

# The placing of Early Bronze Age metalwork deposits: new evidence from Scotland

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## Introduction

In 2004 Trevor Cowie published an article with the intriguing title 'Special places for special axes?'. He drew attention to the distinctive locations in Scotland at which Early Bronze Age metalwork had been discovered. A few objects were single finds, but the majority consisted of larger collections that are usually described as 'hoards'. As his paper suggested, most of the discoveries were of axeheads, but there were also some knives, daggers and personal ornaments. They formed part of a well-defined tradition of metalworking in Northern Britain. These artefacts were contemporary with the Bell Beakers and Food Vessels found in graves and seem to have been made of metal introduced from south-west Ireland, much of which was recycled.

Where they had accurate provenances, the findspots were distinctive and in two cases chance finds of early metalwork have been followed by excavation. These places were not associated with monuments but some of them occupied prominent positions in the landscape, including natural mounds, rock outcrops, hilltops and passes. Most commanded extensive views over the surrounding country and Cowie noted the special importance of springs and watercourses in the vicinity.

Similar locations were used in other ways in Early Bronze Age Scotland. Glacial mounds like those associated with metal hoards were sometimes chosen as the sites of cemeteries or stone settings, and at times their forms were modified. At Croftmoraig, for instance, one of these features was reshaped to provide a platform on which a stone circle was built. Not far away, at Lundin, another setting of monoliths was erected on a similar earthwork, but in this case it was bounded by a shallow ditch which made it look like a round barrow. At the exact centre of the circle at Croftmoraig an erratic rock was embedded in the natural till. Something similar happened at the Wren's Egg, where a more conspicuous boulder was located on a prominent knoll. In this case it was accompanied by two standing stones, but excavation cast doubt on the idea that it had been enclosed by monoliths.

In some respects the contents of these hoards were as distinctive as their locations. Not all the artefacts were complete, but wear analysis suggests that certain fragments continued to circulate after they were broken. An individual collection might include a mixture of recently made items as well those with longer histories. Occasionally axes were

decorated with similar motifs to the pottery found in graves, but the designs could have been created after those artefacts had been used or damaged. It is possible that their embellishment took place incrementally, and at some stage individual objects were coated with tin to give them a silvery sheen. None of these observations supports the idea favoured by early researchers that such collections were concealed at times of crisis and never recovered.

## The relationship between Dail na Caraidh and Ben Nevis

The only metalwork assemblage to be investigated on a large scale was at Dail na Caraidh. It was found beside a natural mound and was located on a terrace overlooking the confluence of two rivers. It is not clear whether the artefacts had been buried or left on the land surface. They consisted of two, or possibly three, groups of metalwork and included axes and knives or daggers. Brendan O'Connor, who reported on the artefacts, suggested not all these items were deposited simultaneously. Pollen analysis showed that the site was only lightly wooded and could have been recognised from a distance. Still more striking, it commanded a clear view of Ben Nevis, the highest mountain in Britain.

There the matter might have rested, but work at one of the places mentioned earlier raised another possibility. Not only had a natural mound been reshaped when the stone circle was built at Croftmoraig, it commanded a dramatic view of the midsummer sunset behind Schiehallion, one of the most conspicuous peaks in the southern Highlands of Scotland. Was it possible that the relationship between Dail na Caraidh and Ben Nevis took a similar form? It soon became apparent that in this case the sun would appear from behind the mountain on the shortest day of the year. That can hardly have gone unnoticed when so many earlier prehistoric monuments were associated with the solar cycle. It seemed much more than a coincidence that one of the largest assemblages of early metalwork should be related to the highest summit in the British Isles.

Is this striking relationship limited to the finds from Dail na Caraidh – on any account an exceptional collection of artefacts? To take the discussion further it is necessary to establish some criteria for investigating comparable findspots.

## Methodology

The project has a simple aim. It is to show whether similar relationships can be identified between other deposits of Early Bronze Age metalwork and the position of the sun. Several

features influence the examples selected for analysis. The first is that the collections should date from the end of the third millennium and the earlier second millennium BC. For that reason the sample is virtually the same as that employed in Cowie's study, but it is limited to places where two or more objects were found together; it is possible that some 'single finds' originally formed part of a larger collection but that cannot be assumed. A second criterion is that the locations of these 'hoards' should be clearly documented. It means that some of the places considered in the original study have to be omitted. A minimum requirement is that the sites are located within a 100 m square on the United Kingdom National Grid, and ideally within 10 m.

To allow direct comparison with the evidence from Dail na Caraidh this study is limited to the position of the sun in relation to the deposits of metalwork. In certain cases it is visible as it crosses the sky between dawn and dusk. That is unremarkable in itself, so two further stipulations are required. The study is restricted to the midwinter and midsummer solstices as these not only define the turning points of the year, they mark the limits of the solar arc. Between midwinter and midsummer the sun travels furthest across the sky, but between midsummer and midwinter that pattern is reversed and over time it comes closer to the horizon. This is clearly visible.

Another consideration is even more important. At Dail na Caraidh the most striking relationship is between the rising sun and the sheer mass of Ben Nevis. What would have struck an observer in the past was *a spectacle* – had the sun emerged from a level horizon some of that drama would have been lost. That is why the character of the skyline is important. Only where the positions of the solstices corresponded with distinctive topographical features is the analysis worth pursuing.

Since it is impractical to visit all the findspots at exactly the right times of year two calculations are required; they are described in detail in an appendix to this paper. The first is to reconstruct the modern skyline as it appears from places associated with collections of metalwork. Such projections have been checked on the ground and found to be remarkably accurate. That is important as the same method makes it possible to calculate the positions of the sun at the solstices. This process not only supports the original analysis of Dail na Caraidh, it suggests two other sites where similar relationships can be observed. There are further cases in which it did not happen. Either there are no obvious landmarks to identify on the horizon, or the skyline is so close to the location of a hoard site that the sun is hidden from view. At best a distinct glow is visible in the directions of the solstice, but such observations must be regarded with caution. The clearest evidence comes from sites where the orb of the sun is clearly visible.

In the most promising instances a second calculation is needed. The positions of the sunrise and sunset were slightly different four thousand years ago. For that reason their locations in 2000 BC are substituted for those identified by the original analysis. In each case

the relationship suggested by contemporary observations is as strong, or even stronger, when they are back-projected to the Bronze Age.

## Results of the analysis

Cowie's original study discussed twelve hoards as well as some single finds. Eleven findspots are reasonably provenanced and are worth studying by the methods just described. The other one (Colleonard) must be omitted. A further candidate, Urquhart Castle, presents some difficulties but is also considered here. Half the hoards discussed by Cowie do not provide any evidence for a relationship with the solstices. The best known of these are the Migdale hoard and those from the Hill of Finglenny, Bunrannoch and the Pass of Ballater. All were found in striking natural locations. A further six locations provided plausible results, and again the metalwork was found in similar settings. The assemblage from Dail na Caraidh was by the end of another glacial mound; the Knockgranish hoard was discovered beside a prominent rock; and the same applies to the finds from Maidens, Port Murray. The hoard from Dunsapie Crag was found by another outcrop overlooking the modern city of Edinburgh. By contrast, the metalwork from Tarradale was deposited beside an ancient monument – a megalithic tomb.

## Detailed relationships

### Sunrise or sunset

In three cases metalwork was deposited where people could have watched the sun rising or setting behind a prominent peak.

#### 1. Dail na Caraidh

This is the most complex of the sites and included two or three concentration of artefacts. As many as twenty complete or broken axes and eight knives or daggers were deposited there. Dail na Caraidh occupies a conspicuous position with a direct view of the profile of Ben Nevis five km to the south east. At the midwinter solstice the sun appears from behind the flank of the mountain and rises above a conspicuous valley west of its summit.

#### 2. Dunsapie Crag

The hoard consisted of three bronze axes discovered near a low outcrop. Its position commands an extensive view towards the Firth of Forth but the view to the south-west is blocked by a prominent summit. This is where the midwinter sun sets into the southern limit of the high ground.

### 3. Maidens, Port Murray

This hoard was composed of five axes and an armlet discovered when a conspicuous rock was quarried during the construction of a shipyard. Its location is well recorded but nothing remains of the site today. The findspot would have commanded an extensive view out to sea and in 2000 BC the midsummer sun would have set into the middle of the Isle of Arran which appears on the horizon twenty four km away. During the Neolithic period the island had been the source of a widely distributed raw material, pitchstone. Close to its west coast is the important Neolithic and Early Bronze Age monument complex on Machrie Moor

### Sunrise and sunset

In another three or four instances an observer could follow the course of the midwinter sun as it crossed the sky at the solstices. The positions of the sunrise and sunset correspond to features in the far horizon. It is harder to decide whether this happened by chance and each case must be assessed on its merits. These sites share the common feature that they face the southern sky and, with one dubious exception, do not command views towards the north.

### 4. Tarradale

Here parts of two bronze daggers have been recovered from steeply sloping ground just outside a megalithic tomb. The findspot commands a vista extending across a river and its estuary towards a more distant area of high ground. Again the midwinter sun can be observed as it crosses the sky. Subtle changes of topography on the horizon correspond to the positions of the midwinter sunrise and sunset. On the ground the relationship is particularly striking where the sun descends into the opening of a distant valley to the south west.

### 5. Knockgranish

The Knockgranish hoard consists of two axes which were discovered by a metal detectorist beside a conspicuous boulder. It was in an area of open moorland, but its exact location was never recorded in detail. Fortunately, there is a photograph of the site taken after the discovery and this has allowed its position to be relocated. The rock commands an unbroken vista of the midwinter sun as it travels across the sky from morning to evening. In 2000 BC it

rose above a slight valley to the south east and set into the flank of a low hill to the south west. It would have passed over the Cairngorm Mountains which are usually covered by snow at this time of year and might have glowed in the winter light. Immediately west of the findspot there is a small peat-filled hollow colonised by marsh plants. At the time when the hoard was deposited it could have been a pool.

#### 6. Auchnacree

This site was not considered by Cowie. The metalwork consists of four axes, two armlets and two knife-daggers. From the findspot the midwinter sun can be viewed as it travels over the hills on the southern horizon. The sun rises from sloping ground to the south east of the site and sets into a valley to its south west.

#### 7. Urquhart Castle as a further candidate?

Urquhart Castle presents a special problem. It is recorded that two axes were found there, but, unfortunately, two castles share the same name. One is on the Moray Firth and the other overlooks Loch Ness. A good discussion of the problem is provided by Canmore, the online database of Historic Environment Scotland, which opts for the second alternative. That could be important as this location commands a view along the loch towards the north east (the position of the midsummer sunrise). In the opposite direction it extends to the south west (the axis of the midwinter sunset).

### Discussion

It is obvious that these observations command different levels of confidence, and this is reflected by the order in which they have been presented. The evidence from Dail na Caraidh, Dunsapie Crag and Maidens is unambiguous, although one can never eliminate the possibility that the relationship between these hoards and the solstices might have arisen by chance. On the other hand, Ben Nevis and Dunsapie Crag are particularly distinctive landmarks which might have had histories of their own. That is certainly true of the Isle of Arran, the only site in this sample to show a clear relationship with the midsummer sun.

Those three locations were associated with a single event. By contrast, Tarradale, Knockgranish and Auchnacree were in places with clear views of the midwinter sky from sunrise to sunset. These events correspond to more subtle features on the horizon, but by its very nature the relationship is less immediately apparent. On the other hand, it may be no accident that none of these sites has an extensive view towards the north. At Tarradale the rising sun could be seen across an expanse of open water and at Knockgranish its passage through the winter sky would have created a striking effect if the Cairngorms were covered by snow. More local effects might have been important too, and it is likely that the two axes found at Knockgranish were deposited near to a pool. The hoard from Urquhart Castle

may involve the same relationship between the sun and an expanse of water, but the argument cannot be taken further unless more is discovered about the original findspot.

Finally, one observation links almost all the locations. With the exception of Maidens (and possibly Urquhart Castle) these relationships concern the *midwinter* solstice. There seems to have been less emphasis on the position of the midsummer sun. Was that because the shortest day of the year is a time of uncertainty when the hours of daylight diminished and plants, animals and vulnerable members of society came under increasing pressure? Were distinctive objects deposited to celebrate the turning point of the year and the approach of spring? Or were such offerings intended to ensure that this change did happen and that the sun would recover its power?

## Appendix The methods of calculation

Calculating where the sun rose and set in the past on the solstices is possible using GIS. It is important to take into account the effect of the angle of the horizon above the horizontal, as this can make a large difference to where events took place on the horizon, especially in hilly / mountainous terrain (Fig X). The following process was used (tools used in ArcGIS are given):

1. Obtain a reasonably high resolution Digital Elevation Model (DEM). The Ordnance Survey's soon to be deprecated 10m resolution Profile dataset was used for the calculations presented here, as it features less modern human artefacts (e.g. railway cuttings or bridge piers) than their newer Terrain 5 dataset.
2. Create a point dataset for your site. Extract the elevation value for your point from the DEM [ArcGIS: Extract Values to Points], add a reasonable offset to make sure the point is above the ground surface (1.75m was used here as an approximation of the height of a person) and then convert it to a 3D point [ArcGIS: Feature to 3D by Attribute]. Also extract the Latitude (in decimal degrees) of your point as an attribute [ArcGIS: Calculate Geometry in the attribute table].
3. Create a visible skyline from your point using the DEM dataset for the terrain [ArcGIS: Skyline]. If you are only interested in a single solstice event (e.g. midwinter sunrise), then you only need to create a skyline for the relevant quadrant.
4. Construct sightlines from your point to the skyline using relatively small azimuth intervals (0.5° was used for most of the analyses here). This automatically provides you with the azimuth and horizon angle measures that you will need to calculate celestial declination [ArcGIS: Construct Sight Lines].
5. Calculate the associated celestial declination of each sight line using the formula given by Ruggles (1999: 22):  $\sin \delta = \sin \lambda \sin h + \cos \lambda \cos h \cos A$  (where:  $\delta$  = declination angle;  $\lambda$  = latitude;  $h$  = horizon angle;  $A$  = azimuth angle) [ArcGIS: Field Calculator in the attribute table; values must be converted to radians].

6. Select the line which has the value closest to the celestial declination of the event of interest and export it as a new layer. For the study presented here, the relevant celestial declinations in 2000BC were  $23.85^\circ$  for midsummer and  $-23.85^\circ$  for midwinter (Ruggles 1999: 57). If there is no line near the values then the sun (e.g.) did not rise or set at that location during the solstices, or you may need to recalculate the sightlines using a smaller azimuth increment.
7. To extract the point on the horizon where the relevant celestial event happened, calculate the intersection point between the exported sightline and the skyline [ArcGIS: Intersect 3D].
8. The results can then be mapped conventionally or in 3D [ArcGIS: using ArcScene].

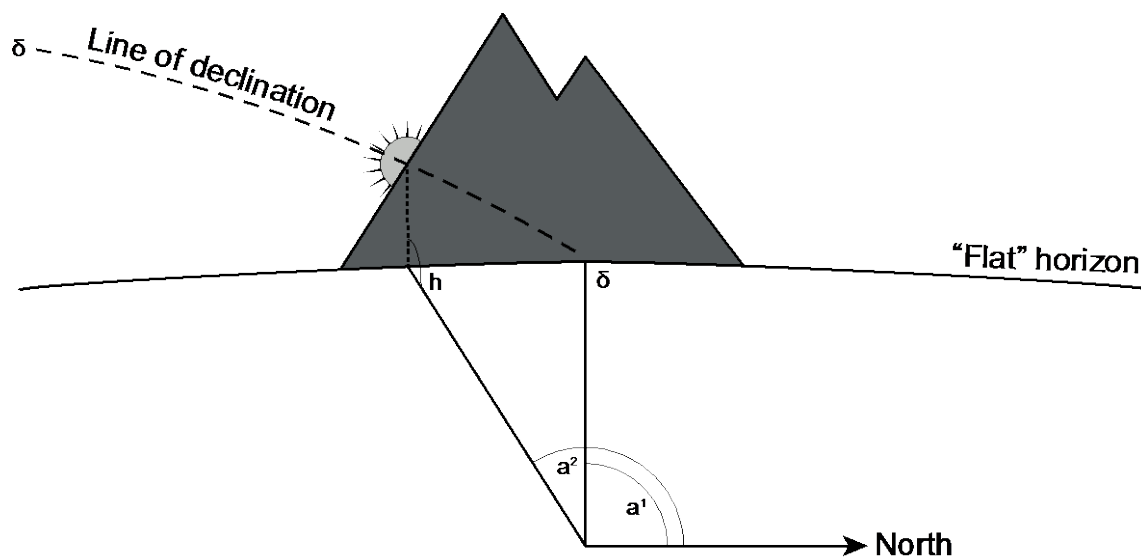


Figure X: Illustration of the importance of taking into account angle above the horizon when calculating celestial declination.

#### Bibliography:

Ruggles, C.L.N. 1999. *Astronomy in Prehistoric Britain and Ireland*. New Haven, CT: Yale University Press.