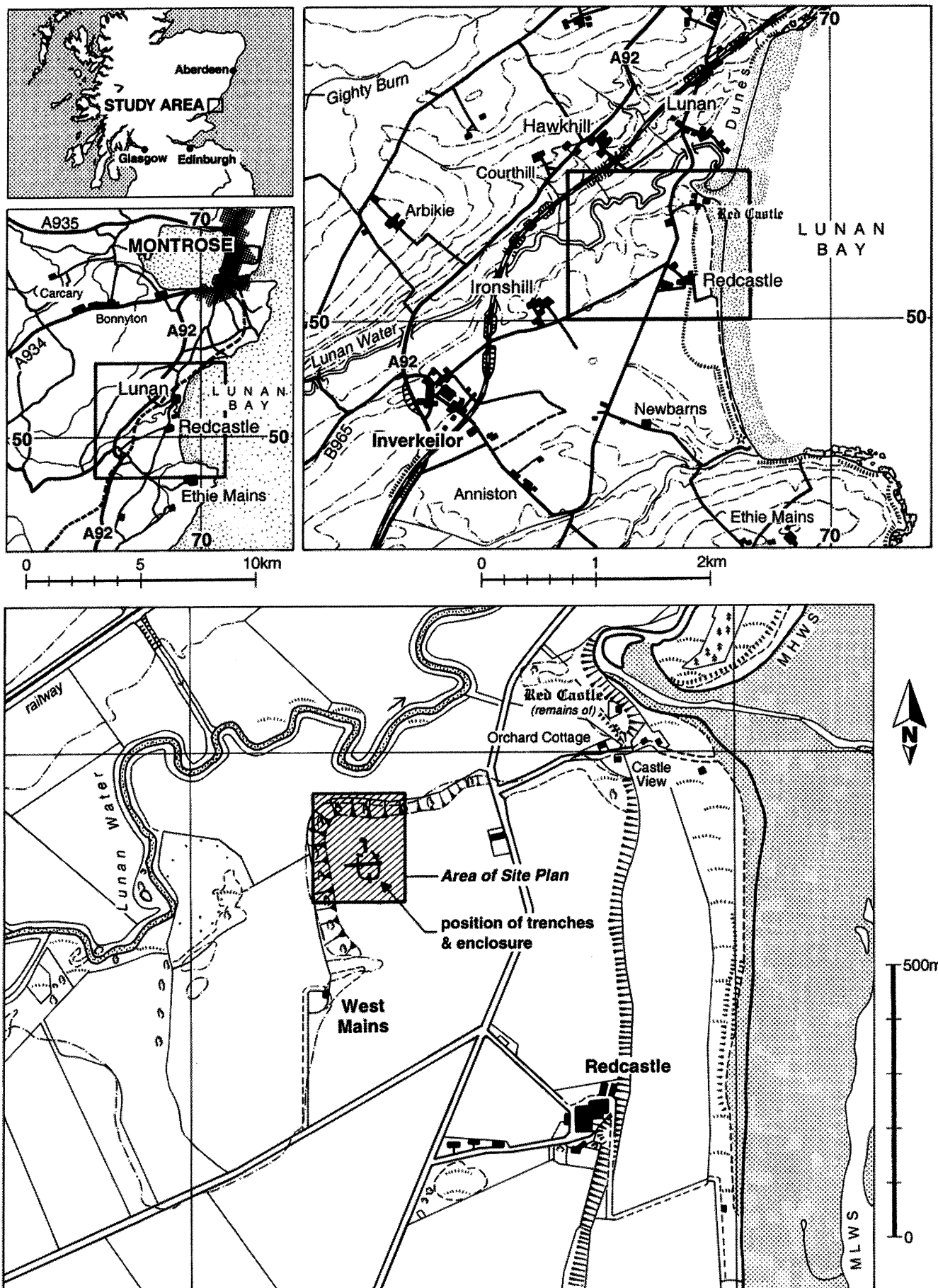




Illus 1 Location map (based on the OS map, Crown Copyright).

Investigation of a cropmark enclosure at West Mains, Lunan Bay, Angus

Derek Alexander

with a contribution by Adrian Tams

Introduction

This report presents the results of trial trenching undertaken at the cropmark enclosure at West Mains, Redcastle, Lunan Bay, Angus (Illus 1; NGR: NO 6832 5081; NMRS No NO65SE 31). The work was carried out in September 1998 as part of the University of Edinburgh's Angus and South Aberdeenshire Field School.

Lunan Valley is extremely rich in cropmark sites and Historic Scotland has recently undertaken one of its largest cropmark scheduling programmes. One of the aims of the Field School is to investigate a variety of cropmark sites, to examine their nature, extent and date, and to assess the amount of damage to these features caused by ploughing (Finlayson *et al* 1999).

The site is located 220m NNE of West Mains in a gently undulating field above the river terraces of the Lunan Water. Aerial photographs taken in 1988 reveal a rectilinear enclosure with flattened ends, bowed sides and rounded corners (Illus 2, RCAHMS AP No 050308). This enclosure measures at least 54m SSE to NNW by a maximum of 37m transversely within the ditch. The lack of sufficient secure control points on these photographs precluded the preparation of a rectified plot. A visit to the site indicated that the enclosure appeared to run across a natural hollow which corresponds to the elongated dark mark visible on the aerial photograph. This hollow was considered to indicate the presence of deeper soil and to have potential implications for varying preservation on the site. The north-western corner of this enclosure does not appear on the aerial photograph and suggested that the enclosure ditch might not have survived in this area. In addition to investigating the state of preservation of the enclosure, it was hoped that the project could locate some evidence for its date and function.

Aims and objectives

The aims and objectives of the archaeological investigations were as follows:

- To examine areas of apparent differential preservation of the enclosure ditch;
- To examine the differences between areas which appear as light and dark on the aerial photograph;
- To determine the date and functions of the enclosure;
- To teach a range of fieldwork methods to the undergraduate students.

Methods and results

Geophysical survey (not illustrated)

Resistivity survey was carried out prior to excavation in an attempt to detect the enclosure ditch and any associated features would be detected. Survey of four 30m by 30m grids was undertaken using a Geoscan RM15 resistivity meter with the twin probe array. However, on the resultant plots the enclosure ditch was only visible as a very faint, negative resistance anomaly. It is debatable whether this geophysical anomaly would have been recognised without the supporting evidence provided by the very clear cropmark visible on the oblique aerial photograph (Illus 2).

Excavation (Illus 3 and 4)

Six trenches were excavated radially at selected intervals around the perimeter of the enclosure (Illus 3). Firstly, a single large trench was excavated across the full width of the enclosure, within the area of the natural hollow (Trench 1). Once the perimeter ditch had been located the other trenches (2–5) were excavated to examine the line of the enclosure ditch elsewhere. A contour plan of the local microtopography was constructed and the results of this survey are presented in Illus 3, where the contours are shown as relative at 0.5m intervals below the highest point on the ridge to the north of the enclosure.

Enclosure

Trench 1 (60m by 2m) was excavated by machine across the middle of the natural hollow to locate the east and west alignments of the enclosure ditch. Each consisted of a V-shaped ditch, cut into a sandy gravel subsoil (Illus 4). The western ditch was located at a depth of about 0.5m below the surface. It was c. 1m wide and 0.45m deep. The eastern ditch in contrast was located at a depth of 0.8m below the surface, cut into the silty sand subsoil, and was c. 1.05m wide by 0.5m deep. The ditches were filled with a mix of silts and sands incorporating some lenses of gravel. Most of the ditch fill was similar to, and indistinguishable from, the buried ploughsoil. The topsoil was c. 0.35m deep and, apart from at the west end, it overlay a



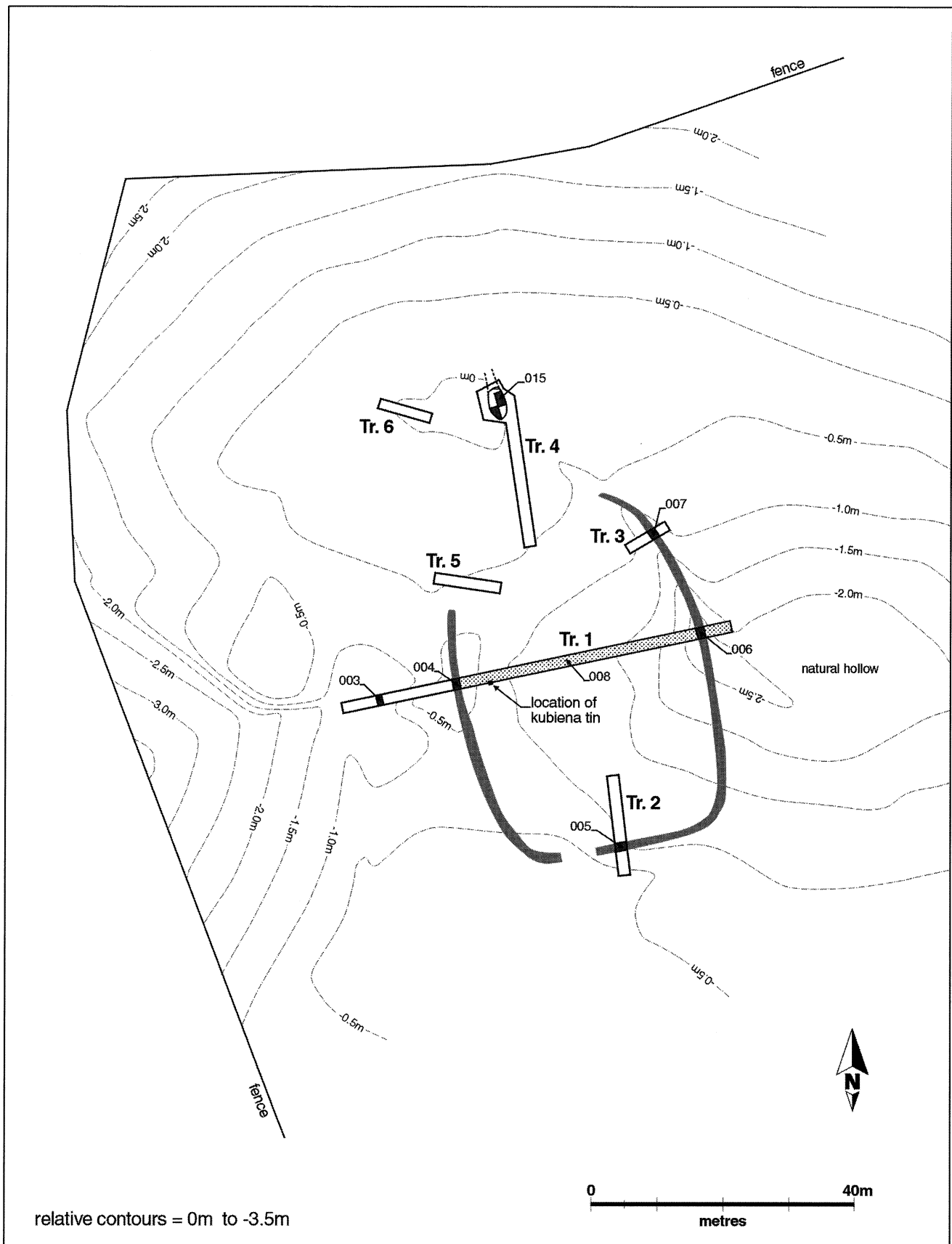
Illus 2 Aerial photograph (Crown Copyright: Royal Commission on the Ancient and Historical Monuments of Scotland).

buried ploughsoil deposit of silty sand which increased in depth from 0.15m (20m from the west end) to 0.4m in depth at the east end.

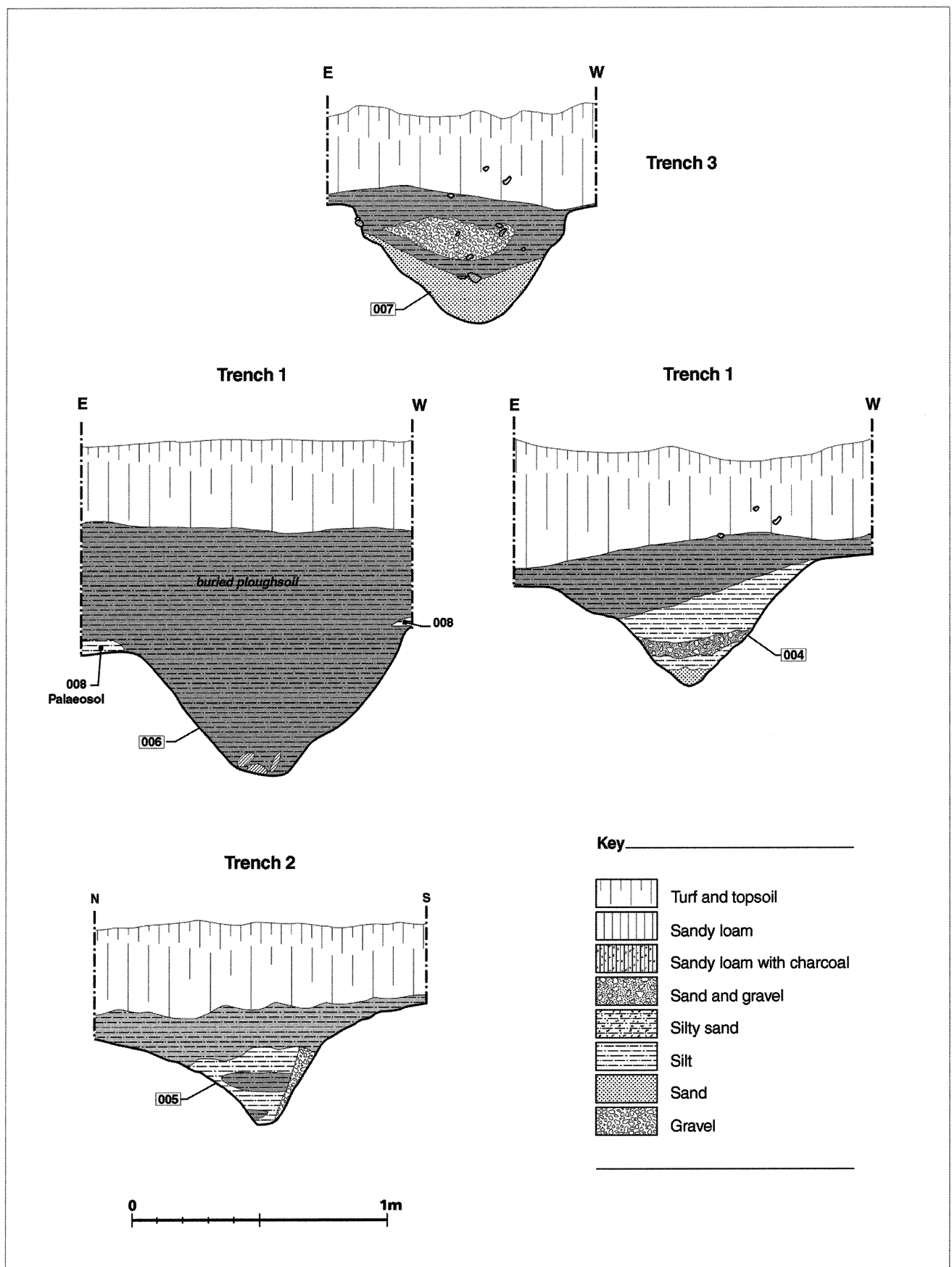
Below this buried ploughsoil, across much of the trench (Illus 3), was a dark brown/black palaeosol (008) which directly overlay the clean silty sand subsoil. This palaeosol was only located in Trench 1: its extent was presumably restricted to the base of the natural hollow. The eastern ditch of the enclosure had been cut down through this layer and therefore must post-date its formation (Illus 4). The palaeosol was best preserved on the inside of the western enclosure ditch (004). Although it was noted up to and beyond the eastern ditch (006) it was more patchy. No cut for the ditches could be discerned within the overlying buried

ploughsoil, which also appears to fill the ditch. It is likely, therefore, that the ditch was cut from the level of the palaeosol and was subsequently filled in and buried beneath a deep deposit (0.35–0.40m) of ploughsoil.

There was no buried ploughsoil or palaeosol in Trenches 2 and 3, where the enclosure ditch was identified immediately below the topsoil, which was 0.3–0.4m deep. In both cases the ditch was V-shaped and 0.8–0.9m wide by 0.4–0.5m deep. No trace of the ditch was found in Trench 5, matching its absence on the aerial photograph. No other features were revealed in the interior of the enclosure. Neither the ditch fills nor the excavated areas within the enclosure produced any small finds. There is thus no dating evidence.



Illus 3 Plan of cropmark enclosure and location of trenches.



Illus 4 Ditch sections.

Other features

Removal of the topsoil revealed a narrow linear feature (003) at the west end of Trench 1 (Illus 3). This feature, which did not appear on the aerial photograph, proved upon excavation to be only 0.15m deep.

Trench 4 was initially 24m long by 2m wide and was aligned north to south in an attempt to locate the northern side of the enclosure (Illus 3), which again did not show on the aerial photograph. It quickly became apparent that either the ditch did not survive in this area, or it had never been present here. However, at the north end of the trench a large dark area was identified on a slight rise and the trench was widened accordingly to reveal its full extent. This feature (015) appeared initially to be a large oval pit 5m long by 2.2m wide. Two quadrants (south-east and north-west) were excavated and revealed it to be up to 1.7m deep (Illus 5). Its upper fills consisted of a medium brown sandy loam with varying amounts of charcoal fragments. Below this there was another band of sandy loam which contained noticeably more charcoal fragments along with patches of clay and sand. Under this was a thick layer of mixed gravel containing some lenses of silt. This layer in turn sealed the basal fill which was a grey silty sand. No artefacts were recovered from this pit although a few fragments of poorly preserved unidentifiable bone were found in the gravel layer within it.

Prior to its excavation, this feature was suspected to be a relatively modern pit for burying dead livestock but this proved not to be the case—no skeletal remains were recovered and the nature of the fills suggest that

the pit silted up over a period of time rather than being deliberately backfilled. The most puzzling aspect was at its northern end, where its lower fills continued for at least 1m, beneath gravel deposits which had been thought on the surface to have been subsoil. Unfortunately because of the proximity of the edge of the trench, with a spoil heap above, it was not safe to attempt to pursue these layers any further. The northern edge of this feature was thus not located. It seems unlikely that the northern edge of the pit had been tunneled out and it is probable therefore that the upper fill of the pit at this point consisted of redeposited subsoil, so compacted that its edge could not be seen from the surface. The function and date of this feature remain unknown but its elongated form, depth, steep sides and flat base all suggest it could be one terminal of a souterrain without stone lining. Similar structures, presumably originally lined with timber or wicker have been excavated nearby at Redcastle to the east (DES 1998, 15) and Ironhill to the west (DES 1998, 14).

Trench 6 was excavated to the west of feature 015 in Trench 4 to check whether any other remains were identifiable along this slight ridge. No archaeological features were present in this trench.

Soil micromorphology

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Introduction

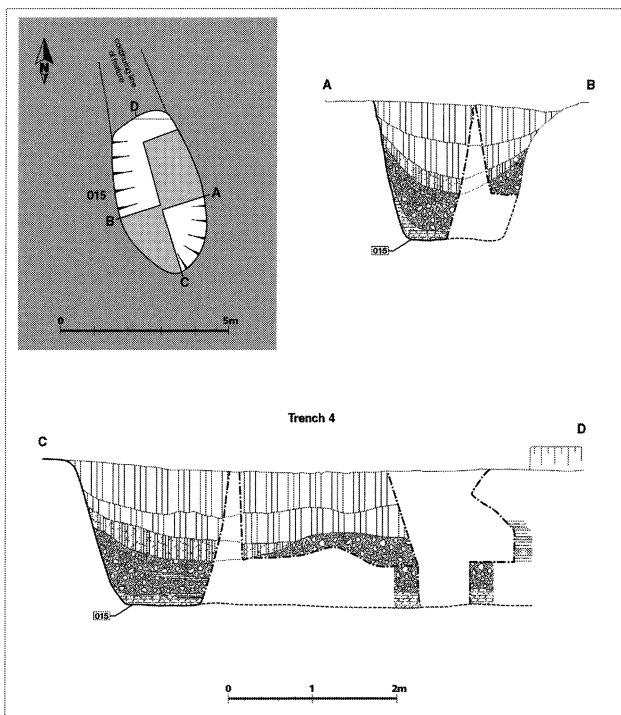
Excavation of Trench 1 revealed a palaeosol which had been buried by a silty sand ploughed (Ap) horizon. An undisturbed soil sample was taken using a

13 cm monolith tin with the intention of undertaking soil micromorphological analysis to determine whether the full profile of the buried soil survived and to assess the potential for pollen analysis.

Methods

The monolith tin was examined in the laboratory and the stratification recorded before sub-sampling with an 85mm x 60mm x 35mm kubiena tin. The sub-sample for analysis was taken from the lower 90mm of the monolith tin, since the upper 40mm was composed of the overlying the Ap horizon.

An 80mm x 50mm thin section was produced from the sub-sample by Dr. E.A. Fitzpatrick, Department of Plant and Soil Science, University of Aberdeen, using the standard methods of acetone drying, resin impregnation and thin sectioning (Fitzpatrick 1983; 1993). The thin sections were analysed using the methods and terminology recommended by Bullock *et al* (1985).



Illus 5 Sections of elongated pit in Trench 4.

Results

Table 1 *A summary description of the palaeosol at West Mains (context 008).*

mineral components		ground mass		pedofeatures	microstructures
<i>coarse material</i>	<i>fine material</i>	<i>coarse material</i>	<i>fine material</i>	typic coatings around	dominately
poorly sorted	none present	chitonic random	undifferentiated,	mineral grains;	pellicular
sand-sized grains			brown amorphous	faecal pellets	grain structure.
					One channel
					running through
					the section

There is little evidence for post depositional alteration of the soil, the analysis revealing a 75mm depth of uniform material. The soil has undergone significant biological activity, evidence being dominant faecal pellets of Enchaetrid worms.

Discussion

A palaeosol is defined as a soil formed on a landscape of the past (Wright 1992), with buried palaeosols occurring where the original land surface has been covered with younger deposits. Buried palaeosols have their characteristics largely fossilised by the surface accumulation of various sediments, where some secondary changes may occur, although these changes are usually minor (Wright 1986).

The micromorphological evidence supports the initial observation of the sediment having once been a surface soil, which has been subsequently buried by the overlying Ap horizon.

The textural pedofeatures of fine material surrounding the mineral grains in the thin section cannot be attributed to recent cultivation activity but rather are relict features of earlier cultivation practices. Textural pedofeatures of this nature are indicative of cultivated, exposed soils lacking permanent vegetation cover and with declining structural stability to which a reduced organic matter content would contribute. The physical processes forming these micromorphological features involve the structural break up of the soil surface by cultivation implements, slaking and mobilisation of water saturated soil followed by deposition against a barrier or when the soil dries out (Simpson 1997).

The evidence for the soil having once been a surface is further substantiated by the present of the excremental pedofeatures of faecal pellets. These are thought to belong to the Enchaetrid worm species, which survive in a specific ecological niche not greater than 100mm below ground surface, with a soil acidity of pH 3.5–8 (Fitzpatrick, pers comm).

The organic content of the soil is estimated at 10 % from the thin section, representing a soil with moderate organic material. The organic content constitutes the fine material in the thin section and is amorphous in nature, this being well decomposed and produced by bioturbation. This percentage organic content and fine nature of the organic material could represent traces of infield cultivation practices and plaggen manuring, a

technique that has been identified in the north-east of Scotland by Glentworth (1944). This practice would correspond with the evidence from the textural and excremental pedofeatures described previously. The fine material in the thin section was well decomposed by bioturbation and represents only the early stages of soil formation. The lack of development in the fine material could be an indication of the soil having been buried quickly by the overlying Ap horizon.

Conclusion

Soil micromorphology has revealed that the buried material represents a palaeosol which has undergone a relatively short period of formation at the ground surface, having been rapidly buried by the overlying ploughed soil. There is no direct dating evidence for this palaeosol, but given the apparent speed at which it was sealed and the possibility that the soil represents a relict of infield cultivation and plaggen manuring, a medieval or slightly later date seems most likely.

Discussion

The archaeological excavation at West Mains located the enclosure ditch and confirmed the pattern of evidence visible on the oblique aerial photograph. Where there were no cropmarks of the ditch no archaeological features were recovered and *vice versa*. The differences between the light and dark stones on the photograph appear to be a result of soil deposits of varying depths being present coupled with a difference in the underlying geology. The dark patch on the photograph corresponds to the natural hollow which has a silty sand subsoil, sealed below a partially preserved palaeosol. This paleosol lies under a deposit of buried plough soil with topsoil above. By contrast, the light areas correspond to the higher parts of the topography and consist of coarse gravel covered by a thin layer of topsoil. What is interesting is that the enclosure not only runs across this natural hollow but is also sealed below the layer of ploughsoil. The deposition of this ploughsoil was probably fairly rapid, certainly fast enough for it to seal, and therefore preserve, the palaeosol. Although the date of the ploughsoil is unknown, it is possible that it is associated with more intensive farming practices from the medieval period onwards.

It was anticipated that the enclosure ditch would be better preserved towards the base of the natural hollow, and although this was the case, the difference was not as marked as had been expected. The ditches in Trench 1 were up to 0.2m wider at the top but only up to 0.10m deeper than those uncovered in Trenches 2 and 3. The damage to the site by ploughing appears, therefore, to have been relatively even across its extent.

Unfortunately no artefacts were recovered from any of the trenches within the enclosure and no samples which would provide material suitable for dating were identified. The function of the enclosure thus also remains unknown and the morphology of the cropmark itself is not diagnostic. It does run across the natural hollow which might argue against it being a domestic settlement site as the central area would be less well-drained. Perhaps it was a simple stock enclosure associated with the large pit on the ridge to the north. If the enclosure and the large pit are related, which may explain why there was no trace of a ditch on the north side of the enclosure, then the elongated pit is unlikely to be a souterrain of Iron Age date. However, in the absence of any dating evidence from the ditched enclosure, the elongated pit or the palaeosol, any more definite explanation remains elusive.

Acknowledgements

Funding for the project was provided by Historic Scotland and the Department of Archaeology, University of Edinburgh. The Field School and the author wish to thank Frank Geddes for granting his permission to undertake this excavation. Thanks are also due to Dr Ian Armit, then with Historic Scotland and now at the University of Belfast, for comments on the field results; to Dr Geraint Coles and Mike Church, University of Edinburgh Department of Archaeology, and to Dr Mike Cressey, CFA, for discussing the possibilities regarding the formation of the palaeosol; to the students who undertook the fieldwork, and to the supervisors, Rob Engl and Mairi Davis. The author is indebted to Andy Dunwell and Prof Ian Ralston who commented on an earlier draft of this paper. Responsibility for this final form rests with CFA and the authors. The illustrations were produced by Kevin Hicks.

Archiving

The complete archive, including the Data Structure Report (Alexander 1998b), will be deposited in the NMRS, while reproducible elements will be supplied to the Aberdeenshire and Angus Sites and Monuments Record.

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Abstract

Trial trenching of a cropmark rectilinear at West Mains, Angus (NO 6832 5081) was carried out in 1998 as part of the University of Edinburgh's Angus and South Aberdeenshire Field School. The objectives were to determine the nature, extent and degree of preservation of the cropmark features. Excavation revealed that the enclosure ditch was close to the present surface where it showed on the aerial photograph, but elsewhere it was sealed below a layer of buried ploughsoil deposited in a natural depression probably by agricultural activity. This ploughsoil sealed an organic rich palaeosol, which the ditch of the enclosure clearly cut through. A large pit, not apparent on the aerial photograph, was discovered to the north of the enclosure. No datable artefacts or materials suitable for radiocarbon dating were recovered from it, but its elongated form, depth, steep sides and flat base all suggest it could be the terminal of a souterrain without stone lining.

Keywords

cropmark
enclosure
palaeosol
souterrain
trial trenching