Late Bronze Age Casting Debris and Other Base Metal Finds from Haughey’s Fort

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Abstract
This paper provides a full overview of base metal finds from the excavations conducted at Haughey’s Fort between 1987 and 1995. Most of the assemblage consists of waste metal from casting activities relating to the Late Bronze Age occupation of the site. A small minority of objects are of later date, mostly Iron Age. Both the latter and the vast majority of Late Bronze Age metal items were recovered from a specific sector of the inner enclosure. Typological parallels, context and chronology of the finds are discussed, and a tentative interpretation of the evidence is proposed.

Introduction

The 1987 to 1995 seasons at Haughey’s Fort produced a modest number of base metal items, some of which have already been mentioned previously in the relevant interim reports. The finds comprise four complete or near-complete objects as well as a number of smaller fragments and casting debris. No metal objects were found during any of the subsequent seasons. The purpose of this paper is to provide a full overview of the relevant finds and an interpretation of their context (Tabs. 1–3). Not included here are the gold items from the site, as these are dealt with by Richard Warner in a separate article in the present issue.

Most base-metal objects from Haughey’s Fort were subjected to p-XRF analysis using a Bruker S1 Turbo SD-LE handheld spectrometer, with the aim of determining their elemental composition. Beam exposure time was 30 seconds per sample. Given the poor state of preservation of many of the items, which effectively prevented the extraction of uncorroded metal, and the fact that most of the smaller pieces of casting debris only survive as corrosion products with little or no uncorroded metal remaining, it was generally only possible to take measurements of more or less heavily oxidized surfaces. As the high mobility of both lead and tin during the corrosion process renders any attempt at a more detailed interpretation of these measurements futile, here we only provide qualitative information, indicating the presence or absence of the three main elements detected: copper, tin, and lead (Tab. 1). For this purpose ‘presence’ is defined as a p-XRF measurement of more than 1 per cent. Unsurprisingly, most of the fragments and all of the casting debris recovered from Late Bronze Age features at the site consist of ternary bronze alloys. A single lead-tin alloy item was also identified (see below).

The finds

Three of the four complete or near-complete non-ferrous base metal objects recovered during the excavation are small rings (Figs. 1.3, 4, 17: 2.3–5). Similar pieces regularly occur in hoards of the Dowris phase (Eogan 1983, 11), but given their wide currency throughout the Late Bronze Age of both Atlantic and Continental Europe, this form cannot be viewed as indicative of a specific metalworking phase or regional metalworking tradition.

Two of the rings have similar dimensions and were retrieved from the same feature (Tab. 1, nos. 3 & 4). It hence seems likely that they formed part of a single set, either destined for joint use or even produced on site as part of the same lot. All three rings are manufactured from ternary bronze, which is what one would expect of Irish and indeed most other Atlantic Late Bronze Age metalwork. Despite the common occurrence of similar rings also in contemporary Urnfield contexts, where ternary alloys tend to be much less common, it thus seems rather unlikely that we are dealing with imports from the Continental sphere.

Apart from the three complete rings mentioned above, a small ring fragment was also recovered (Fig. 1.7). Interestingly, this fragment is the only lead-tin object in the entire assemblage, and it may be significant that it was retrieved from a feature that did not produce any ternary bronzes or other metalwork (Tab. 1, no. 7). Warner (pers. comm. 08/05/2014) suggests that this could be the core of a gold-foil-covered penannular ring of Late Bronze Age date, pointing out that while such pieces are often described as ‘tin’, use of a lead-tin alloy would seem equally feasible.

The most notable near-complete bronze item found during the excavations is a disk-headed pin with bent stem (‘sunflower pin’) that, except for some corrosion damage to its tip, is pristinely preserved (Figs. 1.2; 2.1). It has been suggested that the raised rim of the disc and the small finial at its centre might indicate that it was originally designed to hold a setting or inlay (Mallory et al. 1996, 12). However, if such a setting or inlay indeed existed at some stage, no trace of it survives. Some patches of differential patination in the disc’s interior are undiagnostic in this respect (Tab. 1, no. 2).

While this particular design has no close parallels among the Irish corpus of sunflower pins (cf. Eogan 1974), pieces with similar raised rims – but without bent stem – are occasionally found in other parts of Atlantic Europe (Ruiz-Gálvez Priego 1995, pl. 20.5). Still, the peculiar combination of morphological features encountered in the pin from Haughey’s Fort is with-
Fig. 1 Base metal finds from the 1987 to 1995 excavation seasons at Haughey’s Fort. Item numbers in this figure correspond to those in Tables 1 and 2.
out close comparisons anywhere in the wide distribution area of disc-headed pins with bent stem, stretching along the Atlantic façade from south-western Spain (Ferrer Albelda et al. 1997, fig. 4.3) to the eastern Baltic (Vasks & Vijups 2004, fig. 17.1–4). Analytical data that might help to narrow down its possible origin are not available for this item. Because of a coating applied to its surface in order to prevent further corrosion damage when put on display at the Navan Centre, and as conservation concerns did not recommend the removal of this coating, no p-XRF analysis could be conducted.

Apart from the aforementioned complete or near-complete pieces, two larger fragments and a multitude of very small items, mostly casting debris, have been recovered during the excavations. The first of the two larger objects is a buckle fragment retrieved from the plough soil during the 1987 season, close to the southern perimeter of the area enclosed by the inner ditch (Fig. 1.1). In the original interim report, Mallory (1988, 15, fig. 6.1) already indicated that this was likely a modern item without any connection to the Bronze Age occupation of the site. This has now been confirmed by p-XRF analysis demonstrating that the object was manufactured from red brass, an alloy unknown from later prehistoric contexts in Ireland and the rest of NW Europe (Tab. 1, no. 1).

In contrast, the second large base-metal fragment from the site, according to both its composition and its context is clearly of Late Bronze Age date (Figs. 1.10; 2.2). Its original function, however, is somewhat less obvious. In the respective interim report it was tentatively identified as a possible bracelet fragment (Mallory 1991a, 20), but such an interpretation is inconsistent with the presence of a raised rim running along one of its inner edges (Tab. 1, no. 10). Also, no bracelets of similar shape and decoration are known from Atlantic Europe or neighbouring lands. The closest parallel that could be cited in favour of an interpretation as a bracelet fragment is provided...
by a similarly decorated strip of sheet bronze from a hoard found near Márok in Hungary, dating to the opening stages of the Urnfield period and identified – not necessarily correctly – as a bracelet fragment by Mozsolics (1985, 147, pl. 92.5).

However, its similarity with the find from Haughey’s Fort is superficial at best, which is why here we are proposing a reading of the latter as a cup handle, probably from a vessel not entirely unlike those recovered from the Tamlaght hoard, located only about half a mile from Haughey’s Fort (cf. Warner 2006, 21, figs. 3 & 4). Clearly, our fragment does not belong to either of the two vessels deposited at Tamlaght, none of which is missing its handle. The Type Jenišovice cup found with that assemblage came fragmented, but with its handle included. For the associated Type Fuchsstadt bowl, despite its damaged state we can be reasonably certain that it had never been fitted with a handle to begin with. In contrast to the two vessels from the Tamlaght hoard, there are good arguments for interpreting the piece from Haughey’s Fort not as yet another import from Urnfield lands, but as a local copy of a Central European template.1 While handles on Urnfield vessels with sheet-metal body are generally also manufactured from sheet metal, the piece from Haughey’s Fort is clearly cast, apparently using the lost-wax technique. Cast handles and handle attachments are typically a feature of Atlantic Late Bronze Age sheet-metal vessels (i.e. cauldrons and buckets; no cups of Atlantic manufacture have so far been recovered; cf. Gerloff 2010, 39 ff.), which would seem to indicate local production. While fully cast vessels – body and handle in one piece – are also known from the Urnfield world and from the Late Bronze Age of northern Europe, their handles are of a very different shape than those found on Urnfield sheet-metal cups, which the fragment from Haughey’s Fort appears to be mimicking. The latter’s lead content also supports the notion of an Atlantic manufacture.

At the same time, it is clear that if we are indeed dealing with a local copy of an Urnfield cup, it could not have been modelled directly on either of the two vessels from Tamlaght, given that one of them comes without a handle and the other one features an altogether different handle design. Rather, we would have to assume knowledge by the respective craftsman of yet another Urnfield vessel, featuring a handle decorated with three parallel lines close to both its edges. This motif is commonly encountered with cups of both the Fuchsstadt and the Jenišovice types, whereas only a single instance is known of its occurrence with a Type Friedrichsruhe cup (Martin 2009, inserts 1–3).

The presence of casting debris in the same pit that produced the cup handle, as well as in several other Late Bronze Age features excavated during the 1989 and 1990 seasons, demonstrates that bronze objects were manufactured on-site. A plausible argument can thus be made not only that an attempt to copy imported Urnfield cups was undertaken locally, but also that casting was undertaken locally, as evidenced by the presence of casting debris in the same pit that produced the cup handle. This is supported by the presence of iron ore in several Late Bronze Age features excavated during the 1987 to 1995 seasons at Haughey’s Fort, as indicated in Fig. 3.

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1 We are confident in ruling out an interpretation of the fragment from Haughey’s Fort as a bucket handle, a possibility previously proposed by Warner (2006, 24). While strap-shaped handles of broadly similar design do occur on Atlantic buckets, their decoration and curvature is very different from that displayed by our fragment (cf. Gerloff 2010, pls. 117–141). Warner (pers. comm. 08/05/2014) now agrees that a reading of this piece as a local copy of an Urnfield cup handle is considerably more likely.
but also that more than just the two vessels recovered as part of the Tamlaght hoard reached the area.

While we cannot rule out that the handle fragment from Haughey’s Fort might represent scrap from an object manufactured elsewhere that was intended to be recycled at the site, the find of Urnfield imports in its immediate vicinity and closely related to the handle’s likely prototype clearly favours a scenario in which this fragment came to be deposited following the scrapping of a flawed casting of local manufacture.

Evidence for on-site production of metalwork is also provided by other casting debris recovered from a number of features. This consists mostly of small – sometimes minuscule – droplets, a number of amorphous fragments, a lip, and what appears to be a small piece of casting flash (Fig. 1.5, 6, 8, 9, 11–16, 18–27). The relatively large number of quite minute
pieces in the assemblage follows from the wet sieving of all pit contents under laboratory conditions, with most of the very small debris retrieved from the dry residue (Tab. 1, nos. 5, 6, 8, 9, 11–16, 18–27).

Unfortunately, other than the cup handle discussed above, we are lacking any clues as to the types of object cast. The aforementioned small bronze rings may or may not have been produced locally. In any case, the presence of a piece of flash demonstrates the use of a two-piece mould. As the cup handle shows clear signs of having been cast in the lost-wax technique, the flash must relate to the manufacture of a different category of object. Given the limitations in the available evidence, it is difficult to draw any further conclusions based on the casting debris.

Apart from ternary bronze and lead-tin items, the 1987 to 1995 excavations have also produced a small number of iron objects: a strap, a rivet and what appears to be a decorative nail or pin retrieved from the same pit (Ft. 299) as well as a small iron knife blade from a different feature (Ft. 278). In typo-chronological terms all of these are fairly undiagnostic (Fig. 1.28–31), though with its straight-edged blade the knife in particular resembles similar finds from 1st millennium BC contexts much more closely than knives from later periods, which tend to display curved blades and/or narrower tangs (cf. O’Kelly 1964, 41 f., fig. 4). Its nearest parallel is probably a rectangular section it differs greatly from the round-sectioned (Waterman & Lynn 1997, 85, fig. 39.3), with its flattened rectangular section it differs greatly from the round-sectioned piece retrieved from our Ft. 299 (Fig. 1.30).

It should be mentioned here that various types of iron ore have also been recovered during the excavations at Haughey’s Fort, all of them apparently from Late Bronze Age features (Fig. 3). Both the small amount of ore involved and the lack of any evidence for on-site smelting make it appear highly unlikely that it was destined to be used as raw material for the production of metallic iron (Tab. 3). Interestingly, a number of Late Bronze Age pottery fragments from the site which due to their unusually high weight were submitted to p-XRF analysis showed an iron content between 20 and more than 30 per cent. This could indicate that iron ores might have been used as a tempering agent in pottery production.

**Context and chronology**

Most metal found during the excavations comes from a limited number of pit features in an area measuring c. 15 × 15m and located slightly to the south-east of the centre of the inner ditch enclosure, close to the edge of the excavated sector. At some stage, this area was at least partially enclosed by what appears to have been a stockade fence. While no stratigraphic evidence is available to demonstrate strict contemporaneity between this fence and the features that have produced the casting debris, their relative position would seem to indicate some kind of correlation (Fig. 4; see also the site plan in Mallory, this issue). Similar structures are also attested from other Irish Late Bronze Age sites in connection with evidence for metalworking activities, namely Lough Eskragh (Site B) and Rathgall (Cotter 2013, 243).

Alignments of some larger and deeper pit features in the interior of the area enclosed by the stockade fence are more difficult to interpret, partially because we cannot be certain to what extent they might continue beyond the limits of the excavation. If originally they held posts that were later extracted, a possibility pondered by the excavator (Mallory 1991a, 19), this could indicate the existence of some kind of roofed structure under whose cover most of the metalworking activities took place. Some shelter from the elements would clearly have been required for this purpose, as suggested by practical considerations and also demonstrated by experimental work (Crew & Rehren 2002, 95 f.). While a structure with a rectangular layout, which the shape of the pit alignments seems to hint at, at first glance would appear out of place in an Irish Bronze Age or Iron Age context, it is worth remembering that Tara has produced similar evidence, albeit of a later date (ibid.).

Virtually all of the bronze casting debris was recovered from such deep pit features (Fts. 48, 267, 276, 277, 306) which have also produced the three small bronze rings (Fts. 48, 306) and the cup handle (Ft. 277), together with variable amounts of pottery and organic material, though not all of the relevant features formed part of recognisable alignments. In some instances the same pits also provided possible evidence of in-situ gold working (cf. Mallory 1991a, 20, fig. 7; Warner, this issue), and in one case a considerable amount of burnt clay (Ft. 277).

However, in contrast to the evidence from Navan Fort (Waterman & Lynn 1997, 89) identifiable mould or crucible fragments are entirely lacking, and the same holds true for any structural remains discernibly related to metalworking activities, such as furnaces or melting hearths. A couple of large pits somewhat to the south of the area in which the metal waste was concentrated contained large stones, clay lenses or layers, and abundant charcoal (Fts. 282, 289). While it might be tempting to suggest a possible connection between these and on-site metalworking, there is no direct evidence to support such a notion, and no casting debris has been recovered from those features. Interestingly though, most of the iron ore was found in the same area (cf. Mallory 1991a, 18) (Fig. 4).

The available evidence thus does not allow us to draw further conclusions regarding the chaîne opératoire, and given

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2 Lu 1826 (charcoal; from hearth – Settlement 8): 2020 ± 55 BP = 176 Cal BC – 83 Cal AD (Warner et al. 1990, 49); this and all other radiocarbon dates referred to in this article have been calibrated with the Calib 7.0 software (to the IntCal13 calibration curve), standard deviation is given at 2 sigma.
the lack of any technical ceramics or structural remains directly relating to metalworking, it might even be tempting to argue against a utilitarian nature of the metal debris. However, there is also no evidence from this part of the site that might be interpreted as indicative of an act of intentional or structured deposition, and the presence of a casting flash and a lip among the waste metal are hardly reconcilable with the notion of ritual burning having produced the droplets and other molten bits. On balance then it seems most likely that we are indeed dealing with a workshop area in which both bronze casting and gold working took place, and while a different sector of Haughey’s Fort has produced features for which a ritual background is being considered by the excavators (Mallory & Lynn 2002, 535), these are not associated with any metal finds.

Various possible explanations for the lack of crucible and mould fragments from the features that have produced casting debris come to mind. For one, the latter are situated very close to the edge of the excavated part of the site, and it seems rather doubtful if the entire workshop area has been unearthed. There is also difficulty in determining under which circumstances most of the waste metal would have been deposited in those pits. If they indeed at one stage held posts and were only filled in after these had been removed, the fill would most likely consist of surface material from the immediate surroundings. Such residual material does not necessarily need to include ceramic detritus from the casting process, which might well have been cleared out and dumped outside the working area. There certainly is evidence for this practice from Late Bronze Age workshops in other parts of western Europe (González Prats 1992, 245), though at corresponding Irish sites that have seen extensive excavation, mould and crucible fragments were usually encountered in what would appear to have been the actual workshop areas (Cotter 2013, 241–243).

Another question that also needs to be asked is that of the relationship between the metalworking activity at Haughey’s Fort and the ritually deposited clay mould fragments from the nearby King’s Stables (Lynn 1977, 48, fig. 6). Based on the available evidence no clear link can be established between these, although it seems reasonably safe to assume some degree of contemporaneity between the two sites.

One of the pits in the working area at Haughey’s Fort, from which both a bronze casting droplet and a gold stud have been retrieved (Pt. 267), has a radiocarbon determination attached to it that provides an approximate date for the workshop activity between the 12th and 10th centuries Cal BC. This range coincides with that indicated by radiocarbon determinations from other features across the site (Mallory & Warner 1988, 36) as well as with a dendro-date obtained from a piece of waterlogged oak found in the inner ditch (Baillie & Brown 1998, 45). It also partially overlaps with the available dating evidence from the King’s Stables.

If our interpretation of the larger fragment from Ft. 277 as the imitation of an Urnfield cup handle is correct, a date between the later 12th and mid to late 10th centuries BC would fit its typo-chronology rather well, with an increased likelihood in the later part of that range, as cups of Type Fuchsstadt mostly occur in Ha A2 contexts, but in some instances survive into Ha B1, while those of Type Jenišovice are largely limited to the latter (Martin 2009, 58–59, 66–67).

Finally, it should be noted that all four iron objects from the site were retrieved from pits in the same area that has produced the bronze casting debris and gold fragments. Part of the fill of the pit from which the small iron strap, rivet and nail were recovered (Pt. 299) has since been securely dated to the second half of the first millennium BC and thus considerably postdates any Late Bronze Age activity at the site. The exact nature of the site’s reoccupation at this time remains uncertain, but it appears to have been rather limited in extent (Mallory 1995, 84). As highlighted above, so far no evidence of on-site iron working has come to light, and the small quantity of iron ore recovered from Late Bronze Age features would not seem to bear any relationship to metal production.

Discussion

The haphazard and incomplete nature of the evidence retrieved during the 1987 to 1995 seasons makes it difficult to draw any definitive conclusions regarding the organization of Late Bronze Age metalworking activities at Haughey’s Fort and their immediate social and economic context. In any case, despite the residual character of the finds and with the caveat that not the entire workshop area may have been excavated, its low volume would seem to indicate only a limited number of casting episodes. There is nothing here to suggest that we are dealing with an operation involving resident full-time specialists. It is also apparent that metalworking was probably not the only craft activity practised in this part of the site. This is very much in line with evidence for metalworking from other sites of the Irish Late Bronze Age, amongst which only Rathgall with its more than 4000 clay mould fragments stands out as a singular exception (Cotter 2013, 241–243).

On the other hand, the level of skill and artisanship reflected in the meagre remains from the production process that have so far been recovered at Haughey’s Fort clearly implies some degree of specialist know-how. This holds even truer for the goldwork than for the manufacture of base-metal objects (Warner, this issue), although the apparent attempt of reproducing a foreign prototype by drawing on familiar techniques reveals considerable innovative potential also with re-

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3 UB 3386 (charcoal; from Level 9): 2877 ± 60 BP = 1288–1015 Cal BC (Mallory 1991b, 64); see note 2.
4 UB 2123 (charcoal): 2765 ± 75 BP = 1110–802 Cal BC; UB 2124 (twigs): 2585 ± 80 BP = 903–632 Cal BC; UB 2157 (twigs): 2955 ± 45 BP = 1288–1015 Cal BC; all samples were obtained from the bottom of the artificial pond (Layer 4), and thus should be read as providing a post quem date for the deposition of the mould fragments (Lynn 1977, 53–54), see note 2. Hence, the finds from the King’s Stables in theory could also relate to metalworking activities at Navan Fort, which likewise has produced mould fragments. However, as the latter were recovered from scattered residual contexts with even less coherence to them than those that have produced the metalworking debris at Haughey’s Fort, assessing their exact chronological position is fraught with even more difficulties (cf. Waterman & Lynn 1997, 89).
5 UB 15896 (round wood; from Level 7, with LBA pottery): 2813 ± 26 = 1042–903 Cal BC; UB 3384 (charcoal; from Level 6, Iron Age fill): 2253 ± 26 = 903–432 Cal BC; UB 3385 (charcoal; from Level 1, Iron Age fill): 2221 ± 26 = 375–204 Cal BC (Mallory 1991b, 65), see note 2.
gard to the latter. At the same time, it is far from clear that both bronze casting and gold-working would have formed part of a single craft domain, i.e. that both were practised by the same specialist craftspeople. In some other parts of the Atlantic Late Bronze Age world this was clearly not the case (Armbruster 2000, 193–195), and most authors dealing with the Irish evidence seem to implicitly assume that the same also applies to this island (Taylor 1980, 60–70; Eogan 1995, 91–95). While that is probably a plausible assumption, it has to be stressed that a systematic study along similar lines to that undertaken by Armbruster for Iberia, embarking on a detailed comparison of the techniques used in both craft traditions, is still lacking for Ireland.

Overall then, the metal finds from Haughey’s Fort are certainly consistent with the conventional notion that metalworking in the Irish Late Bronze Age was closely linked to high-status sites (Cotter 2013, 241). In terms of the social contextualization of craftspeople, the limited scale of production implied by the scarcity of metallurgical remains from this and most other relevant sites is much more in line with a scenario of peripatetic specialists not fully tied into residential kin groups or closely circumscribed territorial polities (Eogan 1993, 103) than with the model of resident metalworkers favoured by Ó Faoláin (2004, 107–110). The latter is largely based on the exclusive use of ceramic moulds and on a lack of scrap (‘founder’s’) hoards during this period in Ireland. However, evidence from other parts of Western Europe does not lend much support to the notion of a direct relationship between the mould technology used and the residency or non-residency of artisans (cf. Brandherm 2009, 173–177; Kuijpers 2008, 88 f.). Likewise, a reading of scrap assemblages as utilitarian stockpiles of raw material finds little support in a thorough analysis of the hoard record (Maraszek 2006, 248–261). Some degree of mobility is also suggested by the very rapid spread of new artefact designs and manufacturing techniques that can be observed during the opening stages of the Late Bronze Age.

That said, Ó Faoláin (2004, 109–110) is certainly right in pointing out that one has to allow for the possibility of individual metalworkers operating at different levels of skill serving different types of catchment area, even if we are not currently in a position to discern the extent to which such a tiered system might have been in place and how exactly it would have operated in the Irish Late Bronze Age. Clearly, additional research will be needed to shed more light on the issues at hand, and ideally this should include further fieldwork at Haughey’s Fort as well as at the other sites of the Navan complex.

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<table>
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<th>Weight</th>
<th>Season</th>
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<td>buckle fragment</td>
<td>red brass</td>
<td>64 × 29 × 4 mm</td>
<td>19.5 g</td>
<td>1987</td>
<td>HD87, Level 1 (plough soil)</td>
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<td>2</td>
<td>disk-headed pin with bent stem</td>
<td>(bronze)</td>
<td>110 × 14 mm</td>
<td>7.1 g</td>
<td>1995</td>
<td>Tr. 13, Layer C of inner ditch</td>
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<td>3</td>
<td>ring</td>
<td>ternary bronze</td>
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<td>&lt; 0.1 g</td>
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<td>amorphous fragment</td>
<td>ternary bronze</td>
<td>43 × 8 × 7 mm</td>
<td>2.1 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 277, Level 7</td>
</tr>
<tr>
<td>15</td>
<td>amorphous fragments (3)</td>
<td>ternary bronze</td>
<td>max 10 × 7 × 4 mm</td>
<td>0.8 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 277, Level 1</td>
</tr>
<tr>
<td>16</td>
<td>amorphous fragment</td>
<td>ternary bronze</td>
<td>7 × 5 × 3 mm</td>
<td>&lt; 0.1 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 285, Level 12</td>
</tr>
<tr>
<td>17</td>
<td>ring</td>
<td>ternary bronze</td>
<td>27 × 5 mm</td>
<td>5.1 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 7</td>
</tr>
<tr>
<td>18</td>
<td>casting debris (droplet)</td>
<td>ternary bronze</td>
<td>7 × 4 × 3 mm</td>
<td>0.3 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 7</td>
</tr>
<tr>
<td>19</td>
<td>casting debris (droplet)</td>
<td>ternary bronze</td>
<td>7 × 6 × 5 mm</td>
<td>0.4 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 1</td>
</tr>
<tr>
<td>20</td>
<td>casting debris (2 droplets)</td>
<td>ternary bronze</td>
<td>max 4 × 6 × 5 mm</td>
<td>0.2 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 4</td>
</tr>
<tr>
<td>21</td>
<td>amorphous fragment</td>
<td>ternary bronze</td>
<td>&lt; 2 mm</td>
<td>&lt; 0.1 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 7</td>
</tr>
<tr>
<td>22</td>
<td>casting debris (2 droplets)</td>
<td>ternary bronze</td>
<td>max 5 × 4 mm</td>
<td>0.2 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 12</td>
</tr>
<tr>
<td>23</td>
<td>amorphous fragment</td>
<td>ternary bronze</td>
<td>9 × 6 × 3 mm</td>
<td>0.2 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 12</td>
</tr>
<tr>
<td>24</td>
<td>casting debris (amorphous fragment &amp; 2 droplets)</td>
<td>ternary bronze</td>
<td>max 13 × 8 × 4 mm</td>
<td>0.9 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 13</td>
</tr>
<tr>
<td>25</td>
<td>casting debris (flash)</td>
<td>ternary bronze</td>
<td>17 × 9 × 1 mm</td>
<td>0.3 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 14</td>
</tr>
<tr>
<td>26</td>
<td>casting debris (overspill and droplet)</td>
<td>ternary bronze</td>
<td>11 × 6 × 5 mm</td>
<td>0.5 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 306, Level 18</td>
</tr>
<tr>
<td>27</td>
<td>amorphous fragments (3)</td>
<td>ternary bronze</td>
<td>&lt; 1 mm</td>
<td>&lt; 0.1 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 308, Level 1</td>
</tr>
</tbody>
</table>

Table 1 Non-ferrous base metal finds from Haughey's Fort.

<table>
<thead>
<tr>
<th>No.</th>
<th>Object type</th>
<th>Material</th>
<th>Dimensions</th>
<th>Weight</th>
<th>Season</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>knife blade</td>
<td>iron</td>
<td>42 × 8 × 3 mm</td>
<td>2.4 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 278, Level 4</td>
</tr>
<tr>
<td>29</td>
<td>rivet</td>
<td>iron</td>
<td>21 × 3 × 2 mm</td>
<td>0.8 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 299, Level 1</td>
</tr>
<tr>
<td>30</td>
<td>nail/pin</td>
<td>iron</td>
<td>23 × 4 × 3 mm</td>
<td>0.7 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 299, Level 1</td>
</tr>
<tr>
<td>31</td>
<td>strap</td>
<td>iron</td>
<td>62 × 9 × 4 mm</td>
<td>4.9 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 299, Level 6</td>
</tr>
</tbody>
</table>

Table 2 Iron finds from Haughey's Fort.

<table>
<thead>
<tr>
<th>No.</th>
<th>Object type</th>
<th>Material</th>
<th>Dimensions</th>
<th>Weight</th>
<th>Season</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>unworked piece of haematite</td>
<td>iron(III) oxide</td>
<td>16 × 11 × 9 mm</td>
<td>4.0 g</td>
<td>1989</td>
<td>Tr. 1, Ft. 162</td>
</tr>
<tr>
<td>33</td>
<td>unworked piece of haematite</td>
<td>iron(III) oxide</td>
<td>24 × 17 × 16 mm</td>
<td>13.2 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 282, Level 1</td>
</tr>
<tr>
<td>34</td>
<td>unworked pieces of limonite</td>
<td>iron(III) oxide-hydroxides</td>
<td>max 40 × 28 × 8 mm</td>
<td>37.3 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 283, Level 2</td>
</tr>
<tr>
<td>35</td>
<td>unworked piece of limonite</td>
<td>iron(III) oxide-hydroxides</td>
<td>16 × 12 × 5 mm</td>
<td>1.4 g</td>
<td>1990</td>
<td>Tr. 10, Ft. 322</td>
</tr>
</tbody>
</table>

Table 3 Iron ore from Haughey's Fort.