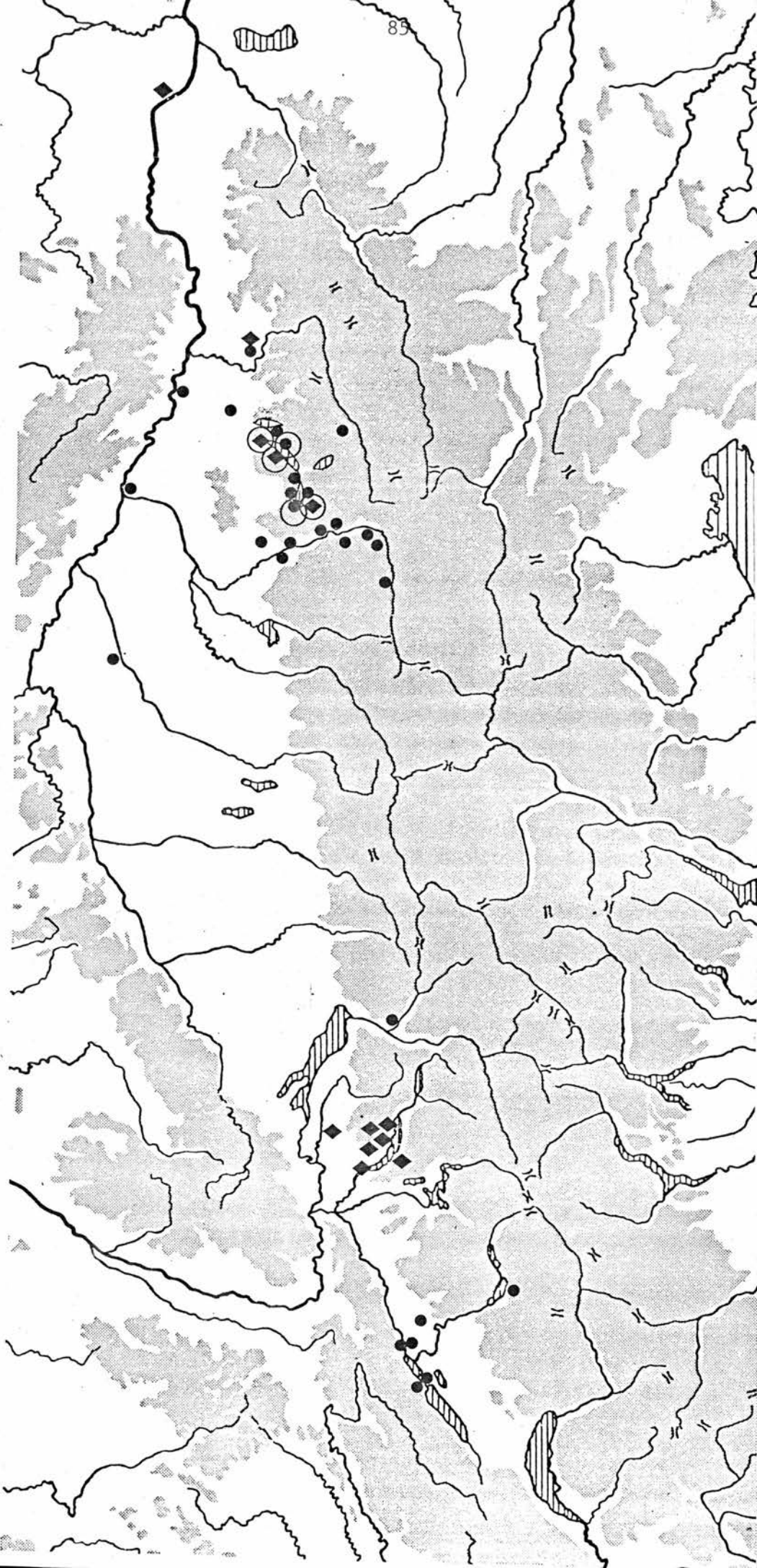


Fig. 93. Distribution of pieces and droplets of metal and bun ingots (●; cf. App. XXa), and crucibles (◆; cf. App. XXb). Encircled symbols denote more than 2 finds of the same type found on a single site. Scale 1:3,000,000.

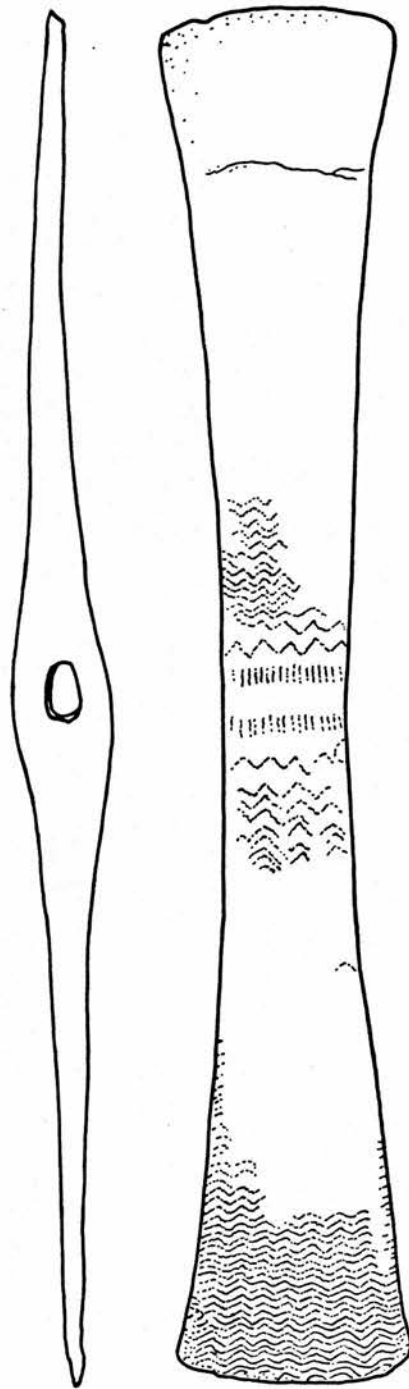


Fig. 94. Double axe.

Kűsnecht.

Scale 1:2.3

Fig. 95a. γ -Spectrum of a copper-based sample after short decay .

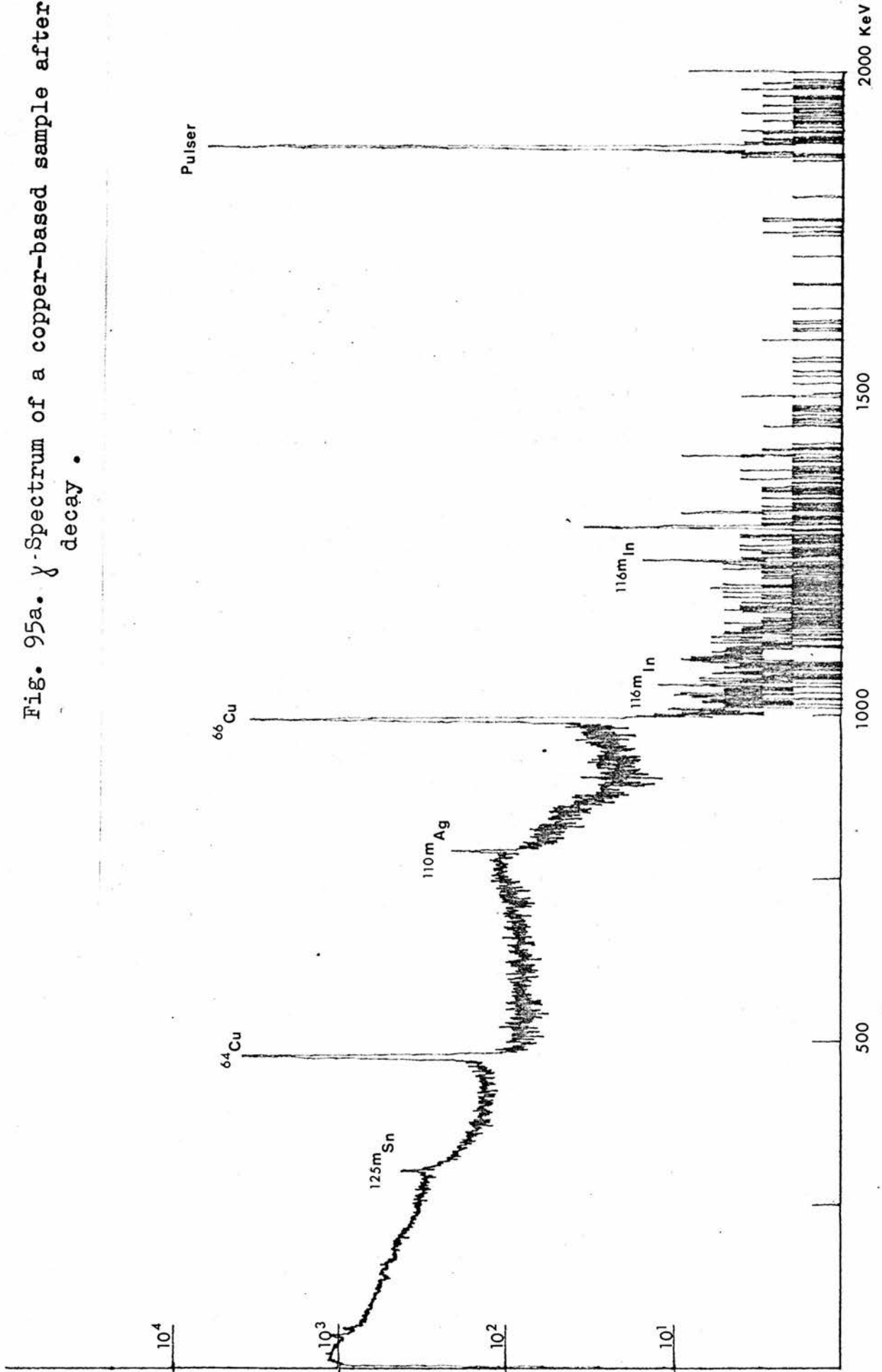
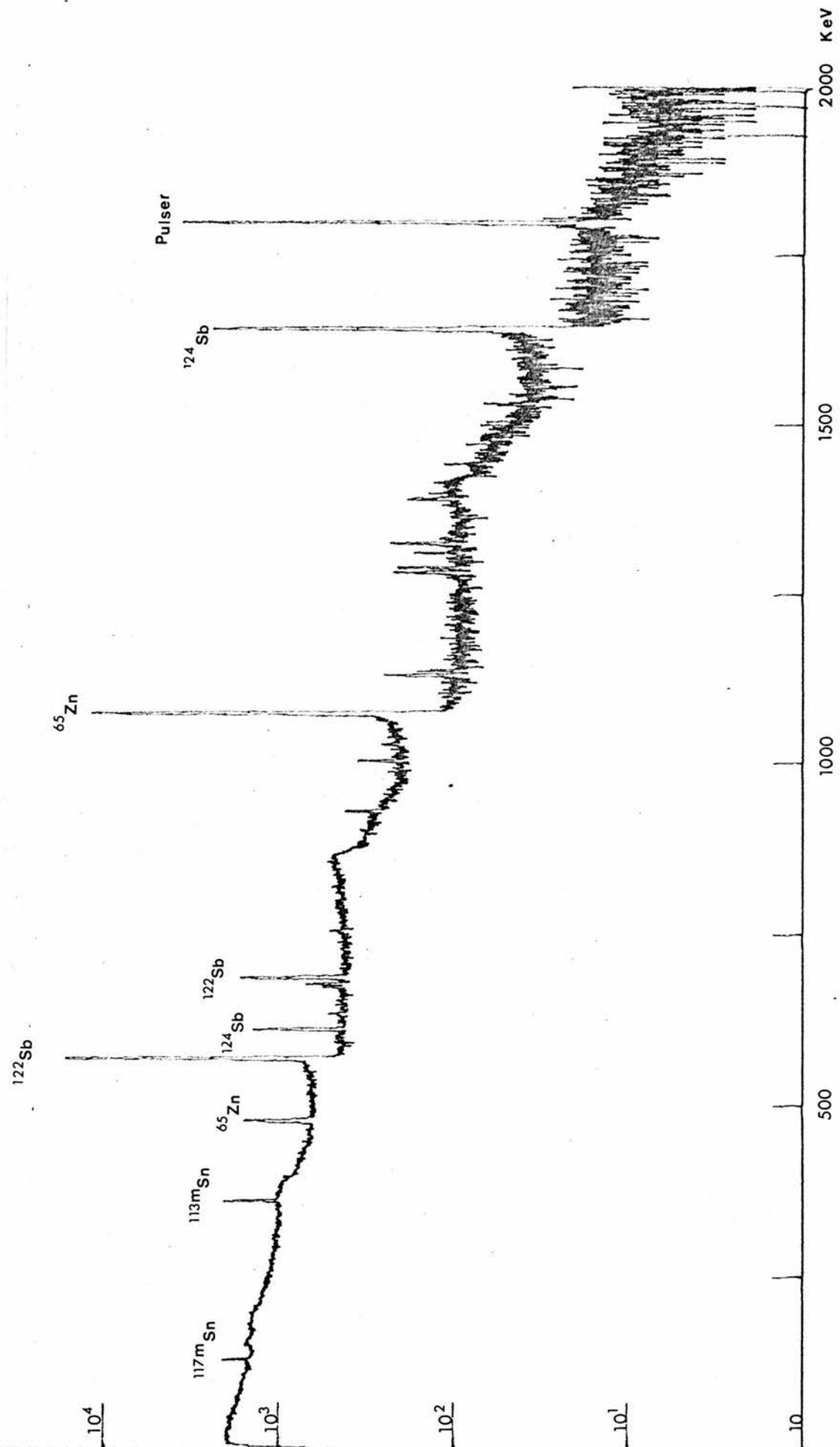


Fig.95b. γ -Spectrum of a copper-based sample after long decay.



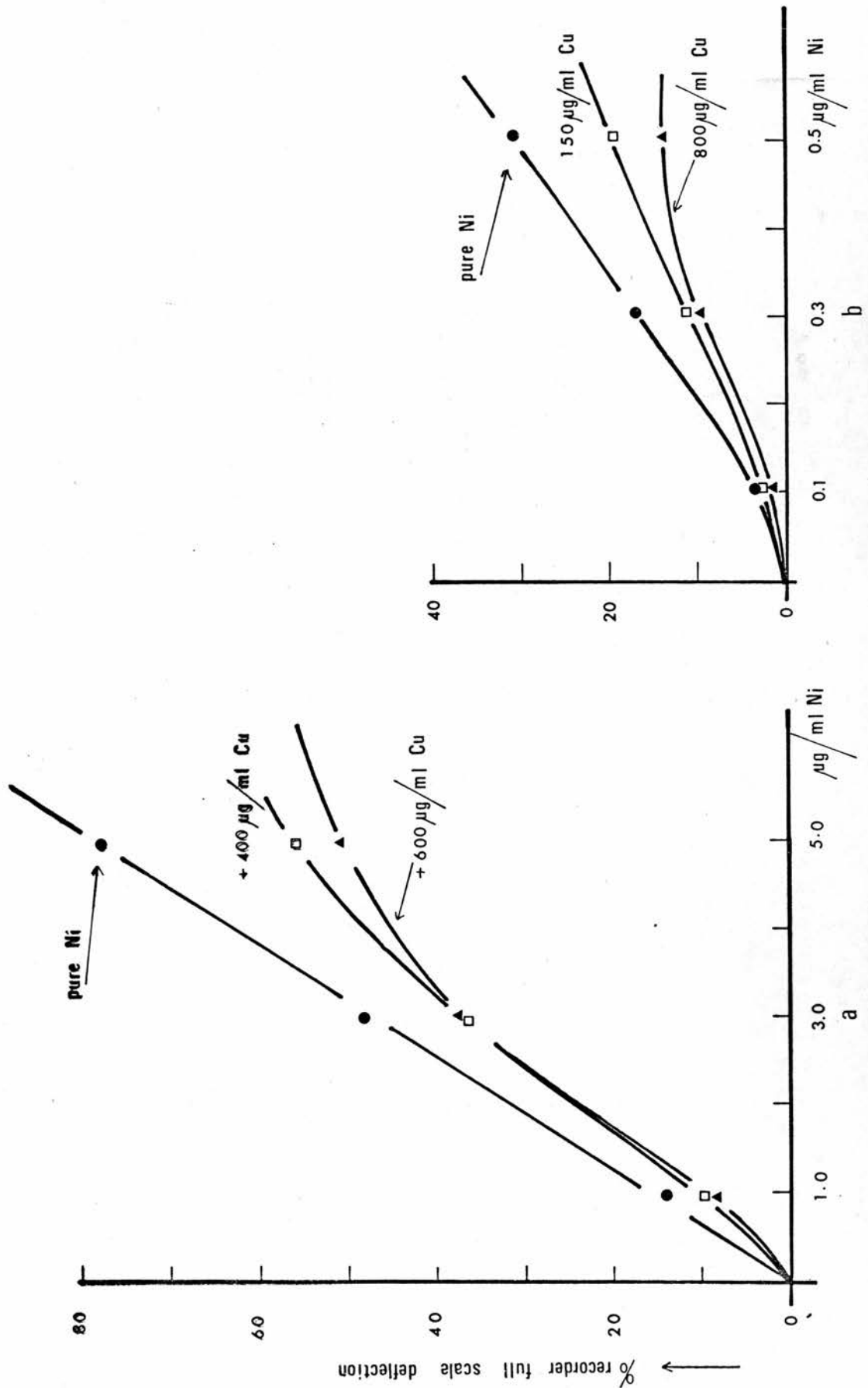
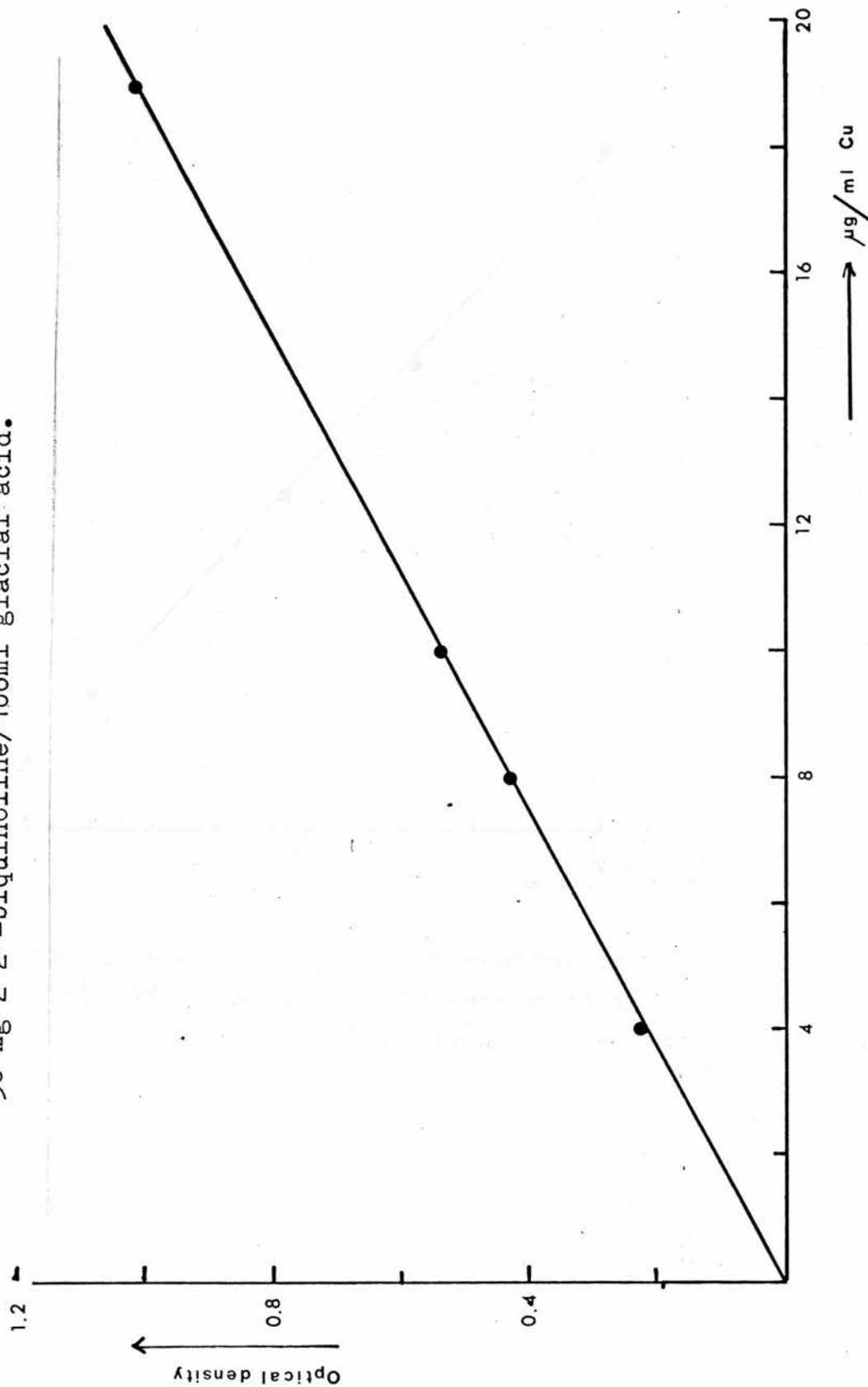


Fig.96. Matrix effect on nickel during atomic absorption spectroscopy.

Fig. 97. Calibration curve for the determination of copper (after Felsenfeld, 1960). Standards were read at 545 nm against reagent blank set at zero absorbance, using 5%hydroxylammoniumchloride and 50 mg 2'2'-biquinoline/100ml glacial acid.



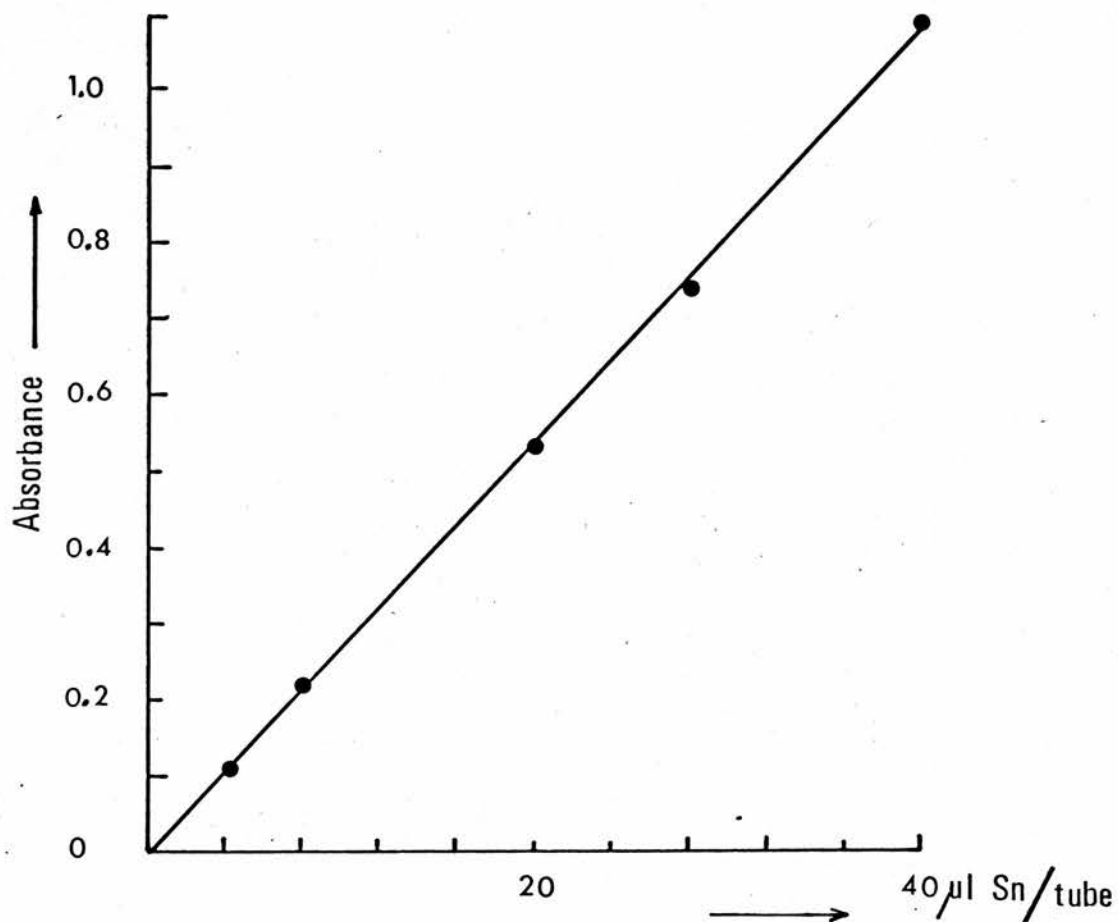


Fig.98. Calibration curve for the determination of tin (after Corbin,1973). The standards were read in 1 cm cells at 660 nm against reagent blank set at zero absorbance, using reagent containing 40 mg pyrocatechol violet/100 ml acid mixture.

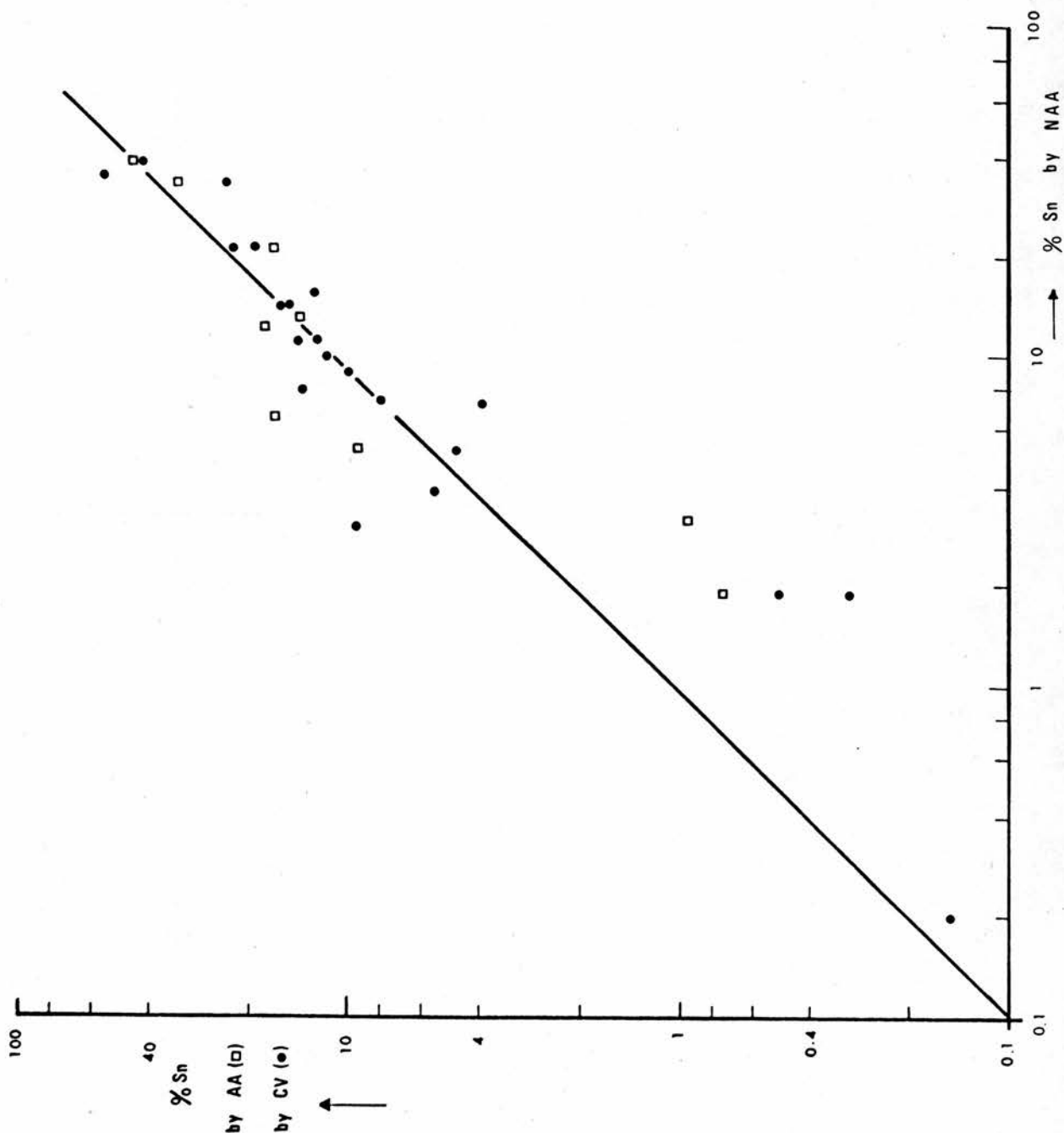
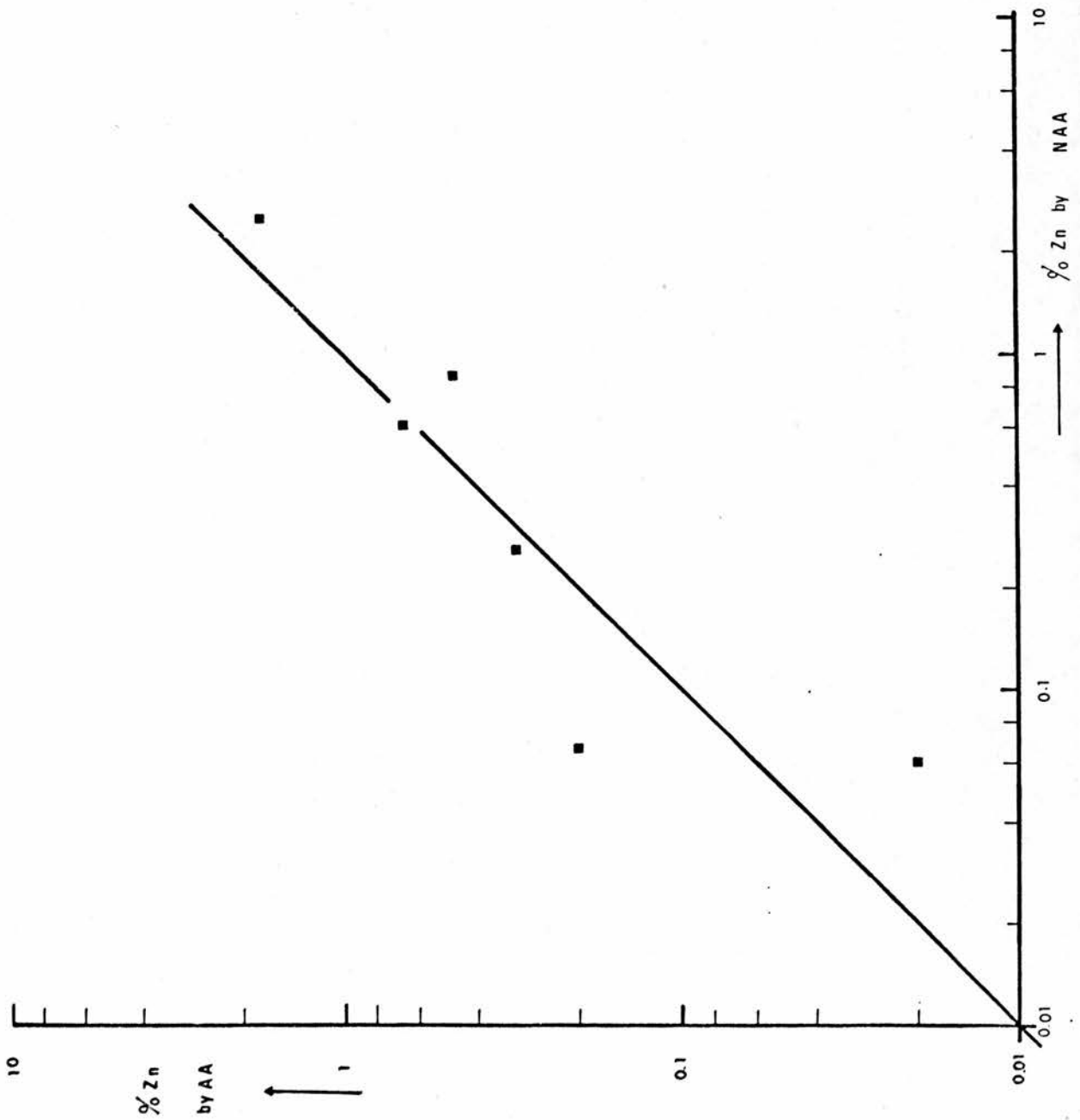


Fig.99. Comparison of results of tin measurements obtained by atomic absorption spectroscopy and neutron activation analysis (□) and by pyrocatechol violet method and neutron activation analysis (●), on a double logarithmic scale.

Fig.100. Comparison of zinc results obtained by atomic absorption spectroscopy and neutron activation analysis.



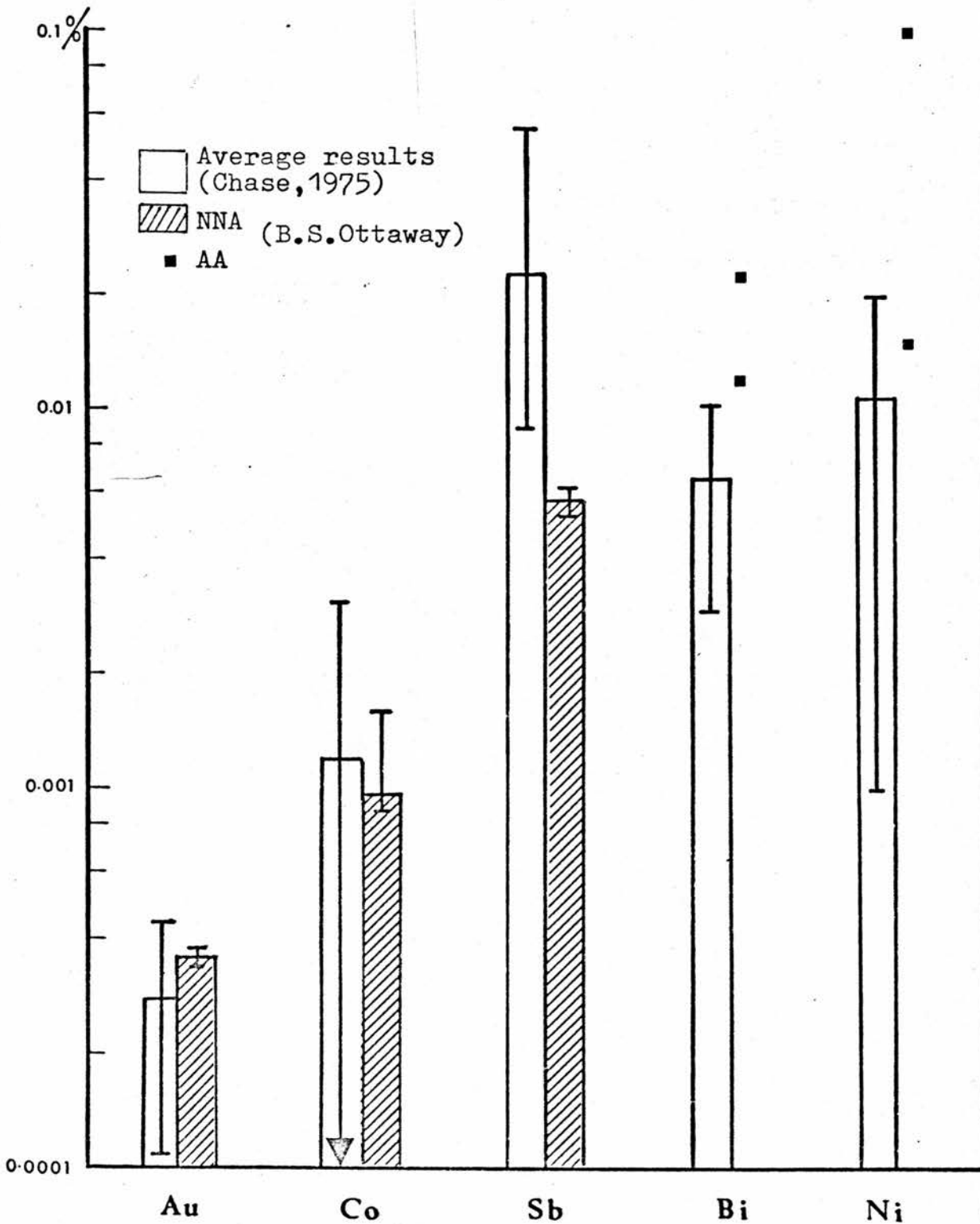


Fig.101. Comparison of Ottaway's results (obtained by neutron activation analysis (NAA) for elements Au, Co and Sb; by atomic absorption spectroscopy (AA) for the elements Bi and Ni) with average results collated by Chase (1975) from interlaboratory comparison on 'Washington Standard H₁'.

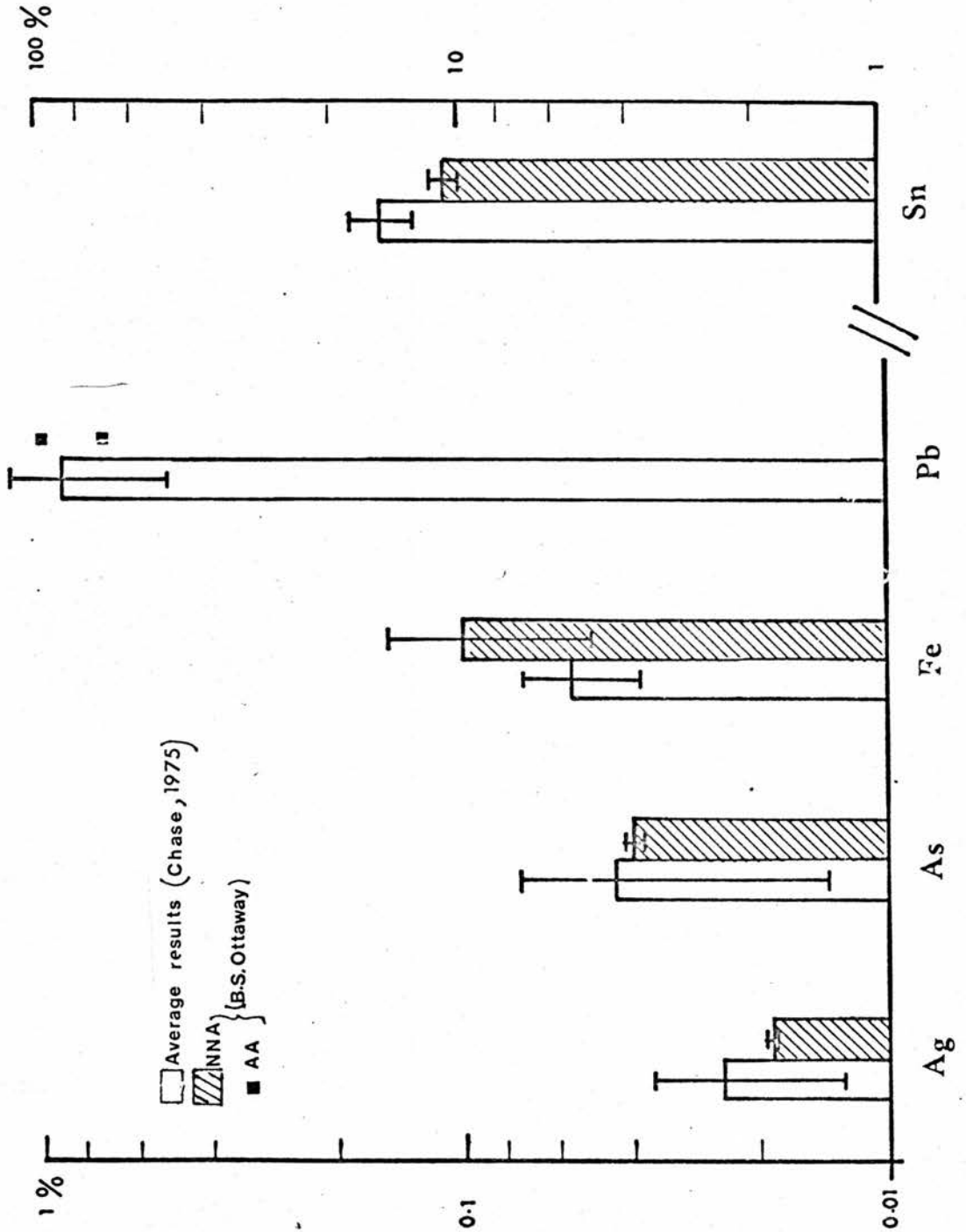
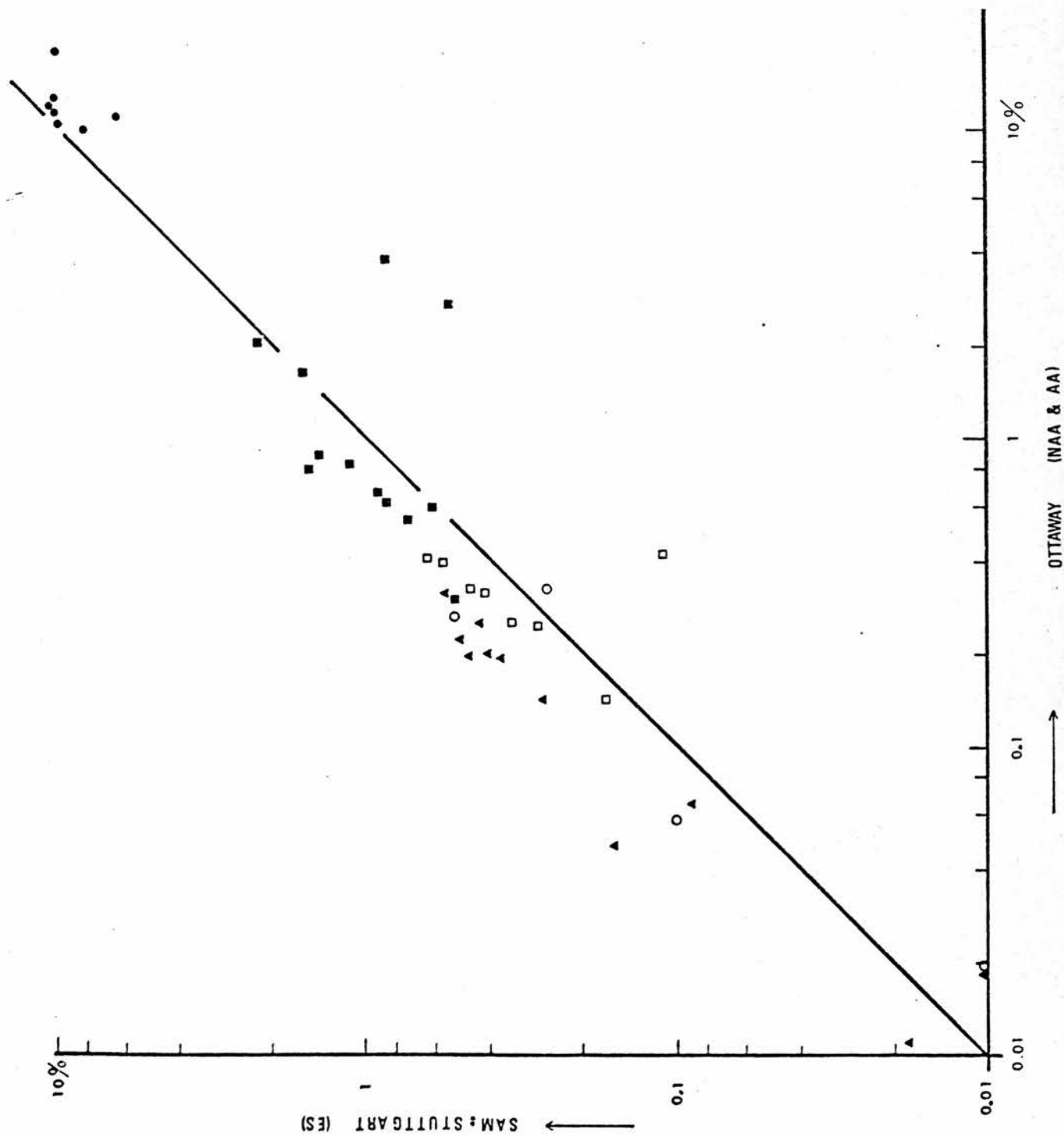


Fig.102. Comparison of Ottaway's results (obtained by NAA for elements Ag, As, Fe and Sn; by AA for element Pb) with the average results collated by Chase (1975) from interlaboratory comparison on 'Washington Standard H₁'.

Fig. 103. Comparison of Stuttgart's analyses (obtained by emission spectroscopy (ES)) and Ottaway's analyses (obtained by neutron activation analysis (NAA) and atomic absorption spectroscopy (AA)) on double logarithmic scale.

● = Sn; ○ = Ni; ■ = As; □ = Sb; ▲ = Ag.



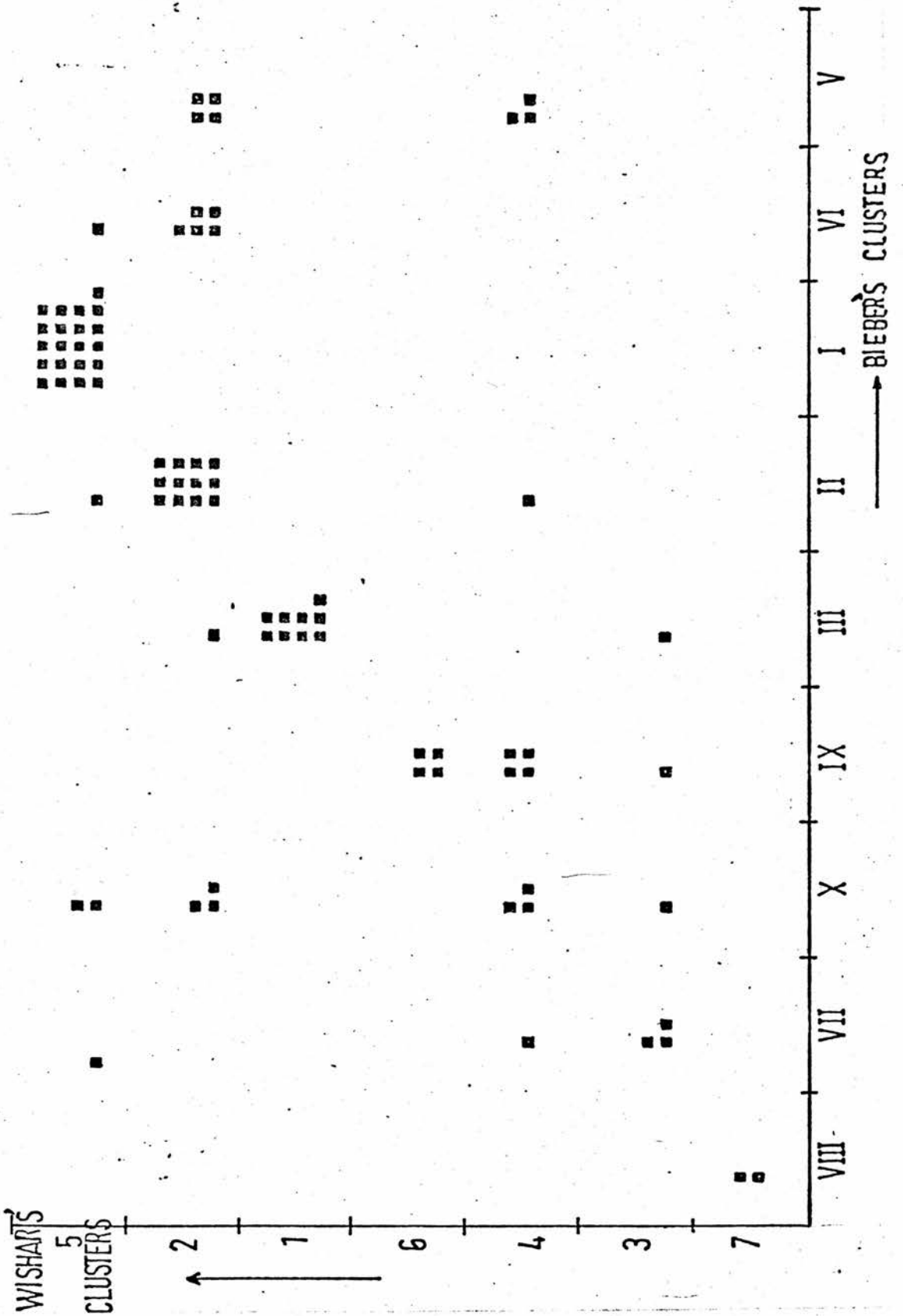


Fig.104. Comparison of groups obtained using Wishart's and Bieber/Olivier's cluster analyses on test data.

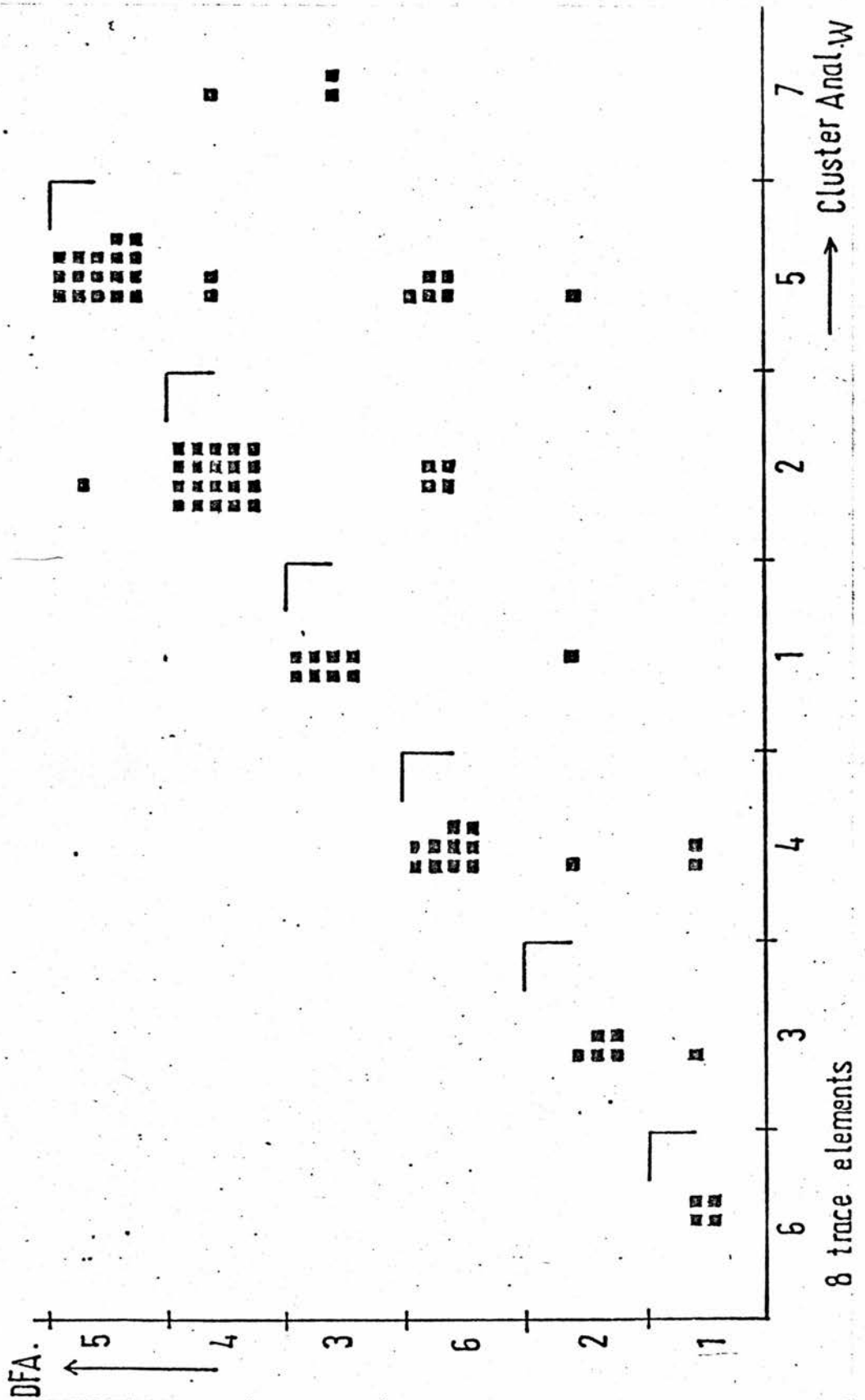


Fig.105. Comparison of groups obtained by using discriminant analysis and Wishart's cluster analysis on test data.

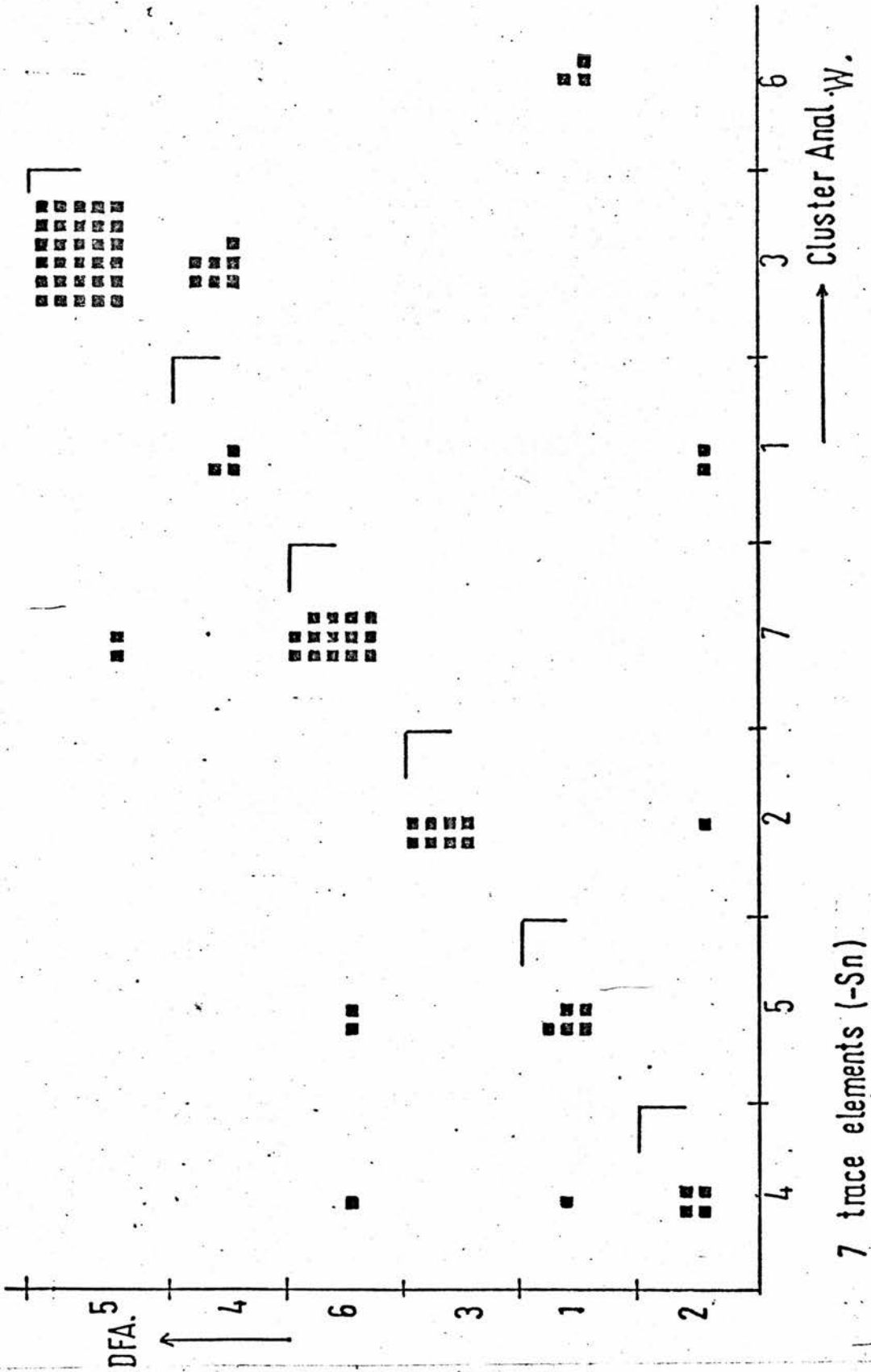
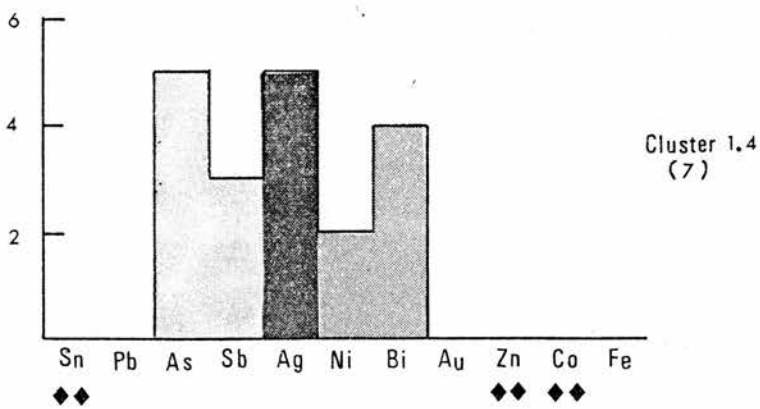
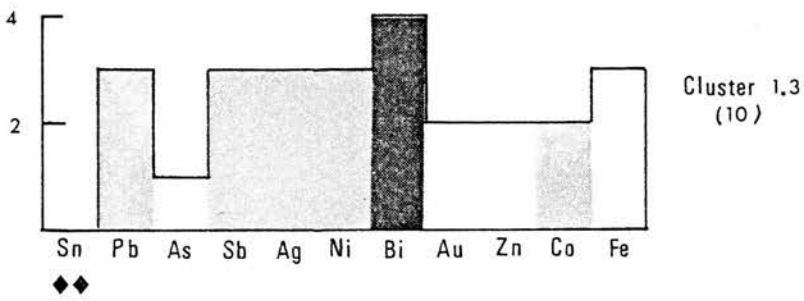
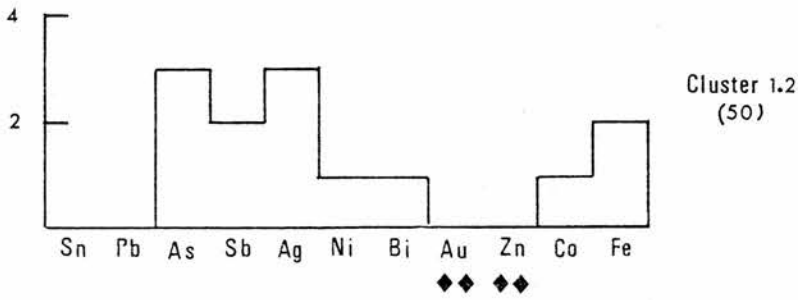
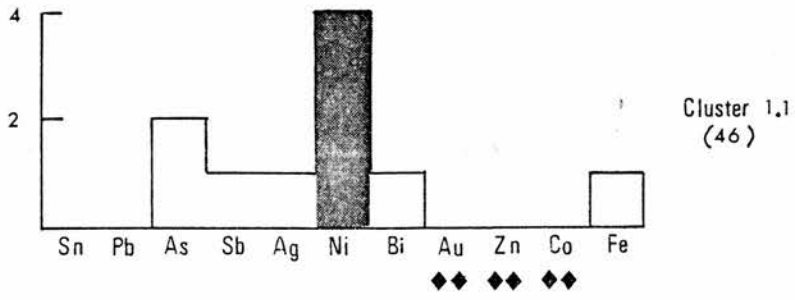
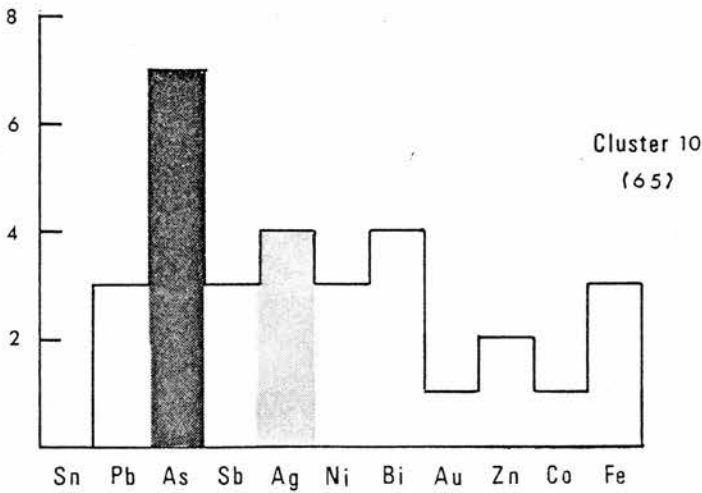
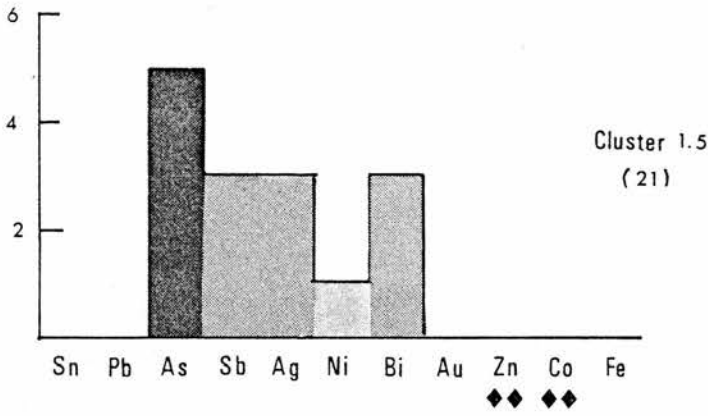
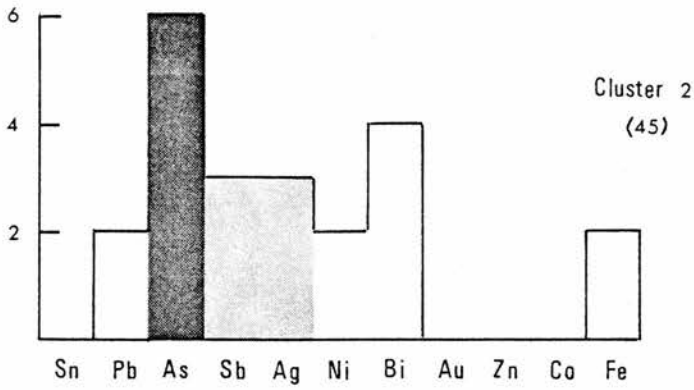


Fig. 106. Comparison of groups obtained by discriminant analysis and Wishart's cluster analysis on test data. In both grouping methods tin was masked to check that its presence did not outweigh the result.



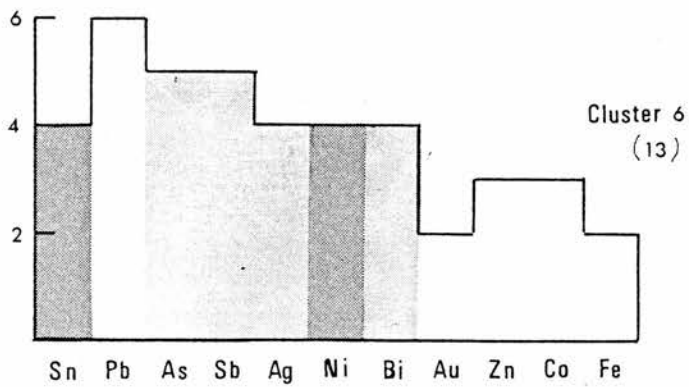
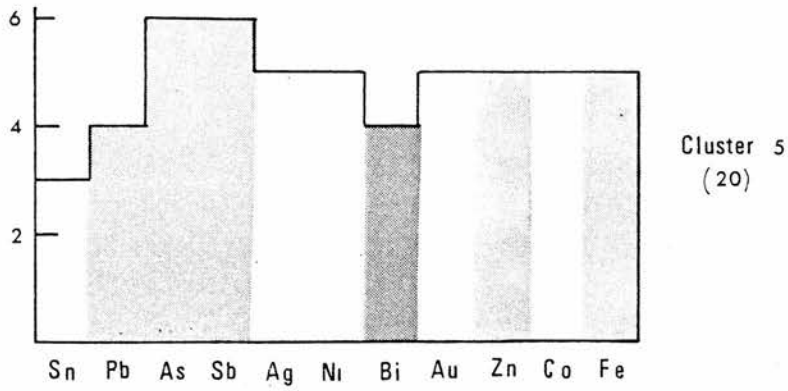
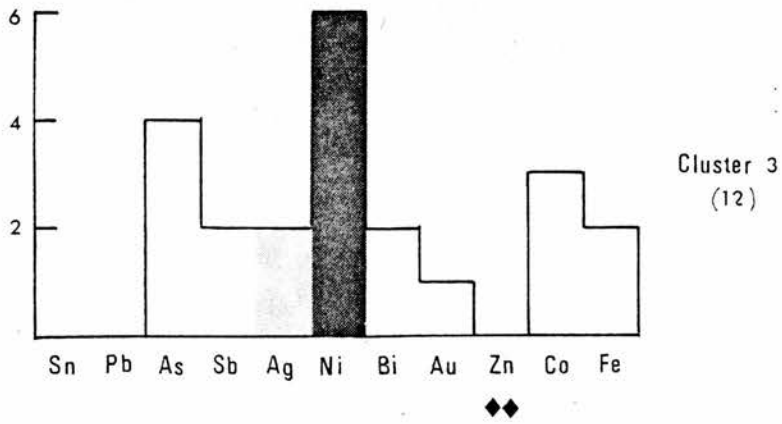
	Coeff. of Variation
◆◆	0
■	< 50
▒	< 100
░	< 150
□	> 150

Fig. 107. Impurity patterns of sub-clusters of cluster 1. The ordinates represent log. concentrations starting from an arbitrary base for each element.



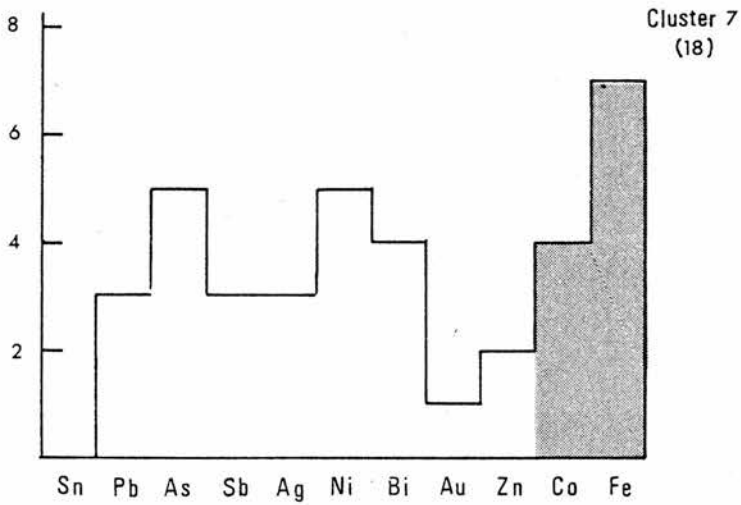
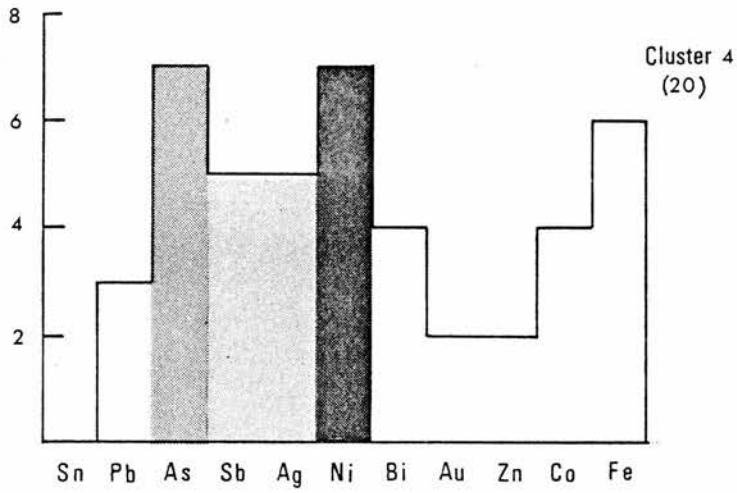
	% Coefficient of Variation
◆◆	0
■	< 50
▒	< 100
░	< 150
□	> 150

Fig. 108. Impurity patterns of cluster 2 , 1.5 and 10. The ordinates represent log. concentrations starting from an arbitrary base for each element.



	% Coeff. of Variation
◆◆	0
■	< 50
▒	< 100
░	< 150
□	> 150

Fig. 109. Impurity patterns of clusters 3, 5 and 6. The ordinates represent log concentrations starting from an arbitrary base for each element.







	% Coeff. of Variation
	< 50
	< 100
	< 150
	> 150

Fig. 110. Impurity patterns of clusters 4 and 7. The ordinates represent log. concentrations starting from an arbitrary base for each element.

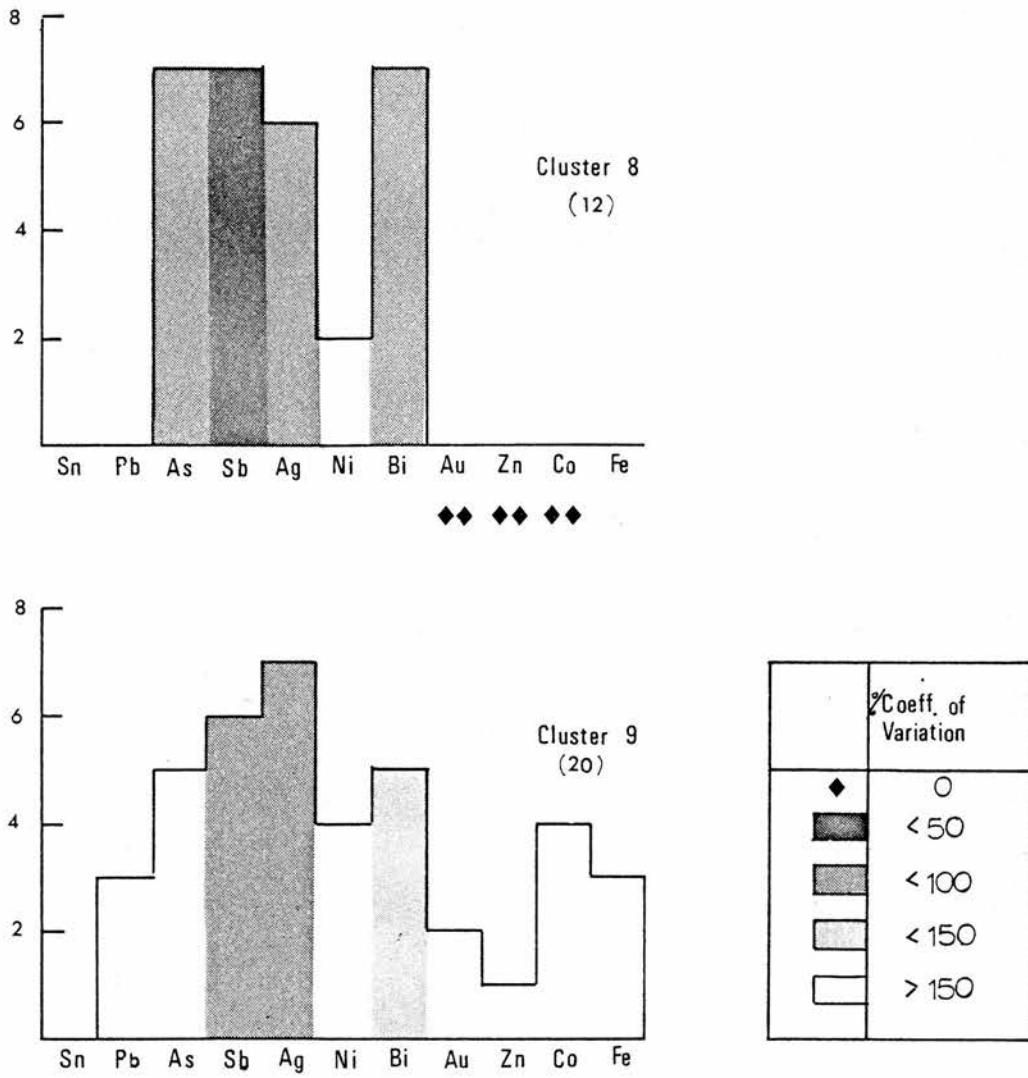


Fig. 111. Impurity patterns for clusters 8 and 9. The ordinates represent log. concentrations starting from an arbitrary base for each element.

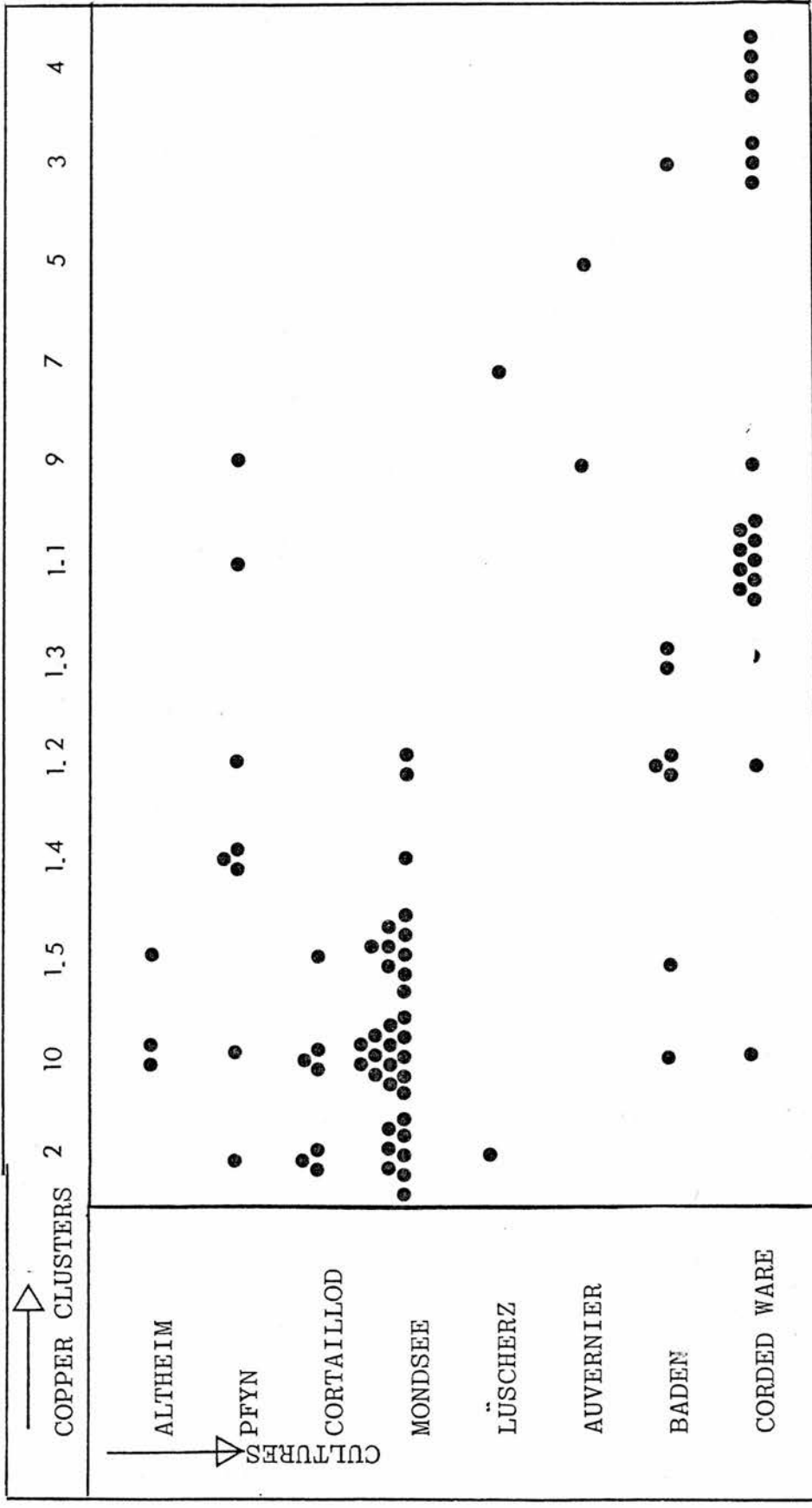


Fig. 112. Number of associated artifacts in each copper cluster, plotted against cultures.

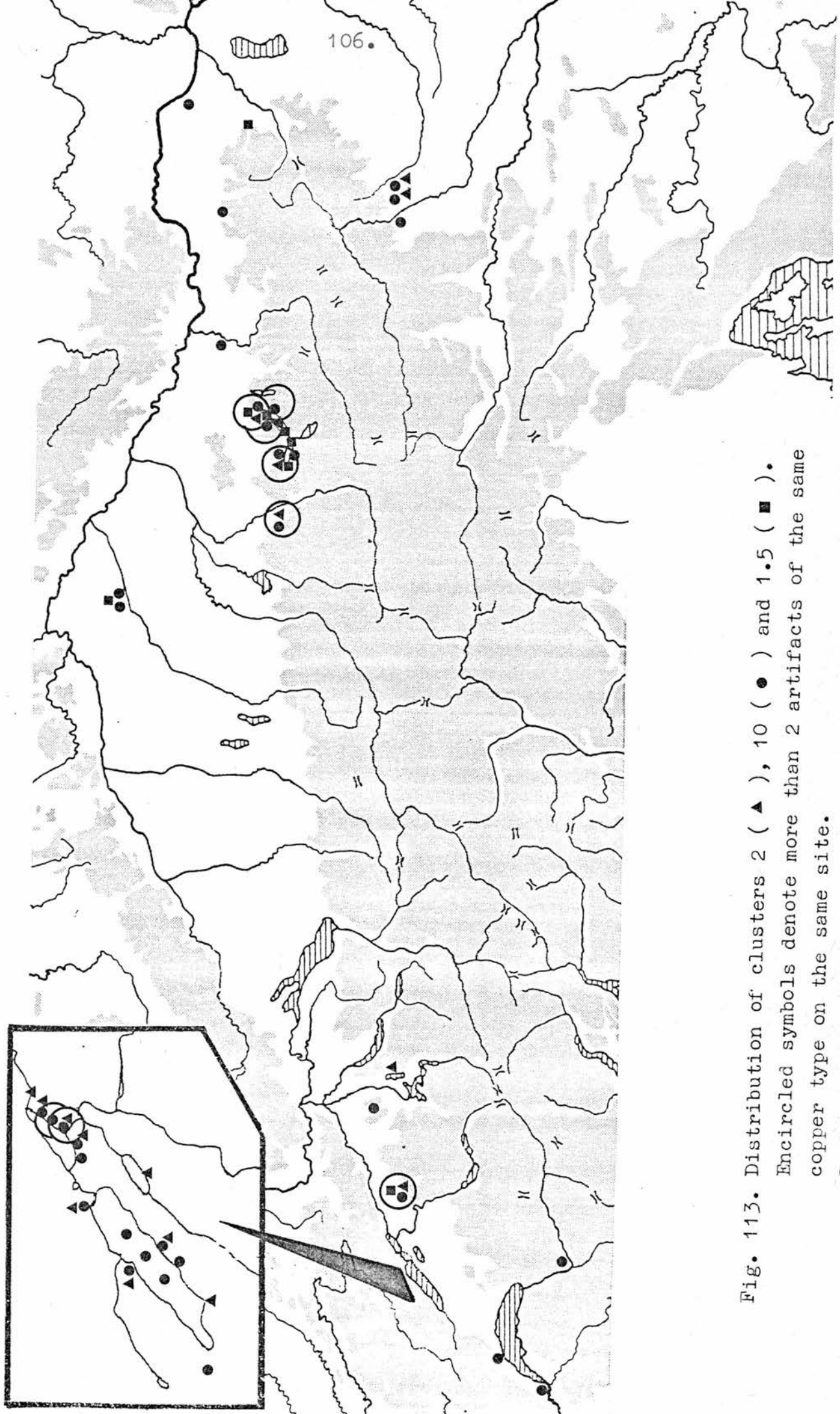
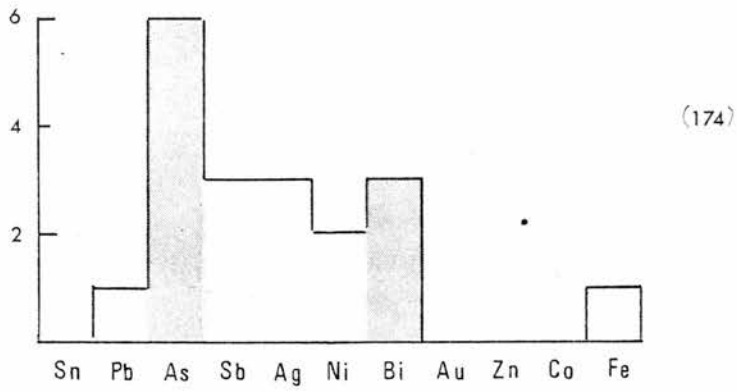


Fig. 113. Distribution of clusters 2 (▲), 10 (●) and 1.5 (■).
 Encircled symbols denote more than 2 artifacts of the same
 copper type on the same site.
 Scale 1:3,000,000.



	% Coeff. of Variation
■	< 150
□	> 150

Fig. 114. Impurity pattern of group containing clusters 2, 10 and 1.5, when arsenic is masked. The ordinates represent log. concentrations starting from an arbitrary base for each element.

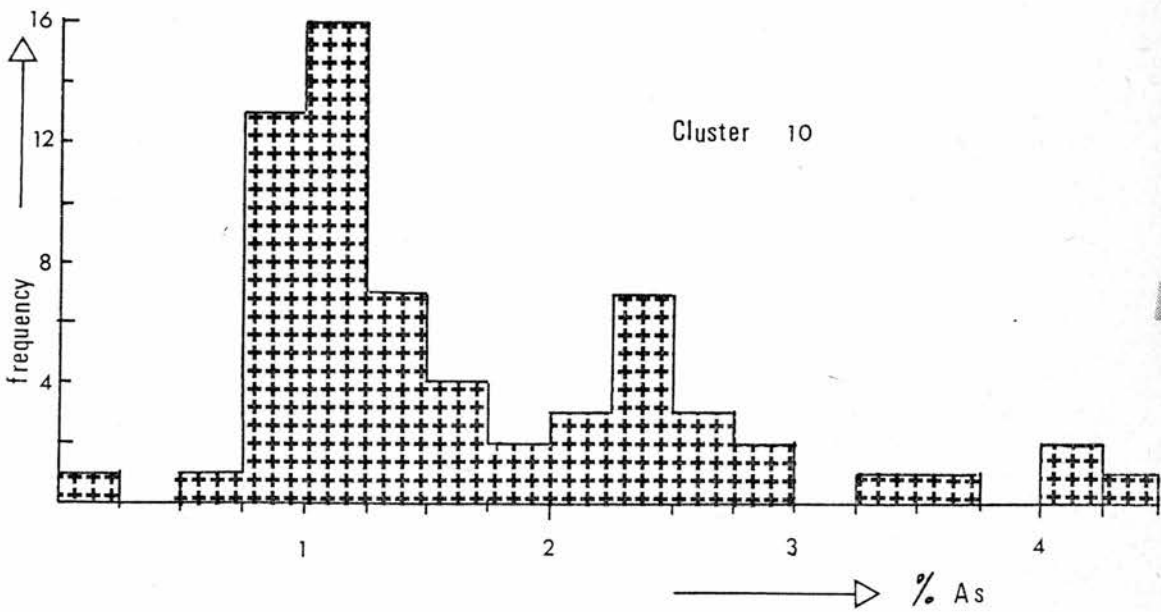
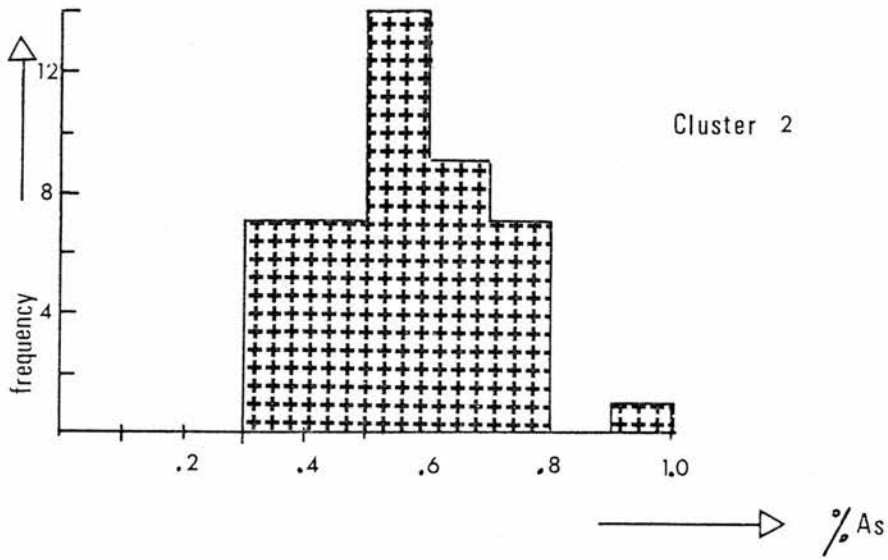


Fig. 115. Arsenic contents of copper clusters 2 and 10.

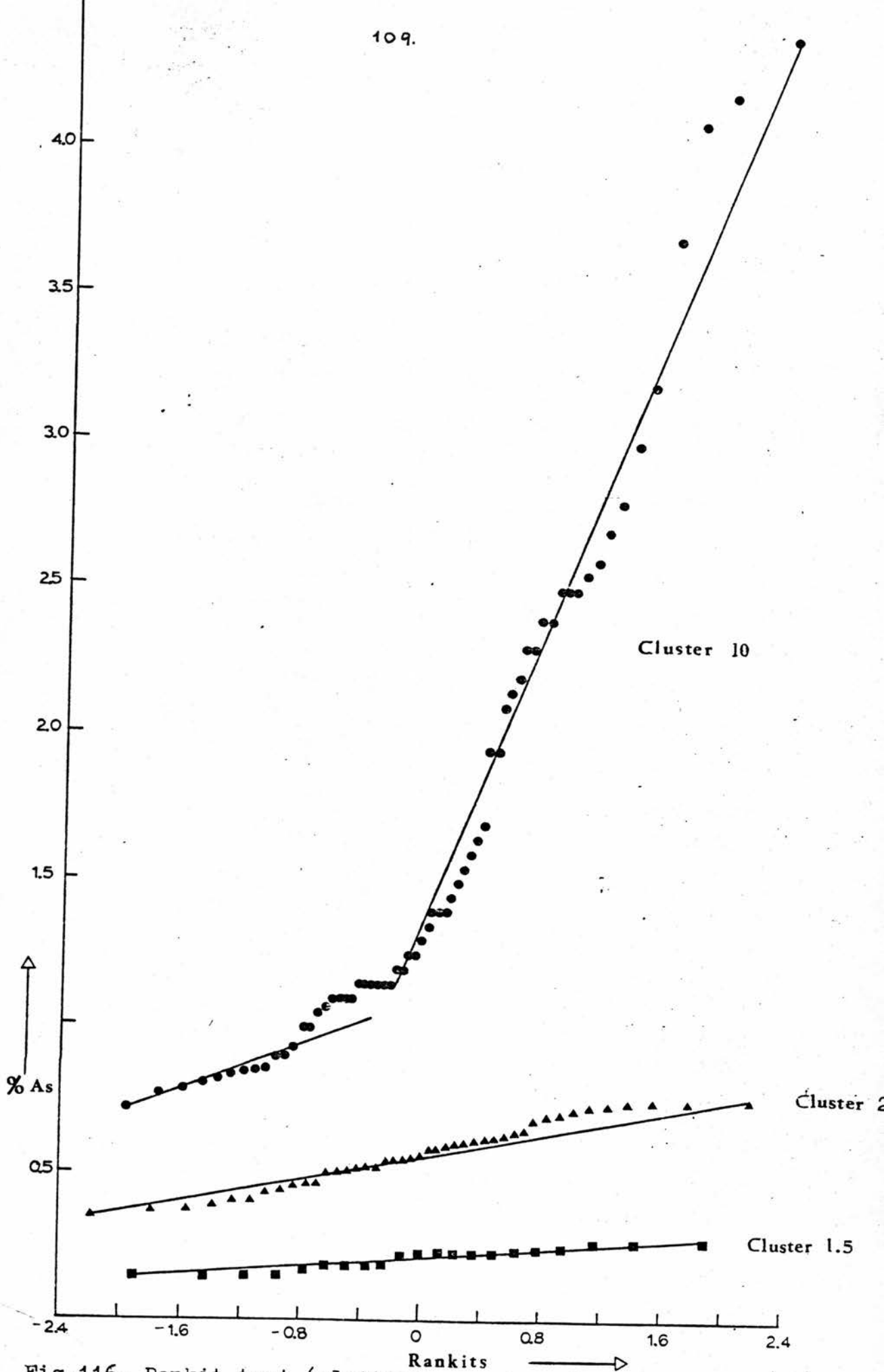


Fig.116. Rankit test (plotting arsenic values against expected normal order statistics) for Cluster 1.5 , 2 and 10 (see Chapter IV,p.205 and Chapter V,p.230).

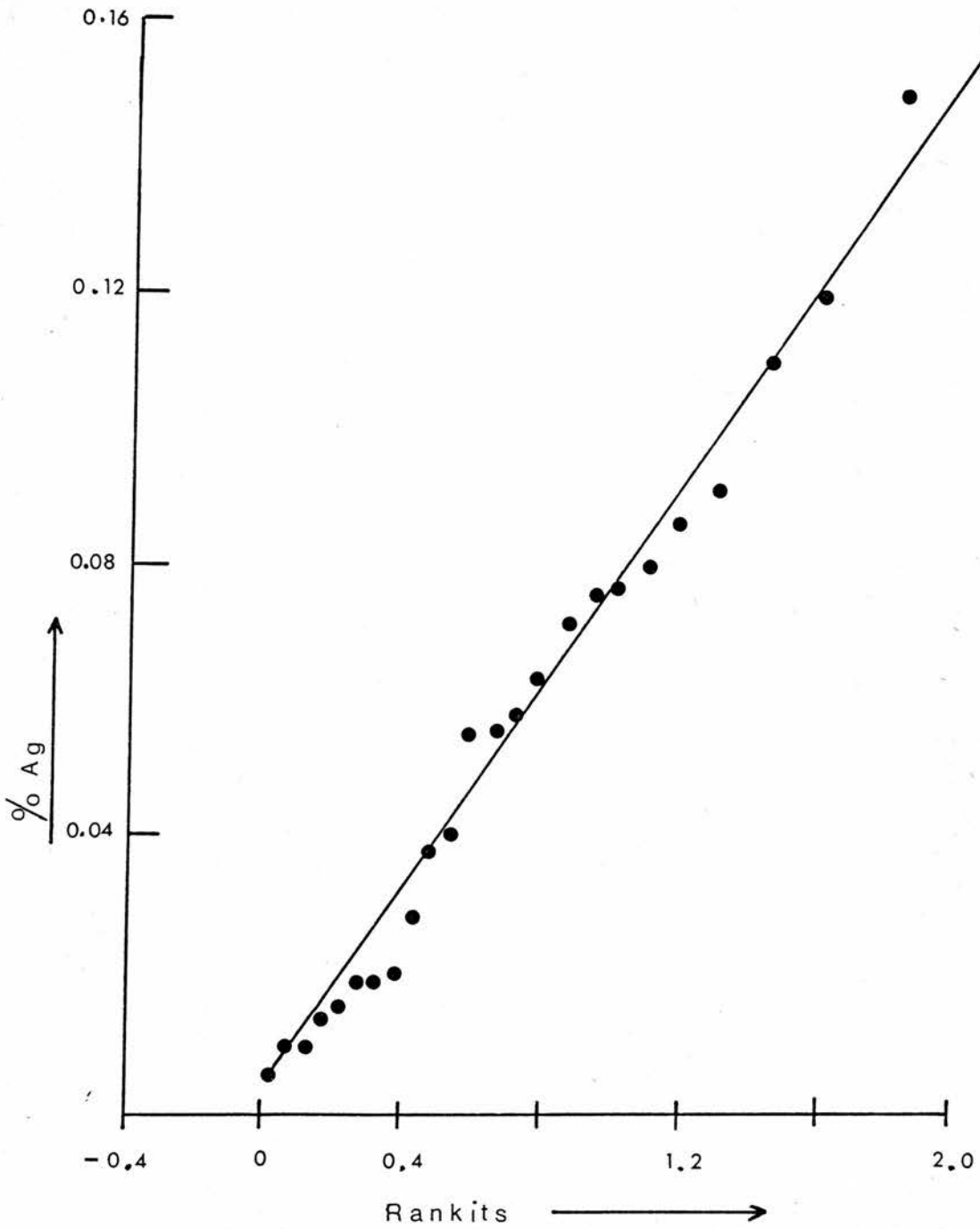


Fig. 117. Rankit test (plotting silver values against expected normal order statistics) for Cluster 10 (for discussion see Chapter IV, p.205 and Chapter V, p.230).

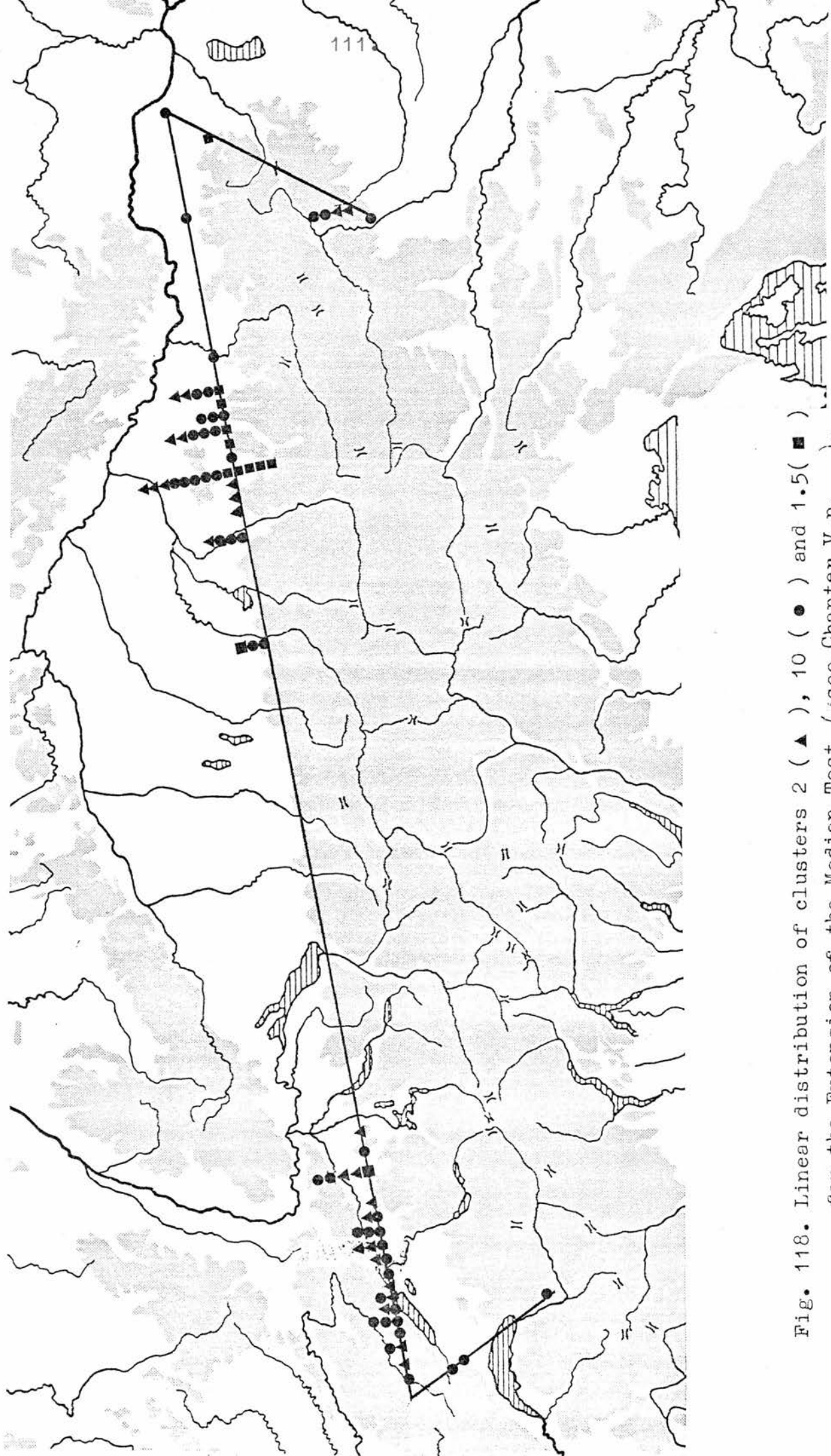


Fig. 118. Linear distribution of clusters 2 (▲), 10 (●) and 1.5 (■) for the Extension of the Median Test (see Chapter V, p.).

Scale 1:3,000,000.

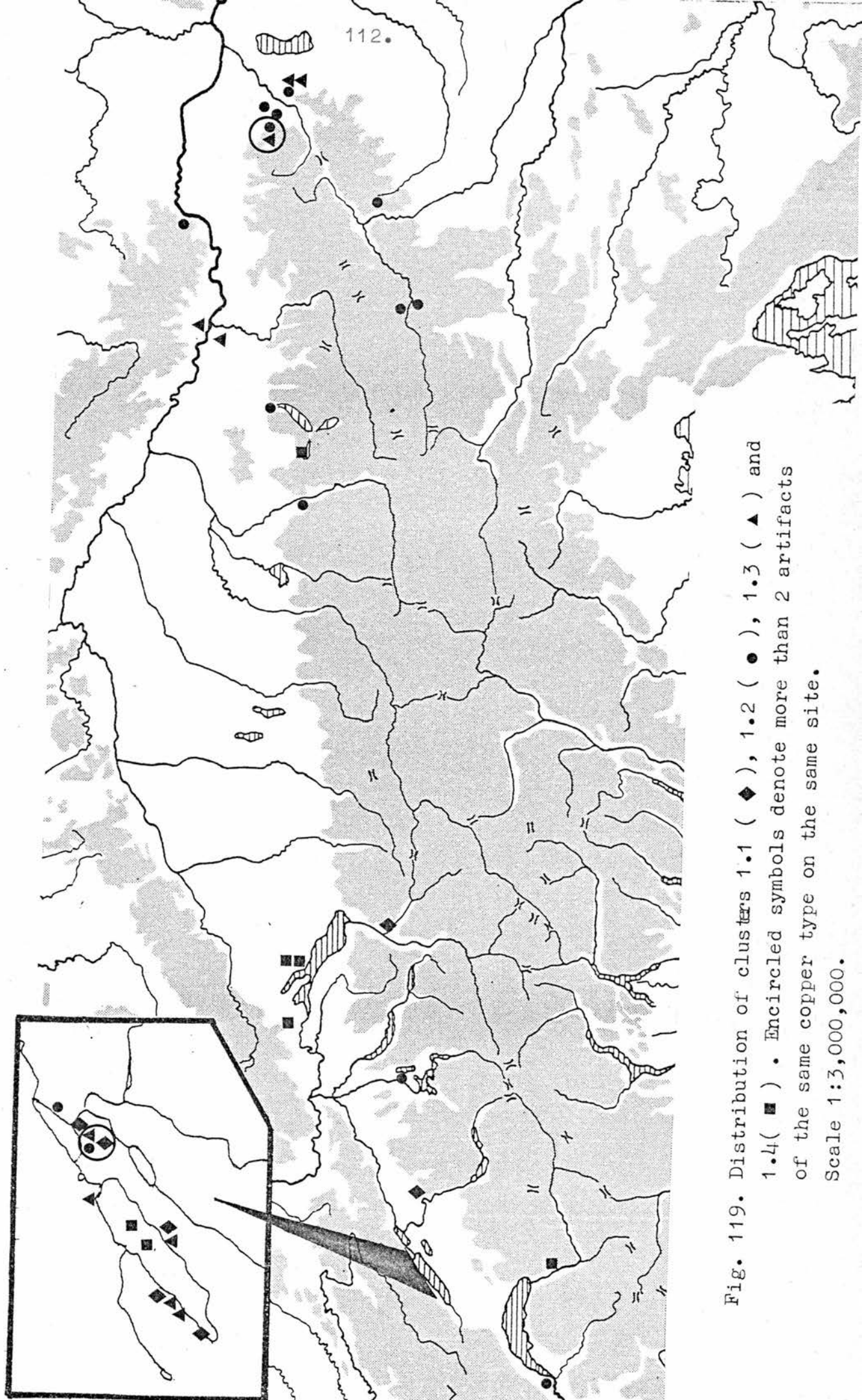


Fig. 119. Distribution of clusters 1.1 (◆), 1.2 (●), 1.3 (▲) and 1.4(■) . Encircled symbols denote more than 2 artifacts of the same copper type on the same site. Scale 1:3,000,000.

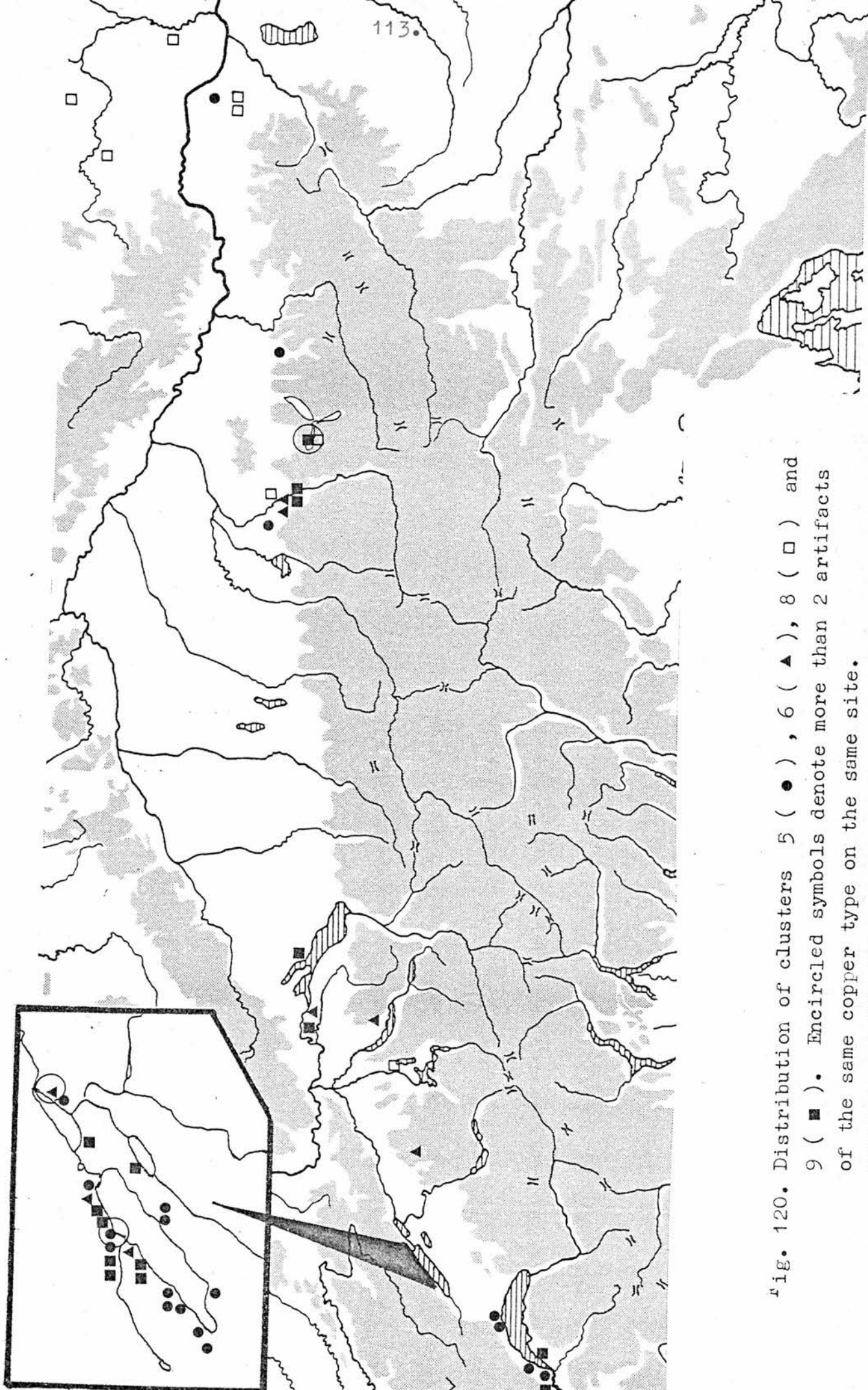


Fig. 120. Distribution of clusters 5 (●), 6 (▲), 8 (□) and 9 (■). Encircled symbols denote more than 2 artifacts of the same copper type on the same site. Scale 1 : 3,000,000.

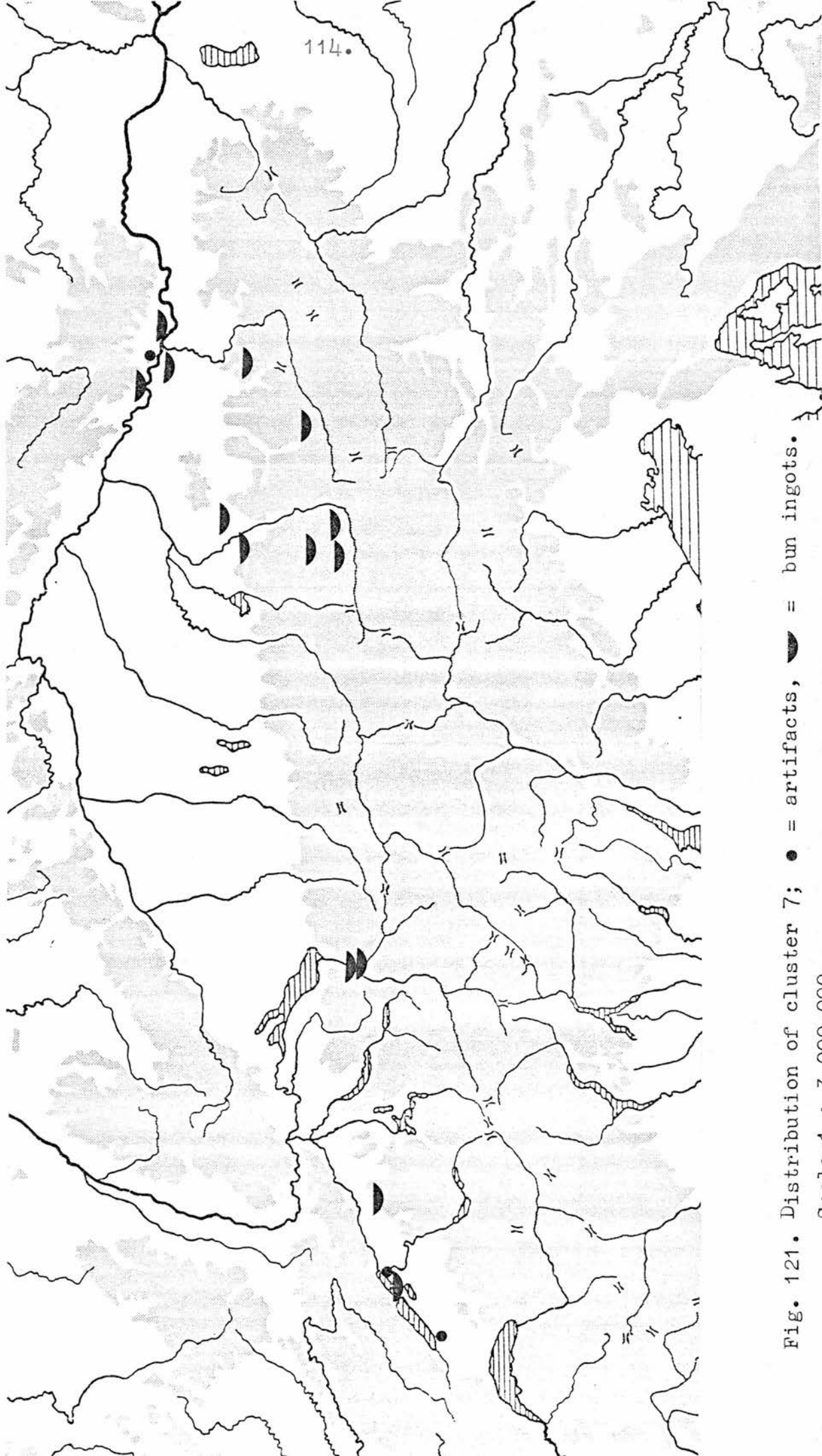


Fig. 121. Distribution of cluster 7; ● = artifacts, ◐ = bun ingots.
 Scale 1 : 3,000,000.

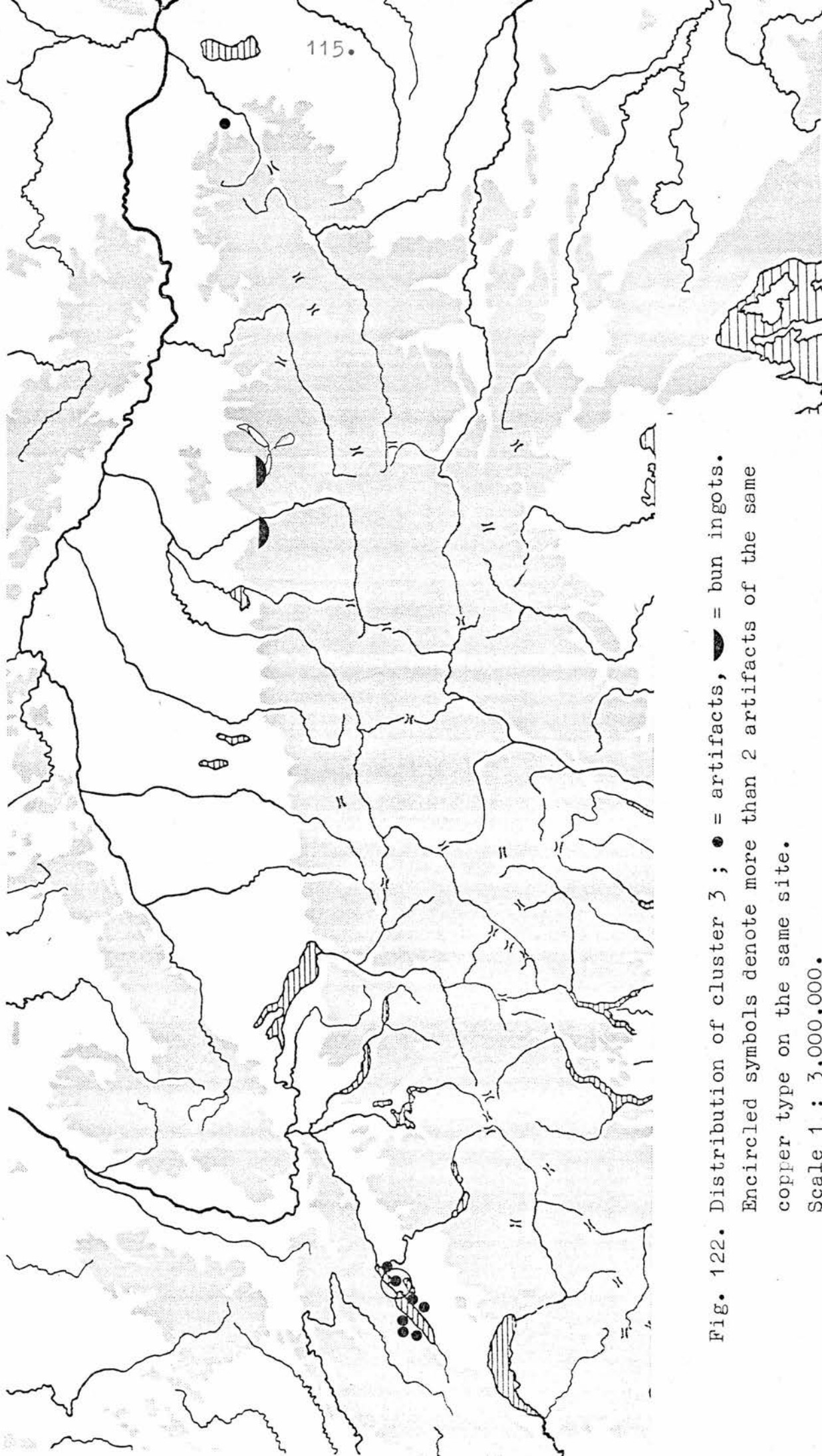


Fig. 122. Distribution of cluster 3 ; ● = artifacts, ◐ = bun ingots.
Encircled symbols denote more than 2 artifacts of the same
copper type on the same site.
Scale 1 : 3,000,000.

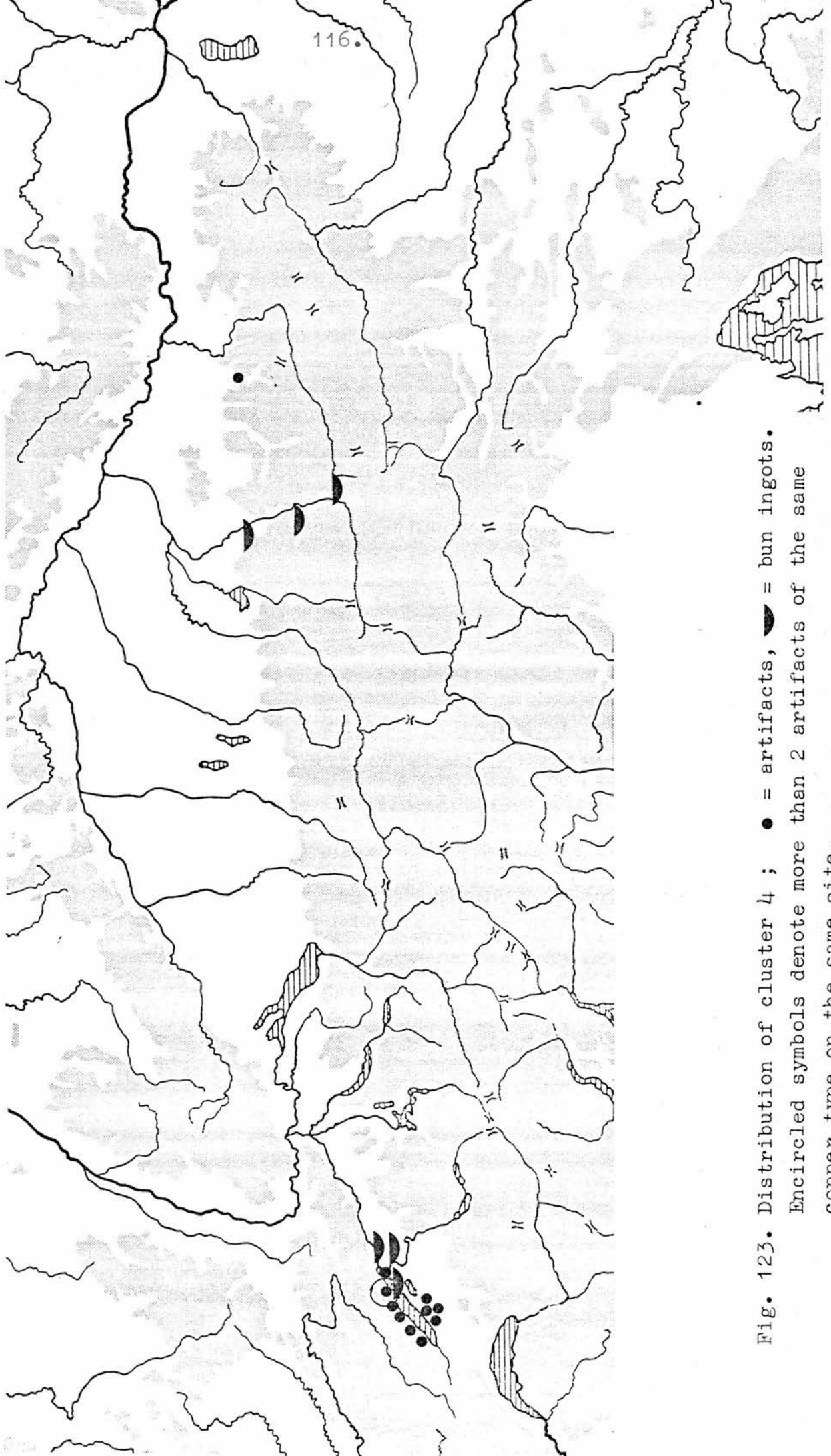


Fig. 123. Distribution of cluster 4 ; ● = artifacts, ◐ = bun ingots.

Encircled symbols denote more than 2 artifacts of the same copper type on the same site.

Scale 1 : 3,000,000.

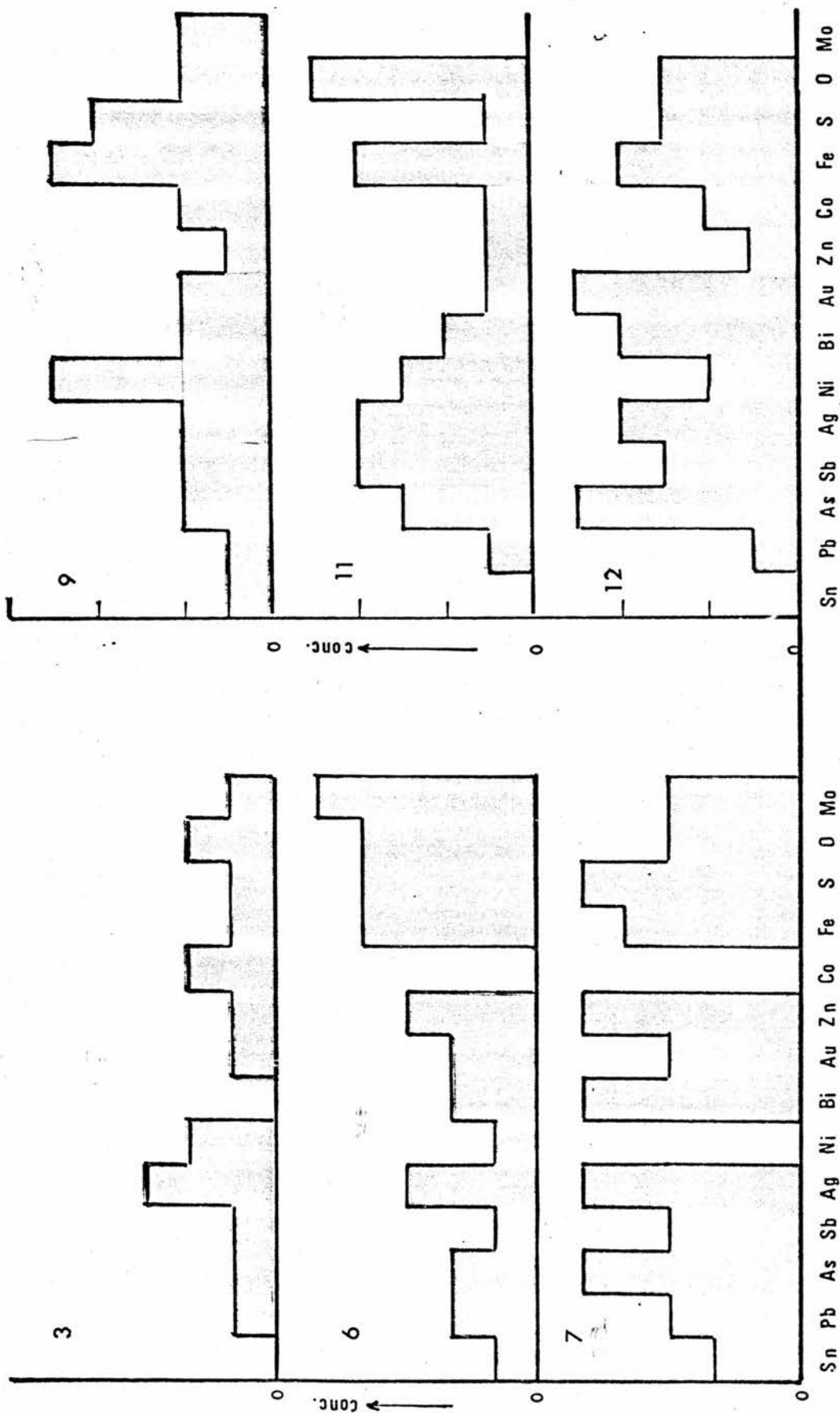


Fig.124. Impurity patterns of copper ore types suggested by Pellissonnier & Michel(1972,p.226).The coding is theirs.

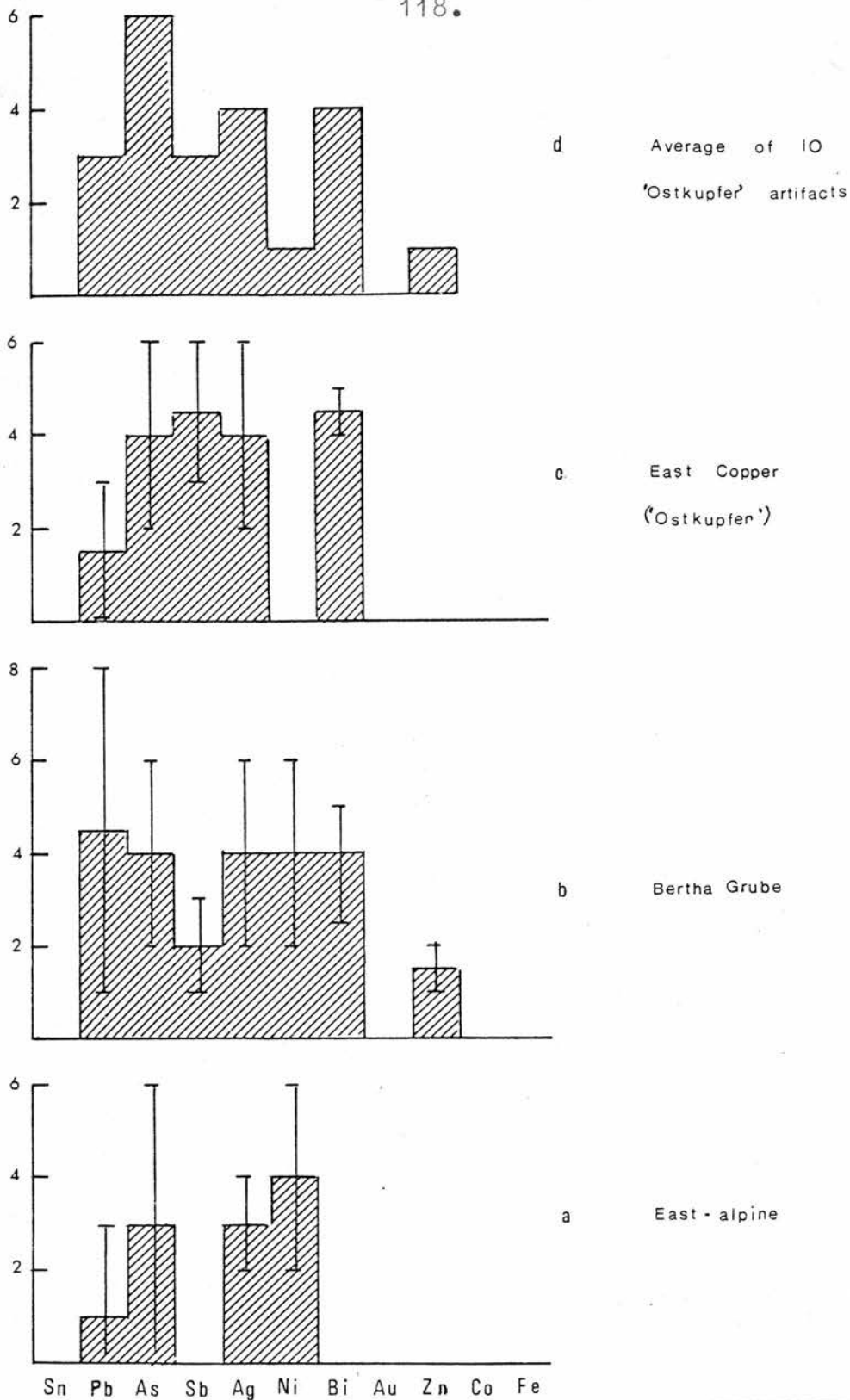


Fig. 125. Impurity patterns of Pittioni's 'East-alpine' (a) and 'Bertha-Grube' type of copper (b) and his 'East Copper' ('Ostkupfer') (c); (d) = the average of ten artifacts of 'East Copper' composition (after Pittioni) analysed by Stuttgart. The ordinates represent log. concentrations starting from an arbitrary base for each element. The vertical lines indicate the range within which the element can fall.

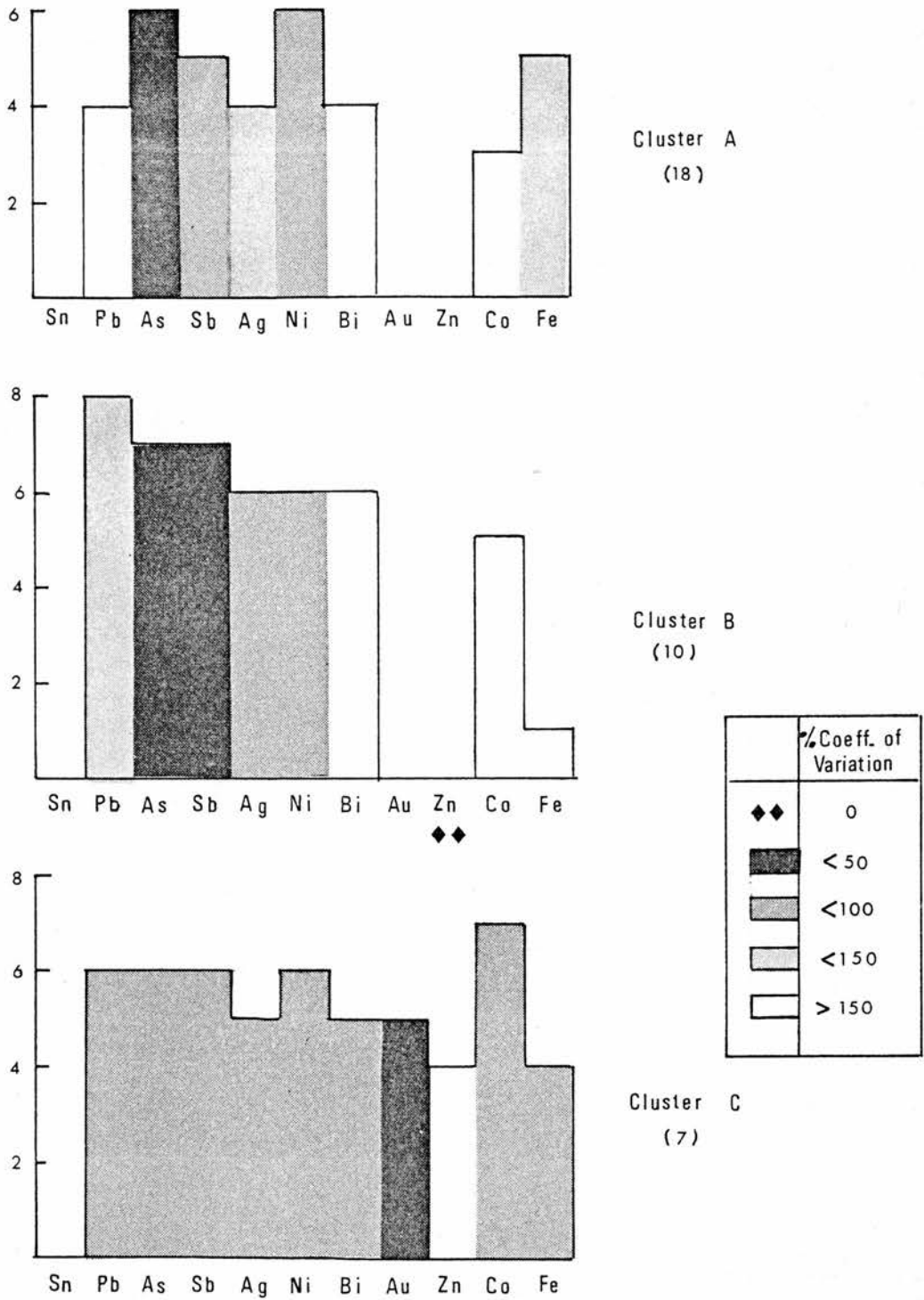


Fig. 126. Impurity patterns of bronze clusters A, B and C, where tin was masked before clustering. The ordinates represent log. concentrations starting from an arbitrary base for each element.

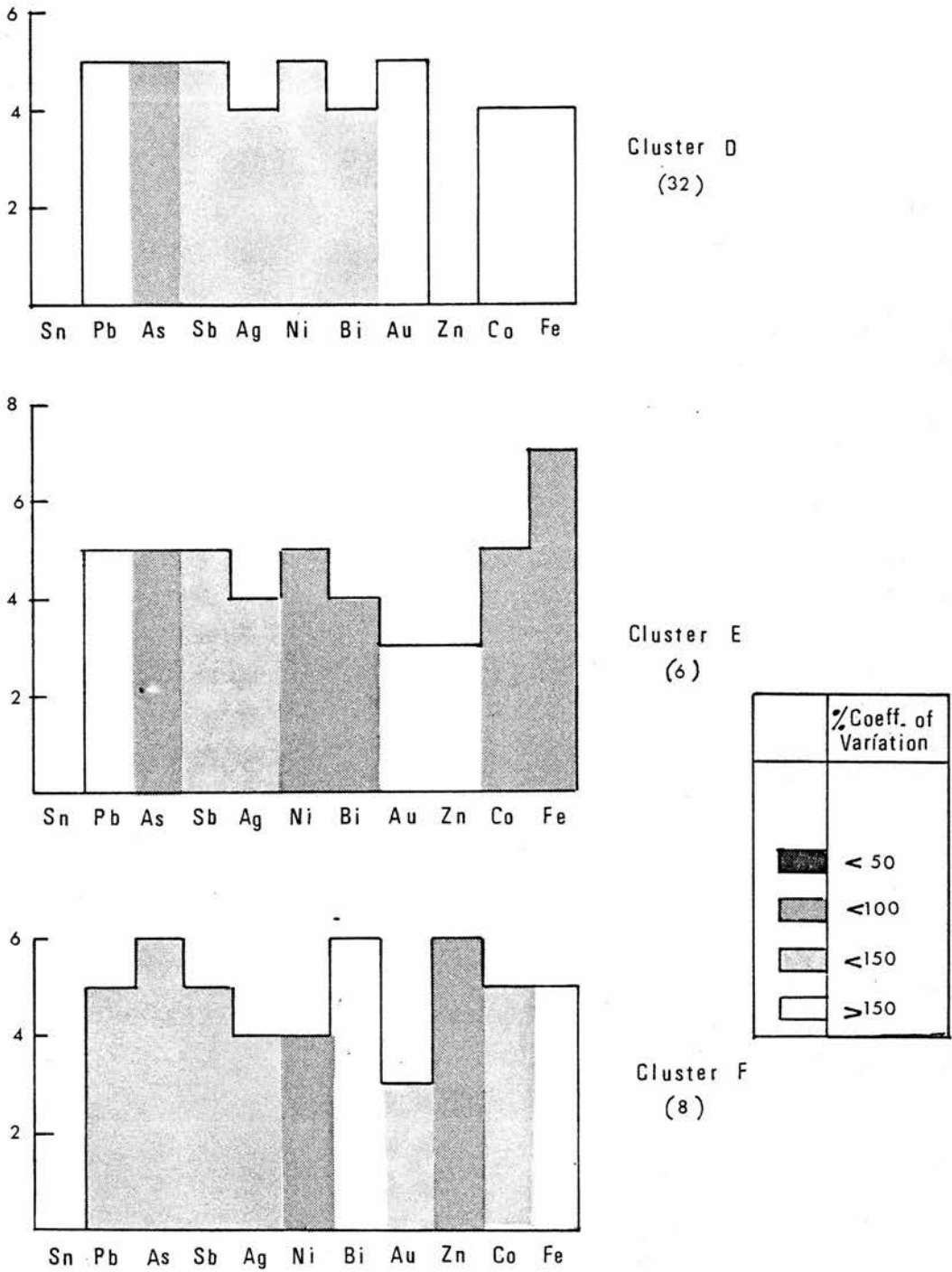


Fig. 127. Impurity patterns of bronze clusters D, E and F, where tin was masked before clustering. The ordinates represent log. concentrations starting from an arbitrary base for each element.

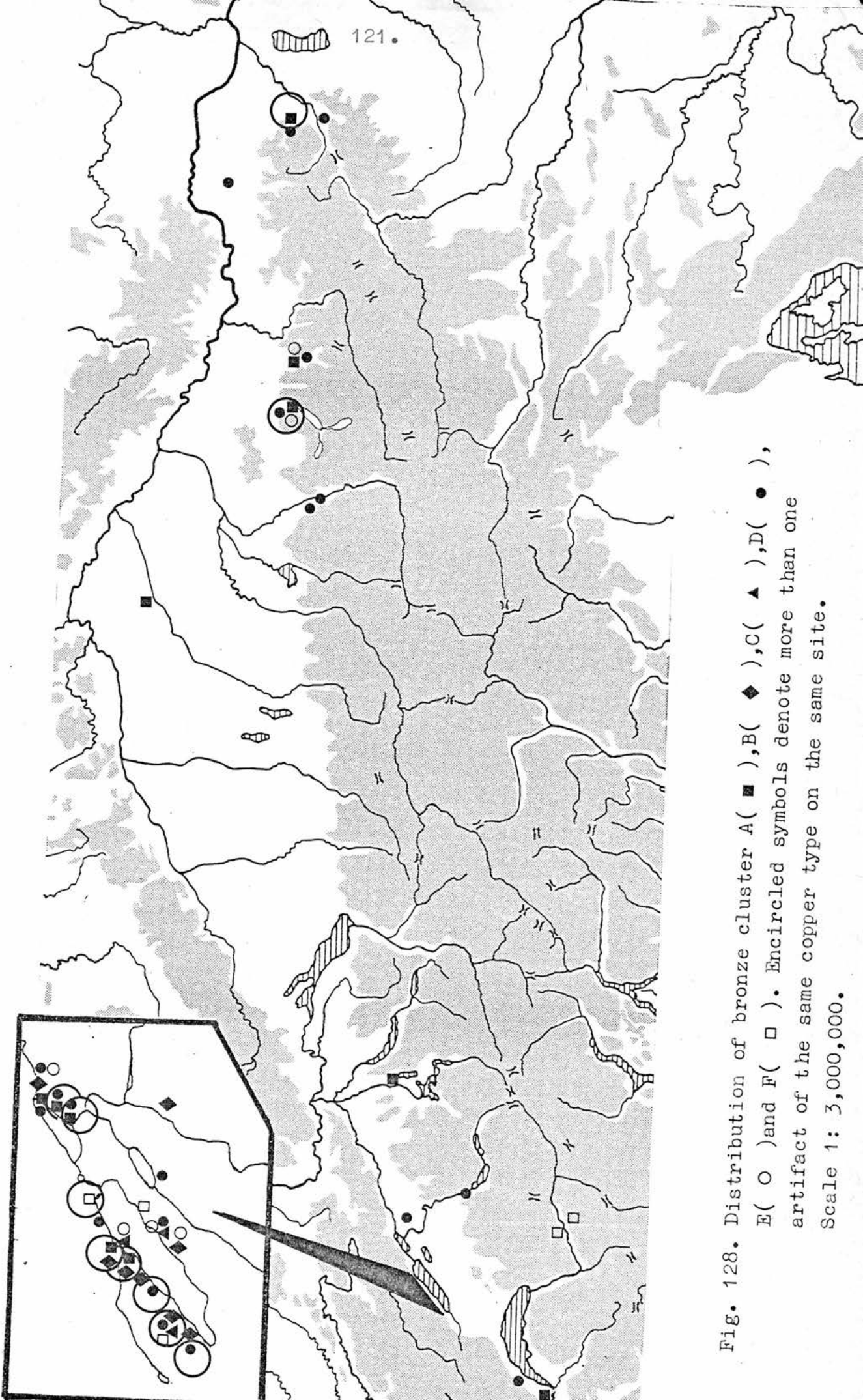


Fig. 128. Distribution of bronze cluster A (■), B(◆), C(▲), D(●), E(O) and F(□). Encircled symbols denote more than one artifact of the same copper type on the same site.
 Scale 1: 3,000,000.



Pl. 1



Pl. 2



Pl. 3



Pl. 4



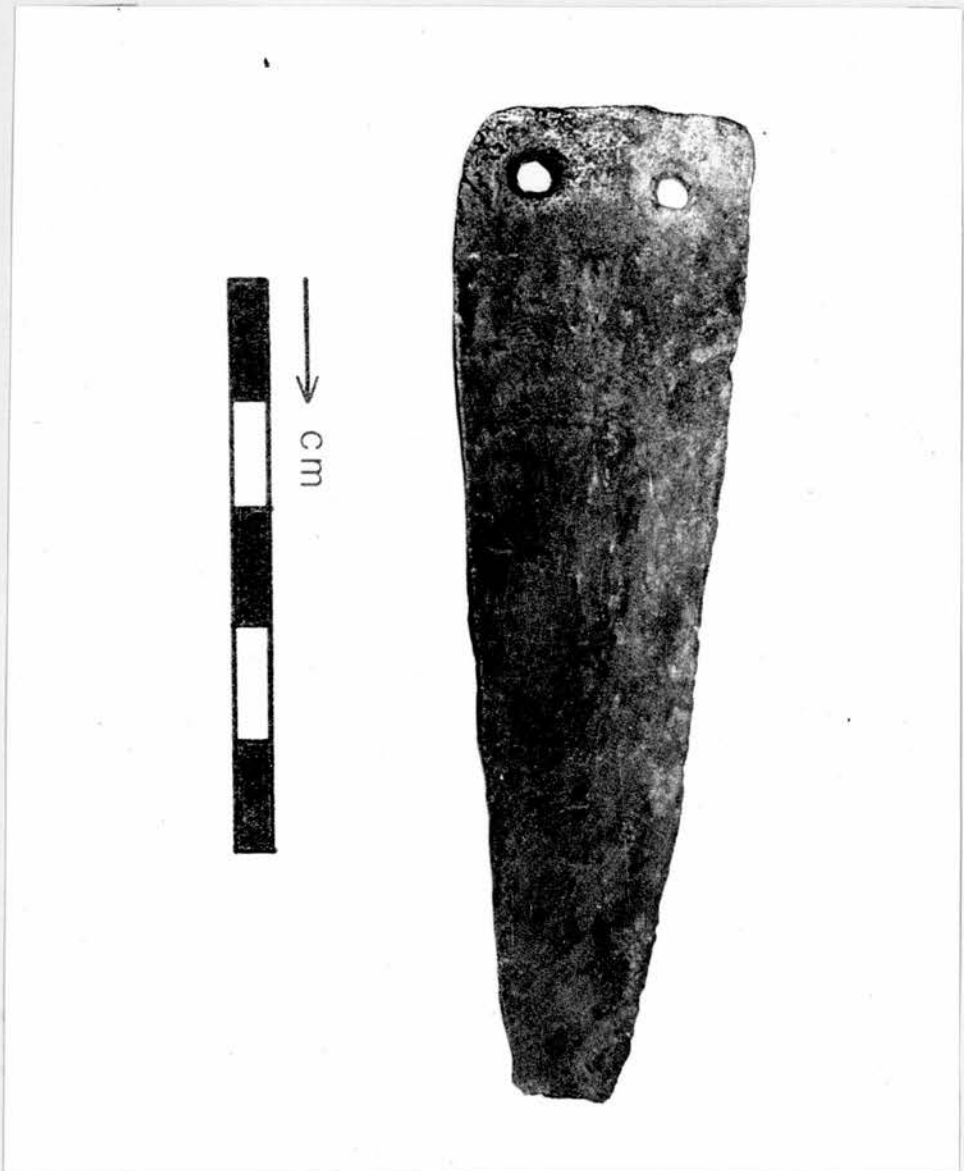
Pl. 5



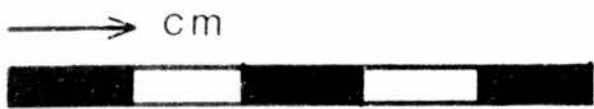


cm





Pl. 9



Pl. 10



Pl. 11



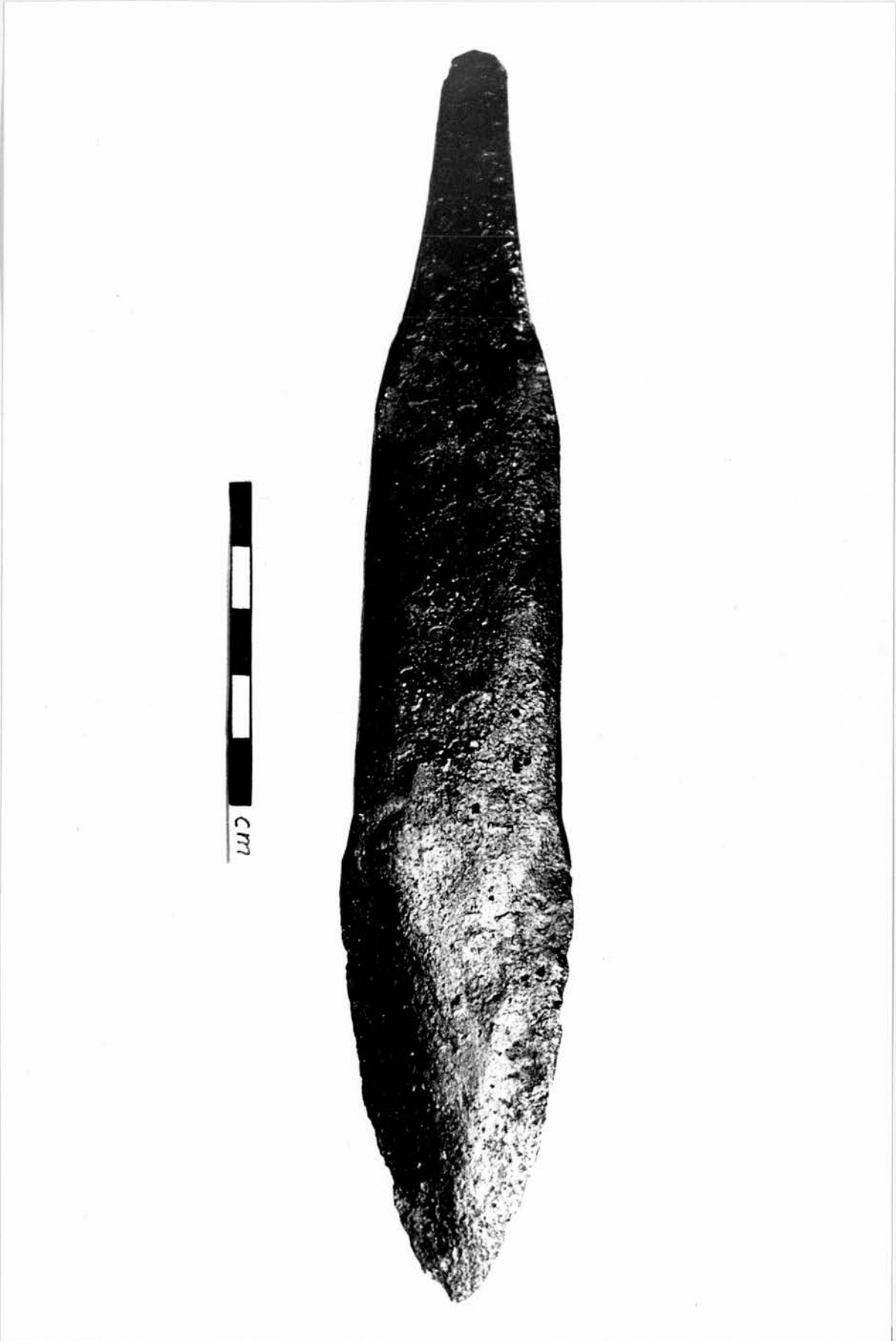
Pl. 12



Pl. 13

125

131



Pl. 14



Pl. 15



Pl. 16

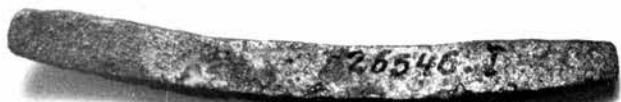
L277

133



Pl. 17

→ cm

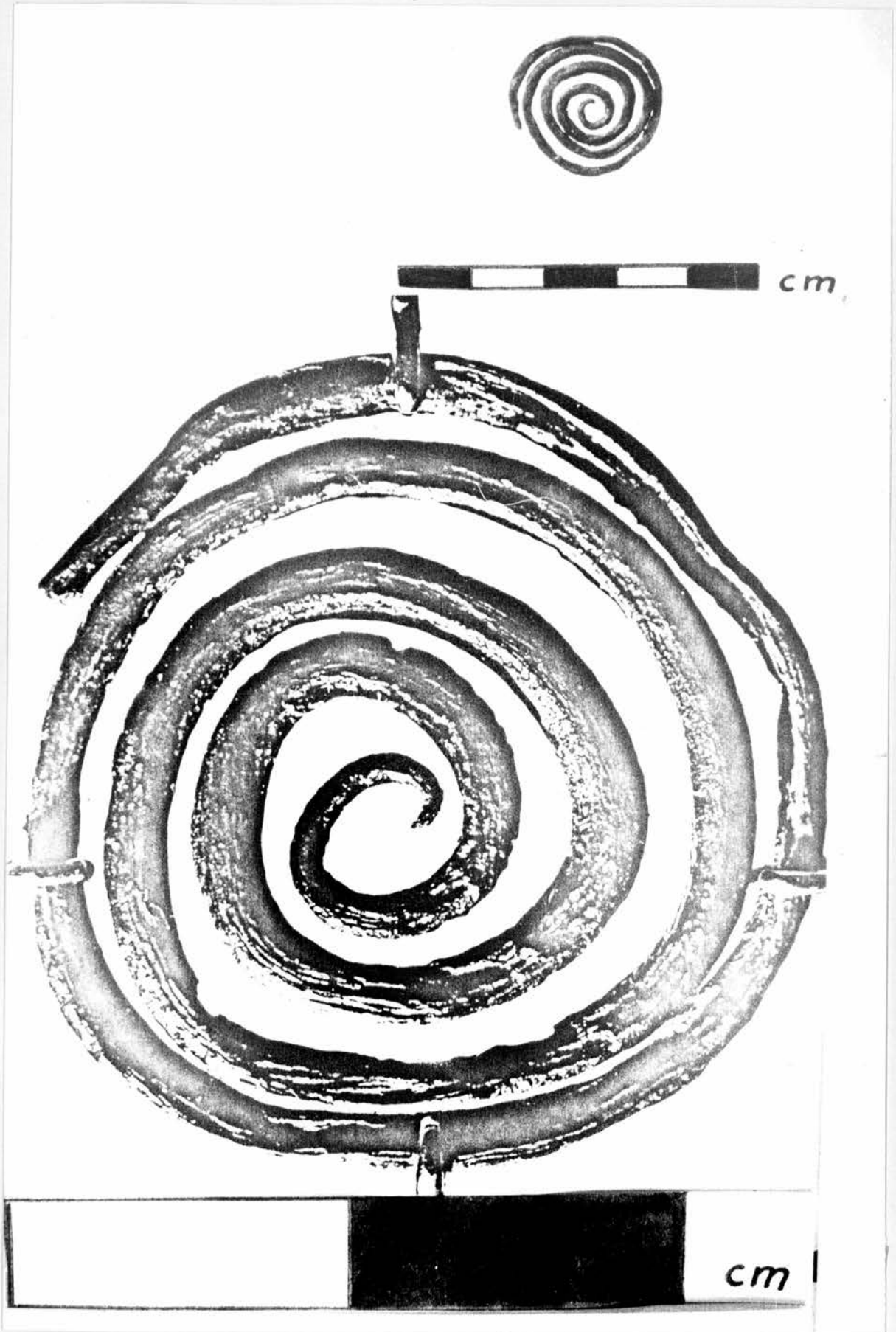




pl. 19





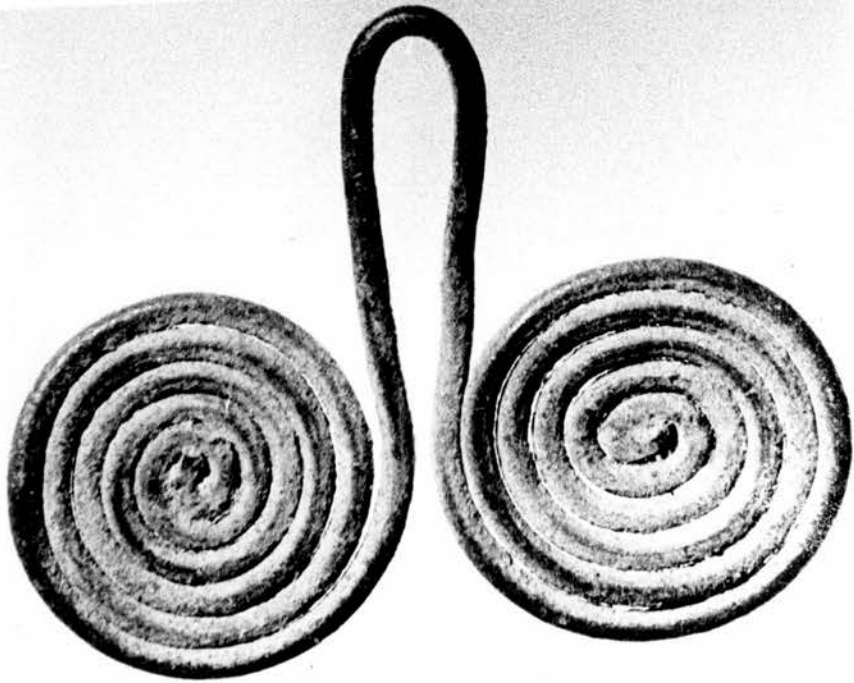


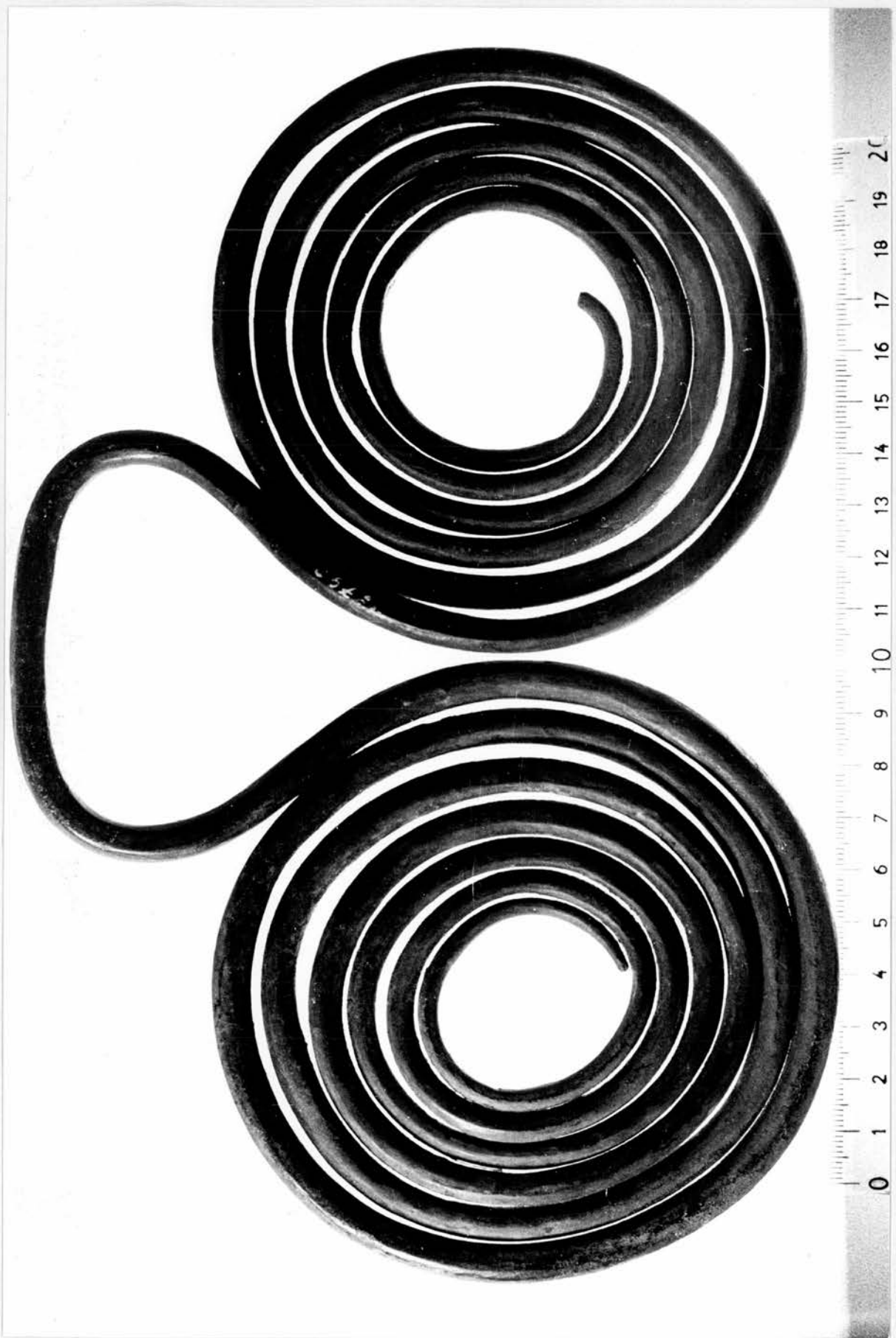


Pl. 23



Pl. 24

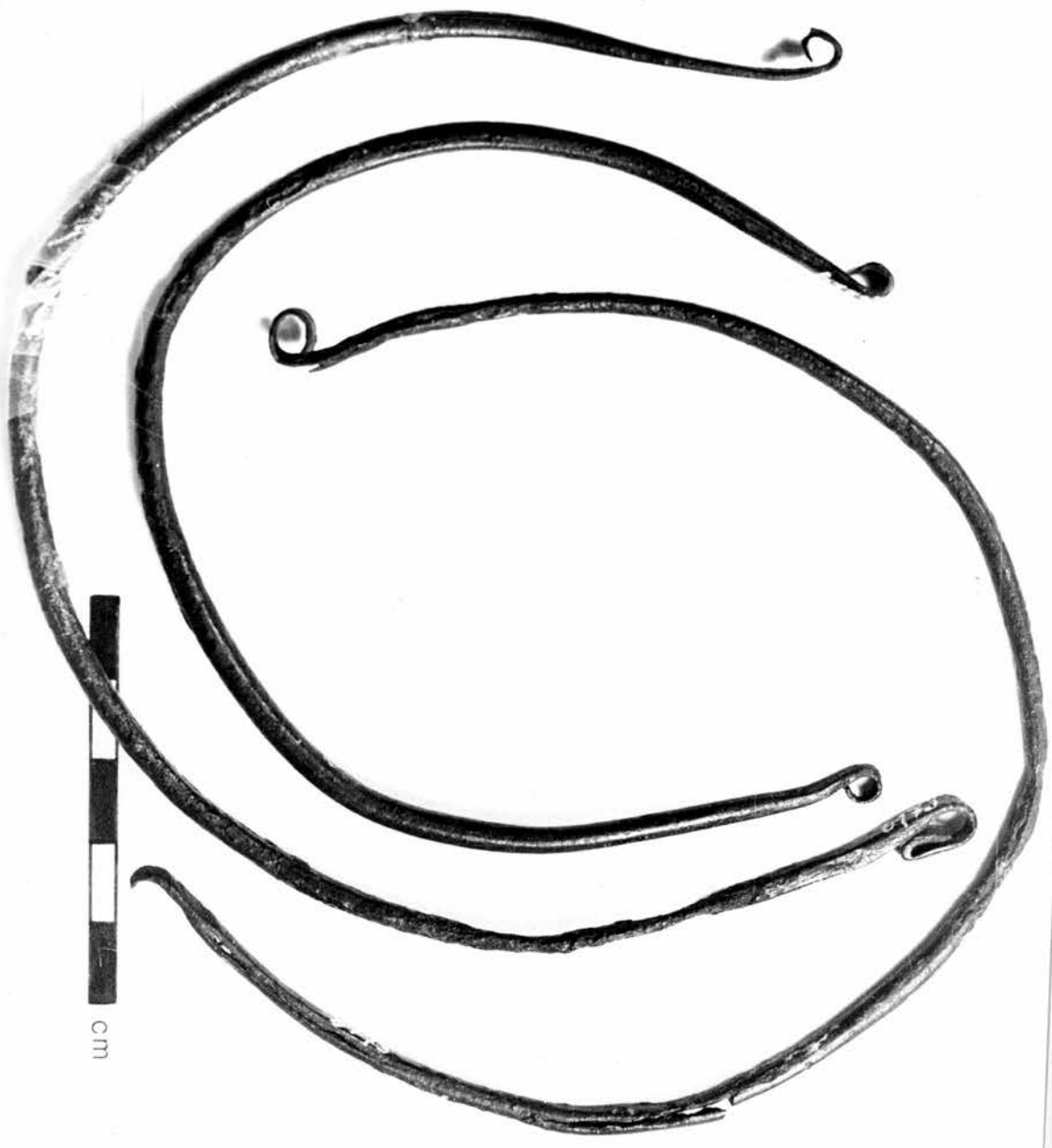
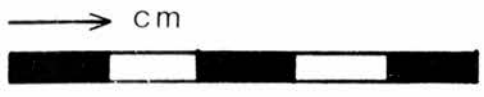




Pl. 27



Pl. 28



134

144



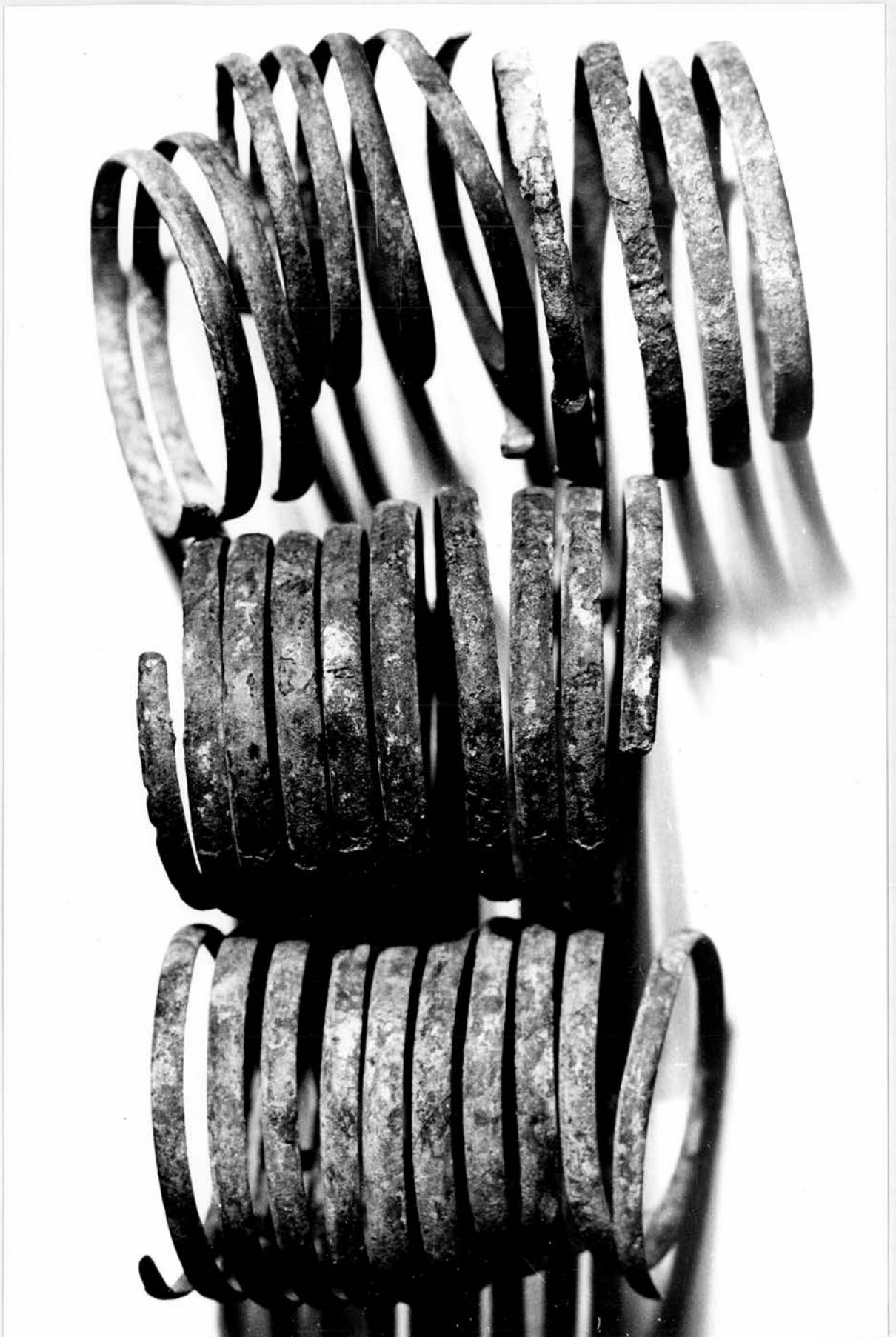
Pl. 30

139

145



Pl. 31



147

147



Pl. 33

Abbreviations used in Appendices.

- * Denotes securely associated finds.
- F.U. Denotes that the exact find site is unknown.
- Old Grouping (in App.II) Refers to grouping after Sangmeister and Strahm (1974,p248)
- New Grouping (in App.II) Refers to grouping achieved by discriminant and cluster analysis.
- T (in App.II) = Axes of type Thayngen.
- B (in App.II) = Axes of type Bevaix.
- R (in App.II) = Axes of type Robenhausen.
- A.,G.,S. Denote Austria, Germany and Switzerland, respectively, when one catalogue serves all three countries.
- Numbers preceding site names in App. II & IVa are those used for discriminant and cluster analysis.
- Number in parenthesis after site denotes number of objects of that type found at that site.
- Second analysis number in parenthesis (underneath first analysis) denotes duplicate analysis of artifact is available, but was not used in cluster analysis to avoid overweighing.

APPENDIX I - List of radiocarbon dates used for figs. 6 and 44a.

¹⁴ C dates (bc)	Lab. No.	Site, country	Culture	Reference
3290±40	Gr 7160	Sengkofen, nr. Regensburg, Germany	Altheim	I. Burger (pers. comm.)
3210±120	Bern	Breitingerstr, Zürich, Switzerland	Pfyn	Drack, 1961
2700±	Kopenhagen	Weier III, Switzerland	"	Guyan, 1976
2990±	"	" II,	"	" "
3080±	"	" I,	"	" "
3390±	"	" X,	"	" "
2740±130	B43	Thayngen, Weier, Switzerland	"	RC, 1959, 140
2740±180	B44	" "	"	RC " "
2830±130	B45	" "	"	RC " "
2800±60	GrN4202	Niederwil, Switzerland	"	RC 1967, 132
2800±60	GrN4204	" "	"	RC " "
2440±80	B114	Burgäschisee-Süd, Switzerland	Cortailod	Müller-Beck & Oeschinger, 1967
3000±90	B115	" "	"	" "
3000±90	B115/2	" "	"	" "
2980±120	B116	" "	"	" "
2800±100	B116/2	" "	"	" "
2540±90	B118/A	" "	"	" "
2680±180	B118/B	" "	"	" "
2800±100	B119/A	" "	"	" "
2850±130	B119/B	" "	"	" "
2550±100	B120	" "	"	" "
2730±100	B121	" "	"	" "
2800±100	B122	" "	"	" "
2580±100	B123	" "	"	" "
2600±110	B125	" "	"	" "
2550±110	B126	" "	"	" "
2840±120	B244	" "	"	" "
2680±120	B245	" "	"	" "

APPENDIX I contd. (1)

¹⁴ C dates (bc)	Lab. No.	Site, country	Culture	Reference
3180-100	?Bern	Petit Chasseur	Cortaillod	Gallay, 1972c
3150-100	-	"	"	"
2960-260	-	"	"	"
2880-90	-	"	"	"
2800-100	B234	St. Leonard, Valais	"	Sauter et al. 1971
3150-70	B2111	Petit Chasseur	"	"
3200-120	-	Vallon des Vaux	"	Sitterding, 1972
2980-40	GrN 5601	"	"	"
2960-130	-	See, Mondsee, Austria	Mondsee	Reitinger, 1968
2610-110	VR1250	Mooswinkel, Attersee, Austria	"	RC, 1973, 433
2990-120	VR1311	Scharfling I Mondsee, Austria	"	RC, 1974, 281
2920-100	VR1312	" II "	"	RC "
2710-90	VR1313	" III "	"	RC "
2830-90	VR1314	" IV "	"	RC "
2400-90	VR1331	Mooswinkel	"	RC, 1975
2310-90	VR1332	"	"	RC "
2480-100	VR1333	"	"	RC "
2440-80	VR1355	Misling II, Attersee	"	RC, 1976
2760-90	VR1356	"	"	RC "
2660-90	VR1357	"	"	RC "
2500-100	VR1358	"	"	RC "
2570-40	GrN6940	"	Baden	Ruttkey, 1975
2350-200	M2166	"	"	RC, 1972
3330-120	Bern	Breitingerstr., Zürich, Switzerland	Horgen?	Drack, 1961
2382-70	GrN949	Lac de Chalain, Switzerland	"	Science, 1958, 1553
2132-135	GrN670	" " "	"	" "
2220-250	B778	Vinelz, Switzerland	Lüscherz	RC, 1970, 379
2510-250	B779	"	"	RC "

APPENDIX I contd. (2)

¹⁴ C dates (bc)	Lab. No.	Site, country	Culture	Reference
2350-110	B2206	Yverdon, Switzerland	Auvernier	Strahm, pers. comm.
2150-120	B2207	"	"	"
2220-100	B2208	"	"	"
2210-110	B2209	"	"	"
2190-100	B2210	"	"	"
2370-110	B2211	"	"	"
2410-90	B2212	"	"	"
2020-100	B2213	"	"	"
2310-100	B2214	"	"	"
2350-110	B2215	"	"	"
2280-110	B2216	"	"	"
2250-100	B2217	"	"	"
1950-100	B2200	"	" and Corded Ware	"
2130-110	B2201	"	"	"
1950-110	B2202	"	"	"
2060-100	B2203	"	"	"
2130-100	B2204	"	"	"
2080-100	B2205	"	"	"
2210-120	B643	Auvernier, "	"	RC 1967, 30
2050-150	B644	"	"	"
2230-120	B645	"	"	"
2012-120	B646	"	"	"
2050-120	B685	"	"	"
2210-100	B686	"	"	"
2040-100	B687	"	"	"
2190-140	B688	"	"	"
2180-100	B689	"	"	"
2680-100	B 690	"	"	"

Other dates used for fig. 6: for Baden culture as suggested by Neustupny (1973a); for Corded Ware culture as used by Ottaway (1973d).

APPENDIX II - LIST OF FLAT AXES, SWITZERLAND AND LAKE CONSTANCE.

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	GROUPING OLD(NEW)	ANALYSIS NO.
01*	CHAM, ST. ANDREAS FIG. 59a	ZUG	6000(old), 56/228(new)		T(T)	SAM 2844
02*	WETZIKON, ROBENHAUSEN FIG. 58a	ZÜRICH	469 - 1 -		T(R)	-
03*	ZÜRICH, WOLLISHOFEN, FIG. 58b	ZÜRICH	1234		T(R)	-
04*	ZÜRICH, WOLLISHOFEN, FIG. 58c	ZÜRICH	1233		T(R)	-
05*	ZÜRICH, BAUSCHANZE FIG. 58d	ZÜRICH	1003 -11-		T(R)	-
06	DÜRNTEN	ZÜRICH	2336 a-1-		-	SAM 794a
07	GENEVA	GENEVA	8637		-	BAR 29
08	BEX	LAUSANNE	CT 1529		-	SAM 7280
09*	DIETIKON, SENNE FIG. 59b	ZÜRICH	2273		T(T)	-
10	CORSIER	GENEVA	7465		-	BAR 31
11*	LIMMAT FIG. 59c	ZÜRICH	2243		T(T)	-
12*	RISCH-SCHWARZBACH, PL. 1, FIG. 58e	ZUG	9800		B(R)	SAM 2845
13*	MÖNCHALTDORF FIG. 59d	ZÜRICH	44661		T(T)	-
14	CHEVROUX PL. 3,	LAUSANNE	9845 II		B(B)	-
15*	HITZKIRCH, SEEMATTE PL. 2, FIG. 60a	HITZKIRCH	185		T(T)	SAM 7293
16	BEVAIX	NEUCHÂTEL	BX177(new), Bx3003(old)		-	BAR66, SAM 22248
17	SEEHAUSEN	-	-	ANTIQUA, 1885, T. 20, 4	-	-
18	SIPPLINGEN, GERMANY	STUTTGART	-	ANTIQUA, 1885, T. 20.1	-	-
19*	VINELZ FIG. 60b	BERN	21118		B(T)	SAM 2787
20	VULLY-LE-BAS	FREIBURG	9003		-	-
21	ZUG-OTTERSUIL	ZUG	-	SAM II	-	SAM 2846
22	ZÜRICH-SEE	COLL. L. GAUTHIER	-		-	-
23	F. J. (IN KT. ZÜRICH)	ZÜRICH	-	ANTIQUA, 1885, T. 21, 5	-	-
24	TREYAL, BEVAIX FIG. 61A, a	ZÜRICH	L4788		B(B)	-
25	EHRENDINGEN	ZÜRICH	2335a-1-		-	-
26	HALLAU	ZÜRICH	-	OSBORNE, ANTIQUA, 1884 T. 8.1	-	-
27	FU	NEUCHÂTEL	855		-	-
28	ST. BLAISE	ZÜRICH	-	GROSS, 1883, T. X, 9	-	-
29	TREYAL	NEUCHÂTEL	-	VOUGA, 1934, T. 24, 89	-	-
30	TREYAL	NEUCHÂTEL	-	ANTIQUA, 1885, T. 25.7	-	-
31	F. J.	NEUCHÂTEL	1510		-	SAM 22242
32	VULLY-LE-BAS	NEUCHÂTEL	-	SCHWAB, 1970, ABB. 1, 2	-	-
33	WETZIKON, ROBENHAUSEN (WOODEN MODEL)	ZÜRICH	-	MESSIKOMER, 1913, T. 17, 4	-	-
34	LANGENBRUCK	LIESTAL	-		-	-
35	SION	LIESTAL	-	HEIERLI, 1901, ABB. 111a	-	-

APPENDIX II(contd) - LIST OF FLAT AXES, SWITZERLAND AND LAKE CONSTANCE.

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	GROUPING OLD(NEW)	ANALYSIS NO.
36	PREZ-VERS-NOREAZ	BERN	29900 (NOW LOST)			-
37	NUSSDORF-MAURACH, G	STUTTART	A3091			O&W98
38	NUSSDORF-MAURACH, G.	STUTTART	A3093			O&W120
39	THAYNGEN	SCHAFFHAUSEN	-	DRACK, 1969, ABB. 15, 6 (WRONG FIG.)		O&W99
40	NUSSBACH-MAURACH, G	STUTTART	A3092			O&W307
41*	VINELZ	BERN	5188			-
42	TRACHSELWALD	BERN	18926			SAM 2862
43	VULLY-LE-BAS	FREIBURG	9001			-
44	STEIN AM RHEIN	SCHAFFHAUSEN	-	ANTIQUA, 1885, 87		-
45	GENEVA	GENEVA	8636			SAM 707, BAR 28
46	ST. BLAISE	NEUCHÂTEL	SB40		B(R)	SAM 22268, BAR 61
47*	AUVERNIER	NEUCHÂTEL	1509		T(T)	SAM 22264
48*	ZÜRICH I QUAI BRÜCKE	ZÜRICH	9483		T(T)	-
49*	KATZENSEE	-	-	ANTIQUA, 1885, T. 21.2	T(T)	-
50*	THAYNGEN	-	-	SAM I, OTTO & WITTER, 1952	T(T)	SAM 099
51*	HORW	COLLECTION LANG				O&W 99
52*	EGOLZWIL 4	LUZERN	-	AMREIN, 1939, ABB. 31	T(T)	-
53	MONT-SUR-ROLLE	LAUSANNE	CT 1777	SANGMEISTER & STRAHM 1974	T(T)	-
54	VALLAMEND	BERN	9964		B(B)	-
55	F.U., LAKE NEUCHÂTEL	NEUCHÂTEL	84	(COLL. ARENSE; BEAU)	B(B)	SAM 2785
56	CONCISE	COLOGNE	5043		- (B)	SAM 22243
57	ESCHENZ	FRAUENFELD	9366		B(R)	O&W 1184
58	KREUZLINGEN, GERMANY	CONSTANCE	-	REINERTH, 1926	B(B)	SAM 16600
59	ESTAVAYER	BERN	8550		B(B)	-
60	GRENG	BERN	-	SCHWAB, 1970, ABB. 2, 5	B	-
62	PREFARGIER	CONCISE (COLL. MEUREN)		ANTIQUA, 1883, T. 1213	B(R)	-
63	GRENG	BERN	-	SCHWAB, 1970, ABB. 2, 1	B	SAM 2860
64	GRENG	BERN	-	SCHWAB, 1970, ABB. 2, 2		-
65	GRENG	BERN	-	SCHWAB, 1970 ABB. 2, 3		-
66	GRENG	BERN	-	SCHWAB, 1970 ABB. 2, 4		-
FULLY		GENEVA	B5730	SAM II		SAM 7073
GROSSAUFOLTERN		BERN	28187	SAM II		SAM 2867
MONT		LAUSANNE	CT/1777	SAM II		SAM 7279
F.U. (LAKE CONSTANCE)		COLL. LANG; HORN-STAAD		PERS. COMM. C. STRAHM		-

APPENDIX III

DATAFILE OF MEASUREMENTS OF ALL SWISS FLAT AXES

NO	L	W1	W2	W3	T	WEIGHT
01.	9.50	1.80	2.40	4.10	14.10	199.00
02.	6.90	2.10	2.55	3.40	5.50	78.20
03.	7.60	2.40	2.70	4.00	7.00	122.10
04.	8.00	2.20	2.80	3.40	6.00	128.20
05.	5.90	1.90	2.60	3.40	6.00	81.80
06.	23.70	2.70	4.05	9.00		
07.	8.86	2.90	3.20	4.60	13.70	303.10
08.	12.90	3.40	4.25	6.40	11.80	437.40
09.	10.00	1.90	2.50	4.00	11.00	183.60
10.	10.44	2.30	3.25	3.90	10.00	191.90
11.	10.25	1.90	2.50	4.00	12.00	219.20
12.	8.70	2.40	3.00	3.70	8.20	134.00
13.	12.90	1.80	2.90	5.30	14.80	349.60
14.	10.77	2.34	4.30	5.70	13.10	307.7
15.	8.20	2.00	2.40	3.85	12.10	150.00
16.	9.30	4.10	4.50	5.10	13.00	370.00
17.	9.50	2.80	4.20	6.00	10.01	
18.	8.20	1.40	2.60	3.00	10.01	
19.	12.00	2.20	3.20	4.35	10.50	
20.	12.30	2.20	4.10	5.50	10.00	367.50
21.	10.77	1.50	3.21	4.74	9.00	36.00
22.	8.20	2.90	3.90	4.90	9.00	
23.	8.50	1.50	3.00	4.50	10.50	393.00
24.	13.80	2.63	3.95	4.80	11.80	
25.	12.85	2.25	3.90	7.20	10.50	393.60
26.	11.60	4.20	6.00	7.00	0.00	0.00
27.	16.50	2.60	4.40	8.50	9.00	0.00
28.	6.00	2.80	3.40	5.00	0.00	0.00
29.	8.60	3.80	4.20	5.20	10.00	0.00
30.	0.00	0.00	4.05	5.85	0.00	0.00
31.	17.60	4.40	6.00	8.50	10.00	
32.	17.80	3.80	5.00	8.00	10.00	0.00
33.	13.80	3.00	4.00	5.00	0.00	0.00
34.	9.10	2.00	3.10	4.00	9.00	0.00
35.	12.20	1.20	1.20	4.20	0.00	0.00
36.	8.00	1.60	2.20	3.40	0.00	0.00
37.	7.50	2.70	3.90	4.80	15.00	0.00
38.	6.60	1.50	2.25	2.85	12.00	0.00
39.	21.80	2.00	4.20	7.20	0.00	0.00
40.	6.20	1.00	1.60	1.80	6.00	0.00
41.	10.20	1.90	2.40	2.90	1.30	
42.	14.30	2.00	2.70	4.00	11.00	
43.	18.00	3.90	5.10	8.20	9.50	727.50
44.	16.70	1.60	4.10	6.50	6.00	
45.	23.00	5.15	3.21	10.70	12.00	447.90
46.	8.40	2.20	3.60	4.20	10.01	220.00
47.	10.70	1.90	3.00	4.30	11.50	
48.	12.40	2.30	2.80	3.80	10.01	
49.	12.30	1.80	2.40	3.98	10.50	
50.	10.90	1.00	2.10	3.60	10.01	
51.	10.20	1.00	1.90	3.10	11.00	
52.	12.95	2.35	3.00	4.70	15.00	
53.	10.10	2.70	4.15	5.85	9.50	
54.	16.30	3.10	4.35	6.25	13.00	
55.	11.35	2.40	3.60	5.40	11.50	
56.	6.40	2.20	3.00	3.60	6.00	
57.	10.30	3.30	4.25	5.50	9.50	
58.	10.60	2.50	3.20	4.40	7.00	
59.	6.20	3.10	3.60	4.30	6.50	
60.	14.80	2.30	4.00	5.60	10.01	
62.	7.35	2.80	3.40	3.85	10.01	
63.	7.50	1.60	2.40	2.60	7.00	
64.	7.40	2.00	2.40	3.40	10.01	
65.	10.80	1.60	2.60	4.10	10.01	
66.	12.20	1.80	3.40	5.60	8.00	

APPENDIX IVa - LIST OF FLAT AXES, AUSTRIA AND LOWER BAVARIA.

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
A01 ATTERSEE		VÖCKLABRUCK	637		SAM 14470
A02 ATTERSEE	FIG. 66b	VÖCKLABRUCK	636		SAM 14467
A03 ATTERSEE	FIG. 66c	VÖCKLABRUCK	619(A114)		SAM 14466
A04 AUFHAM		VÖCKLABRUCK	638		SAM 14469
A05 GÖSTING		GRAZ	15209		SAM 2481
A06 KRONSTORF		LINZ	4419		O&W 235, BAR 97
A07 LANDFRIEDSTETTEN		WIESELBURG	123		-
A08 LANA-GAULSCHLUCHT		MERAN	92		-
A09 LINZ-ST. PETER	FIG. 67a	LINZ	4796		BAR 95
A10 MISLING		VÖCKLABRUCK	M115		-
A11 MISLING		VÖCKLABRUCK	613	SAM III	SAM 14465
A12 MISLING		COLL. SCHMIDT		WILLVONSEDER, 1968 T.22.11&22, 13	-
A13 MONDSEE		COLL. SCHMIDT	6555		-
A14 MONDSEE		VIENNA	6565(A8087)		SAM 4350
A15 MONDSEE		LINZ			SAM 4347
A16 MONDSEE		MONDSEE			-
A17 MONDSEE	PL.4	UNI. VIENNA			-
A18 MONDSEE		UNI. VIENNA	6564		SAM 4345
A19 MONDSEE	PL.5	UNI. VIENNA	6566		SAM 4349
		UNI. VIENNA	6558		SAM 4348
		UNI. VIENNA	6562	SAM II	SAM 4340
		UNI. VIENNA	6561	SAM II	SAM 4341,
					O&W 234
		UNI. VIENNA	6563	SAM II	SAM 4342
		UNI. VIENNA	6560	SAM II	SAM 4343
		UNI. VIENNA	6557	SAM II	SAM 4344
		UNI. VIENNA	6556	SAM II	SAM 4346
		UNI. VIENNA	6559	SAM II	SAM 4351
		VIENNA	61264		O&W 233
A20 ATTERSEE		GRAZ	14904		-
A21 MURAU		WIESELBURG	30		-
A22 PETZENKIRCHEN		GRAZ	11550		SAM 2474;
A23 PÖSHALS	FIG. 66a	GRAZ			O&W 6
A24 PREINLWALD		GRAZ	1094		-
A25 PUSCHACHER		VÖCKLABRUCK	322 PU		-
RAINBERG		SALZBURG	2659	OTTO & WITTER, 1952	O&W 334
RAINBERG		SALZBURG	2658	OTTO & WITTER, 1952	O&W 335
RAINBERG		SALZBURG	2660	OTTO & WITTER, 1952	O&W 352
RETZ		RETZ	291	SAM II	SAM 6373

APPENDIX IVa (contd) - LIST OF FLAT AXES, AUSTRIA AND LOWER BAVARIA.

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
A28 SCHLÖGELSBACH		VIENNA	1547		O&W 315
A29 SEEWALCHEN		VÖCKLABRUCK	140		-
A30 SEEWALCHEN		VIENNA	37463	OTTO & WITTER 1952,	SAM 3612, O&W 232
A31 SEEWALCHEN		COLL. SCHMIDT			
A32 SEEWALCHEN		VIENNA	-	WILLVONSEDER, 1968 T.22,12	-
A33 ST. LORENZ		VIENNA	45829	WILLVONSEDER, 1968, T.21,11	-
A34 STOLLHOF		WIEN	13794	SAM II	SAM 3780
A35 STOLLHOF		WIEN	13795	OFFENBERGER, 1973, ABB. 64	-
A36 UNTERWÖBLING		ASPARN	2547		SAM 4925
A37 WEYREGG		VIENNA	61264		SAM 4926
A38 WEYREGG		VÖCKLABRUCK	-		-
A39 ZWERNDORF		STILLFRIED	989	REITINGER, 1968, 470	SAM 3613
A40 F.U.		VIENNA	17846	WILLVONSEDER, 1933, ABB.1.5	-
A41 F.U.		VIENNA	16156		SAM 3757
A42 F.U.		VIENNA	17855		SAM 3659
A43 F.U.		VIENNA	15025		SAM 3642
A44 F.U.		VIENNA	17849		SAM 3753
A45 F.U.		VIENNA	17842		SAM 3638
A46 F.U. (UPPER AUSTRIA)		VIENNA	17854		-
A47 UPPER AUSTRIA		ASHMOLEAN:	1927:1489		SAM 3640
A48 F.U.		VIENNA	17425		-
A49 F.U.		VIENNA	16155		SAM 3669
A50 F.U. 'HUNGARY?'		GENEVA	B1003		SAM 3754
A51 F.U.		ASHMOLEAN	1927:1490		BAR 44
A52* ALTHEIM		MUNICH	StS 1919		-
A53 HARTBERG	FIG. 67b	GRAZ	14915		SAM 8, O&W 278
A54 AUHÖGL		-	-	REITINGER, 1963, 275	-
A55 F.U.		ASHMOLEAN	1927:1491	DRIEHAUS, 1960, T.44	-
A56 PLATTENSEE, AUSTRIA		GENEVA	B5330		-
A57 HARGELSBERG		-	-	HABERMEIER, 1974(1973)ABB.31	BAR 42
F.U.?SLOVAKIA		VIENNA	17843		SAM 3633
F.U.		VIENNA	17853		SAM 3641
F.U.		VIENNA	16159		SAM 3660
F.U.		VIENNA	16158		SAM 3661
F.U.		VIENNA	16157		SAM 3667

APPENDIX IVb - AXE HAMMERS & ADZE AXES; AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
LINZ-ST. PETER	FIG. 69b	LINZ	A4795		BAR 96
PUCH		-	-	PITTONI, 1954, FIG. 136	-
STEINDORF		-	-	PITTONI, 1954, FIG. 141	-
ZWERNDORF* (copy)	FIG. 69a	VIENNA	6250		
F.U.	PL. 6	MÖDLING	U5		BAR 104
F.U. ?UPPER AUSTRIA		LINZ	A3137		BAR 102

DATAFILE OF MEASUREMENTS OF ALL AUSTRIAN FLAT AXES

NO	L	W1	W2	W3	T	WEIGHT
A01	10.50	2.65	3.50	4.90	10.00	0.00
A02	9.50	3.00	3.70	5.00	8.00	0.00
A03	11.50	2.60	3.40	4.40	8.00	0.00
A04	9.00	2.70	4.00	4.70	7.00	0.00
A05	13.00	2.80	4.10	4.60	8.00	284.00
A06	9.20	2.60	3.30	4.20	7.50	160.00
A07	18.50	3.91	5.00	5.61	13.20	790.00
A08	13.80	1.95	3.00	6.15	14.25	400.00
A09	18.15	1.45	2.70	3.90	13.00	370.00
A10	6.40	2.20	2.90	3.85	6.80	0.00
A11	5.70	1.65	3.15	3.75	0.00	0.00
A12	5.70	1.80	2.70	3.45	0.00	0.00
A13	4.93	1.80	2.53	3.13	0.00	0.00
A14	8.80	3.40	4.00	5.03	8.50	200.00
A15	5.30	1.90	2.90	3.80	7.20	0.00
A16	8.38	3.90	4.05	4.30	3.60	70.00
A17	7.00	2.30	2.90	3.30	5.20	57.00
A18	7.66	2.40	2.80	4.85	9.90	160.00
A19	7.00	2.65	3.60	4.57	7.70	115.00
A20	7.80	2.60	3.00	4.00	0.00	0.00
A21	12.40	2.60	3.00	4.60	7.00	247.00
A22	7.60	2.40	2.20	3.05	6.40	70.00
A23	5.65	2.20	2.70	3.35	7.50	84.00
A24	11.70	3.30	3.90	4.40	5.00	147.00
A25	9.50	3.25	4.35	5.40	7.00	0.00
A26	14.60	2.12	2.80	4.40	12.00	0.00
A27	15.00	2.20	3.20	4.40	12.00	0.00
A28	8.40	2.00	3.40	4.00	4.00	0.00
A29	7.20	2.30	3.70	4.70	7.00	0.00
A30	9.45	2.85	3.60	4.80	0.00	0.00
A31	5.78	1.80	3.08	3.60	0.00	0.00
A32	8.70	2.55	3.45	4.35	0.00	0.00
A33	7.60	2.60	3.20	4.20	6.00	0.00
A34	14.00	2.10	3.70	5.40	16.80	527.00
A35	16.60	2.20	3.40	4.00	22.30	744.00
A36	8.60	1.65	3.55	3.60	9.10	0.00
A37	8.71	2.50	3.40	4.40	8.80	163.00
A38	8.70	2.70	3.75	4.58	0.00	0.00
A39	7.00	1.80	2.60	3.40	0.00	98.00
A40	13.90	4.40	5.40	5.50	13.50	602.00
A41	12.30	3.40	4.10	4.60	11.80	372.00
A42	13.00	2.40	3.00	5.70	13.60	423.00
A43	14.50	1.60	2.65	5.50	15.30	288.00
A44	12.50	2.00	2.40	4.10	6.80	145.00
A45	18.90	2.40	3.70	4.40	21.30	882.00
A46	6.63	1.80	2.40	2.75	7.40	64.00
A47	7.95	3.80	4.20	4.70	3.00	95.00
A48	12.20	2.80	4.15	4.50	12.00	0.00
A49	15.65	7.80	9.00	10.00	11.50	0.00
A50	9.45	3.80	4.50	5.10	12.40	335.60
A51	12.20	6.10	6.90	7.40	9.00	580.00
A52	5.80	1.80	2.40	3.60	6.00	0.00
A53	13.40	1.95	3.35	5.50	15.00	467.00
A54	9.15	2.10	2.48	3.75	5.00	0.00
A55	11.60	3.45	4.60	5.40	12.50	590.00
A56	12.60	2.90	3.55	3.60	4.00	110.70
A57	9.40	1.50	3.20	3.60	9.00	0.00

APPENDIX VIa - LARGE AND SMALL FLAT DAGGERS WITH STRAIGHT HAFTING PLATE - SWITZERLAND.

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
AUVERNIER		BERN	5546		-
BEVAIX	(2)	NEUCHÂTEL	-		-
CHEVROUX		LAUSANNE	19039 II		-
CHEVROUX	PL. 9	LAUSANNE	9975 II		-
CORCELETTES		BERN	25600		-
CORCELETTES		BERN	25601		SAM 2963
ESTAVAYER		BERN	89/11-1/28		-
ESTAVAYER		NEUCHÂTEL	EST 17		BAR 70, (SAM 22237)
FONT		?	-	SCHWAB, 1970, FIG. 4, 4; ANTIQUA, 1885, T25, 1	-
GREIFENSEE 'STOREN'		ZÜRICH	35982		-
LÜSCHERZ		BERN	18648		SAM 2924
LÜSCHERZ		ZÜRICH	8913		-
MÖRIGEN		BERN	7830		SAM 3031
MÖRIGEN		BERN	18853		SAM 2975
ONNENS	PL. 7	LAUSANNE	-		BAR 27
PORTALBAN		COLL. BECK	-	SCHWAB, 1970, FIG. 4, 5; ANTIQUA, 1883.	-
VERSOIX	PL. 8	GENEVA	B5801		BAR 35
VERSOIX	PL. 8	GENEVA	9147		BAR 34
VINELZ*	FIG. 71b	ZÜRICH	8991		-
VINELZ*		BEKN	-		-
VINELZ*		BERN	-		-
VINELZ*		BERN	180		SAM 2836
VINELZ*		BERN	5181		SAM 2837
VINELZ*		BERN	5184		-
YVONAND/PEUPLERAIE *	FIG. 71a	?NEUCHÂTEL	-	NOT YET CATALOGUED	BAR 88, (SAM 22050)
F.U.		NEUCHÂTEL	528		-

APPENDIX VIb - FLAT DAGGERS WITH CONCAVE HAFTING PLATE - SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
FONT		ESTAVAYER	-	SCHWAB, 1970, FIG. 4,1	-
FONT		COLL. BECK	-	ANTIQUA, 1885, T.14,10	-

APPENDIX VIc - FLAT DAGGERS WITH ROUND HAFTING PLATE - AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
ATTERSEE	FIG. 74a	VÖCKLABRUCK	458		-
GREIN, DANUBE		-	-	WILLVONSEDER, 1968, 218	-
LANGENSTEINER WAND*		STEYR	-	KNEIDINGER, 1942, T.IV,52	-
MONDSEE	PL.12	UNI. VIENNA	6571		-
OBER ELSARN		LANGENLOIS	59		-
SCHNEIDERLOCH		GRAZ	12029		-
SEEWALCHEN, ATTERSEE	FIG.74b	VIENNA	62383		-
SEEWALCHEN, ATTERSEE		VIENNA	35611		SAM 3616
SEEWALCHEN, ATTERSEE		COLL. SCHMIDT		WILLVONSEDER, 1968, T.23,4	-
SEEWALCHEN, ATTERSEE		COLL. SCHMIDT		WILLVONSEDER, 1968, T.23,7	-
SEEWALCHEN, ATTERSEE		COLL. SCHMIDT		WILLVONSEDER, 1968, T.23,5	-
WEYREGG, ATTERSEE		COLL. SCHMIDT		WILLVONSEDEK, 1968, T.23,6	-
WIESELBURG		ASPARN/ZAYA	8663		SAM 3614

APPENDIX VIb - FLAT DAGGERS WITH ROUND HAFTING PLATE - SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
AUVERNIER		NEUCHÂTEL	166		BAR 86
AUVERNIER		NEUCHÂTEL	AUV. 915		BAR 93
BEVAIX		NEUCHÂTEL	BX 155		BAR 67, (SAM 22231)
CHAMPREVEYRES		GENEVA	B 2684		BAR 46
CHEVROUX	Pl. 10	LAUSANNE	19279 II		-
CHEVROUX		LAUSANNE	16636 II		-
CONCISE		LAUSANNE	26792 I		BAR 13
CORCELETTES		BERN	23599		-
CORCELETTES		BERN	25599		SAM 2962
ESTAVAYER	Pl. 11	GENEVA	B5247		SAM 7046, BAR 36
ESTAVAYER		BERN	89/11-1/30		-
FONT		FREIBURG	1379		-
GEROLFINGEN		GENEVA	B 727		SAM 7104
HAUTERIVE		NEUCHÂTEL	HR 427 (OLD:H 156)		BAR 71
LÛSCHERZ		ZÛRICH	8914		-
MÛRIGEN		BERN	7653		SAM 3039
SCHLEINIKON		ZÛRICH	21849		-
SCHMITTEN		FREIBURG	1248		SAM 7164

APPENDIX VIc - LARGE FLAT DAGGERS WITH ROUND HAFTING PLATE - SWITZERLAND

CONCISE		NEUCHÂTEL	CONC 61 (49 OLD)		BAR 64
LA RAISSE		NEUCHÂTEL	CONC 844		-
SUTZ LATRIGEN	FIG. 73	ZÛRICH	8989		-

APPENDIX VI f - FLAT DAGGERS WITH TRAPEZOIDAL HAFTING PLATES - AUSTRIA & SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
CHEVROUX, S		LAUSANNE	16075 II		-
BEVAIX FRAGMENT, S.		NEUCHÂTEL	BEVAIX 4619		-
ESTAVAYER		FREIBURG	5211		-
SUTZ-LATTRIGEN, S		BERN	3411		SAM 2923
MONDSEE, A		LINZ	6573 (A8086)		-

APPENDIX VI g - UNCERTAIN TYPES OF FLAT DAGGERS - SWITZERLAND

GEROLFJINGEN		ZÜRICH	9000 (HAFTING PLATE BROKEN)		-
MORGES		LAUSANNE	25214 (2303) (HAFTING PLATE BROKEN)		BAR 25
ST. BLAISE		GENEVA	B4207 (SO-CALLED 'KERBDOLCH')		SAM 7108; BAR 37
VALAIS		GENEVA	B3442 (HAFTING PLATE BROKEN)		BAR 33

APPENDIX VIh - UNCERTAIN TYPES OF DAGGERS - AUSTRIA & SWITZERLAND (ANALYSED
BY STUTTGART, BUT COULD NOT BE FOUND IN MUSEUMS)

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
F.U.? ATTERSEE		VÖCKLABRUCK	458 AS	SAM III	SAM 14472
BEVAIX		BIEL	BX 1806	SAM II	SAM 3113
CHEVROUX		BERN	25657	SAM II	SAM 22241
ESTAVAYER		GENEVA	B5247	SAM II	SAM 7046
GEROLFINGEN		GENEVA	B727	SAM II	SAM 7104, BAR 45
GEROLFINGEN		BERN	19606	SAM II	SAM 2922
GRENG (FRAGMENT)		MURTEN	404	SCHWAB, 1970, ABB.4, 17	-
GRENG (FRAGMENT)		BIEL	G 1795	SAM II	SAM 3112
MÖRIGEN		BIEL	MO 1647	SAM II	SAM 3115
MÖRIGEN		BERN	7610	SAM II	SAM 3036
MÖRIGEN		BERN	7652	SAM II	SAM 3038
MÖRIGEN		BERN	7837	SAM II	SAM 3043
MÖRIGEN (FRAGMENT)		BERN	18852	SAM II	SAM 2974
NEUCHÂTEL, LA COUDRE		BERN	2520	SAM II	SAM 3032
PORT		BERN	27618	SAM II	SAM 2937
SCHWARZBACH		ZUG	7321	SAM II	SAM 2848
SUTZ-LATTRIGEN		BERN	32423	SAM II	SAM 2820
SUTZ-LATTRIGEN		BERN	3184	SAM II	SAM 2832
THUN		BERN	10342	SAM II	SAM 2831
F.U.		NEUCHÂTEL	-	SAM III	SAM 22244

APPENDIX VIIa - DAGGERS WITH MIDRIB--SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
AIGUILLES DES BAULMES		GENEVA	B5159		BAR 47
AUVERNIER		NEUCHÂTEL	572		-
BEVAIX		NEUCHÂTEL	BX 154		BAR 69
					(SAM 22230)
BRÜGG		BERN	29596		SAM 2943
CHAMPREVEYRES		NEUCHÂTEL	-		-
CHAMPS DE VEX VALLAIS		GENEVA	B795		BAR 49
CHEVROUX		LAUSANNE	16636 II		BAR 8
CHEVROUX		LAUSANNE	20726 II		BAR 7
COLOMBIER		NEUCHÂTEL	COL 29?21(NEW)2190(OLD)		-
COLOMBIER		NEUCHÂTEL	COL 20 (NEW)COL1873(OLD)		SAM 22234,
					BAR 76
COLOMBIER		NEUCHÂTEL	COL 17		BAR 75
COLOMBIER		NEUCHÂTEL	COL 27		BAR 73
ESTAVAYER		NEUCHÂTEL	ESTAV 4		-
ESTAVAYER		FREIBURG	5220		-
EUX VIVES		GENEVA	B112?		BAR 48
FONT		COLL. BECK	-		-
LÜSCHERZ		BERN	3782		SAM 2931
LÜSCHERZ		BERN	3986		SAM 2929
MÖRGES		LAUSANNE	25213		BAR 26
MÖRIGEN		BERN	7648		SAM 3037
MÖRIGEN		NEUCHÂTEL	MOR 21(MÖRIGEN 103(OLD))		BAR 72
PORTALBAN		NEUCHÂTEL	PT 2 (P 29)		-
PORTALBAN		NEUCHÂTEL	PT 2		BAR 78
PORTALBAN	(3)	COLL. BECK	-		-
ST. BLAISE		NEUCHÂTEL	SB 39		BAR 60,
					(SAM 22238)
ST. BLAISE		ZÜRICH	8995		-
VINELZ*	FIG. 75b	BERN	5195		SAM 2842
VINELZ*	FIG. 75a	BERN	5175		SAM 2834
VINELZ*	FIG. 75c	BERN	5183		SAM 2838
FU.		NEUCHÂTEL	1132		-

APPENDIX VIIb - DAGGERS WITH MIDRIB AND ROUND HAFTING PLATES - AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
CARNUNTUM		CARNUNTUM	2145		-
BUCHORT, ATTERSEE		-	-		-
LORCH		ENNS	P48		-
MONDSEE		UNI VIENNA	6569		O&W 256
WEYREGG, ATTERSEE	FIG. 75d	VIENNA	1658		SAM 3617
WIESELBURG		ASPARN/ZAYA	4320		-
FU.		CARNUNTUM	2147		-

APPENDIX VIIc-DAGGERS WITH MIDRIB AND TRAPEZOIDAL HAFTING PLATES-AUSTRIA AND SWITZERLAND

MONDSEE, A	PL. 13	UNI VIENNA	6574		-
MONDSEE, A	PL. 13	UNI VIENNA	6572		-
MÖRIGEN, S		BERN	7610		-
PRÈS LYON, S		GENÈVA	B3415		BAR 53
WEYREGG, ATTERSEE, A	FIG. 75e	VIENNA	1657		SAM 3615
FU, A		CARNUNTUM	2146		-

APPENDIX VIId - TANGED DAGGERS - AUSTRIA & SWITZERLAND

WIEN XXII-ASPERN,*A	FIG. 77 PL. 14	ASPARN/ZAYA	14853		BAR 103
COLOMBIER, S	FIG. 76b	NEUCHÂTEL	COL 18 (525 OLD)		SAM 22233, BAR 77
FONT, S		NEUCHÂTEL	-		-
LÜSCHERZ, S	FIG. 76a	ZÜRICH	3911		-
MONRUZ, S		BERN	9520 (OR KNIFE?)		-
ST. BLAISE, S	FIG. 76c	ZÜRICH	19709		-
ST. BLAISE, S	FIG. 76d	ZÜRICH	19708		-
ST. BLAISE, S	FIG. 70a	NEUCHÂTEL	SB44		BAR 63, (SAM22239)
				SCHWAB, 1970, ABB. 2, 12	-

APPENDIX VIIIa - KNIVES - AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
ATTERSEE (4)		COLL. SCHMIDT	(LOST)	WILLVONSEDER, 1968, T.23,8,9,14,16 -	
KALTENLEUTGBEN		COLL. FICHTINGER	(LOST)	MICHNA, 1929, ABB.1,2 -	
LANGENSTEINER WAND*		STEYK	-	REITINGER, 1968, P.339 -	
MONDSEE		UNI VIENNA	6568	BENINGER, 1961,63 -	
PAURA*		BAD WIMSBACH-NEYDHARDING	-	HELL & KOBLITZ, 1918, ABB.13,2&3 -	
RAINBERG (2)		-	-	HELL, 1943, FIG.2,2&5 -	
RAINBERG (2)		SALZBURG	HELL 304	SAM III	SAM 14477
RAINBERG		SALZBURG	HELL 304	SAM III	SAM 14478
RAINBERG		SALZBURG	HELL 304	SAM III	O&W 255
SEEWALCHEN, ATTERSEE		VIENNA	62385	WILLVONSEDER, 1968, T.23,1-3,10-13,15 -	
SEEWALCHEN, ATTERSEE (8)		COLL. SCHMIDT	(LOST)	WILLVONSEDER, 1968, T.21,13 -	
SEEWALCHEN, ATTERSEE		VIENNA	-		
SEEWALCHEN, ATTERSEE FIG.78e		VOCKLABRUCK	629		SAM 14473
SEEWALCHEN, ATTERSEE FIG.78d		VIENNA	62384		SAM 4895
ST. JACOB		GRAZ	11417		O&W 87

APPENDIX VIIIb - KNIVES - SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
BEVAIX		NEUCHÂTEL	156		BAR 68 (SAM 22232)
ERLENHÖLZLI		ZÜRICH	42749		-
ESTAVAYER	FIG. 78c	NEUCHÂTEL	ESTAV. 10		-
ESTAVAYER		NEUCHÂTEL	8		-
FONT		NEUCHÂTEL	-	SCHWAB, 1970, ABB.2,11	-
GEROLFINGEN		BERN	19606	(OR SHEET COPPER?)	-
MONRUZ	FIG. 78a	BERN	9520	(OR DAGGER?)	-
MORGES		LAUSANNE	25213		-
ST. BLAISE	FIG. 78b	ZÜRICH	8994		-

APPENDIX IXa - PINS (ROLLENNADEL)-SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
AUVERNIER/BRISE-LAME*		-	-	STRAHM 1975a, 19	-
CORCELLE PRÈS CONCISE PL. 15		LAUSANNE	27457 I		-
YVERDON AV. DES SPORTS		YVERDON	-		-
YVONAND/GEILLINGER* FIG. 79a		YVERDON	-		BAR 90, (SAM 22140)
YVONAND/GEILLINGER* FIG. 79b		YVERDON	-		SAM 22141

APPENDIX IXb - AWLS WITH ROUND SHAFTS - AUSTRIA & SWITZERLAND

RAINBERG, A.		-	-	HELL, 1943, ABB.2,4	-
CHEVROUX, S.		LAUSANNE	16835		-
ESTAVAYER, S.		-	-	SCHWAB, 1970, ABB.1,10	-
PORTALBAN, S.		NEUCHÂTEL	-	SCHWAB, 1970, ABB.2,7	-
VINELZ, S.*	FIG. 79g	BERN	5176		-
VINELZ, S.*		BERN	-	STRAHM, 1971a, FIG.25,12	-

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AWLS OF UNCERTAIN TYPE- AUSTRIA & SWITZERLAND

CORTAILLOD, S		BIEL	Cd 970	SAM II	SAM 3156
MÖRIGEN, S		BERN	7777	SAM II	SAM 3041
PRÜCKLERMAUER*, A (2)		STEYR?	-	MITTERKALKGRUBER, 1954	-

APPENDIX IXc - AWLS WITH SQUARE SHAFTS AND POINTED ENDS

AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
ATTERSEE		COLL. SCHMIDT	LOST		
OBER-ELSARN		LANGENLOIS	62	WILLVONSEDER, 1968, T.25	-
SEEWALCHEN		VOCKLA BRUCK	543		-
SEEWALCHEN		VIENNA	62386		-
SEEWALCHEN	Pl. 17	VIENNA	37465		-
SEEWALCHEN	FIG.79e	VIENNA	62386		SAM 4898
SEEWALCHEN		VIENNA	62386	SAM II	SAM 4899
SEEWALCHEN		VIENNA	-	WILLVONSEDER, 1968, T.24,12	-
SEEWALCHEN		VIENNA	-	WILLVONSEDER, 1968, T.24,11	-
SEEWALCHEN		VIENNA	37465	SAM II	SAM 4900
SEEWALCHEN	Pl. 17	VIENNA	37466		SAM 4901
SEEWALCHEN	Pl. 17	VIENNA	1511	SAM II	SAM 4896
SEEWALCHEN	FIG.79c	VIENNA	1511	SAM II	SAM 4897

GERMANY

ALTHEIM *	(3)	FIG.79h MUNICH	1919.601-604		SAM 7
WALLERFING-BACHLING *		-	-	SIEGROTH, 1972, FIG.10,8	-
HANGNAU (6)		UNTERUHLIDINGEN		(IN SHOWCASE; NUMBER NOT OBTAINABLE)	-

APPENDIX IXc (contd.) - AWLS WITH SQUARE SHAFTS AND POINTED ENDS

SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
AUVERNIER/LA SAUNERIE *		NEUCHÂTEL	AUV. 2250		BAR 89 (SAM 22224)
AUVERNIER/LA SAUNERIE		NEUCHÂTEL	AUV. 2780		SAM 22223
AUVERNIER		BERN	8438		SAM 3054
BEVAIX		NEUCHÂTEL	BX 49		SAM 22228
BEVAIX		NEUCHÂTEL	BX 76		SAM 22229
CHEVROUX	(12)	LAUSANNE	16028 II		-
CONCISE	(7)	LAUSANNE	23762		-
CORCELETTES, GRANSON	PL. 16	BIEL	Cs1913		SAM 3151
ESTAVAYER		NEUCHÂTEL	ESTAVAYER 6		SAM 22235
ESTAVAYER		NEUCHÂTEL	ESTAVAYER 11		SAM 22236
LÜSCHERZ		ZÜRICH	8915		-
LÜSCHEPZ		BERN	3987		SAM 2927
MÖRIGEN		BERN	7685		SAM 3040
MÖRIGEN		BERN	23380		SAM 3033
MOOSEEDORF		BERN	9945		SAM 3049
ST. BLAISE		ZÜRICH	19712		-
SUTZ		BERN	4891		SAM 2932
VINELZ *		BERN	5198	(PROB. CHISEL)	SAM 2843
VINELZ *		BERN	-	STRAHM 1971a, FIG.25,11	-
VINELZ *		BERN	5196		SAM 3089
VINELZ *		BERN	5193		SAM 3088
VINELZ *	FIG.79d	BERN	5192		SAM 3087
VINELZ *		BERN	5178		SAM 2835
VINELZ *		BERN	5169		SAM 2833
VINELZ *	FIG.79f	ZÜRICH	8390		-
YVERDON		YVERDON	-		-
ZUG/SUMF		ZUG	1516		-
ZUG/SUMF		ZUG	398		-
ZUG/SUMF		ZUG	397		-
ZÜRICH/GROSSER HAFNER *		ZÜRICH	1035-17		-
ZÜRICH/WOLLISHOFEN		ZÜRICH	1190-90		-
ZÜRICH/UTOQUAI		-	-	STRAHM, 1971a, T.27,1	-

APPENDIX X - CHISELS OF SOUTHERN GERMANY & SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
BURGÄSCHISEE-SÜD	FIG. 81a	BERN	50494		SAM 3090
CHEVROUX		BERN	25749		SAM 2953
CHEVROUX		BERN	-		-
CHEVROUX		BERN	25750		SAM 2954
CHEVROUX		LAUSANNE	10291		BAR 2
CHEVROUX		LAUSANNE	20044 II		BAR 3
CHEVROUX		LAUSANNE	16135 II (AWL)		BAR 4
CHEVROUX		LAUSANNE	19783 II		BAR 5
CHEVROUX		LAUSANNE	15981 II		BAR 6
CHEVROUX		LAUSANNE	15976 II		BAR 11
CONCISE		NEUCHÂTEL	Conc 62 (853 old)		BAR 65
CONCISE		BIEL	Ce 1694		SAM 3155
CONCISE (7)	PL. 18	LAUSANNE	28564 I		BAR 17-23
CORCEI FTTES		LAUSANNE	-		BAR 24
ESTAVAYER		BERN	8647		SAM 3058
FAULENSEE, SPIEZ		BERN	8998		-
GEROLFINGEN		COLMAR	-		SAM 18029
GEROLFINGEN		ZÜRICH	8999		-
HAGNAU (2)		UNTERUHLDINGEN			-
LÜSCHERZ		BERN	18645		SAM 2926
MÖRIGEN		BERN	7819		SAM 3042
MÖRIGEN		BERN	23379	SAM II ('AWL')	SAM 3044
ONNENS		LAUSANNE	28430 III	SAM II ('AWL')	-
PORT, STATION SPERS		BERN	27677		SAM 2941
ST. BLAISE		NEUCHÂTEL	19710		-
VINELZ *	FIG. 81b	BERN	5194	SAM II ('AWL')	SAM 2841
VINELZ *	FIG. 81c	BERN	5187		SAM 2839 ('AWL')
VINELZ *	FIG. 81d	BERN	4+357		-
VINELZ *		BERN	5196?		-
VINELZ*		BERN	5198		SAM 2843
ZUG, SUMPF		ZUG	1560		-

APPENDIX X (contd.). CHISELS NOT FOUND IN MUSEUMS BUT ANALYSED BY STUTTGART

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
AUVERNIER		BERN	8441	SAM II	SAM 3055
CORCELETES, GRANSON		BIEL	CS 1917	SAM II	SAM 3153
CORCELETES, GRANSON		BIEL	CS 1914	SAM II	SAM 3149
CORTAILLOD		BIEL	CD 972	SAM II	SAM 3150
CORTAILLOD		BIEL	CD 974	SAM II	SAM 3152
CORTAILLOD		BIEL	CD 973	SAM II	SAM 3154
CORTAILLOD		BIEL	CD 967	SAM II	SAM 3157
ESTAVAYER		BERN	8544	SAM II	SAM 3078
MÖRIGEN		BERN	7536	SAM II	SAM 2925
F.U. LAKE NEUCHÂTEL		BERN	9525	SAM II	SAM 3046
F.U.		VIENNA	15024	SAM II	SAM 3690

APPENDIX XI - RING-BEADS - SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
BAULMES, * ABRI DE LA CURE (1)	(56)	NEUCHÂTEL, B168 (PRIVATE)			SAM 21674
BURGASCHISEE-SÜD*	(1)	BERN	13360		SAM 2987-3026
CONCISE	(1)	NEUCHÂTEL	27457		-
CORTAILLOD	(?1)	BOUDRY	-		-
GEROLFINGEN	(12) FIG. 82a-d	BERN	3039-3054		-
GEROLFINGEN	(8)	BERN	3054		-
GEROLFINGEN	(1)	BERN	27451		SAM 3100
GEROLFINGEN	(1)	BERN	27452		-
GEROLFINGEN	(10)	BERN	27429-438		-
GEROLFINGEN	(5)	BERN	18638-42		-
GEROLFINGEN	(4)	BERN	-	SAM II	SAM 3092-3096
ESTAVAYER	(1)	ZÜRICH	23196		-
FONT	(2)	COLL. BECK	-		-
LÜSCHERZ	(1)	-	-	FORRER, ANTIQUA 1885	-
MARIN-EPARNIER	(25) FIG. 82e	COLL. BARDEL-THORENS (NOW LOST)		FORRER, 1885	-
MÖRIGEN	(1)	BERN	4397		-
SUTZ	(1)	COLL. IRLET	-		-
VINELZ*	(1)	BERN	-	STRAHM, 1971, FIG. 25, 23	-
BICONIAL BEADS - SWITZERLAND					
ESTAVAYER	(12) FIG. 82i, f	ZÜRICH	23196		-
ESTAVAYER	(1) FIG. 82h	ZÜRICH	36003		-
ESTAVAYER-FONT	(1)	ESTAVAYER	-	SCHWAB, 1970, FIG. 3, 24	-
FONT	(2) FIG. 82k	COLL. BECK	-	SCHWAB, 1970, FIG. 3, 23, 27	-
GEROLFINGEN	(5)	BERN	27439-53		-
GEROLFINGEN	(1)	BERN	3054		-
MUNTELIER	(1)	FREIBURG	2575		-
ST. BLAISE	(1) FIG. 82, l	COLL. ZINTGRAFF, ST. BLAISE,		MUNRO, 1890, FIG. 8, 18	-
VINELZ*	(46) FIG. 82g	BERN	5236		SAM 2876-2921

APPENDIX XII - TUBES OF SHEET COPPER - AUSTRIA AND SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
CHEVROUX, S	(1)	LAUSANNE	17190 II		BAR 12
CORCELLES, S	(4)	LAUSANNE	27457 I		BAR 15
CONCISE, S	(1)	LAUSANNE	-		-
LÖDERSDORF, A	(1)	GRAZ	10557		SAM 2478
VINELZ, S*	(1)	BERN	5190		-
YVERDON, S	(1)	YVERDON, COLL.	KRATTINGER		-
ZUG, Sumpf, S	(1)	ZUG	1568		-

APPENDIX XIII - SPIRAL CYLINDERS

AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
LÖDERSDORF		GRAZ	10558		SAM 2477
STOLLHOF	(7) PL.20	VIENNA	13796		SAM 4936-4942
STOLLHOF		VIENNA	13796	SAM II	SAM 6643
STOLLHOF		VIENNA	13796	SAM II	SAM 6644
STOLLHOF	(4)	BADEN	243-245, 247	SAM II	SAM 6087-6090
UNTERWÖBLING		ASPARN/ZAYA	-		-
FU, NEAR CARNUNTUM(6)		CARNUNTUM	1898		-

SWITZERLAND

CHEVROUX		LAUSANNE	12205 II	BAND: FLAT	-
CHEVROUX		LAUSANNE	-	BAND FLAT	BAR 14
CHEVROUX		LAUSANNE	20059	BAND: TRIANGULAR	-
CONCISE		LAUSANNE	24720 I		-
CORCELLE		LAUSANNE	27457 I		-
GEROLFINGEN	(3)	BERN	-	SAM II	SAM 3097-3099
VINELZ*		BERN	5192		-
ZUG, SUMPF	(4)	ZUG	404-407	BAND: TRIANGULAR	-
ZUG, SUMPF	(2)	ZUG	409, 410	BAND: FLAT	-
ZUG, SUMPF	(2)	ZUG	1569, 1609	BAND: FLAT 8mm WIDE	-

APPENDIX XIV - SINGLE SPIRALS - AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
ATTERSEE		VÖCKLABRUCK	641 AS		-
ATTERSEE		COLL. SCHMIDT (LOST)		WILLVONSEDER, 1968, T.19, 18 -	
BADEN-KÖNIGSHÖHLE*		BADEN	1458	KYRLE, 1924	-
HALLWANG		SALZBURG	5785		O&W 465
MONDSEE		INST. VIENNA	6580	OTTO & WITTER, 1952	O&W 253
MONDSEE	PL.23	INST. VIENNA	6581		-
MONDSEE	PL.23	INST. VIENNA	6582		-
WIEN-JIRAWETZ*	PL.21	VIENNA	-		-
FU.		CARNUNTUM	1898		-
SWITZERLAND					
NIEDERWIL, GACHNANG*	PL.22a,b	PRIVATE COLL.	-		-
NIEDERWIL, GACHNANG* (COPY)		ZÜRICH	48492		-
LÜSCHERZ	FIG. 85b	BERN	44358		-
VALLON DES VAUX *		-	-	SITTERDING, 1972, 32&86	-
VINELZ*	FIG. 85a	BERN	2		-
PIECES OF 'WIRE' - AUSTRIA					
OSSARN*	PL.24	VIENNA	60855		-
SEEWALCHEN, ATTERSEE		VIENNA	-	WILLVONSEDER, 1968, T.24, 19 -	-

APPENDIX XV - SPECTACLE SPIRALS

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
AUSTRIA					
STOLLHOF	(6) PL.27	VIENNA	13792 & 13793		SAM 4927-4932
GERMANY					
'BODENSEE' HAGNAU		- UNTERUHLINGEN	-	SPINDLER, 19718 FIG. 8a	-
SWITZERLAND					
AUVERNIER		ZÜRICH	48706		-
CHEVROUX		BOUDRY	-		-
CONCISE		YVERDON	1564		SAM 7790
CONCISE		LAUSANNE	-		BAR 10
CONCISE	PL.25	ZÜRICH	59622		-
CORCELETTES		ZÜRICH	-	GROSS, 1883, T.23,12	-
CORCELETTES, GRANDSON	PL.26	ZÜRICH	9252		-
CORTAILLOD		-	-		-
ESTAVAYER		COLL. BECK	-	MUNRO, 1890, T.10,7	-
FONT	FIG. 86b	FREIBURG	1455	FORRER, 1885, T.14,8	-
GALS, ST. JOHANN	FIG. 86a	BERN	22535		-
MORIGEN (OF GOLD)		-	-		-
MOOSSELDORF		BERN	30091	STRAHM, PERSONAL COMM.	-
'NEUCHÂTEL', LAKE		COLOGNE	-	SPINDLER, 1971, FIG. 13	-

APPENDIX XVI - PENDANTS - GERMANY AND SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
ALTHEIM*, G	FIG. 88a	MUNICH	1919.600		SAM 9
ST. BLAISE, S.	FIG. 88e	NEUCHÂTEL	SB38		BAR 62
VINELZ*, S.	(2)	BERN	5185, 5186		-
VINELZ*, S.	FIG. 88b	BERN	5172		-
VINELZ*, S.	FIG. 88c	BERN	5182		SAM 3086
VINELZ, * FRAGMENT	FIG. 88d	BERN	5189		-
VINELZ, * FRAGMENT		BERN	5179		-
VINELZ, * FRAGMENT		ZÜRICH	8992		-

APPENDIX XVIIa - LIST OF ÖSENHALSRINGE - AUSTRIA .

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
BADEN-KÖNIGHÖHLE *	FIG. 90a	BADEN		LADENBAUER-OREL, 1954	SAM 6080
LEOBERSDORF*	(2) PL.28	VIENNA	623&624		SAM 3731 & 3730
LICHTENWÖRTH*	(3) FIG.90b, PL.29	ASPARN/ZAYA	6173		SAM 4638-4639
LICHTENWÖRTH*		-	-	PITTIONI 1954	-
LICHTENWÖRTH* FRAGM. (2)		ASPARN/ZAYA		SAM II	SAM 4636-4637
MAXGLAN, GLANHOFEN (2)		SALZBURG	5784 & 5784A		O&W 155 & 446
ST. PANTALEON		WIESELBURG	31		-

APPENDIX XVIIb - ÖSENBÄNDER - SWITZERLAND

CONCISE F.U.	FIG. 91a	LAUSANNE NEUCHÂTEL	- 1452	STRAHM, 1971, FIG. 35,2 STRAHM, 1971, FIG. 35,1	- SAM 22240
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APPENDIX XVIII - LIST OF SICKLE-KNIVES - AUSTRIA

MICHELDORF (4)	FIG. 91c	LINZ	A616,618,625,626		BAR91,92,98,99, O&W 401,1049
PAURA*	FIG. 91b	WYMSBACH-NEYDHARDING		BENINGER, 1961, FIG. 11,3	-
PAURA, *FRAGMENT		WYMSBACH-NEYDHARDING		BENINGER, 1961,	-
RAINBERG		SALZBURG		HELL & KOBLITZ, 1918	-
SEEWALCHEN		VÖCKLABRUK	105 S		-
STOLLHOF		VIENNA	13798 (5)		SAM 4943

APPENDIX XIXa - LIST OF FISH HOOKS - AUSTRIA, GERMANY AND SWITZERLAND

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
ATTERSEE, A.	(7)	COLL. SCHMIDT		WILLVONSEDER, 1969, T.22, 1-7	-
CORTAILLOD, S.		-		MUNRO, 1890, FIG. 10, 2	-
MONDSEE, A.		-		MUNRO, 1890, FIG. 39, 14	-
PAURA*, A.	FIG. 91d	WIMSBACH-NEYDHARDING		BENINGER, 1961, FIG. 11, 4	-
SEEWALCHEN, A.	(5)	VOCKLABRUCK		WILLVONSEDER, 1969, T.24, 5-9	-
?SEEWALCHEN, A.	(5)	VIENNA		WILLVONSEDER, 1969, T.24, 14-18	-
UNTERUHLINGEN, S		-		MUNRO, 1890, FIG. 32, 12&19.	-

APPENDIX XIXb - LIST OF UNIDENTIFIED METAL PIECES -AUSTRIA, GERMANY & SWITZERLAND

ALTHEIM*, G.		MUNICH	19/601		-
BURGSTALL, A.		HELL-SALZBURG		OTTO & WITTER, 1952,	O&W 1313
COLOMBIER, S.		NEUCHÂTEL	COL 22 (P24)		BAR 74
CONCISE, S.		LAUSANNE	255d4 I		BAR 16
ESCHEN, S.		ZÜRICH	40275	(BELONGS TO PFYN GROUP)	-
PAURA, A*		WIMSBACH-NEYDHARDING		BENINGER, 1961, 74	-
KLINGELBERG, A.		HELL-SALZBURG		OTTO & WITTER, 1952,	O&W 1297
LANGENSTEINER WAND*, A.		STEYR		REITINGER, 1968, 227	-
MAXGLAN, A.		-		HELL, 1952b (BELONGS TO	-
MUHLBACHGRABEN, A.		LINZ		MUNCHSHOFENER GROUP?)	-
RAINBERG, A.		-		REITINGER, 1968, 104	-
REBENSTEINER MAUER*, A.		-		HELL, 1943, FIG. 2, 6	-
SONNBICHL*, A.		LINZ		REITINGER, 1968, 104	-
WEYREGG, A.		LINZ		REITINGER, 1968, 104	-
		COLL. SCHMIDT-		REITINGER, 1968, 468-9	-

APPENDIX XXa - LIST OF PIECES OF METAL OR BUN INGOT AND DROPLETS OF METAL -

AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM	ANALYSIS NO.
FREINBERG	(2) FIG 92 a	LINZ	A2295&2296		-
GLANEGG		SALZBURG	57896		-
HALLSTATT		LINZ	A2281		-
HEINRICHSTRUCH		LINZ	A2994		-
KIENBERGWAND/MONDSEE(2)		SALZBURG	9137		-
LAIIDEREKG/BISCHOFSHOFEN(2)		SALZBURG	1413&1414		-
MATTSEE		HELL-SALZBURG			-
MAXGLAN		HELL-SALZBURG		OTTO & WITTER, 1952	O&W 1273
MITTERBERG		HELL-SALZBURG	1720		-
MITTERSEE		HELL-SALZBURG	5312		-
MONDSEE		-	-		-
MONDSEE (DROPLET)	PL.31	-	-	FRANZ & WENINGER, 1927	-
MONDSEE (DROPLET)		-	-	FRANZ & WENINGER, 1927	-
MUHLDOBF		UNIV. VIENNA	-		-
PAURA	(8)	LINZ	A2283		-
PRÜCKLERMAUER*		-	-	BENINGER, 1961, P.73, 74, 85, 87	-
RABENSTEIN LUEG		LINZ	-	REITINGER, 1968, 227	-
SCHIEFFAU		HELL-SALZBURG-		OTTO & WITTER, 1952	O&W.1269
SEEWALCHEN	(3)	HELL-SALZBURG-		OTTO & WITTER, 1952	O&W 1250
ST. GEORGEN/PINZGAU		VIENNA	62393		-
'TRAUNMÜNDUNG & UNTERACH PL.30		SALZBURG	1403		-
		SALZBURG	A8084	REITINGER, 1968, 431	-
GERMANY					
ALTHEIM*		MUNICH	1919:599-604		SAM 10
SWITZERLAND					
AESCHI/SPIEZ		BERN	9850		-
BRÜGG/ZIHL		-	-	SAM II	SAM 2940
BRÜGG/ZIHL		-	-	SAM II	SAM 2939
FELDKIRCH/BLASENBERG		BREGENZ	PR.41.1-41.3		-
MÜNCHENBUCHSEE		BERN	9848		-
TSCHUGG	(2)	BERN	9851&9853		-

APPENDIX XXb - LIST OF CRUCIBLES

AUSTRIA

SITE	ILLUSTRATION	MUSEUM	INVENTORY NO.	REFERENCE IF NOT FOUND IN MUSEUM
BISAMBERG*, FRAGMENTS	-	-	-	RUTTKAY, IN PRESS
PRUCKLERMAUER*	LINZ	LINZ	-	REITTINGER, 1968, 227
MONDSEE, WITH HANDLES, ROUND	-	-	-	FRANZ & WENINGER, 1927
MONDSEE, FRAGMENTS (5)	-	-	-	FRANZ & WENINGER, 1927
MONDSEE, WITH HANDLE, RECTANGULAR	-	-	-	FRANZ & WENINGER, 1927
MONDSEE, WITH 2 HANDLES	-	-	-	FRANZ & WENINGER, 1927
MONDSEE (4)	-	-	-	FRANZ & WENINGER, 1927
MONDSEE, 1 THICKWALLED CLAY PIECE	-	-	-	FRANZ & WENINGER, 1927
MONDSEE, WITH HANDLE	UNIV. VIENNA	UNIV. VIENNA	-	REITTINGER, 1968, FIG.32
MONDSEE, WITH HANDLE	LINZ	LINZ	-	REITTINGER, 1968, 430
MONDSEE, WITH HANDLE	PL.30	VIENNA	-	
WEYREGG, WITH HANDLE	-	VIENNA	20566	
WEYREGG, WITH HANDLE	-	VIENNA	8688	
WEYREGG, FRAGMENT	UNI. VIENNA	UNI. VIENNA	20566	WILLVONSEDER, 1968, T.30, 8
SEEWALCHEN, FRAGMENT	COLL. SCHMIDT	COLL. SCHMIDT	-	WILLVONSEDER, 1968, T.30, 7
SEEWALCHEN, WITH HANDLE	COLL. SCHMIDT	COLL. SCHMIDT	-	WILLVONSEDER, 1968, T.30, 6
SEEWALCHEN, HANDLE	COLL. SCHMIDT	COLL. SCHMIDT	-	
SWITZERLAND				
HORGEN/DAMPFSCHIFFWEG* (2)	ZÜRICH	ZÜRICH	-	SANGMEISTER & STRAHM, 1974
NIEDERWIL, GACHNANG*	-	-	-	WATERBOLK & VAN ZEIST, 1966
MANNEDORF	-	-	-	ANTIQUA, 1885, 87
PFÄFFIKON, IRGENHAUSEN	-	-	-	FORRER, 1885, 103
STÄFA, UREIKON	-	-	-	WINIGER, 1971, T.80, 45-46
WETZIKON-ROBENHAUSEN * (10)	-	-	-	WYSS, 1969, 136 AND FIG.17, 3
ZÜRICH-ENGE, BREITINGERSTRASSE*	-	-	-	SANGMEISTER & STRAHM, 1974

APPENDIX XXI. DATAFILE WITH RESULTS OF ANALYSES CARRIED OUT BY OTTAWAY

NUMBER OF		SN	PB	AS	SB	AG	NI	BI	AU	ZN	CO	FE
SAMPLE												
BAR	2	0.00	-.100	1.200	0.200	0.170	-.100	-.1000	0.0080	0.000	0.0280	-.100
BAR	3	11.00	0.170	0.130	0.037	0.000	0.550	0.0091	0.0052	0.000	0.0150	0.200
BAR	4	7.10	0.390	0.610	0.260	0.000	0.085	0.0280	0.0120	0.000	0.1100	0.150
BAR	5	9.70	0.540	0.660	0.180	0.130	0.370	0.0120	0.0170	0.000	0.2100	0.096
BAR	6	13.00	0.850	0.490	0.190	0.000	0.470	0.0000	0.0110	0.000	0.1900	0.040
BAR	7	0.00	0.040	1.100	0.096	0.650	0.720	0.0044	0.0012	0.000	0.0000	0.028
BAR	8	0.00	0.009	0.750	0.066	0.180	0.660	0.0048	0.0009	0.000	0.0000	0.250
BAR	9	0.00	0.002	-.100	-.100	-.100	0.240	0.0076	-.1000	-.100	-.1000	0.580
BAR	10	0.00	-.100	0.036	0.004	0.023	-.100	-.1000	0.0090	0.020	0.0033	0.190
BAR	11	3.80	1.000	0.000	1.200	0.250	0.390	0.0460	0.3600	0.000	0.0730	0.029
BAR	12	7.80	0.620	0.130	0.710	0.130	0.370	0.0350	0.0039	0.000	0.5000	0.053
BAR	13	0.00	0.051	2.600	0.060	0.012	2.600	0.0003	0.0000	0.130	0.0330	0.048
BAR	14	21.00	0.230	0.100	0.260	0.120	0.000	0.0052	0.0100	0.120	0.0280	1.100
BAR	15	0.00	0.000	0.000	0.004	0.003	0.000	0.0030	0.0005	0.000	0.0008	0.110
BAR	16	3.10	0.810	0.390	0.620	0.094	0.280	0.0200	0.0110	0.031	0.0610	0.027
BAR	17	0.00	0.056	-.100	1.600	0.230	0.036	0.0300	-.1000	0.120	0.1500	0.046
BAR	18	11.00	1.600	2.000	0.510	0.150	0.290	0.0180	0.0110	0.000	0.1900	0.033
BAR	19	14.00	0.510	1.200	0.530	0.200	0.073	0.1600	0.0000	0.600	0.0096	0.170
BAR	20	0.00	0.028	0.000	0.007	0.026	0.036	0.0089	0.0000	0.000	0.0028	0.031
BAR	21	7.00	0.370	1.700	0.790	0.260	0.630	0.0052	0.0073	0.260	0.3200	0.045
BAR	22	33.00	0.530	0.320	0.230	0.081	0.085	0.0070	0.0051	0.120	0.0500	0.034
BAR	23	21.00	0.180	0.230	0.200	0.079	0.023	0.0061	0.0000	0.130	0.0100	0.097
BAR	24	7.50	0.370	0.100	0.310	0.110	0.210	0.0023	0.0085	0.000	0.0800	0.025
BAR	25	0.00	0.099	0.000	0.210	0.140	-.100	-.1000	0.0000	0.370	0.0060	-.100
BAR	26	0.00	0.094	0.000	0.000	0.000	0.077	0.0120	0.0000	0.000	0.0340	0.025
BAR	27	0.00	0.410	0.370	0.130	0.054	0.084	0.0008	0.0078	0.130	0.0010	0.280
BAR	28	0.00	0.005	3.700	0.006	0.018	0.095	0.0033	0.0000	0.130	0.0030	0.660
BAR	29	0.00	0.000	0.250	0.074	0.093	0.049	0.0000	0.0000	0.000	0.0030	0.078
BAR	30	0.00	0.008	0.000	1.500	2.200	-.100	0.0140	0.0049	0.000	0.0330	0.380
BAR	31	0.00	0.025	0.000	0.590	4.500	0.021	0.0120	0.0029	0.000	0.0050	0.044

APPENDIX XXI (CONTD).

SAMPLE	SN	PB	AS	SB	AG	NI	BI	AU	ZN	CO	FE
BAR 32	0.00	0.009	-1.100	1.900	2.900	0.690	0.0450	-1.1000	0.000	0.0360	0.000
BAR 33	35.00	0.370	0.180	0.099	0.190	0.028	0.0510	0.1000	0.000	0.0650	0.170
BAR 34	0.00	0.230	0.093	0.300	0.110	0.056	0.0091	0.0130	0.000	0.0007	0.026
BAR 35	38.00	0.009	0.170	0.021	0.370	0.000	0.0074	0.0070	0.000	0.0010	0.000
BAR 36	0.00	-1.100	0.780	0.000	0.000	-1.100	-1.1000	0.0009	0.000	0.0040	-1.100
BAR 37	0.00	0.033	2.600	0.026	0.056	0.023	0.0057	0.0000	0.000	0.0006	0.074
BAR 38	5.00	0.590	0.000	0.220	0.550	0.039	0.0086	0.0080	0.000	0.0010	0.026
BAR 39	0.00	-1.100	0.760	0.870	0.050	-1.100	-1.1000	0.0180	0.960	0.0160	-1.100
BAR 40	0.00	0.041	0.530	0.420	0.046	0.058	0.0050	0.0081	0.500	0.0000	0.000
BAR 41	0.00	0.098	0.039	0.180	0.000	0.005	0.0120	0.0047	0.290	0.0000	0.370
BAR 42	0.00	-1.100	3.000	0.140	0.000	-1.100	-1.1000	0.0130	0.000	0.0000	-1.100
BAR 43	0.00	0.014	0.130	0.200	0.000	0.008	0.0077	0.0061	0.250	0.0000	0.110
BAR 44	0.00	0.034	0.500	0.350	0.000	0.000	0.0065	0.0160	0.660	0.0000	0.004
BAR 45	0.00	-1.100	0.350	1.300	0.110	0.017	-1.1000	0.1100	0.980	0.0120	-1.100
BAR 46	0.20	0.120	0.320	0.780	0.000	0.330	0.0098	0.0280	0.660	0.0000	0.053
BAR 47	0.10	-1.100	0.400	0.480	0.000	-1.100	-1.1000	0.0100	0.710	0.0490	-1.100
BAR 48	0.00	0.270	0.900	0.370	0.000	0.100	0.0039	0.0490	0.180	0.0000	0.000
BAR 49	15.00	0.000	0.130	0.091	0.046	0.120	0.0710	0.0046	0.280	0.0025	0.000
BAR 50	4.80	0.170	0.000	0.210	0.000	0.028	0.0028	0.0044	0.650	0.0100	0.600
BAR 51	2.00	0.008	0.140	0.130	0.000	0.510	0.0077	0.0000	-1.100	0.0000	0.000
BAR 52	3.80	0.092	0.051	0.024	0.000	0.000	0.0000	0.0043	0.910	0.0000	0.084
BAR 53	1.90	0.011	0.210	0.060	0.008	0.047	0.0000	0.0073	0.270	0.0340	0.024
BAR 54	-0.10	0.020	-1.100	-1.100	-1.100	0.079	0.0060	-1.1000	-1.100	-1.1000	0.330
BAR 55	3.20	1.600	0.059	0.170	0.130	0.018	0.0130	0.0840	1.800	0.0070	0.110
BAR 60	3.30	0.068	0.390	0.000	0.000	0.070	0.0010	0.0000	0.860	0.0000	0.001
BAR 61	2.40	0.000	0.000	0.000	0.000	0.019	0.0025	0.0000	0.590	0.0000	0.000
BAR 62	1.90	0.043	0.000	1.600	0.980	0.000	0.0000	0.0000	1.500	0.0130	0.000
BAR 63	0.00	0.004	1.700	0.071	0.000	1.200	0.0059	0.0000	0.000	0.0130	0.050
BAR 64	0.00	0.000	0.020	0.000	0.006	0.039	0.0068	0.0014	0.000	0.0007	0.025
BAR 65	0.00	0.092	0.020	0.000	0.008	0.043	0.0000	0.0004	0.000	0.0009	0.029

APPENDIX XXI (CONTD.).

NUMBER OF		SN	PB	AS	SB	AG	NI	BI	AU	ZN	CO	FE
SAMPLE												
BAR	66	0.00	0.006	0.000	0.250	0.830	0.042	0.0050	0.0008	0.000	0.0012	0.020
BAR	67	0.00	0.004	0.000	0.000	0.004	0.320	0.0045	0.0005	0.000	0.0012	0.028
BAR	68	0.00	0.001	0.910	0.000	0.006	0.039	0.0170	0.0003	0.000	0.0009	0.026
BAR	69	0.00	0.170	2.700	0.051	0.014	0.041	0.0031	0.0032	0.000	0.0020	0.063
BAR	70	0.00	0.000	0.990	0.190	0.130	0.700	0.0097	0.0004	0.000	0.0045	0.000
BAR	71	3.00	0.280	0.086	0.410	0.044	0.013	0.0230	0.0017	0.000	0.0044	0.220
BAR	72	12.00	0.009	0.470	0.310	0.160	0.670	0.0089	0.0007	0.000	0.0000	0.500
BAR	73	11.00	0.280	0.240	0.100	0.019	0.270	0.0180	0.0053	0.000	0.0190	0.530
BAR	74	7.10	0.840	0.540	0.560	0.082	0.840	0.0068	0.0120	0.000	0.1700	0.055
BAR	75	13.00	0.027	0.460	0.200	0.190	0.046	0.0100	0.0024	0.000	0.0000	0.000
BAR	76	12.00	0.063	0.440	0.220	0.190	0.093	0.0180	0.0022	0.000	0.0000	0.009
BAR	77	0.00	0.011	0.046	0.260	0.850	0.093	0.0037	0.0004	0.000	0.0000	0.046
BAR	78	9.00	0.058	0.510	0.030	0.010	0.240	0.0120	0.0026	0.250	0.0140	0.110
BAR	79	6.70	0.028	0.190	0.200	0.025	0.000	0.0021	0.0008	0.000	0.0000	0.000
BAR	80	0.00	0.230	2.300	5.600	0.057	3.700	0.0250	0.0250	0.000	0.4700	1.500
BAR	81	0.00	0.410	-1.100	-1.100	-1.100	4.000	0.0180	-1.000	0.000	-1.000	0.024
BAR	82	8.90	0.053	0.034	0.053	0.063	0.040	0.0042	0.0120	0.000	0.0017	0.260
BAR	83	5.40	0.018	0.047	0.150	0.052	0.290	0.0081	0.0020	0.000	0.0018	0.035
BAR	84	5.20	0.200	0.000	0.560	0.390	0.066	0.0064	0.0021	0.000	0.0045	0.240
BAR	85	0.00	0.000	0.000	0.008	0.010	0.180	0.0110	0.0013	0.000	0.0038	0.048
BAR	86	0.00	0.075	0.000	2.100	0.540	1.100	0.0037	0.0100	0.000	0.1400	0.140
BAR	87	6.50	0.380	1.600	0.390	0.026	0.110	0.0190	0.0000	0.000	0.0032	0.049
BAR	88	0.00	0.000	0.000	0.000	0.011	0.260	0.0074	0.0089	0.000	0.0024	0.110
BAR	89	0.00	0.027	0.830	0.210	0.320	1.000	0.0140	0.0035	0.000	0.0024	0.590
BAR	90	0.00	0.019	0.590	0.000	0.066	0.037	0.0510	0.0000	0.000	0.0005	0.710
BAR	91	0.00	0.026	3.000	0.045	0.003	1.400	0.0032	0.0000	0.000	0.0220	0.160
BAR	92	2.70	0.000	0.560	0.078	0.005	0.097	0.0130	0.0000	0.000	0.0069	0.150
BAR	93	0.00	0.056	0.930	2.100	-1.100	0.900	0.0019	0.0072	0.000	-1.000	0.087
BAR	95	0.00	0.000	0.000	0.000	0.000	0.019	0.0025	0.0020	0.031	0.0004	0.580
BAR	96	0.00	0.023	0.000	0.002	0.003	0.027	0.0019	0.0004	0.032	0.0006	0.000

APPENDIX XXI (CONTD.).

NUMBER OF SAMPLE	SN	PB	AS	SB	AG	NI	BI	AU	ZN	CO	FE
BAR 97	0.00	0.013	1.100	0.005	0.004	0.062	0.0130	0.0000	0.032	0.0004	0.055
BAR 98	0.00	0.000	0.740	0.007	0.011	0.066	0.0082	0.0063	0.045	0.0040	0.044
BAR 99	0.00	0.280	2.500	0.026	0.004	0.034	0.0051	0.0000	0.044	0.0007	0.051
BAR 100	0.00	0.000	0.043	0.004	0.005	0.032	0.0150	0.0000	0.032	0.0290	0.082
BAR 101	0.00	0.062	0.750	0.016	0.008	0.000	0.0160	0.0000	0.039	0.0007	0.130
BAR 102	0.00	0.013	0.000	0.003	0.001	0.042	0.0100	0.0020	0.036	0.0010	0.049
BAR 103	0.00	0.140	~.100	0.032	0.075	0.098	0.0076	~.1000	0.031	0.0004	0.110
BAR 104	0.00	0.009	0.013	0.003	0.006	0.063	0.0140	0.0046	0.027	0.0006	0.300
BAR 106	0.00	0.000	1.400	0.012	0.009	0.019	0.0051	0.0054	0.000	0.0002	0.038
BAR 107	0.00	0.000	0.000	0.066	0.240	0.042	0.0380	0.0037	0.000	0.0005	0.032
BAR 108	15.00	0.710	0.026	0.015	0.022	0.240	0.0120	0.0034	0.000	0.0010	0.027
BAR 109	14.00	1.000	0.026	0.019	0.023	0.015	0.0230	0.0036	0.000	0.0010	0.000
BAR 110	3.10	0.170	0.110	0.078	0.180	0.000	0.0096	0.0056	0.000	0.0040	0.100
BAR 111	3.20	0.200	0.110	0.079	0.180	0.000	0.0092	0.0054	0.000	0.0040	0.086
BAR 112	4.90	7.300	0.000	0.260	0.000	0.530	0.0028	0.0000	5.500	0.0030	0.064
BAR 113	4.30	7.600	0.000	0.260	0.003	0.700	0.0064	0.0000	5.000	0.0030	0.092
BAR 114	0.00	0.000	0.000	0.001	0.000	0.026	0.0000	0.0003	0.000	0.0050	0.760

ALL RESULTS ARE IN PERCENT BY WEIGHT.
 METHOD OF ANALYSIS FOR PB, NI, BI & FE WAS ATOMIC ABSORPTION SPECTROSCOPY.
 FOR ALL OTHER ELEMENTS THE METHOD WAS NEUTRON ACTIVATION ANALYSIS.
 MISSING VALUES ARE DENOTED BY ~.100. FOR KEY TO ANALYSIS/ARTIFACT CF APPENDIX XXI.

Anal. No.	Site	Museum	Inventory no.	Type of artifact
BARB02	Chevroux	Lausanne	10291	Chisel
03	"	"	20044II	"
04	"	"	16135II	"
05	"	"	19783II	"
06	"	"	15981II	"
07	"	"	20726II	dagger with midrib
08	"	"	16636II	" " "
09	"	"	20726II	rivet of dagger Anal No. 07
10	Concise	"	-	spectacle spiral
11	Chevroux	"	15976II	chisel
12	"	"	17190II	tube of sheet copper
13	Concise	"	26792I	flat dagger
14	Chevroux	"	-	spiral cylinder
15	Corcelle	"	27457I	tube of sheet copper
16	Concise	"	25584I	fragment
17	"	"	25562I (Concise B 1896)	chisel
18	"	"	26546I	"
19	"	"	27780I	"
20	"	"	27781I (1899)	"
21	"	"	25570I (1896)	"
22	"	"	24050I (Concise B)	"
23	"	"	28564I	"
24	Corcellettes	"	-	"
25	Morges	"	2303 (25214)	flat dagger
26	"	"	25213	" " "
27	Onnens	"	-	"
28	Geneva, Gas Station	Geneva	8636	flat axe
29	"	"	8637	" " "
30	"	"	8638	flanged axe
31	Corsier	"	7465	flat axe
32	'Valais'	"	E5653	dagger with midrib
33	"	"	B3442	flat dagger
34	Versoix	"	9147	" " "
35	"	"	B5801	" " "
36	Estavayer	"	B5247	" " "
37	St. Blaise	"	E4207	" " "
38	'Lac de Bienne'	"	13256	flanged axe

Anal. No.	Site	Museum	Inventory No.	Type of artifact
39	'Pierre a Niton'	Geneva	B1395	flanged axe
40	Fully	"	B5730	"
41	St. Prex	"	8506	"
42	Plattensee	"	B5330	flat axe
43	'Hungary'	"	B1001	"
44	'Hungary'	"	B1003	"
45	Gerolfingen, Oefeli	"	B727	flat dagger
46	Champreyvres	"	B2684	"
47	Aiguilles des Baulmes	"	B5159	dagger with midrib
48	Eaux Vives	"	B1189	"
49	Champs de Vex Valais	"	B795	"
50	Sion	"	Pe1	awl
51	"	Prehist.Inst.Geneva	-	Löffelbeil
52	"	"	-	"
53	près Lyon	Geneva	B3415	dagger with midrib
54	Pompaples	"	B5536	"
55	La Balmes	"	E321	Belt buckle (medieval)
60	St. Blaise	Neuchâtel	SB39	dagger with midrib
61	"	"	SB40	flat axe
62	"	"	SB38	pendant
63	"	"	-	flat dagger
64	Concise	"	Conc61(49)	"
65	"	"	Conc62(853)	chisel
66	Bevaix	"	Bx177(Bx3003)	flat axe
67	"	"	Bx155	flat dagger
68	"	"	Bx156	flat dagger/knife
69	"	"	Bx154(3C23)	dagger with midrib
70	Estavayer	"	Est 17	flat dagger
71	Hauterive	"	Hr427(H156)	"
72	Mûrigen	"	Mûr21 (M103)	dagger with midrib
73	Colombier	"	Col 27 (2190)	"
74	"	"	Col122 (P24)	awl
75	"	"	Col117 (P190)	dagger with midrib
76	"	"	Col 20 (Coll1873)	"
77	"	"	Col 18 (525)	flat dagger/knife
78	Portalban	"	Pt2 (P29)	dagger with midrib

Anal No.	Site	Museum	Inventory No.	Type of Artifact
79	FU	Neuchâtel	-	flanged axe
80	Salez	"	SG2	"
81	"	"	SG1	"
82	Ins	"	-	"
83	Fribourg	"	Fribourg 1	"
84	Sugiez, Fully le bas	"	Sug 4	"
85	Portalban	"	Pt3	"
86	Auvernier	"	Auv 915	flat dagger (reddish zone cf. Anal No. 93 for golden zone.)
87	Auvernier	Neuchâtel	Auv 916	dagger with midrib
88	Yvonand*	"?	-	flat dagger, exc. 1973
89	Auvernier*	"	Auv 2250	awl
90	Yvonand*	Yverdon	-	pin awl, awl exc. 1974
91	Michelsdorf	Linz	616	sickle
92	"	"	626	"
93	Auvernier	Neuchâtel	Auv 915	flat dagger from golden zone
95	Linz St. Peter	Linz	A4796	large massive axe
96	"	"	A4795	shafthole axe
97	Kronstorf	"	A4419	flat axe
98	Michelsdorf	"	618	sickle
99	"	"	625	"
100	Mühldorf	"	A2283	bun ingot
102	'Upper Austria'	"	A3137	adze axe
103	Wien-Essling, Asparn	Asparn	14853	tanged dagger
104	Mödling	Mödling	U5	hammer axe (with shafthole)
106	Villa Nova di San Pedro	Arch. Dept. Edinb. Univ.	-	awl
107	"	"	-	"
108	Standard H1	Washington	-	"
109	Standard H1	"	-	"
110	Standard H2	"	-	"
111	Standard H2	"	-	"
112	Standard H3	"	-	"
113	Standard H3	"	-	"
114	Rudna Glava (ore)	-	-	"

Identification of objects in Appendix XXI. Figures in parenthesis are old inventory numbers.

APPENDIX XXIII CONVERSION OF NON-NUMERICAL SYMBOLS USED BY OTTO & WITTER AND SAM TO NUMERICAL VALUES

	0.01% (except Bi & Au)	TRACE		+	++	+++	≥0.05%	≥1.0%	≥10%
		SAM	O&W						
Sn	-	0.01	0.01						15
Pb	0.005	0.002	0.005						15
As	0.004	0.002	0.005						
Sb	0.004	0.002	0.005						
Ag	0.005	0.002	0.005						
Ni	0.005	0.002	0.005						
Bi	0.0005	0.0002	0.001						
Au	-	0.0002	0.0002	0.0003					
Zn	0.005	0.002	0.005						
Co	-	0.005	0.005	0.008	0.03	0.05			
Fe	-	0.001	0.001	0.02	0.03		1.5	3.0	

Appendix XXIV

FILE IDENTIFIER : BPOUZE21.

Anal.No	Sn	Pb	As	Sb	Ag	Ni	Bi	Au	Zn	Co	Fe	Artifact	Site	Museum	Inv.No
SAP 7	12.00	0.700	0.360	0.200	0.070	0.810	0.0010	0.0000	0.010	0.0100	0.150	* 'Awl'	Altheim	Munich	1919.604
SAP 2820	4.20	0.300	0.310	0.570	0.190	1.250	0.0000	0.0000	0.000	0.0000	0.000	Dagger	Sutz-Lattrigen	Bern	32423
SAP 2831	15.00	0.500	0.050	0.130	0.029	0.002	0.0050	0.0000	0.000	0.0000	0.000	"	Thun, Renzenbühl	"	10342
SAP 2848	15.00	0.000	0.610	0.150	0.065	0.600	0.0020	0.0000	0.000	0.0000	0.050	"	Hünenberg, Schwarzbach Zug	Bern	7321
SAP 2867	4.50	0.060	0.010	0.270	0.120	0.025	0.0005	0.0000	0.000	0.0000	0.000	Flat axe	Grossaffoltern	"	28187
SAP 2932	15.00	0.300	0.290	0.030	0.015	0.240	0.0002	0.0000	0.000	0.0000	0.029	Square awl	Sutz-Lattrigen	"	4891
SAP 2947	4.90	0.000	1.450	3.000	0.710	2.600	0.0002	0.0000	0.000	0.0000	0.000	Dagger	Port, St. Spers	"	27618
SAP 2940	15.00	0.060	0.005	0.000	0.005	0.290	0.0002	0.0000	0.000	0.0000	3.000	'Gussbrocken'	Brügg, Zihl	"	40079
SAP 2943	15.00	0.340	0.170	0.100	0.036	0.043	0.0130	0.0000	0.000	0.0000	0.000	Dagger	Brügg	"	29596
SAP 2974	15.00	0.000	0.020	0.020	0.005	0.810	0.0000	0.0000	0.000	0.0000	0.000	"	Brügg	"	18852
SAP 2975	7.20	0.060	0.060	0.120	0.080	0.000	0.0020	0.0000	0.000	0.0000	0.000	"	Mörigen	"	18853
SAP 3031	0.10	0.060	0.950	0.580	0.140	0.310	0.0000	0.0000	0.000	0.0000	0.000	"	"	"	7830
SAP 3038	3.90	0.000	0.030	0.140	0.029	0.042	0.0020	0.0000	0.000	0.0000	0.000	"	"	"	7652
SAP 3039	2.90	0.000	0.130	0.200	0.044	0.028	0.0020	0.0000	0.000	0.0000	0.000	"	"	"	7653
SAP 3040	5.20	0.270	0.440	0.610	0.034	0.029	0.0180	0.0000	0.000	0.0000	0.001	Square awl	"	"	7685
SAP 3063	15.00	0.000	0.740	0.170	0.016	0.260	0.0005	0.0000	0.000	0.0000	0.430	Dagger	"	"	7837
SAP 3056	0.10	0.530	1.050	1.200	0.700	0.920	0.0230	0.0000	0.000	0.0080	0.001	Square awl	Auvernier	"	8438
SAP 3055	2.40	1.050	0.780	1.550	0.740	0.600	0.0170	0.0000	0.000	0.0080	0.013	Square chisel	"	"	8441
SAP 3058	2.50	0.570	0.940	1.390	0.320	0.860	0.0480	0.0000	0.000	0.0000	0.000	"	Estavayer	"	8647
SAP 3078	10.00	0.640	0.390	0.720	0.100	0.200	0.0120	0.0000	0.000	0.0160	0.730	"	"	"	8544
SAP 3097	10.00	0.200	0.050	0.080	0.066	0.053	0.0170	0.0000	0.000	0.0000	0.002	Spiral cylinder	Täuffelen, Gerolfingen	"	-
SAP 3098	10.00	1.500	0.020	0.060	0.017	0.087	0.0005	0.0000	0.000	0.0000	0.011	"	"	"	-
SAP 3099	10.00	0.170	0.040	0.060	0.005	0.000	0.0060	0.0000	0.000	0.0000	0.015	"	"	"	-
SAP 3112	2.75	0.130	0.002	0.000	0.029	0.100	0.0002	0.0000	0.000	0.0000	0.001	Dagger	Gregg	Biel	01795
SAP 3113	2.10	0.100	0.650	0.050	0.300	0.260	0.0002	0.0000	0.000	0.0000	0.000	"	Bevaix	"	Bx1806
SAP 3145	10.00	0.000	1.100	2.150	1.700	0.350	0.0210	0.0000	0.000	0.0050	0.007	Chisel	Grandson, Corcelettes	"	Cs1914
SAP 3151	10.00	0.000	0.320	0.100	0.044	0.150	0.0005	0.0000	0.000	0.0000	0.067	Square awl	"	"	Cs1913
SAP 3152	4.30	3.300	1.170	2.750	0.880	0.870	0.3100	0.0002	0.000	0.0020	0.001	Square chisel	Cortailod	"	Cd974
SAP 3153	10.00	0.130	0.180	0.540	0.076	0.065	0.0080	0.0000	0.000	0.0000	0.057	"	Grandson, Corcelettes	"	Cs1917
SAP 3154	10.00	0.000	0.620	1.750	0.230	0.530	0.0100	0.0000	0.000	0.0080	0.000	"	Cortailod	"	Cs973
SAP 3155	10.00	2.150	0.830	0.450	0.110	0.340	0.0060	0.0000	0.000	0.0080	0.007	"	Boncise	"	Ce1694
SAP 3156	10.00	0.440	0.820	0.660	0.076	0.110	0.0000	0.0000	0.000	0.0000	0.110	Awl	Cortailod	"	Cd970
SAP 3157	10.00	0.170	0.820	0.200	0.046	0.190	0.0120	0.0000	0.000	0.0000	0.074	Square chisel	Seewalchen	"	Cd967
SAP 3014	10.00	0.000	0.990	0.040	0.002	0.250	0.0002	0.0000	0.000	0.0000	0.230	Dagger	"	Wien	35611
SAP 3016	15.00	0.160	0.510	0.100	0.002	0.210	0.0140	0.0000	0.000	0.0000	1.500	"	"	"	62383
SAP 4635	6.30	0.005	0.260	0.270	0.005	0.240	0.0000	0.0000	0.000	0.0000	0.030	Spiral arm ring	Lichtenwörth	Asparn	4313
SAP 4398	7.30	0.300	0.900	0.060	0.005	0.290	0.0002	0.0000	0.000	0.0000	0.020	Awl	Seewalchen	Wien	62386
SAP 4499	10.00	0.000	0.380	0.040	0.002	0.340	0.0002	0.0000	0.000	0.0000	0.020	"	"	"	37465
SAP 4900	2.00	0.060	0.360	1.020	0.002	0.310	0.0000	0.0000	0.000	0.0000	0.030	"	"	"	37466
SAP 4901	3.70	0.000	0.080	0.003	0.150	0.000	0.0005	0.0000	0.000	0.0000	0.020	"	"	"	243-245
SAP 6027	15.00	0.602	0.970	0.080	0.030	0.290	0.0000	0.0000	0.000	0.0000	0.001	Spiral cylinder	Stollhof	Baden	247-250
SAP 6028	6.20	0.050	0.620	0.210	0.150	0.490	0.0110	0.0000	0.000	0.0000	0.020	"	"	"	251
SAP 6029	9.40	1.360	0.140	0.240	0.270	0.020	0.0150	0.0000	0.000	0.0000	0.020	"	"	"	251
SAP 6990	10.00	0.000	0.200	0.190	0.020	0.320	0.0000	0.0000	0.000	0.0000	0.020	"	"	"	251
SAP 7451	2.40	0.500	0.350	0.190	0.090	0.230	0.0000	0.0000	0.000	0.0000	0.000	Flat axe	Genf, Grêts St-Laurent	Genf	8656

Appendix XXIV contd. (1)

SAR	7165	4.16	0.002	0.320	0.260	0.270	2.000	0.0000	0.0000	0.0066	0.0000	0.0000	6.000	Dagger	Täuffelen, Gerolfingen	Genf	B727
SAR	7164	2.50	0.031	1.900	2.500	0.730	1.450	0.0600	0.0000	0.0000	0.0000	0.1000	0.000	"	Schmitzen, Lanthen	Fribourg	1248
S	177	12.00	0.005	0.005	0.050	0.100	0.030	0.6010	0.0000	0.0000	0.0000	0.0050	0.000	Ring	Unterwöbling	Wien	51781
S	401	3.20	0.005	0.170	0.005	0.005	0.070	0.6000	0.0003	0.0000	0.0050	0.000	0.000	Sickle	Micheldorf	Linz	A625
S	1449	5.00	0.005	0.500	0.200	0.010	0.300	0.0010	0.0000	0.0000	0.0050	2.000	0.000	"	"	"	626
S	1769	6.00	0.005	0.010	0.005	0.005	0.400	0.0010	0.0000	0.0000	0.0050	0.001	0.001	Pickaxe	Mitterberg (mine)	Salzburg	303
S	1773	16.50	0.050	0.050	0.100	0.030	0.500	0.0010	0.0000	0.0000	0.0050	0.100	0.100	Piece of metal	Maxglan	Hell-Salzburg	20044II
S	1774	11.00	0.170	0.130	0.037	0.000	0.550	0.0091	0.0052	0.0000	0.0150	0.200	0.200	Chisel	Chevroux	Lausanne	16135II
S	4	7.10	0.399	0.010	0.260	0.000	0.085	0.0280	0.0120	0.0000	0.1100	0.150	0.150	"	"	"	19783II
S	5	9.70	0.540	0.660	0.130	0.430	0.370	0.0120	0.0170	0.0000	0.2100	0.096	0.096	"	"	"	15981II
S	6	13.00	0.850	0.490	0.190	0.000	0.470	0.0000	0.0110	0.0000	0.1900	0.040	0.040	"	"	"	15976II
S	11	3.80	1.000	0.000	1.200	0.250	0.370	0.0660	0.3600	0.0000	0.0730	0.029	0.029	"	"	"	17190II
S	12	7.30	0.670	0.130	0.710	0.150	0.370	0.0350	0.0039	0.0000	0.5000	0.053	0.053	Tube of sheet copper	"	"	-
S	14	21.00	0.230	0.100	0.260	0.120	0.000	0.0052	0.0100	0.120	0.0280	1.100	1.100	Spiral cylinder	"	"	25584I
S	16	3.10	0.010	0.390	0.620	0.094	0.230	0.0200	0.0110	0.031	0.0610	0.027	0.027	Fragment	Concise	"	26546I
S	18	11.00	1.000	2.000	0.510	0.150	0.290	0.0180	0.0110	0.0000	0.1900	0.033	0.033	Chisel	"	"	27780I
S	21	7.00	0.370	1.700	0.790	0.260	0.650	0.0052	0.0073	0.260	0.3200	0.045	0.045	"	"	"	25570I
S	27	33.00	0.530	0.320	0.230	0.081	0.085	0.0070	0.0051	0.120	0.0500	0.034	0.034	"	"	"	24050I
S	23	21.00	0.180	0.230	0.200	0.079	0.023	0.0061	0.0000	0.130	0.0100	0.097	0.097	"	"	"	28564I
S	24	7.50	0.370	0.100	0.310	0.110	0.210	0.0023	0.0085	0.0000	0.0800	0.025	0.025	"	Corcelettes	"	-
S	35	35.00	0.570	0.130	0.099	0.190	0.028	0.0510	0.1000	0.0000	0.0650	0.170	0.170	Flat dagger	Valais	Geneva	B3442
S	35	35.00	0.570	0.130	0.099	0.190	0.028	0.0510	0.1000	0.0000	0.0650	0.170	0.170	"	Valais	"	B5801
S	35	35.00	0.570	0.130	0.099	0.190	0.028	0.0510	0.1000	0.0000	0.0650	0.170	0.170	"	Versois	"	B795
S	49	15.00	0.000	0.130	0.091	0.066	0.120	0.0710	0.0046	0.280	0.0025	0.000	0.000	Dagger	Champs Vex	Valais	
S	50	4.30	0.170	0.000	0.210	0.000	0.028	0.0028	0.0044	0.650	0.0150	0.600	0.600	Awl	Sion	"	
S	60	3.30	0.000	0.390	0.000	0.000	0.070	0.0010	0.0600	0.860	0.0000	0.001	0.001	Dagger	St.Blaise	P.Inst.Genf	PeI
S	61	2.40	0.000	0.000	0.000	0.000	0.019	0.0025	0.0000	0.590	0.0000	0.000	0.000	"	"	Neuchâtel	SB39
S	71	3.00	0.230	0.000	0.410	0.044	0.013	0.0230	0.0017	0.0000	0.0044	0.220	0.220	Flat axe	Hauterive	"	SB40
S	72	12.00	0.500	0.670	0.310	0.160	0.670	0.0089	0.0007	0.0000	0.0000	0.500	0.500	Flat dagger	Mörigen	"	Hr427
S	73	11.00	0.260	0.240	0.100	0.019	0.270	0.0180	0.0053	0.0000	0.0190	0.530	0.530	Dagger	Colombier	"	Mor21
S	74	7.10	0.340	0.560	0.560	0.082	0.340	0.0068	0.0120	0.0000	0.1700	0.055	0.055	"	"	"	Col127
S	75	13.00	0.027	0.460	0.200	0.190	0.046	0.0100	0.0024	0.0000	0.0000	0.000	0.000	Awl	"	"	Col117
S	76	12.00	0.003	0.460	0.220	0.190	0.093	0.0180	0.0022	0.0000	0.0000	0.009	0.009	"	"	"	Col20
S	77	9.00	0.050	0.310	0.030	0.010	0.240	0.0120	0.0026	0.250	0.0140	0.110	0.110	"	Portalban	"	Pt2
S	87	0.50	0.350	1.000	0.390	0.026	0.110	0.0190	0.0000	0.0000	0.0032	0.049	0.049	"	Auvernier	"	Auv916
S	92	2.70	0.000	0.560	0.070	0.005	0.097	0.0130	0.0000	0.0000	0.0069	0.150	0.150	Sickle	Michelsdorf	Linz	626

Appendix XXV (Data file of copper artifacts)

FILE IDENTIFIER : CU362

* = securely associated

Anal.No	Sn	Pb	As	Sb	Ag	Ni	Bi	Au	Zn	Co	Fe	Artifact	Site	Mus. Inv.No
SAI 8	0.00	0.002	0.170	0.002	0.020	0.010	0.0010	0.0000	0.000	0.0000	0.000	flat axe	Altheim	München 1919.599
SAP 9	0.00	0.060	1.150	0.020	0.050	0.050	0.0023	0.0000	0.000	0.0000	0.000	sheetmetal piece	"	" 600
SAP 10	0.00	0.020	1.950	0.050	0.100	0.070	0.0090	0.0000	0.000	0.0000	0.000	'Gusstück'	"	" ?
SAP 796a	0.20	1.300	0.000	0.100	0.030	0.020	0.0010	0.0000	0.000	0.0000	0.000	flat axe	Därnten	Zürich 2336a-12
SAH 2474	0.00	0.000	0.000	0.007	0.016	0.000	0.0000	0.0000	0.000	0.0000	0.000	flat axe	Pöls, Judenberg	Graz 11550
SAH 2475	0.00	0.019	0.500	0.066	0.011	0.005	0.0005	0.0002	0.000	0.0000	0.000	ring	Lödersdorf	" 10553
SAM 2477	0.00	0.017	0.450	0.060	0.016	0.005	0.0010	0.0002	0.000	0.0000	0.001	spiral cylinder	"	" 10557
SAH 2478	0.00	0.000	0.940	0.050	0.016	0.005	0.0020	0.0002	0.000	0.0000	0.001	tube	Graz, Gösting	" 15209
SAH 2481	0.00	0.005	1.200	0.030	0.014	0.002	0.0020	0.0002	0.000	0.0000	0.001	flat axe	Feldkirch, Blasenbg.	Bregenz 41.3
SAH 2776	0.00	0.000	0.020	0.010	0.072	0.120	0.0005	0.0000	0.000	0.0000	0.001	'Gusskuchen'	"	" 41.2
SAH 2777	0.00	0.000	0.004	0.030	0.035	0.100	0.0005	0.0000	0.000	0.0000	0.300	"	"	" 41.1
SAH 2778	0.00	0.000	0.160	0.100	0.062	0.270	0.0020	0.0000	0.000	0.0000	1.300	flat axe	Vallamand	Bern 9964
SAH 2785	0.00	0.000	0.000	0.150	1.750	0.002	0.0005	0.0000	0.000	0.0000	0.000	"	Vinelz	21118
SAH 2787	0.00	0.000	0.000	0.250	0.700	0.002	0.0005	0.0000	0.000	0.0000	0.000	dagger	Sutz-Lattringen	" 3184
SAM 2832	0.00	0.000	0.370	0.002	0.026	0.000	0.0240	0.0000	0.000	0.0000	0.000	awl	"	" 5169
SAP 2833	0.00	0.000	0.000	0.000	0.002	0.099	0.0000	0.0000	0.000	0.0000	0.000	dagger	"	" 5175
SAP 2834	0.00	0.000	0.300	0.100	0.037	0.670	0.0005	0.0000	0.000	0.0000	0.000	awl (square)	"	" 5178?
SAH 2835	0.00	0.000	0.000	0.000	0.005	0.540	0.0000	0.0000	0.000	0.0000	0.000	awl (square)	"	" 5180
SAH 2836	0.00	0.000	0.000	0.000	0.005	0.160	0.0000	0.0000	0.000	0.0000	0.000	dagger	"	" 5181
SAH 2837	0.00	0.000	0.000	0.000	0.005	0.520	0.0000	0.0000	0.000	0.0000	0.000	"	"	" 5183
SAH 2838	0.00	0.000	3.100	0.090	0.000	2.700	0.0010	0.0000	0.000	0.0000	0.000	awl (square) / chisel	"	" 5187
SAH 2839	0.00	0.000	0.002	0.100	0.005	0.430	0.0000	0.0000	0.000	0.0000	0.000	"	"	" 5194
SAH 2841	0.00	0.000	0.000	0.000	0.002	0.160	0.0000	0.0000	0.000	0.0000	0.000	dagger	"	" 5195
SAH 2842	0.00	0.000	3.400	0.000	0.019	0.047	0.0830	0.0000	0.000	0.0000	0.000	awl (square)	"	" 5198
SAH 2843	0.00	0.000	0.280	0.390	0.220	2.000	0.0020	0.0000	0.000	0.0000	0.000	flat axe	Cham, St. Andreas	Zug 56/228
SAH 2844	0.00	0.000	0.000	2.700	0.086	0.000	0.0080	0.0000	0.000	0.0000	0.000	"	Hünenberg, Schwarzbach	" 9800
SAH 2845	0.00	0.000	0.002	0.002	0.016	0.090	0.0005	0.0000	0.000	0.0000	0.000	"	Zug, Otterswil	Zug
SAH 2846	0.00	0.000	0.740	0.002	0.025	0.000	0.0030	0.0000	0.000	0.0000	0.000	" (fragm)	Zug, Trachselwald	Bern 18891
SAH 2360	0.00	0.000	0.090	0.020	0.000	0.000	0.0005	0.0000	0.000	0.0000	0.000	flat axe (roughout)	Ötting	Bern 18926
SAH 2362	0.69	0.000	0.000	0.007	0.016	0.005	0.0000	0.0000	0.000	0.0000	0.000	"	Vinelz	" 5236u
SAP 2376	0.00	0.000	0.000	0.000	0.002	0.002	0.0000	0.0000	0.000	0.0000	0.000	bead (biconical)	"	"
SAH 2877	0.00	0.000	0.000	0.000	0.000	0.098	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2878	0.00	0.000	0.000	0.000	0.002	0.100	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAP 2379	0.00	0.000	0.000	0.000	0.000	0.092	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2880	0.00	0.000	0.000	0.000	0.000	0.100	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAP 2381	0.00	0.000	0.000	0.000	0.000	0.100	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2882	0.00	0.000	0.000	0.020	0.058	0.000	0.0090	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2883	0.00	0.000	0.000	0.000	0.002	0.069	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2884	0.00	0.000	0.000	0.000	0.000	0.090	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2885	0.00	0.000	0.000	0.000	0.000	0.000	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2886	0.00	0.000	0.000	0.000	0.000	0.110	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2887	0.00	0.000	0.000	0.000	0.000	0.002	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2888	0.00	0.000	0.000	0.000	0.000	0.035	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2889	0.00	0.000	0.000	0.000	0.000	0.032	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2890	0.00	0.000	0.000	0.000	0.000	0.073	0.0000	0.0000	0.000	0.0000	0.000	"	"	"
SAH 2890	0.00	0.000	0.000	0.000	0.000	0.033	0.0000	0.0000	0.000	0.0000	0.000	"	"	"

Appendix XXV contd.(5)

SAV 22233	0.00	0.050	0.000	0.500	1.800	0.200	0.0040	0.0000	0.000	0.0060	0.000
SAV 22234	0.00	0.160	0.000	0.790	1.300	0.110	0.0240	0.0000	0.000	0.0000	0.000
SAV 22235	0.00	0.040	0.000	0.000	0.100	0.020	0.0070	0.0000	0.000	0.0000	0.000
SAV 22236	0.00	0.000	0.040	0.000	0.005	0.160	0.0000	0.0000	0.000	0.0000	0.000
SAV 22240	0.00	0.000	0.000	0.000	0.120	0.017	0.0040	0.0000	0.000	0.0000	0.000
SAV 22241	0.00	0.100	2.300	0.000	0.070	0.020	0.0060	0.0000	0.000	0.0000	0.000
SAV 22242	0.00	0.000	0.930	0.000	0.091	0.005	0.0002	0.0000	0.000	0.0000	0.000
SAV 22243	0.00	0.000	1.700	0.000	0.006	0.000	0.0000	0.0000	0.000	0.0000	0.000
SAV 22244	0.01	0.000	4.200	0.000	0.007	0.024	0.1900	0.0000	0.000	0.0000	0.000
SAV 22249	0.00	0.000	0.000	0.000	0.040	0.500	0.0002	0.0003	0.000	0.0000	0.000
SAV 22764	0.00	0.076	0.000	0.360	1.400	0.018	0.0090	0.0000	0.000	0.0000	0.000
SAV 23056	0.04	0.000	0.000	0.000	0.013	0.000	0.0000	0.0000	0.000	0.0000	0.000
O&V 6	0.00	0.005	0.000	0.000	0.005	0.005	0.0000	0.0000	0.000	0.0000	0.000
O&V 87	0.01	0.005	0.000	0.000	0.010	0.005	0.0000	0.0000	0.000	0.0000	0.000
O&V 98	0.00	0.000	0.005	0.000	0.130	0.005	0.0020	0.0005	0.000	0.0000	0.005
O&V 99	0.00	0.000	0.000	0.005	0.200	0.005	0.0020	0.0000	0.000	0.0000	0.000
O&V 120	0.00	0.000	0.000	0.200	0.300	0.005	0.0020	0.0000	0.000	0.0000	0.000
O&V 155	0.01	0.005	0.000	0.000	0.010	0.040	0.0020	0.0000	0.000	0.0050	0.050
O&V 232	0.00	0.005	1.200	0.000	0.005	0.005	0.0020	0.0000	0.000	0.0000	0.000
O&V 233	0.00	0.005	0.160	0.005	0.005	0.005	0.0020	0.0005	0.000	0.0000	0.000
O&V 234	0.01	0.005	1.000	0.000	0.005	0.005	0.0000	0.0000	0.000	0.0000	0.000
O&V 235	0.00	0.005	1.000	0.000	0.005	0.005	0.0000	0.0000	0.000	0.0000	0.000
O&V 253	0.00	0.005	0.150	0.005	0.005	0.005	0.0020	0.0000	0.000	0.0000	0.000
O&V 254	0.00	0.005	2.300	0.000	0.005	0.005	0.0020	0.0000	0.000	0.0000	0.000
O&V 255	0.00	0.005	1.300	0.005	0.005	0.005	0.0020	0.0000	0.000	0.0000	0.000
O&V 256	0.00	0.005	4.100	0.000	0.005	0.005	0.0020	0.0000	0.000	0.0000	0.000
O&V 278	0.00	0.005	0.300	0.005	0.030	0.005	0.0020	0.0003	0.000	0.0000	0.005
O&V 307	0.00	0.005	0.200	0.005	0.130	0.005	0.0020	0.0000	0.000	0.0000	0.000
O&V 315	0.00	0.020	2.800	0.000	0.005	0.005	0.0020	0.0000	0.000	0.0000	0.005
O&V 334	0.01	0.100	1.600	0.005	0.080	0.005	0.0020	0.0005	0.000	0.0000	0.000
O&V 335	0.01	0.100	1.000	0.005	0.200	0.005	0.0100	0.0000	0.000	0.0000	0.000
O&V 352	0.01	0.005	1.100	0.100	0.080	0.005	0.0020	0.0005	0.000	0.0000	0.000
O&V 446	0.01	0.005	2.200	2.800	0.600	0.040	0.1400	0.0000	0.000	0.0000	0.000
O&V 465	0.00	0.000	0.600	0.600	0.700	0.005	0.0020	0.0000	0.000	0.0000	0.005
O&V 634	0.03	0.010	1.200	1.100	1.300	0.005	0.0100	0.0000	0.000	0.0000	0.000
O&V 1183	0.01	0.000	0.000	0.000	0.000	0.500	0.0000	0.0003	0.000	0.0050	0.005
O&V 1184	0.01	0.005	0.000	0.000	0.005	0.070	0.0020	0.0000	0.000	0.0050	0.050
O&V 1207	0.50	0.005	0.005	0.000	0.005	0.100	0.0000	0.0000	0.000	0.0050	0.005
O&V 1242	0.01	0.005	0.005	0.000	0.005	0.005	0.0000	0.0000	0.000	0.0050	0.310
O&V 1243	0.00	0.000	0.050	0.000	0.000	0.005	0.0000-0.1000	0.000	0.000	0.0050	0.230
O&V 1249	0.00	0.000	0.500	0.000	0.000	0.005	0.0000-0.1000	0.000	0.000	0.0050	0.230
O&V 1269	0.01	0.005	3.000	0.700	0.010	2.140	0.0080	0.0000	0.000	0.0050	3.240
O&V 1296	0.01	0.005	1.000	0.005	0.005	0.750	0.0020	0.0000	0.000	0.0050	0.140
O&V 1297	0.01	0.005	0.200	0.050	0.005	0.750	0.0020	0.0000	0.000	0.0050	0.750
O&V 1298	0.02	0.030	0.600	0.050	0.160	1.250	0.0020	0.0008	0.000	0.0100	3.150
O&V 1299	0.01	0.005	1.500	0.100	0.005	0.300	0.0020	0.0000	0.000	0.0050	0.000
O&V 1300	0.01	0.000	0.300	0.005	0.005	0.350	0.0000	0.0000	0.000	0.0050	0.005
O&V 1311	0.01	0.005	0.005	0.000	0.030	0.050	0.0000	0.0000	0.000	0.0050	1.020
O&V 1312	0.01	0.005	0.005	0.000	0.005	0.250	0.0020	0.0000	0.000	0.0050	0.200
O&V 1313	0.01	0.005	0.005	0.000	0.005	0.100	0.0020	0.0000	0.000	0.0050	0.300
O&V 1314	0.02	0.050	0.005	0.000	0.020	0.050	0.0060	0.0000	0.000	0.0050	0.830

Colombier	"	"	Col 18
"	"	"	Col 20
Estavsayer	"	"	Est. 6
"	"	"	Est. 11
F.U.	"	Bern	1452
Chevroux	"	"	25657
F.U.	"	Neuchâtel	1510
F.U.	"	"	Col. Beau 84
F.U.	"	"	"
Delley, Portalban	"	"	Pt 3
Auvernier	"	"	1509
Pölsbals, Styria	Graz	"	11530
St. J. cob, Marburg	"	"	14417
Nussdorf-Maurach	Stuttgart A3091	"	"
Thayngen Weiher	Schaffhausen	"	"
Nussdorf-Maurach	Stuttgart A3093	"	"
Maxglan	Salzburg 5784a	"	"
Seewalchen	Wien	"	37463
Attersee	"	"	61264
"	Inst. "	"	6561
"	Inst. Linz	"	AH 19
Kronstorf, Enns	Inst. Wien	"	6580
Mondssee	Graz	"	"
Lödersdorf	Wien	"	62385
Attersee	Wien	"	6569
Mondssee	Inst. Wien	"	"
Altheim	München	"	1919. 899
Nussdorf-Maurach	Stuttgart A3092	"	"
Schölgelsbach, Kilb	Wien	"	1547
Rainberg	Salzburg 2659	"	"
"	"	"	2658
"	"	"	2660
Maxglan	"	"	5784
Hallwang	"	"	5785
Mondssee	Wien	"	38772
Lüscherz	Zürich	"	"
Concise	Koln	"	5043
Mühlviertel	Linz	"	A702
Muhldorf, Upper A.	Linz	"	A2283
Lejðeregg, Björhofsh.	Salzburg 1413	"	1414
Rabenstein, Lueg	Hell/Salzburg	"	"
Glanegg	Salzburg 5789b	"	"
Klingelberg, Pongau	Hell/Salzburg	"	"
Freinberg, Linz	Linz	"	A2296
Kienbergwand, Mondsee	Hell Salzburg	"	"
"	Salzburg 937	"	"
Traunmündung	Linz	"	A2292
Mattsee	Hell Salzburg	"	"
Burgstall, Pinzgau	"	"	"
St. Georgen	Salzburg	"	1408

Appendix XXV contd. (7)

BAR 98	0.00	0.000	0.740	0.007	0.011	0.066	0.0082	0.0063	0.045	0.0040	0.044	Sickle	Michelsdorf	"	618
BAR 99	0.00	0.280	2.500	0.026	0.004	0.034	0.0051	0.0000	0.044	0.0007	0.051	"	"	"	625
BAR 100	0.00	0.000	0.043	0.004	0.005	0.032	0.0150	0.0000	0.032	0.0290	0.082	Bun ingot	Mühdorf	"	A2283
BAR 101	0.00	0.062	0.750	0.016	0.008	0.000	0.0160	0.0000	0.039	0.0007	0.130	'Axe	'Upper Austria'	"	A3137
BAR 102	0.00	0.013	0.000	0.003	0.001	0.042	0.0100	0.0020	0.036	0.0010	0.049	Dagger	Wien-Essling	Asparn	14853
BAR 103	0.00	0.140	0.100	0.032	0.075	0.093	0.0076	0.1000	0.031	0.0004	0.110	Hammer axe	Mödling	Mödling	U5
BAR 104	0.00	0.007	0.013	0.003	0.006	0.063	0.0140	0.0046	0.027	0.0006	0.300	Double axe	Hüttwilen	Frauenfeld	9067
AXX 1	0.00	0.000	0.010	0.000	1.000	0.050	0.0000	0.0000	0.050	0.0000	0.000		(analysis:Angeli,1953)		

Appendix XXVI. List of Analysis Numbers contained in Copper Clusters 1.1 - 1.5 and 2 - 10.

Copper Cluster 1.1									O&W 1184
SAM 2776	SAM 2883	SAM 2895	SAM 2906	SAM 2919					
SAM 2833	SAM 2885	SAM 2896	SAM 2907	SAM 2921					
SAM 2836	SAM 2887	SAM 2897	SAM 2908	SAM 2924					
SAM 2841	SAM 2888	SAM 2900	SAM 2909	SAM 2962					
SAM 2877	SAM 2889	SAM 2901	SAM 2912	SAM 3049					
SAM 2878	SAM 2890	SAM 2902	SAM 2913	SAM 3086					
SAM 2879	SAM 2891	SAM 2903	SAM 2914	SAM 3087					
SAM 2880	SAM 2893	SAM 2904	SAM 2915	SAM 3089					
SAM 2882	SAM 2894	SAM 2905	SAM 2916	SAM22236					
Copper Cluster 1.2									
SAM 2474	SAM 2918	SAM 3730	SAM 4931	SAM 4942					
SAM 2845	SAM 2920	SAM 3753	SAM 4932	SAM 4943					
SAM 2876	SAM 3033	SAM 3780	SAM 4933	SAM 6080					
SAM 2884	SAM 3638	SAM 4638	SAM 4934	SAM 6643					
SAM 2886	SAM 3641	SAM 4896	SAM 4936	SAM 6644					
SAM 2898	SAM 3642	SAM 4925	SAM 4937	SAM23056					
SAM 2899	SAM 3659	SAM 4927	SAM 4938	O&W 6					
SAM 2910	SAM 3660	SAM 4928	SAM 4939	O&W 87					
SAM 2911	SAM 3667	SAM 4929	SAM 4940	O&W 155					
SAM 2917	SAM 3690	SAM 4930	SAM 4941	BAR 29					
Copper Cluster 1.3									
SAM 2881	SAM 4637	SAM22235	BAR 20	BAR 96					
SAM 4636	SAM 4926	BAR 15	BAR 64	BAR 102					
Copper Cluster 1.4									
SAM 3046	SAM 7280	O&W 98	O&W 307						
SAM 4348	SAM22240	O&W 99							
Copper Cluster 1.5									
SAM 8	SAM 2998	SAM 3005	SAM 4341	SAM 4897				O&W 234	
SAM 2988	SAM 2999	SAM 3008	SAM 4342	SAM14465				O&W 253	
SAM 2995	SAM 3000	SAM 3025	SAM 4345	SAM14467				O&W 278	
SAM 2996	SAM 3002	SAM 3731	SAM 4346	SAM14469					

Appendix XXVI.(contd.1)

Copper Cluster 2							
SAM 2475	SAM 2987	SAM 3010	SAM 3019	SAM 7108			
SAM 2477	SAM 2989	SAM 3011	SAM 3020	SAM14470			
SAM 2832	SAM 2992	SAM 3012	SAM 3612	SAM14472			
SAM 2846	SAM 2994	SAM 3013	SAM 3640	SAM14473			
SAM 2860	SAM 2997	SAM 3014	SAM 3661	SAM14477			
SAM 2922	SAM 3004	SAM 3015	SAM 3669	SAM18029			
SAM 2926	SAM 3006	SAM 3016	SAM 4340	SAM22141			
SAM 2941	SAM 3007	SAM 3017	SAM 4343	BAR 68			
SAM 2953	SAM 3009	SAM 3018	SAM 4347	BAR 101			
Copper Cluster 3							
SAM 2835	SAM 2839	SAM 4639	SAM22228	O&W 1183		O&W 1321	
SAM 2837	SAM 2954	SAM 7790	SAM22249	O&W 1300		BAR 67	
Copper Cluster 4							
SAM 2834	SAM 2939	SAM 3088	BAR 7	BAR 63			
SAM 2838	SAM 2963	O&W 1269	BAR 8	BAR 70			
SAM 2843	SAM 3027	O&W 1296	BAR 13	BAR 89			
SAM 2931	SAM 3063	O&W 1297	BAR 36	BAR 91			
Copper Cluster 5							
BAR 2	BAR 25	BAR 43	BAR 47	BAR 88		BAR 104	
BAR 9	BAR 26	BAR 44	BAR 48	BAR 93			
BAR 10	BAR 27	BAR 45	BAR 62	BAR 98			
BAR 17	BAR 34	BAR 46	BAR 86	BAR 100			
Copper Cluster 6							
SAM 794	SAM 3036	SAM 3041	SAM 3150	SAM14479		O&W 1207	
SAM 2862	SAM 3037	SAM 3042	SAM14475	SAM16600		BAR 53	
						BAR 65	

Appendix XXVI (contd.2)

Copper Cluster 7					
SAM 2777	SAM 3028	O&W 1248	O&W 1311	O&W 1314	O&W 1319
SAM 2778	SAM 3066	O&W 1249	O&W 1312	O&W 1315	BAR 90
SAM 2927	O&W 1242	O&W 1298	O&W 1313	O&W 1316	BAR 95
Copper Cluster 8					
SAM 2844	SAM 3772	SAM 3774	SAM 3776	SAM 5190	SAM 6373
SAM 3633	SAM 3773	SAM 3775	SAM 4439	SAM 5191	O&W 446
Copper Cluster 9					
SAM 2785	SAM 3771	SAM22233	O&W 465	BAR 32	
SAM 2787	SAM14478	SAM22234	O&W 634	BAR 66	
SAM 3032	SAM22223	SAM22264	BAR 30	BAR 77	
SAM 3770	SAM22229	O&W 120	BAR 31	AXX 1	
Copper Cluster 10					
SAM 9	SAM 3021	SAM 3115	SAM 7279	O&W 256	
SAM 10	SAM 3022	SAM 3613	SAM 7293	O&W 315	
SAM 2478	SAM 3023	SAM 3615	SAM14466	O&W 334	
SAM 2481	SAM 3024	SAM 3617	SAM21674	O&W 335	
SAM 2842	SAM 3026	SAM 3754	SAM22241	O&W 352	
SAM 2923	SAM 3044	SAM 3757	SAM22242	O&W 1299	
SAM 2925	SAM 3090	SAM 4344	SAM22243	BAR 28	
SAM 2929	SAM 3092	SAM 4349	SAM22244	BAR 37	
SAM 2990	SAM 3093	SAM 4350	O&W 232	BAR 42	
SAM 2991	SAM 3094	SAM 4351	O&W 233	BAR 69	
SAM 2993	SAM 3095	SAM 4895	O&W 235	BAR 97	
SAM 3001	SAM 3096	SAM 7046	O&W 254	BAR 99	
SAM 3003	SAM 3100	SAM 7072	O&W 255	BAR 103	

Appendix XXVII. List of Analysis Numbers contained in Bronze Clusters A - F (Sn is masked).

Bronze Cluster A							
SAM 7	SAM 2974	SAM 3156	SAM 4898	SAM 6090	BAR	72	
SAM 2820	SAM 3031	SAM 3157	SAM 6087	SAM 7051	BAR	87	
SAM 2848	SAM 3043	SAM 3614	SAM 6088	SAM 7104	BAR	92	
Bronze Cluster B							
SAM 2937	SAM 3055	SAM 3113	SAM 3152	SAM 3155			
SAM 3054	SAM 3058	SAM 3149	SAM 3154	SAM 7164			
Bronze Cluster C							
BAR 4	BAR 6	BAR 18	BAR 74				
BAR 5	BAR 12	BAR 21					
Bronze Cluster D							
SAM 2831	SAM 3039	SAM 3151	SAM 6089	BAR 11	BAR	75	
SAM 2867	SAM 3040	SAM 3153	O&W 177	BAR 16	BAR	76	
SAM 2932	SAM 3097	SAM 4635	O&W 401	BAR 24			
SAM 2943	SAM 3098	SAM 4899	O&W 1209	BAR 33			
SAM 2975	SAM 3099	SAM 4900	O&W 1273	BAR 35			
SAM 3038	SAM 3112	SAM 4901	BAR 3	BAR 71			
Bronze Cluster E							
SAM 2940	SAM 3616	BAR 14					
SAM 3078	O&W 1049	BAR 73					
Bronze Cluster F							
BAR 19	BAR 23	BAR 50	BAR 61				
BAR 22	BAR 49	BAR 60	BAR 78				

APPENDIX XXVIII

Element Code	Sn	Pb	As	Sb	Ag	Ni	Bi	Au	Zn	Co	Fe
0	< 0.01	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0001	< 0.0001	< 0.001	< 0.0001	< 0.001
1	0.03	0.003	0.003	0.003	0.003	0.003	0.0003	0.0003	0.003	0.0003	0.003
2	0.1	0.01	0.01	0.01	0.01	0.01	0.001	0.001	0.01	0.001	0.01
3	0.3	0.03	0.03	0.03	0.03	0.03	0.003	0.003	0.03	0.003	0.03
4	1.0	0.1	0.1	0.1	0.1	0.1	0.01	0.01	0.1	0.01	0.1
5	3.0	0.3	0.3	0.3	0.3	0.3	0.03	0.03	0.3	0.03	0.3
6	10.0	1.0	1.0	1.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0
7	30.0	3.0	3.0	3.0	3.0	3.0	0.3	0.3	3.0	0.3	3.0
8	> 30.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0	10.0	1.0	10.0
9		> 10.0	> 10.0	> 10.0	> 10.0	> 10.0	3.0	3.0	> 10.0	3.0	> 10.0

Identification of codes used for grouping of metal analyses.

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Swiss Neolithic copper beads: currency, ornament or prestige items?

Barbara Ottaway and Christian Strahm

Archaeological background

Before analysing in detail the copper objects which provide the basis for this paper, it is desirable to give some background information on two relevant Swiss cultures belonging to the end of the early Neolithic period, which may be unfamiliar to some of our readers. These are the Cortaillod and the Pfyn cultures. More detailed descriptions than those that follow can be found in Drack (1969) and Winiger (1971).

The Cortaillod culture is found in western and central Switzerland, as far north as Lake Zürich (plate 7). In the south-west there are a few settlements around Lake Geneva which have not been thoroughly investigated. The Jura mountains bound the culture on the north and west, although it is often difficult to say where the Cortaillod culture ends and the Chassey begins (see below). The main concentration of known settlements is around Lake Neuchâtel, but this is mainly due to the active period of excavations following the 'correction of the Jura waters' in the last century. Cortaillod settlements are found in forest-free zones or near transport routes, i.e. in moorland, or lake-sides or on the banks of rivers. A few hill-top sites are known, but none away from water on cultivatable land.

This distribution of settlement sites is also characteristic of the Pfyn culture, which is found in northern Switzerland, from Lake Zürich to Lake Constance, and along the upper Rhine (plate 7). On the north the Pfyn culture was limited by the Michelsberg culture. The Pfyn culture was indeed for long thought to be part of the latter, but is now recognized to be of local development, influenced from the east, in particular by the Lengyel group of cultures.

The origin of the first phase of the Cortaillod culture is as yet unknown, but it developed before the major northward spread of the Mediterranean influence which culminated in the Chassey culture of south-eastern France. However, during the maximal spread of the latter, it infiltrated the western part of the Cortaillod area (Sauter and Gallay 1969), giving rise to the large west European cultural group known as the Almeria-Chassey-Cortaillod-Lagozza. The Cortaillod culture is stratigraphically found above the Egolzwil III and below the Lüscherz culture, although it is so closely followed by the latter as to form a continuum. It has contacts on the east with the Pfyn culture, and the way in which it merges on the west with the Chassey has already been mentioned. The main contacts of the Pfyn culture are with the east (Altheim, Lengyel). Stratigraphically the Pfyn culture lies below Horgen and the Corded Ware cultures.

Agriculture played an important part in the economy of both Pfyn and Cortaillod cultures, but the former appears to have developed it more intensively, particularly with respect to animal husbandry. The ratio of domestic (mostly pig and cattle) to wild animals estimated from bones is commonly 75 : 25 in Pfyn settlements where animals were clearly kept within the settlements. In Cortaillod settlements the ratio is more normally 50 : 50. At Burgäschisee-Süd it was as low as 15 : 85, although the domesticated animal remains at this site included highly domesticated cattle, as well as ovids. Few cattle in Cortaillod sites were over-wintered.

Cereal-growing was conspicuous in both the Cortaillod and the Pfyn settlements, and several highly developed cereals have been distinguished (Bandi and Müller-Beck 1967). A plough has been found at Burgäschisee. Apart from this, however, there was a very intensive collection of wild foods and plant material particularly well illustrated at Burgäschisee-Süd (fig. 13). Although both cultures lived by the waterside, and harpoons, fish-hooks, fish-nets, net sinkers and floats as well as boats and paddles have been found (Wyss 1969: Abb. 8), fish remains are very scarce.

Cortaillod villages were made up of three to eight houses; assuming an extended family unit in each house, the village might typically contain fifty people. The villages were always surrounded by a palisade or fence, as were those of the Pfyn culture, but too little is known of Pfyn villages to speak of the number of houses. Cortaillod houses were rectangular and constructed of wattle and daub, or thin logs sometimes daubed with clay. They contained a single central hearth. We know that the Cortaillod houses built on smaller lakes had floors separated from the damp ground either by a single layer of logs, or by several layers of logs and branches. No floors survive from houses built by the larger lakes, so we cannot be sure that they were above ground (or water) level. Some Pfyn houses (e.g. at Thayngen) were, however, built on stilts, but others (e.g. at Niederwil) were large longhouses built with planks, partitioned inside, and with a hearth in each section which was continuously renewed (Waterbolk and van Zeist 1966).

Both Pfyn and Cortaillod pottery was of very good quality. The latter was thin walled, smooth, often polished and well fired. Decorations were few, usually incised geometric patterns. White birch-bark decoration, in strips glued to the vessel with birch-bark tar, is characteristic. The number of pottery types found is limited (fig. 10) and the forms often seem reminiscent of a leather sack filled with water. Pfyn pottery, on the other hand, has a large variety in forms (fig. 11), but decoration is very rare.

In the Cortaillod area, white flint from the Jura was extensively used for tools. Axes made from stones from the surrounding moraines had no characteristic shape, while stone battle-axes are typical of the Pfyn culture. Bone and antler tools were common in both cultures, but in the Cortaillod culture wooden vessels and tools were particularly numerous, and ornaments such as stone or antler pendants, usually rod-shaped, are found. A very important difference between the two cultures is that there is good evidence in Pfyn settlements for copper working in the form of crucibles (Wyss 1969), droplets of spilt metal and numerous flat axes. It is not known from where the copper came, and there are no ores in eastern Switzerland. While in the Cortaillod area, apart from the copper beads to be discussed, copper objects are fewer, they often cannot be positively identified with Cortaillod sites. It is remarkable that cultures succeeding the Cortaillod and the Pfyn cultures have practically no copper finds.

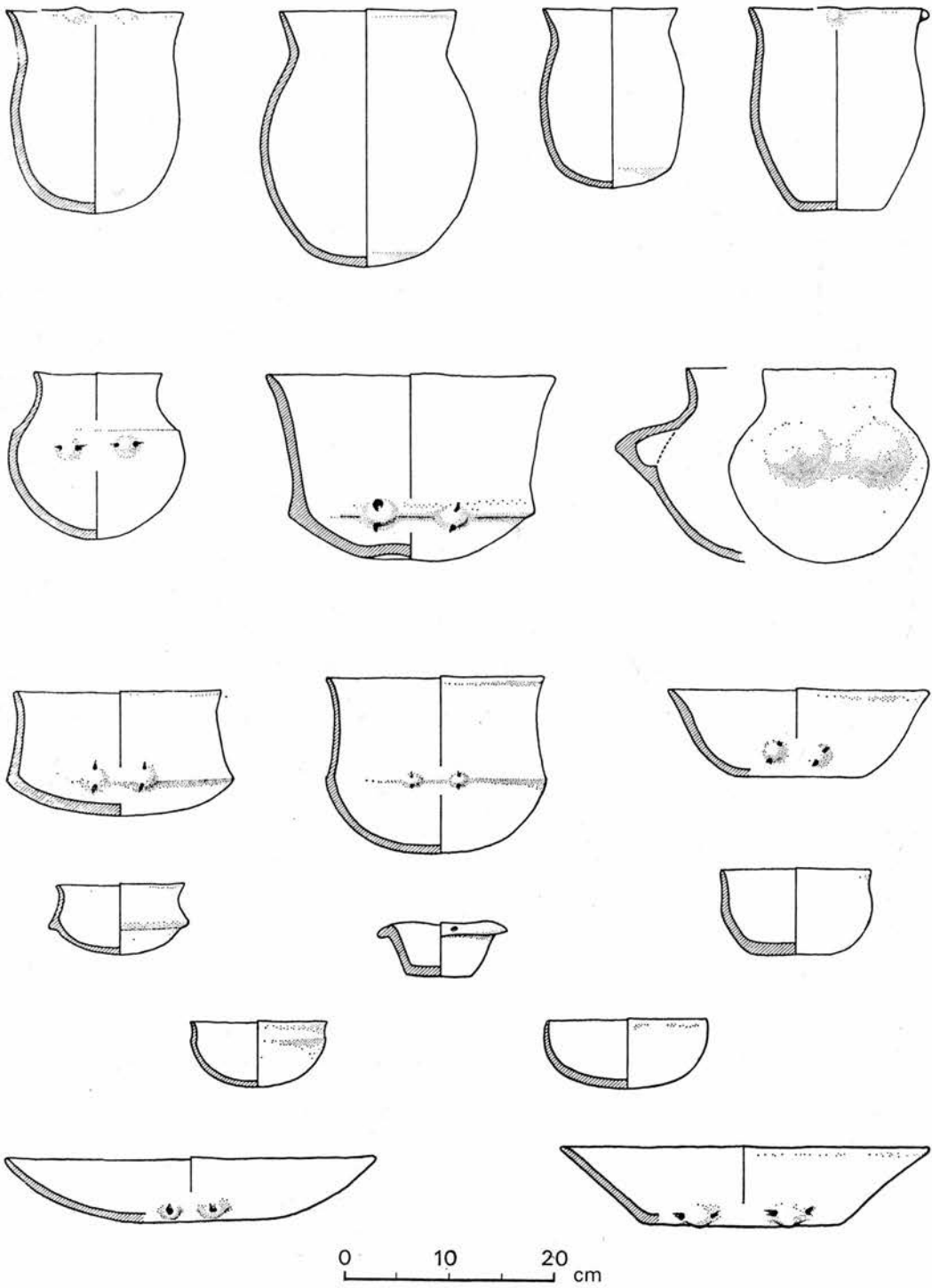


Figure 10 Representative pottery of the Cortaillod culture. (After Sauter and Gallay, 1969, fig. 9)

EWA

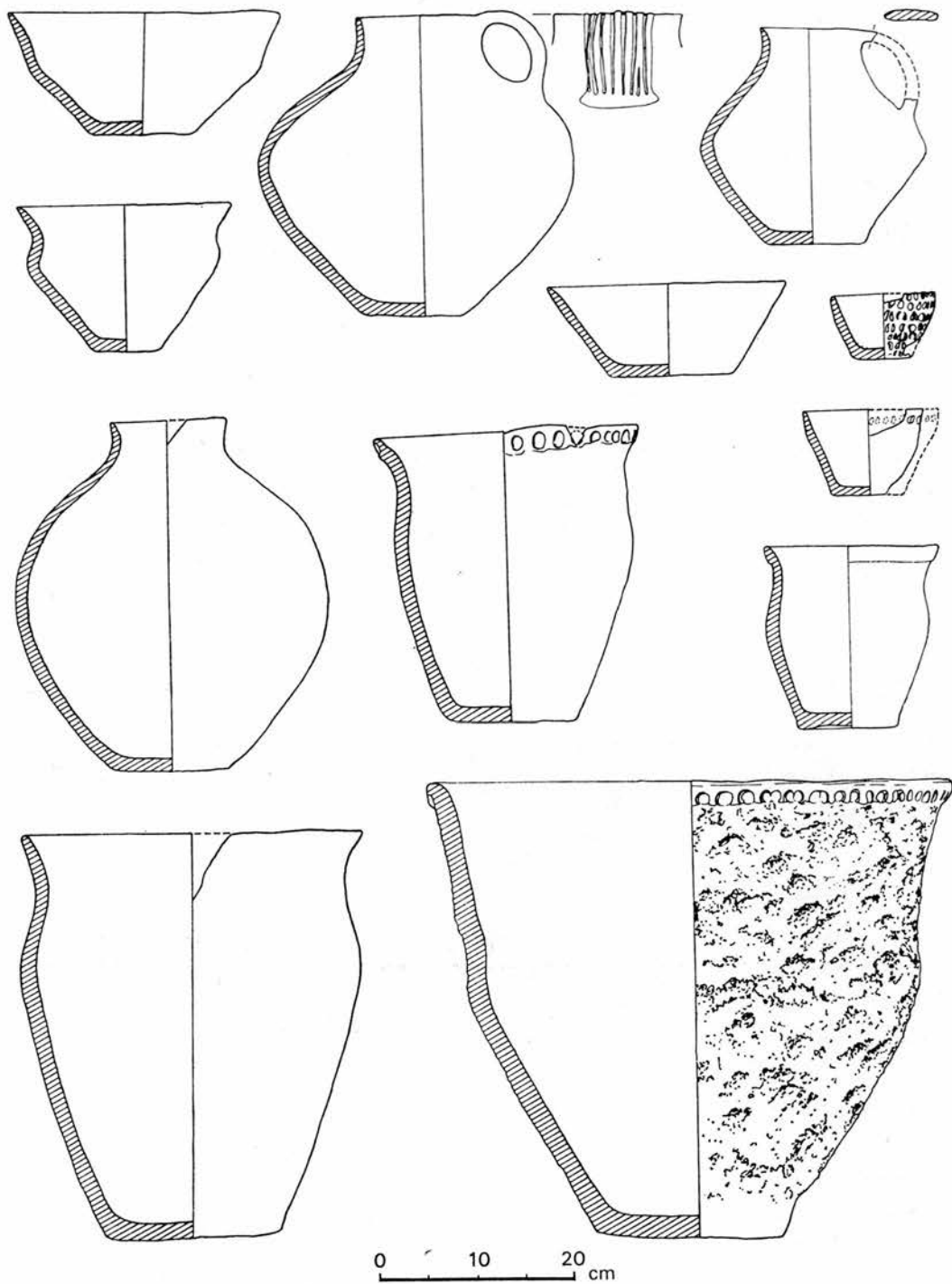


Figure 11 Representative pottery of the Pfyn culture. (After Winiger, 1971, plates 73 and 74)

The two cultures flourished coevally. This can be seen by the frequent finds of Pfyn objects, such as battle-axes, handled jugs and the typical 'Backteller' in Cortaillod settlements and, to a slightly lesser degree, Cortaillod objects in Pfyn sites. Direct proof of the contemporaneity between Burgäschisee-Süd, Thayngen and Niederwil has been shown by matching tree-ring chronologies (Bandi and Müller-Beck 1967). The only radiocarbon dates available at the time of writing are from Burgäschisee (Bandi and Müller-Beck 1967) and provide an interquartile range (Ottaway 1973b) of 2850–2570 B.C. (uncorrected) or of 3630–3250 B.C. when corrected to calendar years by the MASCA curve (Michael, Ralph and Han 1973). Dates from the Pfyn sites are expected in the near future.

The find of copper beads at Burgäschisee-Süd focused attention on the fact that it is the non-metal-working Cortaillod culture which had a considerable number of bead finds. The way in which the Burgäschisee-Süd beads had been carefully deposited in the ground and a detailed technological study suggested that they were more than mere ornaments and the possibility that they were a kind of currency or basis of exchange is investigated here.

Cortaillod copper beads

Before the reasons for these suggestions are discussed, the Cortaillod beads will be described in some detail. During the 1967 excavation of the settlement of Seeberg, Burgäschisee-Süd, a total of fifty-six copper beads was found north of the north wall of house 2. They had been carefully deposited there in a shallow pit in the soil without container or sack. The beads were strung on two separate rough cords, whose ends were simply knotted to prevent them from sliding off. They could not have been used as necklaces at the time of the deposition, for there was no mechanism of fastening them round the neck. The beads were well preserved, yet had differing kinds of verdigris, indicating that varying groups had been at some time under varying atmospheric conditions leading to different stages in oxidation. In other words, they had not always been together as two strings. It is possible that there had been other smaller beads such as the two very small loose beads which were found in a bad state of preservation on the top of the two strings.

String I consists of eighteen irregular round and heavy beads. Their inside is flat, their outside strongly rounded mostly with faint grooves. All have seams indicating the way in which they were produced: indentations were made at intervals along a bar, and small pieces were then broken off. These short pieces were then bent round until their ends met or even overlapped. The seam was often smoothed by hammering or polishing.

String II consists of thirty-six beads and their method of production is the same as for string I (although the original metal bar was probably flatter). However, the beads are more cylindrical and broader than those of string I and their sides are usually flattened. Most of the seams have not been smoothed or worked over. Two of these beads had blobs of metal added to them.

From a detailed study of the Burgäschisee beads (Sangmeister and Strahm 1974) we can deduce that these are ring-beads, which were not ornaments at the time of deposition,

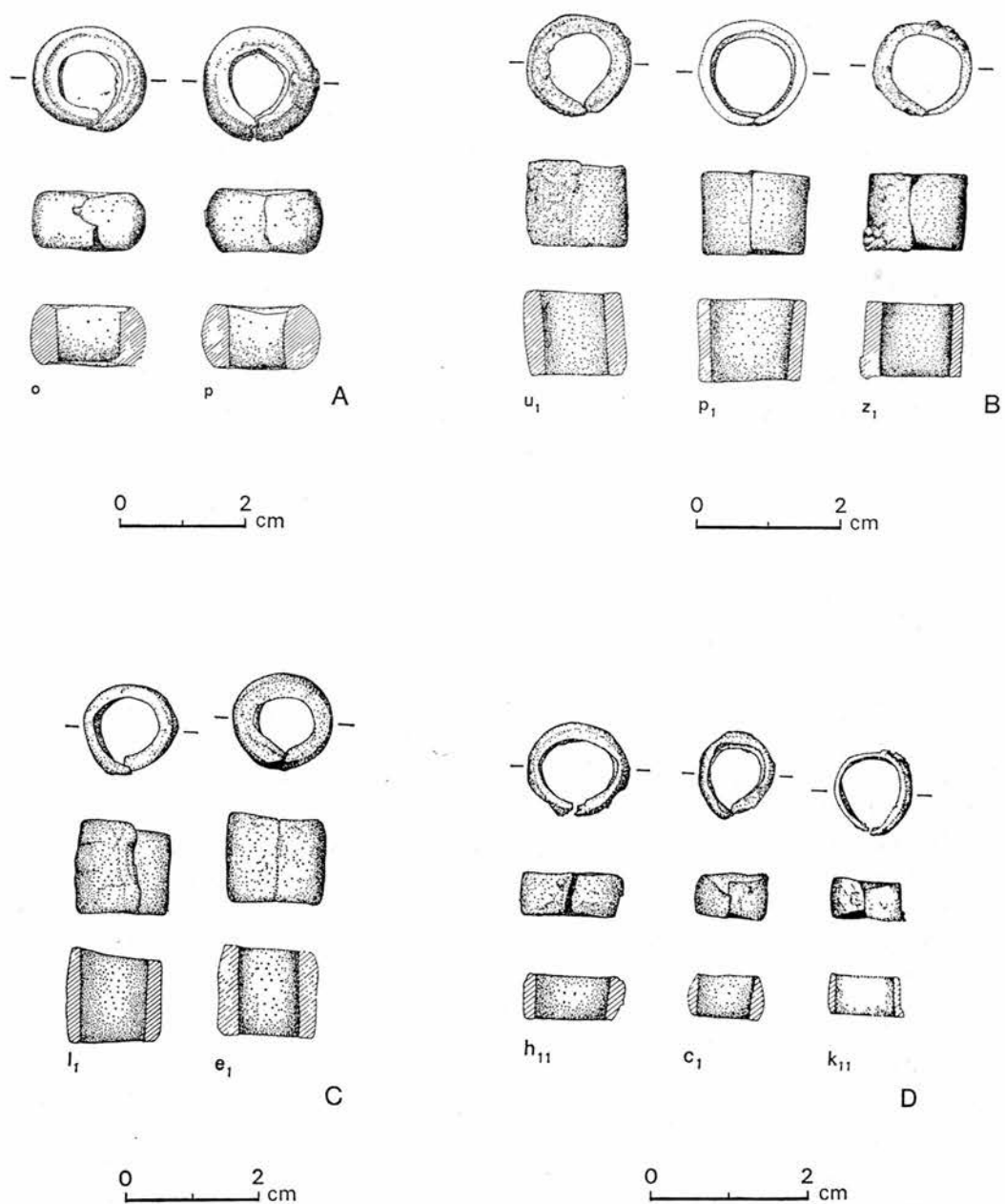


Figure 12 Some of the copper beads from Seeberg, Burgäschisee-Süd (cf. figure 4): A. string I, bar 1; typologically and by DFA (discriminant function analysis); B. string II, bar 4; typologically and by DFA; C. string II. Both from bars 2 or 3 by DFA; typologically l_1 from bar 4 and e_1 from bar 3; D. beads from string II, fashioned from end pieces of bars (not chemically analysed). (Based on Sangmeister and Strahm, 1973, figs 8, 9 and 10)

although some of them had traces of wear. We can be reasonably sure that all the beads of strings I and II survived since they were found on their original cords. The beads on each string are not of any precise unit value in breadth, thickness or weight, the

beads of string II ranging in weight from 0.57 to 8.79 g. and those from string I ranging from 8.05 to 17.32 g. (with a median of 4.25 and 13.32 g. respectively). It has been shown that the beads were made from five different bars, four of them approximately of standard length (30 cm.). It could also be shown that string I incorporated some of the beads from a bar which had been used mainly for string II (i.e. beads were changed around and rearranged). Further, it has been shown that some beads show signs of wear, while others which seem to have been made by the same person do not, suggesting that they have been separated at some time. Two beads from string II have metal pieces added to them, presumably to make up a certain weight, since repair was not necessary. The impurity pattern of the copper used for the beads varies somewhat but within a limited range permitting the assumption that the raw material came from the same copper ore, although probably from different smelts. Statistical examination of the forty analytical results by discriminant function analysis (Hoel 1962) showed that bar 1 (ten beads in string I, fig. 12A) was different from bar 4 (ten beads in string II, fig. 12B) and from the copper of bars 2 and 3 (fig. 12C, strings I and II). The latter, however, could not be distinguished from one another. Thus the evidence suggests that the bars came from a similar source, but from at least three smelts. The fifth bar and some end pieces have not been analysed, since beads made from it are too small (fig. 12D). The overall characteristic impurity pattern of the beads is of high As (0.19–1.15%), low Sb, low Ag and sometimes traces of Bi or Pb. The chisel-shaped implement which has been found at Burgäschisee-Süd as a single find, but within the settlement, has a similar impurity pattern to the beads, but with a higher arsenical content (2.5%), which could make it capable of cutting the arsenical copper bars from which the beads were produced.

The distribution map (plate 8) shows that beads come only from a limited area around Lake Neuchâtel within the Cortaillod region. There are eighty beads beside those at Burgäschisee-Süd; all have been made by a method similar to that described above. The variation in width of the original copper bars is greater than at Burgäschisee, ranging between 2 to 12 mm. It can be estimated that for these known examples at least a further seven to eight copper bars had been used. Only eight beads other than those from Burgäschisee have been analysed. Their impurity patterns show that they are all similar enough to assume the same source of copper, but the sample is not big enough to draw conclusions from. The other beads have been found in groups of between one and four (cf. plate 8) with the exception of one string – depicted as a necklace in the only surviving illustration (Forrer 1884) from Préfargier – which is now unfortunately lost, and probably another one from Gerolfingen. A chisel of similar type and appearance as that of Burgäschisee-Süd has been found at Gerolfingen and it too has the same high As, low Sb, low Ag pattern as the beads. We have therefore tentative evidence of at least two sites where bars for the beads could have been cut.

Some ethnographic paradigms

Before examining ethnographic data which provided the ideas and possible parallels for our material, we would like to state our definition of currency and some other technical expressions. We agree with Einzig (1949) that *currency* is 'current money, i.e.

money actually in physical circulation or capable of being put into circulation', where *money* is 'a unit or objects conforming to a reasonable degree to some standard of uniformity which is employed for making a large proportion of the payment customary in the community concerned, and which is accepted for payment largely with the intention of employing it for making payments' and where *payment* includes payment of any kind, not just commercial payment. We disagree with Godelier (1971) whose definition ('in order for a commodity to function as money, it must be possible to exchange it for the totality of other commodities, it must work as their general equivalent') would seem to exclude even coins in the Dark Ages, when they were at times so scarce that the communities reverted to barter.

It is important to remember that '[primitive] currencies were in most cases never exchanged for land or labour and that their accumulation and circulation among the individuals and groups did not entail a general development of production forces as is the case with the accumulation of capital in capitalist market societies' (Godelier 1971). A market economy cannot automatically be assumed. Highly civilized ancient cultures as well as contemporary primitive communities have lived well on non-marketing (or market-less) economies. Such non-marketing economies have been found to be instituted in two basic patterns: either reciprocity or redistribution, or sometimes a combination of the two (Polany 1971; Sahlins 1974). One must be careful to free oneself from modern implications of certain words and expressions. Even Malinowski and Firth used bundles of attributes which money has in industrialized market-economies in an attempt to find a true model (Dalton 1971). In the absence of written information finer determinant factors such as kinship systems, or phenomena such as the Maori *hau* – the spirit of the gift (Mauss 1950, but see also Sahlins 1974) – may never be identified. Nor will one ever be absolutely certain whether all facts have been taken into account which could influence the distinction between currency, favourite medium of barter, medium of exchange or store of value. The latter by its very nature, cannot be currency in the sense as defined above. The *favourite medium of barter* is generally said to precede the medium of exchange. It is some object accepted in return for goods or services. It is not for direct consumption, and because the recipient expects to be able to obtain for it the goods and services which are required and because there will be no difficulty in passing it on, it becomes a favourite medium of barter. The *medium of exchange* may be accepted in payment for a limited number of goods only and may as such not rate as currency. However, one must be aware that one is dealing basically with a self-sufficient economy and therefore the number of categories of goods and services to be paid for is apt to be very small.

There is a wealth of different 'models' of primitive currency since each system studied differs in significant details from all the others. We have isolated two or three concepts or models from this mass of ethnographic information which seem to be particularly useful in interpreting our data.

A concept which takes into account the self-sufficiency of the Cortailod culture, is that of *special purpose money* illustrated here by the Zande of central Africa (Reining 1959). In pre-European days each family, consisting of one man, his wives and dependants, was largely a self-sufficient unit. There seems to have been little exchange amongst the households, although a limited number of items – such as iron tools and spears

made from locally smelted ore – had a limited application as a medium of exchange, mainly for marriage payments and social services. Even after the introduction of money by Europeans it was only treated as a special commodity associated with imported goods which it alone would buy. Nothing of it was spent on daily subsistence, i.e. on food, since this would be regarded as ‘wasting’ the special purpose money. This non-use of money – in whatever form – for acquiring food is very common in primitive societies (Sahlins 1974).

Other self-sufficient, usually market-less, economies regarded transactions of labour, resources, material goods and even services as non-commercial. They used special purpose money (e.g. pigs’ tusks, cattle, spears, yap stones) for obligatory gifts to kin and friends and obligatory payments to chiefs and priests, for bridewealth, bloodwealth and mortuary payments, etc. (Dalton 1971).

B The idea of the *dual nature* of the material can best be illustrated by the ‘salt-currency’ of the Baruya of New Guinea (Godelier 1971). The main economic activity of the Baruya is agriculture, together with pig husbandry and a considerable production of vegetal salt. The circulation of this salt among the Baruya takes two forms: (1) redistribution amongst relatives and friends, exchange in payment of services, occasionally exchange for goods bartered within the group, and (2) commercial exchange within the group. The salt is, however, also exchanged for goods with strangers. The double nature of the Baruya’s wealth item is illustrated by the fact that the salt is at one and the same time commodity and non-commodity, currency and gift, depending on whether it is being bartered between the groups or being circulated within the groups.

This idea – from the customer’s point of view – could be applied to copper imported for beads by the Cortaillod societies. First it functions as a commodity which must be imported, then it functions as a prestige item, or object of social exchange circulating within the group through the mechanism of gift and of other forms of redistribution. (The exchange of gifts in prehistoric societies, i.e. late Hallstatt and La Tène, has been discussed recently by Fischer (1973).) The same object or material therefore changes its function. As Godelier points out the function as prestige item is the dominant one, ‘since its roots and meaning spring from requirements of the dominant structures of the primitive social organization’. However, he also points out that it is not sufficient for a wealth item to circulate as a commodity to be a currency. For this, one further condition is necessary: it must be possible to exchange the item for several commodities of different type (otherwise it would be a medium of barter). Unfortunately, this is almost impossible to establish for prehistoric societies and we are left to see how the rest of the model fits the data.

The Baruya may, in fact, throw important light on this question, since they too have a basically Neolithic economy. Many of these Neolithic societies had to import the raw material for some of their tools. The Baruya were able to do so. Their salt had an exchange value, because it has a use-value to begin with (it is interesting that in the society of the Baruya as well as in that of their customers the use of salt is minimal; it is only used for ritual consumption such as at ceremonies of birth, marriage, initiation etc.) The salt certainly functions as money because it can be exchanged for other commodities, such as stone axes and the service of a sorcerer, it is therefore a general equivalent. Furthermore, salt in the form of bars, is divisible and careful packaging makes it

easily transportable and allows it to keep for many years. Godelier further found that the basis of exchange value of salt money is not based on exchange of labour equivalents. Salt is expensive because it is a luxury item and its production requires both technical skill and 'magical' knowledge which neighbouring tribes do not possess. Thus the Baruya request payment for their monopoly of a scarce product and secret knowledge and their partners are usually willing to pay.

The parallel with our Neolithic culture need hardly be pointed out; in our case the Cortaillod society was the one which had to satisfy the exchange partner, although we cannot say whether he was the specialist himself or a middleman.

C The *MNA system* (Codere 1968) is a more sophisticated model, but it is useful to discuss the Cortaillod beads in terms of it. It may be most simply defined in terms of three symbols:

M = money stuff

N = number or counting system

A = amounts system.

In terms of such a model, the beads are M; it can be assumed that the people were capable of enumerating the beads, judging by their competent way of building, for instance. The fact that string I has exactly half the number of beads yet twice the weight of string II, and furthermore that two beads had metal added to them (to make up some particular weight?) could be taken to indicate that they had set up an arbitrary weight or amounts system. The smaller beads would then have a lower denomination than the larger beads. Whether there were enough beads available in prehistoric times to fulfil the needs of commerce or transactions or other forms of payment is impossible to say. The 116 beads which have been found in Cortaillod associations were probably not enough – even allowing for the unknown percentage of beads undiscovered or destroyed by adverse soil conditions. It is possible that beads served as a principal monetary unit or standard of value or unit of account. This would have facilitated the transactions of goods or services by barter, since all objects could be reduced to a common denominator. Thus, without having to use the (monetary) metal a fair exchange could be ensured. This system of unit of account is illustrated by the Egyptian *deben* and *chat*, which are units of weight of copper in the form of rings.

Outside parallels to the Cortaillod beads

As mentioned above, there are no coeval cultural groups in Switzerland where similar copper beads have been found. In fact, in the whole of Europe during the period under consideration, i.e. 2850–2570 B.C. (interquartile range of uncorrected C14 dates for Burgäschisee), the only beads which can be found are those from Görmigk (Germany) belonging to a Baalberg culture burial.

Copper beads were used in preceding periods: by the Early Copper Age Tiszapolgar culture of Hungary (e.g. at Deszk A), by the Cucuteni A culture (e.g. at Hăbășești) and by the Polish Late Lengyel culture. All these cultures used smaller beads and

used them in a clearly different context from the Cortaillod culture, since they were all found in graves. Furthermore, the Hungarian beads do not seem to be ring-beads but were made by piercing through the middle (Bognar-Kutzián 1972: 23). It could also be shown (Ottaway 1973a) that at Brześć Kujawski in Poland the burials containing copper beads – often in some profusion – were in no way distinguished from other burials. It seems therefore unlikely that beads represented wealth items in this group.

Beads are found associated with later cultures such as the Corded Ware cultures of central Germany and Bohemia. In Switzerland the distribution remains as in late Cortaillod times: around Lake Neuchâtel. Beads also occur then in France, but are all of a different (biconical) type.

Copper flat axes

Other copper objects existed in Switzerland at this and slightly later times. Thirty-three copper flat axes which are usually on typological grounds termed as belonging either to type Thayngen (closely associated with the Pfyn culture) or to type Bevaix have been found. These were grouped by discriminant function analysis. ~~Figure 14~~ *Pl. 8* shows the distribution of the resulting three groups. Group 3 was used by both Pfyn and Cortaillod cultures, giving thus further evidence for contact between the two groups. It is, however, interesting that the copper used for this type of axe is quite different from that used for the Cortaillod beads, although there are not enough analyses to allow a generalization about the type of copper ore. The axes have very clear marks of wear, usually all in one direction, indicating their functional use. Even within the homogeneous groups 1 and 3 there are considerable variations in dimensions, particularly in length and thickness, for example, the mean length is 8.36 cm. but with a standard deviation of 3.5 cm., and the mean thickness is 7.68 mm. with a standard deviation of 3.67 mm., although the mean width at the butt is 2.2 cm. with a standard deviation of only 0.1 cm. These axes cannot therefore be regarded as standard units. Moreover, all group 3 axes have been found as stray finds and not carefully deposited or buried (i.e. destroyed, cf. Binford 1963). Thus flat copper axes cannot be considered as anything else but functional tools.

A further point must be mentioned here: it is usually assumed that the Cortaillod culture obtained its copper from the metal-working Pfyn culture and although influences in the early Cortaillod period came from a general eastern direction, it is precisely during the late Cortaillod phases that the Mediterranean middle Neolithic (Lagozza-Chasseen) expanded and made itself felt in Switzerland for the first time.

Conclusions

We conclude that the communities usually grouped together under 'Cortaillod culture' which were settled in the Swiss lake district and especially around Lake Neuchâtel,

were the only people at this time in Europe who had the idea of forming the relatively new and exotic material, copper, into beads. It could be simply an expression of their desire for ornamentation, but we feel that the evidence laid out above points towards a different direction.

The model (fig. 13) illustrates our idea of the social unit as found at Burgäschisee-

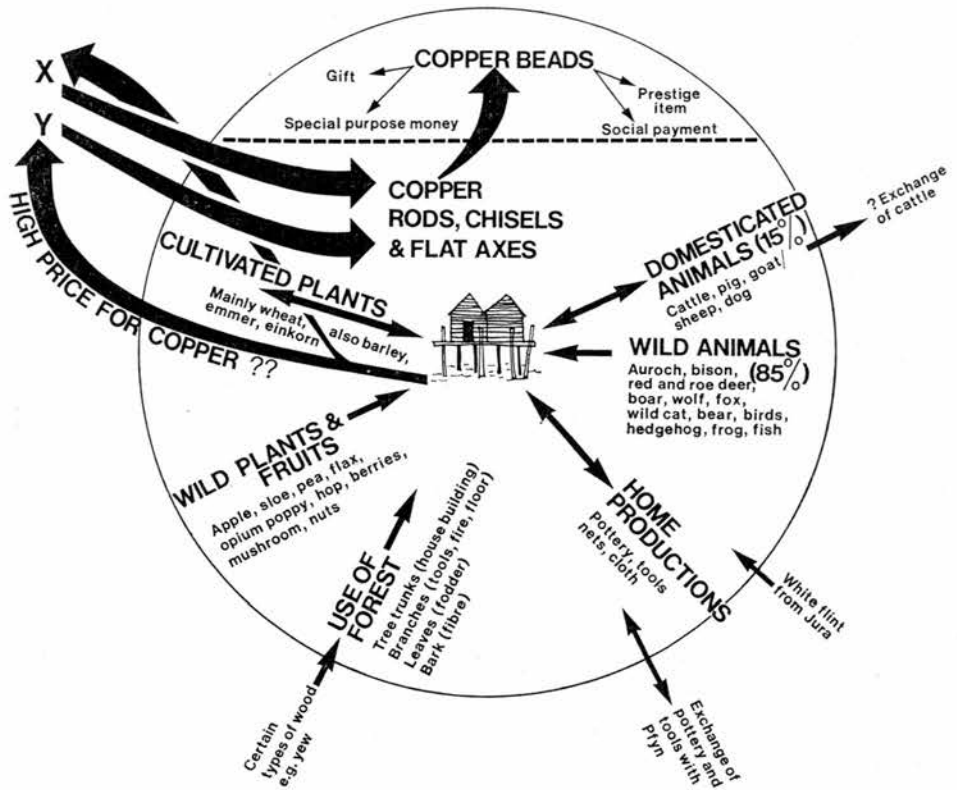


Figure 13 Model of the social unit at Burgäschisee-Süd, Switzerland

Süd. It may represent most of the later Cortaillod lake-side settlements, although the pattern probably differed considerably for the contemporary terrestrial settlements. Into the basically self-sufficient agricultural economy (i.e. growing mainly wheat, but also barley, emmer and einkorn; collecting/cultivating opium poppy, apple, sloe, pea, flax, nightshade, rowan, cherry, fungi, nuts; domesticating cattle, pig, goat/sheep and dog (15%); hunting aurochs, bison, red and roe deer, boar, wolf, fox, bear, wild cat, rabbit, bird and hedgehog (85%) but also supplementing their diet with frogs and fish), a luxury commodity, copper, was imported. Once it was inside the communities a part of this material changed to a non-commodity, in the form of beads. It thus became a prestige item, such as would be used to indicate a certain social status and would then be used for payment of social services, marriage payment, possibly bloodwealth (e.g. after fatal accidents), and generally act as a coveted and highly sought-after gift, since its social exchange value was high.

The reason why this combined model has been chosen is that there is clear evidence that the communities as illustrated at Burgäschisee-Süd were self-sufficient. Moreover, although there was probably an exchange mechanism of surplus harvest or hunting and fishing expeditions amongst the communities around Lake Neuchâtel, they constituted basically a non-marketing society. At Burgäschisee, which is the only site not directly on Lake Neuchâtel, there is further evidence that not all livestock was exchanged with neighbouring groups: the goat/sheep there is noticeably smaller than in other coeval lake-side settlements, a trait which would have been lost had the animals come from a joint pool of livestock. A self-sufficient non-marketing economy has no need for money for commercial purposes. It seems to us that the MNA system is basically market-orientated and although the basic ingredients of MNA could easily and attractively be incorporated into our model, it does not by itself fit the facts in their entirety. It does appear, however, that the copper beads are ideally explained in terms of their dual nature of commodity and non-commodity, whose production from the ore needs special skill, which the Cortaillod society clearly did not possess, and thus they must have valued it highly. This imported material had scarcity value and objects not needed directly as tools, such as axes, would tend to become the favourite medium of barter. In the non-market economy with which we are dealing, it would then tend to become means of non-commercial payment and prestige items. The beads were therefore automatically valuables such as were used by the Zande for payments of obligatory gifts and other social commitments.

It could be shown that the beads which are together on one string now have not always been together. Thus individual beads and not whole sets had changed hands. This does not agree with a hypothesis that beads were purely ornamental, but rather supports the special purpose money/gift model.

The fact that no such beads are known by any of the neighbouring cultural groups, with which the Cortaillod peoples are known to have had contact, almost automatically excludes their use for external commercial activities.

Finally there are numerous similarities for ring-beads, beads or rings used as currency or in social exchange systems in prehistoric (e.g. Egypt) as well as in primitive present-day societies (e.g. manillas in West Africa's currency). This lends additional circumstantial evidence to our model.

We should not like to say that the Cortaillod beads are the first value-items in prehistoric Europe. Marine spondylus shells were particularly popular during the beginning of the Neolithic in central Europe; banded flint was exported during the Mesolithic and the Neolithic period from Kielce in Poland to places such as Hungary; while jade axes, whose source has yet to be found, are distributed widely over central western Europe and Britain (see Smith 1965).

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Abstract

Ottaway, B. and Strahm, Ch.

Swiss Neolithic copper beads: currency, ornament or prestige items?

The Cortaillod culture, settled around the lakes of west Switzerland, is the only culture in this part of Europe of its time (mid-fourth millennium B.C.) known to have accumulated copper beads, although it did not itself work copper, unlike the contemporaneous Pfyn culture of northern Switzerland. The possibility that these beads were a form of currency or basis of exchange is examined in the light of several ethnographic examples. Using the detailed excavation results from the settlement at Burgäschisee-Süd, a model of the economic relationships of the Cortaillod village is proposed in which the beads might have been used for social exchange or functioned as a special purpose money.

Trade patterns in the Central Highlands of Peru in the first millennium B.C.

David L. Browman

In reconstructing the development of the pristine state in Peru, a number of basic assumptions have been made. After consideration of the economic interactions of the Jauja-Huancayo polity in the Central Andes during the first millennium B.C., I would propose modifying two of these assumptions. In simple terms, the two are, first, that with the advent of a suitable number and range of domesticated plant species, the Peruvian populace inexorably adopted patterns of settled agricultural village life; and second, that the Chavin religious cult (here used synonymously with the pristine Peruvian state) extended throughout Peru, following its first major expansion of approximately 1200-1000 B.C. (uncorrected radiocarbon years).

In many areas of Peru, agriculture did begin to play an increasingly important role between 3000 and 1500 B.C., with greater quantities and varieties of domestic plants being exploited, and with a general increase in the tempo of cultural change (MacNeish and others 1970; Moseley 1972; Patterson 1971a). Since food production required inhabitants to spend more time each year in one place than they had previously, permanent settlements eventually emerged in many areas. In return for a dependable food supply, the early Peruvian agriculturalist sacrificed mobility and variety of diet; he traded his role as a generalist in the acquisition or production of food, for that of a specialist. To provide the power and the complex technology (such as elaborate irrigation works that involve skilful engineering, or agricultural terracing that requires careful construction and yearly upkeep), the agricultural society needed a much more sophisticated political structure than was previously required.

It is proposed that one measure of increasing sedentism should be increasing trade. The sedentary agricultural communities would no longer have direct access to certain resources utilized under their previous more nomadic hunting and gathering regime. Trade is a major mechanism by which former ecological zones could still be exploited by increasingly sedentary agriculturalists. Economic dependence on trade and the redistribution of food would encourage a more sophisticated political system, which could provide stability for economic growth and mobilize the populace for the successful exploitation of resources within the trade complex. The location of such developing political centres and their spheres of influence should help us to understand the development of the pristine state.

Twelve months of fieldwork in the Peruvian Andes by this writer provide the data against which our basic assumptions are compared. The locus of research was the Jauja-

Plate 5a Jasper seal from Megiddo, eighth century B.C. Length 3.7 cm. (Pritchard 1954: 85 no. 276)



Plate 5b Electrum coin from Ephesus, seventh-sixth century B.C. Length 2.4 cm. (Head 1911: 571.) Drawing by M. Alterman. London, British Museum



Plate 6a Silver disc from Zinçirli, eighth century B.C. Diameter 8.5 cm. (Balmuth 1971: plate 3e.) Berlin, Staatliche Museen *Plate 6b* Seal impression from Zinçirli, eighth century B.C. Diameter 1.1 cm. (Andrae 1943: plate 38b) *Plate 6c* Silver coin from Zinçirli, eighth century B.C. Diameter 8.5 cm. (Andrae 1943: plate 58u.) Berlin, Staatliche Museen

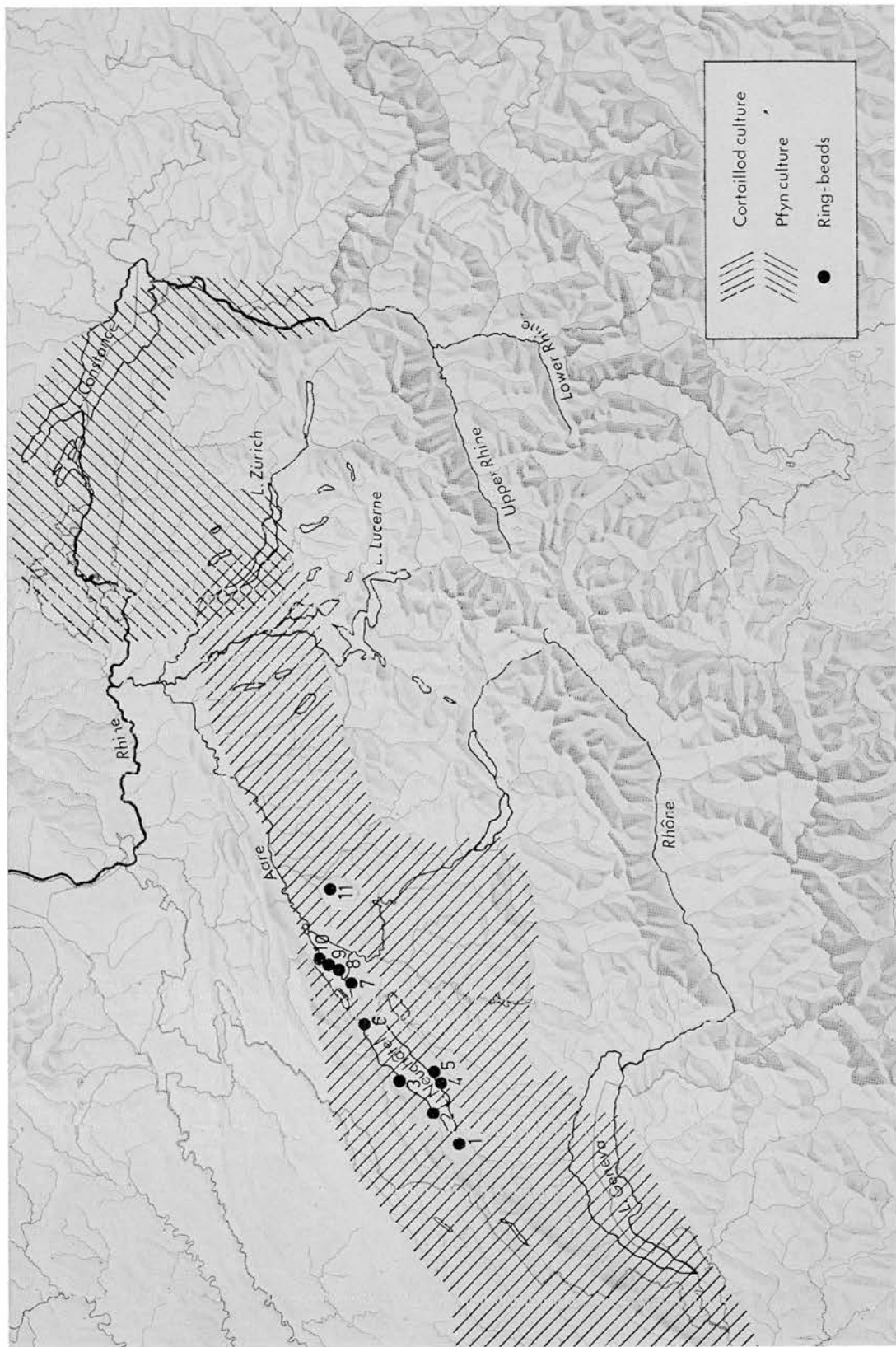


Plate 7 Distribution of the Cortaillod and Pfyn cultures in Switzerland. The numbers refer to sites where ring-beads of copper have been found: 1. Baulmes, Abr. de la Cure; 2. Concise; 3. Cortaillod; 4. Estavayer; 5. Font; 6. Mar n-Epagnier, Préfargier; 7. Lüscherz; 8. Gerolfingen, Oefeli; 9. Mar n-Epagnier, Préfargier; 10. Mar n-Epagnier, Préfargier; 11. Mar n-Epagnier, Préfargier.

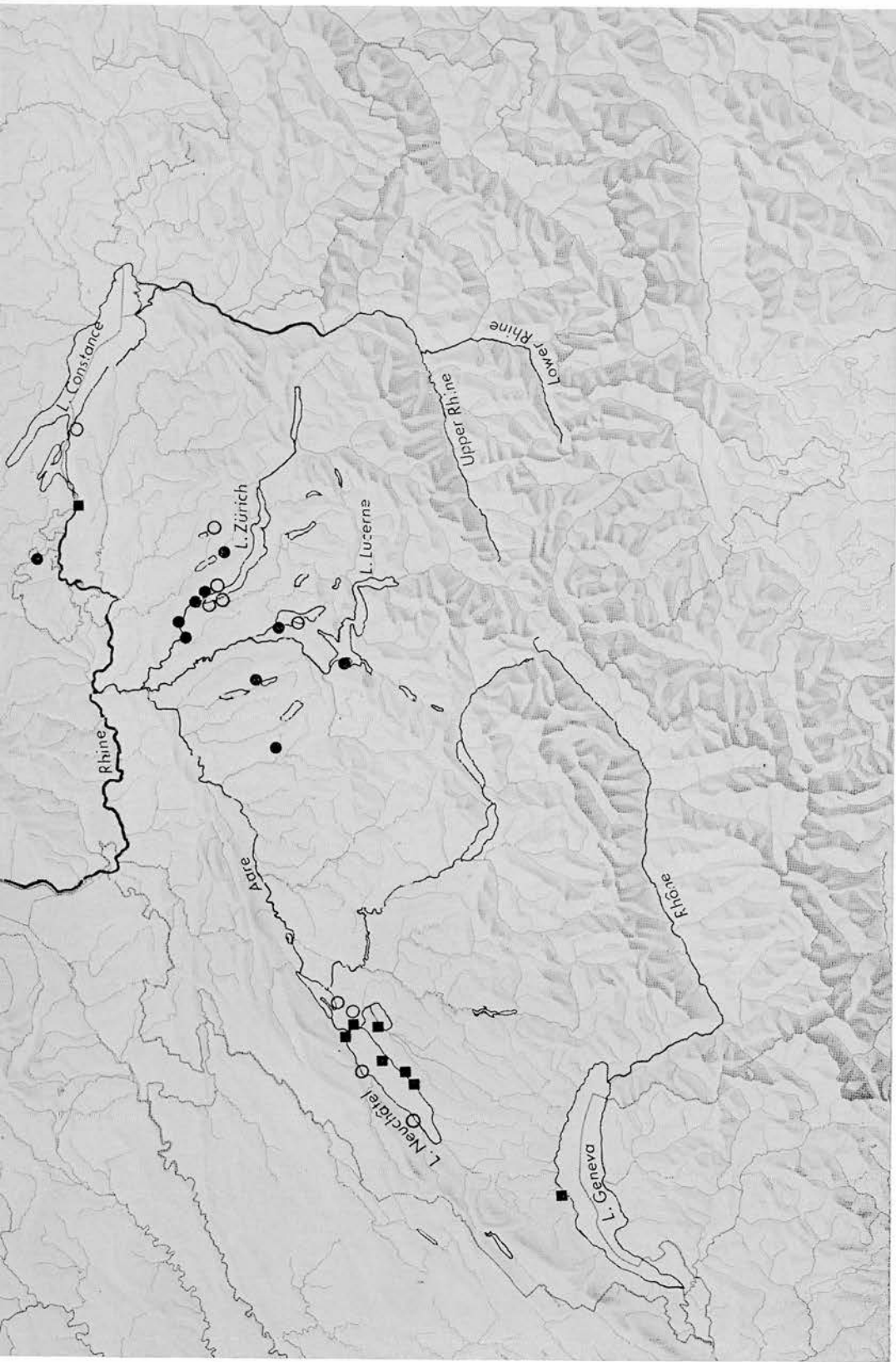


Plate 8 Distribution of the three groups of copper flat axes distinguished by DFA: ● = Mostly original type Thayngen (Cham, St. Andreas; Dietikon; Egolzwil 4; Hitzkirch, Seematte; Horw; Katzensee; Mönch-altdorf, Sack; Thayngen, Weier; Zürich, Limmat; Qua brücke); ■ = Mostly original type Bevaix (Estavayer, Mont-sur-Rolle; Pré-argier; St. Blaise; Vallamand; Lake Neuchâtel.); ○ = Mixed types Thayngen and Bevaix (Auvernier; Concise; P. éfargier; Risch, Schwarzbach; Vinelz; Wetzikon, Robenhäusen; Zürich, Bauschanze; Zürich-Wollishofen (2))

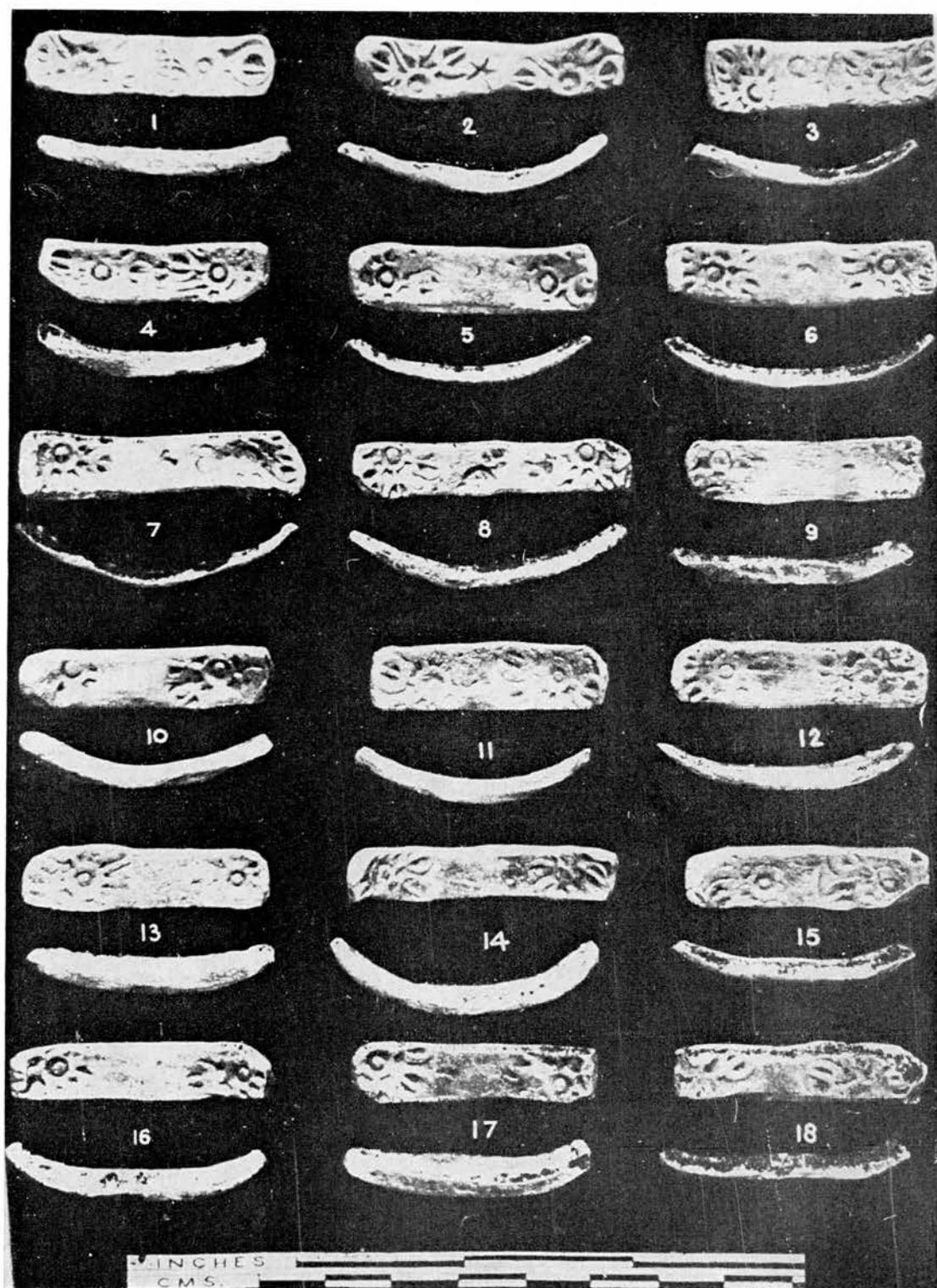


Plate 9 Bent bars from Taxila

Ottaway
Ph. D., 1979.
Th. Sect. 2.

Print-Out A. Run on 362 Copper Objects.

Clustering Type 7.

			Copper Clusters	Boundary Value
	34	SAM 2879-.		
0.000	35	SAM 2880-I		
0.000	68	SAM 2914-I		
0.000	70	SAM 2916-'-.		
-0.000	32	SAM 2877-. I-		-0.5
0.000	75	SAM 2921-'-. I I		
-0.000	16	SAM 2833-'-. I I		I
-0.000	67	SAM 2913-'-' I		I
-0.006	40	SAM 2885-. I-		I
0.000	63	SAM 2909-I I I		V
0.000	66	SAM 2912-I I I		
0.000	69	SAM 2915-I I I		
0.000	73	SAM 2919-I I I		
0.000	78	SAM 2924-'-. I I		
-0.002	140	SAM 3049-. I-' I		
-0.000	143	SAM 3086-'-' I		
-0.027	10	SAM 2776-'-.		
-0.057	47	SAM 2893-. I-		
0.000	50	SAM 2896-'-. I I		
-0.000	43	SAM 2888-. I-. I I		
-0.000	45	SAM 2890-'-' I I I		
-0.000	42	SAM 2887-. I-. I I		
-0.000	48	SAM 2894-'-' I I I		
-0.000	146	SAM 3089-'-. I I	1.1	
-0.000	33	SAM 2878-. I-. I I		
-0.000	38	SAM 2883-'-' I I I		
-0.005	46	SAM 2891-. I-. I I		
0.000	55	SAM 2901-I I I I		
0.000	56	SAM 2902-I I I I		
0.000	57	SAM 2903-'-. I I I I		
-0.000	60	SAM 2906-'-. I I I I		
-0.000	59	SAM 2905-. I-. I I I I		
0.000	61	SAM 2907-'-. I I I I I I		
-0.000	49	SAM 2895-'-. I I I I I I		
-0.000	44	SAM 2889-'-' I I I I I		
-0.002	54	SAM 2900-. I-' I I I		
0.000	62	SAM 2908-'-. I I I I		
-0.000	37	SAM 2882-'-. I I I I		
-0.000	51	SAM 2897-. I-' I I I		
-0.000	58	SAM 2904-'-' I I I		
-0.023	289	O&W 1184-'-' I		
-0.077	88	SAM 2962-'-.		
-0.149	19	SAM 2836-. I-		
-0.000	23	SAM 2841-'-. I I		
-0.001	256	SAM22236-'-. I I		
-0.005	144	SAM 3087-'-' I		
				I

-2.298	41	SAM 2886-		I
0.000	52	SAM 2898-I		I-
0.000	53	SAM 2899-I		I I
0.000	65	SAM 2911-I		I I
0.000	74	SAM 2920-'-		I I
-0.000	31	SAM 2876-'-		I I
-0.000	39	SAM 2884-. I-		I I
0.000	64	SAM 2910-I I I		I I
0.000	71	SAM 2917-I I I		I I
0.000	72	SAM 2918-I I I		I I
0.000	166	SAM 3660-'-' I		I I
-0.000	170	SAM 3690-. I-		I I
0.000	173	SAM 3753-I I I		I I
0.000	183	SAM 3780-I I I		I I
0.000	204	SAM 4925-I I I		I I
0.000	210	SAM 4931-I I I		I I
0.000	213	SAM 4934-I I I		I I
0.000	214	SAM 4936-I I I		I I
0.000	216	SAM 4938-I I I		I I
0.000	226	SAM 6643-'-' I		I I
-0.000	161	SAM 3638-. I-		I I
0.000	212	SAM 4933-I I I		I I
0.000	217	SAM 4939-'-. I I		I I
-0.000	227	SAM 6644-'-. I I		I I
-0.000	215	SAM 4937-. I-. I I		I I
0.000	218	SAM 4940-'-. I I I I		I I
-0.000	220	SAM 4942-'-' I I I		I I
-0.000	219	SAM 4941-'-' I		I I
-0.001	206	SAM 4927-. I-		I I
0.000	207	SAM 4928-'-' I		I I
-0.001	265	O&W 6-'-. I I		I I
-0.002	224	SAM 6080-'-. I I		I I
-0.004	27	SAM 2845-. I-. I I		I I
-0.000	133	SAM 3033-'-. I I		I I
-0.000	5	SAM 2474-. I-. I I		I I
-0.000	164	SAM 3642-'-. I I I I		I I
-0.000	211	SAM 4932-'-' I I I		I I
-0.003	266	O&W 87-'-' I		I I
-0.021	163	SAM 3641-. I-. I I		I I
-0.003	171	SAM 3730-'-' I		I I
-0.039	264	SAM23056-'-. I I		I I
-0.043	168	SAM 3667-. I-. I I		I I
-0.000	208	SAM 4929-'-. I I		I I
-0.001	209	SAM 4930-'-. I I		I I
-0.001	202	SAM 4896-'-. I I		I I
-0.007	221	SAM 4943-'-' I		I I
-0.134	165	SAM 3659-. I-. I I		I I
-0.021	199	SAM 4638-'-' I		I I
-0.294	270	O&W 155-. I-. I I		I I
-0.087	321	BAR 29-'-' I		I I
				I

			I	I	I
			I	I	I
-0.536	197	SAM 4636-	I-	I	I
-0.001	205	SAM 4926--	I	I	I
-0.006	198	SAM 4637--	I	I	I
-0.019	36	SAM 2881--	I	I	I
-0.096	314	BAR 15-	I-	I	I
-0.051	338	BAR 64--	I	I	I
-0.134	255	SAM22235-	I-	I	I
-0.061	316	BAR 20--	I	I	I
-0.213	353	BAR 96-	I-	I	I
-0.089	359	BAR 102--	I	I	I
			I	I	I

1.3

			I	I	I
			I	I	I
-0.676	257	SAM22240-	I-	I	I
-0.007	267	O&W 98--	I	I	I
-0.017	232	SAM 7280--	I	I	I
-0.048	192	SAM 4348-	I-	I	I
-0.013	268	O&W 99--	I	I	I
-0.030	280	O&W 307--	I	I	I
-0.163	139	SAM 3046--	I	I	I
			I	I	I
			I	I	I

1.4

			I	I	I
			I	I	I
-0.862	190	SAM 4346-	I-	I	I
-0.000	237	SAM14467--	I	I	I
-0.000	185	SAM 4341--	I	I	I
-0.002	238	SAM14469--	I	I	I
-0.008	91	SAM 2988-	I-	I	I
-0.001	99	SAM 2996--	I	I	I
-0.004	189	SAM 4345--	I	I	I
-0.012	186	SAM 4342-	I-	I	I
-0.003	279	O&W 278--	I	I	I
-0.017	111	SAM 3008--	I	I	I
-0.052	1	SAM 8-	I-	I	I
-0.001	235	SAM14465--	I	I	I
-0.004	98	SAM 2995-	I-	I	I
-0.001	203	SAM 4897--	I	I	I
-0.007	108	SAM 3005-	I-	I	I
-0.001	172	SAM 3731--	I	I	I
-0.003	275	O&W 253--	I	I	I
-0.011	273	O&W 234--	I	I	I
-0.065	102	SAM 2999-	I-	I	I
-0.000	103	SAM 3000--	I	I	I
-0.001	101	SAM 2998--	I	I	I
-0.002	105	SAM 3002--	I	I	I
-0.011	128	SAM 3025--	I	I	I
			I	I	I

1.5

			I	I	I	I
-10.265	297	O&W 1298-	I-	I	I	I
-0.007	304	O&W 1315--	I	I	I	I
-0.129	12	SAM 2778-	I-	I	I	I
-0.021	306	O&W 1319--	I	I	I	I
-0.065	81	SAM 2927--	I	I	I	I
-0.079	142	SAM 3066--	I	I	I	I
-0.473	300	O&W 1311-	I-	I	I	I
-0.015	303	O&W 1314--	I	I	I	I
-0.030	305	O&W 1316--	I	I	I	I
-0.094	352	BAR 95--	I	I	I	I
-0.777	131	SAM 3028-	I-	I	I	I
-0.187	349	BAR 90--	I	I	I	I
-2.406	291	O&W 1242-	I-	I	I	I
-0.016	292	O&W 1248--	I	I	I	I
-0.042	302	O&W 1313--	I	I	I	I
-0.141	11	SAM 2777--	I	I	I	I
-0.237	301	O&W 1312--	I	I	I	I
-0.482	293	O&W 1249--	I	I	I	I

7

-22.196	222	SAM 5190-	I-	I	I	I
-0.003	223	SAM 5191--	I	I	I	I
-0.067	196	SAM 4439-	I-	I	I	I
-0.009	285	O&W 446--	I	I	I	I
-0.362	26	SAM 2844--	I	I	I	I
-1.026	180	SAM 3774-	I-	I	I	I
-0.005	182	SAM 3776--	I	I	I	I
-0.121	178	SAM 3772-	I-	I	I	I
-0.022	181	SAM 3775--	I	I	I	I
-0.053	179	SAM 3773--	I	I	I	I
-0.646	160	SAM 3633-	I-	I	I	I
-0.122	225	SAM 6373--	I	I	I	I

8

-6.693	340	BAR 66-	I-	I	I	I
-0.006	345	BAR 77--	I	I	I	I
-0.029	14	SAM 2787--	I	I	I	I
-0.120	244	SAM14478-	I-	I	I	I
-0.059	362	AXX 1--	I	I	I	I
-0.218	250	SAM22223--	I	I	I	I
-0.408	252	SAM22229-	I-	I	I	I
-0.013	263	SAM22264--	I	I	I	I
-0.018	253	SAM22233--	I	I	I	I
-0.065	13	SAM 2785-	I-	I	I	I
-0.024	323	BAR 31--	I	I	I	I
-0.169	254	SAM22234--	I	I	I	I
-1.311	132	SAM 3032-	I-	I	I	I
-0.169	269	O&W 120--	I	I	I	I
-1.665	176	SAM 3770-	I-	I	I	I
-0.013	177	SAM 3771--	I	I	I	I
-0.034	287	O&W 634--	I	I	I	I
-0.106	286	O&W 465--	I	I	I	I
-0.358	322	BAR 30-	I-	I	I	I
-0.020	324	BAR 32--	I	I	I	I

9

-53.010	79	SAM 2925-	I I
-0.000	154	SAM 3115--'	I-
-0.000	276	O&W 254--'	I
-0.001	175	SAM 3757--'	I
-0.005	158	SAM 3615-. I-	I
-0.001	233	SAM 7293--' I	I
-0.011	174	SAM 3754-. I-	I
-0.001	236	SAM14466--' I	I
-0.045	147	SAM 3090-. I-	I
-0.003	281	O&W 315--' I I	I
-0.010	278	O&W 256-. I-' I	I
-0.004	327	BAR 37--' I	I
-0.271	231	SAM 7279-. I-	I
-0.081	354	BAR 97--' I	I
-0.423	320	BAR 28-. I-	I
-0.198	328	BAR 42--' I I	I
-0.282	298	O&W 1299--' I	I
-1.226	24	SAM 2842-. I-	I
-0.014	82	SAM 2929--' I I	I
-0.105	261	SAM22244--' I	I
-1.780	3	SAM 10-. I-	I
-0.004	258	SAM22241--' I I I	I
-0.014	195	SAM 4351--' I I I	I
-0.051	343	BAR 69--' I I I	I
-0.216	2	SAM 9-. I-. I I I	I
-0.009	188	SAM 4344--' I I I I I	I
-0.040	282	O&W 334--' I I I I I	I
-0.456	356	BAR 99-. I-' I I	I
-0.033	360	BAR 103--' I I I	I
-0.310	283	O&W 335--' I I	I
-5.458	148	SAM 3092-. I-	I-
-0.000	150	SAM 3094--' I	I
-0.003	277	O&W 255--' I	I
-0.015	153	SAM 3100--' I	I
-0.032	151	SAM 3095-. I-. I	I
-0.001	260	SAM22243--' I I I	I
-0.013	228	SAM 7046--' I I	I
-0.165	77	SAM 2923-. I-. I	I
-0.001	149	SAM 3093--' I I I	I
-0.002	159	SAM 3617--' I I I	I
-0.009	248	SAM21674-. I-. I I I	I
-0.002	271	O&W 232--' I I I I I	I
-0.004	9	SAM 2481-. I-' I I I I	I
-0.002	194	SAM 4350--' I I I I	I
-0.060	125	SAM 3022-. I-' I I	I
-0.002	127	SAM 3024--' I I I	I
-0.005	193	SAM 4349--' I I I	I
-0.023	129	SAM 3026-. I-. I I I	I
-0.008	138	SAM 3044--' I I I I	I
-0.043	284	O&W 352--' I I	I
-1.176	152	SAM 3096-. I-	I-
-0.001	274	O&W 235--' I	I
-0.012	8	SAM 2478--' I	I
-0.088	157	SAM 3613-. I-. I	I
-0.006	201	SAM 4895--' I I I	I
-0.009	272	O&W 233--' I I I	I
-0.041	93	SAM 2990-. I-' I I	I
-0.007	94	SAM 2991--' I I I	I
-0.011	124	SAM 3021--' I I I	I
-0.018	106	SAM 3003--' I I	I
-0.159	104	SAM 3001-. I-. I	I
-0.004	259	SAM22242--' I I I	I
-0.029	96	SAM 2993-. I-' I I	I
-0.005	126	SAM 3023--' I I	I
-0.326	229	SAM 7073--' I	I

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Print-Out C. Run on 81 Bronze Objects, all Elements used.

Clustering Type 7

		Bronze Clusters	Boundary Value
-0.015	13	SAM 3038-. I-	
	23	SAM 3099-'-. I I	
-0.067	48	O&W 177-'-. I I	
-0.094	11	SAM 2975-. I-	
-0.031	40	SAM 4901-'-' I	-5.1
-0.235	29	SAM 3153-'-. I I	
-0.528	27	SAM 3151-. I-	
-0.084	36	SAM 4635-'-. I I	
-0.110	38	SAM 4899-'-' I	
-0.793	21	SAM 3097-. I-	
-0.060	22	SAM 3098-'-. I I	
-0.276	43	SAM 6089-'-' I	
-1.105	3	SAM 2831-. I-	
-0.019	9	SAM 2943-'-. I I	
-0.117	6	SAM 2932-'-. I I	d
-0.512	77	BAR 75-. I-' I	
-0.025	78	BAR 76-'-' I	
-3.051	24	SAM 3112-. I-	
-0.018	49	O&W 401-'-. I I	
-0.026	14	SAM 3039-'-. I I	
-0.075	5	SAM 2867-'-. I I	
-0.176	51	O&W 1209-'-. I I	
-0.502	15	SAM 3040-. I-. I I	
-0.216	73	BAR 71-'-' I I I	
-0.809	60	BAR 16-. I-. I I	
-0.437	66	BAR 24-'-' I I I	
-0.975	39	SAM 4900-'-' I	

-13.597	4	SAM 2848-. I-	
-0.032	10	SAM 2974-'-. I	
-0.250	1	SAM 7-'-. I	
-0.516	74	BAR 72-'-. I	
-0.859	52	O&W 1273-. I-. I	
-0.050	53	BAR 3-'-' I I	
-1.240	2	SAM 2820-. I-. I	
-0.102	46	SAM 7104-'-' I I	
-4.336	8	SAM 2940-. I-. I	e
-0.038	35	SAM 3616-'-. I I I	
-0.146	50	O&W 1049-'-. I I I	
-0.232	20	SAM 3078-'-. I I I	
-0.451	59	BAR 14-. I-. I I I	
-0.318	75	BAR 73-'-' I I I I	
-3.364	64	BAR 22-. I-' I I	
-0.068	68	BAR 35-'-. I I I	
-0.126	65	BAR 23-'-. I I I	
-0.304	67	BAR 33-'-' I I I	

-5.304	71	BAR 60-	I-	I
-0.039	72	BAR 61--	I I	I
-0.072	70	BAR 50--	I I	I
-0.161	79	BAR 78--	I I	I
-0.966	62	BAR 19-	I-	I
-0.274	69	BAR 49--	I	I

f

-7.431	37	SAM 4898-	I-	I
-0.041	44	SAM 6090--	I I I	
-0.094	33	SAM 3157- I-	I I I	
-0.079	34	SAM 3614-- I	I I I	
-0.505	16	SAM 3043- I-	I I I	
-0.227	41	SAM 6087-- I	I I I	
-0.901	12	SAM 3031- I-	I I I	
-0.180	80	BAR 87--	I I I I I	
-0.263	32	SAM 3156-- I	I I I I	
-1.376	45	SAM 7051- I-	I I	
-0.161	81	BAR 92--	I	I I
-0.335	42	SAM 6088--	I I	

a


-8.359	17	SAM 3054-	I-	
-0.051	19	SAM 3058--	I	
-0.093	18	SAM 3055--	I	
-0.341	26	SAM 3149--	I	
-0.502	7	SAM 2937- I-	I	
-0.095	47	SAM 7164-- I	I	
-0.660	28	SAM 3152--	I	
-2.128	25	SAM 3113- I-	I	
-0.112	30	SAM 3154--	I I I	
-0.453	31	SAM 3155--	I I	

b

-5.143	55	BAR 5-	I-	
-0.077	56	BAR 6--	I	
-0.125	58	BAR 12--	I	
-0.235	76	BAR 74--	I	
-0.508	54	BAR 4--	I	
-0.817	61	BAR 18- I-	I	
-0.179	63	BAR 21--	I I	
-1.398	57	BAR 11--		

c

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 Th. Sect. 2.



Print-Out B. Run on Bronze Objects, Sn masked.

Clustering Type 7

		Bronze Clusters	Boundary Value
	37	SAM 4898-.	
-0.002	44	SAM 6090-'-.	
-0.007	41	SAM 6087-'-.	
-0.048	45	SAM 7051-'-.	
-0.100	33	SAM 3157-. I-.	-5.1
-0.079	34	SAM 3614-'-' I	
-0.528	16	SAM 3043-. I-.	
-0.272	81	BAR 92-'-' I	
-0.869	12	SAM 3031-. I-.	
-0.148	32	SAM 3156-'-. I I	A
-0.227	80	BAR 87-'-' I	
-4.721	4	SAM 2848-. I-.	
-0.027	10	SAM 2974-'-. I I	
-0.161	42	SAM 6088-'-. I I	
-0.802	2	SAM 2820-. I-' I	
-0.102	46	SAM 7104-'-. I I	
-0.242	1	SAM 7-'-. I I	
-0.480	74	BAR 72-'-' I	
		I	
		I	
		I	

		I	
		I	
-8.276	17	SAM 3054-. I-.	
-0.030	19	SAM 3058-'-. I I	
-0.076	18	SAM 3055-'-. I I	
-0.333	26	SAM 3149-'-. I I	
-0.509	7	SAM 2937-. I-.	
-0.093	47	SAM 7164-'-' I I I	B
-0.668	28	SAM 3152-'-. I I	
-2.212	25	SAM 3113-. I-.	
-0.040	30	SAM 3154-'-. I I I I	
-0.437	31	SAM 3155-'-' I I I	
		I I I	
		I I I	
		I I I	

		I I I	
		I I I	
-5.513	55	BAR 5-. I-' I	
-0.056	56	BAR 6-'-. I I	
-0.112	58	BAR 12-'-. I I	
-0.200	76	BAR 74-'-. I I	C
-0.478	54	BAR 4-'-. I I	
-0.827	61	BAR 18-. I-' I	
-0.171	63	BAR 21-'-' I	
		I	

-16.363	3	SAM 2831-	I	
-0.003	13	SAM 3038--	I	
-0.008	14	SAM 3039--	I	
-0.013	23	SAM 3099--	I	
-0.036	9	SAM 2943--	I	
-0.047	24	SAM 3112-. I-	I	
-0.026	49	O&W 401--' I	I	
-0.137	11	SAM 2975-. I-	I	
-0.007	48	O&W 177--' I I	I	
-0.022	40	SAM 4901--' I I	I	
-0.038	5	SAM 2867--' I	I	
-0.495	21	SAM 3097-. I-	I	
-0.060	22	SAM 3098--' I	I	
-1.216	77	BAR 75-. I-	I	
-0.023	78	BAR 76--' I I	I	
-0.382	43	SAM 6089-. I-' I	I	D
-0.140	68	BAR 35--' I	I	
-1.691	6	SAM 2932-. I-	I	
-0.025	27	SAM 3151--' I I	I	
-0.066	36	SAM 4635--' I I	I	
-0.085	38	SAM 4899--' I I	I	
-0.589	51	O&W 1209-. I-' I	I	
-0.026	52	O&W 1273--' I I	I	
-0.088	53	BAR 3--' I	I	
-3.023	29	SAM 3153-. I-	I	
-0.115	73	BAR 71--' I I I	I	
-0.266	15	SAM 3040--' I I I	I	
-0.558	39	SAM 4900--' I I I	I	
-1.191	60	BAR 16-. I-. I I I	I	
-0.379	66	BAR 24--' I I I I	I	
-2.082	57	BAR 11-. I-' I I	I	
-0.157	67	BAR 33--' I I	I	
		I I	I I	*****
		I I	I I	
-7.686	8	SAM 2940-. I-'	I	
-0.031	35	SAM 3616--' I	I	
-0.068	50	O&W 1049--' I	I	
-0.247	20	SAM 3078-. I-	I	E
-0.218	59	BAR 14--' I I	I	
-0.373	75	BAR 73--' I	I	
		I I	I I	*****
		I I	I I	
-5.314	71	BAR 60-. I-'	I	
-0.036	72	BAR 61--' I	I	
-0.073	70	BAR 50--' I	I	
-0.151	79	BAR 78--' I	I	
-0.732	64	BAR 22-. I-. I	I	F
-0.132	65	BAR 23--' I I	I	
-0.986	62	BAR 19-. I-'	I	
-0.270	69	BAR 49--' I	I	

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 Th. Sect. 2.

Print-Out D. Discriminant Analysis on 362 Copper Analyses, grouped, a priori, by Cluster Analysis.

ARRAY LINE	PERCENTAGE PROBABILITY	OPTIMAL SUB-GROUP	USERS CODE	CLUSTER NUMBER
		OF GROUP ONE		
1	10	1	SAM 2776	
2	16	1	SAM 2833	
3	19	1	SAM 2836	
4	23	1	SAM 2841	
5	32	1	SAM 2877	
6	33	1	SAM 2878	
7	34	1	SAM 2879	
8	35	1	SAM 2880	
9	37	1	SAM 2882	
10	38	1	SAM 2883	
11	40	1	SAM 2885	
12	42	1	SAM 2887	
13	43	1	SAM 2888	
14	44	1	SAM 2889	
15	45	1	SAM 2890	
16	46	1	SAM 2891	
17	47	1	SAM 2893	
18	48	1	SAM 2894	
19	49	1	SAM 2895	
20	50	1	SAM 2896	
21	51	1	SAM 2897	1.1
22	54	1	SAM 2900	
23	55	1	SAM 2901	
24	56	1	SAM 2902	
25	57	1	SAM 2903	
26	58	1	SAM 2904	
27	59	1	SAM 2905	
28	60	1	SAM 2906	
29	61	1	SAM 2907	
30	62	1	SAM 2908	
31	63	1	SAM 2909	
32	66	1	SAM 2912	
33	67	1	SAM 2913	
34	68	1	SAM 2914	
35	69	1	SAM 2915	
36	70	1	SAM 2916	
37	73	1	SAM 2919	
38	75	1	SAM 2921	
39	78	1	SAM 2924	
40	88	1	SAM 2962	
41	140	1	SAM 3049	
42	143	1	SAM 3086	
43	144	1	SAM 3087	
44	146	1	SAM 3089	
45	256	1	SAM22236	
46	289	1	O&W 1184	

47	5	100.0	2	SAM 2474
48	27	100.0	2	SAM 2845
49	31	100.0	2	SAM 2876
50	39	100.0	2	SAM 2884
51	41	100.0	2	SAM 2886
52	52	100.0	2	SAM 2898
53	53	100.0	2	SAM 2899
54	64	100.0	2	SAM 2910
55	65	100.0	2	SAM 2911
56	71	100.0	2	SAM 2917
57	72	100.0	2	SAM 2918
58	74	100.0	2	SAM 2920
59	133	100.0	2	SAM 3033
60	161	100.0	2	SAM 3638
61	163	100.0	2	SAM 3641
62	164	100.0	2	SAM 3642
63	165	84.7	2	SAM 3659
64	166	100.0	2	SAM 3660
65	168	100.0	2	SAM 3667
66	170	100.0	2	SAM 3690
67	171	100.0	2	SAM 3730
68	173	100.0	2	SAM 3753
69	183	100.0	2	SAM 3780
70	199	100.0	2	SAM 4638
71	202	100.0	2	SAM 4896
72	204	100.0	2	SAM 4925
73	206	100.0	2	SAM 4927
74	207	100.0	2	SAM 4928
75	208	100.0	2	SAM 4929
76	209	100.0	2	SAM 4930
77	210	100.0	2	SAM 4931
78	211	100.0	2	SAM 4932
79	212	100.0	2	SAM 4933
80	213	100.0	2	SAM 4934
81	214	100.0	2	SAM 4936
82	215	100.0	2	SAM 4937
83	216	100.0	2	SAM 4938
84	217	100.0	2	SAM 4939
85	218	100.0	2	SAM 4940
86	219	100.0	2	SAM 4941
87	220	100.0	2	SAM 4942
88	221	98.9	2	SAM 4943
89	224	100.0	2	SAM 6080
90	226	100.0	2	SAM 6643
91	227	100.0	2	SAM 6644
92	264	100.0	2	SAM23056
93	265	100.0	2	O&W 6
94	266	100.0	2	O&W 87
95	270	100.0	2	O&W 155
96	321	71.2	5	BAR 29

—
1.2

97	36	100.0	3	SAM 2881
98	197	100.0	3	SAM 4636
99	198	100.0	3	SAM 4637
100	205	100.0	3	SAM 4926
101	255	100.0	3	SAM22235
102	314	100.0	3	BAR 15
103	316	100.0	3	BAR 20
104	338	100.0	3	BAR 64
105	353	100.0	3	BAR 96
106	359	100.0	3	BAR 102

1.3

107	139	100.0	4	SAM 3046
108	192	100.0	4	SAM 4348
109	232	100.0	4	SAM 7280
110	257	100.0	4	SAM22240
111	267	100.0	4	O&W 98
112	268	100.0	4	O&W 99
113	280	100.0	4	O&W 307

1.4

114	1	100.0	5	SAM 8
115	91	100.0	5	SAM 2988
116	98	100.0	5	SAM 2995
117	99	100.0	5	SAM 2996
118	101	100.0	5	SAM 2998
119	102	100.0	5	SAM 2999
120	103	100.0	5	SAM 3000
121	105	99.9	5	SAM 3002
122	108	100.0	5	SAM 3005
123	111	100.0	5	SAM 3008
124	128	99.5	5	SAM 3025
125	172	93.5	5	SAM 3731
126	185	100.0	5	SAM 4341
127	186	100.0	5	SAM 4342
128	189	100.0	5	SAM 4345
129	190	100.0	5	SAM 4346
130	203	98.7	5	SAM 4897
131	235	99.9	5	SAM14465
132	237	100.0	5	SAM14467
133	238	100.0	5	SAM14469
134	273	100.0	5	O&W 234
135	275	99.0	5	O&W 253
136	279	100.0	5	O&W 278

1.5

OPTIMAL
GROUP

137	6	58.7	2	SAM 2475
138	7	56.4	2	SAM 2477
139	15	49.8	2	SAM 2832
140	28	65.0	2	SAM 2846
141	29	65.0	2	SAM 2860
142	76	60.1	2	SAM 2922
143	80	60.7	2	SAM 2926
144	85	55.7	2	SAM 2941
145	86	59.2	2	SAM 2953
146	90	64.2	2	SAM 2987
147	92	63.7	2	SAM 2989
148	95	63.4	2	SAM 2992
149	97	54.2	2	SAM 2994
150	100	51.1	2	SAM 2997
151	107	63.0	2	SAM 3004
152	109	62.4	2	SAM 3006
153	110	53.5	2	SAM 3007
154	112	59.6	2	SAM 3009
155	113	59.6	2	SAM 3010
156	114	60.4	2	SAM 3011
157	115	59.6	2	SAM 3012
158	116	60.4	2	SAM 3013
159	117	58.7	2	SAM 3014
160	118	61.8	2	SAM 3015
161	119	55.5	2	SAM 3016
162	120	64.8	2	SAM 3017
163	121	64.5	2	SAM 3018
164	122	61.8	2	SAM 3019
165	123	62.4	2	SAM 3020
166	156	52.4	2	SAM 3612
167	162	63.3	2	SAM 3640
168	167	63.2	2	SAM 3661
169	169	53.9	2	SAM 3669
170	184	60.7	2	SAM 4340
171	187	64.9	2	SAM 4343
172	191	51.4	2	SAM 4347
173	230	59.8	2	SAM 7108
174	239	56.7	2	SAM14470
175	240	56.2	2	SAM14472
176	241	64.6	2	SAM14473
177	243	60.5	2	SAM14477
178	247	62.8	2	SAM18029
179	249	65.4	2	SAM22141
180	342	65.3	2	BAR 68
181	358	66.0	2	BAR 101

2

182	18	95.6	3	SAM 2835
183	20	94.5	3	SAM 2837
184	22	83.7	3	SAM 2839
185	87	39.2	1	SAM 2954
186	200	86.5	3	SAM 4639
187	234	95.6	3	SAM 7790
188	251	91.8	3	SAM22228
189	262	93.3	3	SAM22249
190	288	93.4	3	O&W 1183
191	299	63.9	3	O&W 1300
192	307	93.3	3	O&W 1321
193	341	63.4	3	BAR 67

3

194	17	98.3	3	SAM 2834
195	21	100.0	4	SAM 2838
196	25	100.0	4	SAM 2843
197	83	100.0	4	SAM 2931
198	84	100.0	4	SAM 2939
199	89	100.0	4	SAM 2963
200	130	95.1	3	SAM 3027
201	141	94.7	4	SAM 3063
202	145	100.0	4	SAM 3088
203	294	99.8	4	O&W 1269
204	295	90.2	3	O&W 1296
205	296	87.3	3	O&W 1297
206	309	76.3	3	BAR 7
207	310	92.4	3	BAR 8
208	313	100.0	4	BAR 13
209	326	75.5	10	BAR 36
210	337	100.0	4	BAR 63
211	344	93.6	3	BAR 70
212	348	70.8	4	BAR 89
213	350	100.0	4	BAR 91

4

214	308	95.1	10	BAR 2
215	311	99.8	7	BAR 9
216	312	49.0	2	BAR 10
217	315	100.0	5	BAR 17
218	317	100.0	5	BAR 25
219	318	61.3	1	BAR 26
220	319	79.2	5	BAR 27
221	325	63.3	1	BAR 34
222	329	90.5	5	BAR 43
223	330	100.0	5	BAR 44
224	331	100.0	5	BAR 45
225	332	100.0	5	BAR 46
226	333	100.0	5	BAR 47
227	334	79.6	5	BAR 48
228	336	100.0	5	BAR 62
229	346	99.8	5	BAR 86
230	347	44.2	1	BAR 88
231	351	100.0	8	BAR 93
232	355	62.5	2	BAR 98
233	357	61.6	1	BAR 100
234	361	65.3	1	BAR 104

5

235	4	100.0	6	SAM 794
236	30	100.0	6	SAM 2862
237	134	100.0	6	SAM 3036
238	135	39.6	1	SAM 3037
239	136	100.0	6	SAM 3041
240	137	100.0	6	SAM 3042
241	155	100.0	6	SAM 3150
242	242	57.3	1	SAM14475
243	245	63.4	1	SAM14479
244	246	62.7	1	SAM16600
245	290	99.4	6	O&W 1207
246	335	100.0	6	BAR 53
247	339	61.0	1	BAR 65

6

248	11	62.9	1	SAM 2777
249	12	100.0	7	SAM 2778
250	81	100.0	7	SAM 2927
251	131	58.2	1	SAM 3028
252	142	100.0	7	SAM 3066
253	291	61.1	1	O&W 1242
254	292	97.3	7	O&W 1248
255	293	86.6	7	O&W 1249
256	297	100.0	7	O&W 1298
257	300	99.4	7	O&W 1311
258	301	49.0	1	O&W 1312
259	302	62.6	1	O&W 1313
260	303	94.4	7	O&W 1314
261	304	100.0	7	O&W 1315
262	305	93.4	7	O&W 1316
263	306	99.8	7	O&W 1319
264	349	62.2	7	BAR 90
265	352	44.6	7	BAR 95

7

266	26	100.0	8	SAM 2844
267	160	66.8	1	SAM 3633
268	178	100.0	8	SAM 3772
269	179	100.0	8	SAM 3773
270	180	100.0	8	SAM 3774
271	181	100.0	8	SAM 3775
272	182	100.0	8	SAM 3776
273	196	100.0	8	SAM 4439
274	222	100.0	8	SAM 5190
275	223	100.0	8	SAM 5191
276	225	70.2	1	SAM 6373
277	285	100.0	8	O&W 446

8

278	13	100.0	9	SAM 2785
279	14	40.9	1	SAM 2787
280	132	63.6	1	SAM 3032
281	176	100.0	9	SAM 3770
282	177	100.0	9	SAM 3771
283	244	51.6	1	SAM14478
284	250	43.6	1	SAM22223
285	252	100.0	9	SAM22229
286	253	100.0	9	SAM22233
287	254	100.0	9	SAM22234
288	263	100.0	9	SAM22264
289	269	63.0	1	O&W 120
290	286	64.5	9	O&W 465
291	287	100.0	9	O&W 634
292	322	100.0	9	BAR 30
293	323	100.0	9	BAR 31
294	324	100.0	9	BAR 32
295	340	85.2	9	BAR 66
296	345	90.2	9	BAR 77
297	362	97.9	9	AXX 1

9

298	2	51.0	10	SAM	9
299	3	98.1	10	SAM	10
300	8	61.0	2	SAM	2478
301	9	56.9	10	SAM	2481
302	24	100.0	10	SAM	2842
303	77	52.4	10	SAM	2923
304	79	99.8	10	SAM	2925
305	82	100.0	10	SAM	2929
306	93	64.5	2	SAM	2990
307	94	64.8	2	SAM	2991
308	96	62.9	2	SAM	2993
309	104	61.4	2	SAM	3001
310	106	63.9	2	SAM	3003
311	124	63.8	2	SAM	3021
312	125	47.3	2	SAM	3022
313	126	62.5	2	SAM	3023
314	127	47.0	2	SAM	3024
315	129	52.3	10	SAM	3026
316	138	66.1	10	SAM	3044
317	147	99.9	10	SAM	3090
318	148	80.3	10	SAM	3092
319	149	59.3	10	SAM	3093
320	150	80.4	10	SAM	3094
321	151	93.6	10	SAM	3095
322	152	50.8	2	SAM	3096
323	153	84.5	10	SAM	3100
324	154	99.8	10	SAM	3115
325	157	64.2	2	SAM	3613
326	158	98.4	10	SAM	3615
327	159	52.0	10	SAM	3617
328	174	99.9	10	SAM	3754
329	175	99.4	10	SAM	3757
330	188	77.0	10	SAM	4344
331	193	50.8	2	SAM	4349
332	194	48.8	10	SAM	4350
333	195	99.9	10	SAM	4351
334	201	63.4	2	SAM	4895
335	228	87.8	10	SAM	7046
336	229	61.5	2	SAM	7073
337	231	70.5	10	SAM	7279
338	233	99.3	10	SAM	7293
339	236	99.5	10	SAM1	4466
340	248	65.4	10	SAM2	1674
341	258	99.7	10	SAM2	2241
342	259	58.8	2	SAM2	2242
343	260	95.0	10	SAM2	2243
344	261	100.0	10	SAM2	2244
345	271	57.8	10	O&W	232
346	272	61.8	2	O&W	233
347	274	54.9	2	O&W	235
348	276	99.7	10	O&W	254
349	277	69.7	10	O&W	255
350	278	100.0	10	O&W	256
351	281	100.0	10	O&W	315
352	282	92.6	10	O&W	334
353	283	55.2	2	O&W	335
354	284	49.6	2	O&W	352
355	298	75.9	10	O&W	1299
356	320	100.0	10	BAR	28
357	327	99.9	10	BAR	37
358	328	100.0	10	BAR	42
359	343	100.0	10	BAR	69
360	354	53.8	2	BAR	97
361	356	99.9	10	BAR	99
362	360	91.1	7	BAR	103