# THE WESTERN STONE FORTS PROJECT 

EXCAVATIONS AT DÚN AONGHASA AND DÚN EOGHANACHTA

VOLUME 3

# The Western Stone Forts Project 

# Excavations at Dún Aonghasa and Dún Eoghanachta <br> Volume 3 

## Claire Cotter

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Dún Aonghasa:Context information (brief description of contexts in each cutting) see: Contexts Dún Aonghasa; downloadable PDF.

Dún Eoghanachta: Context information (brief description of contexts in each cutting) see: Contexts Dún Eoghanachta; downloadable PDF.

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## The results of the Western Stone Forts Project will be published in five volumes.

## First phase

Volume 1: Introduction and background to the Western Stone Forts Project.
Excavations at Dún Aonghasa: the structural evidence.

Volume 2: Excavations at Dún Aonghasa (continued).
Material remains and environmental evidence.
Summary and conclusions.
Excavations at Dún Eoghanachta.

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Excavation appendices: Dún Aonghasa and Dún Eoghanachta.
Tabulated data including finds catalogues and appendix tables.
Ancillary studies associated with the excavations at Dún Aonghasa.
Analysis relating to discard patterns of finds and food remains.

## Second phase

Volume 4: The Aran Islands.
Volume 5: Western stone forts.
The wider Atlantic province.

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## INTRODUCTION

Dún Aonghasa is one of the best-known archaeological monuments in the west of Ireland and stands at the cliff-edge on the island of Inis Mór, Aran Islands, Co. Galway. The site is a late Bronze Age hillfort built ca. 1000BC and remodelled in the early Medieval period, possibly sometime around AD 800. It has been a National Monument in state care since the late nineteenth century.

The fort was excavated in 1992-1995 as part of the Western Stone Forts Project, one of four projects initiated by the state-funded research organisation the Discovery Programme in 1992. The Western Stone Forts project focussed on a distinctive group of large stone forts. The overall research objective was to identify and investigate settlements dating from the prehistoric Iron Age (broadly the period from 500 BC to AD 500 ). Dún Aonghasa was seen as a potential candidate for a number of reasons: it seemed to belong to the hillfort class (a monument type considered to be late prehistoric in origins); it possessed a chevaux de frise (a defensive cordon made up of stone pillars); and a prehistoric fibula (a safety-pin-type brooch) had been found at the site in the nineteenth century. Impressive drystone monuments elsewhere along the Atlantic fringe of Europe (mainly in Portugal, Spain and Scotland) were securely dated to the prehistoric Iron Age. The use of chevaux de frise also appeared to belong to the same period. All in all, then, Dún Aonghasa seemed to offer good potential to help fill the gap in knowledge regarding settlement of the late prehistoric period in Ireland.

Like most archaeological excavations, the results answered some of the research questions, failed to answer others and produced some unexpected results. The fort proved to have a long history, beginning in the late Bronze Age around 1000 BC and extending down into the early medieval period around AD 1000. The late Bronze Age phase was the most easily recognisable-the characteristic cooking ware pottery and items such as broken clay moulds are good chronological indicators. A majority of the radiocarbon dates from the site also fall into the period $1100-800 \mathrm{BC}$. The early medieval horizon was comparatively poorly represented; only a small part of the finds assemblage seems to date from that period. A major refurbishment of the fort took place sometime during the last quarter of the first millennium AD , however, and the impressive appearance of the fort today is largely due to those works.

Dún Eoghanachta, also on Inis Mór and also a National Monument, is a much smaller stone fort. It belongs to the ringfort class and is a very prestigious example of a type of stone ringfort known as a cashel. A single short season of excavation carried out at the fort in 1995 showed it to have been built in the early medieval period, possibly during the ninth century.

The results of both excavations have been published as

The Western Stone Forts Project: Excavations at Dun Aonghasa and Dún Eoghanachta,Volume 1 andVolume 2 by Claire Cotter.
Wordwell, Dublin. 2012. 739pp, 579 illustrations.

The archives made available here make upVolume 3 of the Western Stone Forts series of publications:

The Western Stone Forts Project:Excavations at Dún Aonghasa and Dún Eoghanchta, Volume 3, Finds Catalogues, Raw Data Tables and Ancillary Studies by Claire Cotter 2013.

Two further volumes ( $4 \& 5$ ) associated with the Western Stone Forts project will appear in 2013. Volume 4 looks at the Aran forts as a group. Volume 5 looks at stone forts along the west coast of Ireland and in the broader Atlantic zone of northern Europe.

## Volume 3

Volume 3 has three main parts:
Parts $1 \& 2$ contain data relevant to Dún Aonghasa. Part 1 (Appendix 1 - Appendix 4) contains tabulated data, mainly finds catalogues, raw data for scientific analyses and raw data associated with the analysis of the animal bone assemblage. It includes a small number of figures. Part 2 (Appendices 5-13) is made up a series of articles or ancillary studies on aspects of the finds assemblage, metalworking / metal finds or other topics e.g. late prehistoric hillforts. These studies were carried out as part of the post-excavation work or as spin-offs from that work but were not included in the published volumes. Part 2 is preceded by a short preface and accompanied by a small number of figures.

Part 3 contains data relevant to Dun Eoghanachta. It contains two appendices: Appendix 14 is made up of finds catalogues and Appendix 15 contains the raw data associated with the analysis of the animal bone assemblage.

## VOLUME 3

## PART 1 TABULATED DATA DÚN AONGHASA

## Appendix 1 Dún Aonghasa Finds

## Appendix 1.1 Catalogue of old chert finds (N. Finlay)

\(\left.$$
\begin{array}{l|l|l|l}\hline \mathbf{1 9 1 1 . 1} & \text { Old find } & \text { Secondary chunk of chert } & \begin{array}{l}\text { MW } 15 \mathrm{~mm} \\
\text { ML 29mm } \\
\text { MTH } 11 \mathrm{~mm}\end{array} \\
\hline \mathbf{1 9 1 1 . 2} & \text { Old find } & \begin{array}{l}\text { broad convex end scraper made of chert. Fairly simple, hand } \\
\text { hammer percussion technique; un-diagnostic but would fit into a } \\
\text { later prehistoric context. }\end{array}
$$ \& ML 28 \mathrm{~mm} <br>

MTH 5 \mathrm{~mm}\end{array}\right]\)| MW: 10 mm |
| :--- |
| $\mathbf{1 9 1 1 . 3}$ |

(See Catalogue of Bronze artefacts Appendix 1.13 for descriptions of the bronze fibula and ring also found in the nineteenth century).

## LATE BRONZE AGE POTTERY

| Appendix $\mathbf{1 . 2}$ |  |  |  |
| :--- | :--- | :--- | :--- |
| Pottery quantified by context (R. Cleary) |  |  |  |
| Feature | Feature description | Number sherds | \% weight (g) |
| 9 | may be in situ layer | 23 | 0.26 |
| 10 | sub-sod layer | 22 | 0.87 |
| 14 | sub-sod layer | 64 | 2 |
| 26 | may be in situ layer | 49 | 1.43 |
| 52 | sub-sod layer | 1 | 0.02 |
| 1200 | sub-sod layer | 1 | 0.08 |
| 1201 | sub-sod layer | 2 | 0.16 |
| Total |  | 162 | $4.82 \%$ |

Appendix Table 1.2.1 Pottery from disturbed or re-deposited sub-sod layers; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 56 | redeposited, | 70 | 1.65 |
|  | $1120-910$ CalBC (Date 10) |  |  |
| Total |  | 70 | $1.65 \%$ |

Appendix Table 1.2.2 Pottery from possible backfill in structure 1; Cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 47 | Layer | 8 | 0.33 |
| 70 | Layer | 19 | 0.6 |
| 71 | layer, 1000-820 CalBC (Date 17) | 6 | 0.1 |
| 82 | Layer | 11 | 0.2 |
| 85 | Layer | 11 | 0.53 |
| 87 | Layer | 1 | 0.008 |
| 267 | Layer | 88 | 2.25 |
| Total |  | 144 | $4.018 \%$ |

Appendix Table 1.2.3 Immediate post-hearth layers, late Bronze Age, cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 257 | Layer | 5 | 0.05 |
| 262 | Layer | 8 | 0.07 |
| 271 | layer, 1130-890 CalBC (Date 27) | 32 | 0.96 |
| 279 | layer, 1070-800 (Date 38) | 107 | 1.17 |
| 281 | Layer | 92 | 2.29 |
| 282 | Layer | 8 | 0.1 |
| 283 | Layer | 38 | 0.85 |
| 289 | Layer | 28 | 0.64 |
| 290 | Layer | 47 | 1.92 |
| 291 | Layer | 11 | 0.25 |
| 295 | Layer | 6 | 0.09 |
| 296 | Layer | 4 | 0.02 |
| 297 | Layer | 24 | 0.51 |
| 1000 | Layer | 1 | 0.008 |
| Total |  | 411 | $8.928 \%$ |

Appendix Table 1.2.4 Pottery from hearth and associated occupation layers; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 88 | Layer | 25 | 1.38 |
| 251 | Layer | 1 | 0.06 |
| 253 | Layer | 94 | 1.06 |
| 255 | Layer | 14 | 0.68 |
| Total |  | 134 | $3.18 \%$ |

Appendix Table 1.2.5 Pottery from wider hearth area; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| $21 / 32$ | Layer | 396 | 22.14 |
| 22 | Layer | 12 | 0.4 |
| 36 | Layer | 1 | 0.03 |
| 94 | Layer | 4 | 0.08 |


| 95 | layer; post dating Hut 4 | 10 | 0.11 |
| :--- | :--- | :--- | :--- |
| 99 | Layer | 5 | 0.06 |
| 202 | layer; post dating Hut 6 | 61 | 1.62 |
| 1204 | Layer | 13 | 0.43 |
| 1207 | Layer | 11 | 0.2 |
| 1209 | Layer | 2 | 0.06 |
| 1212 | Layer | 68 | 0.55 |
| 1217 | Layer | 5 | 0.04 |
| Total |  | 588 | $25.72 \%$ |

Appendix Table 1.2.6 Pottery from re-deposited or in situ layers in southern half of cutting 1 , between zones of paving associated with structures.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 28 | Layer | 1 | 0.02 |
| 41 | Layer | 67 | 1.96 |
| 42 | layer, 1120-810 CalBC (Date 4) | 17 | 0.72 |
| 43 | layer, 900-770 CalBC (Date 16) | 49 | 1.43 |
| 50 B | Layer | 2 | 0.07 |
| Total |  | 107 | $3.10 \%$ |

Appendix Table 1.2.7 Pottery from in situ late Bronze Age stratigraphy; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :---: | :--- | :--- |
| 203 | layer, 1190-920 CalBC (Date 11) | 23 | 0.26 |
| 208 | layer, 1460-1120 CalBC (Date 14) | 22 | 0.87 |
| 209 | layer, 1460-1120 CalBC (Date 14) | 64 | 2 |
| Total |  | 98 | $3.66 \%$ |

Appendix Table 1.2.8 Pottery from well preserved late Bronze Age occupation build-up, pre-structure 1, cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 66 | Layer | 39 | 1.03 |
| 68 | Layer | 15 | 0.63 |
| 98 | layer, 770 - 410 CalBC (Date 9) | 14 | 0.58 |
| Total |  | 68 | $2.24 \%$ |

Appendix Table 1.2.9 Pottery from top of undisturbed late Bronze Age occupation buildup; pre-structure 1 ; west side of cutting 1 .

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 33 | Layer | 3 | 0.05 |
| 51 | layer, 770 - 410 CalBC (Date 18) | 18 | 0.24 |
| 258 | layer, 760-400 CalBC (Date 22) | 8 | 0.2 |
| Total |  | 28 | $0.49 \%$ |

Appendix Table 1.2.10 Pottery from residual late Bronze Age surface; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 69 | layer, 1010-840 CalBC (Date 21) | 4 | 0.14 |
| 76 | Layer | 279 | 7.32 |
| Total |  | 283 | $7.46 \%$ |

Appendix Table 1.2.11 Pottery from in situ pocket of late Bronze Age occupation horizon predating structures 2 and 5; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 269 | layer, 930-810 CalBC (Date 30) | 17 | 0.36 |
| 270 | Layer | 19 | 0.26 |
| Total |  | 36 | $0.62 \%$ |

Appendix Table 1.2.12 Pottery from occupation surface associated with structure 8 and area to north of it; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |


| 220 | layer, 1500-1390 CalBC (Date 15) | 28 | 0.75 |
| :--- | :--- | :--- | :--- |
| Total |  | 28 | $0.75 \%$ |

Appendix Table 1.2.13 Pottery from bedrock depression - late Bronze Age (dump?); cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 210 | Layer | 3 | 0.03 |
| 219 | Layer | 12 | 0.15 |
| 238 | Layer | 1 | 0.008 |
| 239 | Layer | 160 | 5.27 |
| 241 | Layer | 10 | 0.59 |
| 244 | Layer | 302 | 6.57 |
| 1219 | layer; 910-800 CalBC (Date 34) | 26 | 0.21 |
| 1220 | Layer | 8 | 0.07 |
| 1221 | Layer | 9 | 0.07 |
| 1224 | layer; medieval handle | 57 | 0.46 |
| 1226 | Layer | 462 | 3.77 |
| Total |  | 1126 | $18.688 \%$ |

Appendix Table 1.2.14 Pottery from in situ and disturbed layers - stratigraphically earlier than pottery in Appendix Table 1.2.7; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 216 | layer, 1270 -1050 CalBC (Date 13) | 52 | 1.13 |
| 217 | Layer | 26 | 0.86 |
| 221 | layer, 1370 - 1120 CalBC (Date 12) | 8 | 0.13 |
| Total |  | 86 | $2.12 \%$ |

Appendix Table 1.2.15 Pottery from primary level deposits adjacent to west wall; stratigraphically later than layer F220; cutting 1.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 1104 | layer, 980 -810 CalBC (Date 32) | 61 | 1.54 |
| 1105 | Layer | 1 | 0.03 |
| 1107 | layer, 1070-890 CalBC (Date 37) | 14 | 0.06 |
| 1108 | layer, 1070-890 CalBC | 18 | 0.09 |
| Total |  | 94 | $1.72 \%$ |

Appendix Table 1.2.16 Late Bronze Age habitation on east side of upper plateau, cutting 11.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 7 | Layer | 1 | 0.03 |
| 101 | Layer | 26 | 0.73 |
| 105 | layer, 920-540 CalBC (Date7) | 17 | 0.26 |
| 106 | Layer | 42 | 0.77 |
| 107 | sub-sod layer | 65 | 1.03 |
| Total |  | 151 | $2.82 \%$ |

Appendix Table 1.2.17 Pottery from late Bronze Age levels; cutting 2, middle enclosure.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 311 | upper midden | 1 | 0.07 |
| 314 | lower midden | 3 | 0.02 |
| 315 | wall core and midden upcast | 29 | 0.28 |
| Total |  | 33 | $0.37 \%$ |

Appendix Table 1.2.18 Pottery from midden cutting 3, middle enclosure.

| Feature | Feature description | Number sherds | \% weight (g) |
| :--- | :--- | :--- | :--- |
| 912 | Layer | 16 | 0.5 |
| 938 | Layer | 2 | 0.008 |
| 941 | Layer | 2 | 0.008 |
| 948 | Layer | 4 | 0.008 |
| 956 | Layer | 3 | 0.008 |


| 957 | Layer | 2 | 0.04 |
| :--- | :--- | :--- | :--- |
| 961 | Layer | 136 | 3.64 |
| 969 | Layer | 1 | 0.04 |
| 971 | Layer | 1 | 0.03 |
| 972 | Layer | 2 | 0.02 |
| 975 | Layer | 1 | 0.02 |
| 976 | Layer | 15 | 0.27 |
| 978 A | Layer | 3 | 0.02 |
| 982 | Layer | 5 | 0.15 |
| Total |  | 193 | $4.762 \%$ |

Appendix Table 1.2.19 Pottery from cutting 9, middle enclosure.

Appendix 1.3 Table of numerical and percentage weight distribution of total pottery assemblage (R. Cleary)

| Feature No. | No. of sherds | \% weight |
| :---: | :---: | :---: |
| 7 | 1 | 0.03 |
| 9 | 23 | 0.26 |
| 10 | 22 | 0.87 |
| 14 | 64 | 2.00 |
| 21 | 252 | 15.79 |
| 22 | 12 | 0.40 |
| 26 | 49 | 1.43 |
| 28 | 1 | 0.02 |
| 32 | 144 | 6.35 |
| 33 | 2 | 0.05 |
| 36 | 1 | 0.03 |
| 41 | 67 | 1.96 |
| 42 | 17 | 0.72 |
| 43 | 20 | 0.33 |
| 47 | 8 | 0.33 |
| 51 | 18 | 0.24 |
| 52 | 1 | 0.02 |
| 56 | 70 | 1.65 |
| 66 | 39 | 1.03 |
| 68 | 15 | 0.63 |
| 69 | 4 | 0.14 |
| 70 | 19 | 0.60 |
| 71 | 6 | 0.10 |
| 76 | 279 | 7.32 |
| 82 | 11 | 0.20 |
| 85 | 11 | 0.53 |
| 87 | 1 | 0.008 |


| 88 | 25 | 1.38 |
| :---: | :---: | :---: |
| 94 | 4 | 0.08 |
| 95 | 10 | 0.11 |
| 98 | 14 | 0.58 |
| 99 | 5 | 0.06 |
| 101 | 26 | 0.73 |
| 105 | 17 | 0.26 |
| 106 | 42 | 0.77 |
| 107 | 65 | 1.03 |
| 202 | 61 | 1.62 |
| 203 | 25 | 1.23 |
| 208 | 59 | 1.77 |
| 209 | 14 | 0.66 |
| 210 | 3 | 0.03 |
| 216 | 52 | 1.13 |
| 217 | 26 | 0.86 |
| 219 | 12 | 0.15 |
| 220 | 28 | 0.75 |
| 221 | 8 | 0.13 |
| 223 | 1 | 0.08 |
| 225 | 20 | 0.44 |
| 238 | 1 | 0.008 |
| 239 | 160 | 5.27 |
| 241 | 10 | 0.59 |
| 242 | 1 | 0.02 |
| 243 | 2 | 0.008 |
| 244 | 302 | 6.59 |
| 247 | 76 | 1.49 |
| 251 | 1 | 0.06 |
| 253 | 94 | 1.60 |
| 255 | 14 | 0.68 |


| 257 | 5 | 0.05 |
| :---: | :---: | :---: |
| 258 | 8 | 0.20 |
| 262 | 8 | 0.07 |
| 267 | 88 | 2.25 |
| 269 | 17 | 0.36 |
| 270 | 19 | 0.26 |
| 271 | 32 | 0.96 |
| 279 | 107 | 1.17 |
| 281 | 92 | 2.29 |
| 282 | 8 | 0.1 |
| 283 | 38 | 0.85 |
| 284 | 6 | 0.02 |
| 285 | 13 | 0.16 |
| 289 | 28 | 0.64 |
| 290 | 47 | 1.92 |
| 291 | 11 | 0.25 |
| 295 | 6 | 0.09 |
| 296 | 4 | 0.02 |
| 297 | 24 | 0.51 |
| 311 | 1 | 0.07 |
| 314 | 3 | 0.02 |
| 315 | 29 | 0.28 |
| 802 | 11 | 0.21 |
| 912 | 16 | 0.50 |
| 938 | 2 | 0.008 |
| 941 | 2 | 0.008 |
| 948 | 4 | 0.008 |
| 956 | 3 | 0.008 |
| 957 | 2 | 0.04 |
| 961 | 136 | 3.64 |
| 969 | 1 | 0.04 |


| 971 | 1 | 0.03 |
| :---: | :---: | :---: |
| 972 | 2 | 0.02 |
| 975 | 1 | 0.02 |
| 976 | 15 | 0.27 |
| 982 | 5 | 0.15 |
| 1000 | 1 | 0.008 |
| 1104 | 61 | 1.54 |
| 1105 | 1 | 0.03 |
| 1107 | 14 | 0.06 |
| 1108 | 18 | 0.09 |
| 1200 | 1 | 0.08 |
| 1201 | 2 | 0.16 |
| 1204 | 13 | 0.43 |
| 1207 | 11 | 0.20 |
| 1209 | 2 | 0.06 |
| 1212 | 68 | 0.55 |
| 1217 | 5 | 0.04 |
| 1219 | 26 | 0.21 |
| 1220 | 8 | 0.07 |
| 1221 | 9 | 0.07 |
| 1224 | 57 | 0.46 |
| 1226 | 462 | 3.77 |
| 1227 | 5 | 0.04 |
| 297a | 13 | 0.11 |
| 50B | 8 | 0.07 |
| 82/253 | 2 | 0.02 |
| 978a | 3 | 0.02 |
| 98/106 | 10 | 0.08 |
| No context* | 154 | 1.146 |
| Total | 3502 | 100\% |

Appendix 1.4 Concordance Tables 1.4.1-1.4.5: illustrated pottery, estimated dimensions and contextual information (R. Cleary).
(diameter and height measurements are in cm .:thickness measurements are in mm.)

| Fig. 8.7 | Sherd no. | Feature | Rim D | Base D. | Height | Thickness |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 2010 | 244 | 20 |  |  | 12 |
| 2 | 2067 | 244 | 20.5 | 15 | 14 | 11.7 |
| 3 | 2804 | 961 | 20 |  |  | 14 |
| 4 | 2793 | 1219 | 16 |  |  | 12 |
| 5 | 2341 | 271 | 16 |  |  | 16 |
| 6 | 1703 | 241 | 16 |  |  | 11.7 |
| 7 | 1495 | 239 | 12.5 |  |  | 9.1 |
| Appendix Table 1.4.1 |  | Pottery illustrated in Vol. 2, Fig. 8.7 |  |  |  |  |
| Fig. 8.7 | Sherd no. | Feature | Rim D. | Base D. | Height | Thickness |
| 1 | 2057 | 76 | 16 |  |  | 13 |
| 2 | 1545 | 105 | 12 |  |  | 6.7 |
| 3 | 1531 | 106 | 12 |  |  | 9 |
| 4 | 1534 | 107 | 14 |  |  | 7.4 |
| 5 | 1546 | 107 | 14 |  |  | 8.8 |
| 6 | 1550 | 107 | 14 |  |  | 10.6 |
| 7 | 1698 | 239 | 16 |  |  | 17 |
| 8 | 1734 | 239 | 17 |  |  | 12.5 |
| 9 | 1769 | 244 | 14 |  |  | 8.8 |
| 10 | 1854 | 244 | 16 |  |  | 13.7 |
| 11 | 1757 | 244 | 14.5 |  |  | 13.2 |
| 12 | 2012 | 244 | 16 |  |  | 12.6 |
| 13 | 1863 | 244 | 14 |  |  | 9.4 |
| 14 | 2193 | 267 | 11 |  |  | 7.9 |
| 15 | 2117 | 267 | 11 |  |  | 6.2 |
| 16 | 2711 | 1105 | 12.5 |  |  | 9.6 |


| Appendix Table 1.4.2 |  | Pottery illustrated in Vol. 2, Fig. 8.7 |  |  |  | Thickness |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Fig. 8.8 | Sherd no. | Feature | Rim D. | Base D. | Height |  |
| 1 | 151 | 21 | 33 | 19.5 | 33 | 11.4 |
| Appendix Table 1.4.3 |  | Pottery illustrated in Vol. 2, Fig. 8.8 |  |  |  |  |
| Fig. 8.9 | Sherd no. | Feature | Rim D. | Base D. | Height | Thickness |
| 1 | 1308 | 255 | 26 |  |  | 17.3 |
| 2 | 1003 | 41 | 24 |  |  | 14.2 |
| 3 | 796 | 32 | 24 |  |  | 14 |
| 4 | 1100 | 41 | 22.5 |  |  | 12 |
| 5 | 543 | 32 | 24.5 | 17 | 20.5 | 14 |
| 6 | 1134 | 88 | 18 |  |  | 9.7 |
| 7 | 932 | 209 | 19.5 |  |  | 11.3 |
| 8 | 1227 | 220 | 18 |  |  | 11.4 |
| 9 | 106 | 14 | 14.5 |  |  | 7.2 |
| 10 | 84 | 14 | 15 |  |  | 10.2 |
| 11 | 121 | 14 | 14.5 |  |  | 7 |
| 12 | 166 | 10 | 13 |  |  | 8.7 |
| 13 | 760 | 56 | 12.5 |  |  | 7.6 |


| Appendix Table 1.4.4 | Pottery illustrated in Vol. 2, Fig.8.9 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Fig. 8.10 | Sherd no. | Feature | Rim D. | Base D. | Height |
| 1 | 1624 | 107 | 14.5 | Thickness |  |
| 2 | 1751 | 239 | 12 | 8 |  |
| 3 | 1725 | 239 | 12.5 | 12.3 |  |
| 4 | 1747 | 239 | 10 | 9 |  |
| 5 | 1818 | 244 | 12.5 | 8.7 |  |
| 6 | 2312 | 247 | 12 | 8.4 |  |
| 7 | 1483 | 239 | 14 | 10 |  |
| 8 | 1706 | 239 | 14 | 10.8 |  |
| 9 | 2698 | 104 | 14 | 11.3 |  |


| 10 | 2902 | 1226 | 16.5 | 11.3 |
| :--- | :--- | :--- | :--- | :--- |
| 11 | 2082 | 247 | 14 | 11.7 |
| 12 | 2366 | 267 | 16 | 16.8 |
| 13 | 2039 | 244 | 14.5 | 11.3 |
| 14 | 1611 | 29 | 16 | 12.7 |
| 15 | 171 | 10 | 14 | 13.2 |

Appendix Table 1.4.5 Pottery illustrated in Vol. 2, Fig. 8.10

## Appendix 1.5 Results of Thermal Colour Tests (R.Cleary)

Results of thermal colour tests (TCT). All the samples are from pottery sherds with the exception of no. 160 (clay mould fragment; Appendix Fig. 1.5b), and no. 213 (crucible fragment: Appendix Fig. 1.5c). Results of the TCT test from a clay sample collected on the island are shown in Appendix Fig. 1.5d.


Appendix Fig. 1.5a


Appendix Fig. 1.5b


## Appendix Fig. 1.5c



## Appendix Fig. 1.5d

## Appendix 1.6 Petrographic Analysis of Ceramic Thin Sections (R. Unitt)

 (see also Appendix Figs 1.7a, b, c, d, e, f, g)
## Pottery

Section No.4: 92E102:484, cutting 1, layer F56
Clay: The black coloured clay is opaque.
Sand/silt: The sand and silt sized particles are dominated by calcite with minor quartz, chlorite, altered plagioclase and highly altered basic igneous rock.
Temper: The temper contains mainly calcite (up to 2.5 mm ), with minor altered feldspar, altered basic igneous rock and possible granitic material composed from altered plagioclase and quartz.

Section No.12: 92E102:104, cutting 1, layer F26
Clay: Brown to orange-brown with iron oxides/hydroxides and opaques masking clay minerals. Sand/silt: The sand and silt sized particles consist of calcite, quartz, opaques and alkali feldspar. Temper: The temper contains mainly calcite (up to 1 mm ) with minor quartz and alkali feldspar.

Section No.13: 92E102:214, cutting 1, layer F42
Clay: Brown to orange-brown with clay minerals partially masked by iron oxide/hydroxides.
Sand/silt: The sand and silt sized particles mainly consist of calcite, quartz and alkali feldspar (partially altered) with minor cryptocrystalline silica and sandstone.
Temper: The temper is dominantly composed of calcite (up to 1.2 mm ). The remaining temper contains quartz, partially altered alkali feldspar, cryptocrystalline silica, granitic rock (quartz + alkali feldspar), grog (darker clay than host with sand and silt-sized particles of quartz) and a large ( 3.5 mm ) woody fragment.

Section No.14: 92E102:83, cutting 1, layer F14 (Appendix Fig. 1.7a)
Clay: Dark brown with iron oxide/hydroxides.
Sand/silt: The sand and silt sized particles are composed from calcite, shell fragments and minor quartz.
Temper: The temper contains shell fragments (up to 5 mm ), calcite (up to 4 mm ) and sparry limestone.

Section No.16: 92E102:245, cutting 1, layer F14
Clay: Dark brown/black to orange-brown with iron oxide/hydroxides masking clay minerals.
Sand/silt: The sand and silt sized particles are composed from calcite, quartz and opaques.
Temper: The temper is completely made up from calcite (up to 1.5 mm ).
Section No.17: 92E102:167, cutting 1, layer F10 (Appendix Fig. 1.7b)
Clay: Dark brown to black with iron oxide/hydroxides masking clay minerals.
Sand/silt: The sand and silt sized particles are dominated by calcite with minor quartz, sandstone and a rounded altered volcanic fragment.
Temper: The temper contains only calcite (up to 2.5 mm ).
Section No.18: 92E102:79, cutting 1, layer14
Clay: Brown to dark brown to orange-brown with iron oxide/hydroxides and opaques.
Sand/silt: The sand and silt sized particles are composed from calcite and minor quartz.

Temper: The temper is composed solely of calcite (up to 1.5 mm ).
Section No.19: 92E102:83, cutting 1, layer F14
Clay: Brown to dark brown with iron oxide/hydroxides and opaques.
Sand/silt: The sand and silt sized particles are of calcite and minor quartz.
Temper: The temper contains only calcite (up to 1.75 mm ).
Section No.22: 92E102:151, cutting 1, layer F21 (Appendix Fig.1.7c).
Clay: Brown to orange-brown with iron oxide/hydroxides masking clay minerals.
Sand/silt: The sand and silt sized particles are composed from calcite, quartz and opaques.
Temper: The temper is dominated by calcite (up to 1.5 mm ). A single fragment containing minute pore-like structures is identified as either bone or possibly a fish scale.

Section No.20/27: 92E102:2040, cutting 1, layer F76 (Appendix Fig. 1.7d)
In hand specimen this sample contains calcite and olivine variety peridot.
Clay: Dark-brown to black with iron oxide/hydroxides masking clay minerals.
Sand/silt: The sand and silt sized particles are dominated by calcite with quartz, rare chlorite and weathered igneous fragments.
Temper: The temper is dominated by calcite (up to 1 mm ). There are, however, significant fragments (up to 3 mm ) of basic igneous rocks. One fragment is fine grained and contains magnetite, plagioclase and hornblende while the other is coarse grained containing hornblende (some altering to chlorite), plagioclase, sprays of possibly amphibole and an opaque mineral which may be ilmenite. The temper also contains rare quartz and quartz aggregates (vein quartz, sandstone, granite?).

## Clay Moulds

Section No.1: 92E102:663, cutting 1, layer F32 (Appendix Fig. 1.7e and 1.7f)
Fabric coarse, micaceous with quartz. Grey inner layer following curvature of mould with offwhite margin below and buff brown outer layer.
Clay: Orange-brown to black with clay minerals partially masked by iron oxide/hydroxide and opaques.
Sand/silt: The sand and silt sized particles are composed of quartz, biotite, alkali feldspar (some partially altered) and plagioclase.
Temper: The temper contains fragments of the minerals quartz, biotite (up to 1 mm and containing pleochroic haloes), plagioclase (some partially altered), alkali feldspar (some partially altered) and minor myrmekite, sphene (yellow to green body colour) and amphibole (pleochroic yellow-green to pale olive green). Rock fragments of quartz + sphene and quartz + alkali feldspar + plagioclase (up to 2 mm ) also occur in the temper.

Section No.3: 92E102:110, cutting 1, layer F26
Three layers, finer grained inner part. Gritty fabric, buff brown in colour.
Clay: Pale orange-brown with iron oxide/hydroxides.
Sand/silt: The sand and silt sized particles are dominated by quartz with minor plagioclase, biotite and alkali feldspar.
Temper: The temper contains quartz (up to 1 mm ), alkali feldspar (partially altered), possible granitic fragments of quartz and alkali feldspar.

Section No.6: 92E102:594, cutting 1, layer F32
Fine grained, micaceous, sandy fabric. Inner layer grey, outer layer red-brown. Clay: Brown to orange-brown with iron oxide/hydroxides.
Sand/silt: The sand and silt sized particles that dominate the sample are composed from quartz, partially altered alkali feldspar, plagioclase, biotite (some partially altered to chlorite), opaques and minor green-yellow sphene.
Temper: The temper, which only forms a minor component of the sample, contains mainly rock fragments. One fragment $(1.25 \mathrm{~mm})$ of granitic origin comprises quartz, altered alkali feldspar, myrmekite, sphene and a dendritic opaque mineral. Other fragments are generally rounded altered igneous rock or even possibly grog.

Section No.21: 92E102:160, cutting 1, layer F10
Clay: Pale orange-brown with iron oxide/hydroxides and opaques masking clay minerals.
Sand/silt: The sand and silt sized particles are composed from quartz, alkali feldspar (some partially altered, some perthitic), biotite, plagioclase, muscovite, opaques and sphene.
Temper: The temper contains quartz, partially altered feldspar and granitic rock fragments of quartz + alkali feldspar (up to 0.75 mm ).

## Crucible Fragments

Section No.7: 92E102:192, cutting 1, layer F41
Clay: Orange-brown to black with clay minerals partially masked by iron oxide/hydroxide and opaques.
Sand/silt: Angular sand sized particles (less than 0.5 mm ) are the dominant element of this sherd and are composed of quartz, biotite, alkali feldspar (partially or completely altered + some perthite), plagioclase (mainly albite) with minor muscovite, myrmekite (complex intergrowth of quartz and feldspar) and opaques. There are some granitic rock fragments consisting of feldspar and biotite.
Temper: The few fragments of temper are composed of feldspar (both alkali and plagioclase), biotite (some partly altered to chlorite), granitic quartz + feldspar rock and a single fragment of a highly altered fine-grained rock consisting of sericite and quartz.

Section No.5: 92E102: 260, cutting 1, layer F14/26
Grey fabric becoming pinkish/buff towards outer edge. Finely gritty with flakes of biotite visible. Clay: Pale brown to pale orange-brown with clay minerals, silica and opaques.
Sand/silt: The sand and silt sized particles are composed of quartz, alkali feldspar, plagioclase, biotite, myrmekite and rare sphene.
Temper: The temper contains partially altered alkali feldspar (up to 1.75 mm ), biotite (up to 1 mm ), quartz and minor plagioclase.

Section No.23: 92E102:213, cutting 1, layer F41 (Appendix Fig. 1.7g)
Clay: Pale orange-brown with iron oxide/hydroxides obscuring the clay minerals.
Sand/silt: The sand and silt sized particles are composed from quartz, alkali feldspar (some partially altered), plagioclase and biotite with minor euhedral to subhedral green-yellow sphene, amphibole, opaques and muscovite.

Temper: The temper which forms a minor component of this sample contains biotite (up to 0.75 mm ), quartz, alkali feldspar, plagioclase and a granitic rock fragment of quartz + alkali feldspar.

## Fired Clay

Section No.2: clay sample collected for comparison with the clays used to manufacture the pottery and moulds. The sample was taken on the southern cliffs a short distance west of the fort of Dúchathair. This part of the coastline is fringed by a storm beach made up of large boulders; the sample was stratified on the limestone pavement under the boulder beach.
Clay: Orange-brown. The thickness of the slide renders the clay opaque.
Sand/silt: The sand and silt sized particles are dominated by quartz with minor mica and plagioclase feldspar.
Temper: The temper contains cryptocrystalline silica (up to 2 mm ), quartz, possible granitic material and fragments of a dark brown to green, fine grained tuff or sedimentary rock. The cryptocrystalline silica probably represents fragments of chert.

## Petrological Analysis Glossary

Acid igneous rock - an igneous rock with $10 \%$ or more quartz
Basic igneous rock - a quartz-free igneous rock containing plagioclase feldspar
Myrmekite - an intergrowth of worm-like rods of quartz and plagioclase
Perthite - an intergrowth of plagioclase in alkali feldspar
Pyrite - iron sulphide, sometimes known as 'fool's gold

## Appendix 1.7 Photomicrographs of Ceramic Thin Sections (R. Unitt)



## Appendix Fig. 1.7a. Ceramic Thin

 Section 14.92E102:83: Large (up to 4mm) calcite fragments (bottom and top right) with a shell fragment (fibrous appearance, centre 2mm). Photograph taken in cross-polarised light.


Appendix Fig. 1.7b. Ceramic Thin Section 17.
92E102:167: Temper (up to 2 mm ) and sand-silt sized particles of calcite exhibiting typical rhombic forms. Note the different stages of oxidation shown by the clay particles, orange brown highly oxidised (left side) and dark brown to black lightly oxidised (right side). Photograph taken in plane-polarised light.


Appendix Fig. 1.7c. Ceramic Thin Section 22
92E102:151:Calcite dominant temper (up to 1 mm ) with an unusual fragment of porous material which may be either bone or a fish scale. Photograph taken in crosspolarised light.


Appendix Fig. 1.7d. Ceramic Thin Section 20/27.
92E102:2040: Large ( 2 mm ) fragment of basic igneous material in a calcite dominated temper. Note the dark brown to black clay that is often associated with this particular temper combination. Photograph taken in plane-polarised light.


Appendix Fig. 1.7e. Ceramic Thin Section 1.
93E102:663 (mould): Granitic fragment ( 2 mm ) comprising quartz (centre), alkali feldspar (left-centre) and plagioclase feldspar (bottom right). Photograph taken in cross-polarised light.


Appendix Fig. 1.7f. Ceramic Thin Section 1. Section 1

93E102:663 (mould): Euhedral (well formed) sphene crystal ( 1.5 mm , centre) with granitic temper of quartz, plagioclase (black and grey bands), alkali feldspar and biotite (pink-green interference colours). Photograph taken in cross-polarised light.


Appendix Fig. 1.7g. Ceramic Thin Section 23.

92E102:213 (crucible): Sand-silt sized particles of quartz, feldspar and mica are the dominant element in this sample. The temper contains a large percentage of biotite (golden-yellow, 0.75 mm , centre). Photograph taken in cross-polarised light.

## CLAY MOULDS

Appendix 1.8 Clay mould pieces grouped by type and context (F. O'Carroll)

|  | Axehead <br> No. 1 |  | Axehead <br> No. 2 |  | Axehead No. 1 or No. <br> 2 | Axehead No. 3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Contexts | Valve (a) | Valve (b) | Valve (a) | Valve (b) |  | Valve (a) | Valve (b) |
| 32 |  | 594 |  | 776 |  | 599/633 | 670 (b) |
| 56 |  |  | 717 |  |  |  |  |
| 202 |  |  |  | 853 |  |  |  |
| 203 |  |  | 915 |  |  |  |  |
| 208 |  |  |  |  |  |  | $\begin{array}{cc} 864 & 867 \\ 884 & 895 \end{array}$ |
| 239 |  | $\begin{aligned} & 1606 \\ & 1646 \end{aligned}$ | 1458 | 1470 | 1645 |  |  |
| 244 | $\begin{array}{ll} 1813 & \\ 1955 & 2147 \end{array}$ | 1926 |  |  |  |  |  |

Appendix Table 1.8.1 Socketed axehead moulds.

|  | Spearhead Type 1 |  |  | Spearhead Type 2 | Spearhead <br> Fragments | Socket <br> Fragments |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Contexts | Valve (a) | Valve (b) | Not <br> Assignable | Not Assignable |  |  |
| 9 |  |  |  | 233 |  |  |
| 10 | 23924 |  | $\begin{array}{ll} 244 \\ e \mathrm{egk}) & (\mathrm{ad} \\ \hline \end{array}$ | $\begin{aligned} & 135(\mathrm{a}-\mathrm{c}) \\ & 162(\mathrm{a}-\mathrm{d}) \\ & 164 \quad 229 \\ & \text { (ab) } 348 \end{aligned}$ | $\begin{aligned} & 135(\mathrm{~d}-\mathrm{e}) \\ & 229(\mathrm{c}) \end{aligned}$ |  |
| 26 | 110 |  |  |  |  |  |
| 32 | 761 |  | 761a-c | 794 |  |  |
| 36 |  |  | 1627 |  |  |  |


| 41 |  |  |  | $\left\lvert\, \begin{array}{lc} 211 & 212 \\ 422 & (a-c) \\ 646 & 1057 \end{array}\right.$ | 192 (d) | $\left\lvert\, \begin{aligned} & 657 \\ & 1078 \end{aligned}\right.$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 43 |  |  | 965 | 420 421 <br> 427 554 <br> (a) 1444  | $\begin{aligned} & 191 \\ & 554 b \end{aligned}$ |  |
|  |  |  |  |  |  | 577 |
| 51 |  | 1380 |  |  | 750 |  |
| 56 |  |  |  | 750 |  |  |
| 70 |  |  |  |  | 790 |  |
| 95 |  |  |  |  | 715 |  |
| 202 |  |  |  |  |  | 875 |
| 203 |  |  |  | 1290 |  |  |
| 217 |  |  |  | 1033 |  |  |
| 219 |  |  |  | 1141 |  |  |
| 232 |  |  | 2308 |  |  |  |
| 239 |  |  |  | 1471 | 1468 | 2395 |
| 244 |  |  | 1805 (a-d) |  | $\begin{aligned} & 1788 \\ & 1799(\mathrm{a}-\mathrm{c}) \\ & 2113 \end{aligned}$ | 1943 |

Appendix Table 1.8.2 Spearhead moulds.

|  | Swords |  |
| :---: | :--- | :--- |
| Contexts |  |  |
| $\mathbf{6}$ | 247 |  |
| $\mathbf{1 0}$ | 157 | 235 |
|  | 358 | (a b) |
| $\mathbf{1 0 , 2 1}$ | $135 / 236$ |  |
| $\mathbf{3 2}$ | 553 | 813 |
| $\mathbf{4 1}$ | 194 | 355 |
| $\mathbf{2 4 4}$ | 1798 |  |
| $\mathbf{2 4 7}$ | 2088 |  |

Appendix Table 1.8.3 Sword moulds.

|  | Knives |
| :---: | :--- |
| Contexts |  |
| $\mathbf{3 2}$ | 619 |
| $\mathbf{4 1}$ | 442 |
| $\mathbf{4 3}$ | 584 |
|  | 1455 |
| $\mathbf{2 0 2}$ | 746 |
| $\mathbf{2 1 9}$ | 1235 |
|  | 1246 |
| $\mathbf{2 3 9}$ | 1465 |
| $\mathbf{2 4 4}$ | 1641 |
| $\mathbf{2 5 5}$ | 17958 |

Appendix Table 1.8.4 Knife moulds.

|  | Ball-headed pins |  |  | Disc-headed pins |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Contexts | Pin 1 |  | Pin 2 | Pin 3 | Pin 4 | Pin 5 | Pin 6 | Pin 7 |
|  | Upper valve Lower valve |  |  |  |  |  |  |  |
| 10 | 135 |  |  | 111 |  |  |  |  |
| 32 | 618 |  | 661 |  | 637 |  | 1377 |  |
| 41 |  | 454 |  |  |  |  |  |  |
| 43 |  |  |  |  |  |  |  | 1456 |
| 95 |  |  |  |  |  | 811 |  |  |
| 239 | 1490 |  |  |  |  |  |  |  |

Appendix Table 1.8.5 Ball-headed and disc-headed pin moulds.

|  | Pin Shank <br> Group 1 | Pin Shank <br> Group 2 | Pin Shank <br> Group 3 | Miscell. Pin <br> Shank <br> Fragments |  |
| :---: | :--- | :--- | :--- | :--- | :--- |
| Contexts | Upper valve Lower valve | Upper valve Lower valve | Upper valve |  |  |
| $\mathbf{1 0}$ |  |  |  |  | 346 |
| $\mathbf{4 1}$ |  |  |  |  |  |


| $\mathbf{7 1}$ |  |  |  | 2587 |  |  |
| :---: | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathbf{2 0 2}$ |  |  |  |  |  | 837 |
| $\mathbf{2 0 0}$ |  |  |  | 2487 |  |  |
| $\mathbf{2 3 9}$ |  |  | 1468 | 1666 | 1469 |  |
| $\mathbf{2 4 4}$ |  |  | 2302 | 1823 |  |  |
| $\mathbf{2 7 0}$ |  |  |  | 2252 |  |  |
| $\mathbf{2 9 0}$ |  | 2677 |  | 2260 |  |  |
| $\mathbf{2 9 7 a}$ | 2626 |  |  |  |  |  |
|  | 2645 |  |  |  |  |  |
|  | 2651 | 2658 |  | 2613 | 2616 |  |

Appendix Table 1.8.6 Pin shank mould groups.

|  | Bracelets |  |
| :---: | :--- | :--- |
| Contexts | Valve (a) | Valve (b) |
| $\mathbf{1 0}$ |  | 90 |
| $\mathbf{4 1}$ | 1021 | 1026 |
|  |  | 1371 |
| $\mathbf{4 3}$ | 406 (a) |  |
|  | 415 | 406 (b) |
| $\mathbf{2 1 6}$ |  | 610 |
|  |  | 1056 |
| $\mathbf{2 1 9}$ |  | 1223 |
| $\mathbf{2 3 9}$ | 1473 | 1619 |
|  | 1664 | 1631 |
| $\mathbf{2 4 4}$ | 2143 | 1790 |
|  |  | 1800 |

Appendix Table 1.8.7 Bracelet moulds.

|  | Gates | Cores |
| :---: | :--- | :--- |
| Contexts |  |  |
| $\mathbf{3 2}$ | 593 | 627 |
| $\mathbf{3 6}$ |  | 1625 |
| $\mathbf{4 1}$ | 433 | 438 |
|  | 1017 | 1046 |


| $\mathbf{2 0 2}$ | 831 863 <br> 874  |  |
| :---: | :--- | :--- | :--- |
| $\mathbf{2 1 7}$ | 1409 |  |
| $\mathbf{2 3 9}$ |  | 1494 |
| $\mathbf{2 7 7 a}$ | 2643 |  |
| $\mathbf{2 7 9}$ |  | 2415 |
| $\mathbf{1 2 1 2}$ |  | 2770 |
| $\mathbf{1 2 2 2}$ |  | 2883 |

Appendix Table 1.8.8 Mould gates and mould cores.

|  | Feature <br> Number | Number of Outer Wrap Fragments | Number of Inner Valve Fragments |
| :---: | :---: | :---: | :---: |
| Cutting 1 | 9 | 1 |  |
|  | 10 | 3 | 2 |
|  | 14 |  | 1 |
|  | 22 | 2 | 1 |
|  | 32 | 6 | 5 |
|  | 36 | 1 | 1 |
|  | 41 | 10 | 4 |
|  | 42 |  | 1 |
|  | 43 | 16 | 8 |
|  | 47 | 1 | 1 |
|  | 50B | 1 |  |
|  | 51 | 1 | 1 |
|  | 56 | 3 |  |
|  | 66 | 1 | 2 |
|  | 76 |  | 1 |
|  | 95 | 1 | 2 |
|  | 98 |  | 3 |
|  | 202 | 8 | 2 |
|  | 203 | 2 | 1 |
|  | 208 |  | 1 |
|  | 209 |  | 1 |
|  | 216 | 2 |  |
|  | 219 | 2 | 4 |
|  | 220 | 1 |  |

\begin{tabular}{|c|c|c|c|}
\hline \& 221
223
224
230
238
239
244
251
253
255
257
258
267 \& \begin{tabular}{l}
2 \\
1 \\
3 \\
19 \\
6 \\
2 \\
1 \\
1
\end{tabular} \& \begin{tabular}{l}
\[
1
\] \\
4 17 \\
1 \\
3 \\
2 \\
1
\end{tabular} \\
\hline \& \[
\begin{gathered}
269 \\
290 \\
291 \\
297 \text { a } \\
1200 \\
1219 \\
1226 \\
1231 \\
\hline
\end{gathered}
\] \& 1

1 \& | $\begin{aligned} & 2 \\ & 3 \end{aligned}$ |
| :--- |
| 1 |
| 1 $3$ | <br>

\hline Cutting 4 \& 403 \& \& 1 <br>
\hline
\end{tabular}

Appendix Table 1.8.9 Numbers of outer wrap and inner valve fragments from individual contexts.

## Appendix 1.9 Clay mould catalogue (F. O'Carroll)

Axehead
No. 1

| Valve (a) |  |  |  |
| :--- | :--- | :--- | ---: |
| 1813 | 244 | Part of neck and body to tip of blade. Matrix for loop present. Area <br> of neck abraded but same pattern as 1955 discernible. Fits with <br> 1955. Contact face broad, horizontal to plane of matrix, slight <br> irregularities. | W. $62 \mathrm{~mm} ;$ <br> T.11mm |


| 1955 | 244 | Fragment of mouth, neck and upper body. Impression of mouth and neck sharp, mouth has broad rim with decoration (broad band flanked by a pair of grooves and ridges) beneath. Contact face broad, slightly abraded, originally slightly uneven. The rim would have been protruding. | L. 56 mm W. 36 mm ; T. $9-11 \mathrm{~mm}$ |
| :---: | :---: | :---: | :---: |
| 2147 | 244 | Fragment of blade area including cutting edge. Contact face slopes down from matrix to edge of mould. Has an inner curved edge which marks the cutting-edge. | $\begin{array}{r} \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \end{array}$ |


| Valve (b) |  |  |  |
| :---: | :---: | :---: | :---: |
| 594 | 232 | Five pieces fitted together to form part of the body, blade and cutting edge. Surface has been abraded, especially at edges of individual pieces, but in places parts of original survive. Cutting edge formed by curving edge of contact face, which sloped down from matrix to edge of mould. Very thick skin of outer wrap remains. | L. 41 mm ; W. 39 mm ; T. 10 mm |
| 1606 | 239 | Small piece, slight dished surface with curved edge of contact face marking cutting edge. Not as reduced as 594 and consequently less grey in colour; nonetheless it is possible that both fitted together at one time. Full thickness of outer wrap present. | $\begin{gathered} \text { L. } 24.5 \mathrm{~mm} \\ \text { W. } 22 \mathrm{~mm} \\ \text { T. } 8.5 \mathrm{~mm} \end{gathered}$ |
| 1646 | 239 | Part of body, no diagnostic features. Similar in appearance to 1606 , may be part of this valve. | L. 26 mm ; W.18mm; T. 10 mm |
| 1926 | 244 | Part of mouth, neck body and loop. Has a flat seat for gate at top of mouth. Neck decoration well preserved, same as 1955 and 1813. Contact face has slight irregularities. Some of outer wrap present. | $\begin{array}{r} \text { L. } 35 \mathrm{~mm} ; \\ \text { W. } 36 \mathrm{~mm} \\ \text { T. } 16-10 \mathrm{~mm} \end{array}$ |

## Axehead No. 2

Valve (a)

| 717 | 56 | Small fragment of mid-section of body, no features, surface <br> slightly dished. Outer wrap present. | L.20mm; <br> W.23mm; <br> T.9mm |  |
| :--- | :---: | :--- | :--- | :--- |
| 915 | 203 | Part of neck, body and blade tip, mouth missing. Decoration at <br> neck now consists of two grooves with two narrow ridges <br> flanking them and a third separating them. The upper part of the | L.45mm; <br> neck may have been further decorated, possibly in a pattern | W.45mm <br> (overall); <br> W.22mm |
|  |  | natrix); <br> similar to axehead No.1. The surviving contact face is broad, <br> generally flat and roughly horizontal to the matrix; there are some <br> irregularities and a slight raised lip at one edge indicates that this <br> was probably an upper valve piece. No outer wrap present. | T.13mm |  |


| 1458 | 239 | Part of blade area and cutting edge. Contact face intact, except for <br> one corner. The cutting edge is formed by the raised curved edge <br> of the contact face, which slopes down to the edge of the mould. <br> A small abraded piece of the outer wrap survives. Joins with <br> pieces 915 and 717. |
| :--- | :--- | :--- |

L. 31 mm ;
W.35mm;
T. 7 mm pieces 915 and 717.

Possible valve (b)

| 776 | 32 | Small, very abraded blade fragment. The surviving part of the contact face slopes down from the matrix to the edge of the mould. There appears to have been a finer surface layer applied to the matrix but this is now very eroded. Part of outer wrap survives and lips over edge. | $\begin{array}{r} \mathrm{L} .28 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \mathrm{T} .11 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 853 | 202 | Part of neck and body, with portion of one contact face. A horizontal groove crosses the neck; this is now abraded and may originally have consisted of a number of grooves and ridges. If this was the case then this is likely to have been part of the opposite valve for 915 ; if the original decoration consisted of a single groove then this valve probably belongs to a third decorated axehead. The contact face is broad; and irregular indentation occurs but is too small to be a loop. The fragment has three layers, a thin outer wrap, an inner wad that is compact but coarser than usual, and a fine surface layer. The same layering is evidence on piece 776 , but the surface of 853 is better preserved. | $\begin{array}{r} \mathrm{L} .34 \mathrm{~mm} ; \\ \mathrm{W} .30 \mathrm{~mm} ; \\ \text { T. } 15 \mathrm{~mm} \end{array}$ |
| 1470 | 239 | Long narrow piece that includes part of the cutting edge and body. The contact face survives only at the cutting edge. This has a slight step and then slopes down to the edge of the mould. A thin outer wrap survives over most of the fragment, but it is possible that there was an additional layer outside this originally. The piece fits with 776 and like the latter and 853 , has a three layer make-up. The presence of a step on the blade contact faces of this piece and piece 1458 makes it less likely that the two valves described here as axehead 2 are from the same mould. The other possibility is that this is the opposite valve for axehead No. 3 , though they are both abraded and now not a good fit. | $\begin{array}{r} \mathrm{L} .49 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \text { T. } 11 \mathrm{~mm} \end{array}$ |

Axehead No. 3

## Valve (a)

32 Fragment join up giving the almost complete valve of an axehead. The mouth is incomplete and one blade-tip is missing.
L.81mm;
W.54mm;
T. 15 mm now irregular. Surface abraded and very rough; the outer wrap is coarse and incomplete. Marks of a binding strip are visible on the upper portion of 663 .

Possible valve (b)

| 670b | 32 | Fragment with slightly undulating surface. In form it resembles part of a mould for a spearhead blade but does not fit either with the blade shape or the fabric type of the identified spearhead moulds. Both the inner wad and the outer wrap are present. | $\begin{gathered} \mathrm{L} .25 \mathrm{~mm} ; \\ \mathrm{W} .22 \mathrm{~mm} ; \\ \text { T. } 13 \mathrm{~mm} \end{gathered}$ |
| :---: | :---: | :---: | :---: |
| 864 | 208 | Small fragment with possible remains of a contact face on one side. Outer wrap present. | $\begin{array}{r} \mathrm{L} .20 \mathrm{~mm} ; \\ \mathrm{W} .17 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \\ \hline \end{array}$ |
| 867 | 208 | Small featureless fragment with smooth flat surface. Outer wrap present. | L. 18 mm ; W. 12 mm ; T. 11 mm |
| 884 | 208 | Small fragment with smooth and slightly concave surface. Outer wrap present. | L. 17 mm ; <br> W.24mm; <br> T. 1 mm |
| 895 | 208 | Featureless fragment with flat surface, no outer wrap. | L. 20 mm ; W. 21 mm ; T.10mm |

Miscellaneous

| 1645 | 239 | Four featureless fragments are registered to this number but only <br> one has any surviving surface. Outer wrap present. The fabric is <br> similar to that in axehead number 1 and valve (a) of axehead <br> number 2. No grey reduced layer. | L.19mm; <br> W.14m; | T.9mm |
| :--- | :--- | :--- | ---: | ---: |

## Spearhead Type 1

Valve (a)

| 110 | 26 | One blade wing and most of midrib of plain spearhead with flat <br> wings and rounded midrib. Narrow contact face, flat. Sectioned <br> for fabric analysis (R. Unitt, Vol. 3, Appendix 1.6, section No. 3). | L.33mm; | W.44m; |
| :--- | :---: | :--- | ---: | ---: |
| 239 | 10 | Part of one valve for a socket with the junction with the blade <br> area visible at one end. One contact face surviving and it expands <br> to accommodate the expansions for the blade wing. The concave <br> surface of the socket matrix is well preserved but the angle <br> between the socket and blade is eroded. | L. $50 \mathrm{~mm} ;$ <br> W.33mm; | T.21mm |


| 240a/b | 43 | Two pieces, part of the midrib and one blade wing, survive on 240a. The surface is markedly abraded at the edge of the wing and the raised contact face that should have been present does not survive. Three layers of clay are visible, but the final outer wrap appears to be missing. Joins to piece 244i and possibly to piece 1386a. The second fragment 240 b is very small and undiagnostic. | L. 10.5 mm ; W. 33 mm ; T. 17 mm ; W. of blade wing; 14 mm ; W. of midrib. 7 mm |
| :---: | :---: | :---: | :---: |
| 244i | 10 | Part of blade wing and midrib from close to the tip where both the blade and the midrib are contracting. Raised contact face along blade edge. Joins with preceding piece. | L. 22 mm ; W. 28 mm ; T. 17 mm |
| 761 | 32 | Part of the blade wing. No trace of the midrib remains. Three layers of clay present. | $\begin{array}{r} \mathrm{L} .29 \mathrm{~mm} ; \\ \mathrm{W} .16 .5 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \end{array}$ |
| 1384 | 43 | Abraded part of one blade wing. Side of midrib present and three layers of clay visible. | L.33mm; W. 26 mm ; T. 12 mm |
| 1386a | 43 | Part of midrib and one blade wing from close to the point of the spearhead. A raised contact face survives along the edge of the wing. Three or possibly four layers of clay can be distinguished in cross-section. | $\begin{gathered} \text { L. } 32.5 \mathrm{~mm} ; \\ \text { W. } 33 \mathrm{~mm} \\ \text { T. } 17 \mathrm{~mm} \end{gathered}$ |
| 1386b | 43 | Part of socket. The fragment is very weathered but part of a broad contact face is preserved on one edge. | L. 23 mm ; W. 24 mm ; T. 13 mm |
| 1386c | 43 | Very abraded piece, possibly part of one blade wing and the side of the midrib. Only central layer of clay survives and there are no original surfaces evident. | $\begin{array}{r} \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{W} .24 \mathrm{~mm} ; \\ \mathrm{T} .13 \mathrm{~mm} \\ \hline \end{array}$ |
| 1386d | 43 | Scrap, very light and with a porous texture. The fabric may have had a vegetable temper which has burnt out. Possibly not part of a mould but waste clay intended for use as grog. |  |
| 1386e | 43 | Small featureless scrap. |  |

Valve (b)

| 244b | 10 | Very weathered, possibly from the blade area, all of the inner fine layer removed. | $\begin{array}{r} \mathrm{L} .21 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \mathrm{T} .16 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 244c | 10 | Both blade wings and tip of midrib present. Raised contact faces at both edges. | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .29 \mathrm{~mm} ; \\ \text { T. } 12 \mathrm{~mm} \end{array}$ |
| 244f | 10 | Part of one blade wing with side of midrib. Very abraded, but the remains of a raised contact face occur along the blade edge. | $\begin{array}{r} \hline \text { L. } 34 \mathrm{~mm} ; \\ \text { W. } 29 \mathrm{~mm} ; \\ \text { T. } 12 \mathrm{~mm} \\ \hline \end{array}$ |
| 244h | 10 | Part of blade wing and midrib. From near the base of the blade where the blade is expanding and the midrib is contracting. Raised contact face along the edge of the wing. | $\begin{array}{r} \mathrm{L} .23 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \mathrm{T} .18 \mathrm{~mm} \\ \hline \end{array}$ |


| 244 j | 10 | Possible piece of a blade wing, severely abraded, traces of midrib <br> and socket. | L. $29 \mathrm{~mm} ;$ <br> W. $20 \mathrm{~mm} ;$ <br> T. 10 mm |
| :--- | :---: | :--- | ---: | ---: |
| 1380 | 51 | Part of one blade wing and midrib. From close to the base of the <br> blade as the blade wing is expanding and the midrib is <br> contracting. Abraded remains of a contact face are preserved on <br> the blade edge. Three layers of clay visible. | L. $19 \mathrm{~mm} ;$ <br> W. $35 \mathrm{~mm} ;$ <br> T .18 mm |

Spearhead 1; catalogue of pieces not assignable to individual valves

| 244a | 10 | Abraded part of socket mouth. Step to seat a gate present. | L. 22 mm ; <br> W. 25 mm ; <br> T. 16 mm |
| :---: | :---: | :---: | :---: |
| 244d | 10 | Fragment of socket, one contact face surviving. | L. 25 mm ; W. 24 mm ; T. 13 mm |
| 244e | 10 | Fragment of socket, one contact face surviving. | L. 16 mm ; W. 22 mm ; T. 10 mm |
| 244 g | 10 | Five pieces join to form part of the socket matrix. One contact face survives, this may not have been set horizontal to the axis of the socket. | L. 59 mm ; W. 42 mm ; T. 15 mm |
| 244k | 10 | Socket fragment, contact face present. | L. 19 mm ; W.19mm; T. 16 mm |
| 352 | 43 | Socket fragment with remains of what may be part of a contact face. The latter is set at an angle and may be the continuation of the line of the blade immediately above the junction of the blade and socket. It does not join with piece 965 below, but may have fitted a small way above it. The outer wrap does not survive. | L.39mm; W.31mm; T. 11 mm |
| 761a | 32 | Part of a socket. Less than half of the width of the valve remains, one contact face, damaged. Three layers of clay visible. | L.54mm; W. 37 mm ; T. 16 mm |
| 761b | 32 | Small midrib fragment, probably from near the point. No trace of blade wing. Three layers of clay visible. | W .7 mm (surviving) |
| 761c | 32 | Scrap of outer wrap with well defined groove, 1 mm wide, made by binding thong. | W. 1 mm (groove) |
| 965 | 43 | Socket fragment from junction of the socket and the blade wing. The latter is set into the broad flat contact face with its edge forming a short oblique line. The overall width of the fragment is expanding at this point to accommodate the blade. Three layers visible. | L. $28 \mathrm{~mm} ;$ W. $24.5 \mathrm{~mm} ;$ T. 11.5 mm |
| 1627 | 36 | Fragment with a very small part of a matrix remaining; this is curved across the long axis and thus may be part of a socket or midrib piece. Assigned to spearhead 1 on fabric type. | L. 25 mm ; W. 21 mm ; T. 11 mm |


| 1805 a | 244 | Very abraded but portion of the blade wing and midrib can be <br> identified. There are no surviving edges; two layers of clay <br> visible in section. | L. $19 \mathrm{~mm} ;$ <br> W. $24 \mathrm{~mm} ;$ <br> T. 10 mm |
| :--- | :---: | :--- | ---: |
| 2308 | 232 | Part of blade wing and midrib from lower section of blade. Very <br> weathered; three layers of clay are visible. | L. $14 \mathrm{~mm} ;$ |
|  |  | W. $24 \mathrm{~mm} ;$ |  |

## Spearhead type 2

92E102:135 is a collection of twenty-four pieces and several tiny scraps of clay mould. Some belong to sword and pin moulds, but at least four are from the type 2 spearhead. Three more fragments with no surviving or clearly identifiable matrix could be assigned to this group on the basis of fabric type.

Spearhead type 2

| 135a | 10 | Three pieces that join together to form part of the midrib and one blade wing. The surface is very abraded and there are only faint traces of the rib and groove in the angle between midrib and blade. This piece is from the junction between the socket and the beginning of the blade and the line of the base of the blade is visible. Parts of an outer layer survive. | $\begin{array}{r} \mathrm{L} .51 \mathrm{~mm} ; \\ \mathrm{W} .30 \mathrm{~mm} ; \\ \mathrm{T} .11 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 135b | 10 | Two pieces that join together to make up part of the midrib and both blade wings. No outer edges survive. Two layers visible. | L.64mm; W. 37 mm ; T. 12 mm |
| 135c | 10 | Fragment with a curving groove on one face. However, the surfaces are so abraded it is not clear whether this face was part of the matrix or the lower layers of the mould. The groove has the appearance of a loop, such as the fine string loops on later basallooped spearheads, but this feature is not consistent with the other details of the spearhead. Two layers visible. | L. 30 mm ; <br> W. 14 mm ; <br> T. 9 mm |
| 162a | 10 | Very abraded piece with none of the original surface remaining. However, the impression of a midrib, one blade wing and part of the other can be identified. The piece comes from close to the point of the spearhead. | L. 16 mm ; W. 27 mm ; T.10mm |
| 162b | 10 | Similar to piece 162 a, possibly the point of the spearhead. Very abraded. Two layers of clay visible. | L. 16 mm ; W. 27 mm ; T. 10 mm |
| 162c | 10 | Featureless scrap. |  |


| 162d | 10 | Part of midrib and one blade wing; the wing is expanding and the midrib is contracting indicating that the piece comes from near the base of the blade. A groove with a faint rib on either side runs between the midrib and the blade wing. The blade is curved with a line defining the bevelled edge. The piece appears to join with 794a but the broken edges of each are very abraded. | L. 34mm; W.31mm; T.14mm |
| :---: | :---: | :---: | :---: |
| 164 | 10 | Possible socket fragment. Fabric similar to spearhead 2. | L. 17 mm ; W. 13 mm ; T. 10.5 mm |
| 211 | 41 | Part of the blade wing. Two layers are visible. The surface is slightly concave but is rough and the fine inner layer is clearly missing. | L. 10 mm ; W. 14 mm ; T. 7.5 mm |
| 212 | 41 | Part of the midrib, no blade wings survive. The surface is very abraded. Three layers of clay visible. | L. 33 mm W. 21 mm T. 12 mm |
| 229a | 10 | Two fragments that join to form what appears to be part of a socket with a step at the junction of the matrix and the contact face. The remainder of the contact face has broken away; the piece is from the area of the socket that had a raised band along the side. Two layers of clay visible. | L. 37 mm ; W. 20 mm ; T. 14 mm |
| 229 b | 10 | Possibly from the very narrow lower part of the blade. The surface is heavily and unevenly abraded. As in piece 229a, two layers of clay are evidence. | L. 22 mm ; W. 20 mm ; T. 13 mm |
| 233 | 9 | Part of midrib and one blade wing; the wing is expanding and the midrib is contracting indicating that the piece comes from near the base of the blade. A groove with a faint rib on either side runs between the midrib and the blade wing. The blade is curved. | L. 29.5 mm ; W. 21 mm ; T. 14 mm |
| 348 | 10 | Part of the socket. Inner fine layer missing, one broad flat contact face survives. Three layers of clay evident. | L.16mm; W. 26 mm ; T. 14 mm |
| 420 | 43 | Part of a shallow midrib and one blade wing. The surface is abraded but the remains of a groove are visible in the junction between the blade and midrib. Two layers present. | L. 19 mm ; W.19mm; T. 9 mm |
| 421 | 43 | Part of the side of the midrib and one blade wing. The surface is abraded but lines delineating the edge of the blade, and the groove located at the junction between the blade and the midrib, are present. Three layers of clay visible. | L. 19 mm ; W.19mm; T.13.5mm |
| 422a | 41 | Consists of three pieces joined together to form the greater part of the midrib and a small part of one blade wing. | L. 42 mm ; W.31mm; T.10mm |
| 422b | 41 | Part of one blade wing and midrib. The blade wing is narrow and the midrib is shallow; the piece may therefore come from closer to the point than 422a. Two layers visible. | $\begin{array}{r} \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .21 .5 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \end{array}$ |


| 422c | 41 | A large piece of outer wrap that sits onto the back giving three layers. The surface of the piece is abraded but traces of the groove/rib along the midrib are visible. Both midrib and blade are narrowing along the length indicating that the fragment is from the upper part of the blade. | L. 41.4 mm ; W. 33 mm ; T. 22.5 mm (total) |
| :---: | :---: | :---: | :---: |
| 427 | 43 | Part of socket with one broad, flat contact face preserved. Probable diameter 26 mm . Four layers visible but the innermost is very abraded. | L. 23.5 mm W. 22 mm ; T. 11 mm |
| 554a | 43 | Part of one blade wing and midrib. Very abraded, fine inner layer missing. Two layers remain. | L. 20 mm ; W. 22 mm ; T. 12 mm |
| 630 | S/H | Part of socket of midrib probably of type 2 spearhead. Inner layer grey, outer beige. | L. 28 mm ; <br> W. 24 mm ; <br> T. 9 mm |
| 646 | 41 | Possible socket fragment from type 2 spearhead socket; very abraded. The piece is either from a socket with a broad contact face or from the midrib/blade wing area. | L. 22 mm ; <br> W. 20 mm ; <br> T. 13 mm |
| 750 | 56 | Point of spearhead with midrib, both blade wings and one contact face. Surface abraded so not all the detail survives. Midrib pronounced, blade wings set at an angle and contact face probably horizontal to axis of matrix. Three layers visible. | L. 29 mm ; W. 33 mm ; T. 11.5 mm |
| 794 | 33 | Very abraded part of midrib and one blade wing. Faint traces of the rib/groove arrangement along the midrib. The inner skin of the outer wrap has two sharply cut parallel grooves across it; a third parallel groove is evident near the break and two additional grooves run diagonally across the long axis of the piece. | L.34mm; <br> W. 24 mm ; <br> T. 17 mm |
| 1033 | 217 | Abraded, possibly burnt part of the blade wing with a groove dividing it from the midrib. The matrix shows a flat plane with one broken edge; there is a narrow, shallow step on the other side below this level. Two layers visible. | $\begin{array}{r} \text { L. } 22 \mathrm{~mm} ; \\ \text { W. } 16.5 \mathrm{~mm} ; \\ \text { T. } 9 \mathrm{~mm} \end{array}$ |
| 1057 | 41 | Part of one blade wing with a groove or step at the junction with the midrib - the latter is now missing. A raised line that demarcates either the bevelled edge or the contact face divides the blade area. The blade is narrowing and the groove or step is contracting in width; the piece is therefore from the base of the blade where the rib running along the midrib would still be quite pronounced. | L. 18 mm ; W. 27 mm ; T.13.5mm |
| 1141 | 219 | Very abraded piece; traces of a raised line may be the bevelled edge of the blade or the beginning of the midrib. Two layers remain; the fragment is assigned to spearhead 1 on the basis of fabric type and the presence of a grey-coloured inner layer. | L. 16.5 mm W. 18 mm T. 9.5 mm |


| 1290 | 203 | Abraded part of the midrib and blade wing close to the tip of the blade. A groove, 1 mm wide, divides the two. The bevelled edge of the blade wing may be discernible but the surface is too abraded to be certain. Three layers visible. This fragment possibly joined to piece 1421 (featureless outer wrap fragment) at one time but the breaks are too weathered now to refit. | L. 18.5 mm <br> W. 17 mm <br> T. 9 mm |
| :---: | :---: | :---: | :---: |
| 1444 | 43 | Abraded part of one blade wing and possibly the beginning of the side of the midrib. Some of the fine inner layer remains and there is a contact face at the edge of the blade. Three layers are visible. May join with the following piece 1471. | L. 14 mm W. 21 mm T.13mm |
| 1471 | 239 | Part of the midrib and one blade wing from close to the point. A groove 1 mm wide separates the two. No bevel edge is visible on the blade surface, but the latter is abraded. Two layers visible. | L. 24 mm ; <br> W. 22 mm ; <br> T. 9 mm |
| 1880 | 244 | Part of a socket valve with a step for a pouring gate. The socket wall slopes outwards gently from the base of the step, narrowing the diameter of the mould. The base of the fragment is complete as if this sat on top of the actual opening the upper part is broken - presumably the pouring cup was broken off. Assigned to spearhead 2 on the basis of fabric type. | L. 19 mm W. 30 mm T. 11 mm |

## Miscellaneous spearhead fragments

| 715 | 95 | Two flat horizontal planes separated by a step. May relate to piece 1779. Two layers visible. | $\begin{array}{r} \mathrm{L} .18 \mathrm{~mm} ; \\ \mathrm{W} .18 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 1779a | 244 | Part of the midrib and one blade but with only a small portion of the junction of the two surviving. There is no clear trace of a groove or rib, possibly because the feature has been weathered away. Alternatively the piece may belong to a third spearhead. The remains of the blade wing indicate that it was flat, perhaps slightly convex, but this does not match the Spearhead 1 blade. Three layers visible. | $\begin{gathered} \mathrm{L} .55 \mathrm{~mm} ; \\ \mathrm{W} .37 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \end{gathered}$ |
| 1779b | 244 | Part of one blade wing. Three layers visible. | L. 25 mm ; W.21mm; T. 17 mm |
| 1779c | 244 | Piece with no surviving matrix but shape and fabric indicate that it is part of a blade wing of this group. | $\begin{array}{r} \mathrm{L} .25 \mathrm{~mm} ; \\ \mathrm{W} .23 \mathrm{~mm} ; \\ \text { T. } 17 \mathrm{~mm} \end{array}$ |
| 2113 | 244 | Part of blade wing, flat with a defining line at the edge of the bevel. No remains of the midrib, but the overall thickness of the mould is increasing at the point where it would have been. Appears similar to piece 1779a. | L. 22 mm ; W. 27 mm ; T.13.5mm |

## Possible spearhead fragments

| 135a-d | 10 | Small undiagnostic scraps that appear to be part of the socket or midrib of an object. No blade wings evident but the pieces may be from spearhead 2. | L.19mm; W. 22 mm ; T. 12 mm |
| :---: | :---: | :---: | :---: |
| 191 | 43 | Small fragment with a dished surface, possibly part of the midrib of a spearhead. Three layers of clay present. Fabric Group 2. | L. 13 mm ; W. 17 mm ; T. 13.5 mm |
| 192d | 41 | Part of a gate for a spearhead socket with a step and one intact face at base. Very weathered. Sixteen other scraps, one with a curve suggestive of socket or midrib. Fabric very weathered. | L. 19 mm ; W. 25 mm ; T. 14 mm |
| 229c | 10 | Undiagnostic fragment but fabric suggests spearhead. | L. 21 mm ; W. 18 mm ; T. 13 mm |
| 554b | 43 | Fragments that join with piece 430 (outer wrap). Inner layer is missing. Section suggests spearhead blade area. Three layers visible. | L. 21 mm ; <br> W. 22 mm ; <br> T. 13 mm |
| 750 | 56 | Three scraps made from fabric similar to spearhead. | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .31 .5 \mathrm{~mm} ; \\ \mathrm{T} .13 \mathrm{~mm} \end{array}$ |
| 790 | 70 | Part of a socket, one contact face survives, all abraded. Curvature is fairly shallow, may be for a smaller piece. The surface is too weathered to be sure of the fabric type. Two layers of clay visible. | L. 27 mm ; W.14m; <br> T. 11 mm |
| 1463 | 239 | Possible blade wing, no remains of midrib but piece is thickest at one side. Three layers visible. | L. 22 mm W. 18 mm ; T. 12 mm |
| 1788 | 244 | Possible blade fragment, surface abraded. Two or three layers visible. | L. 20 mm ; W. 19 mm ; T. 11 mm |

## Socket fragments of uncertain identification

Four or possibly five of these pieces could be socket fragments; while some may belong to the spearhead category, others may be from smaller items such as socketed gouges or chisels. 577 may be either a socket fragment or part of a crucible.

## Socket fragments of uncertain identification

| 577 | 43 | Very abraded piece, probably part of a socket or crucible. Two <br> layers visible. | L. $21 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | ---: |


| 657 | 41 | Possibly part of a socket. However, the piece could equally be from the wrapping of the junction of two valves, as the fabric is more like that of an outer wrap and the shape of the piece is more curved than usual. No contact faces present. | L. 18mm; W. 21 mm ; T.16mm |
| :---: | :---: | :---: | :---: |
| 875 | 202 | Part of a socket. Well preserved, one contact face remains and there is a slight constriction in the line of the inner edge. The fabric is similar to spearhead type 2, but it may have been for casting a smaller piece such as a gouge or socketed punch. | $\begin{array}{r} \hline \text { L. } 26 \mathrm{~mm} ; \\ \text { W. } 23 \mathrm{~mm} ; \\ \text { T. } 10 \mathrm{~mm} \end{array}$ |
| 1078 | 41 | Thin fragment, broken in four, and made from fine fabric; grey in colour with pale surfaces. Remains of what appears to be the gate step are present at one end. One contact face survives. Could possibly be the inner layer of the socket of spearhead type 2. | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .33 \mathrm{~mm} ; \\ \text { T. } 10 \mathrm{~mm} \\ \text { (max). } \end{array}$ |
| 1943 | 244 | Two refitted pieces; possibly part of a socket similar to 1078 above. One contact face remains intact. The curvature is shallow and only the fine inner layer survives. | $\begin{array}{r} \hline \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{W} .12 \mathrm{~mm} ; \\ \text { T. } 7 \mathrm{~mm} \\ \hline \end{array}$ |
| 2395 | 239 | Part of a socket, possibly of a spearhead as it seems to belong to Fabric Group 2, but could also have been for a smaller implement. | $\begin{array}{r} \mathrm{L} .24 \mathrm{~mm} ; \\ \mathrm{W} .15 \mathrm{~mm} ; \\ \text { T. } 9 \mathrm{~mm} \end{array}$ |
| 2583 | 279 | Consists of a collection of small sherds, two of which are definitely socket pieces, could equally be gouge. Paste is very fine. | L. 18 mm ; W. 21 mm ; T.19mm |


| Swords |  |  |  |
| :---: | :---: | :---: | :---: |
| 135/236 | 10, 21 | One piece from the group registered as 135 fits with 236 to form a long piece of the blade matrix. This is dished in cross-section and a crack running along the centre has split the fragment. The contact face is abraded and worn away on one side; the bevelled edge of the blade may be discernible. Outer wrap preserved. Six further fragments in the group are abraded, but can be assigned to the sword mould category on the basis of fabric. | L. 60 mm ; W. 43 mm (mould), 32 mm (matrix); T. 14 mm |
| 157 | 10 | Abraded fragment with small area of relatively smooth, dished matrix surface preserved. This, and the profile of the mould, suggests the piece is from a sword blade. | $\begin{array}{r} \mathrm{L} .23 \mathrm{~mm} ; \\ \text { W. } 33 \mathrm{~mm} ; \\ \text { T. } 16 \mathrm{~mm} \end{array}$ |
| 194 | 41 | Fragment with longitudinal central crack. Both contact faces survive but are abraded. These indicate that the blade was narrowing at this point, either towards the butt or the point. The outer skin(s) of the outer wrap have partly eroded away revealing a crisply outlined groove made by a binding thong. The mould was therefore bound before the full outer wrap was applied. | L. 26 mm ; <br> W. 42 mm <br> (matrix <br> 25mm); <br> T. 12 mm |
| 235 | 10 | Small piece retaining the impression of about half the width of the blade. One contact face survives but is eroded. Outer wrap partly preserved. | $\begin{array}{r} \mathrm{L} .14 \mathrm{~mm} ; \\ \mathrm{W} .23 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \\ \hline \end{array}$ |


| 247 | 6 | Matrix with dished surface and converging contact faces. This piece is from quite close to the point of the sword. Both contact faces look as though they may have been horizontal. The fragment is abraded; one layer of the outer wrap remains but there may have been additional skins. | L. 39 mm ; W. 35 mm (mould), W. 25 mm 13 mm (matrix); T.10mm |
| :---: | :---: | :---: | :---: |
| 355 | 41 | Piece with dished surface and converging contact faces. The contact face is intact on one side only but its line is visible on the other edge. This fragment is from slightly nearer to the point than 235; the two pieces do not refit but clearly come from near adjacent parts of the mould. Both probably formed part of the opposite valve to 247 . Two layers survive, but there was probably a third outer wrap. | L. 37 mm ; <br> W. 31 mm (mould; W. 25 mm (max. width of matrix); T. 18 mm |
| 358a/b | 10 | Two pieces that join together. The surface is abraded and has a shallow linear groove, possibly marking one side of the butt. The fact that the groove is set at an angle across the fragment would further support the identification. The fabric is similar to the other sword mould pieces. Part of outer wrap present. | L. 40 mm ; W.19mm; T.10mm; Groove; L. 23 mm ; W. 3 mm |
| 553 | 32 | Piece representing half of mould width. The matrix surface is dished; one contact face present but eroded. Outer wrap does not survive. | L. 24 mm ; W.22mm; T. 12 mm |
| 813 | 32 | Piece with contact face. This has a curving edge and inverted shallow v-shaped profile. The remainder of the abraded matrix surface is slightly dished. Part of outer wrap present. | L.33mm; W. $26 \mathrm{~mm} ;$ T. $9 \mathrm{~mm} ; \mathrm{W}$. of matrix. 11 mm |
| 1798 | 244 | Collection of five fragments. No definite matrix survives but on the basis of general shape and fabric the pieces appear to be part of a sword mould. |  |
| 2088 | 247 | Discoloured, possibly burnt piece with an accretion on the smooth surface. It appears to be part of mould for a sword blade but no contact face survives. No outer wrap present. | L. 18 mm ; W. 25 mm ; T. 12 mm |

## Knives

| 442 | 41 | Two pieces that fit together; the matrix is dished and is most <br> probably part of a knife blade. There are faint remains of a <br> contact face on one side. The surviving part of the outer wrap is <br> brick red in colour. | L.19mm; <br> W.25mm <br> (mould); <br> W.21mm <br> (matrix); |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  | T. 7 mm |


| 584 | 43 | Very small fragment, possibly from the tang of a knife. Part of a contact face survives and slopes upwards from the matrix to the edge. The matrix is flat, but so little remains there are no features. The presence of a step, flat matrix and the angle of the contact face make it possible that this is a piece from a matching valve for either of the foregoing two pieces. | L. 15 mm ; W. 15 mm (mould); W. 2.5 mm (matrix); T. 7 mm |
| :---: | :---: | :---: | :---: |
| 619 | 32 | Blade fragment with dished cross-section and well-preserved surface. Both contact faces are present but incomplete on one side. As these are also slightly dished, this is most probably an upper valve piece. Outer wrap present. | L. 19 mm ; W. 26 mm (mould); W. 18 mm (matrix); T. 8 mm |
| 746 | 202 | Piece with tang and shoulder of blade. The top of the tang is complete and the edge rounded. The outer wrap does not quite extend to the top and projects slightly, as if to make a seat for a pouring gate. A groove runs down the centre of the matrix, starting halfway down the tang and extending on to the blade. Both contact faces slope down from the matrix edge to the mould edge, although this is less pronounced on one side. The matrix, like that of 1246, is dished in cross-section. These two factors, in particular the angle of the contact faces, make it unlikely that 746 and 1246 come from matching valves. The matrix on the latter is also slightly wider. | $\mathrm{L} .45 \mathrm{~mm} ;$ W .24 mm (mould); W .9 mm (matrix at tang); T .9 mm |
| 1235 | 219 | Knife blade. Part of one contact face only. Approximately half of the width of the matrix is present. Slight undulating, may be close to shoulder/tang. Outer wrap present. | L. 20 mm ; W. 14 mm ; T. 8 mm |
| 1246 | 219 | Piece with tang and traces of shoulder of blade. The matrix is abraded but a central groove runs the length of the fragment. The contact faces slope from the edge of the matrix down to a slight step down on the sides of the mould. The lower part of one edge is damaged but the outturn for the shoulder of the blade can be identified on the other. Outer wrap present. | L. 32 mm ; W. 20 mm (mould); 11 mm (matrix); T. 5 mm |
| 1338 | 255 | Worn and abraded piece with narrow central groove, flat surfaces on either side of it and edges possibly indicating beginnings of contact faces. The latter have now disappeared. It is possible that the piece is from the tang/upper blade area. Outer wrap does not survive. | $\begin{array}{r} \text { L. } 25 \mathrm{~mm} ; \\ \text { W. } 21.5 \mathrm{~mm} \\ \text { T. } 7.5 \mathrm{~mm} \end{array}$ |
| 1455 | 43 | Piece with one contact face surviving. The matrix is slightly abraded and the outer wrap does not survive. | L.18mm; W. 14 mm ; T. 5 mm |


| 1465 | 239 | Knife point. The matrix shows the end of the blade narrowing to a rounded tip. The surface is weathered and not as fine as on the previous fragments. The matrix is off-centre on the mould so that one contact face is quite narrow. Both contact faces slope downwards slightly from matrix edge to mould edge. A thin layer of the outer wrap remains and this presumably was originally enveloped by another layer. | L. 35 mm (mould); L. 25 mm (matrix); W. 25 mm (mould), W. 14 mm (matrix); T. 9 mm |
| :---: | :---: | :---: | :---: |
| 1641 | 239 | Small fragment, possibly representing the blade point. The matrix has a flat surface and possibly converging sides. Both contact faces slope down from matrix edge to mould edge. Outer wrap present. | L. 14 mm (mould), L. 12 mm (matrix); W.19mm (mould), W. 7 mm (matrix); T. $10 \mathrm{~mm} ; \mathrm{D}$. of matrix; 5 mm |
| 1658 | 239 | Piece with abraded concave surface. These are faint traces of one contact face; this appears to slope down from the matrix to the mould edge. Only a skim of the outer wrap remains attached to the inner wad. | L. 22 mm ; <br> W.21mm; <br> T. 6 mm |
| 1792 | 244 | Knife blade including point section, made up now of four fragments that refit; a fifth fragment probably also forms part of the same piece. The mould has a rounded point and the matrix here is set off-centre. Both contact faces are abraded but slope upwards slightly from the matrix edge to the mould edge. Outer wrap present. The piece looks as if it should be the opposite valve for 1465 above, but they do not fit very well together. This may be due to abrasion of the contact faces. Dimensions of largest fragment with point. | L. 39 mm ; <br> L. 32 mm <br> (matrix); <br> W. 29 mm <br> (mould; <br> W. 17 mm <br> (matrix); <br> T.10mm |

## Fragments of uncertain identification

| 1665 | 239 | There are several pieces assigned this number but a matrix is <br> preserved on only one example; most of the remainder are scraps. <br> All are made from the same fabric, probably Fabric Group 1. The <br> piece with the matrix has a rounded top or rim which possibly be | L. $21 \mathrm{~mm} ;$ <br> W seat for a gate. The matrix itself is damaged; it is flat on one | T.8.5mm <br> long side and has an upturn on the other. Outer wrap present. <br> Tang? |
| :--- | :--- | :--- | ---: | ---: |


| 1707 | 95 | One contact face remains. This is sloping downwards from the <br> matrix towards the outer part. The matrix is long and flat and <br> there would have been an allowance for a thickness of 2-3mm <br> against the contact face. The other side is broken, only a tiny part <br> of the upturn for the opposite contact face remains. No outer <br> wrap. Fabric Group 1. | W. $22 \mathrm{~mm} ;$ <br> W. $14 \mathrm{~mm} ;$ | T. 6 mm |
| :--- | :--- | :--- | ---: | ---: |

## Pin heads

None of the pin head moulds are complete. All belong to Fabric Group I.

## Ball-headed pins

## Pin 1

| Upper valve |  |  |  |
| :---: | :---: | :---: | :---: |
| 135 g | 10 | Abraded portion of shank, although the cross-section becomes more rounded rather than triangular from one end to the other. This piece appears to refit with 1490 . Outer wrap present. Groove for shank, 4 mm wide and 2 mm deep. | $\begin{array}{r} \hline \mathrm{L} .29 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \mathrm{T} .14 \mathrm{~mm} \end{array}$ |
| 618 | 32 | Piece of upper valve, as in the previous piece, the cross-section is rounded but relatively deep. Fabric as for 1490 and 135 above. The groove for the shank widens at one end; this may result from weathering but could also be an expansion to meet with a pouring gate. The contact faces are weathered. A narrow sharp groove on the back is an impression of a binding strip. Groove for shank: 4 mm wide and 2 mm deep. | $\begin{array}{r} \hline \text { L. } 38 \mathrm{~mm} ; \\ \text { W. } 23 \mathrm{~mm} \text {; } \\ \text { T. } 13 \mathrm{~mm} \end{array}$ |
| 1490 | 239 | Abraded part of the upper valve of a mould for a pin with a plain, ball-shaped head. The contact faces are wide and flat. The matrix for the head consists of a depression, 19 mm wide by 12 mm long and 5 mm deep. Two small depressions that occur in the angles between the shank and head may be keying devices. The matrix for the shank is shallowest ( 5 mm wide by 1.3 mm deep) at this point. Apart from the presence of a few larger quartz inclusions in the fabric it conforms to Fabric Group 1. Only a thin skin of the outer wrap survives; this is made from similar fabric but is looser in structure. | $\begin{array}{r} \mathrm{L} .54 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \mathrm{T} .16 \mathrm{~mm} \end{array}$ |

## Lower valve

| 454 | This is a lower valve piece with one end shaped either to act as a <br> pouring funnel, or as a seat for a gate. The funnel feature is <br> asymmetrically set around the opening for the pin shank and is <br> incomplete. The fragment cannot be matched with any other <br> group and is probably part of the lower valve of the preceding <br> pieces. The contact faces are flat and abraded. Fabric Group 1, no <br> large grains visible. Groove for shank, 4mm wide and 2mm deep. | L.30mm; | W.23mm; |
| :--- | :--- | :--- | :--- |

Pin 2

| 661 | 32 | Abraded piece, not complete across the width but probably from <br> a lower valve. The groove for the shank can be traced along one <br> surface and runs to an oval shaped depression, 10.5 mm by 5 mm <br> and 3 mm deep. The groove possibly continues on the other side <br> of this depression. Fabric is compact, probably Group 1. Outer <br> wrap crumbly. This may be a similar pinhead to 1490 or perhaps <br> it was of more complex form. Groove for shank 5mm wide and at <br> least 1mm deep. | L.32mm; | T. $13 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | :--- | :--- |

## Disc-headed pins

## Pin 3

| 111 | 10 | Piece with part of central hollow, 4,5mm in diameter, remaining. <br> An interval of 5mm separates the hollow from a surrounding <br> groove 1mm deep. Part of a concave contact face, 5mm wide, <br> remains. Original diameter of pin head ca. 15 mm. | L. $14 \mathrm{~mm} ;$ <br> W.19mm; |
| :--- | :--- | :--- | ---: |

## Pin 4

| 637 | 32 | Approximately half the diameter of this pinhead survives. A <br> single outer groove encloses a blank, but steeply sloping, inner <br> area with a central depression. This would have given a pinhead <br> that sloped down from a central boss to an outer ridge, ca. 20mm <br> in overall diameter. Contact face slightly convex. Outer wrap <br> present. | L. 27 mm x <br> $20 \mathrm{~mm} ;$ | boss; 4 mm |
| :--- | :--- | :--- | ---: | ---: |

Pin 5

| 811 | 95 | This piece is distorted as if it had been burnt after discard. <br> Classification as a pinhead is based on the triangular profile of <br> the mould and the presence of a small central depression that may <br> have been for a boss. Outer layer survives and the underside <br> comes to a point along the central axis. | W.18mm; <br> W. | T. $7 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | ---: | ---: |

Pin 6

| 1377 | 32 | This piece is also very abraded but a tiny (3mm in diameter by <br> 1 mm deep) central depression remains. The original contact faces <br> have disappeared; the remainder of surface is eroded and the | L.20mm; <br> outer wrap does not survive. The piece is triangular in profile, <br> similar to 811 above. | T.17.5mm |
| :--- | :--- | :--- | ---: | ---: |


| Pin 7 | 43 | Piece with half of the central hollow (5mm in diameter by 3 mm <br> deep) preserved. This is surrounded by a convex ring bordered by | L. $25 \mathrm{~mm} ;$ <br> W sharply cut groove. A concave, slightly sloping contact face | T.9mm <br> surrounds the groove. Outer wrap, 4mm thick, present but broken <br> at edge of contact face. Original diameter of head ca. 16 mm. |
| :--- | ---: | :--- | ---: | ---: |

## Pin Shank Groups

This is represented by shank pieces only; parts of two matching valves are present. All the pieces were recovered from the edge of the large hearth in the northern part of Cutting 1.

## Group 1

| Upper valve |  |  |  |
| :---: | :---: | :---: | :---: |
| 2626 | 297a | Triangular in section. Fits to 2651 . Groove is 4 mm wide and 1 mm deep. Contact faces flat then tilts upwards, this forms a lip over the side of the lower valve. Traces of the outer wrap remain. The fragment narrows from the end which refits with 2651, but the sides are abraded. | L. 17 mm ; W.16mm; T.14.5mm |
| 2645 | 297a | Triangular in section, splays notably along length. Part of the outer wrap survives. The piece is discoloured and appears slightly warped at the wider end; it was probably burnt after discard. Groove for shank: 4 to 5 mm wide by $<2 \mathrm{~mm}$ deep. | L. $35 \mathrm{~mm} ;$ W. $26-38 \mathrm{~mm} ;$ T. 16 mm |
| 2651 | 297a | Triangular in section. Refits with piece 2626. The matrix is quite shallow. The contact faces are slightly uneven, but matched by those on the lower valve piece. Very little outer wrap survives. Groove for shank: $39 \mathrm{~mm}-42 \mathrm{~mm}$ wide by 1 mm deep. | L. 47 mm ; W. 24 mm ; T. 17 mm |
| 2658 | 297a | This piece is discoloured in a similar manner to 2645 and may also have been burnt. Triangular in cross-section. The fragment widens slightly from one end to the other, but it is difficult to say by how much as the sides are abraded. The profile also becomes rounded. These two factors distinguish it from the rest of the upper valve pieces. However, the fact that, like the latter, the flat, narrow contact faces are higher on one side than one the other makes it more likely that this was also part of the upper valve. No outer wrap survives. Impressions of a binding strip occur on the | L.38mm; W. 23 mm ; T. 14 mm |


|  |  | back but are damaged. Groove for shank: 4 mm wide and 1 mm deep. |  |
| :---: | :---: | :---: | :---: |
| Lower valve |  |  |  |
| 2623 | 297a | Two pieces that match the upper valve; the mould tapers from 39 mm wide at one end to 20 mm at the other. It is semi-circular in cross-section and over half of the matrix for the pin groove is present. The contact faces are flat, becoming rounded at sides. No outer wrap present. A semi-spherical depression located slightly off-centre on the back of the piece at its wider end is probably a key for the outer wrap. Grey reduction layer in centre. This piece fits perfectly to the upper valve pieces. Groove for shank: 4 mm 5 mm wide; $3.5 \mathrm{~mm}-4 \mathrm{~mm}$ deep. | $\begin{array}{r} \mathrm{L} .69 \mathrm{~mm} ; \\ \mathrm{W} .39 \mathrm{~mm} ; \\ \mathrm{T} .14 \mathrm{~mm} \end{array}$ |
| 2677 | 200 | Small fragment, probably from lower valve and made of similar fabric to the remaining pieces of this pin; the width of the inner wad is also similar to the foregoing. The surviving part of the matrix is 9 mm long by 4 mm wide but the contact faces are too eroded to establish the depth. Traces of outer wrap remains. | L. 16 mm ; W. 18 mm ; T. 10 mm |

## Pin Shank Group 2

The pieces representing this pin form a less coherent group than either of the above. Classification as a group is based on the shape and size of the mould pieces, as well as on the form of the matrices. The fabric is similar to Pins 1 and 2 (i.e. Fabric Group 1) but the temper does not include any noticeably large grains.
Group 2

| Upper valve |  |  |  |
| :---: | :---: | :---: | :---: |
| 2613 | 297a | The mould piece is semi-circular in cross-section but it is possible that it is part of a upper valve. Based on the find spot, it could be part of pin 2, but the form appears to be different. The piece is abraded, with flat contact faces that were probably higher at the mould edges; it may be from close to the point of the shank. Outer wrap present and contains temper grains 1 mm in size. Groove of shank: 3 mm wide, narrowing to 2 mm ; depth $>1 \mathrm{~mm}$. | L. 24 mm ; <br> W. 16 mm ; <br> T. 9 mm |
| 2587 | 71 | Two refitted pieces of triangular cross-section. On one fragment both mould and matrix widen and the latter also deepens. No outer wrap. Weathered, texture appears coarser than in pin 2 but this is probably due to poorer preservation. Groove for shank: 4 mm wide and 1 mm deep. | $\begin{array}{r} \text { (A); L. } 37 \mathrm{~mm} ; \\ \text { W. } 29 \mathrm{~mm} ; \\ \text { T. } 12 \mathrm{~mm} .(\mathrm{B}) \\ \mathrm{W} .23 \mathrm{~mm} ; \\ \text { T. } 21 \mathrm{~mm} \end{array}$ |


| Lower valve |  |  |  |
| :---: | :---: | :---: | :---: |
| 1468 | 239 | Matrix is well preserved but contact faces are abraded. Contact faces sloped down from edge of matrix to mould edges. Inner wad is quite thick ( 9 mm ) in comparison to other pieces. Outer wrap thin, partly missing. Groove for shank: 4 mm wide by 3 mm deep. | L. 15 mm ; W.16mm; T. 12 mm |
| 2252 | 270 | The matrix is off-centre in the mould. One of the contact faces appears to be higher at one end, but this may be due to abrasion. Outer wrap present, but broken away to expose intact inner wad. Groove for shank: 4 mm wide by 1 mm deep. | L. 25 mm ; <br> W.23mm; <br> T. 9 mm |
| 2260 | 270 | The matrix also slightly off-centre in this mould fragment. The contact faces slope up from the edges of the matrix and then fall away to the sides of the mould. One of the contact edges is relatively broad while the second is more irregular. Outer wrap intact. Groove for shank: 4 mm wide by 2 mm deep. | L. 24 mm ; W. 22 mm ; T.10mm |
| 2302 | 244 | Abraded piece, especially at one end where the contact faces and matrix are worn down. The contact faces are flat and slope away slightly from the edges of the matrix. Outer wrap present. Groove for shank: 4 mm wide by 2 mm deep. | L. 21 mm ; <br> W. 22 mm ; <br> T.9mm |
| 2487 | 200 | Outer wrap missing and base is flat. The mould and the matrix both taper in width along the length. The piece seems to be a point as, although the end is not closed, there is no apparent break. The contact faces are flat and narrow. Groove for shank: $3 \mathrm{~mm}-2.5 \mathrm{~mm}$ wide and 1.5 mm deep. | $\begin{array}{r} \text { L. } 31 \mathrm{~mm} \\ \text { W. } 13-8.5 \mathrm{~mm} \\ \mathrm{~T} .12 \mathrm{~mm} \end{array}$ |
| 2616 | 297A | Piece with more than half the width of the shank matrix surviving. The contact faces are rounded and probably sloped up from the matrix edges and back down to the sides of the mould. Outer wrap present, broken in places revealing inner wad 10 mm thick. Groove for shank: 4 mm wide and 2.5 mm deep. | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .20 .5 \mathrm{~mm} ; \\ \mathrm{T} .18 .5 \mathrm{~mm} \end{array}$ |

## Pin Shank Group 3

The fabric of these fragments is much coarser than in the previous pieces. It is similar to that used to make the sword moulds (Fabric Group 2). The pin groove is also larger, casting a shank of between 5 mm and 6 mm in diameter. Only three pieces, all belonging to an upper valve, have been recovered. All were recovered from different layers but come from the same area in Cutting 1.

Group 3

## Upper valve

| 346 | 10 | Weathered, contact faces slope upwards from groove edge then <br> back to mould edges. Outer wrap missing. Groove for shank: <br> 5.5 mm wide and 4mm deep. | L.39mm; <br> W.27mm; |  |
| :--- | ---: | :--- | ---: | ---: |


| 1666 | 239 | Piece with deep wall marked groove set slightly askew in mould. Contact faces similar to 346 above. Outer wrap present in patches and includes temper grains $<1 \mathrm{~mm}$. The inner wad has a triangular profile. Groove for shank: 6 mm wide and 3 mm deep. | L. 55 mm W. 27 mm ; T. 17 mm |
| :---: | :---: | :---: | :---: |
| 1823 | 244 | Piece joins with 1666. Inner wad has triangular cross-section whilst that of the outer wrap is more rounded. Groove well marked; contact faces as in 1666 . Outer wrap fabric is coarse with grains $<2 \mathrm{~m}$ visible. Groove for shank: 5 mm wide and 2 mm deep. | L.30mm; W. 32 mm ; T. 21 mm |

## Miscellaneous pin shank fragments

The following pieces do not form a group but are pieces that do not appear to belong to the previous pin shank groups.

Miscellaneous pin shank fragments

| 184 | 41 | Very abraded scrap with possible groove in surface. Outer wrap <br> eroded. Fabric Group I. | L. $12 \mathrm{~mm} ;$ <br> $\mathrm{W} .14 \mathrm{~mm} ;$ <br> T .8 .5 mm |  |
| :--- | :---: | :--- | ---: | ---: |
| 837 | 202 | Part of lower valve. The base of the groove is well preserved but <br> the sides and contact faces are abraded. Fabric Group I. Outer <br> wrap coarse, may belong to pin 2, but the inner wad is not as <br> thick. Groove for shank: ca. 4-5mm wide by 2mm deep. | L. $24.5 \mathrm{~mm} ;$ <br> W. $25 \mathrm{~mm} ;$ | T .12 .5 mm |

## Bracelets

| Upper valves |  |  |  |
| :---: | :---: | :---: | :---: |
| 406a | 43 | Two refitted pieces; the line of breakage ran along the line of the groove. Only the outer edge of the matrix and the outer contact face are intact. The latter is dished and $c a .5 \mathrm{~mm}$ wide. Part of outer wrap remains. | L. 29 mm ; W.19mm; T. 7 mm |
| 415 | 43 | Very worn piece with half of the matrix and one dished contact face surviving. | $\begin{array}{r} \mathrm{L} .25 \mathrm{~mm} ; \\ \mathrm{W} .15 \mathrm{~mm} ; \\ \text { T. } 12 \mathrm{~mm} \end{array}$ |
| 1021 | 41 | Small abraded fragment. The outer half of the matrix survives as a step, but the inner edge has broken away. Outer contact face and part of outer wrap present. | L. 11 mm ; W. 13 mm ; T. 9 mm |


| 1473 | 239 | Fragment in three parts all of which are abraded. Two pieces join <br> along the line of the groove. The third piece is larger with a <br> matrix 2.5mm wide. It has a flat contact face with a slight lip at <br> the edge where the outer wrap meets it. | L. 25mm; <br> W.14m; <br> T. 8 mm |
| :--- | :---: | :--- | ---: |
| 1664 | 239 | Piece with half the matrix and part of the outer contact face <br> present; the latter is concave in profile. The groove measures ca. <br> 25mm wide by 13mm deep. Part of outer wrap survives. Probably <br> part of the same valve as 1473. | L.22mm; <br> W. $14 \mathrm{~mm} ;$ <br> T. 8 mm |
| 2143 | 244 | Possibly a small fragment from an upper valve. One surface is <br> flat or dished. Part of another surface slopes away from it to a <br> broken edge; it is not clear if there was an opposite face to this <br> sloped surface. | L. $11 \mathrm{~mm} ;$ <br> W. $12 \mathrm{~mm} ;$ <br> T. 9 mm |


| Lower valves |  |  |  |
| :---: | :---: | :---: | :---: |
| 90 | 10 | Very weathered piece; the edges of the matrix are worn and not intact at any point. The groove was at least 2.5 mm wide and 1.5 mm deep. The contact faces slope down from the edges of the matrix. Outer wrap occurs only in patches. | $\begin{array}{r} \mathrm{L} .49 .5 \mathrm{~mm} ; \\ \mathrm{W} .17 .5 \mathrm{~mm} ; \\ \mathrm{T} .10 \mathrm{~mm} \end{array}$ |
| 406b | 43 | Small fragment with abraded contact faces that slope down from the edges of matrix. Groove measures 3.5 mm wide by 1 mm deep. The piece has been cut diagonally at one end across the groove and contact faces. Outer wrap present on base. | $\begin{array}{r} \mathrm{L} .16 \mathrm{~mm} ; \\ \mathrm{W} .17 .5 \mathrm{~mm} ; \\ \mathrm{T} .10 \mathrm{~mm} \end{array}$ |
| 610 | 43 | Piece with intact matrix of rounded ' v ' profile. Groove is 3.5 mm wide by 2 mm deep. Contact faces slope down from matrix edges. The outer edge of the mould is flat while the inner edge is rounded. Part of the outer wrap remains. | L. 33.5 mm ; W.18mm; T. 11 mm |
| 1026 | 41 | Small and abraded fragment probably from lower valve. Remains of a small groove with slight curvature evident and part of the contact face survives on one side. Outer wrap evidenced only by thin skin of clay. | $\begin{array}{r} \text { L. } 15 \mathrm{~mm} ; \\ \text { W. } 13.5 \mathrm{~mm} ; \\ \text { T. } 8.5 \mathrm{~mm} \end{array}$ |
| 1056 | 216 | Abraded piece, probably from lower valve. Traces of a curved groove evident. Contact faces and outer wrap not preserved. | L. 12 mm ; <br> W. 15 mm ; <br> T. 6 mm |
| 1223 | 219 | Fragment with inner part of matrix and contact face present; the latter is slightly dished. The outer wrap lips up over the surviving contact face. The groove is $c a .2 .5 \mathrm{~mm}$ wide by 2 mm deep. | L. 18 mm ; W.16mm; T. 9 mm |
| 1371 | 41 | Abraded fragment with outer edge and part of inner edge of curving groove present. The matrix is 2.5 mm wide and at least 1 mm deep. The slightly convex outer contact face slopes down to the outer edge of mould; the latter is flat and no outer wrap is evident. | L. 22 mm ; <br> W. 17 mm ; <br> T. 9 mm |
| 1619 | 239 | Piece broken along the line of the matrix so that only the inner edge of the groove and the inner contact face survive. Traces of outer wrap remain. | L. 17 mm ; W.10mm; T. 8 mm |


| 1631 | 239 | Piece with relatively well-preserved matrix. The curved groove is 3.3 mm wide by 1.3 mm deep and flanked by contact faces that slope down to the edges of the mould. Both contact faces are slightly convex. The outer wrap survives across the base. | L. 29 mm ; W. 21 mm ; T. 12 mm |
| :---: | :---: | :---: | :---: |
| 1790 | 244 | Small abraded scrap with only a trace of a curving groove. The contact faces are also abraded. The inner is missing about half its width and all its surface; the complete width of the outer is present but most of its surface has gone. Traces of outer wrap present. Enough survives to show this was a lower valve. | $\begin{array}{r} \mathrm{L} .15 \mathrm{~mm} ; \\ \text { W. } 14.5 \mathrm{~mm} ; \\ \text { T.8.5mm } \end{array}$ |
| 1800 | 244 | Three scraps that join. Break line runs along the base of the groove. The groove is $c a .3 \mathrm{~mm}$ wide by $c a .2 \mathrm{~mm}$ deep. The flat, slightly convex contact face slopes from the matrix edges down to mould edges. The latter are narrow and rounded. Outer wrap missing. | L. 14 mm ; W. 17 mm ; T. 7 mm |

Gate moulds

| 433 | 41 | Short gate, step on base. Rim intact for short length, outer wrap fabric. | L. 23 mm ; W. 18 mm ; T. 15 mm |
| :---: | :---: | :---: | :---: |
| 438 | 41 | Bulbous lump of clay, vitrified. The concave interior is stepped. | L. 20 mm ; W. 22 mm ; T. 17 mm |
| 593 | 32 | Rim and step at base present. A longitudinal groove runs from the rim to midway on reverse face. On contact face is present suggesting a two-piece gate. |  |
| 831 | 202 | Small step at base. Rim is intact and there is a noticeable curve. | L. 21 mm ; W. 18 mm ; T. 8.5 mm |
| 863 | 202 | Rim and base are intact. Seating depression or feature on base. Coarse fabric. | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .41 .5 \mathrm{~mm} ; \\ \mathrm{T} .14 \mathrm{~mm} \\ \hline \end{array}$ |
| 874 | 202 | Only a very small piece of the rim remains; the base is also incomplete. This is the largest of the surviving gate moulds. It was formed of two parts, an inner solid plug of coarse clay and an outer wrap moulded around it to form the rim. | L. 39 mm ; W. 38 mm ; T. 22 mm |
| 1017 | 41 | Rim missing; the step at the base is intact and the wall is curved. | L. 25 mm ; W. 23 mm ; T. 12.5 mm |
| 1046 | 41 | Fragment that was part of a large gate. Traces of a seating step evident so it may be part of 874 above. | $\begin{array}{r} \mathrm{L} .14 \mathrm{~mm} ; \\ \mathrm{W} .31 .5 \mathrm{~mm} ; \\ \mathrm{T} .12 .5 \mathrm{~mm} \\ \hline \end{array}$ |
| 1409 | 217 | Weathered piece, broadly similar in shape to the above gates but lacking a curved interior. This may be due to abrasion and the inner face has also been heat damaged. There is a concavity as | L. 19 mm ; W. 28 mm ; T. 16 mm |


|  |  | opposed to a step on the base. Rim does not survive. |  |
| :---: | :---: | :---: | :---: |
| 1811 | 244 | Find rim, curve suggests a reasonably large piece. Internal face is gently convex. Surface is abraded. | L. 23 mm ; <br> W. 24 mm ; <br> T. 9.5 mm |
| 2095 | 88 | Small fine gate, interior abraded, no step; the rim is damaged but visible. Colour and fabric similar to 2643. | L. 19 mm ; W. 17 mm ; T. 6 mm |
| 2643 | 277a | Very fine rim, slender wall, narrow. Step or seat is well preserved. Gentle curvature. The fabric and find spot suggest that it may have been part of a pin mould. | $\mathrm{L} .19 \mathrm{~mm} ;$ $\mathrm{W} .21 \mathrm{~mm} ;$ T .10 mm (base); T. 2 mm (rim) |
| 3061 | 255 | Consists of three layers, or central one with outer layer lapped over top, forming rim. Probably a pouring gate. Fine fabric and some cracking at the rim may suggest that it was a small crucible fragment. | L.20mm; W. 20 mm ; T. 10 mm |
| 3065 | 253 | Probably a gate type piece. Not necessarily separately made from mould but detached-in breakage after casting. Very similar to other gate pieces. Distinct 'inner core' and outer later pulled up to rim now damaged. This fragment has finished edges and shallow inner curvature and could possibly be the end of a mould for a large pointed object such as a sword or spear. | L.26mm; W. 37 mm ; T. 21 mm |


| Cores |  |  |  |
| :---: | :---: | :---: | :---: |
| 627 | 32 | Weathered piece belonging to Fabric Group 2. The fragment comes to a point but is flat rather than curved on one face. | $\begin{array}{r} \mathrm{L} .18 \mathrm{~mm} ; \\ \text { W. } 12 \mathrm{~mm} ; \\ \text { T. } 9 \mathrm{~mm} \end{array}$ |
| 1494 | 239 | Lump of clay, possibly Fabric Group 1. The outer face is curved and retains part of a smooth surface. The interior has a layered appearance, as of a clay rolled up into a ball. | $\begin{array}{r} \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{W} .20 \mathrm{~mm} ; \\ \mathrm{T} .17 \mathrm{~mm} \end{array}$ |
| 1625 | 36 | Very small fragment with one smooth curved surface; broken across remainder. Possibly a socket core for a small and cylindrical object. | $\begin{array}{r} \mathrm{L} .9 \mathrm{~mm} ; \\ \mathrm{W} .13 \mathrm{~mm} ; \\ \mathrm{T} .7 \mathrm{~mm} \\ \hline \end{array}$ |
| 2415 | 279 | Possibly a core or gate fragment now broken into several pieces. The largest has a curved outer surface; its inner surface is either broken or abraded but small lumps of clay adhering to it suggest that it was damaged by other means. The presence of two layers and a possible contact face could indicate that the piece was part of a gate or socket rather than a core. Fabric Group 1. | L. 20 mm ; W.26mm; T. 14 mm |


| 2770 | 1212 | Fragment of outer wrap. Fine fabric. Smoothish surface-slightly <br> curved. May be a core for a socketed axehead as it appears wider <br> than deep. | L.22mm; <br> W.17mm; <br> T.11mm |  |
| :--- | :---: | :--- | :--- | ---: |
| 2883 | 1222 | Possible core fragment of medium coarse oxidised fabric. <br> Roughly triangular in shape, and rectangular in section. Appears | L.31mm; <br> W.22mm; <br> to be broken only at one end. Tapers. May be from a socketed <br> axehead as it seems too wide for a spearhead or gouge. Could <br> equally be the tip of the outer wrap of a sword or spearhead <br> mould. | T.16mm |

## CRUCIBLES

Appendix 1.10 Distribution of crucible fragments by crucible and context ( F . O'Carroll)

| Context | Crucible 1 | Crucible 2 | Crucible 3 | Crucible 3a | Crucible 4 | Crucible 5 | Misc. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 10 |  |  |  | 345a | 169 |  |  |
| 14 | 55 |  | 266 |  |  |  |  |
| 14/26 |  |  |  |  |  | 260 |  |
| 22 |  |  |  |  | 1432 |  |  |
| 26 |  |  |  |  |  | 99 | 2477 |
| 32 |  |  | 824 |  |  |  |  |
| 41 |  |  | 1915 | 445 |  |  |  |
| 56 |  |  | 476 | 506 |  | $470 \quad 749$ |  |
| 94 |  |  | 414423 |  |  |  |  |
| 202 |  |  | 757 |  |  |  |  |
| 217 |  |  |  |  |  | 1160 |  |
| 239 |  | $\begin{aligned} & 1489 \\ & 1634 \end{aligned}$ | $\begin{aligned} & 1477 \\ & 1603 \end{aligned}$ |  | 1659 |  | 1607 |
| 244 |  | $\begin{aligned} & 1736 \mathrm{a} \\ & 1807 \end{aligned}$ |  |  | $\begin{aligned} & 1787 \\ & 1791 \end{aligned}$ | 1851 |  |
| Unstratified |  |  |  |  | 1817 |  |  |

## Appendix 1.11 Catalogue of crucibles (F. O'Carroll)

Crucible 1

| 55 | 14 | Small, incomplete cup-shaped crucible that is deeper than it is <br> wider. A large proportion of the rim, and part of one side, are <br> missing. The wall thickens from rim to base from 2mm on one <br> side and 4mm on the other to 9.5 mm at the base. The crucible <br> has an external projection $(<14 \mathrm{~mm}$ wide by 10 mm thick) <br> halfway up the shallower back wall. | D.24-37mm |
| :--- | :--- | :--- | :--- | :--- |

Crucible 2

| 1489 | 239 | Small fragment of a side wall, thickening towards the base. Two <br> layers visible, but may be three present. | L. $21 \mathrm{~mm} ;$ <br> W. $18.5 \mathrm{~mm} ;$ <br> T. 7 mm |
| :--- | :--- | :--- | ---: |


| 1634 | 239 | Small fragment, possibly from close to the base as the wall thickens at one edge. Interior grey, probably affected by heat. Three layers visible. | L. 20 mm ; W. 17 mm ; T. 8 mm |
| :---: | :---: | :---: | :---: |
| 1736a/b | 244 | Rim/body wall piece (a) and small rim fragment (b) similar in thickness and form to crucible 1. Piece (b) is broken at the point where the wall thickens above the base; three layers of clay are visible. The rim is narrow and rounded, 2 mm thick. Rimsherd (b) is very fine and small. | L. 32 mm ; W. 32 mm ; T. 6 mm (lower end) |
| 1807 | 244 | Fragment of lower part of side. Interior looks affected by heat. Two or possibly three layers visible. | L. 19 mm ; <br> W. 14 mm ; <br> T. 6 mm |
| Crucible 3 |  |  |  |
| 266 | 14 | Base-angle fragment. The surface is abraded and the clay layers are separating. | L. 28 mm ; W. 27 mm ; T. 18 mm |
| 414 | 94 | Rimsherd with worn groove underneath. The inner face is grey and slightly cracked due to heat. There is an extra layer of clay at one corner and this has probably spalled off the remainder of the surface. Three layers visible. | L. $13 \mathrm{~mm} ;$ $\mathrm{W} .20 .5 \mathrm{~mm} ;$ T .12 mm |
| 423 | 94 | Small projection probably similar to that visible on piece 345 a. If so, it must have been applied to the rim area to facilitate a grip by a tongs. The projection seems too small to have acted as a handle like that on Crucible 1 (55). Grey in colour and slightly cindery in texture. | L. 17 mm ; W.16mm; T. 7 mm |
| 476 | 56 | Rim and body sherd. The wall is thinner than the other Crucible 4 pieces but, as the wall thickness varies across the height, the fragment is still likely to belong to this group. One side of the inner face curves sharply as if close to a spout and there is metal residue evident on the rim. Appears to join with 1659, but as the latter is abraded this is not certain. | L. 29.5 mm ; W. 22 mm ; T. 14 mm |
| 757 | 202 | Rimsherd with smooth groove on lower side. Smooth outer layer and one or more inner layers visible. Joins with 1915. | L. 25 mm ; W.18mm; T. 14 mm |
| 824 | 32 | Rimsherd with a step or remains of a groove on the underside. The curvature of the outer and inner faces is not typical, being more sharply incurved on the inside. | L. $24 \mathrm{~mm} ;$ W. $18.5 \mathrm{~mm} ;$ T. 13.5 mm |
| 1477 | 239 | Rimsherd with eroding surface layers. May be part of 824. | $\mathrm{L} .23 \mathrm{~mm} ;$ $\mathrm{W} .24 .5 \mathrm{~mm} ;$ T .14 mm |


| 1603 | 239 | Rimsherd with slight curvature. The piece is broken irregularly <br> and it is not clear whether the rim was applied or integral to the <br> original manufacture of the crucible. The fabric is fine and <br> homogenous, no layers can be distinguished but the clay seems <br> more compacted at the surfaces. | L.18mm; <br> T.16m; |  |
| :--- | :---: | :--- | ---: | ---: |
| 1915 | 41 | Rimsherd, very weathered. A worn step or groove on the <br> underside suggests the rim was built up in layers or is a <br> secondary repair. Joins with 757. | L. $21 \mathrm{~mm} ;$ |  |

Crucible 3 a

| 345a | 10 | Rimsherd with a protrusion at one point. The interior layers have broken off. There is metal residue on the rim surface in red patches (see Salter, this report). Joins with 506. | L. 22.5 mm ; <br> W. 34.5 mm ; <br> T.10mm; L. of protrusion 7 mm |
| :---: | :---: | :---: | :---: |
| 445 | 41 | Rimsherd with longitudinal cracks. The under surface is smooth, and the piece appears to be either a later addition to a crucible, which subsequently became detached, or alternatively, part of a rim that was built up in stages by drawing up thin skins of clay. | $\begin{array}{r} \mathrm{L} .7 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \text { T. } 10 \mathrm{~mm} \end{array}$ |
| 506 | 56 | Rimsherd. Inner face missing, probably due to heat. Small red blotches on the rim are corroded metal residues. Joins with 345a. | L. 20 mm W. 14 mm T. 9 mm |

Crucible 4

| 169 | 10 | Rim and body sherd; a raised part on the inside of one edge may be all that remains of the rim proper. The surviving rim portion is cracked and affected by heat. At least three layers of clay visible. | L.34mm; W. 22 mm ; T .17 mm |
| :---: | :---: | :---: | :---: |
| 1432 | 22 | Rim and body wall made up of two refitted sherds. A sharper than normal curve suggests the piece may be from close to the spout. Metal residues evident on the rim. The inner surface below the rim is uneven possibly as a result of flaking. Three layers visible. | $\begin{array}{r} \mathrm{L} .47 \mathrm{~mm} ; \\ \mathrm{W} .47 .5 \mathrm{~mm} ; \\ \mathrm{T} .18 .5 \mathrm{~mm} \end{array}$ |
| 1659 | 239 | Very abraded rimsherd with cracks running down the rim. Slight internal curvature visible. Seems to join to 1432 and 476. Two layers remaining. | L. 24 mm ; <br> W. 22 mm ; <br> T. 12 mm |
| 1787 | 244 | Part of the side wall with a tiny part of the rim intact; inner face is damaged at this point. Joins with 1791 and 1817 and the inner curvature of the whole piece suggest an oval or sub-triangular form. Three layers visible. | $\begin{array}{r} \mathrm{L} .33 \mathrm{~mm} ; \\ \text { W. } 28 \mathrm{~mm} \text {; } \\ \text { T. } 12.5 \mathrm{~mm} \end{array}$ |
| 1791 | 244 | Rim and body sherd. Rim is grey, probably the effect of heat. Pieces have broken off from the interior. Three layers visible. Joins with 1817. | L. 45 mm ; W. 32 mm ; T.16mm |


| 1817 | S/H | Bodysherd with curvature on both axes, probably broken above <br> base proper. Three layers visible. Joins with 1791. | L.18mm; |
| :--- | :--- | :--- | ---: |

Crucible 5

| 99 | 26 | Very abraded spout fragment. Rim and wall are curved, especially internally. At least three layers visible. Joins with rimsherd 470. | L. 41 mm ; W. 30 mm ; T. 13.5 mm |
| :---: | :---: | :---: | :---: |
| 260 | 14/26 | Large part of a shallow broad crucible. Consists of three pieces joined together to form part of the rim and base. The rim has longitudinal cracks and has been affected by heat. It varies in thickness and the surface also seems more worn in one part. At least four layers are visible in section and re-lining of the interior, or parts of it, seems to have occurred. Thin-section, No. 5 (R. Unitt, Vol. 3, Appendix 1.6). | $\begin{array}{r} \text { H. } 31 \mathrm{~mm} ; \\ \text { W. } 54 \mathrm{~mm} ; \mathrm{T} \\ \text { of base } \\ 15 \mathrm{~mm} ; \mathrm{T} . \text { of } \\ \text { rim } 7 \mathrm{~mm} \end{array}$ |
| 470 | 56 | Rimsherd with cracked surface and possibly re-lined. In section, a layer of clay 4 mm thick is applied over a lower, similarly pointed piece and may be a new rim applied on a worn one. Joins with 99. | L. 26.5 mm ; <br> W. 40 mm ; <br> T.15.5mm |
| 749 | 56 | Lump with smooth leached surface and broken, heat-damaged underside. Appears to be part of a protrusion similar to that on the rim of Crucible 3. | L. 26 mm ; W. 18 mm ; T. 10 mm |
| 1160 | 217 | Basesherd. Slightly thicker on one side with a gentle curvature visible in section. The base is roughly similar to piece 260 . The fabric is fairly homogenous with over three layers visible. | L. 27 mm ; W. 35 mm ; T. 18 mm |
| 1851 | 244 | Very abraded rimsherd with remains of step on the underside. Fabric is sandy with a fairly rich quartz temper. | L. 22 mm W. 18 mm ; T. 16 mm |

Miscellaneous rim fragments

| 1607 | 239 | Rim fragment from a crucible. | L. $14 \mathrm{~mm} ;$ |
| :--- | :---: | :--- | ---: |
|  |  |  | W. $12 \mathrm{~mm} ;$ |
|  |  | T. 9 mm |  |
| 2477 | 26 | Rim fragment from a crucible. | L.22mm; |
|  |  |  | W. $16 \mathrm{~mm} ;$ |
|  |  |  | T.11mm |

## Appendix 1.12 Catalogue of metal-working debris (C. Salter)

## Material Class: Crucible fragment

| Find No. | Feature | Description | Weight |
| :---: | :---: | :---: | :---: |
| 55 | 14 | Crucible. Small crucible with pinch handle, which has been used to melt copper alloy. Three small metallic prills are stuck to the outside of the crucible. All looked very corroded and did not give a response to the metal detector. Initially, the fabric looks different from that seen in the two other crucible fragments, in that it appeared to a have a coarser structure, and a more heavily glazed exterior surface. It is difficult to be sure, however, as 00506 and 00476 do not have any comparative broken surfaces, and probably have not been fired to the same temperature, although both have been used. Roughly 26.5 mm internal diameter at top, deepest wall 37 mm , but much shallower at the back with a depth of 23.5 mm . External 35 mm diameter parallel with handle, 33.5 mm cup with handle direction, 49.5 mm overall including the handle. | 27.3 g |
| 476 | 56 | Small fragment of crucible rim. One corroded-out metal prill on rim. | 8.2 g |
| 506/345A | 56 | Small finds 506 and 345a. Crucible with unusual lip. | 5.6 g |

Material Class: Low density slag

| 1059 | 220 | Fuel ash slag type material. One side flat, the other irregular. This <br> form has been observed in association with blacksmithing activity <br> where it is thought to be the remains of a clay cover applied to a <br> blade prior to annealing and quenching. The purpose for this <br> temporary clay cover is thought to be either to protect the metal <br> from oxidisation during the annealing stage, to control the rate of <br> quench or to be associated with brazing. | 2.3 g |
| :--- | :---: | :--- | :---: |
| 1814 | 1814 | Irregular flow of fuel ash slag. | 2.4 g |
| 2298 | 85 | Sintered soil. Parts of the soil matrix have been heated to a <br> sufficiently high temperature to start melting. | 0.7 g |
| 2802 | 1201 | Sintered soil and metal oxide with possible fragment of copper <br> oxide scale. | 0.5 g |

Material Class: Iron ore

| 931 | 203 | Unidentifiable fragment. Probably iron oxide. | 0.3 g |
| :--- | :---: | :--- | :--- |
| 2999 | 1231 | Fragment of limonite and magnetite. Piece is magnetic suggesting <br> that it is a piece of natural ironstone that has been heated and <br> partially reduced, or it is a fragment of corroded iron. The piece is <br> too small for any further work. | 0.2 g |


| 101 | 26 | Hemi-spherical iron-oxide nodule, probably originally an iron <br> sulphide nodule which has been converted to iron oxide whilst in <br> the soil. | 23.8 g |
| :--- | :---: | :--- | :---: |
| 315 | 9 | Irregular iron-ore nodule, probably oxidised iron sulphide nodule. | 18.1 g |
| 481 | 56 | Iron-ore nodule probably formed by the oxidisation of an iron <br> sulphide as some areas show pseudomorphs of the original <br> sulphide crystal forms. There are a few inclusions of mafic <br> minerals (possibly zinc sulphide) or very fine grained rock which <br> might give an indication of the source of these nodules. | 16.7 g |
| 1076 | 216 | Oxidised fragment of radiating iron sulphide nodule with a minor <br> amount of the original sulphide mineral still present. | 10.4 g |
| 1130 | 219 | Round iron-ore nodule, probably oxidised iron sulphide nodule. | 22.1 g |
| 1317 | 255 | Irregular fragment of iron-ore, probably naturally oxidised iron <br> sulphide nodule. | 19.7 g |
| 1503 | 106 | Probably an oxidised iron sulphide nodule but rather harder than <br> normal. | 4.4 g |
| 1730 | 239 | Probably oxidised iron sulphide nodule. | 8.6 g |
| 2052 | 88 | Spherical nodule of oxidized iron sulphide. Rather harder than is <br> normally the case. | 7.5 g |

## BRONZE ARTEFACTS

Appendix 1.13 Catalogue of Bronze Artefacts (C. Cotter)

## Old Finds

| Find no. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 1911.6 | Old find | Incomplete. Ring of bronze pin retaining slight remains of wrapover pin. The ring is annular and shouldered with slight expansions on either side of the head. It is decorated with a cast ribbing and has a stud-setting with a central hole on the lower side. According to Colley March (1894, 224-8), traces of red enamel were still visible in the setting at the end of the nineteenth century. | D. $21 \mathrm{~mm} ; \mathrm{W}$. <br> 4 mm ; <br> T. 1.5 mm ; <br> Setting <br> D. 6 mm |
| $\begin{gathered} \text { P776 } \\ \text { OC36:17 } \end{gathered}$ | Old find | Incomplete. Bronze fibula, rod-bow type. The pin and most of the coiled spring are now missing; a riveted repair on the bow indicates that the brooch also broke in antiquity. The bow has a gentle curve and a flattened rounded cross-section at its foot end. It is decorated with fine milling terminating at birds head modelling at the junction with the foot (Raftery 1984, Pl. 47, no. 1; Harbison 1988, 125, fig. 121). The foot is relatively large and has a simple turned-over leaf on the base of the catchplate. | L. 81 mm . |

## Bronze artefacts of late Bronze Age or likely late Bronze Age date

Weapons, Tools \& Implements

| Find No. | Feature | Description | Dimensions |
| ---: | :---: | :--- | ---: |
| 43 | 6 | Incomplete. Tip of bronze blade. Curved blade fragment with <br> traces of tapering midrib. Blade edges sharp but chipped and <br> blunt tip. Fragment is bent longitudinally towards point of <br> breakage. Lozenge-shaped in section. Bronze disease at breaks. | L.23.5mm; <br> Comparanda: Eogan 1983; Raftery 1983; O'Riordain 1954, 383, |
| fig.31. |  |  |  |


| 941 | 209 | Complete. Tweezers made from a single bent-over strip with looped grip (D.10mm). Edges of strip are slightly bent upwards at the top of the loop, giving the head a concave surface. Strip narrows ( 5 mm ) below head before widening out ( $<8 \mathrm{~mm}$ ) towards the ends. Ends are slightly rounded and are chipped and worn. 8 mm splay between ends. Some surface corrosion. Comparanda: Eogan 1983, 36, fig. 10.15 (Bishopsland); 89, fig.44B.1; 151, fig.84.1. Raftery 1983, 198, fig.152.539. O'Kelly 1962, 38, fig.3.56. | L. 67.5 mm ; W. 7.5 mm ; T. 1.5 mm |
| :---: | :---: | :---: | :---: |
| 204 | 47 | Incomplete. Chisel or rivet/peg fragment. Upper part of piece survives. This is square in section and slightly concave on two surfaces. The top of the object has been hammered. Tapers slightly from 4 mm to 3 mm . The fragment may be from a small chisel of similar size to 1038 , but is lighter and less well made than the latter. Alternatively it may have been part of a peg similar to no. 2369. | $\begin{array}{r} \text { L. } 20 \mathrm{~mm} \text {; } \\ \text { W. } 3.5 \mathrm{~mm} ; \\ \text { T. } 3.5 \mathrm{~mm} \end{array}$ |
| 1038 | 217 | Incomplete. Chisel fragment. Working end of small finely made chisel. Square-sectioned; tapers in thickness from 3.5 mm to 2 mm towards working end. Blade rounded off; 3 mm wide. | L. 21 mm ; W. 4 mm ; T. 3 mm |
| 1395 | 220 | Complete. Chisel. Very fine, well-made tool. Straight in profile. Rectangular in section, thins out now to form a blade-like edge at both ends, no signs of having been hammered. Traces of wear at both ends, one end slightly chipped. Slight surface corrosion. | L. 30 mm ; W.3mm; T. 2 mm |
| 1493 | 239 | Complete. Chisel. Small finely-made implement with chisel-like blade at one end. Shank is very fine, curved to form irregular 'S' shaped profile, rectangular in section. The lower 18 mm or so is expanded and rounded off to form "blade" and there is a slight triangular-shaped nick out of one side. The opposite end is flattened and thins out to a straight edge 3 mm wide by 0.5 mm thick. The curved profile allows the piece to be securely gripped between finger and thumb. | L. 27 mm ; W. 5 mm ; T. 3.5 mm |



## Hollow bronze rings

Complete. Four transversely perforated rings with lateral buffer-shaped projections. All are elliptical in section with flat upper and lower faces and hour-glass centres. They have prominent casting seams on interior and exterior.

| 2823a | 1204 | Undecorated. Unexpanded buffers with two sets of worn threads; buffers 5 mm long with external diam. 11 mm by 10 mm . Wear around buffer ends evidenced by thinning of metal. One side of ring is patched on upper and lower surfaces. Casting seams are sharp on interior. Inner ends of perforations of irregular oval shape. | D .41 mm (including buffers) by 32 mm ; H. 9 mm ; T. 11.5 mm |
| :---: | :---: | :---: | :---: |
| 2823b | 1204 | Undecorated. Unexpanded buffers 5 mm long, external diam. 10 mm with two sets of threads. Patched in four places, three of which are above internal casting seam. Evidence of wear around buffers; on both short sides of one buffer and lower side of opposite buffer. Inner ends of transeverse perforation are irregular oval-rectangular and show signs of corresponding wear. | D. 41 mm (including buffers) by 32 mm ; H.9mm; T. 11 mm |
| 2823c | 1204 | Decorated with two concentric lines on both faces - decoration shows more wear on one surface. Unexpanded buffers - external diam. 12 mm by $10 \mathrm{~mm}, 5 \mathrm{~mm}$ long with two sets of threads. Casting seams are sharp on interior and inner ends of perforations are roughly circular in shape. Buffers and ring not as worn as either (a) or (b). | D. 41.5 mm (including buffers) by 34 mm ; H. 8.5 mm ; T. 11 mm |
| 2823d | 1204 | Decorated with one to two concentric lines on both faces. Unexpanded buffers - external diam. 12 mm by $10 \mathrm{~mm}, 4.5 \mathrm{~mm}$ long - with two sets of threads. Wear similar to c) above but decoration less sharp. Inner ends of perforations roughly circular in outline. | D. 41 mm (including buffers) by 34.5 mm ; H. 8 mm ; T.11mm |

## Bronze artefacts of possible late Bronze Age date

Ornamental Objects

| 10 | 1 | Complete. Bracelet (child's?). Slightly misshapen and break now <br> on one side. Very faint traces of what may be file marks at <br> intervals along edges. Rectangular to D-shaped in section. Fits <br> clay mould pieces for bracelet and therefore possibly made on | D. $53 \mathrm{~mm} ;$ <br> site. However similar bracelets known from Early Medieval <br> contexts. Found in sod layer. | H.3mm |
| :--- | :--- | :--- | ---: | ---: |


| 1524 | 106 | Incomplete. Ring. Two-thirds of small, hollow ring ' C '-shaped in section, made from hammered-over strip. One end is worn and rounded and other is clearly broken. Originally penannular? Laminar corrosion and bronze disease. Seems too small to have been a finger ring. Comparanda: Raftery 1983, 278, fig.147.864 | D. 16 mm ; <br> W.4mm; T. 6 mm |
| :---: | :---: | :---: | :---: |
| Pins |  |  |  |
| 203 | 41 | Incomplete. Cup-headed? pin. Circular head (D.5mm; H.3.5mm) formed by expansion of shank; hollow 1.5 mm deep in top. Shank is in two fragments but was straight and roughly circular in section. Broadens out now from 3.5 mm to 4 mm towards broken end due to splitting of the metal. Surfaces have a 'whittled', unfinished appearance. Slight bronze disease. Comparanda: O'Kelly 1962, 35, fig. 2.375 (possible finished example). | L. 59 mm ; D. 3.5 mm |
| 564 | 41 | Incomplete. Nail-headed pin. Finely made with head formed by a slight expansion of shank (D.3mm). Top is oval in shape and flat. The shank is smooth, circular to oval in section and straight in profile. It tapers from 3 mm to 2 mm wide at the point of breakage. | $\overline{\mathrm{L} .45 \mathrm{~mm} ;}$ $\text { D. } 2 \mathrm{~mm}$ |
| 2629 | 918 | Incomplete. ?Pin shank. Thirteen scraps, all very misshapen due to corrosion but some conjoin. Largest piece preserves shape of what may be a flattened circular shank, 2.5 mm in diameter. | Largest; L. 14 mm ; W. 7 mm ; T. 4 mm |
| Pegs |  |  |  |
| 2026 | 52 (eroded 1204) | Complete. Small, fine well-made rivet or peg. Head is flat, approximately square, measuring 2.5 mm by 2.5 mm . 'Overhangs' on one side, appears hammered. The shank is rectangular in section and straight in profile. Tapers from 2.5 mm by 2 mm to 1.5 mm , to blunt point. Very slight groove in one side of object, just below the head. Excellent condition. | $\begin{array}{r} \text { L. } 16 \mathrm{~mm} ; \\ \text { W. } 2.5 \mathrm{~mm} ; \\ \text { T. } 2 \mathrm{~mm} \text {. } \end{array}$ |
| 2369 | 269 | Complete. Short-rod like piece with circular section. Curves slightly in profile; traces of what may be filed down casting ridges evident. Both ends are worn, one appears hammered. | L. 26 mm ; D. 4.5 mm |

## Bronze artefacts of Iron Age date

## Weapons, tools and ornaments

| 2405 | 269 | Complete. Section of a scabbard chape? Longitudinally curved <br> binding with a 'C' shaped section terminating at one end in a <br> circular clamp (D.11.5mm). This has an unperforated and slightly <br> convex centre on the front and has a flat back. The piece ends | L.50mm; <br> abruptly in a smooth edge at the lower end. On the reverse side <br> the upper edge expands slightly $(c .1 \mathrm{~mm})$ and the metal also thins |
| :--- | :--- | :--- | ---: |

out very slightly but there is no definite trace of any breakage.

Ornamental Objects

| 119 | 14 | Complete. Necklace clasp. Excellent condition. Consisting of an <br> 'S'-shaped strip with decorative tightly coiled ends. Two sets of <br> faint incisions, resembling nicks, on the central stem may also be <br> decorative features. | L.31mm; |
| :--- | :--- | :--- | ---: |
|  |  |  | W. $1.3 \mathrm{~mm} ;$ |

Bronze and mixed metal artefacts of early medieval date

| Pins |  |  |  |
| :---: | :---: | :---: | :---: |
| 7 | 6 | Incomplete. Pin shank. Head missing. Upper end flattened and curved over. Tapering shank is rectangular in section with pointed tip now very worn and blunt. Heavy laminar corrosion and also some bronze disease. Dimensions and curved head suggest that the shank belongs to the ring-pin (1911:6) found at the fort in the nineteenth century (see Old Finds). | $\begin{array}{r} \text { L. } 70 \mathrm{~mm} ; \\ \mathrm{W} .4-2 \mathrm{~mm} \\ \text { T. } 3-2 \mathrm{~mm} \end{array}$ |
| Bosses |  |  |  |
| 75 | 14 | Incomplete. Stud Dome-shaped boss, possibly bronze over ?tin. Hollow centre with some highly corroded iron adhering to interior. Similar to 92E102:00218. Laminar corrosion, some bronze disease. | D. 15 mm ; H. 7.5 mm ; T. 2 mm |
| 218 | 14 | Complete. Stud Dome-shaped boss, similar to 92E102:0075. Semi-circular in section, centre hollow. Exterior is decorated with incised lines dividing the surface into radial segments. Highly corroded iron adhering to interior fills half the hollow centre - an iron nail head here would measure $c a .9 \mathrm{~mm}$ in diameter. | D. 17 mm ; H. 8.5 mm ; T. 3 mm |

## Undated bronze artefacts

## Bindings \& Strips

| 8 | 6 | Incomplete. Strip. Two fragments of a corroded strip or sheet | a) L.16mm; |
| :---: | ---: | :--- | ---: |
|  |  | object. Some bronze disease and surface corrosion. | W.10mm; |
|  |  |  | T.9-5mm and |
|  |  |  | b)L.19mm, |
|  |  |  | W. 15 mm, |
|  |  | T.6-3mm |  |


| 46 | 6 | Incomplete. Binding. Cut from thin sheet of bronze. Rectangular <br> strip, now slightly bent with both ends broken. Surface corroded. | L.29mm; <br> W.7mm; <br> T.1mm |
| ---: | :---: | :--- | ---: |
| 172 | 14 | Incomplete. Narrow strip broken at both ends. Lozenge shaped in <br> section. Bent at right angles and flattens out towards one end. | L.37.5mm; <br> Slight bronze disease and surface corrosion. Comparanda: |
| O'Riordain 1954, 362, fig.28.9; 411; fig.43.1 | T.2mm |  |  |


| Rods \& Pegs | 70 | Incomplete. Rod? Narrow bent fragment, oval in section and <br> slightly curved to form an irregular 'S' shape. One end is broken. <br> The other end is blunt - may be original or broken and reworked. | L.32mm; <br> S.3mm <br> Slight bronze disease and surface corrosion. Comparanda: <br> Raftery 1983, 281; fig.154.872. O'Kelly, 1963, 41, fig.3.343. |
| :---: | :--- | :--- | :--- |


| Scraps \& Fragments |  |  |  |
| :---: | :---: | :---: | :---: |
| 49 | 6 | Incomplete. Irregular rod-like fragment. Approximately oval in section. Has longitudinal splits; broken at both ends. Laminar corrosion. Probably a waste fragment. | L. 25.5 mm ; W. 5 mm ; T. 4 mm |
| 595 | 41 | Incomplete. Small indistinctive scrap. Heavily corroded with bronze disease. |  |
| 655 | 73 | Incomplete. Small flat triangular-shaped scrap. Come corrosion. | $\begin{gathered} \text { L. } 8 \mathrm{~mm} \text {; } \\ \text { W. } 5 \mathrm{~mm} \text {; } \\ \text { T. } 1.5 \mathrm{~mm} \end{gathered}$ |
| 666 | 41 | Incomplete. Small indistinctive scrap. Heavily corroded with bronze disease. | $\begin{array}{r} \hline \text { L. } 6.5 \mathrm{~mm} ; \\ \text { W. } 6 \mathrm{~mm} \text {; } \\ \text { T. } 2 \mathrm{~mm} \\ \hline \end{array}$ |
| 1526 | 106 | Incomplete. Bronze fragment, very corroded but could be part of blade. Heavy for size. Comparanda: Raftery 1984, 284. | L. 22 mm ; W. 14 mm ; T. 5 mm |
| 2834 | 1207 | Incomplete. Small undiagnostic scrap. Heavily corroded. | $\begin{array}{r} \text { L. } 6 \mathrm{~mm} ; \\ \text { W. } 4.5 \mathrm{~mm} ; \\ \text { T. } 2 \mathrm{~mm} \end{array}$ |
| 2869 | 1226 | Incomplete. Small chip of bronze, semi-circular in section. The surfaces are rough; appears filed in places. Some corrosion. | L. 13 mm ; W. 5 mm ; T.3mm |

L.32mm; D. 1 mm corroded. The shank is extremely thin, circular in section and slightly bent towards head. Tapers to a sharp point. Resembles a dressmaker's pin or shroud pin. Probably relatively modern.

## LITHIC ARTEFACTS

## Appendix 1.14 Coarse Stone Artefacts Catalogue (A. Clarke; petrological identifications by D. Harper)

Pounder/grinders

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 140 | 9 | Granite. Flat oval in shape. On one end double ridged facets have been worked and the opposite end is pecked almost to a facet. One face is smoothed and flattened and has pecking in the centre. Some pecking too around the perimeter. | L. 125 mm ; W. 92 mm ; T. 52 mm |
| 246 | U/S | Limestone. Sub-circular in shape. Two facets form a ridge around half of the perimeter. Two faces are worn smooth. | L. 88 mm ; W.70mm; T. 58 mm |
| 616 | 32 | Quartz sandstone, burnt fragment. Remnant ridged facets most probably originally around most of perimeter. | L. 85 mm ; W. 90 mm ; T. 36.5 mm |
| 1277 | 221 | Quartz. Miniature pounder/ grinder. Facets have been worked around most of the perimeter and one face has been worn flat and smooth. | L. 55 mm ; W. 47 mm ; T. 37 mm |
| 1336 | 209 | Quartz sandstone. Regular oval in shape. Single pecked facet on either end. Possibly some smoothing on one face. Probable underutilised pounder/grinder. | L. 210 mm ; W. 93 mm ; T.90mm |
| 1618 | 3 | Granite. Flat oval in shape. Broad facets have been pecked on either end. One face is smoothed and there is heavy flaking from another face. | L. 107 mm ; W. 86 mm ; T. 52 mm |
| 1801 | 244 | Quartz sandstone. Sub-spherical in shape. There are heavily worn ridged facets around the perimeter and some large flakes have been removed incidentally. One face has been worn flat and smooth. | L. 108 mm ; W. 108 mm ; T. 85 mm |
| 1998 | 76 | Limestone, broken down length. Ovoid in shape. Broad facets on either end with some flake removal. | L. 84 mm ; W. 69 mm ; T. 36 mm |
| 2132 | 267 | Quartz siltstone. Ovoid in shape. There is a single broad facet on one end. Both faces have been worn flat and smooth. | L. 184 mm ; W.94mm; T. 63 mm |
| 2195 | 269 | Limestone. Sub-spherical in shape. On one end there is a flat facet and on the opposite end there are ridged facets. These facets are stained brown, possibly from the substance which was being processed. | L. 75 mm ; W. 73 mm ; T.71mm |
| 2217 | 269 | Granite. This cobble has been almost completely reshaped by grinding and rubbing wear. Either end bears a single rounded facet and both faces are smoothed. | L. 64 mm ; W. 67 mm ; T. 55 mm |


| 2358 | 704 | Dolerite, broken. Sub-oval in shape. A broad facet has been worked on one end. The opposite end has been flaked and damaged over the original facet. Both faces have been worn smooth. | L.88mm; W. 63 mm ; T. 42 mm |
| :---: | :---: | :---: | :---: |
| 2505 | 71 | Limestone. Sub-circular in shape. A broad facet has been worked around the whole of the cobble. | L. 106 mm ; W. 96 mm ; T. 84 mm |
| 2578 | 267 | Limestone. Two facets form a ridge on one end. Facets have been pecked on either side and on opposite ends. One face has been worn flat and smooth. | L. 77 mm ; W. 67 mm ; T. 42 mm |
| 2738 | 948 | Quartz sandstone. Flat oval in shape. Single broad facet on one end. One flattish face has been smoothed. | L. 90 mm ; <br> W. 70 mm ; <br> T. 40 mm |
| 2833 | 977 | Quartz sandstone. Flat oval in shape. At one end two facets form a ridge with some incidental flaking. Some pecking around opposite end and edges. One face is flattened and smoothed. | $\begin{array}{r} \mathrm{L} .127 \mathrm{~mm} ; \\ \mathrm{W} .107 \mathrm{~mm} ; \\ \mathrm{T} .42 \mathrm{~mm} \end{array}$ |
| 3002 | 302 | Quartz sandstone. Sub-circular in shape. Broad ridged facets have been worked around most of the perimeter. One face has been smoothed. | $\begin{array}{r} \hline \text { L. } 110 \mathrm{~mm} ; \\ \text { W. } 102 \mathrm{~mm} ; \\ \text { T. } 67 \mathrm{~mm} \\ \hline \end{array}$ |
| 3003 | 302 | Quartz siltstone. Angular ovoid in shape. Two facets on one pointy end form a ridge. Single facet on opposite end. One flat smoothed face. | $\begin{array}{r} \mathrm{L} .107 \mathrm{~mm} ; \\ \mathrm{W} .102 \mathrm{~mm} ; \\ \text { T. } 65 \mathrm{~mm} \\ \hline \end{array}$ |
| 3016 | 314 | Quartz siltstone. Ovoid in shape. A single broad facet has been worn on either end. One face has been flattened and smoothed. | L. 117 mm ; W. 79 mm ; T. 50 mm |

Faceted cobbles

| 76 | 15 | Quartz sandstone. Flat circular. Facet around most of perimeter. Faces smoothed and there is one with possible gloss residue. | $\begin{array}{r} \mathrm{L} .95 \mathrm{~mm} ; \\ \mathrm{W} .87 \mathrm{~mm} ; \\ \mathrm{T} .35 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 309 | 9 | Granite. Sub-oval. Two facets form ridge on one end. | $\begin{array}{r} \mathrm{L} .72 \mathrm{~mm} ; \\ \mathrm{W} .63 \mathrm{~mm} ; \\ \mathrm{T} .52 \mathrm{~mm} \\ \hline \end{array}$ |
| 744 | 202 | Pink quartzite. Sub-rectangular. One face particularly smooth and shiny. Small ground area on one pointy end. | $\begin{array}{r} \mathrm{L} .82 \mathrm{~mm} ; \\ \mathrm{W} .69 \mathrm{~mm} ; \\ \text { T. } 28 \mathrm{~mm} \end{array}$ |
| 835 | U/S | Pink quartzite. Either end ground to rounded facets. One very flat polished face and another face with polish. | $\begin{array}{r} \mathrm{L} .85 \mathrm{~mm} ; \\ \mathrm{W} .40 \mathrm{~mm} ; \\ \text { T. } 55 \mathrm{~mm} \\ \hline \end{array}$ |
| 877 | 203 | Granite. Sub-triangular. There is a narrow ground facet on one edge and one flat face is shiny along one edge. | L. 66 mm ; W. 57 mm ; T. 40 mm |
| 1049 | 217 | Diorite. Sub-oval. One flat face is rubbed smooth. Tiny facet on either end. | $\begin{array}{r} \mathrm{L} .90 \mathrm{~mm} ; \\ \mathrm{W} .53 \mathrm{~mm} ; \\ \text { T. } 32 \mathrm{~mm} \end{array}$ |


| 1065 | 217 | Sub-triangular buff quartzite pebble. Broad end has finely-shaped bevel which is polished. Very nice. | L. 62 mm ; W. 45 mm ; T. 20 mm |
| :---: | :---: | :---: | :---: |
| 1081 | 217 | Quartz sandstone. Sub-triangular. Two facets on one end form ridge. One facet on opposite end. One face flat and smoothed. | L. 82 mm ; W. 60 mm ; T. 30 mm |
| 1200 | 258 | Burnt fragment, quartz sandstone. Broad facet on unbroken end. One face flattened and smooth. | L. 77 mm ; W. 90 mm ; T. 39 mm |
| 1630 | 239 | Quartz siltstone. Ovoid. Two facets on one end form an overworn ridge. Pecking on opposite end and one face possibly worn. | L. 84 mm ; W. 54 mm ; T. 44 mm |
| 1922 | 257 | Quartzite. Angular cobble with one facet worked on a point. | L. 85 mm ; W. 72 mm ; T. 47 mm |
| 2338 | 269 | Pink quartzite. Sub-rectangular. All faces smooth and shiny. Two smooth facets on either end. | $\begin{array}{r} \mathrm{L} .97 \mathrm{~mm} ; \\ \mathrm{W} .36 \mathrm{~mm} ; \\ \mathrm{T} .32 \mathrm{~mm} \end{array}$ |
| 2448 | 279 | Pink quartzite. Sub-rectangular. Shiny on faces and ground facet on one end. | L. 80 mm ; W. 36 mm ; 7.31 mm |
| 2493 | 290 | Quartzite. Sub-triangular pebble with small facets on either end. One face has been worn flat and smooth/ shiny. | L. 64 mm ; W. 48 mm ; T. 28 mm |
| 2569 | 297 | Pink quartzite. Irregular. Smooth and shiny on most faces. Small patches of grinding on edge and end form facets. | L. 84 mm ; W. 54 mm ; T .41 mm |
| 2670 | 253 | Quartz siltstone. Ovoid. Light facet on one end. | L. 92 mm ; <br> W. 52 mm ; <br> T. 45 mm |
| 3017 | 313 | Pink quartzite. Sub-rectangular. One flat face and smooth and shiny over most of surfaces. Single ground facet on both ends. | L. 74 mm ; W. 35 mm ; T. 27 mm |

## Plain hammerstones

| 58 | 10 | Limestone. Cylindrical with some pecking on either end. | L. 130 mm W. 52 mm ; T. 50 mm |
| :---: | :---: | :---: | :---: |
| 810 | 32 | Limestone, broken. Light pecking on surviving end. | L. 91 mm ; <br> W. 75 mm ; T. 63.5 mm |
| 870 | 82 | Quartz sandstone, spall. This is a flake which has probably been removed from a cobble through its use as a hammerstone. | L. 54 mm ; W. 43 mm ; T.13.5mm |


| 881 | 208 | Limestone, abraded and broken. Fragment of a cobble with an area of pecking on the unbroken end. | L.79mm; W. 95 mm ; T. 67 mm |
| :---: | :---: | :---: | :---: |
| 892 | 203 | Limestone, abraded. Ovoid in shape. Pecked on one end and opposite end has been very heavily damaged by flaking. | L. 142 mm ; W. 78 mm ; T. 64 mm |
| 970 | 82 | Limestone, abraded and broken. Pecking around perimeter and over both faces. One face possibly also flat and smoothed. | $\begin{array}{r} \text { L. } 75 \mathrm{~mm} ; \\ \text { W. } 117 \mathrm{~mm} ; \\ \text { T. } 55 \mathrm{~mm} \\ \hline \end{array}$ |
| 1144 | 85 | Quartz sandstone. Tapering and oval in shape. One end flaked, opposite end pecked. | L. 160 mm ; W. 95 mm ; T. 53 mm |
| 1167 | 85 | Limestone, abraded. Elongated oval in shape. One end has been pecked and flaked. | L. 90 mm ; W. 48 mm ; T. 30 mm |
| 1301 | 220 | Limestone. Ovoid in shape. Some light pecking around perimeter and one flake removed. | L. 95 mm ; W. 70 mm ; T. 43 mm |
| 1454 | 239 | Limestone, abraded. Flat oval in shape. Some light pecking on either end. | L. 84 mm ; W. 59 mm ; T. 26 mm |
| 1462 | 239 | Limestone, spall. Flake detached from use of the cobble as a hammerstone. | L. 54 mm ; W. 72 mm ; T. 14 mm |
| 1553a | 107 | Quartz siltstone. Flat oval in shape. Light pecking on one end and down part of one side. | L. 89 mm ; W. 70 mm ; T. 30 mm |
| 2374 | 279 | Quartz sandstone. Flat oval in shape. Very light pecking on one end. | L. 53 mm ; W. 30 mm ; T. 19 mm |
| 2620 | 297a | Limestone, abraded and broken. Fragment with heavy pecking on surviving end. | L. $37 \mathrm{~mm} ;$ W. $48.5 \mathrm{~mm} ;$ T. 36.5 mm |
| 2685 | U/S | Limestone. Oval in shape. Light pecking on either end and one face possibly flattened and smoothed. | L. 155 mm ; W. 73 mm ; T. 55 mm |
| 2768 2808 | 939 1201 | Quartz, spall. Flake detached from use of cobble as hammerstone. <br> Pink quartzite. Irregular-shaped cobble with heavy pecking and flaking on three corners. | L. $50 \mathrm{~mm} ;$ W. $10 \mathrm{~mm} ;$ T. 23 mm L. $140 \mathrm{~mm} ;$ W. $130 \mathrm{~mm} ;$ T. 77 mm |
| 3037 | 1219 | Limestone, spall. Probable spall from a hammerstone. | $\begin{array}{r} \mathrm{L} .81 \mathrm{~mm} ; \\ \mathrm{W} .59 .5 \mathrm{~mm} ; \\ \mathrm{T} .20 \mathrm{~mm} \end{array}$ |


| 4002 | 400 | Limestone, abraded. Flat oval in shape. Flake damage on either end. | L.76mm; <br> W. $52 \mathrm{~mm} ;$ <br> T. 22 mm |
| :--- | :--- | :--- | :--- | ---: |

Rounded cobbles with rubbed faces

| 20 | 6 | Red chert-like material. Oval pebble flaked irregularly on one end and with some of the flake scars shiny as if from rubbing. A patch of smoothing also on one face. | L. 77 mm ; W. 38 mm ; T. 23 mm |
| :---: | :---: | :---: | :---: |
| 251 | U/S | Limestone, fragment. One smoothed face has possible glossy residue. | L. 49 mm ; W. 35 mm ; T. 27 mm |
| 252 | U/S | Granite, burnt fragment. One smooth face survives. | L. 54.5 mm ; <br> W. 34 mm ; <br> T. 28 mm |
| 256 | U/S | Quartz sandstone, abraded. Flat oval in shape with one flat smoothed face. | L. 88 mm ; W. 68 mm ; T. 35 mm |
| 261 | 26 | Igneous. Elongated in shape. Surface is shiny all over as if from rubbing. | L. 70 mm ; W.35mm; T.30mm |
| 264 | 31 | Granite. Oval in shape with one flat smooth face. | L.68mm; W. 52 mm ; T. 34 mm |
| 284 | 14 | Limestone, fragment. One possibly smoothed face. | L. 69 mm ; W. 40 mm ; T. 21 mm |
| 293/294 | 10 | Granite, fragment. One flat smoothed face with traces of a glossy residue. | $\begin{array}{r} \mathrm{L} .100 \mathrm{~mm} ; \\ \mathrm{W} .41 .5 \mathrm{~mm} ; \\ \mathrm{T} .23 \mathrm{~mm} \end{array}$ |
| 316 | 9 | Granite. Irregular in shape with one flat face possibly smoothed. | L. 91 mm ; W. 42 mm ; $T .47 \mathrm{~mm}$ |
| 325 | 26 | Green banded chert. One face appears to be slightly smoothed. | L. 86 mm ; W. 59 mm ; T. 44 mm |
| 326 | 15 | Limestone. Flat oval in shape. Both faces have been worn smooth with some glossy residue. There is some flake damage on one end. | L. 100 mm ; W. 80 mm ; T. 25 mm |
| 359 | 10 | Quartz sandstone. Flat oval in shape. Two faces appear to have been worn smooth. | L. 65 mm ; W. 40 mm ; T. 23 mm |
| 419 | 47 | Quartz sandstone. Irregular in shape. Lower face flattened and smoothed. | L. 190 mm ; <br> W. 117 mm ; <br> T. 69 mm |


| 531 | 98 | Quartz sandstone. Flat oval in shape. Both faces are flattened and rubbed. | L.70mm; W. 55 mm ; T. 28 mm |
| :---: | :---: | :---: | :---: |
| 608 | 32 | Quartz sandstone, spall. 608, 611 and 1048 conjoin to form fragment of a rubbing stone. Split across bedding planes. | $\begin{array}{r} \mathrm{L} .66 \mathrm{~mm} ; \\ \mathrm{W} .61 .5 \mathrm{~mm} ; \\ \mathrm{T} .16 \mathrm{~mm} \\ \hline \end{array}$ |
| 611 | 32 | See 608. | L. 84.5 mm ; <br> W.70mm; <br> T. 14.5 mm |
| 696 | 66 | Pink quartzite. Flat oval in shape. Opposite faces appear to have been rubbed and smoothed. | L. 57 mm ; W. 49 mm ; T. 35 mm |
| 723 | 202 | Limestone, abraded, broken. One smoothed face. | L. 57.5 mm ; W. 72 mm ; $T .45 \mathrm{~mm}$ |
| 726 | 95 | Pink quartzite, fragment. One face flat and smoothed. | L. 52 mm ; W. 42 mm ; T. 25 mm |
| 778 | 32 | Quartz sandstone, fragment. Fragment of one flat smoothed face survives. | L. 62 mm ; <br> W. 24 mm ; <br> T.33mm |
| 802 | 32 | Pink quartzite. Sub-oval in shape. Two faces appear to have been smoothed. | L. 69 mm ; W. 48 mm ; T. 33 mm |
| 815 | 202 | Quartz sandstone, abraded. Flat oval in shape. One possible flat smoothed face. | L. 75 mm ; W. 49 mm ; T. 17 mm |
| 873 | 208 | Quartz sandstone. Flat oval in shape. Possibly worn on one face. | L. 79 mm ; W. 45 mm ; T .29 mm |
| 886 | 208 | Quartz sandstone. Flat oval in shape. Rubbing has formed a very slight bevelling of one end. One face worn smooth. | L. 72 mm ; W. 51 mm ; T. 23 mm |
| 992 | 82 | Pink quartzite. Sub-oval in shape. One face has been flattened and smoothed. | L. 65 mm ; W. 57 mm ; $T .37 \mathrm{~mm}$ |
| 1008 | 43 | Granite. Sub-oval in shape. Smoothing on both faces and one end. | L. 55 mm ; W. 49 mm ; T.36mm |
| 1013 | 41 | Limestone, abraded. Elongated oval in shape. Part of one face is flat and smoothed. Some pecking on opposite end. | L. 108 mm ; W. 56 mm ; T. 44 mm |


| 1048 | 217 | See 608. | $\begin{array}{r} \mathrm{L} .35 \mathrm{~mm} ; \\ \text { W. } 30.5 \mathrm{~mm} ; \\ \text { T. } 10 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 1073 | 85 | Quartz sandstone, fragment. The surviving face is smooth and shiny. | $\begin{array}{r} \mathrm{L} .62 \mathrm{~mm} ; \\ \mathrm{W} .39 .5 \mathrm{~mm} ; \\ \mathrm{T} .26 \mathrm{~mm} \\ \hline \end{array}$ |
| 1135 | 209 | Diorite. Flat oval in shape. Both faces are smooth and slightly shiny. | L. 85 mm ; W. 76 mm ; $T .37 \mathrm{~mm}$ |
| 1187 | 85 | Pink quartzite, fragment One flat smoothed face. | L. 50 mm ; W. 50 mm ; T. 18.5 mm |
| 1193 | 219 | Quartz sandstone, fragment. Sub-rectangular in shape with two smoothed faces. | $\begin{array}{r} \mathrm{L} .50 \mathrm{~mm} ; \\ \text { W. } 28.5 \mathrm{~mm} ; \\ \mathrm{T} .22 .5 \mathrm{~mm} \\ \hline \end{array}$ |
| 1265 | 220 | Pink quartzite. Smooth and shiny over most of the surface. | L. 65 mm ; W. 37 mm ; T. 30 mm |
| 1267 | 221 | Pink quartzite. Sub-triangular in shape. Smooth and shiny all over. | L. 67 mm ; W. 31 mm ; T. 28 mm |
| 1297b | 223 | Metamorphic rock, abraded. Sub-spherical in shape. Parts of the surface may be worn through rubbing. | L. 73 mm ; W. 73 mm ; T. 65 mm |
| 1341 | 255 | Quartz sandstone, spall. Spall from a cobble with glossy residue on one face. | L. 93 mm ; W. 55 mm ; T. 25 mm |
| 1342 | 255 | Granite. Sub-triangular in shape. One face is flat and shiny and the upper face has a patch of glossy residue. | L. 63 mm ; W. 45 mm ; T.30mm |
| 1389 | 253 | Quartzite. One smooth shiny face. | L. 38 mm ; W. 34 mm ; $T .23 \mathrm{~mm}$ |
| 1391 | 253 | Quartz sandstone. Flat oval in shape. Rubbed and shiny on both faces. | L. 80 mm ; W. 47 mm ; T. 26 mm |
| 1392a | U/S | Pink quartzite. Sub oval in shape. One face is flat and smoothed with some possible glossy residue which also extends down one side. | L. 70 mm ; W. 54 mm ; T. 42 mm |
| 1392b | U/S | Pink quartzite. Sub-oval in shape. One flat face is smoothed. | L. 71 mm ; W. 50 mm ; T. 35 mm |
|  |  |  |  |


| 1401 | 220 | Limestone, abraded. Flat circular in shape. Both faces worn smooth. | L. 76 mm ; <br> W.66mm; <br> T. 26 mm |
| :---: | :---: | :---: | :---: |
| 1518 | 101 | Limestone. Ovoid in shape. One flat face rubbed smooth. | L. 47 mm ; W. 33 mm ; T. 24 mm |
| 1543 | 107 | Pink quartzite. Flat oval in shape. Both faces are smoothed. | L. 57 mm ; W. 49 mm ; T. 27 mm |
| 1544 | 105 | Quartz siltstone. Flat oval in shape. Both faces appear flattened and smooth. | L. 135 mm ; W. 96 mm ; T. 52 mm |
| 1650 | 51 | Limestone. Flat oval in shape. Some rubbed areas around edges and on both faces. Light pecking too on either end. | L. 73 mm ; W. 39 mm ; T. 23 mm |
| 1685 | 239 | Quartz siltstone. Irregular in shape. One face may have been smoothed. | L. 95 mm ; W. 73 mm ; T. 40 mm |
| 1692 | 95 | Quartz sandstone. Sub-circular in shape. One flat face has been worn smooth by rubbing. Some pecking around one edge. | $\begin{array}{r} \hline \text { L. } 175 \mathrm{~mm} ; \\ \mathrm{W} .170 \mathrm{~mm} ; \\ \text { T. } 85 \mathrm{~mm} \\ \hline \end{array}$ |
| 1694 | 14 | Quartz sandstone. Irregular in shape with part of one surface smoothed. | L. 75 mm ; W. 68 mm ; T. 52 mm |
| 1861 | 244 | Igneous. Irregular in shape. One flattish face smooth and shiny. | L. 85 mm ; W. 48 mm ; T. 33 mm |
| 1876 | 244 | Pink quartzite. Sub-rectangular in shape. Smooth and shiny over most of surface. | L. 53 mm ; W. 28 mm ; T .21 mm |
| 1985 | 76 | Quartz sandstone. Flat oval in shape. There is a glossy residue or polish around the edge of one face. | L. 112 mm ; W. 86 mm ; T. 32 mm |
| 1986 | 76 | Granite. Flat circular cobble with one face worn smooth. Large flakes have also been removed from around the edge. | $\begin{array}{r} \hline \text { L. } 108 \mathrm{~mm} ; \\ \text { W. } 101 \mathrm{~mm} ; \\ \text { T. } 32 \mathrm{~mm} \\ \hline \end{array}$ |
| 2050 | 244 | Limestone. Flat oval in shape. One face worn smooth. | $\begin{array}{r} \mathrm{L} .82 \mathrm{~mm} ; \\ \mathrm{W} .55 \mathrm{~mm} ; \\ \mathrm{T} .27 \mathrm{~mm} \\ \hline \end{array}$ |
| 2084 | 69 | Limestone, abraded. One smoothed face. | L. 25 mm ; W. 24 mm ; T. 13 mm |
| 2127 | 267 | Pink quartzite. Sub-oval in shape. One flattened and smoothed face. | L. 91 mm ; W. 55 mm ; T. 48 mm |


| 2182 | 269 | Quartz siltstone. Flat circular in shape. Two faces worn smooth. | $\begin{array}{r} \mathrm{L} .55 \mathrm{~mm} ; \\ \mathrm{W} .45 \mathrm{~mm} ; \\ \mathrm{T} .19 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 2231 | 270 | Pink quartzite, fragment. Blocky fine-grained lump. Two/three surfaces are smooth and undulating as if from use as a sharpening stone. | L. 86.5 mm ; W. 84 mm ; T. 56 mm |
| 2245 | 69 | Quartz sandstone. Flat sub-triangular in shape. Worn and shiny on one face. | L. 47 mm ; W.42mm; T. 18 mm |
| 2270 | 285 | Quartz sandstone. Sub-triangular in shape. Some shiny parts on a face. | L. 78 mm ; W.65mm; T. 32 mm |
| 2349 | 244 | Limestone, fragment. One shiny face. | L. $35 \mathrm{~mm} ;$ <br> $\mathrm{W} .32 .5 \mathrm{~mm} ;$ <br> T .27 mm |
| 2354 | 139 | Quartz sandstone, broken. Sub-rectangular in shape. Lower flat face is smoothed with a light polish. | L. 104 mm ; <br> W. 62 mm ; <br> T. 70 mm |
| 2378 | 70 | Quartz sandstone, spall. Probable spall from rubbing stone. | L. 31 mm ; W. 22 mm ; T. 4.5 mm |
| 2403 | 253 | Quartz siltstone. Sub-triangular in shape. One slightly uneven but smoothed face. | L. 109 mm ; W. 75 mm ; T. 37 mm |
| 2412 | U/S | Pink quartzite, fragment. One face has been smoothed and multidirectional striations are visible. | L. 79 mm ; W.86mm; T. 43 mm |
| 2428 | 76 | Quartz sandstone. Small round pebble with two shiny faces. | L. 35 mm ; W. 30 mm ; T. 18 mm |
| 2440 | 26 | Pink quartzite, fragment. One flat polished face. | L. 33 mm ; <br> W. 23 mm ; <br> T. 8 mm |
| 2455 | 26 | Quartz sandstone, burnt fragment. Surviving faces appear smooth. | $\begin{array}{r} \text { L. } 64 \mathrm{~mm} ; \\ \text { W. } 124 \mathrm{~mm} ; \\ \mathrm{T} .32 \mathrm{~mm} \\ \hline \end{array}$ |
| 2488 | 283 | Quartz sandstone. Flat oval in shape. One smoothed face. | L. 49 mm ; W. 37 mm ; T. 24 mm |
| 2513 | 258 | Pink quartzite. Sub-oval in shape. Especially flat and shiny on one face. | L. 53 mm ; W. 29 mm ; T. 26 mm |
| 2630 | 297a | Limestone, broken. Very shiny on one flattened face. One facet also on unbroken end. | L. 50 mm ; W. 39 mm ; T. 21 mm |


| 2674 | 253 | Quartz sandstone. Small round pebble with shiny patches on opposite faces. | L. 40 mm ; W. 40 mm ; T. 30 mm |
| :---: | :---: | :---: | :---: |
| 2679 | 87 | Quartz siltstone. One face is particularly smooth. | L. 90 mm ; W. 53 mm ; T. 28 mm |
| 2682 | 912 | Dolerite. Sub-rectangular in shape. Worn shiny and smooth all over. | L. 80 mm ; W. 49 mm ; T. 25 mm |
| 2743 | 948 | Pink quartzite. Irregular in shape. Both undulating faces have patches of smoothing and possible glossy residue. | $\begin{gathered} \text { L. } 130 \mathrm{~mm} ; \\ \text { W. } 103 \mathrm{~mm} ; \\ \text { T. } 47 \mathrm{~mm} \end{gathered}$ |
| 2755 | 951 | Granite. Irregular in shape. One shiny worn face. | L. 38 mm ; W. 29 mm ; T. 22 mm |
| 2765 | 1212 | Pink quartzite. Flat semi-circular in shape. One face smoothed. | L. 130 mm ; W.60mm; T. 30 mm |
| 2805 | 965 | Pink quartzite. Oval in shape. One smoothed face. | L. 54 mm ; <br> W. 40 mm ; <br> $T .27 \mathrm{~mm}$ |
| 2891 | 976 | Limestone. Flat circular in shape. One face flattened and smoothed. | L. 90 mm ; W. 78 mm ; T.36mm |
| 3013 | 313 | Quartz siltstone. Flat oval in shape. Both faces worn smooth. | L. 27 mm ; W.23mm; T. 13 mm |
| 3038 | 951 | Pink quartzite. Sub-oval in shape. One flattened and smoothed face. | L. 91 mm ; W. 54 mm ; T. 41 mm |
| 3040 | 958 | Limestone. Flat circular in shape. One or both faces have been smoothed. | L. 77 mm ; W.65mm; T. 30 mm |
| 3056 | $6 \backslash 14$ | Pink quartzite, broken. Sub-rectangular in shape. Possible smoothed faces. | L. 64 mm ; W. 31 mm ; T. 23 mm |

Rounded cobbles with significantly altered faces

| 308 | 42 | Limestone. Tabular cobble on which one side has been flattened and <br> smoothed through use. | L.97mm; <br> W. $72 \mathrm{~mm} ;$ |
| :--- | :---: | :--- | ---: | ---: |
|  |  |  | T.30mm |


| 511 | 98 | Pink quartzite, fragment. One smooth flat face. | L. 82 mm ; <br> W.40mm; <br> T. 15 mm |
| :---: | :---: | :---: | :---: |
| 871 | 70 | Quartz siltstone. Sub-rectangular in shape. One face has been rubbed flat and smooth and some striations are visible. There are areas of pecking on either end. | L.48mm; W. 43 mm ; T. 23 mm |
| 1027 | 217 | Pink quartzite. Tiny fragment with one very flat face which is smooth and polished. | L.30mm; W. 21 mm ; T .7 mm |
| 1040 | 85 | Diorite. Sub-cuboid in shape with at least four faces which have been worn flat and smooth. One of the faces has an angled facet. There is a broad ground facet on one of the ends and a side and possibly a rougher facet on the opposite end. | L. 91 mm ; W. 75 mm ; T. 56 mm |
| 1253 | 258 | Quartz sandstone. Flat oval in shape. Very nice piece with flattened and smoothed faces and edges. Patches of a glossy residue especially around the edges. | L. 75 mm ; W. 55 mm ; T. 15 mm |
| 1337 | 255 | Quartz sandstone, burnt fragment. Refits with 434. | L. 50 mm ; W. 38 mm ; T.44mm |
| 1346 | 258 | Quartz sandstone, abraded. Irregular-shaped cobble with one flattened and smoothed face. | L. 91 mm ; W. 60 mm ; T. 60 mm |
| 1445 | 43 | Quartz sandstone, broken. Sub-circular in shape. One face has been worn completely flat and smooth right out to the edges. Nice piece. | L. 47 mm ; W. 74 mm ; T. 24 mm |
| 1696 | 14 | Quartz sandstone, broken. Ovoid in shape. One face has been flattened and smoothed and partially polished. | L. 105 mm ; W. 73 mm ; T. 53 mm |
| 1824 | 247 | Quartz sandstone. Flat circular in shape. One face has been flattened and smoothed. There is also a patch of pecking around the perimeter. | L. 55 mm ; W. 51 mm ; T. 20 mm |
| 2141 | 270 | Limestone, broken. One flattened and smoothed face. | L. 57 mm ; W. 80 mm ; T. 62 mm |
| 2340 | 282 | Quartz sandstone. Sub-rectangular in shape. Two contiguous faces have been worn flat and smooth and there is some polish here too. | L. 117 mm ; W.64mm; T. 54 mm |
| 2351 | 239 | Granite, fragment. A flat smooth face has been formed on the break. | L. 136 mm ; W.91mm; T. 67 mm |
| 2656 | 253 | Quartz siltstone. Large oval cobble with one flattened and smoothed face. Possibly pecked on either end. | L. 170 mm ; W. 115 mm ; T.78mm |


| 3018 | 313 | Quartz. Sub-triangular in shape. Highly polished, particularly on one <br> flattened face. | L. $54 \mathrm{~mm} ;$ <br> W.47mm; <br> T. 23 mm |
| :--- | :---: | :--- | ---: |
| 3019 | 314 | Mudstone. Sub-rectangular in shape. There is a high polish all over <br> the original cortex and on parts of the broken underside. The <br> rubbing has also formed a light bevel on one end. | L. $107 \mathrm{~mm} ;$ <br> W.35m; |
|  |  | T.14mm |  |

Tabular cobbles with rubbed faces

| 409 | 43 | Quartz sandstone. Tabular, fragment. Remains of a very flat face which is smoothed out to edges. Some polish/ gloss residue around the edge. | L. 100 mm ; W. 80 mm ; T. 32 mm |
| :---: | :---: | :---: | :---: |
| 922 | 82 | Quartz sandstone. Narrow tabular stone with one face worn smooth and a light bevel rubbed on one end. | L. 17 mm ; W. 24 mm ; T. 9 mm |
| 1349 | 255 | Rectangular in shape with one smoothed face. | L. 62 mm ; W. 45 mm ; T. 15 mm |
| 1365 | U/S | Limestone, broken. Thick tabular fragment. One flat face has been smoothed and polished. Uni-directional striations are visible. | $\begin{array}{r} \mathrm{L} .145 \mathrm{~mm} ; \\ \mathrm{W} .100 \mathrm{~mm} ; \\ \mathrm{T} .58 \mathrm{~mm} \\ \hline \end{array}$ |
| 1418 | 239 | Quartz siltstone, broken. Partial survival of flat highly polished face. | $\begin{array}{r} \text { L. } 112 \mathrm{~mm} \text {; } \\ \mathrm{W} .102 \mathrm{~mm} \\ \text { T. } 55 \mathrm{~mm} \\ \hline \end{array}$ |
| 1424 | 202 | Quartz siltstone. Sub-triangular in plan. One flat face and one side are very smooth and almost polished. Opposite face is smoothed. | L. 112 mm ; W. 70 mm ; T. 25 mm |
| 1453 | 239 | Quartz sandstone. Thick tabular fragment. One face has been partially smoothed. | L. 63 mm ; W. 53 mm ; T. 33.5 mm |
| 1461 | 239 | Limestone, abraded. Small tabular fragment with one smoothed face. | L. 58 mm ; W. 42 mm ; T. 18 mm |
| 1509 | 101 | Quartz sandstone. Tabular fragment. Very slightly uneven smoothed face. | L. 115 mm ; W. 100 mm ; T. 46 mm |
| 1662 | 239 | Limestone, abraded. Tabular fragment with one flat smoothed face. | L. 70 mm ; W. 68 mm ; T. 25 mm |
| 1722 | 10 | Red sandstone. Tabular, fragment. One flat smoothed face. | L. 66 mm ; W.63mm; T. 29.5 mm |
| 2407 | 279 | Quartz siltstone. Triangular in plan. Both faces are flat and smoothed and there is a polish on one corner. | L. 86 mm ; W. 69 mm ; T. 19 mm |


| 2451 | S/H | Igneous. Cuboid block. At least three faces appear to have been deliberately flattened and smoothed. | L. 100 mm ; <br> W. 100 mm ; <br> T. 94 mm |
| :---: | :---: | :---: | :---: |
| 2650 | 297a | Quartz siltstone, broken. Tabular with curved sides. Both of the faces and all edges have been finely smoothed over original rough surface. | L. 96 mm ; W. 63 mm ; T.10mm |
| 2751 | 1209 | Calcareous siltstone, broken. Tabular. One face altered to be very flat and smoothed right out to the edges. | L. 106 mm ; W. 62 mm ; T. 24 mm |
| 2809 | 1207 | Quartz sandstone, broken. Tabular with one flat smoothed face. | L. 42 mm ; <br> W.61mm; <br> T. 12 mm |
| 2915 | 1225 | Limestone, fragment. Tabular flake with one possible smoothed face. | L. 113 mm ; W. 99 mm ; T. 15.5 mm |
| 2922 | 1226 | Quartzitic schist, fragment. Tabular with one flat smoothed face. | L. 75 mm ; W.53mm; T. 29 mm |
| 2967 | 1226 | Limestone, broken. Tabular with one smoothed face. | L. 96 mm ; W.86mm; T .17 mm |
| 3071 | 255 | Quartz siltstone. Trapezoidal-shaped thin slab. Uncertain as to whether deliberately shaped or not. | L. 31 mm ; <br> W. 32 mm ; <br> T. 6 mm |

Tabular cobbles with altered edges

| 629 | 32 | Tabular quartz sandstone, fragment. Surviving edge is rounded and polished. | $\begin{array}{r} \mathrm{L} .49 .5 \mathrm{~mm} ; \\ \mathrm{W} .37 \mathrm{~mm} ; \\ \mathrm{T} .7 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 978 | 43 | Tabular piece of quartz sandstone. A facet formed down one side and one end bevelled. | L. 100 mm ; W. 74 mm ; T. 12 mm |
| 1910 | 244 | Tabular piece of calcareous siltstone, triangular in plan. The entire circumference is rounded and shiny and one long edge has been shaped to an acute angle. | L. 104 mm ; <br> W.68mm; T. 7 mm |
| 2402 | 283 | Tabular piece of quartz sandstone. One end has been bevelled and the opposite end is faceted. One face may have been partially smoothed. | L. 87 mm ; W. 52 mm ; T. 18 mm |
| 2433 | S/H | Tabular piece of mudstone, abraded and broken. There is a high polish down one irregular edge. | L.81mm; W. 77 mm ; T. 14 mm |

## Unused cobbles

| 60 | 10 | Granite. Irregular-shaped boulder. | L. 228 mm ; W. 166 mm ; T.160mm |
| :---: | :---: | :---: | :---: |
| 61 | 10 | Limestone, abraded and broken. | L. 112 mm ; W. 72 mm ; T. 42 mm |
| 62 | 10 | Limestone, broken. | L. 93 mm ; W. 83 mm ; T. 50 mm |
| 250 | 10 | Limestone, fragment. The cortical face is most probably natural. | L. 108 mm ; W. 105 mm ; T. 28 mm |
| 253 | U/S | Granite. | L. 87 mm ; W. 72 mm ; T. 55 mm |
| 254 | U/S | Limestone, abraded and broken. | L.54mm; W. 53 mm ; T. 40 mm |
| 275 | 10 | Limestone, abraded and broken. | L. 72 mm ; W. 90 mm ; T. 34 mm |
| 292 | 10 | Limestone, abraded and broken. | $\begin{array}{r} \mathrm{L} .63 \mathrm{~mm} ; \\ \mathrm{W} .76 .5 \mathrm{~mm} ; \\ \mathrm{T} .40 \mathrm{~mm} \\ \hline \end{array}$ |
| 313 | 9 | Granite. | L. 27 mm ; W. 23 mm ; T. 7 mm |
| 320 | 29 | Granite, fragment. | L. 83.5 mm ; W.63mm; T. 38 mm |
| 339 | 26 | Quartz sandstone, burnt fragment. | L. 50 mm ; W.48mm; T. 30 mm |
| 340 | 10 | Granite, abraded. | L.52mm; W. 45 mm ; T. 26 mm |
| 344 | 10 | Limestone, abraded and broken. | L. 38.5 mm ; <br> W. 59 mm ; <br> T. 21.5 mm |
| 493 | 56 | Pink quartzite, fragment. | L. 33 mm ; W. 12 mm ; T. 12 mm |
| 505 | 56 | Limestone. Sub-spherical in shape. Nice, but most probably not used. | L.33mm; W. 30 mm ; T. 27 mm |


| 515 | 56 | Limestone, abraded and broken. | L. 50 mm ; W. 50 mm ; T. 53 mm |
| :---: | :---: | :---: | :---: |
| 536 | 95 | Limestone, abraded. | L. 125 mm ; W. 112 mm ; $T .52 \mathrm{~mm}$ |
| 545 | 41 | Quartz sandstone, burnt fragment. | L. 100 mm ; W. 71 mm ; T. 22 mm |
| 609 | 32 | Limestone, abraded and broken. | L. 46 mm ; W. 29 mm ; T. 16.5 mm |
| 625 | 32 | Limestone, burnt fragment. | L. 35 mm ; W.48mm; T. 28.5 mm |
| 631 | 32 | Limestone, burnt fragment. | L.69mm; W. 55 mm ; T. 32 mm |
| 672 | 32 | Limestone, abraded and broken. | L. 25 mm ; W. 30 mm ; T. 28 mm |
| 714 | 95 | Limestone, abraded and broken. | $\begin{array}{r} \hline \text { L. } 58.5 \mathrm{~mm} ; \\ \mathrm{W} .71 .5 \mathrm{~mm} ; \\ \mathrm{T} .48 \mathrm{~mm} \\ \hline \end{array}$ |
| 716 | 66 | Limestone, abraded. | L. 65 mm ; W. 55 mm ; T. 35 mm |
| 719 | 51 | Quartz sandstone, burnt fragment. | L. 39 mm ; W. 51 mm ; T .21 mm |
| 720 | 70 | Limestone, abraded. | L. 50 mm ; W. 45 mm ; T. 31 mm |
| 769 | 95 | Diorite, spall. | $\begin{array}{r} \mathrm{L} .75 \mathrm{~mm} ; \\ \mathrm{W} .41 .5 \mathrm{~mm} ; \\ \mathrm{T} .11 \mathrm{~mm} \\ \hline \end{array}$ |
| 782 | 202 | Granite. | L. 35 mm ; W. 33 mm ; T. 27 mm |
| 803 | 32 | Pink quartzite. Ovoid in shape. | L. 68 mm ; W. 35 mm ; T. 32 mm |
| 809 | 70 | Pink quartzite. | L. 72 mm ; W.67mm; T. 40 mm |


| 814 | 70 | Granite. | L. 48 mm ; W. 37 mm ; T. 25 mm |
| :---: | :---: | :---: | :---: |
| 827 | 71 | Limestone, abraded and broken. | L. 59 mm ; W. 38 mm ; T. 27 mm |
| 880 | 208 | Pink quartzite. | L. 58 mm ; W. 42 mm ; T. 32 mm |
| 896 | 208 | Limestone. | L. 43 mm ; W. 37 mm ; T. 27 mm |
| 919 | 208 | Limestone, broken. | L. 52 mm ; W.69mm; T. 19 mm |
| 921 | 77a | Pink quartzite. | L. 67 mm ; W.39mm; T. 29 mm |
| 923 | 82 | Quartz sandstone, spall. | L. 81.5 mm ; W. 45 mm ; T. 23 mm |
| 945 | 209 | Limestone. | L. 27 mm ; W. 25 mm ; T. 16 mm |
| 1029 | 41 | Limestone, abraded and broken. | $\begin{array}{r} \text { L. } 46.5 \mathrm{~mm} ; \\ \text { W. } 93 \mathrm{~mm} ; \\ \text { T. } 44 \mathrm{~mm} \\ \hline \end{array}$ |
| 1063 | 217 | Pink quartzite, fragment. | $\begin{array}{r} \text { L. } 86.5 \mathrm{~mm} ; \\ \text { W. } 45 \mathrm{~mm} ; \\ \text { T. } 23 \mathrm{~mm} \\ \hline \end{array}$ |
| 1114 | 217 | Limestone, abraded and broken. | $\mathrm{L} .72 \mathrm{~mm} ;$ $\mathrm{W} .78 .5 \mathrm{~mm} ;$ T .33 mm |
| 1139 | 88 | Quartz sandstone, fragment. | $\begin{array}{r} \mathrm{L} .75 \mathrm{~mm} ; \\ \mathrm{W} .48 .5 \mathrm{~mm} ; \\ \mathrm{T} .46 .5 \mathrm{~mm} \\ \hline \end{array}$ |
| 1166 | 85 | Limestone, abraded and broken. | L. 72 mm ; W.63mm; T. 42 mm |
| 1173 | 219 | Limestone, abraded and broken. | L. 89 mm ; W. 90 mm ; T. 23 mm |
| 1185 | 85 | Igneous. Small and unused but very shiny cortex. | L. 22 mm ; <br> W. 12 mm ; <br> T. 8 mm |


| 1202 | 85 | Fragment. | L. 17.5 mm ; <br> W.20mm; <br> T. 18.5 mm |
| :---: | :---: | :---: | :---: |
| 1209 | 255 | Quartz sandstone, burnt fragment. | L. 74 mm ; W. 96 mm ; T. 40 mm |
| 1272 | 221 | Limestone fragment. | L. 47 mm ; W. 39 mm ; T. 28 mm |
| 1297c | 223 | Amphibolite, fragment. | L. 126 mm ; <br> W. 112 mm ; <br> T. 59 mm |
| 1502 | 105 | Quartz sandstone, burnt. | L. 68 mm ; W. 39 mm ; T. 21 mm |
| $1553 b$ 1614 | 107 239 | Quartz siltstone. <br> Limestone, abraded and broken. | L. 57 mm ; W.36mm; T. 21 mm L. 112 mm ; W. 81 mm ; T. 16 mm |
| 1632 | 239 | Limestone, burnt fragment. | L. 61 mm ; W. 57 mm ; T. 29 mm |
| 1660 | 51 | Diorite, fragment. Large fragment of a boulder, most probably not artefactual. | L. 201 mm ; W. 69 mm ; T. 84 mm |
| 1693 | 14 | Limestone, fragment. | $\begin{array}{r} \text { L. } 110 \mathrm{~mm} ; \\ \text { W. } 102.5 \mathrm{~mm} ; \\ \text { T. } 19 \mathrm{~mm} \\ \hline \end{array}$ |
| 1701 | 239 | Pink quartzite, spall. | L. 78.6 mm ; W.31.5mm; T. 31.5 mm |
| 1756 | 239 | Limestone, abraded and broken. | L. 69 mm ; W. 54 mm ; T. 14 mm |
| 1757 | 244 | Limestone. | L. 61 mm ; W. 39 mm ; T. 25 mm |
| 1869 | 244 | Limestone, abraded and broken. | L. 98 mm ; W. 70 mm ; T .41 mm |
| 1911 | 244 | Limestone, abraded. | L. 56 mm ; W. 38 mm ; T. 32 mm |


| 1970 | 244 | Quartz sandstone. | L. 22 mm ; W.18mm; T.16mm |
| :---: | :---: | :---: | :---: |
| 2062 | 76 | Limestone, abraded. | L. 95 mm ; W. 55 mm ; T. 34 mm |
| 2101 | 88 | Quartz sandstone. | L. 50 mm ; W. 38 mm ; T. 30 mm |
| 2109 | 270 | Quartz siltstone. | L. 42 mm ; W. 32 mm ; T .21 mm |
| 2111 | 87 | Quartz siltstone. | L. 90 mm ; W.54mm; T. 30 mm |
| 2145 | 244 | Limestone. Thin natural slab. | L. 208 mm ; <br> W. 178 mm ; <br> T.16mm |
| 2152a | 267 | Quartz sandstone, burnt fragment. | L. 64 mm ; W. 58 mm ; T. 24 mm |
| 2152b | 267 | Quartz sandstone, burnt fragment. | L. 62 mm ; <br> W. 52 mm ; <br> T. 36 mm |
| 2213 | 283 | Pink quartzite. | L. 50 mm ; W.33mm; T. 26 mm |
| 2350 | 239 | Psammite, spall. | $\begin{array}{r} \text { L. } 67.5 \mathrm{~mm} ; \\ \text { W. } 33 \mathrm{~mm} \text {; } \\ \text { T. } 26 \mathrm{~mm} \\ \hline \end{array}$ |
| 2355 | 244 | Pink quartzite, fragment. | $\begin{array}{r} \text { L. } 17.5 \mathrm{~mm} ; \\ \text { W. } 31 \mathrm{~mm} ; \\ \text { T. } 23 \mathrm{~mm} \end{array}$ |
| 2371 | 285 | Limestone, burnt. | L. 60 mm ; W. 39 mm ; T. 39 mm |
| 2388 | 70 | Limestone. Finger-like pebble. | L. 65 mm ; W. 22 mm ; T. 20 mm |
| 2456 | 26 | Limestone, abraded and broken. Refits with 2577. | L. 107 mm ; W. 78 mm ; T. 33 mm |
| 2527 | 291 | Red sandstone. | L. 72 mm ; W. 77 mm ; T. 45 mm |


| 2557 | 902 | Quartz sandstone, abraded and broken. | L. 48 mm ; <br> W. 98 mm ; <br> T. 20 mm |
| :---: | :---: | :---: | :---: |
| 2577 | 9 | Limestone, abraded and broken. Refits with 2456. | L. 107 mm ; W. 78 mm ; T.33mm |
| 2597 | 1000 | Natural spar of calcite. | L. 49 mm ; W. 35 mm ; T. 33 mm |
| 2669 | 253 | Pink quartzite, fragment. | L. 65 mm ; W. 43 mm ; T. 24 mm |
| 2688 | 1104 | Granite, fragment. | L. 26 mm ; W. 54 mm ; T. 25 mm |
| 2744 | 948 | Limestone, abraded and broken. | $\begin{array}{r} \text { L. } 63.5 \mathrm{~mm} ; \\ \text { W. } 57 \mathrm{~mm} ; \\ \text { T. } 36 \mathrm{~mm} \\ \hline \end{array}$ |
| 2746 | 949 | Limestone, abraded. | L. 52 mm ; W.48mm; T. 18 mm |
| 2748 | 947 | Gneiss. | L. 85 mm ; W. 74 mm ; T. 28 mm |
| 2754 | 1209 | Limestone. Three small pebbles. | L. 20 mm ; W.20mm; T. 8 mm |
| 2763 | 1212 | Pink quartzite. | L. 76 mm ; W.50mm; T. 49 mm |
| 2807 | 962 | Limestone, abraded. | L. 108 mm ; W. 67 mm ; T. 22 mm |
| 2832 | 965 | Granite. | L. 40 mm ; W. 34 mm ; T. 20 mm |
| 2844 | 977 | Metadolerite, broken. | L. 141 mm ; W. 86 mm ; T. 63 mm |
| 2854 | 976 | Metamorphic. | L. 72 mm ; W. 60 mm ; T. 35 mm |
| 2861 | 1226 | Metamorphic, fragment. | $\begin{array}{r} \text { L. } 16.5 \mathrm{~mm} ; \\ \text { W. } 21 \mathrm{~mm} ; \\ \text { T. } 17 \mathrm{~mm} \end{array}$ |


| 2889 | 1218 | Limestone. | L.48mm; <br> W.34mm; <br> T. 29 mm |
| :---: | :---: | :---: | :---: |
| 2906 | 1219 | Quartz sandstone, fragment. | $\begin{array}{r} \text { L. } 235 \mathrm{~mm} ; \\ \mathrm{W} .117 \mathrm{~mm} ; \\ \text { T. } 28.5 \mathrm{~mm} \\ \hline \end{array}$ |
| 2959 | 1226 | Limestone, abraded and broken. | L.40mm; W. 41 mm ; T.19mm |
| 2962 | 1226 | Quartz sandstone. | L. 61 mm ; W. 47 mm ; T. 15 mm |
| 2966 | 1226 | Limestone, abraded and broken. Tabular fragments. | L. 107 mm ; W.60mm; T. 38 mm |
| 2992 | 1231 | Limestone, abraded and broken. | L. 74 mm ; W. 73 mm ; T. 60 mm |
| 2993 | 1212 | Quartz sandstone, fragment. | L. 14 mm ; W. 33 mm ; T. 28 mm |
| 3014 | 313 | Limestone, abraded. | L. 48 mm ; W. 46 mm ; T. 40 mm |
| 3032 | 313 | Quartz. | L. 26 mm ; W. 22 mm ; T. 15 mm |
| 3034 | 1219 | Limestone, abraded and broken. | L. 67 mm ; W. 52 mm ; T. 27 mm |

Burnt pieces, unidentifiable
No sign of use or modification: classified as burnt unidentifiable lithic pieces.

| 279 | 14 |  |
| :--- | :---: | :--- |
| 296 | 10 |  |
| 328 | 3 |  |
| 523 | $\mathrm{U} / \mathrm{S}$ |  |
| 576 | 95 |  |
| 641 | 32 |  |
| 748 | 56 |  |
| 793 | 71 |  |
| 1019 | 82 |  |
| 1079 | 85 |  |
| 1390 | S/H |  |


| 1420 | 22 |  |
| :--- | :---: | :--- |
| 1513 | 101 |  |
| 2074 | 76 |  |
| 2450 | 26 |  |
| 2522 | 71 |  |
| 2687 | 1101 |  |
| 2689 | 1104 |  |
| 2964 | 1226 |  |

## Grinding slabs

| 47 | 6 | Sub-rectangular slab of granite, possibly burnt. The upper face which has been worked smooth is flaking off. Both long sides are undulating but smoothed and polished. C.F. 115. | L. 215 mm ; W. 114 mm ; T. 40 mm |
| :---: | :---: | :---: | :---: |
| 115 | 26 | Sub-rectangular slab of granite. One face has been worn right out to the edges and this is flat but not as smooth as others of this type. Most heavily worn around the outer edge. One long side is undulating and smooth and polished. | $\begin{gathered} \text { L. } 340 \mathrm{~mm} ; \\ \text { W. } 150 \mathrm{~mm} ; \\ \text { T. } 60 \mathrm{~mm} \end{gathered}$ |
| 215 | $? 6$ | Sub-rectangular slab of granite. One face has been worn right out to the edges. This is slightly convex in cross-section and smooth, particularly around the edges. | L. 270 mm ; W.14mm; T. 65 mm |
| 226 | 14 | Fragment of a slab of granite. One flat face has been worn smooth right out to the edges. Particularly smooth around the outer rim. | $\begin{array}{r} \text { L. } 139 \mathrm{~mm} ; \\ \text { W. } 165 \mathrm{~mm} \text {; } \\ \text { T. } 72 \mathrm{~mm} \\ \hline \end{array}$ |
| 285 | 14 | Sub-rectangular slab of granite. One face has been worn right out to the edges. This face is slightly irregular but the raised areas are most heavily worn and quite smooth. Most heavily smoothed around the outer edge. | $\begin{array}{r} \text { L. } 255 \mathrm{~mm} ; \\ \text { W. } 200 \mathrm{~mm} ; \\ \text { T. } 70 \mathrm{~mm} \end{array}$ |
| 286 | $? 6$ | Sub-rectangular slab of granite. One face has been worn right out to the edges. This face is flat and very smooth and polished especially around the edges. | $\begin{array}{r} \text { L. } 295 \mathrm{~mm} ; \\ \text { W. } 170 \mathrm{~mm} ; \\ \text { T. } 70 \mathrm{~mm} \\ \hline \end{array}$ |
| 683 | 51 | Sub-rectangular slab of fine-grained sandstone. There are areas of smoothing on one face which extend out to one edge. The side contiguous to this edge is also worn flat and smooth. Some smoothing on the opposite face too. | L. 230 mm ; W. 100 mm ; T.70mm |
| 822 | 32 | Fragment of quartz sandstone with smoothed face. Probable grinding slab. | L. 118 mm ; W. 107 mm ; T. 68 mm |
| 1361 | S/H | Sub-rectangular block of quartz sandstone. One face has been worn right out to the edges and is very slightly convex in cross-section and smooth. | $\begin{array}{r} \hline \text { L. } 300 \mathrm{~mm} ; \\ \text { W. } 170 \mathrm{~mm} ; \\ \text { T. } 68 \mathrm{~mm} \\ \hline \end{array}$ |
| 1393 | 293 | Fragment of a slab of quartz siltstone. Worked face has been worn right out to the edges. | L. 78 mm ; W.48mm; T. 42.5 mm |


| 1447 | 43 | Fragment of a slab of quartz sandstone. One face has been flattened and smoothed particularly around the outer edge. | L. 160 mm ; W. 99 mm ; T. 49 mm |
| :---: | :---: | :---: | :---: |
| 1689 | 6 | Fragment of a sub-rectangular block of quartz sandstone. One face is very smooth and has been worked right out to the edges. | L. 195 mm ; W. 98 mm ; T. 84 mm |
| 2119 | 267 | Slab of coarse-grained granite. Ovoid in plan with a rounded base. The worked surface is smooth and it is worn right out to the edges. | $\begin{array}{r} \mathrm{L} .370 \mathrm{~mm} ; \\ \mathrm{W} .260 \mathrm{~mm} \\ \text { T. } 90 \mathrm{~mm} \end{array}$ |
| 2246 | 270 | Sub-rectangular block of quartzite. One face has been worn right out to the edges and this is very smooth. | $\begin{gathered} \mathrm{L} .280 \mathrm{~mm} ; \\ \mathrm{W} .160 \mathrm{~mm} \\ \text { T. } 82 \mathrm{~mm} \end{gathered}$ |
| 2313 |  | Trapezoidal-shaped slab of limestone, abraded. One face may have been worn smooth although this is difficult to determine because of abrasion. | $\begin{array}{r} \text { L. } 310 \mathrm{~mm} ; \\ \text { W. } 182 \mathrm{~mm} ; \\ \text { T. } 42 \mathrm{~mm} \\ \hline \end{array}$ |
| 2664 | 257 | Half of a large coarse-grained sandstone cobble, abraded. The broken face has been flattened and smoothed. | $\begin{array}{r} \text { L. } 250 \mathrm{~mm} ; \\ \text { W. } 160 \mathrm{~mm} ; \\ \text { T. } 48 \mathrm{~mm} \end{array}$ |

Fist-type grinders

| 209 | 47 | Syenite. Shaped by flaking and then ground over most of this upper surface to a rough, sub-spherical form. Part of one side bears polish over an irregular surface. Base is very flat and polished. | $\begin{array}{r} \text { L. } 102 \mathrm{~mm} ; \\ \text { W. } ; 55 \mathrm{~mm} ; \\ \text { T. } 72 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 876 | 203 | Ultra-basic rock. Probable blank. Shaped by flaking to form a humpback with flattish sides. The piece has then been pecked/ground along the long axis and one side bears polish. Base is still roughly worked, no smoothing or polishing. | L. 105 mm ; <br> W. 53 mm ; <br> T. 85 mm |
| 1297a | 223 | Amphibolite. Shaped by flaking to form a hump-back with flattish sides. Pecked/ground along long axis. One side is polished over irregular surface. Base is very flat and polished. | L. 79 mm ; W. 53 mm ; T. 60 mm |
| 1323 | 257 | Amphibolite. Shaped by flaking to form a hump-back with flattish sides. Pecked/ground along long axis. One side has smoothing over an irregular surface. Base is very flat and polished with visible unidirectional striations. | L. 109 mm W. 58 mm ; T. 92 mm |

## Perforated pieces and spindle whorls

| 6 | 1 | Limestone slab, abraded, trapezoidal in plan. A perforation has been <br> made off-centre and a semi-circular groove is aligned with the hole <br> on the narrow edge. Probably some sort of weight. Hole 28mm x <br> l $6 \mathrm{~mm} ;$ groove 28mm; 18mm. | L.180mm; |
| :--- | :---: | :--- | ---: |
| 44 | 6 | Irregular-shaped lump of vesicular limestone. Resembles a piece of <br> pumice. There is a perforation at one end, which may be an <br> enhanced natural perforation. Diameter of hole 8 mm. | L.37mm; |


| 1886 | 244 | Bead. Quartz siltstone. Circular, with a flat cross-section and <br> straight sides. Ground and polished all over. Straight-sided central <br> perforation. | L. $17 \mathrm{~mm} ;$ <br> W.17mm; <br> T.7mm |
| :--- | :---: | :--- | :--- | ---: |
| 2449 | 26 | Spindle whorl. Limestone. Ground all over to form a circular shape <br> with a flat cross-section and rounded edges. The central perforation <br> has a slightly skewed biconical cross-section, 12mm in diameter. | L. $40 \mathrm{~mm} ;$ <br> W.40mm; <br> T.15mm |
| 3006 | 309 | Spindle whorl. Limestone, burnt fragment. Circular in plan with a <br> flattish cross-section and rounded edges. Most probably originally <br> ground to shape. Central conical-shaped perforation. | L. $48 \mathrm{~mm} ;$ <br> W. $48 \mathrm{~mm} ;$ <br> T. 13 mm |

Stone discs and counters

| 607 | 32 | Small stone disc. Thick tabular piece of limestone. Roughly chipped around the edge to form a sub-circular outline. | L.40mm; W. 37 mm ; T.12mm |
| :---: | :---: | :---: | :---: |
| 840 | 97 | Stone disc. Slab of quartz sandstone which has been flaked bifacially around the edge to form an oval shape. Patches of red discolouration on one face may indicate heat damage. | L. 185 mm ; W. 165 mm ; T. 15 mm |
| 1161 | 219 | Small stone disc. Thick tabular piece of limestone. Roughly chipped around the edge to form a sub-circular outline. | L.48mm; W. 46 mm ; T.13mm |
| 1921 | 14 | Stone disc. Tabular piece of quartz feldspar sandstone. Chipped bifacially around most of perimeter to form a roughly triangular shape. | $\begin{array}{r} \text { L. } 175 \mathrm{~mm} ; \\ \text { W. } 165 \mathrm{~mm} ; \\ \text { T. } 17 \mathrm{~mm} \\ \hline \end{array}$ |
| 2432 | 270 | Limestone. Probable counter. Disc-shaped. Ground all over to form flattish faces and a rounded edge. | L. 13 mm ; W.13mm; T. 8 mm |
| 3047 | 994 | Small stone disc. Thick tabular piece of limestone. Roughly chipped around the edge to form a sub-circular outline. | L.33mm; W. 29 mm ; $\qquad$ |
| 3066 | 82 | Quartz sandstone, abraded. Probable counter but too abraded to determine whether it is ground or not. | L. 14 mm ; W. 14 mm ; T. 4 mm |


| Bracelets |  |  |  |
| :---: | :---: | :---: | :---: |
| 161 | 29 | Dark green-black igneous or metamorhic rock. Fragment. The bracelet has been ground and polished all over and it has an oval cross-section. Inner diameter 67 mm ; outer diameter 95 mm . 14 mm thick. | L. 52 mm ; W. 12 mm ; T. 14 mm |
| 773 | 32 | Dark green-brown ultra-basic rock. Fragment. The bracelet has been ground and polished all over and it has a D-shaped section. 13 mm thick. | L. 27 mm ; W.13mm; T. 13 mm |
| 1839 | 244 | Small cylindrical-shaped object of ?siltstone. Surface has been polished but either end has been more roughly ground to form convex surfaces. A small conical hole has been made on one side ?attempted perforation. Probable reworked bracelet fragment. | L. 13 mm ; W. 14 mm ; T. 14 mm |


| 2521 | 290 | Amphibolite or basic igneous rock. Fragment. The bracelet has been <br> ground and polished all over and has a circular section. Probable <br> internal diameter of 73mm. 16mm wide and thick. | L. $40 \mathrm{~mm} ;$ <br> W.17.5mm; <br> T. |
| :--- | :---: | :--- | :--- | ---: |
| Hones and whetstones |  |  |  |

Ground and polished micaceous siltstone
All of these pieces are made on quartz mica siltstone, most are unidentifiable

| 452 | 41 | Small flake from a highly polished object. Abrupt curve on one side <br> of dorsal edge. | L.23mm; <br> W. $13 \mathrm{~mm} ;$ |
| :--- | :---: | :--- | ---: |
| 643 | 51 | Polished piece. Stubby and sub-rectangular in cross-section. Both <br> ends originally shaped to a slight curve. Both ends damaged. Refits <br> with 2461 a flake from one of the ends. | L.40mm; <br> W.21mm; <br> T. 18 mm |
| 800 | 32 | Tabular fragment, badly damaged. Possibly polished on one uneven <br> face. On the opposite face there is smoothing with visible multi- <br> directional striations. | L.97mm;  <br>   |
|  |  |  | T. $75 \mathrm{~mm} ;$ |


| 2129 | 270 | Fragment. Surviving curved face is highly polished with visible multi-directional striations. | L. 47 mm ; W.56mm; T. 20 mm |
| :---: | :---: | :---: | :---: |
| 2189 | 269 | Tabular fragment. Polished all over with visible striations. The edges are formed by narrow rubbed facets with some flake damage. 10 mm thick. | L. 45 mm ; W. 40 mm ; T. 8.5 mm |
| 2461 | 270 | Fragment. Polished. Refits with 643. | L. $29 \mathrm{~mm} ;$ <br> W. 20.5 mm ; <br> T. 6.5 mm |


| Stone balls |  |  |  |
| :---: | :---: | :---: | :---: |
| 865 | 208 | Sub-spherical ball of pink sandstone. Probably pecked or ground to shape with one definite flattened face. | $\begin{array}{r} \mathrm{L} .74 \mathrm{~mm} ; \\ \mathrm{W} .73 \mathrm{~mm} ; \\ \mathrm{T} .68 \mathrm{~mm} \\ \hline \end{array}$ |
| 2005 | 26 | Sub-spherical ball of limestone, abraded and broken. Probably pecked to shape although difficult to determine because of surface abrasion. | $\begin{array}{r} \mathrm{L} .57 \mathrm{~mm} ; \\ \mathrm{W} .68 \mathrm{~mm} ; \\ \text { T. } 69 \mathrm{~mm} \\ \hline \end{array}$ |
| 2195 | 269 | Sub-spherical ball of limestone. There is pecking over the ball to shape it with particular emphasis on the ends. One flattened face. A brown stain on the pecked areas may be from substances processed, or else the stain was to colour the piece. | $\begin{array}{r} \mathrm{L} .75 \mathrm{~mm} ; \\ \mathrm{W} .73 \mathrm{~mm} ; \\ \mathrm{T} .71 \mathrm{~mm} \end{array}$ |

Bevelled and polished cobble

| (217 |
| :--- |

## Appendix 1.15 Flaked Lithics Catalogue (A. Clarke)

## Flaked Lithics

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 1 | 1 | Chert. Flake core with cortex on one face. Flaked from opposed platforms, one cortical, the other flat inner. | L.30mm; <br> W. 39 mm ; <br> T. 14 mm |
| 17 | U/S | Chert. Three large blocky chunks most likely to be natural. | L. 80 mm ; W. 50 mm ; T. 44 mm ; L. 50 mm ; W. 48 mm ; T. 22 mm ; L. 35 mm ; W. 22 mm ; T. 17 mm |
| 72 | 10 | Small chunk of orange flint. Heavily patinated. | L. 15 mm ; W. 13 mm ; T. 8 mm |
| 87 | 14 | Not seen. Small piece with one smooth surface. The rest are rough and uneven. | L. 13 mm ; W. 15 mm ; T. 8.5 mm |
| 221 | 26 | Chert. Flake core, without cortex. Irregular flaking from opposed platforms. | L. 33 mm ; W. 47 mm ; T. 28 mm |
| 278 | 14 | Chert. Blocky inner chunk possibly natural. | L. 45 mm ; W. 24 mm ; T. 13 mm |
| 300 | 9 | Chert. Small multi-platform flake core. With cortex. | L.30mm; W. 13 mm ; T. 12 mm |
| 343 | 10 | Chert. Blocky inner chunk possibly natural. | L. 32 mm ; W. 15 mm ; T. 12 mm |
| 407 | 43 | Chert. Broken inner flake. | L. 20 mm ; W. 18 mm ; T. 8 mm |
| 519 | 56 | Chert. Inner flake. | L. 20 mm ; W. 17 mm ; T. 11 mm |
| 520 | 98 | Chert. Probable fragment from a scalar core. Without cortex. | L. 52 mm ; W. 17 mm ; T. 7 mm |


| 525 | 98 | Chert. Inner flake. | L. 20 mm ; W.15mm; T. 11 mm |
| :---: | :---: | :---: | :---: |
| 537 | 98 | Grey flint. Retouched inner flake. Steep retouch around most of the edge of this squat flake. | $\begin{array}{r} \text { L. } 12 \mathrm{~mm} \text {; } \\ \text { W. } 20 \mathrm{~mm} \text {; } \\ \text { T. } 6 \mathrm{~mm} \\ \hline \end{array}$ |
| 559 | 41 | Chert. Inner chunk. | $\begin{array}{r} \mathrm{L} .51 \mathrm{~mm} ; \\ \mathrm{W} .26 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \\ \hline \end{array}$ |
| 925 | 203 | Chert. Inner flake, broken. | $\begin{array}{r} \mathrm{L} .42 \mathrm{~mm} \text {; } \\ \text { W. } 25 \mathrm{~mm} \text {; } \\ \text { T. } 6 \mathrm{~mm} \end{array}$ |
| 1032a | 217 | Pink quartzite. Primary flake. | $\begin{array}{r} \mathrm{L} .43 \mathrm{~mm} ; \\ \mathrm{W} .47 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \end{array}$ |
| 1032b | 217 | Pink quartzite. Primary flake. | $\begin{array}{r} \mathrm{L} .26 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \text { T. } 7 \mathrm{~mm} \\ \hline \end{array}$ |
| 1127a | 216 | Chert. Inner chunk. | $\begin{array}{r} \mathrm{L} .50 \mathrm{~mm} ; \\ \mathrm{W} .27 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \end{array}$ |
| 1127b | 216 | Chert. Inner flake. | L. 30 mm ; W. 5 mm ; T. 5 mm |
| 1132 | 88 | Chert. Blocky inner chunk most probably natural. | $\begin{array}{r} \mathrm{L} .44 \mathrm{~mm} ; \\ \mathrm{W} .26 \mathrm{~mm} ; \\ \mathrm{T} .17 \mathrm{~mm} \\ \hline \end{array}$ |
| 1138 | 88 | Chert, ?burnt. Inner flake, broken. | $\begin{array}{r} \mathrm{L} .27 \mathrm{~mm} ; \\ \text { W. } 20 \mathrm{~mm} ; \\ \text { T. } 9 \mathrm{~mm} \\ \hline \end{array}$ |
| 1182 | 217 | Chert. Inner, broken blade-like flake. | $\begin{array}{r} \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{W} .10 \mathrm{~mm} ; \\ \mathrm{T} .4 \mathrm{~mm} \\ \hline \end{array}$ |
| 1189 | 88 | Chert. Inner flake. | $\begin{array}{r} \mathrm{L} .18 \mathrm{~mm} ; \\ \mathrm{W} .30 \mathrm{~mm} ; \\ \mathrm{T} .10 \mathrm{~mm} \\ \hline \end{array}$ |
| 1197 | 219 | Chert. Inner flake. | $\begin{array}{r} \text { L. } 22 \mathrm{~mm} ; \\ \text { W. } 18 \mathrm{~mm} ; \\ \text { T. } 7 \mathrm{~mm} \end{array}$ |
| 1258 | 255 | Chert. Inner flake. | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .40 \mathrm{~mm} ; \\ \mathrm{T} .14 \mathrm{~mm} \\ \hline \end{array}$ |
| 1364 | 221 | Chert. Inner flake, burnt. | $\begin{array}{r} \mathrm{L} .35 \mathrm{~mm} ; \\ \mathrm{W} .21 \mathrm{~mm} ; \\ \mathrm{T} .7 \mathrm{~mm} \\ \hline \end{array}$ |


| 1373 | U.S. | Chert. Probably a natural chunk. ?burnt. | L. 27 mm ; <br> W.14mm; <br> T. 9 mm |
| :---: | :---: | :---: | :---: |
| 1536 | 107 | Chert. Retouched inner flake. Shallow edge retouch on distal end and right lateral. | $\begin{array}{r} \text { L. } 23 \mathrm{~mm} ; \\ \text { W. } 22 \mathrm{~mm} ; \\ \text { T. } 8 \mathrm{~mm} \end{array}$ |
| 1900 | 244 | Chert. Inner flake, broken. | $\begin{array}{r} \mathrm{L} .20 \mathrm{~mm} ; \\ \text { W. } 25 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \end{array}$ |
| 1923a | 257 | Chert. Inner flake. | $\begin{gathered} \mathrm{L} .35 \mathrm{~mm} ; \\ \mathrm{W} .30 \mathrm{~mm} ; \\ \text { T. } 14 \mathrm{~mm} \end{gathered}$ |
| 1923b | 257 | Chert. Inner flake. | $\begin{array}{r} \text { L. } 22 \mathrm{~mm} ; \\ \text { W. } 20 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \\ \hline \end{array}$ |
| 1923c | 257 | Chert. Inner flake. | $\begin{array}{r} \hline \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{W} .17 \mathrm{~mm} ; \\ \mathrm{T} .4 \mathrm{~mm} \\ \hline \end{array}$ |
| 1923d | 257 | Chert. Inner flake. | $\begin{array}{r} \hline \text { L. } 28 \mathrm{~mm} ; \\ \text { W. } 20 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm} \end{array}$ |
| 1923e | 257 | Chert. Inner flake. | L. 22 mm ; <br> W.9mm; T. 3 mm |
| 1923f | 257 | Chert. Inner flake. | $\begin{array}{r} \mathrm{L} .18 \mathrm{~mm} ; \\ \text { W. } 10 \mathrm{~mm} ; \\ \text { T. } 1 \mathrm{~mm} \end{array}$ |
| 1923g | 257 | Chert. Inner flake. | $\begin{array}{r} \mathrm{L} .15 \mathrm{~mm} \text {; } \\ \mathrm{W} .17 \mathrm{~mm} ; \\ \text { T. } 4 \mathrm{~mm} \end{array}$ |
| 1923h | 257 | Chert. Inner flake. | L. 14 mm ; W.16mm; T. 4 mm |
| 1923i | 257 | Chert. Inner flake. | L. 17 mm ; W.10mm; T. 3 mm |
| 1923j | 257 | Chert. Inner chunk. | $\begin{array}{r} \hline \text { L. } 23 \mathrm{~mm} \text {; } \\ \text { W. } 13 \mathrm{~mm} \text {; } \\ \text { T. } 7 \mathrm{~mm} \\ \hline \end{array}$ |
| 1923k | 257 | Chert. Inner chunk. | $\begin{array}{r} \mathrm{L} .15 \mathrm{~mm} ; \\ \text { W. } 10 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \\ \hline \end{array}$ |
| 19231 | 257 | Chert. Inner chunk. | $\begin{array}{r} \hline \text { L. } 12 \mathrm{~mm} ; \\ \text { W. } 12 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \end{array}$ |


| 1923m | 257 | Chert. Inner chunk. | $\begin{aligned} & \text { L. } 5 \mathrm{~mm} ; \\ & \text { W. } 5 \mathrm{~mm} ; \\ & \text { T. } 2 \mathrm{~mm} \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| 1937 | 244 | Chert. Not seen but identified as a blade. | L. 11 mm ; <br> W. 7 mm ; T. 2 mm |
| 1952 | 244 | Chert. Broken inner blade-like flake. | L. 20 mm ; <br> W. 17 mm ; <br> T. 5 mm |
| 1972 | 244 | Chert. Inner flake. | $\begin{gathered} \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{W} .26 \mathrm{~mm} ; \\ \mathrm{T} .7 \mathrm{~mm} \end{gathered}$ |
| 2100 | 267 | Chert. Inner flake. | $\begin{array}{r} \mathrm{L} .20 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \end{array}$ |
| 2105 | 247 | Chert. Inner flake. | L. 21 mm ; <br> W. 14 mm ; <br> T. 4 mm |
| 2153 | 270 | Chert. Inner flake. | $\begin{array}{r} \hline \text { L. } 23 \mathrm{~mm} ; \\ \text { W. } 25 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm} \end{array}$ |
| 2161 | ?253 | Chert. Inner flake, broken. | L. 44 mm ; <br> W. 42 mm ; <br> T. 5 mm |
| 2179 | 282 | Chert. Inner flake. | $\begin{array}{r} \mathrm{L} .20 \mathrm{~mm} ; \\ \mathrm{W} .18 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm} \\ \hline \end{array}$ |
| 2185 | 253 | Chert. Inner flake, broken. | L. 26 mm ; <br> W.36mm; <br> T. 7 mm |
| 2194 | 282 | Chert. Inner chunk. | L. 16 mm ; <br> W. 13 mm ; <br> T. 7 mm |
| 2201 | 253 | Chert. Fine double-edged scalar core. Without cortex. | L. 27 mm ; <br> W. 17 mm ; <br> T. 6 mm |
| 2204 | 253 | Chert. Amorphous core. Without cortex. | $\begin{array}{r} \mathrm{L} .17 \mathrm{~mm} \text {; } \\ \mathrm{W} .37 \mathrm{~mm} ; \\ \mathrm{T} .19 \mathrm{~mm} \end{array}$ |
| 2206 | 253 | Chert. Secondary flake. | L.36mm; <br> W. 31 mm ; <br> T. 15 mm |
| 2280 | 285 | Chert. Inner flake, broken. | L. 25 mm ; <br> W. 19 mm ; <br> T. 6 mm |


| 2291 | 267 | Chert. Inner flake. | L. 38 mm ; W.19mm; T. 9 mm |
| :---: | :---: | :---: | :---: |
| 2311 | 270 | Chert. Nice thumbnail scraper made on a stubby inner flake. | L. 17 mm ; W.18mm; T. 8 mm |
| 2334 | 257 | Chert. Inner flake. | L.36mm; W.31mm; T. 15 mm |
| 2339 | 270 | Chert. Inner chunk. | $\begin{array}{r} \mathrm{L} .40 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} \\ \text { T. } 18 \mathrm{~mm} \end{array}$ |
| 2356 | 238 | Chert. Single -platform core with flake removal. Without cortex. | $\begin{array}{r} \mathrm{L} .20 \mathrm{~mm} ; \\ \mathrm{W} .52 \mathrm{~mm} ; \\ \mathrm{T} .35 \mathrm{~mm} \\ \hline \end{array}$ |
| 2393 | 88 | Chert. Inner flake. | $\begin{array}{r} \text { L. } 33 \mathrm{~mm} ; \\ \text { W. } 20 \mathrm{~mm} \text {; } \\ \text { T. } 14 \mathrm{~mm} \\ \hline \end{array}$ |
| 2421 | 10 | Chert. Inner chunk. | $\begin{array}{r} \mathrm{L} .25 \mathrm{~mm} ; \\ \mathrm{W} .17 \mathrm{~mm} ; \\ \mathrm{T} .8 \mathrm{~mm} \end{array}$ |
| 2470 | S/H | Chert. Inner flake. | L. 37 mm ; W. 11 mm ; T. 10 mm |
| 2539 | 289 | Chert. Inner, blade-like flake. | $\begin{array}{r} \mathrm{L} .23 \mathrm{~mm} ; \\ \text { W. } 12 \mathrm{~mm} \text {; } \\ \text { T. } 5 \mathrm{~mm} \end{array}$ |
| 2549 | 239 | Chert. Inner flake, broken. | $\begin{array}{r} \mathrm{L} .20 \mathrm{~mm} \text {; } \\ \mathrm{W} .27 \mathrm{~mm} ; \\ \mathrm{T} .7 \mathrm{~mm} \\ \hline \end{array}$ |
| 2556 | 297 | Chert. Secondary chunk. | $\begin{array}{r} \mathrm{L} .18 \mathrm{~mm} ; \\ \mathrm{W} .10 \mathrm{~mm} ; \\ \mathrm{T} .8 \mathrm{~mm} \\ \hline \end{array}$ |
| 2646 | 297a | Chert. Multi-platform flake core. Without cortex. | $\begin{array}{r} \mathrm{L} .31 \mathrm{~mm} ; \\ \mathrm{W} .30 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \\ \hline \end{array}$ |
| 2657 | 297a | Chert. Inner flake, burnt, broken. | $\begin{array}{r} \mathrm{L} .21 \mathrm{~mm} ; \\ \mathrm{W} .24 \mathrm{~mm} ; \\ \mathrm{T} .7 \mathrm{~mm} \\ \hline \end{array}$ |
| 2686 | 902 | Chert. Irregular flaked chunk. Without cortex. | $\begin{array}{r} \mathrm{L} .25 \mathrm{~mm} ; \\ \text { W. } 20 \mathrm{~mm} \text {; } \\ \text { T. } 15 \mathrm{~mm} \\ \hline \end{array}$ |
| 2732 | 1018 | Chert. Inner chunk. | $\begin{array}{r} \mathrm{L} .41 \mathrm{~mm} ; \\ \mathrm{W} .27 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \end{array}$ |


| 2756 | 1209 | Chert. Inner flake. | L. 35 mm ; W. 35 mm ; T. 14 mm |
| :---: | :---: | :---: | :---: |
| 2780 | 1218 | Chert. Inner, thick, blade-like flake. Possible light, nibbling retouch down right lateral edge. | L.38mm; W. 25 mm ; T. 12 mm |
| 2783 | 1218 | Chert. Inner flake. | L. 19 mm ; W.14mm; T. 5 mm |
| 2817 | 1204 | Chert. Inner chunk, probably natural. | L. 60 mm ; W. 34 mm ; T. 18 mm |
| 2818 | 1204 | Chert. Inner flake. | L. 42 mm ; W. 43 mm ; T. 12 mm |
| 2835 | 1224 | Flint. Small chip, patinated. | L.10mm; W.14mm; T. 4 mm |
| 2839 | 1224 | Chert. Secondary flake. | L. 35 mm ; W. 21 mm ; T. 5 mm |
| 2855 | 976 | Pink quartzite. Platform core with cortex. Flakes removed from inner flat platform. | L. 30 mm ; W. 42 mm ; T. 39 mm |
| 2866 | 1226 | Chert. Inner flake. | L.32mm; W. 15 mm ; T. 4 mm |
| 2892 | 1219 | Chert. Inner flake, broken. | L. 18 mm ; <br> W. 15 mm ; <br> T. 3 mm |
| 2903 | 1219 | Chert. Inner flake. | L. 27 mm ; W. 24 mm ; T. 6 mm |
| 2928 | 1225 | Chert. Inner chunk. | L. 12 mm ; W. 7 mm ; T. 5 mm |
| 2968 | 1200 | Chert. Inner flake. | L. 16 mm ; W.9mm; T. 4 mm |
| 2286 | 286 | Chert. Five blocky chunks, two with cortex, most probably natural. | $\begin{array}{r} \mathrm{L} .63-17 \mathrm{~mm} ; \\ \text { W. } 55-15 \mathrm{~mm} ; \\ \text { T. } 27-5 \mathrm{~mm} \\ \hline \end{array}$ |
| 2332a | 244 | Chert. Inner chunk. | L. 35 mm ; <br> W. 22 mm ; <br> T. 9 mm |

$\left.\begin{array}{l|c|l|r}2332 \mathrm{~b} & 244 & \text { Chert. Inner chunk. } & \text { L. } 19 \mathrm{~mm} ; \\ & & & \text { W. } 6 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm}\end{array}\right]$ L. $44 \mathrm{~mm} ;$

## Appendix 1.16 Pumice Catalogue (A. Clarke and A. Newton)

Pumice lumps which exhibit worn faces and grooves or else just with grooves

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 237 | 21 | Worn faces make a cuboid shape. Possibly some very shallow grooving on the faces. | L. 23 mm ; <br> W. 21 mm ; <br> T. 20 mm |
| 530 | 98 | Nice piece. At least four U-shaped grooves worn at angles around the surface of the piece. Grooves $6 \mathrm{~mm}-8 \mathrm{~mm}$ wide. | L. 41 mm W. 33 mm T. 27 mm |
| 624 | 51 | One concave worn face across which there are two light narrow grooves. | L. 37 mm W. 21 mm T. 19 mm |
| 781 | 32 | A series of three U-shaped grooves, 6 mm wide, run around the piece. | L. 43 mm W. 36 mm T. 25 mm |
| 957 | 203 | One convex worn face with a U-shaped groove 7 mm wide running across it. One other shallower groove 11 mm wide, along one side. | $\begin{array}{r} \hline \text { L. } 42 \mathrm{~mm} ; \\ \mathrm{W} .32 \mathrm{~mm} ; \\ \text { T. } 19 \mathrm{~mm} \end{array}$ |
| 1009 | 85 | Slightly worn faces with a possible shallow worn U-shaped groove. | L. 30 mm W. 25 mm T. 20 mm |
| 1070 | 217 | Two possible grooves which are very shallow. | L. 28 mm W. 19 mm ; T.19mm |
| 1326 | 253 | Shallow U-shaped groove, 7 mm wide, running across a skewed worn face. | L.38mm W. 31 mm T. 18 mm |
| 1843 | 244 | Shallow U-shaped groove across one face. | L. 30 mm W. 25 mm ; T. 18 mm |
| 2149 | 244 | Sub-triangular piece with at least three short, U-shaped grooves running at angles across faces. | L. 55 mm W. 53 mm ; T. 28 mm |
| 2180 | 281 | Wide shallow U-shaped groove. | L. 25 mm W. 23 mm T. 15 mm |
| 2492 | 283 | One face has two wide, very shallow U-shaped grooves. | L. 43 mm W. 32 mm T. 22 mm |

Pumice lumps with one or more worn faces

| 198 | 42 | Some flat, worn faces. Sampled by A. Newton. | L. $40 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | ---: |
|  |  |  | W. $35 \mathrm{~mm} ;$ |
|  |  | $T .27 \mathrm{~mm}$ |  |


| 333 | $2 \backslash 6$ | One concave, worn face. Sampled by A. Newton. | $\begin{gathered} \mathrm{L} .54 \mathrm{~mm} ; \\ \mathrm{W} .40 \mathrm{~mm} ; \\ \mathrm{T} .38 \mathrm{~mm} \end{gathered}$ |
| :---: | :---: | :---: | :---: |
| 334 | $2 \backslash 6$ | Sampled by A Newton. | $\begin{array}{r} \hline \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .31 \mathrm{~mm} ; \\ \mathrm{T} .19 \mathrm{~mm} \\ \hline \end{array}$ |
| 335 | $2 \backslash 6$ | One convex, worn face. | $\begin{gathered} \mathrm{L} .37 \mathrm{~mm} ; \\ \text { W. } 30 \mathrm{~mm} ; \\ \text { T. } 20 \mathrm{~mm} \end{gathered}$ |
| 357 | 41 | One face worn flat. Opposite face worn to a concave crosssection. | $\begin{array}{r} \mathrm{L} .37 \mathrm{~mm} ; \\ \mathrm{W} .31 \mathrm{~mm} ; \\ \text { T. } 20 \mathrm{~mm} \end{array}$ |
| 360a | 5 | One concave face worn at the end. | $\begin{array}{r} \mathrm{L} .37 \mathrm{~mm} ; \\ \mathrm{W} .32 \mathrm{~mm} ; \\ \mathrm{T} .18 \mathrm{~mm} \end{array}$ |
| 360b | 5 | Opposite faces possibly worn. | $\begin{array}{r} \mathrm{L} .46 \mathrm{~mm} ; \\ \mathrm{W} .33 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \\ \hline \end{array}$ |
| 408 | 43 | One face worn to be skewed in profile. | $\begin{array}{r} \mathrm{L} .31 \mathrm{~mm} ; \\ \mathrm{W} .31 \mathrm{~mm} ; \\ \text { T. } 28 \mathrm{~mm} \end{array}$ |
| 440 | 41 | Large piece with one long flat face and perpendicular to this is a worn skewed face. | $\begin{array}{r} \mathrm{L} .70 \mathrm{~mm} ; \\ \mathrm{W} .33 \mathrm{~mm} ; \\ \text { T. } 27 \mathrm{~mm} \\ \hline \end{array}$ |
| 501 | 56 | Circular in plan. Both faces are worn flat, one at an angle. The sides are rubbed and faceted too. | $\begin{array}{r} \mathrm{L} .23 \mathrm{~mm} ; \\ \mathrm{W} .20 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \end{array}$ |
| 568 | 41 | Large fragment with remains of a worn skewed face. | $\begin{array}{r} \mathrm{L} .57 \mathrm{~mm} ; \\ \mathrm{W} .40 \mathrm{~mm} ; \\ \mathrm{T} .43 \mathrm{~mm} \\ \hline \end{array}$ |
| 578 | 95 | Four faces worn flat give a rectangular cross-section. | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .15 \mathrm{~mm} ; \\ \mathrm{T} .14 \mathrm{~mm} \\ \hline \end{array}$ |
| 658a | 66 | Rounded lump with one flat worn face. | $\begin{array}{r} \mathrm{L} .48 \mathrm{~mm} ; \\ \mathrm{W} .32 \mathrm{~mm} ; \\ \mathrm{T} .25 \mathrm{~mm} \\ \hline \end{array}$ |
| 704 | 208 | Generally smoothed faces, two of which are concave. | $\begin{array}{r} \mathrm{L} .41 \mathrm{~mm} ; \\ \mathrm{W} .35 \mathrm{~mm} ; \\ \mathrm{T} .25 \mathrm{~mm} \\ \hline \end{array}$ |
| 709 | 208 | Two flat worn faces. | $\begin{array}{r} \mathrm{L} .25 \mathrm{~mm} ; \\ \mathrm{W} .18 \mathrm{~mm} ; \\ \mathrm{T} .14 \mathrm{~mm} \end{array}$ |
| 718 | 51 | Possibly one worn skewed face. | $\begin{array}{r} \mathrm{L} .45 \mathrm{~mm} ; \\ \mathrm{W} .30 \mathrm{~mm} ; \\ \text { T. } 22 \mathrm{~mm} \end{array}$ |


| 722 | 56 | Rounded lump with one long edge worn to a slightly concave face. | L.68mm; W. 45 mm ; T. 38 mm |
| :---: | :---: | :---: | :---: |
| 727 | 202 | Large fragment with remains of a worn skewed face. | $\begin{array}{r} \text { L. } 46 \mathrm{~mm} ; \\ \text { W. } 42 \mathrm{~mm} \text {; } \\ \text { T. } 30 \mathrm{~mm} \\ \hline \end{array}$ |
| 765 | 10 | Three of the worn faces are skewed and form ridges between the worked areas. | $\begin{array}{r} \mathrm{L} .41 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \text { T. } 27 \mathrm{~mm} \\ \hline \end{array}$ |
| 879 | 203 | Both faces worn slightly skewed. | $\begin{array}{r} \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .24 \mathrm{~mm} ; \\ \mathrm{T} .13 \mathrm{~mm} \\ \hline \end{array}$ |
| 883 | 203 | One smoothed flattish face with a bevel formed along one edge. | $\begin{array}{r} \mathrm{L} .37 \mathrm{~mm} ; \\ \mathrm{W} .27 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \\ \hline \end{array}$ |
| 891 | 208 | One flat worn face. | $\begin{array}{r} \text { L. } 30 \mathrm{~mm} ; \\ \text { W. } 20 \mathrm{~mm} ; \\ \text { T. } 12 \mathrm{~mm} \\ \hline \end{array}$ |
| 894 | 203 | Opposite faces worn flat. | $\begin{array}{r} \mathrm{L} .40 \mathrm{~mm} ; \\ \mathrm{W} .20 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \\ \hline \end{array}$ |
| 903 | 203 | One deeply worn concave face. | $\begin{array}{r} \mathrm{L} .58 \mathrm{~mm} ; \\ \mathrm{W} .35 \mathrm{~mm} ; \\ \text { T. } 25 \mathrm{~mm} \end{array}$ |
| 914 | 208 | Two worn contiguous faces. Convex and concave. | $\begin{array}{r} \mathrm{L} .37 \mathrm{~mm} ; \\ \text { W. } 37 \mathrm{~mm} \text {; } \\ \text { T. } 23 \mathrm{~mm} \end{array}$ |
| 917 | 203 | Two worn concave faces form an angle to each other. | $\begin{array}{r} \text { L. } 33 \mathrm{~mm} ; \\ \text { W. } 30 \mathrm{~mm} \text {; } \\ \text { T. } 23 \mathrm{~mm} \\ \hline \end{array}$ |
| 930 | 203 | One worn concave face. | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \text { T. } 18 \mathrm{~mm} \end{array}$ |
| 933 | 82 | Fragment. Opposite faces are heavily worn, one face flat and other concave. | $\begin{array}{r} \mathrm{L} .40 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \text { T. } 16 \mathrm{~mm} \end{array}$ |
| 934 | 77 | One flattish face and three concavely worn faces. | $\begin{array}{r} \text { L. } 52 \mathrm{~mm} \text {; } \\ \text { W. } 35 \mathrm{~mm} \text {; } \\ \text { T. } 25 \mathrm{~mm} \\ \hline \end{array}$ |
| 953 | 82 | Irregular piece with two worn faces down long sides. | $\begin{array}{r} \mathrm{L} .60 \mathrm{~mm} ; \\ \mathrm{W} .55 \mathrm{~mm} ; \\ \mathrm{T} .30 \mathrm{~mm} \end{array}$ |
| 955 | 203 | Large piece. Opposite faces are worn very slightly convex in section. | $\begin{array}{r} \mathrm{L} .68 \mathrm{~mm} ; \\ \mathrm{W} .48 \mathrm{~mm} \\ \text { T. } 32 \mathrm{~mm} \\ \hline \end{array}$ |


| 956 | 82 | One slightly concave face on rounded lump. | L. 34 mm ; W. 25 mm ; T. 18 mm |
| :---: | :---: | :---: | :---: |
| 986 | 82 | Rounded lump with one flat worn face. | $\begin{array}{r} \text { L. } 30 \mathrm{~mm} ; \\ \text { W. } 24 \mathrm{~mm} ; \\ \text { T. } 20 \mathrm{~mm} \\ \hline \end{array}$ |
| 987 | 82 | One face appears to have been worn to an irregular concave section. | $\begin{array}{r} \mathrm{L} .45 \mathrm{~mm} ; \\ \mathrm{W} .34 \mathrm{~mm} ; \\ \text { T. } 26 \mathrm{~mm} \end{array}$ |
| 1018 | 82 | One possible smoothed face. | $\begin{array}{r} \mathrm{L} .27 \mathrm{~mm} ; \\ \mathrm{W} .17 \mathrm{~mm} ; \\ \text { T. } 12 \mathrm{~mm} \\ \hline \end{array}$ |
| 1036 | 217 | Heavily worn piece. Two concave faces and one convex face give this piece an unusual shape. | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .27 \mathrm{~mm} ; \\ \text { T. } 21 \mathrm{~mm} \end{array}$ |
| 1055 | 217 | Flat, sub-triangular in shape with large vesicles. At least one side has been worn flat. | $\begin{array}{r} \mathrm{L} .78 \mathrm{~mm} ; \\ \mathrm{W} .67 \mathrm{~mm} ; \\ \text { T. } 30 \mathrm{~mm} \\ \hline \end{array}$ |
| 1064 | 217 | One flat, worn face. | L. 22 mm ; W. 21 mm ; <br> T. 14 mm |
| 1074 | 216 | One worn side forms a slight point. | L. 25 mm ; W. 21 mm ; T. 15 mm |
| 1080 | 217 | Nice concave face, almost dished. | $\begin{array}{r} \mathrm{L} .37 \mathrm{~mm} ; \\ \mathrm{W} .33 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \end{array}$ |
| 1174 | 219 | One worn concave face. | $\begin{array}{r} \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{W} .22 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \\ \hline \end{array}$ |
| 1218 | 255 | One irregularly-smoothed face. | $\begin{array}{r} \text { L. } 37 \mathrm{~mm} ; \\ \text { W. } 26 \mathrm{~mm} ; \\ \text { T. } 15 \mathrm{~mm} \\ \hline \end{array}$ |
| 1222 | 253 | One concave almost dished face. | $\begin{array}{r} \text { L. } 34 \mathrm{~mm} \text {; } \\ \text { W. } 26 \mathrm{~mm} \text {; } \\ \text { T. } 20 \mathrm{~mm} \end{array}$ |
| 1225 | 219 | Rounded lump with one slightly concave face. | $\begin{array}{r} \mathrm{L} .21 \mathrm{~mm} ; \\ \mathrm{W} .21 \mathrm{~mm} ; \\ \mathrm{T} .21 \mathrm{~mm} \end{array}$ |
| 1236 | 255 | One worn concave face. | $\begin{array}{r} \mathrm{L} .48 \mathrm{~mm} ; \\ \mathrm{W} .35 \mathrm{~mm} ; \\ \mathrm{T} .25 \mathrm{~mm} \\ \hline \end{array}$ |
| 1248 | 255 | Two flat faces worn at angles to form a wedge-shaped piece. | $\begin{array}{r} \mathrm{L} .40 \mathrm{~mm} ; \\ \mathrm{W} .27 \mathrm{~mm} ; \\ \text { T. } 25 \mathrm{~mm} \\ \hline \end{array}$ |


| 1276 | 255 | Two contiguous worn faces form a wedge shape. | $\begin{array}{r} \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .21 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 1281 | 253 | Opposite faces worn flat. | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \text { T. } 13 \mathrm{~mm} \\ \hline \end{array}$ |
| 1283 | 220 | One skewed worn face. | $\begin{array}{r} \mathrm{L} .35 \mathrm{~mm} ; \\ \mathrm{W} .24 \mathrm{~mm} ; \\ \mathrm{T} .18 \mathrm{~mm} \\ \hline \end{array}$ |
| 1288 | 220 | Some irregularly-worn faces. | $\begin{array}{r} \mathrm{L} .52 \mathrm{~mm} ; \\ \mathrm{W} .44 \mathrm{~mm} ; \\ \text { T. } 39 \mathrm{~mm} \end{array}$ |
| 1321 | 220 | One worn concave face. | $\begin{gathered} \mathrm{L} .35 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \text { T. } 15 \mathrm{~mm} \end{gathered}$ |
| 1339 | 255 | Possibly one worn skewed face. | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .22 \mathrm{~mm} \text {; } \\ \text { T. } 20 \mathrm{~mm} \\ \hline \end{array}$ |
| 1414 | 202 | Rounded lump with one worn skewed face. | $\begin{array}{r} \mathrm{L} .35 \mathrm{~mm} ; \\ \mathrm{W} .26 \mathrm{~mm} ; \\ \mathrm{T} .19 \mathrm{~mm} \\ \hline \end{array}$ |
| 1464 | 230 | One face worn flat. | $\begin{array}{r} \mathrm{L} .47 \mathrm{~mm} ; \\ \mathrm{W} .24 \mathrm{~mm} ; \\ \mathrm{T} .21 \mathrm{~mm} \\ \hline \end{array}$ |
| 1492 | 239 | One worn concave face. | $\begin{array}{r} \mathrm{L} .34 \mathrm{~mm} ; \\ \text { W. } 24 \mathrm{~mm} ; \\ \text { T. } 20 \mathrm{~mm} \end{array}$ |
| 1499 | 239 | At least one worn, concave face. | L. 21 mm ; W.18mm; T. 11 mm |
| 1512 | 101 | Fragment. One face slightly worn. | $\begin{array}{r} \mathrm{L} .23 \mathrm{~mm} ; \\ \mathrm{W} .14 \mathrm{~mm} ; \\ \mathrm{T} .11 \mathrm{~mm} \\ \hline \end{array}$ |
| 1604 | 239 | Sub-triangular in shape. At least two worn faces. | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \text { T. } 19 \mathrm{~mm} \\ \hline \end{array}$ |
| 1637 | 219 | One small flat worn face. | $\begin{array}{r} \mathrm{L} .19 \mathrm{~mm} ; \\ \mathrm{W} .17 \mathrm{~mm} ; \\ \mathrm{T} .17 \mathrm{~mm} \end{array}$ |
| 1714 | 239 | One flat, worn face. | $\begin{array}{r} \mathrm{L} .29 \mathrm{~mm} ; \\ \mathrm{W} .23 \mathrm{~mm} ; \\ \text { T. } 19 \mathrm{~mm} \\ \hline \end{array}$ |
| 1770 | 244 | One concave worn face. | $\begin{array}{r} \mathrm{L} .46 \mathrm{~mm} ; \\ \mathrm{W} .34 \mathrm{~mm} ; \\ \mathrm{T} .14 \mathrm{~mm} \end{array}$ |


| 1789 | 244 | Irregular piece with at least three worn skewed faces. Two contiguous faces make a wedge shape. | $\begin{array}{r} \mathrm{L} .65 \mathrm{~mm} ; \\ \mathrm{W} .50 \mathrm{~mm} ; \\ \text { T. } 40 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 1809 | 244 | One very flat, worn face. | $\begin{array}{r} \hline \mathrm{L} .20 \mathrm{~mm} ; \\ \mathrm{W} .22 \mathrm{~mm} ; \\ \text { T. } 22 \mathrm{~mm} \\ \hline \end{array}$ |
| 1815 | 244 | One worn concave face. | $\begin{array}{r} \hline \text { L. } 22 \mathrm{~mm} ; \\ \mathrm{W} .22 \mathrm{~mm} ; \\ \text { T. } 16 \mathrm{~mm} \end{array}$ |
| 1845 | 244 | One very flat, worn face. | $\begin{array}{r} \mathrm{L} .35 \mathrm{~mm} ; \\ \mathrm{W} .42 \mathrm{~mm} ; \\ \text { T. } 33 \mathrm{~mm} \end{array}$ |
| 1856 | 244 | Slightly worn faces give a cuboid shape. | $\begin{array}{r} \mathrm{L} .27 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} \\ \mathrm{~T} .17 \mathrm{~mm} \\ \hline \end{array}$ |
| 1884 | 244 | One slightly skewed worn face. | L. 43 mm ; W. 34 mm ; T. 22 mm |
| 1958 | 244 | One nice flat worn face. | L. 35 mm ; W. 31 mm ; T. 16 mm |
| 1995 | 244 | One irregular worn face. | L. 46 mm ; W. 28 mm ; T. 10 mm |
| 2098 | S/H | One large flat face and two smaller flat faces at angles to it. | $\begin{array}{r} \mathrm{L} .65 \mathrm{~mm} ; \\ \mathrm{W} .38 \mathrm{~mm} ; \\ \mathrm{T} .28 \mathrm{~mm} \end{array}$ |
| 2164 | 281 | One slightly irregular worn face | $\begin{array}{r} \mathrm{L} .43 \mathrm{~mm} ; \\ \mathrm{W} .34 \mathrm{~mm} ; \\ \text { T. } 22 \mathrm{~mm} \\ \hline \end{array}$ |
| 2183 | 269 | One worn slightly uneven face. Possible tracking from slight grooves? | L. 40 mm ; W. 30 mm ; T. 23 mm |
| 2184 | 253 | Two contiguous flat faces form a right-angled edge. One slightly worn concave face. | $\begin{array}{r} \mathrm{L} .25 \mathrm{~mm} ; \\ \mathrm{W} .23 \mathrm{~mm} ; \\ \text { T. } 20 \mathrm{~mm} \\ \hline \end{array}$ |
| 2192 | 269 | One convex worn face. | $\begin{array}{r} \text { L. } 50 \mathrm{~mm} ; \\ \mathrm{W} .26 \mathrm{~mm} ; \\ \text { T. } 23 \mathrm{~mm} \\ \hline \end{array}$ |
| 2208 | 285 | One flat worn face. | $\begin{array}{r} \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .24 \mathrm{~mm} ; \\ \mathrm{T} .16 \mathrm{~mm} \end{array}$ |
| 2303 | 217 | One worn convex face. | L. 18 mm ; W. 16 mm ; T. 12 mm |


| 2319 | 267 | Triangular in shape with at least two worn faces. | $\begin{array}{r} \mathrm{L} .27 \mathrm{~mm} ; \\ \mathrm{W} .23 \mathrm{~mm} ; \\ \mathrm{T} .16 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 2372 | 255 | One worn slightly concave face. | $\begin{array}{r} \text { L. } 30 \mathrm{~mm} ; \\ \text { W. } 28 \mathrm{~mm} ; \\ \text { T. } 14 \mathrm{~mm} \end{array}$ |
| 2385 | 253 | Large vesicles. Probably one worn flat face. | $\begin{array}{r} \mathrm{L} .55 \mathrm{~mm} ; \\ \mathrm{W} .41 \mathrm{~mm} ; \\ \text { T. } 23 \mathrm{~mm} \\ \hline \end{array}$ |
| 2453 | 279 | One face worn slightly skewed and another worn flat. These two face meet to form a wedge shape. | $\begin{array}{r} \mathrm{L} .48 \mathrm{~mm} ; \\ \mathrm{W} .35 \mathrm{~mm} ; \\ \text { T. } 26 \mathrm{~mm} \\ \hline \end{array}$ |
| 2481 | 279a | Faces generally very worn. One concave face. | $\begin{array}{r} \mathrm{L} .36 \mathrm{~mm} ; \\ \mathrm{W} .31 \mathrm{~mm} ; \\ \mathrm{T} .23 \mathrm{~mm} \\ \hline \end{array}$ |
| 2519 | 71 | One concave, almost dished face. | $\begin{array}{r} \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .33 \mathrm{~mm} ; \\ \text { T. } 16 \mathrm{~mm} \end{array}$ |
| 2550 | 291 | One small flat worn face. | $\begin{array}{r} \mathrm{L} .46 \mathrm{~mm} ; \\ \mathrm{W} .38 \mathrm{~mm} ; \\ \text { T. } 32 \mathrm{~mm} \end{array}$ |
| 2562b | 297 | Faces worn to an angle. | $\begin{gathered} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .20 \mathrm{~mm} ; \\ \text { T. } 17 \mathrm{~mm} \end{gathered}$ |
| 2585 | 85 | Rounded lump with possible smoothed surface. | $\begin{array}{r} \text { L. } 41 \mathrm{~mm} \text {; } \\ \text { W. } 32 \mathrm{~mm} \text {; } \\ \text { T. } 23 \mathrm{~mm} \end{array}$ |
| 2638 | 289 | One worn convex face. | $\begin{gathered} \mathrm{L} .37 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \mathrm{T} .17 \mathrm{~mm} \end{gathered}$ |
| 2733 | 938 | One irregularly-smoothed face. | $\begin{array}{r} \mathrm{L} .36 \mathrm{~mm} ; \\ \mathrm{W} .27 \mathrm{~mm} ; \\ \mathrm{T} .25 \mathrm{~mm} \\ \hline \end{array}$ |
| 2792 | 956 | Flat and circular in plan. The lower face has been worn to a concave section. | $\begin{array}{r} \mathrm{L} .45 \mathrm{~mm} ; \\ \mathrm{W} .38 \mathrm{~mm} ; \\ \mathrm{T} .17 \mathrm{~mm} \\ \hline \end{array}$ |
| 2890 | 1220 | One face worn flat, another face worn slightly skewed. | $\begin{array}{r} \mathrm{L} .27 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \text { T. } 19 \mathrm{~mm} \\ \hline \end{array}$ |
| 2938 | 1226 | One face worn flat, another face perpendicular to the first is also flat and an angular edge is formed. | $\begin{array}{r} \hline \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .26 \mathrm{~mm} ; \\ \mathrm{T} .21 \mathrm{~mm} \\ \hline \end{array}$ |
| 3046 | 984 | One long face worn flat. | $\begin{gathered} \mathrm{L} .52 \mathrm{~mm} ; \\ \mathrm{W} .22 \mathrm{~mm} ; \\ \mathrm{T} .18 \mathrm{~mm} \end{gathered}$ |


| 3057 a | 267 | Worn all over. Two contiguous faces form a wedge-shape. | L. $40 \mathrm{~mm} ;$ |
| :--- | :---: | :--- | ---: |
|  |  |  | W.18mm; |
|  |  | T.15mm |  |
| 3057 b | 267 | One slightly convex face. | L. $40 \mathrm{~mm} ;$ |
|  |  |  | W.36m; |
|  |  |  | T.25mm |
| 4008 | 403 | Sub-triangular shape with at least two worn faces. | W. $40 \mathrm{~mm} ;$ |
|  |  |  | $T .35 \mathrm{~mm} ;$ |
|  |  |  | T.30mm |

Rounded lumps which do not appear worn

| 675 | 70 |  | L. 44 mm ; W. 37 mm ; T. 18 mm |
| :---: | :---: | :---: | :---: |
| 733 | 202 |  | $\begin{array}{r} \text { L. } 35 \mathrm{~mm} ; \\ \text { W. } 35 \mathrm{~mm} ; \\ \text { T. } 12 \mathrm{~mm} \end{array}$ |
| 847 | 208 |  | $\begin{array}{r} \hline \mathrm{L} .40 \mathrm{~mm} ; \\ \mathrm{W} .31 \mathrm{~mm} ; \\ \mathrm{T} .22 \mathrm{~mm} \\ \hline \end{array}$ |
| 954 | 210 |  | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .24 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \\ \hline \end{array}$ |
| 981 | 82 |  | $\begin{array}{r} \hline \mathrm{L} .41 \mathrm{~mm} ; \\ \mathrm{W} .36 \mathrm{~mm} ; \\ \mathrm{T} .21 \mathrm{~mm} \\ \hline \end{array}$ |
| 982 | 82 |  | $\begin{array}{r} \mathrm{L} .35 \mathrm{~mm} ; \\ \text { W. } 34 \mathrm{~mm} \text {; } \\ \text { T. } 25 \mathrm{~mm} \end{array}$ |
| 985 | 43 | ?Possible worn faces | L. 28 mm ; W.19mm; T. 16 mm |
| 996 | 82 |  | $\begin{array}{r} \hline \mathrm{L} .19 \mathrm{~mm} ; \\ \mathrm{W} .15 \mathrm{~mm} ; \\ \mathrm{T} .14 \mathrm{~mm} \\ \hline \end{array}$ |
| 1012 | 41 |  | $\begin{array}{r} \hline \mathrm{L} .48 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \mathrm{T} .18 \mathrm{~mm} \end{array}$ |
| 1066 | 82 |  | $\begin{array}{r} \mathrm{L} .51 \mathrm{~mm} ; \\ \mathrm{W} .38 \mathrm{~mm} \\ \text { T. } 25 \mathrm{~mm} \end{array}$ |
| 1118 | 216 | ?Possible worn faces | L. 35 mm ; W. 24 mm ; T. 13 mm |


| 1194 | 219 |  | $\begin{array}{r} \text { L. } 25 \mathrm{~mm} ; \\ \mathrm{W} .22 \mathrm{~mm} ; \\ \text { T. } 15 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 1232 | 255 |  | L. 24 mm ; W. 22 mm ; T. 11 mm |
| 1245 | 253 | ?Possible worn faces | L. 47 mm ; W.34mm; T. 25 mm |
| 1263 | 255 | ?Possible worn faces | $\mathrm{L} .27 \mathrm{~mm} ;$ $\mathrm{W} .27 \mathrm{~mm} ;$ T .13 mm |
| 1264 | 255 | ?Possible worn faces | $\begin{array}{r} \mathrm{L} .25 \mathrm{~mm} \text {; } \\ \mathrm{W} .20 \mathrm{~mm} ; \\ \mathrm{T} .17 \mathrm{~mm} \end{array}$ |
| 1284 | 255 |  | $\begin{array}{r} \hline \mathrm{L} .18 \mathrm{~mm} ; \\ \mathrm{W} .16 \mathrm{~mm} ; \\ \mathrm{T} .12 \mathrm{~mm} \\ \hline \end{array}$ |
| 1289 | 220 | ?Possible worn faces | $\begin{aligned} & \text { L. } 37 \mathrm{~mm} \text {; } \\ & \text { W. } 30 \mathrm{~mm} \text {; } \\ & \text { T. } 25 \mathrm{~mm} \end{aligned}$ |
| 1303 | 220 |  | L. $31 \mathrm{~mm} ;$ $\mathrm{W} .22 \mathrm{~mm} ;$ T .18 mm |
| 1319 | 253 |  | $\begin{array}{r} \mathrm{L} .33 \mathrm{~mm} ; \\ \mathrm{W} .27 \mathrm{~mm} ; \\ \text { T. } 22 \mathrm{~mm} \end{array}$ |
| 1623 | 241 |  | L. $19 \mathrm{~mm} ;$ W. $18 \mathrm{~mm} ;$ T. 11 mm |
| 1803 | 244 | ?Possible worn faces | L. 23 mm ; <br> W. 18 mm ; <br> T. 14 mm |
| 1841 | 244 | ?Possible worn faces | L. 27 mm ; W.18mm; T. 13 mm |
| 1878 | 244 | Very smooth finish | $\begin{array}{r} \text { L. } 23 \mathrm{~mm} ; \\ \text { W. } 22 \mathrm{~mm} ; \\ \text { T. } 20 \mathrm{~mm} \\ \hline \end{array}$ |
| 1959 | 244 |  | $\begin{array}{r} \hline \text { L. } 37 \mathrm{~mm} ; \\ \text { W. } 28 \mathrm{~mm} ; \\ \text { T. } 22 \mathrm{~mm} \\ \hline \end{array}$ |
| 2114 | 87 |  | $\begin{array}{r} \hline \text { L. } 32 \mathrm{~mm} ; \\ \mathrm{W} .25 \mathrm{~mm} ; \\ \text { T. } 25 \mathrm{~mm} \\ \hline \end{array}$ |


| 2126 | 267 |  | L.46mm; <br> W. 31 mm ; <br> T. 30 mm |
| :---: | :---: | :---: | :---: |
| 2225 | 267 | ?Possible worn faces | L. 48 mm ; W. 42 mm ; T. 25 mm |
| 2230 | 267 |  | L. 27 mm ; W. 14 mm ; T. 11 mm |
| 2235 | 283 |  | L. 34 mm <br> W. 22 mm ; <br> T. 17 mm |
| 2259 | 267 |  | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .24 \mathrm{~mm} ; \\ \mathrm{T} .13 \mathrm{~mm} \end{array}$ |
| 2373 | 255 |  | $\begin{array}{r} \mathrm{L} .23 \mathrm{~mm} ; \\ \mathrm{W} .20 \mathrm{~mm} ; \\ \mathrm{T} .13 \mathrm{~mm} \\ \hline \end{array}$ |
| 2380 | 253 |  | L. 24 mm ; <br> W.15mm; <br> T. 12 mm |
| 2476 | 283 | ?Possible worn faces | $\begin{array}{r} \hline \mathrm{L} .38 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \mathrm{T} .21 \mathrm{~mm} \\ \hline \end{array}$ |
| 2592 | 290 |  | $\begin{array}{r} \text { L. } 37 \mathrm{~mm} ; \\ \text { W. } 28 \mathrm{~mm} ; \\ \text { T. } 20 \mathrm{~mm} \end{array}$ |
| 2668 | 253 |  | $\begin{array}{r} \text { L. } 33 \mathrm{~mm} ; \\ \text { W. } 33 \mathrm{~mm} ; \\ \text { T. } 19 \mathrm{~mm} \end{array}$ |
| 2893 | 1226 |  | $\begin{array}{r} \mathrm{L} .42 \mathrm{~mm} ; \\ \mathrm{W} .28 \mathrm{~mm} ; \\ \mathrm{T} .18 \mathrm{~mm} \\ \hline \end{array}$ |
| 2900 | 1219 |  | L. 23 mm ; W. 17 mm ; T. 11 mm |
| 2562a | 297 |  | L. 17 mm ; W.16mm; T. 14 mm |
| 658b | 66 |  | $\begin{array}{r} \hline \text { L. } 28 \mathrm{~mm} ; \\ \text { W. } 22 \mathrm{~mm} ; \\ \text { T. } 17 \mathrm{~mm} \\ \hline \end{array}$ |

Angular lumps of pumice which appear to be unworked

| 1567 | 41 | Fragment | L. 32 mm ; W. 20 mm ; T. 17 mm |
| :---: | :---: | :---: | :---: |
| 839 | 70 |  | L. 34 mm ; W. 28 mm ; T. 18 mm |
| 936 | 82 |  | $\begin{array}{r} \hline \mathrm{L} .40 \mathrm{~mm} ; \\ \mathrm{W} .26 \mathrm{~mm} ; \\ \mathrm{T} .23 \mathrm{~mm} \\ \hline \end{array}$ |
| 998 | 43 |  | L. 20 mm ; W. 15 mm ; T. 10 mm |
| 1122 | 217 | Fragment. Large vesicles. | L. 32 mm ; W. 22 mm ; T. 15 mm |
| 1175 | 219 | Tiny fragment with large vesicles. | L. 13 mm ; W.9mm; T. 7 mm |
| 1198 | 219 | Fragment. | L. 49 mm ; W. 39 mm ; T. 19 mm |
| 1210 | 219 |  | L. 26 mm ; W. 19 mm ; T. 16 mm |
| 1212 | 255 | Fragment. | L. 21 mm ; W. 15 mm ; T. 13 mm |
| 1250 | 255 |  | L. 63 mm ; W. 52 mm ; T. 38 mm |
| 1252 | 253 |  | $\begin{array}{r} \hline \text { L. } 36 \mathrm{~mm} ; \\ \mathrm{W} .30 \mathrm{~mm} ; \\ \mathrm{T} .23 \mathrm{~mm} \\ \hline \end{array}$ |
| 1269 | 253 |  | $\begin{array}{r} \hline \mathrm{L} .60 \mathrm{~mm} ; \\ \mathrm{W} .44 \mathrm{~mm} ; \\ \mathrm{T} .27 \mathrm{~mm} \\ \hline \end{array}$ |
| 1278 | 221 |  | L. 40 mm ; W. 36 mm ; T. 25 mm |
| 1329 | 253 | Fragment. | L. 20 mm ; W. 13 mm ; T. 12 mm |
| 1548 | 107 | Large vesicles. | $\begin{array}{r} \hline \mathrm{L} .34 \mathrm{~mm} ; \\ \mathrm{W} .30 \mathrm{~mm} ; \\ \mathrm{T} .27 \mathrm{~mm} \\ \hline \end{array}$ |


| 1690 | 95 | Fragment. | L. 15 mm ; W.12mm; T. 5 mm |
| :---: | :---: | :---: | :---: |
| 1697 | 95 |  | L. 25 mm ; W. 13 mm ; T. 8 mm |
| 1715 | 208 |  | L. 18 mm ; W.13mm; T. 12 mm |
| 1718 | 239 |  | L. 43 mm ; W. 23 mm ; T. 18 mm |
| 1719 | 239 | Large vesicles. | L. 32 mm ; W. 27 mm ; T. 22 mm |
| 1793 | 244 | Fragment. | L. 17 mm ; W.9mm; T. 9 mm |
| 1932 | 244 | Fragment. Large vesicles. | L.32mm; <br> W. 26 mm ; <br> T. 25 mm |
| 1956 | 244 |  | L. 33 mm ; W. 21 mm ; T. 14 mm |
| 2042 | 76 |  | $\begin{array}{r} \text { L. } 35 \mathrm{~mm} ; \\ \text { W. } 29 \mathrm{~mm} ; \\ \text { T. } 29 \mathrm{~mm} \end{array}$ |
| 2104 | 247 |  | L. 27 mm ; W. 21 mm ; T. 20 mm |
| 2258 | 283 |  | L. 22 mm ; <br> W. 22 mm ; <br> T.18mm |
| 2560 | 296 |  | L. 40 mm ; W. 28 mm ; T. 23 mm |
| 2723 | 938 |  | L. 44 mm ; W. 34 mm ; T. 26 mm |
| 2749 | 948 |  | L. 44 mm ; W. 29 mm ; T. 23 mm |
| 2790 | 956 |  | L. 27 mm ; <br> W. 22 mm ; <br> T.19mm |


| 2553 | 297 | Fragment | L. $30.5 \mathrm{~mm} ;$ |
| :--- | :---: | :--- | ---: |
|  |  |  | W. $24 \mathrm{~mm} ;$ |
| 2970 | 1226 | Large vesicles. | T.20.5mm |
|  |  |  | L. $19 \mathrm{~mm} ;$ |
|  |  |  | W. $15 \mathrm{~mm} ;$ |
| 3059 | 253 |  | T.11mm |
|  |  |  | W.28mm; |
|  |  |  | W. $22 \mathrm{~mm} ;$ |
|  |  |  |  |

$\qquad$

## Appendix 1.17 Stone Axe Catalogue (G. Cooney)

## Introduction to the catalogue

The drawn face is referred to as face 1 , the obverse as face 2 . The cutting edge is called the edge and the part of each face above the edge is referred to as the blade. The opposite end is the butt. The lateral junctions between the two faces are called the sides and the side view is referred to as the profile. The Irish Stone Axe Project number is also appended to the description where relevant. For more on the Irish Stone Axe Project see Cooney and Mandal 1998.

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 1327 | 253 | Shale axe, ground and partially polished. Right side irregular pointed, almost straight. Numerous flakes removed, upper portion extensively flaked to produce distinct indentation or notch, for hafting. Left side straight, slightly convex, naturally flat (joint surface). Junctions with blade. Left side of edge badly chipped, right side sharper. Edge asymmetrical, straight in section. Faces are bedding planes, some grinding on lower areas. Face 1 rougher (for hafting?). Butt naturally flat, slightly oblique, has been ground flat. Profile is asymmetrical; thin, cross-section is narrow oval (one flat side). Irish Stone Axe Project: 20040. | L. 112 mm ; <br> W.63mm; <br> T. 20 mm ; <br> Wt. 264 g |
| 2322 | 2 | Shale axe/adze, partially ground. Left side straightish, naturally flattened. Right side concave, naturally flat. Junctions with blade. Edge blunt, may be reground, face 2. Faces, unworked bedding planes apart from slight grinding face 1 . Grinding on face 1 blade is very coarse/heavy. Butt more oblique in plan than rounded. This is a cobble worked at the blade end. Profile is asymmetrical; thin, cross-section is sub-rectangular. Irish Stone Axe Project: 20041. | L. 120 mm ; W. 53 mm ; T.18mm; Wt. 147 g |
| 2167 | 269 | Possible fragment of shale axehead, either of butt or junction of side and badly damaged edge. However, could be a fragment of a number of artefact types. Roughly triangular in shape, more consistent with being fragment of side of axe and edge. If so both faces ground, side round, edge very heavily chipped and damaged. | L.36mm; W. 27 mm ; T. 11 mm |


| 1065 | 217 | Modified cobble, probably of sandstone rather than quartzite. <br> Sides irregular, expand from the 'butt', naturally flattened. Right <br> side concave, naturally flat. Junctions with 'blade' or broad end. <br> This end is flat in face view and bevelled in section, with a <br> broader area adjoining face 1 and a narrower 'blade' area <br> adjoining face 2. This is a result of working from both faces, <br> giving a markedly asymmetrical 'blade' profile that exhibits <br> junctions with both faces. Broader blade area has distinct pattern <br> of wear striae running perpendicular to the bevel. Faces flat, <br> naturally smoothed. Face 2 appears to have substance adhering in <br> patches to the surface. Butt end rounded in shape. This is a cobble <br> worked at the broad end. Profile is symmetrical; medium, cross- <br> section is sub-rectangular. Form of the object is inconsistent with <br> it being used as an axe or in a related way. Perhaps a type of <br> burnisher. | L.60mm; |
| :--- | :---: | :--- | ---: |
| W.43mm; |  |  |  |
| Related artefacts |  |  |  |

## BEADS

## Appendix 1.18 Amber Beads Catalogue (C. Feeney-Johnson and C. Sandes)

| Beads |  |  |  |
| :---: | :---: | :---: | :---: |
| Find no. | Feature | Description | Dimensions |
| 86 | 14 | Incomplete. Half bead of weathered dark orange coloured amber. Slightly irregular disc shape with rounded edges and scratched surface. Large circular perforation, 7.5 mm in diameter. | D. 21.5 mm ; T. 11 mm |
| 1053 | 85 | Incomplete. Three small fragments from at least two tiny amber beads. The fragments are in very poor condition, with brittle dull brown surfaces. Original thickness preserved on one fragment. | T.6mm |
| 1157 | 88 | Complete. Small disc-shaped bead of pale orange coloured amber. Good condition. Signs of wear on one side. The perforation is 3 mm in diameter. | D. 17 mm ; W.31mm; H. 2.5 mm |
| 1312 | 220 | Complete. Small, abraded amber bead in poor condition. Bead is rectangular with rounded edges in section. The cylindrical perforation is slightly off-centre and has a diameter of 4 mm . | D. 10 mm ; H. 4.5 mm |
| 1762 | 239 | Incomplete. Slightly less than half a bead of weathered reddish brown amber. Disc-shaped with rounded edges and incomplete perforation through the short axis. A V-shaped channel extending the width of one of the broken edges is possibly all that remains of an additional perforation through the long axis. | $\begin{array}{r} \text { D. }>18.5 \mathrm{~m} ; \\ \text { H. } 7.5 \mathrm{~mm} \end{array}$ |
| 2044 | 76 | Complete. Small bead of semi-translucent dark orange amber. Flattened spherical shape. Slightly off-centre circular perforation, 5.5 mm in diameter. On one face, the perforation is flattened around the circumference, as a result of friction from an adjoining bead. | D. 14 mm ; H.9mm |
| 2150 | 267 | Complete. Bead of semi-translucent dark orange amber. Flattened spherical shape. Slightly off-centre circular perforation, drilled from both sides and measuring 4.5 mm in diameter. | D. 24 mm ; H. 15 mm |
| 2390 | 70 | Complete. Disc-shaped bead with rounded edges. Heavily crazed, dull brown surface. Slightly off-centre circular perforation, 4 mm in diameter. | $\begin{aligned} & \text { D. } 17.5 \mathrm{~mm} \text {; } \\ & \text { H. } 8.5-9 \mathrm{~mm} \end{aligned}$ |
| 2392 | 70 | Complete. Disc-shaped bead with rounded edges. Poor condition, with cracked and brittle dull brown surface. Slightly off-centre circular perforation, drilled from both sides and measuring 5.5 mm in diameter. | $\begin{aligned} & \text { D. } 22.5 \mathrm{~mm} ; \\ & \text { H. } 10 \mathrm{~mm} \end{aligned}$ |
| 2401 | 253 | Complete. Disc-shaped bead with rounded edges. Heavily crazed, dull brown surface. Slightly off-centre, circular perforation, 6 mm in diameter. Both faces have single opposing depressions, which are probably natural. | $\begin{array}{r} \text { D. } 22 \mathrm{~mm} ; \mathrm{H} .9- \\ 7 \mathrm{~mm} \end{array}$ |


| 2608 | 911 | Complete. Bead of opaque dull, reddish-brown amber, with a 'squashed' barrel-like appearance. Oval outline and flattened oval section. Circular perforation, 3 mm in diameter, drilled though the long axis. | H.19mm; <br> W.16mm; <br> T. 7 mm |
| :---: | :---: | :---: | :---: |
| 2634 | 918 | Complete. Bead of opaque, dull, reddish-brown amber. Slightly flattened barrel shape with tapered ends. Oval section. Circular perforation, 3 mm in diameter, drilled through the long axis. | H.19mm; W. 11 mm ; T. 8 mm |
| 2758 | 1801 | Incomplete. Tiny amber fragment with one curved edge. Possibly part of a bead. L. $5 \mathrm{~mm} ;$ W. $4.5 \mathrm{~mm} ;$ T.3mm) | H. 4.5 mm |
| 2850 | 1225 | Incomplete. Possible bead fragment of weathered, dark orange amber, with D-shaped section. | $\begin{array}{r} \hline \mathrm{D}>.9 \mathrm{~mm} ; \\ \mathrm{T} .5 \mathrm{~mm} \\ \hline \end{array}$ |
| 2853 | 1212 | Incomplete. Tiny scraps of amber. Dimensions not possible. |  |
| 4011 | 290 | Complete. Amber stud. Plano-convex in section. Poor condition. | D. 10 mm ; T. 4 mm |

## Appendix 1.19 Blue Glass Beads Catalogue (M. Fitzgerald)

## Group 1

Find No. Feature Description
1560112 Complete; good condition. Small turquoise green glass bead. Dimensions Rectangular with rounded sides in section. Central, cylindrical D.3mm; perforation with 2 mm diameter. Glass is turquoise green to pale blue in colour. Traces of wear, and chipping around perforation. Comparanda: Mallory 1991, 22-23. Ó'Ríordáin 1949, 95, fig.19; Ó'Ríordáin 1954, 354-358, 383, 410; Raftery 1969, 83; Henderson 1988, 442.

Group 2
Find No. Feature Description

## Dimensions

| 833 | 77 | Incomplete; good condition. Half of a tiny blue glass bead. <br> Flattened oval in section. Cylindrical perforation of 0.5mm in <br> diameter. Surfaces appear slightly worn. Comparanda: Mallory <br> 1991,22-23. | D.2.5mm; <br> H.2mm |
| ---: | :---: | :--- | ---: |
| 961 | 82 | Complete; good condition. Tiny blue glass bead. Oval section; <br> slightly flattened on surfaces. Cylindrical perforation of 1mm in <br> diameter. Damage in the form of a vertical groove is evident in <br> one side. Comparanda: Mallory 1991, 22-23. | D.2.5mm; <br> H.1.5mm |
| 2103 | 269 | Complete; good condition. Tiny blue glass bead. Disc-like bead <br> with rounded sides. Central cylindrical perforation of 0.5mm in <br> diameter. Surfaces are worn. Comparanda: Mallory 1991, 22-23. | D.3mm; <br> H. 1 mm |


| 2803 | 1200 | Complete; good condition. Tiny blue glass bead. Flattened spherical section. Central cylindrical perforation of 1.5 mm diameter. Surfaces of bead are slightly scratched. Comparanda: Mallory 1991, 22-23. | D. 3 mm ; H. 2 mm |
| :---: | :---: | :---: | :---: |
| 3005 | 309 | Complete; good condition. Tiny blue glass bead. Flattened oval section. Central cylindrical perforation with diameter of 0.5 mm . Comparanda: Mallory 1991, 22-23. | D. 3 mm ; H. 1 mm |
| 3011 | 313 | Complete; good condition. Tiny blue glass bead. Flattened spherical section. Cylindrical, slightly off-centre, perforation of 0.5 mm diameter. Comparanda: Mallory 1991, 22-23. | D. 2 mm ; H. 1 mm |
| 3015 | 313 | Complete; good condition. Tiny blue glass bead. Flattened spherical section. Central cylindrical perforation, 1 mm in diameter. Evidence of wear to one side of perforation - gives it appearance of being slightly off-centre. Comparanda: Mallory 1991, 22-23. | D. 3 mm ; H. 2 mm |
| Group 3 |  |  |  |
| 16 | 1 | Incomplete; good condition. One third of a blue glass bead. Rectangular section. Cylindrical perforation; had a diameter of at least 5 mm . Traces of wear on surface. Comparanda: Ó'Ríordáin 1949, 89-90, fig.19; Raftery 1969, 83, fig.30; Raftery 1981, 180. | D. $>6.5 \mathrm{~mm}$; H. 4 mm |
| 82 | 14 | Incomplete; good condition. Half of a blue glass bead. Rounded section. Slightly flattened on surfaces. Cylindrical perforation of 5 mm diameter. Surface slightly pocked. Evidence of surface wear and scratching. From bead identical to 92E102:00158. Comparanda: Hencken 1938, 40, fig.24. Ó'Ríordáin 1949, 89-90, fig. 19. | $\begin{aligned} & \hline \text { D. } 8.5 \mathrm{~mm} ; \\ & \text { H. } 7 \mathrm{~mm} \end{aligned}$ |
| 158 | 21 | Complete; good condition. Globular blue glass bead in two halves. Rounded section. Slightly flattened on surfaces. It has central, cylindrical perforation, 5 mm in diameter. The glass is 'pocked' in places and there is evidence of wear around the perforation. Identical to 92E102:00082. Comparanda: Hencken, 1938, 40, fig.24. Ó'Ríordáin 1949, 89-90, fig. 19. | D. 9.5 mm ; H. 6 mm |
| 552 | 41 | Complete; good condition. Blue glass bead. Rectangular with slightly rounded sides in section. Slightly off-centre, cylindrical perforation with diameter of $c a .4 \mathrm{~mm}$. Glass is opaque. Comparanda: Hencken, 1938, 40, fig.24. Ó'Ríordáin, 1949, 8990, fig. 19. | $\begin{aligned} & \hline \text { D. } 9 \mathrm{~mm} ; \\ & \text { H. } 7 \mathrm{~mm} \end{aligned}$ |


| 2863 | 1227 | Complete; poor condition. Medium-sized dark blue glass bead. <br> Flattened spherical in section; slightly off-centre, cylindrical <br> perforation, 4mm in diameter. At edge of perforation, on one <br> surface, is a tiny hole of ca. 0.5mm diameter which holds small, <br> round metallic-looking object - may possibly be a stud? One side <br> of bead is worn thin, with a crack in glass at this point. Edges of <br> perforation are worn and chipped. Bead is a darker shade of blue <br> than other Dún Aonghasa glass beads. Comparanda: Ó'Ríordáin <br> 1949. 89-90, fig.19; Raftery 1969, 83; Raftery 1981, 180; <br> Hencken 1938, 40, fig.24. | D.8mm; <br> H. 6 mm |
| :---: | :---: | :--- | :--- |
| 2949 | 1226 | Incomplete; good condition. One third of a small blue glass bead. <br> Rectangular section with rounded sides. Cylindrical perforation <br> of ca. 5mm in diameter. Surfaces are scratched and bead is worn. <br> Traces of wear around the perforation. Comparanda: Ó'Ríordáin <br> 1949, 89-90, fig.19; Raftery 1969, 83; Raftery 1981, 180; <br> Hencken 1938, 40, fig.24. | D. $>6 \mathrm{~mm} ;$ <br> H.4.5mm |
| 4020 | 1201 | Complete; good condition. A dark barrel-shaped blue glass bead. <br> Opaque. Central cylindrical perforation measuring 3mm in <br> diameter. | D. $8 \mathrm{~mm} ;$ <br> H.5mm |

## Appendix 1.20 Shell Beads and Objects Catalogue (M. FitzGerald)

## Beads

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 1119 | 216 | Perforated limpet shell. Fragile condition. Edge along one side has broken off. | D.31-26mm; T. 1 mm |
| 1422 | 22 | Tiny, rounded circular object of shell. Hollow semi-circular section with perforation in flat surface. Possibly natural, or a pin head? | D. 4 mm ; T.3mm |
| 2747 | 949 | Small, complete cowrie shell with a small perforation ( 2 mm by 1 mm ), probably natural, in one end. No signs of modification. | L. 9 mm W. 7 mm T. 6 mm |
| 1131 | 82 | Tiny cowrie sea shell. Semi-circular cross-section with opening in base. Identical to 92E102:01340. | L. 10 mm W.7.5mm |
| 1340 | 220 | Tiny cowrie sea shell Semi-circular cross-section and opening in base. Identical to 92E102:01131. | L. 9 mm ; W. 7 mm |

Unperforated shells (red cowrie only)

| 2932 | 985 | Small, complete cowrie shell. No signs of modification. | L. $10 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | ---: |
|  |  | W.8m; |  |
|  |  | T. 7 mm |  |

Modified and unmodified scallop shells

| 2545 | 297 | Two almost complete scallop shells and $c a$. three fragments. Unmodified. | D. $98 \mathrm{~mm} ;$ T. $2 \mathrm{~mm} ;$ D. $111 \mathrm{~mm} ;$ T. 2 mm |
| :---: | :---: | :---: | :---: |
| 2930 | 985 | Fragment of a scallop shell. No signs of modification. Reddening of shell on the interior is natural. | L. 84 mm ; <br> W. 46 mm ; <br> T. 2 mm |
| 2931 | 985 | Fragment of a scallop shell. Slight reddening on interior natural? | L. 38 mm ; W. 30 mm ; T. 2.5 mm |
| 2933 | 983A | Fragment of a scallop shell. Reddening on interior - natural? | $\begin{gathered} \hline \text { L. } 37.5 \mathrm{~mm} \text {; } \\ \text { W. } 32 \mathrm{~mm} \text {; } \\ \text { T. } 2.5 \mathrm{~mm} \\ \hline \end{gathered}$ |
| 2934 | 983B | Almost complete valve of a scallop shell. No definite signs of working but could have been used as a lamp. |  |

## Appendix 1.21 Pumice and Stone Beads and Rock Crystals Catalogue (M. FitzGerald; petrological identifications by D. Harper)

## Pumice

| Find No. | Feature | Description | Dimensions |  |
| :--- | :---: | :--- | :--- | ---: |
| 70 | 19 | Incomplete. Circa half of a circular pumice bead, dark brown in <br> colour with a gritty surface. Flat upper and lower surfaces with | D.19mm; <br> rounded sides. Approximately half of the hour-glass perforation | T.12mm |
|  |  | remains; original diameter $c a .5 \mathrm{~mm}$. The broken edges appear to <br> have been slightly smoothed, but this may be due to weathering. |  |  |


| Quartz | 244 | lomplete. Cylindrical bead made from brown quartz siltstone. <br> Smooth polished surfaces. One surface is slightly rounded and in <br> section the object is square with rounded sides. There is an <br> attempt at a perforation; this is 3mm in diameter and very much <br> "off-centre". It is possible that this bead is a reworked bracelet <br> fragment. | L.13mm; <br> 1839 |
| :--- | :---: | :--- | ---: |
| 1886 | 244 | Complete. Finely-made, polished, disc-like stone bead made from <br> brown quartz siltstone. In section the bead is rectangular with <br> rounded sides; slightly off-centre hour-glass perforation, 7mm in <br> diameter. | D.17mm; <br> T.6mm |
| 2706 | 941 | lomplete. White bead of milky quartz, oval in section with <br> cylindrical perforation 2mm in diameter. There are slight traces <br> of wear around the edges of the perforation. | D.8.5mm; <br> T. 4 mm |


| 2824 | 965 | Incomplete. Tiny quartz bead. D-shaped in section with one <br> slightly curved surface. This surface is also slightly smoothed. <br> The opposing surface is rough and has a shallow off-centre <br> groove, possibly the remains of a perforation. It is possible that <br> the bead may have been broken during manufacture. | D.1.5mm; <br> W. $10 \mathrm{~mm} ;$ <br> T. 6 mm |
| :--- | :---: | :--- | :--- | :--- |
| Limestone |  |  |  |
| 33 | 9 | Complete. Circular, perforated bead made from crinoidal <br> limestone of local provenance. Very finely made with highly <br> decorative crinoids that occur as white and brown spots. The bead <br> is rectangular with rounded sides and the slightly off-centre, <br> hour-glass perforation is 5.5mm in diameter. There are traces of <br> wear around the perforation. | D.17mm; |
| Complete. Small geoid shaped stone consisting of a limestone <br> pebble with corallites, no doubt picked up on the shore. This may <br> have been raw material for a similar bead to no.33. It is abraded <br> and may have been worked to some extent. | D.19mm by <br> 15.5 mm |  |  |

Cryptocrystalline quartz, flint, chert or agate

| 175 | 10 | Complete. Small perforated stone bead made from <br> cryptocrystalline quartz, flint or agate. Slightly oval-shaped and <br> thin and disc-like in appearance. The cylindrical perforation is <br> slightly off-centre and 2mm in diameter. The surfaces of the bead <br> are uneven and there are traces of polish evident. | D.7mm x <br> $8 \mathrm{~mm} ;$ |  |
| :--- | :---: | :--- | ---: | ---: |
| 178 | 14 | Incomplete. Half of a stone bead (original diameter 12mm) <br> similar to but larger than 175. Of cryptocrystalline quartz, flint or | D.12mm; <br> agate. The broken edges appear to have been smoothed down so <br> the bead is crescent-shaped and has a wedge-shaped section. One | T. <br> surface is smooth and flat, almost as if it has been cut. The other <br> is rounded. The bead is polished. The perforation is cylindrical <br> but tapers slightly towards the flat surface and is 3mm in <br> diameter. |
| 224 | 51 | Complete. Small, perforated circular bead made from chert or <br> flint. The bead is flat and disc-shaped bead thinning out slightly <br> at one edge from 2mm to 1.5mm. It has an off-centre cylindrical <br> perforation 2mm in diameter. | T.1.5mm; <br> 2 mm |  |

Crinoid ossicle

| 216 | 52 | Complete. Minuscule bead made from a single crinoidal ossicle <br> or limestone fossil, of local provenance. Rectangular in section. <br> The central cylindrical perforation is 0.5 mm in diameter and there <br> are faint incisions from the perforation to the edge of the bead. | D.3mm; <br> T. 1 mm |
| :--- | :--- | :--- | ---: |


| 612 | U/S | Complete. Bead made from tiny circular fossil from local limestone. The bead is flat and disc-like, rectangular in section with faint traces of incisions towards the edge. The star-shaped central perforation is 1 mm in diameter and probably an enhancement of a natural depression. | D. 5 mm , T. 2 mm |
| :---: | :---: | :---: | :---: |
| 1335 | 228 | Complete. Small fossil bead from local limestone. The bead is thin and disc-like with a relatively large rectangular perforation. Faint incisions visible towards the edges, which are extremely thin ( $1-1.5 \mathrm{~mm}$ ). The cylindrical perforation is 2.5 mm in max. width. | D. 4.45 mm ; T. 1.5 mm |
| 2713 | 1704 | Complete. Tiny bead made from limestone crinoid ossicle of local provenance. Circular disc-shaped fossil with central, cylindrical perforation, 1 mm in diameter. | D. 2 mm ; T. 1 mm |
| 2725 | 1204 | Complete. Tiny bead made from limestone crinoid ossicle of local provenance. Disc-like with a central perforation 1.5 mm in diameter. Thins slightly to one side. | D. 4 mm ; T. 1 mm |

## Unknown rock type

| 1561 | 112 | Incomplete. Tiny circular brown polished bead, of unknown rock <br> type, identical to 92E102:03010. In section the bead is wedge- <br> shaped with a rounded side. The bead thins out towards an off- <br> centre perforation, 0.5mm in diameter, which has now partly <br> broken away. | D.3mm; <br> T. $1 \mathrm{~mm}-$ <br> 2 mm. |  |
| :--- | :---: | :--- | ---: | ---: |
| 3010 | 313 | Incomplete. Tiny circular brown polished bead (original diameter <br> of 3mm) and identical to 1561. In section it is wedge-shaped with <br> one rounded side and thinning out towards the perforated edge. <br> The perforation is to one side and now partly broken away but <br> was 0.5mm in diameter originally. | D.3mm; | T. $\mathrm{mm}-$ |

Rock Crystals
$\left.\begin{array}{l|c|l|r}\hline 890 & 82 & \begin{array}{l}\text { Small irregular-shaped rock quartz crystal. Surfaces of some faces } \\ \text { are chipped and have striations or scratch marks. }\end{array} & \begin{array}{r}\text { L. } 16 \mathrm{~mm} ; \\ \end{array} \\ & & & \text { W. } 11.5 \mathrm{~mm} ; \\ \text { T. } 9.5 \mathrm{~mm}\end{array}\right]$

## BONE ARTEFACTS

## Appendix 1.22 Bone Points Catalogue (C. Mullins)

Points

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 57 | 14 | Length of bone cut from segment of longbone wall of large animal. Wide oval in section through most of length becoming gradually more rounded in section as it tapers nearing the point. Side tapers very gently through most of length; rate of taper becoming stronger in final 35 mm . Point intact. Surface is badly corroded and root marked. No manufacture marks. Final 10mm of point bears a vague patchy surface polish. Also remains of some polish at sides. | L. 95 mm ; <br> W. 13 mm ; <br> T. 6 mm |
| 174 | 14 | Very well worked piece. Possibly represents lower working end of larger object. Sides taper evenly to point. Fracture surfaces finely rounded into underside throughout length. Trace of marrow cavity in upper area, fading out at 9 mm above point when piece also adopts finely rounded section; continues to taper in round to sharp point. Point intact but slightly damaged at both sides. Entire surface has fine surface sheen over clearly visible horizontal file marks. | L. 24 mm ; W. 7 mm ; T. 3 mm |
| 262 | 26/14 | Produced from longitudinal segment of longbone wall. Sides taper fairly evenly to point, though is some irregularity in upper sides. Fracture surfaces are rounded, especially in lower half where taper is even and symmetrical. Upper part retains concaveconvex section which disappears at 8 mm from point when oval section shape is adopted. Point is intact. No manufacture marks visible but fracture surfaces and final 8 mm display surface sheen. | $\begin{gathered} \text { L. } 53 \mathrm{~mm} ; \\ \text { W. } 9 \mathrm{~mm} \text {; } \\ \text { T. } 3 \mathrm{~mm} \end{gathered}$ |
| 347 | 9 | Produced from wide longitudinal segment of longbone wall of large animal. Upper area retains deeply curved section, diminishing in depth towards the working end. Fracture surfaces rounded and upper sides taper evenly towards working end. At 18 mm above point sides converge more sharply for short distance and then resume with a gentler taper at which point the object takes on a stoutly rounded section, continuing to taper in the round to point. Point is intact but slightly damaged. Surface is quite corroded but horizontal file marks are visible around working end. | $\begin{gathered} \text { L. } 56.5 \mathrm{~mm} ; \\ \text { W. } 21 \mathrm{~mm} ; \\ \text { T. } 5.5 \mathrm{~mm} \end{gathered}$ |


| 640 | 14,16 | Produced from longitudinal segment of longbone wall of large animal. May possibly represent upper part of bone point, though upper ends of bone points tend to remain rough and unfinished. Cut from the cancellous area of longbone near articular end. Top is smoothed with a shine, possibly from wear. Other end broken. Rectangular/ oval in section with smooth appearance, possibly from prolonged handling. No manufacture marks visible. | L.38mm; W. 12 mm ; T. 9.5 mm |
| :---: | :---: | :---: | :---: |
| 652 | 32/41 | Finely worked piece, probably represents broken working end of larger piece. Approximately oval-shaped in section with sides tapering fairly evenly, although somewhat asymmetrically, to sharp point. Sides are finely rounded into underside becoming more so nearing point. Final $c a .8 \mathrm{~mm}$ adopts a more rounded cross-section and tapers in the round to point. Front surface retains trace of marrow cavity. Point perfectly intact. Fine, horizontal file marks visible on sides and surface bears fine allover sheen. | $\begin{array}{r} \mathrm{L} .28 \mathrm{~mm} ; \\ \mathrm{W} .8 .5 \mathrm{~mm} ; \\ \text { T. } 5.5 \mathrm{~mm} \end{array}$ |
| 779 | 70 | Fairly well-made piece. Produced from longitudinal segment of longbone wall. Sides are approximately parallel before tapering for final $c a .17 \mathrm{~mm}$ on left and final 15 mm on right, to point. Fracture edges appear to have been rounded, most noticeably on left, though upper left side is broken. Final 10 mm adopts more rounded cross-section continuing to taper in the round to point. Point is perfectly intact. Trace of marrow cavity continues down most of front surface. Some longitudinal facets from longitudinal knife cuts are visible around lower end. | $\begin{gathered} \hline \mathrm{L} .37 \mathrm{~mm} ; \\ \text { W. } 7 \mathrm{~mm} \text {; } \\ \text { T. } 5 \mathrm{~mm} \end{gathered}$ |
| 959 | 82 | Produced from longitudinal segment of longbone wall. Upper part almost wedge-shaped in section with slight curve. Upper sides taper very gently, rate of taper becomes more abrupt at $c a$. 13 mm from point. Fracture surfaces are left rough until nearing point of taper when some secondary working becomes apparent. Final 7 mm is worked rounded section and tapers to sharp point. Extreme tip of point is broken. Object is now broken into two pieces along approximate midline. | L. 37 mm ; W.10mm; T. 4.5 mm |
| 976 | 82 | Produced from longitudinal segment of longbone wall. Shallow curved section in upper area, fading out just below midline. Fracture surfaces left unworked in upper area where sides also run parallel. From approximate midline sides taper to point; in this area fracture surfaces show some rounding, becomes more definite for final 17 mm on left and for final 12 mm on right. This final part of working end has fine oval/square section and continues to taper on all faces to sharp point which is still intact. | L. 73 mm ; W. 12 mm ; T. 5 mm |
| 1042 | 217 | Approximately oval-sectioned length of bone tapered evenly from all faces to point. Point intact and very sharp. Surface is very corroded with no surface detail visible. | L. 31.5 mm <br> W.6.5mm T. 4.5 mm |


| 1091 | 85 | Very roughly-made piece. Produced from longitudinal segment of longbone wall of large animal. Sides taper to point. Roughly wedge shaped in section until nearing point when the fracture surfaces join, creating a triangular section. No secondary modification. | L. 63 mm ; <br> W. 20 mm ; <br> T. 4 mm |
| :---: | :---: | :---: | :---: |
| 1105a | 216 | Group of six bone points found together. Produced from longitudinal segments of longbone wall. 92E102:1105a: Retains shallow curved section with parallel sides through most of length down to round sectioned working end. Fracture surfaces show no secondary working until 20 mm from point where sides are rounded into oval shaped cross-section which tapers sharply to point. Point is intact. No surface evidence of file marks though traces of polish (manufacture or wear) remain on working end. | L.76mm; W. 11 mm ; T. 5 mm |
| 1105b | 216 | 92E102:1105b: Retains curved section with irregularly parallel sides through most of length down to round-sectioned working end. Fracture surfaces show no secondary working until 20 mm from point where they are rounded off, creating oval/rounded section, and begin to taper abruptly to point. Final 10 mm are finely rounded. Point is intact though slightly damaged. Final 56 mm of working end retains surface polish (wear or manufacture). Surface otherwise seems partly peeled, possibly removing more extensive evidence of manufacture. | L. 77 mm ; W. 20 mm ; T. 5.5 mm |
| 1105c | 216 | 92E102:1105c: Retains curved section in upper area. Sides taper evenly to point. Fracture surfaces show no secondary working until 18 mm from point when the shape adopts roughly rounded cross-section, tapering to point. Point is intact though possibly slightly damaged. Some remains of surface polish remain around lower working end. | L. 86 mm ; W. 16 mm ; T. 6 mm |
| 1105d | 216 | 92E102:1105d: Roughly rectangular shaped in section with irregular sides above working end. Fracture surfaces are left rough until 20 mm above point - object becomes worked into round sectioned working end; tapers to intact point. Final 10 15 mm retains remains of surface polish with possibly faint trace of encircling file marks. | L. 85 mm ; W.13mm; T. 6 mm |
| 1105e | 216 | 92E102:1105e: Retains curved section with irregularly tapering sides above round sectioned working end. Fracture surfaces are left rough. Working end begins at $c a .18 \mathrm{~mm}$ above point when sides taper inwards abruptly to produce round sectioned, spindlelike working end; continues to taper to point. Extreme tip of point is broken. Working end surface retains traces of polish. | $\begin{array}{r} \text { L. } 79 \mathrm{~mm} ; \\ \text { W. } 14.5 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm} \end{array}$ |
| 1105f | 216 | 92E102:1105f: Poorly-worked piece. Trace of marrow cavity persists above working end, which is comprised of final 15 mm . Fracture surfaces are left unworked and sides taper irregularly above this area. At $c a .15 \mathrm{~mm}$ above tip sides become smoothed and rounded and, at $10-11 \mathrm{~mm}$ above tip, working end becomes worked in round, adopting finely rounded cross-section, tapering | L. 67 mm ; W. 10 mm ; T. 4.5 mm |


|  |  | all the time to intact point. Object has very slight lateral curve. |  |
| :---: | :---: | :---: | :---: |
| 1123 | 217 | Produced from narrow longitudinal segment of longbone wall. Appears only roughly worked but outer layer of bone has peeled away leaving an uneven surface and possibly removing evidence of fine grade manufacture. Axis is bent to one side at obtuse angle, about a third from top. For remainder of length sides taper regularly to fine point. Upper end is clearly intact and curved in section at very top. Slight polish on upper surface at edges. Point seems intact though extreme tip may be damaged. | L. 128 mm <br> W.9.5mm; T. 5 mm |
| 1124 | 88 | Produced from longitudinal segment of longbone wall. Sides taper evenly to point. Fracture surfaces are rounded and smoothed, merging into underside. Upper area is almost wedgeshaped in section. Trace of marrow cavity fades out at 18 mm above point and object adopts oval cross-section, tapering to round section nearing point. Final 6 mm is worked in the round to intact point. Rounded fracture surfaces and final few mm of point bear fine surface sheen. Top may be broken post-manufacture. | $\begin{array}{r} \text { L. } 32 \mathrm{~mm} ; \\ \text { W. } 10-2 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \end{array}$ |
| 1125 | 88 | Probable broken working end of a bone point. Perfectly oval in section except for slight trace of marrow cavity down front. Sides are finely rounded, merging into underside, and taper evenly to point, the tip of which is broken. Entire surface is finely polished and sides show clear horizontal file marks. Underside shows coarse vertical groove marks. | L. 19.5 mm ; W. $13-4 \mathrm{~mm}$; T. 5 mm |
| 1142 | 216 | Produced from longitudinal segment of longbone wall. Upper part is somewhat L -shaped in section due to manner in which it has been split from bone. Sides taper fairly evenly to point. Fracture surfaces are rounded throughout most of length. Lshaped section diminishes towards point, fading out completely at 6 mm from end. Final 9 mm has been worked into rounded section, continues to taper to now broken point. Fracture surfaces show clear horizontal file marks which are less clear in lower rounded area, possibly through wear. | $\begin{array}{r} \text { L. } 39.5 \mathrm{~mm} ; \\ \text { W. } 13-4 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm} \end{array}$ |
| 1148 | 217 | Produced from longitudinal segment of longbone wall. Almost oval in section with slight trace of curved section. Sides are rounded throughout length, merging into underside for most of length. Sides taper evenly to point. Lower half gradually becomes more rounded near point, especially for final 10 mm . Point is very sharp and in perfect condition. Upper area is composed largely of spongy bone. Faint file marks visible on fracture surfaces and around final ca. 20 mm of point. | L.69mm; W. 17 mm ; T. 4.5 mm |
| 1159 | 85 | Produced from longitudinal segment of longbone wall. Pronounced lateral curve to longitudinal axis. Surface very corroded with no surface detail. Wedge shaped in section throughout most of length. Final $c a .26 \mathrm{~mm}$ becomes rounded/triangular in section. Sides taper evenly throughout length to intact point. | L. 72 mm ; W. 13 mm ; T. 6 mm |


| 1164 | 219 | Possibly produced from pig fibula. Small longbone, unmodified except for oblique cut to lower end of one side creating a sharp point at one end. No secondary working apparent. Length of sharpened part 25 mm . | L. 57 mm ; W. 8 mm ; T. 4.5 mm |
| :---: | :---: | :---: | :---: |
| 1192 | 219 | Approximately square sectioned length of bone which tapers bilaterally to point. Extreme tip of one or both of adjacent faces is also bevelled for final few mm of point. May be some secondary working on one side but this is uncertain. No manufacture marks visible. | L. 22.5 mm ; W. 5 mm ; T. 5 mm |
| 1208 | 219 | Possible, broken, working end. Round sectioned piece, tapering in the round to point, the tip of which is broken. Fine surface sheen with horizontal file marks all over. | L. 16 mm ; W.6mm; T. 5 mm |
| 1217 | 255 | Produced from longitudinal segment of longbone wall. Retains remains of marrow cavity in upper area. Some spongy bone showing near the upper end with remains of what may be articular surface at top. Piece is irregularly shaped. Right side continues straight down with no taper while left splays out from top before converging sharply inwards to form narrow pointed working end with diamond-shaped cross-section. Fracture surfaces show no secondary working above working end. Working end is worked in the round, taking on round section as it approaches broken tip. Remains of file marks are faintly visible around working end. | L. 82 mm ; W.19mm; T.10mm |
| 1233 | 255 | Produced from longitudinal segment of longbone wall. Retains shallow curved section down most of length. Sides are parallel in upper region but begin to taper towards point in the lower $c a .1 / 3$ of length. Fracture surfaces are left rough but secondary working of edges, in form of rounding and smoothing, has been applied from point of taper on left side. On right side secondary working is only present for final $c a .15 \mathrm{~mm}$ and from here working end is worked into an oval cross-section. Point is intact but slightly damaged. No trace is filing visible though lower 15 mm has good surface polish. | L.93mm; W.16mm; T. 16 mm |
| 1244 | 255 | Produced from longitudinal segment of longbone wall. Retains shallow curved section in upper half, fading out almost completely in lower area. Upper sides run parallel but show no secondary working. Final 26 mm taper to point; the left side of this area has been rounded and smoothed while the corresponding right side remains rough except for final 8 mm . Point is perfectly intact but its final 8 mm length is broken into a separate piece. | $\begin{array}{r} \text { L. } 36 \mathrm{~mm} ; \\ \text { W. } 9.5 \mathrm{~mm} ; \\ \text { T. } 3 \mathrm{~mm} \end{array}$ |


| 1251 | 255 | Finely-worked piece. Produced from wide longitudinal segment of longbone of large animal. Upper part appears to be missing and object has broken into a number of conjoining fragments. Three other loose fragments may be part of upper region of piece. Retains curved cross-section in upper region. Sides converge regularly to point. Fracture surfaces in uppermost region are left unworked. From $c a$. 1/3 distance from top, fracture surfaces become smoothed and rounded and from the approximate centre they merge into underside in continuous curve. Final $c a .1 / 3$ adopts a finely-rounded cross-section continuing to taper to sharp, perfectly intact, point. Final $1 / 3$ is finely polished and manufacture marks are still discernible in the form of fine vertical and transverse file marks. | L. 82 mm ; W. 19 mm ; T. 7 mm |
| :---: | :---: | :---: | :---: |
| 1256 | 220 | Probably represents broken working end. Roughly round sectioned piece of bone, tapering in the round to sharp point which is very slightly curved to one side. Composed largely of spongy bone. No manufacture marks visible. Polish concentrated on both sides and around extreme tip of point suggesting that polish may be result of use. Point is perfectly intact. | L. 22.5 mm ; W. 5 mm ; T. 5 mm |
| 1268 | 255 | Produced from longitudinal segment of longbone wall. Upper part retains deep curved section which diminishes in depth through length. Sides taper fairly regularly to point with more noticeable taper in lower half. Some rounding of fracture surfaces even in upper half but bone texture is chalky. Fracture surfaces in lower half, where sides show more pronounced taper, are rounded into underside. Final 7 mm are worked in the round to round sectioned point. Point is intact but its tip may be broken or damaged. Faint traces of polish survive in patches around working end and on upper rounded fracture surfaces. | $\begin{array}{r} \text { L. } 43 \mathrm{~mm} ; \\ \text { W. } 9.5 \mathrm{~mm} ; \\ \text { T. } 3.5 \mathrm{~m} \end{array}$ |
| 1279 | 255 | Produced from narrow longitudinal segment of longbone wall of large animal. Remains of marrow cavity continue down most of length. Fracture surfaces are totally unworked until final $c a$. 15 mm when object is shaped into finely rounded tapering point, the lower extremity of which is broken. Upper sides taper gently but rate of taper is greater in round sectioned working end. | L. 75 mm ; W. 17 mm ; T. 7 mm |
| 1280 | 220 | Sheep/goat metatarsal/metacarpal; retains distal epiphysis and distal area of shaft in upper part. From 15 mm below top, one side of shaft has been split away for remainder of length. Remaining projection has been worked into tapered point. Upper fracture surfaces are irregular with no secondary working but rate of taper becomes regular in lower half - fracture surfaces have been rounded and smoothed. Natural concave-convex cross-section is retained for most of length. Final 8 mm adopts finely rounded section shape, tapering to a sharp point, tip of which is now missing. Upper rims of articular condyles have been trimmed away. Transverse file marks are clearly visible on sides of lower | L. 118 mm |


|  |  | working end. |  |
| :---: | :---: | :---: | :---: |
| 1293 | 220 | Object is cut from broad segment of outer wall of long bone and therefore retains no trace of medullar cavity, giving it a D-shaped cross-section. Retains part of articular end at top. From top, sides taper evenly to point. For final 20 mm taper is greater and sides are further worked, creating an oval-shaped cross-section which narrows to sharp, intact, point. No details of surface manufacture are visible but outer layer of bone has peeled away. | L.78mm; W.22mm; T. 5 mm |
| 1302 | 220 | Doubtful bone point. Produced from a longitudinal segment of the longbone of a large animal. Parallel sides with base cut off diagonally and bevel from the underside creating sharp edge. No sign of manufacture marks but surface is very corroded. Very slight trace of polish along edge of base. Lower point on edge of base is recently broken. | $\begin{array}{r} \text { L. } 52 \mathrm{~mm} \text {; } \\ \text { W. } 9.5 \mathrm{~mm} \text {; } \\ \text { T. } 3.5 \mathrm{~mm} \end{array}$ |
| 1304 | 220 | Produced from longitudinal segment of longbone wall. Deeply curved section throughout most of length, becoming shallower for final $10-15 \mathrm{~mm}$. No secondary working on fracture surfaces in upper area where sides also run parallel. For final $c a .20 \mathrm{~mm}$ sides taper evenly to point and in this area the fracture surfaces become finely rounded into the underside. Lower working end is broken. Surface is generally very corroded but a slight sheen remains on the rounded fracture surfaces of the working end. | $\begin{array}{r} \text { L. } 55.5 \mathrm{~mm} \\ \text { W. } 9.5 \mathrm{~mm} \\ \text { T. } 3 \mathrm{~mm} \end{array}$ |
| 1305 | 220 | Probably cut from longitudinal segment of longbone wall. Surface is very corroded with no apparent secondary working. Fracture surfaces taper evenly, with slight lateral curve, to point. Object has broad rectangular section shape in upper area narrowing to wedge shape further down. Fracture surfaces converge at front surface for final 5 mm giving a triangular crosssection. | L. 35 mm ; W.10mm; T.3.5mm |
| 1314 | 220 | Produced from narrow longitudinal segment of longbone wall. Poorly worked except for working end. Natural concave-convex cross-section has been lost in splitting process. Sides converge evenly to fine, sharp point. Upper left side is slightly broken. Fracture surfaces show no secondary working in upper region. Final 40 mm (i.e. tapering area) on left side and final 29 mm on right side show some secondary rounding which becomes more definite nearing tip. Final $c a$. $10-15 \mathrm{~mm}$ is worked all around to fine round sectioned point with sharp, intact, tip. | $\begin{array}{r} \mathrm{L} .82 \mathrm{~mm} ; \\ \mathrm{W} .17 .5 \mathrm{~mm} \\ \text { T. } 7 \mathrm{~mm} \end{array}$ |


| 1315 | 220 | Produced from longitudinal segment of longbone wall of large animal. Fairly roughly made. Retains curved cross-section throughout most of length. Fracture surfaces show no secondary working. Tapers fairly regularly throughout length to the pointed tip but the taper is greater for the last approximately 12 mm and at this point the sides have been rounded and smoothed. Final approximately 9 mm are worked in the round to an oval-sectioned point which tapers to a sharp tip which, while intact, may be slightly damaged. No manufacture marks visible. | L. 120 mm ; <br> W. 27 mm ; <br> T. 8 mm |
| :---: | :---: | :---: | :---: |
| 1334 | 220 | Sheep/goat metatarsal/metacarpal which retains complete distal epiphysis and distal portion of shaft in upper part. From ca. 20 mm below top, one side of shaft has been split away. Leaves a projection of bone on the other side which retains the concaveconvex section in its upper area and tapers fairly evenly through length to round-sectioned point. Fracture surfaces in upper area are left rough though there is some secondary filing on the upper left fracture surface. Fracture surfaces in the lower $c a .15 \mathrm{~mm}$ are rounded and smoothed to merge into underside; creating a rounded cross-section in final $c a$. 5 mm . Point is intact. | L. 92.5 mm |
| 1382 | 32 | Fairly crudely-worked piece. Produced from wide longitudinal segment of longbone wall of large animal. Retains deeply curved section in upper part and trace of marrow cavity down to end. Sides are irregular for upper $c a .2 / 3$ of length before tapering evenly to sharp point. Little secondary working apparent. Left side of tapered working end has been somewhat smoothed - this may be attributable to use rather than deliberate manufacturing process. Only final $15-20 \mathrm{~mm}$ of right side of working end shows secondary modification - has a rounded and polished surface which continues around underside of point and unto left side. No secondary working on front surface of extreme tip. Point is sharp and intact. | L.79mm; <br> W. 24 mm ; <br> T. 6.5 mm |
| 1388 | 14 | Possibly composed of sheep/goat metatarsal. Poorly-worked piece. Produced from a longitudinal sidewall segment of bone. Retains portion of proximal head in upper end. Sides taper irregularly to pointed tip. Right side is bevelled close to point. No secondary working visible but surface has peeled. Point seems intact. | L.98mm; W. 12 mm ; T. 3 mm |
| 1394 | 238 | Poorly-worked piece. Produced from narrow longitudinal segment of longbone wall of large animal. Retains trace of marrow cavity throughout length to working end. Sides run parallel in upper area with no secondary working of fracture surfaces. For final 25 mm , sides become slightly rounded, creating a more rounded cross-section and sides begin to taper to point, tip of which is now broken. Longitudinal axis adopts a slight lateral curve at top of working end. Horizontal file marks are visible around working end. | L. 80 mm ; W. 11 mm ; T. 5 mm |


| 1452 | 239 | Very finely-worked piece. Produced from longitudinal segment of longbone wall of large animal. May represent detached working end of more complete bone point. Oval or rounded rectangular in cross-section, tapering evenly from both sides throughout length to sharp point. Final 8 mm adopts rounded cross-section and tapers in the round to point. This area also has fine surface polish which continues upwards in places. Point intact. Upper surface appears to be broken. | L. 41.5 mm ; W.8.5mm; T.6mm |
| :---: | :---: | :---: | :---: |
| 1508 | 101 | Produced from narrow longitudinal segment of longbone wall. Square/oval in section with faint trace of marrow cavity down most of length. Fracture edges have been rounded, in places merging into underside. Sides in upper half are irregularly parallel but from centre they taper evenly and gently to point with a very slight swelling of shank in upper end of lower half. In lower half-sides are finely rounded to merge into underside and final $20-25 \mathrm{~mm}$ adopts a finely rounded section and tapers in round to sharp point which is still perfectly intact. Fine file marks are visible on upper sides. | L. 61.5 mm ; <br> W. 5.5 mm ; T. 4.5 mm |
| 1554 | 106 | Produced from longitudinal segment of longbone wall of large animal. Very well made piece. Retains trace of marrow cavity throughout most of length. Sides converge fairly evenly to finely rounded working end with rate of taper being more pronounced in region of working end. Fracture surfaces are left rough above working end. Final 20 mm comprises working end and here bone has been worked all around into oval sectioned form, tapering to rounded section towards extreme tip. Extreme tip of original sharp point is now broken. Surface of working end is highly smoothed either due to manufacture process or from use. | L. 82 mm ; <br> W. 15 mm ; <br> T .7 mm |
| 1555 | 106 | Cut from longitudinal segment of longbone wall. Upper left side is broken. Otherwise had curved section in upper area, fading out below centre. Sides taper fairly evenly to point. Some secondary working, in form of lateral trimming - horizontal file marks also visible at side of upper right fracture surface. From ca. 1/3 distance down length of object, both sides have been rounded slightly. Final 15 mm adopts oval section continuing to taper to point. Final 5 mm is worked in round to produce a fine point. Point still intact. | L. 42 mm ; <br> W.6mm; T. 2 mm |
| 1608 | 239 | Produced from longitudinal segment of longbone wall. Sides converge evenly to round-sectioned and finely-pointed tip. Piece is composed from outer area of longbone wall, retaining little of natural bone shape. Fracture surfaces appear to be slightly reworked for lower 34 mm while area nearing point has been worked in the round for final $c a .15 \mathrm{~mm}$. Point is intact. Little detail is visible concerning surface working as surface has peeled considerable. Upper region is composed largely of spongy bone. There is a circular perforation just below the upper end. | L. 91 mm ; W. 16 mm ; T. 5 mm |


| 1610 | 239 | Produced from longitudinal segment of longbone wall. Very well made piece. Retains natural curved section in upper region. Sides taper evenly throughout length to point. Fracture surfaces are finely rounded, blending into underside in central region. Final ca. 20 mm are finely-worked all round into round sectioned tapering working end. Point is sharp and intact. Upper part may be broken as secondary working at sides continues right up to top which is unusual. No surface manufacture marks visible. | L. 72 mm ; W. 20 mm ; T. 8 mm |
| :---: | :---: | :---: | :---: |
| 1679 | 239 | Produced from longitudinal segment of longbone wall of large animal. Piece has been worked into rounded cross-section, which tapers evenly to the point. Point has been deliberately blunted by being cut off horizontally above tip. Upper area either broken post-manufacture or left rough. Surface is heavily root marked. No manufacture marks visible. | L. 46 mm ; W.10mm; T.7.5mm |
| 1728 | 217 | Produced from longitudinal segment of longbone wall of large animal. Shallow concave-convex section in upper part with no secondary working of fracture surfaces. Sides run approximately parallel in upper half, beginning to converge towards point in lower half and here sides also show secondary modification in the form of rounding off. The final $1 / 3$ takes on finely rounded crosssection and continues to taper to point. Extreme tip of point is broken. Slight lateral curve to longitudinal axis. File marks are visible in lower area encircling round sectioned working end. | L.88mm; W. 16 mm ; T.7.5mm |
| 1743 | 239 | Fairly well made piece. Produced from narrow longitudinal segment of longbone wall. Faint vestige of marrow cavity is still visible down the centre. Fracture surfaces have been rounded throughout entire length. The front surface has been worked into a rounded form from $c a .1 / 2$ way down length while final 15 mm is worked all round to form a round-sectioned working end with a tapered sharp point. Sides are parallel for most of length, beginning to converge towards point at $c a .30 \mathrm{~mm}$ above tip. Extreme tip of point is intact. The pronounced anterior-posterior longitudinal curve is a feature of the raw material. | L. 102 mm ; W. 9.5 mm ; T. 7.5 mm |
| 1862 | 221 | Produced from longitudinal segment of longbone wall. Roughly made piece. Parallel sides with fracture surfaces showing no secondary working. At $c a .1 / 3$ distance from lower end right side is bevelled to form sharp, triangular sectioned point. Fracture surfaces are smoothed in this area, possibly from use more than from secondary working. Point is perfectly intact. | $\begin{array}{r} \mathrm{L} .91 \mathrm{~mm} ; \\ \text { W. } 12 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \end{array}$ |


| 1891 | 244 | Fairly well made piece. Composed from small sheep or goat radius with one side wall split off longitudinally below top. Remaining segment of bone has been tapered into a finely sharpened point, its upper region being curved in section, forming an oval section for final $c a .13 \mathrm{~mm}$. Curved longitudinal axis is a feature of bone from which piece is manufactured though manufacture process appears to have emphasised this. Point is perfectly intact. Traces of file marks are still visible around working end. | $\begin{array}{r} \text { L. } 79.5 \mathrm{~mm} ; \\ \text { W. } 15.5 \mathrm{~mm} \text {; } \\ \text { T. } 8.5 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 1953 | 244 | Sheep/goat metacarpal/metatarsal which retains full circumference of shaft for final $c a .35 \mathrm{~mm}$ at distal end of bone. Distal articulation appears to have been broken off. At $c a .35 \mathrm{~mm}$ below top, shaft has been cut obliquely from one side as far as opposite wall leaving only a thin projection of bone. Projection has been worked in the round to form finely shaped oval sectioned working end which tapers evenly to sharp point, becoming more rounded in section in lower half. Working end is very finely-worked. Point is intact but extreme tip seems broken. | L. 62 mm ; W.14mm; T. 10 mm |
| 2122 | 270 | Tiny, round sectioned short length of bone which tapers in the round to sharp point. Possibly represents tip of working end of point. Surface is slightly uneven. Lower half has fine, though patchy, surface polish. Possibly produced from full longbone shaft with tiny hole in centre representing marrow cavity. Some surface polish exists on broken upper surface. | L. 16 mm |
| 2128 | 267 | A well-made bone point tapering to end in a rounded blunt tip which has been burnt slightly, probably to harden it. The tip is also polished. The point is rectangular in section and there is a slight groove in one surface following the shape of the bone. Surfaces are smooth and worn. | $\begin{array}{r} \text { L. } 37.5 \mathrm{~mm} ; \\ \text { W. } 12.4 \mathrm{~mm} ; \\ \text { T. } 6.3 \mathrm{~mm} \end{array}$ |
| 2130 | 267 | Produced from longitudinal segment of wall of longbone of large animal. Retains trace of marrow cavity down centre. Sides taper to narrow point. Well made with secondary working down left side where fracture edge has been lightly smoothed and rounded. Final 25 mm of right side has been smoothed and rounded and final 14 mm of piece has been carefully-worked to finely rounded and sharply tapered point. Extreme tip of point broken. Remains of file marks encircling the working end are visible. | $\begin{array}{r} \mathrm{L} .91 \mathrm{~mm} ; \\ \text { W. } 21.5 \mathrm{~mm} ; \\ \text { T. } 8 \mathrm{~mm} \end{array}$ |
| 2134 | 267 | Well-made piece. Produced from longitudinal segment of longbone of large animal. Retains deeply curved section in upper half, fading out towards working end. Side runs parallel with rough fracture surfaces before tapering sharply at 34 mm above point on left and at 22 mm above point on right to form an oval/round sectioned working end. Rate of taper lessens at $c a$. 19 mm from point and working end tapers gently to point, tip of which is now broken. Final 5 mm possesses fine surface polish all around. | L.74mm; W. 17 mm ; T .7 mm |


| 2181 | 269 | Oval-sectioned length of bone worked in the round and tapered gently, with emphasis of taper in final few mm, to perfectly intact point. Well-worked but no surface manufacture marks or polish. | L. 17 mm ; W. 7 mm ; T. 5 mm |
| :---: | :---: | :---: | :---: |
| 2214 | 269 | Produced from longitudinal segment of longbone wall. Upper part retains deep concave-convex section with parallel sides but fracture surfaces are left rough. For final 29 mm on left, sides taper evenly to sharp point. This is repeated on right side for final 20 mm . In this tapered area sides become finely rounded into underside and for final 8 mm object is worked into roundsectioned working end which continues to taper in the round to sharp, fine, perfectly intact point. | L. 62 mm ; W. 9 mm ; T. 3 mm |
| 2218 | 279 | Fairly roughly-made piece. Produced from narrow longitudinal segment of longbone wall of large animal. Wedge-shaped in section in upper area with rough fracture surfaces. Sides taper fairly evenly in lower half but are approximately parallel above this. Is some secondary rounding of sides from point of taper and final 15 mm adopts a rounded cross-section which continues to taper to point, tip of which is now broken. This area also shows fine surface polish although surface is somewhat corroded. | L. 53 mm ; W.16mm; T. 8 mm |
| 2239 | 267 | Produced from wide longitudinal segment of longbone wall of large animal. Shape is quite symmetrical with evenly tapering sides, with slight outwards expansion around centre, to point. Almost rectangular in section with little trace of natural curved cross-section of longbone. Left fracture surface is rounded except for upper region, right fracture surface remains rough or has been damaged post manufacture. Final $c a .10 \mathrm{~mm}$ adopts rounded section and continues to taper in the round to point. Extreme tip of point is broken or damaged. Final few mm of point shows a deep surface polish. | L. 68.5 mm ; W.19mm; T .7 mm |
| 2269 | 267 | Very well-made piece. Produced from narrow longitudinal segment of longbone wall of large animal. Traces of marrow cavity almost totally obliterated by high level of modification. Fracture surfaces have been rounded and smoothed, merging into underside creating a smoothly oval cross-section throughout length. Sides taper fairly evenly to point but more strongly for final $c a .10 \mathrm{~mm}$ when object also adopts a rounded cross-section. Point intact. Fine file marks visible in places on surface. | L.67mm; W. 11 mm ; T. 8 mm |


| 2278 | 244 | Very finely-worked piece Produced from longitudinal segment of longbone wall. Originally retained deeply curved section in upper area, diminishing towards point, but right upper side is broken post manufacture. Left side tapers evenly to point as does remaining right side. Fracture surfaces on left are rounded, merging with underside in continuous curve from mid-length. Remaining right side also merges into underside. Final 9 mm adopts a finely-rounded cross-section which continues to taper in round to sharp point, extreme tip of which is now broken. Surface is extensively root-marked. Lower area, especially working end, displays a fine surface polish. | L. 43 mm ; W. 7 mm ; T. 3.5 mm |
| :---: | :---: | :---: | :---: |
| 2293 | 271 | Produced from longitudinal segment of longbone wall. Fracture surfaces taper unevenly to point. No evidence of any secondary working and therefore no real differentiation between working end and upper part. Final $c a .15 \mathrm{~mm}$ displays slight sheen which overlies rough fracture surfaces suggesting this is result of use. Upper part has a shallow concave-convex section. Trace of marrow cavity continues down to tip. Point intact. | L. 71.5 mm ; W. 10 mm ; T.3.5mm |
| 2297 | 85 | Fairly well-made piece. Produced from longitudinal segment of longbone wall of large animal. Upper part is triangular in crosssection with no secondary working. Sides taper throughout length but show a greater degree of taper approaching point. Lower half becomes roughly rounded with degree of modification becoming greater nearing tip. Final $c a .10 \mathrm{~mm}$ is worked to finely-rounded form and appears to have tapered to finely-pointed tip, which is now broken. Manufacture marks have been polished away either as part of manufacture process or through use. | L. 99 mm ; W. 17 mm ; T. 15 mm |
| 2304 | 217 | Produced from longitudinal segment of longbone. Broadly wedge shaped in section with sides tapering evenly to sharp point. Final 6 mm adopts more rounded cross-section and continues to taper to point. Faint traces of surface polish survives, especially around final few mm. Surface is otherwise very corroded so details of manufacture are not clear. Point perfectly intact. | L. 32 mm ; W. 5.5 mm ; T. 3 mm |
| 2309 | 244 | Produced from wide longitudinal segment of longbone wall. Broadly rectangular in section at top, just retaining a trace of marrow cavity almost to point. In upper half fracture surfaces show no secondary working and sides are somewhat irregular. In lower half, i.e. final $c a .27 \mathrm{~mm}$, fracture surfaces become rounded and adopt a regular taper to sharp point. Final 8 mm is worked in round to oval section shape and tapers in round to perfectly intact point. Faint horizontal file marks on lower sides. | $\begin{array}{r} \text { L. } 55 \mathrm{~mm} ; \\ \mathrm{W} .13 .5 \mathrm{~mm} ; \\ \mathrm{T} .3 \mathrm{~mm} \end{array}$ |


| 2314 | 285 | Produced from wide longitudinal segment of longbone wall. Upper part of object is almost rectangular shaped in section with little trace of marrow cavity. Right side tapers evenly, with a slight outward curve in upper half to point. Left side appears to have been same but its upper area is now broken, possibly postmanufacture. Fracture surfaces are finely rounded and smoothed. For final 16 mm object tapers more sharply to point and for final 5 mm object is worked into a round section shape. Tip of point is now broken. | L. 53 mm ; W.16mm; T. 6.5 mm |
| :---: | :---: | :---: | :---: |
| 2316 | 279 | Produced either from longitudinal segment of long bone or from antler. Approximately oval/rectangular in section. Right side tapers evenly to point. Left side splays outwards from top for just less than half of length before turning in an obtuse angle and tapering evenly to point. Sides are smoothed and rounded throughout length. For final 14 mm object is worked to approximately oval sectioned working end, continuing to taper to sharp perfectly intact point. Final 14 mm has fine surface polish all round. | $\begin{array}{r} \mathrm{L} .53 \mathrm{~mm} ; \\ \mathrm{W} .12 \mathrm{~mm} ; \\ \mathrm{T} .6 \mathrm{~mm} \end{array}$ |
| 2317 | 279 | Produced from longitudinal segment of longbone wall of large animal. Retains shallow curved section shape through most of length. Right side tapers evenly to point, left is slightly more irregular Fracture surfaces have been slightly rounded throughout most of length but left remains rough in area immediately below top. From midpoint sides become rounded into underside and from $c a .12 \mathrm{~mm}$ above point object is worked in the round, adopting finely shaped oval cross-section while continuing to taper to sharp perfectly intact point. Horizontal file marks clearly visible along upper sides. Final 20 mm on sides and underside show fine polish. | L. 75 mm ; W. 11 mm ; T. 5 mm |
| 2383 | 267 | Produced from longitudinal segment of wall of longbone of large animal. Very well made. Retains strongly curved cross-section down most of length. Most of left fracture edge has been finely rounded and smoothed. Some effort has also been made to smoothen fracture edge on right. Sides are approximately parallel in upper part. At $c a .40 \mathrm{~mm}$ from lower end sides converge abruptly to form a finely round sectioned and elongated working end which lies mainly to one side (i.e. tapers more strongly on right) and which continues to taper towards point. A sliver of bone has broken from left side of working end, post-manufacture but in antiquity. There was no attempt to erase this mark. Actual point is intact but appears slightly damaged from use. Upper $1 / 3$ of object shows little secondary working and fracture edges are left mainly rough. Sides of working end show strong marks of filing which are not visible on rounded fracture surfaces above. Some transverse filing marks are visible on underside above working end. | L. 114 mm W. 20 mm ; T. 11 mm |


| 2386 | 253 | Produced from narrow longitudinal segment of longbone wall of large animal. Upper part is almost square sectioned but with trace of marrow cavity continuing down most of length. Sides run parallel with no secondary working of fracture surfaces. Final $c a$. 25 mm shows a sudden lateral curve and from here fracture surfaces become rounded, merging into underside a few mm below this. From this spot working end becomes more finely rounded as it approaches broken point, taking on rounded section for final 10 mm . | L.65mm; W. 12 mm ; T. 8 mm |
| :---: | :---: | :---: | :---: |
| 2394 | 88 | Possible broken working end from larger point. Sub-oval in section - shaped from sides and front surface. Tapers evenly from sides and front surface to point. Point intact but extreme tip is broken. Upper surface is rough and may be broken. Faint file marks visible down sides and on lower underside. | L.30mm; W. 11 mm ; T. 6.5 mm |
| 2408 | 283 | Produced from longitudinal segment of longbone wall of large animal. Upper part is wedge sectioned with fracture surfaces showing no secondary working. Sides are irregularly parallel. Trace of marrow cavity continues through most of length. For final 25 mm fracture surfaces become rounded and taper evenly to point. Final 14 mm adopts finely rounded, stout, section shape which continues to taper in the round to point. Tip of point is now broken. Horizontal file marks are clearly visible at sides, these have been obliterated by final polish on lower 10 mm , either as a result of manufacture or of use. | L. 72 mm ; W. 17 mm ; T. 8 mm |
| 2427 | 290 | Produced from narrow longitudinal segment of longbone wall of large animal. Wedge shaped in section throughout length, narrowing towards point. Retains trace of marrow cavity down centre almost to end. Laterally curved longitudinal axis. Sides taper evenly to point. Fracture surfaces left totally unworked. There is some smoothing of fracture surfaces in lower region but this appears to result from use. For final $c a .10 \mathrm{~mm}$ the anterior and posterior surfaces appear to have been bevelled to create a sharp point perfectly intact. | L. 84 mm ; <br> W.14mm; <br> T. 8 mm |
| 2435 | 282 | Cut from longitudinal segment of longbone wall. Sides run parallel until final 17 mm when they taper abruptly to point. Fracture surfaces of parallel sides are mainly unworked - there has been some rounding off of lower right fracture surface. Upper part is vaguely right angled in section due to manner in which it has been split from bone. This diminishes throughout length, especially from place of taper where section becomes more oval. Final 10 mm takes on oval cross-section and continues to taper to point, extreme tip of which is broken. | $\begin{array}{r} \text { L. } 45 \mathrm{~mm} ; \\ \text { W. } 8.5 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \end{array}$ |


| 2443 | 290 | Well-made piece. Produced from wide longitudinal segment of longbone wall of large animal. Wide rectangular in cross-section with slight trace of marrow cavity on front surface. Sides are vaguely rounded and adopt even taper to point from 8 mm below top. Sides become more rounded towards working end and the final 6 mm adopts a finely circular cross-section, continuing to taper to point, tip of which is now broken. Upper sides display clearly visible horizontal file marks. Rounded part of working end shows very fine surface polish with no manufacture marks visible. Underside also has surface sheen though natural bone surface texture has not been worked away. | L. 45 mm ; W. 15 mm ; T. 5 mm |
| :---: | :---: | :---: | :---: |
| 2491 | 283 | Produced from longitudinal segment of longbone wall. Sides taper evenly to point with slight outward bulge around centre. Upper left side broken. Retains deep curved section in upper half, fading out completely in lower half to create oval section which continues to taper from sides to point. Fracture surfaces are finely rounded into underside throughout length, especially in upper half. Final $c a .6 \mathrm{~mm}$ tapers on all surfaces to intact point. Fine file marks visible over much of surface. Just below top is a longitudinal slit or eye, 8 mm long. | $\begin{gathered} \mathrm{L} .51 \mathrm{~mm} ; \\ \text { W. } 8 \mathrm{~mm} \text {; } \\ \text { T. } 3 \mathrm{~mm} \end{gathered}$ |
| 2523 | 244 | Produced from longitudinal segment of longbone wall of large animal. Upper area has parallel sides with rough fracture surfaces, possibly broken post manufacture. Some trace of marrow cavity continues to just above working end. On lower left side above working end is level fracture surface with appearance of being knife cut. Lower $1 / 3$ of object comprises working end where sides begin to taper and cross-section becomes rounded, continuing to taper to point. Transition from parallel sides to tapered sides is gradual on left but on right, side has been cut inwards obliquely to produce narrow working end. Point is intact though possibly slightly damaged. Horizontal file marks are clearly visible at sides and underside on upper working end. Lower working end displays fine surface polish. | L. 57 mm ; W. 15 mm ; T. 7 mm |
| 2524 | 9 | Produced from longitudinal segment of longbone of large animal. Poorly made. Upper part retains deeply curved section which fades out at approximate centre. Longitudinal axis is strongly curved laterally but otherwise sides taper evenly to point. Fracture surfaces seem to be left rough but final $c a .25 \mathrm{~mm}$ on right have been reworked to roughly rounded form. Final $c a$. 10 mm have been worked from both sides to form triangular sectioned working end. Point is intact. | L. 75 mm ; <br> W. 25 mm ; <br> T. 3 mm |


| 2583 | 297 | Produced from longitudinal segment of longbone of large animal. Upper half retains a curved cross-section. Sides converge evenly throughout length to, now missing, point. Working end is triangular/oval sectioned, becoming more clearly oval towards lower end. Secondary working has taken place around working end as demonstrated by rounded edges. Surface is poorly preserved and fine detail of surface finish is not visible. Fracture surfaces in upper region appear to have been slightly smoothed. | L. 80 mm ; W. 17 mm ; T.10mm |
| :---: | :---: | :---: | :---: |
| 2642 | 83 | Well made piece cut from narrow longitudinal segment of longbone wall. Section shape is almost oval/rectangular throughout most of length with trace of marrow cavity remaining, in form of shallow groove, down front. Fracture surfaces are well rounded, partly merging into underside. Sides are approximately parallel, slightly expanding towards midline, before tapering at 19 mm from point. Final 6-7mm takes on perfectly rounded cross- section, tapering in round to point which is now broken away. Top is intact with some secondary finishing. No manufacture marks visible but worked surface has good polish. | L. 50 mm |
| 2665 | 257 | Produced from longitudinal segment of longbone wall of large animal. Very well made piece. Retains deeply curved section in upper part. Sides converge evenly to round sectioned and tapered working end, extreme tip of which is now broken. Fracture surfaces have been smoothed throughout their extent; from $c a$. $1 / 3$ distance from top they are finely rounded and smoothed, blending into underside nearer tip. Final 10 mm have been finely rounded to round sectioned point; its extreme tip broken. No manufacture marks visible - may have been either polished or worn off surface from use. | L. 103 mm ; <br> W. 22 mm ; <br> T. 8 mm |
| 2667 | 253 | Produced from longitudinal segment of longbone. Sides taper evenly to sharp point. Upper half retains curved section shape. Fracture surfaces left rough until $c a .17 \mathrm{~mm}$ above point on right (unclear on left due to damage) where they become rounded and blended into underside. From $c a .13 \mathrm{~mm}$ above point, object is worked in round to form fine round sectioned and sharp point, extreme tip of which is broken. | L. 44 mm ; W. 7 mm ; T. 3 mm |
| 2718 | 1201 | Produced from a narrow longitudinal segment of longbone wall of large animal. Well made. Retains spongy bone in upper area. Flat top may represent part of articular surface of longbone. Rectangular/square in section with curved edges i.e. fracture surfaces have been rounded. Slightly angled to one side at approximate centre. Upper left side is split away, probably post manufacture. Sides taper evenly to point below angle. At 15 mm from lower end section assumes a rounded shape and continues to taper to intact point. Final 15 mm of point bears fine surface polish in patches. Outer layer of bone has peeled away in areas between these patches of polish and also possibly over remaining | $\begin{array}{r} \mathrm{L} .60 \mathrm{~mm} ; \\ \mathrm{W} .10 \mathrm{~mm} ; \\ \text { T. } 9 \mathrm{~mm} \end{array}$ |


|  |  | surface of object. |  |
| :---: | :---: | :---: | :---: |
| 2739 | 1202 | Very crudely produced piece composed from broad segment of longbone wall. Left side tapers fairly regularly to point while right side is irregular to 20 mm above point; from here it again tapers fairly evenly. No secondary working of fracture edges visible except for final $10-12 \mathrm{~mm}$ above point where what appears to be a couple of secondary cut marks are visible at edges. There has been little or no attempt to round these edges; slight polish displayed in this area may be due to use. | $\begin{array}{r} \text { L. } 120 \mathrm{~mm} ; \\ \text { W. } 24-17 \mathrm{~mm} \\ \text { T. } 4 \mathrm{~mm} \end{array}$ |
| 2741 | 1020 | Cut from longitudinal segment of longbone of large animal. Upper sides are irregularly parallel while lower half tapers evenly and symmetrically to point. Wedge shaped section in upper half becomes rectangular in lower half. Bone surface is very corroded, making it difficult to say whether upper fracture surfaces have secondary working or not. Fracture surfaces on lower tapered part are slightly rounded. Point is intact. Lower fracture surfaces have slight shine but no clear manufacture marks. | L. 69.5 mm ; W. 11 mm ; T. 5 mm |
| 2772 | 1212 | Produced from wide longitudinal segment of longbone of large animal. Sides are irregular with fracture surfaces showing little secondary working above working end. Curved section persists in upper area but final 27 mm has been worked into oval/round section; tapers evenly to intact point. Transverse fine marks are visible on rounded sides above working end. Final 16 mm bears fine surface polish all round. | L. 82 mm ; <br> W.18mm; <br> T. 9 mm |
| 2781 | 1218 | Produced from narrow longitudinal segment of longbone of large animal. Trace of marrow cavity survives in upper half. Sides taper somewhat unevenly to pointed end with very slight lateral curve. Left fracture surfaces show no secondary working while right fracture surfaces are slightly smoothed and rounded. Working end comprises final $c a .1 / 3$ of length when object becomes gradually worked in round to form round sectioned tapering point. Point is intact. Actual working end surface bears a fine surface sheen. | L.83.5mm; <br> W. 10.5 mm ; <br> T. 7.5 mm |
| 2782 | 1218 | Produced from longitudinal segment of longbone of large animal. Upper area retains curved section which diminishes towards working end. Sides taper evenly to point. Fracture surfaces are left rough above working end. At 20 mm from point object assumes a triangular cross-section and cut sides become slightly smoothed and rounded. Continues to taper to sharp, perfectly intact, point. Final few mm above point retains all round surface polish. | L. 72 mm ; W. 15 mm ; T. 5 mm |


| 2786 | 1219 | Produced from longitudinal segment of longbone - outer wall only is utilised and therefore piece retains no trace of marrow cavity in its cross-section. Sides run parallel at slight diagonal before tapering evenly to point. Upper edges are left rough. From point at which taper begins, sides become rounded into underside. Lower working end, for final 10 mm , is finely rounded into Dshaped cross-section. Front surface is flat, having been split longitudinally - this may have happened post manufacture as there are now no signs of working on this front surface. Point intact. | L. $44 \mathrm{~mm} ;$ $\mathrm{W} .25-3 \mathrm{~mm} ;$ $\mathrm{T} .6 .5-3 \mathrm{~mm}$ |
| :---: | :---: | :---: | :---: |
| 2797 | 1220 | Small, roughly made piece. Produced from longitudinal segment of longbone. Irregularly tapering sides with vaguely curved crosssection. At approximate centre object adopts semi-rounded crosssection and sides run parallel before converging a few mm above tip. Lower half bears good surface polish. | $\begin{array}{r} \text { L. } 24 \mathrm{~mm} ; \\ \text { W. } 6-2 \mathrm{~mm} ; \\ \text { T. } 3-2 \mathrm{~mm} \end{array}$ |
| 2815 | 1204 | Produced from segment of longbone of large animal. Retains shallowly curved section in upper region. Left side tapers evenly to point. Right side tapers more irregularly. Fracture surfaces left unworked. From 25 mm above point fracture edges become smoothed and rounded, merging into underside and front surface, forming a rounded cross-section which continues to taper to intact point. Rounded working end retains good surface polish with no actual file marks visible. | L. 81.5 mm ; <br> W.15mm; T. 5 mm |
| 2846 | 1224 | Produced from metacarpal/metatarsal of sheep/goat. Working end is very finely-worked. Upper part retains full circumference of longbone shaft with distal articulation broken off. Working end has been produced by removing section of shaft for final 43 mm , leaving projection of bone, of ccs, which tapers evenly and symmetrically throughout length to point. Fracture surfaces are rounded for most of length, merging into underside for final 23 mm . Final 6 mm takes on finely rounded section, tapering in the round to point, tip of which is broken. Fracture surfaces on lower working end bear very fine surface polish. Faint trace of horizontal filing on tapered sides. | $\begin{array}{r} \mathrm{L} .62 .5 \mathrm{~mm} \\ \mathrm{~W} .13 \mathrm{~mm} \\ \text { T. } 9 \mathrm{~mm} \end{array}$ |
| 2924 | 1226 | Produced from wide longitudinal segment of longbone wall. Deeply curved section in upper area. Fracture surfaces in upper region appear to have been cut with knife on left side but are left rough on right. For final 30 mm there appears to have been an attempt to rework piece into broad oval section. This becomes more pronounced towards point. Final part of point is broken away. Surface is quite corroded with no surface detail apparent. | $\begin{array}{r} \text { L. } 81 \mathrm{~mm} ; \\ \text { W. } 24-9.5 \mathrm{~mm} ; \\ \text { T. } 6-5 \mathrm{~mm} \end{array}$ |


| 2978 | 1225 | Produced from longitudinal segment of longbone of large animal. Exceptionally stout in its proportions. Retains part of marrow cavity down most of length, diminishing towards point. Fracture surfaces have been rounded into underside on right and either left rough or broken post manufacture on left. Sides taper evenly to point. Object is worked in the round for final 30 mm , assuming a perfectly rounded cross-section for final 22 mm . Point seems either worn or deliberately blunted and, while intact, is slightly damaged on one side. Round sectioned point has a slight surface polish. Surface is generally quite rough and root marked. | L. 77 mm ; W. 21 mm ; T.10mm |
| :---: | :---: | :---: | :---: |
| 2996 | 1219 | Produced from longitudinal segment of longbone. Almost rectangular in section with faint trace of marrow cavity. Fracture surfaces left rough and taper unevenly to point. Final 10 mm is worked from sides and front to form irregularly round sectioned point; tapers evenly to sharp tip. Underside is left largely unworked. Point still intact. Faint diagonal file marks are visible around point for final 10 mm . | L. 40.5 mm ; W. 9 mm ; T. 5 mm |
| 2997 | 1224 | Well-worked piece. Produced from longitudinal segment of longbone wall. Sides taper evenly to point. Upper left corner of top is broken. Upper area retains curved section shape with fracture surfaces showing no secondary working. Some secondary working appears for final 22 mm on left and for final 16 mm on right where sides become slightly smoothed - may also be result of use. Final 10 mm is worked in round to form a fine round sectioned working end which tapers to sharp point. Faint transverse file marks are visible around lower working end. | L. 49 mm ; W. 8 mm ; T. 3 mm |
| 3033 | 1224 | Produced from sheep/goat metatarsal. The proximal epiphyses is retained in upper part. At 20 mm below top shaft of longbone has been broken away leaving a narrow segment projecting for a further $c a .67 \mathrm{~mm}$. This segment is curved in section with parallel sides; fracture surfaces appear to be cut instead of broken and are, therefore, quite smooth. From 13 mm above point on left and 17 mm on right, sides taper to form a sharp point. Some rounding of fracture surfaces is visible above taper, especially on left. At 9 mm from point, a finely rounded section is assumed. Point is intact. Both knife cut marks and file marks are visible on tapered edges. File marks are also visible on underside in this area and on final few mm of point. | L. 86 mm |
| 4012 | US | Incomplete bone point. Polished surfaces. Sides tapering to a blunt point. | L. 54.1 mm ; W.7.4mm; T. 3.4 mm |
| 4019 | 99/68 | Curved bone point - worked only at the tip. The external surface of the bone is flat and smooth and the inner surface is rough and grooved. Sub-rectangular in section. | L. 94.3 mm ; <br> W. 22.5 mm ; <br> T. 6 mm |


| 4032 | $253 / 255$ | Incomplete bone point. Produced from longitudinal segment of <br> longbone of large animal. Retains part of marrow cavity down <br> most of length, diminishing towards point. Fracture surfaces have <br> been rounded into underside on right and broken post <br> manufacture on left. Sides taper evenly to point. Object is worked <br> in the round (now damaged on left) for final 19mm. Point is <br> lightly damaged on one side. Polished surface at point. | L. $52 \mathrm{~mm} ;$ <br> W. $13 \mathrm{~mm} ;$ <br> T. 6 mm |  |
| :--- | :---: | :--- | :--- | ---: |
| 4035 | 258 | Gouge. An incomplete hollow bone point. Only point and lower <br> part of shaft intact. From 34mm above point one side of shaft has <br> been split away for remainder of length. Remaining projection <br> has been worked into tapered point. Oval in section. Final 7mm <br> adopts oval section shape, tapering to a sharp point, tip of which <br> is now missing. Upper rims of articular condyles have been <br> trimmed away. Some patches of wear polish are clearly visible on <br> sides of point. | T. $83 \mathrm{~mm} ;$ |  |

## Appendix 1.23 Bone Needles and Pins Catalogue (M. FitzGerald)

## Type 1: Boat-shaped needles

Find No. Feature Description

## Dimensions

| 828 | 208 | Incomplete. Tip and about one-third of shank of polished bone needle; broken near centre. The shank is roughly U-shaped in section with a groove on one surface. Tapers in width from 5 mm at point of breakage to 2 mm at slightly off-centre, blunt tip. Broken below where perforation may have been. Central longitudinal groove which fades out towards tip; 2 mm wide by 25 mm long and 1 mm deep. Patches of polish along both edges of it. | L. 36 mm ; W. 5 mm ; T. 3.5 mm |
| :---: | :---: | :---: | :---: |
| 843 | 202 | Incomplete. About half of shank and tip of bone needle. Shank is oval in section with slightly curved profile. Tapers from 7 mm by 4 mm to 1 mm diameter at sharp tip. Broken across central slottype perforation. Surfaces are rough and uneven, though needle is quite well-made and has traces of polish along the shank. Longitudinal groove on both surfaces. On one side it tapers and fades out from central perforation to point ( 14 mm long by 3 mm to 1 mm wide). Groove in other surface is more pronounced but also tapers out to point ( 17 mm long by 3 mm to 1 mm wide). Perforation is 3 mm wide and 5 mm long; the needle is broken at this point. | L. 49 mm ; W. 6 mm ; T. 4 mm , |
| 960 | 41 | Incomplete. Tip missing and one side of central slot-type perforation. Shank is rectangular with rounded sides in section; slightly curved profile. Tapers from 6 mm by 3 mm to 2 mm diameter at blunt point. Surfaces are worn, have traces of polish along shank. Central perforation is 9 mm long, and $c a$. 2 mm wide. A short shallow longitudinal groove on both sides - either side of perforation. Groove in 'outer' surface tapers from perforation to shallow point, from 2 mm to 1 mm , and is 23 mm long. Groove in other surface is similar but continues to where shank is broken; 32 mm long and tapers from 2 mm to 1 mm . | $\begin{array}{r} \hline \text { L. } 68 \mathrm{~mm} ; \\ \text { W. } 55 \mathrm{~mm} ; \\ \text { T. } 3 \mathrm{~mm} \end{array}$ |


| 1240 | 255 | Incomplete. Two fragments of two needles. Both are finely made and are polished, and have broken across the perforation. A) has a shank of rectangular section with a tapering shank, from 6 mm at the perforation to 1 mm at the blunt tip. The tip is slightly offcentre. Shank is broken across the perforation. The profile is straight, and the needle is polished. There is a longitudinal groove on both surfaces, one more prominent than the other. The former tapers, and fades out towards the tip; 30 mm long and 2 mm wide. The groove on the other side tapers from the perforation to a point, and is shallow; 1 mm long, 1.5 mm wide. Slot-like perforation is 6 mm long by 1.5 mm wide. B) has a fine shank which tapers to a point, from 5 mm by 2 mm at the perforation to 1 mm diameter at the blunt tip. Rectangular with rounded sides in section; straight in profile. It has a slightly short longitudinal groove on both surfaces, tapering from the slot-like perforation. In one surface it is 14 mm long by 2 mm wide, and in the other it is 10 mm by 1 mm . The perforation is 6 mm by approximately 2 mm wide, and the needle has broken across it. | A) L. 40 mm ; <br> W. 5.5 mm ; <br> T. 2 mm <br> B)L. 29 mm ; <br> W.6mm; T. 2 mm |
| :---: | :---: | :---: | :---: |
| 1753 | 244 | Incomplete. Two shank fragments. Shank is oval in section with slightly curved profile. Tapers from 7 mm by 3.5 mm in the centre to 1 mm in diameter at the blunt point at each end. Surfaces are smooth, with traces of polish along the shank. There is a central groove and perforation. Short groove in both surfaces, 13 mm and 18 mm long respectively, which taper from 2 mm wide to a point. Grooves are carved diagonally across the shank. Faint grooves in the other piece of the needle. The central, slot-like, perforation has a diameter of 2 mm and is 5.5 mm long; the needle is broken across it. | $\begin{array}{r} \mathrm{L} .58 \mathrm{~mm} \mathrm{x} \\ 46.5 \mathrm{~mm} ; \\ \mathrm{W} .7 \mathrm{~mm} ; \\ \mathrm{T} .4 \mathrm{~mm} \end{array}$ |
| 2200 | 282 | Complete. Polished needle. Shank is very finely made. Curved profile, tapers from an oval section of 6 mm by 3.5 mm to a circular section of 2 mm diameter at blunt point at either end. Surfaces are polished but also quite worn. Central groove and perforation. Longitudinal groove in both surfaces which only extends from a maximum of 5 mm beyond the perforation. Tapers to a point. Slot-type perforation is 11 mm long by 2 mm wide. | L. 88 mm ; W. 6.5 mm ; T. 3.5 mm |


| 2272 | 284 | Incomplete. Very tip of one end is missing. The shank is finely <br> made. Curved profile. Oval in section at centre and for one half, <br> but tapering to a circular section for the other half. Tapers from <br> 8mm by 4.5mm to 2 mm in diameter at the blunt tip. Central <br> groove in both surfaces and a perforation. Extensive patches of <br> polish remaining, but the surfaces are worn. A short longitudinal <br> groove tapering to a point either side of the perforation in both <br> surfaces of the needle. On the outer surface, it starts just above <br> the perforation and fades out along the oval-section half; 23mm <br> long by 5mm wide. Groove in the inner surface tapers from either <br> side of the perforation to a point, and is 8 mm long by W. 5 mm <br> wide. Slot-type perforation is 6 mm by 5 mm. | L. $09 \mathrm{~mm} ;$ <br> W. $8 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | :--- |

Type 1b: Bone needle

| 1069 | 217 | Complete; finely-made, tapering needle with perforation and <br> groove. The head is rounded and undifferentiated from rest of <br> needle. Oval in section. Groove on outer surface continues to top <br> of head. The shank is rectangular in section; curved in profile. <br> Tapers from 7mm by 3.5mm to 2 mm in diameter at blunt tip. <br> Oval-shaped, slightly off-centre perforation, 4.5mm long by | L.98.5mm; <br> l.5mm wide located just below head. Groove either side of <br> perforation in both surfaces. Surfaces are very worn but there are |
| :--- | :--- | :--- | ---: |
| faint <br> faraces of polish along sides. Groove in one surface it starts |  |  |  |
| just below head, above perforation, widens to take in perforation, <br> and then gradually fades out above tip; 2mm wide, and 54 mm <br> long. Groove in other surface is 15.5 mm long and is diagonal <br> across shank, taking in the slot-like perforation. |  |  |  |

Type 2: Bone needles

| 36 | 9 | Incomplete. Lower part of shank and tip missing. Head is <br> unexpanded and perforated with slightly rounded top (L. $5 \mathrm{~mm} ;$ <br> W.5.5mm; T.2mm). Rectangular with rounded sides in section. <br> Eccentric perforation (D.2.5mm) is hour-glass in section. Shank | L. $25 \mathrm{~mm} ;$ <br> is oval in section and slightly curved in profile. Tapers from <br> diameter of 5mm by 3mm to 3.5mm by 3mm. Traces of polish on <br> head and along shank. |
| :--- | :--- | :--- | ---: |
| 1137 | 88 | Complete. Two parts. Unexpanded perforated oval-shaped head <br> and tapering shank. Top is square off. Rectangular with rounded <br> sides in cross-section. Eccentric perforation (D.3mm) A second <br> perforation attempt (D.1.5mm) below. The shank is flattened oval <br> in section and curved in profile. Tapers from 6mm by 3mm to | W.76mm; <br> 2mm at blunt point. Surfaces are worn but there are patches of |
| polish along shank. |  |  |  |


| 1146 | 217 | Incomplete. Head missing. Broken just below perforation. Shank tapers from rectangular section of 5 mm by 2.5 mm to circular section of 2 mm diameter at blunt tip. Slightly curved profile. Slight groove in one surface. Surfaces are worn with traces of polish around tip. Slight longitudinal groove, 24.5 mm long by 2 mm wide, which tapers and fades out towards the point. | L. 57 mm ; W. 5 mm ; T. 3 mm |
| :---: | :---: | :---: | :---: |
| 1385 | 217 | Incomplete. Two fragments. Tip missing. Unexpanded rounded head (L. $8 \mathrm{~mm}, \mathrm{~W} .7 .5 \mathrm{~mm}$; T.3mm) with rectangular with rounded sides section. Top of head is slightly flattened. Perforation is hour-glass in shape (D.2mm). Shank is flattened circular in section and tapers from 6 mm by 4 mm below head to 3.5 mm by 3 mm . Surfaces are smooth with patches of polish at head and along shank. | L. 48 mm ; W. 5 mm ; T. 4 mm |
| 1412 | 220 | Complete. Rounded unexpanded head (L.8.5mm; W.7.5mm; T.2.5mm). Rectangular with rounded sides in section. Eccentric perforation of hour-glass shape (D. 3.5 mm ). Shank of flattened circular section and straight in profile. Fine and tapering from 5 mm by 3.5 mm below head to 2 mm in diameter at blunt tip. Traces of polish around tip but otherwise surfaces are worn and rough. | $\begin{array}{r} \mathrm{L} .45 \mathrm{~mm} ; \\ \mathrm{W} .4 .5 \mathrm{~mm} ; \\ \mathrm{T} .3 .5 \mathrm{~mm} \end{array}$ |
| 1964 | 257 | Incomplete. Shank and tip missing. Head appears to have been sliced deliberately at a diagonal angle in half. Top of head is flat. Rectangular with rounded side in section. Cylindrical perforation (D.3mm). Surfaces are smooth and polished. | L. 18 mm ; W.4mm; T. 4 mm |
| 2108 | 244 | Complete. Unexpanded head and tapering shank. Head is squareshaped (L. 6 mm ; W. 6 mm ; T.2mm) with rounded top. Rectangular with rounded sides in section. Perforation is hour-glass shaped (D. 2 mm ). Shank of rectangular with rounded sides section and curved in profile. Tapers from 5 mm by 2 mm below head, to 2 mm by 1 mm at blunt tip. Slight groove in one surface from 9 mm below perforation (L. 36.5 mm long by 1 mm wide). Slight groove or incision above tip may be natural. Surfaces are worn and smooth with patches of polish, particularly on upper part of shank. | L. 71.5 mm ; W. 4.5 mm ; T. 3 mm |
| 2188 | 270 | Incomplete. Undifferentiated perforated head and upper part of shank. The head is rectangular in section and flat-topped (L. 4 mm ; W. 4.5 mm ; T. 3 mm ). Hour-glass perforation (D. 2 mm ). The shank is circular in section and a diameter of 4 mm . Fine and highly polished, grey in colour. | $\begin{aligned} & \text { L. } 25 \mathrm{~mm} ; \\ & \text { D. } 4 \mathrm{~mm} \end{aligned}$ |
| 2389 | 76 | Incomplete. Upper part of head missing. Unexpanded head and tapering shank. Rectangular in section (L.3mm; W.5.5mm; T.3mm). Hour-glass perforation (D. 2 mm ). Shank is rectangular with rounded sides in section and curved in profile. Tapers from 5.5 mm by 3 mm at head to 1.5 mm by 1 mm at blunt tip. Bone is dark brown in colour, and has worn surfaces. Faint traces of polish around perforation and just above tip. | L. 72 mm ; W at Hd. 6 mm , W.4.5; T. 3.5 mm |


| 2426 | 290 | Complete. Unexpanded head and tapering shank. Head is rectangular in shape with a rectangular with rounded sides section. Perforation (D.2mm) is hour-glass shaped. Evidence on one surface of vertically incised line either side of perforation but stopping before shank. Shank is rectangular with rounded sides in section and straight in profile. Curves very slightly towards point. Tapers from 4 mm by 3 mm below head to 1.5 mm in diameter at blunt tip. Surfaces are smooth and polished. | L.60mm; W.4mm; T. 3 mm |
| :---: | :---: | :---: | :---: |
| 2484 | 290 | Incomplete. Upper part of head missing. Unexpanded head and tapering shank. Flattened oval in section (L. 5 mm ; W. 7 mm ; T.3.5mm). Broken across cylindrical perforation (D.3mm). Shank is circular with rounded sides in section and curved in profile. Tapers from 5 mm by 3.5 mm below head to 2 mm in diameter at blunt tip. Surfaces are smooth and highly polished. | L. 80 mm ; W.6mm; T. 4 mm |
| 2501 | 802 | Complete. Unexpanded head and tapering shank. Head is oval in section (L. 23 mm ; W. 5 mm ; T.3mm). Eccentric perforation (D. 4 mm by 1.5 mm ) is pear-shaped. Indentation in back of head incorporates perforation. Evidence on one surface of vertically incised line either side of perforation. Surfaces are rough and worn. Shank is rectangular in section and curved in profile. Tapers from 5 mm by 3 mm at head to 1 mm in diameter at blunt tip. One side is flatter, smoother and has traces of polish. Other surfaces are rough and worn. | L. 74 mm ; W. 5 mm ; T. 2.5 mm |
| 2601 | 271 | Incomplete. Top of head missing. Unexpanded head (L.3.5mm, W. 6 mm ; T.3mm). Rectangular with rounded sides in section. Perforation is hour-glass shaped (D.1.5mm). Slight shallow groove, 11 mm long by 1 mm wide, extending from perforation down to shank. Shank is flattened oval to circular in section. Tapers from 6 mm by 3 mm at head to 1.5 mm in diameter at blunt tip. Slightly bent/angled in centre. Surfaces along shaft are slightly uneven but are smooth and polished. | L. 5 mm ; W. 5 mm ; T.3mm |
| 2606 | 912 | Complete. Unexpanded head and tapering shank. Head rectangular with rounded sides in section. Eccentric cylindrical perforation (D. 2 mm ). Shank is circular in section and tapers from 5 mm by 4 mm below head to 2 mm at blunt tip. Surfaces are worn and rough but there are traces of polish along sides of shank. | L. 63 mm ; D. 4 mm |
| 2661 | 253 | Complete. Unexpanded square head with rounded top (L.7mm; W. 7 mm ; T. 4 mm ). Rectangular with rounded sides, tapers slightly to one side in section. Off-centre perforation is rectangular with rounded corners, and is 3 mm by 2 mm . Head has smooth polished surfaces. Shank tapers from 5 mm by 3 mm below head to diameter of 1.5 mm at blunt tip. Finely made with smooth polished surfaces. | L. 54 mm ; W. 4 mm ; T. 3 mm |


| 4010 | 269 | Incomplete. Top of head and the point and lower part of shank <br> are missing. The shank is sub-rectangular in section. Tapers from <br> 5 mm to 4 mm in diameter. All surfaces are highly polished. | W. $25 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | ---: |

## PINS

Type 1: Plain bone pins

| 1300 | 253 | Complete. Plain undecorated-headed pin. The head is undifferentiated from shank. Slightly rounded top; rectangular with rounded sides in section. It measures 4 mm by 6 mm by 4 mm . No perforation. The shank is rectangular in section. Indents slightly about halfway down shank and tapers to a blunt but wellmade point 2 mm in diameter, from lower part of shank. Surfaces are smooth with patches of polish. |  |
| :---: | :---: | :---: | :---: |
| 1352 | 255 | Complete. Plain, undecorated, polished well-made pin. The head is undifferentiated from shank, slightly rounded top, and is rectangular with rounded sides in section. It measures 4 mm wide by 3 mm thick. No perforation. The shank is rectangular to circular in section, tapers from 4 mm by 3.5 mm to a 2 mm diameter at blunt tip. Slightly curved in profile. Smooth, polished surfaces. | L. 64 mm ; W. 4 mm ; T.3.5mm |
| 1744 | 239 | Complete. Undecorated, finely-made pin with a plain undifferentiated head and a tapering shank. The head is rectangular with rounded sides in section. Slightly rounded top; roughly square; measures 5 mm by 5 mm by 2.5 mm . No perforation. The shank is oval in section and curved in profile. Tapers from 5 mm by 2.5 mm at head to 2 mm by 1 mm at blunt tip. Surfaces are smooth and polished, highly so in places. |  |
| 1745 | 244 | Complete, fine, undecorated pin with plain, undifferentiated head. The head is flat-topped, circular in section, diameter of 3 mm . No perforation. Traces of polish around top. The shank tapers very slightly from diameter of 3 mm at head to 1 mm at sharp tip. In centre, section is oval. Straight in profile and has smooth surfaces. | L. 75.5 mm W.3.5mm T.3mm |
| 1775 | 239 | Complete. Fine, undecorated pin with a plain, undifferentiated head and tapering shank. The head is plain, flat-topped, rectangular in section and measuring 5 mm by 4.5 mm by 2.5 mm . No perforation. Traces of polish. The shank is flattened oval in section, 4 mm by 2.5 mm ; straight in profile. The lower part of shank widens slightly to 4.5 mm by 3 mm before curving slightly and tapering to blunt point of 2 mm in diameter. Surfaces are smooth and polished. | $\begin{array}{r} \mathrm{L} .59 \mathrm{~mm} \\ \mathrm{~W} .4 .5 \mathrm{~mm} \\ \mathrm{~T} .3 \mathrm{~mm} \end{array}$ |

L.53mm; D. 3 mm fine, undecorated pin. The head is rectangular in section, 4 mm by 1.5 mm . Slightly grooved in one surface, 10 mm long by 2 mm wide, from top of pin. No perforation. Surfaces are smooth and polished. The shank is rectangular in section but broadens out to become circular before beginning to taper; measures 4 mm by 4 mm at head to 3 mm diameter towards broken end. Surfaces are smooth and polished.

## Type :; Annular-headed bone pins

| 598 | 47 | Incomplete. Head fragment. An unexpanded flat rounded perforated head with rectangular with rounded sides in section. The perforation is oval-shaped of hour-glass form and slightly off-centre; diameter of 4 mm by 3 mm . The head is well-made, has smooth surfaces and remains of polish particularly along top of head. Bone is dark brown in colour. Beginning of shank at base of head is also oval in section. | L. 12mm; W. 10 mm ; T.3.5mm |
| :---: | :---: | :---: | :---: |
| 705 | 208 | Complete. In two parts. The unperforated head is expanded on one side and straight on the other with a tapering shank. The head is flattened oval in section; measures 10 mm by 8.5 mm by 5 mm . Rounded top, unperforated but with slight indentation, 3 mm in diameter, suggesting an attempt to perforate it. Smooth surfaces with traces of polish. The shank is sub-angular-shaped in section and tapers to circular section for blunt tip. Surfaces mid-shank have been squared off. The shank tapers from 7 mm by 5 mm below the head to 2 mm in diameter at the tip. Slight groove or nick, 2 mm by 2 mm , in one side 11 mm from tip which appears intentional. | $\begin{aligned} & \text { L. } 91 \mathrm{~mm} ; \\ & \text { D. } 5 \mathrm{~mm} \end{aligned}$ |
| 918 | 203 | Incomplete. Top of head missing. Undecorated pin with expanded rounded head. The head is rectangular with rounded sides in section. Perforation originally hour-glass in form but only about one-third remains, measuring 5 mm in diameter. It is off-centre, and may be cause of breakage. Remaining piece of head measures 8 mm by 8.5 mm by 2 mm . The shank is circular in section, gets thicker towards centre before tapering to point. Slightly curved profile. It measures 5.5 mm by 4 mm below head, expands to 5 mm in diameter at centre and tapers to 1 mm diameter at tip. Very rough, worn surfaces, though traces of polish evidence. | $\begin{gathered} \hline \text { L. } 95 \mathrm{~mm} \text {; } \\ \text { D. } 5 \mathrm{~mm} . \end{gathered}$ |


| 1231 | 255 | Complete. Undecorated pin with expanded head in two pieces. Circular expanded head of $10 \mathrm{~mm} \times 9 \mathrm{~mm}$ by 2.5 mm . Rectangular with rounded sides in section. Perforation is slightly eccentric, hour-glass in form of 3.5 mm in diameter. Polish along top of head. The shank is flattened, oval in section just below head, becoming more rounded to circular-sectioned towards middle of shank. Straight in profile. Length is 63 mm . Tapers from 5 mm by 3 mm below head to diameter of 5 mm in centre and of 2 mm at tip. Tip is still quite pointed. Polish along shank. | L. 73 mm ; D. 4.5 mm |
| :---: | :---: | :---: | :---: |
| 1467 | 239 | Complete. Well-made pin with expanded head. Flat, expanded, circular head measuring 12 mm by 10 mm by 3 mm . Rectangular with rounded sides in section. Perforation is hour-glass in form and 3.5 mm in diameter. Very slight, shallow groove in one surface either side of perforation, but not continuing down shank. Surfaces are smooth, traces of polish along edges. Shank is rectangular with rounded sides in section; curves very slightly in profile. Tapers from 6 mm by 4 mm to diameter of 2 mm at blunt tip. Smooth surfaces with patches of polish. | L. 94 mm ; W.6mm; T. 4.5 mm |
| 1727 | 217 | Complete. Crudely-made pin with expanded head and tapering shank. The head is expanded from shank on one side. Flat-topped and roughly squared off. Rectangular with rounded sides in section; measures 12 mm by 10 mm by 4 mm . Perforation is of hour-glass type and is slightly off-centre. It has a diameter of 2.5 mm . There is polish along the top of the head and around the perforation. The shank is irregularly shaped, roughly circular in section; tapers from 7 mm by 5 mm below head to a diameter of 2 mm , to blunt tip. Surfaces are rough and worn-weathered. | $\begin{array}{r} \text { L. } 70 \mathrm{~mm} ; \\ \text { W. } 6.5 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \end{array}$ |
| 1768 | 244 | Complete. Large fine undecorated pin with circular expanded head. The head is rectangular with rounded sides in section, slightly curved in profile, measuring 11 mm by 10 mm by 4.5 mm . Slightly off-centre perforation, hour-glass in form, 4 mm in diameter. The shank is circular in section, 4.5 mm in diameter below head, 5 mm in centre and 1.5 mm at tip. Widens in centre before tapering to sharp point. Surfaces are smooth and worn. No traces of polish left. | L. 101.5 mm ; D. 5 mm |
| 1874 | 244 | Complete. Finely-made. Undecorated pin with circular, expanded head and tapering shank. The head has a circular expanded head of 11.5 mm by 10 mm by 4.5 mm . Rectangular with rounded sides in section, slightly curved in profile. The perforation is slightly off-centre, hour-glass in section, diameter of 2.5 mm . Traces of polish around head. The shank is circular in section, tapers from 5 mm in diameter below head to 1.5 mm at blunt tip. Slightly curved profile. The tip is off-centre. Surfaces are smooth and worn with patches of polish. | L. 102.5 mm ; <br> D. 4.5 mm |


| 2398 | 244 | Incomplete. Elaborate pin head, broken at perforation. Head roughly inverted 'y'-shaped. Top is circular in section, tapering out to flattened oval section at perforation, from 3 mm in diameter to 9.5 mm by 5 mm . About one-third of perforation is remaining; probably hour-glass in section. On upper part of head, there are four narrow circumlinear grooves which give it a beaded effect. Top of head is slightly rounded. Traces of polish. Circular section. Surfaces are smooth and worn with traces of polish. | L. 47.5 mm W. 5 mm ; T. 4 mm . |
| :---: | :---: | :---: | :---: |
| 2563 | 297 | Complete; undecorated pin with circular expanded head (D.9mm; T .3 mm ) and tapering shank. Head is rectangular with rounded sides in section; centrally perforated. Perforation is 2 mm in diameter and is hour-glass in section. Surfaces are smooth, with polish along top of head. The shank is rectangular, with rounded sides in section and middle of shank where it becomes circular; 6 mm by 3 mm below head, 5 mm in centre before tapering to 1.5 mm at blunt tip. Surfaces are smooth and worn with patches of polish, particularly around centre of shank. | L. 102mm; W. at Hd .14 mm ; D. 5 mm |
| 2676 | 297a | Complete. Fine well-made pin with circular expanded head and tapering shank. Head ( 10 mm by 12 mm by 3 mm ) is rectangular with rounded sides in section. Large off-centre perforation is hour-glass in section and has a diameter of 5 mm . Smooth worn surfaces. The shank is circular in section and straight in profile. Tapers from 5 mm below head to 1.5 mm in diameter at blunt tip. Surfaces are worn and rough but have traces of polish along shank. | $\begin{array}{r} \text { L. } 68 \mathrm{~mm} ; \mathrm{W} \text {. } \\ \text { at Hd. } 11.5, \\ \text { D. } 5 \mathrm{~mm} \end{array}$ |
| Type :; Nail-headed pins |  |  |  |
| 1028 | 217 | Complete. Well-made undecorated, flat nail-headed pin with tapering shank. Head is flat and oval-shaped, 10 mm by 8 mm . Tapers in to shank. No perforation. Traces of polish around top. Shank is circular in section and tapers, from 5 mm to 1.5 mm , to sharp tip. Surfaces are worn, traces of polish especially around tip. | L. 71 mm ; <br> D. 5 mm |
| 1457 | 43 | Incomplete. Head and shank of a nail-headed pin. The head is round and flat (L. 5 mm ; D. 7 mm ) on top and narrow slightly to where it joins shank. Circular in cross-section with a slightly curved profile. The surface is worn with traces of polish. A small fragment is broken away at one side of head. | L. 43.5 mm ; D. 5 mm |


| 1633 | 239 | Complete. Well-made, undecorated pin with 'nail' head and fine <br> shank. The head is oval and flat-topped with a diameter of <br> 7.5mm. Tapers in to shank. No perforation. Top is smooth and <br> polished. The shank is circular in section and tapers from 5mm <br> below head to 1.5mm at tip in diameter. Lower part of shank is <br> worn and rough. Tip is blunt. Smooth surfaces and traces of <br> polish, particularly around tip. | L. $83 \mathrm{~mm} ;$ <br> W. $5 \mathrm{~mm} ;$ <br> T. 5 mm |
| :--- | :---: | :--- | :--- |
| 2989 | 1226 | Complete. In two fragments. Nail-headed pin. Head is flat-topped <br> and circular in section (4.5mm by 5.5mm). On one side it is in <br> line with the pin, elsewhere it overhangs shank. A slight <br> indentation below head, but shank then expands slightly and <br> maintains that thickness until it tapers to a blunt tip (D.2mm). <br> The shank is circular in section and straight in profile. Polished <br> pin. | L. $83 \mathrm{~mm} ;$ <br> D. 5 mm |

Miscellaneous bone pins

Crutch-headed pin

| 39 | 6 | Incomplete. Lower part of shank and tip missing. Crutch-head pin with tapering shank. The head is flat-topped, rectangular in section; measures 7.5 mm by 6 mm by 3 mm . Hour-glass sectioned perforation which is slightly off-centre and has a diameter of 3 mm . On top of head is finely-incised ' $x$ ' to one side. Traces of polish around head. The shank is flattened oval in cross-section; slightly curved profile. Tapers from 6 mm by 4 mm below head to 5 mm by 3 mm where broken. Smooth, slightly polished surfaces but in some places worn and more rough. | $\begin{array}{r} \mathrm{L} .52 \mathrm{~mm} \\ \mathrm{~W} .5 .5 \mathrm{~mm} \\ \text { T. } 3.5 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| Segmented-head bone pin |  |  |  |
| 499 | 56 | Complete. Finely-made pin with decorated head, tapering shank and blunt tip. The head is circular in section. Ornate head divided into four unequal panels, between 2 mm and 4 mm wide, by four incisions, $5 \mathrm{~mm}-1 \mathrm{~mm}$ wide, which produce beaded effect. Traces of polish on top and around head. The shank is circular in section; has curved profile from mid-shank to slightly blunt tip. Tapers from 4 mm , below head, to 2 mm in diameter at tip. Traces of polish along shank. | L. 77 mm ; D. 3 mm |

Paddle-headed bone pin

| 1022 | 217 | Incomplete. Undecorated expanded head and shank of pin. The head is rectangular of 18 mm by 11 mm by 5 mm ; expanded on one side, goes straight up from shank on the other. Rectangular in section. Incomplete perforation on both sides; hour-glass in section and 2.5 mm in diameter. Perforation attempts are not exactly opposite each other - would not join if continued through to opposing side. Surfaces are smooth with traces of polish. Only 20 mm of shank surviving. Tapers from 7 mm by 5 mm below head to 5 mmm in diameter. Surfaces are smooth and worn with traces of polish. | L.39.5mm; W. 7 mm ; T. 5 mm |
| :---: | :---: | :---: | :---: |
| Pig-fibula pin |  |  |  |
| 2162 | 281 | Complete. Fine undecorated pin with naturally expanded head and tapering shank. Carved from pig fibula. Head formed by joint end of bone. Rectangular in section and measures 10 mm by 13 mm by 4 mm . Triangular in shape - expanding from shank - and flat-topped. Perforation to one side which is funnel-shaped and has diameter of 2 mm . The shank is fine, circular in section and straight in profile. Tapers from 7 mm by 3 mm below head to diameters of 3 mm in centre and 1 mm at sharp tip. Lower shank is very curved. Notch just above tip, 1 mm by 1 mm - probably natural. Smooth surfaces with traces of polish. | L. 40 mm ; W. 45 mm ; T. 3.5 mm |

## Indeterminate bone pins/needles

| 511 | 98 | Incomplete. Shank fragment. Circular in section and straight profile. Rough worn surfaces with traces of polish. Tapers from diameter of 4 mm to 3 mm . | L.31.5mm; W. 5.5 mm ; T. 4 mm |
| :---: | :---: | :---: | :---: |
| 585 | 41 | Incomplete. Shank fragment. Oval in section and straight in profile. Smooth grey surface with traces of polish. Possibly from near tip of pin. | L. 17 mm ; W.3mm; T. 2.5 mm |
| 659 | 70 | Incomplete. Shank and tip fragment. Shank is rectangular with rounded sides in section and straight in profile. Tapers from 4 mm by 3 mm to diameter of 1 mm at blunt tip. Rough, worn surface, but traces of polish, especially around tip. | L. 26 mm ; W.4mm; T. 3 mm |
| 687 | 203 | Incomplete. Tapering shank fragment. Circular in section and slight 'bulge' suggests that it may have come from centre of pin shank. Tapers in diameter from 4.5 mm to 3 mm . Smooth worn surfaces. | $\begin{array}{r} \text { L. } 26 \mathrm{~mm} \text {; } \\ \text { W. } 4.5 \mathrm{~mm} \text {; } \\ \text { T. } 3.5 \mathrm{~mm} \end{array}$ |
| 971 | 82 | Incomplete. Short shank fragment. Diamond-shaped section. Bone is dark brown, almost black in colour. Surfaces are quite worn with traces of polish. | L. 17.5 mm ; W. 4.5 mm ; T. 3 mm |
| 1088 | 217 | Incomplete. Small shank fragment. Circular in section. Tapers from 5 mm to 4.5 mm . Smooth surfaces with traces of polish. | L. 21.5 mm ; W. 5 mm ; T. 5 mm |


| 1089 | 85 | Incomplete. Tip of finely-made bone pin. Shank is circular in section. Tapers from 4.5 mm to 1.5 mm in diameter, to blunt tip. Very, smooth, polished surfaces. | L. 21 mm ; <br> W. 44 mm ; <br> T. 4 mm |
| :---: | :---: | :---: | :---: |
| 1095 | 85 | Incomplete. Shank fragment. Oval in section. Tapers from 4mm by 3.5 mm to 3.5 mm by 3 mm . Smooth surfaces. | $\begin{array}{r} \mathrm{L} .12 \mathrm{~mm} ; \\ \mathrm{W} .3 .5 \mathrm{~mm} ; \\ \mathrm{T} .44 \mathrm{~mm} \\ \hline \end{array}$ |
| 1172 | 85 | Incomplete. Tip of pin shank. Flattened oval in section and slightly curved in profile. Tapers from 4 mm by 3 mm to 1 mm in diameter, to blunt point. | L. 19 mm ; W.6mm; T. 4 mm |
| 1178 | 219 | Incomplete. Pin roughout. Crude shank. Head and tip are missing. Roughly circular in section; sides have been crudely squared off. Tapers, from diameter of 6.5 mm to 6 mm by 4 mm , to semicircular section. Polish along edges of squaring off. | L. 27.5 mm ; W. 4 mm ; T. 3 mm |
| 1191 | 85 | Incomplete. Small polished shank fragment. Circular in section, 4.5 mm in diameter. Highly polished and dark grey in colour. Possibly from finely-made pin. | L. 11.5 mm ; D. 4.5 mm |
| 1196 | 90 | Incomplete. Shank in two fragments. Circular in section and straight in profile. Tapers from 4.5 mm to 3 mm in diameter. At wider end, sliver of bone has been removed lengthways from underside - may be secondary reworking. Patches of polish along shank. | L. 72 mm ; <br> D. 4.5 mm |
| 1234 | 255 | Incomplete. Shank fragment. Oval in section, shows little sign of working though there are two smooth surfaces. Rough weathered surface. | L. 15 mm ; W. 8 mm ; T. 7 mm |
| 1243 | 255 | Incomplete. Shank and tip in two fragments. Flattened circular section. Tapers from 4.5 mm by 4 mm to diameter of 2 mm at blunt tip. Slightly curved profile; tip is slightly off-centre. Polished surfaces - probably from finely-made pin. | L. 40 mm ; W. 4 mm ; T. 3.5 mm |
| 1254 | 220 | Incomplete. Shank and tip fragment. Flattened circular section, curved in profile. Tapers from 4 mm by 3 mm to 2 mm diameter at blunt tip. Surfaces are worn and rough. Traces of polish along shank and around tip. | L. 51 mm ; W.4mm; T. 3 mm |
| 1287 | 221 | Incomplete. Tip and shank fragment. Triangular in cross section with a slightly curved profile. Point is slightly rounded. Traces of polish on edges. Smooth surfaces. | L. 27 mm ; W.4mm; T. 3.5 mm |
| 1309 | 257 | Incomplete. Tip and shank fragment. Flattened oval in section, 4 mm by 3 mm , and tapers to blunt tip of 2 mm diameter. Curves slightly in profile. Traces of polish along shank and around tip. | $\mathrm{L} .33 \mathrm{~mm}$ $\text { D. } 3.5 \mathrm{~mm}$ |
| 1310 |  | Complete. Pin/needle rough-out. The head (L. 9 mm, W. 9 mm , T .4 mm ) is slightly expanded and curved on one side and straight on opposite site. The top is flat. Shaft (L.51.5mm; W.6.5mm; T. 4 mm ) is sub-rectangular in cross-section with one flat face and other side retaining the hollow natural bone. This narrows to an off-centre rounded tip. The upper surface and one long side appear polished. The opposite side and the underside are rough. | L. 60 mm ; W.9mm; T. 4 mm |


| 1472 | 239 | Incomplete. Tip and lower part of shank. Circular in section and 5 mm in diameter. Tapers to blunt tip of 2 mm in diameter. Smooth surfaces. | L.36.5mm; D. 5 mm |
| :---: | :---: | :---: | :---: |
| 1556 | 106 | Incomplete. Fine shank fragment. Flattened oval section. Tapers from 3.5 mm by 3 mm to 2 mm in diameter. Thinner end is worn and rough, otherwise surfaces are smooth. | L. 31.5 mm ; <br> W.3.5mm; T. 3 mm |
| 1563 | 113 | Incomplete. Shank fragment. Rectangular with rounded sides in section. Tapers slightly from 4 mm by 3 mm to 2 mm in diameter at blunt tip, patches of polish. Surfaces are rough and worn along shank. | L. 48 mm ; W. 4 mm ; T. 3 mm |
| 1648 | 51 | Incomplete. Tip and shank of pin. Circular in section. Tapers from 5 mm to 3 mm in diameter at blunt point. Surfaces are very worn and abraded; traces of polish around point. | L. 26 mm ; D. 5 mm |
| 1710 | 239 | Incomplete. Fragment of bone that tapers to a point. Flattened rectangular in section with a curved profile. Smooth though worn surfaces with traces of polish. |  |
| 1717 | 239 | Incomplete. Lower shank fragment of pin. Circular in section. Tapers slightly from 6 mm in diameter to flattened circular section 3 mm by 2 mm . Rough surfaces but traces of polish towards where tip is broken off. | L. 26 mm ; <br> D. 6 mm |
| 1721 | 239 | Incomplete. Small shank fragment. Circular in section. Grey in colour, highly polished. | L. 12 mm ; <br> D. 4 mm |
| 1748 | 239 | Incomplete. Lower shank fragment. Circular in section and tapers from 4 mm to 1 mm at sharp tip. Small nick, 2 mm by 1 mm , about 10 mm above tip which is possibly deliberate. Surfaces are smooth with patches of polish. Possibly from a finely-made pin. | L. 40 mm ; D. 4 mm |
| 1806 | 244 | Incomplete. Roughout. Tip missing. Rough expanded head (L. 9 mm ; W. 8 mm ; T. 5 mm ). Shank is circular in section and tapering to the tip. Surface now has some patches of the original surface but also abraded and worn areas. A small incised 'x' on the lower shank may be natural. |  |
| 1849 | 244 | Incomplete. Tip of head. Broken in antiquity. Top of head is flat and oval in cross-section. About one-third of perforation remaining. Top of head has evidence for wear and polish. The other surfaces are comparatively rough. | L. 7.5 mm ; W.9mm; T.7mm |
| 1850 | 244 | Incomplete. Tip and shank fragment. Flattened oval section. Tapers from 4 mm by 3 mm to 1.5 mm in diameter at sharp point. Smooth, worn surfaces. | L. 18 mm ; W.4mm; T. 3 mm |
| 1859 | 244 | Incomplete. Tip fragment. Shank is circular in section and tapers to blunt point. Surfaces are very worn and abraded but there are traces of surface wear and polish. | L. 17 mm ; D. 4 mm |
| 2023 | 81 | Incomplete. Tip and fine shank fragment. Oval in section. Tapers from 3.5 mm by 2.5 mm to 1 mm by 0.5 mm , to sharp point. Grey in colour. Uneven surfaces but highly polished. |  |


| 2159 | 244 | Incomplete. Tip and shank fragment. Rectangular in section with a curved profile. Tapers from 4 mm by 3 mm to a 1.5 mm diameter at sharp tip. Smooth surfaces with patches of polish. | L. 42 mm ; W. 5 mm ; T. 3 mm |
| :---: | :---: | :---: | :---: |
| 2197 | 282 | Incomplete. Three shank fragments, only two of which are conjoining. Roughly circular in section. Tapering. Surfaces are abraded and worn. One fragment preserves a smooth polished strip on it. | L. 40 mm ; D. 5 mm (2 conjoined) L. 23 mm ; D. 4 mm |
| 2240 | 69 | Incomplete. Shank fragment. Circular in section and tapers in diameter from 4 mm to 3 mm . Dark brown in colour with smooth, worn but polished surfaces, particularly towards lower end of fragment. | $\begin{gathered} \text { L. } 29 \mathrm{~mm} ; \\ \text { D. } 4 \mathrm{~mm} \text {. } \end{gathered}$ |
| 2284 | 283 | Incomplete. Shank fragment. Oval in section. Smooth but worn surfaces - no traces of polish remaining. | $\begin{array}{r} \text { L. } 26 \mathrm{~mm} ; \\ \text { W. } 3.5 \mathrm{~mm} ; \\ \text { T. } 3 \mathrm{~mm} \\ \hline \end{array}$ |
| 2310 | 270 | Incomplete. Tip and fine shank. Circular in section and curved in profile. Widens from diameter of 4 mm at upper end to 5 mm in centre before tapering to sharp tip of 1 mm diameter. Two chips missing from one edge where shank has been broken, measuring 3.5 mm by 1 mm and 6 mm by 4.5 mm respectively. Smooth, worn surfaces. No trace of polish remains. | $\begin{gathered} \hline \text { L. } 83 \mathrm{~mm} ; \\ \text { D. } 5 \mathrm{~mm} \end{gathered}$ |
| 2377 | 255 | Incomplete. Tip and fine tapering shank. Circular in section and straight in profile. Tapers from 4 mm to 1 mm in diameter at blunt tip. Surfaces are smooth with patches of polish on upper part of fragment. | L. 37.5 mm ; <br> D. 4 mm |
| 2418 | 220 | Incomplete. Tip and lower shank fragment. Rectangular with rounded sides in section and straight profile. Curves slightly and tapers from 5 mm by 4 mm to 1.5 mm by 1 mm at blunt tip. Surfaces are worn, slightly traces of polish around tip. From finely-made pin. | L. 59 mm ; W. 5 mm ; T.4mm |
| 2565 | 297 | Incomplete. Shank fragment. Circular in section. Surface is rough and worn but with traces of polish. | $\begin{aligned} & \hline \text { L. } 19 \mathrm{~mm} \text {; } \\ & \text { D. } 3.5 \mathrm{~mm} \\ & \hline \end{aligned}$ |
| 2701 | 1200 | Incomplete. Off-split fragment from tip. Very tip is intact but rest of remaining shank is split. Flattened oval to circular in section. Tapers to sharp tip and is slightly curved in profile. Surface is smooth with traces of polish around tip. | L. 32 mm ; W.4mm; T. 2 mm |
| 2752 | 1211 | Incomplete. Upper part of shank. Rectangular in section. Appears to have broken just below head. No sign of any expansion but break suggest that there may have been a perforation; just below break is very slight indentation in back. Shank then tapers, from 5 mm to 3.5 mm , to circular section, 4 mm in diameter. Curved in profile and has a slight groove in one surface. Groove is 15 mm long, 3 mm wide and less than 1 mm in depth. This pin may have been similar to 92E102:01137, 1744 or 2426. | L. 52 mm ; W. $5-4 \mathrm{~mm}$; T. $3.5-4 \mathrm{~mm}$ |


| 2991 | 1231 | Incomplete. Tip and fine shank fragment. Oval in section, <br> tapering to circular-section sharp tip. Tapers from 5mm by 4 mm <br> to 2 mm in diameter. Surfaces are polished, particularly around <br> tip. | L. $40.5 \mathrm{~mm} ;$ <br> W. $5-2 \mathrm{~mm} ;$ <br> T.4-2mm |
| :--- | :--- | :--- | ---: | ---: |

## Appendix 1.24 Bone Spindle-Whorls Catalogue (R. O'Brien)

Whorls

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 139 | 26 | Plain ox femora whorl. Underside damaged on one side. Domed surface has traces of polish. Central perforation, drilled from upper surface, is hourglass shaped and splayed at the base. | D. $43-45 \mathrm{~mm}$; <br> T. $15.5-28 \mathrm{~mm} ;$ <br> Perforation <br> W. 6-13mm; <br> Wt. 15.8g. |
| 220 | 26 | Plain ox femora whorl. Central hourglass perforation drilled from the upper surface. | D. $35-$ $37.5 \mathrm{~mm} ;$ T. $16-19 \mathrm{~mm} ;$ Perforation W. $5.5-9 \mathrm{~mm} ;$ Wt. 9.1 g |
| 2276 | 285 | Plain ox femora whorl. Central perforation is barrel-shaped and drilled from one face. | D.42-49mm; <br> T. $18.5-33 \mathrm{~mm} ;$ <br> Perforation <br> W. $8-12 \mathrm{~mm}$; <br> Wt. 19.7 g |
| 4034 | 239 | Plain ox femora whorl. Underside damaged. Domed surface. Central perforation, drilled from upper surface, is splayed at the base. | D. $38-41 \mathrm{~mm}$ <br> T.22-27mm; <br> Perforation <br> W. $5.5-9 \mathrm{~mm}$; <br> Wt. 12.5 g |

## Appendix 1.25 Miscellaneous Bone and Antler Artefacts Catalogue (M. FitzGerald)

Late Bronze Age /possible late Bronze Age artefacts
Beads and Pendants

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 290 | 47 | Tooth with circular perforation |  |
| 412 | 47 | Incomplete; perforated tooth - broken across top. Small pointed tooth with perforation 7 mm above tip of tooth. Perforation is 3 mm in diameter, and cylindrical. | $\begin{gathered} \hline \text { L. } 21 \mathrm{~mm} ; \\ \text { W. } 9 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm} \end{gathered}$ |
| 478 | 56 | Complete; small polished cylindrical bead. Circular section; hourglass perforation. Outer surface has two rough grooves, between which are two rough ' + 's. May be natural features of bone. Polished surfaces. | D. 10 mm <br> H.13mm; |
| 2238 | 267 | Incomplete; pendant in two halves made from a pig's tusk. Rectangular in section; tapers from 18 mm to 8 mm in width, at rounded point. Semi-circular open perforation in top - appears to be complete - it has finished edges. Grooves in both sides of pendant just below top, which measures 7 mm and 10 mm long respectively. Is split longitudinally in half. Pendant is polished. | $\begin{array}{r} \mathrm{L} .46 \mathrm{~mm} ; \\ \mathrm{W} .18 .5 \mathrm{~mm} ; \\ \mathrm{T} .10 \mathrm{~mm} \end{array}$ |


| 263 | 26/14 | Incomplete; two pieces of a possible haft. Carved from red deer antler. Rectangular in shape with thin rectangular curved section; very slightly curved profile. Shallow, irregular groove incised near one end of smaller piece, and larger piece has two roughly conjoining incised lines also near one end. The pieces are very worn. | L. 41 mm ; <br> W. 20 mm ; <br> T. 4 mm |
| :---: | :---: | :---: | :---: |
| 1306 | 220 | Incomplete; small, hollow handle broken at both ends. Fine, ovalsectioned. Central hollow of 4.5 mm diameter. Very smooth, worn surfaces with faint traces of polish. Unclear what it may have been a handle for. | L. 46 mm ; <br> D. 11 mm ; <br> T. 10.5 mm |
| 1344 | 220 | Complete; slightly curved handle. Well-made. Oval to circular in section. Tapers towards flat and smooth top from 24 mm by 18 mm to 15 mm in diameter. Numerous scratch marks on one surface towards hafting end. Surfaces are very smooth, worn. Traces of polish around top of handle. Unclear what it may have been a handle for. | $\begin{array}{r} \text { L. } 92 \mathrm{~mm} ; \\ \text { D. } 23 \mathrm{~mm} \mathrm{x} \\ 18 \mathrm{~mm} \end{array}$ |
| 2233 | 270 | Incomplete; perforated, broken handle. Well-made. Tubular with a hollow centre. Oval-sectioned, curves slightly in profile. Three perforations, $6 \mathrm{~mm}-7 \mathrm{~mm}$ in diameter, in one surface, and two remaining in the other. Surfaces are worn and smooth; traces of polish along surfaces and around top. Unclear what it may have been a handle for. | L. 125 mm ; <br> W. 23 mm ; <br> T. 17 mm |


| Spatula |  |  |  |
| :--- | :--- | :--- | ---: |
| 59 | 10 | Bone spatula. Incomplete; handled, spatula-type object, broken <br> across 'blade'. Carved from large mammal rib. Finely made, flat <br> implement. Roughly circular expanded head, 19mm by 22mm; | W.100mm; <br> narrow handle, 34mm by 13mm by 3mm - widens slightly to |
| form blade 40mm by 3mm thick. Blade widens slightly from |  |  |  |


| Double-perforated object    <br> 118 26 Incomplete; Double-perforated bone tool with a blunt and <br> rounded point at one end and broken across the upper perforation <br> at the other. Lower perforation is off-centre. Traces of polish <br> particularly around blunt point. Oval in cross-section. L.31.5mm; <br> W.5.5mm; <br> 4.4 mm    |
| :--- |
| 4014 |
| 267 |


| Awl | 217 | Small fine awl with flattened circular section. Handle part is <br> 26 mm by 5 mm by 4mm, and point is 16 mm by 3 mm in diameter. <br> Head is rounded off, and tip is blunt. Traces of polish remaining <br> but surfaces are very abraded. | L.42.5mm; |
| :--- | :--- | :--- | ---: |


| Rib knives |  |  |  |  |  |  |
| :--- | :---: | :--- | ---: | ---: | :---: | :---: |
| 1082 | 85 | Rib bone, which has been worked. Tapers to a rounded point at <br> end. Sides are damaged/chipped and it has broken. Bone is | L.123mm; <br> W.28mm; <br> smooth. Patches of surface wear/polish. | T.10mm |  |  |

## Pronged implements

| 685 | 216 | Gouge? Incomplete, perforated head of possible gouge. Broken <br> across the shank. Head of gouge formed by joint of large bone. <br> Perforation, diameter 6.5mm, in top of joint. Traces of polish <br> around perforation, otherwise surfaces are worn. | L. $70 \mathrm{~mm} ;$ <br> W. $37 \mathrm{~mm} ;$ <br> T. 11 mm, |
| :--- | :--- | :--- | ---: |
| W.O.P. 4 mm |  |  |  |,


| 4013 | 267 | Gouge. A complete hollow object, sub-triangular in section. Both <br> ends are pointed. The narrow end is defined by a single flat- <br> tipped blunt point and is chipped at the tip. The wider end has <br> two pronged points. The area between these points was notched <br> in a roughly rectangular shape. Also it appears that originally <br> there was a third point. Its condition is much poorer than the <br> narrow end and the tip of one of its points is broken. There are <br> traces of polish on the gouge, particularly on the underside, and <br> around the edges of the point at the narrow end. | L.7.6mm; | T.2.3mm |
| :--- | ---: | :--- | :--- | ---: |
| 4015 | 257 | Incomplete hollow worked bone implement. Both ends are <br> double-pointed but in different planes. The tips of all four points <br> are now damaged. | L. $102 \mathrm{~mm} ;$ <br> W. 27 mm |  |

Indeterminate artefact

| 2722 | 938 | Incomplete fragment of irregular worked bone. Hollow semi- <br> circular sectioned bone. Two semi-circular shaped notches cut <br> out of one edge, of 8mm and 12 mm diameter respectively. Traces <br> of polish; one side is blackened. | L. $60 \mathrm{~mm} ;$ <br> W. $12 \mathrm{~mm} ;$ <br> T.3mm |
| :--- | :--- | :--- | ---: |

## Early medieval artefacts

Combs

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 48 | 6 | Incomplete; sideplates, teethplates, teeth and pegs of decorated, double-sided comb. One end of the comb is missing. Probably carved from antler. Sideplates. Two 'c'-sectioned side plates, with | L. 71.5 mm ; <br> W.19mm; <br> T. 5 mm | two remaining, broken, pegs in each. One peg joins with another in other side plate, joining two together. One end of sideplates is smoothed and polished. Both sideplates decorated with rectangles incised with diagonal lines. Pegs holding sideplates together were in place before decoration was carved. Teethplates: Two pieces and four fragments of teethplates. One has complete tooth, and on opposite side part of tooth, still attached. Complete tooth is 19 mm from base to tip. Both pieces of teethplate have broken where perforated. These perforations, diameter $3.5 \mathrm{~mm}-4 \mathrm{~mm}$, were for pegs to hold teethplates in place. Teethplates are 20 mm wide by 3 mm thick. Teeth are rectangular in section and taper from 3 mm by 2 mm to 1.5 mm by 1 mm . 43 teeth remaining, including two still attached to teethplate.

Pegs: Five remaining pegs, three of which are still in sideplates; measure $12 \mathrm{~mm}-13 \mathrm{~mm}$ long, and $c a .5 \mathrm{~mm}$ in diameter. Taper slightly from one end to other, in some cases are slightly curved and vary in section from circular to oval.

| 356 | 6 | Incomplete; fragments from comb sideplate and endplate; one comb tooth. Sideplate: Small fragment of sideplate, 15 mm by 5 mm by 3.5 mm . Appears to have had same type of incised decoration as 92E102:48. Decorated surface is polished. Part of peg perforation remaining. Endplate: Two small, probable end plate fragments. Larger is 19.5 mm by 11 mm by 3 mm . Both have 'dot and circle' decoration, circles are 4.5 mm in diameter, and dots 1 mm in diameter. | L. 32 mm ; W. 11 mm ; T. 3 mm |
| :---: | :---: | :---: | :---: |
| Buttons |  |  |  |
| 1450 | 22 | Incomplete; $c a$. half of decorated, single-perforated button. Carved from an unidentifiable bone. Finely made with convex front and concave back. Flattened semi-circular in section. Front is decorated with two finely incised, circumlinear lines around outer edge and around edge of central perforation. Cylindrical perforation 4.5 mm in diameter. Reverse of button is plain and, as with rest of button, is worn and smooth with traces of polish. | D. 22.5 mm ; <br> W. 15 mm ; <br> T. 4 mm |
| 2261 | 267 | Complete; circular disc/ button with two perforations. Probably carved from a scapula of a large mammal. Flat disc of bone with two off-centre perforations; one is circular, diameter of 3 mm . The second is roughly rectangular and is 5 mm long by 3.5 mm wide. The disc is very slightly curved in profile, and has very worn surfaces. It thins slightly, to 1.5 mm , towards edge in some places. Possibly some sort of weaving tablet. | $\begin{array}{r} \text { D. } 35.5 \mathrm{~mm} \text {; } \\ \text { T. } 2 \mathrm{~mm} \end{array}$ |

Ferrule

| 131 | 14 | Incomplete; half of a small, decorated haft. Carved from a red <br> deer antler. Cylindrical shaped, rectangular in section with <br> rounded sides. Outer surface is very worn, some horizontally <br> incised circumlinear lines remain; a pair at each end and three in <br> the centre. Perforation was cylindrical; diameter is 8mm. | L. $18 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | ---: |

Whalebone chopping board

| 56 | $6 \backslash 10$ | Whalebone chopping board. Incomplete; oval-shaped, flat, piece <br> with one end chipped away. 'Slice' of bone with a smoothed <br> surface with numerous scratch marks on it. The outer surface is <br> rough - natural bone appearance. Edges are smooth and rounded <br> but chipped in places. Slightly curved in profile. | L. $110 \mathrm{~mm} ;$ <br> W.67mm; | T. 8 mm |
| :--- | :---: | :--- | :--- | ---: |

Gaming piece or whorl roughout

| 1221 | 51 | Bone Disc. Complete oval-shaped charred bone disc. Rectangular | D.25.5mm x |
| :--- | ---: | :--- | ---: | ---: |
|  |  | section. Slightly burnt. Smooth surfaces with traces of polish. | $19.5 \mathrm{~mm} ;$ |
|  | Edges of one surface are chipped. Possibly a gaming piece. | T.6.5mm |  |

## IRON ARTEFACTS

Appendix 1.26 Iron Objects Catalogue (M. FitzGerald)

## Iron Blades

| Find No. | Feature | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 4 | 1 | Portion of blade back ( 2 pieces and 6 fragments). Triangular in cross-section but cutting edge not preserved. Varies in thickness from 7 mm to 4 mm , and to 2 mm towards the cutting edge. Organic material on three fragments may be remains of knife handle. | $\begin{array}{r} \mathrm{L} .75 \mathrm{~mm} ; \\ \mathrm{W} .18 \mathrm{~mm} \\ \text { T. } 6.4-4.4 \mathrm{~mm} \end{array}$ |
| 35 | 8 | Blade tip. Tapers in width from 23 mm to 12 mm at rounded tip. At wider end, blade is either split and corroded, or two pieces have been corroded together. | L. 54 mm ; <br> W. 24 mm ; T. 5 mm |
| 144 | 10 | Portion of flat thin blade with two cutting edges tapering in width from 20 mm to 12 mm . | L. 27.3 mm ; W.21.6mm; T. 2 mm |
| 168 | 9 | Blade tip? Flat curved fragment tapering in width from 10 mm to 5 mm at tip. | $\begin{array}{r} \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{W} .10-4 \mathrm{~mm} ; \\ \mathrm{T} .4 .4 \mathrm{~mm} \\ \hline \end{array}$ |
| 199 | 41 | Portion of blade with two long straight edges and with one broken and one curved blade end. | L. 30.7 mm ; W. 18.8 mm ; T. 4.2 mm |
| 225 | 6 | Portion of blade with tang. Blade tapers slightly in width from 23 mm to 12 mm . Cutting edge not preserved. Possible whittle tang, set just below back (L. 18 mm ; W. 11 mm ; T. 5 mm ). | L. 41 mm ; <br> W. 23 mm ; <br> T. 6 mm |
| 258 | 9 | Portion of blade with tang from a whittle-tanged knife with arched back. Both terminals broken. Blade tapers from 18.5 mm to 14.5 mm in width and measures 5 mm thick at back and 2.5 mm at cutting edge. Tang, set just below back, of hollow rectangular section. | L. 93 mm ; <br> W.20mm; <br> T. $6-2 \mathrm{~mm}$ |
| 1896 | 10 | Portion of blade with tang. Small section of cutting edge; 2 mm thick, where blade curves in below shoulder. Tang (L. 48 mm ; $T .5 \mathrm{~mm}$ ) of rectangular section tapers in width from 12 mm at shoulder to 4 mm at top. | L. 42 mm ; <br> W.10mm; <br> T. 4 mm |
| 2006 | 26 | Portion of blade with tip (also 9 other fragments. Tapers in width from 25 mm to 17 mm at tip. Has one straight and one slightly curved edge. Associated organic material (wood or bone) may be remains of handle. | L. 49 mm ; <br> W. 25 mm ; T. 5 mm |
| 2867 | 1226 | Portion of blade? A metallic iron fragment of roughly oval crosssection. | $\begin{array}{r} \mathrm{L} .19 \mathrm{~mm} ; \\ \mathrm{W} .12 .5 \mathrm{~mm} ; \\ \mathrm{T} .6 \mathrm{~mm} \\ \hline \end{array}$ |
| 2979 | 1226 | Small portion of blade (two conjoining fragments) from near the tip end. Rectangular in cross-section. Thins towards one side form 5 mm to 2 mm . | L. 14 mm ; W.18mm; T. 5 mm |


| 2985 | 1226 | Portion of blade of rectangular cross-section but thins in thickness from 4 mm to 2 mm and tapers in width from 16 mm to 13.5 mm .2979 may be from the same knife. | $\begin{array}{r} \mathrm{L} .60 \mathrm{~mm} ; \\ \text { W. } 22 \mathrm{~mm} \text {; } \\ \text { T. } 7 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 3044 | U/S | Small flat fragment of a blade with rectangular section. | L. 15 mm ; W. 15 mm ; T. 5 mm |
| 3053 | 66 | Portion of blade with tang? The blade is preserved in five (nonconjoining) fragments without features. The tang (L.26.5mm; T. 8 mm ) was rectangular and tapers from 10 mm to 8 mm . | L. 28 mm ; W.10mm; T. 7 mm |


| 587 | 47 | Shank fragment. Of hollow circular section tapering from 3.5mm to 2 mm at worn pointed end. | L. 26 mm ; W. 3.5 mm |
| :---: | :---: | :---: | :---: |
| 602 | 32 | Point fragment. Rough and uneven surfaces. Of iron or copper alloy (C. Salter). | L. 23 mm ; W. 3 mm |
| 1098 | 85 | Shank fragment of a fine iron pin from a brooch or similar delicate artefact. Of hollow circular section. | L. 15 mm ; W. 2 mm |
| 1950 | 244 | Head and shank fragment. Nail-head (D.10mm x 9mm) type with eccentrically placed shank (L. 13 mm ; W. 4 mm ; T. 3.5 mm ) of square section. | L. 16 mm ; <br> W.7.5mm |
| 1951 | 244 | Shank fragment. Fine shank with roughly rounded section. Slightly bent. | L. 13.5 mm ; W. 5 mm |
| 2087 | 69 | Shank fragment with another object (possibly the ring part of a ring pin, D. $14 \mathrm{~mm} ;$ T. 9 mm ) corroded onto it. Roughly circular in section. | $\begin{aligned} & \hline \mathrm{L} .37 \mathrm{~mm} ; \\ & \mathrm{W} .5 \mathrm{~mm} \end{aligned}$ |
| 2576 | 907 | Shank fragment. Fine shank, tapering in diameter from 5 mm to 2.5 mm where it is slightly bent. Roughly semi-circular in section. Lime encrusted. | L. 28.5 mm ; W. 5 mm |
| 3051 | 66 | Head and shank preserved in eight non-conjoining fragments. Small circular piece ( $\mathrm{D} .10 \times 12 \mathrm{~mm}$; T. 3 mm ) may be the ring from a ring-pin. Fine shank of roughly circular section. | L. 16 mm ; W. 4 mm |
| 3069 | 269 | Shank fragment. Of flattened rectangular section. Tapers from 4 mm to 1 mm . Slightly curved profile. | L. 20mm; W. 5 mm |


| Iron Nails |  |  |  |
| :--- | :---: | :--- | ---: |
| 37 | 9 | Hollow shank fragment. Split longitudinally. Roughly semi- <br> circular in section. | L.24mm; <br> W.9mm |
| 38 | 6 | Head and shank fragment. Flat, roughly circular head (D.8). <br> Roughly square sectioned shank split longitudinally. | L.23mm; <br> W.6mm; <br> D.8mm |
| 45 | 6 | Head and shank fragment. Round dome-shaped head (D.28; <br> H.10) with part of the original head edge evident. Rim of head <br> drops below the start of the shaft. Portion of roughly circular <br> sectioned shank (L.22mm) narrows from the head (W.10-5mm). | L.31mm; <br> W.10mm; <br> D.28mm |


| 141 | 9 | Head fragment. Large dome-shaped head (D.30 x 26) (similar to <br> 45). | L.24mm; <br> D.30mm |
| :--- | :---: | :--- | ---: |
| 223 | 6 | Head and shank fragment. Large roughly round head (D.23-27; <br> H.12). Roughly square sectioned shank with traces of copper? <br> adhering to the tip end (L.34m; W.7-5nn; T.6-4mm). | L.41mm; <br> W.7mm; <br> D.27mm |
| 248 | 29 | Small shank fragment. Roughly rectangular in section. Tapers <br> slightly. | L.7mm; <br> W.6mm |
| 271 | 1 | A modern '6 inch' nail. | L.51mm |


| 34 | 6 | A length of finely pointed iron wire encased in non-metal corrosion (possibly organic) for all its length except for 5 mm which forms a point at one end (D.1.5mm). Perhaps the remains of an awl. | L. 40 mm |
| :---: | :---: | :---: | :---: |
| 270 | 6 | Rod with square-sectioned stem. Slightly fluted or twisted. Broken at one end. | L. 120.5 mm ; W. 5 mm ; T. 5 mm |
| 272 | 6 | Iron rod preserved in six fragments. Rectangular in section. | L. 31 mm ; W.9mm; |


|  |  |  | W. 8 mm |
| :--- | :---: | :--- | ---: |
| 2279 | 1 | Iron rod (L.84mm) with protruding fine wire at one end. Slightly <br> bent in profile and tapering in width from 5.5 mm to 3 mm at the <br> wire end. Circular in section. Wire protrudes for 7 mm from rod <br> and tapers from 3 mm to 2 mm to form a point. | L. $123 \mathrm{~mm} ;$ <br> W.5.5mm |

Iron Plates

| 27 | 6 | Fragment of iron plate of rectangular section. Slightly curved profile. | L.38mm; W. 35 mm ; T. 4 mm |
| :---: | :---: | :---: | :---: |
| 66 | 10 | Several fragments of conjoined iron plate. Circular aperture $(6 \mathrm{~mm}$ by 10 mm$)$ in one surface where plate is slightly thicker (T.8mm). This aperture does not perforate other surface. | L.38mm; W. 37 mm 27 mm ; T. 5 mm |
| 89 | 14 | Fragment of iron plate of rectangular outline and section. Small object corroded onto it on one side and the other has a nail or rivet. Rivet of rounded section with round flat head. Head and upper part of shaft corroded onto plate (L.31mm, D. of shaft 8 mm ; D. of head 15 mm ). | L. 27 mm ; <br> W.23mm; <br> T. 6 mm |
| 159 | 21 | Roughly triangular shaped fragment of iron plate with a rivet on one side. Plate is rectangular in section. Short round-sectioned (D. 10 mm ) rivet fragment projects 6 mm from plate. | L. 29 mm <br> W. 33 mm <br> 7.7 mm |
| 298 | 9 | Fragment of rectangular-shaped plate with one edge slightly curved over. Rectangular in section. | $\begin{aligned} & \text { L. } 33.7 \mathrm{~mm} ; \\ & \text { W. } 12.6 \mathrm{~mm} ; \end{aligned}$ $\mathrm{T} .3 \mathrm{~mm}$ |
| 337 | 6 | Two fragments of plate, a nail shank and one other fragment. One plate is pear-shaped with a circular aperture (D. 4 mm ). Nail shank is oval in section and broken at both ends (L. 29 mm ; W. 8 mm ; T. 6 mm ). Also a small rectangular fragment of plate. | L. 20 mm <br> W. 14 mm <br> T. 4 mm |
| 3043 | 1211 | Fragment of iron plate with a thin strip attached to one edge. This strip curves underneath and may have joined the opposite edge of plate where there is now a break but this is now too corroded to verify. | L.30mm; W. 17 mm ; T. 7 mm |

Miscellaneous Iron Objects

| 13 | 1 | Object consisting of nine conjoining shank fragments and one curved strip (L. 21 mm ; W. 12 mm ; T. 15 mm ). Shank of rectangular section. |  |
| :---: | :---: | :---: | :---: |
| 19 | 1 | Object. Six pieces of flattish iron. Roughly rectangular in section. One piece is slightly curved. Part of a bladed instrument or iron strap? | L. 40 mm ; W. 32 mm ; T. 11 mm |


| 42 | 6 | Object. Flat triangular object. Rectangular in section. Tapers in width from 20 mm to 8 mm . Wider end has a rounded corner and has a blade-like appearance. A tanged chisel? | $\begin{array}{r} \mathrm{L} .47 \mathrm{~mm} ; \\ \mathrm{W} .20-8 \mathrm{~mm} ; \\ \mathrm{T} .5 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 65 | 9 | Chisel. Tanged chisel or awl in two fragments. Fine point of chisel was wedge shaped (W. $3 \mathrm{~mm} \times \mathrm{T} .1 \mathrm{~mm}$ ) widening to form a rectangular sectioned portion ( 6.5 mm by 4 mm ). Other fragment forms a square tang tapering from 6.5 mm to 4 mm square. Broken at both ends. Similar object from Rath of Synods (Raftery, 1969, fig.25:E61:131 O'Kelly, 1962, 44-46, fig.6;565, 569, 523 (awls); fig. 7:48 (chisels). | L. 52 mm ; W. 8 mm ; T. 8 mm |
| 73 | 10 | Object. Triangular-shaped curved piece. Rectangular in section. Broken at both ends. Tapering from 21 mm to 12 mm . Possible from an unusual brocket/staple or perhaps from a fibula. | $\begin{array}{r} \text { L. } 55 \mathrm{~mm} \\ \text { W. } 20.6-7 \mathrm{~mm} \\ \mathrm{~T} .5-3.5 \mathrm{~mm} \end{array}$ |
| 120 | 10 | Socket. Cylindrical object broken at one end and with a lump of corrosion on other. | $\begin{gathered} \hline \text { L. } 33 \mathrm{~mm} ; \\ \text { D. } 6 \mathrm{~mm} \\ \hline \end{gathered}$ |
| 126 | 10 | Ferrule tip. Small hollow point. Tapers from 8 mm to 1 mm to form a point. | L. 29 mm ; D. 8 mm |
| 152 | 14 | Dish. Fragment of flat base of dish with circumlinear marks around base. | L. 60 mm ; <br> W. 49 mm ; <br> T .2 mm |
| 243 | 6 | Incomplete. Unidentified object. Metal alloy: iron possibly containing some copper. Rectilinear curved metal strip has folded over binding along one edge and piece protruding at right angles on the inner edge of curve. Probably modern. | L. 52.5 mm ; W. 13 mm ; T. 1.5 mm |
| 268 | 14 | Object. A square shaped piece with aperture and twelve unidentifiable fragments. Square piece with thin rectangular section. Sub-square perforation ( $5 \mathrm{~mm} \times 7 \mathrm{~mm}$ ) which appears to have been pushed through from one side. Has a slight lip around it on the upper surface. Two thin flat fragments, possibly part of a blade (L.33mm; W.20mm; T.4mm). Also a tubular fragment possibly from a nail shaft (L. 25 mm ; D. 5 mm ). Specialist also notes a flat piece of corrosion with grass marks and an angled scrap. | L. 25 mm ; <br> W.23mm; <br> T. 4 mm |
| 449 | 56 | Object. Hook and two small fragments. Fine hook (L.12mm; D. 4 mm ) attached to a fine, thin piece of iron. All from a broochtype object. | L. 12 mm ; <br> W. 22 mm ; <br> T. 4 mm |
| 939 | 82 | Object. Fine rod-like object. Round-sectioned piece bent at a right-angle. Possibly a pin shank or fine rivet. | $\begin{array}{r} \hline \mathrm{L} .22 \mathrm{~mm} ; \\ \mathrm{D} .5 \mathrm{~mm} \\ \hline \end{array}$ |
| 1156 | 88 | Object. A rectangular piece of 'stony' iron with flattened oval section. Tapers from 12.5 mm to 8 mm and is broken at both ends. Blade-like but too thick. | L. 17 mm ; W. 13 mm ; T. $5-3 \mathrm{~mm}$ |
| 1971 | 251 | Tag? A fine curved/bent strip fragment. Rectangular in shape and thin rectangular section. Both ends broken. Small lump in one surface could be the remains of a rivet. | L.31mm; <br> W.14mm; <br> T. 5 mm |


| 2362 | 66 | Object. A small disc-like piece with a tiny perforation (D.2mm) and an unidentifiable scrap (L. 8.5 mm ; W. $11 \mathrm{~mm} ; \mathrm{T} .2 \mathrm{~mm}$ ). | L. 14 mm ; W. 10 mm ; T. 5 mm |
| :---: | :---: | :---: | :---: |
| 2753 | 1211 | Tang. Three fragments of possible knife tang. Tapers from 16 mm to 5 mm to end in a flat pointed tip. | L. 49 mm ; W. 20 mm ; T. 19 mm |
| 2757 | 1211 | Tang. Possible tanged tool. Tapers in length from 18 mm to 7 mm . Roughly square in section. Lump of corrosion at the wider end. | $\begin{array}{r} \text { L. } 89 \mathrm{~mm} \\ \text { W. } 9.5-23 \mathrm{~mm} \\ \text { T. } 7-14 \mathrm{~mm} \end{array}$ |
| 2759 | 1212 | Hook. Possible fish hook with a bent upper arm but missing tip. Rounded in section but becoming flat towards upper part. Also two miscellaneous scraps. | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .4 .5 \mathrm{~mm} ; \\ \text { T. } 8 \mathrm{~mm} \\ \hline \end{array}$ |
| 2811 | 1209 | Shaft. Two fragments of possible shaft. Circular in section. | L. 19.5 mm ; W. 20 mm ; T. 11 mm |
| 2851 | 1225 | Strip. Thin strip of iron with slight longitudinal curve. Rectangular in section. | L. 25 mm ; W. 15 mm ; T. 5 mm |
| 2858 | 1226 | Tang. Possible tang fragment tapering from roughly round section at one end (D.10mm) to rectangular section at the other ( $6 \mathrm{~mm} \times 4 \mathrm{~mm}$ ). | $\begin{array}{r} \text { L. } 24 \mathrm{~mm} \\ \mathrm{~W} .12-16 \mathrm{~mm} \\ \mathrm{~T} .11 .5 \mathrm{~mm} \end{array}$ |
| 2860 | 1226 | Object. Possible tip of pointed object. Fine, slightly bent with a blunt tip and flat rectangular section. | $\begin{array}{r} \hline \text { L. } 13 \mathrm{~mm} \text {; } \\ \text { W. } 9.5- \\ 5.5 \mathrm{~mm} ; \\ \text { T. } 3 \mathrm{~mm} \end{array}$ |
| 2912 | 1207 | Staple. Part of an iron staple. Roughly circular-sectioned piece. One end is bent at right angles and tapers to a blunt point. | $\begin{array}{r} \text { L. } 30 \mathrm{~mm} ; \\ \text { W. } 9-4 \mathrm{~mm} ; \\ \text { T. } 9-4 \mathrm{~mm} \\ \hline \end{array}$ |
| 2914 | 1225 | Object. Represented by three fragments: a hook and two fragments of a shank. The hook is small and fine (from a larger object) with the wider end bent at right angles. It then tapers to a point. It is rectangular in section (L. 8 mm ; W. $7-3 \mathrm{~mm}$; T. 1.5 mm 3 mm ). One of the other fragments possibly consists of the head and shaft of a nail. The other is a fragment of the shank and has a hollow flattened rectangular section (L. 25 mm ; W. 10.5 mm ; T. 8.5 mm ). | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .22 .5 \mathrm{~mm} \\ \mathrm{~T} .18 \mathrm{~mm} \end{array}$ |
| 2916 | 1225 | Object. Fine stem-like fragment from a pin or from the top of a tang. Oval in section and tapering from 4 mm to 11 mm . | L. 26 mm ; W. 13 mm ; T. 8.5 mm |
| 2918 | 1225 | Object. Short fragment of a stem possibly from a nail or staple. Roughly circular in section and tapering slightly. | L. $19 \mathrm{~mm} ;$ $\mathrm{W} .12-5 \mathrm{~mm} ;$ $\mathrm{T} .8-6 \mathrm{~mm}$ |
| 2921 | 1207 | Object. Fragment of a plate? with a rivet. Rectangular fragment with flattened rectangular section with a rivet with roughly circular section protruding from it (L. 7 mm ; D. 7 mm ). | L. 21 mm ; W.16mm; T. 4 mm |


| 2923 | 1225 | Shaft. Three fragments of a stem possibly from a nail. Roughly circular in section. Largest fragment is slightly curved. | L.34mm; W.11mm; T. 9 mm |
| :---: | :---: | :---: | :---: |
| 2935 | 1225 | Staple. Fragment of a staple. Square-sectioned piece. Slightly bent at one end. | $\begin{gathered} \hline \text { L. } 23 \mathrm{~mm} ; \\ \text { W. } 6 \mathrm{~mm} \text {; } \\ \text { T. } 5 \mathrm{~mm} \\ \hline \end{gathered}$ |
| 2942 | 1212 | Rivet. Large fragment of a possible rivet. Tapering circular section with wider end attached to a corroded lump, possibly the head of the rivet or the remains of a plate. A small twisted piece of circular section is attached to the rivet and may be the remains of a large staple. | L. 76 mm ; W. 44 mm ; T.35mm |
| 2955 | 1200 | Shaft. Small fragment of a shaft, possibly from a pin or small nail. Circular in section. | L. 13 mm ; W. 8 mm ; T. 7 mm |
| 2969 | 1200 | Shaft. Small fragment of a shaft possibly from a pin or a small nail. Circular in section and slightly curved. | L. 16 mm ; W. 11 mm ; T. 7 mm |
| 2972 | 1207 | Shaft. Fragment of a possible shaft. Short hollow, piece with oval to circular section. | $\begin{array}{r} \text { L. } 16 \mathrm{~mm} ; \\ \text { W. } 13.5 \mathrm{~mm} ; \\ \text { T.11.5mm } \end{array}$ |
| 2995 | 1219 | Binding. Small fragment of iron binding? Longitudinally curved. Hollow piece. | L. 17.5 mm W. 8 mm ; T. 2 mm |
| 3052 | 66 | Binding. Four fragments of possible binding. One piece is thin and rectangular in section, strip-like in shape. Edges seem complete but ends broken. One end is bent/curls over slightly. Three other similar but more corroded fragments. | L. 25 mm ; W.10mm; T. 2 mm |
| 3062 | 22 | Shaft. Possible shaft fragment. Circular in section. May have been part of a loop but is heavily corroded. | L. 29 mm ; W.19mm; T. 7 mm |
| 3073 | 47 | Ring. Half of a fine ring-like object (D.19mm) and two scraps. Ring of rectangular section. Lump of corrosion attached. | T.6mm |

Iron Fragments

| 2 | 1 | Two fragments of the same object with roughly rectangular <br> section. The larger fragment has a slight lump on one surface. <br> The smaller fragment measures L.18mm; W.18mm and T.5mm | L. $24 \mathrm{~mm} ;$ <br> W.18m; |  |
| :--- | :---: | :--- | ---: | ---: |
| 64 | 9 | Two fragments of the same object. Rectangular in section. <br> Appears folded over. Possibly bog ore. Smaller fragment | L. $32 \mathrm{~mm} ;$ <br> measures L.25mm; W.9mm; T.7mm. | $\mathrm{T} .16 \mathrm{~mm} ;$ |


| 273 | 6 | Small flake of iron with thin rectangular section. Slightly tapering but irregularly shaped. Possible organic remains evident on one side. | L. 22 mm ; <br> W.10mm; <br> T. 3 mm |
| :---: | :---: | :---: | :---: |
| 304 | 9 | Small rectangular shaped fragment of iron. Tapers slightly in width from 15 mm to 12 mm . Rectangular section. | L. 33 mm ; W. 15 mm ; T. 7 mm |
| 539 | 98 | Small semi-circular fragment of iron with hollow centre and oval section. | L. 17 mm ; W. 11 mm ; T.4.4mm |
| 897 | 208 | A fragment of metallic iron. Wedge-shaped with rectangular section. Possible traces of round-headed rivets on two adjacent sides. | L. 44 mm ; W. 37 mm ; T. 19 mm |
| 904 | 208 | Small semi-circular lump of iron with one flat and one uneven corroded face. Edges of flat surface appear to be folded over irregular surface in some places. | L. 40 mm ; W. 29 mm |
| 1459 | 10 | Small sub-rectangular fragment of iron. Rectangular in section. One end is bent/curves over slightly. | L.19.5mm; W.16mm; T. 11 mm |
| 1917 | 41 | A completely corroded metallic iron object of sheet or strip. The original object represented by central void surrounded by shell of iron oxides. In places there is also some copper mineralisation present. This is most likely to be the result of post-depositional electrolyical replacement. | L.33mm; W.31mm; T. 12 mm |
| 1976 | 244 | Small sub-rectangular shaped fragment of iron. Thin rectangular section. One edge tapers slightly. Possibly a blade fragment. | L. 18 mm ; W.18mm; T. 5 mm |
| 2090 | 51 | Five conjoining fragments of iron forming a roughly square lump of rectangular section. Centre is split open. Possibly the remains of a corroded blade. Also two non-conjoining fragments (L. 15 mm ; W. $14 \mathrm{~mm} ;$ T. 7 mm and L. 24 mm ; W. $10 \mathrm{~mm} ;$ T. 11 mm ). | L.38mm; W. 33 mm ; T. 16 mm |
| 2327 |  | Fragment of iron with three scraps. Fragment is rectangular in shape with thin rectangular section. Centre is split. Possibly from a blade. | L.19mm; W.16mm; T. 4 mm |
| 2375 | 14 | Small flattish fragment of iron. Roughly rectangular in outline. | L. 24 mm ; W. 17 mm ; T. 8 mm |
| 2681 | 900 | Curved fragment of iron with rectangular cross-section. Fine rivet, with circular section, on one surface (L.4mm; D.2.5mm). | L. 28 mm ; W. 14 mm ; T. 9 mm |
| 2812 | 1207 | Long fragment of iron which bends towards one end. Roughly rectangular in section. | L.39mm; W. 21 mm ; T. 15 mm |
| 2820 | 1209 | Roughly rectangular flat fragment of iron. Possibly part of a blade. | L. 42 mm ; W. 36 mm ; T. 13.5 mm |


| 2837 | 1207 | Two small fragments of iron. One consists of a shaft fragment with circular section. The second is rectangular in shape with a hollow rounded section. | $\begin{array}{r} \mathrm{L} .13 \mathrm{~mm} ; \\ \mathrm{W} .8 .5 \mathrm{~mm} \\ \mathrm{~T} .8 .5 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 2895 | 1207 | Small thin flake fragment of iron. Iron is folded over. Possibly from a knife. | L. 16 mm ; W. 16 mm ; T. 5 mm |
| 2941 | 1226 | A corroded lump of iron. Probably from a number of objects. One part appears to have an oval section. The smaller fragment measures L. $17.5 \mathrm{~mm} ;$ W. $16 \mathrm{~mm} ;$ T. 12 mm . | L. 56 mm ; W. 32 mm ; T. 28 mm |
| 3054 | 66 | Seven small fragments of iron. Three form the shank of an object. Two fragments have flat surfaces. Possibly waste. | L. 17 mm ; W.16mm; T. 5 mm |
| 4009 | 403 | Numerous fine flaky fragments of iron. Possibly the remains of a strap or binding. | T. 1 mm |


| Iron Scraps |  |  |  |
| :---: | :---: | :---: | :---: |
| 50 | 6 | Small scraps (bagged with 52). |  |
| 52 | 6 | A small scrap (bagged with 50). |  |
| 91 | 14 | Two scraps. Possibly conjoined. | L.34mm; W. 15 mm ; T. 2.5 mm |
| 145 | 14 | Four scraps. From iron working. | L. 13 mm ; W. 13 mm ; T. 5 mm |
| 180 | 26 | Tiny scrap. Residue from iron working. | L. 10 mm ; W. 8 mm ; T. 3 mm |
| 202 | 41 | A flat piece. | $\begin{gathered} \text { L. } 16.5 \mathrm{~mm} \text {; } \\ \text { W. } 13 \mathrm{~mm} \text {; } \\ \text { T. } 2.5 \mathrm{~mm} \\ \hline \end{gathered}$ |
| 217 | 52 | Thirteen scraps of non-magnetic iron - two pieces may possibly be from a nail. | L. 20 mm ; W. 8 mm ; T.9mm |
| 319 | 26 | Scrap. | L. 19 mm ; W. 14 mm ; T.3mm |
| 362 | 26 | Three small thin fragments. Residue from iron working. | L. 11.5 mm ; W. 8 mm ; T .1 mm |
| 468 | 66 | Three pieces of iron. | L. 18 mm ; <br> W. 16 mm ; <br> T. 8 mm |
| 538 | 98 | Two flakes. | L. 16 mm ; W. 11 mm ; T. 4 mm |


| 887 | 203 | Six amorphous flakes. | L. 21 mm ; <br> W.18mm; T. 3 mm |
| :---: | :---: | :---: | :---: |
| 1044 | 85 | Numerous tiny scraps. | L. 16 mm ; W. 12 mm ; T. 7 mm |
| 1313 | 220 | A tiny flake. | L. 13 mm ; W.9mm; T. 2 mm |
| 1370 | 70 | A curving, tapering wedge-shaped fragment. | L. $26 \mathrm{~mm} ;$ W. $11-6 \mathrm{~mm} ;$ T. $5.5-3 \mathrm{~mm}$ |
| 1400 | 220 | Tiny scrap. | L. 11 mm ; W.11mm; T. 5 mm |
| 1411 | 22 | A scrap with a 'stony appearance'. | L. 13 mm ; W.10mm; T. 7 mm |
| 1417 | 22 | Two tiny scraps. | L. 7 mm ; W. 5 mm ; T. 2 mm |
| 1504 | 105 | Two thin flakes. | L. 12 mm ; W.9mm; T. 0.5 mm |
| 1711 | 239 | A small scrap of sub-rectangular shape. | L. 16 mm ; W.11mm; T. 5 mm |
| 2035 | 88 | A small flake of iron. | L. 12 mm ; <br> W.10mm; <br> T. 3 mm |
| 2092 | 69 | A small thin scrap. Sub-rectangular in shape. | L. 13 mm ; W.11mm; T. 3.5 mm |
| 2096 | 69 | Three tiny scraps. | L. 10 mm ; W. 5 mm ; T. 2 mm |
| 2363 | 66 | Two scraps. | L. 11.5 mm ; W.9mm; T. 4 mm |
| 2364 | 69 | Two flakes. Larger one is concave. Other scrap has a tiny strip/rod attached to it (L. 9 mm ; W. 12 mm ; T. 5 mm ). | L. 20 mm ; <br> W. 12 mm ; <br> T. 2 mm |
| 2368 | 79 | A small flake. Sub-rectangular in shape. | L. 13 mm ; W. 10 mm ; T. 3 mm |


| 2575 | 907 | Three tiny scraps. | L. 11 mm ; W. 5 mm ; T. 2 mm |
| :---: | :---: | :---: | :---: |
| 2849 | 1225 | Small irregular shaped scrap. | L. 19 mm ; W. 14 mm ; T.10mm |
| 2868 | 1226 | Small flake. | L. 22 mm ; W.10mm; T. 4 mm |
| 2887 | 1200 | Small lump with triangular section. | $\begin{array}{r} \mathrm{L} .30 \mathrm{~mm} ; \\ \mathrm{W} .17 .5 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \\ \hline \end{array}$ |
| 2897 | 1207 | Three scraps. From the one object. One fragment is square in section. | L. 14.5 mm ; W. 11 mm ; T. 6 mm |
| 2899 | 1207 | Small scrap. | L. 11 mm ; W.9mm; T. 5 mm |
| 2908 | 1207 | Small flake. | L. 13 mm ; W.12mm; T. 4.5 mm |
| 2913 | 1207 | Two small lumps. From same object. | $\begin{array}{r} \hline \mathrm{L} .18 .5 \mathrm{~mm} ; \\ \mathrm{W} .17 .5 \mathrm{~mm} ; \\ \mathrm{T} .13 \mathrm{~mm} \\ \hline \end{array}$ |
| 2925 | 1225 | Small chip. Curved longitudinally. | L. 11 mm ; W.6mm; T. 5 mm |
| 2940 | 1226 | Small piece. | L. 14 mm ; W.9mm; T. 6 mm |
| 2948 | 1207 | Small piece- may be natural. | L. 16 mm ; W.8mm; T. 5 mm |
| 2951 | 1226 | Small lump - may be natural. | L. 14.5 mm ; W. 12 mm ; T. 9 mm |
| 2956 | 1226 | Thin scrap. | L. 27 mm ; W.16mm; T. 5.5 mm |
| 2973 | 1207 | Small flake. | L. 15 mm ; W.10mm; T. 3.5 mm |
| 3055 | 66 | Numerous tiny scraps. | L. 25 mm ; <br> W. 15 mm ; <br> T. 8 mm |


| 3058 | 76 | Four unidentifiable scraps. | L. 21 mm ; W.14mm; T. 4 mm |
| :---: | :---: | :---: | :---: |
| 4006 | 400 | Small thin piece. | L. 19 mm ; W. 12 mm ; T. 3 mm |
| 305 | 9 | Hard pan concentration, probably around an iron object. Completely oxidised. | L.36mm; W. 26 mm ; T. 24 mm |

## Appendix 1.27 Modern Finds Catalogue (M. FitzGerald)

Beads

| Find No. | Feature | Description | Dimensions |
| :--- | :---: | :--- | ---: |
| 2315 | 271 | Tiny red plastic bead. Roughly circular with a central perforation. | L.3.5mm; |
|  |  |  | W.3mm; |
|  |  |  | T.2mm |
| 3007 | U/S | White circular perforated glass bead. | T.6mm |

## Buttons

| 25 |  | Modern button. |  |
| :--- | :---: | :--- | ---: |
| 51 | 6 | Bone button. |  |
| 4007 | 403 | Cream coloured plastic button with four eyeholes in centre. | T. 0.5 mm |


| Bullet |  |  |  |
| :--- | :--- | :--- | :--- |
| 4001 | 401 | Small metal bullet cartridge with 'F' stamped in top. | L. $15 \mathrm{~mm} ;$ <br> T. 0.5 mm |

## Cartridges

| 22 | 6 | Modern spent bullet cartridge. |  |
| :---: | :---: | :---: | :---: |
| 23 |  | Modern spent bullet. |  |
| 53 | 6 | Modern bullet cartridge. |  |
| 68 | 9 | Modern spent bullet cartridge. |  |
| 2528 | 900 | Corroded metal cartridge. From shot-gun cartridge. "Haelclochert 12" imprinted on top. | $\begin{array}{r} \hline \mathrm{W} .7 \mathrm{~mm} ; \\ \mathrm{T} .2 \mathrm{~mm} \\ \hline \end{array}$ |
| 2821 | 1204 | Brass bullet cartridge - similar to 2957 and 2872. | L. 17 mm ; T. 0.5 mm |
| 2830 | 1019 | Corroded top of a brass shotgun cartridge. | W. 15 mm |
| 2872 | 1226 | One small brass bullet cartridge. | L. 15 mm ; T. 0.5 mm |
| 2957 | 1200 | Brass bullet cartridge similar to 2872. | L. 16 mm ; T. 0.5 mm |
| 3004 | 307 | Top of a metal shotgun cartridge. "M. Clogherty No. 12 Galway' imprinted on top. | $\begin{array}{r} \text { W. } 13 \mathrm{~mm} \text {; } \\ \text { T. } 2.5 \mathrm{~mm} \\ \hline \end{array}$ |
| 3022 | 315 | Small spent metal bullet cartridge; ' D ' is stamped in top. | L. 16 mm ; T. 0.5 mm |

## Musket Balls

| 40 | 6 | Shot medieval or post-medieval musket ball. |  |
| :--- | :---: | :--- | :---: |
| 165 | 10 | Shot musket ball. |  |
| 437 | 41 | Grey-white iron musket ball. |  |

Clay Pipes

| 18 | 1 | Clay pipe bore/stem. |
| :--- | :--- | :--- |


| 69 | 10 | Clay pipe stem. |  |  |
| :--- | :---: | :--- | :--- | ---: |
| 123 | 10 | Decorated portion of pipe stem. |  |  |
| 137 | 9 | White piece of clay possible from a clay pipe. |  |  |
| 146 | 30 | Three clay pipe stems. | L.37mm; <br> W.3mm |  |
| 155 | 10 | Fragment of clay pipe stem. | L.32mm; <br> 1562 | 113 | Stem with central hole which narrows at one end. $\quad$| L. $26 \mathrm{~mm} ;$ |
| ---: |
| 2329 |


| Cloth |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| 14 | 1 | A fragment of modern cloth. |  |  |  |  |


| Coins |  |  |  |  |  | Modern 3 pennies and 1/2 penny. |  |
| :--- | :---: | :--- | ---: | :---: | :---: | :---: | :---: |
| 24 |  | Modern half-crown. |  |  |  |  |  |
| 26 | 6 | Modern penny. |  |  |  |  |  |
| 31 | 1 | A penny coin dated to 1908. | T.1.5mm |  |  |  |  |
| 142 | 305 | An Irish penny dated to 1971. Some corrosion and wear evident. <br> (Still legal tender). |  |  |  |  |  |
| 3000 | 305 | Copper coin. 1943 English threepence; Head - King George VI. | T.2.5mm |  |  |  |  |

## Crucifix Medal

| 32 | 6 | Crucifix medal. |  |
| :--- | :--- | :--- | :--- |


| Glass |  |  |  |
| :---: | :---: | :---: | :---: |
| 311 | 9 | Two pieces of glass, green and orange. |  |
| 314 | 9 | Two small pieces of glass, one with ridges. |  |
| 327 | 1 | Piece of brown coloured glass. |  |
| 338 | 6 | Glass. |  |
| 410 | 43 | Thin sherd of green glass with air bubbles in it. | L. 29 mm ; W. 11 mm ; T. 2.5 mm |
| 2328 | 1 | Fragment of thin curved green glass. | L. 21.5 mm ; W.11.5mm; T. 2 mm |

## Miscellaneous Finds

| 2509 | 71 | Part of base/lid of tin can. | L. 47 mm ; W.21mm; T. 1 mm |
| :---: | :---: | :---: | :---: |
| 2974 | 935 | Twisted metal strip that is gold-plated. Silvery colour underneath - nickel? Traces of rust adhering. Light weight. | L. 43 mm ; W.4mm; T. 1 mm |
| 3049 | 6 | Triangular shaped fishing weight with an iron loop at the apex. Surfaces are rough. The loop at the top is formed by an iron wire, one end of which comes out at the base of the weight. | $\begin{array}{r} \mathrm{L} .33 \mathrm{~mm} ; \\ \mathrm{W} .26 \mathrm{~mm} ; \\ \text { T. } 20 \mathrm{~mm} \\ \hline \end{array}$ |

## Bronze pieces from Dún Aonghasa not illustrated in Volume 2



Appendix Figure 1.13.1 bronze items of likely late Bronze Age date.


Appendix Fig.1.13.2 Miscellaneous bronze pieces. Scale 1:1

Iron Finds from Dun Aonghasa not illustrated in Volume 2


Appendix Figure 1.26.1 Scale 1:1


Appendix Figure 1.26.2. Scale 1:1


Appendix Figure 1.26.3. Scale 1:1


Appendix Figure 1.26.4. Scale 1:1


Appendix Figure 1.26.5. Scale 1:1

## MAMMAL AND BIRD BONES

## Appendix 2.1 Mammal Bone Data (F. McCormick and E. Murphy)

| Sample | Date | Cattle | Sheep | Pig | Red deer | Fox | Seal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |
| 10 | MBA/LBA | 47 | 19 | - | - | - | - |
| 11 | MBA/LBA | 203 | 239 | - | - | - | - |
| 13 | MBA/LBA | 16 | 25 | 1 | - | - | - |
| $14+$ | MBA/LBA | 475 | 527 | 17 | 1 | - | 1 |


| 9 | LBA | 317 | 135 | 3 | - | - | - |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 12 | LBA | 188 | 122 | - | 2 | - | - |
| $17+$ | LBA | 387 | 304 | 15 | - | - | - |
| 21 | LBA | 132 | 93 | 10 | 4 | - | - |
| $23+$ | LBA | 329 | 146 | 4 | - | - | - |
| $29+$ | LBA | 1203 | 736 | 26 | - | 1 | 1 |
| 30 | LBA | 337 | 138 | 2 | 1 | - | 1 |
| $31+$ | LBA | 1204 | 590 | 11 | - | - | - |
| 37 | LBA | 49 | 16 | - | - | - | - |
| 38 | LBA | 1560 | 610 | 10 | - | - | - |
| 41 | LBA | 86 | 53 | 5 | - | - | - |
| 42 | LBA | 172 | 177 | 4 | - | - | - |
| 44 | LBA | 117 | 137 | 14 | - | - | - |
| 45 | LBA | 128 | 177 | 28 | - | - | - |
| 47 | LBA | 94 | 137 | 7 | - | - | - |
| $52+$ | LBA | 888 | 553 | 4 | - | - | - |
| 55 | LBA | 522 | 476 | 1 | - | 1 | - |
| $92+$ | LBA | 212 | 339 | 1 | - | - | - |
| 101 | LBA | 314 | 346 | 2 | - | - | 1 |
| $119 a$ | LBA | 101 | 102 | 1 | - | - | - |
|  |  |  |  |  | $\mathbf{1 4 8}$ | $\mathbf{7}$ | $\mathbf{2}$ |
|  | LBA total | $\mathbf{8 3 4 0}$ | $\mathbf{5 3 8 7}$ | $\mathbf{3 8 . 8}$ | $\mathbf{1 . 0 6}$ | $\mathbf{0 . 0 5}$ | $\mathbf{0 . 0 1}$ |
|  | LBA $\%$ | $\mathbf{6 0 . 0 6}$ |  |  | $\mathbf{0 . 0 2}$ |  |  |

[^0]| Sample | Date | Cattle | Sheep | Pig | Red deer | Fox | Seal | N |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  | 455 |
| 9 | LBA | 69.7 | 29.7 | 0.7 | - | - | - | 66 |
| 10 | MBA/LBA | 71.2 | 28.8 | - | - | - | - | 442 |
| 11 | MBA/LBA | 45.9 | 54.1 | - | - | - | - | 312 |
| 12 | LBA | 60.3 | 39.1 | - | 0.6 | - | - | 42 |
| 13 | MBA/LBA | 38.1 | 59.5 | 2.4 | - | - | - | 42 |
| $14+$ | MBA/LBA | 46.5 | 51.6 | 1.7 | 0.1 | - | 0.1 | 1021 |
| $17+$ | LBA | 54.8 | 43.1 | 2.1 | - | - | - | 706 |
| 21 | LBA | 55.2 | 38.9 | 4.2 | 1.7 | - | - | 239 |
| $23+$ | LBA | 68.7 | 30.5 | 0.8 | - | - | - | 479 |
| $29+$ | LBA | 61.1 | 37.4 | 1.3 | - | 0.1 | 0.1 | 1967 |
| 30 | LBA | 70.9 | 28.8 | 0.4 | 0.2 | - | 0.2 | 479 |
| $31+$ | LBA | 66.7 | 32.7 | 0.6 | - | - | - | 1805 |
| 37 | LBA | 60.1 | 39.7 | 0.2 | - | - | - | 65 |
| 38 | LBA | 71.5 | 28 | 0.5 | - | - | - | 2180 |
| 41 | LBA | 59.7 | 36.8 | 3.5 | - | - | - | 144 |
| 42 | LBA | 47.1 | 48.5 | 1.1 | - | - | - | 363 |
| 44 | LBA | 43.7 | 51.1 | 5.2 | - | - | - | 268 |
| 45 | LBA | 38.4 | 53.2 | 8.4 | - | - | - | 333 |
| 47 | LBA | 39.5 | 57.6 | 2.9 | - | - | - | 238 |
| $52+$ | LBA | 61.5 | 38.3 | 0.3 | - | - | - | 1445 |
| 55 | LBA | 52.2 | 47.6 | 0.1 | - | 0.1 | - | 1000 |
| $92+$ | LBA | 38.4 | 61.4 | 0.2 | - | - | - | 522 |
| 101 | LBA | 47.4 | 52.2 | 0.3 | - | - | 0.2 | 663 |
| $119 a$ | LBA | 49.5 | 50 | 0.5 | - | - | - | 204 |

Appendix Table 2.1.2 Distribution of mammal bone fragments expressed as percentages.

| Sample | Date | Cattle | Sheep | Pig | Red deer | Fox | Seal | N |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 9 | LBA | 5 | 5 | 1 | - | - | - | 11 |
| 12 | LBA | 4 | 5 | - | 1 | - | - | 10 |
| 17+ | LBA | 4 | 10 | 1 | - | - | - | 15 |
| 21 | LBA | 2 | 3 | 1 | 1 | - | - | 7 |
| 23+ | LBA | 3 | 4 | 1 | - | - | - | 8 |
| 29+ | LBA | 8 | 13 | 1 | - | 1 | 1 | 24 |
| 30 | LBA | 3 | 3 | 1 | 1 | - | - | 8 |
| $31+$ | LBA | 13 | 10 | 1 | - | - | - | 24 |
| 37 | LBA | 4 | 3 | 1 | - | - | - | 8 |
| 38 | LBA | 14 | 10 | 1 | - | - | - | 25 |
| 41 | LBA | 1 | 2 | 1 | - | - | - | 4 |
| 42 | LBA | 1 | 4 | 1 | - | - | - | 6 |
| 44 | LBA | 2 | 5 | 1 | - | - | - | 8 |
| 45 | LBA | 2 | 5 | 1 | - | - | - | 8 |
| 47 | LBA | 2 | 4 | 1 | - | - | - | 7 |
| 52+ | LBA | 7 | 9 | 1 | - | - | - | 17 |
| 55 | LBA | 7 | 12 | 1 | - | 1 | - | 21 |
| 92+ | LBA | 3 | 9 | 1 | - | - | - | 13 |
| 101 | LBA | 7 | 11 | 1 | - | - | 1 | 20 |
| 119a | LBA | 4 | 3 | 1 | - | - | - | 8 |
|  | Total | 96 | 130 | 19 | 3 | 2 | 2 | 252 |
|  | Total \% | 37.9 | 51.4 | 7.5 | 1.2 | 0.8 | 0.8 | 100 |
| 10 | MBA/LBA | 2 | 1 | - | - | - | - | 3 |
| 11 | MBA/LBA | 2 | 5 | - | - | - | - | 7 |
| 13 | MBA/LBA | 1 | 2 | 1 | - | - | - | 4 |
| 14+ | MBA/LBA | 9 | 9 | 1 | 1 | - | 1 | 21 |
|  | Total | 14 | 17 | 2 | 1 | 0 | 1 | 35 |
|  | Total \% | 40 | 48.6 | 5.6 | 2.9 | 0.0 | 2.9 | 100 |

Appendix Table 2.1.3 Mammal Bone: distribution of minimum number of individual (MNI) numbers.

## Cattle

| Sample | 9 | 10 | 11 | 12 | 13 | 14+ | 17+ | 21 | 23+ | 29+ | 30 | 31 | 35 | 37 | 38 | 41 | 42 | 44 | 45 | 47 | 52+ | 55 | 92+ | 101 | 119 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Horn | 1 | 1 | 7 | - | 1 | 4 | 2 | - | 1 | 10 | 4 | 18 | 1 | 4 | 21 | - | - | 1 | - | - | 6 | 3 | 1 | - | 2 |
| Skull | 6 | - | 1 | 1 | - | 7 | 5 | - | 7 | 30 | 13 | 54 | 3 | 13 | 93 | 1 | 4 | 3 | 4 | 2 | 41 | 18 | 2 | 7 | 2 |
| Mandible | 25 | 4 | 12 | 13 | - | 30 | 26 | 10 | 31 | 63 | 27 | 96 | 26 | 22 | 137 | 2 | 5 | 4 | 11 | 12 | 39 | 28 | 91 | 5 | 5 |
| Teeth | 113 | 8 | 82 | 35 | 7 | 137 | 132 | 56 | 125 | 358 | 95 | 285 | - | 52 | 349 | 48 | 67 | 52 | 45 | 35 | 335 | 173 | - | 128 | 39 |
| Atlas | 6 | - | 3 | 2 | 1 | 2 | 2 | 1 | 2 | 4 | 1 | 7 | - | 1 | 4 | 1 | - | - | - | - | 6 | - | - | - | - |
| Axis | - | - | 3 | 1 | - | 3 | 4 | 1 | 1 | 0 | - | 6 | - | 2 | 9 | - | - | - | - | - | 5 | 2 | 12 | 4 | - |
| Scapula | 1 | 2 | 10 | 5 | - | 13 | 9 | - | 1 | 26 | 10 | 25 | 1 | 7 | 39 | 2 | 6 | 1 | 4 | 7 | 33 | 13 | 5 | 7 | - |
| Humerus | 11 | 2 | 4 | 11 | - | 18 | 19 | 1 | 15 | 67 | 21 | 75 | 7 | 23 | 63 | 1 | 13 | 3 | 4 | 4 | 35 | 19 | 10 | 16 | 1 |
| Radius | 16 | 5 | 12 | 9 | 1 | 24 | 18 | 6 | 20 | 51 | 14 | 64 | 1 | 20 | 65 | 1 | 6 | 2 | 3 | 3 | 25 | 25 | 6 | 11 | 10 |
| Ulna | 1 | 2 | 3 | 4 | - | 5 | 4 | 3 | 2 | 16 | 7 | 15 | - | 1 | 23 | 2 | 2 | 1 | 1 | - | 13 | 17 | 3 | 3 | 1 |
| Metacarpal | 13 | - | 7 | 13 | - | 19 | 17 | 4 | 9 | 33 | 16 | 46 | 3 | 10 | 37 | 3 | 5 | 1 | 3 | - | 35 | 10 | 10 | 7 | 1 |
| Pelvis | 10 | - | 9 | 9 | - | 22 | 16 | 8 | 16 | 56 | 14 | 57 | - | 12 | 73 | 2 | 3 | 2 | 2 | 1 | 25 | 19 | 7 | 9 | 8 |
| Femur | 10 | 2 | 6 | 14 | - | 27 | 17 | 5 | 19 | 94 | 12 | 85 | - | 21 | 72 | 5 | 10 | 4 | 5 | 9 | 39 | 16 | 2 | 17 | 4 |
| Patella | 3 | - | 1 | 1 | - | 5 | 5 | - | 1 | 11 |  | 10 | - | 5 | 9 | - | - | 2 | - | 1 | 6 | 5 | - | 2 | 1 |
| Tibia | 20 | 2 | 7 | 6 | - | 20 | 7 | 6 | 15 | 68 | 20 | 72 | 2 | 18 | 83 | 5 | 5 | 5 | 3 | 2 | 29 | 25 | 5 | 20 | 5 |
| Astralagus | 3 | 2 | 1 | 4 | - | 3 | 3 | 4 | 0 | 18 | 1 | 25 | - | 4 | 19 | 1 | 2 | 4 | 5 | - | 3 | 8 | 5 | 8 | - |
| Calcaneus | 11 | 1 | 2 | 6 | 2 | 11 | 10 | 6 | 12 | 29 | 6 | 23 | 1 | 10 | 41 | 2 | 1 | 4 | 1 | - | 12 | 19 | 10 | 9 | - |
| Metatarsal | 19 | 5 | 6 | 14 | - | 28 | 21 | 4 | 13 | 55 | 23 | 49 | 3 | 12 | 51 | 4 | 10 | 6 | 5 | 5 | 22 | 17 | 2 | 14 | - |
| Phalanx 1 | 14 | 3 | 11 | 25 | 2 | 51 | 31 | 4 | 17 | 87 | 13 | 65 | 1 | 32 | 106 | 4 | 15 | 9 | 7 | 6 | 86 | 46 | 13 | 22 | 9 |
| Phalanx 2 | 21 | 4 | 14 | 8 | 2 | 35 | 23 | 8 | 13 | 81 | 22 | 68 | - | 15 | 83 | - | 8 | 7 | 8 | 4 | 48 | 31 | 16 | 18 | 7 |
| Phalanx 3 | 13 | - | 2 | 7 | - | 11 | 16 | 5 | 9 | 46 | 18 | 59 | - | 16 | 63 | 2 | 10 | 6 | 17 | 3 | 45 | 28 | 12 | 7 | 6 |

Appendix Table 2.1.4 Distribution of cattle bone fragments.

## Sheep

| Sample | 9 | 10 | 11 | 12 | 13 | 14+ | 17+ | 21 | 23+ | 29+ | 30 | 31 | 35 | 37 | 38 | 41 | 42 | 44 | 45 | 47 | 52+ | 55 | 92+ | 101 | 119 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Horn | 1 | - | - | - | - | 1 | 1 | - | 0 | 2 | 2 | 7 | - | 1 | - | - | - | - | 1 | 1 | - | - | - | 2 | - |
| Skull | 6 | - | 2 | 1 | 2 | 6 | 4 | - | 2 | 19 | 3 | 34 | - | 22 | 32 | 8 | 11 | 8 | 9 | 13 | 22 | 7 | - | 5 | 2 |
| Mandible | 25 | 1 | 6 | 8 | - | 36 | 24 | 4 | 2 | 30 | 19 | 33 | - | 20 | 47 | 2 | 11 | 6 | 5 | 6 | 24 | 14 | 10 | 14 | 3 |
| Teeth | 113 | 2 | 62 | 28 | 8 | 135 | 92 | 25 | 51 | 167 | 31 | 118 | 10 | 44 | 152 | 17 | 58 | 38 | 42 | 40 | 146 | 113 | 102 | 71 | 42 |
| Atlas | 6 | - | - | - | - | 0 | - | - | 1 | 2 | 1 | 2 | - | - | - | - | - | 1 | - | - | - | - | - | - | - |
| Axis | - | - | - | - | - | 3 | 2 | 2 | 0 | 1 | 2 | 2 | - | - | 2 | - | - | 1 | 1 | 2 | - | 3 | - | - | 1 |
| Scapula | 1 | - | 6 | 7 | - | 17 | 8 | 2 | 5 | 26 | 2 | 11 | 1 | 4 | 14 | 1 | 1 | 5 | 4 | 3 | 18 | 13 | 4 | 8 | 1 |
| Humerus | 11 | 1 | 20 | 9 | 1 | 19 | 9 | 7 | 7 | 47 | 9 | 29 | - | 10 | 22 | 1 | 12 | 8 | 9 | 7 | 22 | 36 | 23 | 17 | 5 |
| Radius | 16 | - | 12 | 11 | - | 31 | 23 | 4 | 7 | 62 | 7 | 41 | - | 16 | 38 | - | 11 | 8 | 11 | 9 | 37 | 39 | 22 | 48 | 6 |
| Ulna | 1 | - | 6 | 3 | - | 14 | 7 | 2 | 3 | 14 | 3 | 10 | - | 5 | 11 | 2 | 3 | 6 | 6 | 4 | 9 | 16 | 4 | 14 | 1 |
| Metacarpal | 13 | 2 | 16 | 8 | - | 31 | 11 | 7 | 8 | 28 | 7 | 20 | - | 8 | 19 | 3 | 7 | 3 | 7 | 5 | 26 | 16 | 10 | 23 | 1 |
| Pelvis | 10 | 2 | 13 | 11 | - | 36 | 30 | 6 | 14 | 38 | 12 | 41 | 1 | 12 | 32 | 3 | 11 | 8 | 17 | 2 | 24 | 28 | 17 | 22 | 4 |
| Femur | 10 | 2 | 24 | 4 | 4 | 36 | 15 | 3 | 7 | 71 | 2 | 69 | 3 | 15 | 28 | 3 | 13 | 13 | 13 | 4 | 44 | 40 | 9 | - | 8 |
| Patella | 3 | - | 2 | - | - | 1 | 1 | 1 | 0 | 4 | - | 3 | - | - | 6 | - | 4 | 1 | 1 | 1 | 7 | - | 3 | 2 | 1 |
| Tibia | 20 | 3 | 16 | 8 | 1 | 25 | 7 | 9 | 6 | 44 | 9 | 29 | - | 13 | 19 | 5 | 8 | 3 | 5 | 5 | 21 | 23 | 20 | 33 | 6 |
| Astralagus | 3 | 1 | 7 | 6 | - | 15 | 10 | - | 3 | 22 | 3 | 20 | 1 | 4 | 17 | 1 | 3 | 2 | 8 | 3 | 15 | 22 | 12 | 7 | 3 |
| Calcaneus | 11 | - | 5 | - | 1 | 15 | 10 | 4 | 4 | 26 | 4 | 23 | - | 3 | 13 | - | 7 | 9 | 3 | 7 | 10 | 15 | 14 | 15 | 1 |
| Metatarsal | 19 | 1 | 16 | 8 | 2 | 40 | 19 | 6 | 10 | 54 | 11 | 27 | - | 9 | 18 | 5 | 7 | 4 | 4 | 5 | 32 | 24 | 10 | 30 | 3 |
| Phalanx 1 | 14 | 2 | 12 | 6 | 3 | 34 | 18 | 6 | 11 | 36 | 7 | 35 | - | 9 | 19 | 2 | 6 | 6 | 18 | 16 | 51 | 40 | 47 | 23 | 3 |
| Phalanx 2 | 21 | - | 9 | 3 | 1 | 23 | 10 | 4 | 3 | 23 | - | 22 | - | 2 | 12 | - | 3 | 2 | 5 | 3 | 27 | 19 | 26 | 10 | 8 |
| Phalanx 3 | 13 | - | 5 | 1 | 2 | 9 | 3 | 1 | 2 | 20 | 4 | 14 | - | 1 | 6 | - | 1 | 5 | 8 | 1 | 18 | 8 | 6 | 2 | 3 |

## Appendix Table 2.1.5 Distribution of sheep bone fragments.

| Pig |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sample | 9 | 13 | 14+ | 17+ | 21 | 23+ | 29+ | 30 | 31 | 37 | 38 | 41 | 42 | 44 | 45 | 47 | 52+ | 55 | 101 | 119 |
| Horn | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Skull | - | - | - | - | - | - | 1 | - | - | - | 4 | - | - | - | - | - | - | - | - | - |
| Mandible | - | - | - | 1 | - | - | 2 | - | 1 | - | - | - | - | - | - | - | - | - | - | - |
| Teeth | 1 | 1 | 9 | 8 | 5 | 1 | 11 | 2 | 5 | - | 2 | 3 | - | 8 | 16 | 3 | 2 | - | - | - |
| Atlas | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Axis | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Scapula | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Humerus | - | - | - | - | 1 | - | 1 | - | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| Radius | - | - | 1 | 1 | - | - | 1 | - | - | - | 1 | 1 | - | - | - | 1 | - | - | - | - |
| Ulna | - | - | 1 | - | 1 | - | 1 | - | - | - | 1 | - | 1 | - | - | - | - | - | - | - |
| Metacarpal | - | - | 2 | 2 | 2 | 1 | 4 | - | 2 | 1 | - | - | - | 1 | 3 | 1 | - | - | - | - |
| Pelvis | - | - | - | - | - | - | - | - | 1 | - | - | - | - | 1 | - | - | - | - | - | - |
| Femur | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Patella | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 |
| Tibia | - | - | - | - | - | - | 1 | - | - | - | - | - | - | 1 | - | - | 1 | - | - | - |
| Fibula | - | - | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Astralagus | 1 | - | 1 | 2 | 1 | - | 2 | - | - | - | 1 | - | 1 | - | - | - | - | - | - | - |
| Calcaneus | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 | - | - | - | - | 1 | - |
| Metatarsal | - | - | - | - | - | 2 | - | - | 2 | - | - | 1 | 1 | 1 | 2 | - | - | - | - | - |
| Phalanx 1 | - | - | - | - | - | - | 1 | - | - | - | - | - | - | 1 | 2 | 1 |  | - | - | - |
| Phalanx 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | 1 | 1 | - | - | - |
| Phalanx 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - |

## Appendix Table 2.1.6 Distribution of pig bone fragments.

| Red deer |  |  |  |  |  | Fox |  | Seal |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sample | 12 | 14+ | 21 | 30 | 92+ | 29 | 55 | 14 | 29 | 30 | 101 |
| Horn | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - |
| Skull | - | - | - | - | - | - | - | - | - | - | - |
| Mandible | - | - | - | - | - | - | 1 | - | - | - | - |
| Teeth | - | - | - | - | - | 1 | - | 1 | - | - | - |
| Atlas | - | - | - | - | - | - | - | - | - | - | - |
| Axis | - | - | - | - | - | - | - | - | - | - | - |
| Scapula | - | - | - | - | - | - | - | - | - | - | - |
| Humerus | - | - | - | - | - | - | - | - | - | - | - |
| Radius | - | - | - | - | - | - | - | - | - | - | - |
| Ulna | - | - | - | - | - | - | - | - | - | - | - |
| Metacarpal | - | - | - | - | - | - | - | - | - | 1 | - |
| Pelvis | - | - | - | - | - | - | - | - | 1 | - | - |
| Femur | - | - | - | - | - | - | - | - | - | - | - |
| Patella | - | - | - | - | - | - | - | - | - | - | - |
| Tibia | - | - | 1 | - | - | - | - | - | - | - | - |
| Astralagus | - | - | - | - | - | - | - | - | - | - | - |
| Calcaneus | - | - | - | - | - | - | - | - | - | - | - |
| Metatarsal | - | - | - | - | - | - | - | - | - | - | 1 |
| Phalanx 1 | - | - | 1 | - | 1 | - | - | - | - | - | - |
| Phalanx 2 | - | - | 1 | - | - | - | - | - | - | - | - |
| Phalanx 3 | - | - | - | - | - | - | - | - | - | - | - |

Appendix Table 2.1.7 Distribution of red deer, fox, and seal bone fragments.

| Cattle | Fused | Unfused |
| :--- | :---: | :---: |
| Humerus P | 3 | 13 |
| Humerus D | 40 | 30 |
| Radius P | 39 | 24 |
| Radius D | 7 | 45 |
| Ulna | 5 | 32 |
| Metacarpal D | 9 | 10 |
| Pelvis | 38 | 37 |
|  | 16 | 25 |
| Femur P | 10 | 26 |
| Femur D | 7 | 14 |
| Tibia P | 12 | 35 |
| Tibia D | 21 | 48 |
| Calcaneus | 4 | 11 |

Appendix Table 2.1.8 Cattle bone fusion data from late Bronze Age levels.

| Site | Bone | Approx. age at fusion (in months) | Fused | Unfused |
| :---: | :---: | :---: | :---: | :---: |
| Dun Aonghasa | Pelvis | 7-10 | 38(51\%) | 37(49\%) |
| Mooghaun |  |  | 1 (33\%) | 2 (66\%) |
| Haughey's Fort |  |  | 23 (92\%) | 2 (8\%) |
| Ballyveelish 2 |  |  | 22 (73\%) | $8(27 \%)$ |
| Dun Aonghasa | Humerus D, Radius P | 12-18 | 79(59\%) | 54(41\%) |
| Mooghaun |  |  | 86 (98\%) | 2 (2\%) |
| Haughey's Fort |  |  | 62 (90\%) | 7 (10\%) |
| Ballyveelish 2 |  |  | 12 (75\%) | 4 (25\%) |
| Lough Gur |  |  | 22(100\%) | 0 (0\%) |
| Newgrange |  |  | 96\% | 4\% |
| Dun Aonghasa | Tibia D, Metacarpal D, Metatarsal D | 24-36 | 26(32\%) | 55(68\%) |
| Mooghaun |  |  | 49 (86\%) | 8 (14\%) |
| Navan |  |  | 35 (78\%) | 10 (22\%) |
| Ballyveelish 2 |  |  | 14 (70\%) | 6 (30\%) |
| Lough Gur |  |  | 9(31\%) | 20(69\%) |
| Newgrange |  |  | 88\% | 12\% |
| Dun Aonghasa | Femur P, Calcaneus | 36-42 | 16(39\%) | 25(61\%) |
| Mooghaun |  |  | 29 (57\%) | 22 (43\%) |
| Haughey's Fort |  |  | 14 (45\%) | 17 (55\%) |
| Lough Gur |  |  | 7 (41\%) | 10(59\%) |
| Newgrange |  |  | 49\% | 51\% |
| Dun Aonghasa | Femur D, Tibia P, Humerus P, Radius D | 42-48 | 64(36\%) | 115(64\%) |
| Mooghaun |  |  | 33 (67\%) | 16 (33\%) |
| Haughey's Fort |  |  | 13 (38\%) | 21 (62\%) |
| Ballyveelish 2 |  |  | 8 (57\%) | 6 (43\%) |
| Lough Gur |  |  | 3(50\%) | 3(50\%) |
| Newgrange |  |  | 22\% | 78\% |

Appendix Table 2.1.9 Cattle bone fusion data from Dún Aonghasa and other prehistoric sites.
(after McCormick 1987a; McCormick 1991a; O' Shaughnessy 2003; Van WijngaardenBakker 1986; McCormick and Murray 2007).

| Sheep | Fused | Unfused |
| :--- | :---: | :---: |
| Scapula | 28 | 35 |
| Humerus P | 4 | 15 |
| Humerus D | 75 | 42 |
| Radius P | 46 | 30 |
| Radius D | 13 | 74 |
| Ulna | 11 | 40 |
| Metacarpal D | 15 | 20 |
| Pelvis | 42 | 45 |
| Femur P | 13 | 32 |
| Femur D | 6 | 40 |
| Tibia P | 6 | 33 |
| Tibia D | 22 | 57 |
| Calcaneus | 18 | 61 |
| Metararsal D | 5 | 5 |

Appendix Table 2.1.10 Sheep bone fusion data from late Bronze Age levels.

| Site | Bone | Approx. age at fusion (in months) | Fused | Unfused |
| :---: | :---: | :---: | :---: | :---: |
| Dun Aonghasa | Pelvis | 6-10 | 42(48\%) | 45(52\%) |
| Dun Aonghasa | Humerus D, Radius P | 10 | 121(63\%) | 72(37\%) |
| Chancellorsland Ph. 2 |  |  | 9(75\%) | 3(25\%) |
| Dun Vulan |  |  | 57(77\%) | 17(23\%) |
| Dun Aonghasa | Tibia D, Metacarpal D, Metatarsal D | 18-28 | 42(34\%) | 82(66\%) |
| Chancellorsland Ph. 2 |  |  | 7(30\%) | 16(70\%) |
| Dun Vulan |  |  | 47(41\%) | 67(59\%) |
| Dun Aonghasa | Femur P, Ulna, Calcaneus | 30-36 | 42(24\%) | 133(76\%) |
| Chancellorsland Ph. 2 |  |  | 0 (0\%) | 11(100\%) |
| Dun Vulan |  |  | $31(30 \%)$ | 71(70\%) |
| Dun Aonghasa | Radius D, Humerus P, Femur D, Tibia P | 36-42 | 29(15\%) | 162(85\%) |
| Chancellorsland Ph. 2 |  |  | 3(25\%) | 9(75\%) |
| Dun Vulan |  |  | 36(33\%) | 61(57\%) |

Appendix Table 2.1.11 Sheep bone fusion data from Dún Aonghasa and other sites. (McCarthy 2008; Mulville 1999, 248).

| Astralagus | GLI | BD | Humerus | Bd | Bt |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 61.6 | 38.4 |  | - | 66.3 |
|  | 61 | 39.6 |  | 86.7 | 72.1 |
|  | 60.6 | 37 |  | - | 62.1 |
|  | 60.9 | 35 |  | - | 65 |
|  | - | 37.3 |  | - | 69.2 |
|  | 58 | 36.4 |  | - | 63.1 |
|  | 63.2 | 42.6 |  |  |  |
|  | - | 35.5 |  | Min | 62.1 |
|  | 56.6 | 34.3 |  | Max | 72.1 |
|  | 62.2 | 36.9 |  | Average | 66.3 |
|  | 59.1 | 38.1 |  |  |  |
|  | 56 | 37.1 | Radius | Bp |  |
|  | 62 | 37.1 |  | 68.7 |  |
|  | 59.7 | 36.4 |  | 74.2 |  |
|  | 59.5 | 39.4 |  | 67 |  |
|  | 61.6 | 37.6 |  | 75.1 |  |
|  | 59.6 | 36.6 |  | 72.1 |  |
|  | 59.8 | 38 |  |  |  |
|  | 62.2 | 39 | Min | 67 |  |
|  | 56.1 | 34.7 | Max | 75.1 |  |
|  | 58.2 | 36.4 | Average | 71.42 |  |
|  | 56.6 | 35.6 |  |  |  |
|  | 63.5 | 40.1 |  |  |  |
|  | 60.9 | 38.5 | Metacarpal | Bp | Bd |
|  | 62.8 | 39.4 |  | 50.5 | - |
|  | 57 | 36.4 |  | - | 49.6 |
|  | 63.4 | 41 |  | - | 53.5 |
|  | 59 | 36.3 |  | 52.7 | - |
|  | 60.8 | 37.7 |  | - | 59 |
|  | 61.5 | 36.6 |  | - | 51.9 |
|  | 61.2 | 39.9 |  | - | 50.5 |
|  | 60.9 | 41.1 |  | - | 49.1 |
|  | 60 | 37.9 |  | - | 50.9 |
|  | 58.5 | 35.8 |  | - | 51.3 |
|  | 62.9 | 40 |  | 48.2 | - |
|  | 60.9 | 37.1 |  |  |  |
|  | 59.1 | 38 | Min | 48.2 | 49.1 |
|  | 59.1 | 41.2 | Max | 52.7 | 59 |
|  | 57.9 | 35.8 | Average | 50.47 | 51.98 |
| Min | 56 | 34.3 |  |  |  |
| Max | 63.5 | 42.6 |  |  |  |
| Average | 60.11 | 37.74 |  |  |  |
| SD | 2.1 | 1.953 |  |  |  |

Appendix Table 2.1.12 Cattle bone measurements (mm) after von den Driesch (1976).

| Tibia | $B d$ |  | Calcaneus | $G L$ |
| :---: | :---: | :---: | :---: | :---: |
|  | 52.9 |  |  | 124.6 |
|  | 54.6 |  |  | 117.1 |
|  | 54.2 |  |  | 113.2 |
|  | 54.4 |  |  | 115 |
|  | 57.3 |  |  | 115 |
|  | 53 |  |  | 114.5 |
|  | 53.5 |  |  | 121.6 |
|  | 54.4 |  |  | 121 |
|  |  |  |  | 119.1 |
| Min | 52.9 |  |  |  |
| Max | 57.3 |  | Min | 113.2 |
| Average | 54.29 |  | Max | 124.6 |
| $S D$ | 1.384 |  | Average | 117.9 |
| Metatarsal | Bp | Bd |  |  |
|  | - | 49.6 |  |  |
|  | - | 53.4 |  |  |
|  | - | 47.8 |  |  |
|  | - | 47.7 |  |  |
|  | - | 46.1 |  |  |
|  | - | 51 |  |  |
|  | - | 58.5 |  |  |
|  | 43.9 | - |  |  |
| Min | - | 46.1 |  |  |
| Max | - | 58.5 |  |  |
| Average | - | 50.59 |  |  |

Appendix Table 2.1.13 Cattle bone measurements continued (mm) after von den Driesch (1976).

| Astralagus | GLI | Bd |  | GLI | Bd |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 26 | 15.2 |  | 24 | 15 |
|  | 25.6 | 16.8 |  | 24.1 | - |
|  | 25 | 15.5 |  | 27 | 17 |
|  | 25.3 | 16.6 |  | 24.8 | 15 |
|  | 25.5 | 17 |  | 26.3 | 16.8 |
|  | 25.2 | 17 |  | 26.7 | 15.6 |
|  | 27.7 | 17.7 |  | 27 | 17.9 |
|  | 28.4 | 18.2 |  | 26.3 | 17 |
|  | 25.5 | 17 |  | 25.6 | 16.2 |
|  | 26 | 16.7 |  | 26.8 | 17.2 |
|  | 28.1 | 17.5 |  | 27 | 17 |
|  | 24.8 | 17.8 |  | 25.8 | 15.9 |
|  | 25.4 | 16.1 |  | 25.7 | 16.7 |
|  | 26.2 | 16.9 |  | - | 16.1 |
|  | 26 | 15.6 |  | 25.2 | 16.9 |
|  | 26.2 | 17.2 |  | 26.6 | 17 |
|  | 26.9 | 17.9 |  | 25.3 | 16.3 |
|  | 26 | 16.2 |  | 27.8 | 17.8 |
|  | 24.9 | 15.7 |  | 27 | 17 |
|  | 25 | 16.1 |  | 26.9 | 16.9 |
|  | 29.1 | 17.4 |  | 26.1 | 16.7 |
|  | 25 | 16.1 |  | 26.1 | 16.4 |
|  | 25 | 16 |  | 25.6 | 16.2 |
|  | 28.1 | 17.5 |  | 26.5 | 17.1 |
|  | 24.4 | 15.1 |  | 26.9 | 16.9 |
|  | 27.6 | 17.5 |  | 25.9 | 16.1 |
|  | 24.7 | 16 |  | 26.9 | 16.9 |
|  | 28.8 | 17.5 |  | 27.7 | 17.1 |
|  | 27.7 | 16.2 |  | 26.1 | 17.1 |
|  | 24.9 | 15.1 |  | 28 | 17.9 |
|  | 26.9 | 16.7 |  |  |  |
|  | 24.5 | 16.1 | $N$ | 71 | 71 |
|  | 25.1 | 16.2 | Min | 24 | 15 |
|  | 26.9 | 16.7 | Max | 29.1 | 18.4 |
|  | 26 | 16.6 | Average | 26.28 | 16.68 |
|  | 28.6 | 18.4 | $S D$ | 1.176 | 0.787 |
|  | 26.8 | 17.5 |  |  |  |
|  | 26.6 | 16 |  |  |  |
|  | 28 | 17.5 |  |  |  |
|  | 26.1 | 17 |  |  |  |
|  | 27 | 16.1 |  |  |  |
|  | 26.4 | 16.6 |  |  |  |

Appendix Table 2.1.14 Sheep bone measurements (mm) after von den Driesch (1976).

| Humerus | Bp | Bd | Humerus | Bp | Bd |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 29.2 | 26 |  | - | 23.5 |
|  | 26.5 | 24.9 |  | - | 27 |
|  | 28 | 25.6 |  | 28 | 26 |
|  | 28.4 | 24.4 |  | 25.3 | 23 |
|  | 25 | 24.7 |  | 24.8 | 23.7 |
|  | 26.1 | 23.6 |  |  |  |
|  | 30.6 | 26.7 | N | 35 | 44 |
|  | 27.2 | 25.1 | Min | 24.8 | 23 |
|  | 31.1 | 26.2 | Max | 31.7 | 28.2 |
|  | 28.1 | 25.7 | Average | 28.67 | 25.56 |
|  | 29 | 25.8 | $S D$ | 2.073 | 3.059 |
|  | 29.4 | 26.1 |  |  |  |
|  | 30.6 | 26.1 | Tibia | Bp | Bd |
|  | 29.6 | 25.5 |  | 34 | - |
|  | 30.4 | 28 |  | 32.7 | - |
|  | 28 | 24.8 |  | - | 23.6 |
|  | 29.1 | 25.4 |  | - | 23 |
|  | 28.7 | 24.1 |  | - | 20.7 |
|  | 30.4 | 27 |  | - | 25 |
|  | 28.3 | 24.2 |  | - | 23.1 |
|  | 30.7 | 26.1 |  | - | 23.1 |
|  | 31.4 | 28.1 |  | - | 25.3 |
|  | 29.9 | 26.1 |  | - | 23.6 |
|  | 29.5 | 26.7 |  | - | 23.4 |
|  | 29.4 | - |  | - | 24.1 |
|  | - | 26.3 |  | - | 24.9 |
|  | 27 | 23.7 |  | - | 23.9 |
|  | 28 | 24.5 |  | - | 22.1 |
|  | 29.7 | 25.6 |  | - | 24.5 |
|  | 27.1 | 24.2 |  |  |  |
|  | 31.7 | 27.6 | $\mathbf{N}$ | 2 | 14 |
|  | 28.1 | 24.4 | Min | - | 20.7 |
|  | 29.2 | 25.1 | Max | - | 25.3 |
|  | - | 25.1 | Average | - | 22.76 |
|  | - | 27.1 | $S D$ | - | 2.87 |
|  | - | 25.5 |  |  |  |
|  | - | 25 |  |  |  |
|  | - | 26.1 |  |  |  |
|  | - | 28.2 |  |  |  |
|  | - | 26.3 |  |  |  |

Appendix Table 2.1.15 Sheep bone measurements continued (mm) after von den Driesch (1976).

| Radius | Bp | Bd | Calcaneus | Bp |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 27 | - |  | 50.9 |  |
|  | 23.4 | - |  | 53 |  |
|  | 28 | - |  | 57.4 |  |
|  | 23.4 | - |  | 51.1 |  |
|  | 27.6 | - |  | 54.5 |  |
|  | 25.9 | - |  | 52.1 |  |
|  | 28 | - |  | 51.1 |  |
|  | 28.5 | - |  | 51 |  |
|  | 27.2 | - |  |  |  |
|  | 33 | - | Min | 50.9 |  |
|  | 30.5 | - | Max | 57.4 |  |
|  | - | 25.2 | Average | 52.64 |  |
|  | 27 | - |  |  |  |
|  | 30.4 | - | Femur | Bp | Bd |
|  | , | 27.7 |  | 38.5 | - |
|  | 25.7 | - |  | 43.6 | - |
|  | 24.7 | - |  | - | 33 |
|  | 26.4 | - |  |  |  |
|  | 28.1 | - |  |  |  |
|  | - | 25.5 |  |  |  |
|  | 26 | - |  |  |  |
|  | 27.2 | - |  |  |  |
|  | 25.8 | - |  |  |  |
|  | 30.7 | - |  |  |  |
|  | 30.8 | - |  |  |  |
|  | 27.5 | - |  |  |  |
|  | - | 24.2 |  |  |  |
|  | - | 22.4 |  |  |  |
|  | - | 25.9 |  |  |  |
|  | 28.4 | - |  |  |  |
|  | 28.2 | - |  |  |  |
| N | 25 | 6 |  |  |  |
| Min | 23.4 | 22.4 |  |  |  |
| Max | 33 | 27.7 |  |  |  |
| Average | 27.48 | 22.41 |  |  |  |
| SD | 2.485 | - |  |  |  |

Appendix Table 2.1.16 Sheep bone measurements continued (mm) after von den Driesch (1976).

| Metacarpal | GL | Bp | Bd | SD |
| :---: | :---: | :---: | :---: | :---: |
|  | - | 20.8 | - | - |
|  | - | - | 22.7 | - |
|  | - | - | 21.1 | - |
|  | - | 19.0 | - | - |
|  | - | - | 23.4 | - |
|  | - | - | 22.7 | - |
|  | - | - | 29.0 | - |
|  | - | - | 22.0 | - |
|  | - | 22.6 | - | - |
|  | - | 19.6 | - | - |
|  | - | - | 24.0 | - |
|  | - | - | 22.2 | - |
|  | - | 20.0 | 21.0 | - |
|  | - | 22.1 |  | - |
|  | - | 20.4 | - | - |
|  | - | - | 21.6 | - |
|  | - | - | 22.2 | - |
|  | 141.0 | 25.5 | 28.3 | 16.0 |
|  | 125.9 | 21.2 | 22.5 | 11.9 |
|  | - | 20.0 | - | - |
|  | - | - | 23.7 | - |
| $N$ | 2 | 10 | 14 | 2 |
| Min | 125.9 | 19.0 | 21.0 | 11.9 |
| Max | 141.0 | 25.5 | 29.0 | 16.0 |
| Average | 133.5 | 21.1 | 23.3 | 14.0 |
| SD | 10.7 | 1.9 | 2.4 | 2.9 |
| Metatarsal | GL | Bp | Bd | SD |
|  | - | 16.5 | - | - |
|  | - | - | 22.4 | - |
|  | - | 18.5 | - | - |
|  | - | 19.0 | - | - |
|  | - | 18.6 | - | - |
|  | - | 19.2 | - | - |
|  | - | 19.2 | - | - |
|  | - | - | 21.7 | - |
|  | 133.1 | 18.2 | - | 11.1 |
|  | - | 19.5 | - | - |
|  | - | - | 21.5 | - |
|  | - | 18.7 | - | - |
| Min | - | 16.5 | 21.5 | - |
| Max | - | 19.5 | 22.4 | - |
| Average | - | 18.6 | 21.9 | - |
| $S D$ | - | 0.9 | 0.5 | - |

Appendix Table 2.1.17 Sheep bone measurements continued (mm) after von den Driesch (1976).

Appendix 2.2 Table of bird bone measurements for the 1992/3 assemblages (M. McCarthy and T. O'Sullivan)

| Species | Element | Range |  |
| :---: | :---: | :---: | :---: |
| Guillemot | Ulna | Gl | 54.5-64.1 |
|  |  | Bp | 9.0-11.3 |
|  |  | Bd | 7.1-8.9 |
|  |  | Sc | 4.7-7.7 |
|  | Radius | Gl | 52.2-59.2 |
|  |  | Bp | 4.0-5.8 |
|  |  | Bd | 4.5-5.8 |
|  |  | Sc | 3.0-4.0 |
|  | Humerus | Gl | 79.1 |
|  |  | Bp | 14.5-17.8 |
|  |  | Bd | 10.3-12.0 |
|  |  | Sc | 7.1-7.8 |
|  | Femur | Gl | 42.5-46.5 |
|  |  | Bp | 8.9-10.9 |
|  |  | Bd | 7.6-8.4 |
|  |  | Sc | 4.6-4.7 |
|  | Tibio-tarsus | Gl |  |
|  |  | Bp |  |
|  |  | Bd | 5.8-7.6 |
|  |  | Sc |  |
|  | Tarso-metatarsus | Gl | 35.0-36.1 |
|  |  | Bp | 6.5-7.5 |
|  |  | Bd | 6.8-7.0 |
|  |  | Sc | 3.0-3.5 |
|  | Coracoid | Gl | 30.2-39.0 |
|  |  | Bp |  |
|  |  | Bd |  |
|  |  | Sc |  |
| Shag | Femur | Gl | 57.6-53.2 |
|  |  | Bp | 18.0-14.8 |
|  |  | Bd | 14.7-17.5 |
|  |  | Sc | 6.1-8.6 |
|  | Tibio-tarsus | Gl | 108.5-109.8 |
|  |  | Bp | 17.3-14.7 |
|  |  | Bd | 10.8-12.2 |
|  |  | Sc | 6.0-7.5 |
|  | Tarso-metatarsus | Gl | 57.0-62.2 |
|  |  | Bp | 11.6-12.5 |
|  |  | Bd | 13.0-14.8 |
|  |  | Sc | 5.4-6.4 |


| Species | Element | Range |  |
| :---: | :---: | :---: | :---: |
| Shag (contd.) | Humerus | Gl | 110.2-115.8 |
|  |  | Bp | 19.2-22.8 |
|  |  | Bd | 15.1-12.0 |
|  |  | Sc | 6.4-9.4 |
|  | Carpo-metacarpus | Gl | 56.2-60.3 |
|  |  | Bp | 9.7-12.2 |
|  |  | Bd | 6.4-7.9 |
|  |  | Sc | 3.6-4.3 |
|  | Ulna | Gl | 134.1 |
|  |  | Bp | 8.6-10.8 |
|  |  | Bd | $9.0-10.2$ |
|  |  | Sc | 4.8-6.2 |
|  | Coracid | Gl | 56.9-64.0 |
|  |  | Bp |  |
|  |  | Bd |  |
|  |  | Sc |  |
|  | Radius | Gl | 131.0 |
|  |  | Bp | 15.8-17.4 |
|  |  | Bd | 14.0-18.2 |
|  |  | Sc | 3.2 |
| Razorbill | Carpo-metacarpus | Gl | 37.6-40.5 |
|  |  | Bp | 9.7 - 10.1 |
|  |  | Bd | 6.4 |
|  |  | Sc | 3.4-3.6 |
| Cormorant | Tarso-metatarsus | Gl | 63.6 |
|  |  | Bp | 20.1-20.2 |
|  |  | Bd |  |
|  |  | Sc | $6.7-7.3$ |
|  | Tibio-tarsus | G1 |  |
|  |  | Bp | 21.4 |
|  |  | Bd | 14.8 |
|  |  | Sc | 8.5 |
|  | Femur | Gl | 72.9 |
|  |  | Bp | 20.2 |
|  |  | Bd | 20.3 |
|  |  | Sc | 7.7 |
| Herring gull | Ulna | Gl | 128.0-138.6 |
|  |  | Bp | 9.5-12.0 |
|  |  | Bd | $8.9-10.2$ |
|  |  | Sc | 4.7-5.5 |
|  | Humerus | Gl |  |
|  |  | Bp | 21.0 |
|  |  | Bd |  |
|  |  | Sc | 7.0 |


| Species | Element | Range |  |
| :---: | :---: | :---: | :---: |
| Crow | Tarso-metatarsus | Gl | 58.9 |
|  |  | Bp | 7.6 |
|  |  | Bd | 7.0 |
|  |  | Sc | 3.5 |
|  | Humerus | Gl | 45.6-46.2 |
|  |  | Bp | 13.3-13.7 |
|  |  | Bd |  |
|  |  | Sc | 4.1 |
|  | Carpo-metacarpus | Gl | 48.6 |
|  |  | Bp | 11.3 |
|  |  | Bd | 10.2 |
|  |  | Sc | 3.9 |
| White-tailed eagle | Tibio-tarsus | Gl |  |
|  |  | Bp |  |
|  |  | Bd | 23.0 |
|  |  | Sc | 12.7 |
| Godwit | Tibio-tarsus | Gl |  |
|  |  | Bp |  |
|  |  | Bd | 8.6 |
|  |  | Sc | 4.0 |
| Kittiwake | Carpo-metacarpus | Gl | 43.9 |
|  |  | Bp | 10.0 |
|  |  | Bd | 6.0 |
|  |  | Sc | 3.2 |
| Puffin | Humerus | Gl | 42.4 |
|  |  | Bp | 13.5-10.4 |
|  |  | Bd | 6.4 |
|  |  | Sc | $3.0-4.5$ |
|  | Tibio-tarsus | Gl | $63.2$ |
|  |  | Bp | 8.2 |
|  |  | Bd | 6.1 |
|  |  | Sc | 3.4 |
| Curlew | Humerus | Gl |  |
|  |  | Bp |  |
|  |  | Bd | 14.3-15.2 |
|  |  | Sc | 5.5-5.6 |

Appendix Table 2.2 Bird bone measurements (in mm) for the 1992/3 assemblages (After von den Dreisch 1976).

## HUMAN REMAINS <br> Appendix 3 Dún Aonghasa Human Bone: Skeletal Inventories (B. Ó Donnabháin)

```
Bone Group 1 (92E102:3074)
    L Mandible: Medial half
    L Frontal: Complete
    L Parietal: Fragments
    L Occipital: Complete
    L Temporal: Complete
    L Sphenoid: Complete
    L Zygomatic: Complete
    L Maxilla: Fragments
    L Scapula: Mostly complete
    L Clavicle: Complete
    L Humerus: Proximal half
    L Radius: Complete
    L Ulna: Absent
    L Ilium: Complete
    L Ischium: Complete
    L Pubis: Complete
    L Femur: Complete
    L Tibia: Absent R Tibia: Absent
    Fibula: One complete unsided
    L Ribs: 11
    R Ribs: 12
    Vertebrae (minimum numbers):
            Cervical: }
            Thoracic: }1
            Lumbar: 5
            Sacrum: 1
Appendix Table 3.1 Skeletal Inventory of Bone Group 1 (92E102:3074)
```

Bone Group 21 (92E102:2680)

L Mandible: Absent
L Frontal: Absent
L Parietal: Absent
L Occipital: Absent
L Temporal: Absent
L Sphenoid: Absent
L Zygomatic: Absent
L Maxilla: Absent
L Scapula: Mostly complete
L Clavicle: Lateral half
L Humerus: Fragmentary

R Mandible: Absent
R Frontal: Absent
R Parietal: Absent
R Occipital: Absent
R Temporal: Petrous portion only
R Sphenoid: Absent
R Zygomatic: Absent
R Maxilla: Loose teeth only
R Scapula: Fragmentary
R Clavicle: Absent
R Humerus: Fragmentary

| L Radius: Distal third | R Radius: Fragmentary |
| :--- | :--- |
| L Ulna: Fragmentary | R Ulna: Complete |
|  |  |
| L Scaphoid: Absent | R Scaphoid: Absent |
| L Lunate: Complete | R Lunate: Complete |
| L Triquetrum: Absent | R Triquetrum: Complete |
| L Pisiform: Absent | R Pisiform: Absent |
| L Trapezium: Complete | R Trapezium: Absent |
| L Trapezoid: Complete | R Trapezoid: Absent |
| L Capitate: Complete | R Capitate: Complete |
| L Hamate: Absent | R Hamate: Complete |
| L MC 1: Complete | R MC 1: Complete |
| L MC 2: Complete | R MC 2: Complete |
| L MC 3: Complete | R MC 3: Complete |
| L MC 4: Complete | R MC 4: Complete |
| L MC 5: Complete | R MC 5: Complete |
| Hand Phalanges (Minimum number): 18 |  |


| L Ilium: Complete | R Ilium: Fragments |
| :--- | :--- |
| L Ischium: Fragment | R Ischium: Complete |
| L Pubis: Complete | R Pubis: Absent |
| L Femur: Complete | R Femur: Fragments |
| L Tibia: Fragmentary | R Tibia: Complete |
| L Fibula: Fragmentary | R Fibula: Fragments |
| L Talus: Complete | R Talus: Complete |
| L Calcaneus: Complete | R Calcaneus: Complete |
| L Cuboid: Complete | R Cuboid: Absent |
| L Navicular: Complete | R Navicular: Absent |
| L Cuneiform 1: Complete | R Cuneiform 1: Complete |
| L Cuneiform 2: Complete | R Cuneiform 2: Complete |
| L Cuneiform 3: Complete | R Cuneiform 3: Complete |
| L MT 1: Complete | R MT 1: Complete |
| L MT 2: Complete | R MT 2: Complete |
| L MT 3: Complete | R MT 3: Complete |
| L MT 4: Complete | R MT 4: Complete |
| L MT 5: Complete | R MT 5: Complete |
| Foot Phalanges (Minimum number): 7 |  |

L Ribs: 10
Vertebrae (minimum number):
Cervical: 7
Lumbar: 5

R Ribs: 10

Thoracic: 8
Sacrum: 4

Appendix Table 3.2 Skeletal Inventory of Bone Group 21 (92E102:2680)

## Appendix 4 Dún Aonghasa: radiocarbon-dated charcoal samples (R. Gale)

| Sample | 978a | 42 | 279 | 24 | 48 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Cutting | 9 | 9 | 1 | 1-alcove | 1-alcove |
| Feature | 978a | 963.3 | 279 | 30 | 273 |
| Date | $\begin{aligned} & 2880+50 \mathrm{BP} \\ & (\mathrm{LBA}) \end{aligned}$ | $\begin{aligned} & 2260 \pm 50 \\ & \text { BP } \\ & \text { (Iron Age) } \end{aligned}$ | $2770+60$ BP <br> (Late Bronze Age) | 1545+55BP (Early Historic period) | $1235 \pm 40 \mathrm{BP}$ (Early Historic period) |
| Alnus | - | - | - | - |  |
| Corylus | - | - | - | 5* |  |
| Quercus | 1* | 1* | XXX | 4 |  |
| Salicaceae | - | - | X* | 2* |  |
| Pinus | - | - | X* | - | $5 r^{*}$ |
| Juniperus | - | - | - | - | $1 \mathrm{r}^{*}$ |

Appendix Table 4.1 Radiocarbon dated charcoal.
Key: $\mathrm{r}=$ roundwood; Unquantified charcoal: $\mathrm{x}=$ present; $\mathrm{xxx}=$ dominant. The number of fragments identified is indicated. $*=$ radiocarbon sample.

## PART 2 ANCILLARY STUDIES ASSOCIATED WITH THE EXCAVATIONS AT DÚN AONGHASA

## Preface

There are thirteen appendices in this section. Three (numbers 5, 9 and 10) relate to the scientific analysis of burnt food residues, ash or soils collected in the course of the excavations. A summary of the most important findings of the pottery residue analysis (R. Evershed et al; Appendix 5) was included in Vol. 2 (Cotter 2012, chapter 8.3.8). The full article, outlining recent developments in lipid analysis of food residues and including a detailed account of the methodology used in this instance, appears here. It includes five figs (Appendix Figs 5.1, 5.2, 5.3, 5.4 and 5.5) and two tables (Appendix Tables 5.1 and 5.2). Analysis of ash samples from the inner enclosure at Dún Aonghasa (S. Carter; Appendix 9) was carried out to determine if any of the fuel used was dung or peat. Carter conclusion - that the ash samples derived from the burning of wood - was incorporated into discussions in Vols 1 and 2 but the full analysis can be found here. The results of detailed examination of seventeen soil samples from six locations on the hilltop (C. Ellis) are contained in Appendix 10. Appendix 11 (D. Harper) gives a description of the bedrock geology around Dún Aonghasa (illustrated in Appendix Fig. 11.1) and in the vicinities of the other large stone forts on the Aran Islands.
Two appendices (6 and 7) relate to late Bronze Age metalworking. Appendix 6 (C. Cotter) looks at the spatial distribution of clay mould pieces in the inner enclosure (cutting 1) at Dún Aonghasa. The idea behind this research was to see if discard patterns for individual moulds, or classes of mould could be identified. The results of the analysis are discussed in Volume 1 (Cotter 2012, Chapter 7, Zone B2: summary and comment). The details and some distribution maps (Appendix Figs 6.1, 6.2, 6.3 and 6.4) are included here (discard patterns of potttery and food residues are looked at in Appendix 13 - see below). The first part of Appendix 7 (Appendix 7.1; C.Cotter) consists of an overview of Irish late Bronze Age clay moulds where they have turned up, in what numbers, the types of objects cast in them and chronology. Most of the assemblages could belong to the period $1000-900 \mathrm{BC}$. This is slightly earlier than the traditional date usually suggested for the Dowris phase of the Irish late Bronze Age, to which most of the objects being cast belong. Appendix 7.2 (G. Devlin) describes the technology behind reconstructing the disc-head of a pin using a clay mould piece from Dún Aonghasa; the text includes three figures (Appendix Figs 7.1, 7.2 and 7.3).
The buffered bronze rings from Dún Aonghasa (Appendix 8; C. Cotter and C. Sandes) are of considerable interest. Although there is quite a number of these rings in museum collections, only the Dún Aonghasa rings and a hoard of rings from Rathtinaun, Co. Sligo have been found in the course of archaeological excavation. The article gives an overview of what is possibly a uniquely Irish class of ring. Three tables (Appendix Tables 8.1, 8.2 and 8.3) list all the known rings, including those found in hoards, and their associations. The twelve accompanying illustrations (Appendix Figs $8.1-8.12$ ) show a sample of the rings and some comparable, but more exotic, items in museum collections; a distribution map of provenance and a plot illustrating trends in weight/size are also included in the piece.
The two final appendices (12 and 13) deal with very different subject matter. Appendix 12 (C. Cotter) is an overview of the comparative morphology of a selection of Irish hillforts, including the half dozen or so that have been excavated. The subject of rampart morphology at late Bronze Age hillforts comes up again in Volume 4, chapter 10 (Cotter forthcoming) but it was decided to include the raw data tables (Appendix Tables 12.1 - 12.4) in this volume. The final appendix in Part 2 (Appendix 13, C. Cotter and S. Weadick; maps prepared by A. Corns) deals with pottery and food refuse discard patterns in cutting 1 (the inner enclosure) at Dún Aonghasa. Processing this data was quite a time-consuming exercise and in
the end, it has to be said, generated very little new information. It was clear at the excavation stage that artefacts and ecofacts were more numerous and better preserved in a $2-3 \mathrm{~m}$ wide strip in the lee of the fort wall. Away from the wall, the impact of post-depositional factors the construction of houses, erosion processes etc. - was far greater. The analysis does introduce a respectable 'statistical' element to the data as it survived, of course, and a few interesting questions arose regarding specific 'gaps' - i.e. areas with soil cover but devoid of animal bones, seashells or artefacts. In terms of suggesting models of behaviour, however, the extent to which discarded food refuse and artefacts had been redistributed over a protracted time scale meant that any conclusions would be so tentative, or so hedged about with caveats, as to be virtually meaningless. That in itself can be considered a conclusion presumably.

# Appendix 5 Organic Residue Analysis of Pottery Vessels (R. Evershed, M. Copley, F. Hansel and D.Chivall) ${ }^{1}$ 

## Introduction

Residues of fats and waxes entrapped as absorbed residues associated with ceramic vessels during the processing of organic materials in antiquity are protected from chemical decay and microbial attack (Heron and Evershed, 1993), and can be retrieved and identified even after several thousands of years of burial. The application of modern analytical techniques enable even highly degraded remnants of natural commodities to be characterised and identified (Evershed et al., 1990, 1994, 1997. 1999). The findings of organic residue analysis often provide the only evidence for the exploitation and processing of animal commodities or leafy vegetables, particularly at sites exhibiting a paucity of environmental evidence. To date the use of chemical analyses in the reconstruction of vessel use at various sites in the UK has enabled the identification of animal fats (Copley et al., 2003, 2005a,b,c,d), beeswax (Charters et al., 1995), birch bark tar (Charters et al., 1993a) and the epicuticular waxes of leafy vegetables (Charters et al., 1997; Evershed et al., 1991, 1992, 1994).

The identification of ancient commodities based on lipid residues in pottery is inevitably complicated by the degradative processes occurring during vessel use and burial. However, reliable identifications can be made based on the structures of individual components and comparison of lipid profiles with modern reference materials and those submitted to field and laboratory degradations (Evershed et al., 1995a; Dudd et al., 1998; Evershed, 2008). Degraded animal fats are by far the most commonly identified residues found in association with pottery vessels, and are characterised by a readily recognisable distribution of free fatty acids, monoacylglycerols, diacylglycerols and intact triacylglycerols. However, identification of the particular type of animal from which the fat is derived is much less straightforward and complicated to some extent by chemical and micro-biological alteration (Evershed et al., 1992; Dudd et al., 1998). Distinctions between different animal fat types are based on the distributions and stable carbon isotope compositions ( $\delta^{13} \mathrm{C}$ values) of free fatty acids and other fatty acyl lipids present (Copley et al., 2003, 2005a,b,c,d; Mukherjee et al., 2007, 2008). Our approach exploits fundamental differences in the stable carbon isotope composition of the fatty acid component of the fats of the major domesticates, showing we can draw clear distinctions between remnant fats of different origins in archaeological ceramics (Evershed et al., 1997; Dudd and Evershed, 1998; Mottram et al., 1999; Mukherjee et al., 2007, 2008) and also between ruminant adipose and dairy fat (Copley et al., 2003, Copley et al., 2005a,b,c,d). These differences in stable isotope values were paralleled by differences in fatty acid composition (Mottram et al., 1999), although the former are deemed to be diagenetically more robust (Evershed et al., 1999, 2001; Evershed, 2008).

A more recent development utilises natural variations in the stable hydrogen isotope composition ( $\delta \mathrm{D}$ values) of marine and terrestrial animal fatty acids revealing a new marine palaeodietary proxy, due to less depleted $\delta \mathrm{D}$ values of environmental water in marine environments compared to terrestrial environments (Chivall, 2008; Chivall, Payne and Evershed, unpublished data).

[^1]
## Aims and objectives

This investigation focussed on two groups of sherds from Dún Aonghasa in order to determine the presence (or absence) of organic residues. Herein we present the preliminary results of chemical analyses of these lipid extracts. The characterisation of solvent extractable lipid components was performed by high temperature gas chromatography (HTGC), GC/MS and where sufficient fatty acids were present, their carbon or deuterium stable isotope compositions were investigated.

## Materials and Methods

Lipid analyses were performed using our established protocols which are described in detail in earlier publications (Evershed et al., 1990; Charters et al., 1993b). Briefly, analyses proceeded as follows:

## Solvent extraction of lipid residues

Lipid analyses of potsherds have been performed using our established protocol, whereby $c a .2 \mathrm{~g}$ samples were taken and their surfaces cleaned using a modelling drill to remove any exogenous lipids (e.g. soil or finger lipids due to handling). The samples were then ground to a fine powder, accurately weighed and a known amount ( $20 \mu \mathrm{~g}$ ) of internal standard ( $n$-tetratriacontane) added. The lipids were extracted with a mixture of chloroform and methanol $(2: 1 \mathrm{v} / \mathrm{v})$. Following separation from the ground potsherd the solvent was evaporated under a gentle stream of nitrogen to obtain the total lipid extract (TLE). Portions (generally one fifth aliquots) of the extracts were then trimethylsilylated and submitted directly to analysis by gas chromatography (GC). Where necessary combined gas chromatography/mass spectrometry (GC/MS) analyses were also performed on trimethylsilylated aliquots of the lipid extracts to enable the elucidation of structures of components not identifiable on the basis of GC retention time alone.

## Preparation of trimethylsilyl derivatives

Portions of the TLEs were derivatised using $\mathrm{N}, \mathrm{O}$-bis(trimethylsilyl)trifluoroacetamide (20 $\mathrm{\mu l} ; 70^{\circ} \mathrm{C} ; 20 \mathrm{~min} ; \mathrm{T}-6381$; Sigma-Aldrich Company Ltd., Gillingham, UK) and analysed by gas chromatography (GC) and gas chromatography-mass spectrometry (GC/MS).

## Preparation of fatty acid methyl esters

An aliquot of the TLE was hydrolysed with 0.5 M NaOH in MeOH solution ( 2 ml ; $70^{\circ} \mathrm{C} ; 1 \mathrm{~h}$ ), cooled and then acidified to pH 3 with 3 M HCl . Cyclohexane was used to extract the hydrolysed lipids ( $3 \times 3 \mathrm{~mL}$ ), and these were then combined and the excess solvent evaporated under a gentle stream of nitrogen. The extracts were then separated into their 'acid' and 'neutral' fractions through the use of aminopropyl solid phase columns ( 6 mL glass reservoir; 500 mg sorbent mass; Isolute) that had been flushed with hexane ( 6 mL ). First the neutral fraction was eluted with chloroform/iso-propanol ( $2: 1 \mathrm{v} / \mathrm{v} ; 6 \mathrm{~mL}$ ) and then the acid fraction was eluted with $2 \%$ acetic acid in diethyl ether ( 6 mL ). Fatty acid methyl ester derivatives (FAMEs) of the saponified fatty acid fraction were prepared with the addition of $100 \mu \mathrm{l}$ of boron trifluoride-methanol complex ( $14 \% \mathrm{w} / \mathrm{v}$; Sigma-Aldrich) and heated at $70^{\circ} \mathrm{C}$ for 1 h . In order to stop the reaction, the mixture was cooled and 2 ml of double distilled, DCM extracted water added. The FAMEs were then extracted with hexane $(3 \times 2 \mathrm{~mL})$ and the solvent evaporated under nitrogen, ready for analysis by GC-combustionisotope ratio MS (for carbon) and GC-thermal conversion-IRMS (for deuterium).

## Results and Discussion

Initially, the TLEs of a group of 20 sherds were examined using GC and GC/MS and the results of the analyses are summarised in Appendix Table 5.1 on a sample-by-sample basis, giving the total lipid concentration per gram of powdered sherd, and a summary of the lipid compositions. Where there were sufficient concentrations of lipid present in the extracts, they were submitted to further analysis by GC-C-IRMS (as indicated by an asterisk in column 1 of Appendix Table 5.1).

| Sample | Lipid concentration ( $\mathbf{m g ~ g}^{-1}$ ) | Description |
| :---: | :---: | :---: |
| DA25-46* | 0.089 | FFa (large $\mathrm{C}_{18: 0}$ ) |
| DA26-33 | 0.033 |  |
| DA26-34* | 0.127 | FFa; MAG (tr); DAG (tr); TAG (tr) |
| DA30-26 | 0.099 | FFa (tr); DAG (tr); TAG (tr); K |
| DA32-27 | 0.040 | FFa (tr); K |
| DA32-28 | 0.030 | FFa (tr); MAG (tr); TAG (tr) |
| DA32-33 | 0.025 | FFa (tr) |
| DA33-28* | 0.030 | FFa; MAG; TAG |
| DA34-22* | 0.033 | FFa; MAG |
| DA35-2 | 0.009 | FFa (tr); MAG (tr) |
| DA35-29* | 0.061 | FFa; MAG; DAG (tr); K |
| DA35-40* | 0.060 | FFa; MAG |
| DA38-15* | 0.011 | FFa |
| DA38-29 | 0.049 | FFa (tr); MAG (tr) |
| DA39-19* | 0.050 | FFa |
| DA39-22* | 0.014 | FFa |
| DA40-33 | 0.033 | FFa (tr); TAG (tr) |
| DA41-9 | 0.022 | FFa (tr); TAG (tr) |
| DA41-14 | 0.006 | FFa (tr) |
| DA41-22* | 0.030 | FFa; TAG |

Appendix Table 5.1 Lipid compositions of sherds excavated at Dún Aonghasa. FFa refers to free fatty acids; MAG to monoacylglycerols; DAG to diacylglycerols; TAG to triacylglycerols; K to $\mathrm{C}_{31}, \mathrm{C}_{33} \mathrm{C}_{35}$ mid-chain ketones comprising 31, 33 and 35 carbon atoms, respectively; and tr indicates trace abundances. Samples analysed by GC-C-IRMS are indicated with *.

Nineteen of the 20 sherds ( $95 \%$ ) yielded lipid residues; for which the mean lipid concentration at $0.04 \mathrm{mg} \mathrm{g}^{-1}$ dry weight of sherd (range: 0.01 to $0.13 \mathrm{mg} \mathrm{g}^{-1}$ ). The majority of extracts comprised degraded animal fat residues characterised by a distribution of free fatty acids, mono-, di- and triacylglycerols, an example of which is shown in Appendix Fig. 5.1 It is known that the triacylglycerols (TAGs) are hydrolysed to diacylglycerols (DAGs), monoacylglycerols (MAGs) and free fatty acids during vessels use and burial (Evershed et al., 1992; Evershed, 2008), and TAGs were only detected in three of the 20 lipid extracts, with only traces of MAGs or DAGs present, the remainder comprising free fatty acids (principally $\mathrm{C}_{16: 0}$ and $\mathrm{C}_{18: 0}$ ).. It has been shown in previous studies that the TAGs are good indicators of the origin of fatty residues (Dudd and Evershed, 1998; Mukherjee et al. 2008).


Appendix Fig. 5.1 Partial HTGC profile of the trimethylsilylated TLE of DA 26-34, showing the distribution of components characteristic of a degraded animal fat. Key: $\mathrm{FA}_{\mathrm{x}: 0}$ are saturated fatty acids of carbon chain length x . MAGs are monoacylglycerols, DAGs are diacylglycerols. TAGs are triacylglycerols. $P$ is a plasticizer and IS the internal standard ( $\mathrm{C}_{34}$ alkane).

In three of the sherds (DA30-26, DA32-27 and DA35-29), mid-chain ketones were present in the TLEs. Mid-chain ketones are formed through the heating of fatty acids at high temperature (Evershed et al., 1995b; Raven et al., 1997), and would most likely have been produced during the 'cooking' of animal products.

The distributions of the TAGs are shown in Appendix Fig. 5.2 for the 3 vessels that had these acyl lipid species present. These lipid components are only present in very low abundances ( $<5 \mu \mathrm{~g} \mathrm{~g}^{-1}$ ), however, it can be seen that for all of the vessels the $\mathrm{C}_{48}$ TAG predominates, although the range was from $\mathrm{C}_{48}$ to $\mathrm{C}_{54}$. For samples DA 40-33 and DA 41-9, the TAGs are dominated by the $\mathrm{C}_{48}$ component amongst a distribution that is indicative of a non-ruminant source (but not porcine in origin), although the TAGs were present in very low abundances in these samples. However, for sample DA 41-22, it appears that there is a mixture of ruminant and non-ruminant adipose fats. TAG distributions that include lower molecular weight (i.e. lower carbon number) triacylglycerols are diagnostic of milk fats, however none of the sherds from this assemblage exhibited such a distribution.


## Vessel Number

## Appendix Fig. 5.2 TAG distributions for the Dún Aonghasa samples.

Lower molecular weight TAGs suggest the presence of dairy products, and the proportions of the other acyl lipids are used to distinguish between porcine, ovine, ovi-caprine, ruminant dairy fats and mixed remnant fats.

Appendix Fig. 5.3 is a scatterplot of the $\delta^{13} \mathrm{C}$ values for the ten sherds that contained sufficient fatty acids for GC-C-IRMS analyses. One standard deviation confidence ellipses calculated from reference materials are also shown in the scatterplot, and represent nonruminant (porcine) adipose fats (blue), ruminant adipose fats (green) and ruminant dairy fats (red). It can be seen that the majority of the extracts plot near to the non ruminant (porcine) ellipse, and along a line that extends towards the ruminant adipose fats. The most obvious interpretation is that this is indicative of the mixing of ruminant and non-ruminant fats within the pottery vessels, and from the close proximity of the majority of sherds to the non ruminant (porcine) ellipse, it can be inferred that a higher percentage of non ruminant fats rather than ovine/bovine are present in these extracts. Interestingly, all of the sherds plot along a straight line, and one sample (DA 26-34) has $\delta^{13} \mathrm{C}$ values that are plot near to the ovid/bovid ellipse.


## Appendix Fig. 5.3 Plot of the $\delta 13 \mathrm{C}$ values of the fatty acid methyl esters prepared from lipid extracts from the Dún Aonghasa sherds.

The reference material is represented by confidence ellipses ( 1 standard deviation), with blue being non ruminant (porcine), green being ruminant (bovine and ovi-caprine) and red being of dairy origin. Vessels plotting in between the non-ruminant and ruminant reference fat ellipses are indicative of the mixing of these two fats.

Dairy fats are known to have $\delta^{13} \mathrm{C}_{18: 0}$ values that are approximately $2 \%$ more depleted than the ruminant adipose fats (e.g. Dudd \& Evershed 1998; Copley et al., 2003), and these reflect their different biosynthetic origins (Christie, 1981; McDonald et al., 1988). None of the sherds plotted within the dairy ellipse, indicating that none of these sherds came from vessels that were used to process dairy products in.

The extracts from this first group of sherds from Dún Aonghasa are highly degraded, with TAGs present in detectable concentrations in only three sherds, although in only one of the sherds (DA 41-22) were there sufficient abundances to undertake further GC-C-IRMS analysis on. For this sample, both criteria ( $\delta^{13} \mathrm{C}$ values and lipid distributions) suggest that a mixture of non-ruminant and ruminant adipose fats is present within the sherd. Although the TAGs are susceptible to hydrolytic degradation, the $\delta^{13} \mathrm{C}$ values of the free fatty acids are robust, and are not altered by degradation (Evershed, 2008). Plasticisers were detected in all of the sherds, and these are likely to have derived from the plastic bags in which the sherds were stored. If bulk $\delta^{13} \mathrm{C}$ values for the lipid extracts were determined, this would pose a
problem. However, since the $\delta^{13} \mathrm{C}$ values for the individual fatty acids were obtained, the presence of these plasticizers does not hamper these

The $\delta^{13} \mathrm{C}$ values of the fatty acids for the majority of the sherds point to the mixing of ruminant and non-ruminant adipose fats (either contemporaneously or during subsequent reuse of the vessels). The mixing of ruminant/non-ruminant animal fats results in a mixing curve that runs from the centroids of the two ellipses, and is not a straight line but a curve (Mukherjee et al. 2005) since different species of animal have different abundances of $\mathrm{C}_{16: 0}$ and $\mathrm{C}_{18: 0}$ fatty acids. The fact that all the samples plot along a straight line is intriguing, and warranted further consideration

At mainland sites the higher $\delta^{13} \mathrm{C}$ values correspond to porcine fats; however, at Dún Aonghasa pig bones were very rare, hence we must look to another explanation for the trends observed in the carbon isotope values. The faunal assemblage at the site suggests that the diet of the inhabitants during the Bronze Age was at least partly marine based. The processing of marine resources within the pottery, may have accounted for the unusual $\delta^{13} \mathrm{C}$ values observed as shown by Appendix Fig. 5.4 which includes $\delta^{13} \mathrm{C}$ values of the fatty acids of marine organisms.


Appendix Fig. 5.4 Comparison of $\delta^{13} \mathrm{C}$ values of the $\mathrm{C}_{16: 0}$ and $\mathrm{C}_{18: 0}$ fatty acids from modern terrestrial and marine animals (ellipses; Cobabe \& Pratt, 1995; Copley et al., 2003; Hansel et al. 2011).

During the preparation of this report, a new technique, compound-specific hydrogen isotope analysis, became available, which provides an additional means of classifying the fats in archaeological pottery, particularly marine versus terrestrial fats. To investigate if the processing of marine resources had occurred within the pottery vessels, a further 20 sherds were obtained from the same context and analysed (as the original samples had been exhausted during the initial phase of analysis). The results of screening this second group of sherds are displayed in Appendix Table 5.2 and example chromatograms are shown in Appendix Fig. 5.5.

| Sample | Lipid concentration $\left(\mathrm{mg} \mathrm{~g}^{-1}\right)$ | Description |
| :---: | :---: | :---: |
| DA10-03 | 0.164 | FFa: 16,18 ; K: 33, 35; TAG: 48,50 |
| DA10-24 | 0.024 | FFa: 16, 18; OH: 26; TAG: 48, 50, 52 |
| DA10-45 | 0.084 |  |
| DA11-21 | 0.095 | FFa: 16, 16:1, 18 ; OH: 18 ; K: 31, 33, 34, 35 |
| DA15-1 | 0.041 |  |
| DA17-78 | 0.062 | OH: 26; TAG: 48, 5052 |
| DA20-34* | 0.121 | FFa: 14, 16, 17, 18, 18:1; DAG: 32, 34, 36; TAG: 46, 48, 50, 52, 54 |
| DA20-57* | 0.373 | FFa: 14, 15, 16, 17, 18, 18:1, 19, 20, 21, 22, 24, 26, 28; OH: <br> 26, 28, 30; DAG: 34, 36; W; TAG: 48; 50; 52; 54 |
| DA21-35* | 0.053 | FFa: 16, 18; TAG: 48, 50, 52, 54 |
| DA23-41 | 0.115 | $\begin{aligned} & \text { FFa: } 14,15,16,17,18,20 ; \mathrm{K}: 31,32 \text {, } \\ & 33,34,35,36,37 \end{aligned}$ |
| DA25-91* | 0.188 | FFa: 14, 15, 16, 17, 18, 18:1; OH: 26, 28, 30; TAG: 48, 50, 52 |
| DA25-98 | 0.010 |  |
| DA26-18* | 0.122 | FFa: 16,18 ; OH: $26,28,30$; TAG: 48, 50, 52 |
| DA26-98 | 0.042 | FFa: 16, 18 |
| DA27-30 | 0.053 |  |
| DA27-71 | 0.072 | FFa: 16, 18 |
| DA28-56* | 0.473 | FFa: 14, 16, 17, 18, 18:1; OH: 28; K: 31, 33, 34, 35; TAG: $48,50,52,54$ |
| DA29-02 | 0.050 | FFa: 16, 16:1, 18, 18:1; OH: 26, TAG: 48, 50, 52, 54 |
| DA30-68* | 0.286 | FFa: $14,15,16,17,18,18: 1,19,20$, 22, 24, 26, 28; OH: 26, 30 |

Appendix Table 5.2 Lipid composition of sherds from Dún Aonghasa. FFa = fatty acid; K $=$ ketone; $\mathrm{OH}=$ alcohol; $\mathrm{DAG}=$ diacylglycerol; $\mathrm{TAG}=$ triacylglycerol. Numbers are the number of carbon atoms in each molecule. Components in italics were detected in trace amounts only. Sherds from which extracts were analysed by GC-TC-IRMS are marked with *.

The lipids within this second group of sherds were again highly degraded, with less than half yielding triacylglycerols and of these none contained sufficient to accurately determine the TAG distributions. TAGs with 48 to 54 acyl carbon atoms were detected, and were either dominated by triacylglycerols with 48 acyl carbon atoms (e.g. DA17-78, DA2856; similar to samples DA40-33 and DA41-9 in Appendix Fig. 5.2) or displayed TAGs with 50 and 52 acyl carbon atoms in greatest abundance, similar to the distribution displayed in ruminant adipose fat (e.g. DA10-24, DA20-34).

The remaining lipids within the sherds typically consisted of a range of fatty acids, alcohols and ketones. As well as the commonly occurring palmitic and stearic acids, longer even chain length fatty acids up to octacosanoic acid were detected. Long chain $n$-alcohols of 26, 28 and 30 carbon atoms were also detected, as were ketones of, predominantly, 31, 33 and 35 carbons in length. Wax esters were also identified in sherd DA20-57 (Appendix Fig. 5.5). Once again, the long chain ketones are symptomatic of the heating of fatty acids (Evershed et al., 1995b; Raven et al. 1997), and as such suggest the pots were used for cooking. The wax esters and long chain alcohols are indicative of plant processing (Evershed et al., 1994). The lipid distributions within the pots suggest they were used for heating plant and animal material. The unusual TAG distributions in some sherds suggest any animal fats may not be simply ruminant or porcine derived. Of note, no marine biomarkers including 4,8,12-trimethyltridecanoic acid (Aillaud, 2000) or $\omega$-(o-alkylphenyl) alkanoic acids (Hansel et al., 2004) were found in the lipid residues. However, both these compounds would be present at low abundance in any potsherd prior to burial, and so may not have survived.


Appendix Fig. 5.5 Partial chromatograms of TLEs from Dún Aonghasa. Cx: y is a fatty acid of acyl chain length $x$, with degree of unsaturation y . $\mathrm{C} m \mathrm{~K}$ is a ketone of chain length $m$. $\mathrm{T} k$ is a triacylglycerol containing $k$ acyl carbon atoms. $\mathrm{C} n \mathrm{OH}$ is an alcohol of chain length $n$. P is phthalate contamination.

Only seven of the sherds contained sufficient fatty acyl lipid to be submitted to compound-specific stable hydrogen isotope analysis, utilizing GC-TC-IRMS. These sherds are marked by an asterisk in Appendix Table 5.2. Appendix Fig. 5.4 is a scatter plot of $\delta \mathrm{D}$ $\mathrm{C}_{18: 0}$ versus $\delta \mathrm{D}_{16: 0}$, showing $95 \%$ confidence intervals for marine and terrestrial animal fatty acids, based on analysis of over 50 modern animal tissues (Chivall, 2008). The lipid extracts from the Dún Aonghasa sherds are plotted on Appendix Fig. 5.6 and fall at the border of the terrestrial animal and marine confidence ellipse. While the sherds all show $\delta \mathrm{D}$ $\mathrm{C}_{18: 0}$ and $\delta \mathrm{D} \mathrm{C}_{16: 0}$ values consistent with those of terrestrial adipose tissue, a substantial marine lipid contribution could be present. This is the first time that compound-specific stable hydrogen isotope analysis of archaeological material has been reported.


Appendix Fig. 5.6 $\mathbf{\delta D}$ values for palmitic and stearic acids extracted from sherds recovered from Dún Aonghasa. The $95 \%$ confidence ellipses are based on the $\delta \mathrm{D}$ values for modern fats (Chivall, 2008).

## Conclusions

In summary, the lipids contained within both sets of sherds were poorly preserved. The TAG distributions within the first set of sherds analysed, were unusual in that they did not appear to be resemble those generally seen in residues of the common domesticated animals, i.e. cattle, sheep/goat or pig (Dudd and Evershed, 1998; Mukherjee et al. 2007, 2008). Compound-specific $\delta^{13} \mathrm{C}$ analysis of extracts from the first group of suggested that the lipids were of predominantly non-ruminant (porcine) origin, but the values did not plot along the typical ruminant-porcine fat mixing curves. Additionally, the carbon isotope analyses provided no evidence of dairying. The lack of porcine remains and the large number of fish bones at the site led us to consider marine organisms as significant contributors to the lipid residues surviving in the Dún Aonghasa pottery. The lipid distributions within extracts from the second set of sherds suggested the heating of plant and animal material, whilst the $\delta \mathrm{D}$ values of the fatty acids extracted from these sherds were consistent with mixed marine and terrestrial adipose fat origin.

## Acknowledgements

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## Appendix 6 The metalworking activity as evidenced by the distribution of clay mould fragments (C.Cotter)

Appendix Fig. 6.1 shows the distribution of all mould pieces from cutting 1 (figures can be found at the end of the article). The various 'zones' and the numbered grid squares in the cutting are shown in Appendix Fig. 6.2. The bulk of the fragments (ca. 86\%) were recovered from zone B2, with only $c a .11 \%$ (roughly 42) being found in zone A and $3 \%$ in zone B1 (12 moulds). No mould fragments were found in zone C. Most of the moulds from zone A were found along the eastern perimeter of the large hearth. Their fresh condition compared to the remainder of the mould assemblage, suggested that they were covered over immediately they were discarded and not subsequently disturbed. The majority of the moulds in zone B2 occurred in the eastern half of the cutting, with significant concentrations in squares 7 and 8 , the northern half of square 13 , the south-western quadrant of square 16 and extending on into squares 12 and 15 . Only a small number of mould pieces occurred in the southern part of the zone (squares 2, 3 and 4).

Most of the inner valve and outer wrap fragments were more fragmented and abraded than pieces where some trace of the matrix was preserved. Whether this breakage pattern was original or due to secondary factors is unclear, but there is no doubt that mould fragments would inevitable have been better preserved in areas where there was little or no postdepositional disturbance. The distribution of wrap/valve pieces is broadly similar to that for the assemblage as a whole, but removal of these pieces, leaving only the diagnostic mould fragments (i.e. those classifiable to object type, and gate and core fragments), noticeably cleans up the scatter pattern around the periphery of the main concentrations. Although the diagnostic pieces account for only $44 \%$ of the total assemblage ( 174 out of 392 ), their distribution may give a better picture of where moulds were originally discarded if not smashed.

Eighteen of the diagnostic moulds came from zone A, four were found in zone B1, but the majority (142) came from zone B2. In zone B2, the main clusters occurred in the northeast quadrant. ${ }^{2}$ Appendix Figs 6.3, 6.4 and 6.5 show the distribution of moulds for the different classes of artefacts: Fig. 6.3 (sword/spear/knife/tanged objects), Fig. 6.4 (axes) and Fig. 6.5 (pins). Mould fragments for Spearheads 1 and 2 were found scattered over a wide area ( $c a .126 \mathrm{sq} \mathrm{m}$ ) in zone B2 with mould fragments for Spearhead 2 showing a number of random clusters. Gaps occur in the distribution in squares 9 and 10 and around the stone trough (square 12). Sword pieces were less scattered; seven of the ten fragments were recovered from adjacent squares (squares 9,10 and 13), although they could not be described as closely clustered. Apart from a single knife fragment found in zone A, ten of the eleven remaining knife mould pieces were found in two clusters at the eastern side of zone B2 (squares 7, 10 and 13).

Three individual axes were identified (see Appendix 1.8) with all the mould pieces coming from zone B2. Sixty-six percent (14 out of 21) of these were found in squares 8-13. Mould fragments of Axe 1 were found mainly in squares 5, 8 and 9 ; those of Axe 2 were more widely scattered (squares $10,11,12$ and 13). The Axe 3 mould fragments were concentrated in two areas; south of the stone trough (square 12) and at the southern edge of bedrock hollow F235 (square 14), the latter providing the closest grouping of tool/weapon moulds.

[^2]The seven pinhead mould fragments and associated shank mould fragments all came from zone B2, but moulds from the four pin shank groups were more widely scattered. Groups 1 and 2 pin shank mould pieces were mainly concentrated at the eastern side of the large hearth in zone A, and together accounted for ten of the eighteen diagnostic moulds found in this zone. Further mould pieces of Pin Shank Group 2 were found in zones B1 and B2. Pin Shank Group 3 fragments were found only in square 7, zone B2. With the exception of one piece, all the bracelet mould fragments (not illustrated) came from zone B2 with a notable concentration at the intersection of squares 13,15 and 16; the exception, no. 415 , was found close to the interface between zones B1 and B2. Finally, gate pieces (not illustrated) accounted for most of the remainder of the moulds from zone A and were also found scattered across squares $10,12,13$ and F145 in zone B2. A single core fragment came from zone A; five others were thinly scattered across the eastern and southern part of zone B2.

| Object <br> Class | Level <br> 1 | Level 2a <br> (mainly <br> F239, <br> F244, F219 | $\begin{aligned} & \hline \begin{array}{l} \text { Level } \\ \text { (mainly } \end{array} \\ & \text { deposits } \\ & \text { F43, } \\ & \text { F41) } \end{aligned}$ | Level 2c <br> (mainly <br> deposits <br> F32, F36, <br> F21 | Level 4 overfloor deposits F202 and F95) | Level 5 over-floor deposit F56 | Top archaeology (deposits F1, F6, F9, F10, F14 and F26) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sword | - | 2 | 2 | 3 | - | - | 5 |
| Spearhead | 2 | 11 | 21 | 4 | 2 | 2 | 12 |
| Knife | - | 6 | 3 | 1 | 1 | - | - |
| Axe | 4 | 7 |  | 5 | 1 | 1 | - |
| Bracelet | 1 | 8 | 7 | - | - | - | 1 |
| Pinhead | - | 1 | 2 | 4 | 1 |  | 2 |
| Pin shank | - | 5 | 1 | 1 | - | - | 1 |
| Gate | 1 |  | 4 | 1 | 3 | - | - |
| Core | - | 1 | - | 2 | - | - | - |
| Totals | 8 | 41 | 40 | 21 | 8 | 3 | 21 |

Appendix Table 6.1 Context of the classifiable mould pieces found in zone B2.
Key: Level 1 is the earliest over-bedrock horizon; undisturbed layers date to the late Bronze Age (LBA). Level 2 deposits are of LBA date; Level 4 and Level 5 are made up of disturbed / redeposited / residual LBA material. Level 6 is the top archaeology.

All the pieces from the north area were recovered from the late Bronze Age horizon. Appendix Table 6.1 shows the phase/level and numbers of each class of mould from zone B2 (for chronology see key at bottom of the figure). For the purpose of this analysis, the level 2 deposits were split into 2a (lower spit/truncated upper spit), 2b (upper spit), and 2c (disturbed upper spit). The majority of the moulds ( $72 \%$ ) came from levels $2 \mathrm{a} / \mathrm{b} / \mathrm{c}$ with the level 1 deposits producing less than $6 \%$. Levels 4 and 5 together produced $c a .8 \%$ of the assemblage while the top archaeology yielded almost $15 \%$, most of the latter coming from what was subsequently interpreted as a "high spot" of early stratigraphy.

In summary, in terms of spatial patterning, with the notable exception of the Pin Shank Groups 1 and 2, most of the diagnostic mould fragments were found in zone B2. $60 \%$ of the overall total was recovered in squares $10,12,13,15$ and 16 , i.e. on the interface between the projected floor areas of structures 3 and 4 and within the eastern part of the projected floor area of structure 6 . Outside this main cluster, two other concentrations in zone B2 may be of significance; the group of four spearhead moulds, representing two individual objects, found near the east balk in square 7, and the four mould fragments of Axe 3 found in square 14. The latter group lies well outside the main concentration of moulds. Although no physical variation in the sediments was observed here during excavation, a noticeable gap also occurs in the pottery distribution in the same area.

Turning to stratigraphical context, with the exception of the swords and spearheads, mould pieces from different classes of object and/or individual objects tended to be found in the same general area but not in what could be interpreted as a discrete working zone. $40 \%$ of the bracelet mould fragments (not illustrated) occurred in a single cluster, with 15 of the 17 pieces coming from levels 2 a and 2 b . The knife mould fragments fell mainly into two clusters, with nine of the eleven pieces coming from levels $2 \mathrm{a} / 2 \mathrm{~b}$. Axe 1 mould pieces formed two clusters, all from level 2 a , Axe 2 mould pieces were found in the sub-floor and over-floor levels of structure 1 (levels 1 and 5 respectively) and Axe 3 mould pieces came from levels 1 and 2c. Most of the pieces belonging to Pin Shank Groups 1 and 2 were found at the east side of the hearth in zone A. As noted already, their good state of preservation suggested they were covered over quickly after being discarded and were not disturbed subsequently. The identified Group 1 pin shank mould pieces were confined to zone A, but four additional fragments of the Group 2 pin shank mould fragments were found elsewhere on the site; two of these lay in close proximity in the level 1 horizon in zone B1. The remaining two were found in squares 10 and 12 in zone B2 in the level 1 and level 2 horizons respectively. The Group 3 shank mould pieces and miscellaneous shank mould pieces were all found in zone B2, with most being recovered from level 2 . The concentration of pin shank moulds in zone A, and the almost total absence of moulds for casting other classes of artefact in this part of the site, raises a number of possibilities. There may have been more than one episode of casting, with some of the pins being manufactured on a separate occasion to the remainder of the assemblage. Alternatively, the Group 1 and 2 pin shank moulds may have been the only ones smashed open in the northern area. The fact that all the identified pinhead moulds were found in zone B2 and that half of all the pin shank pieces in the assemblage were found outside zone A, suggests that the latter explanation may be the more likely.


Appendix Figure 6.1 Dún Aonghasa, cutting 1. Distribution of the clay mould pieces; very small undiagnostic fragments have been omitted.


Appendix Fig. 6.2 'Zones' and numbered grid squares in cutting 1.


Appendix Fig. 6.3 Distribution of mould pieces for sword/spear/knife/tanged objects


Appendix Fig. 6.4 Distribution of mould pieces for axes


Appendix Fig. 6.5 Distribution of mould pieces for pins

# Appendix 7.1 Late Bronze Age clay moulds; a brief review of the Irish evidence (C. Cotter). 

## Distribution

Bi -valve clay moulds have been recorded at eighteen locations in Ireland ${ }^{3}$ (Appendix Table 7.1 and see also Vol. 2, Fig. 13.12). Indirect evidence for bronze casting in clay moulds is also provided by the inclusion of headers or casting jets in three hoards - Dreenan, Co. Fermanagh, Money Lower, Co. Laois and 'Co. Roscommon' (Eogan 2000, 5). Thirteen of the sites listed in Appendix Table 7.1 may have been late prehistoric settlements or, in the case of Lough Eskragh and Lough Gara, settlement complexes. Nothing is known of the find circumstances at Bohevny, Co. Fermanagh; the exact context of the moulds from Navan Fort is also unclear. Of the remaining sites, the King's Stables is an artificially constructed pool and forms part of the Eamhain Mhacha complex; it lies $c a$. 200m from the hillfort known as Haughey's Fort. Killymoon appears to have been a specialised site, largely concerned with the industrial processing of possibly a variety of materials, including grain and, perhaps, metals (Hurl et al 1995, 49). Ballykelly was a multiperiod site. During the prehistoric period a ridge-top plateau was used for burial / ritual activity; the single mould piece from the site came from a late Bronze Age funerary pit.

At least ten of the eighteen sites were located in a lacustrine or maritime setting, but as lake or lakeside settlements appear to have been much favoured by the upper echelons of late Bronze Age society, it does not follow that proximity to water was directly associated with the metalworking process itself. A range of settlement classes are represented, including hillforts (2), lake settlements (3), lake side settlements (1 or possibly 2 ) and enclosures (3 or possibly 4). Where there is sufficient information available on an individual site, the architectural status and/or the prestigious artefacts recovered (the list includes gold ornaments, bronze weapons, tools and ornaments, and amber beads) point either to occupation by people of high rank, or to ceremonial activity perhaps by the wider population group. Again, this is hardly surprising, but not all high status sites of the period have produced evidence for moulds or metalworking - notable exceptions are Moynagh Lough, Co. Meath, Knocknalappa Co, Clare, and Ballinderry II, Co. Westmeath. Only two of the seven excavated Irish hillforts have produced late Bronze Age clay moulds. Despite the significant number of late Bronze Age settlements discovered in the course of recent development and infrastructural projects etc., the number of moulds on record has increased by only $c a .1 \%$.

## Context (Appendix Table 7.1)

$84 \%$ of the total number of Irish mould pieces on record ( $\mathrm{n}=4787$ ) come from Rathgall. At the majority of the remaining find sites, the quantity of broken mould pieces recovered is extremely small, with half of the sites ( $n=9$ ) producing only six or less pieces. Assemblages made up of twenty or more fragments are recorded from Rathgall, Dún Aonghasa, Dalkey Island, Lough Gur and Johnstown South but only at the first three sites does the number of fragments exceed one hundred. The amount of information available regarding finds circumstances varies considerably particularly with regard to 'old finds.' The two mould pieces from Bohevny were recovered in unrecorded circumstances (Eogan 1965,

[^3]178). There is some confusion as to whether this is the same site as 'Boho', where Plunkett reported the discovery of a sword mould associated with a crannog (Plunkett 1880, 66-70; $1899,89) .{ }^{4}$ It is unclear how much of the crannog was investigated at the time. The finds circumstances of the assemblage from Old Connaught, ${ }^{5}$ White's Park Bay and Navan Fort are also sketchy, although at the latter, the site type at least is clear. Bay Farm III is unpublished and the wider context of the single piece recovered remains to be seen. At the King's Stables, the clay mould assemblage was interpreted as part of a deliberate deposit placed in the pool around the beginning of the first millennium BC The limited area ( $5 \%$ of the total site) excavated could account for the small number of moulds recovered. As the pieces were redeposited in the first place, however, the size of the 'pool' assemblage may not necessarily throw any light on the scale of the associated metalworking operation. The excavator (Lynn 1977) speculated that the associated metalworking might have been carried out close - no metalworking debris of late Bronze Age date seems to have come to light during subsequent excavations at the broadly contemporary Haughey's Fort. A significant portion (if not all) of Killymoon was excavated (Hurl 1995). ${ }^{6}$ Despite the presence of multiple hearths, the overall evidence for on-site metalworking (two mould pieces, but no crucibles or metal residues etc.) is rather negligible. The excavator suggests the mould pieces were ritually deposited and the finding of two, perhaps deliberately, buried gold objects at the site (Hurl 1995, 26) would lend support to that view. Hurl $(1995,27)$ has also suggested that the industrial activity may have been associated with a large, but now almost totally destroyed enclosure, located some 300m away.

The three largest Irish mould assemblages come from sites that have been extensively excavated, but, at least six other extensively excavated sites (Lough Eskragh, Rathtinaun, Johnstown South, Lough Gur and Ballylegan) have produced only relatively small numbers of mould pieces. The excavations at Ballynakelly and Stamullin were also on a fairly large scale but in each case only a single mould piece was recovered. There are a number of possible explanations for the small size of these assemblages - metalworking activity may have been on a very small scale; mould pieces may not have survived in situ but have been subsequently scattered or deliberately redeposited somewhere else or, finally, the actual casting area may not have been uncovered in the course of the archaeological investigations. The latter explanation seems a distinct possibility in the case of crannog 61 at Lough Gara, and, as at Lough Eskragh, there may have been a designated workshop area (however shortlived) in another part of the lake. A substantial portion of Site B was investigated in the course of the excavations at Lough Eskragh and on current evidence (see below), it seems that the scale of the casting activity there was quite small. This also appears to have been the case at Johnstown South. It is not clear which explanation might be relevant to Lough Gur. Sites D, F and K are all located within 200 m of each other and the handful of moulds from F

[^4]and K could easily have originated from Site D . Whether or not this is the case, the evidence once again seems to point to small scale metalworking. A substantial area was excavated at Ballylegan (McQuade 2009). Five phases of activity were identified, spanning the period from the early Neolithic to the early Medieval era. The late Bronze Age phase comprised a complex of timber-built structures and associated domestic features. As the boundaries of the site were not established, however, it remains a possibility that the metalworking activity was carried out either in the unexcavated portion or somewhere else in the neighbourhood. Three other late Bronze Age sites were identified within a 300 m radius of the main settlement but none of these produced evidence for metalworking. The fact that the mould pieces were found in the same discrete context at the site is noteworthy, however. In cases such as Ballylegan, where a few mould pieces represent the sole evidence for late Bronze Age metalworking, it is hard to make the call, between 'ritual' behaviour and 'casual' loss. What is clear, however, is that at almost all of the sites, the numbers of pieces present would represent only a fraction of the individual moulds in question. The dozen or so mould pieces from Lough Eskragh, for example, come from a minimum of three different objects (sword, knife/sickle and socketed axe). Based on an estimate of the fragmentation rate in the bestpreserved Irish assemblage (Rathgall), broken moulds for three such objects could be expected to produce in excess of forty fragments. ${ }^{7}$ The twelve fragments actually found at the site could therefore be in a primary context or have been brought from elsewhere. In the case of Lough Eskragh, fortunately, there is other material evidence to show that there was on site metalworking, but, such corroborative evidence is lacking in over half of the Irish sites. Again, this may be due to the scale of the individual excavations, but other factors may also be relevant - even at Rathgall, which was clearly a major production site, only two late Bronze Age crucibles seem to have been recovered (B. Raftery, pers. comm.).

## Metalworking; the evidence

As noted above, below a certain threshold, the number of mould pieces present is probably not a reliable indicator of whether an assemblage is in a primary or secondary context. The reasonably clustered concentrations of broken moulds found at Rathgall, Dún Aonghasa, Dalkey Island, Johnstown South, Site D, Lough Gur and Site B, Lough Eskragh, suggest the pieces were discarded fairly close to where metalworking (or some stage(s) of the process), was carried out. The finding of broken crucibles at Rathgall, Dún Aonghasa, Dalkey Island and Lough Eskragh, anvil stones at the latter site, slag at Dalkey Island, bronze ingots at Rathgall and bronze wasters at Lough Gur, all in close proximity to the broken moulds, would also support that conclusion. At a majority of those six sites there is associated evidence for furnaces, either in the form of hearths or extensive spreads of hearth residues. At Site B, Lough Eskragh, the working area was floored with clay and sheltered by a wattle fence. Rathgall also produced evidence for the existence of a sheltered working area, the main features of which were a cobbled floor and a linear concentration of stakeholes, possibly the remains of a windbreak fence or fences. The workshop was located outside the central ditched enclosure but there was ample evidence for both domestic and burial activity in its immediate environs. A number of clay moulds were also found in the eastern part of the site (Raftery 1971) suggesting the casting process may not have been restricted to one location only. At Dalkey Island, the broken moulds and crucibles were concentrated in a restricted area, but the long history of occupation at the site meant that it was not possible to reconstruct any contemporary layout for the settlement. A large hearth located in the lee of the inner enclosing wall seems to have been the focus of the casting activity at Dún

[^5]Aonghasa. As the inner enclosure was the main living space, the metalworking cannot have been very far removed from the contemporary domestic houses. This also seems to have been the case at Site D, Lough Gur, Johnstown South and perhaps some of the 'old sites' such as Bohovny, if indeed, metalworking was carried out there.

No Irish site has produced unequivocal evidence for a workshop building, but experimental reproduction, both of iron working and non-ferrous metalworking, has demonstrated the practical necessity of working under cover (Crew and Rehren 2002, 95). At Rathgall, a possible workshop area was defined by stake holes enclosing a spread of cobbling (Raftery, pers. comm.). O'Riordáin (1954) suggested the Site F building at Lough Gur may have housed the metalworkers, but the intended meaning seems to have been that it catered for their domestic needs. At Ballylegan, three of the four mould pieces came from the fill of a large wooden trough inside a circular building (structure A); the fill also yielded an almost complete cooking ware vessel (McQuade 2009, 69-73). The trough had a circular pit at each end (ibid, 70-72, fig. 3.18 and pl. 3.11) and there were other pits and multiple hearths in the interior of the building. The presence of a trough in the interior of a building is unusual, but as there were no direct signs of metalworking (or any other form of industrial activity) it is hard to say if structure A was used for anything other than domestic purposes. At Jarlshof, Shetland, Hamilton (1956, 23), suggested the bronze smith's workshop was initially located in the courtyard of an abandoned, or partly abandoned, courtyard dwelling (Dwelling 3, phase 111) conjoined to other houses. During a slightly later phase, the workshop was apparently set up in one of the adjoining buildings (ibid). A Scottish site excavated in more recent years is Cladh Hallan, located on the machair in South Uist, the Outer Hebrides (Parker Pearson et al 2004). During the late Bronze Age a terrace of large roundhouses was constructed at an already existing settlement. The construction of the houses involved much ritual deposition including the placing of human remains (some of which had already been mummified for an extended period of time) under the floors. Scattered across the floor of the middle house (the largest of the group) were fragments of clay moulds for casting swords, spears and ornaments. The house was rebuilt / refloored on eight successive occasions in the period ca. $1000-400 \mathrm{BC}$. Following the first rebuilding, three bronze chisels were placed on the floor; ritual deposits of dogs and cremated sheep were buried under the floor in the course of subsequent refurbishments. At the time of writing the site is unpublished and it is not clear if the area where the metalworking took place has been identified.

To sum up, when it comes to spatial patterning, two main trends are evident. In the first (Lough Gur, Dún Aonghasa, Rathgall, Dalkey Island and possibly Ballylegan and Johnstown) the workshop is located within the settlement, while in the second (Lough Eskragh, possibly Lough Gara and Killymoon) the industrial area seems to be located outside - but perhaps relatively close to - the associated settlement. With the exception of Rathgall, none of the sites appears to have been a major production centre. In most cases the casting could have been a one-off event or, at most, consisted of a few very small-scale episodes. The pattern in Scotland is similar, Jarlshof being the only site to date where even a relatively sizable mould assemblage - 240 pieces plus many small fragments (Hamilton 1956) - has been recovered. Coles (1960) listed five other Scottish sites which have yielded clay (as opposed to stone or steatite) moulds for Bronze Age artefacts, but in almost all cases the numbers involved are small, no more than a few pieces. The evidence for Bronze Age metalworking on the Isle of Man is even more limited, a single clay mould piece, a miscast sword, and a copper ingot fragment representing the totality of the recorded material evidence (Davy et al. 1999, 55).

A noteworthy feature is the ritual deposition of broken mould pieces. The pieces from the King's Stables, Killymoon, Stamullin and Ballynakelly have been interpreted by their respective excavators as part of structured depositions associated with ritual / funerary
practises (another possible candidate in this regard is the piece found in the fill of a posthole at Bay Farm III). Among the items deposited with the moulds were a crucible fragment, sherds of late Bronze Age cooking ware, worked / burnt flints, a saddle quern, animal bones. Part of a human skull was recovered in the ritual pool at the King's Stables; portions of two human skulls may also have been deliberately placed in the outer ditch at Stamullin. Such 'ritual' practises are not always easy to identify and it remains at least a possibility, that, among the larger assemblages, some proportion of the mould pieces were deliberately and meaningfully placed in certain locations.

## Chronology

The chronological context of the metalworking phase at Dún Aonghasa is discussed in detail in Vol. 1 (Cotter 2012, Vol. 1, 291-298). The proposed dating hinges around an association between the casting activity and the large hearth found at the northern end of the inner enclosure. In his analysis of the relevant group of dates Warner (Warner 2012; see Vol. 2, 214-227) examines a number of alternative models, and concludes that if all the dates are acceptable then the findings indicate 'that the hearth was certainly in use sometime within the period $1000-900 \mathrm{cal}$. BC, that its start is undefined (but before 900 cal . BC) and that it ended before 820 cal. BC. ...if usage of the hearth was short-lived then that had to be (if the stress-model dates are accepted) between 1000 and 900' (ibid, 219)

At the time of writing, no specific dates are available for the metalworking at Rathgall, but, a significant number (fourteen) of the radiocarbon dates from the site fall into the period $1380-1000$ cal. BC (Raftery 2004, 88). At Lough Eskragh, horizontal timber from layer (3) of the lakeside platform at Site B produced a radiocarbon date of 1520-1161 cal.BC ( $3105 \pm 80$ BP; UB 948; (Williams 1978, 48, appendix 1). At Killymoon, the main phases of activity (phases 4 and 5) saw the build up of mounds of alternating layers of burnt and unburnt material; it was from this context that the clay moulds were recovered. A sample ${ }^{8}$ from the central mound associated with Phase 4 activity yielded a C14 date of 1186900 cal.BC ( $2840 \pm 40 \mathrm{BP}$; GrN 24296). Burnt grain deposits associated with the following Phase 5 activity produced date ranges of 1109-841 cal. BC ( $2820 \pm 40$ BP; GrN 24295) and 811-673 cal. BC ( $2590 \pm 30 \mathrm{BP}$; GrN 22674) (Hurl et al. 1995, 49). At Ballylegan, a date of 1122 - 923 cal. BC ( $2854 \pm 33$; UB-7390) was obtained from Pomoideae (fruitwood) charcoal from the fill of the wooden trough that yielded the moulds (McQuade 2009, 69-71 and appendix 1, 367). The trough was located in structure A; charcoal (oak sapwood) from a posthole of the wall of that building produced a radiocarbon date range of 1128-922 cal. BC ( $2861 \pm 33$ BP; UB-7218). The charcoal may post-date the building (McQuade pers. comm.). A late Bronze Age date, 1253-1007 cal BC (2910 $\pm 32$; UB-7216) was also obtained from a sample of oak charcoal (sapwood) from a posthole of one of the rectangular buildings (structure B) in the same settlement complex (McQuade 2009 69-71 and appendix 1, 366). The Ballynakelly piece was found in a pit (C237), interpreted as a possible token burial place; charcoal (Prunas sp) from the pit was radiocarbon dated to 1193-926 cal.BC (2874 $\pm 39$; UBA-9876). Radiocarbon dates from the fill of the outer ditch / recut features in the ditch at Stamullin broadly fall into the period 980-800 BC. (Ní Lionáin 2006, 2010).

Such a varied range of contexts makes it difficult to suggest a 'narrowed down' date bracket. With the exception of Lough Eskragh, however, all of the dated metalworking activity could fall into the period $c a .1000-900 \mathrm{cal}$. BC. In all cases, the hypothetical time span could be expanded backwards, but only at Killymoon, Dún Aonghasa (and possibly Rathgall and Stamullin) could it be extended forwards. The Lough Eskragh date (1520-1161

[^6]cal. BC) is only one that definitely falls outside the $1000-900$ cal. BC bracket. As the date relates to the construction of the lakeside platform and therefore predates the metalworking phase, it does not necessarily present a problem. The contexts of the dates from most of the other sites could be interpreted as being either broadly contemporary or 'soon after' any associated metalworking phases. Where there are sufficient diagnostic features, the objects cast all seem to be classic Dowris phase artefacts. It may be that the conventional date bracket (ca. 800 BC ) for the commencement of this, the final and most illustrious phase of the Irish late Bronze Age, should be looked at again. There may also be scope for looking at the relative chronology of different artefact classes.

## The metalworking process

Appendix Table 7.2 gives a broad summary of the stages involved in the metalworking process and what follows is a commentary on the nature of the evidence for these at the known Irish sites. ${ }^{9}$ The evidence for ore extraction, smelting, alloying etc. at any of the listed sites is very tenuous. The number of saddle querns (an overall total of thirty-six broken and complete examples) found at Site B, Lough Eskragh is noteworthy and the excavator suggested that some of these might have been used to grind ores (Williams 1978, 47). ${ }^{10}$ Liversage $(1968,186)$ suggested that a piece of copper slag found during the excavations at Dalkey Island might be associated with smelting rather than melting. Given the lack of evidence for smelting at the remainder of the listed sites however, it would seem that in most instances the bronze was brought on site either in the form of ingots and/or broken or damaged items where the metal could be recycled. Presently, there is little or no evidence for the mining of native Irish copper during the late Bronze Age, but whether or not that is an accurate picture remains to be seen. The increasing demand for artefacts, and an expansion in the range of artefact types being manufactured, undoubtedly led to more intensive and / or extensive exploitation of copper sources at that time (Eogan 1993, 95-6). There is a question mark over whether earlier Bronze Age mines continued in production (on this subject see O'Brien 1994 and 2004 and Ó'Faoláin 2004) or whether the bulk of the ores now came from other - possibly overseas - sources. Northover's suggestion that northern Wales was a significant exporter of copper or bronze from the sixteenth century BC onwards (Northover in Davy et al. 1999) is of interest in terms of the relative proximity of north Wales to Rathgall. Excavations at the early prehistoric copper mines at Ross Island (O’Brien 2004) indicated that some of the ore was smelted on site. The range of knowledge, skills, resources and raw materials required for the subsequent production of bronze, however, means that it is unlikely that all stages of that process would have been carried out at one and the same location. Specialised smelting sites of late Bronze Age date have yet to be positively identified in Ireland. ${ }^{11}$ A circular furnace, possibly used for smelting copper, uncovered during recent excavations of a middle/late Bronze Age pit cemetery at Ballyconneely, Co. Clare (Read 1999; 2000, 28-29) may possibly date to this period; the site lies $c a .5 \mathrm{~km}$ from Mooghaun hillfort.

[^7]There is insufficient evidence to indicate whether or not the clays used in mould making were sourced locally or imported, in the latter case, perhaps forming part of the equipage of a visiting smith. Presumably, even the coarsest local pottery clays could be sufficiently refined by washing to be suitable for making up the outer layers of the mould. The much finer clays needed for the contact face might be imported, depending on the quality of the locally available sources. None of the sites listed in Table 7.1 has produced evidence for clay waste that can be directly linked to mould making. That some processing of clay was carried out on site, however, is indicated by the presence of relined crucibles - the practise of relining crucibles seems to have been widespread. Liversage's $(1968,185)$ meticulous analysis of the crucibles from Dalkey Island showed that a clay wash had been applied to the inner surface of the crucible bowls at intervals during the casting process; one crucible had evidence of four melts and four separate applications of slip.

Experiments by Liam McNally (1997, 10-12) have shown that a clay mould might take as long as three weeks to dry fully; the presence of even a small residue of moisture can result in the mould exploding during the firing or pouring stages. Wooden prototypes (e.g. those from Tobermore, Co. Derry, Hodges 1954, 64) or existing metal objects were the most likely templates but some minor reshaping of the matrix was probably required and gates, steps, cores etc. were presumably hand modelled to some extent. ${ }^{12}$ Modern clay modelling tools are generally made from wood; the basic requirements - a blunted point, flat edge and comfortable handgrip - can hardly have altered much over time. None of the bone tools recovered at Dún Aonghasa would seem to have been specifically designed for this function, although a number could have served the purpose quite adequately. The likelihood is that purpose-made modelling tools of either wood or bone would have been part of the smith's own tool kit.

While all the recorded Irish moulds appear to have been made up of composite layers of clay, some diversity is evident in other details. In five of the assemblages, the moulds were strengthened with wooden rods. The moulds from Whitepark Bay had keying features to line up the valves, while those from Dún Aonghasa were held in place with binding thongs. Keying features, similar to those on the Whitepark Bay assemblage, are also present on the clay moulds from Jarshof, Shetland (Hamilton 1956). The binding method, used at Dún Aonghasa, appears to be unique amongst the Irish group, but closer inspection of some of the older mould assemblages might reveal other instances. The use of binding thongs was identified on one of the moulds from Jarlshof; the same piece had been strengthened with a wooden rod and the excavator was of the opinion that the mould had presented particular difficulties during manufacture.

The on-site requirements for the casting stage of bronze working have already been outlined in some detail (Cotter 2012, Vol.1, Chapter 7, zone A). The amount of post-casting finishing required in order to produce an aesthetically pleasing and functional object is surprisingly high. No matter how skilled the smith, the majority of objects cast in clay would have emerged from the moulds with casting flashes, and, probably, in the case of bladed implements, without sufficiently sharp edges. The small finely made chisels found at Dún Aonghasa would have been ideal for removing flashing from very small objects, but are far too delicate for larger-scale work and certainly could not have broken off a casting jet left in the pouring gate. Final polishing and sharpening of cast items probably involved a number of graded materials, possibly including pumice. Again, the pumice found at Dún Aonghasa seems far too soft to have had any real abrasive impact on metal and, if it was used at all, the

[^8]likelihood is that it was only at the fine-finishing / polishing stage. Sand would probably have been a far more effective material for finishing and polishing newly cast bronze artefacts.

## Artefacts represented

Swords are the most common artefact type represented among the mould assemblages, evidence for their manufacture possibly being absent in only three or four cases. Knives/daggers appear to be the next most common type, followed closely by spearheads and axes. The least common types are palstaves, occurring only at Lough Gur and Rathgall, and, among the ornament class, bracelets, which seem at this stage to be present only at Dún Aonghasa (the Rathgall assemblage has yet to be analysed in detail). Bracelet moulds were also present at Jarlshof. On current evidence therefore, it would appear that the production of weapons (swords and spears in particular) may have been the stock-in-trade of most smiths. This impression may be distorted, however, by the much higher number of fragments generated by smashing a sword mould as opposed to moulds for smaller items such as chisels, bracelets etc. Based on his experimental work, Ó'Faoláin (2004, 109) also draws attention to the greater levels of skill required to cast large items such as swords and large spearheads.

Apart from the possible pin mould from Killymoon, an ornament horizon is represented only within the three largest assemblages. The small size of the remaining assemblages precludes from drawing any meaningful conclusions, particularly as there is a whole range of other late Bronze Age objects (e.g. solid and hollow rings, penannular bracelets, various types of chisel, horns etc.) that are not represented in the mould assemblages at all. The existence of three stone moulds for casting socketed axes of Eogan's classes 14 and 17 (Eogan 2000, 4-7) indicates that some objects were cast in stone moulds during the late Bronze Age. So far as it is possible to tell, however, the use of stone moulds seems to have been very much on the decline from the beginning of the late Bronze Age, and their use may have been comparatively rare by the beginning of the first millennium BC . Despite the scarcity of evidence for axe moulds made of clay, for example, the mass production of axes, and the presence of decorative neck mouldings on many examples, made casting in clay moulds more appropriate (ibid).

Clearly, there are a lot more Irish metalworking sites yet to be discovered. Given the present pattern, the likelihood is that large-scale production centres (such as Rathgall) may be exceptional and that most production sites were both short-term and small scale. That pattern would support a model where experienced specialist smiths were brought in as required. Given the small size of the country, it is not inconceivable that large centres like Rathgall, and perhaps a few others yet to be discovered, were the source of the metalworking expertise. Following Howard's model for southern England (Howard 1983, 511-2), Ó'Faoláin (2004, 107-9) has suggested that bronze production in this country was almost sedentary during the late Bronze Age. ${ }^{13}$ While this is probably true in relation to major production sites, like Rathgall, the small scale of the operations at many or perhaps all of the other sites (Dún Aonghasa included) hardly seems to have warranted the presence of a resident smith / fixed workshop. Part-time, small scale metalworking is unlikely to have led to the development of the highly specialized skills required for more complex bronze casting

[^9](e.g. closed, hollow casting around a clay core). As far as the evidence takes us at present then, a scenario where metalworking expertise remained in the gift of comparatively few elites seems the most likely one, initially at least. As noted already, the pattern of metal production in late Bronze Age Scotland seems to be broadly the same as that in Ireland, although nothing on the scale of the Rathgall workshop has so far come to light there. Based on the repertoire of objects, it has frequently been suggested that the Jarlshof smith may have been Irish. A hoard from the Point of Sleat, Skye also contains several Irish artefact types (cup-head pin, spearheads, socketed curved knife).The objects are apparently unused and 'unfiled' and according to Coles $(1960,30)$ 'local production seems improbable.' Recent analysis (Gibson 2000, 84) of the evidence for metalworking in western Iberia during the late Bronze Age suggests a somewhat different model to that proposed for Ireland and Scotland. Speaking of the late Bronze Age in western Iberia, Gibson draws a distinction between mining and metal production on the one hand, and the distribution of the finished products on the other. She suggests that the former was predominantly organised on a local scale without any elite monopoly of either metal exploitation or production, but that the distribution of the finished products may well have remained in the control of elites.

Given the numbers of cast metal artefacts of late Bronze Age date in Irish museum collections, it is surprising that more clay moulds / metalworking sites have not come to light. It will be of interest to see in what contexts future discoveries of clay moulds (especially those for more complex items such as the buffered rings) will be made. A final point of interest here is that the bronze bracelet found at Dún Aonghasa (Cotter 2012, Vol. 2, Fig. 8.33), the bronze axe from Navan fort (Lynn 1997, 89-91) and a pin shank from Johnstown South (Ó'Faoláin 2004, 186) are all possible examples of the on-site survival of objects represented in the individual clay mould assemblages. As far as can be established this seems to be quite a good record - even at Gussage All Saints (a prehistoric Iron Age site in Dorset) where around 6000 clay mould pieces were recovered (Foster 1980), no items cast in the moulds seem to have turned up on the settlement itself.

| Site | Site class | No. of clay moulds distinguishing features | Artefact classes represented | Context and associated / possibly associated metalworking equipment | Main references |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Rathgall, Co. Wicklow | Late Bronze Age hillfort with evidence for both earlier and later activity | ca. 4000 | Class 4 sword, leaf-shaped spearhead, palstaves, socketed gouge, chisel, | 'Workshop' area defined by stake holes - possibly the remains of a windbreak fence and an associated spread of charcoal covered cobbling. As well as moulds, the area produced a domestic pottery assemblage, objects of bronze, lignite, stone, glass, amber and four gold ornaments. None of the crucibles recovered at the site came from the immediate area of the possible workshop. A second small cluster of moulds occurred northwest of the central enclosure and a single mould fragment was found outside the hillfort. <br> Lumps of waste bronze and some ingots, two crucibles and a possible anvil stone were also recovered on the site. | Raftery 1976, 346 and pers.comm. |
| Dún Aonghasa, Co. Galway | Late Bronze Age hillfort | ca. 400 <br> Binding strips on inner and/or outer envelopes. | Socketed axeheads (3), spearheads (2), sword (1), knives (2), ball pinheads (2), disc heads or decorative studs/buttons (4), pin shanks (4), rings or bracelets (2). unclassified socket fragments from suggest the casting of one or more small tools such as gouges, socketed punches or chisels, and a few other fragments may also derive from the tang section of a small tool, in this instance possibly a tanged chisel or razor. Six possible core fragments and fourteen gate | Metalworking took place in the inner enclosure, where there was a scattered distribution of moulds and crucible fragments. With the exception of one concentration of pin moulds, most of the better preserved mould pieces were loosely clustered within a $c a .4 \mathrm{~m}$ area. A large hearth, filled with oak charcoal and built over a laid sand deposit may have been associated with the casting. There was no definite evidence for any "dividing off" feature, but the area immediately surrounding the hearth was floored with stone slabs. <br> Probably one episode of metalworking but possibly two Casting hearth, crucibles, very small amount of broken/spilt bronze. Chisels, grinding slabs. | O'Carroll 2012 |


|  |  |  | fragments were also identified |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Dalkey Island, Co. Dublin | Multiperiod island settlement with episodes of activity from the Late Mesolithic, through early and late prehistory. A promontory fort was built on the site in the Early Medieval period. | 140 (of which $c a$. 20 are identifiable to object type). keying features | Spearhead(s), sword, <br> socketed gouge, socketed axes, ?socketed knife ?sunflower pin | The clay moulds and crucibles were found in site V in the interior of the promontory fort. The subsod deposits in the cutting were up to 0.70 m deep but stratigraphy appears to have been poorly differentiated (Liversage 1968, 59-60). Most of the moulds and crucibles were found in a "black layer" made up of conflated occupation surfaces, or middens, which ranged from early prehistoric to early Medieval in date. A number of hearths, charcoal spreads and pits were found in close proximity, but their relationship to the black layer is unclear. According to the excavator (Liversage 1968, 161 figs 8 and 9), the horizontal and vertical clustering of the moulds pieces, crucibles and late Bronze Age pottery indicated that they had formed a "closed associated group". Possible house foundations occurred at a similar level in the same cutting. <br> Crucibles; a small amount of copper slag described as associated with smelting rather than melting (ibid., 186); chisel. | Liversage 1968, 89-91, figs 20, 21 ; Eogan 2000, 220. |
| Lough Gur, Co. Limerick | Bronze Age settlement: Sites D and F, Knockadoon and outside the enclosure at Circle K. | 116 <br> (Ten pieces from Site D, one hundred from $F$ and six from K) | Class 4 rapiers, palstaves, basal looped spearhead, class 4 sword (?) and knife (?) | The Site F assemblage was recovered a short distance outside a rectangular house located $c a .20 \mathrm{~m}$ from the old lake edge (Ó'Riordáin 1954, fig. 45). The moulds were associated with a hearth, set in a gravel cut hollow $(0.60 \mathrm{~m}$ diameter by 0.13 m deep. Two pieces of bronze waste from casting and Lough Gur class II wares were also recovered. Upcast from this activity was incorporated into a later field bank. The house is undated, the excavator suggested two alternative sequences -the first and preferred interpretation being that the house was used by the metalworkers (Ó'Riordáin 1954, 419). <br> The Site D assemblage (ten pieces of which 6 belonged to a single valve of a spearhead), was found in a group at 'a high level' outside the northern side of House 1; no associated features were recorded. The construction date of the house was not firmly established but it may have been occupied, if not built, during the late Bronze Age. Two refitting fragments of a stone mould for a looped palstave were also associated with House 1 (O'Riordáin 1954, 401); the mould is unusual in that it seems to have required clay insets to function properly. <br> The Circle K assemblage came from 'a high level' outside the northeast sector of the enclosure. There were no associated features. Pieces of bronze casting debris were also recovered from the sod or subsod layer at Circle K. Hearth, bronze waste. | $\begin{aligned} & \hline \text { O'Riordáin 1954, } \\ & \text { 400ff, , 18ff; } \\ & \text { Grogan and } \\ & \text { Eogan, 1987, 383, } \\ & \text { fig. } 32 \text { and fig. } 22 \\ & (301-2) \end{aligned}$ |

$\left.\begin{array}{|l|l|l|l|l|l|}\hline \begin{array}{l}\text { Johnstown } \\ \text { South, Co. } \\ \text { Wicklow }\end{array} & \begin{array}{l}\text { Enclosure (36m by 33m) } \\ \text { with evidence for } \\ \text { prehistoric and early } \\ \text { Medieval activity. } \\ \text { Located at the foot of a } \\ \text { hill ca. 1km from the sea. } \\ \text { The enclosing element } \\ \text { appears to have been } \\ \text { either a wall or a revetted } \\ \text { rubble bank. }\end{array} & \mathbf{5 2} & \begin{array}{l}\text { Socketed } \\ \text { axeheads, leaf- } \\ \text { shaped } \\ \text { spearheads, } \\ \text { socketed } \\ \text { hammerhead(s), } \\ \text { pin shank. }\end{array} & \begin{array}{l}\text { The majority of the clay moulds and crucibles were recovered } \\ \text { in or near the stone scatter that represented the remains of the } \\ \text { enclosing element. The mould horizon contained a large } \\ \text { quantity of domestic refuse, but was not clearly associated with } \\ \text { any particular structure. However, two proximate pits may have } \\ \text { been used for smelting or melting bronze. } \\ \text { Crucibles, possible smelting furnaces }\end{array} \\ \text { Fioclain in }\end{array}\right\}$

|  | early Medieval date. | strengthening rods | object(s) | included cooking ware and 'a considerable number of hammer stones' (ibid). <br> Two bone "pins" with undifferentiated heads could have been modelling tools |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Ballylegan, Co. Tipperary. | Multiphase settlement site located on slightly elevated ground $c a$. 2 km east of the R. Suir. The late Bronze Age phase included the remains of one circular building, three possibly rectangular structures and various associated domestic features. Apart from the moulds, the only finds were coarse pottery and a few lithic objects. <br> Three other late Bronze Age settlements were uncovered within a 300 m radius of the site. | 4 <br> possibly from one or two objects. keying feature on rim valve piece | Socketed, bladed implement with pronounced midrib, probably a spearhead (2 fragments), one fragment for a socketed object probably an axe, the fourth fragment is an undiagnostic outer valve (Becker 2009; McQuade 2009, Pl. 3.10). | The moulds were found inside the largest late Bronze Age building (structure A, $57 \mathrm{~m}^{2}$ ) in the backfill of a timber-lined trough. Other finds in the trough included an almost complete cooking ware pot. There were multiple hearths, pits etc. in the interior of the building. It remains a possibility that the building was associated with industrial activity, but, because of the number of hearths and the multi-phases activity on the site it is difficult to be certain (McQuade pers. comm.). | McQuade 2009; Becker 2009. |
| Navan Fort, Co. Armagh | Multi-phase site | 3 | Pin, bladed implement, (possibly the blade part of the looped and socketed axe found at the site; Lynn 1997, 89) | The moulds came from Waterman's excavations (1961-1971). Two are possibly from Site B, phase 3 - as this falls into the EIA period they are presumably residual. | Lynn 1997, 89. |
| Bohevny, Co. Fermanagh | Lacustrine (?) | 2 <br> strengthening rods | Class 4 sword(s) | Unrecorded circumstances (Eogan 1965, 178). | Hodges 1954, 65, fig. 2, nos 1 and 2 (where they are labelled 'Boho'); Eogan 1965, 178. |
| Killymoon, Co. Tyrone | Late Bronze Age ?industrial site in wetland location. Preceded by middle Bronze Age activity and possibly | 2 | ?Spearhead socket and ring-pin | Metalworking activities at this site are difficult to assess. Sizeable spreads of charcoal were noted across the excavated area but the main features consisted of three 'burnt mounds' or domes composed of alternating layers of ash, charcoal and baked clay. Two had bases composed of scorched wooden | Hurl 1995, 24-27. |


|  | associated with a large enclosure located on higher ground 300 m away. |  |  | planks and the third and largest had a base made of sandstone slabs. No flues were evident and the function of the features is unclear. The two mould pieces were found several metres apart; two dispersed pieces of slag represented the only other metalworking residues. None of the pieces lay within 2 m of the gold objects (a dress fastener and a sleeve fastener) recovered at the site. Other artefacts included a socketed bronze axe, saddle querns (probably associated with substantial quantities of charred barley), hammer stones and spindle whorls. A linear band of stakes (Declan Hurl pers.comm.). |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Boho, Co. Fermanagh. | Crannog | 1 | sword mould | Found on the 'surface of an ancient crannog' (Plunkett 1899); the crannog was associated with' rude huts which were found at a depth of 21 feet underneath peat' (Plunkett 1880). No other associations recorded. | Plunkett 1880, 66-70; Plunkett 1899, 89. |
| Ballynakelly Co. Kildare | Burial pits and other funerary /ritual activity of Bronze Age date | 1 | undiagnostic | The mould fragment and crucible sherd came from a possible token cremation pit of late Bronze Age date. A nearby pit produced a saddle quern. <br> Crucible sherd, saddle quern, worked and unworked flint including a burnt chunk | McCarthy 2010 |
| Bay Farm 111, Carnlough, Co. Antrim | Coastal site, primarily Bronze Age. There are other early prehistoric sites in the immediate vicinity. | 1 | axe | Found in an area of late Bronze Age occupation, in the fill of a post-hole in site now known as Bay Farm III. | Woodman 1977-9; Ó’Faoláin 2004, 33). |
| Stamullin, Co. Meath | Ditched late Bronze Age enclosure associated with both domestic and ritual activity. | 1 | bladed implement, probably a socketed axe | The mould piece was found in the fill of a recut in the secondary outer ditch (the ditch seems to have replaced the earlier, slighter inner ditch). The same context also produced sherds from three late Bronze Age pottery vessels. Among what are interpreted as other structured depositions in the outer ditch are a concentration of artefacts that included a polishing stone, saddle quern and three pieces of briquetage; portions of two human skullcaps may also have been deliberately placed in the ditch. | Ní Líonáin 2008 |

Appendix Table 7.1 Irish sites that have produced late Bronze Age clay moulds
\(\left.$$
\begin{array}{|l|l|l|l|l|}\hline \begin{array}{l}\text { Product } \\
\text { required }\end{array} & \text { Materials } & \text { Process } & \begin{array}{l}\text { Archaeological evidence } \\
\text { (artefacts) }\end{array} & \begin{array}{l}\text { Archaeological evidence } \\
\text { (features) }\end{array} \\
\hline \text { l. Bronze } & \text { a) Raw ores } & \begin{array}{l}\text { Ore breaking, smelting, } \\
\text { alloying, production of } \\
\text { ingots or cakes of bronze }\end{array} & \begin{array}{l}\text { a) Grinding and hammer stones, } \\
\text { anvils, ingot moulds, ore debris, } \\
\text { tongs } \\
\text { b) Bronze ingots } \\
\text { lobjects for } \\
\text { recycling }\end{array} & \begin{array}{l}\text { Workshop } \\
\text { Furnace }\end{array}
$$ <br>

Damaged or broken bronze items\end{array}\right]\)| Dats |
| :--- |

Appendix Table 7.2 Requirements for production of bronze objects

| Site | Sword | Rapier | Spearhead | Axe | Hammer | Palstave | Knife or <br> dagger | Small <br> socketed tools | Ornaments <br> (bracelets or pins) |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Dalkey Island | $\mathbf{X}$ |  | $\mathbf{X}$ | $\mathbf{X}$ |  |  | $\mathbf{X}$ | $\mathbf{X}$ | X |
| Old Connaught. | $\mathbf{X}$ |  |  |  |  |  | $\mathbf{X}$ |  |  |
| Rathgall | $\mathbf{X}$ |  | $\mathbf{X}$ | $\mathbf{X}$ |  | $\mathbf{X}$ |  | $\mathbf{X}$ |  |
| Johnstown South |  |  | $\mathbf{X}$ | $\mathbf{X}$ | $\mathbf{X}$ |  |  | $\mathbf{X}$ |  |
| Lough Gur | $\mathbf{X}$ | $\mathbf{X}$ | $\mathbf{X}$ |  |  | $\mathbf{X}$ | $\mathbf{X}$ |  |  |
| Ballylegan |  |  | $\mathbf{X}$ |  |  |  |  |  |  |
| Dún Aonghasa | $\mathbf{X}$ |  | $\mathbf{X}$ | $\mathbf{X}$ |  |  | $\mathbf{X}$ | $\mathbf{X}$ |  |
| L. Gara | $\mathbf{?}$ |  |  |  |  |  | $\mathbf{X}$ |  | $\mathbf{X}$ |
| L. Eskragh | $\mathbf{X}$ |  |  | $\mathbf{X}$ |  |  | $\mathbf{X}$ |  |  |
| Boho | $\mathbf{X}$ |  |  |  |  |  |  |  |  |
| Bohevny | $\mathbf{X}$ |  |  |  |  |  |  |  |  |
| Whitepark Bay | $\mathbf{X}$ | $\mathbf{X}$ |  |  |  |  |  |  |  |
| Bay Farm III | $\mathbf{X}$ |  |  |  |  |  |  |  |  |
| Kings Stables | $\mathbf{X}$ |  |  |  |  |  |  |  |  |
| Navan Fort | $\mathbf{X}$ |  |  |  |  |  |  |  |  |
| Killymoon |  |  | $\mathbf{X}$ |  |  |  |  |  |  |
| Stamullin |  |  |  | $\mathbf{X} ?$ |  |  |  |  |  |

Appendix Table 7.3 Range of object types cast in Irish clay mould assemblages.

| Site | Site class | No. of clay moulds distinguishing features | Artefact classes represented | Context and associated metalworking equipment |
| :---: | :---: | :---: | :---: | :---: |
| Jarlshof | Late Bronze Age settlement | Ca. 270 plus a large number of small fragments and several pieces of cire perdue moulds (Hamilton 1956, 29, 39) | At least 8 socketed axes, 7 swords (leafshaped V-type), gouge, sunflower pin. The cire perdue moulds were used for casting rods, one circular, the other angular in section Moulds have keying features | Moulds associated with final occupation phase of courtyard type dwellings (Village I, Hamilton 1956, 23-4). According to the excavator, the casting workshop was probably located in the central courtyard of the more or less abandoned Dwelling III and associated activities (preparation of clays, mould making, charcoal making etc.) may have been carried out in the cells opening off the yard and in the adjoining Dwelling IVa, (ibid, 23-4). It is not clear if there were one or more episodes of metalworking during this phase. Features of the courtyard workshop included a hearth and a sandfilled cavity ( 0.40 m by 0.23 m by 0.28 m deep) possibly used to hold moulds upright during pouring stage (ibid, 23). A wide scatter of mould fragments was found within the courtyard dwellings - the discard pattern suggests that they may have been spread with clays and refuse to backfill demolished houses. Bronze casting also continued during the earliest phase of Village II, when the courtyard type dwellings were seemingly replaced by roundhouses. During this period, the main workshop seems to have been located in the remodelled dwelling IV. <br> 11 fragments of crucible but unclear if all of these related to the late Bronze Age phase, sand pit |
| Treprain Law, East Lothian | Multiperiod hillfort. The earliest rampart on the summit may be late Bronze Age. A series of successive defences date from mainly from the prehistoric Iron Age. | Exact number unclear maximum number may be ca. twenty | Published sources give conflicting information but swords, spear and axes may be represented. possible strengthening rod | Old excavation with complex stratigraphy and further complicated by the presence of an assemblage of moulds of post late Bronze Age date (Hodges 1954, 79, Table III; Burley 1955-6, 153-54; Coles 1962; Schmidt and Burgess 1981; Ritchie and Ritchie 1991, 82). More moulds seem to have come to light during the early twenty first century. http://canmore.rcahms.gov.uk/en/site/56374/details/traprain+law/ |
| Galmisdale, Isle of Eigg, Scotland | Terrace with evidence for late Bronze Age and earlier activity earlier Neolithic / Early Bronze Age activity. | No information available | Mould pieces for at least 2 socketed axes, a probable knife and at least one unid object type | The clay moulds were found on a terrace distinguished by the presence of a large boulder. The metalworking episode seems to have been small-scale and short-lived, and unmarked by any formal built structure. A small cache of over 40 flint flakes and tools of possible Neolithic/Early Bronze Age date found on the old ground surface at the foot of the boulder may point to ritual activity in the area. Some of the mould pieces were found in a hillwash deposit, however, and it is possible the primary site lies uphill of the find place - a hut circle has been identified on the terrace immediately above. The objects represented in the mould assemblage fall into the period 1000-800 BC (Cowie 2001, 2002). <br> Clay moulds, crucibles and casting debris |


| Cladh Hallan, <br> South Uist, <br> Outer Hebrides | Late Bronze Age <br> habitation site with <br> evidence for earlier <br> and later occupation | No information available | unpublished |
| :--- | :--- | :--- | :--- | | Clad Hallan is a multi-period and long-lived settlement located on the |
| :--- |
| machair on the west coast of South Uist. A 'scatter of clay mould |
| fragments' was found within the entrance area of the middle of three |
| substantial late Bronze Age roundhouses. Finds of Irish type (including a |
| gold plated hair ring) suggest trade contacts. The site is associated with |
| extraordinary ritual practises, many linked to the placing of foundation |
| deposits under the house floors. Given their findspot, the moulds may also |
| have been ritually deposited (Parker Pearson et al 2004), and see also |
| http://www.shef.ac.uk/archaeology/research/cladh-hallan |

## Appendix Table 7.4 Scottish sites with refractory clay material.

(A very preliminary table; much of the information remains unpublished at the time of writing. Coles (1960) lists a further four or five 'clay mould sites' most of which are located in Atlantic Scotland. Only very small numbers of moulds (in some cases only single fragments) seem to have been recorded at these.

## Appendix 7.2 Digital reconstruction of pin based on 3D laser scan of a mould fragment from Dún Aonghasa (G. Devlin)

The first stage in the reconstruction of the disc-headed pin was to carry out a laser scan of the mould fragment (93E102:637). This was done using a NextEngine 3D Scanner, a compact desktop laser scanner that captures objects at high resolution - up to 0.3 mm point spacing. A total of eight individual scans were required to complete the surface of the mould. These were then pieced together in ScanStudio HD software. The registration was achieved by identifying a minimum of three common points in adjacent scans. The complete registered surface model of the mould was transferred to Geomagic Studio 12 - software designed to generate digital models of physical objects. In this software a final surface wrap was generated from the pointcloud laser scan data.


## Appendix Fig. 7.1 Scan of clay mould piece 93E102:637

A digitally reconstructed pinhead was then created from the surface model. A slice extracted as a profile was taken through the best preserved section of the mould. From that profile it was possible to extrapolate the diameter and shape of the entire pinhead. The digital information in conjunction with contemporary evidence (Eogan 1974) allowed the creation of the modelled version of the pinhead.


## Appendix Fig. 7.2 Profile across the best-preserved surface of the mould

The texturing and final modelling of the pin was carried out using Autodesk 3ds Max. The mould was imported into 3ds max, along with the pinhead profile, which was extrapolated $360^{\circ}$ using the lathe modifier. A pin was created and attached to the pinhead; the dimensions of the pin were estimated using existing examples. A suitable texture and light source was applied to both the pin and the mould before the image was exported as a tiff file. Adobe Photoshop was then used to colour the object.

Appendix Fig. 7.3 Hypothetical reconstruction of the pinhead. Here it is shown with a pin bent at an angle; it is also possible that the pin was straight.

# Appendix 8 Irish transversely-perforated hollow bronze rings with lateral buffer-shaped projections (C. Cotter and C. Sandes) 

## Background

This review was carried out while looking for parallels for the four bronze buffered rings found at Dún Aonghasa. Although this class of ring was frequently mentioned and often illustrated in the literature (particularly in George Eogan's work), it was unclear how many rings were on record and if the object type had any parallels outside the country. A survey of relevant repositories in Ireland and Britain, and the Royal Ontario Museum, Canada yielded a total of 77 examples - these are listed in Appendix Table 8.1. The following review is only a brief foray into the subject of 'bronze buffered rings' - technical analysis and a broader comparative study would no doubt yield a lot more information. It is not beyond the bounds of possibility for example that all of the rings noted here were cast over a fairly short time span and in a very limited number of workshops - perhaps as little as two or three.

The authors are grateful to all those who responded to a request for information and who in many cases, not only provided access to material, but shared their knowledge and information on provenance, associations etc. Particular thanks to the following (listed with the institutions they were associated with in the late 1990's): Mary Cahill and Raghnail Ó'Floinn, National Museum of Ireland; Stella Cherry, Cork Public Museum; Michael Holland, The Hunt Museum; Sinead McCartan, The Ulster Museum; Greer Ramsey, Armagh County Museum; Stuart Needham, The British Museum; the late Andrew Sherratt, The Ashmolean Museum and Robin Boast, Cambridge University Museum. We would also like to express our gratitude to George Eogan for his interest, encouragement, expertise and the many helpful discussions we had on late Bronze Age metalworking.

## Description and classification

Seventy-four buffered bronze rings were examined in the course of the review, the three unseen examples being NMI 1932:6545 (not located), BM 1868 7-9-10 (inadvertently missed out) and the example in the Royal Ontario Museum (ROM918:33:94). NMI 4388 was too incomplete to classify but, based on their sectional profiles, the remaining rings can be broadly sub-divided into two types. Type A rings have a flattened tear-shaped profile, i.e. the outer side is rounded, the upper and lower faces are flat and the inner edge is generally hourglass in section. This is the less common type, accounting for only $20 \%$ of the total (fifteen rings); all four Dún Aonghasa examples are of Type A. There is considerable homogeneity in size/weight amongst the group (Appendix Fig. 8.1), with the smallest ring (NMI1872.10/1) measuring 29 mm in external diameter and the largest (NMI1883.349) 36.5 mm . The weight range also falls within a narrow band, $20.84 \mathrm{~g}-34.57 \mathrm{~g}$ (average $c a .26 \mathrm{~g}$ ) in examples where the clay core is fully preserved. Two Type A rings (nos. 1872.10/1 and 10/2) are remarkably light, weighing only a third to a half of what might be expected. Both lack a clay core, but the metal also seems thinner and more air-pocked than usual. There are secondary modifications to one of the rings (no. 1872.10/1, where the external apertures have been infilled) and the clay cores may have been scraped out at the same time as this was done. Although the thinness of the bronze and the poor casting mean that they represent fairly poor versions of the object type, they do give a general idea of the clay/bronze weight ratio in the smaller examples. Most of the Type A rings tend to have plain unexpanded buffers, or, at best, show
only a very slight expansion in the region of 1 mm or so.


Appendix Fig. 8.1 Diameter and weight of Irish laterally buffered rings.
The graph plots the diameter and weight of fourteen Type $A$ and fifty-four Type B buffered bronze rings; broken rings or those where the clay core is absent are not included. The two atypically light Type A examples may have lost some of their clay core. The Type A rings are fairly uniform in size with a narrow diameter range of 29 mm to 36.5 mm . Type $B$ rings have a much wider diameter range varying from
31.5 mm to 73 mm . In Type A, the diameter is proportionately greater than the weight. This is also true of some of the smaller Type B rings but, with the larger examples, the weight increases dramatically due to the much heavier density of bronze in comparison to clay. The graph suggests that if the diameter of the ring is greater than 49 mm , the relative weight increases disproportionately. Weight differences in rings of similar size must be due to variation in the constitution of the bronze; the difference is so pronounced in some instances that it seems a heavy metal (such as lead) has been added to the copper/tin alloy.

Type B rings have a much more rounded profile with the upper and lower faces, as well as the outer sides, being convex rather than flat. Eighty percent of the total (sixty of the seventy-five classifiable examples) can be assigned to this group (Appendix Fig. 8.1). The shape of the protecting buffers varies and on some examples (e.g. those from Rathtinaun Appendix Fig. 8.6) they are short and stubby and project only 1 mm or so beyond the perforation. On many of the Type B rings, however, the buffers are flared, sometimes expanding to a pronounced trumpet-shape (e.g. NMI W87, NMI 1881:258, NMI 1932: 6444 and 6445 and NMI 1901:49 and 1901:50; Appendix Fig. 8.4). On some examples, the diameter of the lateral perforation and of its protecting buffer can appear disproportionately small when compared to the thickness of the ring (e.g. NMI 1881:258, W84 and W91). Less frequently, the buffers can be disproportionately large and, in the few examples of this type (NMI W90, W72 and W; CPM 1945:17.27; Appendix Figs 8.4 and 8.8), the buffer generally has a broad oval-shaped mouth. The size/weight range of the Type B rings is much greater than that for Type A (Appendix Fig. 8.1) with external diameters ranging $31.5-73 \mathrm{~mm}$ and the weight of examples with intact cores varying from $c a .30 \mathrm{~g}$ to 224.3 g .

## Distribution

In terms of distribution, most of the provenanced examples come from a central eastwest band across the country (Appendix Fig. 8.2) but it seems very likely that some of the unprovenanced rings come from the north or northeast. Neither of the two ring types shows a particular geographical bias. Where two or more rings have been found in definite association, however, they are of the same type and, more often than not, of very similar size and weight, suggesting that they were used in pairs. The similarity in size/weight between certain unprovenanced examples (e.g. CPM 1945. 17.26 and 28; NMI W82 and W83; W90 and W72) suggests that these may also have been 'pairs' originally. This is not always the case with individual museum collections, however. The third ring in the Cork Public Museum collection (Appendix Fig. 8.8) is quite different in appearance from the other two but is similar in many of its details (i.e. size, the presence of wide oval buffers and the lack of a 'through' perforation) to a ring (NMI W) in the National Museum of Ireland collection.


Appendix Fig. 8.2 Distribution of provenanced buffered rings

## Manufacturing details

## Casting

All the rings examined were cast in bivalve clay moulds around a clay core. The casting seam tends to be prominent on the inner circumference in most examples, giving the centre a pronounced hour-glass shaped cross-section. A large proportion of rings also retain residues of metal flashing so that the inner edges have a ragged appearance (e.g. NMI W6, W87, 89 and 72, NMI 1927. 2.1 and 2). In contrast, the casting seam is rarely evident on the exterior, and on the few examples where it is visible it tends to be prominent only around the buffers. The Dún Aonghasa rings are somewhat exceptional in that the exterior casting seams were not filed away. The clay core still remains in situ in the majority of rings and, as noted above, may account for a large proportion of the weight in the smaller examples. In broken examples, e.g. the very poorly preserved ring from the Ballyvadden hoard (Appendix Fig. 8.12 ) it can be clearly seen that the core fills the entire void of the ring, confirming that the clay ring was baked prior to casting. None of the cores could be examined in detail and it remains unclear whether they were made up as two separate pieces with gaps at the perforations, or if a continuous ring of clay was used in the mould and then perforated postcasting. The inner ends of the perforations are extremely rough-edged and worn on most examples so that their original outlines are now eroded away. Drip-like thickening of the metal around the perforations on NMI W81, however, confirms that the holes were cast features rather than the result of subsequent drilling. Finally, a significant number of the rings examined had a distinctive "patch" on either the upper or outer surface; this can be clearly seen on Royal Ontario Museum 918.33 .94 (Appendix Fig. 8.7) Without microscopic analysis, it is not possible to say whether the feature results from friction-wear or repairwork. One possibility is that the 'patch' marks an infilled casting vent.

## Decoration

Decoration appears to be rare on perforated rings with or without lateral buffers. Apart from the two rings from Dún Aonghasa, the only other decorated example is an unprovenanced ring (NMI X2119A), which is remarkably similar but slightly better cast than the Dún Aonghasa examples (see Vol. 2, Fig. 8.34). Here, the decoration also consists of fine, narrow concentric circles on both the upper and lower faces. On all three rings, the decoration is very shallow and considerably worn and it is possible that some of the other rings may have had similar decoration originally. Many of the rings have a slight "collar" at the end of the buffer, but in six rings the collar feature is elaborated into a double row of raised concentric bands. Five of these are Type A rings comprising the Dún Aonghasa examples and the aforementioned NMI X2119a; the sixth example (NMI W81) belongs to Type B and is much larger in size.

## Function

The majority of the rings are in relatively good condition, but all display very definite signs of wear. This is usually reflected in thinning of the buffer ends, often to one side as on the Dún Aonghasa examples, and by more extreme wear-damage around the inner ends of the perforations, clearly evident on the two rings from the Glenstal hoard (Appendix Fig. 8.5) and on the two examples in the Ulster museum collection (Appendix Fig. 8.9). Not all the wear patterns observed were consistent with single stringing and in some cases the strain on the buffer sides seems far more likely to result from a double string or chain link being pulled in opposing directions.

While it is generally accepted that laterally buffered rings probably had a ceremonial function, it is not clear whether they formed part of elaborate horse equipage or of prestigious personal ornaments such as a belt or neck chain. There are two rings that give some idea of how the objects might have been used or worn. NMI W. 7 and W. 8 (Appendix Fig. 8.10) are each attached to short sections of chain by means of a narrow bronze clip. The clip consists of a flat bronze strip ( 1.5 mm thick by 3 mm wide) that is doubled over so that the open end is concealed within the thickness of the ring. The chains are made up of individual lengths of 23 solid cast (and soldered?) bronze rings, averaging 19 mm in diameter, each of these sections then being clipped together. Both the open-ended central clips and the chain links seem rather slight, however, especially when compared with the level of wear around the ring perforations. A transversely perforated bronze ring without protective buffers, in the collection of the National Museum of Ireland (Appendix Fig. 8.10; 1882:212) has a more substantial bronze clip in situ, but in this and the previous examples it is not certain if the fittings are original. It is possible of course that the metal clips and links were also decorative features and that the actual stringing together was done with organic material, such as leather thong.

There are also a number of closely comparable bronze artefacts, most numerous being transversely perforated rings without protective buffers. These were not included in this review but are identical to laterally buffered rings (usually Type B) in shape, size and manufacturing details, differing only in that they lack the protective buffers. Numerous examples of these less elaborate rings exist in the collections of the National Museum of Ireland, the British Museum (at least seven), and the Ulster Museum (eleven plus a number of examples with a single perforation only), as well as smaller numbers in other museums. Direct association between these and the buffered variety is indicated by the finding of both forms of ring in the Maryborough and Rathtinaun hoards. All the transversely perforated rings from Rathtinaun are of very similar appearance and likely to have been cast at the same time. An unprovenanced Type B buffered ring (BM 1868: 7.9.7), very like the Rathtinaun examples in appearance, is fitted with a smaller tightly-fitting inner ring, which has transverse perforations lining up with those of the outer. The inner ring has a near vertical outer edge and flat narrow upper and lower surfaces and is not closely comparable in crosssection to most of the other "unbuffered" rings. A more detailed study, however, particularly of the "groups" of objects in the National Museum of Ireland collection, might show that some of these were in fact designed to fit together.

There are a number of more elaborate bronze items that show some overlap with both the hollow-cast ring tradition on the one hand, and composite and highly decorative items such as the well-known Roscommon chain collar on the other. NMI W. 2 and 3 (both unprovenanced) and Royal Ontario Museum 918.33.98, of Irish provenance, are almost identical (Appendix Fig. 8.11), each being made up of a hollow, bronze ring with looped edging, and a double centrepiece consisting of a second hollow ring and central mount of inverted cone shape. The two National Museum of Ireland rings have solid buffers fitted with pins that were expanded to cup-shaped heads to keep the centrepieces in place; it is not clear if the Royal Ontario Museum example ever had buffers. A bronze ring without buffers in the National Museum of Ireland collection (Appendix Fig. 8.11; NMI W4, unprovenanced) retains a broadly similar centrepiece but the central cone is 'upright'. This ring is far better made than the three previous examples and may have been cast in one or perhaps two pieces rather than three. An additional object of Irish provenance in the Royal Ontario Museum collection also belongs to the closed hollow ring tradition, but has a hollow tube with decorative threads projecting from the outer edge (Appendix Fig. 8.11). The piece appears to be without parallel; peg holes near the end of the tube suggest that, if the object is genuine, it may have been mounted on a staff or some similar object.

Transversely perforated lignite/jet beads are also known from the Bronze Age; a lignite example was found in the late Bronze Age levels at Moynagh Lough, Co. Meath (Bradley 1997, fig. 2 no.14). Jet/lignite 'ring-beads' with unprotected transverse perforations have been recorded in Wales (e.g. BM 65.10.13. 23/24). One of the examples in the British Museum (BM 65.10.12/24) has decoration around its inner edge on both upper and lower surfaces in the form of irregularly-spaced reamed-out holes. This bead type seems to have been relatively small, with external diameters generally less than 25 mm . None of the objects appear to have had buffers. A class of exceptionally large beads known from Britain and Ireland includes some examples with protective collars or buffers. The large oval-shaped jet /lignite bead from Cullahill Mountain, Co. Laois (NMI 1901:62) with 7 mm long buffers protecting the transverse perforation belongs to this group. While the object is comparable in size ( 43 mm by 57 mm by $<17 \mathrm{~mm}$ thick) to many of the bronze rings under review (and larger than most of the Type A rings), the likelihood is that it is significantly earlier than these in date. Similar collared beads of jet/cannel coal/shale are known from the early-to-middle Neolithic period in Scotland (Sheridan and Davis 1998, Sheridan et al 2002).

## Summary and Conclusions

The inclusion of laterally buffered rings in nine late Bronze Age hoards undoubtedly indicates that they were prestige items. Judging by the level of wear and tear evident around the perforations, they were also extensively used - indeed the reason for protective buffers in the first place was presumably to withstand strain. That they were effective for this purpose is clearly illustrated by the much more extensive wear evident around unprotected perforations. The rings from the Rathtinaun hoard indicate that even minimal buffers are effective at withstanding wear. There is good evidence to suggest that rings were utilised in pairs, possibly in some cases at least, in conjunction with perforated rings without buffers. While the smaller examples (e.g. those from Dún Aonghasa) could conceivably have been a component of items of personal ornament, the larger, heavier rings like those from the Rathtinaun hoard, seem far more likely to have been part of horse trappings. The hoard associations of the rings (Appendix Tables 8.2 and 8.3) are interesting in that the accompanying items are also predominantly ornaments. Socketed axes and gouges appear with some frequency but, apart from the spearheads in the (questionable) Drumcooley hoard and the knife in the Ballyvaden hoard, weapons do not feature.

The main distribution of bronze buffered rings is in the northern half of the country, the ring from the Ballyvadden, Co. Wexford hoard being the only definite outlier to this pattern. The hoard associations of the buffered rings (Appendix Table 8.2 and 8.3) plus radiocarbon dates for the Rathtinaun hoard (ca. 800 BC , B. Raftery pers.comm.) and a terminus post quem radiocarbon date from Dún Aonghasa (Vol 2, Date 34; 910-800 cal. BC) place these object types firmly in the Dowris phase of the late Bronze Age. Indeed, if the evidence of hoards is anything to go by, the bronze ring as an artefact type seems hardly to have made an appearance in Ireland much before the beginning of the first millennium BC. Hollow casting, involving a suspended or supported fixed clay core, would seem to have required a relatively advanced level of metalworking skills. As well as a decorative appeal, adding protective buffers to rings would have ensured greater longevity for what were clearly prized objects.

Buffered rings appear to be a uniquely Irish artefact and there are no exact parallels known to the writer from outside the country. A set of nested rings contained in the Parc-ymeirch (Dinorban) hoard of horse harness (Sheppard 1941) is similar to NMI W2. Savory $(1971,258)$ argues that many of the horse harness items represented in that hoard have their roots in France and central Europe and lists in particular the jangles, slotted disc mounts and
slotted reels. As there is also a strong Irish element in some of the Welsh late Bronze Age metalwork, however, it is not inconceivable that the nested rings are of Irish manufacture. The date of deposition of the Parc-y-meirch hoard is unclear; Davies and Lynch (2000, 182) assign it to the end of the late Bronze Age (covering the ninth and eighth centuries BC) while Cunliffe (1991, 411) suggests a broad mid-seventh century date. Eogan (Eogan 1964, 309) draws attention to the slight resemblance between rings with lateral buffers and the bugleshaped objects of the 'Carp's Tongue' sword complex of southeast England. Similar bugleshaped objects are found in north-west France where the 'Carps Tongue' complex is generally considered to have originated (Megaw and Simpson 1979, 317). Eogan (ibid.) also highlights the close resemblance between the Irish rings and rings with four projections that are found in Etruscan contexts in Italy such as that from the Tomba delle tre Navicelle, Vetulonia. Although the Irish buffered rings are quite different in appearance to any of the aforementioned, it seems very likely that they belong to the suite of decorative horse gear current in parts of western and northern Europe during the late Bronze Age, possibly with ultimate origins in central European Urnfields. The relatively small size of the Dún Aonghasa rings may be a reflection of the wealth of the owners. The buffers were almost certainly designed to preserve the life of the objects. Whether this was primarily because of the 'expense' involved in procuring them in the first place or because they were expected to withstand a fair amount of wear and tear is hard to say. Their presence in hoards certainly indicates that they were considered prized items and the wear and tear evident on many of the Irish rings would suggest usage over an extended period. Indeed the very presence of the buffers suggests bronze rings per se were used over a protracted period, the buffered ring perhaps being a 'new improved version' of its un-buffered predecessor.

## Buffered rings occur in the collections of the following museums:

ROM Royal Ontario Museum, Canada
(1) ring

BM British Museum
AM Ashmolean Museum
MC Cambridge Museum
UM Ulster Museum
ACM Armagh County Museum
NMI National Museum of Ireland
CPM Cork Public Museum
HCA/MG Hunt Collection/Museum
(57, including Dún Aonghasa examples)

| Museum No. | Provenance | Qty | Cxt | Associations | W. | D. | T. | L. | Type |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| ROM 918.33.94 | Near Limerick | 1 | S |  | 162.5 | 64 | 21 | 5 | B |
| BM 1921:12.6.35 | Co. Westmeath | 1 | U |  | 134.9 | 58.4 | 19 | 4.8 | B |
| BM 1868 7-97 | Unprovenanced | 1 | U | Ring now has "fixed" <br> centre piece, but <br> possibly corroded on <br> to it; combined wt. |  | 57 | 20.5 | 2 | B |


|  |  |  |  | 231.9 gms |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| BM 1868 7-9 8 | Unprovenanced | 1 | U |  | 128.2 | 57 | 20.5 | 5 | B |
| BM 1868 7-9 10 | Unprovenanced | 1 | U | - | 24.50 | 33.2 | 12.1 | 2 | A |
| BM 1899 7-9-9 | Unprovenanced | 1 | - | Not seen | - | - | - | - |  |
| ACM 16.1935 | Unprovenanced | 1 | U | - | 69 | 45 | 16 | 4 | B |
| UMA134 1951a | Unprovenanced | 1 | U | In box with 1951b; ex Knowles collection | 45 | 40 | 12 | 1 | B |
| UMA134 1951b | Unprovenanced | 1 | U | In box with 1951a; ex Knowles collection | 25.8 | 32 | 8.5 | 1 | B |
| AM.1927.2902 | Ireland | 1 | S |  | - | 70 | 20 | 7.5 | B |
| MC.99.245:4 | Drumcooley, Co. Offaly | 1 | H | $\begin{aligned} & \text { Eogan 1983, 191- } \\ & 192 . \end{aligned}$ | 48.1 | 43 | 14 | 4 | B |
| MC 99.249:2 | Portlaoise, Co. <br> Laois | 2 | H | $\begin{aligned} & \text { Eogan 1983, 100- } \\ & 101 . \end{aligned}$ | 23.6 | 36 | 11.2 | 4 | B |
| MC.99.249:3 | Portlaoise, Co. <br> Laois |  |  | As MC.99.249.2 | 11.4 ? | 33.2 | 9 | 1 | B |
| NMI P. 543 | Unprovenanced | 1 | U | With three large and four smaller rings | 106.9 | 60 | 18 | 5 | B |
| NMI X | Unprovenanced | 1 | S | broken | (2.69) | c. 27 | (8.5) | (3) | ? |
| NMI W | Unprovenanced | 1 | S | No holes from buffers through ring | 33.6 | 40 | 12.5 | 5 | B |
| NMI W11 (94) | Unprovenanced | 1 | S |  | 49 | 32 | 10 | 4.5 | B |
| NMI W6 (B693) | Unprovenanced | 1 | S |  | 135.6 | 45 | 15.5 | 8.5 | B |
| NMI W7 | Unprovenanced | 1 | S |  | 173.1 | 60 | 21 | - | B |
| NMI W70 | Unprovenanced | 1 | S |  | 26.5 | 36 | 10 | 4 | A |
| NMI W71(?) | Unprovenanced | 1 | S |  | 37.7 | 38 | 12 | 5 | B |
| NMI W72 | Unprovenanced | 1 | S |  | 61.2 | 41.5 | 15 | 5 | B |
| NMI W8 | Unprovenanced | 1 | U | Strip through buffers with chain of conjoined rings attached. In box with W7 | 118.6 | 60 | 20.5 | 5.5 | B |
| NMI W80 (B685) | Monaghan | 1 | S |  | 178.1 | 62 | 19 | 9 | B |
| NMI W81 (B686) | Unprovenanced | 1 | S |  | 145.6 | 61 | 20 |  | B |
| NMI W82 | Unprovenanced | 1 | S |  | 217.7 | 73 | 23.5 | 6.5 | B |
| NMI W83 | Unprovenanced | 1 | S |  | 224.3 | 72 | 22 | 7 | B |


| NMI W84 (B687) | Kilfenora? | 1 | S |  | 127.1 | 64 | 21.5 | 6 | B |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NMI W85 (B682) | Unprovenanced | 1 | S |  | 84.2 | 57 | 16 | 5 | B |
| NMI W86 (B675) | Inniftymond? | 1 | S |  | 68.9 | 50 | 15 | 8.5 | B |
| NMI W87 (B684) | Unprovenanced | 1 | S |  | 141.9 | 53 | 19 | 9 | B |
| NMI W88 | Unprovenanced | 1 | S |  | 76.4 | 56 | 15 | 6.5 | B |
| NMI W89 | Unprovenanced | 1 | S |  | 113.6 | 55 | 21 | 6 | B |
| NMI W9.3 | Ballyvadden, Co. <br> Wexford | 1 | H | Eogan 1983, 170- $171 .$ | $\begin{aligned} & c .23 \\ & (10.6) \\ & \hline \end{aligned}$ | (32) | (10) | (4.5) | A |
| NMI W90 (B676) | Unprovenanced | 1 | U | In box with W72, 6 , $11,91,93,70$ and ? 71 | 59.5 | 42 | 14 | 5.5 | B |
| NMI W91 | Unprovenanced | 1 | U | $\begin{aligned} & \text { In box with W90, 72, } \\ & 6,11,93,70 \text { and } 971 \\ & \hline \end{aligned}$ | 57.2 | 43 | 14 | 5 | B |
| NMI W92 (B677) | Unprovenanced | 1 | U | In box with W94, 87, $89$ | 41.3 | 38 | 12 | 5 | B |
| NMI W93 (B680) | Unprovenanced | 1 | U | $\begin{aligned} & \text { In box with W90, 72, } \\ & 6,11,91,70 \text { and } ? 71 \end{aligned}$ | 36.1 | 37 | 11 | 5 | B |
| NMI W94(?) | Unprovenanced | 1 | U | In box with W92, 87, $89$ | 53.5 | 35.5 | 11 | 5.5 | B |
| NMI X2119A | Unprovenanced | 3 | U | With three soldered rings, six rings, one broken ring with clay core visible and two other buffered rings | 24.9 | 34 | 11 | 4.5 | A |
| NMI X2119B | Unprovenanced |  |  | As for NMI X2119A | 29 | 33.5 | 10 | 2.5 | B |
| NMI X2119C | Unprovenanced |  |  | As for NMI X2119A | 20.1 | 31.5 | 10.5 | 4 | B |
| NMI X4388 | Unprovenanced | 1 |  | Fragment | (2.69) | 27 | 8.5 | 3 | A |
| NMI 1883:349 | Unprovenanced | 1 | U | With 22 plain rings, ring with unprotected <br> lateral perforations | 34.57 | 36.5 | 12 | 4 | A |
| NMI 1872.10 (1) | Unprovenanced | 2 | H? | $\begin{aligned} & \text { No inner apertures. } \\ & \text { (Eogan 1983, 199- } \\ & 200) . \\ & \hline \end{aligned}$ | 9.92 | 29 | 7 | 3 | A |
| NMI 1872.10 (2) | Unprovenanced |  |  | As for NMI 1872.10 (1) | 6.43 | 29.5 | 6.5 | 2 | A |
| NMI 1882:214 | Unprovenanced | 1 | S |  | 173.6 | 61.5 | 21.5 | 17 | B |
| NMI 1881:258 | Ballinrobe, Co. | 1 | S |  | 161.3 | 65 | 21 | 5 | B |


|  | Mayo |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NMI 1882:213 | Unprovenanced | 1 | S |  | 173.2 | 61.5 | 21 | 9 | B |
| NM1 1892:36 | Co. Fermanagh | 1 | H | Eogan 1983, 87. | 25.46 | 34 | 9 | 4 | A |
| NMI 1901:49 | Glenstal, Co. <br> Limerick | 2 | H | $\begin{aligned} & \text { Eogan 1983, 103- } \\ & 104 . \end{aligned}$ | 56.23 | 32 | 9 | 6 | B |
| NMI 1901:50 | Glenstal, Co. <br> Limerick |  |  | As for NMI 1901:49 | 50.59 | 33.5 | 12.5 | 5 | B |
| NMI 1927:2.10 | Toorado Td., Co. Limerick | 2 | H | Eogan 1983, 104. | 23.48 | 32 | 10 | 5 | A |
| NMI 1927: 2.9 | Tooradoo Td, Co. <br> Limerick |  |  | As for NMI <br> SA.1927:2.10 | 20.84 | 35 | 9 | 4 | A |
| NMI 1932:6444 | Tuam district, Co. Galway | 2 | O | Eogan 1983, 186187. | 121 | 58.5 | 20 | 4.5 | B |
| NMI 1932:6445 | Tuam district, Co. Galway |  |  | $\begin{array}{\|l} \hline \text { As for NMI } \\ \text { 1932:6444 } \\ \hline \end{array}$ | 39.9 | 34.5 | 11 | 4 | B |
| NMI 1932:6545 | Doon Upper, Co. Galway | 2 | H | Eogan 1983, 88-89. <br> Not located | - | 54 | - | - | - |
| NMI 1937:2607 | Doon Upper, Co. Galway |  |  | $\begin{array}{\|l\|} \hline \text { As for NMI } \\ \text { 1932:6545 } \\ \hline \end{array}$ | 110.1 | 57 | 20 | 8 | B |
| NMI 1939:38 | Killulagh Castle <br> Estate, <br> Co. Westmeath | 1 | H? | Eogan 1983, 168-9. | 24.9 | 32 | 7.5 | 5 | B |
| NMI 1941:23 | Unprovenanced | 1 |  |  | 114.2 | 56 | 20 | 7 | B |
| NMI 1942:422 | Probably Meath | 1 | S |  | 37.7 | 38 | 11.5 | 6 | B |
| NMI P1948:113 | Possibly Newgrange <br> Td, Co. Meath | 1 | S |  | 27.4 | 35 | 12 | 2 | B |
| NMI E20:336 | Rathtinaun, Co.Sligo | 1 | S | Found in marl at edge of Lough Gara | 157.6 | 69 | 20 | 4 | B |
| NMI E21:565 | $\begin{aligned} & \text { Rathtinaun, } \\ & \text { Co.Sligo } \\ & \hline \end{aligned}$ | 2 | H | Eogan 1983, 151-2 | 173.4 | 69 | 20 | 4 | B |
| NMI E21:566 | Rathtinaun, Co.Sligo |  |  | As for NMI E21:565 | 170.1 | 68 | 19.5 | 3 | B |
| NMI 92E102:2823A | Dún Aonghasa, Co. Galway | 4 | H | Hillfort, four rings found together during excavation | 24.92 | 32 | 11.5 | 5 | A |
| NMI 92E102:2823B | Dún Aonghasa, Co. Galway |  |  | $\begin{aligned} & \text { As for NMI } \\ & 92 \mathrm{E} 102: 2823 \mathrm{~A} \\ & \hline \end{aligned}$ | 24.91 | 32 | 11 | 5 | A |


| NMI 92E102:2823C | Dún Aonghasa, Co. Galway |  |  | $\begin{aligned} & \text { As for NMI } \\ & 92 \mathrm{E} 102: 2823 \mathrm{~A} \end{aligned}$ | 29.31 | 34 | 11 | 5 | A |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NMI 92E102:2823D | Dún Aonghasa, Co. <br> Galway |  |  | $\begin{aligned} & \text { As for NMI } \\ & 92 \mathrm{E} 102: 2823 \mathrm{~A} \end{aligned}$ | 28.55 | 34.5 | 11 | 4.5 | A |
| CPM 1945:17/26 | Unprovenanced | 3 | U | UCC collection: in box on string with 17/27 and 17/28 | - | 40 | 14 | 5 | B |
| CPM 1945:17/27 | Unprovenanced |  | U | As above | - | 40 | 14 | 6 | B |
| CPM 1945:17/28 | Unprovenanced |  | U | As above | - | 40 | 12 | 5 | B |
| HCA395 | Boyle, Co. <br> Roscommon | 1 | S |  | 59.5 | 45 | 16 | 2 | B |
| HCA396 | Unprovenanced |  | S |  | 40.3 | 38 | 11 | 2 | B |
| MG59A | Unprovenanced | 4 | U | 4 rings no information on find circumstances | 150.8 | 58 | 19 | 5 | B |
| MG59B | Unprovenanced |  | U | As above | 62.8 | 49 | 15 | 4 | B |
| MG59C | Unprovenanced |  | U | As above | 24 | 33 | 9 | 3 | B |
| MG59D | Unprovenanced |  | U | As above | 25.3 | 33 | 9 | 3 | B |

## Appendix Table 8.1 Catalogue of Irish transversely-perforated hollow bronze rings with lateral buffer-shaped projections.

The abbreviations are as follows: Qty - the number of rings found together; Cxt - context which is divided into $S$ - single, $H$-hoard, U-unknown; $W$ - weight in grams; $D$ - external diameter not including buffers; $T$ - maximum thickness of ring; $L$ - length of the buffers (all measurements are in mm ) Measurements in brackets indicate that the ring is incomplete. All associated artefacts are bronze unless otherwise stated. Entries with question marks are of uncertain provenance or association; a label marked Kilfenora was attached to W84, but glossed as possibly Kerry or Clare. Inniftymond (W86) can probably be interpreted as Ennistymon, but this provenance too is uncertain. Wilde's catalogue (Wilde 1861, 579) listed twenty-three examples of buffered rings (numbered 555-6, 6-11 incl. and 80-94 incl.). Nineteen of those can be identified. The four 'missing' rings (W10, W11, W555 and W556) may also feature here as some of those listed in the table (i.e. ' $W$ ', W70,W71 and W72) are not referenced in Wilde.
(Note added Feb. 2013: There is also a ring in the Metropolitan Museum, New York, accession no.49.125.4b ; provenance given as 'Co. Cavan'. The ring is mounted on a stout pin (49.125.4a), which has an expanded flat head and screw-like threads on the upper part of the shaft.)

| Museum No. | Provenance |  | Find circumstances and list of objects in hoard (from Eogan 1983) | Type |
| :---: | :---: | :---: | :---: | :---: |
| MC.99.245:4 | Drumcooley, near Edenderry Co. Offaly | 1 | A number of objects found in the 1850s but not conclusively forming part of an associated group; Eogan (1983, 191-2) lists the objects of late Bronze Age date as: one Type B buffered ring, leaf-shaped spearhead, spearhead, looped socketed axehead, five small plain solid rings, two amber beads, sandstone piece with groove. | B |
| MC 99.249:2/3 | Maryborough nr. <br> Portlaoise, Co. <br> Laois | 2 | Found in 1872, in "one lump of clay" interpreted as a wooden box; two Type B buffered rings, cup-headed pin, large plain ring, 49 small solid rings, 2 rings, one with a single unprotected transverse perforation, the other with two, socketed gouge (now missing), 109 amber beads, sandstone "seal". | B |
| NMI E21:565/6 | Rathtinaun, Co.Sligo | 2 | Hoard found in wooden box at edge of crannog in L. Gara; Two buffered rings, tweezers, pin, 3 penannular rings (lead? core, gold covered), 4 tin rings, 6 rings, 3 perforated rings, double ring, sheet bronze tube, 31 amber beads, 5 boar tusks. | B |
| NMI W9 (b) | Ballyvadden, Co. Wexford | 1 | Found around 1849 in coarseware pot about 1 m below the surface under a flat flag; one Type A buffered ring, two socketed axeheads, a socketed gouge, one or possibly two solid rings, socketed knife fragment, two other bronze fragments. | A |
| NM1 1892:36 | Co. Fermanagh | 1 | Found "together in Co. Fermanagh"; one Type A buffered ring, socketed gouge, one small and one large plain, solid ring. | A |
| NMI 1901:49/50 | Glenstal, Co. Limerick | 2 | Found 1901 in mountainous land and accompanied by vessel resembling "old flower pot" two Type $B$ buffered rings, looped, socketed axehead, one large hollow ring, one small ring. | B |
| NMI 1927:2.1/2 | Tooradoo td, Co. | 2 | Two type A buffered rings, 105 amber beads, | A |


|  | Limerick |  | four solid rings, four penannular 'hair-rings' <br> (gold-cased, tin cores, decorated), one lignite <br> bead. |  |
| :--- | :--- | :--- | :--- | :--- |
| NMI 1932:6545 <br> NMI 1937.2607 | Doon Upper, <br> Co. Galway | 2 | Two buffered rings, one Type B, second not <br> located, looped, socketed axehead, plain solid <br> ring. | B |
| NMI <br> 92E102:2823A-D | Dún Aonghasa, <br> Co. Galway | 4 | Four Type A rings found together during <br> excavation of hillfort | A |

Appendix Table 8.2 Late Bronze Age hoards containing buffered rings.

| Hoard |  |  |  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |

Appendix Table 8.3 Range of object types in the hoards listed in Appendix Table 8.2


Appendix Fig. 8.3 The Dún Aonghasa buffered rings with (at bottom) the remarkably similar but better cast ring NMI X2119a



Appendix fig. 8.5 Pairs of buffered bronze rings: Type $B$ from Glenstal on left and Type A from Tooradoo on right. (Photo: National Museum of Ireland)


Appendix Fig. 8.6 Bronze rings from Rathtinaun. The upper pair lack buffers; the buffers on the lower pair are extremely worn. (Photo: National Museum of Ireland).


Appendix Fig. 8.7 Bronze ring 'found near Limerick' and now in the Royal Ontario Museum (ROM 918.33.94). The 'patch' on the upper surface (top left of picture) is a feature that occurs on a number of other buffered rings. (Photo: Royal Ontario Museum).


Appendix Fig. 8.8 Three unprovenanced bronze rings from the University College Cork collection, now in the Cork Public Museum. CPM 1945:17/26; CPM 1945:17/27; CPM 1945:17/28. (Photo: Cork Public Museum).


Appendix Fig. 8.9. Unprovenanced bronze rings from the Knowles Collection in the Ulster Museum. (Photo: Ulster Museum).


Appendix Fig. 8.10 Buffered rings with attachments of uncertain date. The chains are made up of composite links that are clipped together. The slightness of the clips would suggest that there was very little strain on the chain. Top left NMI 1882.212; lower left NMI W8; lower right NMI W7. (Photo: National Museum of Ireland).


Appendix Fig. 8.11 Bronze rings with unusual elaborations and fittings. (Photos: National Museum of Ireland, Cork Public Museum and Royal Ontario Museum).


Appendix Fig. 8.12 Broken buffered bronze ring from Ballyvaden with clay core visible. NMI W9 (b). (Photo: National Museum of Ireland).

## Appendix 9 Micromorphological analysis of four samples of ash from Dún Aonghasa (S. Carter)

## Summary

Four samples of sediment from excavations at Dún Aonghasa were studied in thin section; all had been interpreted in the field as ash. Analysis showed that all four samples consist of ash or ash/soil mixtures. The ash is predominantly derived from the burning of wood which yields a highly calcareous ash with a distinctive white colour. Peat, turf, dung and other organic sediments were not a significant source of fuel.

## Introduction

This report presents the results of the analysis of four sediment samples collected during the excavations at Dún Aonghasa in 1993 and 1994. The sediments were all interpreted as ash in the field and the objective of this analysis was to identify the nature of the source fuel or fuels. The four samples selected for analysis can be divided into two related pairs:

| Samples | Feature | Context |
| :--- | :--- | :--- |
| $218 / 219$ | 221, cutting I, zone B2 | Distinct ash fill in hearth |
| $313 / 385$ | $279 / 295$, cutting 1, zone A | Large hearth; 279 overlies ash deposit 295 |

## Methods

Small sub-samples were provided for analysis from the original loose sediment samples; micromorphological analysis is ideally undertaken using undisturbed block samples but in this case only loose samples were available. This limitation was avoided, in part, by selecting small undisturbed fragments of the sediments which had survived intact. These fragments retained their original structure and fabric but their orientation could not be determined. The selected fragments were packed into a standard $8 \times 5 \times 5 \mathrm{~cm}$ Kubiena Tin which had been divided into four compartments with card inserts. The filled tin was air-dried and then resin-impregnated; the impregnated block was cut and a thin section produced using standard techniques at the Department of Environmental Science, University of Stirling (Murphy 1986). The thin section was then analysed using the methods and terminology recommended by Bullock et al (1985).

## Results

Initial examination of the thin section revealed that all four samples comprised variable mixtures of three distinct sediments types along with larger inclusions. Table 1 provides a summary of composition and the various component sediments and inclusions are described more fully below.

| Sediment |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Sample | Separate large components |  |  |  |  |  |
| $\mathbf{2 1 8}$ | Type 1 | Type 2 | Type 3 | Bone | Shell | Rock |
|  | Common small <br> fragments <br> mixed with | Very few <br> small <br> fragments | Common <br> small <br> fragments |  | Few |  |


| $219$ |  |  |  |  | Few | Frequent |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Types 2 and 3 <br> Frequent large fragments with inclusions of bone and Type 2 | Very few small fragments | mixed with <br> Type 1 <br> Dominant <br> large <br> fragments |  |  |  |
| 313 | Very dominant large fragments with inclusions of bone and Type 2 | Very few small fragments | Only one small fragment |  |  |  |
| 385 | None | None | Common large fragments | Frequent | Frequent |  |

## Appendix Table 9.1 Composition of ashes in thin section (see text for description of sediment types).

## Type 1 sediment

Dark brown, non-calcareous sandy silt with frequent small fragments of bone and carbonised wood. Random fabric.

## Type 2 sediment

Highly reflective red-brown non-calcareous sandy silt, occurring as small rounded fragments ( $<1 \mathrm{~mm}$ ) embedded in Type 1 sediment.

## Type 3 sediment

Highly calcareous sediment with frequent to common sand and silt grains (silt very dominantly calcium carbonate) set in a colourless groundmass with frequent dotted inclusions. Calcium carbonate crystals are rarely organised as plant tissue pseudomorphs; phytoliths and diatoms occur in variable but low concentrations and small bone fragments are present in some cases. In some larger fragments there is a banded fabric caused by variable concentrations of calcium carbonate grains, other mineral grains and phytoliths; in the majority of sediment fragments the fabric is random. Type 3 occurs either as discrete larger fragments or as small fragments embedded in Type 1 sediment. Table 2 summarises the variation in Type 3 sediment between the four samples.

## Large separate components

Separate fragments of bone, marine shell and rock occur among the sediment fragments in some samples. They may have originally been embedded in the sediments but fragmentation during sampling has released them.

| Inclusions |  |  | Fabric |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Sample | Bone | Shell | $\begin{array}{l}\text { CaCO3 plant } \\ \text { pseudomorphs } \\ \text { Very few }\end{array}$ | Phytoliths | Few | \(\left.\begin{array}{l}Laminated and <br>

random\end{array}\right]\).

| 219 |  | Very few | Few | Laminated and <br> random <br> Random |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 313 | Frequent small <br> fragments | Few |  | Very few | Frequent small <br> fragments | | Few few |
| :--- |
| fragments |$\quad$| Random |
| :--- |

## Appendix Table 9.2 Variations in composition of Type 3 sediment (ash) in thin section.

## Interpretation

## Composition of the samples

Three types of sediment are present in the samples but only one, Type 3 , can be interpreted as ash and this is discussed in more detail below. Type 1 , which is a common or dominant component of samples 218, 219 and 313, contains carbonised fuel residues but the bulk of this sediment comprises unheated sand and silt. It is therefore essentially soil with a significant wood charcoal and bone content. The much less abundant Type 2 sediment is also dominantly sand and silt but its bright red-brown colour in incident light indicates heating (Courty, et al. 1989, 109). Type 2 can therefore be interpreted as small fragments of Type 1 sediment that have been burnt. Given the low organic matter content of Type 1 it cannot be viewed as a fuel and therefore Type 2 is not an ash. Type 2 is most likely to result from soil fragments becoming incorporated accidentally in fires.

To summarise - the three sediment types are interpreted as follows:
Type 1: soil
Type 2: burnt soil
Type 3: ash

Only sample 385 lacks Types 1 and 2 and therefore consists solely of ash; the other three samples are ash/soil mixes. In samples 218 and 219 , which are from the same pit fill, ash and soil are present in similar quantities but in 218 the two types are intimately mixed, contrasting with the discrete fragments present in 219. This greater degree of mixing in 218 could be an artefact of sampling but, given the apparent survival of intact fragments during sampling, it seems likely that the sediments in sample 218 were mixed before sampling. Postdepositional biological mixing processes (root and invertebrate activity) could be responsible and the relative positions of the two samples in the pit fill may explain their differing condition at the time of excavation. Sample 313, although interpreted as a hearth deposit in the field, contains almost no ash or even burnt soil and its origin should be re-considered in light of this result. It contrasts strongly with the underlying sediment, sample 385 , which is a pure ash.

## Composition and sources of the ash (Type 3 sediment)

All four samples contain variable proportions of an ash which is made distinctive by its high calcium carbonate content. It is this property that created the overall white colour of the samples noted by the excavator which contrasts with the strong red-brown colours frequently associated with ash. Red-brown ashes contain significant levels of iron oxides which become strongly reflective by oxidation during burning. The relative absence of iron oxides in the present ash samples tends to rule out a range of fuels loosely classified as peats and including true organic peat, organic muds, peaty and earthy turves.

Calcium carbonate-rich ashes are most likely to derive from the burning of wood (Courty, et al. 1989, 105) and this is the interpretation at Dún Aonghasa. Very few fragments of ashed plant tissue were noted in samples 218 and 219 only; these carbonate pseudomorphs are extremely fragile and are readily broken up into individual crystals which are abundant in these samples. Wood cannot be the source of the few phytoliths and diatoms noted in the ash. Phytoliths are most likely to derive from grasses and sedges and may have been burnt as the grass, peat or dung. Diatoms occur in peat, dung and other organic sediments. In the rare fragments of ash displaying original sedimentary lamination, these biogenic silica residues are concentrated in specific non-calcareous laminae and this suggests that a grass/peat/dung fuel was rarely used. The dominance of wood over other fuels is supported by the composition of the carbonised plant remains in Type 1 sediment. Here, all identifiable fragments were wood except for one amorphous organic fragment (probably peat) in sample 219.

The survival of calcareous wood ash in an unprotected environment in the west of Ireland is of some interest. Calcium carbonate is readily leached out of near-surface sediments by rainwater moving down through the soil and therefore prehistoric wood ash usually survives in a de-calcified state unless it is protected from leaching. Once de-calcified it is very difficult to identify with confidence. The survival of wood ash at Dún Aonghasa can probably be explained by the high levels of calcium carbonate in the local environment from bedrock and marine shell sources which have maintained the high pH conditions required to preserve the ash.

## Appendix 10 Analysis of soil samples from Dún Aonghasa (C. Ellis)

Seventeen bulk samples derived from six locations on the hilltop were analysed for pH , phosphate, $\mathrm{CaCO}_{3}$ and loss on ignition. Sixteen of the samples were analysed to obtain the characteristic particle-size distribution. The aim of this work was to classify and enable comparison between natural and anthropogenic soils and/or sediments.

## Methods

All samples were subjected to four analyses, using soil in a field moist condition. pH was determined in a $1: 2.5$ soil to distilled water mixture. Loss on ignition used $c a$. 10 g oven dry soil ignited to $400^{\circ} \mathrm{C}$ for four hours. Determination of phosphate used a spot test for easily available phosphate (Hamond 1983). Samples were rated on a three point, scale using the time taken for a blue colour to develop following the addition of the two reagents to the sample. The scale was high ( $0-30$ seconds), medium ( $30-90$ seconds) and low (more than 90 seconds). Calcium carbonate content was assessed semi-quantitatively using a simple field test and the samples assigned to the following classes (based on Hodgson 1976, 57):

| Test rating | $\mathrm{CaCO}_{\mathbf{3}} \mathbf{( \% )}$ | Description |
| :--- | :--- | :--- |
| 0 | 0.1 | Non-calcareous |
| 1 | $0.1-1$ | Non to very slightly calcareous |
| 2 | $1-5$ | Slightly calcareous |
| 3 | $5-10$ | Calcareous |
| 4 | $10+$ | Very calcareous |

All the samples, with the exception of Sample 536 (F1 top soil), were subjected to basic particle-size analysis at one phi intervals from -4 to 4 . The samples were air-dried; however, because of the calcareous nature of the bedrock and the comparative objectives of particle-size analysis of the anthropogenic soils, the organic matter and calcium carbonate were not removed prior to sieving. Numerical description of the particle-size distribution data was carried out following the methods of Folk and Ward (1957).

## Results

The results of pH , loss on ignition, phosphate and calcium carbonate content are given in Table 1. All the soils/sediments are alkaline. The majority of the samples are non-humose mineral soils, with some humose mineral soils (series 2 Samples 541.2.1; 541.2.2; 541.2.4; and series 1 Samples 540.1.1; 540.1.2; 540.1.3) and one organic soil (Sample 536 F1). The majority of samples are extremely calcareous, although the topsoil (Sample 536) is noncalcareous. Levels of available phosphate are high in five of the samples, moderate in five and low in eight.

The results of particle-size analysis are given in Table 2. The sediments/soils fall into four broad classifications; gravelly sand, sandy gravel, gravel and sand. All the samples are poorly sorted. Series 2 samples (five samples) and series 3 samples (three samples) have weakly bimodal distributions (the particle-size distribution does not follow a normal distribution and is characterised by a coarse-grained and a fine-grained peak) and the remaining samples are unimodal (where the particle-size distribution follows a normal distribution and only one class size dominates the distribution). Many of the samples show positive skew (where the distribution has a characteristic skew from the normal distribution and which comprises low percentages of sand and silt/clay) and all three gravelly sands are negatively skewed (where the skew of the normal distribution is towards the pebble and gravel particle-size classes).

## Discussion

The alkalinity and high calcium carbonate content of the soils/sediments is a consequence of the calcareous nature of the bedrock and the mineral components. Sample 536 (F1) tested non-calcareous and it is probable that this result is due to the domination by chert and the masking of limited calcareous mineral grains by organic matter.

## Cutting 1

Sample 536
The phosphate level of the topsoil (F1) is low; however, this result must be treated with extreme caution because of the shallow depth from which the sample was derived and therefore the probability of leaching. This sample was not subjected to particle-size analysis because of the high organic content; however, the coarse to medium sized-sand grains observed under a microscope are generally well rounded and it is probable that some of the sand is windblown.

## Series 2

Series 2, (five samples) exhibits a slight decrease in organic matter with depth, which when coupled with the particle-size analysis may be indicative of limited pedogenesis (soil development). Particle-size analysis shows a clear coarsening of poorly sorted mineral material with depth and a trend from a very negatively skewed distribution to a very positively skewed distribution of the lowermost sample. The gravel and coarse sand-sized components comprise angular limestone clasts, calcite grains and rare iron stained sandstone clasts together with a high proportion of snail shells, marine shells and occasional bone. Because the soil profile was not observed in the field (by the present author) conclusions concerning profile formation processes are unfortunately limited; however, the mineral component of these samples indicates that this material at least is local and the profile appears to have developed in situ. However, this does not negate the probability of occupation, manuring or dumping of organic and inorganic refuse and its incorporation into the soil profile, rather such activity is indicated by the moderate to high levels of easily available phosphate.

## Cutting 9

Sample 538
Sample 538 (F923) is a very poorly sorted, fine sand with angular limestone clasts, a large number of snail shells, bird and fish bones. The sediment has a high content of easily available phosphate.

## Series 1

Series 1, (seven samples) are dominated by gravel, with some sand and very little silt and clay. The coarse mineral clasts from the profile samples were limestone, calcite mineral grains and rare sandstone; these are indicative of a local bedrock source(s). The organic content generally decreases with depth which indicates that the profile was not formed in a single phase and is therefore unlikely to represent simple dumping and redeposition of material into the linear 'valley'. It is more probable that the sediment profile developed in situ; however, from the available information this cannot be confirmed. The organic content of the first three samples within this series is indicative of limited soil development; the organic content may not have been derived from organic rich refuse because the easily available phosphate levels are low (however, see below for further discussion). The moderate easily available phosphate levels in Samples 540.1.4 and 540.1.5 indicate some form of
human and/or animal activity despite the relatively low organic content. One explanation of the sediment profile pattern from low to moderate to low levels of easily available phosphate is that there has been a break in deposition between 30 and 40 cm . A similar hypothesis is proposed to that discussed in relation to Series 3, namely that between 30 and 40 cm lies a boundary (either stable or erosional) where deposition was halted and phosphate was introduced to the sediment. A second explanation is that easily available phosphate has been leached from the upper 30 cm of the old ground surface (?) and was fixed (tranformation into a less soluble form) between $c a .40$ and 60 cm prior to the construction of the wall. The natural gravels at this location (Sample 540.1.7) have a low organic content and a low level of easily available phosphate.

## Cutting 14

Series 3
Series 3 (three samples) comprises very poorly sorted sandy gravels and a gravelly sand. The organic content of the lower two samples is moderate, but that of the top most is low and this sample also has a coarser particle-size distribution. One possible explanation of the difference in organic content between Samples 542.3.1 and the lower two is that an erosional boundary lies between Samples 542.3.1 and 542.3.2. Sample 542.3.2 may represent a truncated soil horizon capped by later sandy gravel which would have been dumped prior to the construction of the wall. A second possible explanation is that what is being observed is either two phases of dumping or the inversion of stratigraphy through dumping and levelling. A third possible explanation is that, prior to the construction of the wall, organic matter and some sand and silt/clay was translocated (through such processes as water movement and bioturbation) down through the shallow profile.

Despite there being no evidence for occupation (C. Cotter pers. comm.), these samples contained high to moderate levels of easily available phosphate. There are a number of possible explanations for the high phosphate content. The sediment from Series 3 has been equated with possibly redeposited, naturally occurring gravel (Cotter pers. comm.) and following this hypothesis the natural bedrock may have a naturally occurring high phosphate content; however, analysis has shown that this is unlikely because the two natural sediments, Samples 537 and 540.1.7, have low easily available phosphate levels. It then follows that the easily available phosphate in the Series 3 samples has been introduced into the sediment probably through human and/or animal activity such as the dumping of organic refuse, which may have included remnants of foodstuffs, urine and excrement. The introduction of phosphate into the sediment may have taken place either prior to its redeposition (only if the sediment represents dumped material to level the ground surface) or post-depositionally which would have been possible in both redeposited and in situ sediment accumulation. It is reasonable to postulate that the source of the easily available phosphate and its artificial accumulation in the case of post-depositional introduction was animal urine and excrement which would have accumulated against the foundations of the wall. The easily available phosphate levels in the Series 3 sediments have remained moderate to high despite the limited depth of the profile ( $c a .30 \mathrm{~cm}$ ) because of the protection from the elements offered by the wall which prevented leaching.

## Cutting 15

Sample 537
Sample 537 (F1506) is a very poorly sorted gravel. The organic content is low, indicating that the sediment has not been affected by soil pedogenesis (soil development) or anthropogenic activity. The low level of easily available phosphate confirms the latter
assertion. The calcareous nature of this potential source rock is reflected all the samples analysed with the exception of the modern top soil (F1).

## Source of mineral material

Samples 537 (natural) and 540.1 .7 (natural) are both gravels with very similar percentages of gravel, sand and silt/clay. Sample 542.3 .1 shares similar particle-size characteristics to Samples 540.1.6 and 540.1.7 and a similar low organic content to Sample 540.1.6. Therefore, it is probable that Sample 542.3 .1 is a redeposited gravel used in the construction of the inner enclosing wall foundations and affected by post-depositional phosphate accumulation. The form of the particle-size distribution in Sample 542.3.3 (possibly redeposited natural) and Sample 537 are also similar, although both Sample 542.3.1 and Sample 543.2.3 contain significantly more sand and silt/clay-sized material. The higher proportion of fine sand and silt/clay in redeposited natural gravels and anthropogenic sediments is a consequence of physical and chemical weathering. The domination of angular gravel and sand-sized limestone particles, the presence of calcite grains and no obvious `alien' lithologies attests that the coarse mineral matter is of local origin. It is apparent that limited pedogenesis has occurred in the profiles of Series 1 and Series 2.

## Summary

The limestone bedrock is the source for much of the mineral particles and it is this calcareous material that is primarily responsible for the alkalinity of all the samples analysed. The organic content of the samples is generally low, with many of the sediments being classified as non-humose mineral soils (less than $4-6 \%$ organic matter dependant on clay content), some as humose mineral soils (generally more than $6 \%$ organic matter) and one (Sample 536) as an organic soil. The sediments have also been classified according to particle-size distribution, these are; gravelly sand, sandy gravel, gravel and sand.

Limited soil development is indicated in the Series 2 profile and it is probable this soil profile developed in situ. The easily available phosphate levels strongly indicate occupation, manuring or dumping of organic and inorganic refuse and its incorporation into the soil profile.

The profile of Series 3 is interesting in that the topmost sample 542.3.1 has the lowest organic content and the coarsest particle-size distribution. A number of hypotheses have been proposed to explain this phenomenon. These include the presence of an erosional boundary between the top and lower samples, two phases of dumping of locally derived sediment, an inversion of stratigraphy (where the material was dug from elsewhere and redeposited with the upper most sediment being deposited first), or the translocation of organic matter and some sand and silt/clay prior to the construction of the wall. The high levels of easily available phosphate in the Series 3 samples is indicative of human and/or animal activity and may represent the accumulation of urine and excrement against the wall foundations.

It is possible that Series 1 represents the in situ development of a sediment/soil profile. The three uppermost samples and the two lowermost samples have low levels of easily available phosphate and the two samples between 40 and 60 cm have moderate phosphate levels, which is indicative of animal and/or human activity. The distribution of phosphate within the profile may be explained either by the presence of a stable or erosional boundary between 30 and 40 cm , or perhaps through a process of downward movement or leaching of phosphate. Comparison of the natural and anthropogenic soils and sediments from Dún Aonghasa strongly suggests that the observed mineral material is locally derived, although much of the sediment may not be in its original location and in many cases has probably been moved, dumped and mixed with anthropogenic refuse.

| Cutting | F. No./ Series | pH | LOI\% | Phosphate | CaCO $_{3}$ |
| :---: | :--- | :---: | :---: | :---: | :---: |
| 1 | $/ 541.2 .1$ | 8.43 | 7.75 | M | 4 |
| 1 | $/ 541.2 .2$ | 8.70 | 6.89 | H | 3 |
| 1 | $/ 541.2 .3$ | 8.69 | 4.67 | H | 2 |
| 1 | $/ 541.2 .4$ | 8.90 | 5.96 | L | 2 |
| 1 | $/ 541.2 .5$ | 8.69 | 3.9 | M | 4 |
| 1 | $1 /$ No.536 | 7.76 | 31.76 | L | 0 |
| 9 | $/ 540.1 .1$ | 8.50 | 6.38 | L | 4 |
| 9 | $/ 540.1 .2$ | 8.65 | 5.46 | L | 4 |
| 9 | $/ 540.1 .3$ | 8.64 | 7.65 | L | 4 |
| 9 | $/ 540.1 .4$ | 9.14 | 3.53 | M | 4 |
| 9 | $/ 540.1 .5$ | 8.83 | 3.06 | M | 4 |
| 9 | $/ 540.1 .6$ | 8.97 | 2.45 | L | 4 |
| 9 | $/ 540.1 .7$ | 8.94 | 0.92 | L | 4 |
| 9 | $923 /$ No. 538 | 8.27 | 2.86 | H | 4 |
| 14 | $/ 542.3 .1$ | 8.14 | 2.61 | H | 4 |
| 14 | $/ 542.3 .2$ | 8.10 | 5.63 | H | 4 |
| 14 | $/ 542.3 .3$ | 8.00 | 4.63 | M | 4 |
| 15 | $1506 /$ No. 537 | 8.96 | 0.86 | L | 4 |

F.No. $=$ feature number; $\mathrm{LOI} \%=$ Percentage loss on ignition (organic matter); $\mathrm{CaCO}_{3}=$ calcium carbonate content.
Appendix Table 10.1 Routine Soil Analysis, Dún Aonghasa.

| Sample <br> / F. No. | Classific. | Mean <br> phi | Sorting | Sorting | Skew | Skew |
| :--- | :--- | :---: | :---: | :--- | :---: | :--- |
| $537 /$ | Gravel | -4.08 | 2.6 | very poorly | 0.28 | positive |
| F1506 |  |  |  |  |  |  |
| 538/ | Sand | 2.25 | 2.84 | very poorly | -0.15 | negative |
| F923 |  |  |  |  |  |  |
| $540.1 .1 /$ | Gravel | -3.25 | 1.69 | poorly | 0.31 | very positive |
| $540.1 .2 /$ | Gravel | -1.5 | 2.89 | very poorly | 0.41 | very positive |
| $540.1 .3 /$ | sandy gravel | -1.92 | 2.41 | very poorly | 0.47 | very positive |
| $540.1 .4 /$ | sandy gravel | -2.33 | 1.87 | poorly | 0.37 | very positive |
| $540.1 .5 /$ | Gravel | -2.67 | 2.15 | very poorly | 0.48 | very positive |
| $540.1 .6 /$ | Gravel | -2.92 | 1.5 | poorly | 0.48 | very positive |
| $540.1 .7 /$ | Gravel | -0.25 | 4.24 | extremely poorly | -0.53 | positive |
| $541.2 .1 /$ | gravelly sand | 0.33 | 2.67 | very poorly negative | -0.28 | negative |
| $541.2 .2 /$ | gravelly sand | -0.233 | 3.94 | very poorly | 0.23 | positive |
| $541.2 .3 /$ | sandy gravel | -0.92 | 3.56 | very poorly | 0.04 | symetrical |
| $541.2 .4 /$ | sandy gravel | -1.17 | 3.69 | very poorly | 0.29 | positive |
| $541.2 .5 /$ | sandy gravel | -2.42 | 3.42 | very poorly | 0.5 | very positive |
| $542.3 .1 /$ | sandy gravel | 0.92 | 3.53 | very poorly | -0.3 | negative |
| $542.3 .2 /$ | gravelly sand | -0.92 | 3.14 | very poorly | 0.72 | very positive |
| $542.3 .3 /$ | sandy gravel |  |  |  |  |  |

## Appendix Table 10.2 Particle-size data, Dún Aonghasa.

## Appendix 11 The bedrock geology at Dún Aonghasa and in the vicinities of the three other large stone forts on Inis Mór (D. Harper)

The type of bedrock available in the vicinity of the forts may have been a factor in determining the exact locations of the four large forts on Inis Mór. At all four sites, blocks of limestone, either loose or easily quarried, were readily available for construction purposes. In each case, the thickness of bedding, orientation and density of jointing together with the type or facies of limestone determined the shape and character of the limestone blocks that could be extracted. Firstly, there is a range of depositional fabrics displayed by the limestones, from finegrained mudstones through wackestones, where the fossil clasts float in a muddy matrix, to packstones where the clasts are in mutual contact. Occasionally grainstones, lacking a muddy matrix, are developed. Secondly, the variable replacement of both clasts and matrix by silica, the process of silicification, has differentially hardened and, in some cases, sharpened the surfaces of the limestone. Thirdly, chert bands, both continuous and more sporadic, punctuate the carbonate sequence. Fourthly, the development of joints with consistent orientations, but with more variable spacings, has modified the surface expression of the limestone. Finally, pressure solution has encouraged the widespread development of stylolites.

Three main types of limestone facies occur around Dún Aonghasa: bioclastic crinoidal limestone, cherty limestone, and massive mudstone with gigantoproductoid brachiopod shells. A crude stratigraphy within the limestone succession was established in the area around the fort (Appendix Fig.11.1). The lower slopes (DU9) are characterised by platy limestones with widely spaced joints and stylolites. These are succeeded by more massive limestones with large brachiopods (DU1 and DU10). Horizons of crinoidal limestones, locally silicified, are commonly finely jointed (DU3 and DU5) and appear to be succeeded by less finely jointed but even more massive facies with crinoids (DU 5); the last units form the pavement within the inner enclosure of the fort. The development of solution structures such as discontinuity surfaces and stylolites also gives some of the limestones a rubbly appearance. Variation in these parameters accounts for the contrast between the hard, platy limestones used in the chevaux de frise and the softer, equi-dimensional blocks in Wall 1.

Fundamental to analysis of the programme of rock use is the description of the joint patterns. The orientation and spacing of joints were measured at ten localities at Dún Aonghasa. The orientation of jointing is very consistent throughout the site: the major joint set trends at south-southwest to north-northeast and the minor set, roughly perpendicular, at south-southeast to north-northwest. Significantly, the main joint direction is almost perpendicular to the cliff edge, hindering the rapid erosion of the cliff line. Two main block types can be readily defined on the basis of lithology and joint spacing. Crinoidal packstones, usually silicified, are finely jointed at a number of localities, e.g. DU5 and DU8 and relatively angular hollows or kamenzitas are developed on the limestone surfaces. The lithotype has ragged surfaces and the narrow joint spacings of the dominant joint orientation have generated fairly narrow, sharp blocks that were ideally suited for use in the chevaux de frise. More massively bedded limestones, some with large brachiopods (DU6 and DU7) and some with crinoids (DU4), have more widely spaced joints developed, generating more equidimensional blocks. Such blocks have been used in all four enclosing walls; commonly the blocks have been quarried locally, virtually adjacent to the walls themselves. Wall 1 consists of equi-dimensional blocks of massively bedded crinoidal limestones similar to the exposures of limestone on the platform in the inner enclosure and in the quarry cuttings along its western side (cuttings 4 and 14). The eastern flank of wall 2 A is composed of a mudstone with gigantoproductoid brachiopods derived adjacent to the wall itself. Two main chert horizons are also associated with the construction surface for the inner and middle enclosure walls. A relatively continuous band of chert occurs beneath wall 1 while a less continuous
band is evident beneath the northern and western flanks of wall 2 a . The partial wall 3 is constructed from blocks of moderately rubbly, dark crinoidal packstone. Wall 4 is composed of moderately rubbly, dark crinoidal mudstone and wackestone with chert horizons removed from adjacent rock exposures.

The stripping away of at least $20,000 \mathrm{~m}^{3}$ of limestone in order to build the two inner walls would have considerably modified the hilltop. There is a simple exponential relationship between bed thickness and outcrop area. A bed thickness of 0.5 m would require $2536 \mathrm{~m}^{2}$ of surface outcrop. Wall 1 has an estimated rock volume of $1268 \mathrm{~m}^{3}$ of limestone. The area of the inner enclosure and its immediate surrounds approximates to $2500 \mathrm{~m}^{2}$, not significantly different from the surface area required to excavate a platform, initially at the height of the "rock table" at the cliff edge, down to its present level. Preliminary Karren Analysis (Plunkett-Dillon 1983)was applied to a surface (DU 9) exposed during excavation of the inner enclosure, a second surface uncovered in the eastern part of the middle enclosure (near DU 1), and an exposed platform west of the fort (DU 8). Both of the previously covered expanses of pavement showed little evidence of Karren development, whereas the exposed site showed sharp angular Karren. It is possible that the surfaces inside the inner enclosure and near DU1 were uncovered during the removal of material for fort construction and subsequently coated by soil and debris generated during habitation.

## Comparative topography: Dúchathair, Dún Eochla and Dún Eoghanachta

The topography in the environs of Dúchathair, on the southeast coast of Inis Mór, appears quite different from that of Dún Aonghasa. The southern cliffs are lower here (ca. 20 m OD) and in many areas are topped by a storm beach composed of enormous boulders. Inland from the storm beach, the terrain is relatively flat but dissected by long, approximately $\mathrm{N}-\mathrm{S}$ orientated valleys that run to the cliff edge. These depressions are subparallel to the main joint direction and may be dry valleys associated with the accentuation of jointing - a particularly deep valley adjacent to the path leading to the fort may be associated with faulting. A boulder field to the north of the fort contains a variety of erratics, mainly granites and red sandstones. In the interior of the fort itself, a large boulder of coarse, well-bedded, polymict sandstone, with clasts of quartz and pink feldspar, probably derived from an Old Red Sandstone erratic.

Within and immediately surrounding the fort, the carboniferous limestones are dominated by partly silicified crinoidal packstones and grainstones. These occur in platy, commonly rubbly, beds that break up to form flat, irregular discoidal blocks. A few hundred metres northwest of the fort, more blocky, gigantoproductoid limestones crop out. Nevertheless, the more irregular limestone blocks were preferentially used for building both the enclosing wall and the surrounding chevaux de frise, probably because of their closer proximity to the site. The platy, silicified limestone facies give a very irregular appearance to the fabric of the wall but, as in the case of Dún Aonghasa, the angular, commonly sharp, limestone blocks with roughened surfaces provided ideal material for the chevaux de frise. At Dún Eochla, the limestones form relatively massive, tabular beds with discontinuity surfaces, giving the quarried stone a rubbly appearance. Dolomite, a brownish, commonly crumbly, magnesian limestone, occurs in the higher parts of the limestone sequence. This readily breaks down to form a brown, iron-rich soil. There is no evidence of clays or shales in this part of the sequence but cherts are common and occur at a number of horizons. The northwest side of the fort is underlain by a discontinuous chert layer while a more continuous bed of chert is developed about a metre below; chert bands and nodules are evident in the wall fabric. The single enclosing wall at Dún Eoghanachta is built of massive mudstones facies with gigantoproductoid brachiopods, matching precisely the lithologies of the bedrock in the immediate vicinity. Widely-spaced joints, together with massive bedding, facilitated
the extraction of relatively large equi-dimensional blocks of limestone, giving the wall a very regular appearance.


[^10]
# Appendix 12 Dún Aonghasa and other Irish hillforts: a brief overview of comparative morphology (C. Cotter) 

At least ten (ca. 14\%) of what Raftery (1972a) categorises as class 2 hillforts seem to have had trivallate or multivallate defences. Cody (1981, 70-80) noted the possible existence of a third outer bank or series of banks at Ballylin, Co. Limerick and there is also a slight possibility that the layout of the hillfort at Cahermore Co. Mayo may have consisted of three (rather than two) concentric enclosures. ${ }^{14}$ Rathgall and Grianán each have four concentric enclosures presently. At both sites, the inner ringfort-like structures probably postdate the remaining defences ${ }^{15}$ - Raftery's own excavations at Rathgall uncovered the possible remains of a low earthen bank predating the central cashel. ${ }^{16}$ The bank was apparently never raised to any significant height (Raftery pers. comm.) and has not to date been considered as part of the defences of the hillfort. The tendency to dismiss some central elements that are relatively "slight" may need to be re-examined however, as in some cases these do not differ significantly from the dimensions of the enclosing walls at prehistoric / possibly prehistoric sites such as Dún Aonghasa, Turlough Hill, Knocknarea (Appendix Table 12.2) and Benagh. ${ }^{17}$ Leaving aside the question of whether or not the central cashel at Grianán might have been preceded by an earlier enclosure, the remaining defences at the site seem to have consisted of two pairs of ramparts rather than three or four distinct lines of defence. Each of the pairs was made up of a bank/ditch/bank combination, Double banks with an intervening ditch are not an uncommon feature at Irish hillforts and the arrangement has also been recorded at other types of large prehistoric enclosure. ${ }^{18}$ At Rathnagree (Appendix Table 12.1), the entire middle rampart is made up of paired banks 5 m apart separated by a $4-5 \mathrm{~m}$ wide ditch, while at Rathcoran the inner and middle ramparts become contiguous (bank/ditch/bank) only where the terrain flattens out along the northeast. At Mooghaun, part of the circuit of the outer line of defence consists of a rubble bank/ditch/rubble bank combination (Grogan 2005). A single rampart (comprising a bank with internal fosse) was also doubled up along a vulnerable flank at Ballylin - in this instance a slighter inner bank was built along the edge of the internal fosse (Cody 1981). Paired ramparts made up a very

[^11]formidable obstacle; overall widths ranged from 8 m at Ballylin, over 11m at Friarstown North, up to 14 m at Knockadigeen (Farrelly and O'Brien 2002, 56) and 15 m in the second outer rampart at the Spinans Hill / Brusselstown Hill complex (Condit 1992, 16-20). At Grianán the combined width of the outer pair of banks averages 10 m while that of the far less substantial inner pair is only around 5 m .

The majority of the recorded trivallate / multivallate sites occur within that band of hillforts that extends across the south central part of the country (Grogan 2005, vol. 2, fig. 7.2). There is a notable concentration of trivallate forts in Co. Wicklow, but otherwise no particular geographic bias is apparent. Future discoveries may well alter that pattern - the disappearance of all three banks at Haughey's Fort and of both lines of defence at Glanbane, Co. Kerry (Raftery, 1994, pl. 12) is a reminder that even substantial defences can disappear from the landscape. Given the level of intensive cartographic and aerial photography work carried out in the country in recent decades, however, additions to the trivallate/multivallate category seem more likely to emerge as a result of intensive study at known sites (e.g. sites that have been deforested in recent years such as Downshill, Co. Wicklow) and the overall distribution pattern may not be significantly altered.

All of the sites listed in Appendix Table 12.1 lie below the $320 \mathrm{~m} / 1050$ foot contour; half lie below 150 m OD, well within what could be considered the contemporary settled landscape. The ascent to Dún Aonghasa begins more or less at sea level, but this is unusual and at most other forts Ordnance Datum gives little indication of the landscape setting. At least three of the sites under discussion are located in close proximity to a second hillfort or possible hillfort, more often than not bivallate, although not necessarily smaller in size. ${ }^{19}$ In most cases, the proximate fort is inter-visible, but excavation would be necessary to indicate contemporary use. The only fort 'pair' that has been excavated to date, i.e. Haughey's Fort and Navan Fort, produced evidence for broadly contemporary prehistoric activity, but the fact that the main enclosure at Navan Fort remains undated, means that the functional relationship of the two sites remains a matter of speculation. The relationship between Dún Aonghasa and some of the other large stone forts on the Aran Islands (e.g. Dún Eochla) is discussed in Vol. 4 (Cotter forthcoming 2013).

## Size and layout

The size range of Irish hillforts is extremely wide, but most examples fall within the range 1.5 - 12 ha . In a general review of Irish hillforts, Grogan (2005, tables 7.1, 7.2) concluded that $69.1 \%$ of sites enclose less than 5 ha, sites between 5 ha and 10 ha account for $17.7 \%$ of the total, and $13.2 \%$ of hillforts are larger than 10ha. Measured against these statistics, Dún Aonghasa seems comparatively large. In terms of overall area, it is larger than $c a .60 \%$ of multivallate and $c a .70 \%$ of univallate hillforts. About $10 \%$ of the seventy or so recorded hillforts fall into the same general size bracket. ${ }^{20}$ Looked at in terms of the size of the inner enclosure only, however, Dún Aonghasa slips way down the comparative scale. Even allowing for some cliff erosion at the site (i.e. taking an estimated internal diameter of 50 m ), the inner enclosure is among the smallest on record.

Circumvallation appears to be the norm at trivallate hillforts and in almost all cases there is a notable symmetry in the layout of the defences i.e. the inner enclosure occupies a

[^12]central or near central position within the hillfort and the outer defences run more or less parallel to each other. Exceptions to this (leaving aside Dún Aonghasa) are Tinoranhill, where the small central enclosure (if this is part of the hillfort) is positioned in the southern half of the middle enclosure, and Mooghaun, where the distance between the middle and outer ramparts varies from 90 m to 165 m . Two sites, Rathnagree and Ballylin have equally, or more or less equally spaced ramparts. At all but one of the remaining forts, the interval between the inner and middle ramparts is less than that between the middle and outer, although, with the exception of Mooghaun, the average difference in spacing is not significant. Haughey's Fort is unusual in that the interval between the middle and inner lines of defence is greater than that between the middle and outer. Four of the forts (Ballylin, Tinoran, Mooghaun and Formoyle) have what might be described as very widely spaced ramparts i.e. lying 40 m or more apart; at Tinoran the intervals are over 150 m . It is difficult to set down absolute measurement values for what constitutes closely spaced (as opposed to paired contiguous) ramparts. There would probably be general agreement, however, that the enclosing walls at the early Medieval stone fort of Cahercommaun, Co. Clare ( $10-21 \mathrm{~m}$ apart), or walls $1 / 2 \mathrm{~b} / 3$ at Dún Aonghasa ( $4-18 \mathrm{~m}$ apart), are closely spaced, while the inner and middle ramparts at Mooghaun ( $21-44 \mathrm{~m}$ apart) and the outer two ramparts at Haughey's Fort (30m apart) are widely spaced. For the sake of argument, closely spaced is defined here as lines of defence up to 25 m apart separated by open ground. By this definition, clearly defined, closely spaced hillfort defences may only occur only at Rathgall, where the inner two of the three positively identified hillfort ramparts lie only 12 m apart. Recent investigations at the site, however, suggest that the final configuration of the middle rampart (bank/ditch/bank) probably dates to the early Medieval period (Mathew Seaver pers. comm.) - for more on this see Vol. 4, chapter 13 (Cotter forthcoming 2013)..

Despite the considerable morphological variations in area and in the spacing and strength of the ramparts hillfort builders managed to maintain as regular a relationship as possible between the disposition of the defences and the topography of the chosen hill. For Class 2 sites it was generally possible to maintain this symmetry within a circumvallate plan and conjoined enclosures like those at Dún Aonghasa are exceptional.

## Strength of ramparts

Appendix Table 12.2 lists six hillforts / hilltop enclosures (Rathgall, Freestone Hill, Keash, Knocknarea, Carrickbanagher and Turlough Hill) where the defences include a stone wall / stone revetted rampart, three examples (Knocknashee, Formoyle and Rathnagree where the enclosing element is a 'stone bank' and four others (Mooghaun, Cahermore, Brusselstown Ring and Knockacarrigeen) that have rubble ramparts. The enclosing elements at the univallate sites of Croaghan, Co. Donegal, Croagh Patrick, Co. Mayo and Garranagrena Lower, Co. Tipperary and at the bivallate site at Rathcoran Co. Wicklow may have been stone walls, rubble ramparts or stony banks. It seems likely that the sites are not all contemporary - indications are that Knocknarea was enclosed in the Neolithic period (Bergh 2000, 14-18) and it would not be surprising if Turlough Hill proved to be of similar or perhaps slightly later date. Excavations on Croagh Patrick (Walsh 1994) did not produce any definitive date for the enclosure there. Mooghaun, Freestone Hill and Rathgall are all of late Bronze Age date. Given that the project is looking in particular at large stone forts along the western seaboard, it may seem surprising that the rampart dimensions of some of the best known of these (e.g. some of the other 'big' Aran forts, Cahercommaun, Co. Clare, Doonamo, Co. Mayo and Dunbeg, Co. Kerry etc.) are not listed in the same table. Although the exact date of many of these forts remains debatable (see Vol. 4 for more on dating), in the view of the writer including them in tables of 'prehistoric' sites is very misleading. The
following brief analysis is based only on general observations. Some of the sites listed have not been seen by the writer and in other cases it is difficult to assess what the original form of a particular rampart might have been.

In terms of width, stone walls with rubble cores appear to have been the slightest of all rampart types (range $c a .1 .5-4 \mathrm{~m}$ ), particularly when the fact that they were only very rarely accompanied by ditches is taken into account. Future investigations may well alter the picture - certainly there are a number of large (but undated) stone enclosures e.g. Carn Townland, Co. Fermanagh (Brannon 1981-2, 60), Drumnasillagh and Glengesh Hill, both in Co. Donegal (Lacey 1983, no. 1405 and 713 respectively), where the enclosing walls are very substantial. If the original ramparts at Croagh Patrick, Croaghan and Rathcoran consisted of conventional upright walls rather than banked up rubble, then these too must have been very substantial. Of the hillforts examined, walls with 'soft' cores (generally made up of stony clay; often indistinguishable from stone-revetted banks made up of varying proportions of stones and clay), seem to have been more formidable. This form of rampart generally averages 4 m or more in width and is frequently accompanied by an external ditch. Rubble ramparts with sloped faces (although not necessarily along the entire perimeter) also appear to have been built on a much grander scale, and those at Mooghaun, Co. Clare and Cahermore, Co. Mayo are amongst the most substantial prehistoric defences in the country. The main rampart at Carn Tigherna, Co. Cork, also of dumped stone construction, averaged 9 m in width (Masterson 1999, 104-5, fig. 2). A similar rampart at Caherdrinny measured up to 10 m wide. ${ }^{21}$ The rubble rampart at the recently excavated hillfort on Knockacarrigeen Hill, Co. Galway (Carey 2002) may have been 7 m or so in width. Without excavation, it is difficult to estimate the original width of a clay, or stone and clay bank, but considerable variation is certainly evident within the hillfort class. The banks at Ballylin appear to have been only some $2-2.50 \mathrm{~m}$ wide, those at Formoyle were up to 5 m wide, those at Rathnagree up to 7 m (Grogan and Kilfeather 1997, 43), while the clay and stone outer bank at Castle Gale, Co. Cork ranged from 6-12m in width (Doody et al 1995, 44, pl. 17). In most cases, banks were accompanied by an external ditch, thus increasing the efficacy of the physical barrier on both the horizontal and vertical scales. The recent excavations at Cashel hillfort, Co. Cork (O’Brien 2005, 2006 and 2012) also show that some banks may have supported palisades. The situation in west Wicklow, where neighbouring hillforts built in broadly similar environmental conditions might have ramparts built of stone, earth and stone, stone-revetted clay, or even a combination of all three indicates that expediency was certainly a major factor when it came to rampart construction. Nonetheless, it would seem that the builders of more substantially defended sites showed some preference for rubble ramparts over vertical walls.

There is not enough information available presently to say if there are any chronological implications in terms of rampart make-up. Speaking of hillforts in northwestern Iberia, for instance, Parcero Oubiña and Cobas Fernández (2004, 8) have suggested that stone walls were far less common than earthen banks in the earliest hillforts, and, where walls did occur, they were comparatively low-level features. The latter would also seem to be true of walls at Irish late Bronze Age hillforts. Compared to other hillforts and hilltop enclosures, the late Bronze Age ramparts at Dún Aonghasa, averaging some 2 m in width and possibly less than that in height, were certainly low down on the size scale. On the other hand, the trivallate category, to which the fort belongs, includes some of the largest hillforts in the country, the largest of the group, Tinoran, being 30ha. in extent.

[^13]
## Use of internal space

Appendix Table 12.3 shows the comparative morphology of Dún Aonghasa and other excavated Irish hillforts. At this point in time, the published excavation evidence allows only very general observations to be made regarding internal layout and the range of activities carried out at these sites. ${ }^{22}$ The information available on Dún Aonghasa, Mooghaun, Freestone Hill and Rathgall did not allow chronological patterns of change in internal layout etc. to be identified and the site histories are discussed as one phase. This is highly unlikely to be the true picture - more meaningful analysis may be possible following the publication of the Rathgall hillfort excavations.

At all four sites there is evidence for activity predating the construction of the hillfort. This is evidenced by the early/middle Bronze Age cairn at Freestone Hill, the enclosures in the north-western quadrant at Mooghaun, the pre-wall 2.1 activity and middle/late Bronze age refuse on the upper plateau at Dún Aonghasa. There is plenty of evidence for an early prehistoric presence on the hill at Rathgall. It is not clear whether activity predating the middle ramparts (B. Raftery pers. comm.) belongs to a pre-hillfort phase, the construction phase of the hillfort, or, to a later date again when the ramparts were modified. The character of the earlier activity varies, but ritual/burial and settlement are both seemingly represented. The fact that the builders of Freestone Hill robbed out the earlier cemetery cairn suggests that use of these sites may not have been continuous and hints that the same population group may not have been associated with the different phases of activity.

At each of the forts there is evidence for occupation-related activity both within the central enclosure and outside it. Grogan suggests that the houses in the middle enclosure at Mooghaun were occupied only during the construction stage of the hillfort; it is not clear if there were ever any houses in the inner enclosure. The late Bronze Age settlement zone uncovered on the interior of the northern flank of wall 2a at Dún Aonghasa may also have been abandoned once construction of the fort was completed. The radiocarbon dates for the house located inside the western flank of the wall (cutting 2; date 7; Cotter 2012, Vol. 1, Chapter 7.1.3), however, show that settlement continued in the middle enclosure after the construction of the hillfort. The exact layout of the late Bronze Age defences at Rathgall is unclear, but the settlement zone was fairly extensive and spread beyond the confines of the hillfort. At Freestone Hill, there appear to have been houses in both the central area and the outer part of the fort. The little that is known about houses in hillforts, suggests they may have been on the small side - so far at any rate far more substantial late Bronze Age houses have been recorded in other (much smaller) contemporary settlement enclosures. Generally speaking, however, the higher levels of exposure, and factors such as soil wash, do not make for ideal preservation conditions at hillforts.

It is not possible to give a close estimate of the size of the population at any of the sites but, apart possibly from Rathgall, none appear to have been densely populated. There was ample room in the middle enclosure at Dún Aonghasa for a large number of houses but there is no evidence to suggest that they ever existed. The substantial build-up of occupation debris in the inner enclosure may evidence intensive and short-term habitation by a relatively large group of people or a longer period of habitation involving a smaller group. The contrast in the material goods found in the inner and middle enclosures is striking, with the latter area producing none of the more exotic prehistoric goods such as amber beads, and only a very small proportion of the bronze items or even pottery. There is a strong hint of a hierarchical use of space which, if it is the case, is potentially interesting.

[^14]The ditched and/or banked sub-enclosures in the interior of Rathgall testify to some formal organisation of the interior at that site. The metalworking was concentrated in one of these ditched enclosures with a zone of low activity divided it off from a second ditched enclosure used for burial. It appears that neither area was permanently zoned off for these purposes, however. The metalworking was on a far smaller scale at Dún Aonghasa and, although the residues of the activity proved to be fairly widely scattered within the inner enclosure, the casting itself probably took place in a restricted area at the northern end of the enclosure.

Evidence for ritual activity, including disposal of the dead, is again confined to Rathgall and Dún Aonghasa. The ritual pit uncovered in the central area at Rathgall suggests that the structure(s) enclosing had some special significance. There is no parallel for this feature at any of the other sites. At Dún Aonghasa, an area at the western side of the inner enclosure may have been reserved for burial (or solely for the interment of infants) towards the end of the late Bronze Age.

| Site | Max alt <br> (m) | Total <br> area <br> (ha). | Area of inner <br> enclosure <br> (ha) | Rampart intervals (m) <br> $\mathbf{1 - 2}$ | Rampart intervals (m) <br> $\mathbf{2 - 3}$ |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Rathnagree, Co.Wicklow <br> WI027:010 | 320 | 4.9 | 0.24 | 35 | $40-50$ |
| Dún Aonghasa, Co. Galway <br> GA110:039 | 250 | 5.7 | ca. 0.19 | Conjoined; interval <70m | $46-198$ |
| Rathgall, Co. Wicklow <br> WI037:016 | 152 | 7.4 | 1.85 | $30 \mathrm{~m} ; 2^{\text {nd }}$ line of defence <br> presently consists of a pair of <br> ramparts 10-12m apart. | $50-60$ |
| Haughey's fort, Co. Armagh <br> ARM 012:013 | 81 | 8.2 | 1.65 | $55-80$ interval between <br> ditches | $<30$ interval between <br> ditches |
| Mooghaun, Co. Clare <br> CL042:074(001) | 91 | 12.5 | 0.84 | $21-44 \mathrm{~m}$ | $45-165 \mathrm{~m}$ |
| Formoyle Beg, Co. Clare, <br> CL044:085 | 220 | 14.2 | 3 | $50-80$ | 95 |
| Rahally, Co. Galway (surviving <br> ringfort at the site:GA086:211) | 108 | 14.4 | 2.14 | 55 | 63 |
| Ballylin, Co. Limerick <br> LI028:085 | 243 | 20.6 | 7.43 | $80-120$ | $50-100$ |
| Rathnagree, Co. Wicklow <br> WI027:010 | 317 | 4.3 | 0.5 | $35-40$ | $40-50$ |
| Tinoranhill, Co. Wicklow <br> WI026:004 | 312 | 15.5 | 0.2 | $125-250$ | 150 |
| Grianán, Co Donegal <br> DG047:012 | 245 | 1.15 ha | 0.04 | $17-25$ (i.e. cashel - inner pair <br> of ramparts) | $15-50$ between inner <br> and outer pair of <br> ramparts |
| Cahermore, Co. Mayo <br> MA043:141(01) diam: 154 m <br> overall; inner enclose 73 m diam. | 60 | 1.9 | 0.42 | 45 | - |
| Commons of Lloyd, Co. Meath. <br> MH016:054 | 130 | 5 | 2.46 | - | 9 |

## Appendix Table 12.1; Trivallate / multivallate Irish hillforts; size, altitude and layout

| Site | No. of ramparts and layout (from interior) | $\begin{aligned} & \hline 1 \text { (Inner) } \\ & \text { Wth/H/ Composition } \end{aligned}$ | $\begin{aligned} & \text { 2 } \\ & \text { Wth/H/ composition } \end{aligned}$ | $\begin{aligned} & 3 \\ & \text { Wth/H/ } \\ & \text { composition } \\ & \hline \end{aligned}$ | Main References |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Rathgall, Co. Wicklow WI037:016 | $\begin{aligned} & 2 \text { or } 3 \\ & \text { B or D-SR/D/SR } \\ & -S R / D \end{aligned}$ | ? Inner bank or ditch (discovered during excavation). | Pair of stone-revetted banks $10-12 \mathrm{~m}$ apart with intervening ditch . Inner:5-6m high. Date of this configuration unclear. | Outer stonerevetted stony bank. | Raftery 1976, 339-357. Becker 2010; M. Seaver pers.comm. |
| Freestone Hill, Co. Kilkenny KK020:018(2) | $\begin{aligned} & \hline 2 \\ & \mathrm{~W}-\mathrm{SR} / \mathrm{D} \end{aligned}$ | wall.1.5-2m wide; only lower course remains | wall $2.5-4 \mathrm{~m}$ wide; $<1 \mathrm{~m}$ high above OGL, $<4 \mathrm{~m}$ above base of ext ditch. Ditch 2 m wide; $0.75 \mathrm{~m}-2 \mathrm{~m}$ deep | ---- | Raftery 1969, 1-108 |
| Turlough Hill, Co. Clare, CL003:036 (01) | $\begin{aligned} & \hline 1 \\ & \mathrm{SR} \end{aligned}$ | Wth. $1.8-3 \mathrm{~m}$; H. 1m on average | ------- | -------- | . |
| Keash, Co. Sligo SL040:009 | $\begin{aligned} & \hline 1 \\ & \mathrm{~W} \end{aligned}$ | Wth.1.5-2m; rubble core; inner and outer slab revetment | ------------ | -------------- | Condit, Gibbons and Timoney, 1991, 62 |
| Knocknarea, Co. Sligo SL013:064 Td. | $\begin{aligned} & 1 \\ & \mathrm{~W} \end{aligned}$ | First phase Wth.ca.2m H.ca. 0.6 m . subsequently covered in gravel to give a 'bank' profile | up to 3 enclosing elements along N sector | zero | Bergh, 2000, 14-18 |
| Carrickbanagher 'The Cashel' Co. Sligo, SL026:141 | $1$ <br> W <br> rubble core faced int. and ext with stone | Wth.2-3m | ------------ | ------- | Condit, Gibbons and Timoney, 1991, 61-2 |
| Knocknashee Common, Co. Sligo SL032:013(01) | $2$ <br> SB/partial second rampart | $\begin{aligned} & \text { Wth.3.8m } \\ & \text { H.1.5m } \end{aligned}$ | zero | ------------ | Condit, Gibbons and Timoney, 1991, 61-62 |
| Formoyle, Co. Clare, CL044:085 | $\begin{aligned} & \hline 3 \\ & \text { SB/D-SB/D-SB } \end{aligned}$ | Bank ext ditch 6-7m (bank 45 m wide and stands $<1.5 \mathrm{~m}$ above ditch; ditch averages 2.5 | 50-80m distant | 100 m | Condit 1995, 34-7. |
| Rathnagree. Co. Wicklow | 3 | Wth. 4 m | ESB: W. 7 | W. 6m | Grogan. and Kilfeather. 1997 |


| Rathcoran, Co. Wicklow | 2 <br> WI027:026 | E\&SB-E\&SB <br> (15m apart, but <br> contiguous for <br> short distance on <br> NE side) | Wth. $<16 \mathrm{~m}$ wide <br> H. |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |

Appendix Table 12. 2; comparative strength of ramparts at forts with walls, possible walls or revetted stone/clay banks.
Omitted are sites belonging to Raftery's class 3 hillforts (selected inland and coastal promontory forts). (The question as to where these might fit into the overall scheme of things is discussed in Volume 4.)
Key
Wth= width; $\mathrm{H}=$ height. $\mathrm{RR}=$ rubble ramparts; $\mathrm{W}=$ wall; $\mathrm{SR}=$ stone revetted rampart; $\mathrm{SB}=$ stony bank; $\mathrm{E} \& \mathrm{SB}$ earth and stone bank; $\mathrm{B}=\mathrm{earthen}$ bank; $\mathrm{D}=$ ditch

| Site | RMP/SMR | Altitude (m) <br> OD | Number of lines <br> of defence | Area enclosed <br> (ha) |
| :--- | :--- | :--- | :--- | :--- |
| Freestone Hill, Co. Kilkenny | KK20:018 | 149 | 1 or 2 | 1.4 |
| Dún Aonghasa | GA110:039 | 87 | 3 | 5.7 |
| Rathgall, Co. Wicklow | WI037:016 | 130 | 3 or 4 | 7.3 |
| Cashel, Co. Cork | CO096:034 | 182 | 2 | 8.2 |
| Haughey's Fort, Co. Armagh | ARM 012:013 | 60 | 3 | 8.2 |
| Mooghaun, Co. Clare | CL042:074 | 80 | 3 | 12.5 |
| Rahally, Co. Galway | GA086:211 | 108 | 3 | 14.4 |

Appendix Table 12.3. Comparative morphology: Dún Aonghasa and other excavated hillforts.

# Appendix 13 Discard pattern of food refuse and pottery in cutting 1, (C. Cotter; maps prepared by S. Weadick, A. Corns, B. Masterson and S. McGlade) 

This short piece focuses on the discard patterns of pottery and food refuse in the inner enclosure (cutting 1; Appendix Fig. 13.1). The pottery was mapped by calculating cumulative weight per square metre. All pottery find-spots were recorded three dimensionally in the course of the excavations; the weight of each sherd (or collection of sherds) was recorded by Rose Cleary in the course of her analysis (Appendix 1.3). The food refuse data is based on the weights of animal bones and limpet shells recovered from individual 4 m by 4 m grid squares (see Appendix Fig. 6.2 for a map of the grid) or smaller units where that information was available. In terms of bulk, periwinkles did not form a hugely significant element of the diet and have been omitted from the analysis. The food refuse data, often based on a single value per 4 m square, means that it has only limited potential - at best, the maps highlight general patterns of disposal. As mentioned in the introduction to Part 2, recording, processing and mapping the relevant data was a time-consuming exercise. The depth of the sediments in any one square clearly had a big influence on the results - very broadly, the stratigraphy in the $2-3 \mathrm{~m}$ strip adjacent to the enclosing wall was about twice the depth of the adjoining 3 m strip. The soil cover in the strip bordering the east balk was generally less than 25 cms thick (i.e. from the top of the sod layer down to bedrock). Removing such anomalies was not possible, as the site formation processes were complex and rarely completely clear. Natural erosion processes, reworking of soils and recycling of building materials, the nineteenth century restoration works and 'trampling' in the modern era ${ }^{23}$ had all taken a toll, but to varying degrees. Trampling must be partly responsible (at least) for the comparatively high fragmentation rate of the pottery, clay moulds, animal bones and shells from the site; its effects were most marked in areas where the soil cover was thin.

Two sets of maps are included here (Appendix Figs 13.2 and 13.3). Each set relates to a particular stratigraphic horizon and contains three maps showing the respective distribution of a) animal bones, b) limpet shells and c) pottery. The maps were generated by grouping together contexts considered to be contemporary or broadly contemporary. The nature of the recorded data meant two different weight value systems had to be used for each set (hence the varied colour schemes).

## Appendix Fig. 13.1 Main structural feastures in cutting 1, the inner enclosure

Appendix Fig. 13.2a/b/c earliest (pre-metalworking) late Bronze Age phase (zone B only). Zone B features: 203, 209, 211, 212, 216/217, 218, 220, 229, 234, 235, 237.
This horizon was identifiable only in the strip adjacent to the enclosing wall. For the most part it was sealed beneath later houses or stratified within hollows in the bedrock. The distributions are to a large extent 'complementary' to those of the overlying horizon (Appendix Fig. 13. 3 maps).

Appendix Fig. 13.3a/b/c: main late Bronze Age phase.

[^15]Zone A features: 24, 70/71/77/82, 84/64, 85a, 86, 88, 97, 251, 254, 255/88/77a, 257/257a, 265a/b, 267/85, 271, F279a/b \& 295, 280/280a, 281, 282, 283/253, 289, 290//290a, 291, 292, 292/261, 296/296a, 297, 297a, 1000, 1002, 1005.
Zone B1 features: 15, 16, 33, 34, 46/46a, 51b, 60, 67, 69, 74, 76, 78, 80, 235, 258/51a, 259, 266/232, 263, 268, 269, 270, 276,281, 284/285, 287, 288.
Zone B2 features: 32, 36, 41, 42, 43, 66/98, 202, 219, 239, 244, 245, 246, 248, 249, 1204, $1212,12317,1218,1219,1220,1221,1222,1224,1225,1226,1227,1232,1234$.
Zone C features: 235, 262.

The distributions of animal bones and limpet shells show a very similar pattern. The most intensive dumping of each was in the vicinity of the large hearth at the northern end of the cutting (zone A) and in the southern end of the cutting (zone B2). In zone B2, the decrease in discarded food refuse adjacent to the enclosing wall is due to the presence of houses (structures 1,7 and 9 , likely to be of early medieval date). The sunken floors of these buildings meant that much of the pre-existing late Bronze Age levels would have been removed during their construction. The concentration of bone/shell and pottery east of structure 1 may well be due to the redeposition of dug out material. Other gaps in the pottery distribution are largely due to either the absence of soil cover or the presence of buildings or structures such as the stone tank.
Appendix Fig. 13.3b shows animal bone distribution and the distribution of finds of late Bronze Age / likely late Bronze Age date (including pottery). Once again there is a notable concordance in bone/shell and finds concentrations.


Appendix Fig.13.1 Main structural feaures (all phases) in cutting 1 (inner enclosure)


Appendix Fig. 13.2a Pottery discard pattern earliest late Bronze Age phase (zone B).


Appendix Fig. 13.2b Animal bone discard pattern earliest late Bronze Age phase (zone B).


Appendix Fig. 13.2c Limpet shell discard pattern earliest late Bronze Age phase (zone B)


Appendix Fig. 13.3a Pottery discard pattern cutting 1, main late Bronze Age phase


Appendix Fig. 13.3b Animal bone discard pattern and finds distribution cutting 1, main late Bronze Age phase


10 m

Appendix Fig. 13.3c Limpet shell discard pattern cutting 1, main late Bronze Age phase

## PART 3 DÚN EOGHANACHTA

## Appendix 14 Dún Eoghanachta Finds

## Appendix 14.1 Flaked and Coarse Lithics (A. Clarke; petrological identifications D. Harper)

## Flaked lithics



| 11 | 3 | Small inner flake of chert. | L. 15 mm ; W. 8 mm ; <br> T. 4 mm |
| :---: | :---: | :---: | :---: |
| 86 | 200 | Small chert pebble. | L. 18 mm ; W. 14 mm ; T. 10 mm |

## Coarse Stones

Rubbing stones

| 18 | 18 | Limestone, oval in shape. Both faces worn flat and smooth. | $\begin{array}{r} \hline \mathrm{L} .57 \mathrm{~mm} ; \\ \mathrm{W} .48 \mathrm{~mm} ; \\ \mathrm{T} .22 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |
| 63 | 26 | Limestone, oval in shape. One possible smoothed face. | $\begin{array}{r} \hline \text { L. } 60 \mathrm{~mm} ; \\ \mathrm{W} .57 \mathrm{~mm} ; \\ \mathrm{T} .24 \mathrm{~mm} \end{array}$ |
| 116 | 209 | Limestone, oval in shape. One possible smoothed face. | $\begin{array}{r} \hline \text { L. } 42 \mathrm{~mm} ; \\ \mathrm{W} .35 \mathrm{~mm} ; \\ \text { T. } 22 \mathrm{~mm} \\ \hline \end{array}$ |
| 35 | 20 | Limestone, oval in shape. One possible concavely worn face. | $\begin{array}{r} \mathrm{L} .68 \mathrm{~mm} ; \\ \mathrm{W} .63 \mathrm{~mm} ; \\ \text { T. } 38 \mathrm{~mm} \end{array}$ |
| 115 | 209 | Limestone, oval in shape. One possible smoothed face. | $\begin{array}{r} \text { L. } 63 \mathrm{~mm} ; \\ \text { W. } 63 \mathrm{~mm} ; \\ \text { T. } 53 \mathrm{~mm} \end{array}$ |
| 126 | 215 | Limestone, flat oval in shape. One possible smoothed face. | $\begin{array}{r} \mathrm{L} .47 \mathrm{~mm} ; \\ \mathrm{W} .37 \mathrm{~mm} ; \\ \mathrm{T} .17 \mathrm{~mm} \\ \hline \end{array}$ |
| 51 | 21 | Quartz. Flat oval in shape with two smoothed faces. | $\begin{array}{r} \hline \text { L. } 68 \mathrm{~mm} ; \\ \mathrm{W} .42 \mathrm{~mm} ; \\ \text { T. } 23 \mathrm{~mm} \\ \hline \end{array}$ |
| 14 | 12 | Limestone, abraded. One smooth rubbed face. | $\begin{array}{r} \mathrm{L} .77 \mathrm{~mm} ; \\ \mathrm{W} .59 \mathrm{~mm} ; \\ \mathrm{T} .40 \mathrm{~mm} \\ \hline \end{array}$ |
| 130 | 200 | Limestone. One face worn smooth. | $\begin{array}{r} \text { L. } 50 \mathrm{~mm} ; \\ \text { W. } 43 \mathrm{~mm} ; \\ \text { T. } 23 \mathrm{~mm} \\ \hline \end{array}$ |
| 87 | 200 | Limestone. One face worn smooth. | $\begin{array}{r} \mathrm{L} .52 \mathrm{~mm} ; \\ \mathrm{W} .51 \mathrm{~mm} ; \\ \mathrm{T} .29 \mathrm{~mm} \\ \hline \end{array}$ |
| 40 | 20 | Limestone. One face smooth and worn to a concave cross-section. | $\begin{array}{r} \mathrm{L} .62 \mathrm{~mm} ; \\ \mathrm{W} .52 \mathrm{~mm} ; \\ \text { T. } 22 \mathrm{~mm} \\ \hline \end{array}$ |
| 97 | 203 | Limestone, oval in shape. One worn face slightly concave in crosssection. Light pecking on opposite ends. | $\begin{array}{r} \text { L. } 105 \mathrm{~mm} ; \\ \text { W. } 80 \mathrm{~mm} ; \\ \text { T. } 48 \mathrm{~mm} \\ \hline \end{array}$ |
| 41 | 21 | Limestone. One possible smoothed face. | $\begin{array}{r} \mathrm{L} .69 \mathrm{~mm} ; \\ \mathrm{W} .60 \mathrm{~mm} ; \\ \text { T. } 50 \mathrm{~mm} \\ \hline \end{array}$ |
| 78a | 21 | Limestone. One face worn to a slight concave cross-section. | L. $68 \mathrm{~mm} ;$ $\mathrm{W} .59 \mathrm{~mm} ;$ T .31 mm |

Rubbing stones with significantly altered faces

| 103 | 203 | Granite, oval in shape. One rubbed face is flattened and smoothed. | L. $52 \mathrm{~mm} ;$ <br> W.44mm; <br> T.29mm |
| :--- | :--- | :--- | ---: |

Tabular cobbles with rubbed faces

| 129 | 20 | Quartz sandstone, tabular fragment. Opposite faces worn smooth. | L.32mm; |
| :--- | :--- | :--- | ---: |
|  |  |  | W.25mm; |
|  |  | T.22mm |  |

Manuports

| 50 | 21 | Granite, fragment. | L. 148 mm ; <br> W. 68 mm ; <br> T. 45 mm |
| :---: | :---: | :---: | :---: |
| 105 | 200 | Limestone, fragment | L. 30 mm ; W. 57 mm ; T. 54 mm |
| 73 | 21 | Limestone. | L. 98 mm ; W. 57 mm ; T. 55 mm |
| 77 | 21 | Mudstone. Outer skin of natural concretion. | L. 95 mm ; W. 53 mm ; T. 12 mm |
| 93 | 200 | Limestone, flat circular in shape. | L. 66 mm ; W. 60 mm ; T. 23 mm |
| 110 | 208 | Limestone, fragment. | L. 45 mm ; W. 25 mm ; T. 11 mm |
| 118 | 213 | Limestone, fragment. | $\begin{array}{r} \mathrm{L} .32 \mathrm{~mm} ; \\ \mathrm{W} .43 .5 \mathrm{~mm} ; \\ \mathrm{T} .38 \mathrm{~mm} \end{array}$ |
| 88 | 200 | Limestone, fragment. | L. 25 mm ; W. 67 mm ; T. 48 mm |
| 7 | 11 | Limestone, fragment. | L. 57 mm ; W. 80 mm ; T. 71.5 mm |
| 83 | 200 | Limestone, egg-shaped. | L. 68 mm ; W. 58 mm ; T. 45 mm |
| 99 | 203 | Igneous, fragment. | L. 64 mm ; W. 32 mm ; T. 28 mm |
| 122a | 214 | Quartz sandstone. Three small, unused pebbles. | L. 36 mm ; W. 30 mm ; T. 22 mm |
| 122b | 214 | see 122a. | L. 31 mm ; W. 27 mm ; T. 11 mm |
| 122c | 214 | see 122a | L. 29 mm ; W. 22 mm ; T. 15 mm |
| 47 | 21 | Limestone. | L. 43 mm ; W. 44 mm ; T. 24 mm |
| 96 | 203 | Limestone. | L. 43 mm ; W. 38 mm ; T. 28 mm |
| 112 | 210 | Limestone, fragment. | L. 69 mm ; W. 40 mm ; |


|  |  |  | T. 28 mm |
| :---: | :---: | :---: | :---: |
| 6 | 11 | Limestone. | L. 85 mm ; W. 40 mm ; T. 26 mm |
| 107 | 200 | Limestone. | L. 52 mm ; W. 37 mm ; T. 23 mm |
| 13 | 12 | Limestone, egg-shaped. | L. 40 mm ; <br> W. 32 mm ; <br> T. 26 mm |
| 106 | 200 | Limestone, fragment. | L. 67 mm ; W. 62 mm ; T. 37 mm |
| 39 | 20 | Quartz sandstone. | L.33mm; W. 27 mm ; T. 12 mm |
| 17 | 18 | Limestone. | L. 50 mm ; <br> W. 44 mm ; <br> T. 30 mm |
| 56 | 21 | Limestone, fragment. | L. 50 mm ; <br> W. 77 mm ; <br> T.34mm |
| 92 | 200 | Limestone, abraded. | $\begin{array}{r} \mathrm{L} .42 \mathrm{~mm} ; \\ \mathrm{W} .38 \mathrm{~mm} ; \\ \mathrm{T} .15 \mathrm{~mm} \\ \hline \end{array}$ |
| 3 | 1 | Limestone, abraded. | L. 57 mm ; W. 47 mm ; T. 43 mm |
| 42 | 21 | Limestone, fragment. | L. 89 mm ; W. 79 mm ; T .47 mm |
| 12 | 12 | Limestone, abraded. | L. 77 mm ; W. 71 mm ; T. 40 mm |
| 4 | 1 | Limestone, abraded. | L. 89 mm ; <br> W. 79 mm ; <br> T. 45 mm |
| 2 | 1 | Limestone, abraded. | L. 98 mm ; <br> W. 75 mm ; <br> T. 46 mm |
| 78b | 21 | Limestone, fragment. | L. 100 mm ; W. 69 mm ; T. 43 mm |

## Grinding slabs

$\left.\begin{array}{l|c|l|r}\hline 58 & 26 & \begin{array}{l}\text { Fragment of a slab of quartz sandstone. One face is worn very flat and } \\ \text { smooth, particularly towards the outer edge of the face. }\end{array} & \begin{array}{r}\text { L. } 280 \mathrm{~mm} ; \\ \text { W. } 86 \mathrm{~mm} ;\end{array} \\ \text { T. } 71 \mathrm{~mm}\end{array}\right]$

Spindle whorl

| 124 | 215 | Tabular piece of calcareous siltstone. It has been ground around the <br> circumference to form a sub-circular shape with flat sides. A bi-conical <br> perforation has been formed in the centre. Probable spindle whorl. | L. $54 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | ---: |

## Hones

| 36 | 20 | Quartz sandstone, broken. Three faces have been worn flat or slightly skewed to form a rectangular cross-section. These faces are very smooth and shiny. | L. 96 mm ; W. 40 mm ; T.33mm |
| :---: | :---: | :---: | :---: |
| 95 | 203 | Mudstone, broken. Four faces are worn flat to form a rectangular crosssection. This hone is slightly skewed along its length. The faces are smooth and there is some gloss on the edges. | L. 65 mm ; W. 22 mm ; T. 11 mm |

## Bracelets

| 34 | 20 | Dark brown/ black mudstone, fragment. Ground all over to form a a <br> bracelet with a probable D-shaped section. Not polished. | Int.D.66mm; <br> W.9.5mm; <br> T.10mm |
| :--- | :---: | :--- | :--- | :--- |
| 114 | 209 | Dark brown/ black mudstone, fragment. Ground and highly polished. D- <br> shaped section. Possibly not originally circular and its size would <br> suggest it is too small for a bracelet and too large for a ring. | Poss. Int. D. <br> $30 \mathrm{~mm} ;$ |

## Appendix 14.2 Bone artefacts catalogue (M. FitzGerald)

## Bone disc/spindle whorl

| Find No. | Context | Description | Dimensions |
| :---: | :---: | :---: | :---: |
| 123 | Cutting 3: <br> Level 2; <br> Feature 208 | A perforated bone disc made from ox vertebrae. Both the disc and its perforation are cylindrical in shape. Perforation is slightly eccentric. The sides of the object show signs of weathering and one edge had a recent chip. There are no signs of use-wear. Possibly an unused spindle whorl, or, alternatively, a large bead. | L. 34 mm ; <br> W. 32 mm ; <br> H. 17 mm ; WOP. 13 mm |

## Appendix 14.3 Beads catalogue (M. FitzGerald petrological identification D. Harper)

## Amber Bead

| Find No. Context | Description | Dimensions |  |
| :--- | :--- | :--- | :--- |
| 108 | Cutting 3; <br> Level 2/3B; <br> Feature 208 | Complete. Small amber bead with flat upper and lower surfaces and <br> rounded sides. The perforation is centrally placed and is cylindrical in <br> shape. In good condition. | D. $11 \mathrm{~mm} ;$ <br> WOP.3.5mm |


| Stone Bead |  |  |  |  |  |
| :--- | :--- | :--- | ---: | ---: | :---: |
| 76 | Cutting 1; <br> Level 2; <br> Feature 21 | Complete. A small circular fossil, that appears to be deliberately <br> centrally perforated and used as a bead. The hole is roughly cylindrical <br> in shape. The surfaces of the stone are smooth possibly from use; the <br> sides have a slight concentric groove with two incised lines. Type of | D. $9 \mathrm{~mm} ;$ <br> stone: silified crinoid ossicle with a pentameric central canal. Its <br> provenance is local. |  |  |

## Appendix 14.4 Silver catalogue (M. Kenny)

Silver coin

| Find No. Context | Description | Dimensions |  |
| :--- | :--- | :--- | ---: | ---: |
| 119 | Cutting 3; <br> Level 2; <br> Feature 214 | A relatively well-preserved silver long-cross penny identified by <br> Michael Kenny (National Museum of Ireland) as an Edward 1 <br> from the Newcastle Mint, which can be dated to ca. AD 1300. The face <br> from <br> shows a somewhat unclear head (from wear) and an inscription reading <br> Villa Nova Castri (town of Newcastle) on the reverse. Edw r angl dns <br> hyb is inscribed on the obverse. The coin is worn around the edges and <br> was probably in circulation for some time. | D.18.5mm |

## Appendix 14.5 Bronze finds catalogue

## Bronze staple

| Find No. Context | Description | Dimensions |  |  |
| :--- | :--- | :--- | :--- | ---: |
| 85 | Cutting 1; <br> Level 4; Layer <br> 200 | Incomplete. The form of this object suggests that it could have <br> functioned as a staple. It is made from sheet bronze and has a right- <br> angled return or bend at one end; the opposite end is broken but may <br> have been similarly finished. The piece was found in the topsoil layer. | L.30mm; | T. $1 \mathrm{~mm} ;$ |

## Appendix 14.6 Iron finds catalogue (C. Cotter and M. FitzGerald)

## Slotted and pointed tool

| 117 | Cutting 3; Level 2; Feature 212 | Complete. Slotted and pointed tool made from a flat plate and with a pointed haft-like projection at one end. A centrally placed longitudinal slot tapers slightly in width being narrowest at the pointed end. | $\begin{array}{r} \text { L. } 113 \mathrm{~mm} ; \\ \text { W. } 19 \mathrm{~mm} ; \\ \text { T. } 10 \mathrm{~mm} \text {. } \\ \text { Slot, } \mathrm{L} .59 \mathrm{~mm} ; \\ \text { W. } 4-5 \mathrm{~mm} . \\ \text { Point, } \\ \text { L. } 23 \mathrm{~mm} ; \\ \text { W. } 9 \mathrm{~mm} ; \\ \text { T. } 7 \mathrm{~mm} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: |


| Knives |  |  |  |
| :---: | :---: | :---: | :---: |
| 23 | Cutting 1; <br> Level 2; <br> Feature 18 | Incomplete and very corroded portion of knife blade. Roughly triangular in section. The blade tapers slightly towards one end and has a straight back and cutting edge. Its tip also tapers bluntly. | L. 40 mm ; W. 11 mm ; T. 5 mm |
| 25 | Cutting 1; <br> Level 2; <br> Feature 13 | Incomplete. The heavily corroded tip end of a whittle-tanged knife, possibly belonging to Goodall's Type C. Triangular in section. Tapers to a blunt point and has a curved cutting edge with a straight back. | $\begin{array}{r} \hline \text { L. } 28 \mathrm{~mm} ; \\ \text { W. } 14 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \\ \hline \end{array}$ |
| 33 | Cutting 1; <br> Level 2; <br> Feature 20 | Incomplete. The tang is missing but the knife was probably of whittle tang type, possibly belonging to Goodall's Type E. Triangular in section. The back is straight but tapers to form the tip. The cutting edge is heavily worn particularly towards the hafted end. | $\begin{array}{r} \hline \text { L. } 68 \mathrm{~mm} ; \\ \text { W. } 15 \mathrm{~mm} ; \\ \text { T. } 5 \mathrm{~mm} \end{array}$ | worn cutting edge with an ' $S$ ' profile and straight back. Both objects taper at the tip end to form a point. The tang is rectangular in section and tapers towards a rounded end.

Blade fragments

| 32 | Cutting 1; <br> Level 2; <br> Feature 20 | Incomplete and heavily corroded blade fragment of knife, possibly of whittle-tang type. Roughly triangular in section. The blade appears to have a straight back and cutting edge but the tip is now missing. | L. 16 mm ; W. 20 mm ; T. 4.5 mm |
| :---: | :---: | :---: | :---: |
| 128 | Cutting 1; <br> Level 2; <br> Feature 20 | Probably a heavily corroded knife blade; it is difficult to suggest an alternative function. The blade is relatively flat and rectangular in section. | L. 26 mm ; <br> W. 25 mm ; <br> T. 5 mm |
| 121 | Cutting 3; <br> Level 2; <br> Feature 214 | Incomplete. A flat piece of iron, possibly a type of blade, but heavy corrosion makes an accurate identification impossible. | $\begin{array}{r} \hline \mathrm{L} .27 \mathrm{~mm} ; \\ \mathrm{W} .22 \mathrm{~mm} ; \\ \mathrm{T} .4 \mathrm{~mm} \end{array}$ |
| 139 | Cutting 1; <br> Level 1; <br> Feature 23 | Incomplete. A small fragment of iron possibly from a blade. Subrectangular in section. Both edges are unbroken. Too corroded to classify. | L. 22 mm ; W. 17 mm ; T. 7.5 mm |

## Double edged blade

| 27 | Cutting 1; <br> Level 2; <br> Feature 13 | Incomplete. A fine blade missing its tang. Tapers to a blunt corroded point. What appears to be the shoulder end of the blade survives but is bent. Both faces appear to have a faint midrib giving the blade a lozenge section. This suggests that the blade was not part of a typical whittle-tanged knife but possibly came from a dagger or double edged knife. | $\begin{array}{r} \mathrm{L} .66 \mathrm{~mm} ; \\ \mathrm{W} .14 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |


| Pin |  |  |  |
| :---: | :---: | :---: | :---: |
| 15 | Cutting 1; <br> Level 2; <br> Feature 12 | Incomplete. This find is very corroded so identification is difficult. It may possibly be the corroded head of a small ring-pin. | L. 15 mm ; W. 11 mm ; T. 8 mm |
| 37 | Cutting 1; Level 2; <br> Feature 20 | An incomplete shaft with a small loop at one end may be part of a heavily corroded pin. Similar to two other pins recovered during the excavation95E136:0064 and 67. | Shaft; L. $45 \mathrm{~mm} ;$ W. $7 \mathrm{~mm} ;$ T. 5 mm. Loop, L. $8 \mathrm{~mm} ;$ W. $11 \mathrm{~mm} ;$ T. 10 mm |
| 45 | Cutting 1; Level 2; <br> Feature 21 | A fragmented ring-pin. Only a section of the shaft and half of its head survives. A second shank of an unidentifiable pin was also found with the ring pin. Both were heavily corroded. | Shaft, L. $32 \mathrm{~mm} ;$ D. $2 \mathrm{~mm} ;$ Ring, D. $21 \mathrm{~mm} ;$ T. 7 mm |
| 64 | Cutting 1; <br> Level 2; <br> Feature 26 | A fragment of the shaft of a pin, which appears, looped over at one end. The shaft is best described as rectangular in section with curved sides. Similar to 95E136:67. | L. $40 \mathrm{~mm} ;$ W. $6 \mathrm{~mm} ;$ T. 5 mm. Loop, L. 15 mm, W. $12 \mathrm{~mm} ;$ T. 8 mm |


| 67 | Cutting 1; <br> Level 2; <br> Feature 26 | Incomplete. All that remains of the pin are two conjoining fragments. Broken at the point where it begins to loop (or it is bent). Shaft is rectangular in section and is heavily corroded. The pin is possibly similar to 95E136:0064. | $\begin{array}{r} \text { L. } 37 \mathrm{~mm} ; \\ \text { W. } 5 \mathrm{~mm} ; \\ \text { T. } 4 \mathrm{~mm} . \text { Loop } \\ \text { L. } 13 \mathrm{~mm} ; \\ \text { W. } 6 \mathrm{~mm} ; \\ \text { T. } 6 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 101 | Cutting 2; <br> Level 2; <br> Feature 203 | Incomplete. Only the shaft survives. It is a long and rather fine example, which may be slightly expanded at one end, which possibly represents the head end. The shaft is oval in section and also heavily corroded. | L. 69 mm ; W.4-6mm; T. $4-6 \mathrm{~mm}$ |

## Fish Hook

| 132 | Cutting 1; <br> Level 2; <br>  <br>  <br> Feature 20 | nncomplete. Only the lower part of the hook remains. The hook has a blunt <br> tip, is rounded in section and is greatly corroded. | L.42mm; <br> D. $4-5 \mathrm{~mm}$. <br> Barb, 31 mm |
| :--- | :--- | :--- | ---: |

## Spearhead

| 46 | Cutting 1; | Incomplete. A hollow or socketed object, which tapers towards one end | L. 56 mm. |
| :--- | :--- | :--- | ---: |
|  | Level 2; | before splaying out slightly. Rounded in section. The object is corroded |  |
| Feature 20 | Socket, |  |  |
| with the corrosion being particularly advanced at the splayed end. The | L.45mm; D.8- |  |  |
| present appearance of the object suggests that it could have been a socketed | 12 mm. |  |  |
|  |  | spearhead (Andy Halpin pers. comm.). | Splayed end, |
|  |  | L. $12 \mathrm{~mm} ;$ |  |
|  |  | W.12mm; |  |
|  |  | T. 4 mm |  |


| Nails |  |  |  |
| :---: | :---: | :---: | :---: |
| 20 | Cutting 1; Level 2; Feature 18 | Complete. Heavily corroded tack-type nail with a flat rounded head. Shaft rectangular in section and tip blunt; may be incomplete. | Shaft, L. $36 \mathrm{~mm} ;$ W. $9 \mathrm{~mm} ;$ T. $6 \mathrm{~mm} . \mathrm{Head}$, L. $21 \mathrm{~mm} ;$ W. 17 mm, T.2. 5 mm . |
| 21 | Cutting 1; Level 2; Feature 14 | Four heavily corroded nail fragments that would have made up one or two nails. All were rounded in section and bent. | L. 35 mm ; W. 7 mm ; T. 8 mm |
| 26 | Cutting 1; Level 2; Feature 20 | Incomplete. Two fragments. Probably the head and shaft of a heavily corroded 'tack' type nail. Shaft rectangular in section. | L. 22 mm ; <br> W. 6 mm . <br> Head, <br> L. 20 mm ; <br> W. 14 mm ; <br> T. 5 mm . |
| 28 | Cutting 1; Level 2; Feature 21 | A possible nail shaft that tapers slightly towards the end. Oval in section and in a heavily corroded state. | Shaft, L. $30 \mathrm{~mm}, \mathrm{~T} .5-$ 8 mm |
| 30 | Cutting 1; Level 2; Feature 20 | Incomplete 'tack' type nail. Head and upper part of shaft survives. Half of the head is missing. Shaft is circular in section. | Shaft, D.37 mm , Head, D. $12-21 \mathrm{~mm}$ |
| 43 | Cutting 1; Level 2; Feature 21 | Two conjoining fragments of nail point and shaft. Circular in cross section. | L. $45 \mathrm{~mm} ;$ W. $9 \mathrm{~mm} ; \mathrm{T} .3-$ 6 mm |


| 79 | Cutting 1; <br> Level 2; <br> Feature 26 | Almost complete. Small 'tack' type nail. Two conjoining fragments broken along shaft. Wide flat circular head with portion broken away. Square sectioned shaft. | Shaft, <br> L. 31 mm ; <br> W.6mm; <br> T.4mm. Head, <br> L. 12 mm ; <br> T.6mm; D.16- <br> 18 mm |
| :---: | :---: | :---: | :---: |
| 89 | Cutting 2; <br> Level 4; <br> Feature 200 | Incomplete. Two fragments of the shaft of a nail. The shaft is rectangular in section and heavily corroded. | L. $39 \mathrm{~mm} ;$ W. $12 \mathrm{~mm} ;$ T. 6 mm <br> T. 6 mm |
| 90 | Cutting 2; Level 4; <br> Feature 200 | Complete. 'Tack' type nail, head and shaft present. The shaft is short and tapers to a blunt point. Heavily corroded. | Head, L. $30 \mathrm{~mm} ;$ W. $26 \mathrm{~mm} ;$ T. 7 mm. Shaft, L. $18 \mathrm{~mm}, \mathrm{~W} .3-$ $10 \mathrm{~mm} ; \mathrm{T} .3-$ 10 mm. |
| 134 | Cutting 1; <br> Level 2; <br> Feature 20 | Incomplete. Shaft of nail with pointed tip. Rounded cross-section. | L. 43 mm ; W.6mm; T. 5 mm |
| 138 | Cutting 1; <br> Level 2; <br> Feature 20 | Incomplete. Fragment of a nail shaft tapering to a blunt tip. Square in section and bent. Similar to some of the nails found in the modern collection (95E136:0001) in the sod. | L. 35 mm ; W. 3.5 mm ; T. $2-3 \mathrm{~mm}$ |
| 142 | Cutting 1; <br> Level 2A; <br> Feature | Incomplete. Tip of nail or rivet which tapers to a blunted point. Other end is broken. Sub-rectangular in section. Very corroded condition. | $\begin{array}{r} \text { L. } 12 \mathrm{~mm} ; \\ \text { W. } 3 \mathrm{~mm} ; \mathrm{T} .1- \\ 2 \mathrm{~mm} \\ \hline \end{array}$ |

Belt slide

| 133 | Cutting 1; | Complete. An iron object, oval in shape but bent at one side. Probably | L. $36 \mathrm{~mm} ;$ |
| :--- | :--- | :--- | ---: |
|  | Level 2; | represents a belt slide. It is rounded rectangular in section. The object is | W. $15 \mathrm{~mm} ;$ |
|  | Feature 20 | also corroded. | T. 6 mm |

## Miscellaneous

| 5 | Cutting 1; <br> Level 4; <br> Feature 1 | Incomplete. Two fragments of an iron strip-like object (a) and (b). Both are flat and rectangular in section and heavily corroded. Possibly some sort of binding. | Piece (a), <br> L. 49 mm ; <br> W. 13 mm ; <br> T. 4 mm . Piece <br> (b), L. 30 mm ; <br> W. 12 mm ; <br> T. 5 mm |
| :---: | :---: | :---: | :---: |
| 8 | Cutting 1; <br> Feature 2 | A microscopic fragment of iron. Too corroded and small to identify form or use. | L. 10 mm ; W. 7 mm ; T. 2 mm |
| 22 | Cutting 1; <br> Level 2; <br> Feature 18 | L-shaped fragment with a circular expansion. Flat piece, heavily corroded. | L. $21 \mathrm{~mm} . \mathrm{L}^{\prime}$, <br> L. 12 mm ; <br> W. 5 mm ; <br> T. 3 mm . <br> Expansion, L. 12 mm ; <br> W. 11 mm ; T. 4 mm |
| 24 | Cutting 1; <br> Level 2; <br> Feature 20 | Incomplete. A microscopic fragment of iron, too small to identify or get dimensions of. |  |
| 48 | Cutting 1; <br> Level 2; <br> Feature 21 | Incomplete. A small scrap of iron. Possibly part of the same object as 95E136:0066 | L. 20 mm ; <br> W. 15 mm ; <br> T. 3 mm |


| 53 | Cutting 1; <br> Level 2; <br> Feature 21 | Incomplete. A fragment from some sort of cylindrical object representing a hollow casing. Only half of its diameter (radius) survives but is in poor condition due to the heavy corrosion. | L. 15 mm ; T. 1.5 mm ; D. 13 mm |
| :---: | :---: | :---: | :---: |
| 62 | Cutting 1; <br> Level 2; <br> Feature 26 | Incomplete. A flattish piece of iron, possibly from the same object as 95E136:0066 | L. 41 mm ; W. 39 mm ; T. 7 mm |
| 66 | Cutting 1; <br> Level 2; <br> Feature 21 | Incomplete. Eight flat fragments of iron of which some conjoin. There are two distinctive pieces: (a) is slightly curved and (b) seems to have had a rivet hole. | Piece (a), <br> L. 30 mm ; <br> W. 24 mm ; <br> T. 5 mm . Piece <br> (b), L. 18 mm ; <br> W. 16 mm ; <br> T. 3 mm . <br> WOP. 6 mm |
| 72 | Cutting 1; <br> Level 2; <br> Feature 21 | Incomplete. A curved iron fragment with no definite edges. Like most of the miscellaneous metal finds, the original object is unidentifiable and also heavily corroded. | $\mathrm{L} .25 \mathrm{~mm} ;$ $\mathrm{W} .7 \mathrm{~mm} ;$ <br> T. 7 mm |
| 74 | Cutting 1; <br> Level 2; <br> Feature 21 | Incomplete. Small iron fragment in poor condition and heavily corroded. A recent break suggests the original object was rectangular in section. | L. 11 mm ; W. 11 mm ; T. 10 mm |
| 75 | Cutting 1; <br> Level 2; <br> Feature 21 | Incomplete. Scrap of iron, flat and heavily corroded. Possibly a fragment from 95E136:0066. | L. 24 mm ; W. 23 mm ; T. 16 mm |
| 80 | Cutting 1; <br> Level 2; <br> Feature 21 | Incomplete. Two iron fragments (a) and (b). These are irregularly shaped but possibly join together. Too corroded to identify object. | Piece (a), <br> L. 29 mm ; <br> W. 18 mm ; <br> T. 8 mm . Piece <br> (b), L. 15 mm ; <br> W. 14 mm ; <br> T. 8 mm |
| 100 | Cutting 2; <br> Level 2; <br> Feature 203 | Bent shaft fragment. Possibly the remains of a bracket or staple. Rectangular in section and heavily corroded. | $\begin{gathered} \mathrm{L} .51 \mathrm{~mm} ; \\ \mathrm{W} .7 \mathrm{~mm} \\ \text { T. } 7 \mathrm{~mm} \\ \hline \end{gathered}$ |
| 104 | Cutting 2; <br> Level 4; <br> Feature 200 | Incomplete. A large collection of iron fragments, approximately 110 flat fragments in all. The original object (or objects) is unidentifiable but may have been relatively modern. | L. 42 mm <br> W. 27 mm ; <br> T. 5 mm |
| 125 | Cutting 3; <br> Level 2; <br> Feature 215 | Incomplete. A linear fragment of iron with a loop at each end - (a) and (b). Roughly rounded in section and in a heavily corroded condition. | L.33mm <br> Loop (a), <br> T.4mm; <br> D. 10 mm . <br> Loop (b), T.6mm; D. 9 mm . |
| 131 | Cutting 2; <br> Level 2; <br> Feature 203 | A hollow cylindrical fragment. The full diameter does not survive, heavily corroded. Similar to 95E136:0053. | $\begin{array}{r} \hline \text { L. } 23 \mathrm{~mm} ; \\ \text { T. } 3 \mathrm{~mm} ; \\ \text { D. } 18 \mathrm{~mm} \\ \hline \end{array}$ |
| 135 | Cutting 1; <br> Level 2; <br> Feature 20 | Incomplete. An iron fragment that is bent at a right angle at one end and tapers to a round tip at the other. It is rectangular in section. | $\begin{gathered} \text { L. } 30 \mathrm{~mm} ; \\ \text { W. } 6 \mathrm{~mm} \text {; } \\ \text { T. } 5 \mathrm{~mm} \end{gathered}$ |
| 136 | Cutting 1; <br> Level 2; <br> Feature 20 | Incomplete. Two flat fragments of iron (a) and (b); both heavily corroded. No diagnostic features apparent. | Piece (a), <br> L. 23 mm ; <br> W. 20 mm ; <br> T.6mm. Piece (b), L. 14 mm ; <br> W.14mm; <br> T. 7 mm |


| 140 | Cutting 1; <br> Level 2C | Incomplete. A scrap of iron possibly part of a rivet or rod, but too corroded to accurately identify. Triangular in section with one edge tapering to a blunt point and the other end broken. Sub-rectangular in section. Both ends are unbroken. Too corroded to classify. | $\begin{array}{r} \text { L. } 24 \mathrm{~mm} ; \\ \text { W. } 2 \mathrm{~mm} ; \\ \text { T. } 0.5-2 \mathrm{~mm} \end{array}$ |
| :---: | :---: | :---: | :---: |
| 141 | Cutting 1; Level 2A | Incomplete. A small flat strip of iron, no features evident. Rectangular in section. One edge is smooth while the other straight edge is broken. Too corroded to classify. | L. 26 mm ; <br> W. 15 mm ; <br> T. $2-5 \mathrm{~mm}$ |
| 143 | Cutting 1; <br> Level 2A; | Incomplete. Four pieces of corroded iron. The largest piece (a) is curved along its length and could represent the remains of a nail or hook. One (b) of the three remaining fragments is roughly triangular in shape. May all be part of same object. | Large piece, <br> L. 17 mm ; <br> D. 8 mm ; <br> Triangular piece, <br> L. 10 mm ; W.9mm; T. 5.5 mm |

## Appendix 15 Mammal Bones (E.V. Murray)

|  | Cattle | Horse | Sheep/Goat | Pig | Dog | Red Deer | Seal | Otter |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Horn/Antler | 19 | - | 2 | - | - | 3 | - | - |
| Skull | 17 | - | 4 | 8 | 2 | - | - | 2 |
| Mandible | 22 | 1 | 14 | 7 | 1 | - | - | 1 |
| Teeth | 106 | 10 | 139 | 24 | 5 | - | - | - |
| Atlas | 1 | - | - | - | - | - | - | - |
| Axis | 5 | - | 1 | - | - | - | - | - |
| Scapula | 12 | - | 13 | 3 | 3 | - | - | - |
| Humerus | 22 | - | 17 | - | 2 | - | - | 1 |
| Radius | 21 | 1 | 30 | 2 | - | - | - | - |
| Ulna | 9 | - | 9 | 8 | - | - | - | - |
| Metacarpal | 4 | - | 7 | 4 | - | - | - | - |
| Pelvis | 12 | - | 29 | 1 | - | - | - | - |
| Femur | 19 | - | 40 | - | 1 | - | - | - |
| Patella | 2 | - | 1 | - | - | - | - | - |
| Tibia | 19 | - | 22 | 1 | - | - | - | 1 |
| Astragalus | 10 | - | 15 | 4 | - | - | - | - |
| Calcaneus | 21 | - | 13 | 4 | 1 | - | - | - |
| Metatarsal | 8 | - | 13 | 2 | - | - | - | - |
| Metapodia | 21 | - | 11 | 7 | - | - | 1 | - |
| Tarpal/Carpal | 9 | - | 11 | - | - | - | - | - |
| Phalanx 1 | 40 | 2 | 37 | 5 | - | - | - | - |
| Phalanx 2 | 22 | - | 19 | 3 | - | - | - | - |
| Phalanx 3 | 22 | 1 | 11 | 6 | - | - | - | - |
| Phalanges | - | - | - | - | - | - | 7 | - |
| Total | 443 | 15 | 458 | 89 | 15 | 3 | 8 | 5 |
| Total \% | 42.8 | 1.4 | 44.2 | 8.6 | 1.4 | 0.3 | 0.8 | 0.5 |
| MNI | 6 | 1 | 8 | 3 | 2 | 1 | 1 | 1 |
| MNI \% | 26.1 | 4.4 | 34.6 | 13 | 8.7 | 4.4 | 4.4 | 4.4 |

Appendix Table 15.1 Distribution of identified fragments and MNIs of animal bones from Dún Eoghanachta Levels $1 \& 2$.

|  | Cattle | Horse | Sheep/Goat | Pig | Dog |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Horn/Antler | 1 | - | - | - | - |
| Skull | - | - | - | 1 |  |
| Mandible | 2 | - | 2 | - | 1 |
| Teeth | 6 | - | - | - | 2 |
| Atlas | - | - | - | - |  |
| Axis | - | - | - | - |  |
| Scapula | - | - | - | - |  |
| Humerus | 1 | - | - | - |  |
| Radius | - | - | - | 1 |  |
| Ulna | 1 | - | - | - |  |
| Metacarpal | - | - | - | - |  |
| Pelvis | 2 | - | - | 1 |  |
| Femur | - | - | - | - |  |
| Patella | 1 | - | - | - | - |
| Tibia | - | - | - | - |  |
| Astragalus | 2 | - | - | - |  |
| Calcaneus | - | - | - | 1 |  |
| Metatarsal | 1 |  | - | - | - |
| Metapodia |  |  | - | - | - |


| Tarpal/Carpal | - | - | - | - | - |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Phalanx 1 | 2 | - | - | - | - |
| Phalanx 2 | 1 | - | - | - | - |
| Phalanx 3 | - | - |  |  |  |
|  |  | 1 | 2 | 8 |  |
| Total | 24 | 1.9 | 32.7 | 3.8 | 15.4 |
| Total \% | 46.2 |  |  |  | 1 |
| MNI | 2 | 16.7 | 16.7 | 16.7 | 1 |
| MNI \% | 33.2 |  | 16.7 |  |  |

Appendix Table 15.2 Distribution of identified fragments and MNIs of animal bones from Dún Eoghanachta, level 3.

|  | Cattle | Horse | Sheep/Goat | Pig | Cat |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Horn/Antler | - | - | - | - | - |
| Skull | 1 | - | 1 | - | - |
| Mandible | - | - | - | - | 1 |
| Teeth | 8 | 20 | 14 | 1 | - |
| Atlas | - | - | - | - | - |
| Axis | - | 1 | - | - | - |
| Scapula | - | - | - | - | - |
| Humerus | - | - | - | - | - |
| Radius | 2 | - | 2 | - | - |
| Ulna | 1 | - | - | - | - |
| Metacarpal | - | - | 1 | - | - |
| Pelvis | 1 | - | - | - | - |
| Femur | 2 | - | - | - | - |
| Patella | - | - | - | - | - |
| Tibia | - | - | 1 | 1 | - |
| Astragalus | 3 | - | 5 | - | - |
| Calcaneus | 2 | - | - | 1 | - |
| Metatarsal | - | - | - | - | - |
| Metapodia | 3 | - | 1 | - | - |
| Tarpal/Carpal | - | - | - | - | - |
| Phalanx 1 | 5 | 1 | 3 | - | - |
| Phalanx 2 | 2 | - | - | - | - |
| Phalanx 3 | - | - | - | - | - |
| Total | 30 | 22 | 28 | 3 | 1 |
| Total \% | 35.7 | 26.2 | 33.3 | 3.6 | 1.2 |
| MNI | 1 | 1 | 3 | 1 | 1 |
| MNI \% | 14.3 | 14.3 | 42.8 | 14.3 | 14.3 |

Appendix Table 15.3 Distribution of identified fragments and MNIs of animal bones from Dún Eoghanachta level 4.

| Sheep/Goat | GL | GLI | Bp | Bd | BT | SD | GLP | SLC |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Levels 1 \& 2 |  |  |  |  |  |  |  |  |
| Scapula | - | - | - | - | - | - | 27.5 | 16.6 |
|  | - | - | - | - | - | - | 27.7 | 16.1 |
| Humerus | - | - | - | 28.7 | - | - | - | - |
|  | - | - | - | 27.9 | - | - | - | - |
|  | - | - | - | 28.1 | 27.9 | - | - | - |
|  | - | - | - | 28.6 | 27.4 | - | - | - |
| Radius | - | - | 25.3 | - | - | - | - | - |
|  | - | - | 25 | - | - | - | - | - |
|  | - | - | 24.1 | - | - | - | - | - |
|  | - | - | 27.7 | - | - | - | - | - |
|  | - | - | - | 25.5 | - | - | - | - |
|  | - | - | - | 25.5 | - | - | - | - |
| Metacarpal | - | - | - | 23.1 | - | - | - | - |
|  | - | - | 19.9 | - | - | - | - | - |
|  | - | - | 21.4 | - | - | - | - | - |
| Femur | - | - | 41.1 | - | - | - | - | - |
| Tibia | - | - | - | 21.1 | - | - | - | - |
|  | - | - | - | 22.4 | - | - | - | - |
|  | - | - | - | 23.4 | - | - | - | - |
|  | - | - | - | 24.6 | - | - | - | - |
| Astragalus | - | 22.3 | - | 15.9 | - | - | - | - |
|  | - | 28.5 | - | 18.2 | - | - | - | - |
|  | - | 27.3 | - | 16.2 | - | - | - | - |
|  | - | 24.8 | - | 15.6 | - | - | - | - |
|  | - | 28.5 | - | 19.1 | - | - | - | - |
|  | - | 25.5 | - | 17.1 | - | - | - | - |
|  | - | 23.3 | - | 15.9 | - | - | - | - |
|  | - | 27.2 | - | 17.2 | - | - | - | - |
|  | - | 25.6 | - | 16.7 | - | - | - | - |
|  | - | 25.8 | - | 16.7 | - | - | - | - |
|  | - | 23.5 | - | 15.1 | - | - | - | - |
|  | - | 25.7 | - | - | - | - | - | - |
|  | - | 24.8 | - | - | - | - | - | - |
|  | - | 23.5 | - | - | - | - | - | - |
| Metatarsal | - | - | - | 24.7 | - | - | - | - |
|  | - | - | - | 24 | - | - | - | - |
| Level 3 |  |  |  |  |  |  |  |  |
| Radius | - | - | 24.7 | - | - | - | - | - |
| Tibia | - | - | - | 23.5 | - | - | - | - |
| Level 4 |  |  |  |  |  |  |  |  |
| Radius | - | - | - | 21.2 | - | - | - | - |
| Metacarpal | 112.4 | - | 19.8 | 22.2 | - | 12.3 | - | - |
| Tibia | - | - | - | 22.5 | - | - | - | - |


| Astragalus | - | 25.3 | - | 15.3 | - | - | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  | - | 26.4 | - | 16.7 | - | - | - | - |
|  | - | 26.6 | - | - | - | - | - | - |

Appendix Table 15.4 Sheep/goat bone measurements from Dún Eoghanachta (in mm) after von den Driesch (1976)

| Cattle | GL | Bp | Bd | BT | GLP | SLC |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Levels $1 \& 2$ |  |  |  |  |  |  |
| Scapula | - | - | - | - | 59.9 | 43.7 |
|  | - | - | - | - | - | - |
| Humerus | - | - | - | 67.0 | - | - |
|  | - | - | 72.0 | 63.2 | - | - |
| Radius | - | - | 70.7 | 65.5 | - | - |
| Metacarpal | - | 68.4 | - | - | - | - |
|  | - | 48.9 | - | - | - | - |
| Tibia | - | - | 51.1 | - | - | - |
| Calcaneus | - | - | 52.8 | - | - | - |
| Astragalus | 115.6 | - | - | - | - | - |
|  | 56.7 | - | - | - | - | - |
|  | 60.1 | - | - | - | - | - |
| Metatarsal | 60.3 | - | - | - | - | - |
|  | 60.1 | - | - | - | - | - |
| Level 4 | - | 43.0 | - | - | - | - |
| Radius | - | - | 49.7 | - | - | - |
| Astragalus | - | - | 50.1 | - | - | - |
|  | - | - | 63.1 | - | - | - |
|  | 58.5 | - | - | - | - | -- |

Appendix Table 15.5 C Appendix Table 15.5 Cattle bone measurements from Dún Eoghanachta (in mm) after von den Dreisch (1976).

| Bone | Approx. Age at <br> Fusion (in months) | No. Fused | No. Unfused |
| :--- | :---: | :---: | :---: |
| Pelvis \& Scapula | $7-10$ | 0 | 3 |
| Humerus D. \& Radius P. | $10-18$ | $9(52.9 \%)$ | $(100 \%)$ |
| Metacarpal D., Tibia D. \& Metatarsal D. | $24-36$ | $4(30.8 \%)$ | $(47.1 \%)$ |
| Femur P. \& Calcaneus | $36-42$ | $6(36.6 \%)$ | 9 |
| Femur D., Humerus P., Radius D., | $42-48$ | $9(40.9 \%)$ | $(68.2 \%)$ |
| Fibia P. \& Ulna. |  |  | 13 |

Appendix Table 15.6 Cattle fusion data from Dún Eoghanachta after Silver (1969). Due to the limited amount of data all levels were combined in this instance. $\mathbf{P}=$ proximal; $\mathbf{D}$ $=$ distal.

|  | GL | Bp | Bd | SD | BT | GLP | SLC | ESH (cm) |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Level 2 |  |  |  |  |  |  |  |  |
| Calcaneus | 21.8 | - | - | - | - | - | - | - |
| Femur | - | 20.6 | - | - | - | - | - | - |
| Scapula | - | - | - | - | - | 17.7 | 16.7 | - |
|  | - | - | - | - | - | 15.2 | - | - |
| Level 3 | - | - | - | - | - | 15.4 | - | - |
| Tibia | 78.5 | - | 12.4 | 7.3 | - | - | - | 23.9 |
| Humerus | - | - | 16.5 | - | 12.6 | - | - | - |
| Radius | - | - | 13.0 | - | - | - | - | - |

Appendix Table 15.7 Measurements of dog bones from Dún Eoghanachta (in mm) after von den Driesch (1976). The estimated shoulder height (ESH) value is in centimetres and is calculated after Harcourt $(1974,154)$.

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[^0]:    Appendix Table 2.1.1 Distribution of mammal bone fragments.

[^1]:    ${ }^{1}$ School of Chemistry, University of Bristol, Cantock's Close, Bristol BS8 ITS

[^2]:    ${ }^{2}$ With the removal of the wrap and valve pieces, the number of moulds found outside this area drops from thirteen to three in the southern part of the zone (squares 1,2 , and 3 ), from twenty-three to eight in square 5 and from forty-two to seventeen in the area adjacent to the enclosing wall on the west (squares 7, 10, 13, 16 and 19).

[^3]:    ${ }^{3}$ Based on information available up to 2010. Single finds of 'possible' moulds (e.g. a piece from Carbury Hill, Co. Kildare; Cotter 2003b) or moulds of uncertain date are not included. A few unclassified clay mould pieces from Mooghaun for example do not appear to have been of Bronze Age date (Grogan 2005, 134, 136). I am grateful to Steven McGlade for drawing attention to the Ballynakelly and Stamullin finds.

[^4]:    ${ }^{4}$ T. Plunkett $(1880,66-70 ; 1899,89)$ reported the discovery of an ancient crannog, associated with 'rude huts which were found at a depth of 21 feet underneath peat' at Boho. He did not mention any clay moulds among the finds in 1880, but in 1899 he exhibited 'a portion of a bronze sword mould' found on the surface of the
    crannog at Boho. Hodges illustrated two sword moulds from 'Boho' (1954, 65, fig. 2, nos 1 and 2) but in the text these are referred to as being from Bohevny. Eogan $(1965,178)$ gives the finds circumstances of the Bohevny moulds as unrecorded. (Williams 1984,8 ) lists them as two separate sites, citing Plunkett and Eogan as sources. Both 'sites' are included here.
    ${ }^{5}$ The site, known as 'Toole's Moat' seems to have consisted of an enclosure located on a gravel ridge. The moulds were casually picked up at the end of the nineteenth century in the course of gravel quarrying. Additional quarrying was carried out at the site in the 1950's and more recently, a portion of the remainder was removed during construction of the Bray-Shankill bypass (Keeley 1989). By the late 1980's the site had the appearance of an irregular overgrown area of raised ground; the only feature evident was a short section of what may have been a truncated ditch (ibid).
    ${ }^{6}$ The recorded (or surviving) extent of the site was fully excavated.

[^5]:    ${ }^{7}$ Based on twenty pieces for a sword mould and ten fragments apiece for knife/sickle and socketed axe moulds. Comparative figures based on the condition of the Dún Aonghasa pieces would be twice or three times that number.

[^6]:    ${ }^{8}$ Sample from layer C95,described as a grey/black, ashy silt (Hurl et al. 1995,13).

[^7]:    ${ }^{9}$ This overview was written before the publication of Simon Ó’Faoláin's comprehensive study of Irish Late Bronze metalworking; reference to O'Faoláin's work has been added on an $\mathrm{ad} h o c$ basis at the editing stage (Ó’Faoláin 2004).
    ${ }^{10}$ No residues from either ore crushing or smelting came to light on any of the areas investigated. An anvil stone (Williams 1978, fig.4) with a pecked working surface could have been used for a variety of tasks e.g., crushing grits, chiselling off casting flashes etc.
    ${ }^{11}$ Extensive evidence for copper smelting uncovered within a double ditched enclosure at Scrahane, Killarney, Co. Kerry (O’Donnell 1998) now seems likely to date to the early Medieval period although the enclosure itself is apparently earlier; the site lies a few kilometres from the mines on Ross Island.

[^8]:    ${ }^{12}$ For a craftsman-like description of the process of mould making, including 'anointing' the parting faces with a feather dipped in a mixture of liquid clay and soot, or grease and soot, see Maryon 1938, 213-17.

[^9]:    ${ }^{13}$ In Howard's analysis (1983, 511-2) smith mobility was assessed in relation to the types of moulds used. . He suggested that smiths using bronze or stone moulds were itinerant (at different scales) whereas those using nonportable, non-reusable clay moulds had fixed workshops on patronized sites. On the basis that only very limited use seems to have been made of stone or bronze moulds here during the late Bronze Age and that there is a 'general absence of substantial founders hoards' Ó'Faoláin (2004, 107-8) suggests that the emphasis was on sedentary bronze production.

[^10]:    Appendix Fig. 11.1 Geological aspects of the hilltop at Dún Aonghasa (D. Harper).

[^11]:    ${ }^{14}$ RMP MA123:041.The outer line of defence is made up of a rubble rampart and the inner by a collapsed stone wall. In the very overgrown area between the two, there are intermittent traces of rubble lying along the line of a break in slope. This may be quarrying debris but it could also be the remains of a robbed out middle rampart.
    ${ }^{15}$ Possible traces of an additional enclosing element, located between the middle and outer ramparts, have recently been identified at Rathgall (R. Shaw pers. comm.).
    ${ }^{16}$ The bank enclosed an area $c a .45 \mathrm{~m}$ in diameter, its line coincided with that of the later cashel in some areas but deviated from it in others (Raftery 1970; 1971). A ditch ( $<3 \mathrm{~m}$ wide by 1.10 m deep) located on the interior of the bank was not a concentric feature and, along parts of its circuit, its line also deviated significantly from that of the bank.
    ${ }^{17}$ The robbed out inner enclosure wall uncovered during Bersu's excavations at Freestone Hill for example ranged from $1.50-2.50 \mathrm{~m}$ in width. It was built on the old ground surface and defined a central enclosure, 36.5 m by 30 m . The wall appears to have delimited a late Bronze Age occupation horizon suggesting it was in existence at least by that period.
    ${ }^{18}$ examples of hillforts with double banks and intervening ditch: Lisdarush, Co, Leitrim (LE008:004; Condit et al 1991, 62), Laghtea, Co. Tipperary (TN019:047), Rathnagree, Co. Wicklow (Appendix Table 12.1), the Spinans Hil/Brusselstown Hill complex (Condit 1992, 16-20). The middle ramparts at Rathgall, and parts of the circuits at Knockadigeen, Co. Tipperary (Farrelly and O’Brien 2002, 56), Mooghaun, Co. Clare (Grogan 2005), Ballylin, Co. Limerick (Cody 1981) and Rathcoran, Co. Wicklow also fall into this category.
    Pairs of banks with an intervening ditch occur at two large enclosures on Friarstown Hill, Co. Limerick (Kelly and Condit 1998, 18) . Grogan (2005, Table 7.1) classifies the sites as hillforts, but Kelly and Condit (ibid) suggest that they may be henges (and thus probably of Neolithic rather than Bronze Age date). Limited excavation of an enclosure defined by double banks with an intervening ditch at Toonafortes, Co. Sligo (Danaher 2007, 58) produced evidence for middle Bronze Age activity.

[^12]:    ${ }^{19}$ A smaller bivallate fort (Knockeen; WW037:018) is located 300 m to the south of Rathgall. Rathnagree Co. Wicklow (WW027:010) is overlooked by the much larger bivallate fort of Rathcoran (WW027:026), that lies 500 m to the east. Navan Fort stands about one 1 km east of Haughey's Fort.
    ${ }^{20}$ These include forts that are trivallate (the Hill of Lloyd, Co. Meath and Rathnagree, Co. Wicklow), bivallate (Rath, Co. Cork and Ballycurragh / Glebe, Co. Offaly) and univallate (Brusselstown Ring, Co. Wicklow; Ardsallagh, Co. Sligo and Donaghmore, Co. Kilkenny).

[^13]:    ${ }^{21}$ Carn Tigherna, CO035:049. Caherdrinny, CO019:097003.

[^14]:    ${ }^{22}$ Dún Aonghasa, Mooghaun and Freestone Hill have been published. At the time of writing, the excavations at Rathgall, Haughey's fort, Cashel fort and Rahally are unpublished. No evidence for any activity, settlement or otherwise, seems to have come to light in the interior of Cashel hillfort, Co. Cork. The writer is grateful to the late Barry Raftery for information on Rathgall.

[^15]:    ${ }^{23}$ Record numbers of up to 1200 people a day visited the site during the peak summer months when the excavations were taking place (1992-1995). In 2010 annual visitors numbered over 100, 000.

