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Excavations on Iona, 1979

John W Barber*

with contributions by S Bohncke, A Fairweather, W Groenman-van Waateringe, D Lehane, F McCormick, I Máté, H Richardson and P Strong

INTRODUCTION (figs 1 & 2; pls 16a–b)

The site of the excavation lay immediately N of Reilig Odhran and E of the Road of the Dead, within the confines of the present Abbey grounds (fig 1; pl 16a). The work was carried out by the Scottish Development Department, Ancient Monuments Branch in advance of an extension to the graveyard. The excavation was directed by the author in his capacity as archaeologist with the Central Excavation Unit (Scotland).

Initially three 5 m squares, identified from S to N as areas A, B and C, were opened in the SE corner of the area. Subsequently these were extended N into areas D and E and also W into the NW and SW areas (fig 2; pl 16b). In areas A, B and C trowelling commenced upon removal of the turves. Experience in these areas showed that the upper 50 cm of soil on the site was unstructured and contained modern debris to its bottom. This soil, described as the Ap 1 and Ap 2 layers below, was machine-stripped over the remainder of the site.

The triangular area excavated included 15 or more of the excavation trenches cut by Professor A C Thomas prior to 1964. Though as yet unpublished some information on these was on file at the National Monuments Record for Scotland and this was made available to the author through the good offices of Mr I Fisher of the Royal Commission on the Ancient and Historical Monuments of Scotland. This is discussed in the appropriate sections below. Like Redknap (1976, 228), the author is relieved of the need for a detailed historical background in light of the forthcoming Royal Commission Inventory of Iona (1982).

Gaelic place names have been rendered, when they first occur in the text, in what seems to be the best approximation to modern Gaelic usage. Thereafter they are rendered in the anglicised forms used in the current OS editions. Thus it is hoped that the importance of the place names may be recognised, and indeed emphasised, whilst the body of the report may not lose whatever claim it may have to being readable.

PHYSICAL BACKGROUND (figs 3 & 4)

Ian Máté

The Inner Hebrides are in the main composed of Tertiary igneous rocks intruded into Mesozoic strata, beneath which lie Pre-Cambrian rocks (ie Torridonian formations and Lewisian Gneiss) the latter of great complexity. The Lewisian landscape contrasts strongly with that of the more recent Tertiary and Mesozoic series. The age of the Lewisian rocks, their hardness and the processes of erosion that they have

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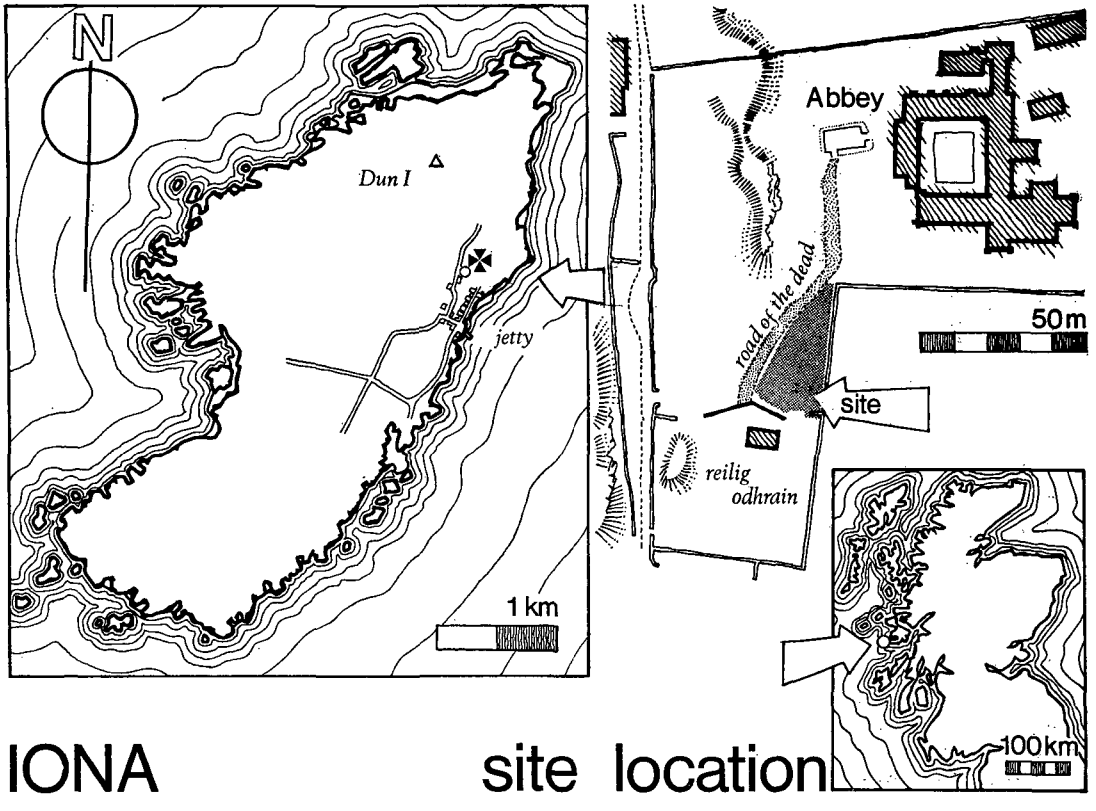


FIG 1 Iona: site location

undergone, combine to form low, bare, hummocky hills with peat hollows between rock exposures. The Mesozoic and Tertiary rocks, relatively recently exposed, are much softer and less resistant to ice action. They tend to form rugged, craggy mountainous terrain deeply cut into by the Quaternary ice sheets. Overlying these formations are the Quaternary deposits (Richey 1961). These can be sub-divided into Pleistocene (pre 10,000BP) and Holocene (post 10,000 BP; Flandrian) deposits.

The Pleistocene deposits, dating from the period between the end of the Tertiary and the end of the Loch Lomond Stadial, include of course many warm interglacial deposits but are mainly represented by glacial till and moraine deposits. The Holocene, or Flandrian, deposits include clays, out-wash gravels and raised-beach deposits (Richey 1961).

Iona's backbone of Lewisian Gneiss gives it its characteristic hummocky landscape with low hills. The highest point, Dun I, a mere 100 m OD, is of Lewisian Gneiss. On the E side of the island Torridonian rocks outcrop giving rise to the highest sea cliffs on Iona, Druim Dhughaill, up to 50 m high (fig 3). North of the Torridonian outcrops on the E coast there are two distinct raised beaches stretching northwards. The higher of these two beaches, confusingly called the 'Intermediate' beach, is c 20 m OD and has an apparent sea cliff running N–S to the W of the village. The lower raised beach has its upper limit marked by a distinct break in slope below the 15 m contour: this is the '25 ft' raised beach.

The only significant depositions since the relative lowering of the sea level are those of the machair lands, mainly in the N and W of the island. The best example is at Camas Cuil an t-Saimh (Bay at the Back of the Ocean). There are also peat deposits; the deepest found, just over 2 m in depth, is located between the Abbey and Dun I at Lochan Mor. A peat column was taken from Lochan Mor for pollen analysis (Appendix 1). This peat was sitting over a light grey silty lacustrine clay which contained no visible plant remains.

Within the excavated area only deposits of glacial and post-glacial type were found. Their extent

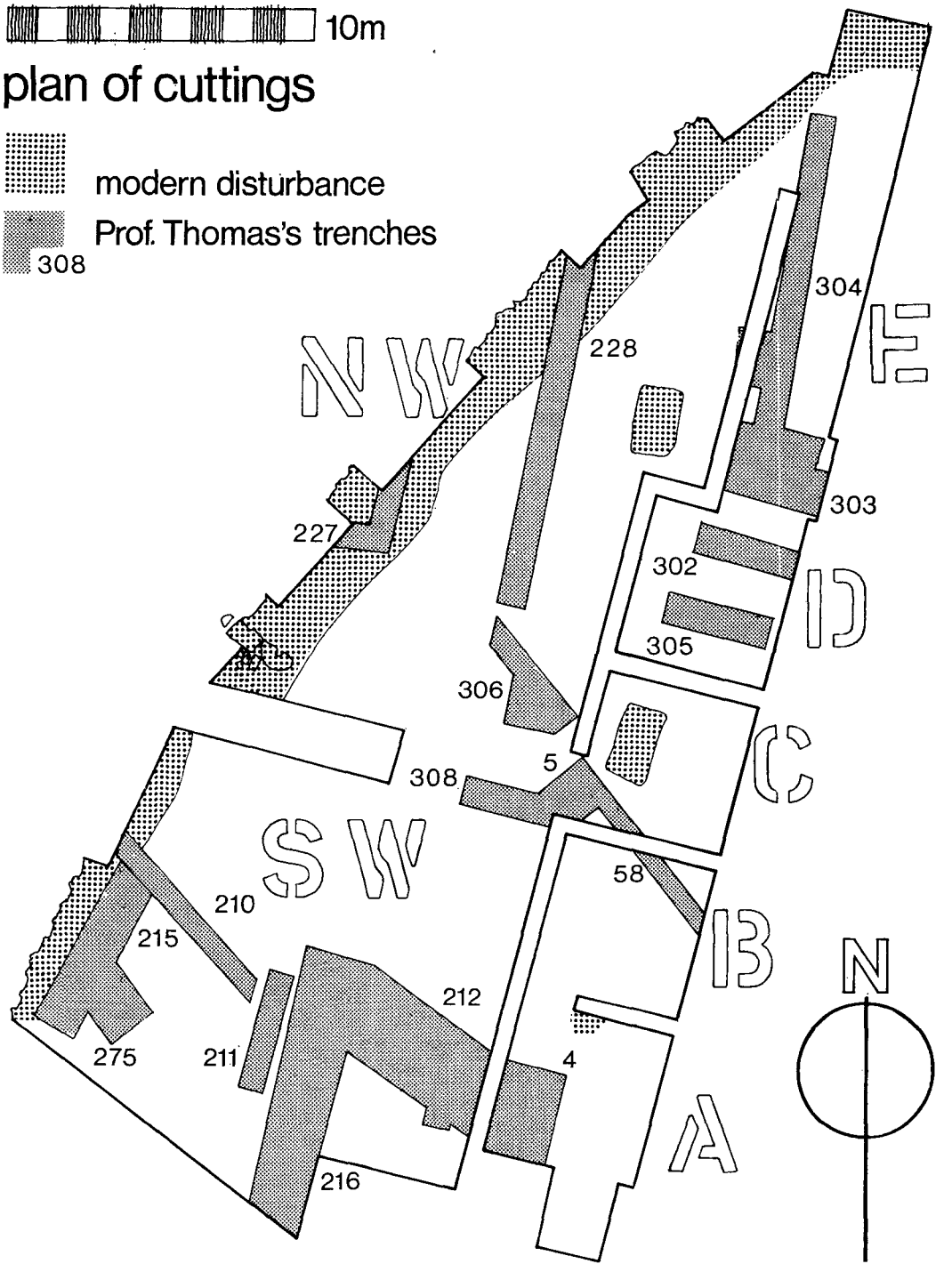


FIG 2 Site plan showing the layout of the cuttings. The fine stipple indicates earlier cuttings made under the direction of Professor C Thomas

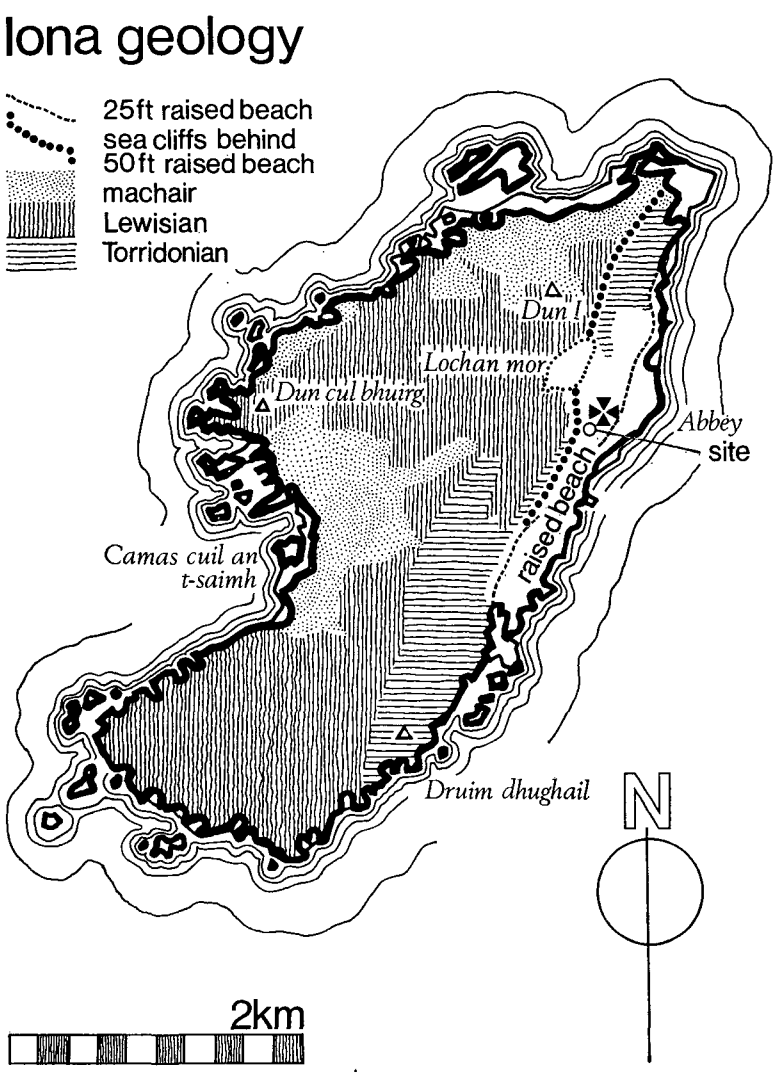


FIG 3 The geology of Iona

TABLE 1

Quaternary deposits underlying the AP_1/AP_2 layers on the site

Deposit	Thickness	Description
'Intermediate' raised beach	0·20–0·25 m	Yellow-brown sands compacted and sorted, uncemented with concreted rotted granitic boulders.
Fluvio-glacial sands and gravel	2·5 m	Yellow-brown lenticular sands and gravels.
Earliest deposit	Unknown	Blue clay.

and sequence are shown in Table 1. The subsoil surface throughout was the top of the 'Intermediate' raised-beach deposit which varied in composition as shown on fig 4. The thickness of the 'Intermediate' raised-beach sands was measured from its present orange surface to the top of the first angular gravel bed. This provided a minimum figure for its thickness. However there is the added complication that the underlying fluvio-glacial sands and gravels do contain sand beds with rounded pebbles.

Blue clay was seen only at the bottom of the ditch which runs E–W across the S edge of the excavated area (Ditch 1, fig 5), and the periglacial sands and gravels were visible in the sides of this and other ditches. Apart from the obvious textural contrast between the clay and the overlying sands and gravels there is a marked contrast in the pH of both. The pH of the clay was 7·4, weakly alkaline, whilst the overlying material was clearly acidic. The pH of the clay points to its marine origins.

In the S ditch the presence of waterlogged peat deposits in the lower half had affected the colouration of the gravels, giving them a greenish hue, a form of gleying. Formation of the reducing conditions necessary for gleying is aided by the presence of organic matter (Hesse 1971, 438) and where reducing conditions exist compounds of iron are characteristically coloured greenish-grey to grey. The precise nature of the resulting Fe II compounds is not known (*ibid*, 332). At the level of the water table strong iron panning interfered with the visual continuity of the gravels, but nonetheless there seemed to be a continuous and increasingly coarse sequence of gravels down to the clay, with some large granitic boulders (averaging 50 cm in diameter) in the base of the gravels.

The age of the raised beach is of some importance since flints and a spread of charcoal were found in a silting layer within a gulley of the beach (fig 6, profile 13). The top of the beach sands is c 19 m OD and beaches at this elevation in this area are attributed to the Late Glacial Interstadial; 14,000 to 13,000 BP down to 10,000 BP (Gray & Lowe 1977, xiii). Corresponding beach ridges have been recognised on Jura by McCann and called 'Late Devensian' (Jardine 1977, 109). The Jura ridges occur between 37 and 12 m above high water mark; they dropped progressively as isostatic recovery out-paced the eustatic rise in sea level after the main glaciation.

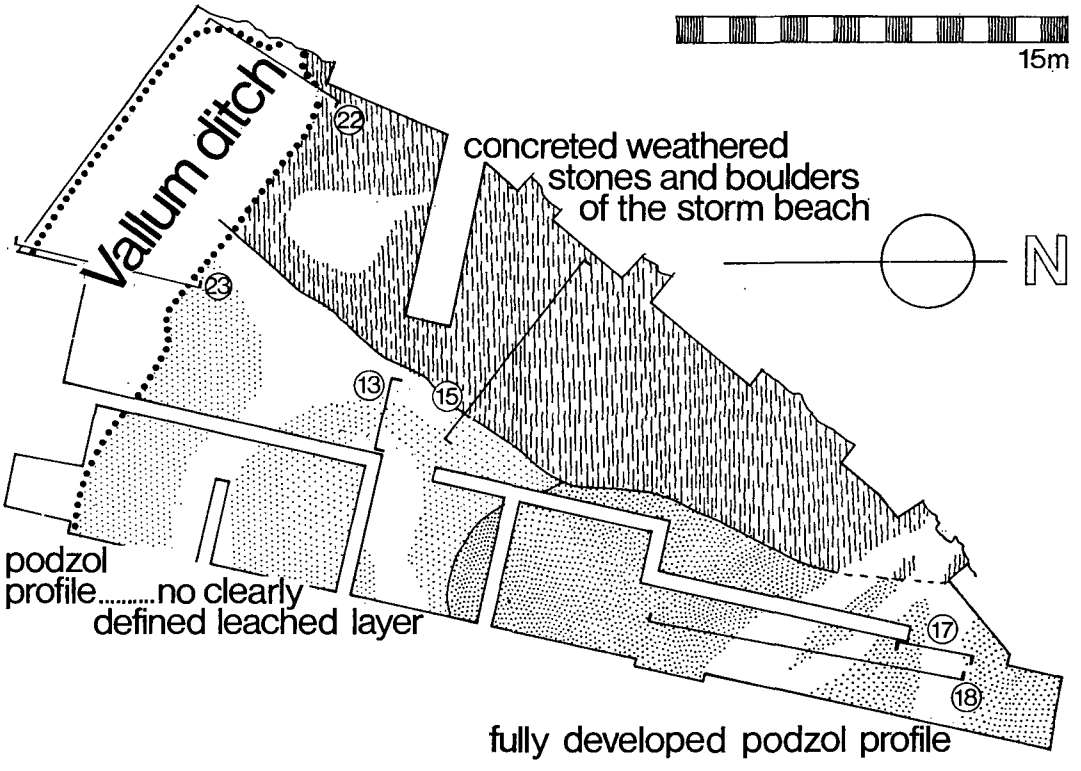


FIG 4 Site soil zones

The conformation of Iona's 'Intermediate' raised beach suggests that it was formed in progressively shallower seas, implying that it formed after the melting of the main Devensian ice sheet. It is argued that deglaciation was complete in Scotland by 12,500 BP (Sissons 1976, 90). The lowering of the sea level continued down to approximately Ordnance Datum, forming the Main Late Glacial shoreline on Iona (Gray & Lowe 1977, 169, fig 3) during the Loch Lomond stadial (11,000 to 10,000 BP; *ibid*, 164, fig 1).

Radiocarbon dates for this period are few and not without their ambiguities (Peacock *et al.* 1977, 89–100), but in general suggest a date of approximately 12,500 BP for the formation of this beach. This order of date is consistent with the pollen evidence from the blue clay (see below p 346) which underlies the beach deposits on site. This suggests that the clay was deposited during the Middle Weichselian (13,500 to 13,000 BP).

All of the deposits so far discussed underlay a nurtured anthropic epipedon which constitutes the AP_1 and AP_2 layers referred to in Table 1. These layers have exceptionally high phosphate values, presumably the result of continuous cultivation. The development of these soils owes very little to the base-poor underlying material.

Table 2 shows the three types of soil profile found beneath the Ap layers, all of which give evidence of the same soil chemistry process, that of podzolisation. The raised-beach sands in the NE quarter of the site (fig 4) display a full and well-developed podzolised profile buried beneath the Ap layers (fig 4). In the SE quarter of the site a poorly developed podzol with no visible leaching zone is buried beneath the Ap layers; but along the W half of the site removal of the Ap layers exposes only the indurated layer of a truncated podzol profile. Thus soil would seem to have been removed along the W, and other well fertilised and highly cultivated soil deposited in the E of the site, burying there the existing thin, sandy, podzolised soils proper to the raised beach.

Profile type C (Table 2), that found in the NE quarter of the excavation area, is a normal podzol development on base-poor, freely draining sands. The date of its burial beneath the Ap layers is of some importance since previous excavators have interpreted it as the Columban old ground surface. Redknap (1976, 230), in describing a 'natural' sand overlain by a 'uniform deposit of black peaty soil', is probably describing nothing more than the Ea and AE layers respectively, of the buried podzolised profile. This profile type is exemplified at the N end of profile 17 and 18 in fig 15.

The layers which lie below the Ap layers in profile type B consist of a series of alternating bands of grey silty sand and orange coarse sands. These represent respectively, wind- and water-borne silty deposits, in a natural gulley in the raised beach, with some temporary stabilisation represented by the grey layers.

Profile type A, beneath the Ap layers, consists of iron-cemented boulders and sands of a storm beach (fig 4 & fig 6, profile 15). This higher, firmer and drier strip of land impedes drainage of water from the W and constitutes a natural trackway over which the Road of the Dead has been laid. The problem of drainage through the concreted storm beach has influenced the form and location of some of the excavated features, as will emerge.

THE EXCAVATED FEATURES (figs 2, 5–19; pls 16b–19a)

John W Barber and Peter Strong.

The excavated features are illustrated in fig 5 and consist of a Natural Gulley, Ditch 1 and Ditch 2 on the S of the site; a setting of post-holes and pits on the E; and Ditches A, B and C (containing drains) on the N. Several smaller features were also excavated. The main features are discussed below in approximately chronological order. For convenience the features illustrated in fig 5 have been given historical names where appropriate: these attributions are further discussed on pp 355–63.

THE NATURAL GULLEY (Ditch 3 on fig 7)

This is the natural gulley in the raised-beach sands described in profile B below. Its entry point to the site was removed by Ditch 1, from which it runs N along the E edge of the boulder

TABLE 2

Profile Type Level	Type A Description	Type B	Type C
0 cm	Ap1: Very dark grey-brown loam with abundant roots, worm casts. Loose uncemented springy, occ. grits very humus rich. Fairly sharp boundary to:—	As type A	As type A
15 cm	Ap2: Dk grey-brown stony loam 10% stones (predom. 6–20 mm) rounded. Uncemented very crumbly porous with abundant worm casts. Top of the layer formed by a line of stones 20–40 mm. Less than 2% charcoal. Sharp boundary to:—	As type A	As type A
50 cm	Bs: Iron stained very stony gravel with sand, angular grits very variable cementation. Lower boundary not seen.	AE: (relict) Grey silt fine and stone-free well sorted, uncemented few roots. Some relict rooting rarely penetrating to next layer. Lower boundary abrupt to:—	AE: DK grey sand humus rich with root mottlings. Uncemented has an irregular but distinct upper boundary and an irregular diffuse lower boundary to:—
60 cm		Bs: Orange coarse sand with silt some decaying granitic pebbles without bleaching rings.	Ea: Light grey sand. Stone free uncemented well sorted, some root mottling. Wavy boundary merging to:
70 cm		This Ae/Bs sequence is repeated up to six times.	Bh: Dark grey sand with 10% stone (6–20 mm), root mottling coming in from above but not penetrating far through. Sharp flat transition to:
76 cm			Bs: Ochreous coarse sand with large (30%) boulders often indurated. Poorly cemented root mottles.
110 cm		C: Coarse sand with 10% boulders of indurated granitic gneiss. This layer is continuous whereas the upper alternating sequence layers are lenticular. Raised beach material.	C: Raised Beach

Notation (except for Bh) from Ragg & Clayden (1973, 17). Bh from Limbrey (1975, 80). Note Bh is not a thin pan.

strip of the raised beach. It is largely truncated by Ditch 2, which also runs along the edge of the boulder spread. However it projects N beyond Ditch 2 for about 5 m before turning E through area C (fig 7). Just W of area C, Professor Thomas's trench (308 on fig 2) had cut into the gulley revealing the alternating silty sand and coarse sandy layers described above as profile type B and illustrated in fig 6 (profile 13). A thumbnail scraper (fig 44, no 415/1) was found projecting from one of the silty layers (fig 6, profile 13). Horizontal excavation along this layer produced some further unworked flints and a small volume of charcoal.

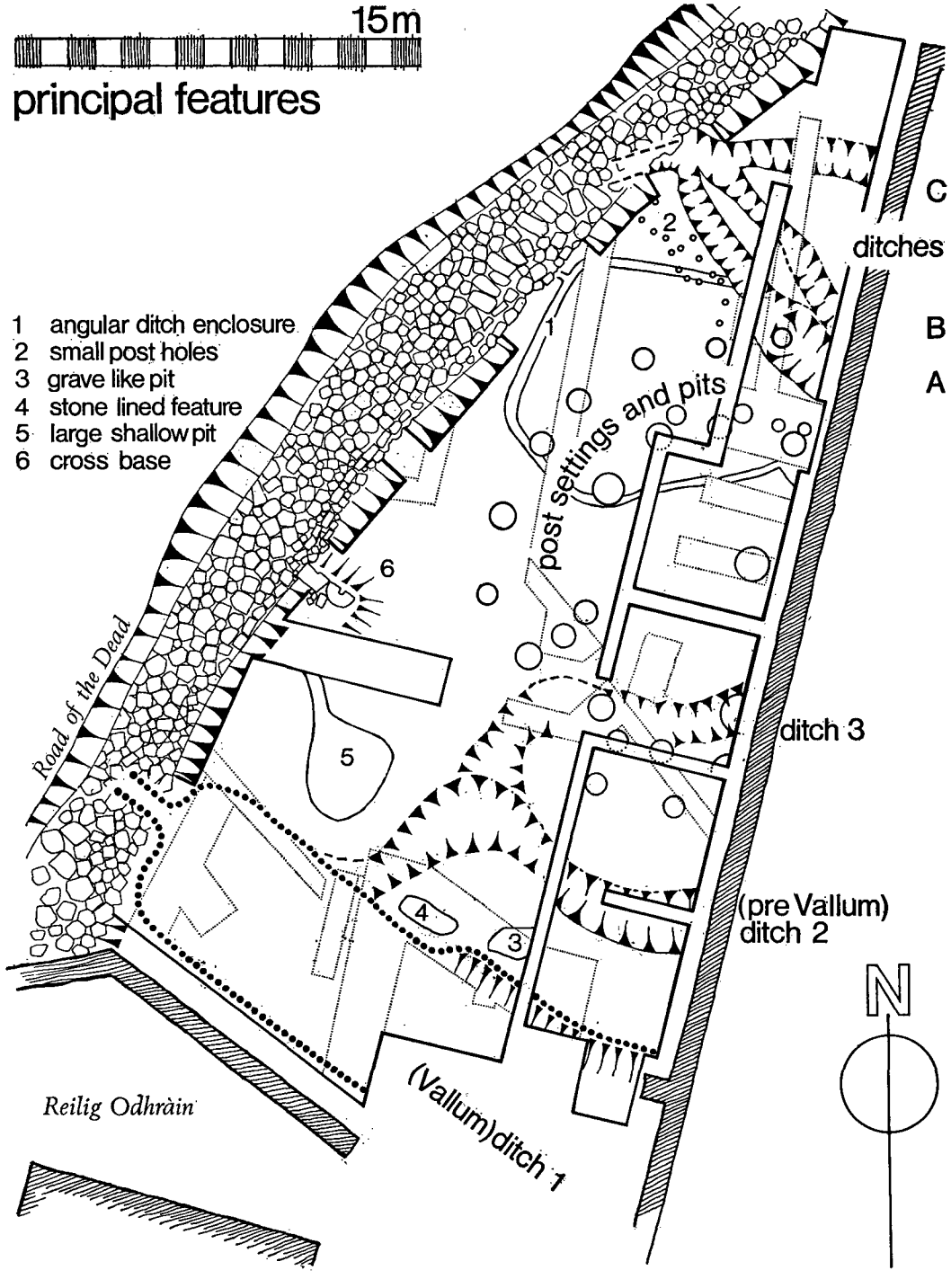


FIG 5 Iona: The excavated features

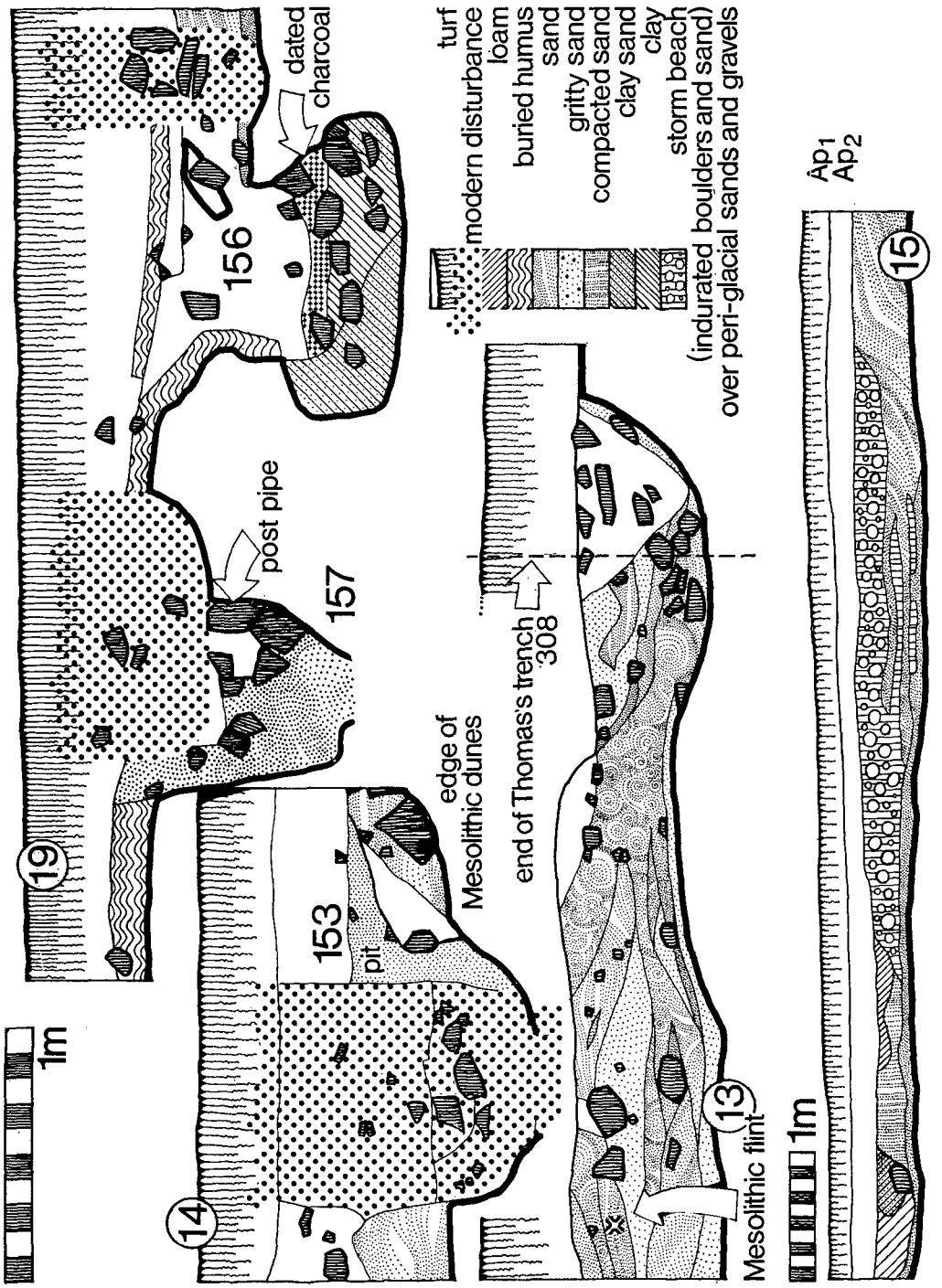


FIG 6 Sections (see fig 7)

DITCH 2 (figs 7–9; pl 17a)

The N edge of this 2 m wide ditch runs E–W along the junction between areas A and B (fig 7). Its truncated layers could be seen in the SW area running W from the baulk and turning S to be cut off by Ditch 1. The 5 m length of ditch between areas A and B was fully excavated and two sections were cut across it in the SW area. On removal of the topsoil the course of the ditch became visible as a series of roughly parallel bands of material (fig 7), segmented at the E end by the soil-filled bottoms of plough furrows which ran N–S across them (fig 19). The outer bands were of a relatively stone-free silty sand whilst the inner ones were far more varied and variable in their stone content and general constitution. At this level it was clear that the natural gulley survived as a narrow strip W of the N–S leg of this ditch.

Excavation in areas A and B revealed the ditch to be 1·20 m deep and 2 m wide, measured from and at the level of the top of the subsoil. The primary infill layer, visible only at the E end (fig 8, profile 5), was crescentic in section, and did not reach up the sides of the ditch to any extent. This was a rich grey-green colour and contained some burnt bone and tooth enamel as well as a little charcoal. Overlying the primary infill was a more strongly developed silting level,

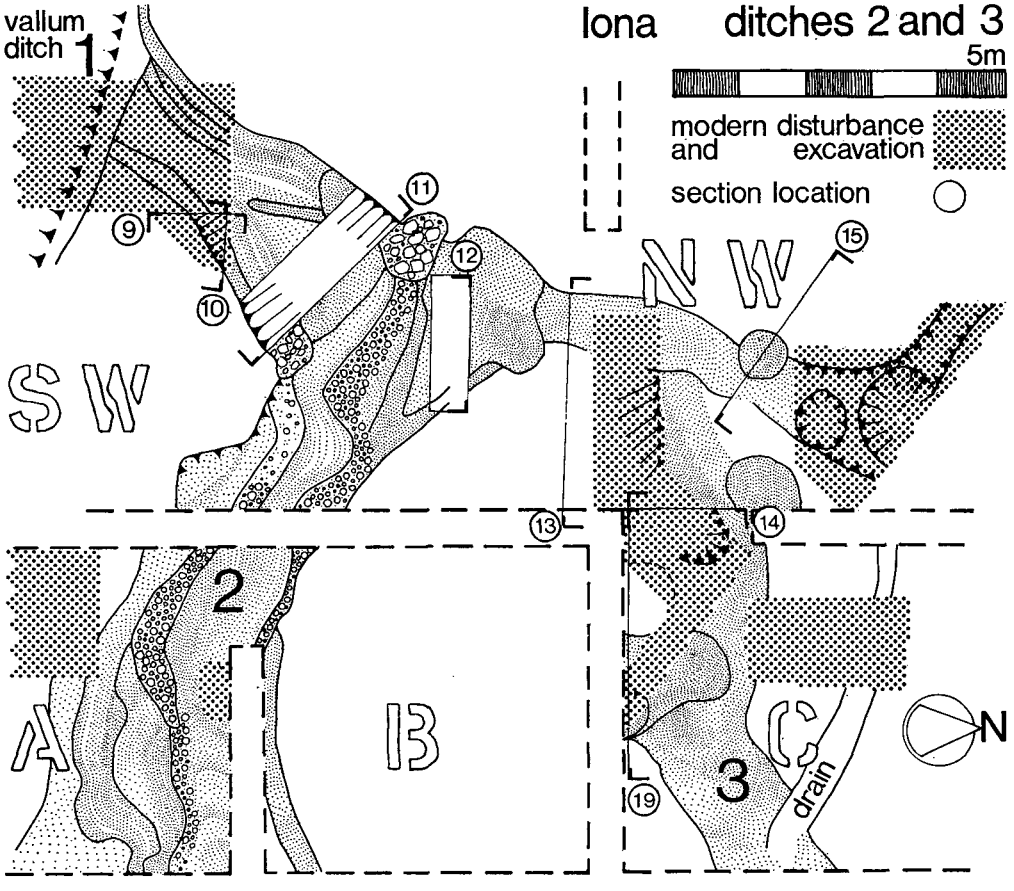


FIG 7 Plan view of Ditch 2 and the natural gulley: the 'bedded' nature of the back fillmaterial of Ditch 2 is indicated

similar in colour and composition to the former but much richer in burnt bone, tooth enamel and charcoal. It also produced a piece of fired clay and some fragments of corroded iron. This layer, was in turn overlain by a series of largely sterile silting layers, the number of which varied along the length of the ditch but nowhere exceeded four.

Finally a silty sand layer had been deposited, very rich in charcoal and containing bone and tooth enamel as well as some corroded iron objects. This was the last natural infill layer, the material above it being deposited in tip lines of sands, gravels and stones and including inverted turves (fig 8, profile 3).

It is clear therefore that Ditch 2 was deliberately backfilled (pl 17a). The course of the ditch has been illustrated in fig 7 at a level immediately under the Ap layers and displays the banded nature of the infill deposit. This banding suggests that the ditch was infilled in its final stages with material derived from bedded deposits, such as the sands and gravels from the fluvio-glacial material underlying the raised beach. The level from which the ditch was dug does not survive. Profiles 7 and 8 (fig 8) both show stony inclusions of the ditch projecting up into the Ap_2 layer and suggest that the original top edges of the ditch have been lost. Thus it is also impossible to say on which side the bank may have been sited. The burden of the evidence from profile 7 suggests that it lay N of the ditch whilst that of profile 8 suggests the S.

The above description of the ditch is based mainly on its excavation in areas A and B, but the sections cut across the ditch in the SW area confirm the sequence outlined. A series of naturally deposited silting layers, some rich in occupation debris, are overlain by banded backfilling (fig 9, profile 11).

DITCH 1 (figs 10–12)

Professor Thomas's excavations in the S part of the site had revealed the presence of a large ditch running E–W across the area. The full depth had not been established, presumably because of the relatively high water-table in this area. Fully excavated it measured 5 to 6 m wide and 2·9 m deep measured from the level of the top of the raised beach. The width cannot be accurately stated because the S edge of the ditch underlay the N wall of Relig Oran. The lower 1·8 m, up to the present water table, was peat filled (fig 10).

Excavation of the ditch began with the emptying of Professor Thomas's trenches, numbered 210/12 and 215/16 on fig 2. Trench 216 was then extended downwards to establish the true nature and extent of the ditch. Thus the depth and stratification of the peat and the wealth of the organic material that it contained were established. Furthermore this deep cutting acted as a sump, collecting the water from the ditch which was then removed by continuous pumping. A longitudinal half-section was then excavated through the soil layers overlying the peat, between this sump and the Road of the Dead. The other half of the soil deposits was then removed by mechanical excavator to reveal the top of the peat throughout. At this stage the extent of flooding prompted the cutting of a second sump, this time by machine, at the W end of the site. Its location was governed mainly by non-archaeological factors. However, its position, retrospectively, can be seen to have been unfortunate, for in digging the sump the E terminal of the ditch and a boulder-built wall-face were uncovered. Fortunately, the information loss was probably not significant.

A further word on the excavation technique is required. The Somerset Levels Project (Coles & Orme 1980, 11–12) has shown how excavation in peat ought to proceed, slowly and in the main by hand or at most using plastic spatulae to recover organic remains free of trowel

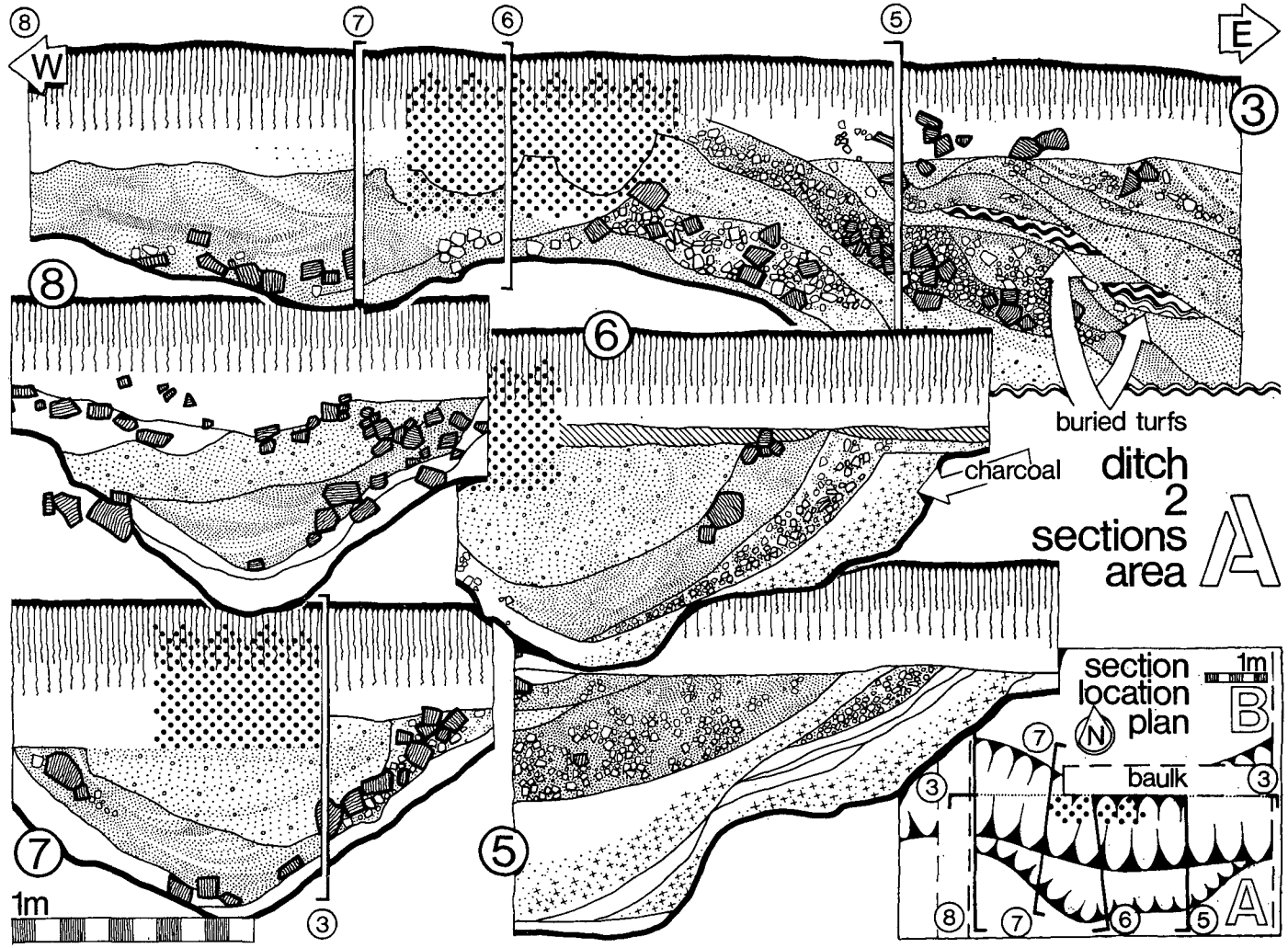


FIG 8 The Ditch 2 sections (see fig 7 for location of the sections)

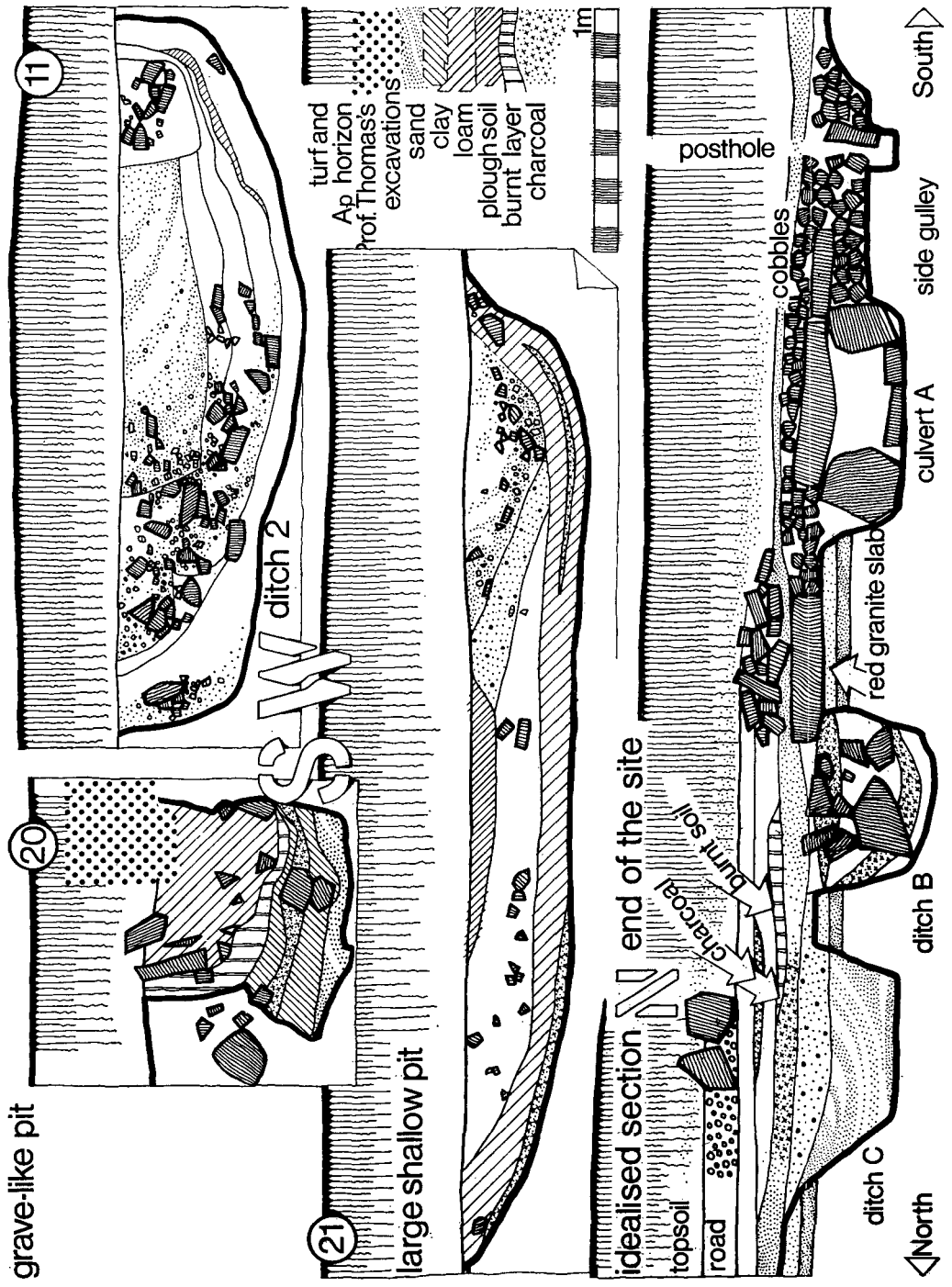


FIG 9 Iona: various sections

scrapes, etc. At Iona the ditch flooded nightly, contaminating the exposed surface and undermining the ditch sides which, composed of sand, slumped inwards with depressing regularity. Time did not therefore permit painstaking excavation and the site was not conducive to shoring. When it became clear, as it speedily did, that trowelling was causing an unacceptable degree of damage to the material being excavated, several possibilities were considered. Finally a system of cutting the peat out in blocks was decided on, working inwards from the profile faces, layer by layer. Although many of the objects of wood, bone and leather were still damaged, the level of damage was felt to be less 'unacceptable' than that produced by the other available techniques.

The excavation of the ditch between the first sump and the Road of the Dead revealed that it terminated at the latter point and this had the effect of making the stratification variable over the excavated length. The actual section recorded at the E end of the excavated length is illustrated in fig 10 but is, to an extent, not truly representative of the area excavated. A synthesis of the variable stratification is offered in fig 11 and the discussion of the deposits recorded can best be understood with respect to this.

The ditch had been cut through the raised beach and fluvio-glacial deposits into the blue clay beneath. The upper part containing the soil layers was wide and rather 'basin' shaped, but the peat in the lower part was enclosed in a steep-sided, V-shaped cut. The bottom of the 'V' was truncated at the level of the clay (fig 10) and a drain-like rectangular cut, 0·3 m deep and 0·6 m wide, projected down into the clay flanked by large boulders. The ditch is described below in terms of these divisions, ie the drain-like feature, the peat layers, and the soil layers.

The drain-like cut. This clay-cut feature existed only at the E end of the excavated area of the ditch. It ran, at its full depth of 30 cm, some 2 m along the ditch bottom and then became gradually shallower, disappearing completely about half way along the excavated length. The primary deposit which it contained was a brown gritty unconsolidated sand whose colour changed to green-brown on the clay side-walls. It did not extend above the top of the clay. Overlying this, and still below the top of the clay, was a light-green, reedy peat; very wet and unconsolidated. Within this peat bunches of alder and willow stems, up to 5 cm in diameter, were found, bound together with willow withies (fig 34, 449/3/4). These presumably prevented the consolidation of this earliest peaty deposit, though the granitic boulders flanking the drain may also have contributed to the process by relieving the pressure of overlying deposits.

The peat layers. The peat layers were enclosed within an area of silty sand which overlay the clay-cut feature and its contents (above) and lined the sides of the ditch. The thickness of this deposit was highly variable and was in general greatest near the top of the peat layers. This type of layer is normally considered to be primary silting into a ditch, but its variability in this instance and the location within it of pieces of leather and worked wood suggest that its formation was a continuous process and that its preserved thickness varied inversely with the rate of peat formation.

Many silty bands lay in the peat, some of them amounting to no more than a 'gritty' area, but two in particular were well developed and in the W end of the ditch constituted continuous layers traceable across the width of the ditch. These provide the basis for the division of the peaty deposits into three blocks on fig 11: lower, middle and upper. Organic material has been found not only in the peat but also in the silting layers, which suggests that the natural infilling of the ditch was a continuous process and that to some extent the division of the peat layers into three blocks is arbitrary. However, the lowest block was rich in animal bone, worked wood, particularly

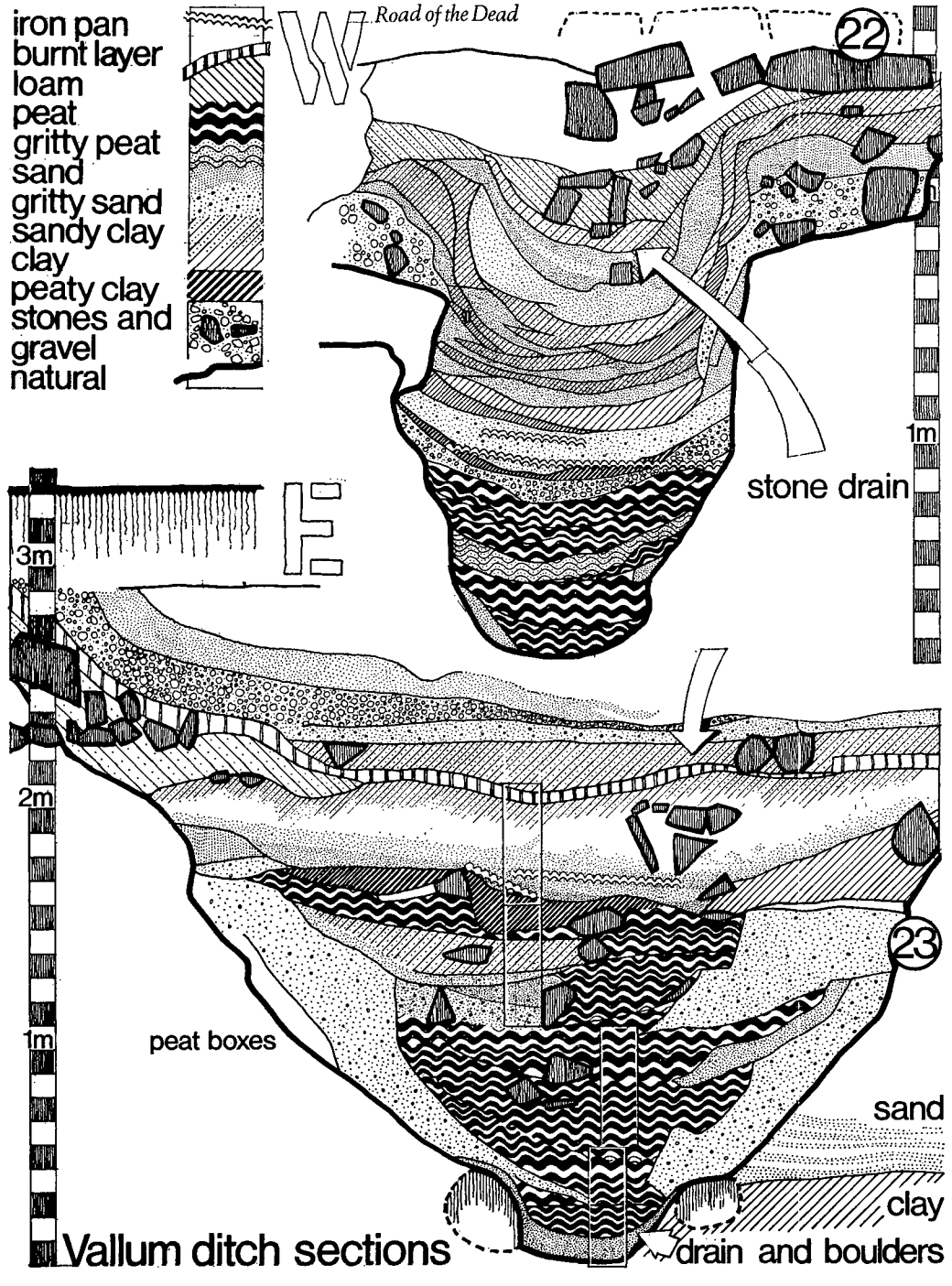


FIG 10 Cross-sections of Ditch 1. Above: across the slot in the causeway; below: across the ditch on the line of the E edge of Professor Thomas's cutting no 216 (see fig 2)

the by-products of wood turning, and leather, whilst the central block contained no leather and the upper contained only unworked wood.

The material from the lower peat block is discussed in detail elsewhere (pp 346 & Appendix 2). At a point some 4 m from the terminal the lower peat block was divided into two deposits by a lens of earth and stones which ran across the width of the ditch (fig 12) and provided the footing for a boulder facing. Beneath this lens the lower half of the block continued into the terminal and thence into a narrow, vertical-sided slot (fig 10) cut through what must be considered an entrance causeway, the line later taken by the Road of the Dead. It is assumed that this slot provided drainage from the opposite terminal of the ditch, a vital function since the concreted deposits underlying the Road of the Dead impede the drainage from the W, (see p 287 above). The boulder facing which rested on the lens of earth and stone revetted a series of sterile soil layers (fig 11) which served to widen the causeway. The upper half of the lower peat block lay against the boulder facing and spread into the ditch proper. The bulk of the turned wood and all of the leather recovered from the lower peat block were located in the lower half of that block, in the peat deposited before the widening of the causeway and the insertion of the boulder facing.

The middle peat block was divided from the lower by the first well-developed silt line. This was up to 0·1 m thick at the boulder facing and was continuous across the width of the ditch. It thinned out eastwards from the boulder facing, so that in fig 10 the lower and middle peat blocks merge at the centre of the ditch. The middle block contained some worked wood and a very little animal bone. It also contained masses of unworked wood in the form of twigs and branches. The silting layer which separated the middle from the upper peat block was also continuous only in the region of the boulder facing. Nothing that was unquestionably man-made was discovered in the upper peat.

The soil layers within Ditch 1. Overlying the upper peat block was a dark peaty layer, slightly blue in colour and with a high proportion of clay. This contained no macro-plant remains. It must be seen as a deliberately introduced layer since no natural source of clay exists above this level from which the enrichment of the clay fraction could be derived.

Resting on the surface of this introduced layer a culverted drain had been constructed along the length of the ditch (fig 12). Its depth increased by 2 m over the length of the S edge of the site. At the W end it lay approximately 0·5 m beneath the paving cobbles of the Road of the Dead whilst at the E end where it was exposed in the S extension of area A it lay some 2·5 m below the present ground surface. Along all of its observed length this drain lay within a single layer, rather than being cut through from above (figs 10 & 11). This suggests that it was constructed free-standing on the layer of introduced clay and that the surrounding material was introduced to revet and cover it.

At the E end, S of area A, this surrounding material formed a single, heterogeneous, deposit from the base of the drain to the bottom of the Ap layers; ie a 2 m deep deposit of unstratified stony, sandy, soil buried the drain. The situation at the W end was rather more complex. The drain was covered with, and contained within, a coarse sandy layer the top of which was 0·10 m above the top of the drain. Overlying this, along the N edge, a pasty green sandy loam lay against the shoulder of the ditch. Set into this, just below the level of the current subsoil, was a line of stone blocks and boulders. These were particularly large along the intersection of Ditch 1 and Ditch 2 but they were clearly visible W of this. However to the E the line degenerated into a tumble of small stones.

Overlying the green sandy loam, on the N side, and the coarse sand layer elsewhere, was a deposit which for the most part consisted of a c 50 mm thick layer of a orange greasy clay-like

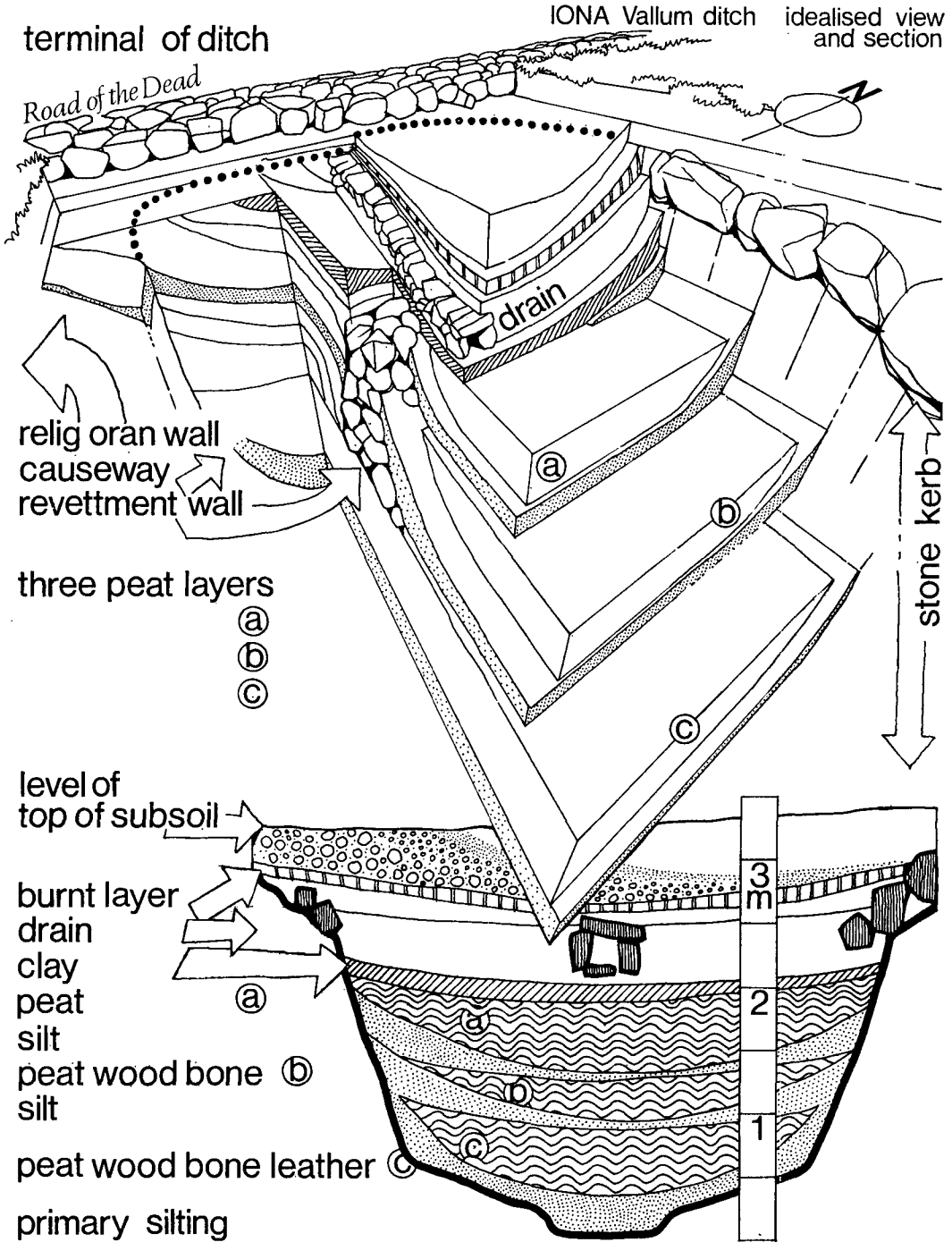


FIG 11 Idealised reconstruction of the Ditch 1 stratigraphy showing the Upper (a), Middle (b), and Lower (c) peat blocks

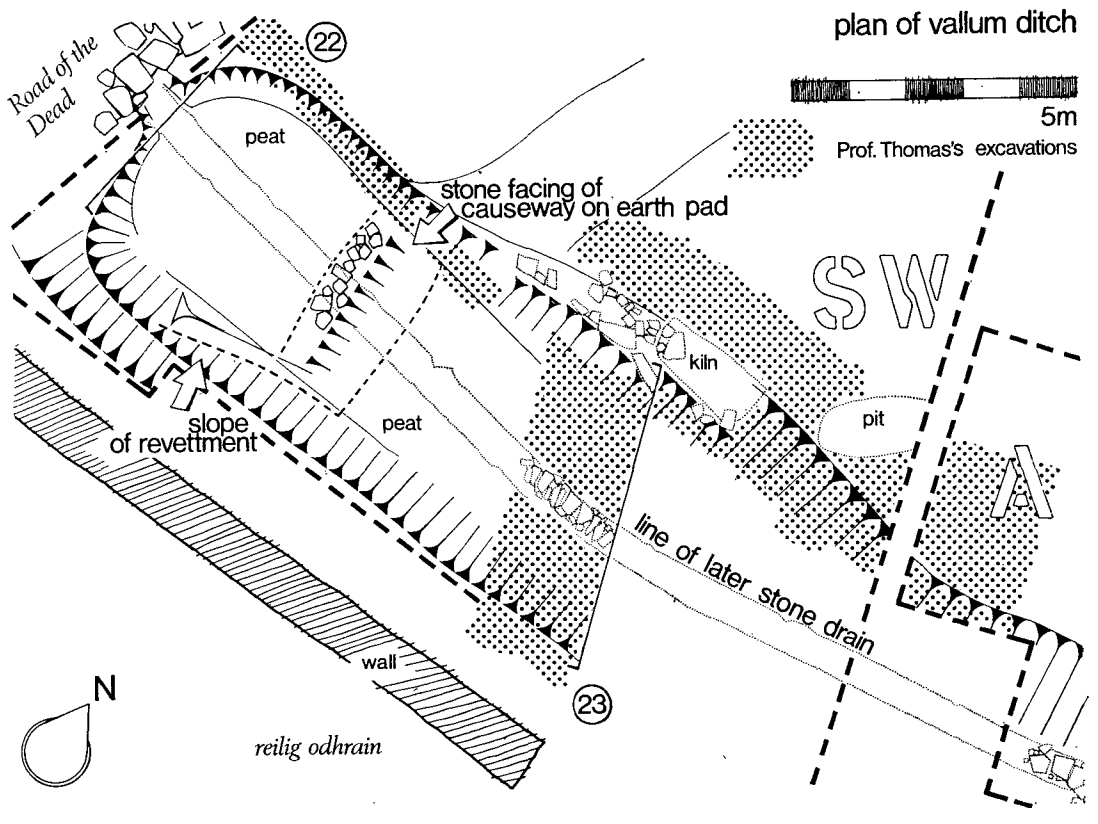


FIG 12 Plan of Ditch 1 showing the line of the medieval drain and the positions of the sections

substance. In some areas, and particularly near the edges of the ditch, this faded into a charcoal-packed black crumbly material. This deposit was visible over all of the excavated area of the ditch and extended W beneath the Road of the Dead. Clearly it does not extend E as far as area A and so must fade out in the intervening, unexcavated, area.

A line of angular blocky stones overlay this deposit along the S side of the ditch. Its full extent, form, and relationships could not be discovered since, with its discovery, the modern wall on the N of Relig Oran was already endangered and further excavation to the S would have undermined it completely. It is not inherently improbable that this constitutes the footings for the original N wall of Relig Oran. It cannot, of course, be contemporary with the original use of the ditch since the stones of which it is composed rest, as outlined above, on top of one of the latest strata in the ditch. This is also true of stones on the N side of the ditch, which must also be rather late in date.

Above the orange clay deposit at the W end of the excavated ditch area the infill was an undifferentiated stony loam which merged into the Ap layers.

THE SETTINGS OF POST-HOLES AND PITS (figs 13–14; pl 17b)

Upon removal of the Ap layers a series of post-holes were revealed as clusters of stones, lying in a dark loamy matrix on the E side of the site (fig 13). In some cases an obvious nest of

stones occurred sitting in the top of the hole. In others a packed group of stones lay like cobbling over the top. In most cases the circle of the post-hole was clearly visible and the removal of the dark surface infill of the majority revealed a characteristic grey-green fill, but those examples (numbers 543, 521, 322) lying within the area of the stone spread of the storm beach (fig 4) presented some difficulty. They were hard to define initially, and their excavation was not facilitated by the similarity of their contents to the surrounding material.

The post-holes define two approximately concentric arcs. The larger of these has a radius of 9·8 m and includes the following numbers: 571, 533, 315, 314, 322, 521 and 543. The inner arc is much less well defined but on its circuit fall some 17 pits or post-holes. Of this total, ten had been excavated by Professor Thomas before 1964 (fig 2). These are numbers: 553, 542, 541, 558, 559, 157, 156, 534, 590 and 153, and to some extent the form, context and natures of these are lacking. The 17 pits or post-holes lie in an arc of between 6·4 and 7·2 m radius (fig 13). The numbers of the other features in the inner arc are: 546, 511, 512, 154, 155, 301 and 544.

The outer arc. The depth and diameter of the post-holes and the diameter of each post-pipe are recorded in Table 3 and the sections of all but two of them are illustrated in fig 14. Post-hole 543 was sectioned eccentrically, and though it was similar to the others, its section is somewhat misleading. Post-hole 571 was largely destroyed by the insertion of a drain, only 0·10 m of its bottom surviving. Examination of the post-holes suggests that the normal processes of post decay *in situ* did not operate in these cases. This is nowhere clearer than in the cases of 315, 521

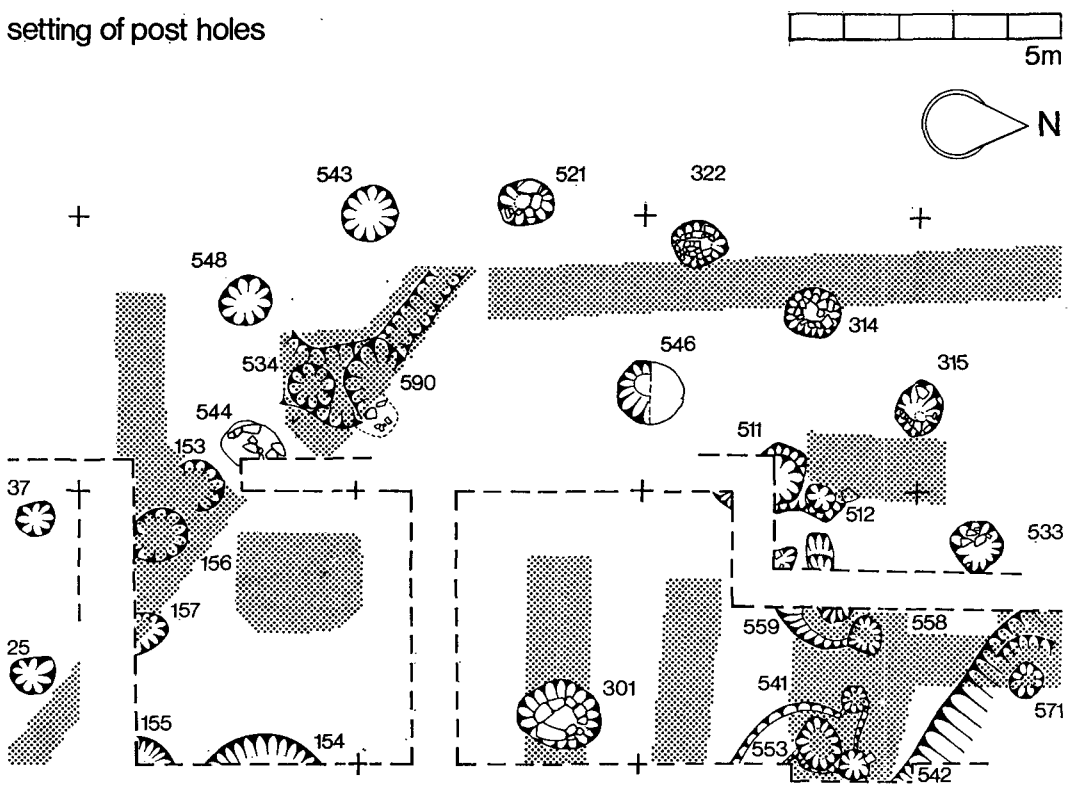


FIG 13 Plan of the post-hole settings on the E of the site

TABLE 3

The post holes of the outer arc (dimensions in cm)

	Depth	Diameter	Post-Pipe Diameter
571	100	60	—
533	85	60	20–25
315	100	80	15–20
314	90	100	20–25
322	90	80	15–18
521	90	100	20
543	100	104	—

and 533, where very large stones filled the upper c 60 cm of the post-holes and covered the post-pipe and surviving post-hole fill. This evidence can only be interpreted as showing that the enclosure or structure formed from the post-holes of the outer arc fell into disuse and that the posts were deliberately removed. Removal was effected by digging into the post-holes to a depth varying from 20 to 60 cm and then pulling the posts free of the soil. The well-constructed packing rings of stones which were visible in the bottom of, for example, 314, 521, and 322 (pl 17b), helped to keep the post-pipe clear and inhibited collapse of packing material into the pipes. Large stones were then dumped into the tops of the post-holes and the ground made good.

Three relationships between this arc and the other features on the site were established. The angular ditched enclosure (see below p 308) was cut by post-hole no 322. Post-hole no 571 lay under a culverted drain (p 306) and post-hole 533 was cut by a cultivation furrow (p 309).

The inner arc. The pits and post-holes at the N and S ends of the inner arc had been totally or partially excavated by Professor Thomas. At the W end five post-holes numbered 541, 542, 553, 558 and 559 had all been disturbed. Post-holes 541 and 542 sat just inside the N edge of a shallow pit within which 553 was located. The lowest parts of the fills of post-holes 553 and 559 survived *in situ* and revealed on excavation a ring of boulders which had formed a packing at the base of the post.

Just W of this group, in the NW area, post-holes 511 and 512 had been damaged by the insertion of a modern horse-burial in a pit, the corner of which came between them so that only a little more than half of each survived, visible respectively in the S and E faces of the pit. Excavation showed them to be deep and substantial post-holes with stone packing near their bottoms. Post-hole 544 was of comparable size and its post-pipe was particularly clear, being filled with a soft sandy silt with some charcoal flecks throughout.

At the S end of the inner setting two groups of features were cut by Professor Thomas's trenches. The first of these (fig 13) consisted of two features; 534, a post-hole c 1·5 m deep, and 590, c 0·9 cm deep. The latter had been fully excavated and its top truncated in the earlier excavation. The second disturbed group consisted of features 157, 153, 544 and 156 (fig 13). These had been previously excavated, in whole or in part, in the trenches marked 58 and 5 on fig 2. Of these, 157 was a post-hole in which a rather poorly defined post-pipe, some 0·20 m in diameter, survived below the bottom of Professor Thomas's trench. 544, another post-hole, survived almost untouched by the cuttings. However of 153 only the strata which dipped into it from the N and which are visible on the W section of area C (fig 6, profile 14) survived. They do not give a clear indication of its size or extent, neither do they indicate whether this had been a pit or a post-hole.

The final disturbed feature in this area was a pit, numbered 156 on fig 13. Only a shallow

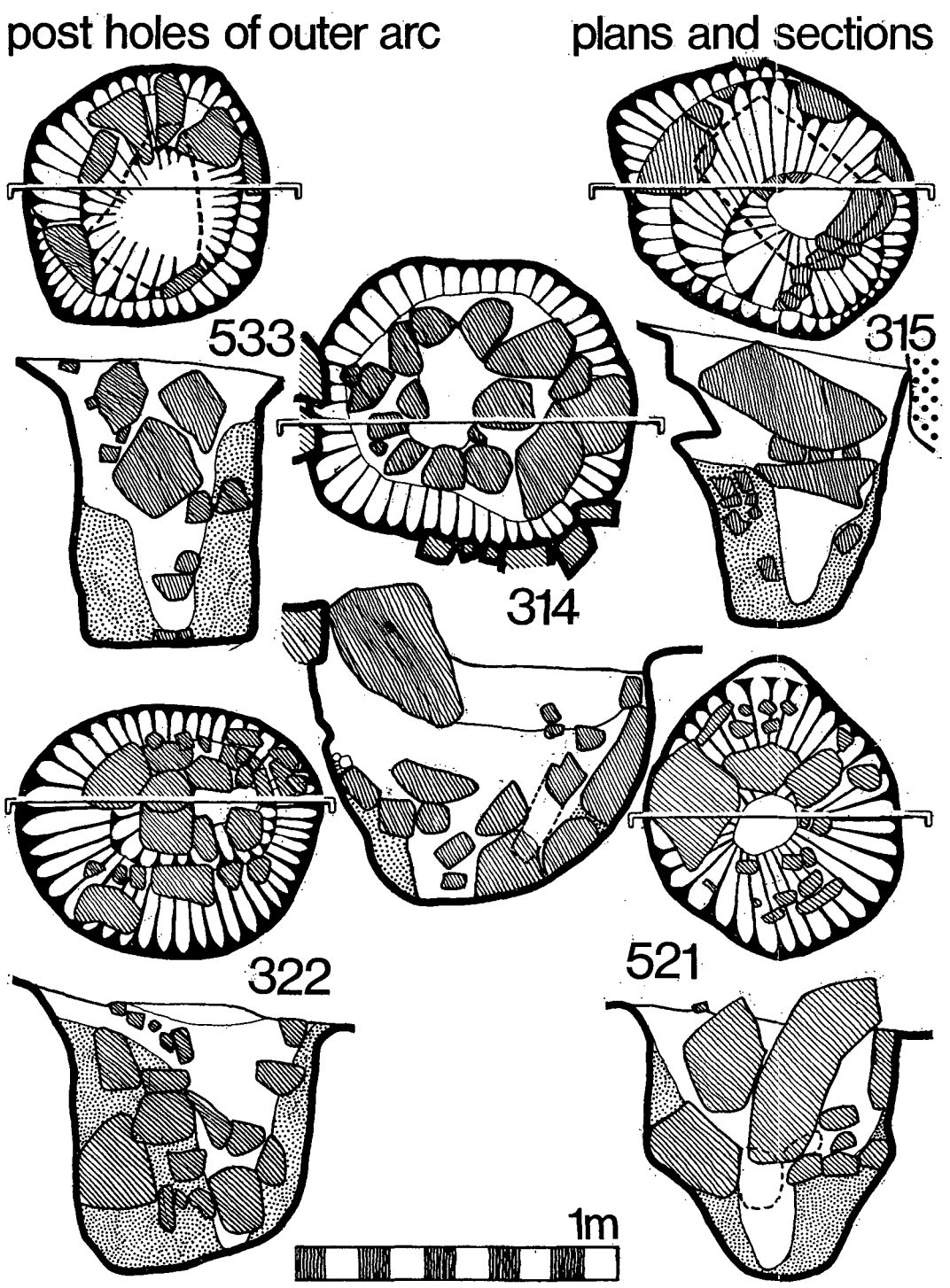


FIG 14 Sections of the post-holes of the outer arc

chord of the pit survived in the N-facing profile in the S of area C. This appeared bell-shaped in section (fig 6, profile 19) and the primary silting did not survive in the profile but was found in the bottom of Professor Thomas's trench no 58. Overlying this, and the lowest layer visible in the profile, was a stone-packed and charcoal-rich layer. This yielded seven large and seven small pieces of slag and five heavily corroded pieces of iron. A small cylindrical bar of blue-green glass with a spiral of yellow glass wound round it (fig 42, no 108 & 23; pl 14) and fragments of bronze, including some which seem to be swarf, were also found in this layer. The stony layer merged upwards into a charcoal-packed layer which was devoid of small finds. This in turn was overlain by a brown sandy soil except at its E edge. Here a thin layer of silty sand, quite stone-free and suggestive of a buried humus layer, ran over and down the E edge of the pit. This rather strange configuration is more understandable if the upper fill in general is seen to be deposited from the W side, the stone-free band thus representing an initial accumulation of silt, to be replaced by a turf line higher up.

Two further apparent post-holes of the inner arc, 155 and 154, were visible only as short arcs beside the baulks. Post-hole 548, with a boulder packing ring in its base, falls between the inner and outer arcs and cannot be confidently attributed to either. The two pits in area B, 25 and 37, bear no obvious relationships with either arc. Within the area enclosed by the inner setting a very large post-hole was found. This, 301, was 1·5 m in diameter and 1·5 m deep. It had been partially excavated by Professor Thomas but retained near its bottom a packing ring of boulders the diameter of which suggests that it held a post of 0·20 m to 0·25 m diameter.

In area C, at the junction of the raised-beach gulley and the E edge of the cutting, the merest edge of another large pit or post-hole was discovered. Its full extent and nature could not be determined.

Post-hole 546 cut the ditched enclosure (below) and so post-dates it. Several post-holes underlay the bottoms of the medieval plough furrows (below), and a coarse-ware vessel base (fig 43) overlay post-hole 511. The buried soil which descended the E side of pit 156 was cut by post-holes 157 (fig 5, profile 19) and 155, so the post-holes must be later than the pit.

THE N FEATURES: DITCHES A, B AND C (figs 15–17)

Removal of the backfill of Professor Thomas's trench, 304 on fig 2 in area E, revealed three ditches or drains (A, B and C) all sectioned by his trench (fig 15, profiles 16 & 18). Ditch C, the earliest and most northerly of them, was infilled with silt and was relatively stone free. This ditch was cut from the level of the ground surface of the podzol at some time before the latter's burial: a shallow gulley had been cut into its silty infill along its S margin in area E. This gulley had itself silted up, and ditch and gulley were finally overlain by a layer of soil before the Ap layers were deposited. Both of the later ditches cut this layer of soil.

Ditch C extended from the E limit of excavation to a point 1 m E of the Road of the Dead, where it was cut by Ditch B. However it seems likely that it once extended beyond this point and passed through the concreted storm-beach deposits. The line of this penetration was subsequently used for ditches B and A (fig 17).

Ditch B was stone-packed and may have served as a drain though the interstices were silted up. It cut Ditch C and was itself cut by Ditch A. At its W exposure it was overlain by two granite slabs the upper surfaces of which were worn smooth. These formed the N limit of the layers covering Ditch A (fig 16, 1).

The S Ditch (A), which was the latest of these ditches, contained a culverted medieval-type

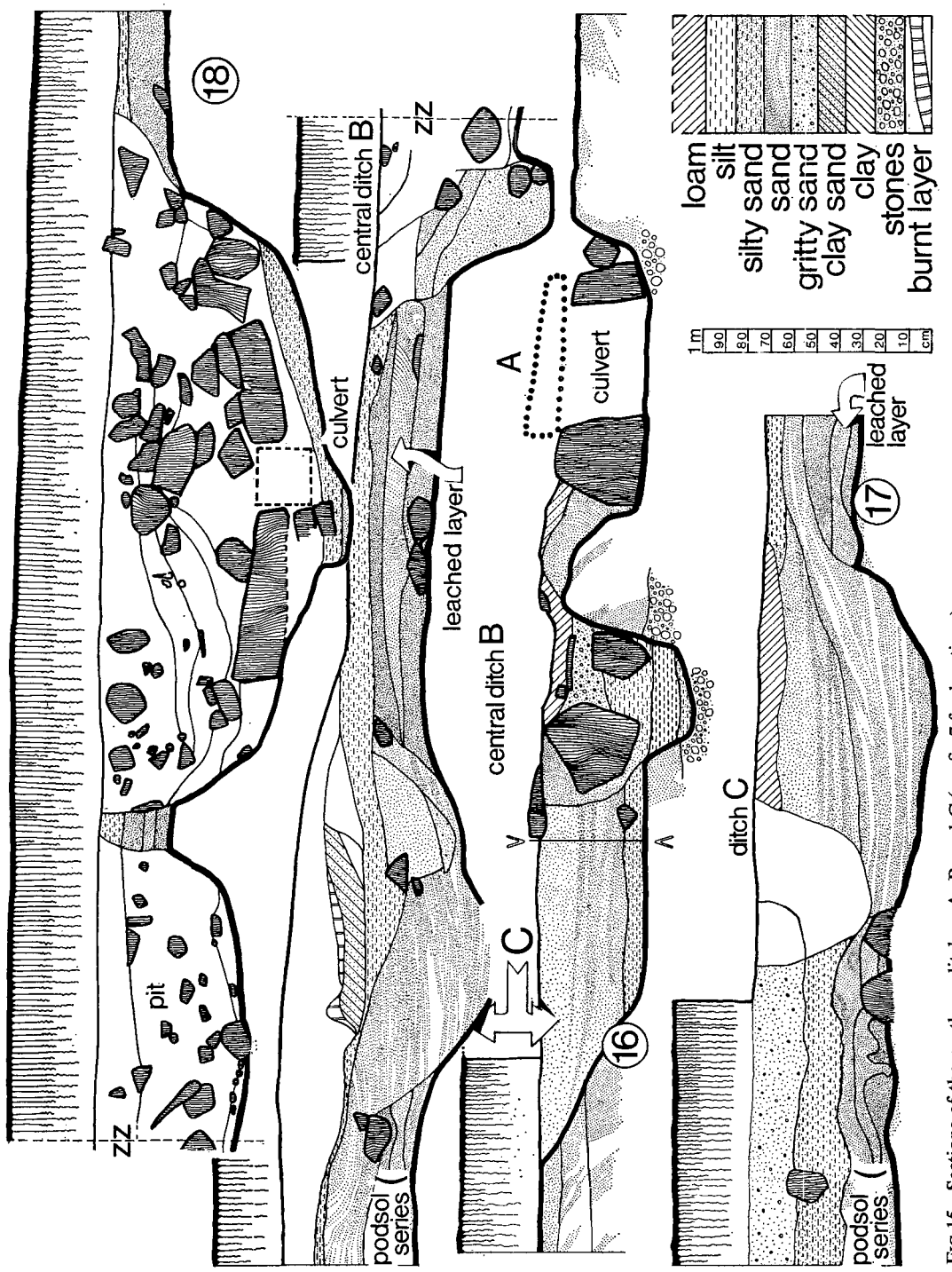


FIG 15 Sections of the northern ditches, A, B, and C (see fig 7 for locations)

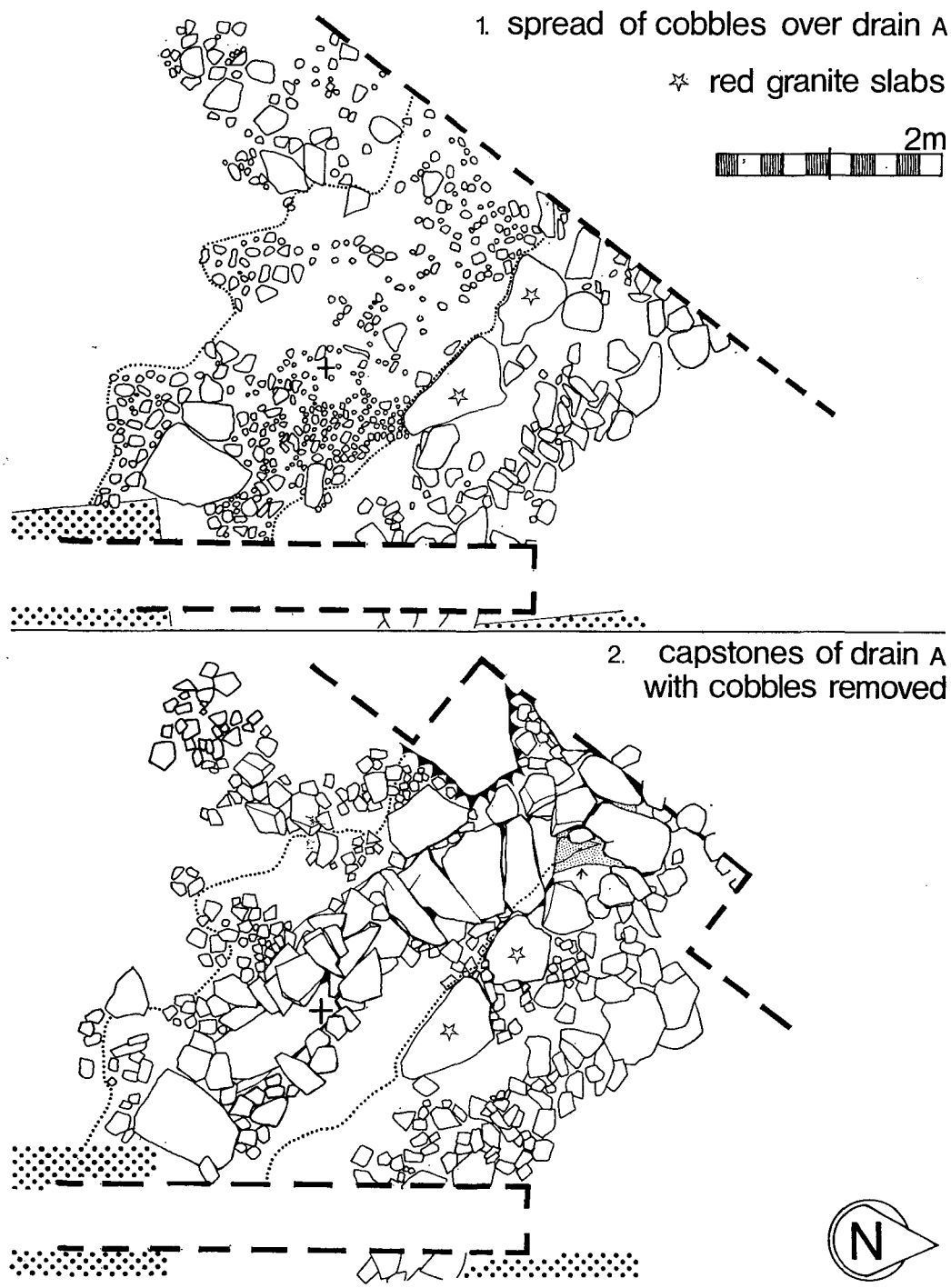


FIG 16 The cobble spread (1, above) covering the drain (2, below) in Ditch A: the spread is bounded on the N by a pair of granite slabs (indicated by a star symbol) with smoothly worn upper surfaces

drain, slab-sided and roofed with slabs and boulders, which ran NW–SE and deepened to the SE. The floor of the drain was paved for the northwesterly two thirds of its exposed length. Its internal dimensions averaged respectively 0·3 m wide by 0·2 m deep. In area E the unpaved bottom of the culvert was c 1 m below the top of the subsoil. The covering slabs of the drain-proper (fig 16, 2) were overlain by a layer of cobbles, which on the W end were overlain by a layer of sand and a further layer of cobbles. These covering layers to the N of the drain extended as far as a pair of granite slabs with worn upper surfaces, laid with their straight S edges in line (fig 16, 2). On the S (fig 17) a series of short gullies abutted the drain at right angles. These were packed with cobbles and joined the drain at points where gaps occurred between adjacent side stones. Flat slabs overlay the junctions of the gullies and the drain at the level of the latter's capstones (fig 16, 2). These cobble-filled gullies were clearly contemporary with the drain and seem designed to enhance its effectiveness. It is significant that they occurred only on the S side where the concreted sands and boulders of the storm beach would have most impeded drainage.

A group of 15 small post-holes ran E–W, in a narrow band immediately S of the drain (fig 17). These commonly had cobbles used as packing stones. In several cases larger, slab-like, packing stones had been used and these were visible above the layers of cobbles. This would seem to suggest that these post-holes were contemporary with or post-dated the cobble spreads. The distribution of cobbles around some of the post-holes suggests that the posts were *in situ* when the cobbles were laid and were probably contemporary. The edge of post-hole 535 lay under a capstone of the drain. On the basis of their diameters and depths it is tempting to separate the postholes into two groups. The first, containing 519, 537, 515, 380, 538, and perhaps 526 and 535, are deeper and wider and form a roughly straight line. However it would be misleading, particularly in view of the conflicting evidence, to place any confidence in such an arrangement.

A well-made 'portal' arrangement of side stones with a boulder capstone, the latter one of the paving stones of the Road of the Dead, was visible at the point where the drain met the Road. E of this, within the excavation area, the sides of the drain proper splayed out to form a sort of water catchment, presumably to take the surface water from the Road.

Beneath the Road of the Dead the drain had silted up along as much of its length as could be examined without disturbing the Road's surface. On the other hand the excavated length was remarkably free of soil and had only a thin (maximum 20 mm) depth of silt in it. It seems probable that it has continued to function as a drain for the surface water from the Road of the Dead and that this has, effectively, kept the channel clear. It is impossible to avoid the conclusion that this drain was contemporary with the Road of the Dead since its capstones formed part of the paving of the Road where it passed beneath the latter.

In the NW area two series of layers and lenses of disturbed soil overlay Ditches A, B and C. An idealised section showing the relationships between these and the ditches is illustrated in fig 9. The two uppermost layers illustrated are modern topsoil, overlain by soil removed in the clearing of the Road of the Dead. The black stony layer beneath them terminated on its S side at a row of head-sized boulders. These deposits seem to represent the construction layers of a road which was at first a simple farm-track and latterly gave access to the Abbey buildings until replaced by the present access road in the recent past. The second sequence of layers lay beneath those described and extended further to the S where they terminated in and on a jumble of stones which had clearly revetted the soil layers. Incorporated in this second sequence were pockets of charcoal and burnt soil. It was not possible to come to any understanding of the nature or function of this feature in the field and none is offered here.

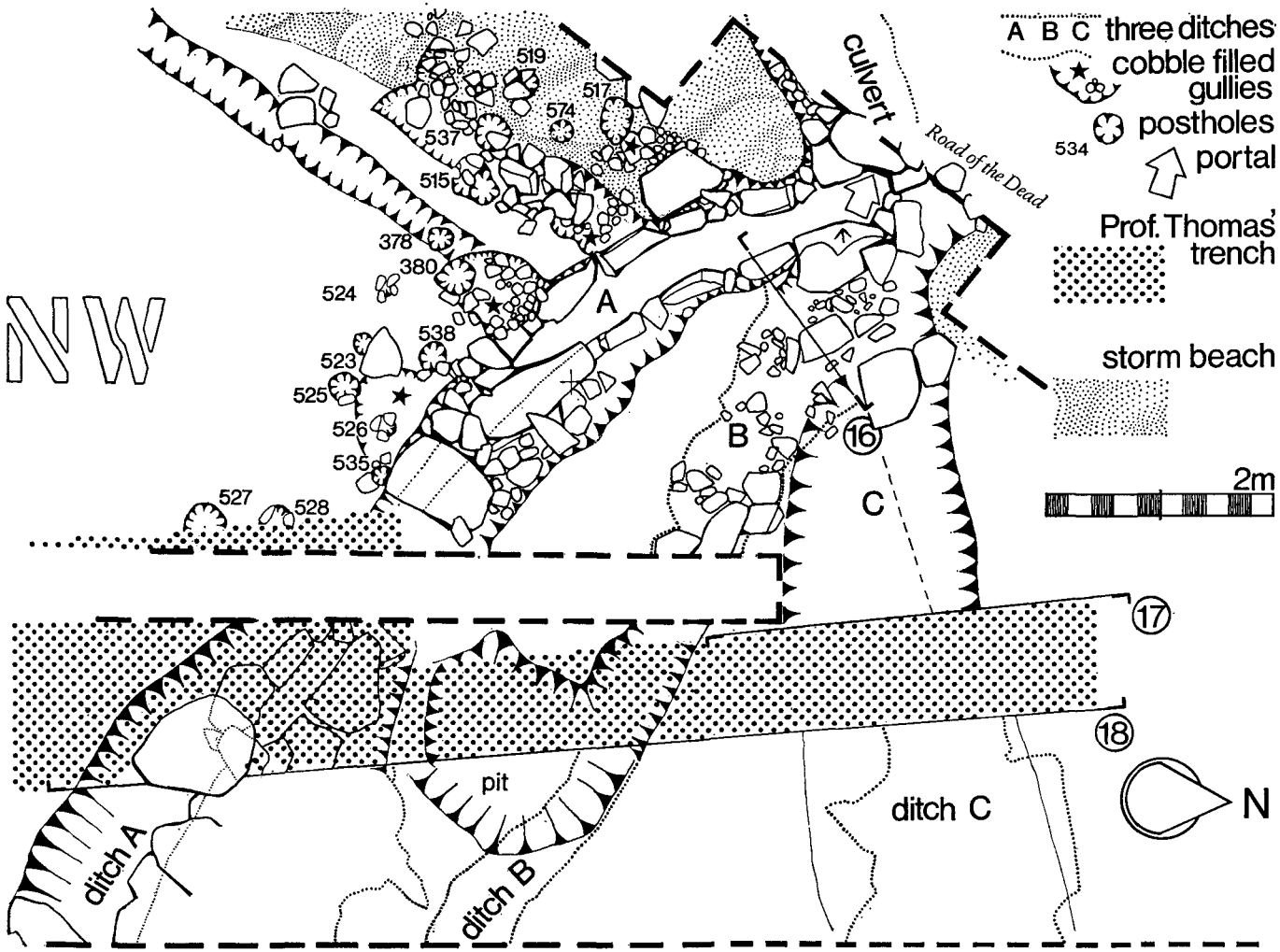


FIG 17 The three N ditches radiating from the now-culverted cut through the concreted storm-beach material

MISCELLANEOUS FEATURES

Included in this category are those features that were either too small and fragmentary or simply too enigmatic to allow of simple interpretation on site. In some cases post-excavation studies have helped to clarify their functions and these are discussed later. Some, the last in this listing, have been included only because they contained small finds. Being only the bottoms of shallow pits surviving beneath the Ap layers they would not otherwise merit publication, and those which were sterile are not listed here.

The angular ditched enclosure (fig 5, feature 1). A shallow ditch was found in the N half of the site, mainly in the NW area but partially in area D (fig 2). It ranged in depth from 0·20 to 0·05 m but averaged 0·10 m deep and 0·15 m wide. Its cross-section was also variable, ranging from U-shaped to an asymmetrical V-shape. In plan it is roughly pentagonal, though the NE vertex and all of the E side is missing. The former was removed by Ditch A and was cut by several of the small post-holes S of that drain. On the W it can be seen to underlie the Road of the Dead and four indistinct furrows ran W from it under the Road. On the S side it was cut by post-holes 322 and 546, of the outer and inner arcs respectively. Its SE extremity is lost in the pit which contained post-holes 541, 542 and 553. It is impossible to suggest an original form or function for this ditch.

A possible cross base (fig 5, feature 6; pl 19a). In the SW corner of the NW area a raised earthen plinth supported an area of large paving slabs. The largest projected W some 50 cm into the Road of the Dead and formed part of its surface. On the E side of the plinth one half of a millstone was laid, level with the stony surface. This had a central rectangular hole and it seems likely that it was originally used in a rolling or crushing mill because neither of the flat circular faces has been smoothed whilst the rim is smooth and polished. This may have been used to hold a cross of wood or stone, the plinth as a whole forming a wayside shrine to the Road of the Dead with which it is clearly contemporary.

A grave-like pit (fig 5, feature 3). This feature, 2 m long by 0·8 m wide and 0·8 m deep measured at the top of the subsoil, had been almost excavated by Professor Thomas. His section line left a thin vertical strip of deposits in the NE corner of the pit (fig 9, profile 20). This revealed a sequence of undifferentiated loam overlying an orange burnt layer, over clay, over a basal deposit of black sandy soil rich in charcoal. It will be noted that this sequence is almost identical to that overlying the drain in the W end of Ditch 1.

A stone-lined feature (fig 5, feature 4, fig 18; pls 18a & 18b). This feature was represented by a paved area measuring 0·90 m by 2·05 m, enclosed within a low 'wall' one to two courses high (fig 18). It had been excavated by Professor Thomas who had re-set some of the stones. From a position beneath the undisturbed stones of the E side (fig 18) a sherd of glazed medieval pottery was recovered (fig 43, no 252/1): the soil between the stones of this feature was black and rich in charcoal. The feature is further discussed on p 361.

A large shallow pit in the SW area (fig 5 & fig 9, section 21). This feature first appeared as a circle of grey soil on the W of the SW area, N of Ditch 1. Excavation revealed a shallow depression c 3 m in diameter, on the bottom and sides of which lay a dark charcoal-rich layer overlain by the grey soil described above. Above this the fill was a dark gravelly sand. Into the top of the latter a channel had been cut which ran off to the NW (fig 5).

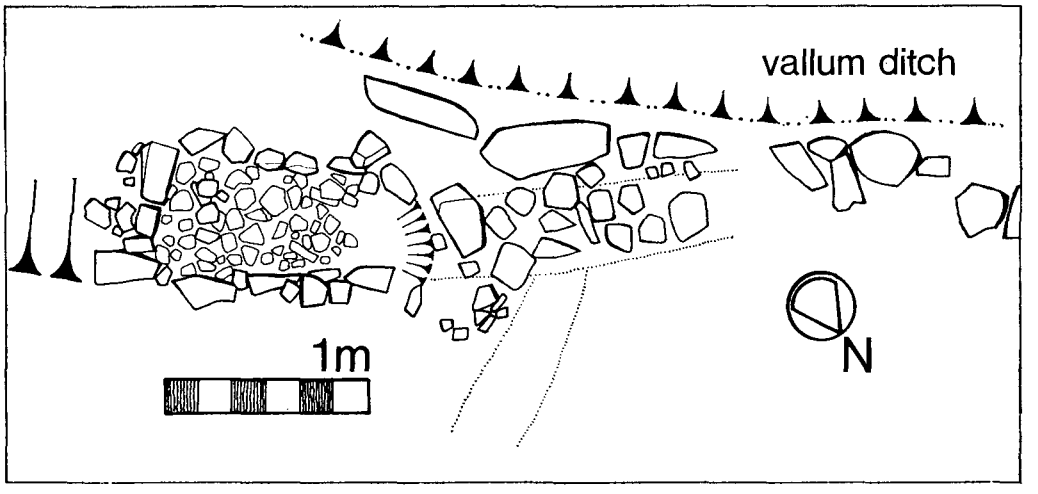


FIG 18 Plan of the stone-lined feature (numbered 4 on fig 5) N of Ditch 1: this is interpreted as part of a grain drying kiln (p 361).

Cultivation furrows (fig 19). The bottoms of a series of furrows were found intermittently over much of the site, but mainly in the S half. These appeared as grooves of varying but shallow (less than 0·1 m) depth cut into the top of the buried soil surface. Their course could not be detected in the Ap layers and while the latter contained modern pottery throughout their depth only medieval-type pottery was found in the cultivation furrows: this would seem to be their date. It is clear that the Ap layers must have been *in situ* when the furrows were cut as only the bottoms of the furrows survived in what would have been the topsoil of the pre-Ap land surface. The furrows illustrated on fig 19 seem to fall into two groups. Those on the SE ran roughly N–S whilst those in the SW ran rather more NE–SW and these appeared to be bounded on the W by a set of somewhat deeper furrows which fitted into the curve of the concreted storm-beach deposit.

Pit 29, *in Area B.* In area B a spread of charcoal and burnt bone was detected within a shallow rectangular pit. This was c 600 mm deep and underlay one of the medieval cultivation furrows. It contained a worked flint (fig 44, no 29/1) and a heavily corroded iron object which subsequent X-ray showed to be a large nail, 160 mm long and up to 8 mm in diameter (no 29/2). Attached to the nail-head by corrosion products, but not pierced by it, was a piece of slate. This preserves two straight sides meeting at right angles and is possibly a roofing slate. Stratified beneath the medieval furrows, these finds are either early medieval or pre-medieval in date.

THE RADIOCARBON DATES

A total of eight samples from the site were dated (Table 4) and these may be considered in three groups, *on the basis of the archaeological evidence.*

Group 1: *Ditch* 1

The dates from Ditch 1 relate to events concerned with the lower peat block. Peat formation in the ditch has been dated to 585 ± 55 ad and the lower block had been formed completely by

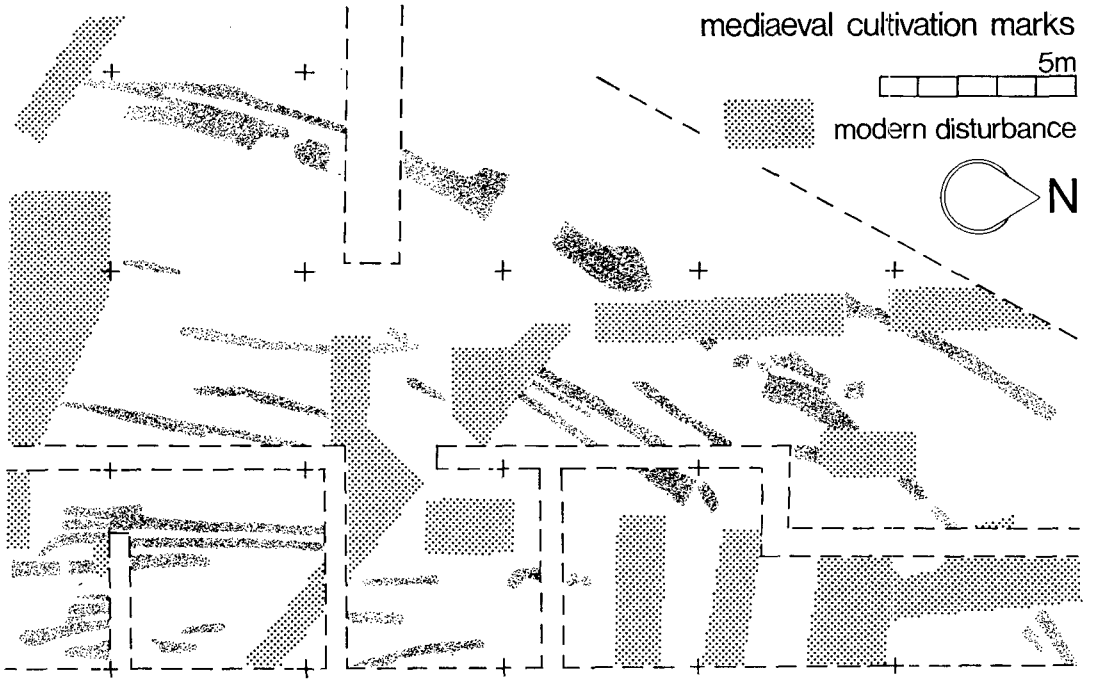


FIG 19 The medieval cultivation furrows

TABLE 4
The Radiocarbon dates

Lab No	Site Code	C_{14} date	Tree-ring range (cf McKerrell 1975)	Dated event
Group 1: Ditch 1				
GU–1245	23/273	690±55 ad	660 to 720 AD	Top of the lower peat block.
GU–1248	23/473	635±55 ad		Peat formed over foot of boulder wall.
GU–1247	23/489	605±55 ad		Insertion of boulder wall foundation.
GU–1246	23/449	615±55 ad		Stratigraphically highest leather found.
GU–1243	23/447	585±55 ad	600 to 635 AD	Primary peat in Ditch 1.

The weighted mean (Long & Rippeteau 1974) of the three dates, GU–1246/7/8, is 618±25 ad which yields a tree-ring range of 615 to 650 AD.

Group 2: Ditch 2				
GU–1281	23/64	470±55 ad		Top silt layer.
GU–1282	23/114	570±60 ad		Second lowest silt layer.

The weighted mean (Long & Rippeteau 1974) of these two dates is 516±40 ad which yields a tree-ring range of 540 to 590 AD.

Group 3: Pit 156				
GU–1262	23/108	595±55 ad	605 to 640 AD	Charcoal layer within pit 156.

690±55 ad (see Table 5 for laboratory numbers). Material from the foundation plinth of the boulder facing returned a date of 605±55 ad whilst a sample from the peat overlying the plinth

yielded a date of 635 ± 55 ad. A sample from the same level and position as the stratigraphically highest piece of leather deposited in the ditch was dated to 615 ± 55 ad.

These dates reflect their stratigraphical order, but this occurrence is due more to coincidence than to theoretical expectations based on counting statistics alone. Thus, given an error of 55 years attached to each date and an overall range of 100 years, it would not be improbable for at least one date to be out of sequence, since the predicted time-span between two dated horizons is small in comparison with the dating error. Only unworked twigs and small branches were selected as samples for dating in an attempt to avoid the problems caused by using wood from varying and usually unknown positions within mature trees, perhaps several centuries old (Alcock 1976, 110). This practice also eliminated the possibility of obtaining unrepresentative dates from worked timbers which might already have served for some decades in a structure before finally being discarded in the ditch.

The three central dates of the Ditch 1 group are closely similar: these date the foundation pad of the inserted boulder wall, the earliest peat formation over the wall's footing, and the highest level at which leather was found. The statistical test for non-coevalness of radiocarbon dates advanced by Long and Rippeteau (1974, 210) suggests that these dates are not 'non-coeval', ie that they represent a duration of time insignificant with respect to the precision of the analysis. The archaeological significance of this conclusion is that the deposition of leather in the ditch ceased at the time that the boulder wall was erected and the causeway extended. Our best estimate of this date is the weighted mean of the three, ie 618 ± 25 ad.

Group 2: *Ditch* 2

The two dates from Ditch 2 are in the reverse of their stratigraphic order. Although a consideration of the counting statistics alone indicates that this inversion is improbable though not impossible, choice of sample material may be the dominant factor for the disagreement between radiocarbon dates and stratigraphic order. The charcoal samples concerned, GU–1281 and GU–1282, were scattered with domestic refuse, respectively through the uppermost and the second-lowest of the five natural silting layers in the ditch. The presence of the refuse makes it extremely likely that the charcoal is debris from hearth sites. Clearly old dry wood is favoured for hearths and the fuel may well have included discarded timbers from old buildings, thus archaeological grounds exist which help to account for the anomalies in these dates.

In the absence of additional radiocarbon dates from this location which might help resolve the age dilemma, the best estimate for the date of Ditch 2, to be regarded as a *terminus post quem*, is given by the weighted mean of the individual dates, ie 516 ± 40 ad. The archaeological implications of these considerations are twofold. Firstly it is probable that the ditch sediments were laid down over a very short period of time; this is discussed elsewhere. The second refers to the possible relationships between this ditch and the historical event of Columba's arrival on Iona. The radiocarbon dates suggest that the ditch was open for a short period of time, which includes, when corrected, the date of Columba's arrival; however they lack the precision and accuracy to pinpoint the specific relationship between the opening of the ditch and the Saint's arrival on the island.

The fact that Ditch 1 cuts Ditch 2 raises the possibility that the time span between their use is minimal. The test for non-coevalness in this case shows that there is a significant difference between the weighted mean of the Ditch 2 dates and the date of the lowest peat in Ditch 1 (GU–1243). There is therefore no statistical support for the hypothesis that Ditch 1 replaced Ditch 2 as the enclosing element of a settlement, though there is some archaeological evidence to the contrary (see Discussion p 356).

Group 3: *Pit 156*

The test for non-coevalness shows that there is a significant difference between the weighted mean of the Ditch 2 dates and the date from pit 156. However the latter is not significantly different from the date for the primary peat deposit in Ditch 1 nor indeed from the three dates relating to the building of the boulder wall. The archaeological implication here is that the pit possibly relates to activities which correspond more closely to the early period of use of Ditch 1 rather than that of Ditch 2.

Professor Alcock's statement that '. . . a further complication arises because the site falls within the historical period, within a framework of dates in calendar years' holds true for Iona just as it does for the site of Castle Rock, Dumbarton, which he was then discussing (1976, 110). The fourth column in Table 4 records the tree-ring date ranges which, in the current state of our knowledge (McKerrell 1975, 119), seem to represent best the areas of time indicated by the radiocarbon dates above, but neither do they help in facilitating the correlation of facts of the archaeological world (*sensu* Clarke 1971, 16) with historical 'facts'.

INTERPRETATION

It is proposed to examine here the chronological relationships between the various excavated features mainly on the basis of the observed stratigraphy and of the radiocarbon dates. The evidence from the finds and palaeo-environmental studies is considered in the Discussion, below.

Period 1

This period extends from the formation of the raised beach to the cutting of Ditch 2.

Phase 1. The deposition of one artefact and several scraps of flint within the Natural Gulley (Ditch 3) in the raised beach.

Phase 2. The cutting of Ditch C and indeed its insilting took place before the burial of the podzol. The onset of podzolisation, in this case, unfortunately does not help to define the date of the ditch any more closely, since, in such free draining sand and gravel soils podzolisation could have begun as soon as the sea had receded from the beach.

Phase 3. The cutting of Ditch B. Though later than Ditch C it is probable that Ditch B also belongs in this phase. Its silty infill contained large stones but was free of the many small stones which might be expected to derive from the Ap material were the latter *in situ* when the ditch infilled (fig 15, profile 18). However the nature of the infill at the W end of Ditch B is much more heterogeneous (fig 15, profile 16) and the possibility that it belongs in the next period cannot be excluded.

Period 2

This period extends from the digging of Ditch 2 to the end of the peat formation in Ditch 1.

Phase 1. The digging and insilting of Ditch 2. This phase has been radio-carbon dated (Table 4 and above) and can best be represented by the mean of the dates as 495 ± 40 ad (*terminus post quem*).

Phase 2. From the backfilling of Ditch 2 to the widening of the causeway of Ditch 1. The backfilling of Ditch 2 and the cutting of Ditch 1, possibly simultaneously, open this phase of activity. Throughout the phase debris and by-products of woodworking and leather-working were deposited into Ditch 1 together with much animal bone. These depositions virtually ceased at a date statistically indistinguishable from the date of the widening of the causeway by the insertion of the boulder facing and the backfilling of the terminal behind it. On the basis of the radiocarbon dating Pit 156 seems also to be attributable to this phase.

Phase 3. The formation of the upper part of the lower peat block. This period of peat formation saw a radical decline in the wood and bone depositions in the ditch, and a complete absence of leather.

Phase 4. The formation of the middle and upper peat blocks.

Period 3
Events and features in this phase post-date the formation of peat in Ditch 1.

Phase 1. During this phase a clay bed was introduced over the peat in Ditch 1 and a culverted drain set upon it and covered with soil. To this phase also is attributed the present boulder-surfacing of the Road of the Dead, together with the construction of the culverted drain in Ditch A and the cross-stance beside the Road of the Dead.

Phase 2. The deposition of burnt material in the W end of Ditch 1 is attributed to this phase, as is the apparently associated linear stone-feature and possibly the grave-like pit. The cultivation furrows may belong either to phase 1 or 2 above or to a succeeding phase.

Period 4
The modern farm access-road which cuts the N end of the site is alone attributed to this phase.

This account of the chronology of the site's features is not fully dated nor is it exhaustive since some features are omitted, eg the angular ditched-enclosure and the post-hole setting. Completion of the chronology depends on the evidence from the finds and the specialist studies which follow. There is, however, one further aspect of the excavation which deserves comment at this point and that is the evidence for the date of the introduction of the Ap soils. Pit 156, which has been dated to 595 ± 55 ad (GU–1262), was dug before the introduction of the soil; and the cultivation furrows which survive beneath the soil are medieval in date. Therefore the Ap layers were introduced some time between these termini. The post-hole settings were also dug some time within this period.

FINDS AND SPECIALIST REPORTS: DITCH 1

THE ANIMAL BONES FROM DITCH 1

Finbar McCormick

Although the bones discussed here are exclusively from the fill of Ditch 1, occasional decalcified bones or tooth-enamel fragments were returned from other features, notably from Ditch 2. The acidic

nature of the soils had destroyed most of the remains: indeed the bones of a modern horse showed considerable deterioration despite having been in the ground for less than 40 years. Generally the bones from archaeological sites disappear when the pH of the soil is below 6·4. The anaerobic conditions of the ditch fill, however, ensured relatively good preservation despite a pH level of 4·6. The amount of bone recovered was relatively small (the minimum number of individuals is a mere 27) and allows only a qualitative assessment of the food economy to be made (Table 5). The bones came from several different levels within the lower peat block. The material from each level was initially examined separately but no significant differences were noticed. Because the quantity was so small the bones were all grouped together for this study.

TABLE 5

Frequencies of bone fragments of different species present in the Ditch fill.

Species	Cattle	Horse	Red Deer	Sheep	Pig	Roe Deer	Otter	Grey Seal	Human	Cetacean
Skull fragment	3									
Mandibula	2		3							
Maxilla	1									
Teeth	35	1			1					
Axis	1			4						
Scapula	9		5	1						
Humerus	16			1						
Radius	25	1	1	2	1			1		
Ulna	7	1								
Metacarpal	8	1				1				
Sacrum	2									
Pelvis	8	1	2	2	1			2		
Femur	15		2	2	1		2			
Patella	4		1							
Tibia	9		1	2			2	1		
Astragalus	3									
Calcaneus	5		2		1					
Metatarsal	7		2							
1st phalanx	4			1					1	
2nd phalanx	4									
3rd phalanx	2									
Other										3*
Total	170	5	19	15	5	1	4	4	1	3

* The cetacean remains consist of 2 rib and 1 vertebra fragment.

The minimum number of individuals (MNI) was estimated using the method outlined by Chaplin (1971). MNI totals from mutually exclusive contexts were added together to make up the final totals (Table 6). The withers' heights of cattle were calculated using the multiplication factors devised by Fock (quoted in van den Driesch & Boessneck 1974). Generally speaking it is difficult to differentiate between the remains of sheep and goat. However, in those cases where identification was possible (after Boessneck 1969) the bones were of sheep. Most of the bones were broken and many displayed butchering marks, indicating that they consisted almost exclusively of discarded food refuse. There were no articulated or semi-articulated skeletons present. One human metatarsal was found.

The two most striking aspects of the faunal remains were the high predominance of cattle and the unusual importance of wild animals in the food economy. The domestic animals present were cattle (*Bos taurus* L), sheep (*Ovis aries* L), pig (*Sus domesticus* Erxleben) and horse (*Equus caballus* L). The wild animals present were red deer (*Cervus elaphus* L), roe deer (*Capreolus capreolus* L), grey seal (*Halichoerus grypus* F), otter (*Lutra lutra* L) and unidentifiable cetacean of pilot whale- or porpoise-size (Table 6).

TABLE 6
Animal bones from Ditch 1.

	Fragments	%	MNI*	%
Cattle	170	76·9	9	33·3
Horse	5	2·2	2	7·4
Sheep	12	5·4	5	18·5
Pig	5	2·2	2	7·4
Red Deer	19	8·5	4	14·8
Grey Seal	4	1·8	2	7·4
Roe Deer	1	0·4	1	3·7
Otter	2	0·9	1	3·7
Cetacean	3	1·3	1	3·7
Total	221		27	

* minimum numbers of individuals

Domestic animals

The demands of tillage may have severely limited the amount of land available for livestock rearing on the island. The faunal remains show that the inhabitants chose to use this limited resource for the rearing of cattle rather than sheep. This is surprising because the barren terrain of the island is more suitable for the latter. The unusually high incidence of wild animals would suggest that the meat available from domestic sources was in relatively short supply and it is this factor that would have governed the choice of livestock economy practised. Although it is possible to raise five sheep on a unit of land that could support only one bovine, and probably even more in the case of Iona, it has been calculated that a dressed cattle carcass weighs twelve times that of a sheep (Chaplin 1971). When one considers, as was the case in Ireland during this period, that cattle may have been kept primarily for their milk with meat being virtually a secondary product, the value of cattle compared with sheep is even more evident. The protein production efficiency is over four times as great for milk as for meat (Bowman 1977, 62). The faunal remains show clearly that sheep and pig were of minor importance compared with cattle. The cattle were small, close in size to a modern Kerry cow (Table 7). A complete metacarpal and metatarsal give estimated withers' heights of 1·11 m and 0·99 m respectively. A metacarpal from Dun Mor Vaul has a total length of 167 mm, which gives a withers' height of 1·02 m (Noddle 1974, 197). These and other cattle measurements show that the cattle population on both sites were similar in size. The sheep were diminutive in size, about the size of a modern Soay, and the horses were approximately the size of a modern pony (Table 8).

The eating of horse flesh was frowned upon by the Early Christian church. It was decreed a forbidden food in 9th-century Irish Penetentials and in Adomnán's *Life of St Columba* it is seen as a practice fitting only for thieves (Anderson & Anderson 1961, 251–3; Bieler 1975, 161). The church seems to have regarded the consumption of horse flesh as a pagan practice. According to *Njal's Saga* the inhabitants of Iceland were told that they 'shall not expose children at birth nor eat horse flesh' when they were christianised in the 11th century (Magnusson & Palsson 1961, 226). Butchering marks on the horse remains from Iona show that despite such laws the animal was still occasionally eaten. Iona is not an isolated instance in this respect. Horse remains have been found on several Early Christian sites in Ireland and on most English Anglo-Saxon sites (Clutton-Brock 1976, 383). The horse bones from Iona are, however, the only examples that can be definitely attributed to a monastic context. It may perhaps be the case that the eating of horse was not forbidden by the original Christian church but that its prohibition was introduced with the Romanist reforms contemporary with Adomnán at the very end of the 7th century. This hypothesis is possibly supported by the fact that in the very early and archaic *Breatha Crolige*, a legal text on sick-maintenance, the eating of horse is not absolutely forbidden but simply recommended as being unsuitable for invalids as it tended to 'stir up sickness in the stomach' (Binchy 1938, 21). Other evidence from the present excavation shows that horse hides were used in leatherworking (page 318).

Wild animals

Wild animals seem to have played an important role in the diet of the inhabitants. Iona is too small an island to support wild herds of deer so it is most likely that the red and roe deer came from the

TABLE 7

Measurements of the bones of cattle (All dimensions in mm).

	Total length	*Prox. width*	*Dist. width*	*Min. shaft width*
Metacarpal	185	51·3	50·5	26·8
			49·4	
Metatarsal	185	38·1	46·4	22·2
			48·0	
Radius	245	46·0	57·4	33·0
	252	70·0	64·0	34·8
	231	—	56·3	31·3
	—	66·0	—	—
	—	70·0	—	—
	—	69·6	—	—
	—	—	70·9	—
	—	—	62·4	—
	—	—	63·7	—
	—	—	61·9	—
Tibia	—	—	54·6	—
	—	—	59·3	—
	—	—	50·5	—

Calcaneus Total length	*Astragalus* Lateral length	*Pelvis* Width of acetubulem (including lip)
129·2	56·6	58·5
117·9	55·2	56·5
116·2	55·8	

Scapula	Greatest width of process articularis	Minimum width of neck
	75·5	61·1
	65·3	51·0

Lengths of M_3 38·2, 36·3, 35·3, 30·0, and 33·4.

TABLE 8

Measurements of the bones of sheep, horse, roe and red deer. (All dimensions in mm).

Sheep	Pelvis (width of acetabulum incl. lip)	21·0, 27·2
	Femur (Distal width)	37·9
	Humerus (Distal width)	26·6
	Scapula (Width of the process articularis)	29·0
Horse	Radius (Distal width)	58·8
Roe deer	Metacarpal (Proximal width)	19·5
Red deer	Metatarsal (Proximal width)	37·9
	Tibia (Proximal width)	74·7
	Radius (Distal width)	47·7, 45·1, 47·6
	Pelvis (Width of acetabulum incl. lip)	51·0
	Calcaneus (Greatest length)	103·6, 109·9
	Scapula (Greatest width of the process articularis)	49·4, 47·5, 49·1, 49·0
	Scapula (Minimum width of neck)	31·0, 30·2, 31·0, 31·6

neighbouring island of Mull. Predictably the resources of the sea were also exploited. It is surprising however that with the exception of cetacean remains no fish bones were found. It may be that their fragile remains did not survive. (However, two small fish vertebrae were recovered during the macro plant study subsequent to the completion of this report).

The grey-seal grounds of the southern Inner Hebrides have today an estimated population of 2,000 individuals (Hewer 1974, 47). The presence of modern breeding grounds is no guarantee that they existed in early historic times or indeed in even more recent times (*ibid*, 47 & 116). Adomnán's *Life of St Columba*, however, shows that breeding was taking place in this area during the Early Christian period and it refers specifically to the killing of the seals on a breeding ground near Mull (Anderson & Anderson 1961, 295). The evidence from the present excavation would indicate that they were hunted for their meat and for their skins (see p 319). They may also have been exploited for their oil but there is no archaeological or literary evidence for this.

Seal bulls of three to four years of age have an average weight of between 77 and 86 kg while cows of the same ages have weights of between 59 and 86 kg. Accurate weights of fully mature animals are not known but cows of over 100 kg and bulls of up to 200 kg are probable (Hewer 1974, 54). White (1953, 398) has estimated that 70% of the total weight of seals consists of usable meat. When one considers that the dressed carcass weight of early cattle was only about 136 kg (Chaplin & Barnetson 1974) the potential of the grey seal as a meat source can be appreciated. It is obvious from Adomnán's account that the monastery at Iona was possessive about its hunting rights to the breeding grounds near Mull. The island was owned by the Abbot of the monastery and hunting of the seals by outsiders was regarded as poaching (Anderson & Anderson 1961, 295–6). It is interesting to note that while seal remains were found on the present and other excavation of the Early Christian levels at the monastic site (Reece 1973, 44), none were found in the medieval middens examined by Smith (1876, 67). It may be that continuous hunting in the Early Christian period caused the seals to abandon their breeding grounds in the area. There are none present in the area today, the nearest being on the Treshnish Isles and Eilean nan Ron off Oronsay (Hewer 1974, 47). The writings of the 11th-century Spanish Muslim geographer Al-'Udhri show that the hunting of young sea mammals by the Viking inhabitants of Ireland was restricted to the breeding season and shortly afterwards. He states that whale calves were born in September and that they were hunted only from October to January as after this 'their flesh is hard and unsuitable for eating' (James 1978, 7). It is possible that the same seasonal hunting was applied to the exploitation of seals and cetaceans by the Iona inhabitants. Reece (1973, 44) noted that only very young and very old seals were found on his excavations on the site. This would strongly suggest that hunting was limited to the breeding season. One of the seals found on the present excavation was a juvenile as its tibia had not yet fused. The eating of dead 'marine animals' washed up on the shore was permitted by the Early Church (Bieler 1975, 177). This was not the case with terrestrial animals as the carcass had to be bled immediately after death or else the flesh was regarded as unclean (*ibid*).

It is unlikely that the otter remains provide evidence of their exploitation as a meat source: it is more probable that they were hunted for their fur. They may also have been regarded as a pest as otters are notorious for devouring fish caught in fishermen's nets. Only four bones were present, two tibiae and two femora, all of which probably came from the same individual. There were no butchering marks present. One of the tibiae is abnormally curved: this is probably due to an injury sustained by the animal when it was very young. Otters are presently fairly widespread among the Hebrides (Knowlton 1977, 109): MacLean (1923, 93) however, states that they are absent from Mull, and Gordon (1920) makes no reference to them in his discussion of the natural history of Iona. Their presence on the Scottish Islands in prehistory is shown by finds from the chambered cairn at Quanterness on Orkney (Clutton-Brock 1979, 118) and there is little reason to suppose that they were not present in the environs of Iona during Early Christian times. Otters have been sighted recently on the Ross of Mull (I Fisher, pers comm).

The red deer were much larger than their modern Scottish counterparts. A modern radius from Arran had a distal width of 38·2 mm compared with 47·6 mm in the case of the example from the ditch fill. This also compares with a distal width of 42·1 mm for a radius from Bronze Age levels at Newgrange, Ireland (van Wijngaarden-Bakker, 1974, 354). A decline in size of red deer since prehistoric times has been noticed throughout central and western Europe (Walvius 1961, 75; see also Pietschmann 1977). This is generally attributed to the gradual disappearance of forests which were the natural habitat of the animal.

CONCLUSION

The evidence from the faunal remains indicates a livestock economy specialising in cattle rearing. Sheep and pig were occasionally eaten and wild animals played an important part in the diet. Besides the animals represented in the present sample, Reece (1973, 44) has shown that the Early Christian inhabitants collected limpets, winkles, whelks and oysters and fished for hake and cod. The diet was also supplemented by fowling (Table 9). The high reliance on wild animals as a food source is not confined to Iona. A similar pattern can be seen in an earlier period at Dun Mor Vaul on nearby Tiree (Noddle 1974, 187–98). On this site, which was occupied between 500 bc and 200 ad, red and roe deer constituted between 13% and 46% of the total fragments. Seals were also hunted but on a much smaller scale than deer. It may be that the intensive exploitation of marine resources and other wild animals in late prehistoric and early Scotland is a phenomenon confined to island settlements due to the limited supply of land available for domesticated animals. Many more assemblages of faunal remains from mainland as well as island sites will have to be examined before this can be ascertained.

A total of 36 bird bones were recovered from the middle and lower peat blocks. Two species were represented, the raven (*Corvus corax*) and the goose (*Anser* sp) (Table 9).

The bones were kindly identified by R E Maliepaard of the Albert Egges van Giffen Instituut voor Prae- en Protohistorie of the University of Amsterdam.

It should be noted that the MNI is probably a low estimate as the material was derived from both the middle and lower peat blocks which represent a considerable chronological spacing.

TABLE 9

Bird remains

	Raven	Goose
mandibula	1	—
sacrum	—	1
sternum	—	1
coracoid	4	—
humerus	6	4
ulna	4	—
carpometacarpal	2	—
femur	2	1
tibiotarsal	5	4
tarsometatarsal	1	—
TOTAL	25	11
MNI	3	3

Bird bones from Ditch 1

THE LEATHER FROM DITCH 1 (figs 20–7; pls 19b, 20)

W Groenman-van Waateringe

The larger fragments of identifiable function are listed (nos 1 to 32) in the Inventory (p 320) and the technical terms used are explained in fig 20. The following pieces are not described in detail: 1 sole fragment, 40 fragments with a closed seam (9 calf/cowhide, 8 cowhide), 4 fragments with a butted seam (1 cowhide, 1 horsehide), 1 fragment with basted stitching, 1 fragment with coarse tunnel stitching (cf repairs at heel of nos 18 and 20) (cowhide), 1 fragment with decorative seam (red deerskin), 2 fragments with small impressed circles (1 cowhide), 8 fragments with small holes (1 cowhide), 19 fragments with rather big holes (2 calf/cowhide, 1 cowhide) 7 waste pieces (1 calf/cowhide, 2 cowhide, 1 red deerskin), 5 straps (2 calf/cowhide, 1 cowhide) and 126 fragments without seams etc (11 calf/cowhide, 7 cowhide, 2 goat or hair-sheepskin).

Identification

Of all the leather pieces found 32% have been identified and include the following: calf (4), calf/cow (40), cow (27), goat or hairsheep (2), horse (5), red deer (3) and seal (2). This list corresponds rather well with the animal bones found (Table 6). The indication 'calf/cowhide' means that the hide is not from a very young calf (small pores, lying close together), nor from a fully adult cow (large pores, widely spaced) but rather from an animal of intermediate age.

Stitches and seams

Stitches used were the running stitch, basting stitch, overstitch (fig 23:3) and tunnel stitch (fig 20:9). Seams used were butted seams and closed seams (the majority) (fig 20: 7 & 8 respectively). Thonging seems to have been used for repairs (fig 21; pl 20) and probably for fastening (but see under *shoes*). The many pieces with rather big holes indicate that mending was a common practice. Sewing was done carefully and with considerable skill. Tanning seems to have been a problem, because most of the fragments show delamination, ie splitting of the leather into grain and flesh layers, caused by incomplete penetration of the tanning liquid. Only once was the stitching material preserved. Microscopic analysis showed this to be of animal origin, probably smooth muscular tissue of the wall of the intestines.

Decoration of the leather was done by impressing small circles in different patterns with the aid of a hollow metal bar of small diameter (fig 22; pl 20). The presence of waste pieces or offcuts point to local manufacturing of leather, or at least mending. This is also suggested by the kinds of leather used, which most probably came from the hides and skins of animals slaughtered locally.

Shoes

Insofar as could be established with certainty, sole and upper were joined together with a closed seam and not by thonging, although the latter, according to Swann (1975, 16), should be characteristic of Dark Age shoes. The use of a wooden last is indicated by one hole occurring in the middle of the sole (fig 23: 12 & 24). In the absence of complete soles it is difficult to determine whether a clear distinction was made between left and right, nor is the overall shape of the sole clear.

It is assumed that there was only one side-seam in the upper and that this was placed at the inside of the foot (cf fig 24). The joinings in the upper were made with butted seams: on the top edge of some shoes a butted seam was used to add a narrow strip of leather, a so-called 'top band'.

The placing of the stitches and the stitch marks indicate that the shoes were made inside-out and turned when finished – commonly known as turnshoes. It is impossible to conclude from the small surviving pieces of upper whether or not thonging was used for fastening as well as mending (cf fig 21: 4, 14). Of particular note is the decorative seam in the middle of the vamp (figs 24 & 25). The tongue-shaped flap rising at the back of the heel merits some comment. Dr Carol van Driel-Murray (pers comm) has expressed the belief that, on the basis of their shape and of the impressions and stitch holes on the flesh side of the identified counters, the five tongue-shaped objects nos 5, 6, 26, 27 and 30 are heel stiffeners (fig 22). The heel stiffeners were sewn flesh-side to flesh-side in the heel with a butted seam along the edges of the upper half. This seam must have been visible on the outside, because the heel stiffener is wider than the tongue of the shoe. In this way the decoration of the heel stiffener fits closely to that of the shoe itself (fig 22, upper right). The lower part of the heel stiffener was sewn with an overstitched seam (fig 22: 5) and tunnel stitched to the flesh side of the counter. The upper was made from one piece of leather (fig 24) or of two pieces, ie with separate vamp and counter (fig 22: 8 and fig 25).

It was possible to reconstruct three shoes more or less completely (figs 24–26). The size of the one complete shoe (size 7 fig 24), when compared with the shoe size for medium-sized males nowadays (8·5), seems somewhat small, but the possibility of shrinkage of the leather while in the ground or after excavation cannot be excluded. Furthermore one has to keep in mind that shoes with a stiff sole are of necessity rather longer (c 2 cm) than shoes with a single, flexible sole. For nos 18 and 25, two reconstructions have been given (figs 25 & 26). The butted seam at the rear end of no 18 is either a side seam or a back seam. Because of the proportions of the remaining part, a side seam is more probable. The shoe would then have had a separate counter, with or without a raised tongue. If the seam were a back seam, a raised tongue would be unlikely. As the heel form of no 25 is totally unknown, a raised tongue may or may not have existed.

The minimum number of shoes found is thus five, because of the five heel stiffeners. The throat can

be of different shape: lobed (fig 24), or with a triangular (fig 25) or round tongue (fig 26). The tongue-shaped rising at the back of the shoe, the heel stiffeners of the same shape and the decoration of small punched circles have not previously been recorded.

Purse

One half of a purse, probably made of cowhide, was found (fig 27; pl 20). Other fragments with rather big holes along one edge, sometimes with actual thonging present, may also belong to this category, although the latter may also be parts of the uppers of thonged shoes, or simply repairs.

Find circumstances and dating evidence

The leather finds came from the lower half of the 3 m deep Ditch 1. This lower half consisted of three blocks of peat, separated by silt layers. In the lowest block, leather, wood and bone were found. The radiocarbon dates for the bottom and top of this peat block are ad 585 ± 55 (GU 1243) and ad 690 ± 55 (GU 1245) respectively. As the leather was distributed randomly throughout the lower half of the lower peat block, its dating can be narrowed down to the period 585 to 618 ad (see p 311).

Comparison with other Leather Finds

Directly comparable finds, either in shape or date, published in a way that makes comparison possible, are not available. Only Wilson (1961) mentions leather finds possibly dating to the same period as the Iona finds. These were recovered from a crannog at Loch Glashan in Argyll (5th-9th century) and the writer notes that 'among much scrap leather were fragments of sheaths, shoes and a jerkin'. No other contemporary leather is known.

When considering the distinguishing marks of the shoes from Iona, the separate sole, turnshoe, decorative seam on vamp, closed seam between sole and upper, butted seam in the upper and top band, are all comparable to more recent material (cf Groenman-van Waateringe 1980). On the other hand, the tongue-shaped rising at the back of the heel, the heel stiffeners and the decoration have no counterparts. Heel stiffeners, apart from those on Roman shoes, do not occur before late medieval times. The different forms of the throat can perhaps be compared with Irish one-piece shoes (Lucas 1956, fig 4), although those from Iona are simpler in form and not decorated. The dating range suggested for the Irish shoes is rather wide (Lucas's type 1), but may overlap with the Iona dating.

In conclusion, the leather finds from Iona are of the utmost interest, since they partly fill-in the gap in our knowledge, which exists in the late Roman-Viking Age gap, concerning shoe fashion from prehistoric to late medieval times (Groenman-van Waateringe 1980 a & b in press).

Leather inventory

These entries have been compiled by Professor Dr Groenman-van Waateringe. Only those fragments which merit individual comment are listed. A summary of the remainder is included in the leather report. The technical terms are explained in fig 20. Where, in the inventory or the report on the leather, a positive identification is not offered, the fragment(s) involved are not identifiable.

1 (fig 23) Fragment of shoe upper, cowhide; closed seam along sole, rather widely separated stitch holes along the opposite side.
2 (fig 21) Fragments with tie (?) holes, held together with leather strip(s).
3 (fig 23) Fragment with overstitched seam, calf/cowhide.
4 (fig 21) Fragment with tie (?) holes, basted together with a leather strip, cowhide.
5 (fig 22) Heel stiffener, calf/cowhide; length 145 mm, width at bottom 75 mm, at top 35 mm; closed seam along edges of upper half, overstitched seam along edges of lower half, edge of upper half decorated with small impressed circles.
6 (fig 22) Fragment of heel stiffener, cowhide; length 150 mm, width at top 30 mm; some widely spread stitch holes along edges, decorated with small impressed circles.
7 (fig 23) More or less square piece, seat of big sole (?); 110×105 mm; grain side deliberately roughened (?), holes along the four edges.

8 (fig 22) Counter of a low shoe with raised tongue on top, probably horsehide; length 200 mm; originally with closed seam along the sole, but in the centre mended with tunnel stitches, only visible at the grain side (ie the patch was attached to this side), top and side edges with butted seam, a slight discolouration and impression in the middle of the counter on the flesh side (indicated by two broken vertical lines in fig 22), suggests a strengthening piece, attached to the flesh side.

9 (fig 23) Fragment, calf/cowhide; closed seam on opposite sides, single stitch hole on third side.

10 (pl 19b) Two roughly triangular fragments, sealskin.

11 (fig 22) Roughly square fragment; decorated with small impressed circles.

12 (fig 23) Fragment of sole forepart, cowhide; length 110 mm; closed seam along outer edges, transverse seam (= repair?) butted, hole originally in the middle of the sole for attaching the shoe to a wooden last while being made.

13 (fig 27; pl 20) One half of a purse, probably cowhide; 110 × 95 mm; top edge with 10 tie holes, lower half of sides and bottom with tunnel stitching at the flesh side.

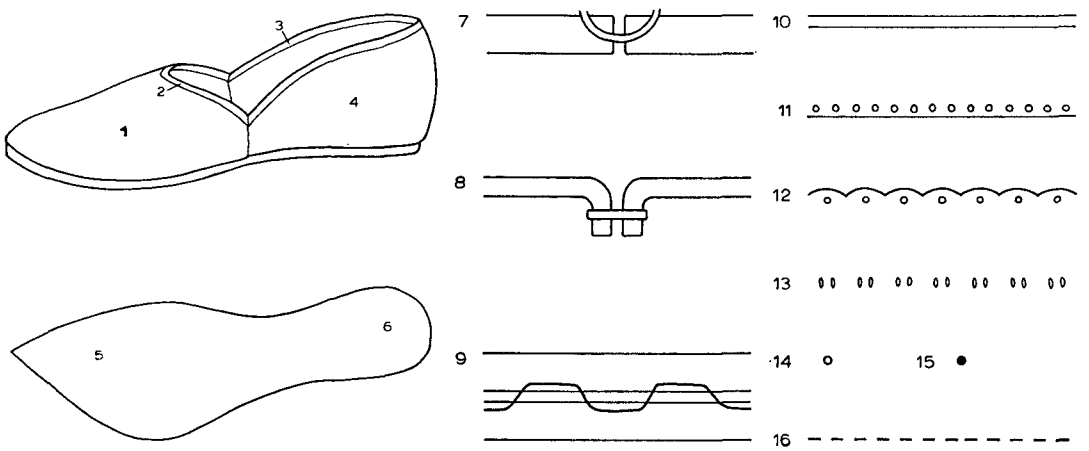


FIG 20 Technical terms used in legends to figs 21–7. Technical terms: 1, vamp; 2, throat; 3, top band; 4, counter; 5, forepart; 6, seat; 7, butted seam; 8, closed seam; 9, tunnel stitching; Legends: 10, butted seam; 11, closed seam; 12, overstitched seam; 13, basted seam; 14, sewing hole; 15, impressed decoration; 16, damaged or (in reconstructions) missing part(s) (Drawing IPP)

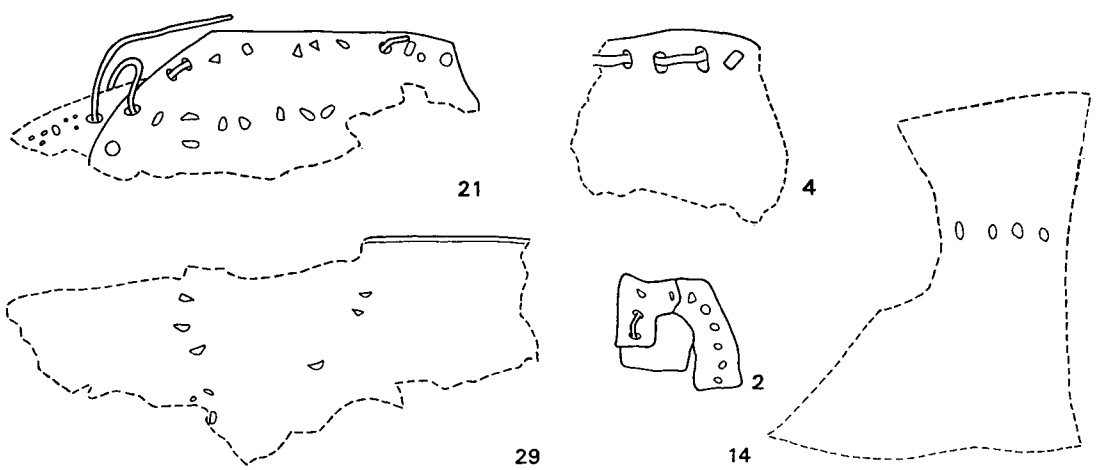


FIG 21 Grain side of fragments nos 2, 4, 14, 21 and 29. (Drawing IPP. Scale 1:2)

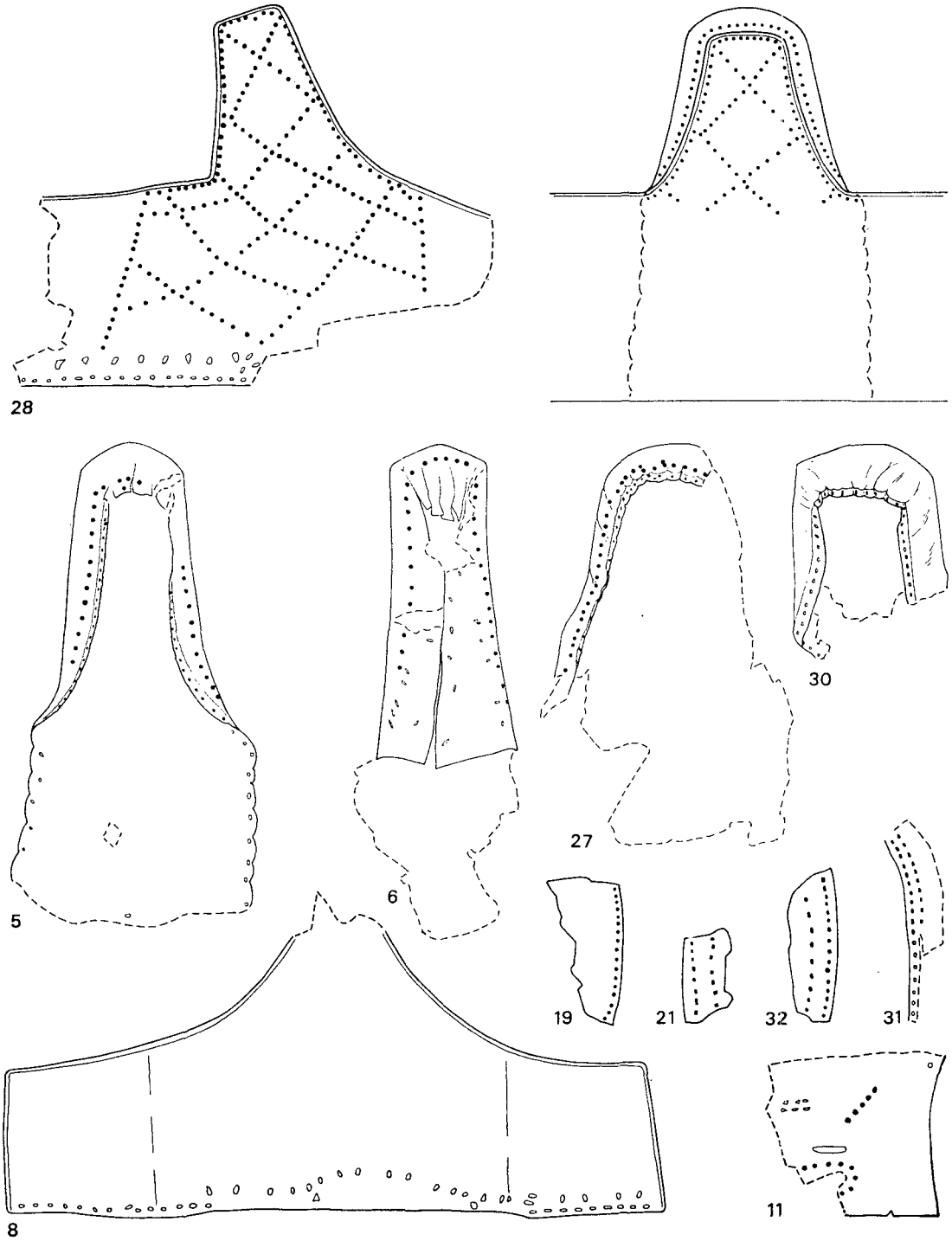


FIG 22 Counters with raised tongue (grain side) nos 8, 28; heel stiffener (flesh side) nos 5–6, 27, 30; decorated fragments (grain side) nos 11, 19, 31–2; reconstruction of heel stiffener sewn to a raised tongue. (Drawing IPP. Scale 1:2)

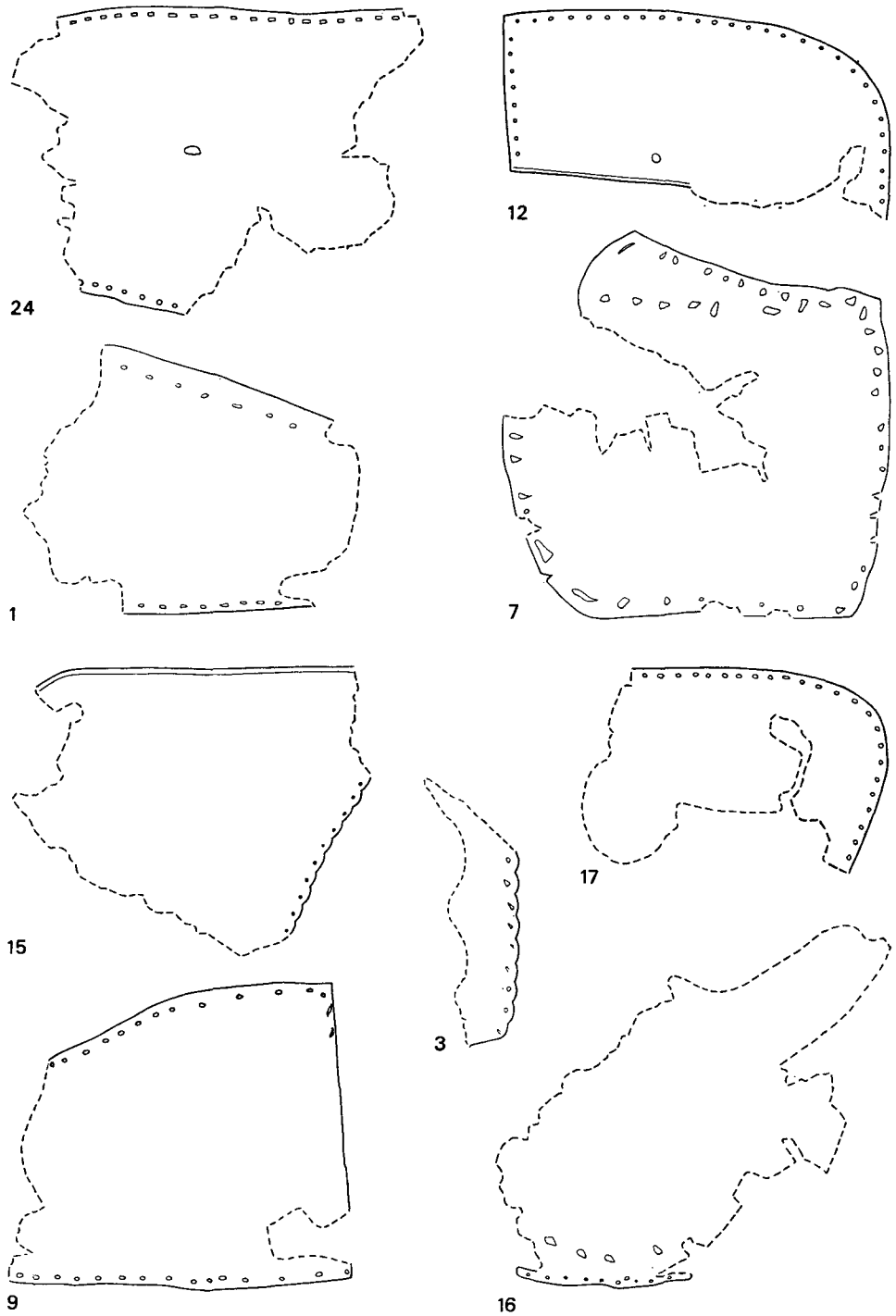


FIG 23 Fragments of soles (flesh side) nos 12, 24; fragments of upper (grain side) nos 1, 16–17; other fragments (grain side) nos 3, 7, 9, 15. (Drawing IPP. Scale 1:2)

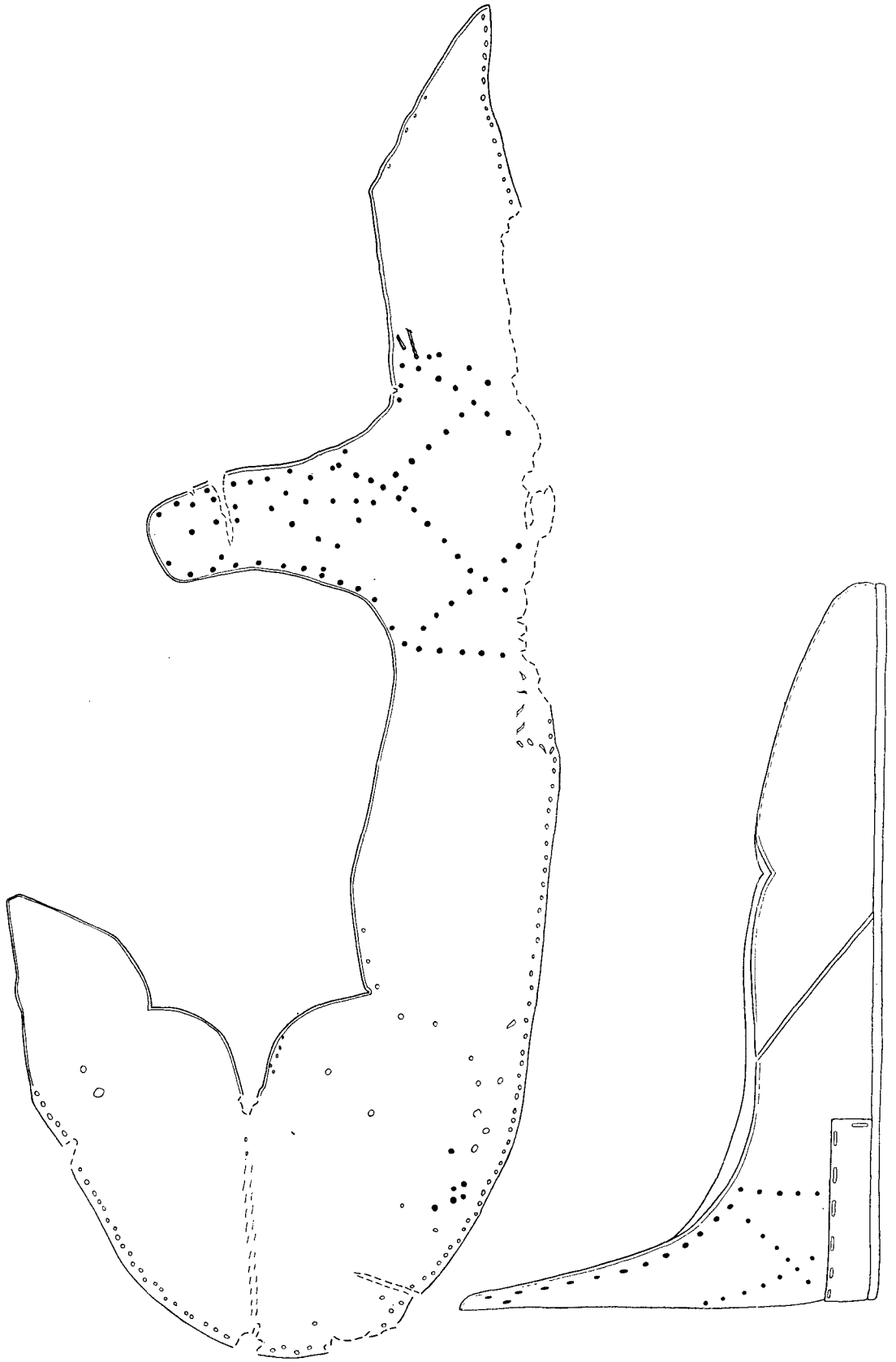


FIG 24 Excavated shoe-upper no 20 (grain side) and reconstruction. (Drawing IPP. Scale 1:2)

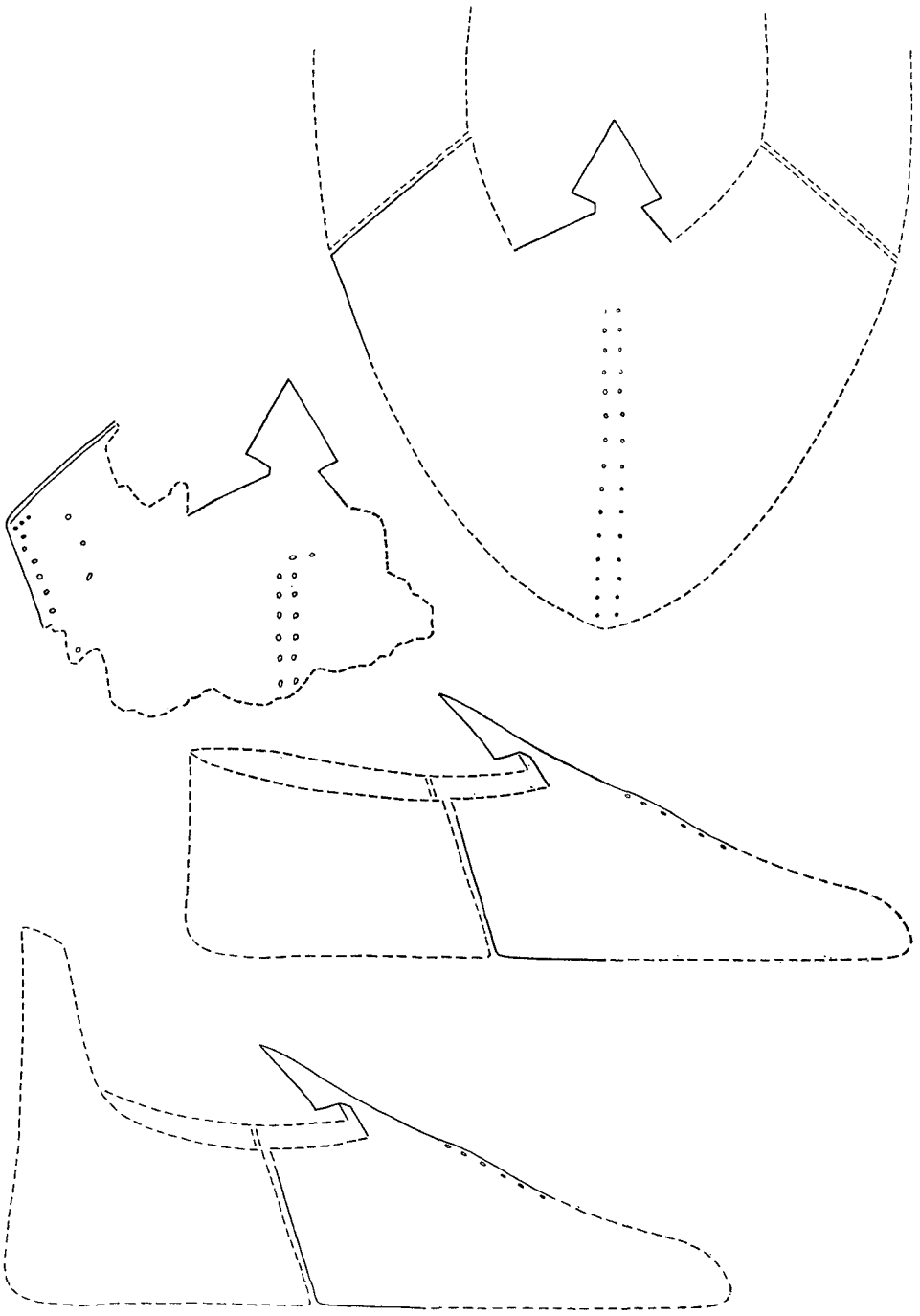


FIG 25 Excavated fragment of shoe-upper no 25 (grain side), cutting pattern and two possible reconstructions. (Drawing IPP. Scale 1:2)

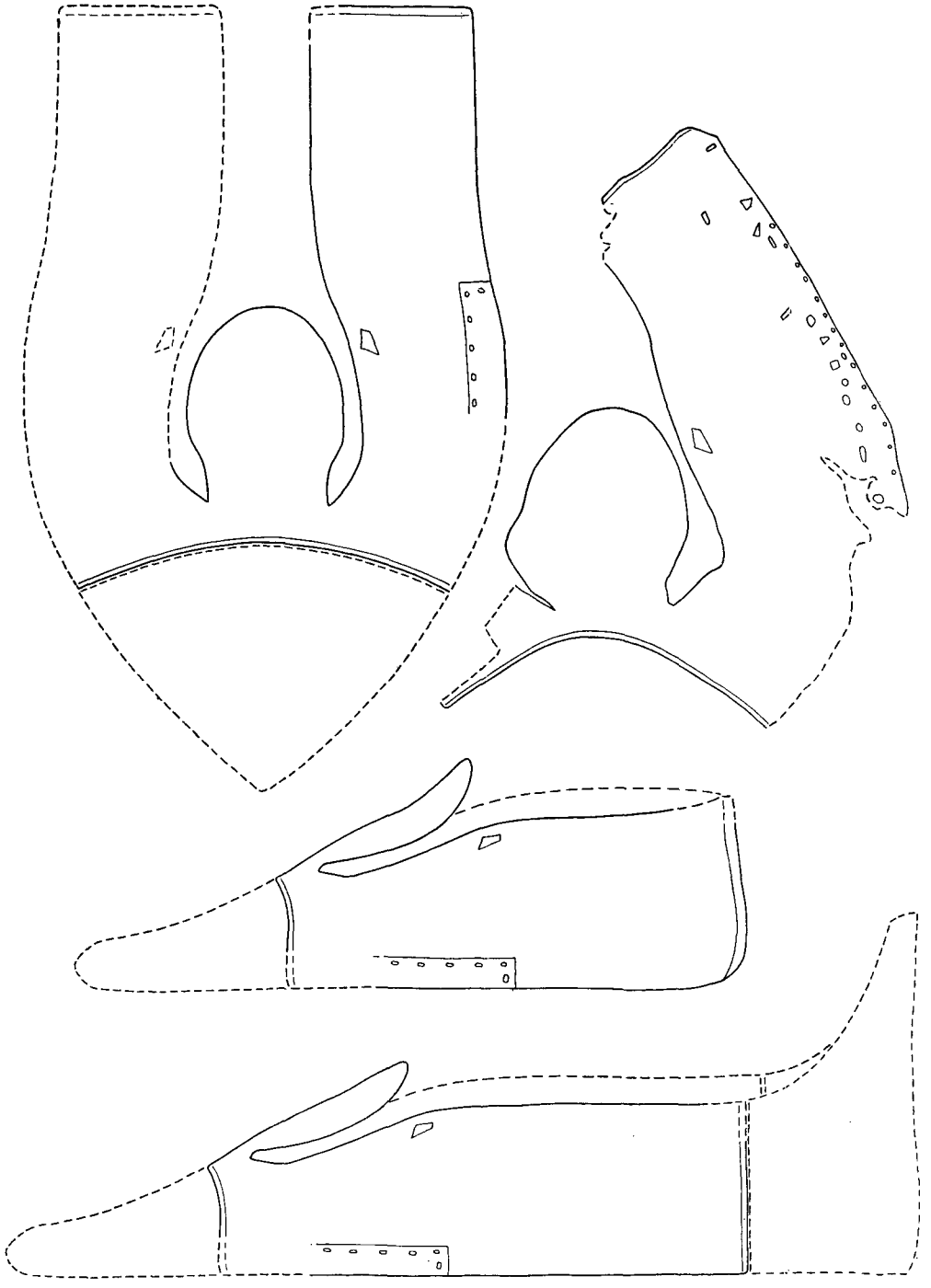


FIG 26 Excavated fragment of shoe-upper no 18 (grain side), cutting pattern and two possible reconstructions. (Drawing IPP. Scale 1:2)

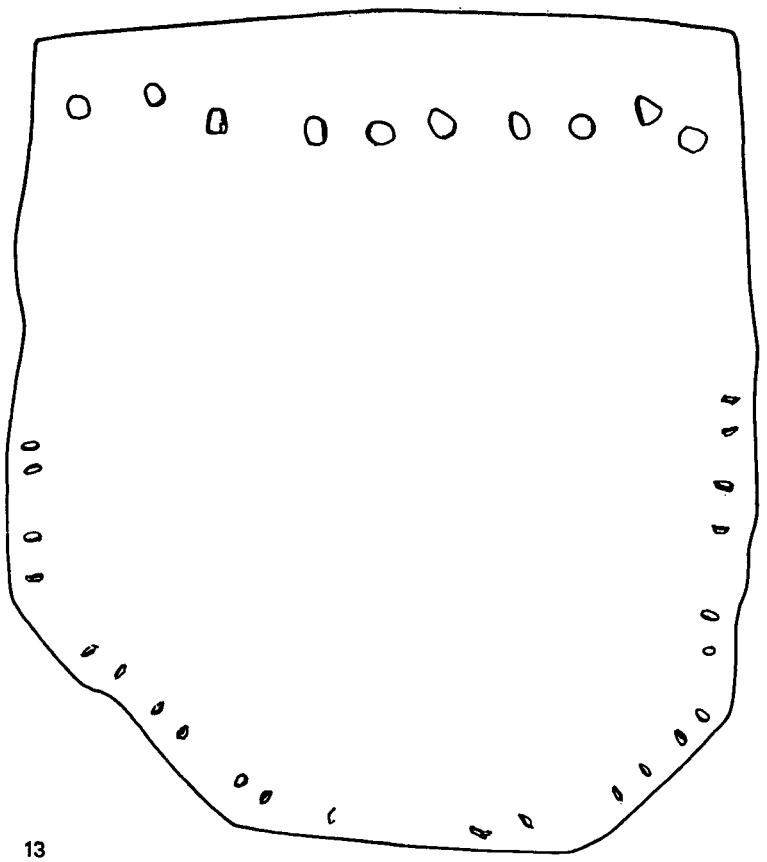


FIG 27 One half of purse (flesh side). (Drawing IPP. Scale 1:1)

14 (fig 21, pl 19b) Fragment of shoe upper (?), red deerskin, with 4 tie holes.
15 (fig 23) Originally triangular (?) fragment or vamp (?), calf/cowhide; overstitched seam along one side, other side with butted seam.
16 (fig 23) Vamp fragment, cowhide; with closed seam and repair holes.
17 (fig 23) Vamp fragment with closed seam.
18 (fig 26) Side fragment of low, left (because of the wear pattern) shoe, calf/cowhide; butted seam at heel or at the side (see p 319) and over vamp, closed seam along sole, big holes for repair, tie hole near throat.
19 (fig 22) Fragment, horsehide; decorated with small impressed circles.
20 (fig 24) Complete low, left shoe, calf/cowhide; length 270 mm (= size 7); closed seam along sole, repair holes near heel, decorative seam from toe to throat, butted seam on inside of foot and along top edge, counter with raised tongue, decorated with small impressed circles, impressions and tunnel stitching on flesh side point to heel stiffener, two slits near top band on right side of raised tongue.
21 (fig 21) Fragment with tie (?) holes through which a leather strap was laced.
22 (pl 20) Fragment, calf/cowhide; decorated with small impressed circles (= raised tongue at top of counter? cf nos 20 and 28).
23 (pl 20) Several fragments held together by leather straps.
24 (fig 23) Sole fragment, forepart and seat missing; closed seam along edges; hole in middle for attaching the shoe to a wooden last during manufacture.
25 (fig 25) Fragment of vamp of left shoe, calf/cowhide; closed seam along sole, butted seam on

inside, decorative seam from the toe in the direction of the throat but not reaching it, triangular tongue at throat.

26 Delaminated fragments of raised tongue and heel stiffener, calf/cowhide; butted seam along edges and decoration of impressed circles.

27 (fig 22) Fragment of heel stiffener, calf/cowhide; closed seam along edges of upper half, decorated with small impressed circles.

28 (fig 22) Fragment of counter with raised tongue, calf/cowhide; closed seam along sole and repair holes near heel, butted seam along top edge, decorated with small impressed circles, impressions on flesh side points to heel stiffener.

29 (fig 21) Fragment with butted seam and tie (?) holes, thick leather.

30 (fig 22; pl 20) Fragment of heel stiffener, calf/cowhide; width at top 45 mm; closed seam along edge.

31 (fig 22) Fragment, calf/cowhide; decorated with a row of small impressed circles.

32 (fig 22) Two fragments with closed seam, decorated with small impressed circles.

THE WOOD FROM DITCH 1 (figs 28–40; pls 21–23)

John Barber

The wood from the Ditch may be divided into two groups: worked wood and masses of unworked twigs and branches. The first group can be further sub-divided into two assemblages, the first containing products and by-products of wood turning and the second those of general carpentry.

Turned wood

The presence of turning marks on even a small part of the surface of an object was sufficient to place it in this category. The lower peat block produced fragments of 3 wooden bowls (figs 29 & 30) and some 31 cone-shaped objects (figs 31–33) which are turning wasters, by-products of the production of wooden bowls and other turned objects.

The arrangement of the anatomical elements of all three bowl-fragments suggests that they were turned from blanks prepared, in the usual way, from short lengths of tree trunk (Barber 1981). These were first split in half lengthways, then trimmed to rough hemispheres. An annulus of wood was then gouged, or chiselled out thereby minimising the volume of wood to be removed by turning (*J Roy Soc Antiq Ir*, 101 (1971), 184). The mandrel of the lathe was attached to a central pillar of wood whilst the turning proceeded and on completion of the vessel this pillar was narrowed at its base by use of a gouge and broken free from the bottom of the bowl, to be discarded as a turning waster (fig 28). Bowl 1 has, clearly preserved, the marks of the gouge used to clear away the splintered wood left by removal of a waster (fig 29; pls 21 a–b): the clarity of these gouge marks and the crisp freshness of the turning marks suggest that this vessel was broken during or soon after finishing. The other two bowls show every sign of being old and much used at the time they were discarded (fig 30).

The grain pattern and orientation of the cones are uniformly consistent with the process of preparation described above. In several instances, eg 447/119 (fig 33), 447/124 (fig 31), etc, the scars left by a gouge in removing the bulk of the wood before turning survive on the upper edges of the cones. These give evidence of a gouge c 20 mm wide, 1·5 mm deep. Where these marks merge into the turned area the ridges between the adjacent gouge-scars bear lathe-marks. The wide circular and flat surface of the cones would, in a mathematical description, be called the base of the cone, but here is called the top since it correlates with the top of the wooden bowl from which it may have been derived. The tops of 20 cones bear either a pyramidal depression or a V-shaped slot chiselled into the surface to an average depth of c 15 mm, eg 447/75 and 447/125 respectively (figs 31–2; pl 22). Three cones have a circular hole drilled into them along their axis of symmetry from the point central to the top (pl 22). With the exception of these three examples all the cones display a small (typically 11 mm by 2 mm) rectangular hole which pierces them to a maximum depth of 30 mm along the axis of symmetry from the top centre point, the latter point being central also to the pyramidal depressions and lying along the line of the base of the V-shaped slot. The long axis of the rectangular hole invariably lies across the grain. In

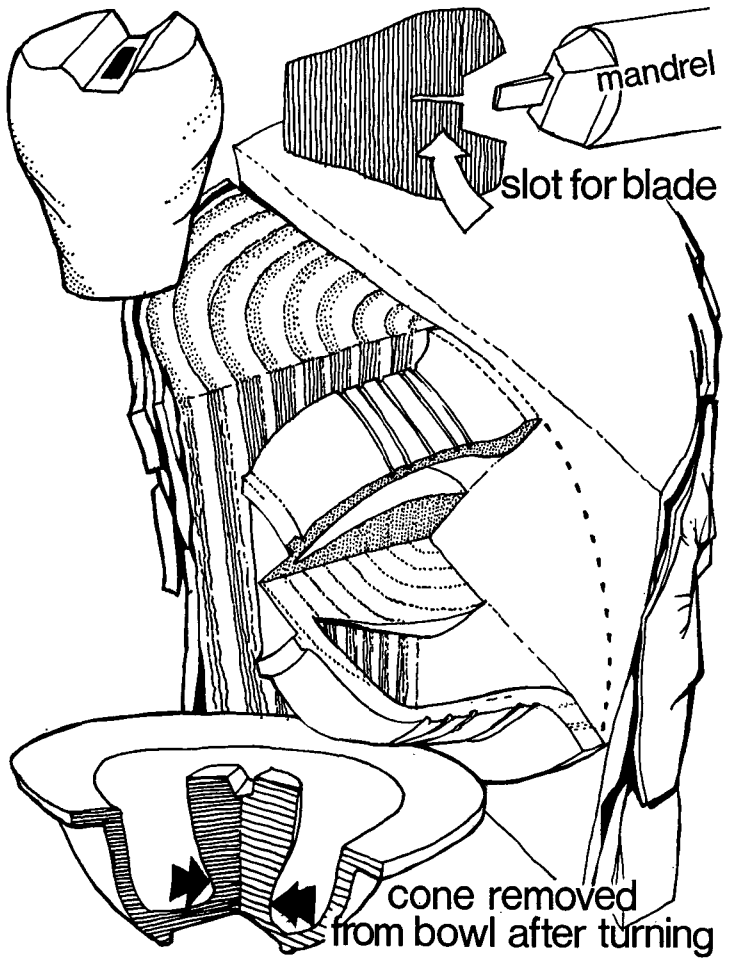


FIG 28 Orientation of the bowl shown in relation to the growth planes of the wood: the form of the lathe-mandrel is based on the evidence of the waste cones

the cases of 447/68, 447/72 and 447/129 and 260/1 (figs 32–33) where no depression or slot is present, the rectangular hole is visible on the otherwise flat, or nearly flat, top surface.

That a chisel-like metal blade has been inserted into the cones making the rectangular holes is made particularly clear in those cases where the cones have been accidentally half-sectioned in antiquity, eg 447/72 (fig 32). Its position in the cones, lying along the rotational axis, suggests that it was mounted in the mandrel of the lathe and that it served to fix the turned object into the lathe and, at least in part, to transmit the torque from the lathe to the turned object. The careful preparation and constant proportions of both the pyramidal depressions and the V-shaped slots suggest that the mandrel tip was tapered to an edge or perhaps to the shape of a truncated pyramid (fig 28), so that torque was also applied via the sides of the depressions and slots. It seems improbable that the 'chisel' blade alone could transmit sufficient torque but it is clear from the four samples referred to above that this was occasionally the case.

The use of a moving (ie dynamic) mandrel points to a different form of lathe than the earlier, particularly Roman, types for which we have evidence. Cones from the Roman sites, like Vindonissa in Switzerland, seem always to have central holes made by spikes. Mounted between fixed spikes, the turned object was rotated by means of a bow, much in the manner of a bow-drill, with the string looped round the object itself (Professor R Fellmann, pers comm). Reference has already been made to the three

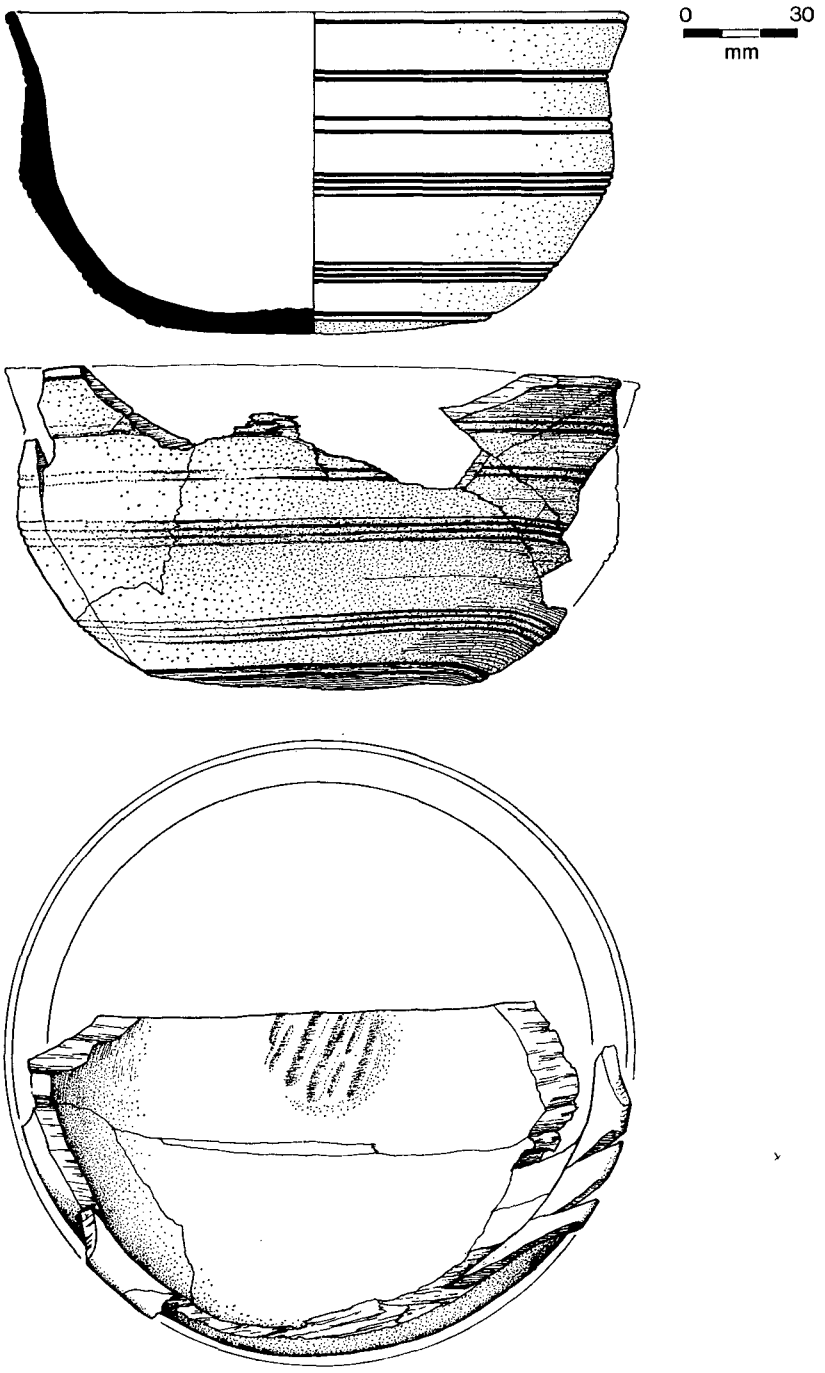


FIG 29 Lathe-turned wooden bowl (Bowl 1) from the lower peat block in Ditch 1

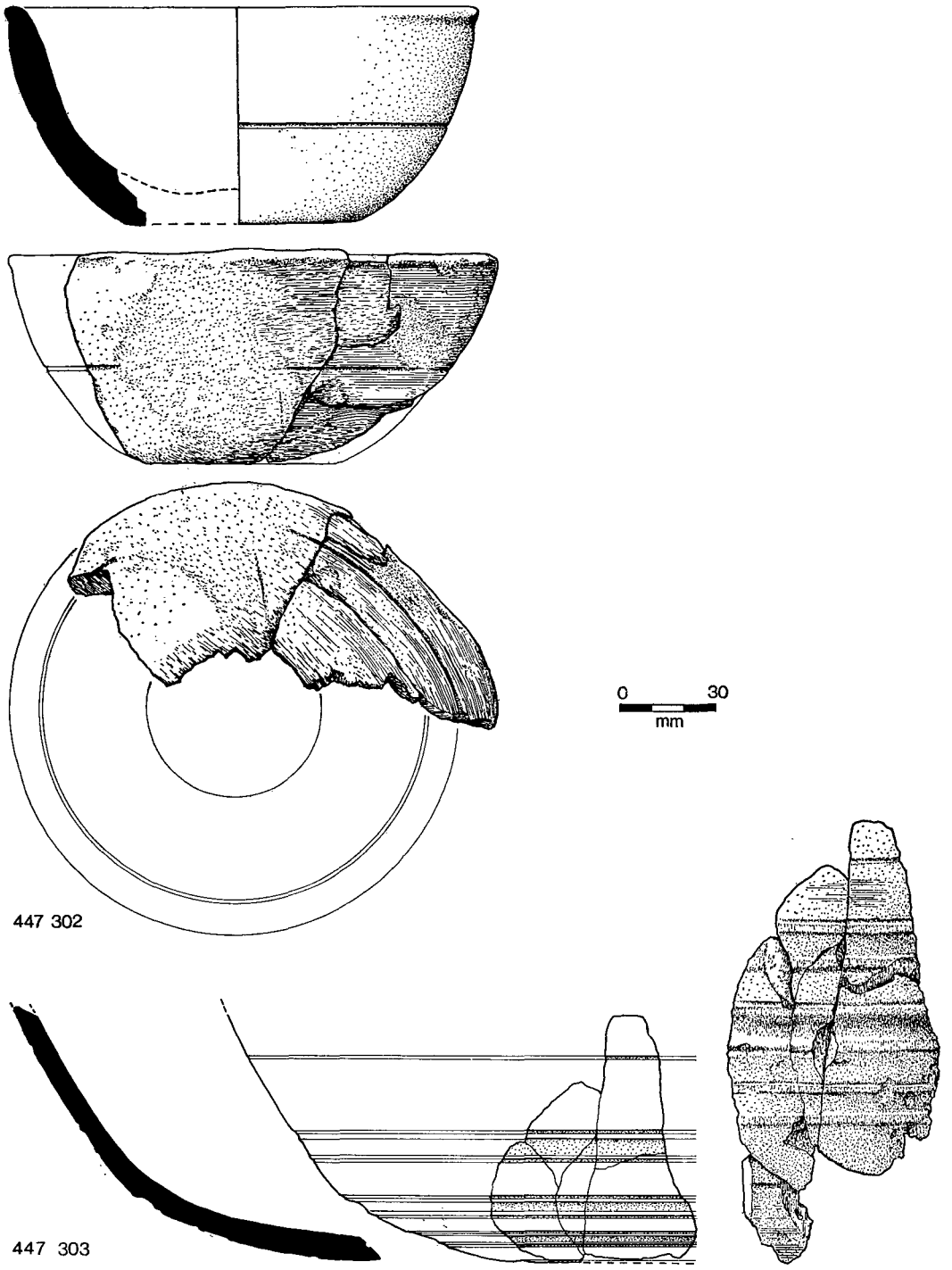


FIG 30 Lathe-turned wooden bowls (Bowl 2, 447/302 and Bowl 3, 447/303) both from the Lower peat block in Ditch 1

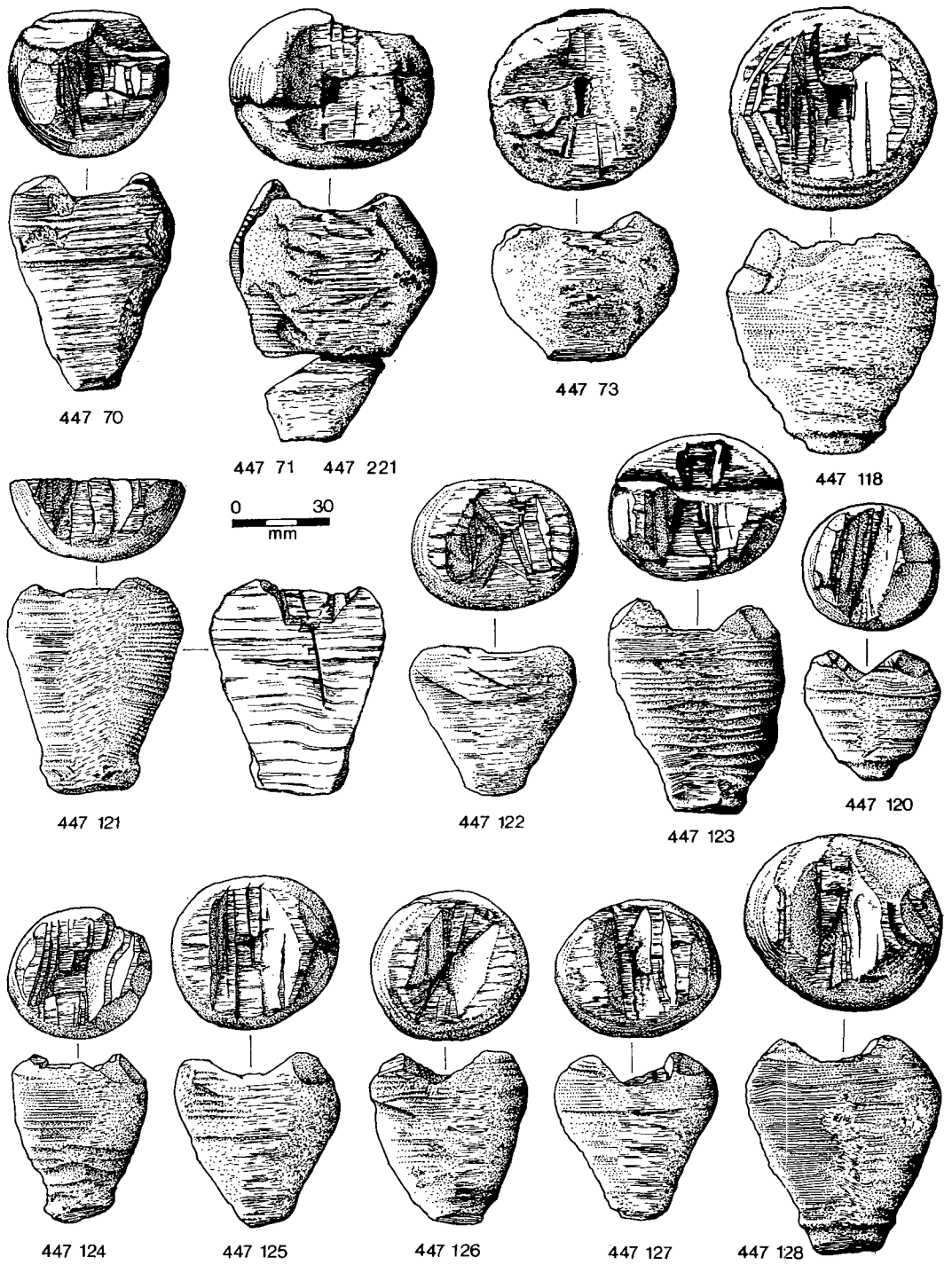


FIG 31 Cone-shaped turning wasters from the lower peat block in Ditch 1

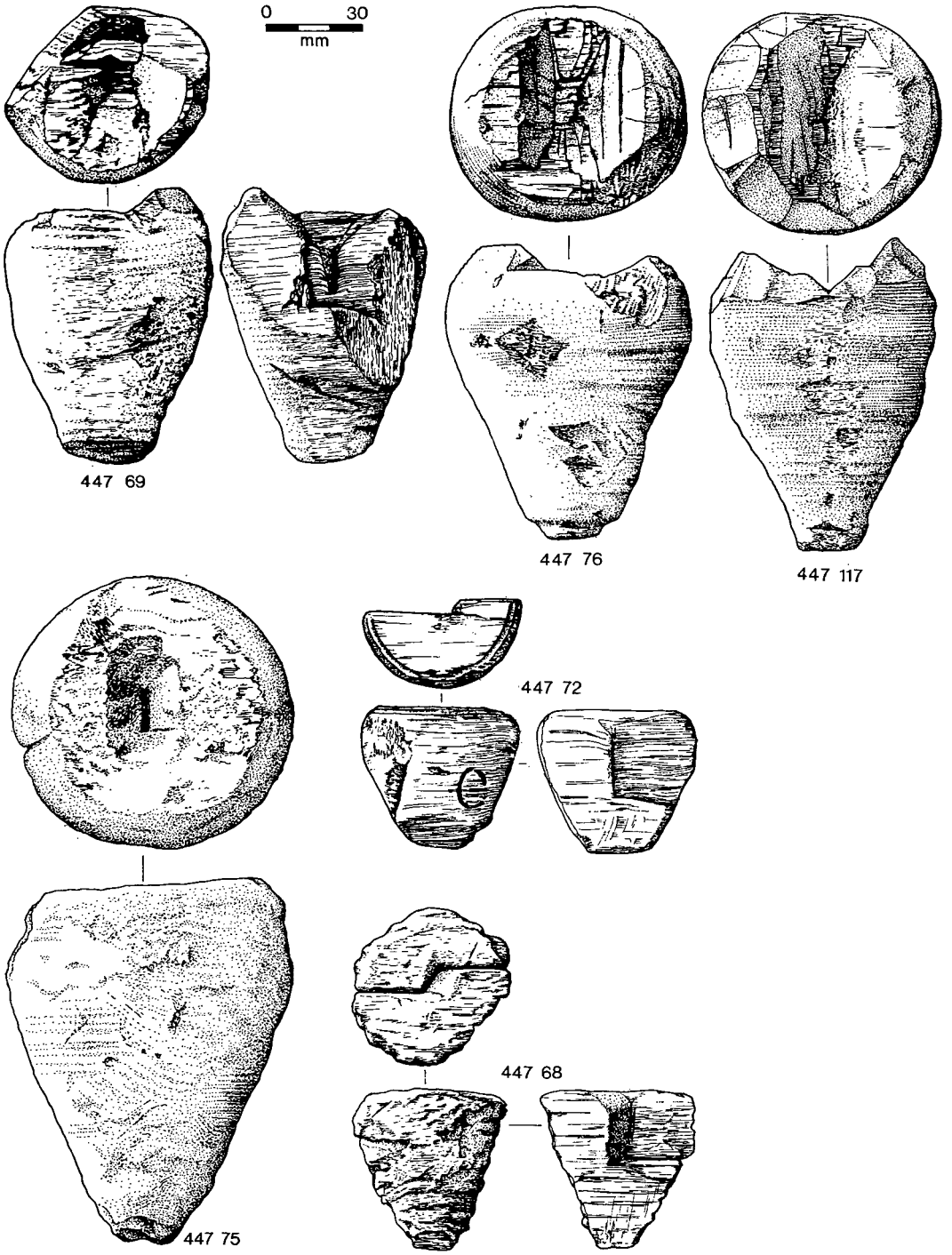


FIG 32 Cone-shaped turning wasters from the lower peat block in Ditch 1

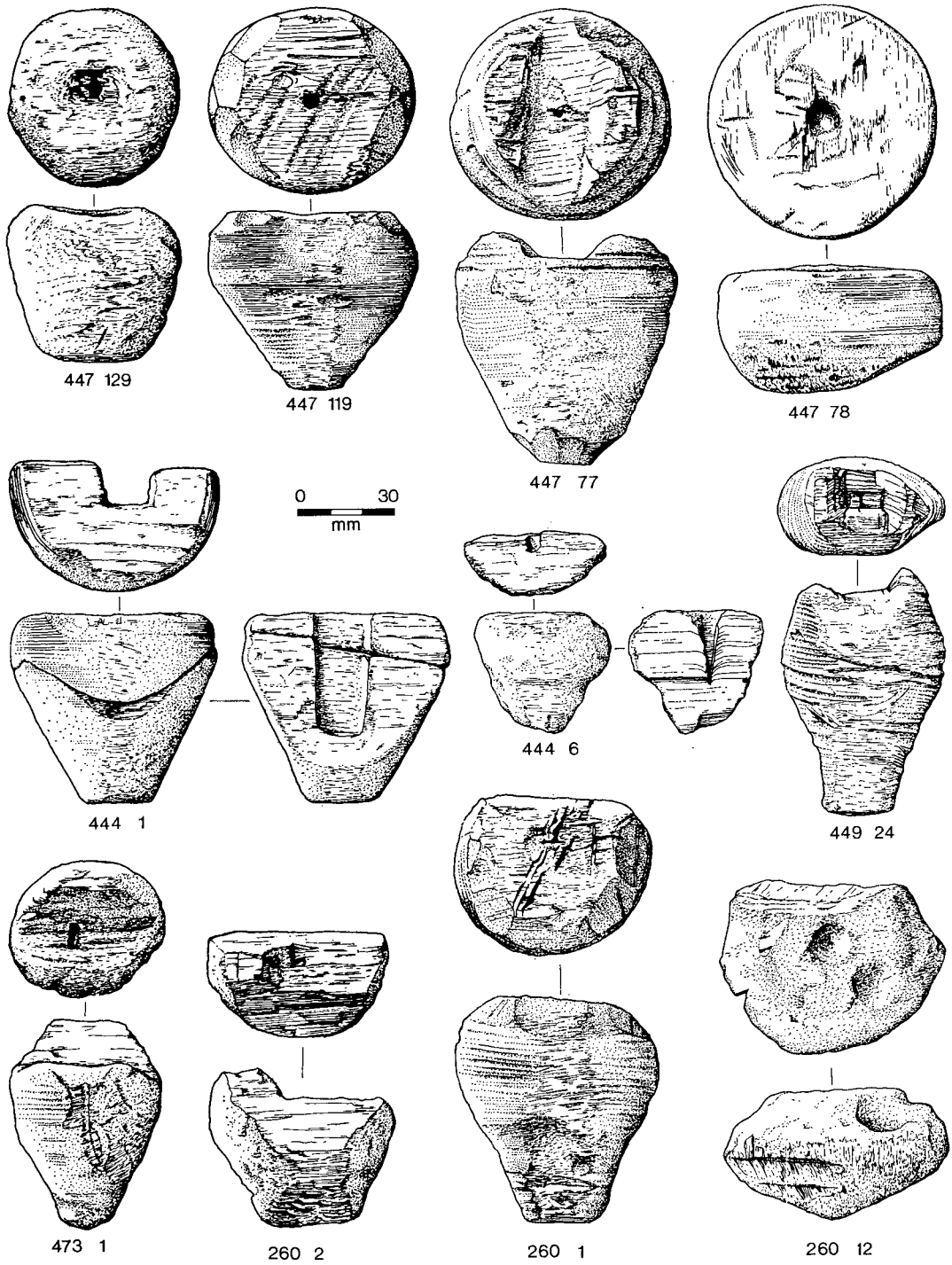


FIG 33 Cone-shaped turning wasters from the lower peat block in Ditch 1

examples from Iona which have cylindrical holes drilled into their tops. These may have resulted from the use of a bow-lathe as described by Professor Fellmann. However, it is also possible that they represent waste cones from the end of the object opposite the mandrel where a cylindrical metal rod formed a static support.

The evidence from the Iona cones is consistent with the use of a pole-lathe. This simple type of lathe survived into the first half of this century in many places throughout the British Isles. The last working example in Ireland, for example, was acquired by the National Museum of Ireland in 1935 (O'Riordain 1940). The nature and function of the lathe are more fully discussed elsewhere (Barber forthcoming a).

The presence of bowls and wasters in the ditch demonstrates quite clearly that a wood turner, or perhaps wood turners, were active in the locality. The bulk of the turned objects were found in the lower part of the first peat block but two wasters were found in the middle peat block. The dimensions and characteristics of the turning wasters are listed in Table 10, from which it will be seen that all but two of

TABLE 10

Lathe-turning wasters.

Find No	Fig No	Max diameters Top	Bottom	Length	Pre-turning gouge marks	Mounting Hole: Rectangular	Mounting Hole: Cylindrical	Mandrel Socket: Pyramidal	Mandrel Socket: V-shaped	Mandrel Socket: Absent
447/68	32	4·66	—	5·0		*				*
447/69	32	5·10	2·74	7·2	*	*			*	
447/70	31	4·90	1·90	6·0	*	*			*	
447/71	31	6·30	4·00	4·9		*				*
447/72	32	4·90	—	4·3		*				*
447/73	31	5·73	—	4·1		*			*	
447/75	32	8·55	3·50	10·8	*	*		*		
447/76	32	6·60	2·63	8·9	*	*			*	
447/77	33	6·73	3·40	6·0		*			*	
447/78	33	7·13	—	5·0			*			*
447/117	32	7·10	2·84	3·9	*	*		*		
447/118	31	6·30	3·05	6·6	*	*		*		
447/119	33	6·27	2·05	5·6	*	*				*
447/120	31	4·00	2·10	3·9	*	*			*	
447/121	31	—	—	6·3	*	*		*		
447/122	31	5·06	2·00	4·9	*	*		*		
447/123	31	4·34	3·30	6·6	*	*		*		
447/124	31	4·15	2·10	5·0	*	*		*		
447/125	31	4·72	2·30	9·4	*	*			*	
447/126	31	4·90	—	5·5		*		*		
447/127	31	4·93	3·00	5·1		*			*	
447/128	31	5·80	2·10	7·1	*	*		*		
447/129	33	5·40	3·40	5·1		*				*
444/1	33	—	2·20	5·6			*			*
449/24	33	3·90	2·00	7·7		*			*	
260/1	33	6·10	5·51	6·8	*	*				*
260/2	33	—	—	4·1		*				*
447/221	—	—	1·82	—		*				*
260/40	—	—	—	3·3		*				
260/12	33	—	—	3·8			*			
473/1	33	4·61	1·83	6·5		*			*	
444/6	33	Fragment only				*				*

Nos 447/126 and 127 are both willow (*Salix*) all the others are alder (*Alnus*).

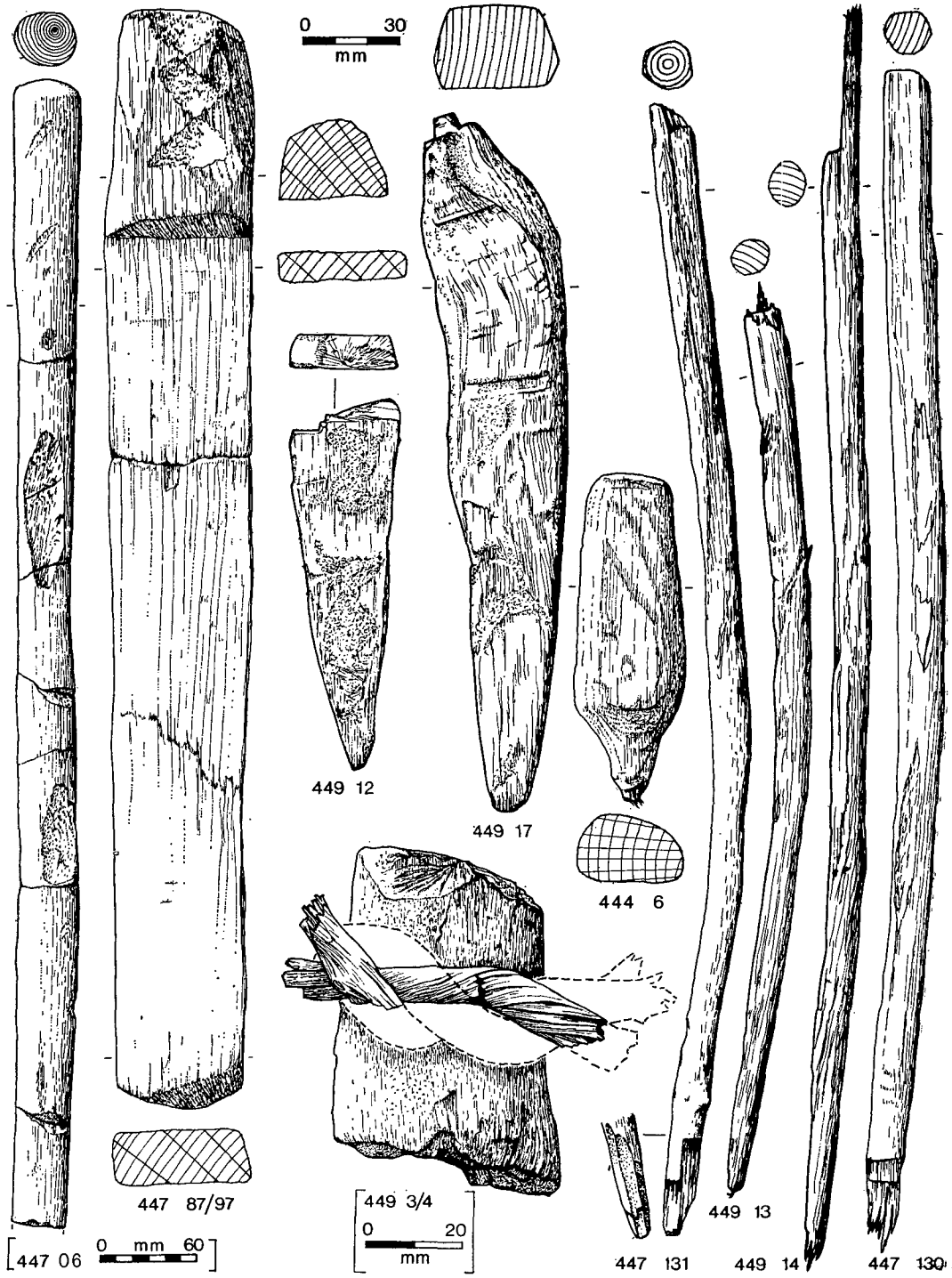


FIG 34 Worked wood from Ditch 1, lower peat block

them are made of *Alnus* (alder) wood. This is a commonly used wood for turning and all three bowl fragments are also of alder. The course of the alder pollen-curve suggests that at least some of the alder wood could be of local origin since a decline in the curve is registered at the bottom of the Ditch 1 section, followed by an increase in the upper peat block (fig 41).

Other worked wood

Also found in the lower peat block was a single simple stave, of *Abies* (fir) c 180 mm long and slightly curved (fig 35 449/8). On its inner face a groove had been cut across its width, c 20 mm from one end: this presumably housed a circular base. On the outer face faint traces of two binding strips have been noted, one 30 mm from the base end, the second 76 mm from the upper end: perforations were of c 3 mm diameter. This stave probably formed part of a simple, near vertical-sided vessel of roughly 200 mm diameter. The object numbered 447/87/97 in fig 34 may also be a stave, with the thickened end functioning as a foot. However as it appears to be unfinished its function must remain uncertain.

The prepared timbers

The second category of wood consists mainly of the offcuts produced in the course of general carpentry on the one hand, and the few artefacts found in Ditch 1. The mass of prepared timbers, by

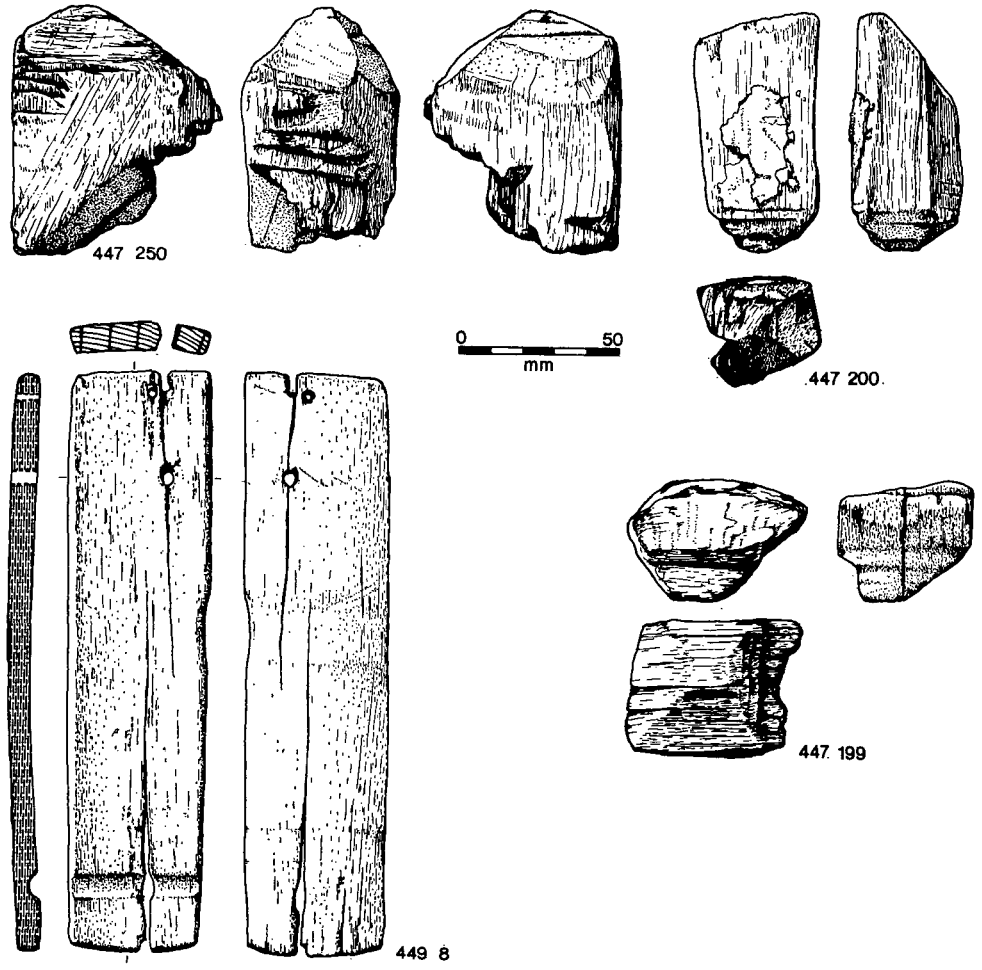


FIG 35 Worked wood from Ditch 1, lower peat block

which is meant those which had undergone conversion or which bore signs of use were examined and categorised in line with the procedures outlined in Crone and Barber (this volume, p 512). The significant characteristics of the individual samples are listed in Table 11 and a range of the material has been illustrated (figs 34–37). The cross-sections in the illustrations have not been conventionally hatched but rather bear an approximate representation of the circuit of the annual rings (curved lines) and the orientation of the medullary rays (straight lines) as these give a direct indication of the mode and extent of the conversion.

It is clear from the distribution of the cross-sectional dimensions of the prepared timbers that the bulk of the material is very small, perhaps the type of distribution which might be expected from the use of sill-beams with wattle walls. The pierced beam, 447/74 in fig 36, could in fact be the corroded remains of such a sill-beam and whilst unrecorded here the lower peat block abounded in suitable wattle-sized material, some at least of which give signs of having been coppiced.

Larger timbers were also used and with a good measure of skill. The baulk 447/196, a squared quarter-section of oak, has grooves cut along the length of two opposite faces (fig 37; pl 23). This may have served as one of a series of uprights, set into a sill-beam, between which planking (see 447/198, fig 37) was slotted. This is illustrated in fig 38, an artist's reconstruction which also shows how prepared panels may have been used. The panel illustrated is based loosely on the fragment 447/1 (fig 36) which, like the other heavy timbers, came from the lower peat block. This has three raised ribs bordering a prepared surface and its thickness has been reduced at the edge (pl 23).

Many of the prepared timbers were very roughly split or chopped to shape, eg 447/18 and 449/9 on fig 36, but in a large proportion some attempt had been made at squaring and trimming the surfaces,

TABLE 11

Stakes, pegs and pins

Find Number	Species	Surviving length (cm)	Diameter (cm)	Width & thickness (cm)	Point: Compressed	Point: Missing	Conversion
STAKES							
447/146	*Corylus*	5·9	2·1				A
447/156	*Alnus*	19·9	3·0			*	A
447/157	*Betula*	21·6	2·7		*		A
447/165	*Salix*	10·2	2·0		*		A
447/167	*Corylus*	9·5	2·0				A
447/169	*Salix*	7·5	2·1				A
447/179	*Betula*	12·0	2·3			*	A
447/188	*Betula*	5·9	—	3·0 × 1·9	*		B
447/216	*Corylus*	19·0	—	2·9 × 1·4			B[1]
447/217	*Pinus*	11·0	3·2				A
447/228	*Quercus*	8·0	—	2·0 × 2·8			
447/238	*Fraxinus*	14·5	1·6				A
447/239	*Corylus*	14·2	1·6			*	A
449/11	*Corylus*	28·5	4·3			*	A
449/12	*Populus*	11·0	—	3·4 × 1·2			B[1]
449/17	*Quercus*	20·5	—	4·0 × 2·4	*		D[2]
485/10	*Salix*	13·0	5·5				A
485/25	*Betula*	8·0	4·0			*	A
489/1	*Quercus*	9·7	2·6 × 1·2		*		C[2]
489/22	*Quercus*	9·2	—	—	*		A
444/7	*Betula*	9·4	4·9		*		A
444/12	*Quercus*	14·2	1·6				A
260/5	*Quercus*	13·0	—	2·8 × 2·8			C[2]
260/21	*Corylus*	14·6	7·3				A
260/26	*Fraxinus*	7·6	3·9				A
260/36	*Corylus*	9·0	1·4				A
260/37	*Pinus*	13·0		2·8 × 1·1		*	E[1]

TABLE 11 (*continued*)

Find Number	Species	Surviving length (cm)	Diameter (cm)	Width & thickness (cm)	Point: Compressed	Point: Missing	Conversion
PEGS (Squared)							
447/136	*Pinus*	16·6		0·6 × 0·8			S
447/171	*Quercus*	7·7		1·6 × 0·8			S
447/189	*Pinus*	7·7		1·5 × 0·7			S
447/213	*Quercus*	8·8		1·1 × 0·8	*		S
485/17	*Pinus*	25·5		1·4 × 1·6	*		S
485/26	*Pinus*	10·0		1·7 × 1·2			S
260/38	*Pinus*	6·1		2·4 × 1·4			S
489/18	*Quercus*	5·8		2·5 × 0·7			S
PEGS (round)							
447/139	*Corylus*	46·6	2·2		*		A
141	*Corylus*	13·2	2·2				A
142	*Corylus*	8·0	2·1				A
143	*Corylus*	10·6	2·2				A
145	*Salix*	5·6	2·2				A
148	*Corylus*	7·0	1·7				A
149	*Betula*	7·0	1·7				A
151	*Corylus*	6·6	2·0				A
154	*Corylus*	6·0	1·6				A
155	*Quercus*	6·8	1·9				A
162	*Corylus*	5·4	1·9				A
163	*Corylus*	8·6	2·2				A
177	*Corylus*	2·5	1·9				A
184	*Prunus*	5·9	X		*		A
202	*Quercus*	5·9	1·4				A
203	*Corylus*	6·5	X				B
204	*Corylus*	6·5	2·2				A
205	*Corylus*	16·6	2·2				A
206	*Corylus*	12·0	X				A
207	*Corylus*	5·0	X				A
208	*Fraxinus*	5·6	1·8				A
210	*Fraxinus*	7·2	1·9				A
212	*Corylus*	7·2	1·1				A
214	*Corylus*	8·8	1·3				A
215	*Corylus*	6·5	1·5				A
237	*Corylus*	10·4	1·5				A
290	*Quercus*	7·0	2·5				E[1]
260/11	*Corylus*	13·6	2·4				A
PINS							
447/130	*Quercus*	36·0	1·3				
131	*Taxus*	34·5	1·1				A[2]
132	*Quercus*	19·0		2·0 × 1·0			
133	*Quercus*	29·6		2·0 × 1·0			
209	*Quercus*	11·5		1·3 × 0·8			
211	*Pinus*	5·8		1·2 × 0·7			
284	*Quercus*	7·0	0·8				
449/13	*Quercus*	38·0	1·1				
449/14	*Quercus*	38·0	1·3				
490/2	*Quercus*	42·0		1·2 × 1·6			
490/3	*Quercus*	14·6		2·2 × 1·0			
490/4	*Quercus*	11·5		2·1 × 1·0			

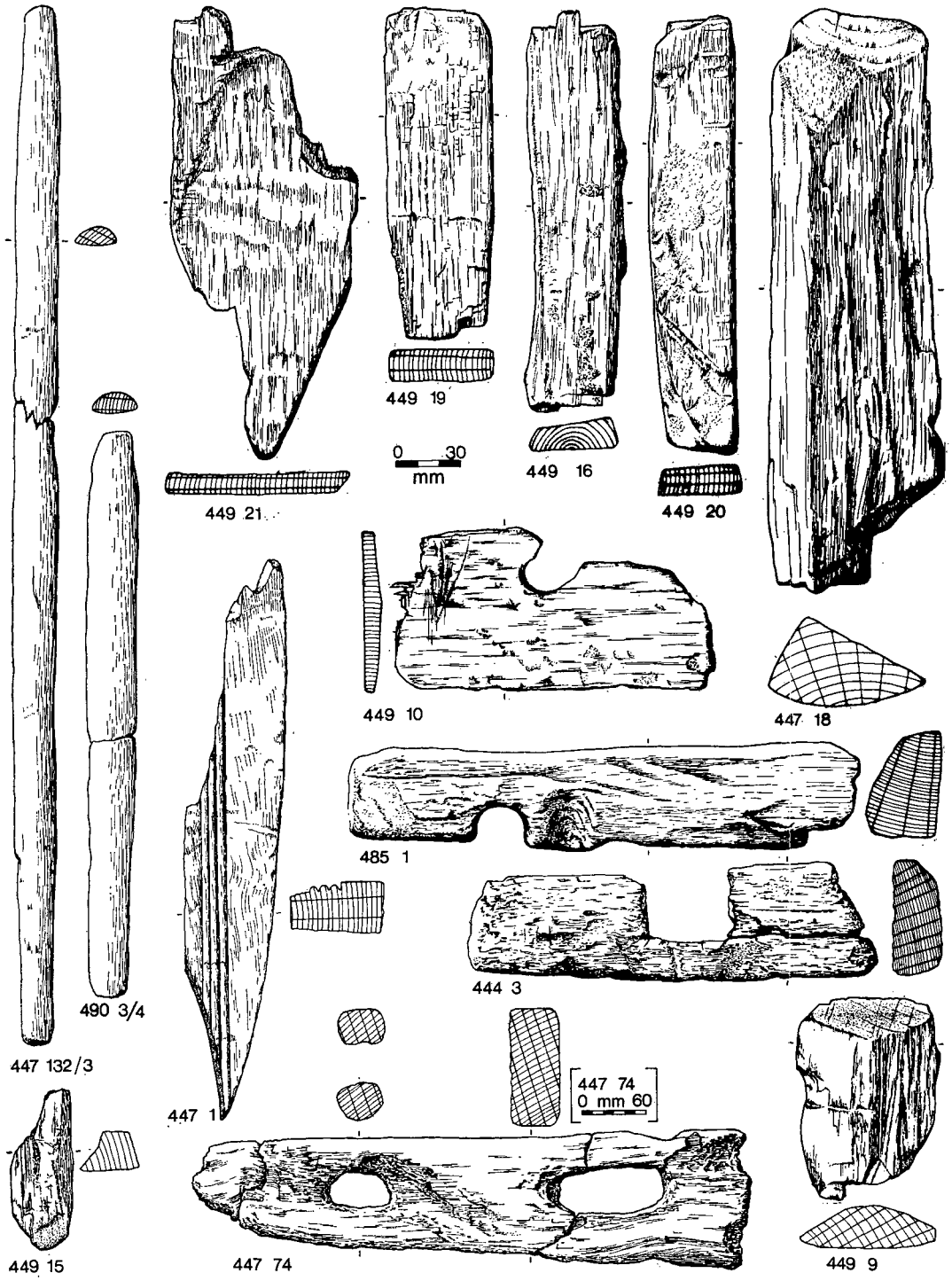


FIG 36 Worked wood from Ditch 1, lower peat block

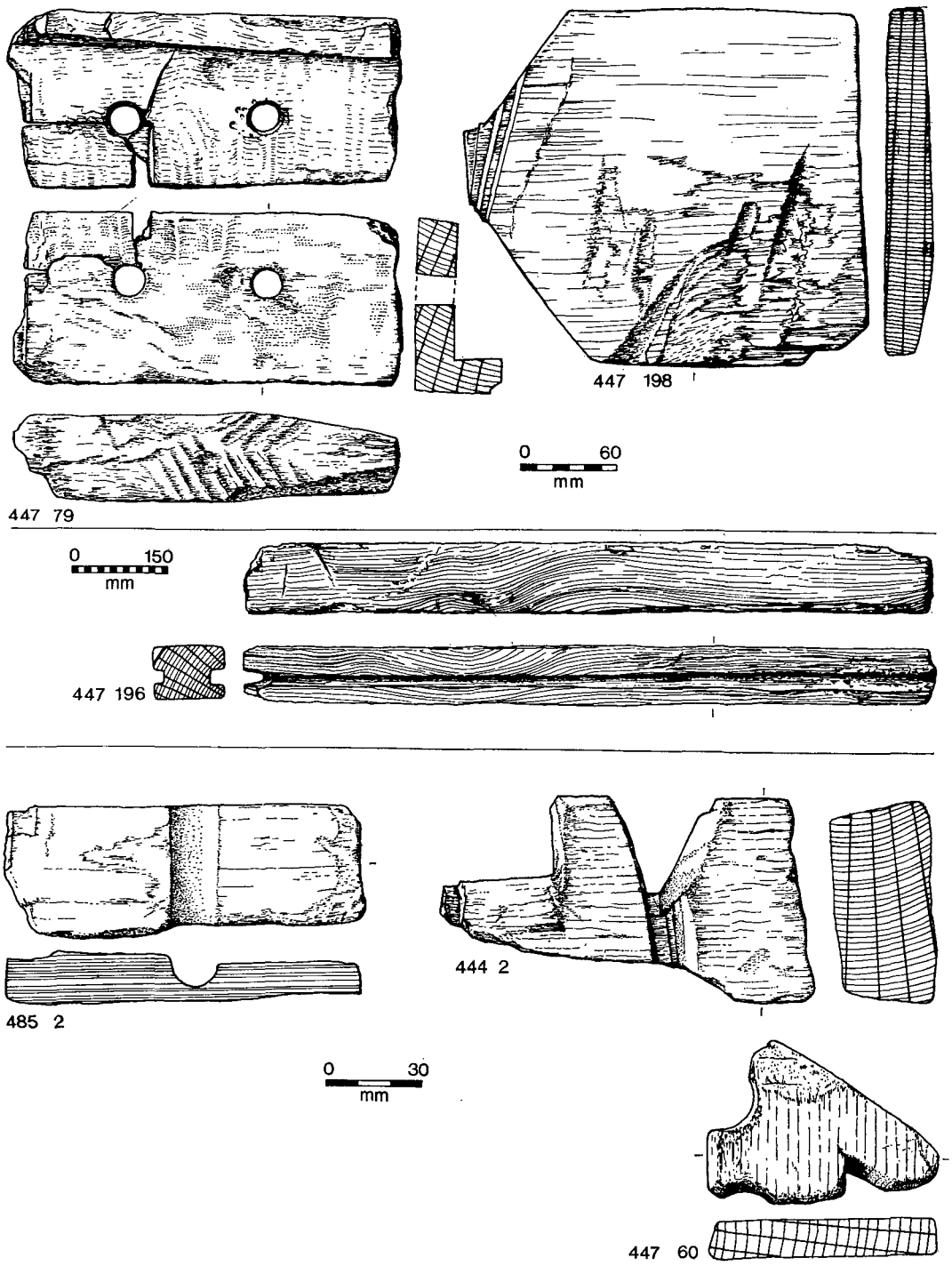


FIG 37 Worked wood from Ditch 1, lower peat block

eg 449/16, 19 and 20 on fig 36. This process is facilitated in woods like oak and ash because their anatomical arrangements are particularly suited to radial splitting. Thus thin planks and boards are readily produced. The very thin sheets which are occasionally found are often described as shingles (Carver 1979, 24) though they may, of course, serve many other functions (cf re-identification as spade by Morris (1980, 205)). Samples 449/10 and 449/21 on fig 36 fall into this general group. It is perhaps relevant to note that where shingles do survive, as in the Norwegian stave churches, they are up to 50 mm thick (Hauglid 1970, 34).

Pieces of wood, whether squared (449/12 and 17) or in the round (449/11), which have been brought to a point are treated as pegs and stakes and recorded in figs 34 & 39 and Table 11. Number 449/11 is a typical example, a hazel sapling chopped to a point but otherwise unworked. Samples 484/1 and 449/26 (fig 39) are of rather different type in that whilst clearly tapered they seem composed of a large blocky 'head' tapering to a cylindrical shank. Such objects are commonly seen in medieval roof structures used as dowels in jointing, the large head remaining visible. Their use in this way has survived into contemporary vernacular architecture and may be seen, for example, in the roof joints of the display cottage reconstructed at Culloden by the National Trust for Scotland.

A trenail, a far more carefully fashioned and prepared dowel, with squared, chamfered head (447/186, fig 39), would have served the same function as those described above though its pleasantly proportioned head would have been rather more ornamental. Although not nearly so well fashioned, 490/10 (fig 39), has a squared head and rounded body and may have served the same function. It must be assumed that the majority of dowels were made of simply trimmed branches like 447/140 (fig 39), many examples of which

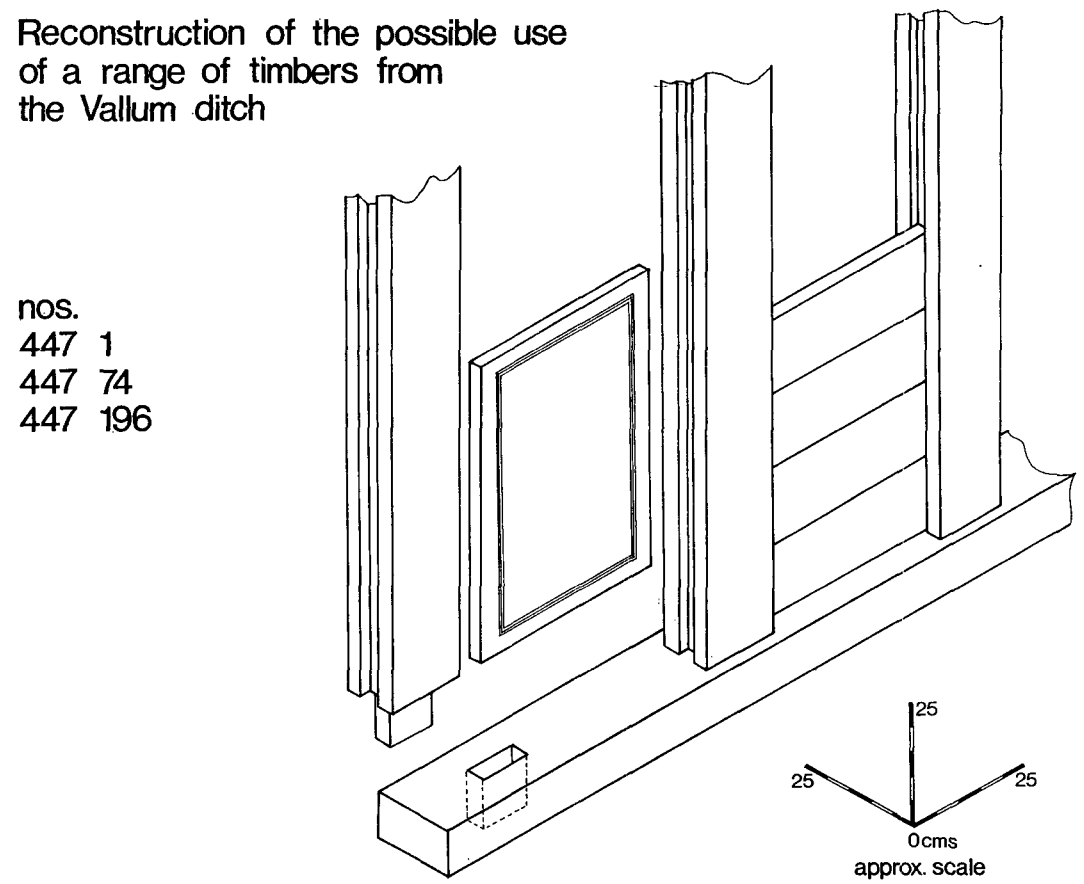


FIG 38 Reconstruction of the types of walling possible using the structural timbers recovered from Ditch 1

were found (Table 11). Roughly trimmed splinters of oak seem also to have been used as dowels occasionally (490/5, fig 39).

A group of long, thin pointed sticks are of some interest (Table 11; fig 34, indicated thus *) and form a distinctive group. Only one of them (447/131) is made in what might be considered the obvious way by trimming a thin branch or sapling. The others, as the illustrated sections show, are fashioned from thin splinters of wood, mainly of oak. Sample 449/13 shows twisting at its broken upper end and suggested the idea that these pins may represent halves of 'staples' twisted and bent over to pin thatch in place; but the use of relatively inflexible hardwood splinters militates against such an interpretation for the group as a whole.

Many of the timbers described above give evidence of jointing, the commonest form of which is by dowels driven through drilled holes (see for example 485/1 and 2; figs 36 & 37). Of particular interest in this respect is 447/79 (fig 37) which may have been used as a 'fishplate', overlapping and strengthening a joint. Mortice joints are evidenced in the sill-beam fragment (447/74) and in sample 444/3, both on fig 36. The three pieces illustrated on fig 35 (447/199, 200 and 250) have ends brought to pyramidal points. This may have resulted from using an axe to detach them from a prepared length of wood but all are small enough to have been severed by a single blow. They may represent a form of jointing akin to a housed mortice where they were set into the thickness of a larger piece of wood.

Fashioned objects

Amongst the fashioned objects from the ditch are a group of what appear to be spatulas, all six derived from the middle peat block. All are made from *Pinus* (pine), and whilst nos 444/19–23 are incomplete, 444/4 has part of a handle surviving (fig 40). The function of these objects is obscure. Three fragments of spoons survived, one from the middle peat block, two from the lower block, (444/22 & 447/135 and 447/185) (all on fig 40). A small knife-fashioned bung or stopper (447/197 on fig 40) made from *Fraxinus* (ash) was also discovered in the lower peat block. In some ways the simplest object found but also the most attractive is 447/06 (fig 34), a staff or walking stick. The smoothly finished head with some 660 mm of its length survives. The section which shows that the circuit of the staff is eccentric to the growth rings indicates the deliberate and careful nature of its preparation.

Whilst no tools have been recovered from the ditch, sufficient evidence exists in the form of the marks surviving on the wood to suggest the main constituent of the Early Christian carpenter's tool kit. The axe seems to have held pride of place in chopping and dressing timbers. The typical 'boxed V's' of axe-dressed wood are clearly visible on many fragments (see especially 447/79, fig 37) and many of the pieces described here, eg the pegs (449/11: fig 39) have been made using no other tool. A very large number of flakes of wood which seem to have resulted from chopping or dressing large timbers with an axe were found in the lower peat block. A typical example, 449/9, is illustrated (fig 36) and displays a distinct planar chop-mark on one face, the other face being almost conchoidally fractured.

The many cleanly drilled holes, eg 485/2 in fig 37, give ample evidence of the use of drills. The average diameter is less than one inch (c 20 mm) and the greatest likelihood is that a spoon bit was used to produce these holes. Small spoon bits were used by the Greeks and Romans in bow-drills (Goodman 1978, 161) but the spoon bit had evolved to larger forms, used as augers, in the Anglo-Saxon period. The hoard from Hurburck, County Durham (Wilson 1971, 78–9) contained an example, whilst the late Viking hoard at Mastermyr, Gotland (Berg 1955, 77) included a range of five spoon bits. The inclusion of a spoon bit in the Early Christian tool kit can therefore be suggested with some confidence.

The panel fragment 447/1 (fig 36) bears three very regular ridges near its edge. Microscopic examination did not reveal any individual tool-marks on these or knife cuts in the furrows. This strongly suggests that a moulding-plane was used to produce the ridged pattern. This is of some importance since despite the many and varied plane types possessed by the Romans (Goodman 1978, 39) there is virtually no known plane from Dark Age sites, while during the Medieval period planes are only known from illustrations. A moulding-plane iron from Newstead (Goodman 1978, 52) provides a close parallel for the form required to produce 447/1.

Knives were used in various ways, eg to strip bark and cut dowels, (see upper face of 447/140 in fig 39), to fashion small artefacts (447/197: fig 40), or to work rather larger pieces like 444/2 (fig 37), which bears many knife marks though its function is obscure.

Saw-marks are completely absent from the assemblage and this is rather the expected pattern since all the wood is converted by radial splitting, and squaring, where executed, is by axe-dressing.

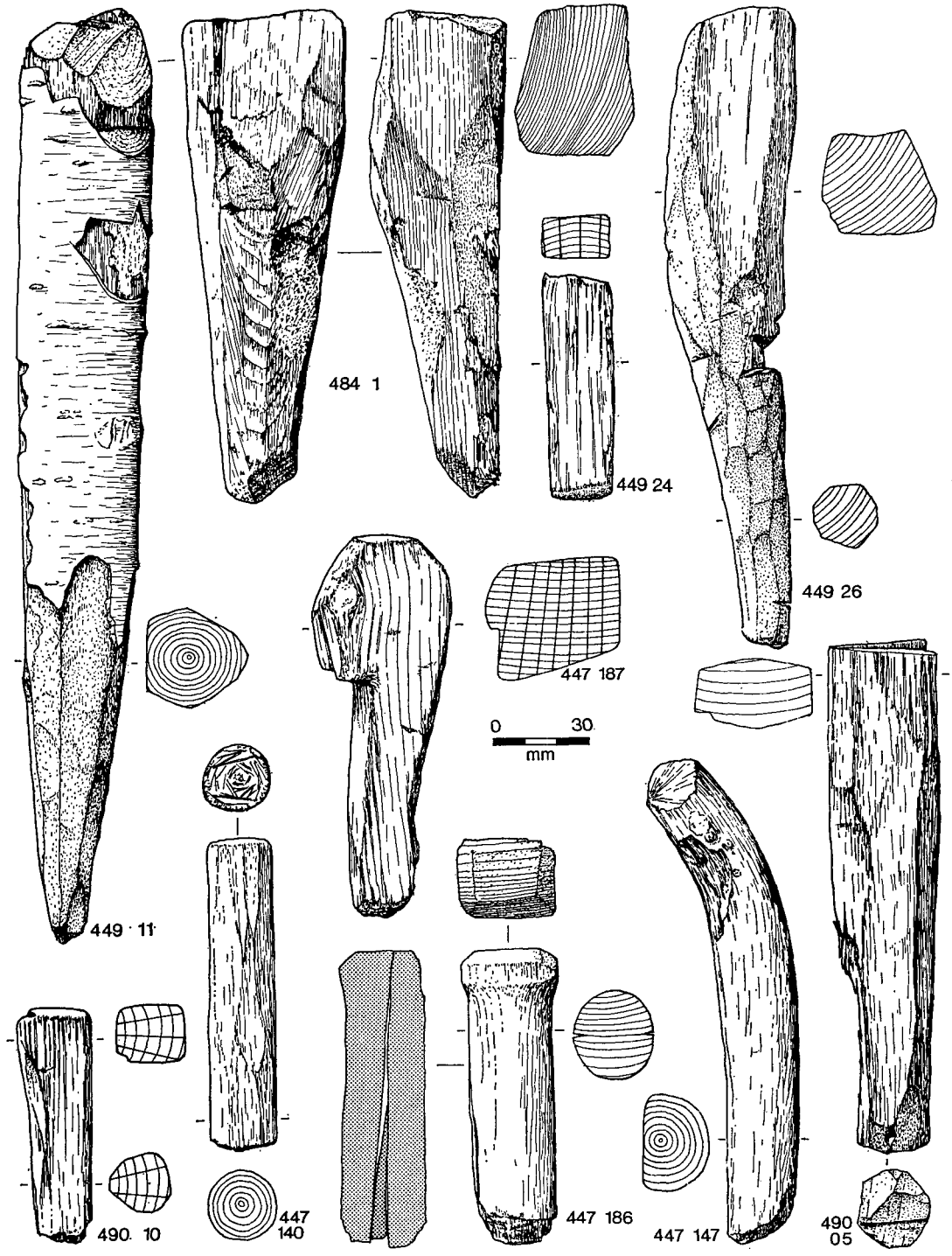


FIG 39 Worked wood from Ditch 1

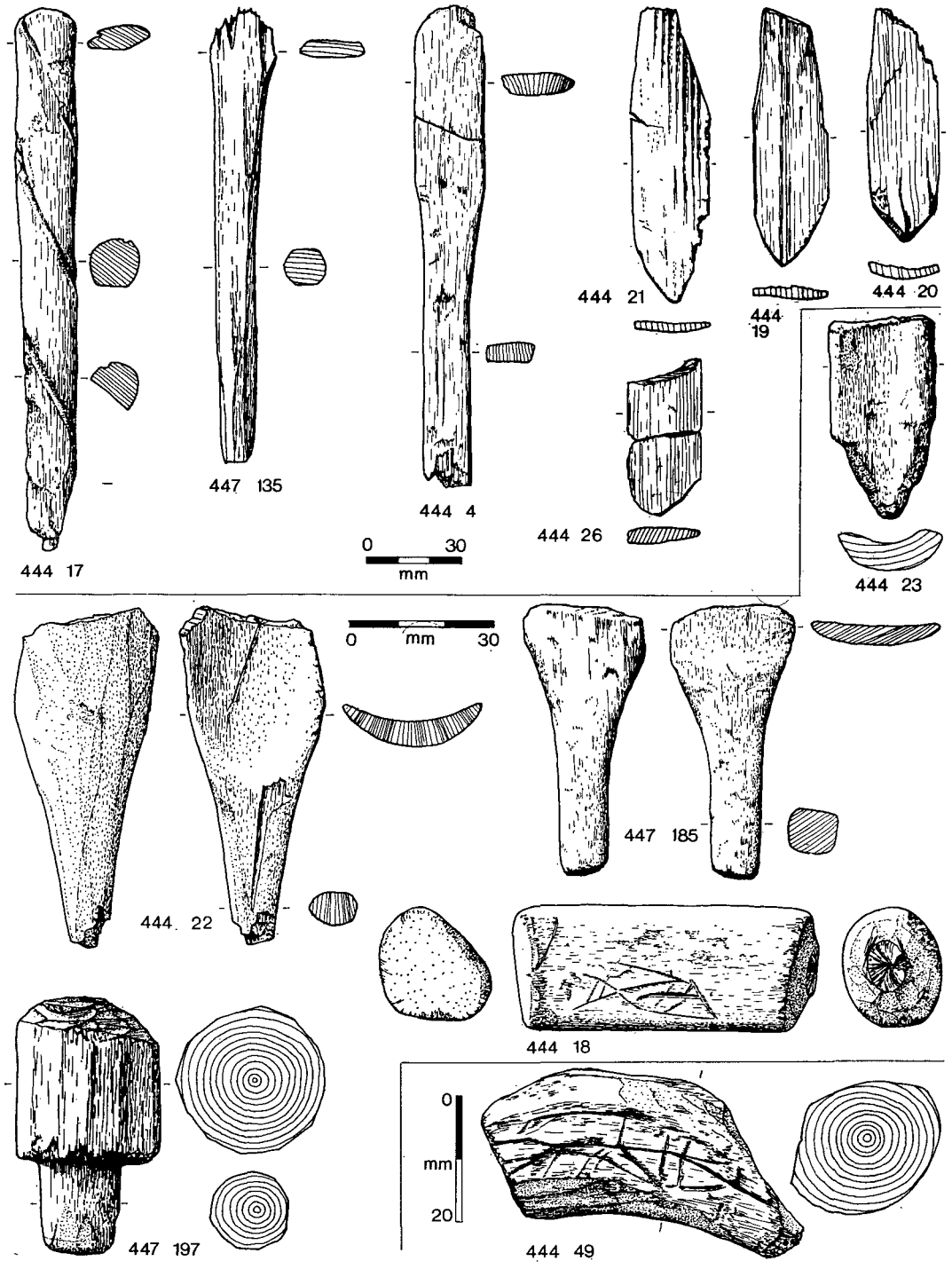


FIG 40 Worked wood from Ditch 1

Evidence exists in the form of toolmarks for the axe, spoon-bit auger, plane and knife and if the chisels and gouges used on the turned material are added to these, the Early Christian tool-kit as evidenced in this assemblage is fully defined.

Ornamented objects

The three objects referred to here can only be considered ornamented in the widest sense of the term. Only one, 444/18 (fig 40) bears what seems to be a recognisable motif, a fish, and even this is rather questionable. Of the other two, 444/17 bears a helical groove which very probably resulted from bark stripping, and 444/49 is a meaningless jumble of shallow grooves. It is possible that 444/18, bearing the fish motif, was intended for use as a simple handle. Some 60 mm long and 20 mm in diameter, it has one smooth end face and the other is knife trimmed through half of its thickness and broken off. The significance of the fish motif has very kindly been commented on by Dr Hilary Richardson (Appendix 3).

THE POLLEN DIAGRAM FROM DITCH 1 (fig 41)

Sjoerd Bohncke

The diagram illustrated in fig 41 was prepared from peat samples collected on site by hammering steel boxes into the ditch profile at the positions indicated on fig 10. Although Ditch 1 is relatively deep and wide it is nevertheless a small catchment area for pollen and thus the diagram mainly reflects changes in the environment close to the ditch. The growth of scrub vegetation or hedgerows on the fringes of the ditch would have intensified this development. For the purpose of the discussion below the diagram has been divided into zones, beginning at the bottom of the profile, characterised by their specific pollen assemblages (fig 41). The zones as composed refer only to local vegetational changes. The pollen sum, the quantity which forms the basis for the calculation of the relative percentages of the species, is based on the total pollen count less the pollen of aquatic plants.

Discussion of the Zones

Zone IoF-1 (0 to 12 cm)

This zone is represented in the column by the blue/grey clay, probably of marine origin (pH 7·4), as discussed in the soils report (p 287). One sample was examined and contained the following species or pollen types:

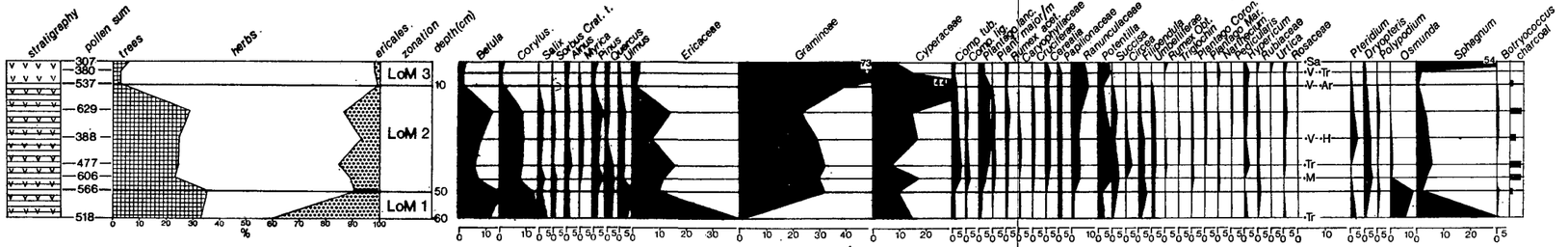
Gramineae (Grasses)	4	*Lotus* sp	1
Ericaceae (Heather)	2	*Betula* sp (Birch)	2
Compositae tubiflorae	1	*Alnus* sp (Alder)	1
Saxifraga oppositifolia (Purple Saxifrage)	1	*Pinus* (Pine)	3

This assemblage indicates a rather open vegetation and must have been deposited in the marine sediments before or during the isostatic uplift of Iona. On the pollen and geomorphological evidence it therefore seems likely that the marine clay cut into by the bottom of Ditch 1 dates to a period earlier than the Late Glacial Interstadial, ie to the Middle Weichselian (down to 13,000 bp).

Zone IoF–2 (12 to 18 cm)

This represents the primary fill of the ditch consisting of coarse sand with a little humic material. The pollen spectra show high values for *Fraxinus excelsior* (ash) and *Quercus* sp (oak), and low percentages of *Corylus avellana* (hazel), *Betula* sp (birch) and *Salix* sp (willow). Part of the pollen in the primary silt must have been redeposited there, washed in from the sides and top of the newly-cut ditch; but the course of the *Fraxinus* curve (high percentages at the bottom, decreasing towards the top of the zone) does indicate that ash must have formed an important part of the vegetation on this more sheltered E side of Iona at the time that Ditch 1 was dug. A radiocarbon date from the bottom of the Ditch of 585 ± 55 ad (GU-1243) suggests that the ditch was dug immediately or very soon after (ie 600–635 AD) the

Pollen analysis
of deposits from Lochan Mor ▶



Pollen analysis of deposits
from the Iona Fosse (Ditch I) ▼

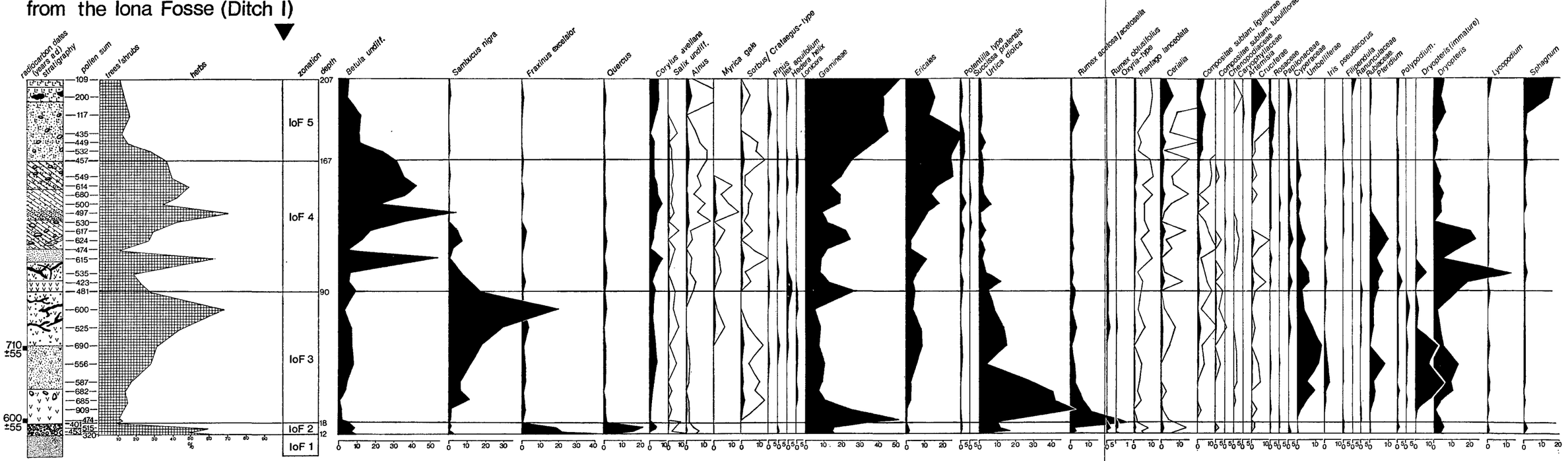


FIG 41 Ditch 1: pollen diagram (below); Lochan Mor: pollen diagram (above)

first monks founded their monastery on Iona (563 AD). While oak and ash formed the dominant tree species on the E side of the island before the intervention of the monks, the more exposed areas probably had a shrub vegetation consisting of birch, willow and probably hazel.

At the end of Zone IoF 2 all five tree species decline. This is likely to be the effect of clearance by the monks to provide themselves with arable land, timber and probably pasture. The presence of a clearance phase in the pollen diagram supports the idea that the monastics were still 'colonising' Iona at that time. From the very bottom of this zone pollens of cereal type are present together with herbs which occur on arable land represented by the following pollen types in the diagram:

Rumex acetosa/acetosella type	Sorrel species
Rumex obtusifolius	Broad-leaved Dock
Cruciferae	
Compositae	
Gramineae	Grasses
Trifolium sp	Clover species
Plantago lanceolata	Ribwort

It is probable that part of the *Urtica dioica* (nettle) pollen derives from the arable land. The presence of cereals in a catchment like the ditch means that at least some of the monastery's arable land, must have bordered the ditch, because Adomnán refers to arable land on the W side of Iona (Anderson & Anderson 1961, 285). The relatively high percentages of cereal pollen in this phase are likely to be the result of the inwash of arable soil and pollen into the ditch.

Zone IoF–3 (18 to 90 cm)

At the transition from Zone IoF 2 to Zone IoF 3 the grasses and the *Rumex acetosa/acetosella* types show high values. The open ground created by digging the ditch will probably have been invaded by these species first. The sediment at this level in the ditch is much more peaty than in the preceding zone which means that the vegetation on the slopes of Ditch 1 must have stabilised the soil by this time. The next feature in this phase is the overwhelming amount of *Urtica* pollen (according to the seed analyses *Urtica dioica*, stinging nettle). In general newly created habitats will be invaded and dominated by individual species before a more balanced vegetation becomes established: the occurrence of *Urtica* and at some levels *Ilex aquifolium* shows the relatively high nitrogen content of the soil. The oak and ash that had been growing nearby before the monastery was founded would have developed quite a rich soil which might explain the occurrence of many of the plants found during the pollen analyses and the macro-remains research. Above the 25 cm level a more balanced vegetation consisting of *Umbelliferae* (according to the macro-remains *Heracleum sphondylium*, cow parsnip and *Anthriscus sylvestris*, cow parsley), *Ranunculaceae*, *Filipendula* (meadowsweet), *Rubiaceae* (bedstraw species), *Gramineae*, and probably from the ditch itself, *Juncaceae* (rushes) and a few sedges. Pollen of the *Juncaceae* usually do not survive, however their seeds have been found amongst the macro-remains from the ditch. All of these species point to nutrient-rich conditions in and alongside the ditch. Between the 30 cm level and the 70 cm level fern species like *Pteridium aquilinum* (bracken), *Dryopteris* sp and *Polypodium* sp occur: at about the 70 cm level the curves for the fern decline. This is partly a relative effect due to the construction of the pollen sum but the overwhelming amount of *Sambucus* (elder) pollen and the presence of its seeds in the macro-remains do prove the presence of extensive elder shrubs or an elder hedgerow on the fringes of the ditch (Pollard *et al* 1974). *Anthriscus sylvestris* (cow parsley) and *Silene* cf *dioica* (red campion) which, according to the macro-remains are present in this zone, are common components of hedge row or woodedges, being reasonably shade tolerant. The shade of the shrubs would have affected the spore-production of the ferns. Other species that could have occurred between the elder shrubs are Sorbus sp (Rowan), *Crataegus* sp (hawthorn), *Ilex aquifolium* (holly), and probably a few hazel and birch shrubs. In this mixed shrub vegetation climbers like *Lonicera periclymenum* (honeysuckle) and *Hedera helix* (ivy) must have had their habitat.

The presence of ash trees nearby, as can be deduced from the presence of ash keys and wood at this level in the peat (see Appendix 2) is not confirmed by the relatively low *Fraxinus* pollen percentages. This leaves the possibility that ash branches were brought to the site and that off-cuts including ash keys were deposited in the ditch. The presence of hazelnuts in the samples juxtaposed with low *Corylus* pollen

percentages presents another inconsistency between the pollen record and the macro-remains at this level. Again this can be assigned to human interference, but in this case it seems more likely that the presence of hazelnuts is due to bird activity.

At the 80 cm level elder reaches its highest values in the pollen diagram, after which a sudden decline follows. The sudden decline can only be explained by deliberate felling of the trees and cannot be explained by competition with other shrubs as there are no such shrub pollen present in the pollen diagram to indicate this. The wood-layer between 90 cm and 96 cm in the column might be the result of this felling. With the decline of the elder there is an increase in the fern spores. There is evidence for the cultivation of cereals during the early and later parts of this phase. However the section between the levels of 35 cm and 70 cm did not contain any cereal pollen and it is possible that during this time agriculture had been abandoned.

The virtual absence of algal spores in the samples from this zone seems peculiar (van Geel 1976). Their absence can only be explained by the fact that the ditch did not contain standing water during this phase and must have been relatively well drained. The presence of *Juncus bufonius* seeds in the macro-remains confirms this interpretation, as toad rush is typical of areas subjected to temporary flooding or variable water levels (Salisbury 1961).

Zone IoF 4 (90 to 167 cm)

The two main characteristics during this phase are the high percentages of birch and heather and an increase in the grasses. The presence of the wood-layer between 90 cm and 96 cm might have made the draining of the ditch less efficient, causing a rise in the water table at least temporarily, and the presence of standing water at least seasonally. These conditions are less favourable for elder and probably prevented the elder from recovering. Birch, already present between the shrubs, then spread alongside the ditch. Conditions also became favourable for heather to invade the ditch or its fringes. The denticulated form of the birch curve in this zone is peculiar. This may be the result of coppicing. *Alnus* restores and reaches the same values as in Zone IoF 2. This suggests that at least some of the alder wood found in the peat from the preceding zones derived from stands of alder on Iona. Cereal pollen grains are present throughout this zone, indicating the continued cultivation of cereals near the ditch.

Zone IoF 5 (167 to 207 cm)

Zone IoF 5 covers the top part of the section. The bottom of this zone shows a sudden decline in birch and hazel and throughout there is a steady increase in the cereal curve. This zone might well reflect the next major episode in the religious history of Iona, ie the settlement of the Benedictine monks in the 12th century. There is also an increase in the herbs that occur on arable land, reflected in the pollen diagram by an increase in the *Compositae, Cruciferae, Rumex acetosa/acetosella* type and *Caryophyllaceae*. The increase in *Sphagnum* (bog moss) spores in the top of this zone is quite remarkable. This level in the column is represented by the orange clayey layer which is interpreted as burnt peat and the presence of *Sphagnum* spores might be correlated with peat sods that came from nearby bogs. However the spores themselves are clearly not burnt. Another possibility is that the top part of the analysed ditch-fill derives already from redeposited arable soil in which herbs, cereals and *Sphagnum* spores were concentrated. The *Sphagnum* spores in this case get even more concentrated due to the resistance to corrosion of the thick spore wall. The soil deposits overlying the burnt peat layer were not investigated since it was clear from the archaeological evidence that these were redeposited in backfilling Ditch 1.

FINDS AND SPECIALIST REPORTS: features other than Ditch 1

Here are discussed finds from the site in general and whilst the majority are from features other than Ditch 1, a single flint and a few medieval pot-sherds from Ditch 1 are included here as a matter of convenience. The normal practice of listing the finds by material has not been followed since they come from such diverse features, of such a wide date-range (Mesolithic to Medieval) as to make their study in coherent groups misleading.

The material is therefore listed here by feature, except for flint and pottery finds which are detailed in the relevant figures (43 & 44). In the case of 'trivial' features like the truncated bottoms of pits etc, found beneath the Ap layers, the feature number used in the site record is also used here.

Ditch 2

The following finds, prefixed '114' are from the second silting layer in Ditch 2 (p 292).

114/1 (fig 42) Fired Clay. A piece, 45 by 20 mm, of fired clay which has one smoothed surface. Not a potsherd.
114/2 Corroded iron object. This proved on X-ray to be a 51 mm length of iron rod, 5 mm in diameter. Possibly the shank of a nail (?).
114/3 Corroded iron object. This broke in two on removal and X-ray showed it to have been a nail. Some 36 mm long, it was 4 to 5 mm in diameter.
114/4 (fig 42) Fragment of burnt clay.
115/5 to 114/19 inclusive. Flints. See the flint report p 354.

Pit 156

Layer 108 in this pit, the charcoal-packed layer described on p 303, above contained the materials listed below.

108/1 to 108/7 inclusive. Seven large pieces of slag.
108/9 Corroded iron object. X-ray shows this to be a nail fragment, including the head. 68 mm long tapering shank, averaging 5 mm diameter.
108/10 Corroded iron object. Shown by X-ray to be a 45 mm long cylindrical rod, average diameter of 5 mm. Possibly shank of a nail.
108/11 Corroded iron object, shown by X-ray to be a nail, 69 mm long and averaging 6 mm in diameter.
108/13 Corroded iron object. Shown by X-ray to be a nail, much heavier than the above, c 85 mm long and 10 mm in average diameter.
108/8 & 108/14 to 108/19 inclusive. Seven small pieces of slag.
108/23 (fig 42; pl 24) Cylinder of blue-green glass with applied helix of opaque yellow glass. In total it measures 13 mm long and 2·75 mm in diameter. The applied yellow glass spiral helix is c 0·5 mm in diameter.
108/20, 21 & 23. These finds are thought to be modern debris included in the backfill of Professor Thomas's trench (fig 2, no 5). They were located in the face of the 108 deposit. Find no 108/20 is a 125 mm length of bronze (or possibly brass) rod, semi-circular in cross-section and 5·5 mm in diameter. Before conservation this bore on its curved face a series of parallel striations indicative of the modern technique of wire and bar production by 'drawing'. The others in this group gave similar evidence of modernity.

Finds from disturbed areas

Under this heading are considered finds returned from areas known to have been recently disturbed. Clearly, on a site such as the present one there is much opportunity for material of an earlier period to be included in features of a later date but this type of disturbance is ignored here.

220/1 etc. Finds of potsherds, some medieval, others possibly earlier, were made – together with modern debris – in the redeposited soil cleared from the surface of the Road of the Dead and along the W of the site. These have been preserved but not detailed here.
303/1 Clay mould-fragment (fig 42). This was discovered in the backfill of the recent excavation trench, 303 on fig 2. The impressed shapes were not those of the cast object but may represent keying or gas-expansion areas, ie related to the moulding process.
304/1 Clay mould-fragment (fig 42). This was found in the backfill of recent excavation trench 304 on fig 2. It would appear to have been a mould for casting pins or bars. Find 114/1 seems to derive from a similar mould.

THE FLINTS

Daragh Lehane.

The flaked-stone assemblage from Iona comprises 32 pieces of flint. The variety of colours represented and the abraded state of the surviving cortex indicate that the raw material was from a derived

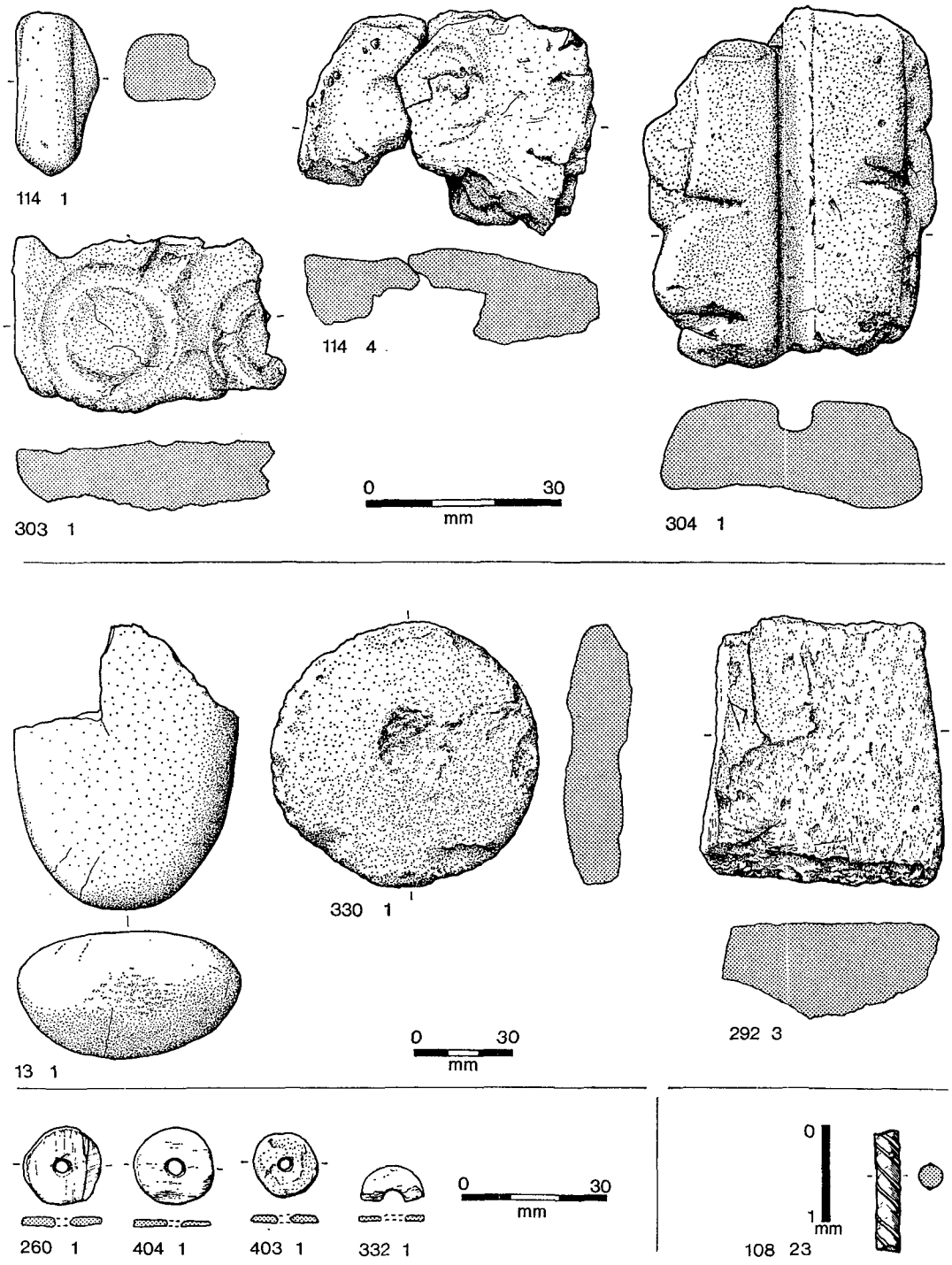


FIG 42 Iona: Clay, stone and glass

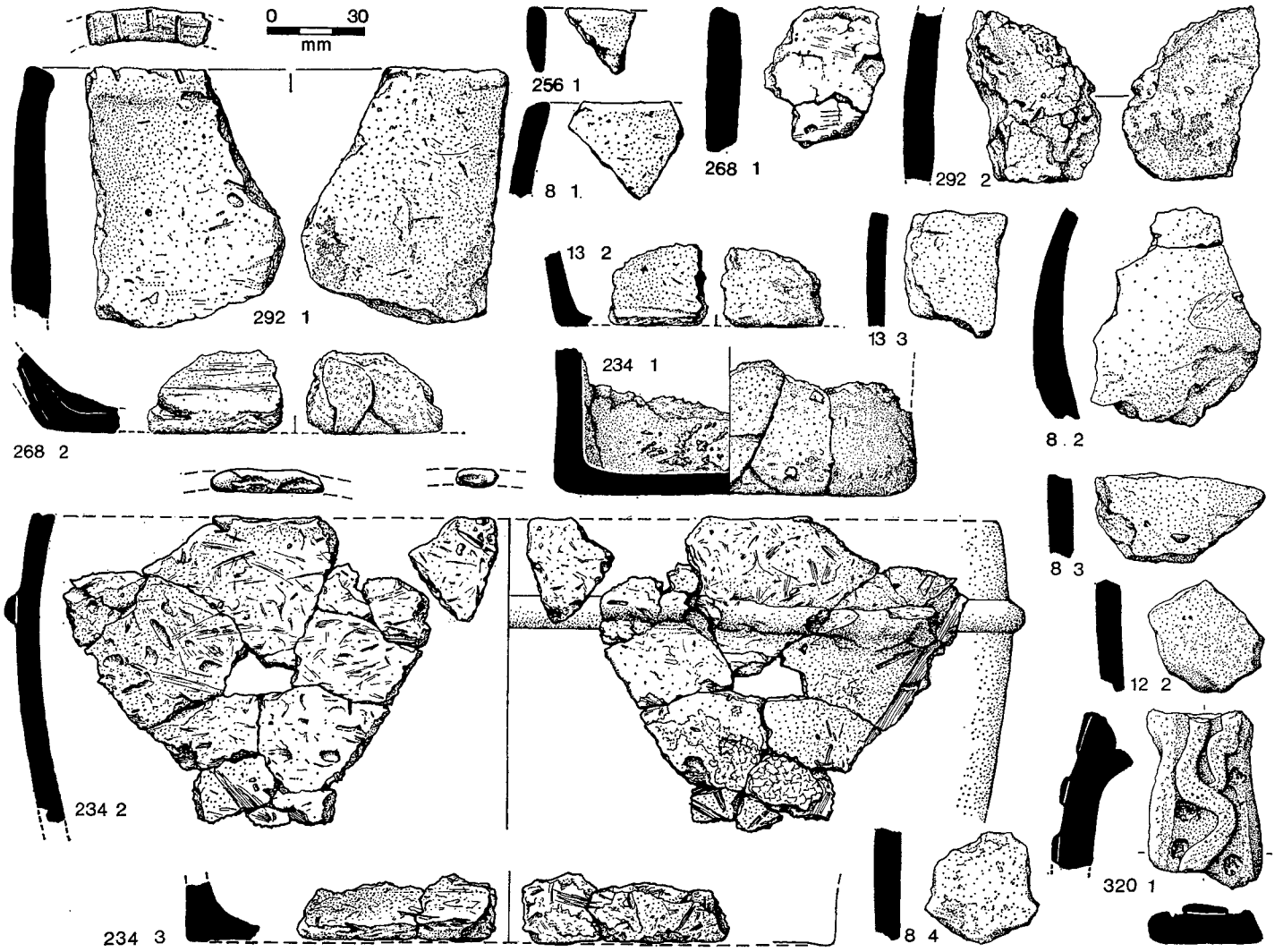


FIG 43 Iona: Pottery

pebble-source. The use of the term assemblage is something of a misnomer since the material is derived from a variety of features of varying date and cannot be considered as a single collection. For this reason no group statistics are offered here. The individual pieces are listed and their significant attributes described in Table 12; the features in which they occur are detailed in the captions to fig 44.

Notes to Table 12

The ventral face of a flake is that bearing the bulb of percussion and during examination flakes were held with this face downwards and the proximal end, bearing the striking platform, towards the observer. The dimensions in the table are given in millimetres and in the order: length, width and thickness. Maximum dimensions are given and the length is defined along the bulbar axis. The dimension chosen for chips is simply the maximum measurement regardless of its orientation. Cortication is the matt discolouration, usually cream or porcelain in colour, which may cover the surface of the flint. Patination is the waxy lustre which may subsequently develop. The colours are described in terms of the Munsell Soil Colour Charts.

Flakes are described as 'primary' if they display cortex on more than 50% of one face; as 'secondary' if the percentage is less than 50 and as 'tertiary' if there is no cortex. Those flakes which are longer than wide by a factor of two or more are called 'blades'. Morphological tools are those for which conventional names can be attributed but in the absence of micro-wear analyses it is important to note that no functional information is implied by these terms. Flakes described as 'retouched' display a minimum of retouch and cannot be attributed to a conventional type. Fragments of what appear to be tools, or complete examples which, though retouched, are relatively amorphous, are titled 'miscellaneous tools'. In a few instances conventional type-names have been tentatively suggested for flakes in the miscellaneous category.

The cross-symbol (+) placed beside the find-numbers means that these finds are illustrated in fig 44.

DISCUSSION

The chronological sequence

The evidence for man's activity on Iona revealed in the present excavation suggests that occupation of the island began in the early Post-Glacial period (site period 1). The rather simplified arguments offered above (p 287) for the date of the raised-beach deposits take no cognisance of the many difficulties involved in determining that date nor, indeed, of the continuing debate (Gray & Lowe 1977, 168). However, an upper date of c 13,000 BP for the formation of the beach seems to be the best current estimate. The quite separate question of the date of the natural gulley in the beach or, more specifically, the date of its infilling, is even more difficult to assess. Clearly it post-dates 13,000 BP but the effort necessary to discover the time-span involved would be out of proportion to the benefits gained. It would have been possible during excavation to pursue the deposits more vigorously and it is still possible to examine the pollen content of the various in-wash layers; but, given only one identifiable artefact and a small scatter of flint débitage, the effort was and is not considered worthwhile.

The Mesolithic date of the early material recovered during the excavation is beyond doubt, but it is not possible to attribute it to any specific culture or culture group. The abundant evidence for Mesolithic settlement in the Inner Hebrides (Mercer 1974) suggests that many of the raised beaches, if not most of them, were either occupied or exploited during this period. Also attributable to the first period of the site, though to its second phase, is Ditch C at the N end of the area. This ditch cuts the podzolised profile, the creation of which, as noted above (page 303), is of uncertain though probably quite early date. Ditch B is somewhat later than C but it is unlikely to be very much later, given the general similarity of their fills and the coincidence of their positions. These ditches are clearly man-made and may have been dug to drain the area W of the

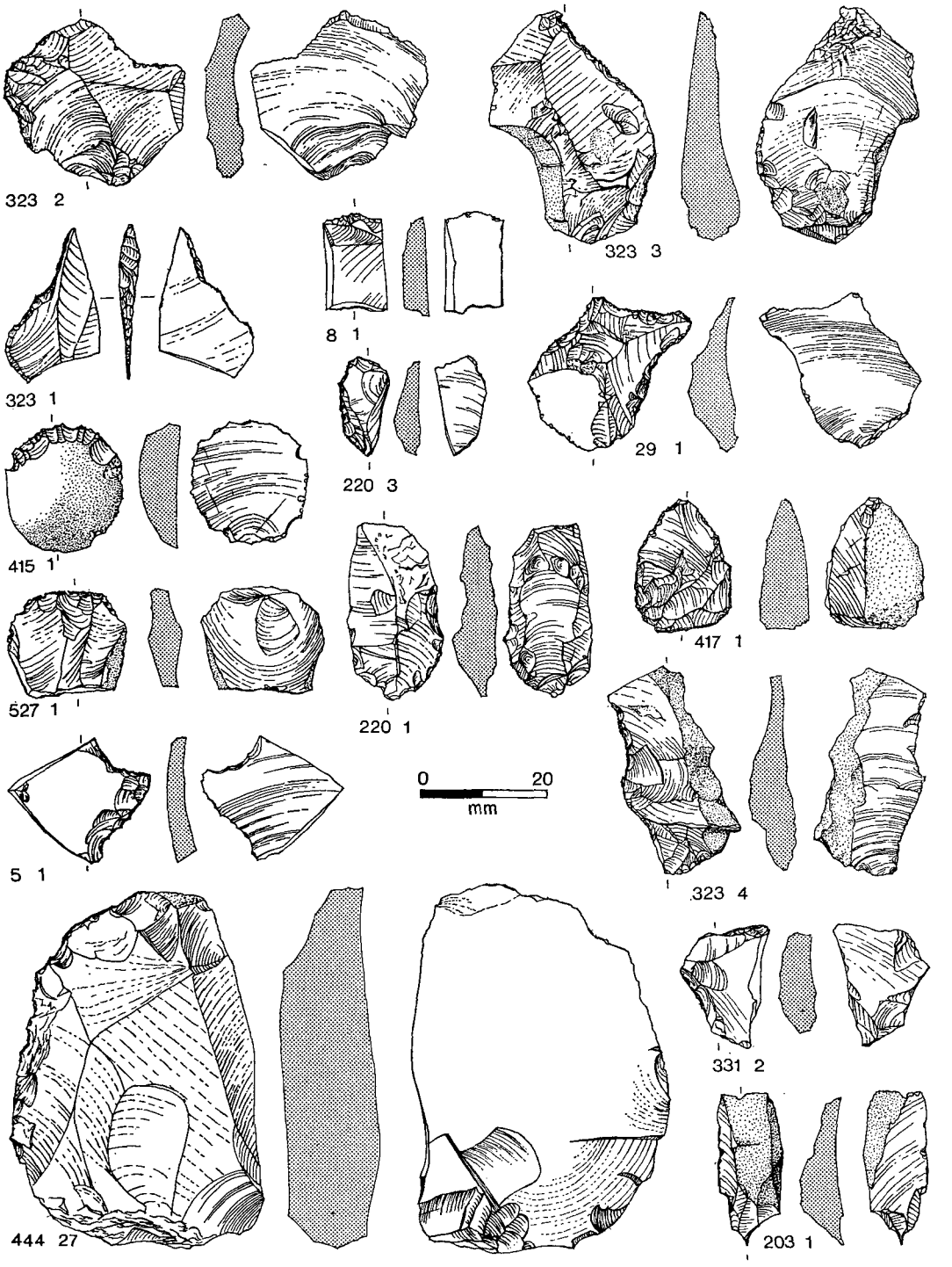


FIG 44 Iona: Flint

TABLE 12: Flint (see notes on p 352)

Find No	Flake	Colour	Corticated	Patinated	Burnt	Broken	Striking platform	Bulb	Dimensions (mm)			Remarks
5/1+	Tert	H10yr/7/1	*	*		Proximal and L missing			07	09	04	Morphological tool. Spurred implement
8/1+	Tert	H10yr/7/2	*			Segment survives			15	09	04	Miscellaneous tool
29/1+	Tert	H2.5yr/4/6	*	*			Facetted	Small	26	17	09	Morphological tool. Notched tool
33/1	Tert	H10yr/8/1			*					1	0	Débitage
114/15	Tert	H2.5yr/6/2	*			Distal survives			17	14	05	Morphological tool. Blunt borer
114/16	Tert	H10yr/6/8	*			L half missing	Small, smooth	Small	21	29	09	Miscellaneous tool
114/17	Sec	H10yr/8/1	*	*			Smooth	Small	20	13	08	Retouched flake, on L and distal
114/18	Sec	H10yr/3/1	*		*	L half missing			21	21	09	Miscellaneous tool
114/19	Sec	H10yr/3/1	*		*	L half missing	Wide, smooth	Large	17	19	08	Miscellaneous tool
114/5	Tert	H10yr/8/1	*		*	Segment survives			18	18	07	Débitage
114/6	Prim	H10yr/8/1			*				14	10	03	Débitage
114/7	Tert	H10yr/8/1			*				13			Chip
114/8	Tert	H10yr/8/1			*				09			Chip
114/9	Tert	H10yr/8/1			*				11			Chip
114/10	Sec	H10yr/8/1			*	Segment survives			21	15	09	Débitage
114/11	Tert	H10yr/7/1	*			Segment survives			14	12	02	Débitage
114/12	Tert	H10yr/5/1	*						22			Chip
114/13	Tert	H10yr/8/1			*	Distal survives			19	16	05	Débitage
114/14	Tert	H10yr/7/2		*			Smooth, small	Small	20	15	02	Débitage
203/1+	Sec	H10yr/7	*		*		Smooth & narrow	Diffuse	16	19	05	Retouched flake. Part of L side lightly retouched
220/1+	Sec	H10yr/8	*		*		Facetted, narrow	Small	23	13	10	Retouched flake. Irregular retouch on R side
220/2	Tert	H10yr/8	*	*	*				35	25	13	Débitage. Chip
220/3+	Tert	H10yr/8	*	*	*	R half missing			15	07	04	Retouched flake. Retouch on L side
323/1+	Sec	H10yr/7/2	*	*			Facetted, narrow	Small	31	15	06	Morphological tool. Notched tool
323/2+	Tert	H2.5yr/4/6	*	*		Distal	Smooth, narrow	Diffuse	25	19	06	Miscellaneous tool
323/3+	Tert	H7.5yr/6/1	*	*	*	R half missing	Smooth, wide	Large	37	22	10	Miscellaneous tool
324/4+	Tert	H7.5yr/7/6	*	*		Distal			10	14	03	Morphological tool. Notched tool
331/2+	Tert	H10yr/7/1	*	*		Distal survives			13	19	05	Miscellaneous tool
415/1+	Prim	H10yr/6/3	*	*					20	19	06	Morphological tool. End of blade scraper
417/1+	Sec	H10yr/8/1	*	*			Facetted	Diffuse	20	14	08	Miscellaneous tool
444/27+	Sec	H10yr/8/1	*			L half missing	Facetted, narrow	Small	53	36	14	Miscellaneous tool. Possible scraper
527/1+	Sec	H10yr/8/1	*	*			Smooth, narrow	Diffuse	23	11	08	Retouched flake. Retouch on L side
527/2	Prim	H10yr/8/1							14	10	03	Débitage

concreted deposits. They could also, of course, be part of an enclosing ditch and bank around settlements or fields and be of any date in the period between the formation of the podzol and its burial.

In an attempt to estimate the extent of early settlement in the area a core was taken from the Lochan Mor deposits and its pollen assemblages analysed (Appendix 1). The elm decline noted in this analysis is interpreted as that decline dating to c 3000 BC and this serves to identify the occurrence of cereal and cultivation-weed pollen as evidence of Neolithic farming in the immediate vicinity of Lochan Mor. Furthermore the plant assemblage noted in the analysis indicates that the raised beach was itself under cultivation during the Neolithic period (p 369). The upper part of the Lochan Mor peat deposit has been cut away for fuel and so the pollen diagram lacks evidence of Bronze and Iron Age settlement on the island. However, a Bronze Age kerbed cairn has been identified by the RCAMS a short distance S of the monastic area; and Professor Thomas's excavation of Dun Cul Bhuirg, prepared for publication by Ritchie and Lane (1980), gives evidence of occupation during the first two centuries AD.

The point to be derived from this brief account of Iona's prehistory is that the raised beach has almost certainly been occupied and cultivated, if not continuously, then at least frequently throughout the Mesolithic, Neolithic, Bronze and Iron Ages. Direct evidence in the form for example of actual settlements is missing, but, accepting the presence of settlement on the island, the probability of its exploitation is likely since almost half of the cultivatable land is raised beach. This situation makes the dating of features discovered in the buried podzol of the monastic area doubly difficult. In the excavations carried out by Thomas, Reece and Rednap the attribution of all such remains to Columban-period activities has led to some strained conclusions. Not least of these is the tortuous route of the *vallum* proposed by Thomas (1971, 30 & our fig 46), forced upon him by the need to enclose putative Columban features. It is in fact difficult to argue for any specific date for Ditches C and B. The absence of podzolisation of their fills might be taken as indicative of a late, eg Iron Age or later, date. On the other hand, since the processes of podzolisation are related to drainage even this observation cannot be accepted on face value.

To the site's second period belong those features for which evidence exists to suggest a Columban association, ie Ditches 1 and 2 and Pit 156. It is perhaps necessary to note that for the purposes of this discussion 'Columban' implies 'Early Christian', ie the period approximately 563 to 806 AD relating to the Iona monastery.

The earliest feature of this period, Ditch 2, can be considered to contain two distinct sets of deposits. The first of these is a series of silting layers which accumulated naturally in the ditch. The second is a series of layers and lenses of material deliberately placed in the ditch to backfill it. Two of the silt layers of Ditch 2 contained many bone remnants, none of which are discussed in the bone report because they were so badly decayed as to be irretrievable. Identified on site by Mr McCormick, they consisted of some small calcined fragments including seal vertebrae and many sets of enamel from the decayed teeth of juvenile cattle. In so far as this evidence goes it suggests that the pattern of exploitation of meat sources was not significantly different from that suggested for Ditch 1. The other finds from Ditch 2 include iron nails and other, unidentifiable, iron objects, burnt clay, flint artefacts and débitage and a distinct spread of charcoal. All of this material is indicative of domestic refuse suggestive of nearby habitation, though none was discovered which was demonstrably contemporary with Ditch 2. The backfilling layers consisted of distinct bands of sands, stones, gravels etc (p 292, above) such as could be derived from the fluvio-glacial material underlying the raised-beach deposits.

Since Ditch 2 is cut by Ditch 1 the possibility that the cutting of Ditch 1 provided both the need and the material for backfilling Ditch 2 must be considered, together with the relationship

of the two ditches to the arrival of Columba in, or soon after, 563 AD. The earliest peat deposit in Ditch 1 has been dated to 585 ± 55 ad which when corrected suggests a date in the range 600 to 635 AD. The lower of the two charcoal-rich silt layers in Ditch 2 dates to 570 ± 60 ad whilst the upper dates to 470 ± 55 ad and it has been argued above that these are best represented by a weighted mean date of 516 ± 40 ad, suggesting a corrected date in the range 540 to 590 AD. The corrected date-ranges indicate the probability that Ditch 2 was dug during a period within which Columba arrived on Iona and Ditch 1 during a slightly later period, when the monastic community was, on the historical evidence, well established. It is accepted here that radiocarbon dates lack the precision to correlate archaeological with historical 'events', but other factors lend support, however slight, to this interpretation.

To begin with, for each metre length of Ditch 1 which was dug, some 10 cubic metres of material were removed, weighing roughly one ton per cubic metre. This task amounted to a major civil-engineering project and is unlikely to have been feasible for a group of monastics freshly arrived on Iona. Even if the tradition of Columba's arrival with a company of 12 followers owes more to biblical allusion than numerical accuracy, it is not likely that the initial settlement population could afford the vast expenditure of manpower represented by Ditch 1 whilst simultaneously coping with the myriad problems of resettlement on the island. The radiocarbon dates suggest that Ditch 1 is too late to have been the primary Columban *vallum monasterii* and its size also militates against such an interpretation. Therefore Ditch 1, though undoubtedly a *vallum* ditch is, at best, secondary. Ditch 2 has been shown by excavation to be earlier than Ditch 1, and the mean of the Ditch 2 dates, when corrected, spans the period of Columba's arrival on Iona. The ditch itself could be either pre- or primary Columban on this evidence. The habitation debris in the upper silt-layer of Ditch 2 was deposited immediately before the ditch was deliberately backfilled. The probability that the backfill material was derived from Ditch 1 has been discussed and, accepting this, it is clear that occupation debris was being deposited in Ditch 2 immediately prior to the digging of Ditch 1.

If it be accepted, then, that *monastic* occupation debris was deposited in the upper silt layer of Ditch 2 the small difference between the admittedly anomalous dates from Ditch 2 would seem to allow of one interpretation only, ie that the occupation debris in the lower silt layer is also derived from the monastic settlement. On balance, therefore, the evidence suggests that Ditch 2 was the primary Columban *vallum monasterii* on Iona and that it was replaced by Ditch 1 early in the 7th century. This conclusion is advanced here, in full consciousness of the weakness of some of the supporting evidence, rather as a hypothesis worthy of further test than a dogmatic statement of archaeological truth. The discovery of high cereal-pollen percentages in the primary silting of Ditch 1 is consistent with this conclusion. This has been interpreted as indicative of redeposition, by run-off, of pollen from adjacent areas which had already been under cultivation.

As originally dug, Ditch 1 was brought to a terminal on the E edge of the concreted belt of the raised beach. The concreted belt forms a slightly raised and dry pathway N from Relig Oran along the later Road of the Dead and its intersection with the *vallum* presents a suitable position for an entrance. It may well be that the decreasing depth of Ditch 2 in the SW area is to be accounted for by the fact that it also was brought to a terminal in the same position, but unfortunately Ditch 1 has removed the crucial evidence. A causeway must be assumed to exist between the excavated terminal and a corresponding terminal on the W side of the concreted belt. Excavation revealed a narrow steep-sided slot cut through this causeway, extending almost the full depth of the ditch and presumably providing drainage for the W extension of the *vallum* ditch and the waterlogged area W of the concretion. The use of the *vallum* ditch as a drain must be seen as an incidental, and perhaps accidental, function much as the stone wall on Church

Island, Valencia, County Kerry (O'Kelly 1958) which, as a *vallum*, delimited the area of monastic sanctuary and also offered protection against walking or being blown off the edge of the island during the frequent storms of that area. The size of Ditch 1 and of the bank which must have been made from its upcast owe considerably more to factors of prestige and aggrandisement than to the practical requirements of drainage. In this regard the massive cashel-wall which forms the *vallum* at Inishmurray (O'Kelly 1973, 13) is a better parallel for Iona's *vallum* than Church Island (*ibid*).

Rubbish from the monastic area was tipped into Ditch 1 virtually from the time it was dug and the organic debris preserved as a result provide an interesting insight into the everyday life of the monastery (below p 365). At a time when about half of the lower peat block had formed (to a depth of 30 to 50 cm), an earthen pad was inserted some 4 m from the terminal as the footing for a boulder wall which retained soil layers dumped in to backfill the terminal and thereby widen the causeway. Material included in the foundation pad has returned a radiocarbon date of 605 ± 55 ad, whilst peat formed over the wall footing has been dated to 635 ± 55 ad (see Table 4 for details). It had been noted during excavation that the stratigraphically highest pieces of leather found in Ditch 1 seemed to occur at the approximate level of the foundation pad. A sample of twigs from this level, close to the leather, has been dated to 615 ± 55 ad. Statistical comparison of this date with the two which fix the date of the wall-insertion shows that they are not significantly different from each other and confirms the field observation that leather ceased to be deposited in Ditch 1 when the boulder wall was inserted. Furthermore, analysis of the finds from the ditch shows that wood-turning waste is also restricted to the peat laid down before the widening of the causeway. The deposition of bone and worked wood continued after this event but on a much reduced scale. Examination of the pollen diagram shows that cereal cultivation was moved away from the immediate environs of the ditch at this time.

Of course the most significant physical change brought by the infilling of the terminal must have been that Ditch 1 ceased to function as a drain for the length of the *vallum* ditch W of the putative causeway. It is inconceivable that the need for drainage which prompted the cutting of the slot through the causeway had simply disappeared; the more so since that need persists to this day. It must be assumed that the drainage was effected in some other way. The date of the widening of the causeway, by the insertion of the wall and backfilling of the terminal, is best represented by the mean of the three dates quoted above, ie 618 ± 25 ad. It is possible to suggest a hypothesis which would account for all of the observed changes occurring at that time. The digging of new ditches would have altered the drainage pattern, removing Ditch 1's function in this respect. Relocation of the service areas in which wood-turning, leather production and, to a lesser extent, general carpentry and butchery took place from the vicinity of the terminal would account for the variations in deposition. Finally, the inclusion of what had been cultivated land beside the *vallum* ditch within the monastic area would, by taking it out of cultivation, account for the elimination of cereal pollen from the ditch. A major reorganisation and extension of the monastic area is therefore indicated. The corrected date-range for 618 ± 25 ad is 618 to 650 AD (Table 4), a period which spans the abbacies of Fergna (or *Virgno*, died 623) and Segene (died 652), the fourth and fifth abbots of Iona. Under Segene the Iona foundation seems to have reached a peak of activity which included correspondence with Rome on the Easter question, the foundation of the monastery at Rathlin and the dispatch of Aidan to develop the Christian church in Northumbria. It is not inconceivable that the monastery on Iona would itself have undergone a significant expansion and reorganisation at such a time.

After 618 ± 25 ad peat carried on forming in Ditch 1 and bone and worked wood continued to be deposited in it up to a level dated to 690 ± 55, at which time deposition tailed off almost to nothing. Thereafter human activity in the area is evidenced only by the occurrence of cereal

pollen and pollen of the weeds of cultivation. This activity continued throughout the entire period of peat formation in the ditch, ie probably until the beginning of the 13th century.

On the basis of its radiocarbon date of 595 ± 55 ad (corrected to the range 605 to 640 AD), the layer of charcoal-rich soil within Pit 156 is likely to be contemporary with the earliest deposits in Ditch 1. The finds of slag from this layer give evidence of metalworking, a not wholly unsuspected activity since virtually all the sites of Early Christian date in the Celtic areas of these islands have produced evidence for metalworking (Laing 1975, 246) often in great profusion, as at Garryduff, Co Cork (O'Kelly 1962). The occurrence of glass-working, implied by the glass rod and bead (pl 24) from this layer is similarly unexceptional on sites of this period. There is little doubt that this pit served as a dump for artisans' refuse before its backfilling, though it may have had other now unknown functions in its primary phase.

The admittedly weak stratigraphic relationship between Pit 156 and the post-hole setting (p 303, above) sets a *terminus post quem* for the post-hole settings of 595 ± 55 ad. The settings present the problem common to all plough- (or cultivation-) truncated features in that no archaeological evidence survives to demonstrate the association of the various post-holes with each other. The rings of packing boulders employed near the bottom of several of the post-holes (fig 14) suggest at least a uniformity of construction, but in practice the placement of the post-holes on two concentric arcs is the major argument for interpreting them as a coherent structure. The term 'structure' is here of course used in a general sense, since the 0·15 to 0·20 m diameter posts of the outer arc could not conceivably support the roof of a structure c 18 m in diameter. The entire ring must therefore have formed an enclosing element to the structure defined by the inner setting or, alternatively, it may have provided the supports for a verandah surrounding the structure proper or provided additional support for the main uprights and the roof. The inner setting could have supported a roofed structure: on the basis of the excavated remains this would seem to have been circular, though of course the apsidal end of an otherwise rectangular structure would present the same evidence. The position of post-hole 301 suggests that a central post or, if 154 is also included, a central setting of posts supported the apex of the roof. No demonstrably contemporary internal features were discovered. The post-holes of the inner ring seem to occur in pairs, suggestive of the replacement, at least once, of the posts of the structure, or perhaps of the entire structure.

Sherds from the base of a flat-bottomed coarse-ware pot (fig 43) and some sherds of a grass-marked base, also flat-bottomed (fig 43) were found in the dark, stony 'saucer' of material which lay in the top of post-hole 112. Further sherds of grass-marked pottery were found in this area during cleaning following machine stripping. The date of the grass-marked pottery provides a *terminus ante quem* for the final decay of the posts. Lane's survey of the dating evidence for grass-marked pottery (Ritchie & Lane 1980) suggests that it was current in the Hebrides from the 9th to the 11th centuries. This, in turn, suggests that the structure represented by the post-hole settings was erected between the early 7th century (the corrected date for Pit 156) and the 11th century AD.

Circular timber structures of the Early Christian period are virtually unknown from excavations and the literature provides few examples. The Palace at Cruachan, unlikely to be typical of the architecture of the period, is the one example cited by Dr Murray (1979, 82) on the basis of her analysis of the literature. Columba's miraculous intervention to save the life of a brother falling from the roof of a 'round monastic house' at Durrow is described by Adomnán (Anderson & Anderson 1961, 495). But apart from these, evidence for circular structures is lacking.

The dating evidence for the post-hole settings also provides a *terminus post quem* for the

introduction of the anthropic epipedon, the Ap soil layers, onto the site. The preservation of the top-soil layers of the podzolised profile beneath the Ap soils indicates that a significant depth of soil was introduced initially since piecemeal depositions would simply have been incorporated into the topsoil. However, it is not necessary to suppose that the *full* depth of soil was introduced at once. Deep cultivation of the Ap layers continued into the medieval period as evidenced by the glazed medieval pot sherds found in the bottoms of the furrows (fig 19), and deposition of soil could have continued over this entire time range.

The use of introduced soils on Early Christian monastic sites is, if not a commonplace occurrence, at least well attested. The little garden-terraces on Scellig Michael off the Iveragh peninsula in SW Ireland provide a particularly striking example since the soil must have been carried up the 600 ft rock face to the terraces NW of the monastic settlement (De Paor 1955, 175, fig 2). Dr Romans of the Macaulay Institute for Soil Research has noted (pers comm) similar introduced soils near Fearn Abbey in Easter Ross. He has very kindly allowed us to publish here a distribution map of the soil deposits (fig 45) which he has surveyed. The total area covered by introduced soils is enormous and, whilst Fearn Abbey may lie on or near the site of an earlier foundation, the greater part of these soils was probably introduced in the Medieval period. The reason for introducing such soils is not clear and not enough analysis has been done to establish their nature and the uses to which they were put. Similar deposits, up to 2 m deep, have been noted lying between Roman and Medieval deposits in London, and McPhail's analysis of their pollen, insect and phytolith assemblages (1981, 309–31) probably indicates the best way forward.

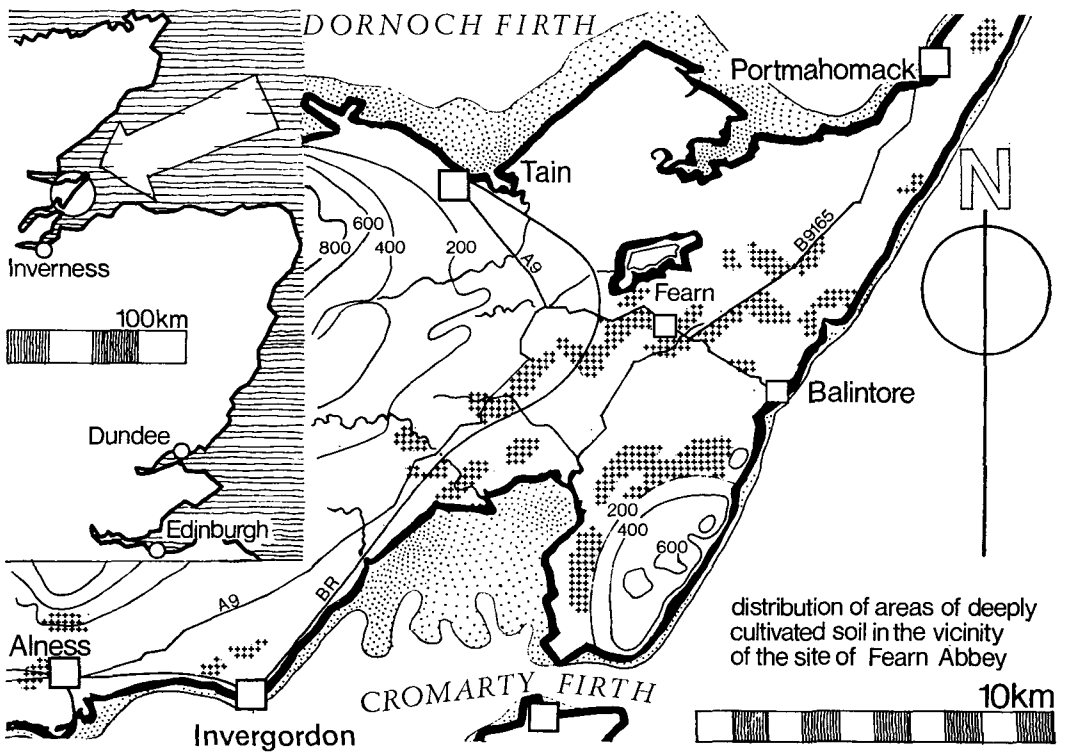


FIG 45 The distribution of introduced soils in the neighbourhood of Fearn Abbey (with kind permission of J C C Romans)

Though there is as yet little evidence to support it, the following hypothesis is offered in explanation of the introduction of soils to Early Christian and later ecclesiastical sites in the hope that future work may test it. The agricultural advances which until recently were attributed to the Romans but which are now clearly shown to have begun to appear in the S of England over the last three centuries BC (Jones 1981) did not reach the NW Atlantic seaboard or Ireland at that time. They were in fact introduced by the Early Christians, though probably not in their earliest phase, as part of their 'economic package'. These improved techniques, which included introduction of soils, together with the centrally organised and large labour force which the monasteries afforded, go some way to accounting for the development of monastic power and wealth, the latter exemplified in their patronage of the arts and in the artistic renaissance which this engendered. Should this hypothesis prove true the existence and extent of such introduced soils may prove a useful indicator of ecclesiastic settlements. Even if it does not prove true such soils will remain archaeologically significant, in the sense that they are man-made, wherever found.

The later period of the site, period 3 (p 313), is represented by the soil layers in Ditch 1. The top of the peat is sealed by an introduced layer of clay on which a culverted drain was erected. This ran along the middle of the ditch and dropped from 50 cm beneath the Road of the Dead to over 2 m at the E end of the ditch, in area A. The drain was buried at the E end under 2 m of soil which fully backfilled the ditch. At the W end however, a broad shallow depression remained, marking the position of the ditch: the E end of this depression was not revealed during excavation.

It must be assumed that the material used to backfill the ditch, particularly at its E exposure, was derived from the (presumed) adjacent bank: no bank was located N of the ditch so it presumably lay to the S. It must therefore be concluded that this event saw the end of the period of use of the ditch and its bank as a *vallum monasterii*. The precise date of this event must remain to some extent a matter of speculation: a widely-quoted 12th century account credits Queen Margaret (died 1093) with rebuilding the monastery at Iona (Anderson 1908, 116). However this account is held to be untrustworthy (Cowan & Easson 1976, 48). The Benedictine community took over the monastic area in the opening years of the 13th century and they or their successors are most likely to have effected land renewal on the scale implied by the levelling of the banks and the refilling of the ditches, the latter, as in area A, still over 2 m deep.

The incomplete backfilling of the excavated W end of the ditch has already been noted. Accepting that the drain-builders were willing to move sufficient soil to fill the 2 m deep ditch it must also be accepted that the infilling of the ditch and ,arguably, the removal of the bank for this purpose, was their explicit intention. Mere burial of the drain could have been done with much less effort.

The depression at the W end which cannot, of course, have resulted from later subsidence (fig 10), therefore deserves some consideration; the obvious reason for its existence would have been the absence of sufficient material to fill the ditch completely, as a result of previous slighting of the bank in this area, which must have been carried out when the church in Relig Oran was erected. The church lies 2 to 3 m S of the putative position of the S lip of the ditch and cannot have been constructed while the bank was still standing (see fig 5). The Romanesque doorway of the church is to be dated later than c 1140 AD but it was inserted into an existing church. The date of construction of this church is not known but it was probably in either the 10th or 11th centuries: the date of the slighting of the bank hereabouts cannot be tied down any closer than this. The selection of a position which required removal of part of a substantial bank for the construction of a church is itself a rather strange decision. One is tempted to wonder if the need

to consecrate that specific position was due to the tradition based on Adomnán's *Life* that Columba's writing-house was near an entrance (Anderson & Anderson 1961, 110). The precise positioning of the church, overlying the position of the bank, may have resulted from the need to avoid the Royal burials which had, even by the 7th century, begun to cluster within Relig Oran. However the present author would be the first to admit the folly of trying to explain archaeological problems in terms of problematic historical models.

Analysis has shown that the orange layer overlying the sealing layer over the drain at the W end of the *vallum* ditch is peat ash. At the level of the orange layer the pollen analysis has shown a marked increase in *Sphagnum* spores and also in the pollen of cereals. The spores, whilst obviously derived from peat, cannot be derived from the peat ash and they suggest that peat was brought into the immediate area of the ditch. It is reasonable to infer that this was then burnt locally and the ash dumped into the depression in the ditch. Though largely separated from it by recent excavation, the orange layer, in its charcoal-rich extension of the ditch sides, seems continuous with the dark charcoal-rich layer enveloping the stone-built feature N of the ditch (fig 5, no 4; fig 18; pl 18). A sherd of glazed medieval pottery from the soil between the side stones of this feature (fig 43, no 268 1) demonstrates its date. It is probable therefore, that the stone feature is the lower part of a corn-drying kiln of medieval date in which peat was burnt to dry the cereal component of the abbey community's diet, the pollen and spores of the cereals and peat coming to rest, together with the dumped peat ash of the orange clayey layer in the W end of Ditch 1. The occurrence of charcoal-rich and peat-ash layers in the bottom of the grave-like feature just E of the corn-drying kiln (fig 5, no 3; fig 9, profile 20) makes it probable that this pit was open while the area was being used for corn drying, and that the pit played a part, albeit an unknown one, in this activity.

It is obvious that ample opportunity existed for the deposition of burnt material in the medieval and later periods. The danger at sites like Iona is that all burning tends to be regarded as Viking destruction with consequent implications for dating of under- and overlying material. The use, by Reece, of grass-tempered pottery to confirm his identification of 9th-century destruction-layers (1973, 42) does little to advance the case.

The position and extent of the early monastery

The identification of Ditch 1 as the ditch of a *vallum monasterii* is beyond doubt. Where the monastery lay in relation to the ditch is altogether a more contentious matter, however. Summarised in fig 46 are four interpretations of the monastic area at Iona. The first of these (fig 46a) is based on Crawford's observations (1933, 460) of the visible surface remains. Professor Thomas (fig 46b), somewhat later, introduced a very irregular *vallum* running N from Relig Oran but stepped to the E to pass under the Abbey (1971, 30). This line seems to have been necessary to achieve two ends, firstly to join the ditch-segments revealed by excavation (the open segments in fig 46b) and secondly to enclose supposedly Columban features discovered during excavation (see *Medieval Archaeol*, 4 (1960), 138). The Royal Commission on Ancient and Historical Monuments for Scotland commissioned a geophysical survey of Iona from the DOE Ancient Monuments Laboratory (London) in 1977. The conclusions of this survey are outlined in fig 46c and the RCAMS's own interpretations are produced in fig 46d. (The author is most grateful to the Royal Commission for their permission to produce these drawings here).

On fig 47 are illustrated those features for which evidence of some sort exists. The banks and ditches N and W of the Abbey are visible on the aerial photographs (pls 25a & 25b). The two curved features E of Relig Oran similarly appear on pl 25a. The terminal and drain through

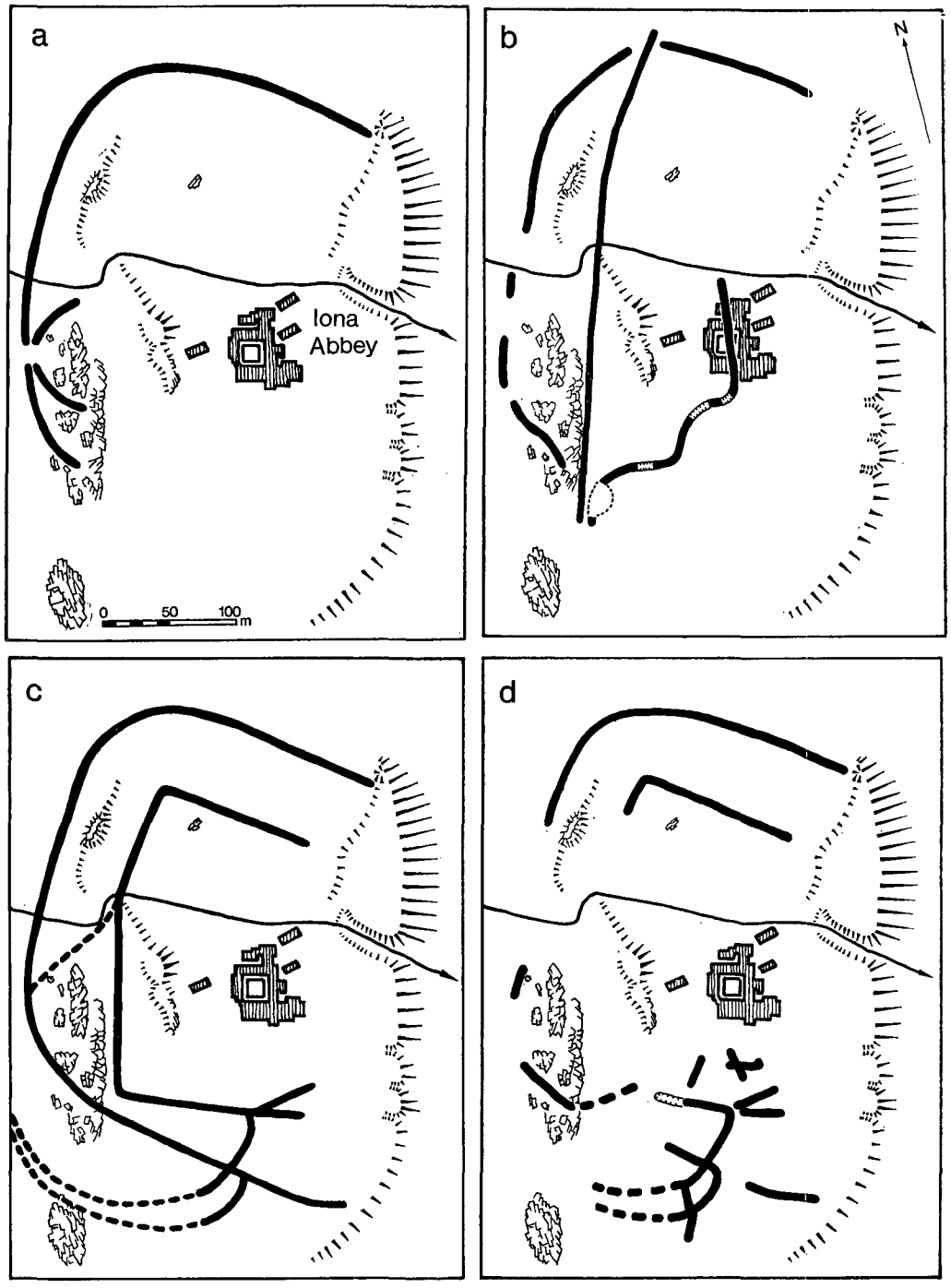


FIG 46 Suggested layout of the *valla* at Iona: a, after Crawford (1933, 460); b, after Thomas (1971, 30); c, after Ancient Mons Lab Report on geophysical survey (RCAMS); d, after RCAMS *Inventory of Iona* (1981)

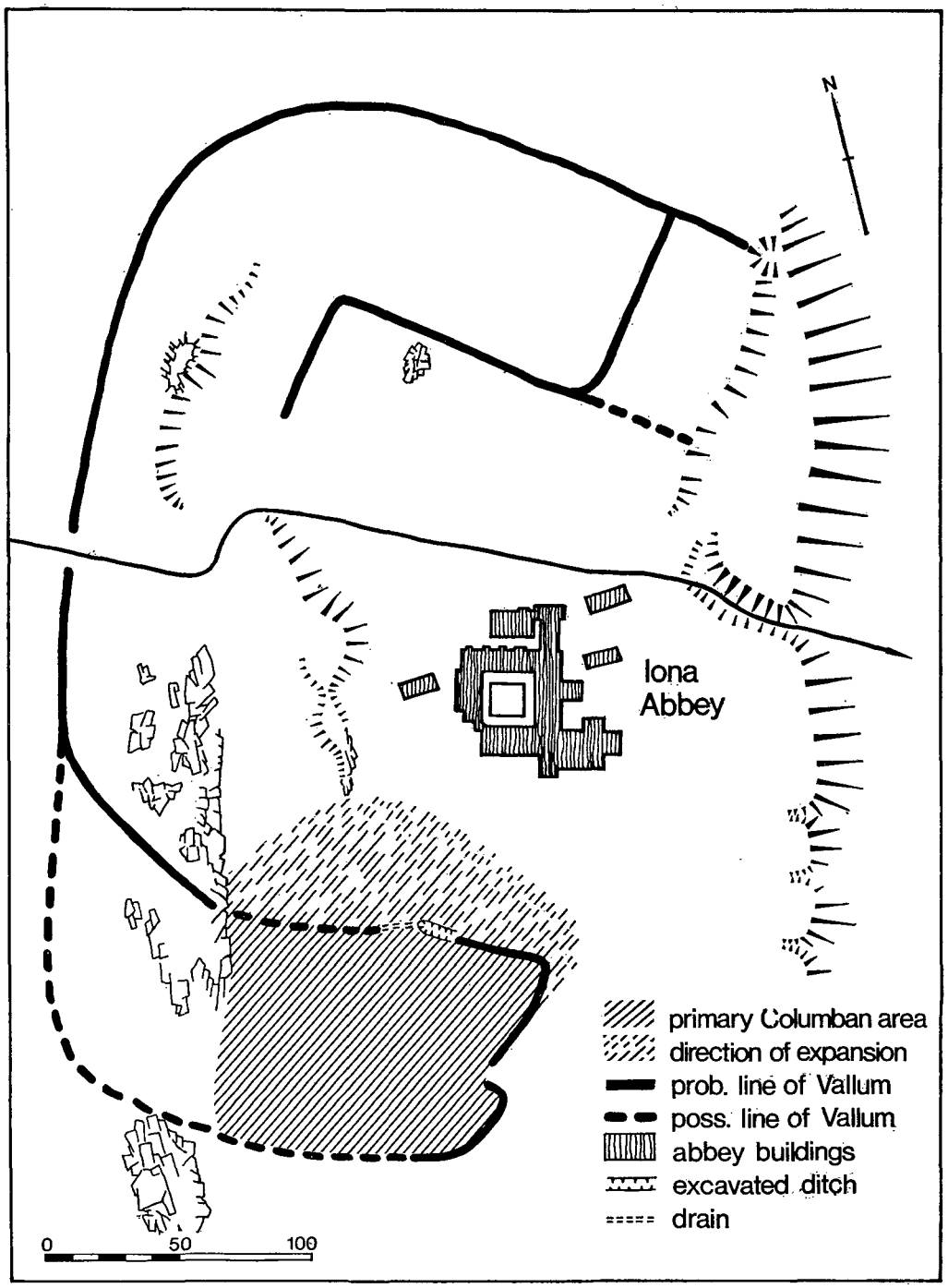


FIG 47 The course of the *valla* determined by adding the evidence from excavation and aerial-photography to the extent visible on the ground surface

the causeway were revealed in the current excavations. No bank was located N of the *vallum* ditch (Ditch 1) during the 1979 excavations. It must be concluded, as already noted, that it lay to the S of the ditch and consequently that the monastic area also lay to the S, now under Relig Oran. The course of Ditch 2 (fig 7), though irregular, is so curved as to enclose an area to the S of it, ie also under Relig Oran. It would appear therefore that until the time of its expansion (represented by the mean date of 618 ± 25 ad), the Early Christian foundation on Iona occupied the area under and S of Relig Oran. Other than the excavated ditch-segment, the exact position of the *vallum monasterii* of this period cannot be stated. It may be that the curved features E of Relig Oran represent the continuation of the excavated section: a section cut by Dr Reece in the grounds of the St Columba Hotel revealed the presence of a sizeable ditch on the line of the southern end of the curved feature, so this may represent the S boundary and the curved features the E boundary of the early 7th-century enclosure. This evidence is tenuous in the extreme and therefore the shaded area on fig 47 is merely a 'best guess' at the extent of the monastic area at the beginning of the 7th century. The area to the N, indicated by broken shading, suggests the direction rather than the extent of the expansion which occurred, it is argued here, at about 618 ± 25 ad.

The relationships between these earliest settlement areas and the greater area enclosed by the extant *vallum* bank and ditch N of the Abbey are not clear. Balaam (1981, 5–14) has analysed the pollen contents of soils buried beneath the *vallum* bank at points N and W of the Abbey. He found virtually no arboreal pollen, in contrast with the pollen of oak and ash amongst others found at the bottom of Ditch 1. This seems to demonstrate that the *vallum* cut by these sections is of later construction than that represented by Ditch 1, since it was erected at a time when the island's cover of ash and oak had been removed.

LIFE IN THE COLUMBAN MONASTERY OF THE EARLY 7TH CENTURY

As noted above, oak and ash trees were growing in the area and cereals were being cultivated close by when Ditch 1 was dug. Run-off into the ditch has increased the apparent extent of all of these in the pollen diagram to some degree but they were clearly present. The oak and ash were quickly eliminated, being replaced by trees like birch and willow which favour open and wet areas and also by trees like elder which colonise nitrogen-rich soils near settlements. All of these species were exploited for a variety of functions, but other timbers, notably pine and oak, were imported, as is well attested in Adomnán's *Life*. Writing between the years 658 and 692 AD (Anderson & Anderson 1961, 5) Adomnán describes how dressed timbers of pine and oak were brought to Iona: they were first drawn over land and subsequently by sea over a 'long and devious route' (*'per longas et oblicas vias'*) (Anderson & Anderson 1961, 454). He also recounts the drawing to Iona, by twelve currachs, of oak timbers from what has been identified as the mouth of the River Shiel which divides Argyll from Inverness. Furthermore he also mentions (*ibid* 329) the collection of a boat-load of bundles of wattles, possibly on Mull, for the construction of a guest-house during Columba's life-time. The excavation provides albeit inferential evidence for further imports, in that although Dr Bohncke has concluded that the alder pollen in Ditch 1 is not all derived from trees on Iona, analysis of the wood has shown that alder was used almost exclusively for wood-turning, all three bowls and all but two of the cones being of this material. The suitability of alder for turning was well known in antiquity: the *Gododdin* mentions the use of '. . . bitter alder-wood cup as well as the spiral drinking-horns . . .' (Jackson 1969, 153). The use of wooden vessels goes some way towards explaining the absence of ceramics from the deposits of this period.

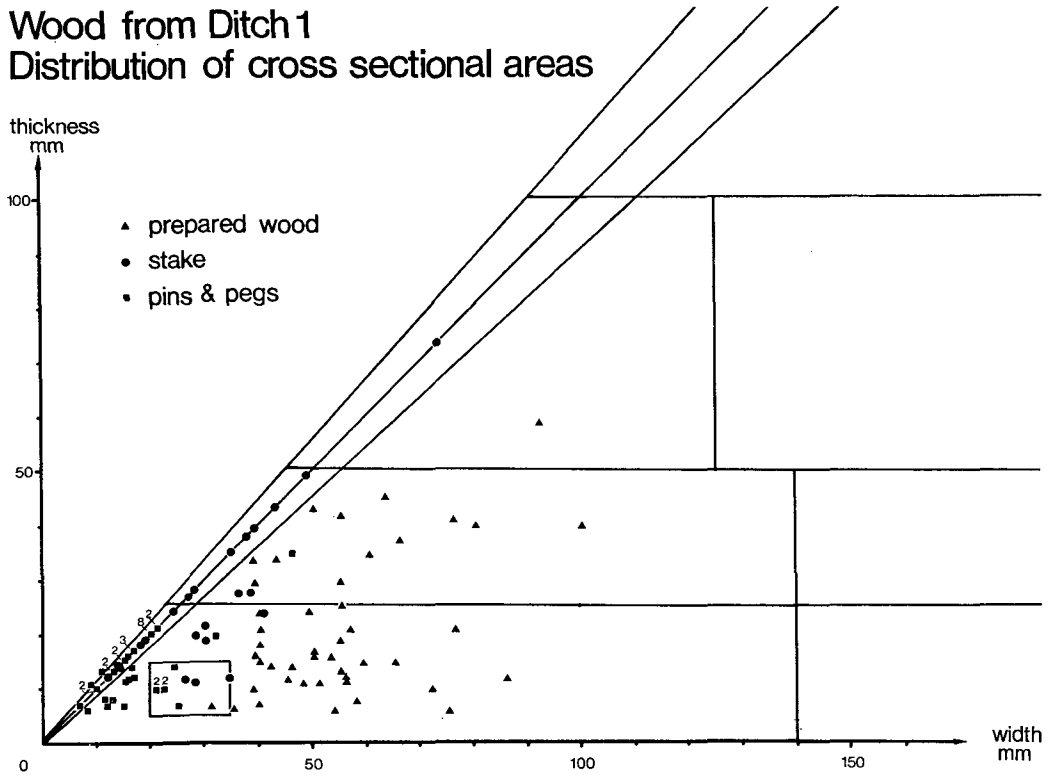


FIG 48 Iona: cross-sectional dimensions of the wood from Ditch 1

Analysis of the scale of surviving structural timbers (fig 48) suggests the possibility that sill-beams with wattles, and presumably daub, were the main elements of local structures. In this context the larger pieces of burnt clay from Ditch 2 may be noted as possible fragments of burnt daub though they bear no wattle impressions. However, some longer timbers, fragments of baulks and of planking, also survived and these indicate the presence of at least a small number of rather more impressive structures, probably of frame-built type. These conclusions, based on the analysis of the wood from Ditch 1, are to some extent borne out by the documentary evidence. Wattles, for building, were collected, and longer timbers – from further afield – also gathered and worked for the construction of 'long ships' and of a 'great house'.

The leather from Ditch 1 (p 318 above) also points to the location nearby of a leather-worker's shop. The many offcuts and discarded shoe-fragments are derived from the hides and skins of cow, calf, hairsheep/goat, horse, red deer and seal, and in their range and relative abundance these parallel the animal species represented by the bones in the ditch.

The shoe forms, characterised by the tongue at instep and occasionally the heels, are closely paralleled by shoes illustrated in a range of early manuscripts (Barber forthcoming b). The 'Millifiori Man' in the *Book of Durrow* (c 680 AD), who symbolises the evangelist Matthew, bears on his feet an apparent representation of shoes with tongues at the heel and instep. The portrait of Saint John in the *Book of Mulling* (c 800? AD) wears shoes with a pronounced tongue at the heel and a scalloped throat. These are strongly reminiscent of shoe no 20 from Iona, illustrated in fig 24. The *Canterbury Psalter's* frontispiece – now wrongly placed in the text (Nordenfalk 1977, 95) – shows King David wearing shoes with a lozenge-shaped tongue and

two straps or thongs crossing on the instep. These shoes can be compared with no 25 in fig 25, from Ditch 1. The *Canterbury Psalter* is dated to the second quarter of the 8th century (*ibid*). Wright (1967, 70) suggests that David's shoes must be the *campagi* which became eventually the liturgical garments proper to a bishop at a pontifical mass. Françoise Henry has drawn together representations of footwear from a range of early manuscripts (1977, 184) and of those illustrated only one cannot be paralleled in the Iona assemblage (note however her omission of the tongues from the shoes of the 'Millifiori Man'). Some 15 shoes or fragments of shoes from archaeological contexts in Ireland, constituting Lucas's Type 1 (1956, 366), are broadly similar to the Iona shoes: they have a clear tongue at the often ornamented instep and the heels, although without tongues, are also commonly ornamented. These seem to differ from the Iona examples mainly in that they are one-piece shoes, sole and upper being cut in a single piece and folded to shape. These examples cover a date-range of from 200 AD to 1000 AD approximately. It would seem, therefore, that the Iona shoes are of a form current in these islands, or at least in the Celtic areas thereof, throughout the first millennium AD.

There is evidence in the manuscript illustrations for the use of soleless stockings, a type of gaiter, whose more recent survivals have been studied by Dr Lucas (1956, 309). Since some of the illustrated examples occur in the *Book of Kells* (see for example fol 28V or fol 32V) it is probable that this type of footwear was also used on Iona (see Barber forthcoming b for a fuller discussion).

The animal bones from Ditch 1 tend to reflect a dietary regime characteristic of small islands rather than of Early Christian settlements in particular. Apart from cultivated cereal crops and domestic stock there is evidence for the exploitation of the deer herds of the adjacent islands and mainland, of seal rookeries and indeed of fish, one or two small bones of which were discovered during the analysis of macro-plant remains. These of course are indicative of deliberate diversification of resources rather than of subsistence economy.

In conclusion, it is possible to envisage the early monastery nestling behind the massive shrub-covered *vallum* in the area now occupied by Relig Oran. In this area were huts of wattle and daub and larger wooden buildings including possibly churches of frame-built construction. The monastics, clad presumably in the *Brat* and *Leine* of the manuscripts, some of them well shod and others in soleless stockings, pursued their various activities; some of them in the wood-turner's shop, others tanning leather and making shoes, yet others engaged in metal- and glass-working, whilst in the *scriptoria* manuscripts were copied and illuminated. Outside the *vallum* fields of cereals were under cultivation to provide food and drink, in supplement to the dairy products, meat, and fish of their diet. The entire scene conveying the impression of a life of self-contained and economically independent activity.

ADDENDUM

In the period between the submission of this report to the *Proceedings* and its publication Dr Reece's report on his excavations at Iona, 1964 to 1974, has been published (Reece 1981). The editor has kindly allowed the addition of the following comments.

1 by Ian Máté

Nicholas Balaam (*in* Reece 1981, 7) notes that the *vallum* runs along the crest of a shingle ridge at 75 ft OD and he identifies this as the '50 ft' raised beach (after Donner 1959 & 1963) dated to the 8th or 9th millennium BC. Current work in this field has brought this identification into question and the zero m isobase for the main late glacial shoreline through Iona is now dated to 9000 BC (Grey & Lowe 1977, 169, fig 3 & 164, fig 1).

2 by John Barber

Dr Reece's discussion on chronology (Reece 1981, 103–10) centres on two questions. Firstly, does the pre-Benedictine phase begin in 563 AD, implying in the event of a positive answer that all pre-Benedictine phenomena are Columban? Secondly, are the many burning layers observed due to Viking destruction, a positive answer implying that all burning layers date to the 9th or 10th centuries AD? Dr Reece considers that both of these questions are answered in the affirmative by a series 15 radiocarbon dates (*ibid*, 108) 'beyond reasonable doubt'.

The spread of these dates has been illustrated in Fig 49 on which the significant dates for the island's

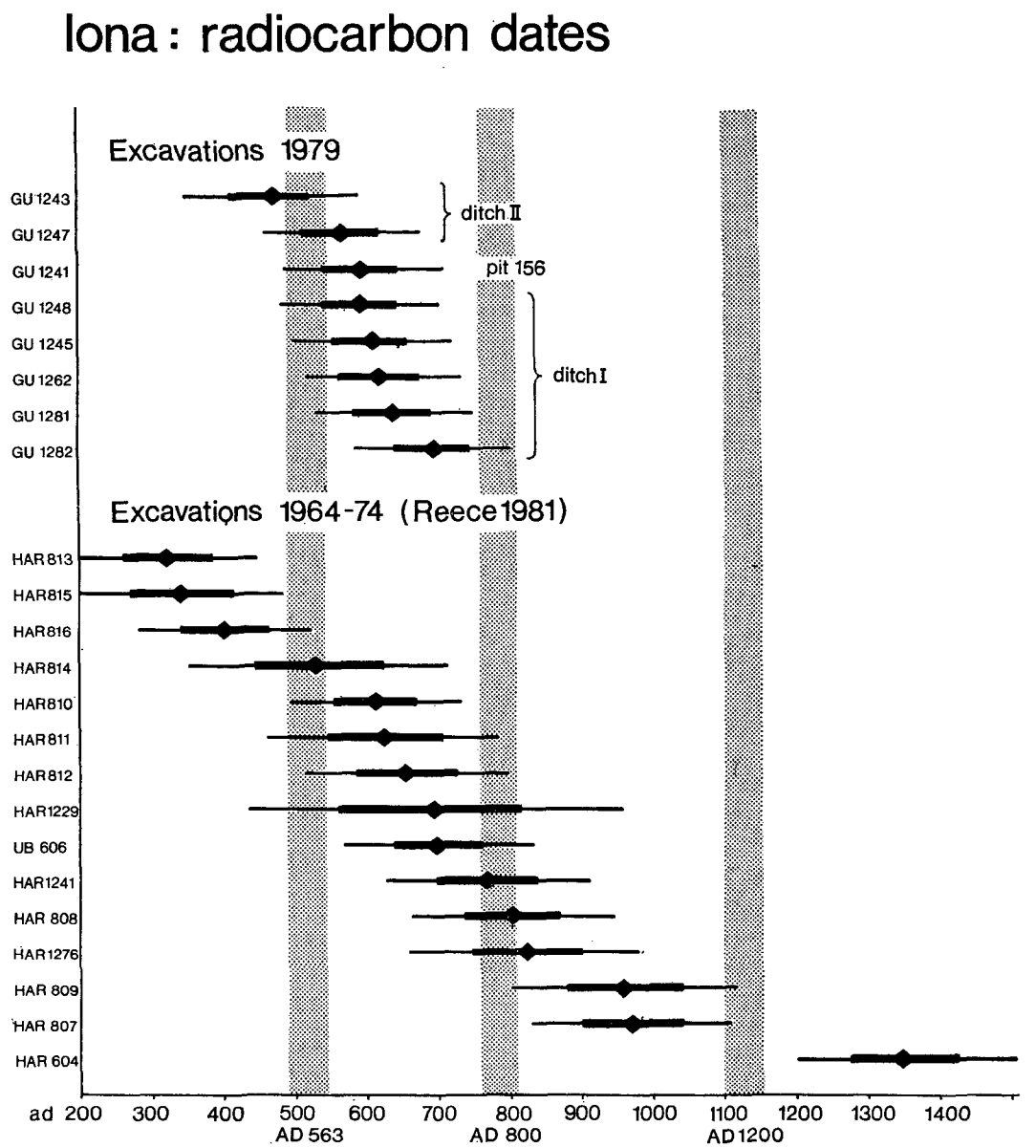


FIG 49 Iona: radiocarbon dates

history of 503, 800 and 1200 AD have been represented by stippled bands (to take account of the uncertainty involved in radiocarbon date correction). It is clear from this that Dr Reece's dates constitute a continuous spread from before 300 ad to after 1000 ad (at the 1 sigma level). In reality there seems to be little support for either of his hypotheses.

On the contrary, the continuity of the date-spread raises the possibility that Ditch 2 is pre-Columban in date and, in the light of the earlier dates in Dr Reece's series, the arguments advanced in my discussion for Ditch 2 being primary or early Columban must be somewhat weakened.

APPENDIX 1

POLLEN ANALYSIS OF THE LOCHAN MOR SECTION (fig 41)

Sjoerd Bohncke

The excavation has given evidence of Mesolithic activity on Iona and it is possible that Ditch 2 is pre-Columban in date. The excavations at Dun Cul Bhuirg (Ritchie & Lane 1980) suggest that the island was inhabited in the 1st and 2nd centuries AD. Furthermore the analysis of the basal layers in the *vallum* ditch (Ditch 1) suggests that this part of the island was cleared of oak and ash woodland at or about the time this ditch was dug, arguably by the Columban monks. In order to provide further comparative material for the *vallum*-ditch deposit a core was taken from Lochan Mor, a drained bog NW of the Abbey (fig 3).

The Lochan Mor basin is bordered by two hills, Dun I to the N and Sgurr an Fhithich to the S. The E side of the basin is formed by raised-beach deposits and outcropping rock. This basin must have begun to fill-in with sediment soon after the relative uplift of the island, after the last glaciation, ie the Loch Lomond Stadial c 10,000 BP. Pennant (1772, 296) and the *Statistical Account* (1795, 203) both record the cutting of peat from Lochan Mor, as indeed does an earlier document in the Argyll estate papers (Inveraray MSS 1753). A stream now runs through Lochan Mor draining a boggy area to the W. Recent drainage-furrows are visible in the land surface running E-W and there are other signs of land improvement. Its surface vegetation is now grass with rushes on the W edge. On the wetter spots patches of *Sphagnum* occur.

The section was obtained from the middle of the northern half of the mire (see fig 41) with a Russian corer. An overlap between the segments of 5 cm was ensured. In the laboratory the section was subsampled at 1 cm intervals and samples at 5 cm intervals were processed. Due to the fact that some truncation of the natural peat succession could be expected the analysis was started at the top sample, proceeding downwards. In total 2·81 m of sediment was extracted, the top of the section being the present vegetation-layer. Table 13 describes the stratification. The pollen sum in this section is based on the total

TABLE 13

The stratification of the peat sample from Lochan Mor

Depth in cm	Description
0–8	*Sphagnum* layer, continuing into present *Sphagnum* vegetation which is a very local patch.
8–64	Brown fibrous peat with some plant remains preserved.
64–115	Light brown fibrous peat with some seeds, probably *Carex* nuts.
115–142	Yellow brown peat, more decomposed.
142–155	Light brown fibrous peat.
155–214	Yellow brown peat, more decomposed.
214–245	Humus-rich clay, brownish with some blue mottle.
245–281	Blue clay, possibly of marine origin.

count of pollen and spores, less the counts of aquatics and *Sphagnum* spores. Only 60 cm of the total section was analysed because the pollen record confirmed the evidence that peat cuttings had taken place on the site. On the basis of the fluctuations in the various pollen-curves in the diagram, three local pollen-zones were identified, LoM 1, LoM 2 and LoM 3, (see fig 41 for the pollen diagram and Table 14 for the description of the curves).

TABLE 14

The Zonation of the Lochan Mor Pollen Diagram

Zone	Depth in cm	Description
LoM 3	1–10	Very low values for tree species. The grasses (*Gramineae*) increase and there is an increase in (*Ranunculacea*). At the bottom of this zone there is a peak in the sedges' (*Cyperaceae*) curve with a maximum value of 44·7%
LoM 2	10–50	The elm percentage declines from 49% at 50 cm depth to 11% at 45 cm depth, and the percentages of birch (*Betula*) and hazel (*Corylus*) also decline though there is a slight increase in pine (*Pinus*). The values for sedges are low with correspondingly high grass values (25% to 37%). The indicators of tillage are well represented throughout this zone, eg *Plantago lanceolata*, *Rumex acetosa/acetosella*, *Compositae*, *Caryophyllaceae*, *Cruciferae* and *Cerealia*.
LoM 1	50–60	This zone is dominated by high *Ericaceae*, *Sphagnum* and *Lycopodium* cf *inundatum* values with some *Cyperaceae* present. Elm forms 4·9% of the pollen sum. Willow (*Salix*), birch (*Betula*) and hazel (*Corylus*) are well represented though declining towards the end of the zone. There are low values for pine (*Pinus*), alder (*Alnus*), oak (*Quercus*) and rowan (*Sorbus*) throughout the zone.

Discussion

Zone LoM 1 (50 to 60 cm)

The high elm percentages and the relatively high values for birch and hazel during Zone 1 date the peat at the comparative level to a period preceding the elm-decline, ie pre-Sub-boreal. During this time birch and hazel formed the dominant tree-species on Iona while willow and rowan formed a minor element in the vegetation. The low alder percentages almost certainly mean that alder can be excluded from the species that formed the vegetation cover on Iona at that time. The low oak-pollen percentages probably derive from oak species growing on more sheltered places on the island, like the cliff footings on the E side of the island and from oak species growing on Mull. Pine was probably absent from the vegetation. The Lochan Mor basin itself probably carried a wet moorland vegetation with *Calluna vulgaris*, *Potentilla sp* (probably *P. erecta*), *Sphagnum* sp and *Osmunda regalis*. In the more mesotrophic areas, probably the W borders of Lochan Mor where small streams drained into the basin, *Filipendula* together with *Ranunculaceae* species, *Succisa pratensis*, *Umbelliferae* species and *Valeriana officinalis* grew. Presumably birch and hazel would have been growing on the raised-beach deposits to the E of Lochan Mor, in which case *Calluna vulgaris* and *Pteridium aquilinum*, bracken, formed the undergrowth. *Dryopteris* and *Polypodium* were present in the vegetation around the basin.

Zone LoM 2 (10 to 50 cm)

The beginning of Zone 2 is characterised by a decline in the indigenous trees and a decline in the elm pollen: heather also shows a remarkable decline. The decline in the elm curve is probably the 'elm-decline' traceable in many West European pollen diagrams and dates to the Atlantic Sub-boreal transition (c 3000 BC). The increase in grasses and herbs shows that a more open vegetation had replaced the earlier tree-cover. The presence of charcoal, cereals and ribwort plantain throughout this zone demonstrates the practice of tillage in the immediate vicinity of Lochan Mor. The decline in the indigenous trees is probably the effect of wood clearance by man to create arable land and provide timber. The area to the E of Lochan Mor, where a sandy soil formed by raised-beach deposits is present, is the most probable location of this farming. The fact that *Pinus*, *Quercus* and *Alnus* do not seem to have been affected by the clearance supports the idea that they were not indigenous to the island.

The *Gramineae* curve and the *Plantago lanceolata* curve are relatively high but no clear evidence can be deduced from the pollen diagram for the presence of pasture land. The increase in the *Potentilla*-type pollen can also be explained by assuming that the raised-beach area to the E of Lochan Mor was exploited and thus formed a habitat for *Potentilla anserina*, silverweed. The roots of silverweed might well have formed part of the diet: MacDonald (1977) referring to cultivation in the mid-19th century on Lewis says,

'During the planting season, when food supplies were low the roots of silverweed were eaten.' *Trifolium arvense*, present at the 40 cm level, grows in open and cultivated dry sand soils (Van Oostroom & Heukels, 1973) and thus also supports the idea of arable land on the raised-beach deposits to the E of Lochan Mor.

Zone LoM 3 (1 to 10 cm)

The pollen assemblage from the top three samples of Zone 3 is totally different from the lower material. The samples contain very little arboreal pollen but instead high grasses, sedges, *Sphagnum* and *Ranunculaceae* abound, indicating rather wet conditions. The present vegetation on the site is relatively wet, being dominated by grasses, patches of *Sphagnum* and some buttercups (*Ranunculaceae*). It is therefore very likely that the top of the LoM 3 zone reflects recent vegetational development on the mire surface and the area surrounding Lochan Mor. In samples 5 and 1 pollen of *Fraxinus excelsior* occur: ash still grows in the area round the monastery. The development of recent peat deposits sitting directly on top of what seems to be Sub-boreal peat deposits is explained by the peat cuttings referred to above. The peak in the sedges (10 cm level), probably caused by bog cotton (*Eriophorium* sp.), is likely to indicate the exact level of peat cuttings. Also the stratigraphical column shows a transition around that level (8 cm). The top sample does not contain any cereal pollen although at the time of sampling a field of oats was ripening just S of the Abbey less than 500 m away. This is a good example of just how localised is the spread of cereal pollen.

Conclusion

The Lochan Mor section shows the existence of Neolithic settlement on the island. The main settlement-area seems to have been the raised-beach deposits on the E of Lochan Mor, although there may have been other settlements on the island. Birch, hazel, willow and rowan seem to have been indigenous to the island but oak, pine and ash do not seem to be present on the island during late Atlantic and Sub-boreal time. Unfortunately, 18th-century peat cutting has removed the deposits representative of the later prehistoric period. It would be interesting to know when *Quercus* and *Fraxinus* became established on Iona since both were clearly present in the primary silt of Ditch 1.

APPENDIX 2

MACRO PLANT SAMPLES FROM DITCH 1

Alan D Fairweather

Introduction

The following report on some non-random samples collected from Ditch 1 suffers the obvious defect that it does not present a picture of the ditch which is truly representative at any level, and in general such pictures as it does present are at odds with those derived from the pollen analysis. The obvious question of why the samples were therefore collected and studied when such a situation was anticipated from the beginning is answered by the extraordinary degree of preservation (pl 26) of the material (even the green colouration survived) on the one hand, and the need to examine a range of specific questions on the other. Amongst the matters examined was the possibility that the masses of twigs, branches, leaves and ash-keys were the by-products of wood-working thrown into the ditch when trunks were cleaned in the vicinity. The considerable quantity of moss posed the possibility that it was latrine debris such as that found at Vindolanda (Seaward 1976, 123). In fact this proved not to be the case: the Early Christians apparently, unlike the Romans (Dickson *et al* 1980, 51), did not defaecate in their ditches. The various samples were examined for presence or absence of species; from the presence and frequency of remains a reconstruction of the vegetation in and around the immediate sampling-area was built up. No attempt was made at any quantitative analysis. The species present in each sample have been listed and their exclusiveness to the sample marked on the list for the sample (see Table 15); numbers of species found are stated. Individual species are discussed where they are considered indicators of particular soil or environmental conditions. Groups of co-occurrences are discussed, as a spread of species gives a more accurate indication of conditions and enables comparisons to be made.

Nomenclature follows that of Clapham *et al* (1962) for flowering plants and Smith (1978) for the mosses. Synonyms are also given for recently revised nomenclature in the moss flora. Common names are printed in the lists.

Methods

Samples were washed in water in a 125 micron sieve. The residue was heated to boiling point with a 5% solution of KOH for 10 minutes and the heated mixture was washed out again over the sieve to remove humic colloidal material. Once washed the residue was transferred by washing-out into a beaker. The material was then examined by pouring small amounts on to a Petrie dish below which a 1 mm squared graph paper was secured. The whole was placed under a 16X binocular microscope and the contents methodically scanned with the aid of numbered cm squares on the graph paper. Seeds and other identifiable material were transferred by fine sable brush or tweezers to marked containers. Extracted material was preserved in a 1:1:1 mixture of formaldehyde: methanol: glycerol. (Dickson 1970; Renfrew *et al* nd). Larger solid lumps of soil were first broken carefully along the bedding planes to expose leaves, leaf prints and larger remains. These were removed with care under water with the aid of droppers which squirted water around and under the remains which were removed from the mass by brush. It was found helpful to fill the dropper with methanol which when miscing with the water caused a vigorous local turbulence which helped to ease out particularly fragile material (eg thin leaves) with minimum damage. Material was lifted clear of the water, once extricated, by manoeuvring glass slides under the subject and lifting with the support of the glass. Such fragile samples were mounted on glass and photographed by M Brooks of the CEU. Very small seeds such as *Juncus* spp (where identification requires microscopic examination of the epidermis for cell shape and arrangement) were mounted on slides in gum chloral and filed for reference.

TABLE 15

List of species	Common name	Peat blocks				
		Lower	Middle	Upper		
				A	B	C
BRYOPHYTA						
Atrichum undulatum (Hedw.) Beauv	Mosses	×		×		
Bryum sp					×	
Dicranum sect *scoparium* (Hedw.)				×	×	
Drepanocladus exanulatus (BSG) Warnst.					×	
Drepanocladus fluitans (Hedw.) Warnst.					×	
Eurhynchium striatum (Hedw.) Schimp.					×	
Homalothecium sericium (Hedw.) Br. Eur. (syn. *Camptothecium sericium*)		×				
Hylocomium splendens (Hedw.) BSG			×	×	×	
Hylocomium brevirostre (Brid.) BSG					×	
Hypnum cupressiforme Hedw.				×		
Isothecium myosuroides Brid.			×			
Isothecium myurum Brid.				×		
Mnium hornum Hedw.				×		
Pleurozium schreberi (Brid.) Mitt.				×		
Rhytidiadelphus loreus (Hedw.) Warnst.				×		
Sphagnum palustre L			×		×	
Thamnobrium alopecurum (Hedw.) Nieuwl (syn. *Thamnium alopecurum* (Hedw.) Br. Eur.)				×		
Thuidium tamariscinum (Hedw.) BSG				×	×	
PTERIDOPHYTA						
	Unidentified Sporangia of ferns	×				
Athyrium felix-femina L (Roth)	Lady Fern	×				
Pteridium aquilinum L (Kuhn)	Bracken Fern			×		
SPERMATOPHYTA						
Anthriscus sylvestris L (Hoffm.)	Cow Parsley	×				×
Betula cf *pubescens* (Ehrh.)	Birch	×	×	×		
Calluna vulgaris L (Hull)	Heather	×	×	×	×	

[*Table 15 continued overleaf*]

TABLE 15 (*continued*)

List of species	Common name	Peat blocks				
		Lower	Middle	Upper		
				A	B	C
Cardamine pratensis L	Lady's Smock	×	×			
Carex cf *rostrata* Stokes	Sedges		×			
Carex spp (Various biconvex and trigonous nutlets not identified to species level)			×	×	×	×
Cirsium vulgare (Savi) Ten.	Spear Thistle					×
Corylus avellana L	Hazel	×			×	
Crataegus monogyna Jaca	Hawthorn					
Epilobium cf *parviflorum* Schreber	Hairy willowherb	×				
Erica cinerea L	Fine-leabed heath		×			
Fraxinus excelsior L	Ash	×				
Heracleum sphondylium L	Hogweed	×				
Ilex aquifolium L	Holly	×			×	
Iris pseudacorus L	Yellow Flag					×
Juncus articulatus L	Jointed rush				×	
Juncus bufonius L	Toad rush	×		×		×
Juncus effusius L	Soft rush		×	×	×	
Lychnis flos-cuculi L	Ragged robin	×				
Poa cf *annua* L	Annual meadowgrass					
Poa cf *pratensis* L	Smooth meadowgrass				×	
Poa trivialis L	Rough meadowgrass		×			×
Ranunculus flammula L	Lesser spearwort				×	
Ranunculus repens L	Creeping buttercup					×
Rumex acetosa L	Sorrel	×				
Rumex acetosella L	Sheep's sorrel		×			
Rumex obtusifolius L	Broad dock	×	×			
Rumex spp		×	×		× ×	×
Rubus fruticosus agg L (Sensu lato)	Bramble, blackberry	×	×			
Salix cf *atro-cinerea* (L) Brot.	Sallow	×			×	
Sambucus nigra L	Elder	×	×			×
Silene cf *dioica* (L) Clairv	Red campion	×				×
Sonchus asper (L) Hill	Prickly sowthistle					
Sorbus aucuparia L	Rowan	×	×			
Stellaria media (L) Vill	Chickweed	×	×		×	
Urtica dioica L	Nettle	×	×	×	×	×
Viola spp	Violet	×				
(56 spp total)						
Unidentified *Umbelliferae*		×				
Unidentified ribbed seed				×		
Unidentified large round seed				×		
(Totals 60 spp)		26	18	14	27	11

Interpretation of plant remains from the lowest peat block

The most abundant seeds were those of *Sambucus nigra* (elder), *Rubus fruticosus* agg (bramble) and *Urtica dioica* (nettle) with many ash (*Fraxinus excelsior*) keys layered through the sample between leaves of *Ilex* and *Salix* (holly and sallow). Fragments of rowan (*Sorbus aucuparia*) seeds could have been imported and voided in bird droppings: the elder and bramble seeds did not show signs of scarification indicative of avian digestion. A few seeds of birch (*Betula* cf *pubescens*) may have been blown in by wind, as a greater concentration of seeds would be expected had the tree been nearby. Hazel (*Corylus avellana*) nuts collected from the sample site contained 7·5% entire shells by weight; the rest were fragments. (Total weight 88·5 g; 12 entire weighing 6·5 g). These entire shells might indicate importation of the nuts for food. None of the shells bore evidence of teeth-marks consistent with small-mammal activity. The frequency of bramble and elder seeds may also indicate their use as a human food source.

The non-woody herb component was most strongly represented by seeds of *Urtica dioica* (nettle, present in all samples) which is an indicator of high soil nitrogen and phosphate levels. The phosphate

level would tend to be confirmed by the abundance of elder, cow parsley (*Anthriscus sylvestris*), hogweed (*Heracleum sphondylium*) and some seeds of red campion (*Silence* cf *dioica*) (Pigott & Taylor 1964). The ephemeral chickweed (*Stellaria media*) would indicate disturbed or bare soil-patches uncolonised by perennials but comparatively rich. *Anthriscus sylvestris* (cow parsley) and other *umbelliferae* (one unidentified) and *Silene* cf *dioica* are common components of the hedgerow or wood edge, being reasonably shade-tolerant. The lady's smock (*Cardamine pratensis*) and ragged robin (*Lynchnis flos-cucili*) are both species of damp meadows or hedgerows. Violets (two *Viola* spp not identified beyond subgeneric level) are common constituents of damp, shady hedge and bank flora. *Juncus bufonius* (toad rush) is typical of areas subject to temporary flooding but with a consistently high water-table such as at pool or stream edges. *Carex* spp require similar conditions. (The identification of sedge nutlets except for a few species is particularly difficult and more accurate habitat-estimation is not possible). The moss *Atrichum undulatum* is tolerant of most environments but is commonest on a neutral to acid substrata on rocks or banks by stream sides.

In summary the remains present would indicate that the ditch was close to an established hedge or wood edge (confirmed by the number of woody species represented) and that the bank was nutrient-rich especially in phosphate (Pigott & Taylor 1964) (*Urtica*, *Sambucus*, *Anthriscus*, *Silene*). A varying water level in the ditch was likely but with a consistently high water table, *Stellaria* possibly colonising the bare soil left as the water level dropped in summer. Drier more acid heath conditions close by would be indicated by the *Calluna* and *Betula* although these could have grown on a drier poorer part of the bank.

Interpretation of plant remains from the central peat block

This soil sample was smaller than the others and larger remains such as leaves were not found. The woody hedgerow or wood-edge species were only represented by seeds of elder (*Sambucus nigra*) and bramble (*Rubus fruticosus*) with broken seeds of rowan (*Sorbus aucuparia*): the latter could have been imported and voided in bird droppings. Sedges (*Carex* spp), represented by biconvex nutlets and the trigonous nutlets of *Carex* cf *rostrata* in some number, with frequent seeds of *Juncus effusus* (soft rush), would point to wetter conditions. *J effusus* is typically found along water edges of pools or wet acid environments with disturbed edges (Van Geel 1978). *J effusus*, *C rostrata* and *Sphagnum palustre* are often found in close association on peaty gleys or podzols of pH 4·5 to 5·0 (Ratcliffe 1964). Of the *Rumex* spp found in the sample two seed-types could be identified to species level. These were *R obfusifolius* (broad dock) and *R acetosella* (sheep's sorrel). The former is tolerant of a very wide range of conditions whilst the latter is an indicator of poor, acid (especially sandy) soil conditions. (It was not however present in large enough numbers to aver that it grew on the sample site and it most probably blew in).

Urtica dioica (nettle) seeds were not as frequent as in other samples but were still common and would indicate the presence of a nitrogen- and phosphate-rich free-draining friable soil. *Stellaria media* would again indicate nutrient-rich bare ground or a disturbed zone uncolonised by perennials. *Cardamine pratensis* (lady's smock) and *Poa trivialis* (rough meadowgrass) are common in a damp hedgerow or wet meadow environment. Buds of *Calluna vulgaris* (ling heather) and a seed of *Erica cinerea* (bell heather would be consistent with the proximity of acid heath and relatively drier conditions. They would be atypical of the community already described and were probably imported by wind-blow. The moss *Hylocomium splendens* is most commonly found growing in grass heath communities and does not tolerate waterlogged or extremely acid conditions. It was most probably growing on the drier parts of the ditch bank. *Isothecium myosuroides* is a moss that is tolerant of acid conditions and most frequently grows on stones and tree stumps in a moist habitat.

The assemblage would suggest a ditch bottom with stands of *Juncus effusus* and *Carex* spp with *Sphagnum palustre* hummocks between. Open patches or bare soil were colonised by *Stellaria media* on the sides or at the water margin. The sides being more freely drained would have *Poa trivialis* and probably other grasses with the moss *Hylocomium splendens* growing in association. The drier bank-top would have elder, bramble and nettle, suggesting a free-draining nitrogen- and phosphate-rich soil.

Interpretation of plant remains from the upper peat block (Sample A)

The main bulk of the moss remains comprised *Thuidium tamariscinum* which is commonly found in association with *Rhytidiadelphus loreus* and *Hylocomium splendens* as it is here. These three moss species

when found together tend to indicate well-drained grassy slopes often with an acidic reaction. *T tamariscinum* is calcifuge and favours a heavy soil and is often found on hedge banks. Both *R loreus* and *H splendens* are similarly calcifuge and will not colonise waterlogged substrata. Both *Dicranum scoparium* and *Hypnum cupressiforme* are mosses with several ecotypes and will tolerate a wide spectrum of environmental conditions. The latter is commonly found on grassy heath with *Thuidium*, *Hylocomium* and *R loreus*. *Atrichum undulatum* is found in similar conditions to those related above and most often on acidic mineral soils (Watson 1968, Smith 1978).

Juncus bufonius (toad rush) is typical of areas subject to temporary flooding or variable water-level at pool edges (Salisbury 1961). *J effusus* (as mentioned above) is found by disturbed water-margins often with *Carex* spp (sedge) in an acid or base-poor site (Ratcliffe 1964, Van Geel 1978). Some seeds of *Betula* cf *pubescens* were found but it is probable that they blew-in from outside the immediate area as the concentration of seeds would otherwise have been greater. A bud of *Calluna vulgaris* (ling heather) was also found which was probably also from outside the ditch, *Calluna* preferring a drier site perhaps on top of the bank. Seeds of *Urtica dioica* (nettle) were present as in all other samples. The nettle probably grew on drier ground further up at the top of the bank.

The assemblage of mosses with *Juncus* and *Carex* would indicate a base-poor soil condition and a lack of physical disturbance.

Interpretation of a deposit of moss within the upper peat block (Sample B)

Dicranum sect *scoparium* is a moss with many ecotypes and may be found in almost any habitat: if anything it is slightly calcifuge. *Mnium hornum* is a common moss with a wide habitat-range but with a preference for acidic conditions, often found on humus, wood and rocks. The closely allied *Drepanocladus exanulatus* and *D fluitans* are both calcifuge and typical of acid conditions especially acid peat-bog; they will tolerate submersions and are often found by streamsides or pools. Similarly *Thamnobryum alopecurum* is found in very wet and often shady habitats on rocks or tree-roots, tolerating submersion. (One ecotype of *T alopecurum* in a smaller form is found in drier more calcareous conditions.)

Hylocomium splendens is most often found in association with flowering plants, frequently on grassy slopes or at wood edges or hedge-banks, and is commonly associated with *Pleurozium schreberi* and *Thuidium tamariscinum P schreberi* is calcifuge and strongly indicative of acid conditions but avoids a very wet habitat. *T tamariscinum* is common on heavy clay soils and hedge-banks avoiding calcareous conditions. *Isothecium myurum* is less acid tolerant than *Isothecium myosuroides* (see middle peat block) and favours rotting wood and stumps and tree-bases in a moist shaded habitat. *Eurhynchium striatum* in contrast to the previous species favours base-rich soils or calciferous substrata; it is however common in hedge banks. It will colonise calcareous pockets in walls and may have grown on a pocket of calcareous sand (common on Iona). *Hylocomium brevirostre*, like *E striatum*, is basiphilous and often found on damp basic walls or on humus-capped stream-side boulders in the shade. Pinnae of *Pteridium aquilinum* (bracken fern) were found in the sample. Bracken requires a depth of at least 20 cm of free-draining soil and the plant was probably growing in the top of the bank or freer-draining sides. Buds of *Calluna* (ling heather) and seeds of *Betula* (birch) were found and were probably blown-in from surrounding heath or the drier top of the bank. Birch seeds were not found in sufficient numbers to indicate the immediate proximity of the tree.

Pieces of *Corylus* (hazel) nuts were found and may have been imported as a food source. *Ilex* (holly) and *Salix* (willow) leaves were found in layers indicating the proximity of these species. *Juncus articulatus* (jointed rush) and *Juncus effusus* (soft rush) seeds were found in some abundance together with *Carex* (sedge) nutlets (both trigonous and biconvex nutlets) indicating a marshy and consistently high water-table which was probably acid. *Rumex* spp (dock or sorrels) too damaged to determine species were present as were the caryopses of *Poa pratensis* (smooth meadowgrass) common in many habitats. Numerous seeds of *Ranunculus flammula* (lesser spearwort) would indicate a wet acidic situation (Gimingham 1964). *R flammula* will tolerate submergence but will not grow in fast-flowing water (Haslam *et al* 1975). Seeds of *Urtica* (nettle) were present indicating a nitrogen- and phosphate-rich soil probably on the freer-draining bank. *Stellaria* (chickweed) was again present indicating bare-soil colonisation.

The remains from the upper peat block indicate a freely-drained hedge or wood edge, with holly, sallow, bracken, nettle and heather growing nearby. The ditch would seem to have been much wetter and less disturbed than in other samples as evidenced by the extensive moss flora. The association of *Juncus*,

Carex, *Sphagnum* and *R flammula* with calcifuge mosses would indicate more acid wet conditions on the ditch bottom.

Interpretation of Plant Remains From the Upper Peat Block (Sample C)

The only woody hedgerow species was represented by the seeds of *Sambucus nigra* (elder). *Urtica* (nettle) was again present in some numbers indicating a freely-draining soil probably on the bank-top with available nitrogen and phosphate (Pigott & Taylor 1964). *Anthriscus sylvestris* confirms the availability of phosphate (Jermy *et al* 1978) as does the presence of *Silene* cf *dioica* and *Sambucus nigra* (Pigott & Taylor 1964). A consistently high water-table with perhaps seasonal flooding is indicated by the presence of *Iris pseudacorus*, *Carex* spp and *J bufonius*. *Ranunculas repens* (creeping buttercup) is a typical member of moist heavy soil associations. *Poa trivialis* is a grass favouring moist shady habitats but will in fact grow in most places.

The species found indicate a damp area, dominated by acid- and nutrient-poor *Juncus*, *Carex* and *Iris*, above which a freer-draining bank, nutrient-rich, especially in phosphates, is suggested with *Urtica* and *Sambucus* as physiognomic dominants.

Species not currently recorded, or recorded as recent introductions to Iona

Ilex, *Fraxinus*, *Salix atrocinerea*, *Hylocomium brevirostre*, *Isothecium myurum*, *Drepanocladus exanulatus:*

Ilex aquifolium (holly) is recorded as present in Jermy & Crabbe (1978) but is not recorded in the *Atlas of the British Flora* (Perring & Walters 1976). The former work being the more recent and more comprehensive specifically to Mull (including Iona) is probably more accurate. (Millar (1972) does not mention the tree). The lack of berries in the sample could be because the tree specimen(s) was a male (the tree is dioecious), or immature, or isolated from pollinating agents. Climatic factors or shading can have an effect on flowering: a lack of July sun, low temperatures and late frosts can adversely affect flowering (Peterken & Lloyd 1967).

Fraxinus excelsior (ash) is recorded in the *Atlas of the British Flora* (Perring & Walters 1976) as a recent introduction; Jermy & Crabbe (1978) regard it as recently planted around houses; it is not mentioned in Millar (1972). *Salix atrocinerea* although mentioned in Millar (1972) is regarded by Jermy & Crabbe (1978) as a misidentification for *Salix aurita: S atrocinerea* is not recorded for Iona by Jermy & Crabbe (1978) or in Perring & Walters (1976). The fossil leaves examined would seem most closely to resemble those of *S atrocinerea* but could be hybrids with *S aurita* or *S caprea*, both currently present. It is hard to give positive identification without twigs and catkins in addition to leaves. *Drepanocladus exanulatus*, *Hylocomium breverostre* and *Isothecium myurum* are not recorded as present on Iona but are currently present on different parts of Mull (Jermy & Crabbe 1978).

Beetle fragments found in this sample are of dung beetles but may have been deposited in an owl- or hawk-pellet. Beetle parts, identified as genus *Geotrupes* by Dr Pelham-Clinter (Royal Scottish Museum) were found elsewhere in this deposit. Other deposits also contained insect remains but these conveyed little environmental information since many insects very probably flew into or were washed into Ditch 1.

APPENDIX 3

NOTE ON THE FISH MOTIF

H Richardson

The fish was frequently used as a Christian symbol from very early times (fig 50a). It is generally believed to have arisen from an acrostic on the initial letters in Greek of the words 'Jesus Christ, Son of God, Saviour', which also form the Greek word for fish. On the other hand, the fish is often found as a symbol of baptism, together with the association of living water, representing the Holy Spirit. Tertullian, *On Baptism* (c 200 AD) says, 'But we, little fish, are born in water' (*On Baptism* 1, 3).

In the British Isles possibly the best known example of a fish is the three-dimensional trout-like fish, spotted with enamel, which was mounted inside the large hanging-bowl found at Sutton Hoo. This

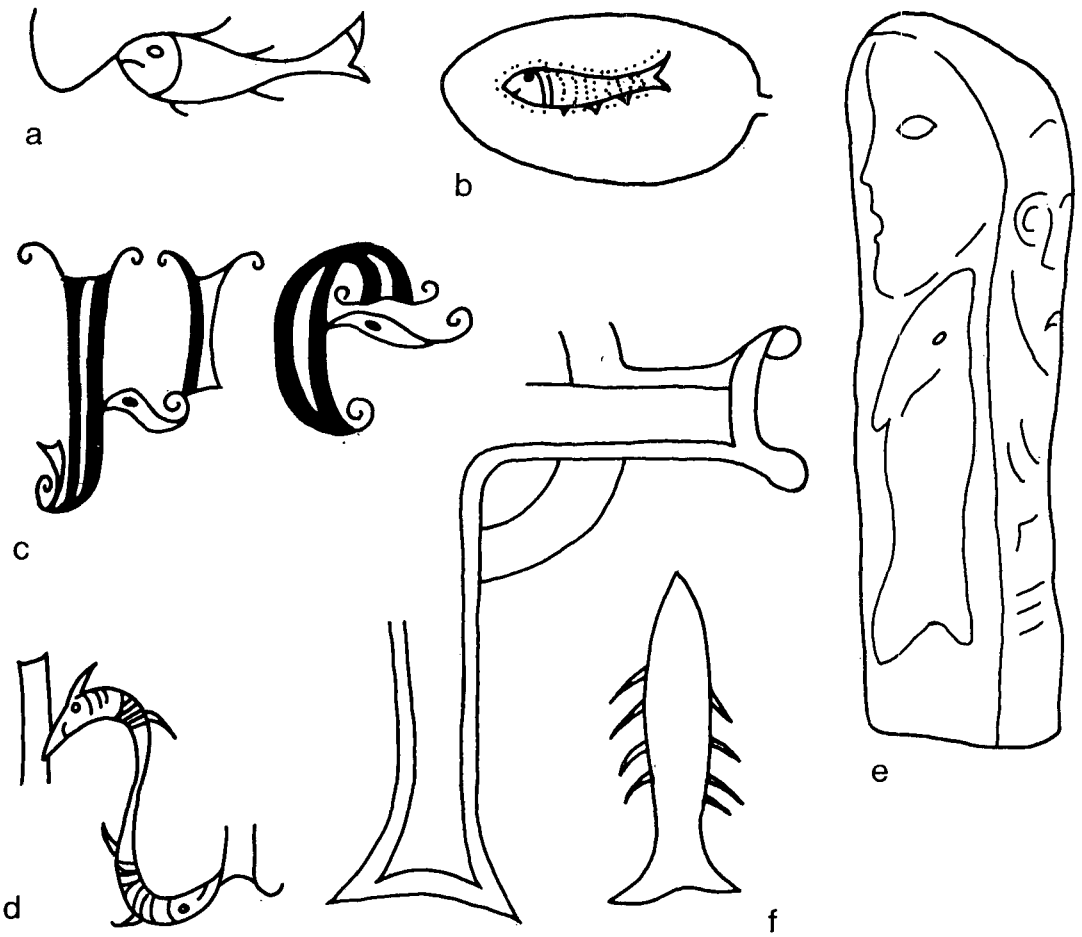


FIG 50 Examples of Early Christian fish motifs: a, Catacomb of Domitilla, early 4th century, Rome; b, Inside bowl of silver spoon, Traprain Law, Edinburgh NMAS; c, Initial N (fol 36r) and E (fol 22r), Cathach, Dublin (RIA); d, Detail of Initial N, p 2, S45, Milan Bibl. Ambrosiana; e Pillar, Carndonagh; f Detail of grave slab, Fuerty (Roscommon). Not to Scale.

probably dates from c 500 AD as it was a precious antique at the time of its burial c 625 AD. Most authorities consider it to be of Irish workmanship. A fish is engraved on one of the silver spoons in the Traprain Law Treasure near Edinburgh, dating from late Roman times (fig 50b). The Faversham hanging-bowl escutcheon consists of two dolphins supporting a central cross, definitely indicating the Christian context of the bowl to which it was attached.

In Ireland fish-like creatures decorating initial letters are found in the earliest known manuscripts. Quite a number occur in the *Cathach* of late-6th or early-7th century date and traditionally linked with St Columba: sometimes only an eye betrays a fishy presence in a design of curved lines (fig 50c). Two interlocked fish form the cross-bar of a letter in an early-7th century manuscript, S 45, of the Ambrosian Library, Milan. The hatching on the bodies appears on the Iona 'fish' too (fig 50d).

In Donegal, not so far from where St Colmcille (Columba) took his leave of Ireland, salmon-like fish are carved on the rather strange short pillars at Carndonagh which are probably of an early date (fig 50e), while at Fuerty, Co Roscommon, an inscribed grave slab, with a cross and accompanying fish (fig 50f), may be assumed to commemorate an Abbot of Clonmacnois who, according to the annals, died in 865 AD.

It would be very far-fetched, judging from the evidence we have, to even suggest that this wooden handle from Iona might have been intended as an implement used in baptism. Nevertheless, it is useful to remember how people must have flocked to famous holy men to be baptised, and Adomnán in his *Life of Columba*, for instance, makes a number of references to the rites of baptism being performed.

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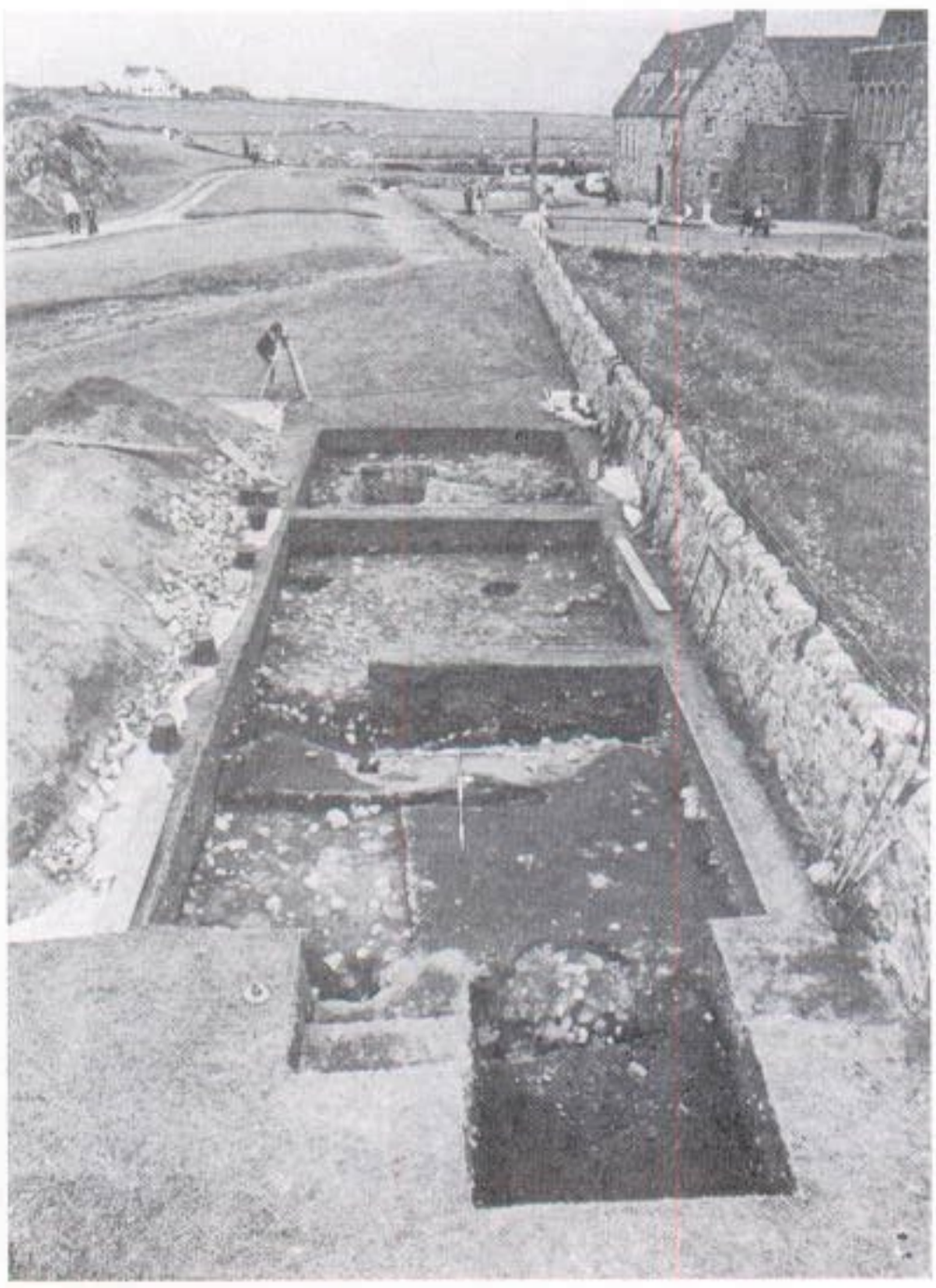
a Iona: general view of the Monastic Area



b Iona: cuttings A, B and C viewed from Relig Oran

a Bands of stones and silt in Ditch 2 illustrate the nature of the deliberately backfilled material

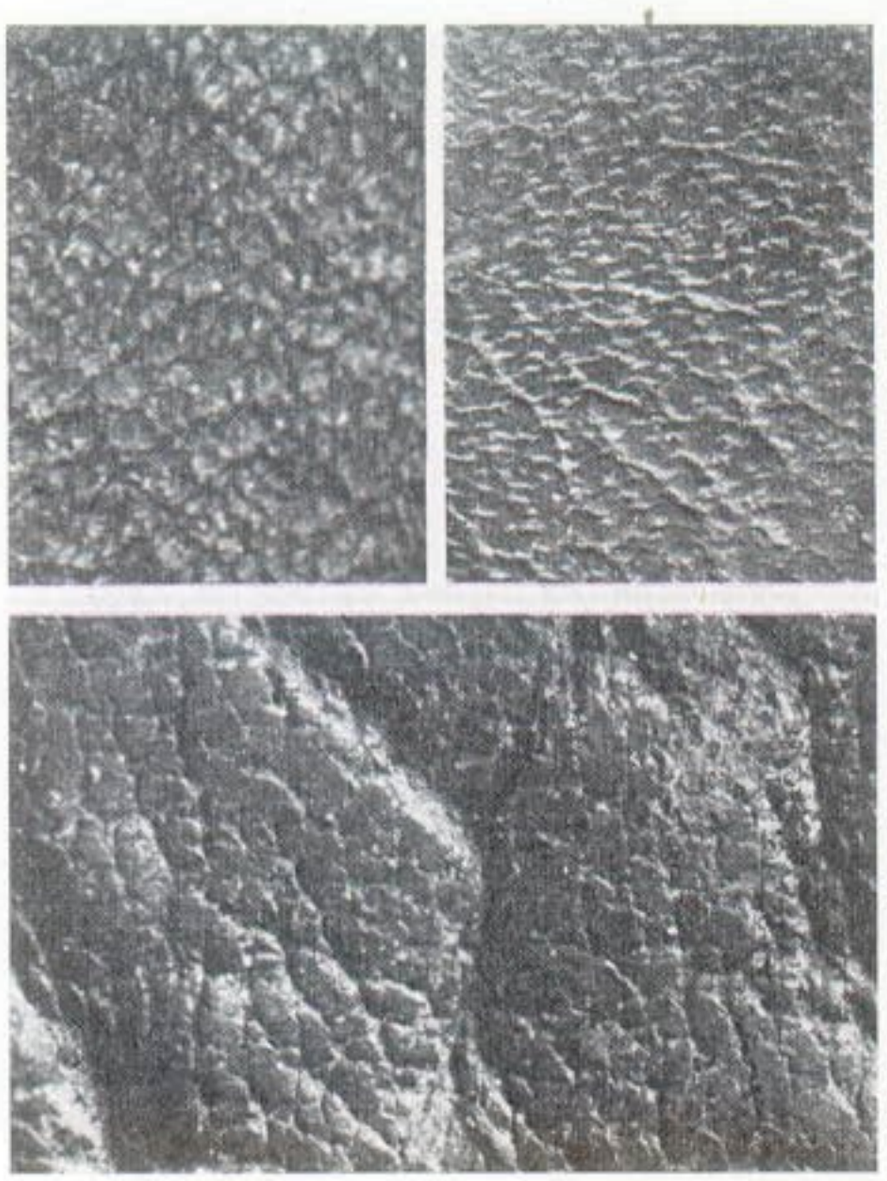
b Nested stones mark the position of a post-hole in the outer arc of the E settings

a

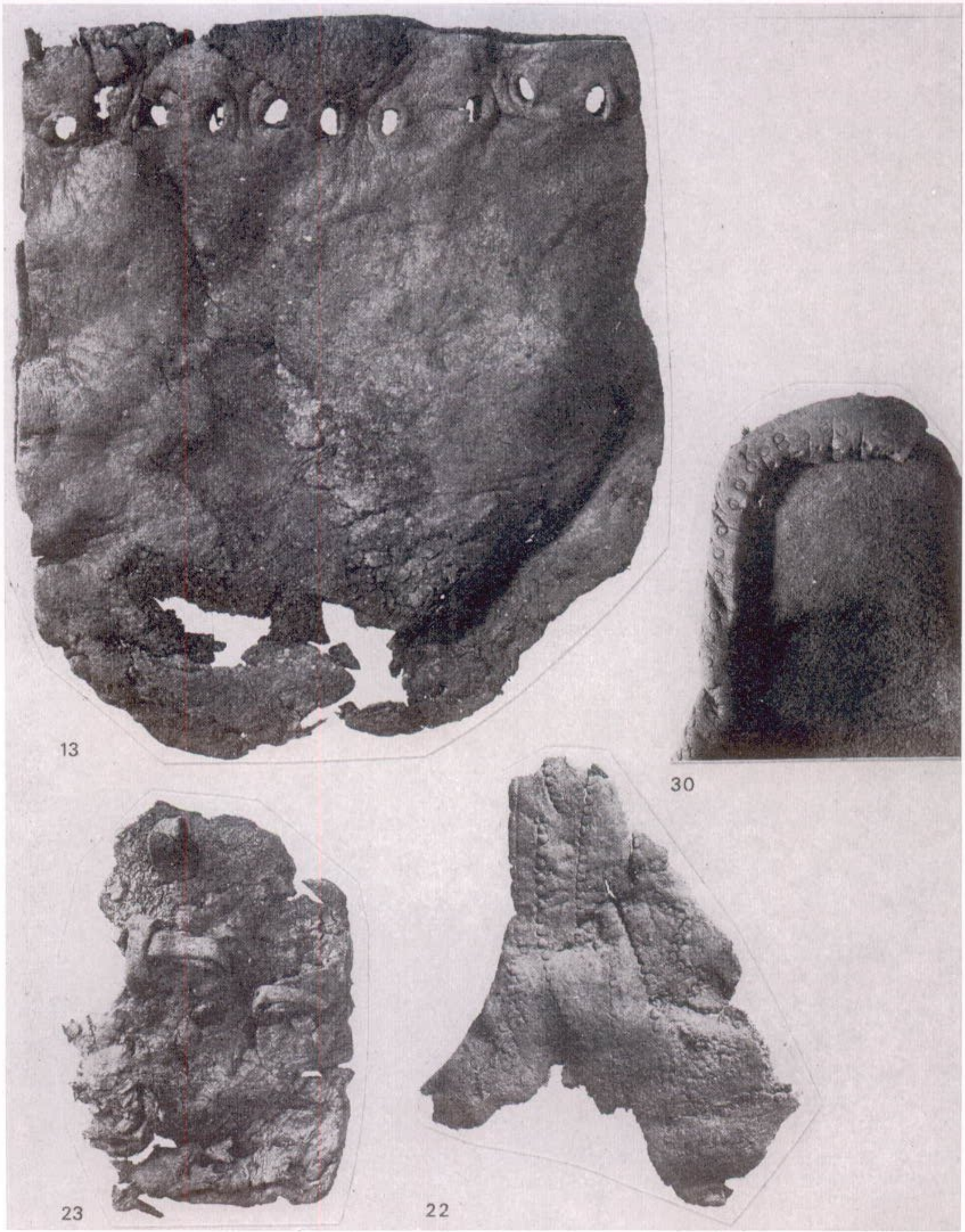
b

a & b The stone-lined feature (no 4 fig 5) which is interpreted as part of a grain drying kiln: it is medieval in date

a Mill-stone re-used as a cross-base beside the Road of the Dead



b Grain pattern of sealskin no 10 (top); horsehide no F444/4 (bottom left); red deerskin no 14 (bottom right) (Photo IPP. Scale 17:1)



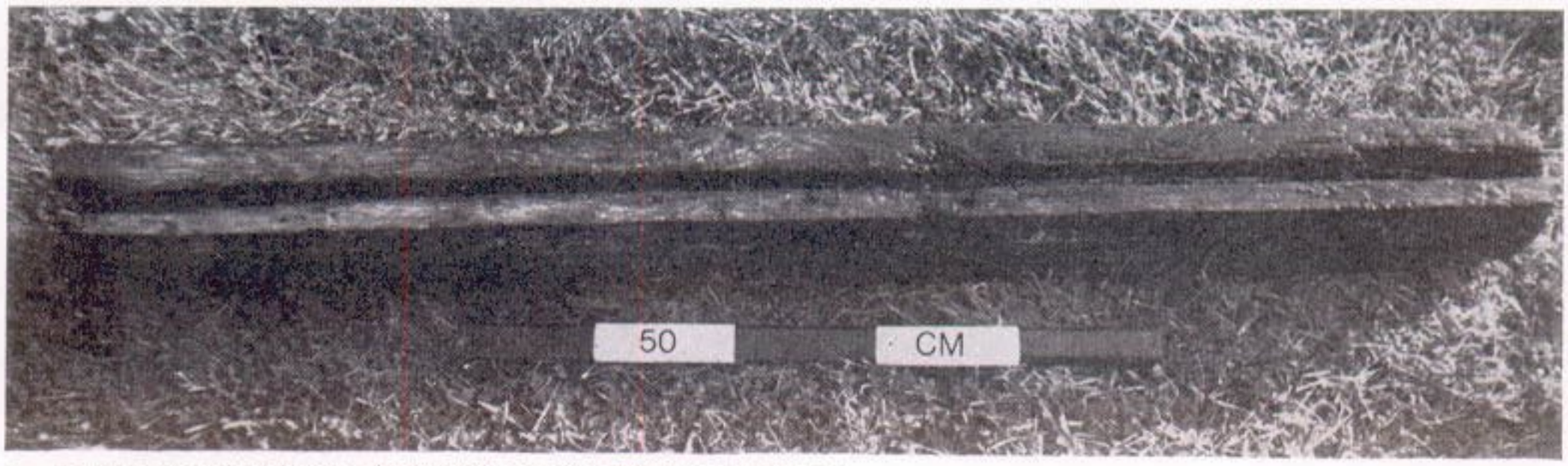
One half of purse no 13; decorated fragment no 22; heel stiffener no 30; fragment held together by leather strap(s) no 23; nos 13, 22-23, grain side; no 30 flesh side (Photo IPP. Scale 1:1)

a Bowl 1

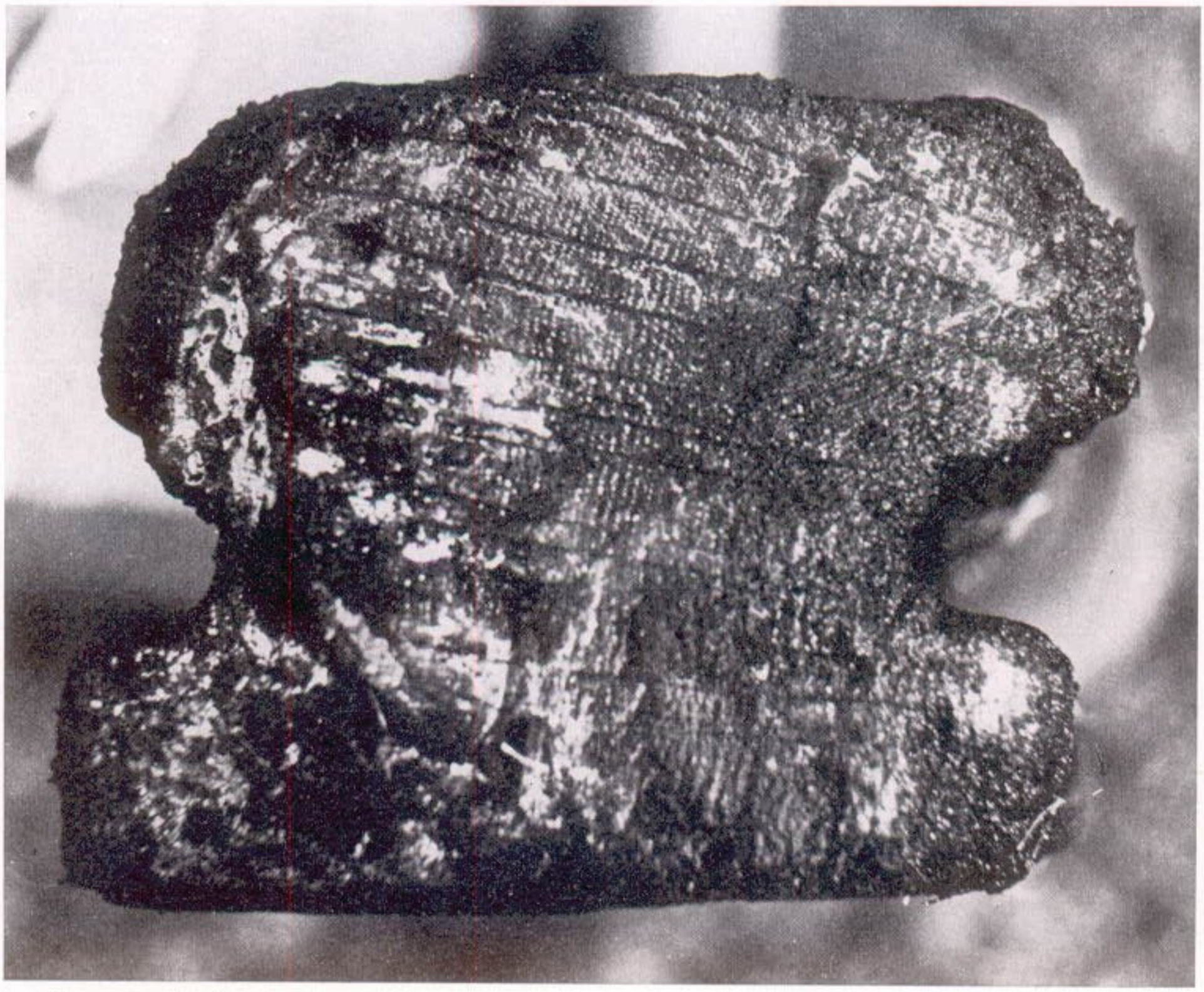
b The interior base of Bowl 1 showing the scars left by the use of a gouge to clean the centre following removal of the waster

a A range of lathe-turning wasters

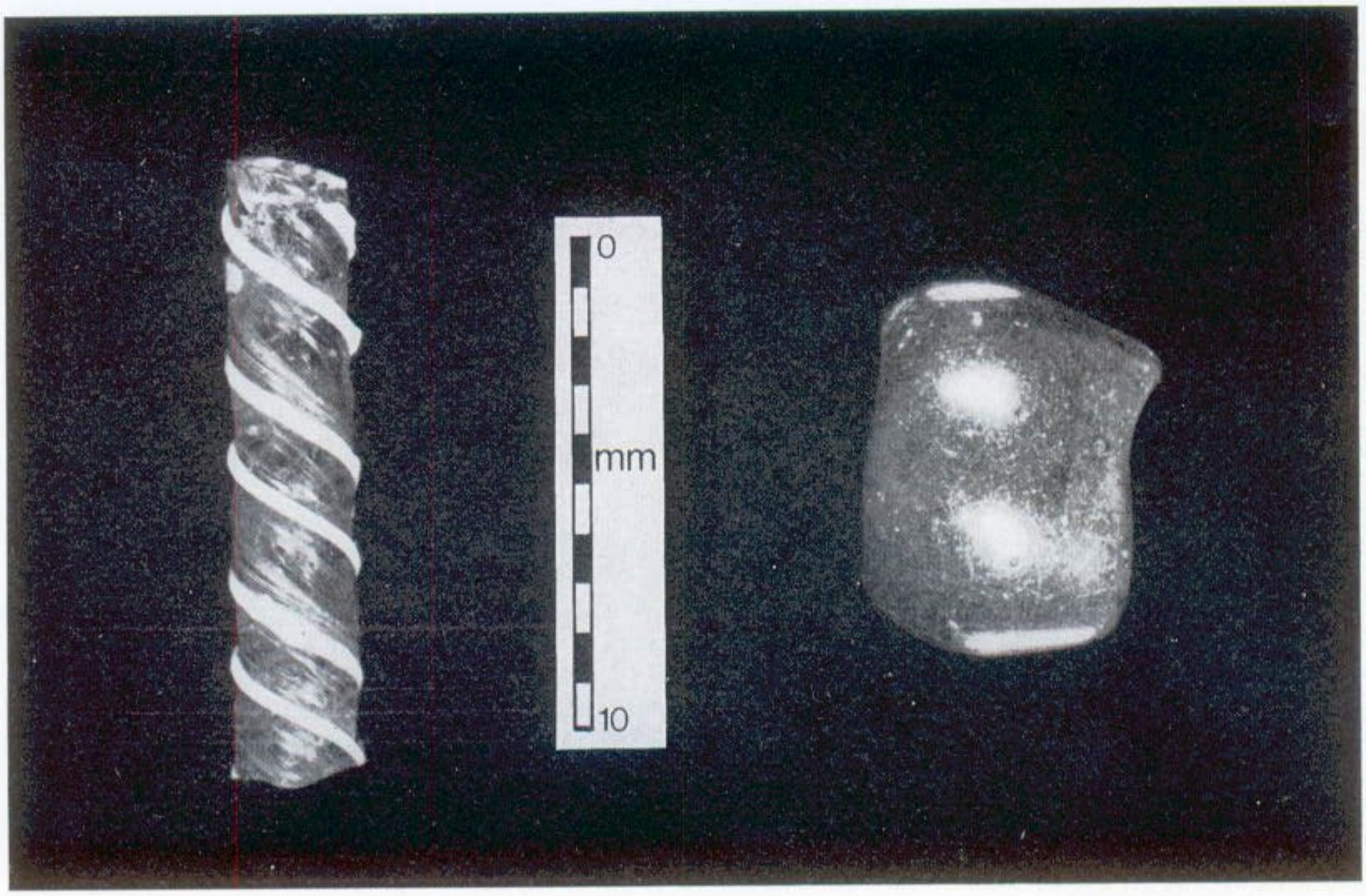
b The tops of two wasters showing the pyramidal cut (left) and one of the less frequent cylindrical fixing-holes (right)



a Large wooden beam (447/196 on fig 37) from Ditch 1



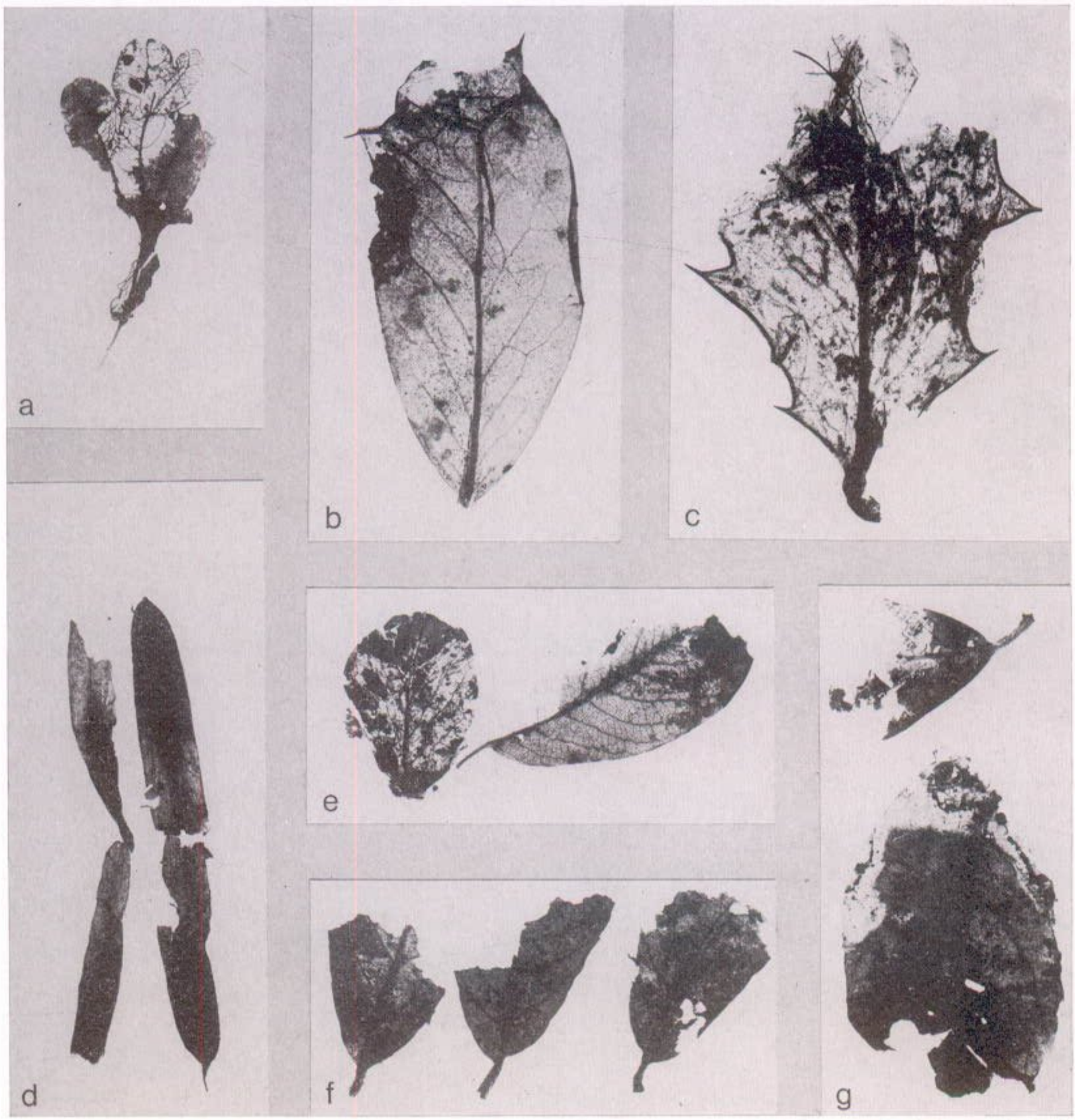
b View of end of beam



The glass rod (blue with yellow spiral) and bead (blue) from Pit 156

a Aerial photograph (RCAMS) showing the *vallum* earthworks N of the Abbey

b Aerial view (RCAMS) from W of the Abbey in which the apparent continuation of Ditch 1 is visible curving round to the farm access-road and thence S to run under the S end of the hotel



Macro-plant remains from Ditch 1. Leaves of Hawthorn (*Crategus monagyna*) (a) and holly (*Ilex aquifolium*) (b and c) and keys of ash (*Fraxinus excelsior*) (d). (e, f and g still to be identified). Even the green pigment of these leaves survives