

# A buried wall in peatland by Sheshader, Isle of Lewis

P J Newell\*

## SUMMARY

*Evidence from the pollen and macrofossil stratigraphy of a buried podzol and blanket peat at Sheshader, Isle of Lewis, suggests that for some time prior to c 3700 bp a woodland or scrub of hazel and birch was replaced by grazed grassland. This gave way to communities typical of moorland. Where blanket peat had developed to a depth of 20 cm on a slope at one point a stone wall was constructed c 2900 bp. During approximately the first 1900 radiocarbon years of peat formation there are indicators of pastoral agriculture; possibly cereal cultivation was practised at certain periods nearby. Thereafter, there may have been a slight recovery of scrub more regionally. Close to the top of the sequence arable cultivation near to the site is clearly shown.*

*The results are set against other investigations of enclosure and settlement in Scotland before the middle of the first millennium bc, where palaeobotanical information is available. A need for grazing land is perhaps demonstrated by the enclosure of moorland and a brief dominance of a grassland vegetation; burnt plant remains in the deposits hint at deliberate interference and latterly management of the vegetation.*

## INTRODUCTION

### BACKGROUND

A buried field-wall at Sheshader, Isle of Lewis (NGR NB 555 348) was reported to Mr T G Cowie, during the course of a survey of coastal erosion on Harris and Lewis, in 1978. Being part of a peat bank that was seasonally cut, the line of the wall (in so far as it could be made out) was surveyed and a vertical sequence of the peat and underlying mineral soil was taken in monolith boxes. In view of other discoveries of buried walls on the island it was hoped to place the wall at Sheshader in an environmental context and to ascertain, at least approximately, the time of its construction.

### METHODOLOGY

From pollen and macrofossil analyses of the collected peat and soil a history of the vegetation of the site and its surroundings was to be inferred, with a chronology provided by radiocarbon dates. In order to see the stratigraphical position of the wall within the peat- and soil-profile limited archaeological excavation was necessary; and to correlate its position within the inferred vegetational history, further samples for palaeobotanical analyses were required.

\* School of Geography, University of Birmingham

## ARCHAEOLOGICAL EXCAVATION

### THE SITE

The solid geology of the Eye Peninsula is largely Precambrian gneiss (Smith & Fettes 1979). That the Peninsula was glaciated during the Late Devensian is shown by the surfaces examined to the south-east of Sheshader (Peacock 1984, 7) and the ice-transported shell deposits at Garrabost (Sutherland & Walker 1984). The parent material for the mineral soil formation is of fragmented rock in a matrix of sand. It is likely that the buried soil is comparable to the type described as a 'peaty podzol with ironpan' (Glentworth 1979).

The course of the buried wall intersects the peat bank a short distance from the highest point of the ground that falls to the Dibidale Burn to the north (see illus 1). There is a slight local concavity of slope which may have meant that the drainage downslope was to a degree impeded. To the east of the peat bank the moorland shows signs of having been cut over; to the west the peat has been removed so that there is only a relatively thin cover over the mineral soil, some of the cover being effectively 'made ground', comprising the top turves of the bank thrown down during cutting.

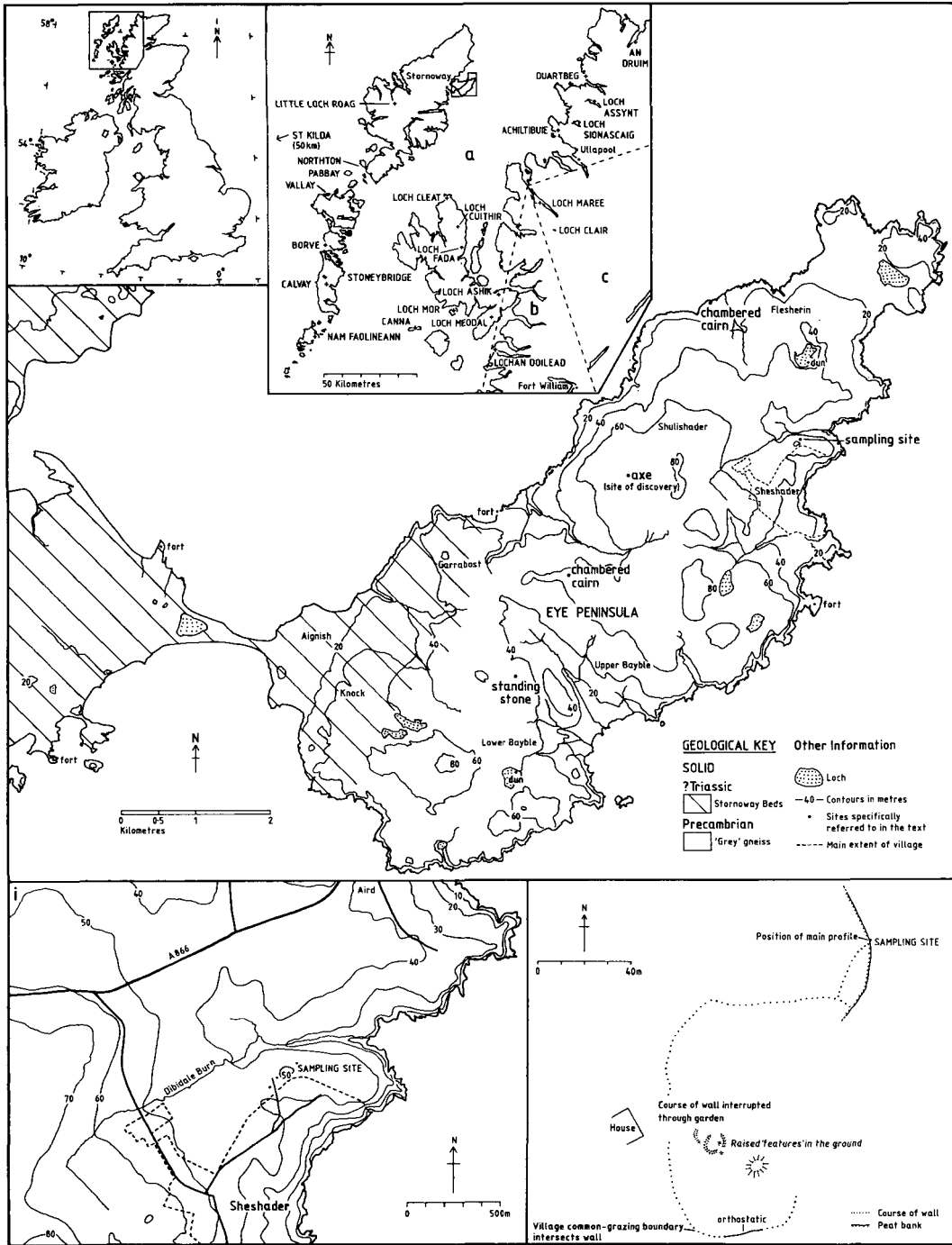
### EXCAVATION

Initially, a small area was opened by removing the turves that surrounded and covered some of the wall; these were turves placed at the foot of the peat bank following the practice described above. When the extent of the stones had been defined, the peat surrounding them, which was *in situ*, was cut away to the top of the mineral substratum. Drainage for the site was obtained by cutting the peat where a large stone had been removed in 1978 (see illus 2). It was observed that the collapsed wall rested on about 20 cm of highly humified peat, which, when freshly exposed, was a mid-brown colour, becoming very dark soon after exposure to air; bands of darker peat were noted in this. The excavation was extended later (the western part of the excavation area) and further sectioning confirmed the same essential stratigraphy from the mineral soil to the spread of stones as seen before. The important results, with the position of samples analysed for pollen and that taken for radiocarbon dating, are shown on illus 2 & 3 (see also illus 4 & 5).

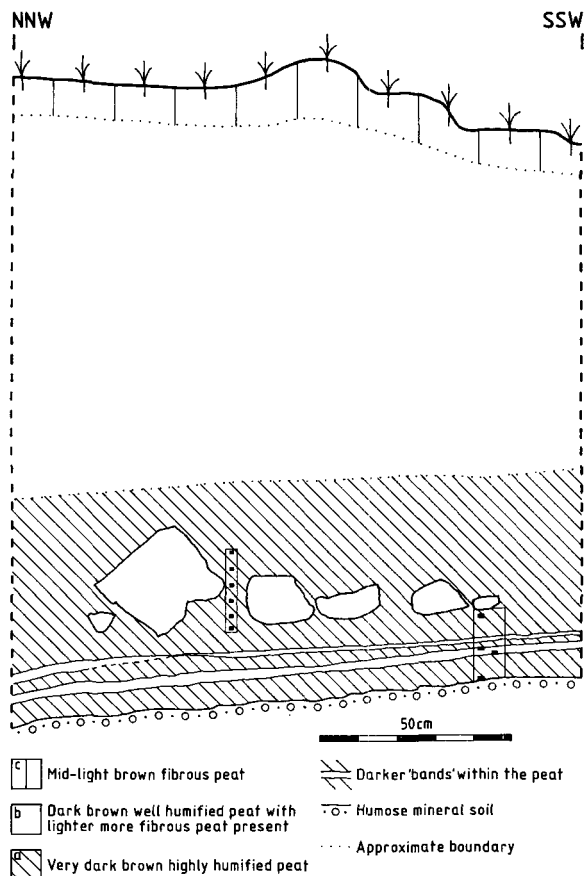
## VEGETATIONAL HISTORY

### THE SITE

As indicated, the vegetation of the site today is one of moorland. At the site the area most cut over is dominated by *Calluna vulgaris* (heather), *Eriophorum angustifolium* (common cotton-grass), *Tricophorum cespitosum* (deer-grass) and *Molinia caerulea* (purple moor-grass), with frequent patches of moss including *Sphagnum* (bog-moss) spp and *Racomitrium lanuginosum* (woolly-haired moss). To the east of the peat bank the vegetation is broadly similar, although less disturbed by cutting; gullies caused by erosion occur between peat that supports hummocks of *Calluna* capped by *Racomitrium lanuginosum*. Towards the cliff edge further east, the moorland is fringed by a grassy sward in which there is abundant *Succisa pratensis* (devil's-bit scabious), with *Potentilla erecta* (common tormentil) and *Leontodon autumnalis* (autumnal hawkbit). *Plantago lanceolata* (ribwort) and *P. maritima* (sea plantain) are present along sheepwalks. The banks of the Dibidale Burn are predominantly covered by grass; on the north side of the burn the moorland has been reseeded to make grass pasture.



ILLUS 1 Simplified geology of the Eye Peninsula (after Smith & Fettes 1979); the sampling site at Sheshader and archaeological sites are also shown. Inset maps show the topography of the site in more detail, the course of the field-wall and selected sites of previous palaeoecological investigations (the zones a, b and c are those of McVean & Ratcliffe (1962), respectively: predominant birch forest, predominant oak forest with birch and predominant pine forest with birch and oak). Key to sites: LLR, Birks & Madsen (1979); D, Moar (1969); AD, LAss, LD, Birks (1980); A, Lamb (1964); LS, LC, Pennington *et al* (1972); LMa, Birks (1972); LC1e, LAsh, LMe, Birks & Williams (1983); LCu, LF, Vasari and Vasari (1968); LMo, Heslop Harrison (1948); Can, Flenley & Pearson (1967); NF, Blackburn (1946); Cal, S, Heslop Harrison & Blackburn (1946); B, Ritchie (1966); V, P, Elton (1938); N, Burleigh *et al* (1973); SK, Walker (1984)



ILLUS 2 Elevation of the peat bank at Sheshader (in 1981) showing the stones of the field-wall in section and the positions of the samples taken for pollen analysis. The principal units of peat stratigraphy (a, b, c) noted in the field are drawn schematically and broadly correspond to the three largest units identified in the main profile

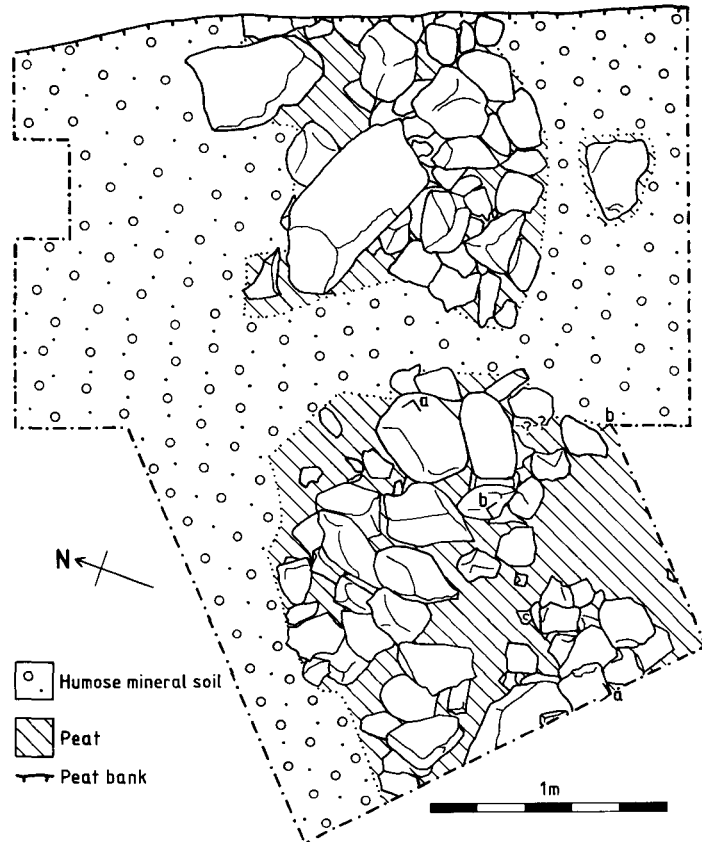
The present climate of the Outer Hebrides is,

‘in essence . . . decidedly windy, often cloudy, and with frequent though not exceptional amounts of rainfall on the low ground. The winter temperatures are high for the latitude and severe frost is relatively uncommon’ (Manley 1979).

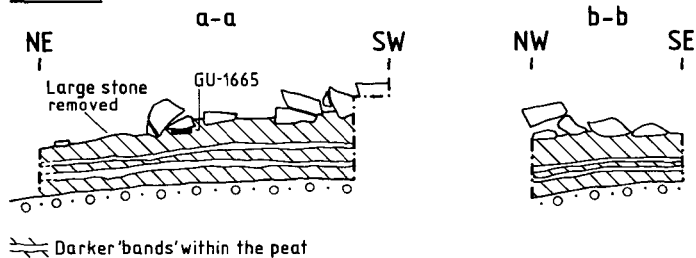
The climate of the interior of the Eye Peninsula is characterized as ‘fairly warm and wet’, and as ‘fairly warm and moist’ for the very low-lying land and coast (Hudson *et al* 1982).

**METHODS**

Samples for pollen analysis were prepared using standard techniques. For samples with a mineral content a treatment of cold 40% HF, followed by hot 10% HCl was used; all samples were acetolysed for three minutes prior to staining with aqueous safranin and mounting in silicone oil (2000 cS). For absolute analyses the volume of wet sediment (1 ml) was measured by displacement in a measuring cylinder of 11 mm diameter, graduated in 0.1 ml divisions. *Lycopodium* tablets were added to the sediment at the beginning, with the aim of obtaining a ratio of fossil pollen:exotics of 2:1 (cf Maher 1981). Complete and

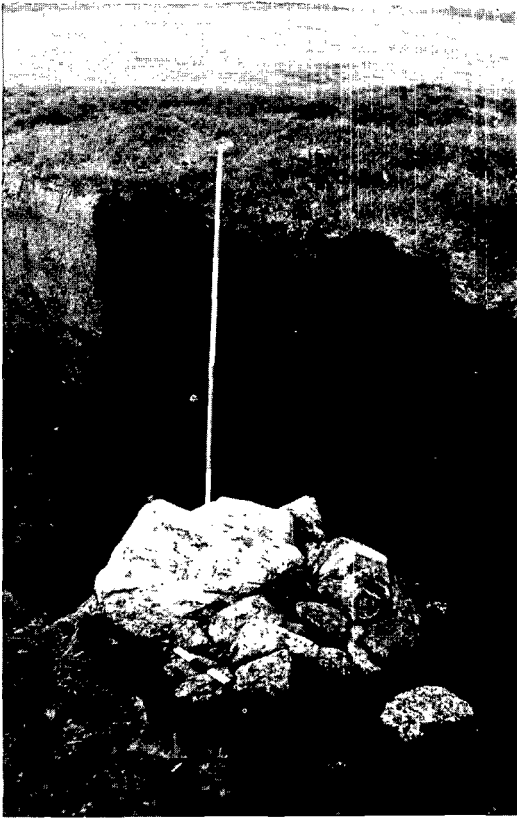


### Sections



ILLUS 3 Plan and sections of the field-wall at Sheshader as revealed by excavations (in 1981, eastern part; and 1982, western part) with the position of the sample submitted for radiocarbon dating also shown. The course of the wall is interrupted owing to the removal of a large stone during peat cutting in 1978

evenly-spaced traverses were made, counting at a magnification of  $\times 500$  or  $\times 520$ . Usually the count of total land pollen exceeds 500 (see illus 6). The macrofossils retained on the sieve during pollen preparation were routinely examined at a magnification of  $\times 6$  (up to  $\times 25$ ). The loss on ignition values were obtained after drying the wet sediment for at least 24 hours at  $70^{\circ}\text{C}$ , grinding and drying for at least a further 12 hours before combusting at  $550^{\circ}\text{C}$  for nine hours. The main symbols for the sediment description (illus 6) are a simplification of the Troels-Smith system (cf Aaby & Berglund 1986). Material for radiocarbon dating was pre-treated to remove the largest plant remains and the most soluble humic acids.



ILLUS 4 Elevation of the peat bank at Sheshader showing the field wall as uncovered in 1981, viewed from the south-west

#### DATING

Three samples from the main profile and one from directly beneath the field wall (GU-1665, see illus 2) were submitted to the University of Glasgow Radiocarbon Dating Laboratory. The calibration to calendar years is after Clark (1975).

TABLE 1

Lab Ref No	Depth (cm)	Years bp ( $\pm 1 \sigma$ )	Mean date BP	Range BP (at $2 \sigma$ )
GU-1454	38.5-40.0	685 $\pm$ 65	620	540-780
GU-1455	119.0-120.0	1840 $\pm$ 60	1760	1650-1950
GU-1456	175.5-178.0	3671 $\pm$ 65	4070	3780-4400
GU-1665	20.0-22.0*	2900 $\pm$ 100	3130	2850-3430

(\*above mineral soil)



ILLUS 5 Elevation of the field wall at Sheshader as uncovered in 1981, viewed from the north

TABLE 2

Deposition rates (calendar years/cm)

	Mean	Range (at $2\sigma$ )
620 BP–1980 AD	?16.7	14.5–20.6
1760 BP–620 BP	14.1	10.8–17.5
4070 BP–1760 BP	40.4	32.1–48.0
4070 BP–3130 BP	?47.9	17.9–78.7

The top of the main profile may have been disturbed so that the assumed date of 1980 AD may be misleading. The last rate has been calculated assuming the same date for the base of the blanket peat under the field-wall at the position of sampling (for GU-1665) as at the base of the main profile.

#### ZONATION OF POLLEN STRATIGRAPHY

The pollen diagram (illus 6) has been divided into three local pollen assemblage zones, with the third further subdivided into six subzones. This has been done by inspection, the boundaries being drawn at the mid-point of the last and first of the pollen spectra of adjacent groups, and therefore do not necessarily accurately reflect the position of change. The dates are derived from interpolation between radiocarbon dates, assuming a constant deposition rate between them.

#### Zone S-1 (194–182.75 cm; before 3700 bp/2200 BC)

Coryloid, *Betula* and *Betula*/Coryloid are comparatively high (up to 50, 18 and 28% TLP (total land pollen) respectively), as are *Polypodium* and Filicales. These five types together characterize the zone. By contrast, *Calluna*, Gramineae and Cyperaceae (where present) at levels 187.5 and 185 cm are  $\leq 5\%$ , although the lowest spectrum (190.5 cm) has higher percentages of *Calluna* (19%) and Gramineae (14%). *Potentilla* is also recorded (5%).

Zone S-2 (182.75–178 cm; before 3700 bp/2200 BC)

There are marked increases in Gramineae and *Plantago lanceolata* from the previous zone (34 and 40% are the respective maxima); whilst *Betula*, Coryloid and *Betula*/Coryloid, *Polypodium* and Filicales are considerably reduced. There are significant percentages of Compositae (6 and 3%) and a rise in *Calluna* has begun at the top level of the zone, to be continued in the next.

Zone S-3 (178.0 cm; 3700 bp–?Present/2200 BC–?AD1980)

*Calluna*, Gramineae (including Cerealia-type), Cyperaceae, or *Potentilla* has the highest percentage at any level.

Subzone S-3a (178–150.25 cm; 3700–2800 bp/2200–1100 BC)

*Calluna* rises to 35% at the first level of the subzone and thereafter is greater than Gramineae, reaching 65% at the last level of the subzone. *Potentilla* is high (19, 27 and 36%) when *Calluna* is comparatively low (38, 41 and 31%) but is reduced to <5% when *Calluna* is >60%. *Ranunculus* grains are commonly present; Cerealia-type, *Trifolium* and Liguliflorae also appear. Overall, tree and shrub pollen ( $\leq 7\%$ ) is much less than in the previous zone, as are fern spores.

Subzone S-3b (150.25–144.25 cm; 2800–2600 bp/1100–800 BC)

The three highest Gramineae values dominate. *Calluna* is <8%, with *Potentilla* 14–19% and there are two high values of *Plantago lanceolata* (6 and 7%). Other possible indicators of agriculture (Cerealia-type, *Rumex acetosa/acetosella*, *Ranunculus*, Caryophyllaceae and *Trifolium*) are represented. Tree and shrub pollen is  $\leq 5\%$ .

Subzone S-3c (144.25–127.5 cm; 2600–2100 bp/800–100 BC)

This is dominated by three maxima of *Calluna* (68–74%). Gramineae is <18%, Cyperaceae <4% and *Potentilla* <6%. *Plantago lanceolata* is >2%. Possible indicators of agriculture : Cerealia-type, *Rumex acetosa/acetosella*, Caryophyllaceae, *Lotus* and Liguliflorae are present. Tree and shrub pollen continues to be low ( $\leq 3\%$ ).

Subzone S-3d (127.5–43.5 cm; 2100–700 bp/100 BC–AD1300)

*Calluna* ranges from 35–43%, Cyperaceae is consistently higher than previously, apart from the single earlier high value (19%) at 150 cm, and *Sphagnum* may be more abundant. *Potentilla* varies from 4 to 33%. *Plantago lanceolata* declines towards the end of the subzone, whilst *Betula* and Coryloid increase slightly after the first two levels to total between 3 and 7%. The highest total for tree and shrub pollen in the zone (S-3) is 11% at level 84 cm.

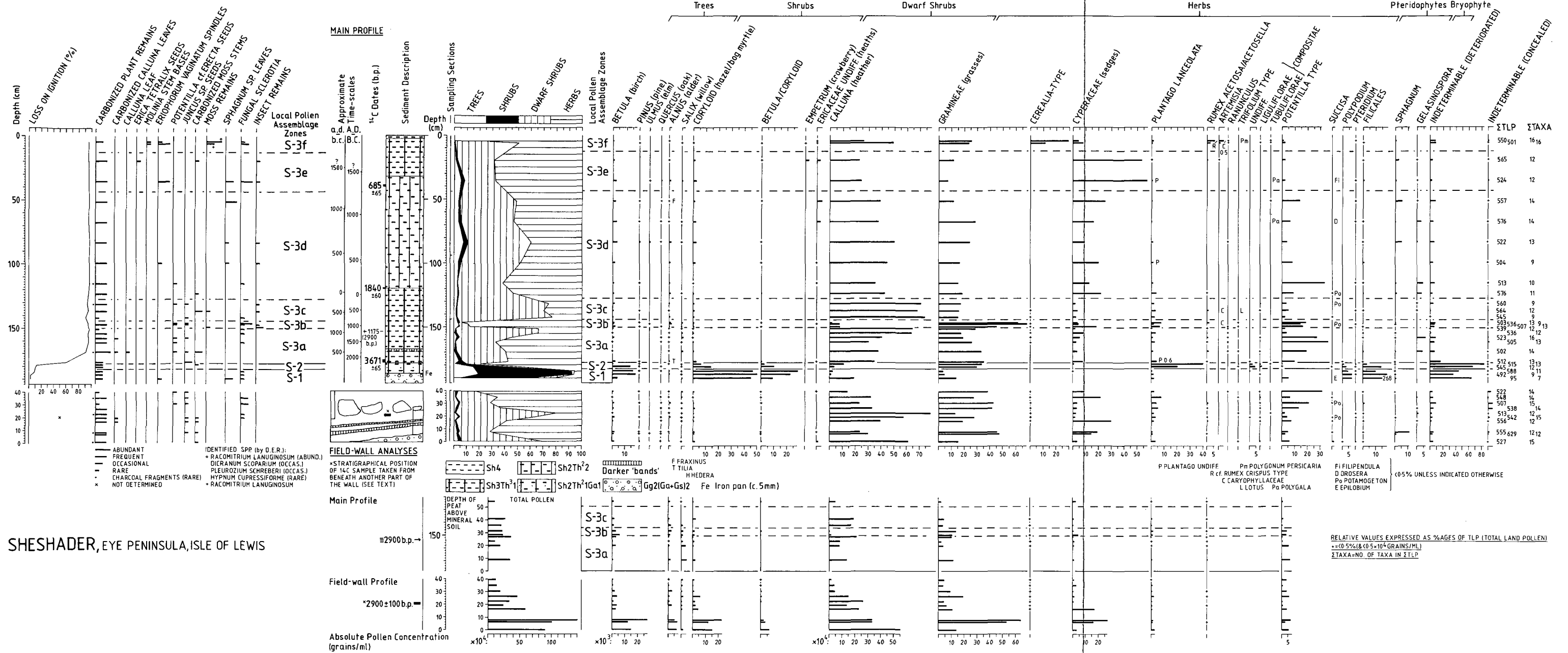
Subzone S-3e (43.5–12.75 cm; 700–?200 bp/1300–?AD1800)

This is defined on the basis of the two maxima of Cyperaceae (58 and 54%) with corresponding reductions in *Calluna* (now 23 and 24%), Gramineae (7 and 12%) and *Potentilla* (2%) compared to S-3d. *Plantago lanceolata* is <1%. Tree and shrub pollen (mainly *Betula* and Coryloid) declines from 8 to 3%.

Subzone S-3f (12.75–0 cm; ?200 bp–?Present/?1800–?AD1980)

Cerealia-type is very high (11 and 30%) and associated with relatively high percentages of *Rumex acetosa/acetosella* and *Artemisia* pollen and smaller amounts of *Plantago lanceolata*. The presence of *Polygonum persicaria*, cf *Rumex crispus* type, and Caryophyllaceae are recorded at the





ILLUS 6 Pollen and macrofossil diagrams of the main-profile and field-wall analyses from Sheshader, Isle of Lewis (Note: the line for Artemisia should begin at 194 cm)

top level. Cyperaceae is much lower than previously (S-3e), but Gramineae has increased, as has *Calluna* at the lowest level (6.5 cm). Tree and shrub pollen is  $\leq 1\%$ .

#### PREVIOUS WORK

As may be seen from the inset map showing the distribution of sites of published palaeoecological work pertinent to the discussion of the post-glacial development of vegetation types in north-west Scotland (illus 1), the Isle of Lewis lies in the region of 'predominant birch forest' suggested by McVean and Ratcliffe (1962, 10–11 and Map 3); within this, much of the eastern side of the island was thought to have supported birch, hazel and rowan, with the west largely without trees (*ibid*, Map B). This hypothetical reconstruction assumed no interference by man and a climate such as prevails today. To test this hypothesis was an aim of the pollen-analytical work of Birks and Madsen (1979), whose diagram is the only one so far published having radiocarbon dates for the postglacial of Lewis. The broad conclusion of the authors implies that Lewis would not have been extensively wooded during this period, but that at certain times birch-hazel scrub would have developed in sheltered localities. There is other independent evidence for at least the local growth of such vegetation on Lewis, eg the tree stumps (of pine, birch and willow) reported by Wilkins (1984), and of pine, by Peacock in Birks and Madsen (1979); the records of birch, hazel and alder (Lewis 1907), and of birch and hazel (Samuelsson 1910). Birch wood was found in the intertidal zone of the island of Pabbay in the Sound of Harris (Elton 1938).

The site of the Little Loch Roag bog (Birks & Madsen 1979) is close to the western seaboard of the island, whose prevailing winds are from across the Atlantic. This may mean that the representation of the vegetation is to an extent restricted to that west of the site, where wind exposure is quite severe. These factors might tend to favour the representation of the local vegetation at or near the site (ie severe exposure perhaps limiting tree growth and flowering, in turn making for relatively unrestricted wind currents over the land mass of the seaboard. The discrepancy between the interpretation of the buried molluscan assemblages at Northton, Harris (Burleigh *et al* 1973) which suggested periods of regional woodland cover, might be explained by allowing a less precisely defined niche for the 'woodland' species, eg 'scrub, tall grassland or heath' (Birks & Madsen 1979).

#### INFERRED VEGETATIONAL HISTORY – MAIN PROFILE

##### Zone S-1 (before 3700 bp/2200 BC)

Although not directly relevant to the discussion of the buried field-wall, it is interesting to note that the inferred vegetation for this zone is that of a hazel and birch scrub or woodland growing nearby, or at the site. Numerous problems are associated with the representation of the taxa recorded in a mineral soil: possible differential preservation (eg Havinga 1984), the possibility of the mixing of assemblages of different periods of time (cf Godwin 1958) and the length of time separating the assemblages incorporated into the profile. Nevertheless, it is accepted that where there is obvious stratification of assemblages this is indicative of general trends of vegetational change (cf Dimpleby 1957; 1985, 4–9). In this case it could be that the *Calluna* and *Plantago lanceolata* grains, for instance, may derive from later spectra than those with predominantly *Betula* (birch) and Coryloid (hazel, bog myrtle); furthermore, the former would not be inconsistent with the spectra of the period before 3700 bp at Little Loch Roag. The high representation of Filicales, particularly at the base, is probably due to resistance to decay, but this effect is not responsible for the high counts of *Betula* and Coryloid pollen as opposed to, say, *Alnus* (alder) or *Pinus* (pine) within the types of tree and shrub pollen. Some contamination of more recent material may have been present in the basal sample, in spite of routine cleaning of the sediments prior to sampling (eg see the record of *Sphagnum* leaves and the values of *Calluna*, Gramineae and *Potentilla*-type pollen).

## Zone S-2 (before 3700 bp/2200 BC)

This zone shows the transition between the scrub or woodland of zone S-1 and the communities of zone S-3 which are characteristic of a landscape with few trees or shrubs and with the acid soil which existed at the beginning of the blanket peat formation. The very high percentage of *Plantago lanceolata* pollen and peaks of Compositae suggest that animals were grazing at the site. The carbonized plant remains recorded in this and the previous zone hint at disturbance of the vegetation. Deliberate clearance, followed by animal management would fit the indications of fire, the decline in woodland or scrub and the possible grazing indicators. Carbonized plant fragments were found in zone S-1 and early human occupation of the area is attested on the Eye Peninsula by the chambered cairns, perhaps of the fifth millennium bp (Henshall 1974, 162). Other archaeological evidence may be cited: the porcellanite axe of Group IX found at Shulishader, which probably belongs to the same period (Smith 1974, 105–6; 1979, 19–20), the standing stone at Bayble may be of Neolithic age, as may also be the cushion mace-head from Knock (Smith 1979, 14–16) and the sherd (probably Neolithic: Cowie, pers comm) from Aignish (see illus 1). It is clear from the position of the hard iron-pan within the pollen assemblages that podsolization began to proceed after the establishment of woodland or scrub; its demise would have accelerated the process of acidification, as would the widespread colonization of *Calluna* in the succeeding zone.

## Zone S-3 (3700 bp–?Present/2200 BC–?AD1980)

The 'field-wall' was constructed during the sequence of vegetational change shown by the spectra of this zone, which form the basis of the subdivision into six subzones. In all, the majority of the pollen reflects changes in moorland vegetation: principally heather, grasses (Gramineae) sedges (Cyperaceae) and tormentil (most likely represented by *Potentilla* type); but the first three have the most bearing on the context of the buried wall. In addition to the moorland vegetation there is a contribution of pollen from plants that may have been growing in an area used for farming (eg Cerealia-type grains (cereal-type, see appendix), *Plantago lanceolata*, *Rumex acetosa/acetosella* (sorrel/sheep's sorrel), *Ranunculus* (buttercup), *Trifolium* type (clover) and Compositae (daisy family)). The moorland itself would have been a source of grazing. The presence of carbonized plant remains may be the result of attempts to control the moorland vegetation.

By contrast, the next two subzones show a less diverse suite of herb types and the records for *Plantago lanceolata* reduce to a lower average value overall, both suggesting a less intensive land-use in the places where settlement is thought, on the basis of the kind of agricultural indicators instanced above, to have been present.

The final subzone witnesses markedly different spectra, with indicators of arable activity clearly present. This activity may have extended to close to the edge of the present-day village boundary, a minimum distance of about 100 m. Thus the Cerealia-type values can be compared to those recorded by Vuorela (maximum of c 35% NAP [non-arboreal pollen], 7% NAP+AP) for fields, which were likely to have included rye, a wind-pollinated cereal, whose edges were 100–320 m away from the sampling site (on a bog fringed by trees). The situation there is not analogous (Nunez & Vuorela 1979), even if the percentages of arboreal pollen (AP) are not considered in the sum so as to more closely approximate to the predominantly non-arboreal (NAP) assemblages at Sheshader. Rather, some mechanism other than straightforward wind dispersal may be additionally involved to produce such high values for a largely self-pollinated group (cf Vuorela 1973).

Considering the zone as a whole it is evident that once the processes resulting in the formation of blanket peat were underway, there was little opportunity for trees or shrubs to establish themselves in the region of pollen catchment for the site. There may have been a slight recovery of scrub or woodland towards the middle of zone S-3 in some places, but in general the extent of peat probably

spread, and was variously too wet, too deep and acid, too often burnt or grazed to have permitted the establishment of anything but the moorland-type of vegetation. At Little Loch Roag the rise of *Calluna* values at 3900 bp (to become >10% thereafter) is thought to reflect the expansion of heather moor; and with it, grassland and pasture, perhaps as an anthropogenic response (Birks & Madsen 1979).

### THE WALL IN ITS ENVIRONMENTAL AND ARCHAEOLOGICAL CONTEXTS

The radiocarbon date for peat taken from directly beneath the wall (GU-1665) is  $2900 \pm 100$  bp; the mean is calibrated as 1175 BC (Clark 1975). The position of the calibrated date is marked on the diagram as it occurs on the time-scale of the main profile by interpolation of calibrated dates. This is just before the maxima of Gramineae and low *Calluna* values of subzone S-3b. The field-wall analyses show a somewhat different form in summary than those of subzones S-3a-c. The basal value of *Calluna* is higher than that for the base of the peat of the main profile, and the pronounced peak of herbaceous types (chiefly of Gramineae) in the main profile (subzone S-3b) is missing from the summary curve of the field-wall analyses. The rise in *Calluna* before S-3b in the main profile is to some extent mirrored at a similar stratigraphic position in the field-wall analyses (the peak at c 20 cm above the mineral soil). Further evidence that the wall was built at a time approximately corresponding to subzone S-3b is provided by the slight fluctuation to lower loss-on-ignition percentages here, the mineral component perhaps in part deriving from the stones of the wall, during their emplacement or as they weathered.

Factors to be borne in mind when considering the correlation of the two sets of analyses are: the possible compression of the peat under the wall and/or subsidence of the stones within the peat; the impossibility of distinguishing the pollen rain of the surrounding vegetation, when the wall was standing, from peat now infilling the space between stones (this is assuming that the stones of the base of the wall are *in situ* and the stones of the upper courses sealed the base, the interstitial peat forming after the wall collapsed); that the profiles are within peat that has formed on a slightly undulating parent substratum and may have formed at different rates; that very local pollen-deposition may be a source of discrepancies.

The deposition rate of peat under the wall, as calculated (47.9 years/cm) is higher than the mean rate of the lower part of the main profile (40.4 years/cm). In the last case this is based on a deeper section of peat (c 57 cm as opposed to 21 cm). A difference would be expected if the base of the peat were compressed compared to that of higher levels. It may be questioned whether, in the context of the eventual depth of peat accumulated over the wall, the temporary extra loading of the stones of the wall would have made an appreciable difference to the apparent basal rates. Concerning the possible sinking of the stones into the peat, it is thought that because the line of the base of the wall (comprising stones of differing size) as shown in section is relatively horizontal, and because the wall was built on heather moorland, any subsidence would not be of consequence. The peak of grass pollen (subzone S-3b) would not be detected in the field-wall analyses if coincident with the time when the wall was standing.

Accepting the correlation of the construction of the wall being around the time of subzone S-3b, from what has been said above this was a period of relatively intensive land-use, with the possibility of cereal cultivation nearby. Grazing on the moorland has probably caused a distinct and 'absolute' decline in the abundance of *Calluna* pollen for at least some tens of years and, interestingly, the only two levels of the zone where no burnt plant material was found in the sieve residues occur during subzone S-3b. Selective over-grazing of the heather is likely to have caused the domination of grasses. If the frequency of moorland burning was reduced this would have taken a possible advantage away

from the heather plants which may respond more quickly to controlled burning; equally, if the balance were already to the favour of the grasses, and were the population of heather too low to increase advantageously, burning might, in any case, have been periodically avoided.

By way of comparison, three other investigations may be mentioned: one relating to the 'field boundary' at the Moss of Achnacree (Ritchie *et al* 1974; Barrett *et al* 1976; Soulsby 1976; Whittington 1983); one in part concerned with buried walls in the vicinity of Callanish, Isle of Lewis (Boncke, in prep; Cowie, in prep); and that of the field wall at Shurton Hill, Shetland (Whittington 1978). Whereas the walls at Achnacree and Shurton Hill had been built on a mineral soil, those found near Callanish were separated from the mineral soil by up to 60 cm of peat. The uppermost part of the mineral soil under the bank at Achnacree was dated to  $1359 \pm 50$  bc (3309 bp). At another part of the Moss the basal peat was dated to  $980 \pm 80$  bc (2930 bp). A single date of 2800 bc (4750 bp) was obtained from the top of the soil on which the dyke at Shurton Hill was built. The pollen analysis from this site suggested that the dyke was constructed when the vegetation was of moorland; preliminary analysis of a peat bank revealing stones in its section from near Callanish offers the same general conclusion. Although at first such a conclusion could have been extended to the site of Achnacree, more detailed work, involving pollen concentration determinations, of a nearby profile has given rise to the possibility that the high Ericoid (heaths) pollen may have been derived from later vegetation and that a spectrum having more Gramineae and especially *Plantago lanceolata* pollen was contemporaneous with the construction of the bank (Whittington 1983).

To these may be added the settlement sites of a house and surrounding enclosure at Cùl a'Bhaile, Jura (Stevenson 1984); the hut-circles and field systems at An Sithean, Islay (Barber & Brown 1984) and the houses and bank discovered at Upper Suisgill, Sutherland (Barclay 1985). At the site on Jura, an open landscape of mainly grassland existed before the enclosure and the initial house were constructed. Agriculture is suggested by the values for *Plantago* spp; ard-marks were recorded in the soil and the lowest layers of the analysed palaeosols contained cereal pollen. After a period of some peat growth the enclosure and house were built. Again agriculture is attested: for instance by *Plantago lanceolata* and *Cerealia* grains. The enclosure wall was of drystone construction and up to 70 cm high. The inner face, as seen in one section, was roughly coursed with the outer being less regular. It was considered probable that the monument was situated at the edge of Bronze-Age settlement and it was ascribed typologically to the first or second millennium bc: the means of the four radiocarbon dates from charcoal from the house ranged from 3214 to 2745 bp (1264–795 bc), but the charcoal was 'probably derived either from an external midden or from scraped-up floor deposits'.

The Group 1 sections (of field walls (A), with associated huts and hut annexes (B)) at An Sithean were characterized as those sealing the  $A_0$  horizon of a podzolized soil. In one case (a hut annexe), this horizon was dated to  $975 \pm 60$  bc and it seemed likely that the annexe wall was constructed shortly after this date. The tree and Coryloid pollen was c 10% TLP at the same level; in common with the other three  $A_0$  horizons containing determinate pollen, the spectrum is dominated by the Ericaceae and Gramineae. *Plantago* undifferentiated takes values from <5% to >20% in these samples. Two of the spectra from the  $A_0$  horizons have *Cerealia* grains present. The primary banks of the field-walls were of earth and stone (c 20 cm high and 'probably never much higher') with the addition of further stones at, or very soon after, the beginning of peat formation in three cases. This may have been the result of clearance associated with the primary banks. Of the Group 1B sections, two (of a hut and its annexe) showed evidence of a later stone bank built after peat had begun to form; the earlier constructions were of earth and stone. It is pointed out that no two sections can be shown to be contemporary, but of Group 1 as a whole the field walls, huts and annexes are stratigraphically post-podzolization and pre-peat formation; they probably belong to the later Bronze Age, the

radiocarbon date (975 bc/2925 bp) providing the basis for this. In discussing the form of the field-banks it was stated that they would all have been ineffective as barriers to livestock, unless surmounted by fencing, hedging or turf-capping.

The excavations at Upper Suisgill uncovered evidence for settlement during the early first millennium bc. Ard-tillage pre-dated the construction (and reconstruction) of a round timber house (1A and 1B) and of a stone-faced earth bank, c 50 cm high as extant; charcoal from the first house (1A) was dated at  $825 \pm 105$  bc. A post from a later house provided a date of  $885 \pm 90$  bc; the date of charcoal from burnt debris on the earth bank possibly associated with this house was  $990 \pm 90$  bc. The pollen stratigraphy of a core taken from a deposit some 2 km away cannot be certainly correlated with the activities represented archaeologically. Carbonized remains of barley and indeterminate cereals were identified from the periods of the initial ard-tillage, and earliest houses and earth bank.

There are now several sites which indicate enclosure of the landscape in the first half of the first millennium bc, whilst at Shurton Hill it may have been considerably earlier. As might be expected, related pollen analyses show open communities, either grassland or heather moorland. The three settlement sites have evidence of cultivation, the two from the Inner Hebrides having cereal pollen in contexts pre-dating the 'field-walls'. The results from Sheshader broadly correspond to those from the majority of the investigations elsewhere in respect of showing enclosure at about 950 bc, with signs of cereal cultivation occurring previously to this and subsequently; other agricultural activity and possible clearance pre-date 1700 bc. The use of drystone walling here presumably relates to blanket peat having begun to form to a depth of c 20 cm, at least at the sampling site.

The small number of investigations, considering their wide geographical distribution, makes any generalization from the available evidence premature. The results from those investigations near Callanish, being from the same island, should be most informative for some interpretation of land-use history in relation to the enclosure of moorland terrain on Lewis.

It has not been possible to give a detailed conclusion as to the type of economy practised during the period when the wall was effective; in the case of the Shurton Hill dyke it was speculated that its effectiveness could have been as a definition of pastoral territory, and as here, the idea of deliberate burning (based on charcoal within the profile) invoked as part of the explanation of vegetational change.

## APPENDIX

The Cerealia-type grains presented on the diagram (illus 6) have a maximum diameter of  $\geq 38$  microns and an annulus diameter of  $\geq 8$ , recorded to the nearest micron. Measurements were made using a graticule having divisions of 1.51 microns at a magnification of  $\times 520$ . After finding Cerealia-type grains within the spectra of subzones S-3a-c during routine analysis, more closely-spaced traverses were scanned at some levels and any additional grains have been included on the diagram, although the total number of additional grains scanned was not made to be a constant. A sample of 25 grains from the 5 cm level was measured after the manner of Andersen (1979), but not standardized with respect to a mean *Corylus* size. The sizes (in microns) were measured to the nearest half division on the graticule to give a mean maximum diameter, 47.2 (range 41.5–53.6), mean 'pollen size', 44.2 (range 39.3–48.7), mean annulus diameter, 11.8 (range 9.1–13.6), mean pore diameter, 4.6 (range 3.0–6.0). With one exception, all the grains were crumpled to an extent, which would tend to give a larger maximum diameter and 'pollen size'. On the criteria of sizes, and assuming a single population of the contributing plant, *Avena fatua* (wild oat) is the most likely to be represented (mean 'pollen size' 44.2, mean annulus diameter 11.9). It is a common weed of arable ground, whether it grew dominantly in such profusion as to give the high values of levels 5 and 6.5 cm is doubtful. The pollen of *Avena sativa* ('common', cultivated oat) has a smaller mean 'pollen size' and annulus diameter (40.9 and 10.7); the mean figures for the grains at Sheshader are within the ranges of those of Andersen (1979).

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#### NOTE ADDED IN PROOF

Whilst this paper was going to the press the work by S J P Bohncke, referred to above (p 90), has been published under the title: 'Vegetation and habitation history of the Callanish area, Isle of Lewis, Scotland', in Birks, H H, Birks, H J B, Kaland, P E & Moe, D (eds) (1988), *The cultural landscape – past, present and future*, Cambridge, 445–61.