PRELIMINARY RESULTS OF THE EXCAVATION ASSESSMENT AT MUNKERHOOSE CLIFF-SECTION AND FARM MOUND, ST BONIFACE CHURCH, PAPA WESTRAY, ORKNEY

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Introduction

The 1990 assessment excavation along the cliff-section adjacent to St Boniface church on Papa Westray was prompted by the threat of coastal erosion. The assessment was funded by Historic Scotland. The site lies on the north-west facing coast (Fig. 1) where erosion, caused by the wind as much as by the action of the sea, is active. The problem is exacerbated by the craggy nature of the local off-shore topography.

An extensive Iron Age settlement, known locally as *Munkerhoose* (RCAHMS 1946, ii, 184, No. 526), is located under and to the west of St Boniface church. A large farm mound, previously identified as *Binnas Kirk* (Lamb 1983, 18) and possibly the site of a separate ecclesiastical building (Marwick 1925, 35), lies to the north. Both settlement mounds, one dominated by stone, the other composed almost wholly of fine mineral sediments, are exposed in the adjacent eroded cliff-section. The settlement complex extends roughly 110 yards (100m) inland and nearly 220 yards (200m) along the coast.

Objectives

The principal aims of the assessment were to determine the horizontal and vertical extent of the site; to record the surface remains, their relationship to each other and to the features exposed in the cliff-section; to record and characterise the nature of the structures and deposits in the cliff-section and to retrieve datable and environmental material from appropriate contexts; to determine the relationship of the farm mound to the Iron Age settlement; and to identify the formation processes and date of the farm mound. The purpose of the assessment was thus to clarify the nature, date and extent of the archaeological deposits and features at the site.

Archaeological and Historical Background

The present church is largely an eighteenth-century rebuild of an originally twelfth-century building and a coped stone or hogback of this period still survives at

the site (Kirkness 1921, 132–4; Lang 1974, 220, 230). An earlier ecclesiastical site, however, is indicated by discoveries, during grave-digging, of two eighth-century cross-incised stones (Kirkness 1921, 134; Radford 1962, 169; Lowe 1987, ii, 122–6). Bone comb fragments of seventh- and eighth-century type have also been recovered from the cliff-section (Arnold 1975).

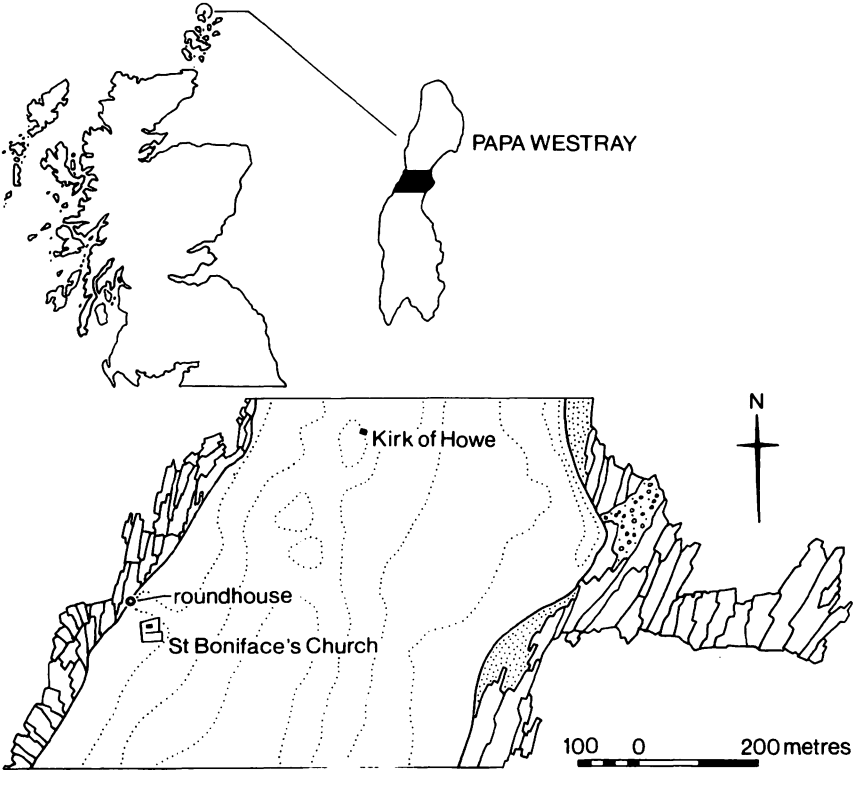

Fig. 1.

The dedication and toponymic evidence is also significant and a case can be made that the site was an important early ecclesiastical centre, possibly the seat of a pre-Norse bishopric associated with the eight-century Northumbrian mission to Pictland (Marwick 1925, 35; Lamb forthcoming). Certainly, references to a mid ninth-century bishopric on the island may be inferred from Thomson's recent (1986) reappraisal of the *Life of St Findan*. The association of Late Iron Age and ecclesiastical sites is also important, given the attendant implications for the continuity of settlement and the development of ecclesiastical sites in the Northern Isles in the period prior to the Norse settlement (Lamb 1983, 8; Lamb forthcoming; Lowe 1987, i, 287–327).

Farm mounds are a class of monument which has only recently been recognised in Orkney (Davidson, Lamb and Simpson 1983) and consequently, to date, they have been little studied. They are substantial accretions of mineral matter, and the monument type, although perhaps best associated in Orkney with the islands of Sanday or North Ronaldsay (Lamb 1980), is also found on Papay. Preliminary investigations in northern Norway have suggested that the key factor affecting the formation of these landforms is probably architectural, mound accumulation being the result of the decay and replacement of turf buildings, with some input from midden, manure and windblown sand (Bertelsen 1989). Investigations on Sanday (Davidson, Harkness and Simpson 1986), on the other hand, have suggested that the mounds formed as the result of the gradual accumulation of midden material, which for one reason or another was left *in situ*. Most of the Norwegian examples and one of the three Sanday farm mounds have been radiocarbon dated to the medieval period. Some, however, have been assigned on the basis of radiocarbon dating to the Iron Age.

St Boniface church, the farm mound and the Munkerhoose settlement complex are impressive monuments in their own right. Together, however, they have been described as 'an assemblage of the greatest historical importance' (Lamb 1983, 8).

METHODOLOGY

Survey

The horizontal and vertical extent of the site was determined by coring. A surface survey, to record the disposition of features in the cliff-section and the form and surface extent of the farm mound and the ground between the churchyard and the sea, was also undertaken (Fig. 2).

Other major features were located. A second, smaller mound with an southeast/northwest aligned rectangular stone building on its summit and a subrectangular platform on its south side was located to the west of the churchyard. It is conceivable that this, and not the large, amorphous mound to the north of the churchyard, is the site of the Binnas Kirk. Additional features which were located include a rectangular platform on the north flank of the northern farm mound, a possible boat naust at the south end of the settlement mound and several circular depressions, possibly kelp pits.

Excavation

The exposed cliff-section was approximately 140 yards (125m) long and was characterised, prior to excavation, as basically consisting, from south to north, of outbuildings, a probable broch, further outbuildings (all with superimposed structures and deposits) and a farm mound. The assessment was conducted by means

of a combination of horizontal excavation and vertical section, utilising the natural breaks of slope on the site, and resulted in the production of a complete stratigraphic record across what is undoubtedly a major prehistoric and medieval settlement complex. Three main section lines (Fig. 3) were utilised and, in all, just over 90 yards (80m) of the cliff-section was investigated.

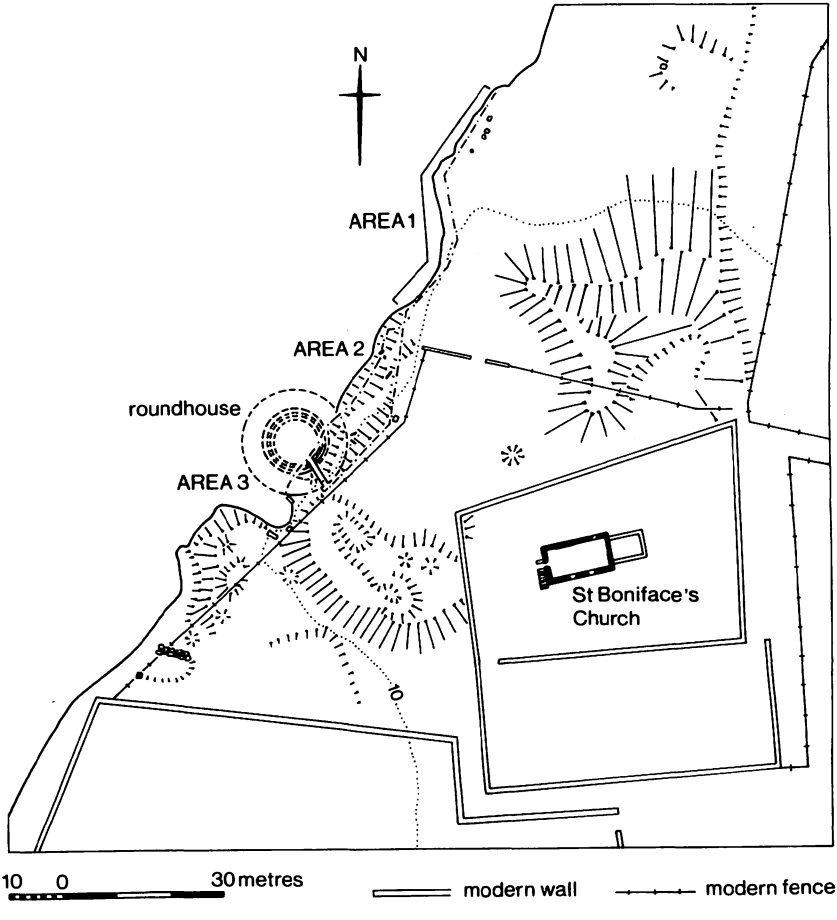

Fig. 2.

The Stratigraphic Sequence

The earliest deposits on the site consisted of sand and sandy loam soils. The earliest features are fragmentary and are poorly understood. Cattle and pig bone from a destruction horizon, overlying sand and sealed by building debris, and over

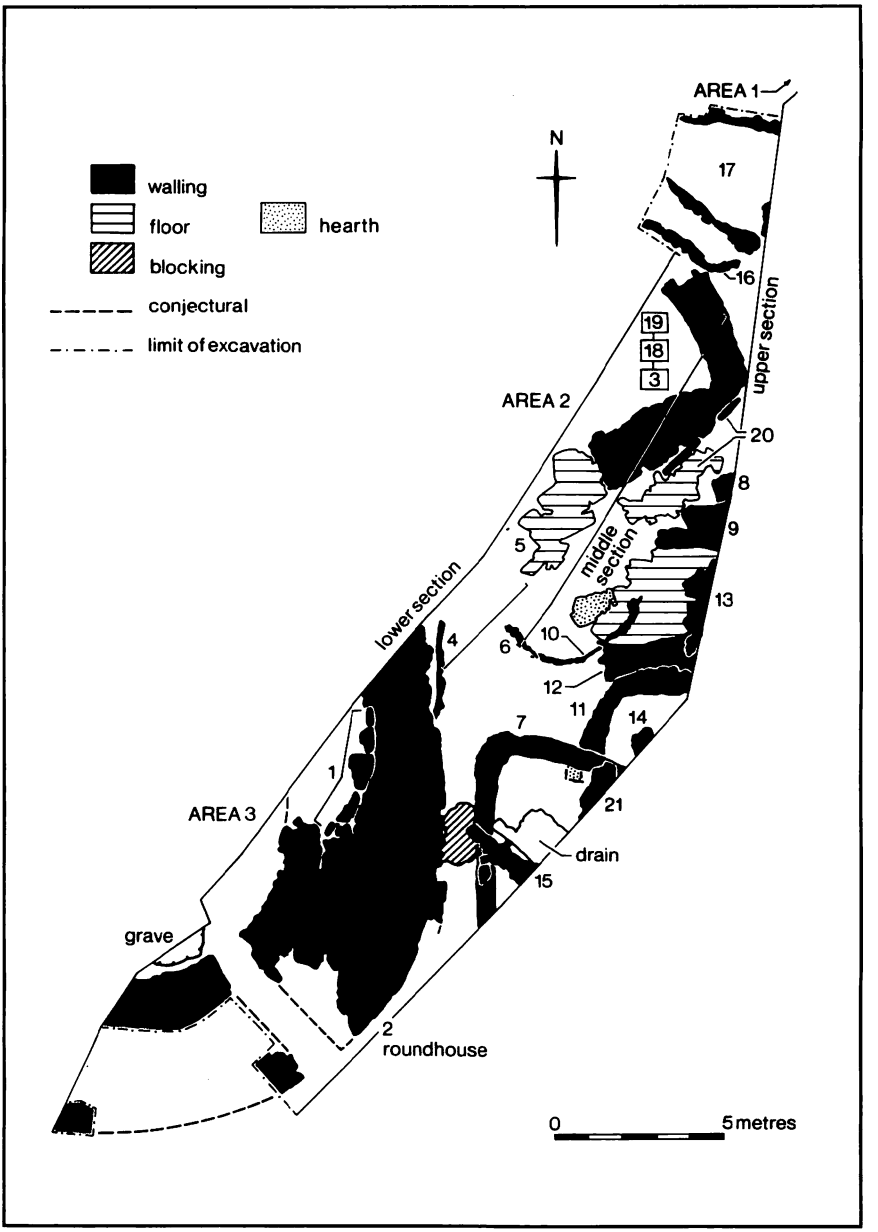
walling
floor
hearth
blocking
conjectural
limit of excavation
N
AREA 1
AREA 2
AREA 3
upper section
middle section
lower section
17
16
19
18
3
20
8
9
13
5
10
6
4
12
11
14
7
1
21
drain
15
grave
2
roundhouse
0
5 metres

Fig. 3.

which the roundhouse (*Structure 2*) was later built, has been radiocarbon dated to around the middle of the second millennium BC (AA-9560, 3175 ± 60 bp, 1610–1320 BC). Cattle bone from the primary sandy surface itself has been radiocarbon dated to the early third millennium BC (AA-9561, 4240 ± 60 bp, 3020–2700 BC).

A small stone-lined grave, aligned roughly north-east to south-west, was inserted into this primary sandy surface. The grave contained the skull and fragments of long bones of a male of indeterminate age (Lorimer personal communication). A pit was also cut into, and a cairn of stones piled over, the same surface. This structure, possibly a funerary monument, was later incorporated into the south wall of the roundhouse. The fragmentary remains of a building (*Structure 1*) were located at the same stratigraphic level. No relationship between the grave, the cairn and the building, however, could be defined. An amorphous stone-lined pit may also belong to this early horizon. These are the earliest known features on the site. They can be dated not later than the mid first millennium BC and, as indicated by the radiocarbon dates from contexts at and near the base of the section, could be considerably earlier. Structure 4, part of a free-standing, cellular or lobate building, which lay immediately to the north of the later roundhouse, clearly formed part of an earlier settlement on the site. The cell, as defined in the Middle Section, was up to 4ft 8in (1.4m) across and was constructed with thick walls, faced on both sides with an earth and rubble core. A series of well-stratified floor surfaces was preserved inside this building. A charcoal-rich ashy floor deposit, containing cattle and red deer bone, has been radiocarbon dated to 1535–1115 BC (AA-9562, 3100 ± 85 bp). Other buildings were located to the north at the same stratigraphic level.

A substantial thick-walled roundhouse (*Structure 2*) was subsequently erected on the site. The structure was built on sandy soil to the west and on building rubble to the east. The walls were constructed with a solid soil and rubble core. The building was entered from the south-east and the exterior face, in this sector, stood nearly 10ft (3m) high. Only part of the south and east sectors of the roundhouse survived but sufficient to demonstrate that the building measured roughly 60ft (17.6m) externally. At least two phases of construction were apparent. In its primary phase the walls were 10ft 8in (3.2m) to 12ft 8in (3.8m) wide, providing an internal space 35ft 4in (10.6m) across (*circa* 950ft^2 (90m^2)). A series of additional internal wall-skins was added, apparently for stability after what appears to have been an early collapse or possibly in connection with the building of a secondary roundhouse inside the building. The floor was neatly paved with large flagstones and covered a drain which extended through the entrance and presumably across the interior of the building.

Radiocarbon dating of a shell midden which accumulated against the exterior of the building, and over which a series of flagged passageways was later built, indicates that the building was constructed before or around the middle of the first millennium BC (GU-3059, 2830 ± 50 bp, 800–390 BC; GU-3271, 2850 ± 50 bp, 800–390 BC). The building is clearly attributable to the Early Iron Age and joins the growing list of early large roundhouses of this period which have been excavated in Orkney in recent years (Tables 1 and 2).

Table 1: Radiocarbon Dates for Early Iron Age Roundhouses in Orkney

	Uncalibrated	Calibrated
Bu, Mainland		
GU 1228 primary occupation of roundhouse	2470 ± 95 bp	830–385 BC
GU 1154 primary occupation of roundhouse	2460 ± 80 bp	810–390 BC
Quanterness, Mainland		
Q 1465 primary occupation of roundhouse	2570 ± 85 bp	915–465 BC
Q 1464 primary occupation of roundhouse	2440 ± 85 bp	810–380 BC
Tofts Ness, Sanday (all samples were taken from later deposits associated with the secondary roundhouse)		
GU 2183	2990 ± 100 bp	1515–950 BC
GU 2207	2510 ± 140 bp	983–370 BC
GU 2288	2470 ± 50 bp	805–410 BC
GU 2544	2470 ± 50 bp	805–410 BC
St Boniface, Papa Westray		
GU 3059 shell midden, TAQ roundhouse	2830 ± 50 bp	800–390 BC
GU 3271 shell midden, TAQ roundhouse	2850 ± 50 bp	800–390 BC
Pierowall, Westray		
GU 1580 occupation deposit, TPQ roundhouse	2510 ± 80 bp	830–395 BC
GU 1581 occupation deposit, TAQ roundhouse	2425 ± 60 bp	780–385 BC
Howe (Phase 5), Mainland		
GU 1789 construction of roundhouse rampart	2405 ± 70 bp	800–385 BC

References: Carter et al. 1984; Dockrill personal communication; Hedges 1987, i; Renfrew 1979; Sharples 1984.

The roundhouse was associated with what appears to have been a contemporary external settlement, subsequently enclosed to the north by a stone-revetted ditch (*Structure 17*). The ditch was up to 10ft (3m) wide and 5ft (1.5m) deep and cut through, thereby largely destroying, an earlier building (*Structure 16*) which had been filled with shell. Radiocarbon dating of the shell from this building clearly indicates that the ditch was cut not earlier than the last half of the first millennium BC (GU-3058, 2620 ± 50 bp, 515–270 BC; GU-3274, 2570 ± 50 bp, 400–50 BC). Shell from the infilling of the ditch itself has been radiocarbon dated to around the first quarter of the first millennium AD (GU-3277, 2350 ± 50 bp, 85 BC – AD 210). Human skeletal remains of an adult male (Lorimer personal communication) were also recovered from the base of the ditch. The radiocarbon dates from Structures 16 and 17, in conjunction with the early *terminus ante quem* date for the roundhouse, would imply that it is more likely than not that the settlement was originally unenclosed. This is an interesting, if not unique, phenomenon. This set of relationships,

regarding the development of the site, fills out the transition from Early Iron Age roundhouse and the Middle Iron Age enclosed settlement. Importantly, however, the early roundhouse certainly attracted and may, from its very inception, have been associated with an extra-mural settlement (Fig. 4). As such, the excavations at St Boniface provide an alternative development model to the phenomenon, in evidence at Bu (Hedges 1987, i) of the 'isolated roundhouse' and the later manifestation, as at Gurness (Hedges 1987, ii), of the fully developed broch settlement.

In a subsequent phase in the development of the extra-mural settlement, a large subrectangular dry-stone building with rounded corners (*Structure 7*) was constructed on the site. This was one of the best preserved buildings traced during the assessment. It was aligned roughly north to south and measured at least 14ft (4.25m) by 11ft 8in (3.5m) inside walls roughly 2ft (65cm) wide. The structure was faced internally and externally with a solid stone core. No trace of an entrance was located. The building was filled with rubble and charcoal-rich sandy soil. It clearly post-dates the construction of the roundhouse and may be of a type found on Iron Age sites elsewhere in northern Scotland, for example at Howe (Carter et al. 1984, 68) and Gurness (Hedges 1987, ii, 67–71) on Orkney Mainland, and at Yarrows and Keiss (Anderson 1901) in Caithness. It may also be related to structures of the kind excavated at Forse (Curle 1941), also in Caithness. Radiocarbon-dating of seemingly fresh and unabraded shell deposits (GU-3282, 2250 ± 50 bp, AD 25–330), which were dumped inside Structure 11 (see below) after the construction of Structure 7, suggest that both buildings could be assigned to the first quarter of the first millennium AD, if the deposits are contemporary with the event and are not older deposits subsequently reworked.

Table 2: Early Iron Age Orcadian Roundhouses (all dimensions in metres)

Site	External Diameter	Internal Diameter	Wall Thickness
St Boniface	17.6	10.6	3.2–3.8 (Primary)
	17.6	7.5	4.9–5.3 (Secondary)
Quanterness	8.8	7.0	0.8–1.4 (Primary)
	10.2	7.0	2.1 (Secondary)
Pierowall	>16.0	?10.0	3.1
Bu	20.0	9.0–10.1	4.8–5.7
Tofts Ness	8.4–9.6	5.2	1.6–2.2

References: Dockrill personal communication; Hedges 1987, i; Renfrew 1979; Sharples 1984.

Fig. 4.

Structure 7 was located roughly 3ft (1m) to the east of the roundhouse, the space between the two buildings forming a paved passage which was relaid because of subsidence on at least two occasions. At the end of the structural sequence, possibly after a period of stone-robbing since the passage between the buildings was filled with a deposit of splintered shale fragments, the passage was blocked by the insertion of a cross-wall and the roundhouse wall was buttressed externally. This may imply that occupation was still continuing inside the roundhouse at this time. It is stratigraphically possible that the walls that were added to the interior of the roundhouse may be contemporary with this event. The absence, however, of any significant floor deposit over the primary roundhouse floor may suggest that these internal and external modifications were dissynchronous.

A small annexe (*Structure 11*) was butted against the north exterior face of Structure 7. Only a small part of the building was located in the excavation area. The building appears to be subrectangular with its longer axis probably aligned roughly east to west. Its masonry was similar in appearance and construction to that in the larger building, Structure 7, to the south. The north wall stood 5ft (1.5m) high and incorporated a low lintelled opening in its base, 2ft 4in (70cm) high. The building was filled with midden material and overlain with lensed ashy deposits. No recognisable floor was located.

A small circular building (Structure 12), 11ft 8in (3.5m) in diameter, its floor neatly paved with large flagstones, was subsequently erected against the north wall of the annexe. The walls of the building were constructed of large orthostats with

coursed dry-stone masonry on top, the whole backed with rubble and midden material. The style of the building is reminiscent of the north-west end of the Late Iron Age House 4 at Buckquoy (Ritchie 1977), and is seen also in the architecture of the undated building at the Point of Buckquoy (Morris 1989, 71–91, 281, ill. 56a) and in the late and post wheelhouse period buildings at Jarlshof (Hamilton 1956, 76). The St Boniface example, on the basis of the stratigraphy and radiocarbon dating evidence, is not earlier than the first quarter of the first millennium AD.

Structure 12 also overlay another building (*Structure 10*), of similar size but constructed solely with crudely coursed walls backed into rubble. A stone feature in the centre of the building may represent the remains of a hearth and trough.

Late buildings, represented by a series of linear dry-stone walls, were located at the top of the section (*Structures 14, 21, 15*). Probably medieval in date, the identification of a buried ground surface below two of these structures clearly reflects a temporary abandonment. Interestingly, this is the only sign of a chronological break on this part of the site. Quite when it occurred, however, is as yet unknown, although a date in the seventh or eighth century AD may be indicated (see below). What seems a real possibility, however, is that settlement on the site, from the latter half of the second millennium BC, through to the foundation of the roundhouse in the first half of the first millennium BC and on into, roughly, the latter part of the first millennium AD, appears to have continued unbroken. Buildings were constructed, repaired, robbed, levelled, rebuilt, reused and ultimately abandoned.

Buildings and deposits at the north end of the site can be related only loosely to the stratigraphic key-sequence. Part of the reason for this break is accounted for by the levelling of the site for the construction of a large subrectangular, free-standing building (*Structure 19*). This building was associated with the working of bronze; a bronze ingot, clay moulds and slag were recovered from its floor. A radiocarbon date (AA-9564, 1815 ± 60 bp, AD 80–365) from midden material which filled the building after its abandonment suggests that Structure 19, too, formed part of the Middle Iron Age settlement.

Earlier structures were severely truncated. The walls of Structure 19 overlay a small, rough oval building (*Structure 16*), which had, itself, been truncated on its north side by the enclosure ditch (*Structure 17*: see above). Structure 16 was constructed with single-faced walls, cut through earlier deposits and cutting into the natural subsoil. It was erected sometime in the later first millennium BC (GU-3274, 2570 ± 50 bp, 400–50 BC). Just to the north of the enclosure ditch, and roughly contemporary with this building, a small cell (*Structure 22*) of a larger lobate building was located, its floor, hearth and occupation deposits, clearly defined in the cliff-section. With the exception of a building to the north (*Structure 23*: discussed below), which was linked by a quite remarkable stone-laid path, this building seems to define the northern limit of Iron Age settlement of the late first millennium BC. The later Iron Age settlement, by way of contrast, appears to have been much smaller and this may reflect a decline in the status and prestige of the settlement.

The farm mound was located at the north end of the excavated cliff-section. It

overlay Iron Age buildings and deposits but it is clear that the initiation of the farm mound owes nothing to this phase of activity on the site.

A substantial stone-built path lay to the north of the ruins of Structure 22. The path was formed of massive stones and was traced over a distance of roughly 12 yards (11m). It was founded, for most of its course, over the natural subsoil and primary sandy soil deposits. To the north the path appeared to be associated with the fugitive remains of a small building (*Structure 23*). The building, presumably of some importance to have merited the time and the effort that must have been taken in laying the path up to it, was poorly preserved and its function unknown.

The area to the east of the path was subsequently filled in with midden material and a crude dry-stone wall (*Structure 24*), which was erected towards the south end of the path, may have been an attempt to revet the midden dumps to the south. By all accounts the area seems to have been given over as a kind of communal rubbish dump. Radiocarbon dating of mammal bone from the basal deposits in the midden indicate that this activity started around the middle of the first millennium AD (GU-3063, 1570 ± 90 bp, AD 285–670). Radiocarbon dating of shell and bone from the uppermost deposits in the midden, however, suggests that dumping terminated quite abruptly in or around the seventh or eighth century AD (GU-3064, 1700 ± 50 bp, AD 605–850; GU-3065, 1370 ± 90 bp, AD 520–870) and a clearly defined ground surface subsequently formed over these deposits. This surface, in places lensed with peat ash, was approximately 8in (20cm) thick. It formed a continuous, more or less level and very distinct horizon throughout the farm mound cliff-section (Fig. 5).

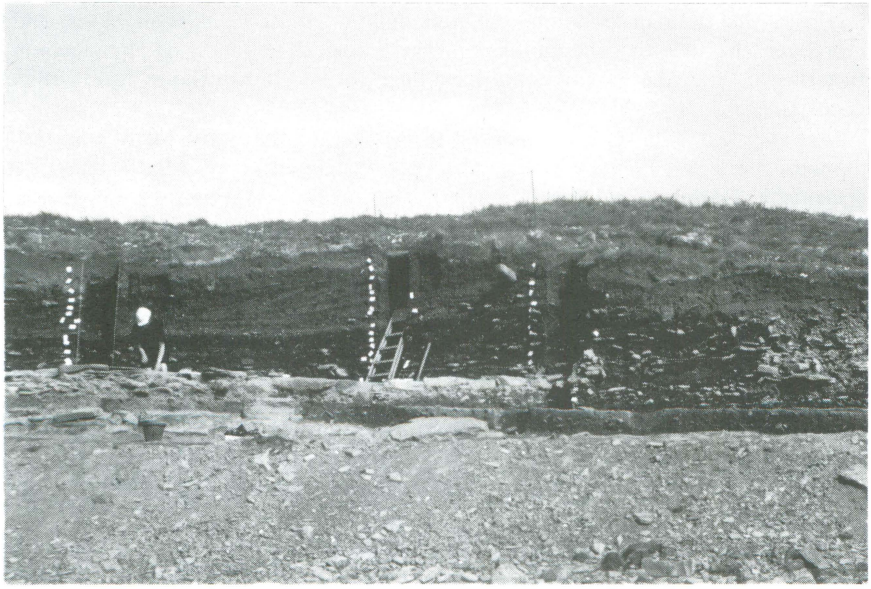

Fig. 5.

The seventh- or eighth-century date is instructive. This is the period of the ecclesiastical foundation of the site and it is tempting to associate this change in use, like the break observed in the structural sequence on the stone settlement mound to the south, with the establishment of the church on the site, although the actual mechanisms that must have attended this event are by no means clear. We have no means of knowing, for example, whether the ecclesiastical foundation was attached to, to serve, an existing and thriving Late Iron Age settlement, or whether the settlement, in decline or previously abandoned, was gifted to the Church by some secular potentate.

It is clear that the old ground surface developed over a considerable period of time, some two to three hundred years on the basis of the radiocarbon dates from above and below it. It was on this surface that the farm mound accumulated, the deposits consisting of thin but extensive layers and lenses of almost entirely ash material with fish bone and some animal bone and shell. The finely layered nature of the soil matrix suggests that the deposits have undergone little or no change since deposition and that accumulation must have been rapid. The rapidity of this accumulation is reflected tellingly in the radiocarbon dates. Radiocarbon dating of the basal deposits of the mound (GU-3066, 1330 ± 50 bp, AD 1010–1185; GU-3067, 920 ± 60 bp, AD 990–1240) are statistically indistinguishable from that recorded in the upper part of the mound (GU-3069, 1270 ± 70 bp, AD 1020–1295). It is, of course, by no means certain that the full chronological span of the monument is necessarily represented by these dates since only the edge of the monument has been exposed in the cliff-section. However, on the basis of the evidence available, the radiocarbon dates reinforce the field observation that accumulation must have been rapid, and, moreover, the view that the monument type is basically a medieval phenomenon. In terms of time, the mound could have been formed in as little as two or three generations.

Iron Age dates have been recorded from some of the north Norwegian farm mounds (Bertelsen 1979), and have also been assigned to two of the Sanday sites (Davidson, Harkness and Simpson 1986). There is nothing inherently improbable with such an ascription, since the underlying processes which created or stimulated mound formation could be common to both historical periods. In the case of the Orkney farm mounds, for example, it may be that mound accumulation correlates with those areas which have poor reserves of blanket peat. It must be asked, however, if the samples from these other sites are really dating mound initiation. It should be clear, for example, that test-pitting of the St Boniface farm mound would have produced Iron Age dates. It is equally clear, however, having examined an extensive slice of the monument that the farm mound element is only represented in the upper strata of the cliff-section. Indeed, part of the problem, which this exposes, lies with the definition of the farm mound as a coherent and clearly identifiable type of monument.

The farm mound deposits were noticeably almost wholly free of artefacts, an observation which would suggest that the mound material derives from a specialised source, presumably non-domestic in character. Three miscellaneous fragments of

copper alloy, including an incised tag, an iron object and several lumps of impressed mortar, from the base of the mound, were the only stratified finds located. The latter find, in particular, is of some considerable significance, implying the destruction or refurbishment of a mortared building on the site, very likely a church, at the very time of the mound's inception.

It is not clear whence and by whom the farm mound was generated. Its size suggests a large, wealthy, settlement, of comparable status perhaps to the Iron Age settlement at its height. The originators of the mound material may be the descendants of these people, and it may be that the decline and contraction of the Iron Age settlement which was noted in the section is more apparent than real, given that the core of the later Iron Age site may have simply been relocated to a different part of the settlement mound. Alternatively, it must be asked whether the farm mound is somehow associated with the ecclesiastical settlement on the site, its generation perhaps the result of a tithe or render system to the ecclesiastical settlement. The mound's apparent *terminus*, sometime in the first quarter of the present millennium, in this example, might then represent the break-up of the early monastic or episcopal establishment on the site and the construction or refurbishment of the church as a parochial church for the island.

Conclusions

This short season of work at Munkerhoose has provided a large body of information, out of all proportion to the size and cost of the fieldwork element. Analysis of the stratigraphic data, the different building types, the stratified coarse pottery assemblage and the environmental evidence will provide an enormous research potential in many academic fields, not only for Iron Age and Early Medieval studies, but also, perhaps most significantly of all, for farm mound studies and research into the origins of these enigmatic landforms.

NOTES

[1] A version of this text was first presented as a paper at the *Ancient Earldoms of Orkney and Caithness Conference*, organised by Orkney Museums service, in November 1991. A related draft was also presented at the *Third Stratigraphy Conference* in the Museum of London, in June 1993. I am grateful to my colleagues at AOC (Scotland) Ltd., especially Dr Stephen Carter and John Barber, and Patrick Ashmore, Principal Inspector of Ancient Monuments, Historic Scotland, who kindly commented on an earlier draft of this paper.

[2] All quoted radiocarbon dates have been calibrated with respect to their calendrical age in accordance with the procedures described by Dalland (1993), using software which incorporates the Belfast calibration curve (Pearson et al. 1986). The dates have been adjusted, where necessary, for the marine effect. The 'Long Continuous Range' dates are equivalent to the 2-sigma level of confidence. I am grateful to Dr Anne Crone and Magnar Dalland, of AOC (Scotland) Ltd., for providing the calibration data.

[3] I am grateful to Stephen Dockrill of the Department of Archaeological Sciences, Bradford University, for the unpublished information regarding the Early Iron Age roundhouse at Tofts Ness.

[4] Historic Scotland arranged and funded the assessment.

REFERENCES

Anderson, J., 'Notices of nine brochs along the Caithness coast from Keiss Bay to Skirza Head, excavated by Sir Francis Tress Barry', *PSAS*, xxxv (1900–1901), 112–48.

Arnold, C.J., 'Fragments of bone comb from Papa Westray, Orkney', *PSAS*, cvi (1974–5), 210–11.

Bertelsen, R., 'Farm mounds in north Norway; a review of recent research', *Norwegian Archaeological Review*, xii (1979), pt. 1, 48–56.

Carter, S.P., Heigh, D., Neil, N.R.J. and Smith, B., 'Interim report on the structures at Howe, Stromness, Orkney', *Glasgow Archaeological Journal*, xi (1984), 61–73.

Curle, A.O., 'An account of the partial excavation of a wag or galleried building at Forse in the parish of Latheron, Caithness', *PSAS*, lxxv (1940–1941), 23–39.

Dalland, M., 'Calibration and stratigraphy', in Barber, J. (ed.), *Interpreting Stratigraphy* (1993), 27–35.

Davidson, D.A., Harkness, D.D. and Simpson, I.A., 'The formation of farm mounds on the island of Sanday, Orkney', *Geoarchaeology*, i (1986), pt. 1, 45–60.

Davidson, D.A., Lamb, R.G. and Simpson, I.A., 'Farm mounds in North Orkney: a preliminary report', *Norwegian Archaeological Review*, xvi (1983), pt. 1, 39–44.

Hamilton, J.R., *Excavations at Jarlshof, Shetland* (HMSO, Edinburgh, 1956).

Hedges, J.W., *Bu, Gurness and the Brochs of Orkney*, 3 volumes (British Archaeological Reports, 1987).

Kirkness, W., 'Notes on the discovery of a coped monument and an incised cross-slab at the graveyard, St Boniface church, Papa Westray, Orkney', *PSAS*, lv (1920–21), 131–4.

Lamb, R.G., *The Archaeological Sites and Monuments of Sanday and North Ronaldsay* (RCAHMS, 1980).

Lamb, R.G., *The Archaeological Sites and Monuments of Papa Westray and Westray* (RCAHMS, 1983).

Lamb, R.G., 'The Papar of Papil' (1988 Shetland Conference, edd. B. Smith and V. Turner, forthcoming).

Lang, J.T., 'Hogback monuments in Scotland', *PSAS*, cv (1972–4), 206–35.

Lowe, C.E., *Early Ecclesiastical Sites in the Northern Isles and Isle of Man: an Archaeological Field Survey* (2 volumes), (Unpublished PhD Thesis, Department of Archaeology, University of Durham, 1987).

Marwick, H., 'Antiquarian notes on Papa Westray', *Proceedings of the Orkney Antiquarian Society*, iii (1924–5), 31–47.

Morris, C.D., *The Birsay Bay Project, i, Brough Road Excavations 1976–82* (University of Durham, Department of Archaeology, 1989).

Pearson, G.W., Pilcher, J.R., Baillie, M.G.L., Corbett, D.M. and Qua, F., 'High precision C14 measurement of Irish oak to show the natural C14 variation from AD 1840 to 5210 BC', *Radiocarbon*, xxviii (1986), pt. 2B, 911–34.

Radford, C.A.R., 'Art and architecture: Celtic and Norse', in Wainwright, F.T. (ed.), *The Northern Isles* (1962), 163–87.

Renfrew, C., *Investigations in Orkney* (1979).

Ritchie, A., 'Excavation of Pictish and Viking-Age farmsteads at Buckquoy, Orkney', *PSAS*, cviii (1976–7), 174–227.

RCAHMS *Inventory of the Ancient Monuments of Orkney and Shetland*, 3 volumes (HMSO, Edinburgh, 1946).

Sharples, N., 'Excavations at Pierowall quarry, Westray, Orkney', *PSAS*, cxiv (1984), 75–125.

Thomson, W.P.L., 'St Findan and the Pictish–Norse transition', in Berry, R.J. and Firth, H.N. (edd.), *The People of Orkney* (1986), 279–87.