

Burnswark Hill: the opening shot of the Antonine reconquest of Scotland?

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This paper represents an interim report of the Burnswark Project that has utilised the techniques of battlefield archaeology to locate and accurately identify missiles across a substantial field of conflict in SW Scotland. The distribution, characteristics, dating and proposed historical context of these missiles are argued to support their use in a dramatic episode of 'exemplary force' by the Roman army. The magnitude of the event might be seen to be compatible with an emperor establishing his legitimacy as a military leader.

The complex of earthworks at Burnswark Hill near Ecclefechan in E. Dumfriesshire has excited the curiosity of antiquarians for centuries¹ and provoked debate amongst historians and archaeologists for the last half-century.² The imposing flat-topped summit is completely enclosed by the denuded ramparts of an Iron Age fort which, at 7 ha, is the largest in Dumfriesshire. Almost 300 m above sea level, the fort commands outstanding views of the Solway Basin and Annandale. Besides being the largest hillfort in SW Scotland, it is exceptional because it is held in the grip of two Roman camps of unusual morphology that straddle it to the north and south. The massive nature of the upstanding Roman earthworks, their extraordinary 'artillery platforms', and their positioning in relation to the hillfort are a unique juxtaposition in Europe. Archaeological investigations were first carried out in the late 19th c.; smaller-scale excavations took place in the early to mid-20th c., followed by the wide-ranging investigation by G. Jobey in 1965-70.³

Early investigators saw the site as one of major conflict with the use of overwhelming force, apparently confirmed by an unparalleled (for Britain) quantity of Roman missiles including lead slingshot, stone ballista balls and iron arrowheads found on site, not only within the Roman camps but also on the summit of the hillfort (fig. 1).⁴ More recent authors have put forward a non-conflict explanation for the considerable Roman military investment at Burnswark, and others have followed this suggestion.⁵ A model of a Roman 'field training school' has been developed, as highlighted by the writings of Josephus (*BJ* 3.5.1).

1 E.g., A. Gordon, *Itinerarium septentrionale* (London 1726) 16; T. Pennant, *A tour in Scotland and voyage to the Hebrides* (Chester 1774) 91; W. Maitland, *The history and antiquities of Scotland*, vol. 1 (London 1757) 192; W. Roy, *The military antiquities of the Romans in Britain* (London 1793) 72 ff.; G. Chalmers, *Caledonia, or an account, historical and topographical, of North Britain*, vol. 1 (London 1807) 120.

2 E.g., K. A. Steer, "John Horsley and the Antonine Wall," *Arch. Ael.* 42 (1964) 24; R. W. Davies, "The Romans at Burnswark," *Historia* 21 (1972) 106.

3 G. Jobey, "Burnswark Hill, Dumfriesshire," *Trans. Dumfries Galloway Nat. Hist. Ant. Soc.* 53 (1978) 57-104.

4 E.g., D. Christison, J. Barbour and J. Anderson, "Account of the excavations of the camps and earthworks at Birrenswark Hill, in Annandale, undertaken by the Society in 1898," *Proc Soc Ant Scot* 33 (1899) 198-249; A. Schulten, "Birrenswark, ein britannisches Numantia," *Neue Jb. f. das klassische Altertum* 17 (1914) 607-17.

5 E.g., Davies (supra n.2) 105; Jobey (supra n.3); W. S. Hanson and G. S. Maxwell, *Rome's north west frontier, the Antonine Wall* (Edinburgh 1983) 26; W. S. Hanson, *Agricola and the conquest of the north* (London 1987) 168; RCAHMS, *Eastern Dumfriesshire, an archaeological landscape* (Edinburgh 1997) 179; G. S. Maxwell, *A gathering of eagles: scenes from Roman Scotland* (Edinburgh 1998) 48; R. J. A. Wilson, *A guide to the Roman remains in Britain* (4th edn.; London 2002) 562; D. J. Breeze, "Burnswark: Roman siege or army training ground?" *ArchJ* 168 (2011) 166-80; A. Wilkins, *Roman imperial artillery* (Dumfries 2017) 124-33.



Fig. 1. South Roman Camp seen from the hillfort rampart; the enlarged hillfort-facing rampart and artillery platforms are clear (J. Reid).

K. Steer, who held a wartime commission and became a ‘monuments man’, was the first to propose this model, in 1964.⁶ His three main objections to the conflict scenario were:

- there was no apparent circumvallation;
- the hillfort or ‘*oppidum*’ was not thought to be strong enough to merit such an elaborate siege complex; and
- Barbour’s excavations in 1898 had suggested semi-permanent buildings in the South Roman Camp, which in Steer’s view would have been more in keeping with a long occupation, and inconsistent with a brief siege.

The non-conflict hypothesis received further support when Jobey’s investigations showed that the original stone rampart of the hillfort had been “deliberately felled” at some time before the missile barrage.⁷ Jobey’s interpretation of the site as a “field-exercise area” was further endorsed by his finding of secondary pavements in the hillfort gateways where he postulated were targets for a Roman ‘firing range’.⁸ These points have been adopted, adapted and supplemented by others in subsequent reviews. Still, academic disagreement over a ‘training’ interpretation was acknowledged by the Scottish Archaeological Research Framework, which stated:

The Roman character of the siege works at Burnswark is, however, not in doubt, but the interpretation of the Burnswark earthworks is highly controversial and renewed fieldwork would offer some resolution.⁹

Several recent authors (amongst whom G. Davies¹⁰ and D. B. Campbell¹¹ have published

6 Steer (supra n.2) 24.

7 Jobey (supra n.3) 67.

8 Ibid. 71. Most of bullets were unstratified, coming from Barbour’s earlier excavation backfill in the gateways. Upon finding one of the lead sling bullets below this paving, Jobey suggested this could be explained by their penetrative power.

9 ScARF, *Scottish Archaeological Research Framework*. 4.1. *Landscapes of conquest and resistance: Burnswark: case study* (Soc. Antiquaries Scotland, 2012), available at: <https://scottishheritagehub.com/content/roman-scotland-panel-report>

10 G. Davies, *Roman siege works* (Stroud 2006) 57-60.

11 D. B. Campbell, *Besieged* (Oxford 2006).

extensively on Roman siege tactics) have advanced their own reservations about the training hypothesis, concluding, on the basis of other examples, that the military works “graphically illustrate an actual episode of warfare”.¹² L. J. F. Keppie wrote that the “plethora of offensive weaponry ... indicates the ferocity of the assault”¹³ but went on to suggest that the fieldworks may not necessarily indicate a lengthy siege but could have been support works for a brief overwhelming assault, which was a prelude to more extensive campaigning farther north.¹⁴ He also pointed out that Jobey’s investigations were carried out at a time “of considerable enthusiasm for identifying ‘the practice works’ of the Roman army” (the 1960s and 70s).¹⁵ Two other sites, Woden Law (Roxburghshire)¹⁶ and Cawthorn (Yorks.),¹⁷ have now been re-interpreted in more conventional terms as native earthworks and irregular Roman fort and camp, respectively.¹⁸

It was against this backdrop of controversy that D. J. Breeze produced an extensive review of the arguments for and against a siege as they stood in 2011.¹⁹ The opposing points he considered may usefully be summarized here in a Table:

ARGUMENTS FOR AND AGAINST A SIEGE
(adapted from Breeze 2011)

<i>Arguments for Roman practice</i>	<i>Arguments for a siegelaassault</i>
Hillfort may have been abandoned at time of construction of Roman camps	Hillfort undefended but possibly occupied at time of missile barrage
Hillfort gateways used as targets	Gateways may be a focus of an assault
Irregular design of camps is evidence for troops practicing rampart building	Unusual design of camps could be a tactical response to a conflict scenario
Structures in the South Camp suggest long-term occupation	Jobey’s excavations failed to confirm any walling in the South Camp
Two phases of South Camp equates to re-use by successive training episodes	Jobey interpreted apparent two phases as an artefact of Roman construction techniques
Lead shot was not a feature of the army under the Principate and used only under the Republic	Lead shot is found in later contexts at several other sites, including 4th-c. Vindolanda
Relatively gentle southern slope precludes a siege	Siege works are proportionate to the strength of the defenders
No detectable circumvallation	Many Roman siege sites have no circumvallation

It will be seen that there is an equipoise to most of the arguments. Breeze himself concluded by highlighting the finely balanced nature of the prevailing data but opted for the

12 D. B. Campbell, “The Roman siege of Burnswark,” *Britannia* 34 (2003) 19-33.

13 L. J. F. Keppie, “Burnswark Hill: native space and Roman invaders,” in W. S. Hanson (ed.), *The army and frontiers of Rome* (JRA Suppl. 74, 2009) 241.

14 *Ibid.* 250.

15 *Ibid.* 247.

16 I. A. Richmond and J. K. St Joseph, “Excavations at Woden Law, 1950,” *ProcSocAntScot* 112 (1982) 277-84.

17 Davies (*supra* n.2) 117.

18 S. Halliday, “Later prehistoric farming in south-eastern Scotland,” in D. W. Harding (ed.), *Later prehistoric settlement in south-east Scotland* (Edinburgh 1982) 82; D. B. Campbell, “Ballistaria in first to mid-third century Britain: a reappraisal,” *Britannia* 15 (1984) 82; H. Welfare and V. Swan, *Roman camps in England: the field archaeology* (London 1995) 137 ff.

19 Breeze (*supra* n.5).

practice scenario. For him, the balance was tipped by “Burnswark’s lack of similarity to other visible siege sites”.²⁰

Since no new evidence was available then, it seemed appropriate to the present authors to approach the question by reviewing the investigations thus far and then add new ballistic data made possible by current techniques. It also seemed useful to attempt to set the events at Burnswark in an historical context so as to offer a possible explanation for the magnitude of the Roman intervention.

Archaeological investigations

The Burnswark site is first mentioned by Alexander Gordon who recorded the two Roman camps in 1726. The complex was surveyed by William Roy in the 1750s.²¹ J. Barbour led the first excavations in 1898.²² There have been three subsequent interventions, by no lesser figures than R. G. Collingwood,²³ J. K. St Joseph,²⁴ and notably by Jobey (1965-70),²⁵ as well as intensive survey.²⁶ The 1898 excavations concentrated on survey and profiling of the earthworks and non-selective ‘turning over’ of the North and South Camps in search of Roman artifacts. G. Jobey’s excavations focused mainly on the hillfort’s gateways and rampart sections, with some small-scale excavation on the hillfort summit and in the South Camp. Finds of sling bullets from the S-facing hillfort gateways and Jobey’s confirmation that the missiles were found to lie *on top of* the old stonework (see below) seemed to corroborate the hypothesis that the Romans had erected ‘targets’ at the gates as a form of firing range. Jobey saw the three large *tituli* of the South Camp as gun platforms “admirably located to allow artillery to play” on the gateways of the hillfort.²⁷ However, he offered no explanation for his finding of a Roman arrowhead sealed by the tumble of a transverse turf bank on the W summit, far from any gateway, or the discovery (his trench 11) of a Roman sword apparently abandoned on the tail of the N rampart of the hillfort.²⁸ In his review of the causes of the abandonment of Antonine Scotland, N. Hodgson addressed the now-confirmed fact that the stone hillfort rampart was tumbled at some point prior to the salvo of missiles; he argued that it was a tactical reality that the “hilltop could have served as a defensible refuge whether or not the old ramparts were intact”.²⁹

Tentative suggestions for when the action at Burnswark took place include the Flavian, Hadrianic, Antonine and Severan periods.³⁰ Early investigators wished to see the hand of

20 Ibid. 180. There are indeed no upstanding siege earthworks with which to compare directly. Opposing camps were employed by the Romans at a number of siege sites, including Masada and Numantia, as highlighted by Schulten (supra n.4). Davies (supra n.11) 39 points to a similar arrangement of an aggressively positioned pair of Caesarian assault camps at Corfinium.

21 Campbell (supra n.11) 21.

22 Christison *et al.* (supra n.4).

23 R. G. Collingwood, “Burnswark reconsidered,” *Trans. Dumfries Galloway Nat. Hist. Ant. Soc.* 3.13 (1925-26) 46-58.

24 J. K. St Joseph, “Forts: from the Esk to Dalmakethar,” in S. N. Miller (ed.), *The Roman occupation of south-western Scotland* (Glasgow 1952) 95-103.

25 Jobey (supra n.3).

26 RCAHMS (supra n.5).

27 Jobey (supra n.3) 91.

28 Ibid. 86.

29 N. Hodgson, “The abandonment of Antonine Scotland: its date and causes.” in Hanson (supra n.13) 187.

30 E.g., R. H. Jones, *Roman camps in Scotland* (Edinburgh 2011) 155-56.

Agricola at work,³¹ but Jobey's discovery of pottery from the first half of the 2nd c. made such an early date less likely.³² Influenced by the morphology of the so-called "Antonine fortlet" set in the NE corner of the South Camp some scholars have been led to suggest a late or post-Antonine date.³³ This earthwork has subsequently been re-assessed as a pre-existing native earthwork incorporated by the Romans into the later camp,³⁴ although the possibility has always existed that the earthwork was later commandeered as a 'policing' fortlet. Keppie suggested that the fortlet was Hadrianic in date and that the South Camp belonged to an action relating to the initial Antonine push into Scotland.³⁵

Project design and methodology

As the previous investigators made no systematic attempt to acquire ballistic data by locating missiles across the site (other than at the hillfort gateways) or to link the data from the missile morphology and fabric with the evidence from other sites, these objectives were included in the project design for our own work. Indeed, the hypothesis of "siege-work training camps" at Burnswark seemed to necessitate testing through examining the rich ballistic evidence. It was hoped that this might produce useful new projectile data that could in turn shed light on the choreography, sequence and timing of events and thereby suggest a possible context for such intense Roman military activity. Our methodology was influenced by investigations elsewhere in Europe which have utilised new approaches in examining the possible rôle of mass violence on the part of the Roman state.³⁶ The work at Baecula,³⁷ Kalkriese,³⁸ Harzhorn³⁹ and Velsen⁴⁰ provided particular models for how ballistic GIS data and battlefield débris could be used to reconstruct Roman military activity. All of these projects owe something to the emergent field of battlefield archaeology. The geolocation of metal-detected projectile scatters had been pioneered by D. Scott and R. Fox at Little Bighorn (USA) in the 1980s.⁴¹ Our project had 4 main strands:

1. Non-invasive location by metal detection of residual Roman lead ammunition across the entirety of the site.
2. Limited targeted excavation to confirm the accuracy of a selection of the predicted find-sites for sling bullets.⁴²

31 G. Macdonald, "Fortifications, Birrenswark or Burnswark," in RCAHMS. *County of Dumfriesshire* (Edinburgh 1920) 97.

32 Jobey (supra n.3) 84.

33 S. S. Frere, *Britannia, a history of Roman Britain* (London 1999) 127.

34 Jones (supra n.30) 155; S. Halliday, pers. comm.

35 Keppie (supra n.13) 249.

36 N. Roymans, and M. Fernández-Götz, "Caesar in Gaul. New perspectives on the archaeology of mass violence," in T. Brindle *et al.* (edd.), *TRAC 2014* (Oxford 2014) 70-80.

37 J. P. Bellón *et al.*, "Baecula: an archaeological analysis of the location of a battle of the Second Punic War," *Limes XX* (Madrid 2009) 253-65.

38 A. Rost, "Characteristics of ancient battlefields: battle of Varus (9 A.D.)," in D. Scott, L. Babits and C. Haecker (edd.), *Fields of conflict: battlefield archaeology from the Roman empire to the Korean War* (Washington, DC 2007) 50-57.

39 F. Berger *et al.*, "Die römisch-germanische Auseinandersetzung am Harzhorn (Lkr. Northeim, Niedersachsen)," *Germania* 88 (2010) 313-403.

40 A. V. A. J. Bosman, "Pouring lead in the pouring rain. Making slingshot under battle conditions," *JRMES* 6 (1995) 99-103.

41 D. Scott and R. Fox, Jr., *Archeological insights into the Custer Battle: a preliminary assessment* (Oklahoma 1987).

42 As Burnswark is scheduled as a nationally important monument, it is not permitted to excavate

3. Slingshot experiments to establish the ballistic characteristics of recovered sling bullets.
4. Lead isotope analysis of samples of lead ammunition from multiple parts of the site to help investigate contemporaneity of use and establish or refute a metallurgical link to stratified lead slingshot from the nearby fort at Birrens.

The aim was to determine if discrete distribution patterns of lead sling bullets (*glandes*) could be recognised, and whether the techniques applied in conflict archaeology to distribution patterns of more modern ordnance (musket balls) could be applied here to suggest a narrative of events.

Research on battlefields of the 17th-19th c. has shown that unstratified artefact distributions are physical evidence for battles, providing information on the location, extent and character of the actions.⁴³ In relation to musket balls, it is noted that

lead is also highly stable over long periods of time; even when unstratified and in low pH or other aggressive soil conditions ... the artifacts also give a highly distinctive signature, compared to ferrous objects, during metal detecting survey and so are relatively easy to recover by systematic survey.⁴⁴

Unlike the majority of sites in the United Kingdom that have been the subject of detecting surveys (e.g., Bosworth Field),⁴⁵ the site of Burnswark is pasture, not arable, and largely unaffected by ploughing. This significantly reduces the twin problems of the dispersal of finds and the distracting overburden of modern material. Burnswark had already produced the highest concentration of Roman lead sling bullets from any British site (133 found in previous investigations). The previous work had also shown that lead finds that were not missile-related represented fewer than 3% of the lead artifacts, adding to the predictive value of metal-detecting. The area was therefore sectorised and surveyed over three seasons by a number of experienced detectorists using a variety of machines all with the ability to discriminate signal types. To achieve result consistency, a single machine was then used to calibrate the reading for each findspot.⁴⁶

To complement the detecting survey, targeted excavation of 5 trenches by hand was undertaken to confirm the nature of the signals recorded by the detectors, primarily concentrating on areas supposed to contain lead sling bullets, but also to confirm other signal groups. One was placed on the S face of the knoll inside the SE gateway of the hillfort to verify the readings and test the relationship of the objects uncovered to the stratigraphic sequence within the interior. The second, placed across the hillfort rampart to the west of the SW gateway, was to determine the relationship of the detected items to the rampart's stratigraphic sequence. The third was placed in the N corner of the North Camp where a distinct cluster of readings came from the 2015 survey. The final two trenches were placed in the South Camp to the rear of the N rampart, to confirm the detected presence of sling bullets there, to test the deposits comprising the ramparts, to locate the former ground surface, and to test for the presence or absence of a road behind the rampart.

detected finds within the designated area, which includes the hillfort and both Roman camps. Consent was obtained for a minimum number of targeted interventions to determine any correlations between the detector readings and sub-surface objects.

⁴³ P. W. M. Freeman and A. Pollard, *Fields of conflict: progress and prospect in battlefield archaeology* (BAR S958; Oxford 2001).

⁴⁴ G. Foard and T. Partida, *Scotland's historic fields of conflict* (Edinburgh 2005) 22.

⁴⁵ G. Foard and A. Curry, *Bosworth 1485: a battlefield rediscovered* (Oxford 2013).

⁴⁶ The reference machine was an XP Deus Mk I (XP Industries Castanet-Tolosan) using a 12" coil and version 2.0 software. The findspots were entered into MapInfo GIS software which allowed the results to be plotted to within the nearest metre.

Survey results

Within the scheduled area 2464 signals were recorded; from the surrounding fields and plantation a further 147 finds were recorded. Of this total, 704 signals were determined to be lead. Of the lead signals outside the scheduled area, 17 were determined upon excavation to be *glandes*, and there was a further cache of 27 in the South Plantation.

The 2015 readings were taken in drier soil conditions than in 2016, when rain fell for several days of rain immediately prior to the survey, increasing the conductivity within the soil and allowing a far greater number of signals to be detected in some areas. In the South Field this led to the recovery of a number of sling bullets in an area that had been extensively detected with no observable results in 2015. However, in the areas of Trenches 3 and 5 (see below) the converse held: the locations that produced concentrations of signals in 2015 showed significantly fewer in 2016. This would suggest that the precise correlation of detected signals to findspots noted by the 2015 excavations may have been to some degree fortuitous, and that a greater number of variables can come into play. This was also the case in respect of the finds made in the 2016 interventions, where more sling bullets were recovered than were recorded by detecting. Although all the detected lead signals proved positive and correctly located individual *glandes*, in some cases multiple sling bullets were located, which may have been caused by signal overlap or close proximity. Spatial accuracy was also very high, with bullets excavated within a couple of centimetres of the marker flags.

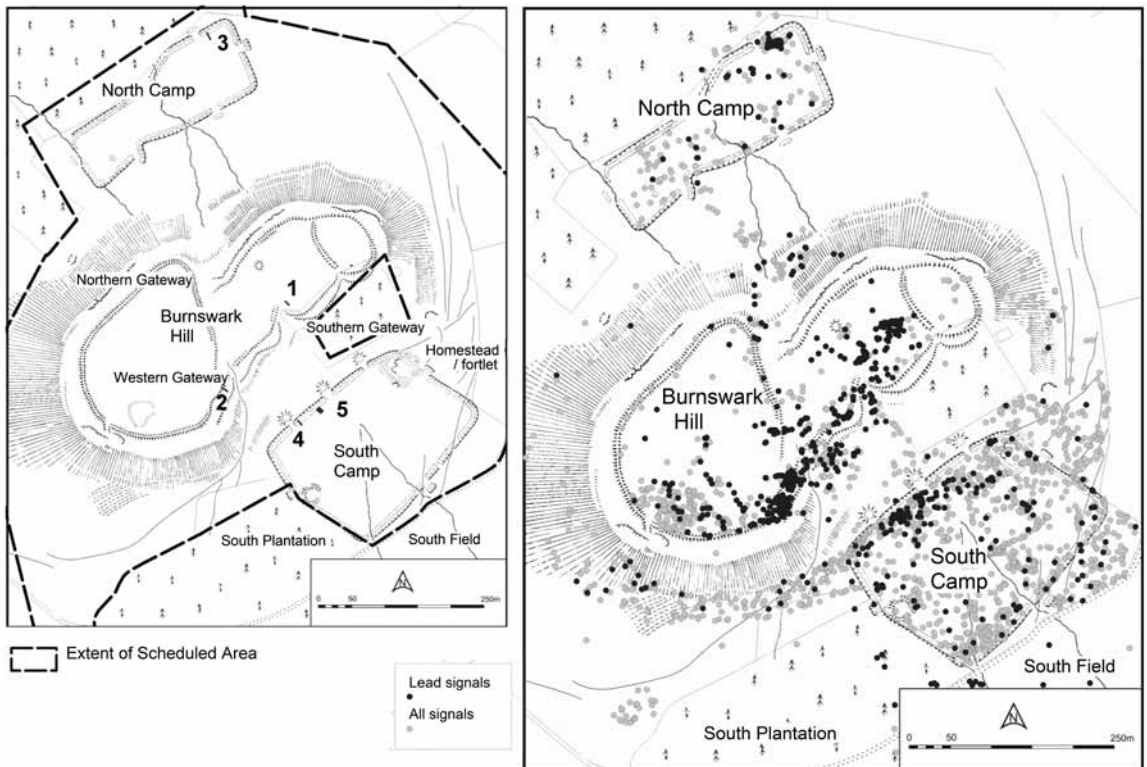


Fig 2. Excavation trenches 1-5 and the distribution of lead signals from 2013 to 2017 (black dots).

Separating lead signals from the overall readings shows a distinct distribution (fig. 2), with a heavy concentration along the rampart of the southern aspect of the hillfort and

over wide parts of the interiors of the middle and W summit. No bullets were detected on the extreme E summit. Although there were scatters around the W and S gateways, the densest concentrations were on the flanking ramparts, particularly the SW shoulder of the hill and a dense band within the hillfort's interior to the east of the S gateway. There was also a linear band along and immediately behind the N rampart of the South Camp, extending around the base of the hillslope to the west. The distribution on the ramparts and within the interior of the fort may reflect different trajectories: one, a direct low trajectory shot aimed at the area of the rampart, which is visible from the base of the slope; the other, a higher trajectory aiming to lob missiles blindly over the visible crest into the interior (which is invisible from the South Camp). A cluster was also noted at one end of the North Camp (see below), along with a relatively localised scattering on the exterior slopes below the hillfort's N gateway.

Targeted excavations

Trench 1, laid out northeast of Jobey's excavation of the central S gateway, found little in the way of structural works within the interior, apart from a single posthole. A broad surface of small angular stones in the SE part of the trench may represent some form of yard surface or a route heading from the entrance towards the E half of the hillfort. The only pottery from the excavations, a fine coarseware with a blackened exterior surface of probable Iron Age date, was recovered from just above this surface. The excavation showed that the preliminary detecting survey was remarkably accurate, with only one survey marker failing to correlate upon excavation with a find, and with finds identified beforehand as lead slingshot being shown to be so. The stratigraphic position of the bullets, just below the topsoil and in the upper surface of subsequent layers, indicates that the barrage of incoming missiles was one of the final events to occur in this part of the site.

Trench 2, laid out on the face of the rampart 45 m west of the hillfort's W gateway, also confirmed sling bullets as belonging to the final recordable activity on the S ramparts and verified Jobey's statement that the bullets overlay the stones of a collapsed or, as he suggested, a rampart that had previously been deliberately demolished. The presence of

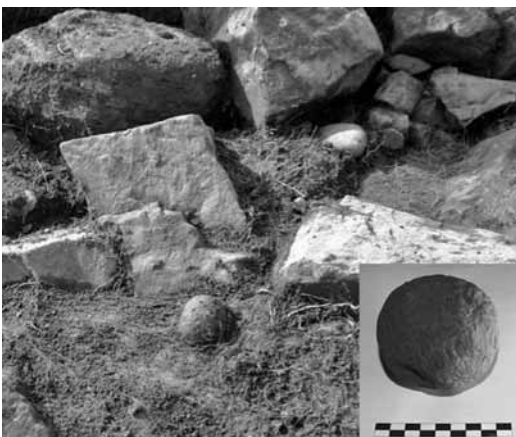


Fig. 3. Ballista ball lying directly above rampart stones (A. Nicholson).

carved stone balls (which, by morphology, size and weight, and by comparison with other projectiles previously found at Burnswark and elsewhere,⁴⁷ can reasonably be interpreted as shot from a ballista), and an iron point possibly from a ballista bolt, all found in the lower part of or directly below the topsoil, strongly point to a missile barrage of mixed weaponry (fig. 3). This location would suggest that the missiles were not being directed at a target in the gateway itself. Indeed, the heavy concentration of lead readings on the shoulder of the hill to the south of the trench, extending up to 105 m from the gateway, would

⁴⁷ M. C. Bishop and J. C. N. Coulston, *Roman military equipment from the Punic Wars until the fall of Rome* (Oxford 2006) 59.

seem to indicate that saturation of long sections of the ramparts themselves was the Roman objective. The front and back edges of the stone ramparts were located, showing it to have been *c.*3 m wide at its base.

Trench 3, set behind the N rampart of the North Camp, uncovered a band of stone that we interpret as the core of the Roman rampart. It seems to consist of local fractured bedrock perhaps cast up from the excavation of an exterior ditch. Unlike the rampart of the South Camp (*trench 4*), on this stretch there was no significant earth banking, which may reflect its position on the lower side of the camp, or it could be related to mediaeval/post-medieval agricultural activities reducing the height of the rampart. The stratigraphic position of the individual sling bullets, just below topsoil and in the upper surface of subsequent layers interpreted as hillwash, again indicated that the missile event was the last stratified activity to occur within the area of the trench. Within the band of stone, however, a large cache of sling bullets lay in a band (*c.*70 x 50 cm) of dark grey, slightly sticky soil that we interpret as the traces of some kind of organic container for the bullets, which were lying side by side and up to 4 layers deep (fig. 4). In total, 375 sling bullets were recovered from the cache; the remainder were deliberately left unexcavated beneath the E section. Most bullets had a white, oxidised surface, but some had little oxidation in places, suggesting that decay had been inhibited, presumably by some kind of container (a leather bag could account for the darker organic soil). The excavated sample constitutes the largest single group of Roman lead sling bullets recovered in Britain and has enabled a new typology to be created (see below).



Fig. 4. Cache of sling bullets within stony rampart layer of the North Camp (A. Nicholson).

Trench 4 revealed a sequence of deposits through the N rampart of the South Camp which could indicate two phases of construction, corroborating the evidence from *Trench 5* and suggestions from LiDAR and other fieldwork⁴⁸ that there may have been more than one phase to this camp. Jobey had found a similar series in his cutting (14) across the rampart of the South Camp but ascribed it to dump lines of added material that had been excavated from the bottom of the ditch in front.⁴⁹ Midway down the trench, on its W edge, a cut feature with vertical packing stones probably represents a timber structure at the rampart's rear that was associated with the defences of the N rampart's westernmost

48 D. Cowley, S. Halliday, H. Welfare and F. Hunter, all pers. comm.

49 Jobey (*supra* n.3) 81.

gateway. Two fragmented sandstone ballista balls, a single lead sling bullet and a copper-alloy strap-fitting were recovered from the rampart's back slope.

Trench 5, also set behind the N rampart of the South Camp, provided the main assemblage of sling bullets from this southern sector, enabling a comparison to be made between the bullets from the South and North Camps and those recovered from the hill in the 2015 excavations as well as in the earlier works by Barbour and Jobey. They derived from two major groups: at the base of the tail of the later rampart, and (as with other sling bullets) just below topsoil and accumulated hillwash. The western group of 28 bullets was found in and amongst the stony deposit overlying a pebble surface. The consistency of their alignment suggested that they may have rolled down the slope of the rampart (rather than simply having been dropped or deposited). The presence of the pebble surface, underlying the tail of the rampart and lying up against an earlier bank on a slightly different alignment (as was revealed in a sondage on the final day of excavation), is suggestive of the N rampart being constructed in two phases. This is consistent with the indications from Trench 4.

The finds

The most significant type of find was Roman lead slingshot. In total, 588 pieces were excavated within the confines of the 5 trenches and in those metal-detecting areas outside the scheduled area where excavation is permitted. The lead shot fell into 6 main types, with a small number that did not conform to the groupings. Two of these classes were known from previous excavations and four new classes were noted. This has allowed re-assessment of the finds from previous excavations, with some of the older finds now re-assigned to the new typology. In 1990, in his review of lead *glandes* across Europe, T. Völling felt able to identify 9 distinct types based on morphology.⁵⁰ Most of these Continental types are variants of the bi-conical ovoid. Some of the earlier specimens show a more elongated spindle shape not so far discovered in Britain. In 1987, S. Greep had suggested a simpler Type I or Type II typology when describing over 60 *glandes* found at Windridge Farm near St Albans and reviewing others found in the country.⁵¹ The Burnswark typology now extends Greep's to create 4 sub-groups within Type I, while adding Types III-VI. In all the major groups of *glandes* from Burnswark the casting line, where visible, lies around the central circumference of the bullet, rather than along the long axis, as seen in the Windridge Farm and most of the Continental examples (fig. 5).

In addition to the *glandes*, two stone projectiles, almost certainly ballista ammunition, were recovered. One was embedded in the collapsed rampart material in Trench 2; the other lay just at the foot of the rampart by the South Camp's W gateway (Trench 4), where the fragmentary remains of two possible others were recovered. All were of local red sandstone. An iron projectile point, again probably from a ballista, was recovered from the rampart material in Trench 2.

Recovered from the back slope of the rampart in Trench 4, in a deposit contemporary with the sling bullets, was a complete cast copper-alloy strap-fitting; it consisted of a circular hoop with a flat circular stud fixed to one side via a neck, and it was decorated with a moulded relief triskele pattern having panels of red and yellow enamel between the arms

50 T. Völling, "Funditores im römischen Heer," *Saaljb* 45 (1990) 24-58.

51 S. J. Greep, "Lead sling-shot from Windridge Farm, St Albans and the use of the sling by the Roman army in Britain," *Britannia* 18 (1987) 183-200.

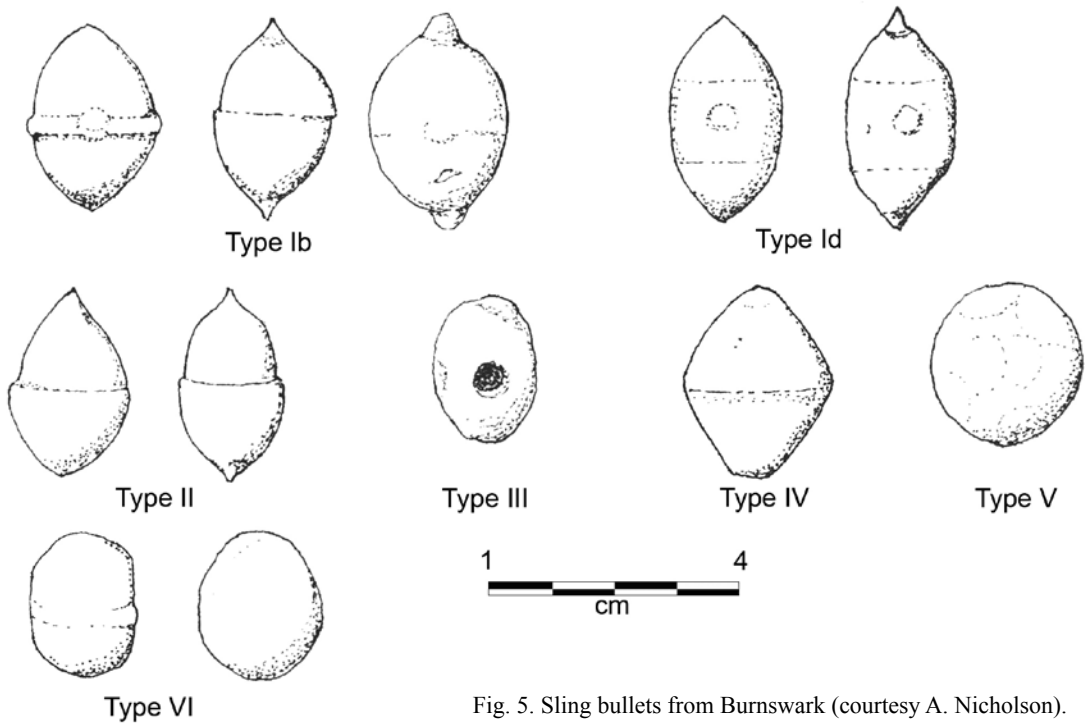


Fig. 5. Sling bullets from Burnswark (courtesy A. Nicholson).

(fig. 6). Buttoned rings are believed to be baldric or sword belt-fasteners and are often found on sites with Roman military associations.⁵² If it was lost at the same time as the bullets, then the piece was in use considerably later than the 50 B.C.–A.D. 60 date span normally ascribed to this group of objects. It may also relate to a possible earlier phase of occupation of the South Camp inferred from the stratigraphy in Trenches 4-5 (see above).

Ballistics experiments

Interpreting events that unfolded at Burnswark is influenced to some extent by our understanding of the ballistic capabilities of the Roman army. Although trilobate arrowheads and carved stone ballista balls have been found on the fort ramparts,⁵³ it is the plethora of *glandes* that offers the most immediate picture of the actions which took place. The several modern experiments aimed at producing meaningful performance data, however, have produced widely varying results, the maximum ranges varying from 70 to 400 m.⁵⁴ As might be expected, the most important factor appears to be the experience of the slinger; thus ‘experts’ achieve up to three times the distance of relative novices.

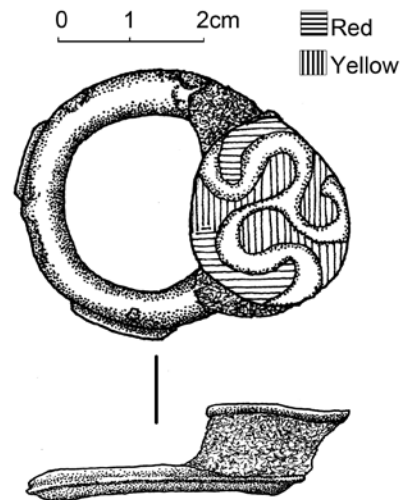


Fig. 6. Buttoned ring (sword belt-fastener); note the triskele enamel motif.

52 F. Minter, “Strap fasteners from Suffolk,” *Lucerna* 28 (2004) 12-14.

53 Jobey (supra n.3) 86.

54 E. T. Skov, *Experimentation in sling weaponry: effectiveness of and archaeological implications for a world-wide primitive technology* (Anthropology Department Theses and Dissertations; Univ. of Nebraska-Lincoln 2013)

Replicating the ballistics of slingshot of the weight and shape of those from Burns-wark using a variety of reproduction slings was therefore considered necessary in order to understand the range and flight characteristics of the ammunition deployed on this site. Such experiments could introduce some confidence that the distances involved were well within the range of an 'average' slinger; they could also determine elements such as drop rate, recovery rate, and visibility that had not been previously tested. For this purpose, a practice slinging-range was set up on a disused playing field and bullets with a variety of shapes and weights were recorded for accuracy, maximum range, and recoverability, using a slinger of several years' experience.⁵⁵ 'Fumble' rates under pressure were also recorded since the phenomenon of dropped, unspent ammunition had been recorded at Little Bighorn and other battlefield sites.⁵⁶ It was also hoped that this could give an indication of the stance positions of the slingers in antiquity.

A total of 300 replica bullets were created from low-lead-content casting alloy (LLCA) or high-density clay. Of these, 20% were drilled with 4-mm holes to replicate the type III bullets mentioned above. Accuracy was established using a 50-cm-diameter hoop at a range of 25 m using video recording at a frame rate of 100 fps. No difference in accuracy was noted between bullet shapes. It was seen that the smaller type III bullets could be fired as multiples in a grape-shot fashion, a phenomenon previously noted by T. Richardson.⁵⁷ The maximum range of the larger bullets was more difficult to establish as they could not be visually tracked beyond 30 m despite receiving a coat of high-visibility paint.

Since lead bullets were impossible to track visually, metal detection was employed to trace the most distant shot. A similar problem of visibility was noted by B. Laharnar of the Slovenian Archaeology Service when he performed similar experiments.⁵⁸ In our experiments, bullets that could be recovered reached 150-170 m. We made three other useful observations. First, it was noted that the unintentional drop rate under stress (rapid fire) was c.5%. Second, the recovery rate of maximum-range 'lob' shots was c.10% without the aid of a metal detector. Third and most unexpected, the smaller shot, several of which had a single 4-mm hole on one side (type III), was noted to be aerophonic (it whistled); the oscillation rate of this shot was calculated from recordings to be 60-80 Hz. This phenomenon, if used in battle, could represent an early kind of psychological warfare, and may relate to Julius Caesar's observation (*Bell. Afr.* 83.4) that the war elephants ran amok terrified by the noise of the slings and stones.

At this point, it may be helpful to set in perspective the comments of Vegetius (*De re militari* 1.16 and 2.23). Writing on military matters in the late 4th c., the author outlined his advice on training recruits in throwing stones and slinging (particularly using the *fustibalus* or staff sling, a weapon not attested during the Early Empire). His comments regarding ammunition are apposite since he stressed the use of stones as being freely available.⁵⁹ Our

55 J. H. Reid and A. Nicholson, "Roman slingshot from Scotland: some new discoveries and recent observations," forthcoming elsewhere.

56 D. D. Scott, *Uncovering history: the legacy of archaeological investigations at the Little Bighorn battlefield national monument, Montana* (Lincoln, NE 2010) 65; also id. (pers. comm.).

57 T. Richardson, "The ballistics of the sling," *Royal Armouries Yearbook* 3 (1998) 47.

58 B. Laharnar, Z. Smit and I. Ravbar, "Sling and slingshots — an example of experimental archaeology and application of statistical methods in archaeology," *Arheo* 28 (2011) 84 [Slovenian with English summary].

59 Stones are used as ammunition for practice and in modern-day slinging competitions in the

experimentation suggested that it is much easier to track the larger surface area of stone ammunition.⁶⁰ It allowed for the fine tuning necessary for practice and confirms that lead bullets are to all intents and purposes invisible in flight.⁶¹

Lead isotope analysis

The contemporaneity of the North and South Roman Camps had never been firmly established; they had been tentatively linked by certain similarities in construction, such as the massive nature of the hillward-facing rampart of each and their oddly configured *tituli*. To test the hypothesis of the use of slingshot in a single event (for which we postulated that the lead signatures might have much in common) or conversely, the hypothesis of repeat visits over a period of time by practicing troops (which might give rise to heterogeneous lead signatures), we utilised lead isotope analysis (LIA). This would help determine if the lead bullets from the North and South Camps and from other widely dispersed areas of the site were linked metallurgically. Of course, this would allow us only to test a linkage in terms of period of use but not necessarily a linkage in terms of the construction of the earthworks.

Prior to our project, no bullets at all had been identified from the North Camp, but following two seasons of excavation multiple bullets were identified and retrieved for examination from both camps, and new specimens were isolated and excavated from the hillfort ramparts as well. A wide selection of shot from across the site was then sampled for mass spectroscopic analysis of three common lead isotopes.⁶² It was hoped that triangulation of this data might add confidence to the morphological assessment. This work is still ongoing but the initial results have been encouraging. The LIA diagram (fig. 7, overleaf) shows that the bullets from Burnswark cluster into two adjacent groups. The main cluster (solid ellipse) encompasses bullet types I, III, IV, V and VI selected randomly from North and South Camps and the hillfort summit. The smaller cluster (dotted circle) is comprised solely of morphologically distinct type II acorn-shaped bullets. The Burnswark examples in this grouping were excavated in the same context as the other shapes from the hillfort's summit. Type II bullets are rare in Britain. The LIA results of this type from Burnswark were compared with three similar type II bullets from Birrens from a late Hadrianic or early Antonine context excavated by A. S. Robertson in the 1960s.⁶³ The Birrens bullets were indeed confirmed as having LIA signatures identical to the Burnswark pieces.⁶⁴ It

Balearic Islands. The sling ammunition at Burnswark consists almost exclusively of lead bullets.

60 *Supra* n.55.

61 Sling stones as used by modern Balearic slingers have a much larger surface area (up to 40 times larger) than lead bullets and are easier to track visually over long distances (>30 m). The distances from the South Camp to the hillfort rampart at Burnswark are significantly in excess of 100 m.

62 The Burnswark Project benefitted from collaboration with R. Müller and S. Klein who are undertaking a wide-ranging programme of LIA analysis of sling bullets from across the empire as an extension of their work on Republican sling bullets: see R. Müller, G. P. Brey, H.-M. Seitz and S. Klein, "Lead isotope analysis on late Republican sling bullets," *Arch. Anth. Sci.* 7 (2015) 473-85.

63 A. S. Robertson, *Birrens (Blatobulgium)* (Edinburgh 1975) 131 fig. 44.

64 As part of the LIA survey, we traced two other type II bullets, both unstratified, from Housesteads and Carlisle. Because of the rarity of this morphology, they too were sampled and found to have LIAs identical to the Burnswark/Birrens type IIs.

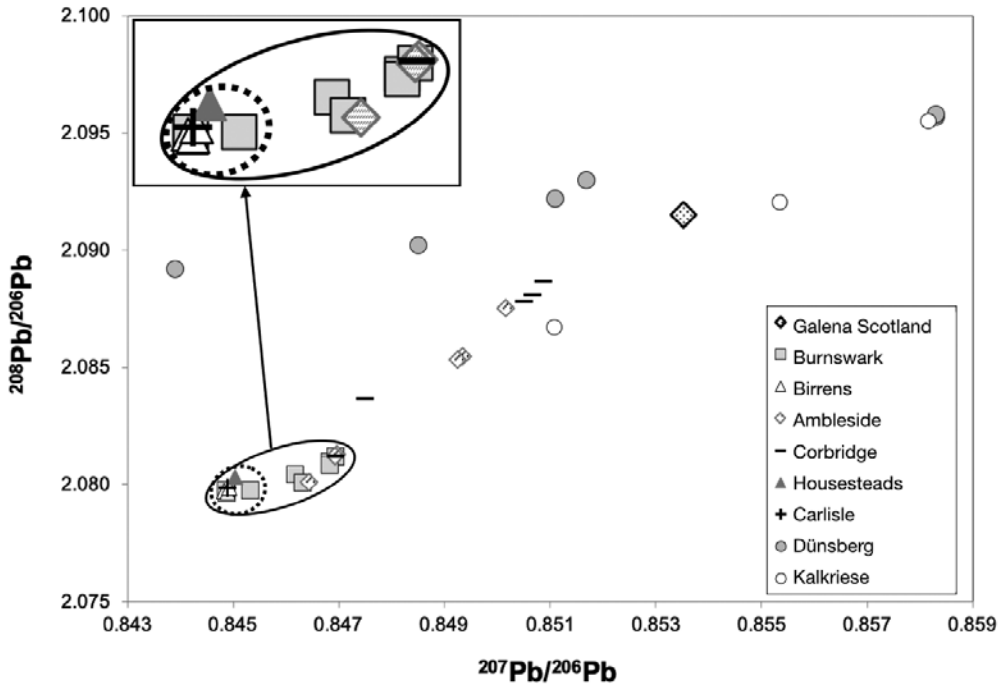


Fig. 7. Lead sling bullet isotope ratios: solid line = Burnswark main group; dotted line = Type II (diagram courtesy R. Müller).

can also be seen from the preliminary LIA diagram that results from other sites are often heterogeneous or display only a loose clustering. By contrast, there is a striking isotopic clustering of the main group from Burnswark irrespective of type or context.

Discussion

It is probably useful to highlight two broad points relating to the ‘practice *versus* siege’ debate (Table 1 above) before considering the data from the current study. First, it is generally accepted that the Roman army created practice earthworks. From a ‘practice’ viewpoint, one might explain the extraordinary shapes of both the Burnswark camps as being due to the ineptitude of novice military engineers, but this is not the case at other practice camps and it would be difficult to ascribe any of the attributes described by Jones in the passage cited to the Roman earthworks at Burnswark. Their unusual shapes may more reasonably be explained as a tactical response to the terrain, as is illustrated at other known siege sites such as camps F and G at Masada⁶⁵ or the highly irregular camps at Numantia.⁶⁶ Second, if Burnswark does represent a ‘practice siegework’, then no similar arrangement has been identified in the empire with which to draw parallels. On the other hand, if it represents a ‘true siege’ (more precisely, an assault supported by defended camps), Burnswark would be the only siege site confidently located in Britain thus far, although several others are known in the Roman world. It has been argued that the uniqueness in Britain renders the conflict theory less likely,⁶⁷ but almost every theatre of major conflict in the empire exhibits traces of a number of sieges.

65 E.g., Davies (supra n.10) 89, fig. 36; Campbell (supra n.11) 175.

66 Schulten (supra n.4) 607-17.

67 Wilkins (supra n.5) 125.

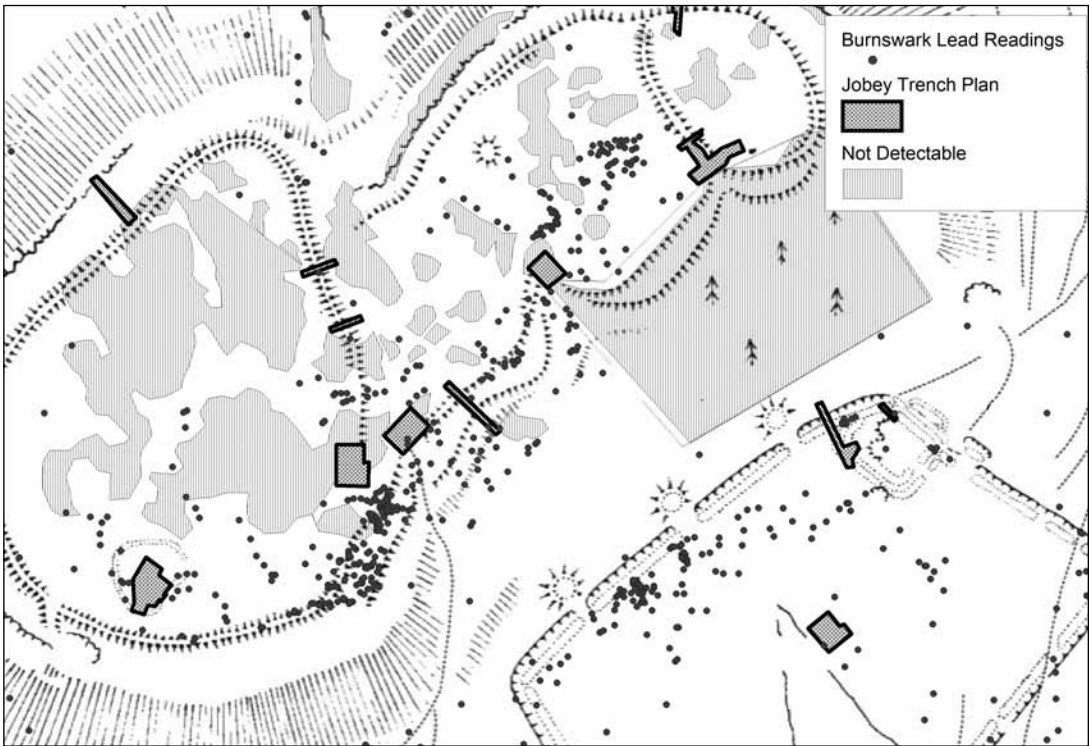


Fig. 8. Detailed view of the distribution of *glances* across the hillfort and South Camp ramparts. Large areas of the summit where metal detectors cannot be employed suggest that the actual numbers may be much higher.

We can now identify the approximate distribution of lead missiles and (as is shown by our excavation and the previous work by Jobey) their stone ballista-ball and arrowhead counterparts from which to suggest the nature of the action at Burnswark (fig. 8).⁶⁸ Could the missile scatter identified by our study reasonably be ascribed to practice? Jobey suggested that the distribution of missiles from his limited excavation in the entrances of the hillfort could support the hypothesis that targets were set up in the derelict gateways. Although attractive to explain why bullets might be found in the gateways,⁶⁹ it is a difficult hypothesis to support when the true distribution of the barrage scatter extends across almost half a kilometre of hillfort rampart. Further, it has rarely been pointed out that both of the gateways on the S side of the hillfort have limited visibility from the South Roman Camp, especially the SE gateway which lies at the end of a gully and is obstructed by the shoulder of the adjacent hill. The distribution pattern from the current study demonstrates that Jobey's deduction that missiles were focussed within the southern gateways for target shooting (actually a product of the limited excavation areas and selection bias) is no longer tenable.

It may be instructive to look for other studies that have produced missile scatters. Conflict archaeology provides spatial distribution data from more recent battles such as

⁶⁸ The hilltop at Burnswark is covered by patches of thick rushes that preclude metal-detecting in c.30% of the area. This would suggest that our results underestimate the missiles actually present, particularly on the W plateau where vegetation is densest.

⁶⁹ Keppie (supra n.13) 246 points out that the gateways and ramparts are where one might expect particularly concentrated fire prior to an assault.

Bosworth,⁷⁰ Killiecrankie⁷¹ and Little Bighorn,⁷² but there are also some sites in antiquity where missile distributions are preserved *in situ*, facilitating a more direct comparison. Gamla is one such place where distribution data has been carefully mapped.⁷³ Here, during the siege prosecuted by Titus in the First Jewish Revolt, the rampart was saturated with a mixture of ballista balls and arrowheads. The intense distribution of missiles,⁷⁴ along the rampart and just inside the Jewish hilltown, is compatible with suppressive fire. It is also comparable to the distribution pattern at Burnswark. Baecula⁷⁵ and Velsen⁷⁶ have also shown wide scatters of missiles, with local clumping. The admixture of projectile types is variable too across sites of the Roman period, some having a predominance of sling bullets, others ballista balls or arrowheads. The contention that the absence of bolt heads must point to training activity⁷⁷ is weakened by the absence of this missile type at Masada, despite the presence of ballista balls.⁷⁸ Similarly, at Gamla, although bolt heads were found, these were in the minority when compared to the thousands of ballista balls and conventional arrowheads.⁷⁹ Despite the acidic soil at Burnswark, which results in poor preservation of iron, several trilobate iron arrowheads were found by Jobey on the ramparts of the hillfort, suggesting the presence of (Syrian?) archers.⁸⁰ Our investigations were focused on lead missiles for the reasons given above; while we located several hundred iron signals, these were not included in the trenches we chose to open and they remain *in situ* for future investigators, but one iron missile head was serendipitously uncovered in the 1-m wide head of trench 2 and a second was accidentally ploughed up in the 1970s on the hillfort's S slope in the forestry plantation.⁸¹

It could be suggested that the finding of 6 different types of lead shot might hint at a missile proving range. The basis of this hypothesis is perhaps unduly influenced by a modern perspective derived from aerodynamic testing centres. It is similar to other previous suggestions by R. W. Davies⁸² (e.g., Roman troops were using up 'expired' ammunition, or 'exploding' bags of 'shrapnel' were being catapulted up the hill). It is clear from other

70 Foard and Curry (supra n.45).

71 A. Hall *et al.*, "Corrosion studies and lead isotope analyses of musket balls from Scottish battlefield sites," in I. Turbanti-Memmi (ed.), *Proc. 37th Int. Symposium on Archaeometry* (Berlin 2011) 593, fig. 1.

72 Scott (supra n.56) 48.

73 D. Syon, "Gamla — city of refuge," in A. M. Berlin and J. A. Overman (edd.), *The First Jewish Revolt: archaeology, history and ideology* (London 2002) 134-53.

74 Over 2000 ballista balls and 1000 arrowheads were excavated mainly along the line of the rampart and just within the town.

75 Bellón (supra n.37) 255. The projectiles from Baecula are mainly conventional iron arrowheads and lead sling bullets.

76 Bosman (supra n.40) 101. The finds from Velsen are almost exclusively lead sling bullets.

77 Breeze (supra n.5) 176.

78 G. D. Stiebel and J. Magness, "The military equipment from Masada," in J. Aviram, G. Foerster, E. Netzer and G. D. Stiebel (edd.), *Masada VIII: The Yigael Yadin excavations 1963-1965, final reports* (Jerusalem 2007) 23. Projectile finds from Masada are ballista balls and conventional arrows.

79 D. Syon, pers. comm.

80 Jobey (supra n.3) 86.

81 W. F. Cormack, "Further surface finds at Burnswark," *Trans. Dumfries Galloway Nat. Hist. Ant. Soc.* 3.8 (1959-60) 190 pl. x. Although this weapon point is triangular in cross section (see the debate in Keppie [supra n.13] 246), bolts of similar profile have been recovered from Chesters, Traprain, Inveresk, and Straubing (Bavaria).

82 Davies (supra n.2) 109.

conflict sites, particularly Velsen,⁸³ that a variety of forms of shot were used during sieges or assaults, probably reflecting the idiosyncrasies of individual units and the work of different armourers and lead-smiths. Roman slingers are known to have used stones and clay shot — a less intensive use of resources, and much easier to track in flight than the smaller moulded lead bullets. It may be considered both wasteful and ineffective to dispose of useful and more lethal ammunition on a ‘firing range’ where the very act of practicing is made difficult by the choice of lead, rather than stone or clay, for the missiles.

Possible historical context

Lead Isotope Analysis has shown further correlations between the bullets, irrespective of their morphological type or spatial location. To judge from their stratigraphic positions in the excavations (both recent and earlier), all the *glandes* recovered may be more or less contemporary.⁸⁴ The identical form and isotope signature of the Type II *glandes* from Burnswark to three Type II *glandes* from stratified deposits at Birrens,⁸⁵ just 4 km to the southeast, is compatible with a late Hadrianic or early Antonine date. The data from Burnswark may represent a primary missile barrage prior to a frontal assault of the hillfort by Roman troops who emerged from a temporary assault camp situated to the south, having also established an elongated blockade camp to the north.

The proposal made in the early 20th c. that the Roman activity at Burnswark was related to the Agricolan invasion was founded on relatively slim evidence: it was based on a desire to recognise the activities of Agricola and on the mistaken belief that lead sling bullets were no longer in use by the army beyond the early 1st c. A.D.⁸⁶ We now know the latter to be false, examples of lead slingshot having been found in several later contexts in Britain, some even coming from a 4th-c. horizon (Vindolanda).⁸⁷ A review of Jobey’s pottery dating evidence,⁸⁸ the finds of coins in the vicinity, and the isotopically-linked bullets from Birrens make a date of the mid-2nd c. more likely. Added to this is the array of discoveries previously made at Birrens: one of Britain’s largest Victory inscriptions, dedicated to Antoninus Pius,⁸⁹ and an inscription indicating the presence of combined vexillations of *XXII Primigenia* from Mainz and *VIII Augusta* from Strasbourg,⁹⁰ legions both known to have been drafted in from the German frontier for the Antonine invasion. Further, west of the ruined fort at Birrens was found a rare figurative representation of the goddess Brigantia, dedicated by an engineer/*architectus* named Amandus.⁹¹ Among other things, the task of *architecti* was to build and maintain assault equipment, including ballistae. Fewer than 20 are known throughout the empire,⁹² yet Birrens yielded an inscription by a second

83 Bosman (supra n.40) 99. The shot from this site are unusually polymorphic.

84 Reid and Nicholson (supra n.55).

85 Robertson (supra n.63) 282.

86 F. Haverfield, “Quarterly notes on Roman Britain,” *The Antiquary* 35 (1899) 72.

87 Greep (supra n.51) 199.

88 Jobey (supra n.3) 84.

89 F. Hunter and I. G. Scott, “The Roman sculpture from Birrens revisited,” *Trans. Dumfries Galloway Nat. Hist. Ant. Soc.* 76 (2002) 81.

90 L. J. F. Keppie, “Roman inscriptions and sculpture from Birrens: a review,” *Trans. Dumfries Galloway Nat. Hist. Ant. Soc.* 69 (1994) 47-48; *RIB* 3486.

91 L. J. F. Keppie and B. J. Arnold, *Corpus signorum Imperii Romani. Great Britain*, vol. 1 fasc. 4 (Oxford 1984) 7-8; *RIB* 2091.

92 E. Evans, “Military architects and building design in Roman Britain,” *Britannia* 25 (1994) 143-64.

architectus named Gamidiahus — a fact not lost on Davies.⁹³ While we recognise the risks associated with correlating archaeological data to known historical events, there may now be sufficient archaeological evidence to put forward a hypothesis that the events at Burnswark hill took place during the re-invasion of Scotland under Hadrian's successor.

It has been argued that Antoninus Pius's principal reason for sanctioning the reconquest of Scotland was his need, as the successor to a number of soldier-emperors, to establish his own legitimacy, rather than because it was a strategic military necessity,⁹⁴ although responding to a revolt of the Brigantes (cf. Paus. 8.43.4) as the main *casus belli* for the invasion remains a possibility.⁹⁵ An emperor with a personal investment in achieving a very favourable outcome may go some way to explain the investment at Burnswark in terms of military engineering. It opens the possibility that Burnswark, lying within 20 km of Hadrian's Wall, could represent the site of the 'first bleeding' of Antonine troops in an act of exemplary violence at the start of a showpiece campaign against the Lowland native population that began in A.D. 139 and culminated three years later with the construction of the Antonine Wall. It comes as no surprise, then, that the main player in this operation was Pius's newly appointed legate of *Britannia*, Quintus Lollius Urbicus (139-142). He was one of a handful of élite legates handpicked by Hadrian to put down the violent Bar Kokhba Revolt in 132-135/6 just three years before coming to Scotland.⁹⁶ According to Dio (69.14.1), a great calamity befell the Jews as a consequence of their rebellion:

Fifty of their most important outposts and 985 of their most famous villages were razed to the ground. 580,000 men were slain in the various raids and battles, and the number of those that perished by famine, disease and fire was past finding out. Thus nearly the whole of Judaea was made desolate.

A career inscription (*CIL* VIII 6706) from his birthplace, Tiddis, records Urbicus as receiving during the Judean campaign some of the highest military decorations, the *hasta pura* and *corona aurea*. It also records that he had been a tribune of *XXII Primigenia*, the same legion as that of the vexillation recorded on the Antonine slab from Birrens.⁹⁷

Conclusions

Non-invasive survey of *c.*1 km² of the Burnswark site has identified the final resting-place of several hundred Roman lead slingshot. Within the context of the prevailing soil conditions, the spatial accuracy of this metal-profiling technique has been confirmed by selective excavation. Targeted excavations also confirmed the presence of stone ballista ammunition from the same context as the lead bullets. Rather than being directed at

Evans considered the possibility, first put forward by S. N. Miller (*JRS* 27 [1937] 208), that the Birrens Amandus might be the trainee engineer from Lower Germany mentioned on an inscription dated to A.D. 209, but she felt the connection was too tenuous. Keppie (supra n.90) was also unconvinced and subsequently dated the religious dedication to Brigantia at Birrens to the Hadrianic/Antonine period: *CIL* XIII 7945.

⁹³ Davies (supra n.2) 113; *RIB* 2096.

⁹⁴ D. J. Breeze, *The Antonine Wall* (Edinburgh 2006) 182.

⁹⁵ J. G. F. Hind, "The 'Genounian' part of Britain," *Britannia* 8 (1977) 229-34. Although Pausanias specifically mentions the Brigantes of Britain, Hind points out that a Genounian district in Britain is unknown and suggests that Pausanias may have been mistaken since there were tribes called Brigantes elsewhere.

⁹⁶ A. R. Birley, *The Roman government of Britain* (Oxford 2005) 137-38.

⁹⁷ Keppie (supra n.90) 47. The slab fragment was found at nearby Hoddum.

targets in the gateways, as previously postulated, the densest distribution of missiles is a swathe across the S face of the hillfort's rampart, which is compatible with suppressive fire. A second thinner cordon behind the hill-facing rampart of the South Roman Camp is in keeping with losses from the slingers themselves. A large cache of bullets recovered from just behind the rampart of the North Camp is in keeping with dumped ammunition, possibly concealed at the end of an assault. The finds have allowed us to offer a new typology of the projectiles. Our ballistic experiments confirm the ramparts to be within range of an average slinger, whereas 'target' shooting at this distance is rendered impossible due to the invisibility of small lead bullets beyond a range of 30 m. The experiments also confirm a drop rate of c.5% and a retrieval rate of less than 10%.

Isotope analysis of *glandes* from across the Burnswark site shows a clustering of LIA results compatible with lead bullets being made and deployed during a single episode. Assessment of specific missiles from the secure early Antonine context at Birrens confirms that morphologically-similar sling bullets from Burnswark have an identical LIA signature. The early Antonine date of these bullets is compatible with the other dating evidence (pottery and coins) available from the summit of the hillfort. Our discovery that the bullet salvo was the final event to take place on the summit, coupled with Jobey's observation that occupation of the roundhouses on the hilltop appears to cease in the mid-2nd c., are compatible with an Antonine incursion. The details of the Antonine campaign in Scotland are lost, but a brief reference is made to it by the *SHA* (*Ant. P.* 5.3) records that the *legatus* Lollius Urbicus acting under the auspices of Antoninus Pius drove back the barbarians and then constructed a wall of turf. It would take Urbicus another three years from his arrival in the north in 138/9 before new coins would be released announcing Antoninus as victor in *Britannia* in 142, allowing him truly to claim the title of *imperator*.⁹⁸ The assault on Burnswark Hill may have been the first blow in that war.

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