

Tulloch Wood, Forres, Moray: the survey and dating of a fragment of prehistoric landscape

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SUMMARY

A 27 ha area of prehistoric settlement and field systems was surveyed at Tulloch Wood, Forres, in February 1990. A programme of sample excavation was carried out in March 1991 and 15 radiocarbon dates were obtained from beneath a range of monument types. Negative features overlain by later banks and cairns were found to be Mesolithic in date but may not be man-made. The earliest dated surface feature is a clearance cairn which is no older than c 2000 BC uncal. A coaxial bank system, established at about 1350–1150 BC uncal, may be contemporary with at least one of the hut circles. Three other hut circles, and modifications to the bank system, appear to be Iron Age in date, c 450 BC to AD 250 uncal. The excavation was arranged and funded by Historic Scotland.

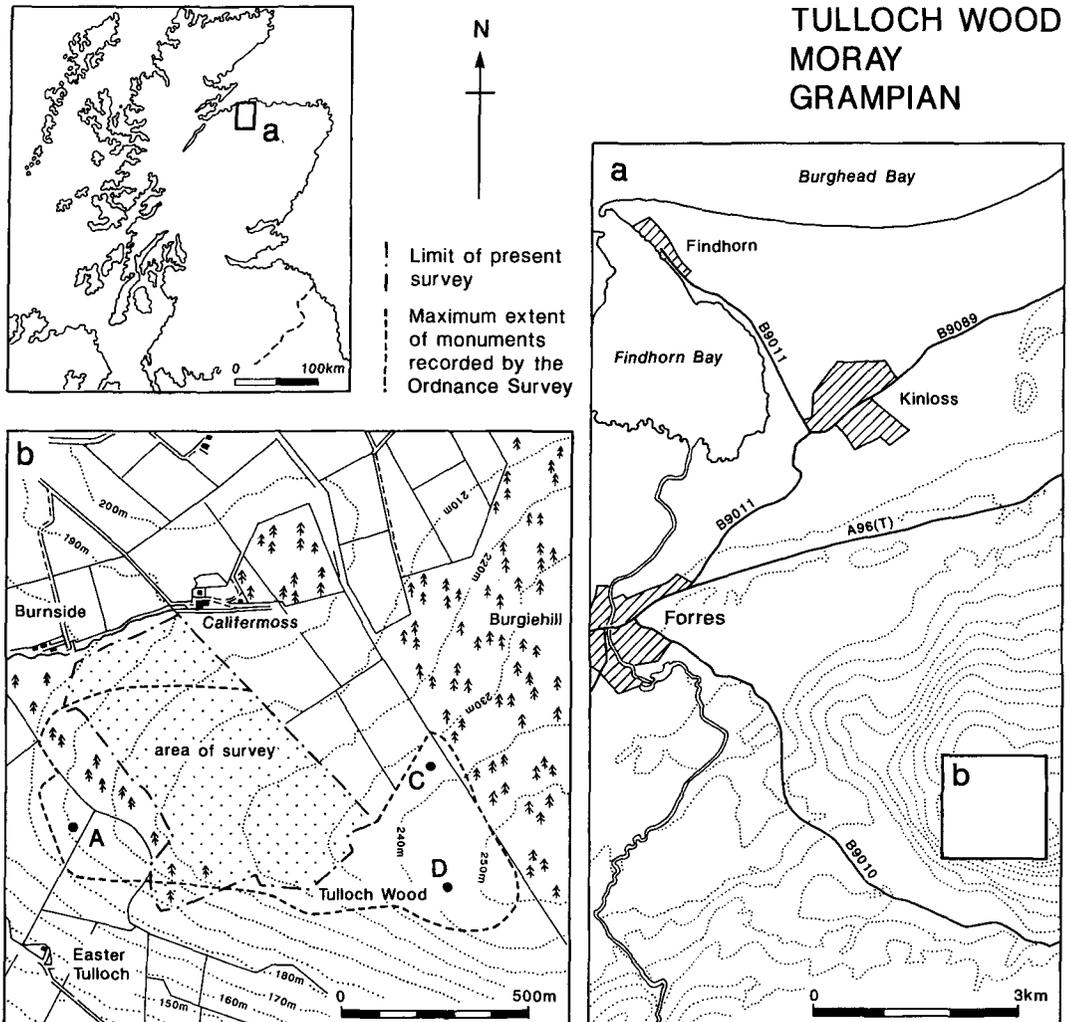
INTRODUCTION

The site at Tulloch Wood (NJ 085 562) is a 27 ha area of prehistoric banks, cairns and hut circles at 180–230 m OD on a north-facing slope overlooking the Moray Firth (illus 1). Between 1988 and 1990 most of Tulloch Wood was clear-felled; extensive tree throw, together with the cutting of new access tracks during the felling operation, caused widespread but slight damage to the archaeological features.

The site, as originally recorded on OS record card NJ 05 NE 9, was described as four stone huts, a fifth possible hut, and a contemporary field system. It extended over an area of c 56 ha of rough pasture and plantation at an altitude of 180–250 m OD. Since 1971, half of the site, including three hut circles, has been destroyed or severely damaged: 22 ha by agricultural improvement and 7 ha by ploughing for forestry. The surviving 27 ha were within Tulloch Wood plantation (25 ha) and an adjacent field to the south-east (2 ha).

In February 1990, Historic Scotland's Archaeological Operations and Conservation Unit carried out a survey of the cleared plantation and produced a plan of the surviving features. Using the survey plan, Grampian Regional Council, in consultation with the landowner, identified areas to be protected from subsequent tree planting. It was also agreed that no ploughing would be carried out before tree planting in this case.

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ILLUS 1 Location plans. Based upon the Ordnance Survey map © Crown copyright

These measures protected the surviving monuments and removed the need for further large-scale fieldwork. However, the site is a rare surviving example of a prehistoric landscape in this area and it was therefore decided that a small-scale investigation would be worth while. The objective of this project was to date the various types of monument and, consequently, to establish how the site developed and how its use changed through time.

SURVEY

The survey (illus 2) covered the rectangular block of land occupied by the former Tulloch Wood plantation and included all surviving areas of prehistoric monuments. On the east side of the plantation there are established fields with no records of ancient features. The rough



ILLUS 2 Plan of surveyed monuments. The numbers are those of the excavated areas

grazing to the south contained a large area of prehistoric features but these were cleared during recent agricultural improvement and only a small area has survived adjacent to the plantation. The south-west corner of the plantation extends an additional 150 m downslope and this area was not felled. This made surveying difficult and means that the plan may be incomplete here. The remainder of the west side of the plantation is bordered by a younger one within which the ground was ploughed before tree planting. The north side of the plantation is marked by a stream, with improved fields beyond, but within 100–150 m of the stream the ground is waterlogged and no prehistoric features have been recorded.

Most of the survey was carried out in poor conditions in February 1990 but the urgent need for a plan of the site made this unavoidable. Tree felling was still in progress and the ground was covered in wind-thrown tree stumps, broken trunks and piles of branches trimmed from the main trunks. Difficulties were compounded by deep snow which lay for most of the duration of the survey. As a result, individual features were located but no attempt was made to record dimensions in detail. The survey was checked in March 1991 during the excavation and minor corrections were made, mostly to the extent of poorly defined banks.

HUT CIRCLES

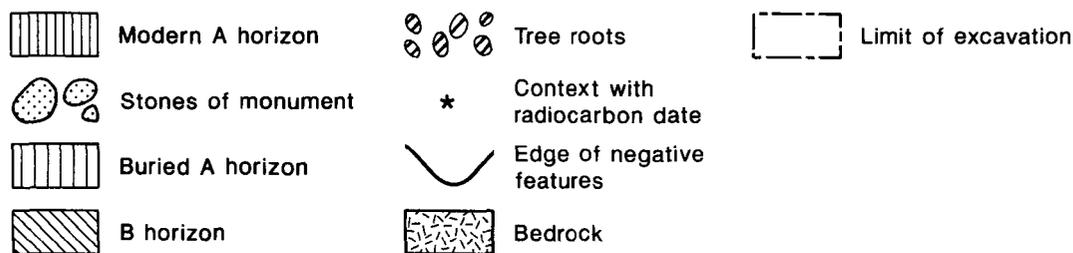
These are identified on the plan by a letter, following the original sequence on the OS record card. Hut Circles A to E were recorded by the Ordnance Survey and F to H were located during the present survey. A, C and D were outside the survey area (illus 1) and have been destroyed as a result of agricultural improvement work. All the surviving examples comprised low circular banks, except Hut Circle E which appears to have been approximately D-shaped. This structure was partly destroyed by the laying of a new track in 1989 but the surviving stretch of bank was clearly straight on its south side where it ran close to another bank.

BANKS

Three types of bank were identified in the field; the most prominent was a set of three long banks, oriented from north-west to south-east (Axial Banks 1, 2 & 3) with short linking banks at right angles. These appeared to form a regular system that may be described as coaxial (Fleming 1987). Bank 1 had a possible gateway consisting of two large boulders set 1.5 m apart. The second group of banks were short, branching and often poorly defined; they did not form a coherent pattern. Both of these types of bank were completely covered with vegetation, with only occasional large stones visible through the turf. The third type of bank was only noted at the south-west edge of the survey area; here, a long angled bank and shorter associated fragments consisted of visible piles of stones with little vegetation cover.

CAIRNS

Over 250 cairns were recorded in the survey but, because of the ground conditions, it was not possible to record dimensions in most cases. No cairns with diameters of less than 3 m were noted, but this was probably the result of snow and vegetation obscuring smaller features. Most were more than 5 m in diameter and the largest example measured was 10 x 8 m. There is a clear pattern to the distribution of the cairns: there are none at the north end of the survey



ILLUS 3 Key for section drawings in illus 4 to 7

area where the ground is poorly drained; and there are relatively few between the axial banks (with the exception of a well-defined cluster to the south-east).

LYNCHETS

There were a few examples, particularly on the steeper south-west slope, of breaks of slope that appeared to be lynchets. Similar breaks of slope were noted on the line of some of the banks.

MISCELLANEOUS

A few features did not fall into the above categories. Some 60 m south-east of Hut Circle E there was a low mound, 10 × 7.5 m, with a hollow centre. This may be a small structure or an unusually shaped clearance cairn. About 65 m north-west of Hut Circle H there was a stone structure, approximately square, with sides 4 m long. On the east side of Axial Bank 2, just north of Area 8, there was a group of very poorly defined short banks which could be the remains of a rectangular structure.

EXCAVATION

A total of 19 areas were excavated (illus 4–7), sampling four hut circles, nine banks, three cairns and one miscellaneous feature (illus 2); 17 of these areas were small trenches cut through a feature in order to sample the underlying soil. They were excavated at least to the top of the B horizon of the buried soil, and the stratigraphy was recorded in section. The other two (Areas 10 & 14) were larger areas located to investigate bank junctions. The banks were revealed in plan, recorded, and then sectioned as in the other areas.

In all areas, bulk soil samples were collected from suitable contexts (marked by a star on the section drawings, illus 3–7: the A horizon of the buried soil in most cases), and processed on site to retrieve charcoal for dating and other carbonized plant remains. The procedure followed is described in detail in the section on dating (see below). No artefacts were recovered from any of the excavations.

AREA 1: HUT CIRCLE F

A 1.8 m long trench was cut from the outside of the bank into its centre on the north side of the hut circle. The bank was 0.4 m high in the centre and consisted of medium and large stones (up to 0.5 m) closely set in a loam matrix (illus 4). It overlay 0.3 m of soil which rested on solid rock. Dating samples

were collected from two contexts in this soil, F1013 and 1014. F1013 was interpreted as an A horizon and 1014 as a B horizon.

AREA 2: HUT CIRCLE B

A 1.4 m long trench was cut from the outside of the bank into its centre on the north side of the hut circle. The bank was 0.45 m high in the centre and consisted of stones up to 0.5 m in size in a peaty matrix (illus 4). It directly overlay a thin spread of stony, charcoal-rich sediment (F1413) which was sampled for charcoal. F1413 overlay 0.15 m of yellow brown loamy sand, interpreted as a B horizon; F1413 is therefore either a heavily disturbed A horizon or an anthropogenic layer.

AREA 3: HUT CIRCLE G

A 2.5 m long trench was cut from the outside of the bank into its centre on the south side of the hut circle. The bank was 0.5 m high in the centre and consisted of large, tightly packed stones (up to 0.5 m) in a peaty matrix (illus 4). It overlay a 0.2 m deep A horizon (F1003) which was sampled.

AREA 4: HUT CIRCLE E

A section was cleaned and recorded where the north side of the bank is cut by a new forestry track. The bank was a poorly defined feature, 1.5 m wide and 0.3 m high, with scattered stones (up to 0.3 m in size) in a sandy loam matrix (illus 4). It overlay a 1.5 m wide band of A horizon (F1503) which was sampled for charcoal.

AREA 5: MISCELLANEOUS FEATURE

This is an oval mound, 10 × 7.5 m, with a central hollow; it is either an unusually shaped clearance cairn or a small structure. A trench, 0.4 m long, was cut from the outside to the crest of the mound, on the east side. The mound was up to 0.6 m high and consisted of closely packed stones (up to 0.4 m in diameter) in a sandy loam matrix. It overlay a buried soil of two horizons, 0.3 m deep, developed in till. The A horizon (F1203) was sampled (illus 4).

AREA 6: TRANSVERSE BANK

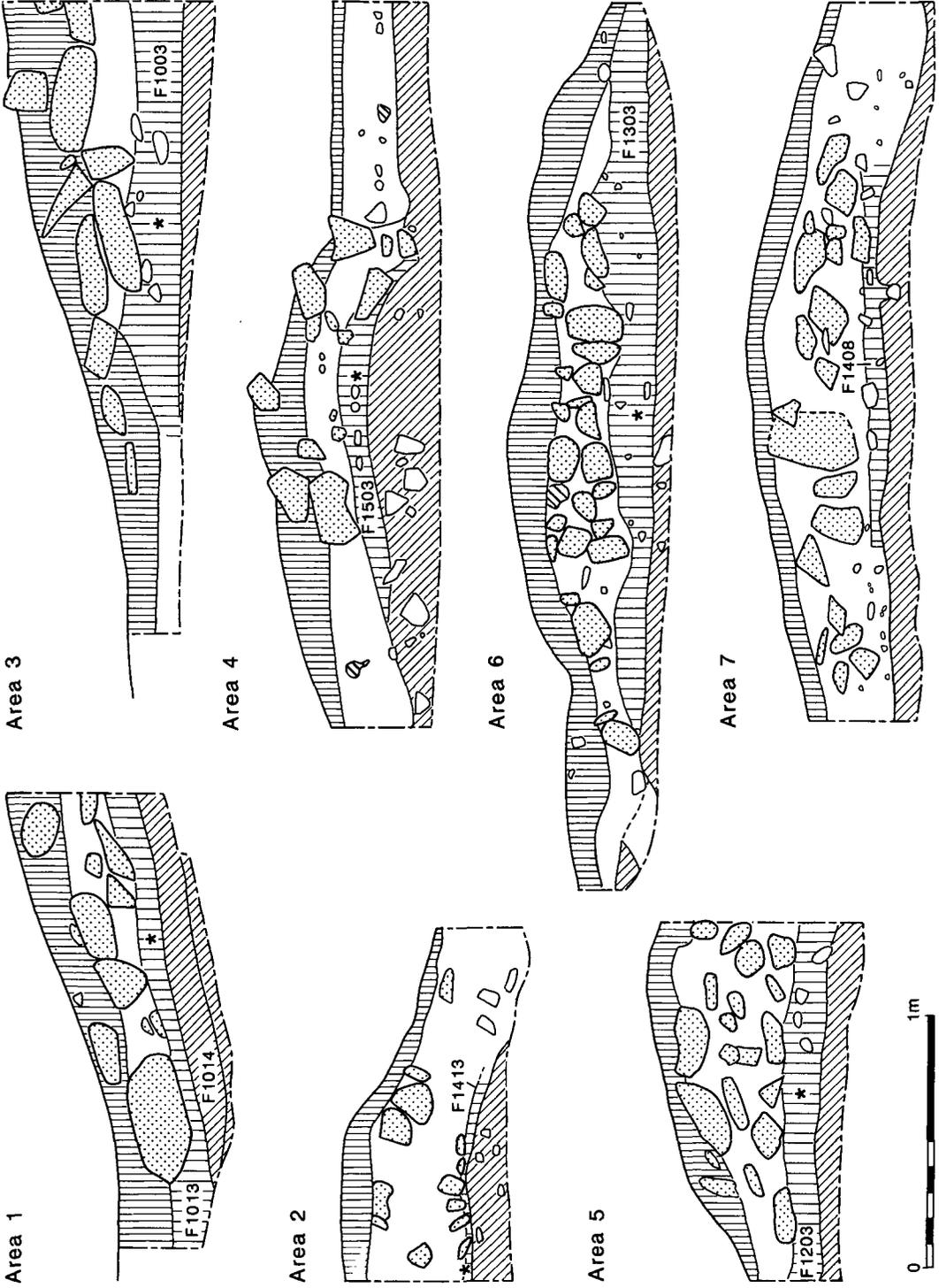
This bank is cut by a new forestry track; the section exposed by the track was cleaned and recorded. The bank was 2 m wide and 0.4 m high and consisted of closely packed stones (up to 0.3 m in size) in a sandy loam matrix. It overlay a well-defined A horizon (F1303), 0.2 m deep, which was sampled (illus 4).

AREA 7: AXIAL BANK 1

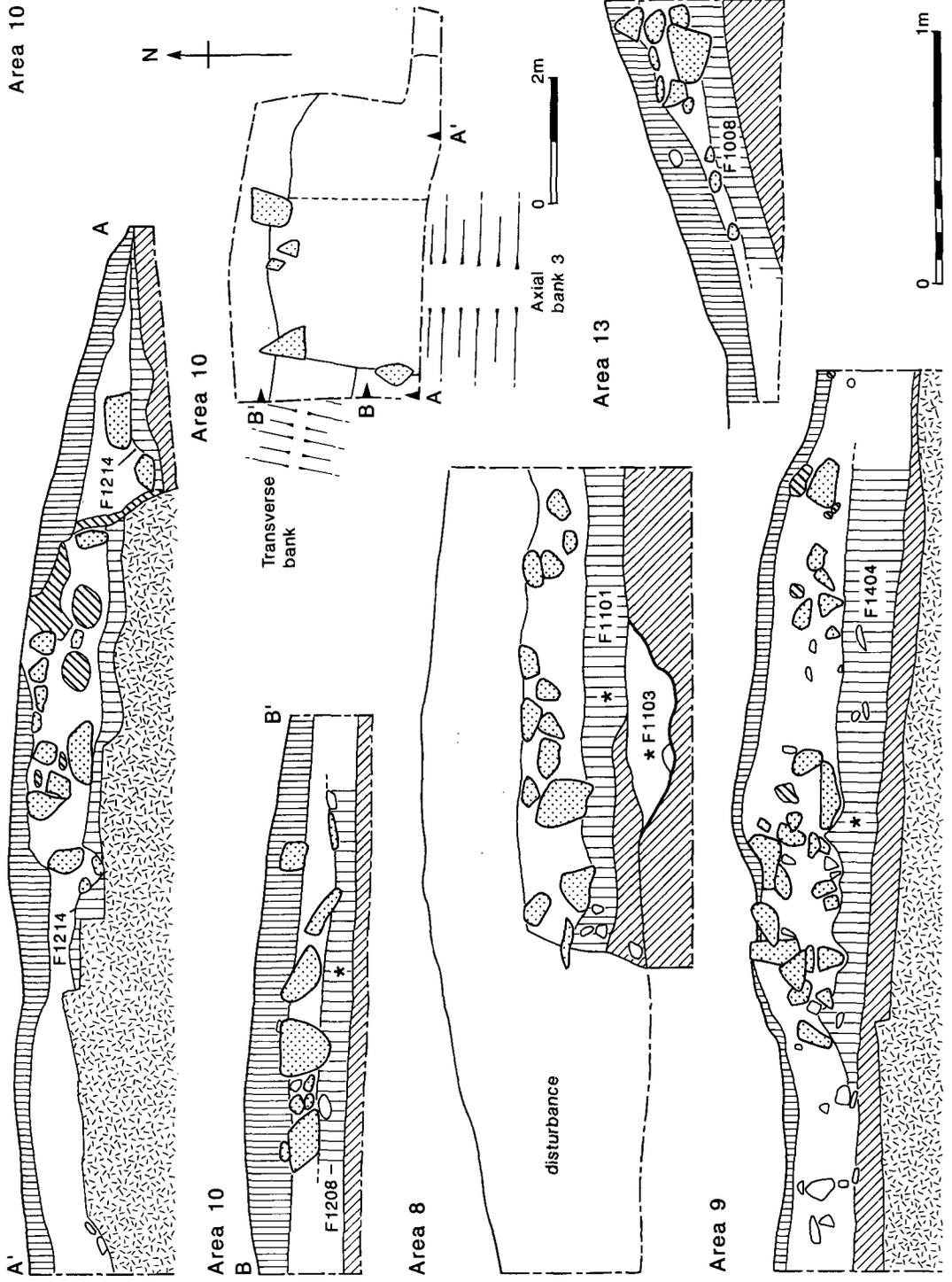
A tree growing on the bank had been uprooted and dragged clear, leaving a section of the bank exposed; this was enlarged to create a full cross-section (illus 4). The bank was 2.5 m wide and 0.45 m high; there was some evidence of structure with large facing stones (up to 0.6 m across) set on edge on the east side and a core of smaller stones (up to 0.3 m). The original width may have been 1.4 m. It overlay an A horizon (F1408), 0.1 m deep, which was sampled.

AREA 8: AXIAL BANK 2

The bank is cut by a new forestry track and the section on the north side of the track was cleaned and recorded (illus 5). The bank was disturbed on its west side by the cutting of the track but was at least



ILLUS 4 Sections of excavated areas 1 to 7



ILLUS 5 Sections and plans of excavated areas 8, 9, 10 and 13

2 m wide and 0.4 m deep. It consisted of stones 0.2–0.4 m diameter in a peaty matrix. It overlay two layers of grey sandy loam (F1101 and 1111) which are interpreted as parts of an A horizon modified after burial. These layers sealed an irregular cut with a charcoal-rich fill (F1103). The cut was 0.2 deep and 0.8 m wide, and a 1.6 m length was exposed in the excavation. Samples were taken from contexts F1101 and 1103.

AREA 9: AXIAL BANK 3

The bank is cut by a new forestry track and the section revealed on the south side of the track was cleaned and recorded (illus 5). The bank was c 2.5 m wide (uncertain because of very vague, spread edges to the bank) and up to 0.45 m high. It consisted of small to large stones in a sandy loam matrix. It overlay a distinct buried soil with an A horizon (F1404) 0.15 m deep and a B horizon of variable depth over solid rock. Context F1404 was sampled.

AREA 10: BANK JUNCTION

A 3 × 5 m trench was located at the north end of Axial Bank 3 where it meets a transverse bank. Removal of the modern topsoil revealed (illus 5) the end of the axial bank, marked by a line of large stones (up to 0.7 m) which were visible through the topsoil. The west side of the axial bank was similarly faced, but the east side had no defined edge and ran out into a shallow spread (0.1 m deep) of smaller stones. This gave the axial bank a total width of almost 5 m but, in section, it was clear that only 2–2.5 m of this was actually the bank itself. The remainder may be a clearance cairn placed against the bank. The axial bank was 0.3 m high in section and overlay a shallow A horizon (F1214) which rested directly on solid rock. The transverse bank abutted the west face of the axial bank. It was 1.5 m wide and 0.3 m deep and consisted of stones (up to 0.2 m) in a sandy loam matrix. It overlay a buried soil with A (F1208) and B horizons; solid rock was not seen on this side of the trench. Contexts 1214 and 1208 (the two A horizons) were sampled.

AREA 11: TRANSVERSE BANK

A trench 3.5 m long was cut across the bank, which was 1.6 m wide and 0.4 m high; it appeared to have been carefully constructed with larger facing stones (up to 0.5 m) and a well-packed core of 0.1–0.3 m stones (illus 6). The bank overlay a buried soil consisting of A (F 1309) and B horizons; F1309 was sampled. About 0.2–0.3 m of sediment has accumulated against the upslope side of the bank.

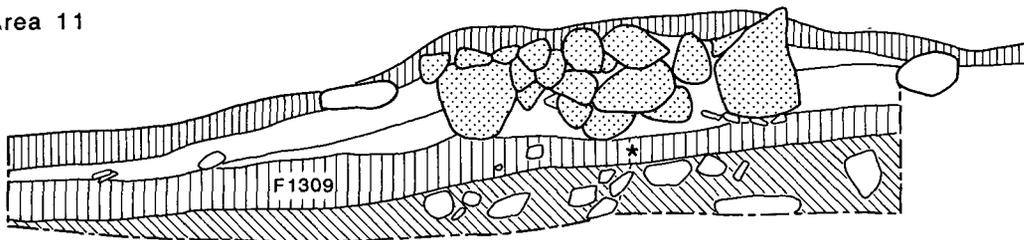
AREA 12: CAIRN

This cairn had been half-sectioned by a new forestry track and the exposed face was cleaned and recorded (illus 6). The cairn was almost 3 m in diameter and 0.65 m high in the section; it consisted of closely spaced stones, up to 0.3 m, long in a peaty matrix. The soil horizon (F1507) beneath the cairn was very stony and therefore the boundary between the two contexts was not clear. It was interpreted as a stony A horizon and was sampled. There was an accumulation of 0.3–0.4 m of sediment on the upslope side of the cairn.

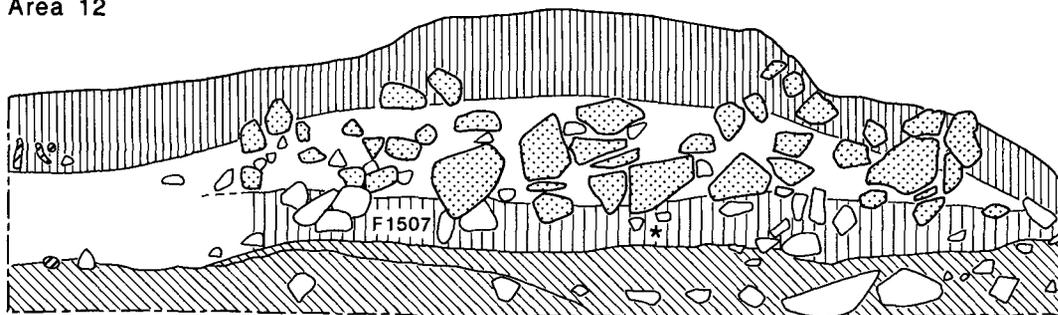
AREA 13: CAIRN

This cairn is located within a well-defined cairnfield in the south-east part of the site. A trench 1.6 m long was cut into the centre of the cairn on its west side (illus 5). The cairn was up to 0.4 m high in the centre and consisted of stones up to 0.25 m long in a sandy loam matrix. It overlay a shallow (0.10–0.15 m) A horizon (F1008), which was sampled.

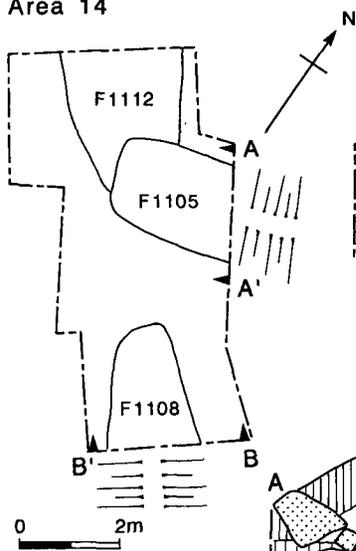
Area 11



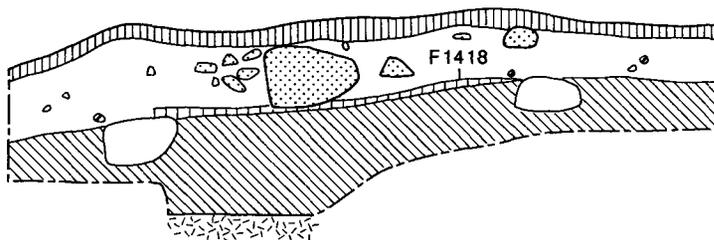
Area 12



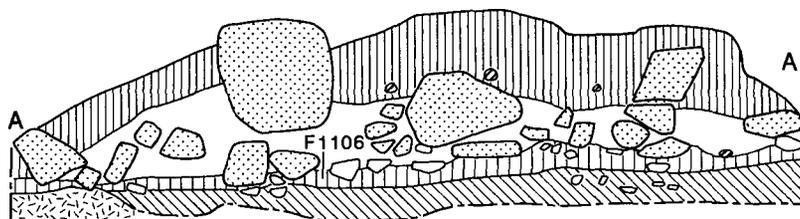
Area 14



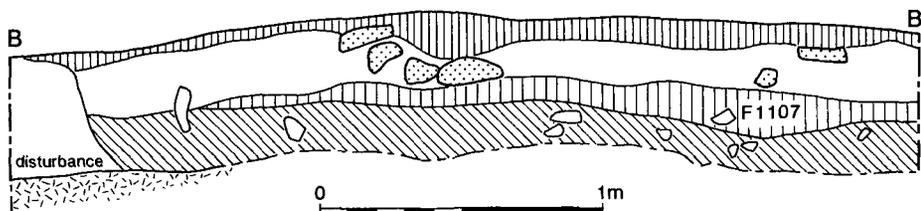
Area 15



Area 14

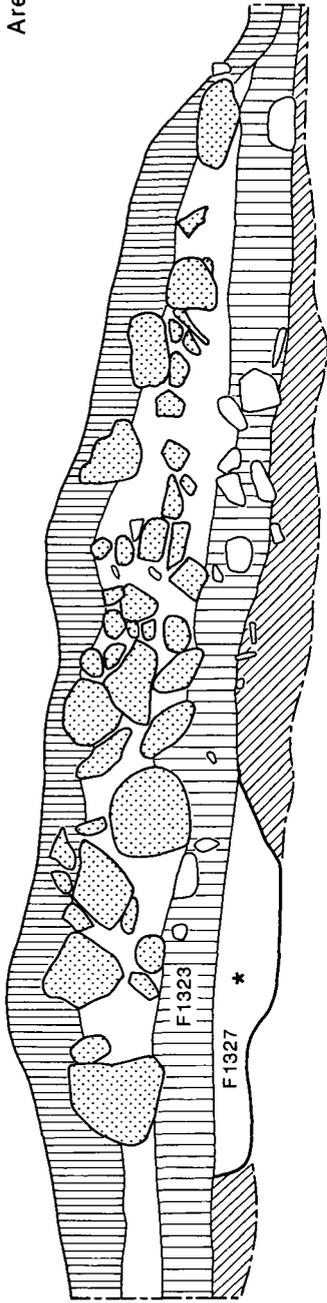


Area 14

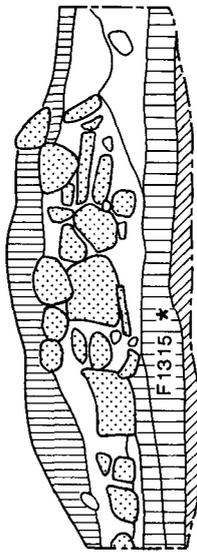


ILLUS 6 Sections and plans of excavated areas 11, 12, 14 and 15

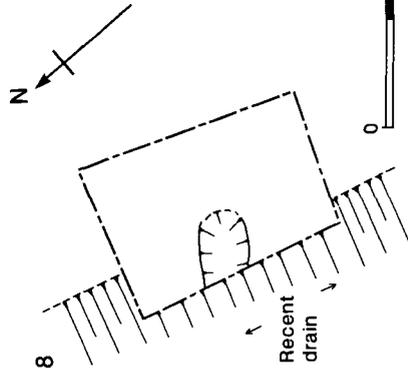
Area 17



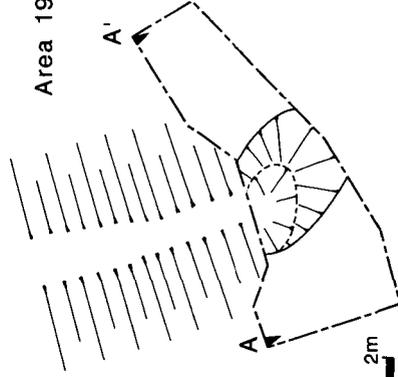
Area 16



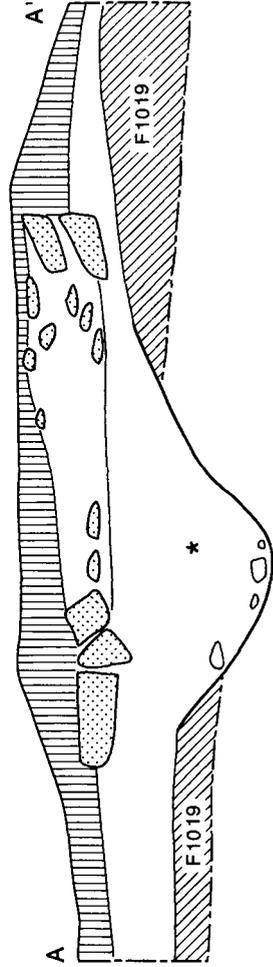
Area 18



Area 19



Area 19



ILLUS 7 Sections and plans of excavated areas 16 to 19

AREA 14: BANK JUNCTION

This 8 × 4 m trench was located to investigate the right-angled junction between two banks, part of the group of banks between Hut Circles B and F. Excavation showed (illus 6) that the longer bank (F1108, 1112), aligned from north-west to south-east, did not stop at the junction but continued for at least 20 m downslope. The short curving bank (F1105) overlay F1112 at the point where they crossed, and there was a 1.6 m wide gap in bank F1108/1112 on the south side of the junction. The earlier bank (F1108/1112) was up to 2.3 m wide but comprised only a single layer of stones (0.2 m deep). F1108 overlay a shallow (0.05–0.10 m) A horizon (F1107) which was sampled. The later bank (F1105) was up to 2.8 m wide and 0.5 m high. It consisted of large, loosely packed stones (up to 0.5 m diameter) in a sandy loam matrix with no defined structure. The bank overlay a shallow (up to 0.1 m) A horizon (F1106), which was sampled.

AREA 15: AXIAL BANK 2

A trench 2.5 m long was cut across the bank; it was c 1.9 m wide, although very poorly defined in section (illus 6), and 0.3 m high. It consisted of small to large stones (up to 0.3 m diameter), loosely packed in a sandy loam matrix. The bank overlay a 30–50 mm thick layer of mottled grey/yellow sandy loam (F1418) that may be the remains of an A horizon or simply the interface of the bank and the B horizon, which is up to 0.4 m deep. F1418 was sampled as the top surface of the buried soil.

AREA 16: AXIAL BANK 1

A 1.9 m trench (illus 7) was cut across the bank; it was 1.5 m wide and 0.5 m high but the position of facing stones on the east side indicated an original width of c 1.1 m. It consisted of stones, up to 0.4 m in the face of the bank and 0.15–0.20 m in the core, with a peaty matrix. Sediment, 0.3 m deep, had accumulated against the west side. The bank overlay a buried soil with A and B horizons; the A horizon (F 1315) was sampled.

AREA 17: CAIRN

This cairn was half-sectioned by a new forestry track; the exposed face was cleaned and recorded (illus 7). The cairn was 3.7 m in diameter and up to 0.55 m high in the section; it consisted of loosely packed stones up to 0.5 m long with a sandy loam matrix. About 0.3 m of sediment had accumulated against the upslope (eastern) side of the cairn. The cairn overlay an A horizon (F1323), 0.25 m deep, which was sampled. During the collection of this sample, a previously un-noticed negative feature (F1326) was exposed. It was an approximately circular but irregular pit, c 1.2 m in diameter and cut 0.18 m into the B horizon. The fill (F1327) contained abundant charcoal and this is probably the source of the charcoal in sample F1323. There was no clear boundary between the A horizon (F1323) and the fill F1327. F1327 was sampled separately.

AREAS 18 & 19: POSSIBLE BOUNDARY LINE

At the north end of the site, Axial Banks 1 and 2 terminate and another bank starts at a point offset between them. The apparent terminals of these three banks form a straight line; this suggests that there was a boundary, with no surviving surface expression, linking these points.

Area 18 was located on a forestry drainage ditch that cut this line. Cleaning of the ditch side revealed a shallow cut (0.1 m deep) in the surface of the B horizon (illus 7). A small area (2 × 1 m) was excavated at this point, but the cut could not be followed more than 0.3 m into the section. If this is a man-made feature, then it appears to be a discontinuous cut.

The line was followed a few metres to the east to the point where it intersected with a bank terminal. A trench 3.2 m long (Area 19) was excavated across the bank in an attempt to establish any relationship between the bank and the alignment. The bank was 1.9 m wide, 0.35 m high and consisted of stones up to 0.4 m in diameter, disturbed by recent tree roots (illus 7). It overlay a layer of light brown sandy loam (F1019) which filled a 0.4 m deep cut through the B horizon into till. The cut was irregular but appeared to be circular as opposed to linear in shape. F1019 was interpreted as both the cut fill and an A horizon of the buried soil; it was sampled. The excavation also showed that the bank continued southwards over this supposed boundary in a reduced form for an unknown distance.

RADIOCARBON DATES

SAMPLE SELECTION

It was anticipated that it would be difficult to collect samples suitable for radiocarbon dating at Tulloch Wood for a variety of reasons: stone clearance cairns and field banks, which make up the majority of the monuments, rarely contain charcoal contemporary with their construction or use and therefore can only be dated relative to other features; hut circles, which, as a focus of human activity, should contain appropriate dating samples, are stratigraphically complex. The sample excavation strategy adopted at Tulloch Wood specifically avoided these areas of high archaeological potential for two reasons. First, it is difficult to understand complex stratigraphy in a small sampling trench, so the context of any charcoal would be unclear. Secondly, because the hut circles had been protected by a management agreement, it was thought to be unacceptable to damage their interiors by trenching.

The solution adopted to meet the problems outlined above was to recover charcoal samples from the soil buried under monuments. The date obtained for such charcoal would provide a *terminus post quem* for the construction of the overlying monument. In the case of the cairns and banks, this method had a high chance of success compared to other potential sources of dates. For the hut circles, it was possible to collect a sample from under the outside of the bank and, it was hoped, avoid significant damage.

The interpretation of radiocarbon dates obtained from charcoal in buried soils requires careful analysis of the source and history of the charcoal. Charcoal may have entered the soil at any time from the establishment of vegetation in the early Flandrian up to the time when the soil was buried. The radiocarbon age of such material is a combination of the time elapsed since burial and the mean radiometric residence time of the charcoal in the soil (Geyh *et al* 1971). Mean radiometric residence time (MRRT) is a term which reflects the effect of radioactive isotope decay on mean residence time and it gives a lower estimate than actual mean residence time. The residence time of charcoal in soil depends on its rate of fragmentation because, below a certain size, it will not be recovered during sample processing. Fragmentation is controlled by charcoal type, original fragment size and soil disturbance processes. No estimates of MRRT are available for charcoal in the Tulloch Wood soils so it is not known how close an estimate it provides of time elapsed since burial.

An additional problem with dating potentially mixed-age charcoal is that it is not possible to calculate a meaningful calibrated date for the sample. Therefore the dates from Tulloch Wood are quoted in uncalibrated radiocarbon years.

METHODS

Twenty-four bulk samples, 2.5–84 litres in size, were processed on site for the recovery of dating material, charred plant remains, and any other environmental or artefactual material. Samples were processed using a water separation machine (Kenward *et al* 1980). The light fractions (flots) were collected in sieves with mesh sizes of 1 mm and 300 microns, and the heavy residue (retent) in a 1 mm mesh.

For contexts identified as appropriate for dating, an initial sample of 30–35 litres was collected (three buckets), floated and wet sieved. The charcoal content of the flot and retent was estimated and additional soil collected if necessary to bring that estimate over 10 g. If the initial estimate indicated a charcoal concentration of less than 1 g per 10 litres of sample, no further sampling was attempted because the large volume of soil required would integrate the charcoal from a very large area. In practice, the volume of successful samples ranged from 30 litres up to 84 litres.

Charcoal for dating was sorted from the greater than 1 mm fraction in the laboratory and ten of the larger fragments were identified from each sample. Sorting for charred plant remains other than charcoal involved 100% of the 1 mm flots and a fraction (12.5–75%) of most 1 mm retents (Table 3: fiche). The retents were fractioned using a riffle sample splitter. Macrofossil identifications were carried out using a low power light microscope and modern seed reference material; nomenclature follows Clapham *et al* (1989).

RESULTS

Radiocarbon dates were obtained for 15 samples of charcoal (Table 1). These may be divided into three groups on the basis of the context type:

- 1 F1103 (Area 8), F1327 (Area 17) and F1018 (Area 19) were all fills of negative features underlying a later bank or cairn; the charcoal should date their infilling rather than the construction of the overlying monument.
- 2 F1413 (Area 2) was a concentrated spread of charcoal which should closely date the construction of the bank of Hut Circle B, which directly overlay it.
- 3 The remaining eleven contexts were A horizons of buried soils and their interpretation is limited by the problems outlined above.

TABLE 1
Radiocarbon dates obtained on charcoal from excavations at Tulloch Wood

Area	Sample	Description	Uncalibrated Age ($\pm 1\sigma$)	AD/BC (uncal)
1	GU-3085	F1013. Buried A horizon under hut circle F	3400 \pm 120 BP	1450 \pm 120
2	GU-3094	F1413. Charcoal rich layer under hut circle B	1890 \pm 50 BP	AD 60 \pm 50
3	GU-3095	F1003. Buried A horizon under hut circle G	1790 \pm 50 BP	AD 160 \pm 50
4	GU-3084	F1503. Buried A horizon under hut circle E	2220 \pm 90 BP	270 \pm 90
5	GU-3087	F1203. Buried A horizon under unidentified monument	3930 \pm 120 BP	1980 \pm 120
6	GU-3086	F1303. Buried A horizon under transverse bank	3160 \pm 100 BP	1210 \pm 100
8	GU-3083	F1101. Buried A horizon under axial bank 2	4960 \pm 80 BP	3010 \pm 80
8	GU-3096	F1103. Fill of feature under axial bank 2	6740 \pm 70 BP	4790 \pm 70
9	GU-3089	F1404. Buried A horizon under axial bank 3	3340 \pm 60 BP	1390 \pm 60
10	GU-3088	F1208. Buried A horizon under transverse bank	2340 \pm 90 BP	390 \pm 90
11	GU-3090	F1309. Buried A horizon under transverse bank	3300 \pm 80 BP	1350 \pm 80
12	GU-3093	F1507. Buried A horizon under cairn	3880 \pm 60 BP	1930 \pm 60
16	GU-3097	F1315. Buried A horizon under axial bank 1	3240 \pm 80 BP	1290 \pm 80
17	GU-3092	F1327. Fill of feature under cairn	6530 \pm 60 BP	4580 \pm 60
19	GU-3091	F1018. Fill of feature under bank	5530 \pm 150 BP	3580 \pm 150

The three samples from negative features produced the earliest dates from the site and they are at least 1500 years older than all the other dates, with the exception of F1101 (Area 8). The charcoal spread F1413 gave a date of AD 60±50 uncal, indicating that the most closely dated monument, Hut Circle B, is Iron Age.

The 11 dates from buried soil A horizons span a wide range from 1980±120 BC to AD 160±50. The only independent check on the value of these dates as estimates of the age of overlying monuments comes from the coaxial field system. If it is assumed that this was a planned system then the three axial banks should be of the same date and the transverse banks should be either contemporary or added later. Three dates were obtained from beneath the axial banks and three from beneath the transverse banks:

Axial banks

F 1101 (Area 8) 3010±80 BC uncal
 F 1404 (Area 9) 1390±60 BC uncal
 F 1315 (Area 16) 1290±80 BC uncal

Transverse banks

F 1309 (Area 11) 1350±80 BC uncal
 F 1303 (Area 6) 1210±100 BC uncal
 F 1208 (Area 10) 390±90 BC uncal

The result from Area 8 stands out as significantly earlier than those from the other two axial banks. This sample was collected from the soil overlying the negative feature F1103 which has a date of 4790±70 BC uncal. It is assumed that charcoal in the soil was in part derived from the much older charcoal-rich fill and therefore the soil date does not reflect the construction date of Axial Bank 2. This leaves a group of four dates of c 1450 to 1150 BC uncal for charcoal in soils under axial and transverse banks, and one later date of 390±90 BC uncal for a transverse bank. This pattern is consistent with the expected result and suggests that the MRRT of the soil charcoal (see Sample Selection, above) does not vary greatly over the site.

The identifications of the charcoal in the dating samples provide evidence that fragmentation may have been rapid in the Tulloch Wood soil (Table 2, fiche 1:E2–3). Six of the soil charcoal samples were each dominated by fragments of one species, with five different species of tree occurring as the dominant. If fragmentation had been a slow process, a mixture of species would have been expected as different inputs of charcoal accumulated in the soil. In these six samples, it seems that most of the larger (ie recent) fragments derive from only one piece of charcoal. If this interpretation is correct, MRRT may be relatively short and the radiocarbon dates are likely therefore to closely reflect the date of soil burial.

INTERPRETATION

The central aim of this project was to determine a chronology for the site; emphasis has therefore been placed on the examination of stratigraphic links and obtaining radiocarbon dates for a wide range of features. The chronology will be discussed first followed by a consideration of the economic and environmental aspects of the site.

CHRONOLOGY

Reconstruction of the site's chronology is based entirely on the radiocarbon dating results as no artefacts were recovered and the types of structure present are not chronologically sensitive. A conservative interpretation of the radiocarbon dates allows for very few conclusions to be reached about chronology. There are the three early negative features of uncertain origin and a date of AD 60±50 uncal from a layer of charcoal under Hut Circle B. The other 11 dates provide *termini post quem* that demonstrate that standing monuments are no earlier than the Bronze Age and in certain cases no earlier than the Iron Age in date. Therefore the landscape is of later prehistoric date but no detailed sequence can be established.

On the basis of the evidence discussed above (Radiocarbon dates: Results), it is possible to argue that the charcoal dates from buried soils are not substantially older than the date of construction of the overlying monument. A more detailed chronology of the site can then be constructed but it is necessary to remember that it is based on the assumption of short MRRT for charcoal in the soil.

The earliest dated features on the site are the negative features coincidentally sealed beneath later monuments in Areas 8, 17 and 19. The dates from Areas 8 and 17 place those features firmly in the Mesolithic, whilst the date of 3580±150 BC uncal from Area 19 borders on the Early Neolithic. If it is accepted that the date of 3010±80 BC uncal from the buried soil in Area 8 is the result of contamination, then the next dated features are from the Early Bronze Age: a cairn constructed after 1930±60 BC uncal (Area 12) and a miscellaneous structure erected after 1980±120 BC uncal (Area 5). These are followed by a group of six dates which place the construction of Hut Circle F later than 1450±120 BC uncal, and the coaxial field system later than 1290±80 BC uncal. There is then a substantial gap before two Iron Age dates: 390±90 BC uncal from beneath a bank added to the coaxial system (Area 10), and 270±90 BC uncal from beneath Hut Circle E. The potentially latest dated features on the site are two more hut circles: B, which is closely dated to AD 60±50 uncal and G, which is later than AD 160±50 BC uncal.

Although the 15 radiocarbon dates can be used to establish a broad chronological framework for the site, most of the surface monuments remain undated and sub-surface features have hardly been investigated. The one cairn which was dated (Area 12) is possibly the oldest dated surface feature; the other equally early date (from Area 5) is from under a monument which could also be a cairn. If the majority of the cairns are correctly interpreted as the product of stone clearance from fields, then they could have been built throughout the occupation of the site. Cairns are most abundant in the north-west part of the survey area, outside the coaxial bank system, although there is one cluster of cairns between Axial Banks 1 and 2, at the south end. The dated cairn (Area 12) apparently predates the construction of the coaxial banks but lies between Axial Banks 2 and 3. This cairn lies at the edge of the main concentration of cairns which ends abruptly on a line 60 m south-west of, and parallel to, Axial Bank 2. The excavated sections of the axial banks showed that they functioned as linear clearance cairns; it is therefore possible that the absence of clearance cairns adjacent to Bank 2 could have resulted from the removal of pre-existing cairns on to the newly created coaxial boundaries. This would imply that all or most of the cairns predate the coaxial field system. The cluster of cairns between Axial Banks 1 and 2 could be an exception to this early date as it appears to respect the banks. Alternatively, it could be argued that this cluster is the uncleared remnant of a larger cairnfield which extended over the position of the later banks. The lack of a date from Area 13 is particularly unfortunate in this respect.

The ages of most of the banks outwith the coaxial system is as uncertain as that of the cairns. The late date from the soil under the transverse bank in Area 10 indicates that the coaxial layout was modified, perhaps 1000 years after its creation, and the undated banks adjacent to the late Hut Circle E may also be examples of this process. None of the banks adjacent to Hut Circles B and F has been dated, and the excavation of Area 14 showed that they were not all constructed at the same time. The main bank between Hut Circles B and F, aligned from north-west to south-east, terminates at the edge of the 'blank' area south-east of Axial Bank 2 and therefore, like the cairns, it may be earlier than the coaxial system.

The field survey identified a group of banks at the south-west limit of the survey area that consisted of exposed stones, unlike the rest which were turfed over. The upper limit of recent cultivation at this point is marked by a massive stone clearance bank, 6 m wide, which runs parallel to the surveyed banks, c 100 m downslope. It is suggested that this group of banks are earlier, but still post-medieval, versions of the modern bank.

ENVIRONMENT AND ECONOMY

The three early (Mesolithic/Early Neolithic) features in Areas 8, 17 and 19 are clearly unconnected with the surface monuments which date, at the earliest, from the early Bronze Age. Man was present in the area of Inverness by 5850±85 BC uncal (Wordsworth 1985) but there is nothing unequivocally man-made about the Tulloch Wood features. They are irregular in shape, and the presence of abundant charcoal in Areas 8 and 17 could be a natural occurrence. No clear relationship has been demonstrated between human activity in Scotland at this time and the presence of charcoal in sediments (Edwards & Ralston 1984). The features in Areas 17 and 19 could be tree-throw holes and that in Area 8 could be a burrow.

The nature and extent of the early Bronze Age occupation is not clear. If the conclusion reached about the date of most of the clearance cairns is correct, it indicates extensive land clearance for agriculture by this time. The northern limit of cairns marks the edge of the freely draining soils, suitable for cultivation. Further evidence for early cultivation comes from the presence of a single carbonized barley grain in the buried soil in Area 5, dated to 1980±120 BC uncal or later (Table 3: fiche 1:E2-3). The grain is evidence both of cereal cultivation and, possibly, of manuring of the soil.

Four of the five surviving hut circles have been dated to later periods; therefore, unless the undated Hut Circle H is earlier than the others, there is no visible early Bronze Age settlement.

The creation of the coaxial bank system, possibly in the later Bronze Age, appears to represent a substantial reorganisation of the agricultural land. The earlier pattern of scattered clearance cairns with no recognizable fields was replaced by a system of long parallel strips of land, 100-150 m wide, with stones cleared to the strip boundaries. The original extent of the coaxial system is not known as its present eastern, southern and western limits are defined by modern fields. However, the northern terminals of the three main axial banks lie within the survey area. The terminal of Bank 3 was revealed in Area 10 where it comes to an abrupt end, marked by larger stones. The northern ends of Banks 1 and 2 were investigated (discussed above: Areas 18 & 19) to test for the possible existence of a boundary now invisible. The former presence of a ditch or fence was not confirmed by excavation, but this line does mark a change of alignment in the axial boundaries. The existence of two groups of axial boundaries with different orientations provides evidence for the former presence of a larger coaxial system.

The possibly contemporary coaxial land divisions on Dartmoor form field systems extending over several thousand hectares (Fleming 1987), but no evidence has yet been recovered for the organization of land on this large scale in Bronze Age Scotland. Indeed, other examples of coaxial land division in Scotland are very rare: Ogston (1931, fig 38) illustrates an undated and doubtful example at Knockenzie in the Howe of Cromar; and Halliday (1982, fig 1) illustrates undated crop-marks of coaxial pit alignments in Midlothian, covering 130 ha.

The reason for the reorganization of the land into strips at Tulloch Wood is not known, but the limited evidence suggests that they were used for arable cultivation. The removal of stone clearance cairns adjacent to Bank 2 would have been unnecessary if the land was to be used as pasture; and cultivation is the most likely cause of the accumulations of sediment on the upslope sides of the axial banks. The axial banks themselves were probably not continuous stockproof walls but functioned as irregular clearance heaps, again suggesting that cultivation rather than pasture was intended.

The absence of radiocarbon dates between 1210±100 BC uncal and 390±90 BC uncal raises the possibility of a break in land-use lasting for at least part of that period. However, the lack of dates from this period could equally reflect limited sampling. Features which may have been part of an Iron Age occupation of the site are three hut circles (B, E & G) and several banks which have been added to the coaxial system. There is no direct evidence for what type of land use took place at this time, although the construction of Hut Circle E, within the axial banks, may indicate some change in land use since the late Bronze Age.

There is no evidence available from which a date for the end of the Iron Age occupation can be suggested. The next activity appears to be the spread of improved agricultural land up the slope to the west of the site; this is an undated but apparently post-medieval event.

CONCLUSIONS

The programme of survey and limited excavation at Tulloch Wood has yielded valuable results for a relatively small investment of resources. The use of on-site sample processing facilities and the immediate estimation of charcoal weights allowed the collection of 15 samples suitable for radiocarbon dating from unpromising contexts, generally buried soils. The interpretation of dates obtained from charcoal in buried soils is not a straightforward process and there is a clear need for further research into the taphonomy of charcoal in soil. As a result of this, the chronology that is proposed for Tulloch Wood depends largely on an untested assumption about the residence time of charcoal in soil.

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