

# Craggie bloomery: iron working in late medieval Sutherland

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## ABSTRACT

*This note details the discovery and partial excavation of a bloomery furnace near Craggie Cottage in Glen Oykel, Sutherland, in 2010. Evidence from the excavation casts light on bloomery iron working tradition and dates the use of the furnace to the late 15th–early 17th centuries.*

## INTRODUCTION

Over a long weekend in mid-September 2010, volunteers from North of Scotland Archaeology Service (NoSAS) and John Atkinson of GUARD Archaeology (formerly Glasgow University Archaeological Research Division) discovered and excavated a late medieval bloomery on a terrace to the north-east of Craggie Cottage, Glen Oykel, Sutherland (illus 1).

The terrace was located on the south-east facing slopes of Knock Craggie (at NGR: NC 33617 05152) at around 110m AOD. Much of the slope and terrace had been peppered with small machine-dug pits and small mounds created in advance of forestry planting. A number of the mounds were noted during field walking by NoSAS volunteers as containing slag. This was reported to Forestry Commission Scotland who commissioned a short exploratory investigation of the site (Atkinson et al 2011: 14–15).

## METHODOLOGY

Prior to excavation, a phase of artefact recovery and survey was conducted to remove all of the slag from the exposed mounds and pits.

Two trenches were subsequently laid out, each approximately 5m×3m. Trench 1 was located over a block of slag evident in pit 34 and oriented north-west/south-east. The second trench was positioned at right angles from this, with a small baulk (c 200mm) separating them (illus 2).

## RESULTS

### *Trench 1*

Excavation revealed the remains of an oval furnace bowl (005) founded upon an old ground surface (012), sitting over the natural sand and gravels of the terrace (illus 3). The furnace bowl was 0.9m×0.6m and oriented north/south (illus 4). Constructed mainly of friable slag material, which sat over a thin band of heat-affected red clay (011), it had a profile that included a distinct overhang along the eastern interior. No visible sign of a tuyere hole was evident, however, the most likely position for this and the associated bellows was on the higher ground to the west. This side had been badly damaged by pit mounding operations.

The bowl contained traces of the final firing in the form of a charcoal and slag-rich layer (010). Analysis of the charcoal revealed that

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TABLE 1  
Analysis of selected charcoal samples from Craggie bloomery

<i>Context</i>	<i>005 / 012</i>	<i>010</i>
<i>Description</i>	<i>Spot sample</i>	<i>Bulk sample</i>
Burnt clay	–	Frequent
Slag	–	Abundant
Modern roots	–	Frequent
Total vol charcoal >4mm	20ml	40ml
% charcoal identified	100%	25%
AMS option	Betula (2.50g) large r/w	Betula (1.36g) large r/w
Alder ( <i>Alnus</i> )	–	2 (0.18g)
Birch ( <i>Betula</i> )	7 (5.91g)	11 (3.62g)

birch dominated the fill, with small traces of alder present (see Miller below and Table 1). A sample of birch round wood was selected for dating and returned a date range of cal AD 1470–1650 (SUERC-32846, 2 $\sigma$ ). A further discrete sample of birch charcoal was also recovered from beneath the furnace bowl (005). This was also dated and returned a range of cal AD 1490–1670 (SUERC-32845, 2 $\sigma$ ).

### *Trench 2*

Excavation revealed two linear features running broadly north-west/south-east across the trench. Feature 009 was narrow and shallow (see illus 3) and could be the base of a furrow associated with post-medieval cultivation of the terrace. In contrast, feature 007 was kidney-shaped in plan and had a lower deposit of charcoal-rich silt (008), capped by a silting layer (003). Fill 008 also contained slag fragments in great numbers and the cut of the pit showed a distinct variation in colour, which may imply burning within the pit.

### IRON WORKING WASTE

Christine Rennie

The assemblage of industrial waste from Craggie is typical of bloomery smelting sites, with the

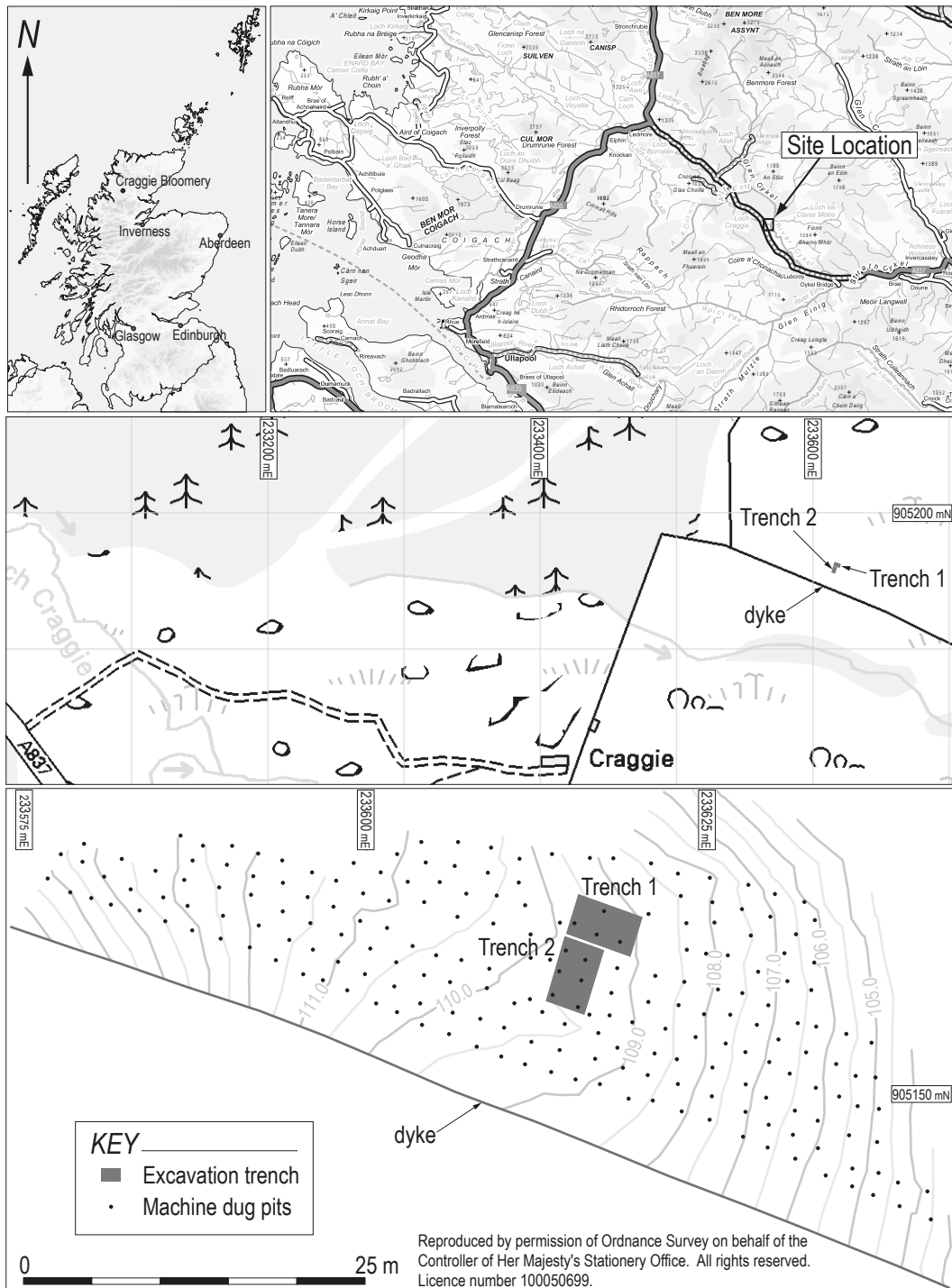
overwhelming majority of material classified as furnace lining, waste and tap slag – forming a total assemblage weight of 58,768g. Much of the material collected was classified as furnace lining, however, at least a third of the assemblage was constituted by iron working waste and occasional fragments of tap slag. The low occurrence of tap slag is unusual for a bloomery site.

Although it would be anticipated that smithing of the unconsolidated bloom was carried out in close proximity to the furnace, no clear-cut evidence of this was found in the form of hammerscale – from a brief examination of the soil samples taken from the excavated features. The source of the metal ore could not be established either, as no evidence of roasted or unroasted ores was recovered.

### BOTANICAL ANALYSIS

Jennifer Miller

Charcoal from two contexts relating to the use of the furnace in trench 1 was analysed (Table 1). The great majority of charcoal recovered was birch (*Betula*), including large round wood fragments from the fill of the bowl (010), and a very small amount of alder (*Alnus*) recovered



ILLUS 1 Site and trench location plan



ILLUS 2 Post-excavation photograph of trench 2 (foreground) and trench 1 (background) from the south-west

mixed with slag and burnt clay from this feature. Birch (*Betula*) was also recovered from beneath the furnace bowl.

The domination of birch charcoal is unusual for a bloomery, but may reflect utilisation of abundantly available local resources. Glen Oykel is within a zone where birch-pine woodlands have always been the dominant *natural* arboreal vegetation (Tipping 1994). Alder is a more usual source of furnace charcoal, being second only to oak in that respect (Tylecote 1962). The high tar content of birch generates a large volume of sticky soot on burning and it is possible that this was a contributing factor to the clay furnace becoming dominated by iron waste products (illus 4) (see discussion).

#### RADIOCARBON DATES

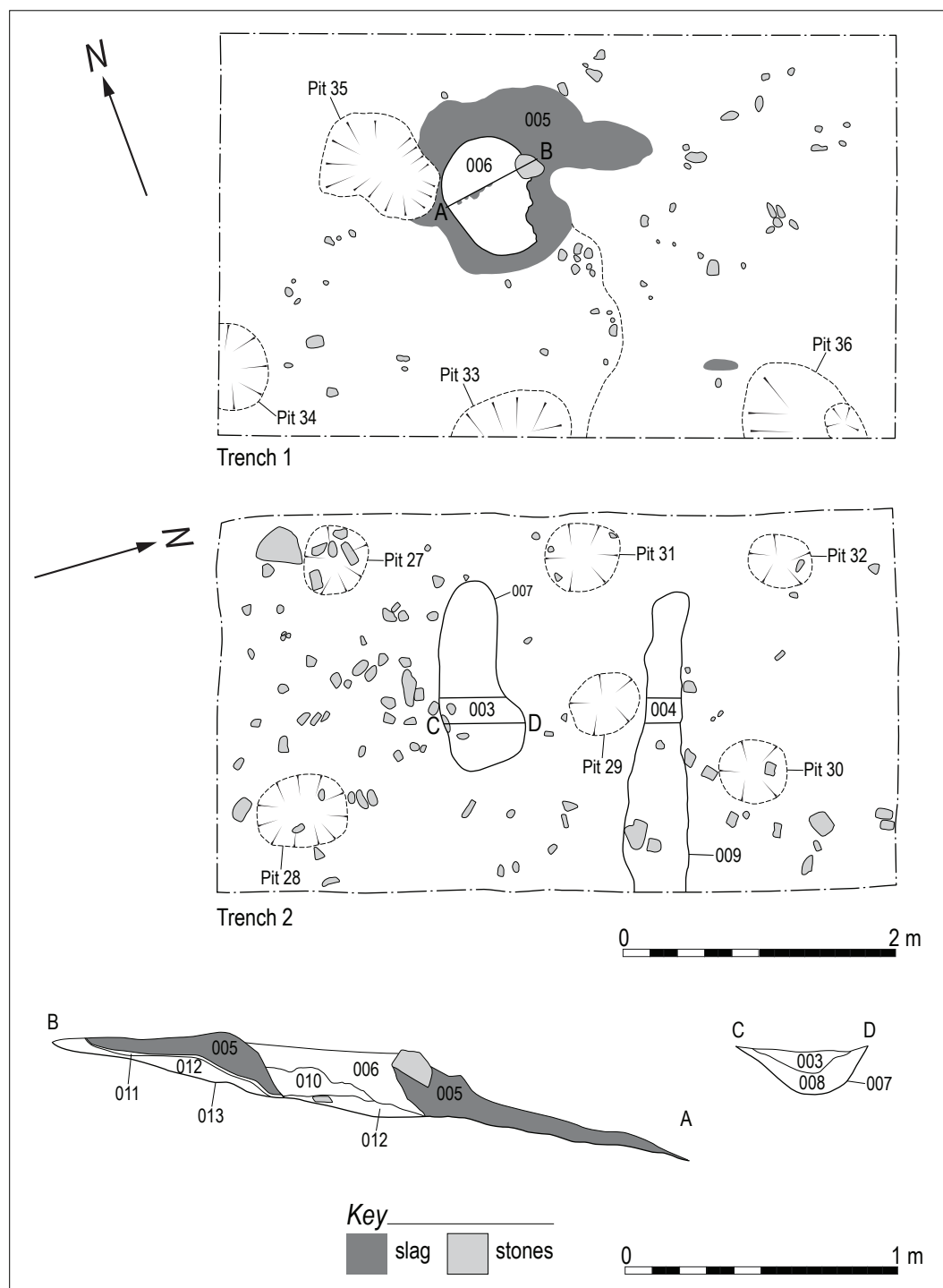
Two samples of birch charcoal were submitted for radiocarbon dating at the Scottish Universities Environmental Research Centre in East Kilbride. Both dates were pursued with the aim of providing

a potential construction date for the furnace and a final date for its use. The results are presented in Table 2 below.

#### DISCUSSION

In 2003, a search of the distribution of early iron working sites in Scotland revealed 294 possible candidates weighted heavily towards the Highland massif (Atkinson 2003). Of that number, 130 sites are currently classed as bloomeries by the National Monuments Record for Scotland (NMRS), 83 examples of which are recorded as bloomery mounds. Only two sites are noted as bloomery scatters. Craggie is notable as a rare example of a previously unrecorded bloomery scatter and especially important given the identification and excavation of a furnace at the site.

Craggie furnace is also exceptional in terms of its scale and construction. At 0.9m × 0.6m, the furnace is substantially larger than comparable examples excavated in Argyll in the late 1990s



ILLUS 3 Plans of trenches 1 and 2 and east/west section through bloomery furnace



TABLE 2  
Radiocarbon dates for Craggie bloomery samples

<i>Sample</i>	<i>Location</i>	<i>Years BP</i>	<i>1σ calibrated</i>	<i>2σ calibrated</i>
SUERC-32846	furnace bowl fill	330 ± 30	AD 1490–1640	AD 1470–1650
SUERC-32845	beneath furnace bowl	290 ± 30	AD 1520–1590	AD 1490–1670

(Photos-Jones et al 1998; Atkinson & Photos-Jones 1999). In the case of Allt na Ceardaich, the furnace was 0.5m × 0.5m and was partially formed by stone blocks and clay walls, whilst the smaller furnace at Tamheich Burn was totally formed by a clay shaft furnace, which was surrounded by drystone outer shell (Photos-Jones et al 1998: 20–1). Craggie appears to have no stone within its construction and to have been built entirely of clay, which had become coated with friable slag during use. Wider comparisons with other excavated sites (eg the 20 sites excavated in the 1960s and published by Aitken

in 1973) has not provided any comparable examples.

In dating terms, Craggie sits within the known sequence for bloomery sites in late medieval Scotland. On the basis of current knowledge, bloomery furnaces date broadly from the 13th to 17th centuries (Atkinson 2003: 38). The two dates recovered from Craggie were statistically identical and seem to suggest that the furnace was only used for a short period of time between the late 15th and early 17th centuries. This evidence, together with the unusual scale and design of the furnace, its friable slag-rich walls and absence of



ILLUS 4 Post-excavation photograph of bloomery furnace from the south-east

a slag mound may all point to its use having been limited. What does seem likely is that the furnace produced the classic 'toffee-like' slag normally associated with functioning bloomery furnaces, and there is clear evidence – in the volume of material recovered (including waste and furnace lining) – to suggest that it operated on more than one occasion. The lack of hammer scale within any of the adjacent features implies that its prime function was possibly related more to smelting than smithing, however, its scale is more in keeping with a smithing hearth arrangement. On balance, with the evidence recovered from this limited investigation we can deduce that a bloom may have been produced and iron worked for a short period at this site. The presence of birch within the last firing and the evidence alluded to by Miller (see above) of its high tar content may explain the evidence further and cast light on why the furnace was abandoned so quickly.

There are certainly few comparable period sites to measure against within the current literature. Excavations such as those undertaken at Glen Docherty, Kinlochewe (Johnston et al 2006), of a large mound of bloomery waste revealed contemporary smelting evidence, but unfortunately no furnace for comparison. In fact, only 12 possible bloomery sites are known from the whole of Sutherland and none of these have attracted any additional investigation. As such, Craggie is unique and casts light on an aspect of late medieval society in the Highlands that is rarely exposed to scrutiny.

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