The Romano-British Exploitation of Coastal Wetlands: Survey and Excavation on the North Somerset Levels, 1993–7

By STEPHEN RIPPON

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INTRODUCTION: THE ROMANO-BRITISH EXPLOITATION OF COASTAL WETLANDS

Areas of coastal marshland formed an important and distinctive part of the landscape of Roman Britain, and current work is showing that different wetlands were utilised in very different ways. Some areas, for example in Essex[1] and Kent,[2] were simply exploited for their natural resources to produce salt and support seasonal grazing. Parts of Fenland were also used in this way, though the higher coastal siltlands were modified through the creation of drainage systems in order to improve agricultural opportunities within a landscape that was still liable to tidal flooding.[3] A third strategy towards wetland exploitation is reclamation: a major transformation of the natural environment, involving the construction of a sea wall along the coast to keep tidal waters out and a system of drainage ditches cut into the surface of the former saltmarsh to lower the water table and remove surface run-off from the surrounding uplands.

One example of this strategy towards wetland exploitation was the Wentlooge Level adjacent to the Severn Estuary in South-East Wales, where up to *c.* 27 km^2 were embanked and systematically drained with a carefully-planned system of long narrow fields, probably to provide meadow land for the military establishment at Caerleon[4] (FIG. 1). Similar work may have been undertaken in the western part of the adjacent Caldicot Level, where parts of a buried Roman drainage system have recently been uncovered close to where an inscription was found during the nineteenth century recording work by legionaries on a linear earthwork, presumably a sea wall.[5] Across the Estuary in the Central Somerset Levels it appears that a conscious decision was made to divide the coastal marshes and exploit their potential in two different ways.[6] The area between the rivers Axe and Parrett was divided by a now extinct river (named in a Saxon charter as the *Siger*). The area to the south (towards the Parrett Estuary) was left as a tidally inundated marsh used to produce salt, possibly in order to supply the military establishment in South Wales. The latter also received

1 Fawn *et al.* 1990; Wilkinson and Murphy 1995.
2 Cunliffe 1988a; Reeves 1995.
3 Crowson 1994; Leah 1992; Murphy 1992; 1993; 1994.
4 Allen and Fulford 1986; Fulford *et al.* 1994; Rippon 1996a, 25–32.
5 Bell 1994; Knight 1962; Locock 1996; 1997; Rippon 1996a, 32–5.
6 Rippon 1995b; 1997a, 65–77.

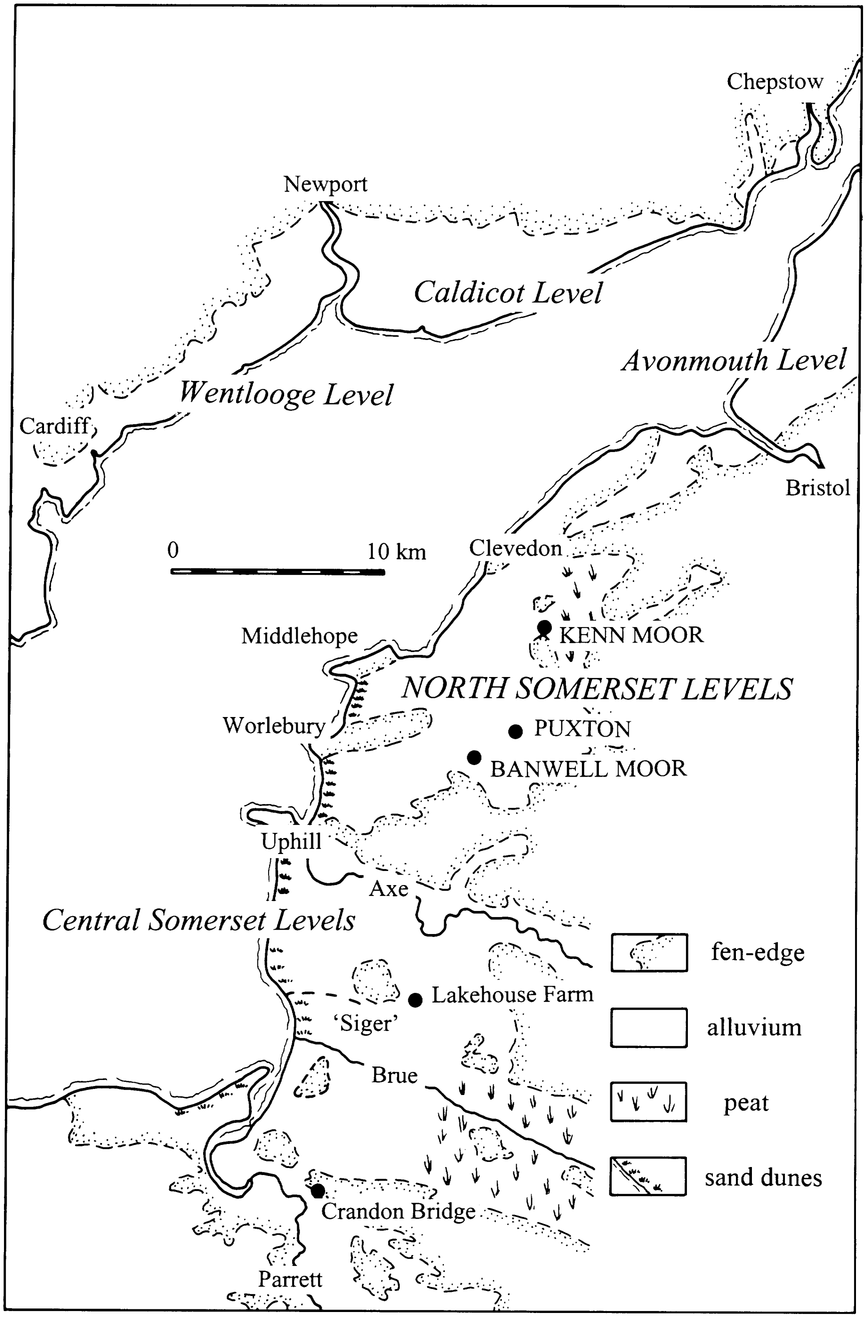


FIG. 1. The Severn Estuary and adjacent wetlands.

pottery from Dorset (BB1) shipped via a port at Crandon Bridge, lying near the mouth of the Parrett.[7] In contrast, the marshes to the north of the *Siger*, around Brent Knoll, were reclaimed and saw the construction of several substantial stone buildings including a possible villa at Lakehouse Farm.

The process of reclamation involves a considerable investment of manpower and materials, alongside the conscious substitution of one set of resources (such as the opportunity for salt production) with another (for example a longer grazing season and a more suitable environment for arable farming). The decision whether to exploit, modify, or transform an area of marshland should reflect wider socio-economic trends within a region, including the perceived relative value of natural resources and the demand for increased agricultural production. Therefore, as a contribution to our understanding of Romano-British attitudes to the landscape the programme of fieldwork reported here was designed to examine when and why the decision was taken to reclaim one of the coastal wetlands that border the Severn Estuary in South-West Britain: the North Somerset Levels, near Weston-super-Mare.

THE NORTH SOMERSET LEVELS PROJECT

One of the major problems with investigating Romano-British landscapes on the Severn Estuary Levels is that in most places they are sealed by *c.* 0.5–1.5 m of later alluvium. By contrast, various surface finds of material from the North Somerset Levels made during the 1950–60s suggested that the Romano-British ground surface lay within reach of the plough,[8] while several undated earthwork complexes that formed extensive 'relict landscapes' on a different orientation to the present pattern of fields and roads could potentially have been Romano-British[9] (FIG. 2). This made it an ideal area in which to investigate the Romano-British use of coastal wetlands.

The North Somerset Levels comprise *c.* 100 km^2 of low-lying ground near Weston-super-Mare, on the eastern side of the Severn Estuary (FIG. 2). The surface deposits mostly comprise blue/grey silty clays of the Wentlooge Formation deposited in a mudflat/saltmarsh environment, though at the inland margins of the Levels, in the lowest-lying 'backfens', there are areas of surface peat.[10] Parts of the coast, between the bedrock outcrops at Uphill, Worlebury, and Middle-hope, are currently protected by sand dunes and observations in Weston-super-Mare indicate that this natural coastal barrier has existed since before the Roman period.[11] There is no evidence whether the remaining stretch of coastline, between Middlehope and Clevedon, has ever been protected by a natural barrier and a substantial earthen sea wall currently keeps the tide at bay. Any Romano-British sea wall is likely to have been lost to erosion, which on the Welsh side of the Estuary has caused the coast to retreat by up to *c.* 0.8 km since the Roman period.[12] It has been estimated that Roman MHWST (Mean High Water Spring Tides) at this point in the Estuary (*c.* 5.6 m OD) was similar to the contemporary ground surface towards the coast (*c.* 5.5 m OD), but up to *c.* 1 m above the height of the Romano-British landscapes several miles inland (*c.* 4.5–4.8 m OD).[13]

Analogy with parts of the English Fenland[14] and the North German wetlands[15] suggests that

7 Allen and Fulford 1996.
8 Clarke 1974; 1975; 1976a, b; 1980; Lilly and Usher 1972.
9 Broomhead 1994 and unpublished survey of Congresbury Parish; Gardner 1985; McDonnell 1988.
10 Butler 1987; Gilbertson and Hawkins 1978; Rippon 1994, 21–34; 1995a, 35–47.
11 Rippon 1997a, 35.
12 Allen 1990, 13–28; Allen and Rippon 1997a.
13 Rippon 1997a, 109–10.
14 See note 3.
15 Korber-Gröhne 1981.

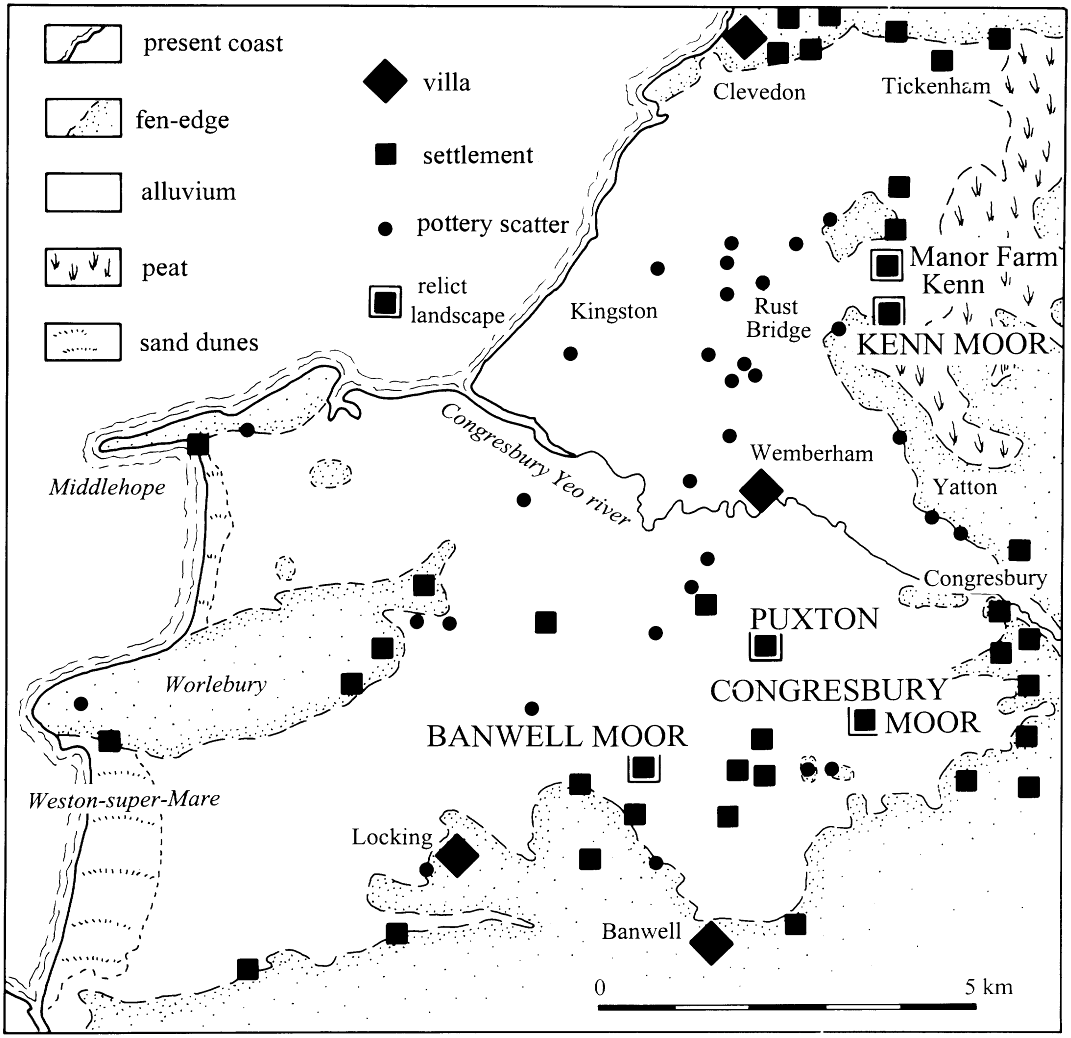


FIG. 2. The North Somerset Levels. Major Romano-British sites including the relict landscapes.

agricultural settlements associated with ditched field-systems need not imply a reclaimed landscape complete with a sea wall; it is quite possible to practise a mixed agricultural economy on a high saltmarsh, though the drainage ditches would have been subject to tidal influence and thus contained a brackish environment. Therefore one of the key questions to be answered for the North Somerset Levels was whether the relict landscapes there were Romano-British in date, and if so, whether they lay in an intertidal environment as was the case in the Fenland, or in a reclaimed landscape similar to that of today. If the latter was the case, then when did this major transformation of the landscape take place, and who was responsible?

Two of the best preserved relict landscapes on the North Somerset Levels, on Banwell and Kenn Moors, were chosen for this programme of survey and excavation, with very limited work carried out on a third, at Puxton. A pottery assemblage from an old excavation on the fourth landscape, at Manor Farm, Kenn, was also examined. The aim was to obtain a plan of each relict landscape, to establish their character and broad chronological development, and to investigate their wider landscape context to establish, in particular, whether they lay in a saltmarsh or a freshwater (i.e. reclaimed) environment. Each site was under a mixture of arable and pasture and a wide range of survey techniques were applied as appropriate (aerial reconnaissance, earthwork survey and fieldwalking, with certain areas selected for metal detecting and geophysics). This led to a series of carefully targeted small-scale excavations which enabled the collection of material culture and palaeoenvironmental assemblages.

The following report is divided into three sections. Firstly the evidence from Banwell, Kenn Moor, and Puxton is described, with comments on the character and date of each landscape. Secondly, the environmental data are brought together, and arranged in a chronological discussion based around the major environmental and cultural changes in the landscape. This is followed by the specialist reports relating to the environmental and artefactual material, and, finally, a general discussion.

SURVEY AND EXCAVATION AT BANWELL MOOR

The Romano-British landscape on Banwell Moor (NGR *c.* ST 390 617) is situated *c.* 0.7 km north-west of the fen-edge at Woolvershill and 2.5 km north-west of the Romano-British villa and modern village of Banwell (FIG. 2). The relict landscape lies on an area of estuarine alluvium in one of the lowest-lying parts of the North Somerset Levels which during the medieval period was left as common pasture and was only enclosed through Parliamentary Act in 1797. The Romano-British ground surface lies at *c.* 4.5–5.1 m OD, compared to the modern ground surface at 4.8–5.3 m OD, making it the lowest-lying of the three Romano-British landscapes examined.

The Romano-British settlement on Banwell Moor was discovered by Marie Clarke in 1974 when trenches for tile under-drainage produced a small amount of Romano-British pottery and a scatter of stone rubble in the western half of 'Twenty Acres Field' by Waterloo Farm (FIG. 3:V; PL. I): subsequent ploughing failed to produce any further material.[16] An antiquarian reference also refers to the discovery of an undated human skeleton around 1800 at 'Taggs Hatch' in the western part of Banwell Moor.[17] The location of this burial is unknown though it is interesting to note that a fragment of human bone was recovered during the excavation of Trench II (see Hamilton-Dyer below).

A series of low-level air photographs taken in 1946 and 1950[18] reveals the earthworks of an extensive relict landscape in the same area, large parts of which have now been ploughed flat. These early photographs, along with further aerial reconnaissance as part of this project, ground-survey in those fields where earthworks survive, and two resistivity surveys enabled the plan of this relict landscape to be established (FIG. 3). To the north and west, there were several clusters of enclosures, slight platforms, and small paddocks, set within larger rectilinear fields. Three possible farmstead complexes can be identified to the north and east of Cannaways Farm (FIG. 3: I, II, and III), with two others to the south-east of Waterloo Farm adjacent to a complex of palaeo-

16 Clarke 1974, 1.
17 Clarke 1977, 1–2.
18 1946: RAF 3G/TUD/UK15/21 Part II; 1950: RAF 541/41/4260; 1995 and 1996: flights by the author.

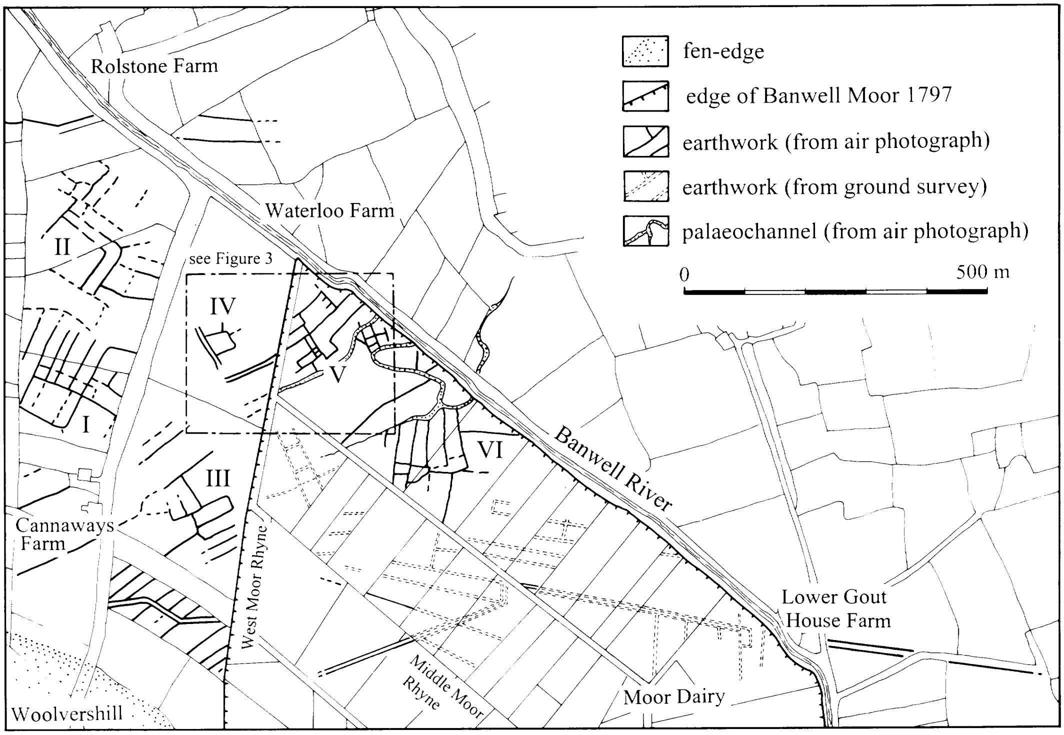


FIG. 3. Banwell Moor. Plan of relict landscape from air photographic transcription and ground survey. Six potential farmstead complexes are marked I–VI.

channels (FIG. 3: V and VI). Between Cannaways and Waterloo Farm lies an apparently fairly isolated, roughly square enclosure associated with a double-ditched feature (FIG. 3: IV). Each of these complexes has a broadly co-axial layout, though there is little evidence for any overall landscape planning or systematic reclamation as seen on the Wentlooge Level: a process of gradual, piecemeal colonisation is suggested.

The opportunity arose to fieldwalk five fields in the western part of this relict landscape. Very little material was recovered (as was the case in 1974: see above), apart from a small and discrete concentration of later Roman pottery on the western side of West Moor Rhyne (FIG. 4).[19] The scarcity of Roman material in the ploughsoil is partly explained by the fact that in some areas the Roman landsurface is buried by later alluvium, though this is not always the case. However, where this buried landsurface has been excavated in Trenches I and II, it was found to contain very little pottery, and so in part the lack of material recovered through fieldwalking may genuinely reflect low-intensity off-site activity, such as manuring (especially compared to Kenn Moor and Puxton: see below).

[19] See Rippon 1997b for the detailed fieldwalking results.

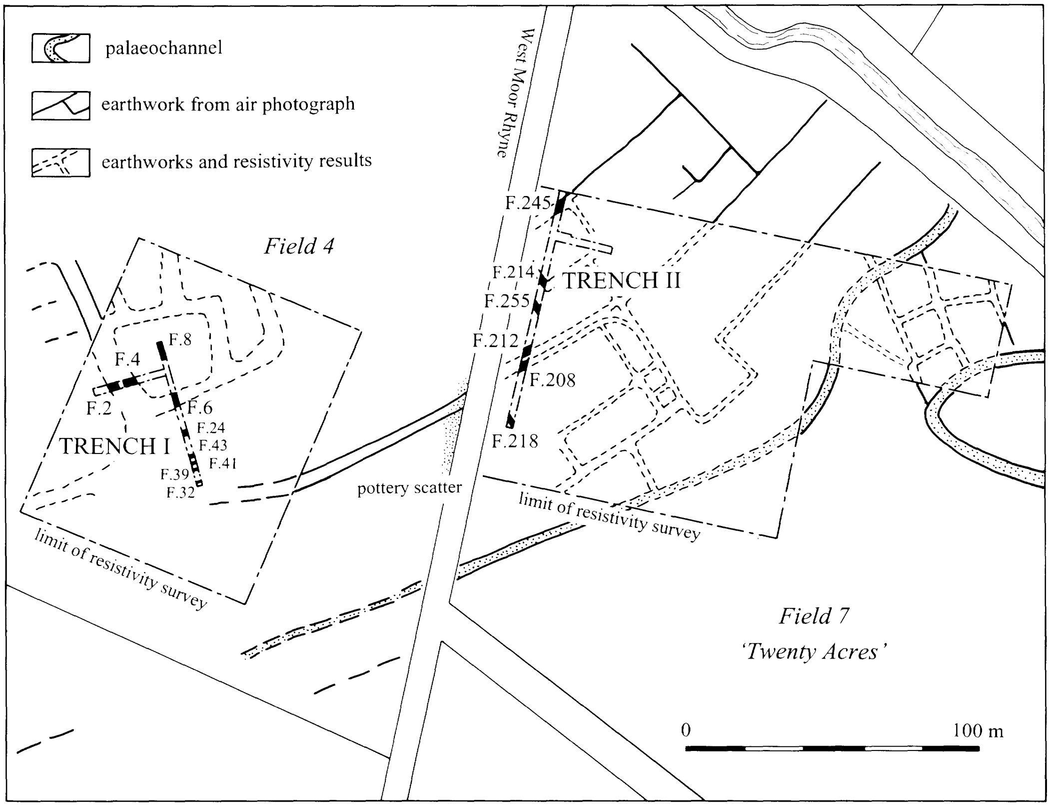


FIG. 4. Banwell Moor. Plan of relict landscape in Fields 4 and 7 (potential farmstead complexes IV and V on FIG. 3), from air photographic transcription and resistivity survey.

TRENCH I (FIGS 4 and 6)

A combination of earthwork and resistivity survey[20] showed that the enclosure in Field 4 was *c.* 30 m square and lay to the north-east of a slightly curvilinear double-ditched feature which can be traced on the 1946 air photographs for some 70 m. Fieldwalking produced just four sherds from the area of the enclosure, while a soil chemistry survey by Andrew Jackson also indicated a relatively low level of human activity. Concentrations of settlement-indicative copper, lead, and zinc were evident over the enclosure ditches, while there were slightly higher than average levels

[20] The resistivity survey was carried out by Kerry Ely, Richard McConnell, and Alex Turner, using a Geoscan RM15 resistance meter operated in the twin electrode configuration with a mobile probe spacing of 0.5 m. Readings were collected at 1.0 m intervals along zig-zag traverses 1.0 m apart. The data was down-loaded to a desk-top PC and processed using Geoplot 2.0. This is consistent with attested problems with this prospection method which can often return average to poor responses over certain geologies such as alluvium and mudstones/clay (English Heritage, *Geophysical Survey in Archaeological Field Evaluation*, 1995, 10–11).

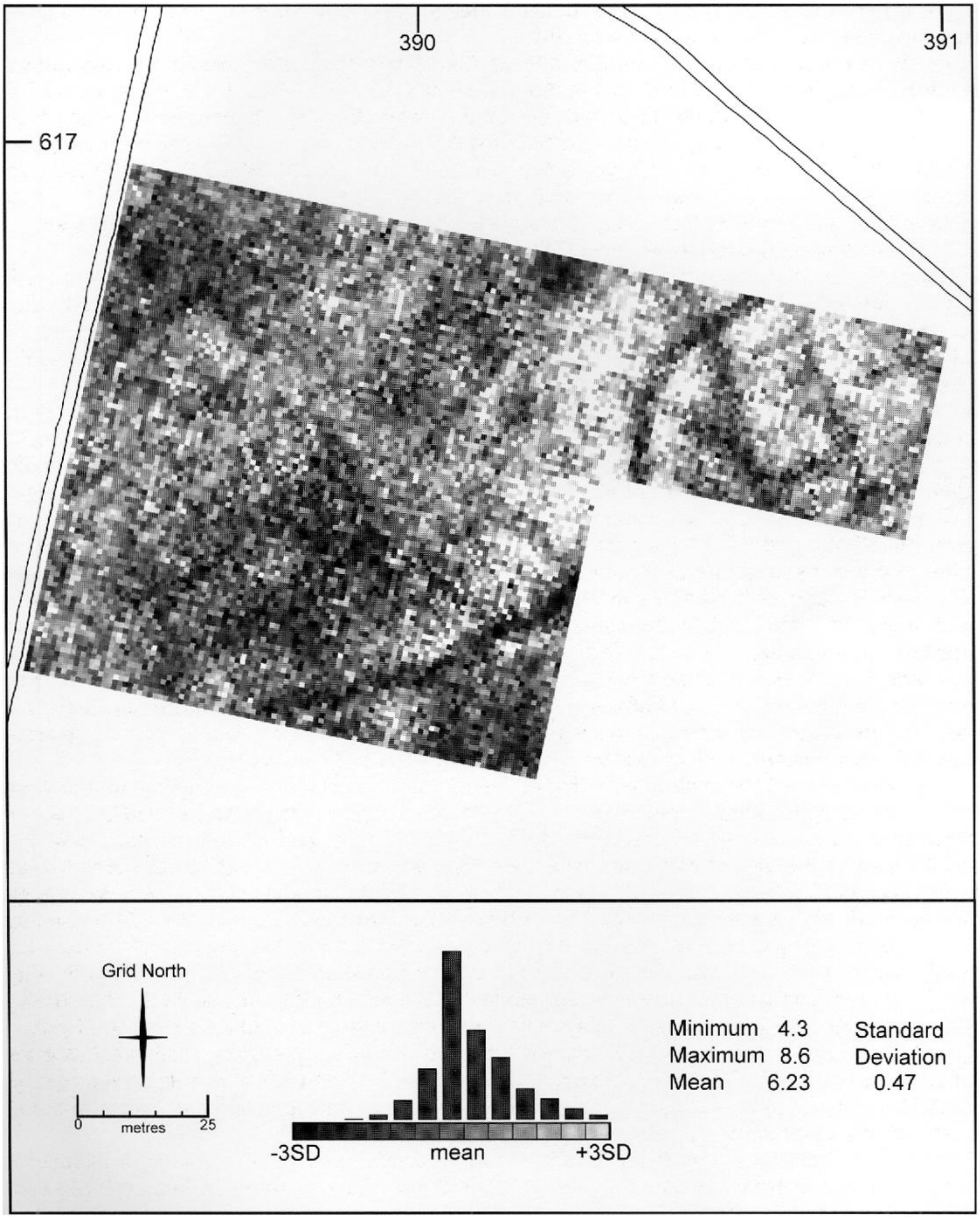


FIG. 5. Banwell Moor. Results of resistivity survey in the western part of Field 7 (for location see FIG. 4).

of chromium, cobalt, manganese, and nickel in the general vicinity, though far lower than has been recorded at known settlement sites.[21]

Trench I showed that the two parallel ditches were just *c.* 3 m apart, presumably defining a trackway. Each ditch (F2 and F4) had a shallow, U-shaped profile, *c.* 2.6 m wide and at least 0.7 m deep; they could not be bottomed due to a high natural watertable, though their profile suggests an original depth of *c.* 0.8–1.0 m. Each contained two fills: a lower light-to-mid-blue/grey silty clay (F2: 35; F4: 31), and an upper more oxidised mid-blue/brown silty clay (F2: 3; F4: 5). These were separated by a thin layer of mid-to-dark blue/grey, slightly silty clay (F2: 17; F4: 16), which rose up the sides of each ditch before levelling out to form a roughly horizontal buried land surface.

The ditch forming the south-east side of this enclosure was also sectioned (F6). It was *c.* 3.5 m wide and at least 0.7 m deep: it could not be bottomed due to the high watertable, but its profile suggests that it may have been *c.* 1.0–1.2 m deep. The basal fill (48) comprised an organically rich black silty clay, overlain by a mid-blue/grey silty clay (38) very similar to Layers 35 and 31 in F2 and F4. This was sealed by a dark horizon (29) which probably equates with that seen in F2 and F4, though in F6 it was much thicker, darker and located lower down in the ditch profile. This in turn was overlain by a relatively dark organically rich blue/grey silty clay (28), and finally a more oxidised mid-blue/brown silty clay (7) very similar to Layers 3 and 5 in F2 and F4. Ditches F2, F4, and F6 were extensively sampled for palaeoenvironmental analysis. Beetles, plant macrofossils, pollen, and snails from the lower fills of each ditch and the absence of foraminifera (microscopic marine protozoa (animals) that possess tests (shells) that are preservable in the fossil/archaeological record) suggest a freshwater pastoral landscape with some disturbed or trampled ground, while the upper, more oxidised, silty clays yielded evidence for more brackish conditions.

The dark horizon seen within each of the ditches equates with a buried landsurface, traces of which were recorded outside the enclosure. However, inside the enclosure this surface was truncated by ploughing, suggesting that it lay on a very slightly raised area of natural alluvium. Those areas inside the enclosure that were excavated proved to be largely devoid of features apart from a shallow hollow (F8) containing numerous small fragments of stone, burnt clay/daub, and charcoal. The absence of other features may reflect a low level of activity which is also suggested by the scarcity of material culture in the ploughsoil and ditches F2, F4 and F6.

To the south-east of the enclosure the buried landsurface reappeared. A sterile natural alluvium (50) was sealed by a mid-grey/brown silty clay (11/34) which appeared to form a buried landsurface from which was cut a series of small gullies (F24, F43, F41, F39, and F32), all oriented SW–NE (parallel with the south-eastern side of the enclosure). Each gully had a steep-sided, flat-bottomed profile, *c.* 0.4–0.5 m deep, *c.* 0.4–0.5 m wide at the top and *c.* 0.3 m wide at the base, and were all filled with mid-grey/brown silty clays. The profile of these features is very similar to spade-dug gullies known as gripes that still provide surface drainage on many parts of the Levels.[22] Both the buried landsurface (11/34) and the silted-up gullies were sealed by a dark-blue/grey slightly silty clay (13/46) very similar to the dark horizon seen in the three ditches, forming an undulating surface at 4.9–5.1 m OD. This in turn was sealed by sterile alluvium (an oxidised mid-blue/brown silty clay: Layer 12/47), only the upper part of which was truncated by modern ploughing, and which equates with Layers 3, 5 and 7 in Ditches F2, F4, and F6. This buried landsurface was investigated further in Trench II, where soil micromorphology established that it represents the development of a stable soil horizon during a pronounced pause in sediment accretion.

The small amount of pottery from Trench I comprised small and abraded sherds. It includes a mixture of material from the Late Iron Age through to later Roman wares including South-East Dorset BB1 and local Congresbury grey ware.

[21] Jackson 1997.

[22] Rippon 1996a, 50–4.

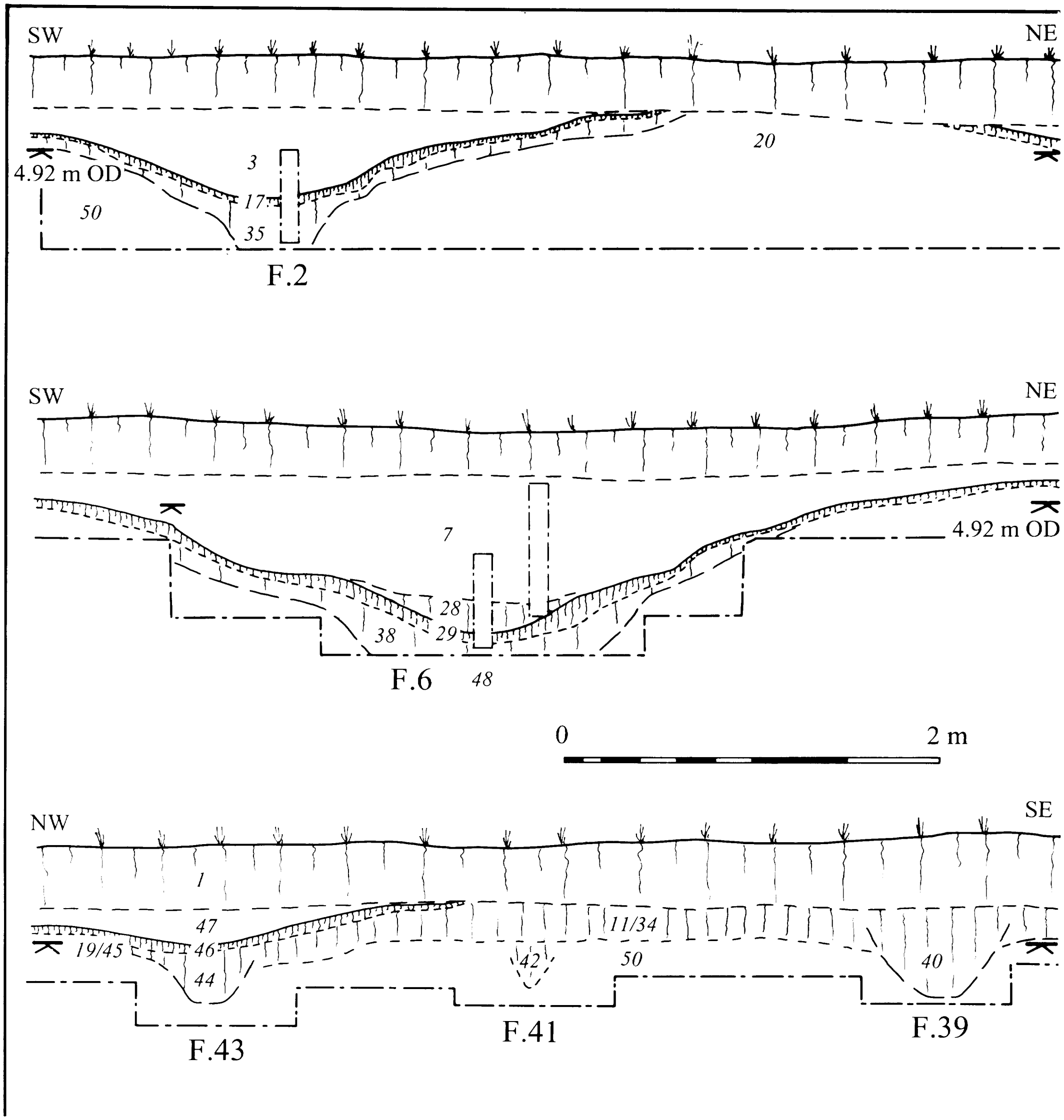
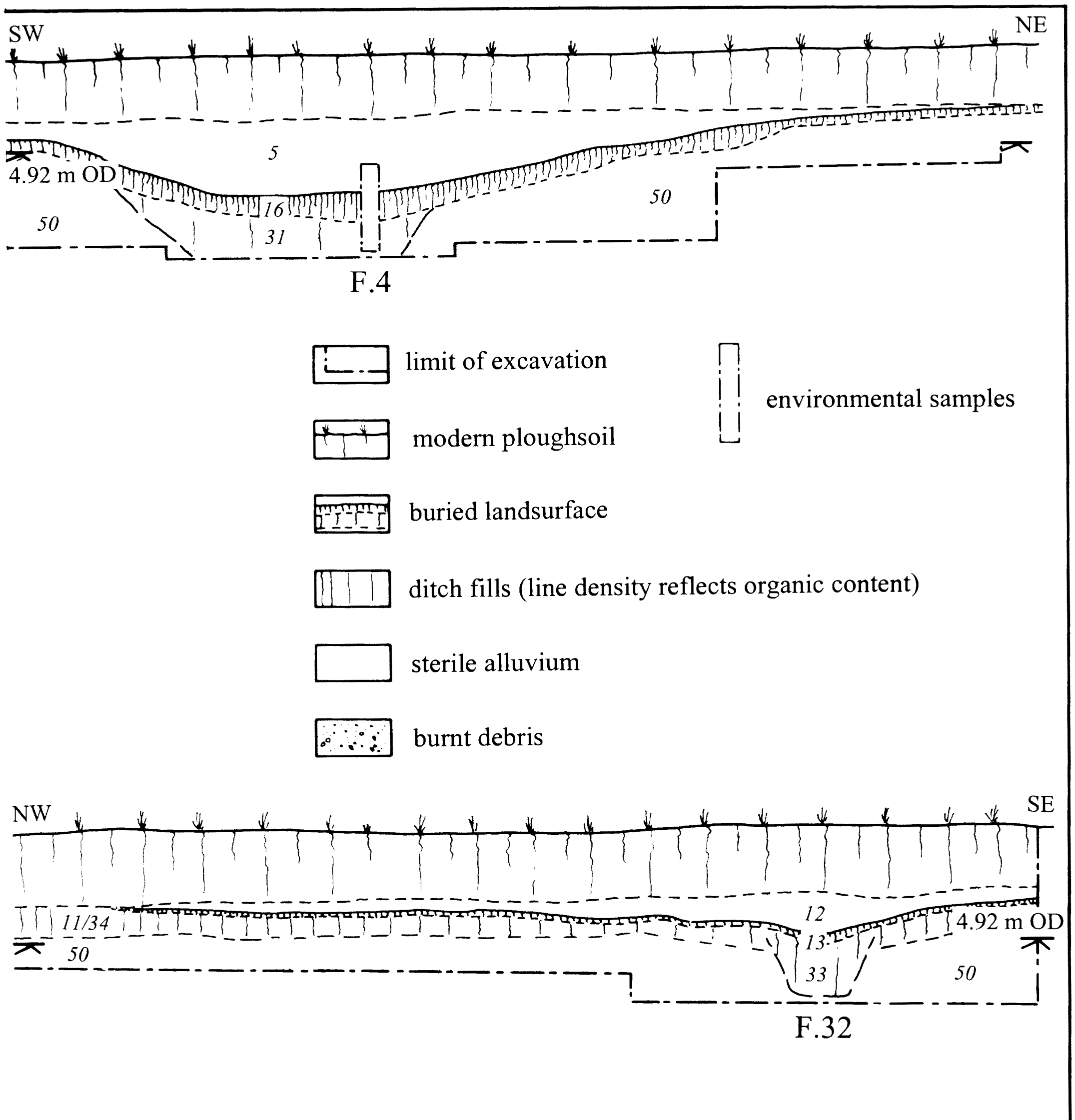


FIG. 6. Banwell Moor, Trench I (Field 4). South-east- and south-west-facing sections through the major ditches and the buried landsurface with its associated gullies.

TRENCH II (FIGS 4, 5 and 7; PL. IIIA)

The complex of paddocks and enclosures marked V on FIG. 4 was sectioned by Trench II. This revealed evidence for two buried landsurfaces intercalated with sterile alluvium, the earlier associated with a late Iron Age saltern, the later with a Romano-British ditched-drainage system (PL. IIIA).

The earliest undulating landsurface (244) lay at a depth of *c.* 0.7–0.9 m (4.25 to 4.45 m OD), and



was marked by a very slight darkening of the natural alluvium and occasional fragments of stone, burnt clay, and charcoal. The only feature recorded was a shallow depression (F281) filled with layers of Late Iron Age pottery, slightly burnt clay, oven fragments, briquetage, charcoal and ashy debris from salt production (Layers 259/279). Around 7 m to the south there was a second dump of burnt material (240/247) associated with a spread of stone rubble (250) which was truncated by one of the later Roman drainage ditches (F208). Environmental evidence points to a high saltmarsh environment.

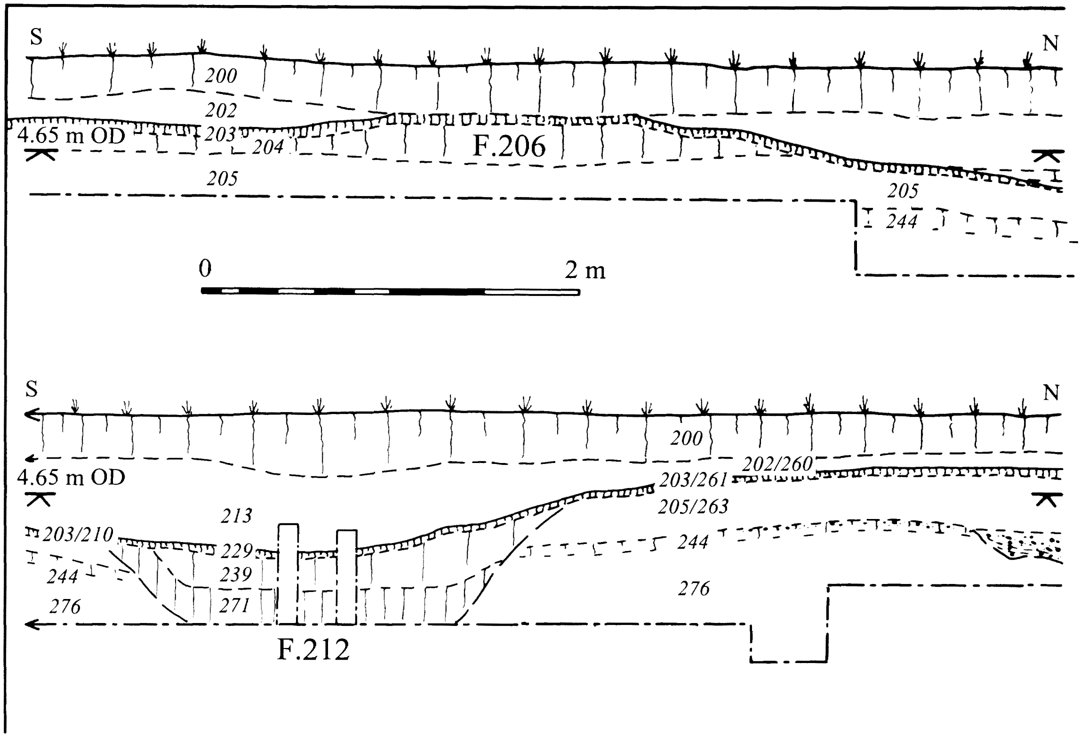
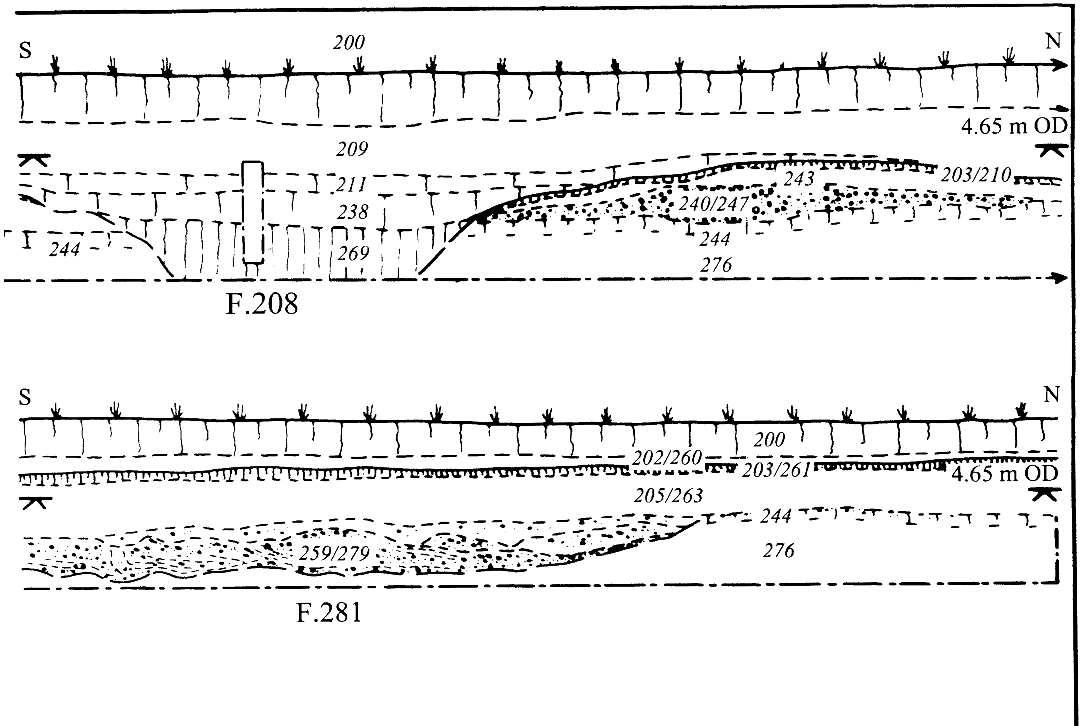


FIG. 7: Banwell Moor Trench II (Field 7). East-facing section through the late Iron Age saltern (240/247 and F281) and part of the later Romano-British buried landsurface with its associated bank (F206) and ditches (F208 and F212). For key see FIG. 6. Note that this section is not at right angles to the line of the later Romano-British ditches (see FIG. 4).

This late prehistoric landscape was buried by a *c.* 0.2–0.4 m thick layer of sterile alluvium (205/253) representing a return to gradual sediment accretion, though this appears to have been primarily in a freshwater environment. This marsh was in turn sealed by a second buried landsurface at *c.* 4.8–4.9 m OD marked by a very dark-blue/black horizon (203/210/261) identical to that recorded in Trench I. At the southern end of Trench II this dark horizon overlay a mid-grey/brown silty clay (204) very similar to Layer 34 in Trench I, which was associated with small abraded fragments of stone, burnt clay, animal bone, and later Roman pottery.

Trench II sectioned six later Romano-British ditches (F218, F208, F212, F255, F214, and F245), all of which were cut from immediately below the dark horizon (203). Each ditch, apart from F208, had a similar sequence of fills to those in Trench I: a lower light-to-mid-blue/grey silty clay, below an organically rich dark horizon which was continuous with the buried landsurface 203, and an upper more oxidised, mid-blue/brown silty clay that sealed the entire late Romano-British landscape in Trench II (e.g. F212: FIG. 7). While most of the ditches had largely silted up by the time that the dark horizon formed across the site, F208 was clearly still open as it contained a different sequence of sediment: organically rich mid-to-light blue/grey silty clays (269, 238), followed by a light-blue/grey silty clay (211), with no dark horizon.

Ditch F208 lay *c.* 2.5 m to the south of F212 and may have defined a trackway very similar to that



in Trench I. Traces of a slight bank (F206) to the south of F208, along with the greater concentration of domestic refuse towards the southern end of Trench II, suggest that the settlement focus lay in the large ditched enclosure in the south-west corner of Field 7, defined by F208/F212 to the north-west and a palaeochannel to the south-east (FIG. 4). Two ditches, F214 and F218, contained moderate amounts of pottery, animal bone, and burnt clay along with charred plant remains. Analysis of the cereals and the associated weeds suggests that they had been grown locally, though the environmental evidence otherwise points to a largely pastoral landscape. The abundant and diverse palaeoenvironmental evidence suggests a wholly freshwater ecology until the deposition of the upper clay 202/209/213/260.

SURVEY AND EXCAVATION AT KENN MOOR

The Romano-British landscape at Kenn Moor is situated *c.* 0.5 km to the north of a bedrock ridge at Ham Farm in the parishes of Kenn and Yatton (NGR *c.* ST 423 677). It mostly lies on an area of low-lying estuarine alluvium though a small outcrop of bedrock was located through resistivity survey just below the surface of Field 5 (at 5.3–5.50 m OD) (PL. II).

The plan of the relict landscape was established through a combination of air-photographic transcription and earthwork survey carried out by the RCHME (FIG. 8).[23] The complex comprises a roughly rectilinear system of enclosures with two clusters of smaller paddocks and platforms which have the appearance of small farm complexes similar to those on Banwell Moor. Like Banwell, the Kenn Moor relict landscape has a broadly coaxial plan, but it is quite unlike the carefully planned layout on Wentlooge. Most of the earthworks have been ploughed out, but within three fields (6–8) the southern possible farmstead complex survives as a well-preserved group of earthworks (PL. II).[24] Faint traces of several features were identified during the field survey of this area which are on a different alignment to, and clearly pre-date, the main system of earthworks, though because they are not visible on the available air photographs their original extent could not be determined. A fourth field (3), at the northern edge of the relict landscape, also still contains well-preserved earthworks in the form of a sub-rectangular mound surrounded by a slight ditch, adjacent to a palaeochannel which could be traced for *c.* 0.7 km. In order to enhance the plan of the northern farmstead complex (in Field 5) a resitivity survey was carried out by Kerry Ely, Richard McConnell, and Alex Turner (FIG. 10). This confirmed the presence of a complex of small paddocks and enclosures, probably representing a farmstead.

Further information about the extent and character of the Kenn Moor landscape was provided by fieldwalking (FIG. 9). Three densities of material were identified which may be interpreted as midden dumping close to the settlement focus, a heavily manured area to the north and west, and a more lightly manured zone beyond this. The edge of the Romano-British settlement was located to the east (Field 16) and west (Field 4) where sherd densities of up to one sherd per m^2 were attained; excavation in Field 16 confirmed that this was part of the main settlement focus which was abandoned and then used for the dumping of midden debris. Fields 9, 21, 22, and 28 produced a lighter scatter of material, with an average of 0.007 sherds per square metre, indicative of fairly heavy manuring for either arable cultivation or the improvement of meadow/pasture. Fields 1, 2, and 27, and the northern parts of Fields 4 and 21 were largely devoid of Romano-British material (apart from a discrete scatter of pottery and stone from a low mound in Field 1). The odd sherds that were recovered are indicative of much lighter manuring, perhaps in an 'infield–outfield' system. Few diagnostic sherds were recovered from the fieldwalking, with BB1 and local Congresbury grey wares predominating. A broadly late Romano-British (third- to fourth-century) date can be applied to most of the material, though Field 16 produced a noticeably greater number of fourth-century regional imports (including Oxfordshire colour-coated ware and mortaria).[25]

Field 16 was also subjected to a metal-detector survey carried out by Martin Tobitt, John Pears, and Richard Pitcairn. The finds were plotted individually, and their distribution conformed to that of the pottery recovered through fieldwalking (cf. FIGS 9 and 10). A total of thirty-three Roman bronze coins was found all of which date between the later third and mid-fourth centuries. Other finds included four lead weights (FIG. 23), a possible knife or razor handle (FIG. 22.1), and a small amount of lead-, tin-, and copper-working debris.

The site at Kenn Moor was first excavated by the North Somerset Archaeological Research

23 The fieldwork was carried out by W.R. Wilson-North, S.A.J. Probert, H. Riley, M.J. Fletcher, and H. Chapman. The air photographic transcription was carried out by C. Dyer. Archive plans and publication illustrations were prepared by P. Newman. The archive report, from which this account has been derived, was written by W.R. Wilson-North and edited by M.J. Fletcher.

24 Rippon 1994, fig. 15.

25 In addition to the Romano-British pottery, an amount of prehistoric, medieval, and post-medieval material was recovered. There are hints of prehistoric activity on the edge of the bedrock in Field 28 where two possibly Bronze Age flints were found; a blade measuring 32/13/5 mm, in fresh condition and partly retouched (from ST 4208 6764); and a truncated flake, with retouch at both ends (at one end after breakage) and possibly used as a scraper (from ST 4195 6770). A truncated blade measuring 26/65 mm, with traces of retouch at the unbroken end may be Mesolithic (from ST 4213 6766). A late prehistoric sherd was also recovered from the same part of the field (ST 4192 6775).

FIG. 8. Kenn Moor. Plan of relict landscape from air photographic transcription and ground survey (copyright RCHME).

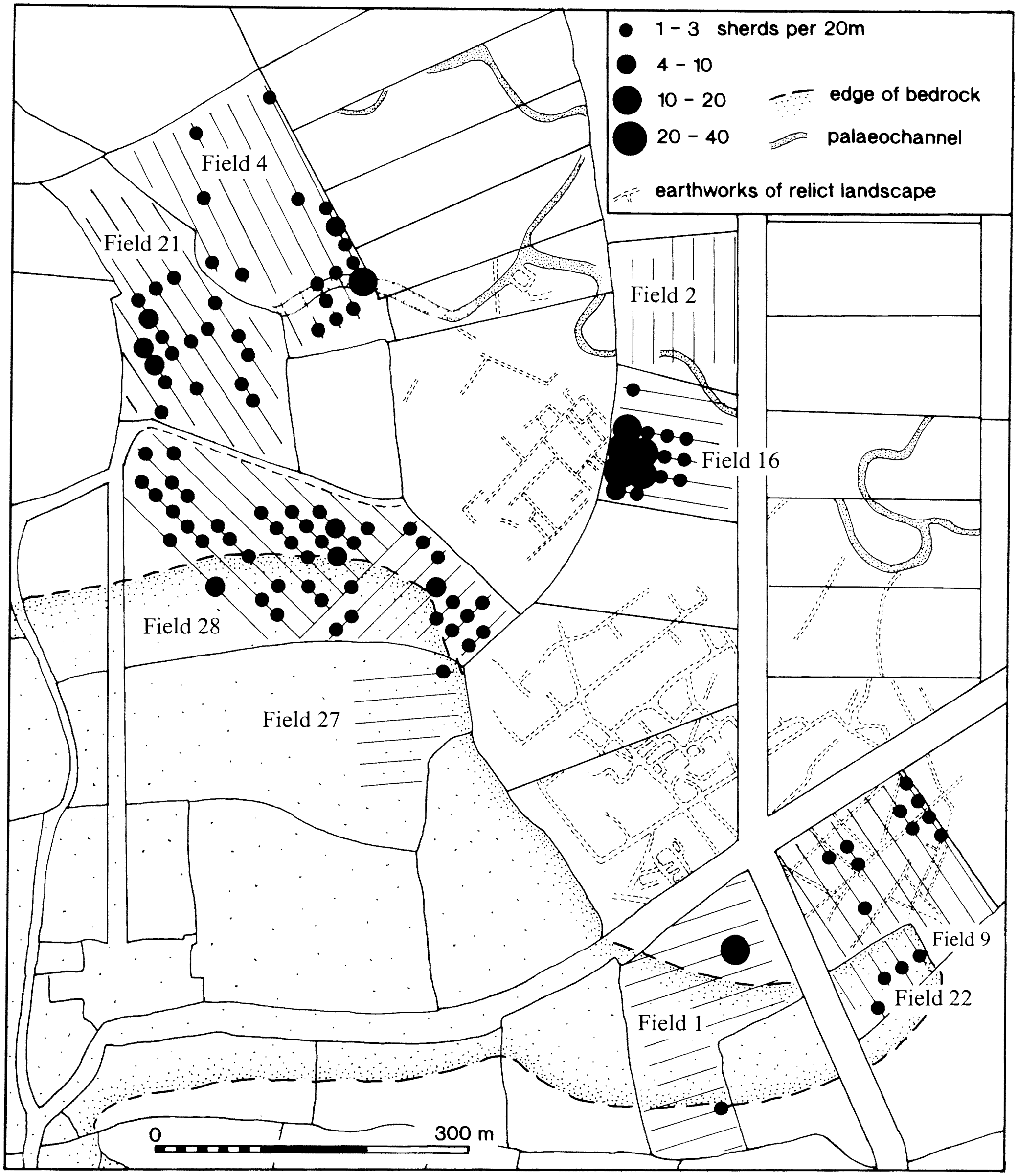


FIG. 9. Kenn Moor. Plan of relict landscape and results of fieldwalking survey.

Group (FIG. 10).[26] In 1959 they trenched the sub-rectangular mound on the northern edge of the relict landscape, revealing a stone structure interpreted at the time as a corn-drier (see Trench A below). In 1960, earthmoving in Field 5 to the south revealed a number of 'floors' and 'pits', and the two trenches that were subsequently dug revealed several spreads of stone, one of which appeared to be a collapsed drystone wall. In 1962 two further small excavations investigated slightly raised areas which probing indicated were also associated with stone rubble.[27] The southern trench revealed an inhumation which, from the waist upwards, was enclosed in a roughly built cist of stone slabs just *c.* 0.1–0.15 m below the present ground surface. A second trench revealed an inhumation lying on, and partly sealed by, a spread of stone rubble *c.* 0.1–0.2 m below the surface. This burial, and the associated rubble, was said to have lain on a slightly raised and possibly ditched mound. Both burials appear to have been oriented roughly north–south.[28]

In 1994 and 1995 eleven trenches were excavated in the northern potential farm complex. Five trenches (G, H, I, J, and K) were positioned in order to section major elements of the enclosure complex. Trenches A, B, and F investigated the sub-rectangular mound in Field 3 on the northern edge of the complex, while Trench C (in the same field) sectioned an element of the relict landscape whose orientation did not conform to the rest. Finally, Trenches D and E sectioned two ditches on the edge of the southern potential farmstead complex. All the ditches contained a similar tripartite sequence of fills unless otherwise stated: a lower light-to-mid-blue/grey silty clay, sealed by a dark blue/grey slightly silty clay, and an upper mid-blue/brown silty clay.

TRENCH G (FIGS 10–11)

Trench G was located in the north-west corner of the northern enclosure-complex, sectioning a slightly raised rectangular platform and its NE (F105) and NW (F143) boundary ditches. Ditch F105 was 2.5 m wide and 0.6 m deep, with a shallow, U-shaped profile. Ditch F143 was approximately 1.3 m wide and 0.65 m deep, though its U-shaped profile was somewhat distorted by slumping. Neither feature contained much domestic debris (just a few scraps of bone and several stone slabs in the lower fills), though a small assemblage of carbonised plant remains from F143 included a single oat grain, a few elements of wheat chaff, and a limited range of weed seeds primarily associated with meadow/grassland. Foraminifera were absent from F143 and diatoms (microscopic algae (plants), various species of which live in fresh, brackish and marine water, and which possess shells comprising two valves that are preservable in the fossil/archaeological record) were poorly preserved but indicative of freshwater conditions.

The lower-lying ground to the west of Ditch F143 was covered by a spread of local Triassic sandstone rubble (108), animal bone, and late third- to fourth-century pottery, at 4.9 m OD, which was in turn sealed by a dark blue/grey, slightly silty clay (109). This layer of rubble had no structure to it and none of the stones appeared to have been worked (apart from a fragment of a quernstone), though several stones had been burnt.

The platform bounded by F105 and F143 was *c.* 0.8 m (*c.* 5.7 m OD) above the adjacent spread of stone rubble, and consisted of a heavily oxidised/desiccated light-to-mid-brown silty clay (137 and 141) that appears to have been dumped, possibly when the adjacent ditches were dug. Its surface was largely devoid of features apart from two shallow linear hollows. F151 was 1.7 m wide and 0.15 m deep and contained a small assemblage of animal bone. F157 was 2.4 m wide, 0.15 m deep,

[26] Lilly and Usher 1972, site 6.

[27] Norman Quinnell of the Ordnance Survey visited the site two years later, and noted the location of the trenches at ST 4231 6776 and ST 4233 6777. The resistivity survey carried out as part of this project indicated areas of high resistance at both locations.

[28] Contemporary photographs taken by Derek Lilly.

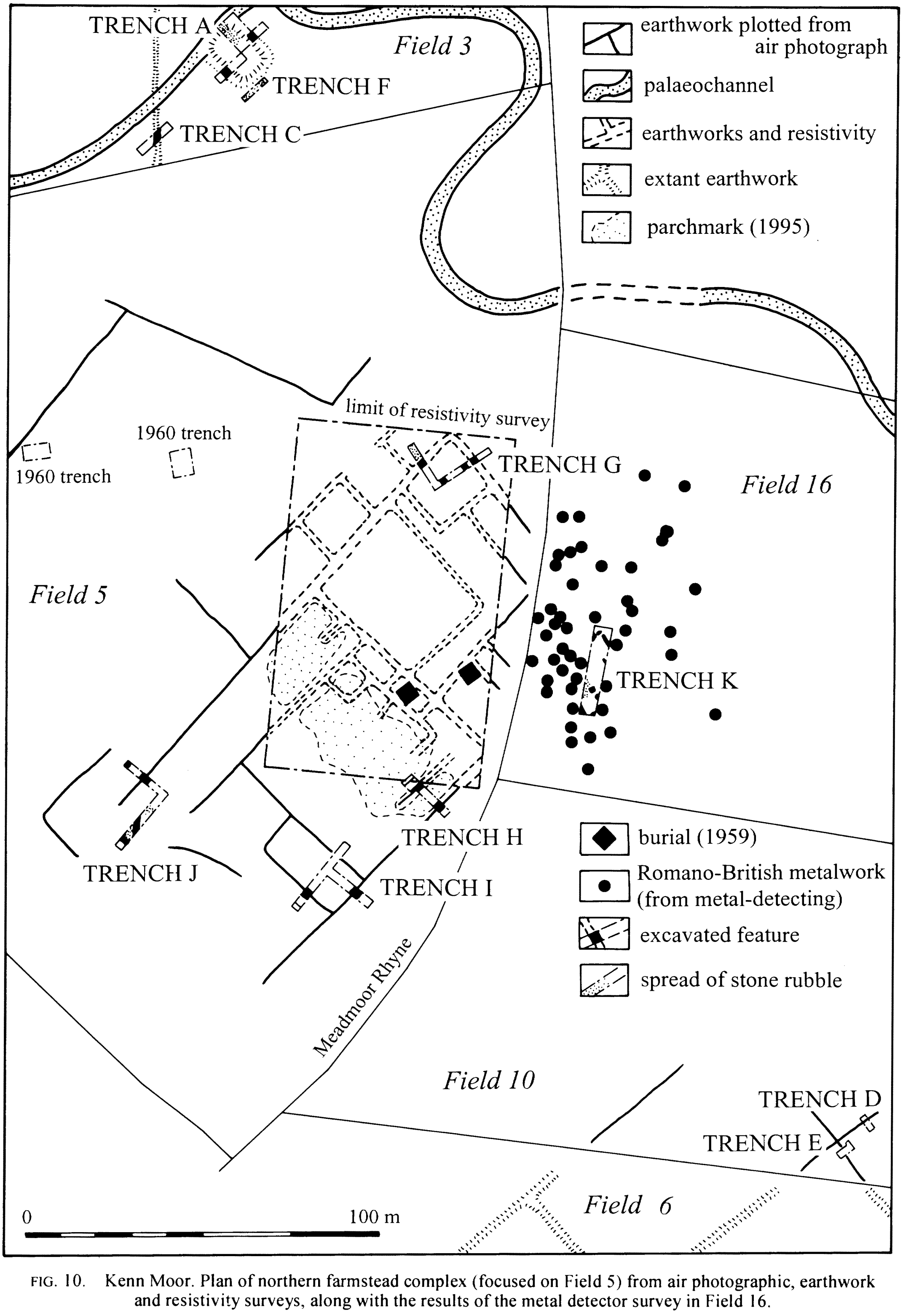


FIG. 10. Kenn Moor. Plan of northern farmstead complex (focused on Field 5) from air photographic, earthwork and resistivity surveys, along with the results of the metal detector survey in Field 16.

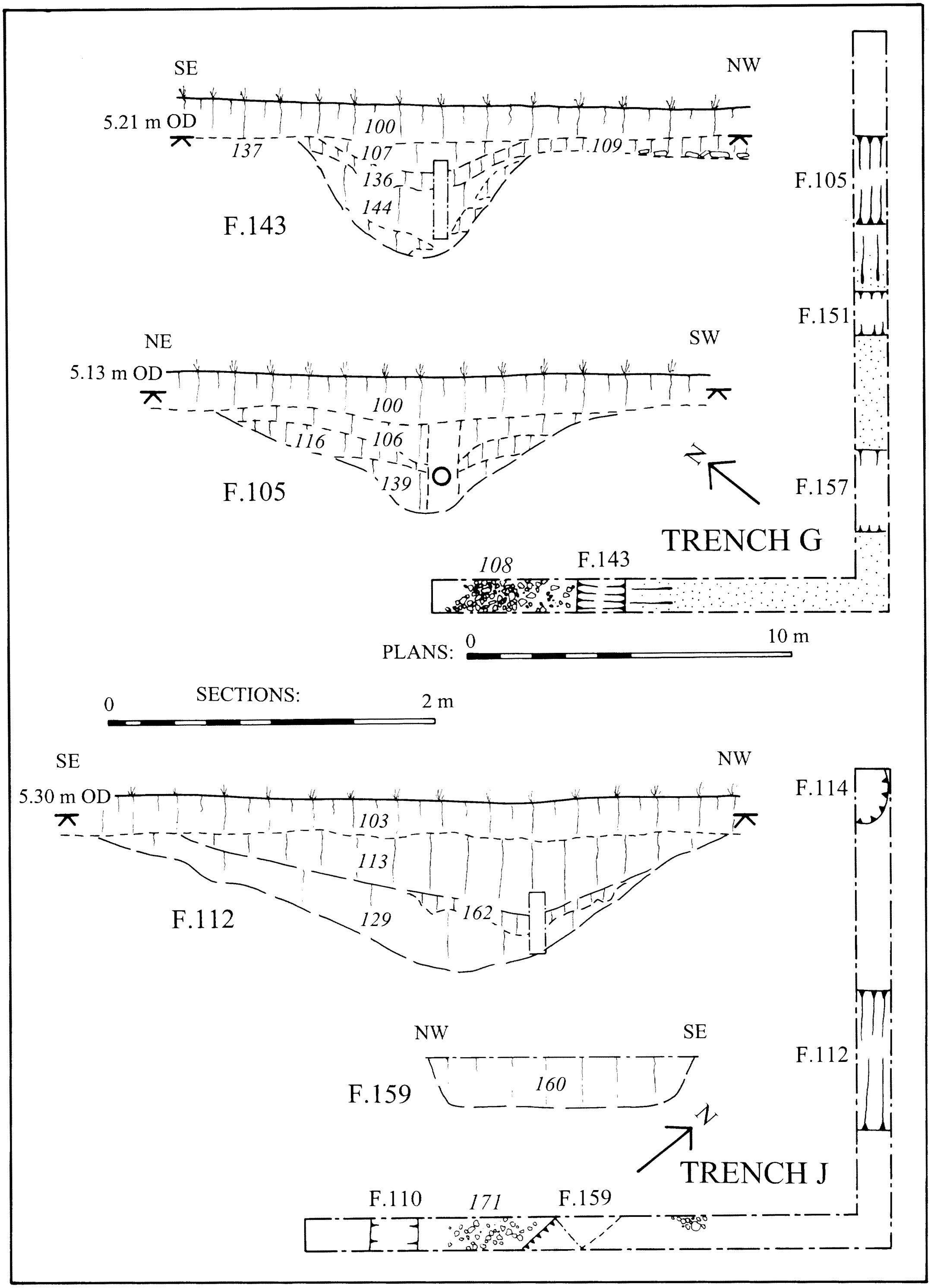


FIG. 11. Kenn Moor. Plan of Trenches G and J, with sections through the major features. For key see FIG. 12.

and filled with a dark brown silty clay loam containing a considerable amount of stone, charcoal (including silicified wheat awns), burnt clay, and bone, along with a small amount of iron-working slag.

TRENCH H (FIGS 10 and 12)

Trench H was laid out to investigate the eastern side of the enclosure (Ditch F119) which measured 1.8 m wide and 0.6 m deep, and ran along the edge of the small bedrock outcrop in Field 5. There was a sequence of four fills, the lowest comprising a thin (0.07 m) layer of light blue/grey slightly silty clay representing a brief period of flooding (166). This was sealed by a thick (0.2 m) deposit of mid-to-dark reddish brown loam (165), largely derived from material washed in from the bedrock sides of the ditch, but with a little water-borne, mid-blue/grey silty clay. This was sealed by similar material, but with a greater alluvial content (Layer 142), which in turn was sealed by a mid-blue/brown silty clay (118). Another ditch, F117, lay 8 m to the west of F119. Though 1.7 m wide, it was just 0.35 m deep, with straight sides and a flat bottom and contained a similar sequence of fills to F117. The only other feature in Trench H was a shallow, steep-sided and flat-bottomed gully/slot, 0.20 m wide and 0.08 m deep (F169), parallel with, and 1.4 m to the west of, Ditch F117. The function of this feature is unclear; there was no sign of any post- or stake-holes along its line, and so it may have housed a sill beam or served as an eaves-drip gully.

TRENCH I (FIGS 10 and 12)

Trench I sectioned a series of ditches in the south-eastern part of the enclosure complex in Field 5. Ditch F130 represents the continuation of F119 in Trench H, though in Trench I it was both wider (2.1 m) and deeper (0.9 m), probably reflecting the fact that its upper half was cut into alluvial clay rather than Triassic bedrock. The lowest fill (164) comprised a light-to-mid-blue/grey slightly silty clay with a dump of Triassic sandstone rubble, pottery, and animal bone towards the bottom. This alluvium must have been deposited fairly quickly, as there was very little trace of sandier material having been washed in from the bedrock into which the lower part of the ditch was dug. This was sealed by a mid-to-dark blue/grey slightly silty clay (132), and finally a mid-blue/brown slightly loamy clay (131).

Ditch F147 was laid out at right angles to F117/130 and was cut wholly into alluvium. Its U-shaped profile was relatively steep sided, though the western side in particular showed signs of slumping. The sequence of fills was very similar to F130 (Layers 168, 161, and 148), but with greater amounts of midden debris. Ditch F147 produced an important range of palaeoenvironmental evidence. The plant macrofossils include wheat, barley, and broad beans, along with weed seeds of arable and meadow/grassland communities. The diatoms indicate freshwater to slightly brackish conditions in a ditch which was prone to drying out, or had an input of eroded terrestrial material. In contrast foraminifera were also recovered which suggest a very brackish and non-vegetated environment, most likely a tidal channel with a clastic (mud/silt) bed rather than a saltmarsh.

Just 1.5 m to the west of Ditch F147 lay a parallel gully (F145), 0.4 m wide and 0.18 m deep, and not dissimilar in profile to those in Trench C (see below). Its fill comprised a mid-to-dark blue/grey silty clay, and contained a relatively large amount of stone rubble. The whole of the lowest-lying (southern) end of Trench I below 5.2 m OD (including both F147 and F145) was subsequently sealed by a sterile mid-blue/brown alluvium, though there was no trace of a buried soil corresponding to the horizon from which F147 and F145 were cut (*c.* 0.4 m below the present ground surface at 5.1 m OD).

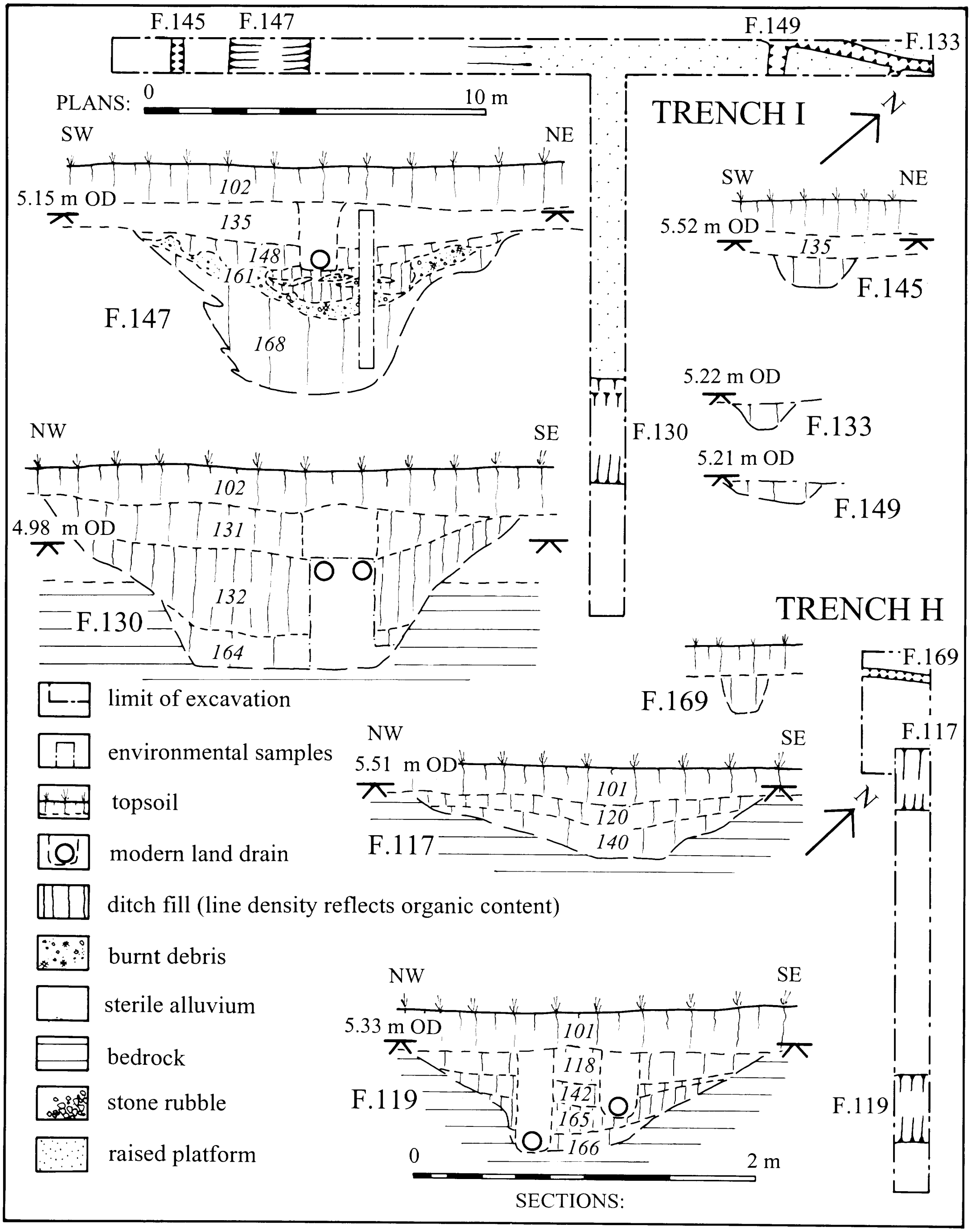


FIG. 12. Kenn Moor. Plan of Trenches H and I, with sections through the major features.

The north-eastern arm of Trench I was positioned across a NW–SE oriented ditch which appeared on the air-photographic transcription, though no trace of an earthwork or vegetation mark was visible on the ground in 1995. However, only a shallow, linear depression, *c.* 0.7 m wide and *c.* 0.1 m deep (F149), and containing a few scraps of pottery and bone, was located at this point. The only other feature in this part of Trench I was a linear gully (F133) on a different alignment to the other elements of the relict landscape. It was 0.4 m wide, 0.1–0.15 m deep with a U-shaped profile, cut by F149. A short stretch of a second gully, F163, ran south and at right angles from F133.

TRENCH J (FIGS 10–11)

Trench J was positioned in the south-west corner of the relict landscape in Field 5, and was designed to provide a second section of the ditch forming the north-western boundary of the main enclosure complex (the other being F143 in Trench G). In Trench J the ditch (F112) was 3.7 m wide and 0.85 m deep (the largest on site). The lowest fill comprised light-to-mid-blue/grey, slightly silty clay containing a few fragments of pottery, bone, and stone (Layer 129). This was partly sealed by a thin layer of dark blue/grey slightly silty clay, containing occasional flecks of charcoal (Layer 162). When it had largely silted up the ditch was recut, with a similarly wide, but rather shallower profile. This was filled with a uniformly mottled mid-blue/brown silty clay (Layer 113). Diatoms from all three layers suggest a largely freshwater environment, though with a slightly brackish element, while the snails suggest fairly still freshwater conditions. Foraminifera were absent.

To the north-west of Ditch F112 lay a curious cut feature, 0.3 m deep and with steep sides and flat bottom (F114). It contained a large slab of sandstone (0.61 x 0.52 x 0.05 m) inclined at 45 degrees, and sealing a cow's scapula. This stone may have been a boundary marker or a rubbing-stone for livestock (both of which can still be seen on the Levels today), though the possibility that this was some form of ritual deposit cannot be ruled out.

The southern arm of Trench J sectioned a shallow, linear hollow, perpendicular to F112, 1.5 m wide and 0.1–0.15 m deep (F110), filled with a mottled mid-blue/brown slightly silty clay (Layer 111), and containing a few sherds of pottery of later second-century date. To the north-east lay an extensive spread of Triassic sandstone rubble (Layer 171), which, like that in Trench G, had no structure. Further to the north-east lay a ditch (F159) 1.2 m wide and 0.3 m deep, running north–south on a different orientation to the rest of the landscape, though aligned with F13 in Trench C (see below). All these features in the south-west arm of Trench J (below 5.2 m OD), including the spread of stone rubble at *c.* 5.1 m OD, were sealed by sterile alluvium (Layer 138) similar to Layers 109 and 135 in Trenches G and I.

TRENCH K (FIGS 10 and 13)

Trench K, in Field 16, examined the north-east corner of the enclosure complex where the fieldwalking and metal-detector surveys had shown a marked concentration of Romano-British material. Removal of the ploughsoil revealed a highly oxidised and disturbed, light brown silty clay containing pottery, bone, stone, and flecks of burnt/clay charcoal (Layer 222). This material was similar to that which makes up the corn-drier mound (see below) and the platform sectioned in Trench G (see above). Layer 222 also appears to have been dumped as it sealed a small, steep-sided gully (0.6 m wide and 0.27 m deep: F231) and in several places covered a mid-blue/grey silty clay with occasional flecks of charcoal (Layer 238) suggestive of a buried ground surface at 4.9 m OD.

Apart from the gully F231, the earliest group of features in Trench K comprised three shallow,

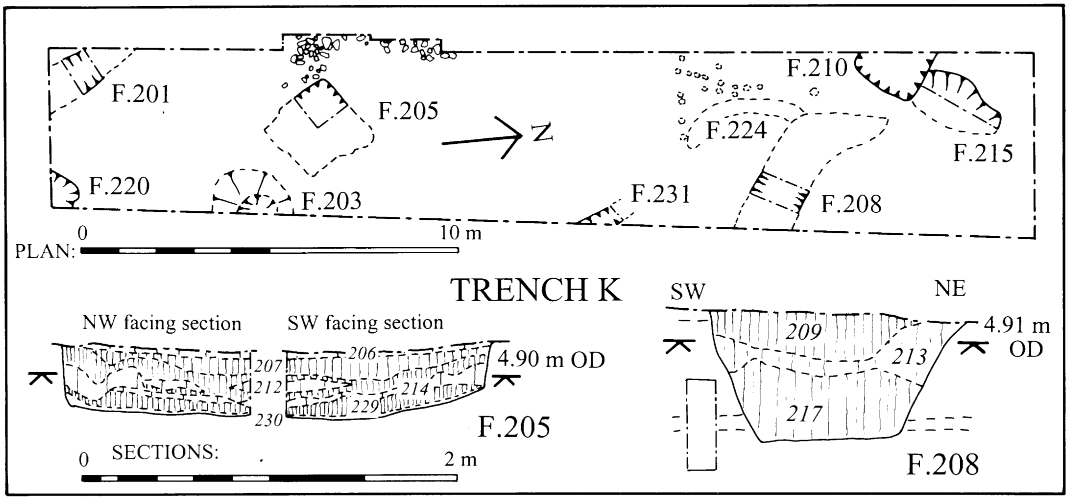


FIG. 13. Kenn Moor. Plan of Trench K with sections through F205 and F208. For key see FIG. 12.

irregularly-shaped pits (F203, F215, F220) whose fills contained just occasional flecks of charcoal and burnt clay, and relatively little bone and pottery (mostly third-century). A second, later, group of features was filled with distinctive midden-type material, dating to the fourth century (F201; F205; F208; F210). Ditch F208 is the continuation of F105 in Trench G, and appears to mark the north-eastern edge of the enclosure complex. F208 was 1.3 m wide, 0.7 m deep, with steep sides and a flat bottom. It was backfilled with three layers of very organically rich, midden-type material, all of which contained abundant pottery, animal bone, stone, charcoal, and burnt clay (Layers 209, 213 and 217). The large assemblage of fresh, unabraded pottery suggests a *terminus post quem* of A.D. 330/5 for its filling. The charred plant macrofossils included grains of wheat, barley, and oats, while weeds included those of cultivated land and particularly grassland/hay meadows. A shallow linear hollow, 1.1 m wide and 0.15 m deep (F201), on the same orientation as Ditch F208 crossed the south-west corner of the trench. It was filled with a mid-to-dark blue/grey silty clay, and contained a fair amount of stone, burnt clay, and flecks of charcoal, though there was little pottery and no bone (Layer 202).

The other important features in Trench K were two square pits. F205 was 2.1 m square, 0.34 m deep, with near-vertical sides and a flat bottom. It was filled with a complex sequence of very dark, organic-rich layers and dumps of clay. The lowest fill (230) was a slightly greenish-yellow, crumbly silty clay resembling cess, though wet-sieving failed to find any mineralised seeds. It sealed the whole of the base of the pit, lapping up against the sides. Its surface followed the contours of the bottom, rather than forming a flat surface as would be expected if this had been deposited as a liquid/slurry. It was sealed by a complex sequence of intercalated lenses of charcoal, blue/grey and grey/brown clays that had clearly been dumped (229; 214; 212; 207; 206). The charred plant remains from F205 were similar to those in the ditch F208, while the pottery suggests a date of filling in the early fourth century.

The other square pit, F210, which cut F215, could only be partly excavated as it extended beyond the edge of the trench. The one complete side measured 1.8 m, while the profile had sloping sides 0.4 m deep and a flat bottom very similar to F205. There were three fills; two layers of very dark midden material (211 and 228) separated by a deposit of dumped clay (226). There was none of the yellow material seen in F205, though the wet sieving did produce mineralised seeds. Once again, the charred plant remains were similar to F208, while the pottery suggests a date of back-filling in the early to mid-fourth century. The function of these two pits remains unclear. Their basic form is suggestive of cess pits, though their dimensions would appear to be too shallow, and such features would not be expected on a rural site since such material would be disposed of on the fields.[29] A range of other functions can be postulated, such as storage or retting flax (though there is no palaeoenvironmental evidence for flax on the site).

A spread of Triassic sandstone rubble survived just below the ploughsoil to the west of, and tipping into, F205. In common with similar spreads in Trenches G and J it had no apparent structure, and none of the stone seemed to have been worked. The subsoil in an area of *c.* 9 m^2 to the south of Pit F210 appeared particularly disturbed and, following repeated cleaning, a range of minor features was revealed. A single line of stake-holes ran east–west, with a double line of holes running north–south towards F208, while to the east lay a shallow curving gully (F224), 0.12 m deep and 0.05 m deep, with steep but sloping sides and a flat bottom.

THE CORN-DRIER MOUND: TRENCHES A, B and F (FIGS 10, 14 and 15)

The enclosure complex in Field 5 lies to the south-west of a palaeochannel which can be traced as an earthwork on early air photographs for some 700 m. A tributary channel (F61), to the north of the relict landscape, was sectioned where a ditched, sub-rectangular mound impinges upon it.

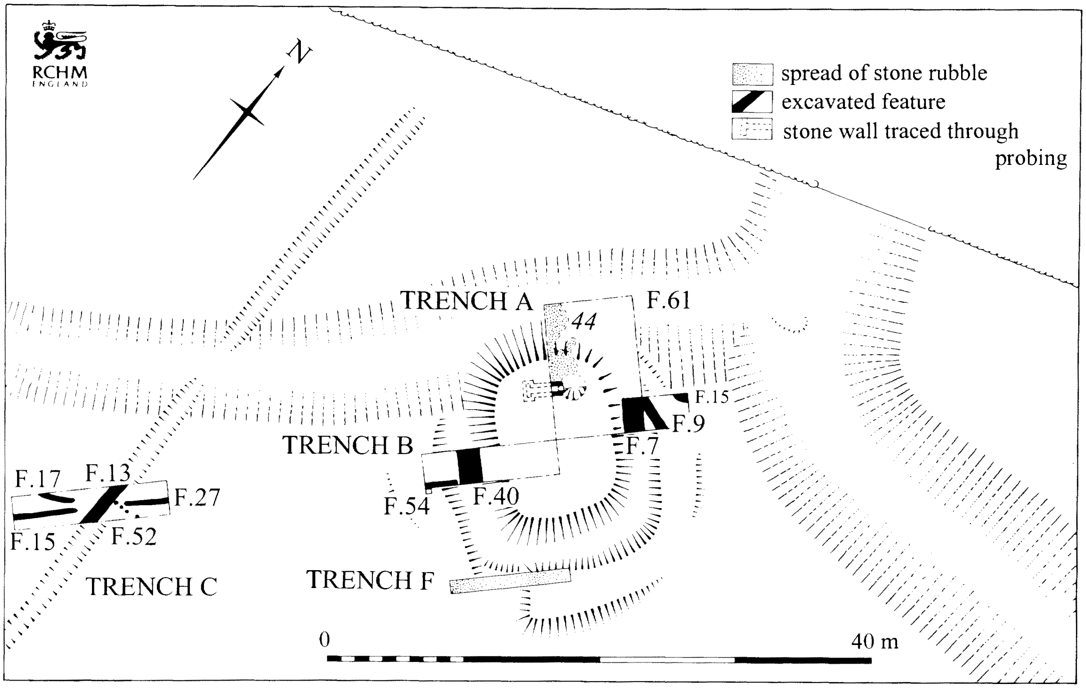


FIG. 14. Kenn Moor. Plan of earthworks in Field 3, including the corn-drier mound, and Trenches A, B, C, and F. See FIG. 15 for detail of Trench A.

[29] For example, many of the cess-pits at Portchester Castle were over 1 m deep: Cunliffe 1975, 78–179.

Plant macrofossils and snails in the palaeochannel sediments (59) immediately below a spread of stone rubble (44) containing later third- to fourth-century pottery suggest a freshwater environment that may have dried up in summer.

The palaeochannel is partly sealed beneath a sub-rectangular mound, aligned north-west to south-east, measuring 16.4 m by 12 m, and standing 0.4 m high (surface 5.7 m OD). On all but its north-western side the mound is enclosed by a shallow ditch 1.5 m wide and 0.2 m deep, with a fragmentary bank on its external lip. The mound was first excavated in 1959 and, though no proper records were kept of this work, a range of contemporary photographs, some with accompanying annotations, allow a basic description to be made.[30] The stone structure comprised two parallel stone walls of drystone construction with a T-shaped end, between which there was apparently '3–4 inches of wood ash'.

In 1993, *c.* 40 per cent of the mound was excavated with sections extending over the palaeochannel to the north and the ditches to the east and west. The mound comprised a heavily oxidised and desiccated light-to-mid-brown silty clay (Layer 4), which was presumably the upcast from the surrounding ditch. This overlay a firm light-blue/grey horizon with occasional light-to-mid-brown mottles (Layer 85; *c.* 5.1–5.2 m OD), which merged with the natural alluvium below. This horizon (85) may represent the surface of the drying saltmarsh after reclamation, but before the development of a true soil.

The major feature uncovered on the mound was part of the stone structure first seen in 1959. This is a simple example of a late Romano-British T-shaped 'corn-drier' found throughout the West Country (PL. IIIB).[31] The two walls of the flue were *c.* 0.4 m wide and of drystone construction, comprising very roughly dressed tabular blocks (*c.* 0.05–0.08 m thick) of local Triassic Sandstone. The complete plan was obtained through probing; internally the flue was 2.0 m long, 0.6 m wide with a T-shaped end 0.85 m wide. The upper two courses of stone were carefully worked so as to provide a sloping/chamfered surface, suggesting that they stand close to their original height. The flue was 0.6 m wide, with a large flat stone at its mouth to form the firebox. Both the flat stone and the adjacent walls showed signs of burning. Little of the 1959 'wood ash' layer survived, and, though there was a small pocket of dark material in one corner (Layer 34), when wet sieved this failed to produce any plant macrofossils. To the east of the flue a large roughly oval-shaped, steep-sided, depression (F24) was probably used for access to the firebox, and as a place to rake the ashes. The sides showed traces of having been affected by heat, but there was no evidence for *in situ* burning.

Relatively little survived to suggest the nature of the above-ground structure which must have covered the corn-drier. To the south of the flue, part of a sub-rectangular slot, 0.24 m deep and 0.35 m wide, extended into the unexcavated area (F90). To the north of the stone structure an extensive layer of stone rubble (44) spread over the surface of the mound and tipped into the adjacent palaeochannel (F61), where it both sealed and was sealed by alluvium. The rubble was largely Triassic sandstone with occasional fragments of Lower Old Red and Carboniferous sandstone, and lay in a jumbled mass that was clearly not designed to form any kind of surface. Several stones were clearly worked in the same fashion as the walls of the flue with rounded corners and chamfered edges, while some showed signs of burning. There was also a large amount of burnt clay/daub, potentially from a wattle and daub superstructure. Once Layer 44 was removed, the surface of the mound was cleaned. This revealed five possible post-holes (F66, F68, F70, F72, F74) each *c.* 0.15–0.3 m in diameter and 0.1–0.2 m deep, with three containing stone packing (F66, F68, F70). In addition there was a linear slot-like feature (F64) with steep sides and a flat bottom

[30] In addition to photographs in Woodspring Museum, several privately owned pictures came to light after the excavations had started: I would like to thank David Crossman, Fred Elliman, and Derek Lilly for providing copies of these.

[31] Morris 1979, 20, fig. 2.

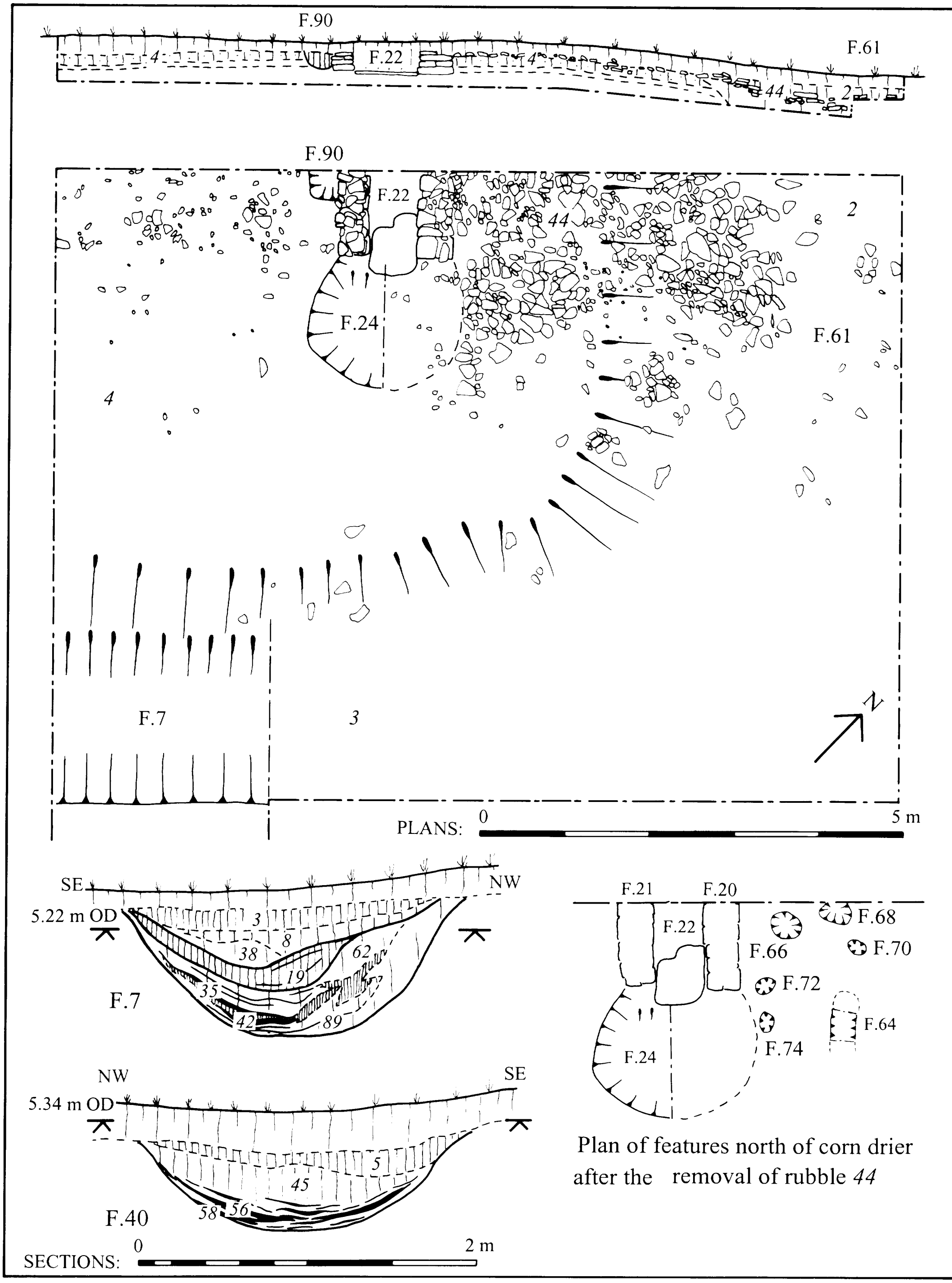


FIG. 15. Kenn Moor. Trench A and sections through F7 and F40.

on the same orientation as the lines of possible post-holes, measuring 0.3 m wide, 0.02 m deep; it was traced for 0.75 m. The rest of the mound, both in Trenches A and B appeared to have been devoid of features.

On three sides, the mound is surrounded by a ditch which presumably provided material with which to construct the mound, and subsequently aided its drainage. A section excavated to the east (F7) revealed a U-shaped ditch with fairly steep sides 0.9 m deep and 1.8 m wide (PL. IVA). The lowest fill (89) comprised a mid-blue/grey clay with several fine lenses of charcoal, burnt grain, and chaff, representing waste fuel from the corn-drier. This was sealed by a series of alternating and intercalated layers of charcoal/burnt grain (35 and 42) and sterile lenses of light-to-mid-blue/grey silty clay (39 and 41). Intruding into this sequence from the west was a mid-brown silty clay (62), indistinguishable from the material that made up the mound (Layer 4). It may represent a combination of slumping and deliberate dumping to maintain the edges of the platform. The ditch was subsequently recut and began to silt up with a dark blue/grey silty clay with occasional thin lenses of charcoal (Layer 19). It was then recut again, and subsequently partly backfilled with a dump of stone rubble and a lens of yellow/brown clay (38). Natural siltation resumed the deposition of mid-to-dark blue/brown silty clays (8 and 3) which merged with the upper fill of the palaeochannel to the north (Layer 2). As these layers lacked charcoal they were presumably deposited after the corn-drier had ceased to function.

The ditch to the west of the mound (F40), sectioned in Trench B, had a similar sequence to the first cut of Ditch F7: a basal fill of blue clay with very fine lenses of charcoal (83), followed by a sequence of intercalated lenses of charcoal (56 and 58) and blue/grey silty clay (57) sealed by mid-to-dark blue/grey slightly silty clays (5 and 45). Curiously, there were no signs of this ditch having been recut. Diatoms suggest that the alluvial deposits represent a freshwater/slightly brackish environment; foraminifera were absent.

The only other features in Trenches A and B were two shallow gullies and an amorphous hollow. One gully, F54 (in Trench B), had steep sides and flat-bottomed profile, *c.* 0.3 m wide and *c.* 0.1 m deep. It ran westwards from, and exactly perpendicular to, Ditch F40. Gully F9 in Trench A had a shallow and irregular profile, with an average width of *c.* 0.75 m, and depth of *c.* 0.1–0.15 m. It was cut by Ditch F7, and was on a very different alignment to the rest of the Romano-British field-system. An amorphous hollow (F11) was also excavated to the east of Ditch F7. It was devoid of finds apart from a stone slab, and several pieces of burnt clay, possibly from a furnace-lining.

The RCHME survey had suggested that there was a slight bank around the ditch that surrounded the mound, with a break to the south-west. Trench F sectioned both the bank and this break. Beneath *c.* 0.25 m of topsoil lay a mixed deposit of mid-to-dark blue/brown silty clay, with frequent charcoal. Spreads of stone rubble lay under the bank while the gap was devoid of stone.

DRAINAGE FEATURES: TRENCH C (FIGS 10 and 14)

Trench C, also in Field 3, was designed to section the earthworks of a north–south oriented ditch (F13) at variance to the rest of the relict landscape, but in line with F159 in Trench J. The earliest cut of F13 was *c.* 1.1 m wide and *c.* 0.5 m deep with steep sides and a flat bottom, and filled with a light-to-mid-brown silty clay (49/50). After it had virtually silted-up, this ditch was recut with a narrower, more V-shaped profile filled with mid-blue/brown silty clay (48) and an upper mid-to-dark brown silty clay (14). Snails indicate an initially open, relatively dry, ditch becoming well-vegetated and with a greater flow of water.

Three shallow gullies appear to have respected F13. The curving F17 had a shallow U-shaped profile, *c.* 0.35–0.40 m wide and *c.* 0.06 m deep, whereas F15 and F27 had steep sides and flat bottoms, *c.* 0.40 m wide and *c.* 0.16 m deep; the line of F27 marks a continuation of F54 in Trench B. Snails from F15 and F27 indicate shallow, thickly vegetated, freshwater conditions.

The third set of features in Trench C comprised a line of four, steep-sided features each *c.* 0.8 m apart. The western three were oval in plan, 0.2–0.3 m in diameter and 0.15–25 m deep (F31, F35, F46). F29 was a little different to the rest, being rectangular in plan, (0.28 by 0.35 m) and just 0.08 m deep. Though there was no evidence of stone packing, the regular spacing and alignment of these features suggests they formed a fence line (F52) approximately perpendicular to the ditch F13.

None of the features in Trench C produced much in the way of dating evidence. Ditch F13 contained no pottery, but appears to pre-date the gullies and represents one of a small group of early features that do not correspond to the predominant SW–NE orientation of the Romano-British landscape. Gullies F15 and F17 produced a handful of small, abraded Romano-British sherds but nothing later. Gullies F15, F 17 and F54 (in Trench B) may in fact be one feature with a break as it crosses F13, and together they form an alignment perpendicular to the corn-drier mound and roughly parallel to the palaeochannel which does conform to the overall SW–NE orientation of the Romano-British enclosure system.

TRENCHES D AND E (FIG. 10)

Two trenches were excavated in Field 10 in order to section elements of the relict landscape which appeared to form part of the southern settlement focus, comprising a complex of small platforms, paddocks, and slightly larger enclosures. Trench D ran across one of the major SW–NE oriented axial elements of the landscape. The earliest phase of ditch (F302) was *c.* 1.5 m wide and 0.65 m deep, with a U-shaped profile and a fairly flat bottom. The lower fill comprised mid-blue/grey clay, with some mixed stone rubble (305) from which a small assemblage of snails suggests a largely freshwater environment. The upper fill comprised a dark brown, organic rich silty clay (304). After F302 had virtually silted up, it was recut by F306, which was filled with mid-to-dark brown organically rich silty clay (303). Both features produced late third- to early fourth-century pottery.

Trench E sectioned one of the minor SE–NW oriented boundaries of the relict landscape. This comprised a broad linear hollow (F312), rather than a more narrowly defined ditch, possibly due to its sides being trampled by livestock seeking drinking-water. Such 'waterings' are still found besides ditches on the Levels and are now usually revetted with stone or concrete to prevent such damage to the ditch sides.[32] F312 was filled with mid-blue/grey silty clay with several bands of brown mottling (310 and 311), and a considerable amount of largely limestone rubble, bone, relatively unabraded pottery (late third- to fourth-century) and a single coin (dated A.D. 270–73).

SURVEY AND EXCAVATION AT PUXTON (FIG. 16)

The third Romano-British relict landscape on the North Somerset Levels, at Puxton (NGR ST 415 630), lies *c.* 3 km north of the fen-edge at Banwell (FIG. 16). The Romano-British ground surface is within the modern ploughsoil, the surface of which lies at *c.* 5.0–5.2 m OD.

The earthworks in this area have been the subject of some discussion as they pre-date an area of medieval common meadow, known as the 'dolmoors' and 'Wickham'.[33] Though a number of Romano-British sherds are reported to have come from the general area,[34] the dating of these earthworks as Romano-British relies upon their morphological similarity to those at Banwell and

32 Rippon 1996a, 60.
33 Gardner 1985, 13–20.
34 Broomhead 1994; Clarke 1980, 1–4.

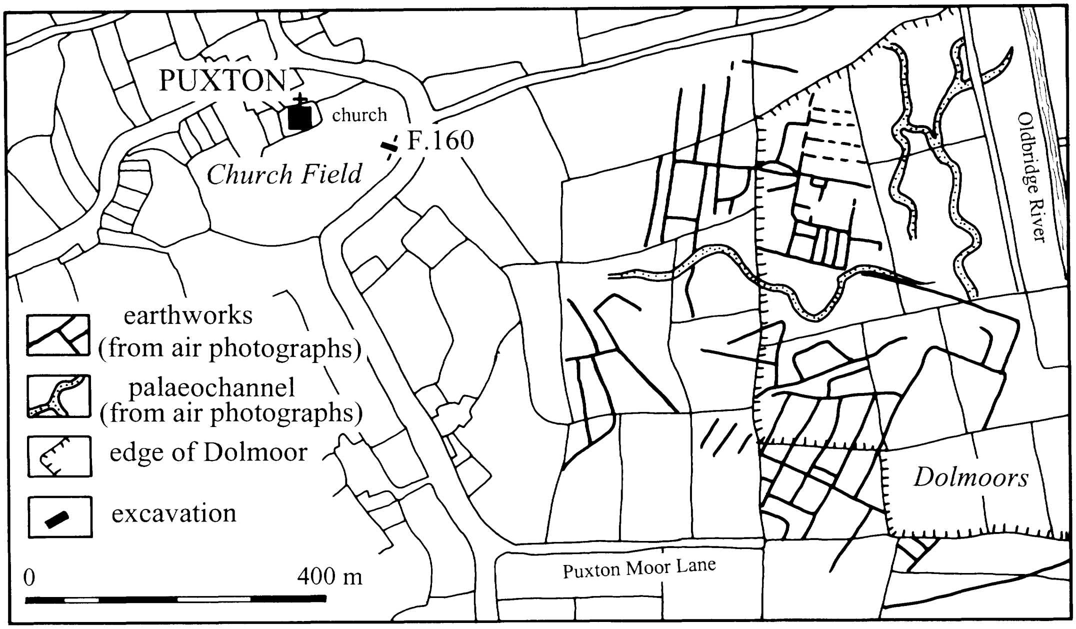


FIG. 16. Puxton. Plan of relict landscape from air photographic transcription, and location of trench in Church Field.

Kenn Moor. The plan of this landscape, derived from air-photographic evidence,[35] comprises a complex of small platforms, paddocks, and enclosures surrounded by slightly larger fields, on a broadly SSW–NNE orientation. The earthworks lie either side of a substantial palaeochannel complex, around which the enclosure system appears to have been laid out. One field has been walked, to the west of the earthworks and immediately south of Puxton church.[36] This revealed a light scatter of Romano-British pottery showing a slightly increased density in the eastern part of the field (i.e. towards the main earthwork complex), with an average density of 0.0125 sherds per m^2, comparable to the heavily manured zone around the settlement at Kenn Moor (see above). The diagnostic sherds from the fieldwalking are all later Roman, and include South-East Dorset BB1, local Congresbury grey ware, and one possible sherd of Oxfordshire ware. An abraded fragment of box-flue tile was also found.

Excavations in this field during 1996 revealed several Romano-British features sealed beneath an early medieval bank.[37] A small ditch, F160 (0.60–0.85 m wide and 0.55 m deep) was oriented SW–NE (FIG. 16). To the west ran a slightly curving SE–NW oriented gully (F156), 0.45 m wide and 0.18 m deep, whose steep sides and flat bottom suggest it was spade-cut. To the north of F156, and parallel with F160, lay a SW–NE oriented gully (F158), just 0.25 m wide and 0.16 m deep, but also with a spade-cut profile. All three features were filled with a similar mid-to-light blue/grey silty clay. Gully F156 produced a small freshwater snail assemblage.

35 RAF 541/41.4257 and 541/257.3232; West Air 32903; photographs by the author.
36 Rippon 1996b, 39–52.
37 Rippon 1996b, fig. 9, Trench 3.

PALAEOENVIRONMENTAL RECONSTRUCTION

By Julie Jones, Nigel Cameron, Paul Davies, Simon Dobinson, Chris Gleed-Owen, Simon Haslett, Jen Heathcote, Anthony Margetts, David Smith, Heather Tinsley, and Huw Williams

A critical part of this programme of fieldwork was the acquisition of palaeoenvironmental material with which to reconstruct the environmental setting of the Romano-British landscapes at Banwell and Kenn Moor. Samples were taken from a wide range of contexts including the buried land-surfaces, midden deposits, and various elements of the drainage system (the palaeochannel, ditches, and gullies). Specialist reports have been produced by the following authors: David Smith (beetles), Nigel Cameron and Simon Dobinson (diatoms), Simon Haslett, Anthony Margetts and Huw Williams (foraminifera), Julie Jones (plant macrofossils), Heather Tinsley (pollen), Sheila Hamilton-Dyer (small mammals), Chris Gleed-Owen (amphibian bones), Paul Davies and Joanne Smith (snails), and Jen Heathcote (soil micromorphology). Full details of sampling strategies, methodologies used and species lists can be found in the specialist reports.

Coastal wetlands are highly dynamic environments and the contexts from which the environmental samples were taken need careful consideration. Sediment accretion on active saltmarshes is a continuous but slow process, though fluctuations in relative sea level can lead to variations in the rate of build up: the lower buried landsurface at Banwell Moor occurred in just such a gradually accreting environment. Reclamation cuts off tidal sediment supply leading to a stabilisation of the land surface, though precipitation and freshwater run-off from the adjacent uplands means that any ditches dug into the surface of a reclaimed marsh would be subject to some silting, particularly as they become clogged with vegetation. The late Roman ditched-drainage systems at Banwell, Kenn, and Puxton were in such a landscape, and therefore the lower fills of these ditches will reflect the contemporary environment. During the late/post-Roman period this formerly freshwater, reclaimed, landscape was once again subjected to tidal flooding and sediment accretion as a result of the failure of the sea walls. This accounts for the alluvium that seals parts of the relict landscapes at Banwell and Kenn and fills the upper parts of many of the late Roman drainage ditches.

In attempting to reconstruct the palaeoenvironment of the North Somerset Levels during the Roman period it is clearly important to distinguish between sediments laid down during the active use of a landscape (that will reflect the contemporary environment) and material deposited after that landscape was abandoned. The former were derived from a number of sources. Most of the snails, waterlogged plant macrofossils, beetles, small mammals, and benthonic diatoms and foraminifera will reflect actual water conditions in the drainage ditches while they were in use. Each species has a particular ecological preference (e.g. freshwater, brackish, intertidal etc.) and though many can tolerate very occasional environmental changes, such as a brief influx of salt water due to a flood event, they will reflect the *normal water conditions*. However, some species of all these groups will have been washed into the ditches from the immediately adjacent areas and reflect the *ground conditions beside the ditches*. Pollen can be very local or blown in from rather greater distances. Planktonic diatoms and foraminifera can be derived from *short term flood events*, but can be easily distinguished from *in situ* assemblages. A proportion of the diatoms, foraminifera, and snails may also have *eroded out of the natural alluvium* into which the ditches were cut and so bear no relationship to the contemporary environment of that ditch, though these can often be distinguished due to their poor condition. Finally, some material was dumped into the ditches in the form of *midden debris* by the human communities living nearby. This is particularly true of the burnt crops and hay recovered from both Banwell and Kenn Moor and could potentially represent local cultivation practices. In the following section the palaeoenvironmental material is discussed in terms of the contexts from which it was recovered, with a broadly chronological approach:

1. The environmental setting of the late Iron Age saltern and its subsequent inundation.

2. The ecology of the late Romano-British landscape and its associated ditched-drainage system.
3. The late Roman buried landsurface at Banwell.
4. The post-Roman inundation.

1. ENVIRONMENTAL SETTING: THE LATE IRON AGE AND EARLY ROMANO-BRITISH INUNDATIONS

During the first millennium B.C, most of the North Somerset Levels appear to have been intertidal mudflats and saltmarshes. The upper part of the alluvial sequence that was laid down at this time, representing pre-occupation sediment upon which the later Romano-British landscape rested, was sampled for foraminifera at Kenn Moor (Trench K). The lower samples were dominated by *Elphidium williamsoni* which indicates low marsh/high mud flat deposition, but an increase in the abundance of *Haynesina germanica*, a species more typical of a depositional position lower in the tidal frame, occurs in the upper levels shortly before the Roman reclamation (although *Elphidium williamsoni* remains common). These results imply general deposition on a non-vegetated high intertidal mudflat, with a change to more saline conditions. This increase in marine influence is supported by the occurrence (albeit rare) of the marine species *Rosalina williamsoni* in the topmost sample. Therefore, prior to reclamation, this was probably an area of non-vegetated mudflat during a period of transgression, reflecting relative sea-level rise.

At Banwell, slight darkening of the natural alluvium associated with fragments of burnt clay and charcoal represented a buried landsurface. Soil micromorphology shows that this horizon represents a pause in sediment accretion followed by drying of the marsh surface. This was associated with features relating to a saltern of first century B.C./first century A.D. date. The snail assemblages from this landsurface and the saltern debris comprise roughly equal numbers of *Hydrobia ventrosa* and *Hydrobia ulvae*, indicative of intertidal saltmarshes. Pollen preservation in the landsurface was poor, although taxa which could indicate halophytic conditions such as sea-plantain (*Plantago maritima*), buck's-horn plantain (*Plantago coronopus*) and the Chenopodiaceae (Goosefoot family) occur as occasional grains, also indicating brackish conditions.

There is some evidence of the wider landscape. A large number of terrestrial snails from the saltern, notably *Vertigo pygmaea* and *Pupilla muscorum*, are indicative of rather drier conditions, while *Vallonia pulchella* inhabits wet meadows and marshes. The pollen taxa present are dominated by grasses with a range of indicators of weedy ground and possibly disturbance suggestive of pastoralism, notably ribwort plantain (*Plantago lanceolata*) and dandelion-type (*Cichorium intybus*). Such species are early colonists and may also have been growing on the saltern mound itself. The plant macrofossils although limited, are also typical of disturbed weedy ground and include dandelion (*Taraxacum*), common nettle (*Urtica dioica*), and common chickweed (*Stellaria media*). Tree pollen percentages are low indicating an open environment. Overall, it would appear that the late Iron Age saltern lay in a weedy grassland which may have been used for grazing, close to an upper saltmarsh limit. Sea water would have reached the saltern via tidal creeks which rarely suffered over-bank flooding, so the wider landscape would not have been regularly inundated.

The saltern debris also produced hard, black amorphous lumps containing the compressed remains of organic material and impressions of fruits including great fen-sedge (*Cladium mariscus*). It is thought that this material is burnt peat and relates to fuel used in the saltmaking process. Only small quantities of charcoal fragments were noted and this suggests that wood was not a major source of fuel. Similar lumps of carbonised material were recovered from the excavation of a salt-making mound at East Huntspill (in the Central Somerset Levels) where the remains of *Sphagnum, Calluna, Erica,* and *Eriophorum* confirm that raised bog peat was used as fuel in the salt extraction process.[38]

[38] Leech *et al.* 1983.

The alluvium sealing the late Iron Age saltern produced limited plant macrofossil, pollen, and snail assemblages. Although pollen preservation was poor, grasses and some indicators of disturbance suggestive of pastoralism, notably ribwort plantain and dandelion-type, could be identified. There is no noticeable increase in pollen of halophytic taxa which continue to be represented as occasional grains. The plant macrofossil assemblage contained occasional fragments of bulrush (*Typha*), duckweed (*Lemna*), and water crowfoot (*Ranunculus* subg *Batrachium*), more typical of freshwater environments, though the dominance of rush (*Juncus* spp.) could indicate marshy and potentially brackish conditions. The very small snail assemblage is difficult to interpret, though the presence of *Bithynia tentaculata* and very low numbers of *Hydrobia* suggest mainly freshwater conditions with just a little brackish influence.

Overall, it would appear that the alluvium overlying the late Iron Age saltern at Banwell was deposited in a largely freshwater environment, though towards the coast more brackish conditions presumably prevailed. This sediment accretion was in the context of the continuing post-glacial rise in sea level, though the episode of salt production at Banwell appears to have occured during a brief pause in this continuing rise in water levels, since a landsurface had time to develop. Pottery from the late Iron Age saltern at Banwell suggests a *terminus post quem* of the first century B.C./early first century A.D. for the resumption of sediment deposition, and around the third century A.D. for its cessation.

2. THE ECOLOGY OF THE LATE ROMANO-BRITISH LANDSCAPE AND ITS ASSOCIATED DITCHED-DRAINAGE SYSTEM

Around the third century extensive ditched-drainage systems were dug at Banwell, Kenn Moor, and Puxton. A wide range of features including ditches and gullies were extensively sampled from these sites to help build up a picture of both the local and wider environment which existed in the later Romano-British period. In particular, sediments from the lower fills of the ditched-drainage systems at Banwell produced a rich suite of floral and faunal remains whose accumulation is attributable to a number of different sources. The pollen and plant macrofossils represent the vegetation growing in the ditch itself, in the fields around the ditch, and in the wider region, with all these elements providing hosts to a range of beetle species. The snails present will also either have inhabited the ditches or reflect conditions in the surrounding landscape.

The local environment of the ditches

The lower fill of the three main ditches (F2, F4, and F6) in Trench 1, and the lower fills of Ditches F208, F212, and F218 in Trench II at Banwell produced an abundance of plants, pollen, beetles, and snails typical of a freshwater environment. Several distinct communities of plants with their associated fauna, typical of a lowland pond or ditch could be distinguished. A series of ecological zones has therefore been suggested for the local environment around the ditched-drainage system at Banwell. These are illustrated in FIG. 17 with many of the species recovered shown in Table 1.

Much of the evidence reflects the vegetation communities and water conditions which would have existed in the ditches. Many of the plants represented here are true aquatics which would live either free-floating or anchored in the muds at the base of the ditch. These include water crowfoot and water-cress (*Rorippa nasturtium-aquaticum*). The presence of duckweed, which often forms dense carpets on the water surface, suggests still or slow-moving water, while horned pondweed (*Zanichellia palustris*) and the algae stonewort (*Chara*), both of which grow entirely submerged, suggest that some depth of water existed in the ditch for at least part of the year. Characeae are often the first plants to colonise newly dug or cleared ditches and ponds, and some species are characteristic of ephemeral bodies of water which dry up completely in summer. Most charophytes

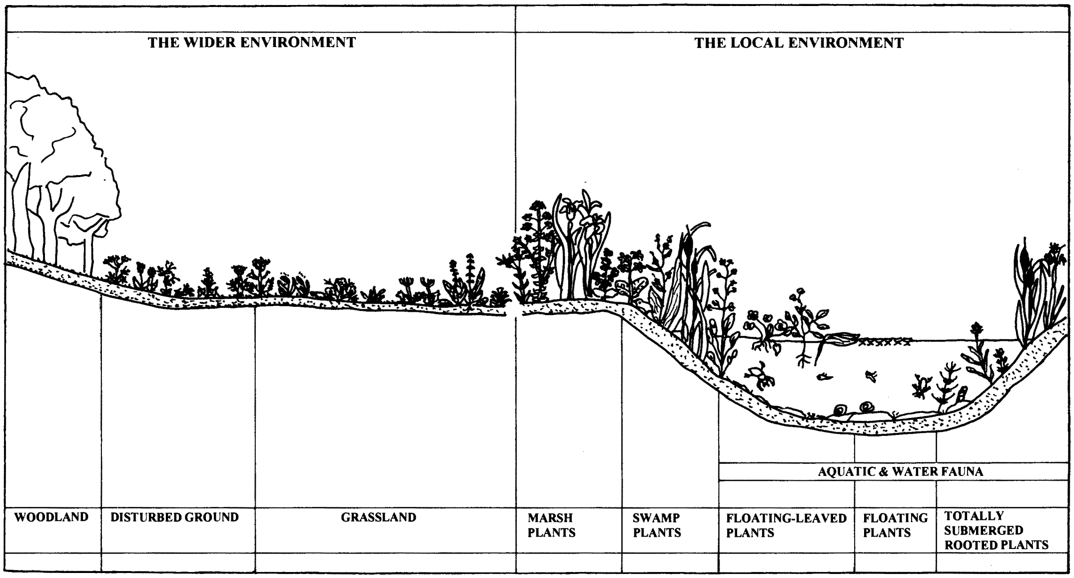


FIG. 17. The later Romano-British landscape and its associated ditched-drainage system at Banwell Moor: zonation of plant communities and associated beetle and snail faunas. *(Drawn by Julie Jones)*

THE WIDER ENVIRONMENT				THE LOCAL ENVIRONMENT				
WOODLAND	**DISTURBED GROUND**	**GRASSLAND**		**MARSH PLANTS**	**SWAMP PLANTS**	**FLOATING-LEAVED PLANTS**	**FLOATING PLANTS**	**TOTALLY SUBMERGED ROOTED PLANTS**
Quercus (p)	*Aethusa cynapium* (m)	*Bellis perennis* (m)		*Eupatorium cannabinum* (m)		*Potamogeton* (p.m)	*Lemna* (m)	*Potamogeton* (p.m)
Betula (p)	*Atriplex* (m)	*Galium mollugo* (m)		*Ranunculus lingua* (m)	*Typha* (p.m)	*Hippuris vulgaris* (m)		*Zanichellia palustris* (m)
Pinus (p)	*Chenopodium album* (m)	*Leontodon* (m)		*Iris pseudacorus* (m)	*A. plantago-aquatica* (m)			*Chara* (m)
Fagus (p)	*C. ficifolium* (m)	*Prunella vulgaris* (m)		*Lychnis flos cuculi* (m)	*Schoenoplectus lacustris* (m)	*Rorippa microphylla* (m)		
Corylus (p)	*C. rubrum/glaucum* (m)	*Rhinanthus minor* (m)		*Lycopus europaeus* (m)	*Sparganium erectum* (m)	*R.nasturtium aquaticum* (m)		
Alnus (p)	*Cerastium* (m)	*Carex* (m) Cyperaceae (p)				*Ranunculus* subg *Batrachium* (m)		
Acer (p)	*Stellaria media* (m)	*Juncus* (m)						
	Fumaria (m)	*Centaurea scabiosa* (p)		*Glyceria* (m) (host to *Notaris acridulus*) (b)				
	Brassicaceae (p)	*Solidago virgaurea* type (p)		*Apium nodiflorum* (m)				
	Persicaria bistorta (p)	*Pulicaria dysentrica* (m)			*Menyanthes trifoliata* (p.m)			
	Persicaria maculosa (m)	*Ranunculus acris/repens/bulbosus* (m)						
	Urtica urens (m)	*R. sardous* (m)		*Hydrocotyle vulgaris* (m)		**AQUATIC & WATER FAUNA**		
	Sonchus oleraceus (m)	Ranunculaceae (p)		*Eleocharis palustris/uniglumis* (m)				
	Sonchus asper (m)	*Rumex obtusifolius* type (p)		*Lysimachia* (p)		**Snails**	**Beetles**	
	Cirsium/Carduus (m) *Cirsium* (p)			*Mentha aquatica* (m)		*Armiger crista*	*Gyrinus* (whirligig species)	
	Cichorium intybus type (p)	Poaceae (p)		*R. sceleratus* (m)		*Lymnaea truncatula*	*Hydraena testacea*	
	Taraxacum sect *Ruderalia* (m)			**Beetles**		*Bithynia tentaculata*	*Cercyon* species	
	Artemisia (p)	*Plantago lanceolata* (p) - host to *Gymnetron labile* & *G. pascuorum* (b)		*Phyllodecta vulgatissima*		*Aniscus leucostoma*	*Agabus* & *Dysticus* (diving water beetles)	
		Snails	**Small mammals**	*Donacia clavipes*		*Planorbis planorbis*	*Occthebius minimus*	
		Pupilla muscorum	*Talps europaea* (mole)	*Demetrias imperialis*				
		Vallonia pulchella	*Sorex* sp (shrew)					
		Vertigo pygmaea	*Microtus agrestis* (short-tailed vole)	*Arvicola terrestris* (water vole)		Cladoceran ephyppia (water flea egg cases)	Caddis fly larvae	
		Trichia hispida	**Beetles**					
			Sitona humeralis					
			Aphodius dung beetles			m = macrofossils. p = pollen. b = beetles.		

TABLE 1. BANWELL MOOR: THE LATER ROMANO-BRITISH LANDSCAPE AND ITS ASSOCIATED DITCHED DRAINAGE SYSTEM: ZONATION OF PLANT COMMUNITIES AND ASSOCIATED BEETLE, SMALL MAMMAL, AND SNAIL FAUNA.

are found in still, fresh water, although several species can tolerate brackish conditions. The majority of the beetle species present are water beetles which would have lived in standing water within the ditch itself. A few species such as the diving water beetles *Agabus* and *Dysticus* favour open water as does the *Gyrinus* or whirligig species. Other water-beetles present, such as *Hydraena testacea, Ochthebius minimus,* and the *Cercyon* species, are associated with shallow freshwaters and mud, usually around the base of aquatic plants. *Bembidion assimile*, *Dryops* species, and *Trogophloeus bilineatus* are often found amongst rich vegetation on the muddy banks of small bodies of still water. It is clear that this body of water was not saline, as there are a wide range of beetle and insect species which exploit such conditions, none of which were recovered here. Remains of watervole were also recovered, which is commonly found associated with densely vegetated ditches and river banks.

The snails recovered from these lower ditch fills at Banwell, with further evidence from a series of ditches and gullies at Kenn Moor, provide additional information regarding conditions and water quality. Many of the samples from both sites have slightly contrasting assemblages with both freshwater, terrestrial, and some brackish species. Most contain a relatively high proportion of the slum species *Anisus leucostoma* which lives in ponds, ditches and marshes and is resistant to its habitat drying out while *Bithynia tentaculata* prefers better water conditions in slow rivers and ditches; it never occurs in small closed stagnant ponds. A very small number of brackish and saltmarsh species (notably *Hydrobia ventrosa*) were identified in a number of the field ditches. The significance of this tiny brackish component can be put into perspective by contrasting it with that from the later fills of the Banwell ditches in which all the snails were *Hydrobia.* Clearly, during their active lives, the settlements at Banwell and Kenn Moor lay in an environment with no direct tidal access.

There is further evidence of the vegetation which would have grown on the ditch sides where the ground would have been covered with water at all except the driest times of year. Bulrush, common club-rush (*Schoenoplectuslacustris*), water plantain (*Alisma plantago-aquatica*), and branched bur-reed (*Sparganium erectum*), found in either the macrofossil or pollen record are all typical swamp plants. Many of the plants recovered are more typical of the marshy area which often exists some distance from the water, but which would nearly always be moist. Species such as water mint (*Mentha aquatica*), common fleabane (*Pulicaria dysentrica*), gipsywort (*Lycopus europaeus*), and fool's watercress (*Apium nodiflorum*) would have grown in such conditions. The insects recovered provide strong evidence for a relatively rich flora of emergent and water-side plants local to the ditch. The presence of reed is indicated by the beetle *Donacia clavipes*, which feeds on *Phragmites communis,* although there was no macrofossil evidence for this. *Demetrias imperialis* is also associated with stands of this plant and with *Typha* reed mace. Other aquatic plants such as the floating grasses *Glyceria* and aquatic *Umbelliferae*, the host plants of *Notaris acridulus* and *Prasocuris phellandri* respectively, were also present. Only one species of insect, *Phyllodeta vulgatissima,* indicates any presence of tree cover, and, given that the host plant of this species is willow (*Salix*), it probably lived close to the water course itself. Many of the drainage ditches on the Levels today are lined with trees, most notably willow, or hedges, usually dominated by hawthorn. There is nothing in the pollen or plant macrofossil record to indicate that the same was the case in the Roman period, suggesting that the landscape was much more open than is the case today.

The fill of the palaeochannel at Kenn Moor, which ran adjacent to the corn-drier, produced abundant waterlogged fruits and seeds of aquatic duckweeds, the algae stonewort, water crowfoot, and rushes suggesting a freshwater environment. Characeae are found in diverse aquatic habitats and, while most species grow in freshwater, several can tolerate brackish conditions and can be found in situations which are subject to periodic saltwater inundation. The snail assemblage contained a relatively high percentage of *Lymnaea peregra* which can tolerate a wide range of habitats, including slightly brackish conditions. However, the smaller numbers of *Bithynia tentaculata* and *Planorbis planorbis* suggest a slow flow of fresh water in a well-vegetated channel. The assemblage from towards the centre of the channel contained a high percentage of *Bathyomphalus contortus*, along with *Bithynia tentaculata*, *Lymnaea peregra*, *Armiger crista*, and

Planorbis planorbis. Some *Aplexa hypnorum*, *Planorbis corneus,* and *Anisus leucostoma* were also present indicating clean, flowing freshwater. Though two brackish species were present (*Hydrobia ulvae* and *Hydrobia ventrosa*), they accounted for just eleven individuals out of the total sample of *c.* 3,000. Both can survive at low salinities and, while they may represent temporary brackish conditions, perhaps due to the breaching of sea walls by a storm, they equally could have been brought to the site on the feet of sea birds, or have been washed out of the natural, estuarine, alluvium.

Diatoms were very poorly preserved at Banwell though several assemblages were recovered from Kenn Moor. However, the dominant taxa in one of the ditches (F40) to the west of the corn-drier mound were consistent with a predominantly freshwater-to-slightly brackish water environment. Most of the diatoms are non-planktonic species that live attached to surfaces, particularly epiphytic on aquatic macrophytes. The dominance of these non-planktonic life-forms is consistent with a shallow-water environment. The diatoms from Ditch F112 are dominated by brackish and freshwater taxa, with a significant oligohalobous indifferent (freshwater) component. The oligohalobous species include a number of taxa with wide salinity tolerances, but nevertheless with optimum growth in freshwater. The polyhalobous (marine) element is very small and is represented only by fragments of the planktonic species *Paralia sulcata* and *Podosira stelligera* which are likely to be allochthonous.

Ditch 147 in the Kenn Moor enclosure complex contained both diatom and foraminifera assemblages. The diatoms are dominated by mesohalobous (brackish) and halophilous (freshwater to slightly brackish) species. In particular a single, halophilous species, *Navicula cincta*, constitutes 59 per cent of the diatom assemblage. The brackish and freshwater taxa are almost all benthic species which are less likely to be transported any distance from their lifetime habitats. Polyhalobous (marine) diatoms are rare and all the taxa recorded are planktonic or semi-planktonic and are, therefore, more likely to have been transported. Ditch F147 was the only feature at Kenn Moor to yield foraminifera and presents something of an anomaly. The samples are characterised by *Elphidium williamsoni*, but also with significant numbers of *Haynesina germanica* and *Ammonia beccarii* which appear analogous to modern high mudflat/low marsh faunas. Due to the lack of any agglutinating species it is likely that the depositional environment was non-vegetated. This ditch is, therefore, interpreted as representing a tidal channel with a clastic (mud/silt) bed rather than a saltmarsh. One possible explanation is that the sediments filling F147 were deposited during flooding events, during which the estuarine waters were prevented from flowing into other parts of the drainage system through a system of sluices, though if this was the case then a stronger storm signature might be expected including higher foraminifera diversity including planktonic species.

Discussion

The Banwell and Kenn Moor palaeoenvironmental assemblages in general represent freshwater conditions and are suggestive of ditches with a range of environments from open to well-vegetated, with slow-moving to stagnant water. All the ditches would be liable to dry out, and there may have been periodic inputs of brackish waters, but no direct tidal access (though F147 remains an anomaly).

The interpretation of a freshwater environment in the Romano-British period is confirmed by comparing the snail assemblages with that in today's landscape. Species such as *Anisus leucostoma*, *Bathyomphalus contortus*, *Bithynia tentaculata*, *Lymnaea palustris*, *Lymnaea peregra*, *Valvata cristata*, *Planorbis planorbis*, and *Sphaerium corneum* are still very common on the North Somerset Levels, while *Hydrobia ulvae* is virtually absent.[39] Drake has identified six

[39] Anderson *et al.* 1993.

types of watercourse on the Gwent Levels on the opposite side of the Severn Estuary: those with slightly saline conditions (such as the back ditch), major rivers, regularly cleaned ditches, more densely vegetated ditches which had not been cleaned for up to ten years, and neglected ditches choked with vegetation. The slightly saline ditches have a distinctive snail assemblage, and recent survey data from the Gwent Levels indicate that otherwise common snails, such as *Bithynia tentaculata*, are conspicuously scarce or absent.[40] The excavated assemblages at Banwell and Kenn Moor compare best with the regularly cleaned and densely vegetated ditches, while those with an abundance of *Anisus leucostoma* are similar to the neglected ditches. Thus, the comparison of the Romano-British and modern assemblages suggests the Roman landscape was much like that of today: a wholly freshwater reclaimed environment drained through a well-maintained hierarchy of gullies and ditches, some of which were relatively open with a through-flow of water, with others being well-vegetated or even overgrown and stagnant.

The presence of a small marine component in some of the diatom assemblages reflects either a contemporary tidal input or the introduction of valves by sediment-mixing processes. Given that the ditches lie on or within estuarine alluvium of the Wentlooge Formation, the latter is a probability. As might be expected, Wentlooge muds have been shown to contain high concentrations of polyhalobous diatoms such as *Paralia sulcata.*[41] Even if there had been an occasional inundation of the ditches by estuarine water, the traces of marine diatoms from the Estuary are exceptionally limited. Here it is perhaps useful to compare diatom assemblages from the ditches at Kenn Moor with the palaeochannel investigated at Barland's Farm and at Caldicot on the Gwent Levels.[42] At Barland's Farm, for example, palaeochannel sediments contained a diversity of types of diatom assemblage, some comparable with the mesohalobous/halophilous assemblages represented at Kenn Moor. However, during the marine transgressive phases recognised at Barland's Farm, the assemblages were dominated (>80 per cent) by polyhalobous taxa. Whether as a result of occasional intrusion into a dominantly brackish water environment or of full tidal conditions, the presence of marine diatoms is numerically much greater than in the Kenn Moor assemblages. The diatom assemblages at Kenn Moor are, therefore, consistent with the hypothesis that the ditches existed on a reclaimed saltmarsh. Although there were fluctuations in salinity within the channels, the water varied from fresh, through slightly brackish, to brackish, suggesting that the ditches may have been infrequently subject to the higher salinities associated with tides from the Estuary.

The wider landscape

The features examined at Banwell and Kenn Moor provided additional evidence of the ground adjacent to the ditches and of the wider landscape. The pollen in the lower sediments of F6 at Banwell is dominated by grasses and sedges with weed types such as ribwort plantain and buttercup (Ranunculaceae) present at low frequencies. These taxa are typical of reclaimed marsh grassland which tends to be rather weedy, although these weeds are also associated with pastoralism. Grassland is also indicated by the presence of seeds of buttercup (*Ranunculus acris/repens/bulbosus*), daisy (*Bellis perennis*), dandelion (*Taraxacum* sect Ruderalia), hedge bedstraw (*Galium mollugo*), yellow rattle (*Rhinanthus minor*), and hawkbit (*Leontodon*). Some of the beetles present include species which feed on plants commonly found as weeds in grassland. For example, *Gymnetron labile* and *G.pascuorum* live on ribwort plantain and *Sitona humeralis* is associated with medicks (*Medicago*). The most direct evidence of pasture is the presence of *Aphodius* beetles which are associated with herbivore dung lying in the open.

40 Drake 1986.
41 Cameron 1993; 1997.
42 Cameron 1996, 20; 1997.

The land snails from Kenn Moor also indicate short-turved, slightly damp grassland. The small assemblage from the palaeochannel included *Pupilla muscorum* and *Vallonia pulchella*, along with smaller numbers of *Trichia hispida* and *Vertigo pygmaea*. A limited assemblage of small mammal bones from both Banwell and Kenn also indicates an essentially freshwater environment. Most of the species present, woodmouse (*Apodemus* sp), short-tailed vole (*Microtus agrestis*), shrew (*Sorex* sp), and mole (*Talps europaea*) are highly adaptable, though all prefer areas with a good vegetation cover. Rough grazing with some scrub would suit both woodmouse and short-tailed vole, while moles cannot survive in areas prone to regular or prolonged flooding, as their feeding galleries would flood. The latter also indicate the development of a soil with earthworms which are intolerant of saline conditions. Amphibians include both frog and toad (including the common toad).

Higher up the ditch profiles at Banwell there is evidence for an increase in the intensity of pastoral use of the area, with higher percentages of pollen of weeds of pastoralism and a whole range of indicators of disturbance. There is also a background element in the macrofossil record of species more typical of disturbed ground, often associated with cultivation. These include both prickly and smooth sow-thistle (*Sonchus asper*), chickweed (*Stellaria media*), fool's parsley (*Aethusa cynapium*), hairy buttercup (*Ranunculus sardous*), narrow-fruited cornsalad, scentless mayweed (*Tripleurospermum inodorum*), and red/oak-leaved goosefoot (*Chenopodium rubrum/glaucum*). Pollen of Brassicaceae (cabbage family) and Chenopodiaceae (goosefoot family) could also be representative of weeds of crops.

A further group of plants typical of heath and bog communities was recovered from the ditch fills at Banwell but is unlikely to have grown in the locality of the enclosure. This includes heather (*Calluna vulgaris*), bell heather (*Erica cinerea*) and cross-leaved heather (*Erica tetralix*). A number of leaves of *Sphagnum* were also recovered, as well as gorse spines (*Ulex* sp). This material may have been collected for domestic use, such as animal feed or bedding and become incorporated as waste material into the ditch fills. In addition to the waterlogged macrofossils, Ditch F214 also produced a considerable quantity of midden debris and a low abundance of charred plant macrofossils was found in several of the other ditch fills. This midden material represents domestic waste and is likely to have originated from occupation nearby. Many of the charred weed seeds associated with the cereal waste are the same as those recovered from the ditch fills preserved in a waterlogged form, which may suggest that the local soils would have been suitable for agriculture, and that wheat and barley crops were being cultivated locally rather than elsewhere.

The low tree pollen frequencies which occur at Banwell throughout the pollen diagram from the ditch suggest that there was very little woodland in the local area during the period in which these sediments accumulated. The absence of any arboreal species of beetle also suggests to some extent a predominantly cleared landscape. Oak is the main tree pollen type with other species recorded at less than 2 per cent of total land pollen. These include pine (*Pinus*), beech (*Fagus*), hazel (*Corylus*), and maple (*Acer*). The source of these tree pollen taxa must have been the higher land around the Levels.

Summary

Following a period of inundation and sediment deposition that sealed the late Iron Age landscape, a stable environment was established at Banwell Moor. The beetles, plants macrofossils, pollen, snails, and small mammals associated with the complex of drainage ditches suggest that the later Romano-British landscape was dominated by open, possibly rather weedy grassland or meadow which was subject to some disturbance, probably by grazing. There was some arable at both Banwell and Kenn Moor, and hay meadows at least at Kenn. The network of drainage ditches associated with this landscape was predominantly freshwater, and supported a rich and varied community of plant and animal life.

This type of environment may have become established fairly quickly once the area had been reclaimed. The most obvious effect of reclamation on saltmarshes is to remove them fairly suddenly from tidal inundation. Once the marsh surface is exposed in this way, the natural process of ripening, already in train in upper saltmarshes, is accelerated and drying out occurs (Ranwell in prep.). Marine sediments are gradually converted to workable alluvial gleys and this process can be hastened by the construction of drainage channels. Colonisation by plants can be fairly rapid with early colonists often those annuals which are readily dispersed by wind and rain. The early vegetation cover is, therefore, often a rather weedy grassland which can contain opportunists of both saltmarsh, brackish, or more terrestrial habitats. The traditional use of much of the reclaimed land in Britain and Europe both today and in the past is as pasture, although conversion to arable land further diversifies the habitat. This conversion can be fairly rapid, cultivation today with modern methods occurring within eighteen months. In the Wash in the 1930s the practice was to plough after only ten years of grazing.[43]

3. LATER ROMANO-BRITISH RECLAMATION: THE UPPER BURIED LANDSURFACE AT BANWELL

At Banwell the drainage ditches were associated with a buried landsurface represented by a dark blue/grey silty clay, associated with fragments of pottery, animal bone, stone, and burnt clay. The surface sealed the partly silted up ditches, although Ditch F208 appears to have remained open. The upper buried landsurface was investigated through soil micromorphology, plant macrofossil, pollen, and snail analyses. Loss-on-ignition tests suggest that the dark colour of this horizon is due to the presence of higher amounts of organic material including relatively high concentrations of charcoal compared to the alluvium both above and below.

The formation of a stable soil is represented by humification of organic material, decalcification, biological activity, and clay translocation. This soil horizon originally included a surface 'A' horizon which is only present in a remnant form evidenced by small fragments in Layer 203. The intimate mixing of these two fabrics suggests strong biological reworking during the period of soil development. A burning event occurred at some point in the soil's history, producing large quantities of finely fragmented charcoal which became reworked into the underlying soil horizons 203 and 204 through biological activity. Redeposition of dirty clay to form textural pedofeatures had occurred within Layer 203, which attest to a period of sparse vegetation or disturbed ground. This may have been during the initial stages of ripening and pedogenesis occurring within the freshly deposited sediment, or may have occurred at some later period when the established vegetation was cleared. The latter explanation seems more likely as many of the clay coatings contain fragments of finely divided charcoal and so must have been translocated after the burning event that formed the charcoal.

Subsequent flooding led to the deposition of further sterile alluvium (202) and erosion of the 'A' horizon. The nature of the interface between Layers 202 and 203 indicates that a strong degree of erosional mixing took place, both contemporary with the accretion of this alluvium and in the immediate post-burial period, which is indicated by small rounded fragments of the buried landsurface (203) and pieces of charcoal incorporated into the base of the overlying alluvium. Biological activity continued for a time at the interface between the buried landsurface (203) and the overburden (202).

The buried soil itself (203 and 204) was extensively sampled for plant macrofossils, pollen, and snails. However, only limited assemblages were recovered with seeds and pollen of largely freshwater taxa such as bulrush/bur-reed, water crowfoot, water mint, and duckweed. Pollen

[43] Gray 1977.

preservation was generally rather poor and of the taxa which could be identified, grasses are dominant along with a range of indicators of disturbance suggestive of pastoralism. The snails present had a wide range of habitat preferences including grassland. Tree pollen percentages are low indicating an open environment. Charred remains were also recovered and included wheat and barley chaff as well as weeds of grassland and damp places.

The origin of the charcoal in the buried landsurface is an enigma. Surfaces of a similar nature which appear as dark horizons in the alluvium have been recorded at various locations in the North Somerset and Avonmouth Levels and can extend over considerable areas.[44] Clearly, at Banwell charcoal was incorporated into the upper surface at some point in the development of the soil but whether this occurred as a result of burning *in situ,* or was washed or blown in, is unclear.

4. THE POST-ROMAN INUNDATION

The inundation of the later Romano-British landsurface led to the deposition of a layer of sterile alluvium over the lower-lying parts of the landscape at Banwell Moor. Samples taken from the upper fills of Ditches F2, F4, F6, F208, and F212 at Banwell Moor for foraminifera show the marked change of environment. Just three species occur here (above the dark horizon): *Ammonia beccarii*, *Elphidium williamsoni*, and *Haynesina germanica*, all of which indicate marine deposition in a low-saltmarsh to high-mudflat intertidal environment. Generally, there appears to be a similar record from each ditch fill, with the lower sediments lacking foraminifera. Either late in the formation of the dark horizon (F4), or shortly after (F2), there was increased tidal influence and the creation of a mud-flat environment, which, as tidal influence decreased, was generally replaced by a low saltmarsh/high mudflat environment. The snails confirm the pattern suggested by the foraminifera. All the samples produced large brackish/estuarine assemblages dominated by *Hydrobia ventrosa* and *Hydrobia ulvae.*

Ditch F208 in Trench II at Banwell was the only one not to be sealed by the dark horizon, suggesting that it was open during the flooding episode that buried the later Romano-British landscape. Foraminifera indicate full marine tidal conditions, while the snail assemblage is dominated by *Hydrobia ventrosa*, *Hydrobia ulvae*, and *Ovatella myosotis* suggesting an open, muddy, estuarine ditch. The pollen also contains evidence for increased marine influence with sea plantain, which occurs in saltmarshes and short turf near the sea, and reached a peak of 10 per cent total land pollen.

Sediment grain size analysis suggests that Banwell Moor was close to the inland limit of the estuarine incursion, but was not totally flooded with tidal waters. The botanical evidence also indicates that some freshwater conditions continued locally. Plant macrofossils from the alluvium sealing the later Romano-British landscape were dominated by rush seeds with a few fragments of hemp agrimony, bulrush, and water plantain along with dandelion (*Taraxacum* sect. *Ruderalia*), dock (*Rumex* spp), and common nettle (*Urtica dioica*). The pollen assemblage from the upper ditch fill also showed an increase in tree pollen, principally oak, which suggests some woodland regeneration on the dryland slopes adjacent to the North Somerset Levels.

SPECIALIST REPORTS

SOIL MICROMORPHOLOGY *By* Jen Heathcote

A monolith sample (0.5 m long) was taken from the southern end of Trench II at Banwell Moor through the late/post-Romano-British alluvium (202), the probable (upper) buried landsurface

44 e.g. Locock 1996; 1997.

(203), and the underlying 'disturbed' (204) and 'undisturbed' (205) late Iron Age/early Romano-British alluvium. The purpose of the analysis was to assess the evidence for interpreting Context 203 as a buried landsurface and to determine the likely depositional and post-depositional history of the sequence.

The sample was consolidated with Crystic resin and three thin sections manufactured to produce a continuous set of samples representing Contexts 202 to 205. The thin sections were analysed using a binocular polarising-light microscope at a series of magnifications between x1 and x250. The descriptive terminology follows Bullock *et al.* (1985) and formal descriptions are available in the archive. Table 2 summarises the key characteristics of each context and Table 3 presents the descriptions and mode of formation of pedogenic features observed.

Overview

The composite properties of Contexts 203, 204, and 205 indicate that they represent a soil profile developed within an alluvial parent material that shows two episodes of sediment accretion. The first episode laid down Context 205. The second deposited material of a similar mineralogical and particle size composition which was altered through subsequent pedological processes (see below) to become Contexts 203 and 204. These two contexts therefore represent soil horizons rather than discrete sedimentological events. A further episode of sediment accretion deposited Context 202 that buried the soil profile. The initial stages of this event caused minor truncation of the soil profile by partially eroding and reworking the upper part of the soil 'A' horizon.

The lower alluvium: late Iron Age/early Romano-British inundation

Context 205 comprises a moderately-sorted silty clay loam alluvium that, following deposition, underwent a period of stabilisation. Drying of the sediment allowed a weak prismatic structure to develop, indicated by the strong vertical orientation of the planar voids present in this unit. During the stable period, surface sediment became preferentially sorted through low-energy inundation events and slaking of this material created inwash features close to the surface. These are expressed as planar voids infilled with non-laminated, greyish brown silty clay. A number of these features show fragmentation and partial incorporation into the groundmass probably due to biological activity contemporary with the later soil development.

The upper buried landsurface and associated soil horizons: later Romano-British reclamation

Contexts 203 and 204 consist of a moderately sorted, silty clay loam alluvium within which horizon development has occurred due to a number of pedogenic processes acting on a stable land-surface. Under low magnification (x5), two markedly different microfabric types (defined as the natural and microscopic arrangement of mineral and organic components) are readily discernible in Context 203.

The dominant microfabric (203.2) that accounts for 75 per cent of the context is characterised by a pale grey-brown (PPL), greyish white (OIL) colouration imparted by its predominantly minerogenic nature. The organic component is rare (< 5 per cent total) and consists of highly comminuted plant tissue fragments showing poor internal preservation. Charcoal fragments are few (*c.* 10 per cent) and randomly distributed through the groundmass. The other microfabric type (203.1) exists as rounded fragments at the upper limit of Context 203 and embedded within microfabric 203.2. It shows marked organic pigmentation of the groundmass, imparting a dark brown (PPL), brown (OIL) colouration that indicates a strong degree of humification of the organic component. Charcoal fragments are common (*c.* 30 per cent) and are randomly dispersed

	composite properties				individual microfabric properties																
					void type					nature of fine material				organic material				pedofeatures			
unit (context)	organic content (%LOI)	microstructure	total porosity (%)	microfabric types	planar voids	channels/chambers	vughs	vesicles	texture	composition	colour (PPL)/(OIL)	limpidity	b-fabric	organic content (visual estimate)	organic pigmentation of groundmass	coarse:amorphous:fine (ratio of fractions)	charcoal	textural	crystalline	amorphous/cryptocrystalline	excrement
202	5.7	crack	15	202	*****	*		**	zc	mineral	pale grey	speckled	crystallitic	*		25:5:70				$AC_1 AC_2$	E_1
203	6.2	angular blocky	20	203.1	*****		**		zc loam	organo-mineral	dark brown	dotted	stipple-speckled	*	*****	5:20:75	***			AC_1	
		angular blocky	20	203.2	*****		**		zc loam	mineral	grey brown	speckled	stipple speckled	*r*		undifferentiated fractions	*	T_1		AC_2	
204	4.3	angular blocky	25	204	***	*	*	***	zc loam	mineral	grey brown	speckled	crystallitic	*r*			*	T_1	$C_1 C_2$	$AC_1 AC_2$	
205	4.1	prismatic	20	205	****	*r*		**	zc loam	mineral	pale grey	speckled	crystallitic	*r*			*	$T_2 T_3 T_4$	$C_1 C_2$	$AC_1 AC_2$	

frequency of components		
very dominant	>70%	*****
dominant	50-70%	****
frequent	30-50%	***
common	15-30%	**
few	5-15%	*
very few (rare)	<5%	*r*

Key to texture symbols:
s - sand
z - silt
c - clay
Key to pedofeature codes:
see Table 2

TABLE 2. BANWELL MOOR, SOIL MICROMORPHOLOGY: KEY MICROFABRIC CHARACTERISTICS OF SAMPLED PROFILE

TABLE 3. BANWELL MOOR, SOIL MICROMORPHOLOGY: PEDOGENIC FEATURES REPRESENTED IN SAMPLED CONTEXTS AND THEIR MODE OF FORMATION

Kind	Group	Type	Description	Code	Interpretation
Textural	coating	typic	non-laminated, impure grey silty clay up to 20µm thick on void walls	T_1	illuviation of silty clay from overlying unit
	infilling	continuous	laminated, impure grey silty clay void infill	T_2	build-up of illuviated clay within lower soil horizon
	coating	typic	greyish brown, fine silty clay infilling voids and coating aggregate surfaces	T_3	surface slaking and redeposition in cracks of fine material during low energy flood events
	infilling	discontinuous	fragments of greyish brown, fine silty clay incorporated into groundmass	T_4	disruption of feature T_3 by biological activity during soil formation period of the profile
Crystalline	nodule		nodules of interlinked euhedral sparite and microsparite crystals	C_1	biogenic granules thought to be produced by earthworms
	coating		coatings of microsparite crystals around void walls	C_2	reprecipitation of calcium carbonate, mobilised from surface horizons by leaching, at lower horizon in base-saturated conditions
Amorphous/ cryptocrystal line	impregnative	mottle	orange (PPL and OIL), diffuse, weak impregnation	AC_1	iron segregation through mechanism of wetting and drying, probably due to groundwater fluctuations
	impregnative	mottle	dark brown (PPL and OIL), sharp, high contrast	AC_2	manganese segregation caused by wetting and drying, probably due to groundwater fluctuations
Excrement			elliptical, organo-mineral, *c.* 100µm diameter	E_1	excrement produced by soil fauna, probably Orabitid mites due to size and morphology.

throughout the groundmass. Both have a stipple-speckled b-fabric and contain slightly weathered sparite and microsparite grains.

The properties and spatial relationship of the two microfabric types indicate that 203.1 represents a remnant 'A' horizon and 203.2 a 'B' horizon. The intimate mixing of these fabrics suggests strong biological reworking at this depth during the period of soil development.

Further evidence for the interpretation of the fabrics in Context 203, forming beneath a stable landsurface, is the slight decalcification indicated by the stipple-speckled nature of the b-fabric (observed under cross-polarised light) and the weathering of sparite grains. The inherent nature of the b-fabric of the alluvium is crystallitic due to the presence of microcrystalline calcium carbonate (calcite) in the fine fraction of the parent material (as evidenced by the underlying horizon, Context 204). Dissolution of the microcrystalline calcite by percolation of slightly acidic soil water (leaching) means that the nature of the b-fabric is imparted only by the orientation of clay domains, resulting in the observed stipple-speckled effect. Re-precipitation of mobilised calcium carbonate from the slightly decalcified upper horizons of the soil profile is evidenced by rare, thin (*c.* 40µm thick) microsparite coatings of some voids in the base-saturated conditions of Contexts 204 and 205.

The amount of fine charcoal present within Contexts 203 and 204 (particularly in Fabric 203.2, the remnant 'A' horizon) indicates that an intense burning event occurred on the landsurface at, or close to, the point where the sequence was sampled. The well-dispersed charcoal fragments contribute to the dark colouration of the contexts observed both in the field descriptions and in thin section. It is not clear whether the charcoal is essentially *in situ* or whether it has been redeposited by wind or water activity. The lack of any burnt soil fragments might initially suggest a redeposition agency, but the uppermost landsurface deposits are only partially preserved and therefore it is possible that any traces of surface burning (such as soil reddening) may have been removed during the erosional episode that truncated the soil profile. Internal slaking is evidenced by rare, dirty clay coatings of void walls and attests to a period of disturbed ground with little or no vegetation cover. As many of the clay coatings include fine fragments of charcoal, it is clear that the slaking event(s) occurred subsequent to the burning episode and attendant charcoal deposition. It is possible to suggest that the burning event may have been intended to clear vegetation or prepare the land for cultivation.

Limited clay mobilisation, translocation, and redeposition (clay illuviation) is exhibited in Context 204 in the form of thin (<20 µm), oriented clay coatings of many void walls. Biological activity is indicated throughout Context 204 and into the upper 70 mm of Context 205. It is evidenced by the presence of nodules of interlinked, euhedral sparite and microsparite crystals comparable to those produced by earthworms. In addition, there is an example of a laminated, dirty clay infilling of an earthworm channel extending for 20 mm into the top of Context 205.

The upper alluvium: late/post-Roman inundation

The unit comprises a well-sorted, calcareous, fine silty clay with shell fragments and exhibits primarily sedimentary characteristics. Only a slight degree of diagenetic alteration is indicated in the form of limited biological activity evidenced by rare, smooth-walled channels that contain few soil fauna excrements as a loose, discontinous infill. The organic matter content is low (<5 per cent) and is in a highly comminuted form, most of which occurs within the soil fauna excrements. The excrements are elliptical, organo-mineral, approximately 100 µm diameter and are most probably produced by Orabitid mites (Bullock *et al.* 1985).

The initial stages of the inundation event that deposited Context 202 is thought to have disrupted the underlying ground surface. The nature of the boundary between the post-Roman alluvium (202) and the late Romano-British landsurface (203) indicates a strong degree of mixing took place both contemporary with the accretion of 202 and in the immediate post-burial period.

Disruption and reworking of the landsurface horizon during the initial stages of sediment accretion is indicated by the fragmentary nature of Fabric 203.2, pieces of which are incorporated into the base of the overlying alluvium together with charcoal. Following burial, biological activity appears to have continued for a time, causing reworking of both 203 and 202 across the boundary, acting to increase its graded nature.

Summary

The presence of a buried landsurface at *c.* 0.4 m beneath the current ground level was confirmed. The soil profile that developed contemporary with this surface was approximately 0.3 m deep and extended into Context 205 (the lower alluvium) indicating a significant period of stability. During this time, humification of organic material, decalcification of the parent material, biological reworking and clay translocation were operating to create horizon differentiation within a calcareous silty clay parent material that was laid down in two separate alluviation events.

PARTICLE SIZE DISTRIBUTION ANALYSIS *By* Gerard Aalbersberg

Twenty-one samples from Ditches F2, F4, and F6 were taken for particle size distribution analysis. Sample preparation followed a modification of the British standard procedure. Organic matter was removed from air-dried samples using hydrogen peroxide (H_2O_2) and the remaining fraction was screened over a 600 μm mesh sieve. The fraction finer than 600 μm was centrifuged, washed with methylated spirit, centrifuged again and dried overnight at 45°C. After weighing, the dried residue was resuspended in a 0.4 per cent sodium hexametaphosphate ($(NaPO_3)_6$) and sodium carbonate (Na_2CO_3) solution. After stirring in the samples in an ultrasound bath, particle size distributions were measured on a Malvern Mastersizer MS20 with a measuring range of 1.2–600 μm.

The samples clearly divide into two groups. The three samples from the top of the fill contain slightly more clay (0–2 μm) and fine silt (2–16 μm) compared to the samples from the lower fills, suggesting deposition in different environments. The samples from F4 and F6 show a similar division between the lower and upper parts of the fills, but not as clearly as F2.

As to the nature of these environments little can be deduced from the analysis, only that none of the samples shows a bimodal distribution pattern which might be indicative of tidal influences. The increase in finer sediment in the top three samples suggests that deposition took place from water with a higher suspended sediment load, though there was little or no current allowing the fine fractions to settle out without being eroded again.

BEETLES *By* David Smith

Coleoptera (beetles) were recovered through wet-sieving the waterlogged lower fills of Ditches F2 (Layer 35), F4 (Layer 31) and F6 (Layer 29) in Banwell Moor Trench I. The flots and residues were sent to the Department of Ancient History and Archaeology, the University of Birmingham, and processed using the standard method of paraffin flotation as outlined in Kenward *et al.*[45] The insect taxa are listed in Table 4 using the taxonomy used by Lucht.[46] As a result of poor preservation and the small sample size the faunas recovered probably should be considered incomplete.

Despite the limited number and poor preservation of these insects, they do provide some useful information. There appears to be little difference between the three assemblages recovered and, as

45 Kenward *et al.* 1980, 3–15.
46 Lucht 1987.

TABLE 4. BANWELL MOOR: BEETLES FROM DITCHES F2, F4 AND F6.

	Ditch F2 (context 35)	**Ditch F4 (context 31)**	**Ditch F6 (context 29)**
Dyschirius globosus (Hbst.)	1		2
Bembidion obliquum Strum.			1
B. assimile Gyll.			3
B. spp.	3	1	2
Pterotichus strenuus (Panz.)			1
P. niger (Schall)	1		
Demetrias imperialis (Germ.)			1
Haliplidae			
Haliplus spp.			2
Dytiscidae			
Agabus spp.	1	1	1
Dytiscus spp.	1		
Gyrinidae			
Gyrinus sp.			1
Hydraenidae			
Hydraena testacea Curt.	2		
H. sp.			1
Ochthebius minimus (F.)			1
0. spp.	2		11
Limnebius sp.			1
Hydrochus angustatus Germ.	1		
Heloporus spp.		2	1
Hydrophilidae			
Cercyon convexiusculus Steph.	4		2
C. sternalis Shp.	1		
C. (aquatic) spp.		1	
Megasterum boleotophagum (Marsh.)			1
Hydrobius fusipes (L.)			2
Laccobius sp.			1
Orthoperidae			
Orthoperus spp.	1		
Staphylinidae			
Lesteva spp.			2
Trogophloeus bilineatus (Steph.)	1		
Oxytelus rugosus (F.)			2
O. sp.	1		
Stenus spp.	2	1	2
Stilicus orbiculatus (Payk.)	1		
Lathrobium spp.	2		
Xantholinus sp.	1		
Philonthus spp.	2		1
Helodidae			
Helodidae Gen. & spp. Indet.	1		
Dryopidae			
Dryops sp.	1		
Cryptophagidae			
Atomaria sp.	1		
Lathridiidae			
Lathridius minutus (group)		1	
Scarabaeidae			
Aphodius ater (Geer)	1		
A. granarius (L.)			2

Table 4 continued

	Ditch F2 (context 35)	Ditch F4 (context 31)	Ditch F6 (context 29)
Chyrsomelidae			
Donacia clavipes F.			3
D. spp.		1	1
Lemna spp.	1		1
Phyllodecta vulgatissima (L.)	1		
Prasocuris phellandri (L.)		1	
Phyllotreta spp.	3	1	1
Cuculionidae			
Apion spp.	3	1	9
Sitona humeralis Steph.	1		
Bagous spp.		1	1
Notaris acridulus (L.)		1	2
Thyrogenes spp.	1		1
Gymnetron labile (Hbst.)			1
G. pascuorum (Gyll.)			1

a result, they will be discussed together. The majority of the species present are water beetles which had been living in standing fresh water within the ditches. A few species such as the diving water beetles *Agabus* and *Dysticus* favour open water as does the *Gyrinus* or whirligig species.[47] Other water beetles present, such as *Hydraena testacea*, *Ochthebius minimus*, and the *Cercyon* species, are associated with shallow freshwaters and mud, usually around the base of aquatic plants,[48] as is the small *Bagous* weevil species. *Hydrochus angustus* is found in a similar situation but rather more stagnant waters.[49] Other species present are often found amongst rich vegetation on the muddy banks of small bodies of still water. In particular, this is the environment favoured by *Bembidion assimile*, *Dryops* species, and *Trogophloeus bilineatus*.[50] One ground beetle, *Bembidion obliquum* is found in this environment, but is normally associated with rather acidic waters.[51] What is clear is that this body of water was not saline, as there are a wide range of beetle and insect species which exploit such conditions of which none was present in the ditches at Banwell Moor.

The insects recovered provide strong evidence for a relatively rich flora of emergent and water-side plants local to the ditch. The presence of reed is indicated by *Donacia clavipes*, which feeds on *Phragmites communis*.[52] *Demetrias imperialis* is also associated with stands of this plant and with *Typha* reed mace.[53] Other aquatic plants such as the floating grasses *Glyceria* and aquatic *Umbelliferae*, the host plants of *Notaris acridulus* and *Prasocuris phellandri* respectively,[54] were also present in the area. Only one species of insect, *Phyllodeta vulgatissima*, indicates any presence of tree cover. Given that the host plant of this species is willow (*Salix*) it probably grew close to the water course itself. The absence of any other arboreal species does suggest, to some extent, the presence of a predominantly cleared landscape.

A limited number of the species provide some information on the nature and land-use of the ground adjacent to the ditches. There is some evidence for surrounding grassland or pasture in the form of beetles which feed on plants commonly found as weeds in grassland. For example, both

47 Friday 1988.
48 Hansen 1987.
49 Hansen 1987.
50 Harde 1984; Lindroth 1974; Tottenham 1954.
51 Lindroth 1974.
52 Koch 1992.
53 Lindroth 1974.
54 Koch 1992.

Gymnetron labile and *G. pascuorum* live on ribwort plantain (*Plantago lanceolata*). Another species found in a similar habitat is *Sitona humeralis* which is associated with medicks (*Medicago*). Perhaps the best indicators for the presence of pasture are the few individuals of *Aphodius* beetles which are associated with herbivore dung lying in the open, usually in grassland.[55] However, these species do have a strong flight potential and could possibly have entered the ditch from further afield.

There are no species of insect present which are directly associated with human occupation, settlement, or buildings. This suggests that there was no major settlement in the direct area, and that settlement waste had not contributed to the fill of these ditches.

DIATOMS *By* Nigel Cameron with Simon Dobinson

Samples for diatom analysis were collected at both Banwell and Kenn Moor. Sample and slide preparation followed standard techniques.[56] Where diatoms were present in sufficient concentrations, percentage counts were made and, given the relatively low diversity of diatom species, a counting sum of *c.* 200 valves per sample was adequate. The principle source of data on species ecology used was Denys,[57] while diatom species' salinity preferences were summarised using the halobian groups of Hustedt:[58]

1. Polyhalobian: >30 g l^{-1}
2. Mesohalobian: 0.2–30 g l^{-1}
3. Oligohalobian – Halophilous: growth optimum in slightly brackish water.
4. Oligohalobian – Indifferent: growth optimum in freshwater but tolerant of slightly brackish water.
5. Halophobous: exclusively freshwater.
6. Unknown: taxa of unknown salinity preference.

Banwell Moor Trench II

Diatoms were absent from the alluvial sequence above and below the late Iron Age saltern (Layers 243, 240/247, 244, 276), and Ditch F212. Diatoms were poorly preserved in Ditch F208, though examples of *Caloneis sp.*, *Fragilaria brevistriata* and *Gyrosigma* sp. were recovered from the lowest excavated fill (269) indicating freshwater conditions. A single valve of the common planktonic estuarine/brackish water species *Cyclotella striata* was present in Layer 238 whose presence may be attributed to a possible influx of allochtonous valves via tidal currents or flooding.[59]

Kenn Moor Trenches A, B, and F

A number of layers were sampled for diatoms around the corn-drier mound. Diatoms were absent from F7 and F9 and the palaeochannel F61, though the diatom assemblages from Layers 58 and 83 in Ditch 40 contained just over 100 valves per sample. These are consistent with a predominantly high conductivity (salinity) freshwater to slightly brackish water environment. The dominant taxa in both samples are mesohalobous and oligohabolous halophilous species groups which are

55 Jessop 1986.
56 Battarbee 1986.
57 Denys 1992.
58 Hustedt, 1953; 1957, 199.
59 Beyens and Denys 1982.

brackish or freshwater species with growth optima at high conductivities. There are also significant numbers of oligohabolous-indifferent freshwater species. With the exception of *Cyclotella meneginiana*, the diatoms are non-planktonic species that live attached to surfaces, particularly epiphytes on aquatic macrophytes (consistent with a ditch environment).

True marine diatoms (polyhalobous and polyhalobous to mesohalobous groups) represent only a minor component in both of the assemblages, though the origin of these few valves raises a critical question. It is possible that they were introduced by estuarine flood events although at such a low concentration there is a possibility that the valves have been eroded from the natural alluvium, or are contaminants, for example in laboratory preparation (though this is very unlikely). Had the ditches been inundated by many tides (maybe more than once a year?), one would expect there to be a substantial estuarine/marine component in the diatom assemblages.

Kenn Moor Trenches G–J

A total of twenty samples was prepared for diatom analysis from three ditches in Field 5; F112 in Trench J, F143 in Trench G, and F147 in Trench I. As a result of poor diatom preservation, low valve concentrations and low species diversity, only three samples were suitable for diatom counting (two from F112 and one from F147). However, poorly preserved diatoms were present at low concentrations in a number of other samples, and useful information could be derived from species presence alone (F147 and F112).

The diatom assemblages recovered from Ditch F112 (Trench J) are dominated by mesohalobous and halophilous taxa, with a significant oligohalobous indifferent (freshwater) component. The oligohalobous species include those with wide salinity tolerances, but nevertheless with growth optima in fresh water. The polyhalobous (marine) element is very small and is represented only by fragments of planktonic species (*Paralia sulcata*, *Podosira stelligera*) which are likely to be allochthonous.[60] It was possible to make percentage analyses for two samples (100 and 101 from Layer 129: FIG. 18).[61] These showed similar overall compositions in terms of halobian groups, but had slightly different species compositions. Sample 101 was dominated by the benthic halophilous species *Navicula veneta*, and the planktonic halophilous species *Cyclotella meneghiniana* was also abundant. In Sample 100, *Cyclotella meneghiniana* becomes the dominant species along with a number of oligohalobous indifferent taxa whilst the percentage of *Navicula veneta* decreases. This change in species composition is difficult to interpret but suggests either an ecological change, such as a change in water quality other than salinity, or a change in the source of the diatom assemblage. Water conductivity, however, remains at approximately the same, slightly brackish, level. Overall, in Samples 100 and 101, the true brackish (mesohalobous) species are less abundant than halophilous and oligohalobous indifferent (freshwater) species.

Diatom preservation in Ditch F143, Trench G was very poor. Six samples were prepared and examined. Layer 136 yielded a single fragment of the mesohalobous species *Bacillaria paradoxa* and two fragments of *Pinnularia* sp. (probably freshwater taxa). Layer 144 contained a single broken valve of *Hantzschia amphioxys*. This freshwater species is usually associated with semi-terrestrial habitats and is tolerant of desiccation.

Seven samples were prepared from Ditch F147 (Samples 112–118). Of these only Sample 115 (from Layer 161) was suitable for diatom counting (FIG. 18), though it was possible to comment on species presence for all samples from this feature. The dominant groups of diatoms in all four layers examined from F147 (Layers 135, 148, 161, 168) are mesohalobous and halophilous taxa. Polyhalobous (marine) taxa are rare and, despite their generally robust structure, are present only

60 See for example Sherrod *et al.* 1989; Vos and de Wolf 1993.

61 We wish to thank Cath Pyke for preparing this figure.

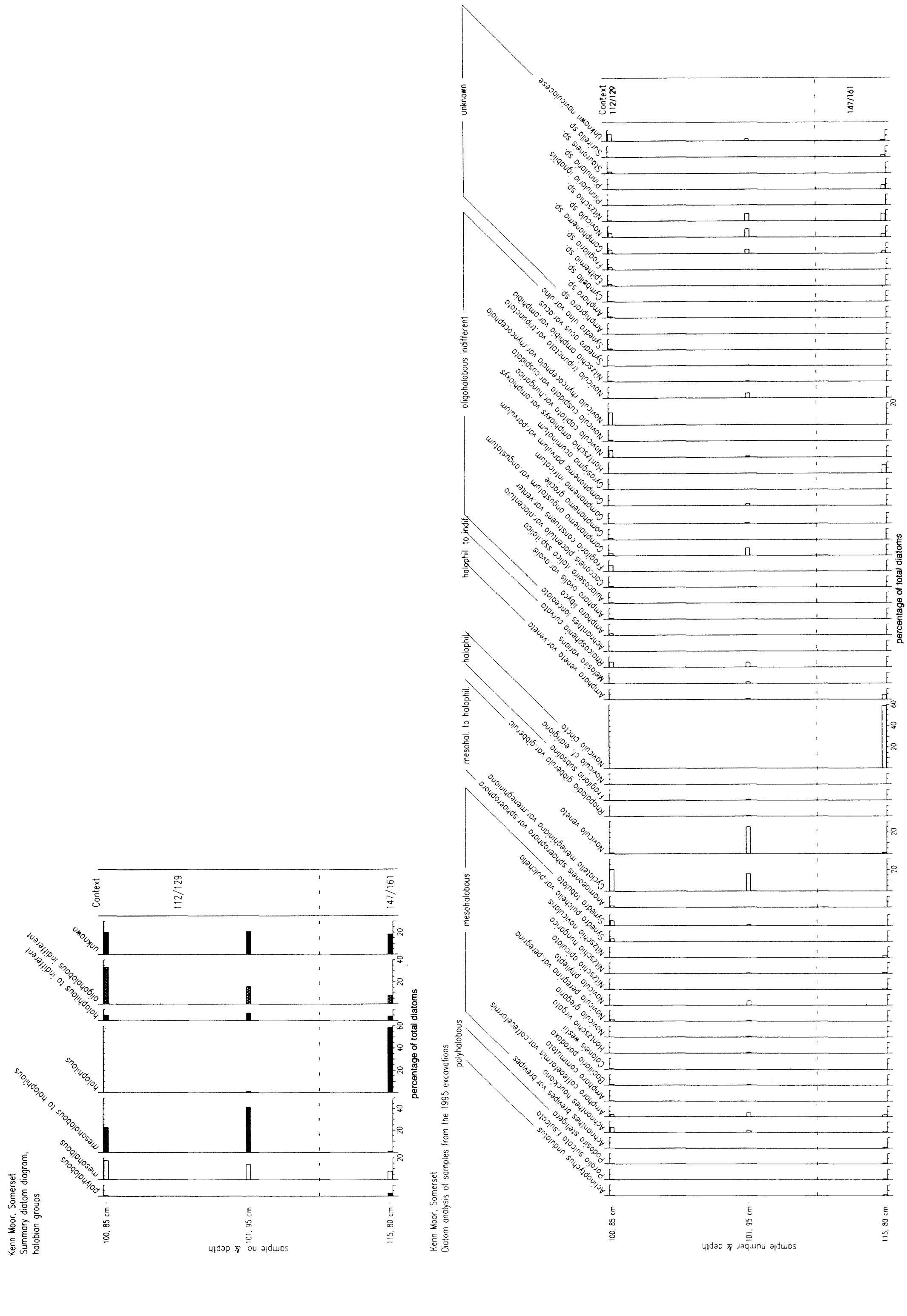


FIG. 18. Kenn Moor. Diatoms from F112 (Layer 129) and F147 (Layer 161).

as valve fragments in Layers 161 and 168. The brackish water and halophilous taxa are almost all benthic species which are less likely to be transported any distance from their lifetime habitats. In contrast, all the marine taxa recorded are planktonic or semi-planktonic and are, therefore, more likely to have been transported. There is also a significant oligohalobous indifferent (freshwater) component in the diatom assemblages. These oligohalobous indifferent species include taxa, for example *Fragilaria construens* var. *venter*, which have wide lifetime ranges and are tolerant to some degree of higher salinities. Notably, six of the seven samples contain *Hantzschia amphioxys*, often associated with terrestrial or semi-terrestrial habitats, and probably reflecting either frequent drying out, or an input of eroded terrestrial material, as would be expected in a ditch. Percentage analysis of Sample 115 supports the conclusion that mesohalobous and halophilous taxa are the dominant (>70 per cent) species of the assemblage. In particular a single, halophilous, species *Navicula cincta* constitutes 59 per cent of the diatom assemblage. It is a benthic, brackish water taxon, likely to be autochthonous, but is heavily silicified and therefore robust, so may therefore be somewhat over-represented in sediments close to its lifetime range.

Discussion

The absence, or poor preservation, of diatom valves in the majority of samples probably reflects an unsuitable preservational environment for diatoms rather than an initial absence of diatoms from the sediments. In alkaline environments (pH > 9) silica dissolution is rapid and even in alkaline environments below this pH, silica dissolution occurs gradually. The likelihood of alkaline conditions is indicated by the survival of coccolith scales, derived from Carboniferous limestone, in many samples. Variable preservation of diatom assemblages has also been found in samples examined from other sites on estuarine alluvium around the Severn Estuary.[62] Given the poor preservation of whole diatom sequences it is unfortunately not possible to detail changes in diatom assemblages through time, though with the limited assemblages available it is clear that there are shifts in species composition related to environmental change.

The presence of a small marine component in some of the diatom assemblages reflects either a contemporary tidal input or the introduction of valves by sediment mixing processes, though, given that the ditches lie on or within estuarine alluvium of the Wentlooge Formation, the latter is a strong possibility. As might be expected, Wentlooge muds have been shown to contain high concentrations of polyhalobous diatoms such as *Paralia sulcata*.[63] However, if there was an occasional inundation of the ditches by estuarine water, this must have been extremely limited as marine diatoms were extremely scarce. The diatom assemblages in the ditches at Kenn Moor and probably Banwell are, therefore, consistent with a reclaimed landscape.

FORAMINIFERA *By* Simon Haslett, Anthony Margetts and Huw Williams[64]

The Upper Wentlooge alluvium at Kenn Moor *By* Simon Haslett

The upper part of the alluvial sequence upon which the later Romano-British landscape rested was sampled for foraminifera at Kenn Moor. The following sequence was observed in Trench K:

0–0.22 m (5.31–5.09 m OD): plough soil
0.22–0.26 m (5.09–5.05 m OD): Layer 233 — mid-to-light brown silty clay, possibly redeposited

62 Crabtree 1990; Cameron, unpublished results from Avonmouth and Brean Down; Haslett *et al.* 1998.
63 Cameron 1993; 1994; Haslett *et al.* 1998.
64 We wish to thank Pat Brunt and Kate Howard for their assistance in the prepatation of this report.

0.26–0.80 m (5.05–4.51 m OD): Layer 234 — light brown (with slight-blue/grey mottling) very silty clay
0.80–0.87 m (4.51–4.44 m OD): Layer 235 — mid-grey/brown silty clay (stable land surface?)
0.87–(1.05+) m (4.44–(4.26) m OD): Layer 236 — mid-blue/grey silty clay.

Samples were taken at depths of 0.64 m (4.674 m OD), 0.725 m (4.589 m OD), 0.803 m (4.489 m OD), 0.885 (4.429 m OD), and 0.965 m (4.349 m OD) below the current ground surface. The lower three samples (Layers 235 and 236) were dominated by *Elphidium williamsoni* with very few *Haynesina germanica*. The upper two samples (Layer 234), however, were characterised by an increase in the abundance of *Haynesina germanica*, although *Elphidium williamsoni* remained common. *Ammonia beccarii* was scarce throughout the section. These results imply general deposition on a non-vegetated high intertidal mudflat, with a distinct superimposed up-section shift to more saline conditions and/or less subaerial exposure — this is coincident with the lithological change from Layer 235 to Layer 234. This increase in marine influence is supported by the occurrence (albeit rare) of the marine species *Rosalina williamsoni* in the topmost sample. Therefore, prior to reclamation, there appears to have been a period of marine transgression, reflecting relative sea-level rise.

The later Romano-British ditched-drainage systems at Kenn Moor *By* Simon Haslett

The following features at Kenn Moor were analysed for foraminifera: Ditch F7, (Trench A), Gully F9 (Trench A), Ditch F40 (Trench B), the palaeochannel F61 (Trench A), Ditch F143 (Trench G), Layer 109 (Trench G), and Ditch F112 (Trench J). None yielded foraminifera and so are considered to be non-marine deposits.

Ditch F147 in Trench I was the only feature to yield foraminifera (Table 5). Samples were collected at 0.1 m intervals down the excavated section. The samples are characterised by a low diversity assemblage dominated by *Elphidium williamsoni*, but also with significant numbers of *Haynesina germanica* and *Ammonia beccarii*. This assemblage appears analogous to modern high mudflat/low marsh faunas, but due to the lack of any agglutinating species it is likely that the depositional environmental was non-vegetated. A change in assemblage composition occurs upward through the sequence, with a fluctuating decline in *Ammonia beccarii* and a complementary increase in *Haynesina germanica* and *Elphidium williamsoni*. This change probably represents a slight regression to lower salinity levels and/or greater subaerial exposure up-section. Therefore, the ditch may have acted as a tidal channel that either silted up, elevating the depositional surface in relation to the tidal frame, or had the flood tide controlled artificially.

The absence of foraminifera from most of the ditches at Kenn Moor, and the lower fills of the ditches at Banwell (see below), can be taken as suggesting freshwater conditions. Ditch F147 is, therefore, a marked anomaly since this one assemblage indicates a very brackish and non-vegetated environment, most likely a tidal channel with a clastic (mud/silt) bed rather than a saltmarsh. The diatom assemblage does indicate some brackish water, though the marine element is very limited.

The later Romano-British ditched-drainage systems at Banwell Moor *By* Simon Haslett, Anthony Margetts and Huw Williams

Samples taken for foraminifera from Ditches F2, F4, and F6 in Trench I clearly illustrate the major change of environment marked by the inundation of the later Romano-British landsurface (Table 5). Just three species occur in the upper fills of these ditches (above the dark horizon): *Ammonia beccarii*, *Elphidium williamsoni*, and *Haynesina germanica*, all of which indicate marine deposition in a low saltmarsh to high mudflat intertidal environment. Generally, there appears to be a similar record from each ditch fill, with the lower sediments (Layers 31, 35, and 38) lacking foraminifera,

TABLE 5. BANWELL MOOR AND KENN MOOR: FORAMINIFERA.

NB samples from Kenn Moor Ditches F7, F9, F40, F112, F143 and Palaeochannel F61 were devoid of foraminifera suggesting non-marine conditions.

Feature	Sample number	Context	Depth (m)	*Ammonia beccarii*	*Elphidium williamsoni*	*Haynesina germanica*	Indicative meaning	Environment
Banwell Moor								
F2	21	3	0.60	3	11	5	MHWNT	low marsh/tidal mudflat
	22	3	0.70	2	6	21	< MHWNT	high mudflat/low marsh
	23	3	0.75	0	0	0	non marine	
	24	17	0.80	0	0	0	non marine	
	25	35	0.85	0	0	0	non marine	
	26	35	0.90	0	0	0	non marine	
	27	35	1.00	0	0	0	non marine	
F4	54	5	0.60	2	7	1	MHWNT	low marsh
	55	5	0.70	0	34	14	MHWNT	low marsh/high mudflat
	56	16	0.80	0	0	19	< MHWNT	mudflat
	57	16	0.90	0	0	0	non marine	
	58	31	1.00	0	0	0	non marine	
	59	31	1.05	0	0	0	non marine	
F6	44	7	0.30	0	0	0	non marine	
	45	7	0.40	0	0	0	non marine	
	47	7	0.60	0	394	13	MHWNT	low marsh
	48	7	0.70	0	22	33	MHWNT	low marsh/high mudflat
	49	7	0.80	0	32	86	< MHWNT	high mudflat/low marsh
	50	7	0.90	24	35	175	MHWNT	low marsh/high mudflat
	51	28	1.00	0	0	3	< MHWNT	(?) mudflat
	52	29	1.05	0	0	0	non marine	
	53	38	1.05	0	0	0	non marine	
F208	172	209	0.50	1	9	6	MHWNT	low marsh/tidal mudflat
	173	211	0.60	3	3	19	MHWNT	low marsh/tidal mudflat
	174	238	0.70	10	6	23	MHWNT	low marsh/tidal mudflat
	175	238	0.80	9	8	25	MHWNT	low marsh/tidal mudflat
	176	269	0.90	0	0	0	non marine	
	177	269	1.00	1	0	2	(?)MHWNT	low marsh/tidal mudflat

Table 5 continued

Feature	Sample number	Context	Depth (m)	*Ammonia beccarii*	*Elphidium williamsoni*	*Haynesina germanica*	Indicative meaning	Environment
F212	187	213	0.60	1	3	0	MHWNT	low marsh/tidal mudflat
	188	213	0.69	5	0	5	MHWNT	low marsh/tidal mudflat
	189	229	0.74	0	0	0	non marine	
	190	239	0.80	1	1	4	MHWNT	low marsh/tidal mudflat
	191	239	0.90	3	1	5	MHWNT	low marsh/tidal mudflat
	192	271	1.00	0	0	0	non marine	
	193	271	1.10	3	0	5	MHWNT	low marsh/tidal mudflat
	124	168	1.00	4	14	3	MHWNT	low marsh/tidal mudflat
	125	169	1.10	5	20	2	MHWNT	low marsh/tidal mudflat
Kenn Moor								
F147	119	148	0.50	0	7	4	MHWNT	low marsh/tidal mudflat
	120	148	0.60	0	14	2	MHWNT	low marsh/tidal mudflat
	121	161	0.70	3	9	4	MHWNT	low marsh/tidal mudflat
	122	161	0.80	0	9	4	MHWNT	low marsh/tidal mudflat
	123	168	0.90	5	19	1	MHW	low/mid-marsh
	124	168	1.00	4	14	3	MHWNT	low marsh/tidal mudflat
	125	169	1.10	5	20	2	MHWNT	low marsh/tidal mudflat

which may indicate non-marine conditions. Either late in the formation of the dark horizon (F4) or shortly after (F2), there was increased tidal influence and the creation of a mudflat environment, which, as tidal influence decreased, was generally replaced by a low saltmarsh/high mudflat environment.

In Ditch F208 (Trench II), foraminifera were absent in the lowest samples, and very rare in the one above (both from Layer 269). These few foraminifera may indicate a minor input of estuarine water during the active life of the ditch, though such small numbers of foraminifera could have been washed out of the natural alluvium. Either way, the ditch must have largely contained a freshwater environment. This changed dramatically with the deposition of the overlying Layer 238 which saw the onset of fully marine tidal conditions, and the species present most likely indicate a non-vegetated tidal surface indicating that this artificial drainage ditch now acted as a tidal creek. The marine influence prevails throughout the remainder of the section, without changes in depositional environment, but perhaps weakening in the uppermost sample where foraminifera abundance declines slightly.

In Ditch F212, a similar pattern of initially low foraminifera abundance followed by a barren sample occurs (Layer 271). The overlying context (239) contains foraminifera in low abundance, but probably indicating tidal conditions once more. The buried soil horizon (Layer 229) is barren of foraminifera, in contrast to 213 above which saw a return to tidal conditions, perhaps in a channel at the inland limits of the creek system.

PLANT MACROFOSSILS *By* Julie Jones

The corn-drier and its associated palaeochannel at Kenn Moor, along with the enclosure complexes at Kenn and Banwell were extensively sampled for the retrieval of plant macrofossil remains. Previous sampling in deposits of estuarine alluvium has shown that concentrations of plant remains are generally low in these types of deposits, so samples as large as possible were taken. Despite the relatively large initial sample size, floats and residues remaining after processing were generally small. Samples were soaked in hot water before wet sieving to a 250 micron float and 500 micron residue. The resulting floats were examined wet under a binocular microscope at x10 magnification, though the charred remains were dried before examination. Nomenclature and habitat information follows Stace,[65] and grain and chaff determinations are based on Jacomet.[66]

The Kenn Moor corn-drier complex (Table 6)

Flue deposits
Most of the original fill of the corn-drier was removed during the 1959 excavations and, although there was a record of 'a layer of 3–4 inches of wood ash', this was not analysed at the time. However, two samples were recovered from the area of the flue in 1994 which it was thought represented a trace of the original deposit left *in situ* (Layer 34), but unfortunately they produced no plant macrofossils. A small cut to the south of the flue (F24, Layer 51) contained a few examples of poorly preserved wheat and barley grain, and chaff.

The ditch deposits
The ditch surrounding the mound was sectioned in two places. F7 on the east side of the mound contained two major charcoal-rich lenses (35 and 42), as well as scatters and minor lenses in Layer 19 above. F40 on the west side of the mound also contained two major lenses of charcoal (56 and 58). The charred remains recovered from the ditch deposits are fairly uniform from both sections. Concentrations of macrofossils were high, although preservation was variable. Overall the cereal grains were in very poor condition with surfaces badly pitted and outer layers burnt away, while other grains were distorted, making identification difficult. This accounts for the large number of grains determined as wheat/barley, or unidentifiable. In contrast the chaff and weed seeds were well preserved.

Wheat and barley grains were recovered, with more barley than wheat in ten out of twelve samples analysed. How reliable a figure this is remains doubtful in view of the large number of grains determined as wheat/barley. However some barley was well enough preserved to confirm hulled barley was present and it was possible in some cases to identify straight grains suggesting both two and six row forms may have been present. Only fourteen sprouted grains were noted in total with fifty-four detached cereal sprouts (coleoptiles) counted, although this only represents 1.8 per cent of the total number of wheat/barley grains. In Layer 42, twelve brome caryopses had sprouted.

Well-preserved glume bases and spikelet forks, with the typical sharp keel and clear lengthwise

[65] Stace 1991.
[66] Jacomet 1987.

TABLE 6. KENN MOOR: PLANT MACROFOSSILS FROM CORN-DRIER COMPLEX.

		Ditch F7			F90	Ditch F40		F61
	Context No:	**19**	**35**	**42**	**51**	**56**	**58**	**59**
	Sample No:	1 21 26	24 27 28	35	40	41 42	43 44	48
CHARRED PLANT REMAINS								
GRAIN								
Triticum sp	Wheat	48	41	62		264	51	16
Triticum sp (sprouted)		1	1			3		1
Triticum sp (tail grain)		3						
Triticum c.f. *dicoccum*						1		
Triticum/Secale sp	Wheat/Rye					2		
c.f. *Triticum* sp		9			3	73		
Triticum/Hordeum sp	Wheat/Barley	122	23	256	4	281	107	5
Hordeum sp	Barley	83	50	194	1	350	63	7
Hordeum sp (straight)		2		2			1	
Hordeum sp (Hulled)	Hulled Barley	17	8	16		57	8	
Hordeum sp (Hulled/straight)		3	3	7			2	
Hordeum sp (Hulled/sprouted)				4				
Hordeum sp (tail grain)		19	6	20		20	8	
Hordeum sp (naked - tail grain)	Naked Barley					2		
c.f. *Hordeum* sp		7				84	2	
Avena sp	Oat	13	10	38		130	25	8
Avena sp (sprouted)			2			1		
Avena/Bromus sp	Oat/Brome	1				45	16	
c.f. *Avena* sp		7	2	5			5	4
Cereal indet		107	58		27	247	16	19
Total:		442	204	604	35	1560	304	60
CHAFF								
Triticum spelta (glume bases)	Spelt Wheat	194	578	2310	2	1227	531	103
Hulled wheat (glume bases)	Wheat	426	451	1220	6	580	718	103
Triticum spelta (spikelet forks)		8	21	150		41	40	
Hulled wheat (spikelet fork)		256	204	586	5	536	236	51
Triticum sp (rachis internode base)		44	70	233		52	85	15
Triticum sp (basal rachis internode)		9	13	74		14	11	
Triticum sp (awns -carbonised & silicified)		21	4			1000+	1000+	19
Hordeum sp (rachis internode)	Barley	62	137	172		150	65	16
Hordeum sp (rachis internode with several segments)		1	20	4		16		4
(estimated no. internodes)		(3)	(41)	(9)		(31)		(8)
Hordeum sp (rachis internode base)		25	62	92		103	54	
Avena sp (floret base)	Oat			2		5	2	
Avena sp (floret base)	Wild oat	1		2		10		
Avena sp (awns)		26	21			2	88	7
Cereal embryos			3				3	
Cereal sprouts		3	8	17		6	4	1
Culm nodes						2		2

Table 6 continued

		Ditch F7			F90	Ditch F40		F61	HABITAT
	Context No:	**19**	**35**	**42**	**51**	**56**	**58**	**59**	
	Sample No:	1	24	35	40	41	43	48	
		21	27			42	44		
		26	28						
WEEDS									
RANUNCULACEAE									
Ranunculus acris/repens/bulbosus	Meadow/Creeping/ Bulbous Buttercup	1							DG
URTICACEAE									
Urtica dioica L.	Common nettle		1						DGHWp
CHENOPODIACEAE									
Atriplex spp	Orache		3	2		7			CDn
Chenopodium album L.	Fat Hen	80	353	27		61	35	15	CDn
C. ficifolium Smith	Fig-leaved Goosefoot					1			CD
C. rubrum/glaucum	Red/Oak-leaved Goosefoot			1					CDs
Chenopodium spp	Goosefoot	55	55	19		62	20	1	
CARYOPHYLLACEAE									
Agrostemma githago L.	Corncockle	1				1			C
Lychnis flos-cuculi L.	Ragged Robin					1			GMSw
POLYGONACEAE									
Fallopia convolvulus (L.) A.Love	Black-bindweed	6	10	6		3	3		CD
Polygonum aviculare L.	Knotgrass	1		1					CD
P. lapathifolia (L.)Gray	Pale Persicaria		4	7		27			CDow
P. maculosa Gray	Redshank	6	18	13		2			CDo
Rumex spp	Dock	42	80	54		73	21	4	
BRASSICACEAE									
Brassica c.f. *nigra* (L.)Koch	Black Mustard		3	2		3	1		DRWs
Brassica/Sinapis spp	Mustard/Rape/Cole etc								
Raphanus raphanistrum ssp *raphanistrum* (pod frag)	Wild Radish			1f		1+f			CD
FABACEAE									
Lathyrus c.f. *nissolia* L.	Grass Vetchling					2			G
Lathyrus/Vicia spp	Vetch					20	8	1	DG
Trifolium/Medicago spp	Clover/Medick	2	2			4		2	DG
LINACEAE									
Linum sp	Flax					1			G
LAMIACEAE									
Galeopsis tetrahit L.	Common Hemp-nettle	1	8						CW
Origanum vulgare L.	Wild Marjoram	1							HSGd
Prunella vulgaris L.	Selfheal					1		1	DG
PLANTAGINACEAE									
Plantago lanceolata L.	Ribwort Plantain	1							G
SCROPHULARIACEAE									
Euphrasia/Odontites spp	Eyebright/Bartsia	1					1		CD
ASTERACEAE									
Anthemis cotula L.	Stinking Chamomile	50	69	5		37	24	13	CDd
Centaurea nigra L.	Common Knapweed		1						DG
Crepis spp	Hawk's-beard	1							DG
Lapsana communis L.	Nipplewort			1		2	2		DH
Leucanthemum vulgare Lam	Oxeye Daisy	5	3						G

Table 6 continued		Ditch F7			F90	Ditch F40		F61	HABITAT
	Context No:	**19**	**35**	**42**	**51**	**56**	**58**	**59**	
	Sample No:	1	24	35	40	41	43	48	
		21	27			42	44		
		26	28						
Senecio spp	Ragwort		1						CDPRW
Tripleurospermum inodorum (L.)Schultz-Bip	Scentless Mayweed			1		1		1	CD
JUNCACEAE									
Juncus sp	Rush							1	GMRw
CYPERACEAE									
Carex spp	Sedge		1	2		4	1	3	GM
Eleocharis palustris/uniglumis	Spike Rush		1	1					MPw
Schoenoplectus lacustris (L.)Palla	Common Club-rush							2	PR
POACEAE									
Bromus cf *racemosus/hordaceus/secalinus*	Smooth/soft/rye Brome	15	39	134		995	55	7	CDG
Bromus spp	Brome								CD
Bromus spp (sprouted)				12					CD
c.f. *Bromus* spp		5	8	4		39	12	4	CD
Cynosurus cristatus L.	Crested Dog's-tail		1	1					G
Poa spp	Meadow-grass	2	1	3					CDG
Poaceae indet	Grass	5	27	16		47	31	3	CDG
Indet		3	4			8	4		
Total:		156	693	312	0	1403	221	58	
WATERLOGGED PLANT REMAINS									
CHARACEAE									
Chara spp	Stonewort							500+	A
RANUNCULACEAE									
Ranunculus subg. *Batrachium* (DC.)A.Gray	Water Crowfoot							20	APR
LEMNACEAE									
Lemna spp	Duckweed							<200	A
JUNCACEAE									
Juncus spp	Rush							<200	GMRw

HABITAT GROUPS

A: Aquatic C: Cultivated/Arable D: Disturbed G: Grassland H: Hedgerow M: Marsh P: Ponds, ditches–stagnant/slow flowing water. R: Rivers and streams S: Scrub W:Woodland

n: nitrogen rich soil o: open habitats p: phosphate rich soils s: coastal w: wet/damp soils

striations, confirmed the presence of spelt wheat. Many glume bases and spikelet forks determined as hulled wheat, because of poor preservation, may also represent spelt. Rachis internode bases and basal rachis internodes (the point at which the rachis joins the stem) were also found. No tough rachis internodes of free-threshing wheat were identified. Barley rachis internodes, some consisting of several segments and internode bases, were equally abundant. Silicified and carbonised awns of wheat/barley were present and were notably abundant in F40.

Oat grains were consistently present, three of these having sprouted. Some of the oat floret bases had the horseshoe-shaped suckermouth scar typical of wild oats, but none more typical of the domesticated variety, suggesting that the oats were a crop weed. Equally, the large numbers of brome caryopses are likely to represent crop weeds. The brome has been identified as smooth/soft/rye brome (*Bromus racemosus/hordaceus/secalinus*) and, although the first two species are more typical of grassy places, rye brome is a typical weed of cereals, marginal, and waste ground.

Many of the other weed seeds recovered are also likely to have been growing with the cereals. Knotgrass (*Polygonum aviculare*) and black bindweed (*Fallopia convolvulus*) are typical of disturbed and cultivated ground and would have been gathered with the crops at harvest. A few occurrences of sedges (*Carex* spp), spike-rush (*Eleocharis palustris/uniglumis*), and rush (*Juncus* sp) indicate areas of damper ground.

Discussion: the environment of cultivation

Spelt is a hardy cereal, ideal for winter sowing, and thrives on heavy soils. Weeds of autumn-sown grain crops, such as wheat (the Secalietea), germinate in the autumn and grow rapidly in the spring along with the crop and are then harvested with the cereals. This group includes stinking chamomile (*Anthemis cotula*), wild radish (*Raphanus raphanistrum*), and some species of vetch. Stinking chamomile suggests the tillage of heavier soils. Weed communities of spring-sown crops (the Chenopodietea) such as barley and oats, peas and beans are adapted to different circumstances. These need greater warmth and nutrients to encourage germination. This community includes many species of the Goosefoot family (*Chenopodium* and *Atriplex* spp). There does tend to be some mixing between these spring and autumn germinating weed communities especially with crop rotation and fallowing, which would have allowed the establishment of longer-lived weeds and grassland plants.

Kenn Moor is situated on marine alluvium which consists of deep stoneless, mainly calcareous clayey soils of the Newchurch 2 Soil Association. It is an area of flat land with risk of flooding and today is mostly under permanent grassland with winter cereals. To the east and south-east is the Downholland 1 Soil Association on marine alluvium and peat with deep humose clayey soils. Two bands of drift over Permo-Triassic reddish mudstone of the Whimple 1 Soil Association also occur to the south and east of the Romano-British settlement and are also susceptible to seasonal waterlogging (Soil Survey of England & Wales 1983).

The cereal and weed assemblages associated with the corn-drier could have grown in the immediate vicinity of Kenn Moor, in much the same way as crops are grown today. However the land would need to have been well drained to allow cultivation, as the cereals would not tolerate waterlogged soils and winter flooding that must have occurred in this low-lying ground if suitable drainage was not carried out. Crops would also suffer from any saltwater inundation. None of the weed seeds have specific habitat requirements such as a preference for more sandy or limestone soils which would suggest the cereals were being grown elsewhere, so it seems possible to suggest that cultivation was local.

Experiments have been carried out in the Netherlands on the viability of growing crops on soils susceptible to flooding from brackish waters. This followed discoveries of the remains of crop plants from settlement sites located in former saltmarsh areas by Korber-Gröhne[67] in the Feddersen Wierde in NW Germany and Van Zeist[68] in the coastal area of the Netherlands. They questioned whether the crops found there, including barley, emmer (*Triticum dicoccum*), gold of pleasure (*Camelina sativa*), flax (*Linum usitatissimum*), and horsebean (*Vicia faba*) were brought into the site or whether they could have been grown on the saltmarsh adjacent to the settlements. In the trials carried out over two seasons by Korber-Gröhne, the same species recovered as fossils

[67] Korber-Gröhne 1981.
[68] van Zeist 1974.

were planted in the saltmarsh (*Juncetum gerardii* grassland). In spite of the slightly salty water the crops grew well until, in each summer, the plots were washed over by storm floods which caused considerable damage. Barley and gold of pleasure were the least sensitive to occasional flooding whereas oats, horsebean, and flax would stand inundation with salt water less well, resulting in partial or complete crop failure. It was concluded that only on the highest parts of an unprotected saltmarsh could crops be planted with the weed seeds recovered suggesting that only summer crops were grown, as storm floods over the winter months would have made cultivation of winter crops unsuitable. However, the weeds at Kenn Moor (and indeed Banwell) were not of this saltmarsh variety, indicating that the crops were grown in a freshwater, reclaimed, landscape.

Discussion: the function of the 'corn-drier'

Corn-driers have been well studied and, although several types have been distinguished, the most common is the T-shaped flue design recorded at Kenn Moor, with a stoking area, flues, and drying floor. The majority seem to belong to the third and fourth centuries A.D.[69] These structures have been shown to be either kilns for the drying of ears of cereals, partially or fully-processed grain, or malting floors for the manufacture of ale. The make up of assemblages of charred plant remains will vary according to the purposes for which kilns were used.[70] Reynolds[71] points out the impracticability of attempting to dry several tons of grain (an annual harvest's worth from a few hectares) in a 'corn-drier', and concludes that malting was a more likely function. Such malting ovens are, indeed, sometimes associated with finds of extensively germinated spelt as recovered at the Romano-British village at Catsgore.[72]

Ethnographic evidence suggests that another function of corn-driers was to parch grain prior to milling.[73] In the case of barley and oats this would have freed them from their enclosing husks, and, as with all grain, would have made milling more efficient. Damp grain tends to crush and smear between millstones rather than grinding to a flour. Processing of cereal crops after harvest follows a series of well defined stages described by Hillman,[74] where the product (the prime grain) and the various by-products (chaff, straw, and weed seeds) are separated from one another. The carbonised remains of these products and by-products recovered from corn-driers can be recognised by their specific composition and different functions have been suggested. These range from drying of whole ears, parching or drying of fully ripe spikelets or fully processed grain, to malting.

Unfortunately the material from the corn-drier at Kenn Moor was recovered from the ditch, a secondary context, and thus is likely to represent a mixture of residues from more than one usage, with sweepings from the different elements of the kiln (i.e. the stokehole, firebox and flue). It does seem clear, however, that, in view of the low concentration of sprouted grains and detached coleoptiles recovered, the use of the kiln for malting can be ruled out. Table 7 shows the low percentage of germinated grains represented, and also the ratio of glume bases to wheat grains clearly illustrating the predominance of glumes over grains.

Parching of fully ripe spikelets of glume wheats, such as spelt, is necessary in damp climates to render the glumes brittle in order to facilitate their removal by pounding and winnowing. This also applies to free-threshing cereals such as hulled barley to facilitate the removal of the lemma. The drying of fully processed grain prior to bulk storage would have been undertaken to prevent further spoilage such as germination or insect attack, although too much drying kills the grain making it unsuitable for seed corn. Storage of grain as semi-cleaned spikelets helps prevent spoilage of the

69 Morris 1979.
70 van der Veen 1989.
71 Reynolds 1981.
72 Hillman 1982.
73 Fenton 1978.
74 Hillman 1981.

TABLE 7. KENN MOOR: PERCENTAGE OF GERMINATED GRAINS AND RATIO OF GLUME BASES TO WHEAT GRAINS FROM SAMPLES TAKEN FROM F7 AND F40 (DITCHES AROUND THE CORN-DRIER MOUND).

Context/ sample	**19/1**	**19/21**	**19/26**	**35/24**	**35/27**	**35/28**	**42/35**	**51/40**	**56/41**	**56/42**	**58/43**	**58/44**
ratio glume bases:wheat grains	61:1	15:1	11:1	35:1	17:1	25:1	80:1	4:1	8:1	9:1	16:1	50:1
percentage germinated grains	1%	0	4%	7%	2%	4%	6%	0	2%	0.5%	4%	2%

grain as the glumes protect the grain. If cereals were dried to prevent further spoilage, some germinated grains would be expected. Some examples of germinated grains are present, not only of the wheat and barley, but also oats and brome. In addition many of the unidentifiable grains were distorted, which may have been due to their high moisture content on charring.

There is documentary evidence that the favourite fuel used for all forms of grain parching was a mixture of chaff and straw with some wood and/or peat.[75] The ashes of the stoke pit are likely to have included many fragments of chaff — glume bases, rachis internodes, awns, and weed seeds — all recovered at Kenn. The presence of silicified remains of wheat/barley awns also points to the use of chaff as fuel. Robinson and Straker[76] have shown that the presence of silicified remains suggest high temperature oxidising conditions which are required to burn out all the carbon and leave only the silica skeleton of remains such as cereal chaff. Such conditions are typical of a bonfire that had burnt down to a heap of glowing charcoal, and are likely to have existed in the stoke pit.

In summary, although it is thought to be possible to determine the function of corn-driers from the composition of the charred remains, in the case of Kenn Moor this has proved difficult in view of the secondary nature of the deposits. However, it seems clear that this was not a malting-oven in view of the low percentage of germinated grains recovered. The high ratio of glume bases to grain and the presence of silicified chaff make it likely that the bulk of the material examined relates to fuel which had been cleared from the oven and deposited in the surrounding ditch. The grains recovered could have trickled down from the drying floor and become incorporated with the fuel. Much larger quantities of grain would be expected if this represented an accidental burning of a crop being dried or parched. Therefore, while it is not possible to be definite from the evidence recovered, it seems likely the Kenn Moor oven was used for the parching of spikelets of spelt wheat and barley prior to milling or for the drying of spikelets prior to storage.

The palaeochannel (F61) (Table 6)
The fill of the palaeochannel (59), which lay adjacent to the corn-drier, was also sampled and produced a similar range of charred remains to those recovered from the ditches surrounding the mound. The silty clay within the palaeochannel also contained abundant waterlogged fruits and seeds of the aquatic species duckweed (*Lemna* spp) and water crowfoot (*Ranunculus* subg. *Batrachium*), which along with several hundred rush (*Juncus* spp) seeds indicates freshwater. Duckweed suggests still freshwater conditions, although one species will tolerate brackish conditions. Hundreds

[75] Hillman 1982.
[76] Robinson and Straker 1991.

of oospores of the aquatic algae stonewort (*Chara* spp) were also recovered. Characeae are found in diverse aquatic habitats including ditches, streams, and puddles. They are often the first plants to colonise newly dug or cleared ponds and ditches and some species are characteristic of ephemeral water bodies which dry up completely in summer. A few species are found in slow-flowing water, although the majority are confined to still water. Most species grow in freshwater, although several species can tolerate brackish water and can be found in situations which are subject to periodic saltwater inundation.[77] The different lines of evidence recovered from the palaeochannel suggest a predominantly freshwater environment, but subject to periodic marine flooding, or possibly backing up of salt water at especially high tides.

The Kenn Moor enclosure complex (Tables 8–9)

The secondary fill of Ditch F143 in Trench G was sampled, but contained only a single oat grain, a few elements of wheat chaff, and a limited range of weed seeds primarily associated with meadow/grassland communities. One of two shallow linear hollows (F157) which contained a considerable amount of charcoal and burnt clay was also sampled but only produced silicified wheat awns.

Two samples recovered from midden material (161) dumped into Ditch F147 in Trench I produced grains of wheat and barley with the presence of spelt wheat confirmed by glume bases. Oat grains were recovered, with a single floret base of wild oat, suggesting some oats may have occurred as crop weeds. Other arable weeds include docks and cleavers. Seven charred seeds of celtic/horse bean (*Vicia faba*) may suggest this crop was also being cultivated. Most of the other weeds such as clover/medick, vetch, and grasses are more typical of meadow/grassland communities. They are similar to those recovered in quantity from features in Field 16, discussed later in more detail. Gully F145 only produced a few hulled wheat glume bases, a single oat awn, and a vetch.

Three features in Trench K were sampled, a ditch (F208) and two steep-sided, flat-bottomed pits (F205 and F210). All of these features were backfilled with midden material including animal bone, charcoal, burnt clay, and daub as well as large amounts of fresh unabraded pottery. The charred macrofossils recovered from all three features are fairly consistent, with the range of grain and chaff found similar to those recovered from the corn drier. Wheat and barley grains occur in

TABLE 8. KENN MOOR: PLANT MACROFOSSILS FROM FEATURES IN TRENCHES G–J.

	Feature No	**F143**	**F157**	**F145**	**F147**
	Context No:	144	158	146	161
	Sample No:	72	134	74	73 76
CHARRED PLANT REMAINS					
Cereals					
Triticum sp	Wheat		1		23
c.f. *Triticum* sp					4
Hordeum sp	Barley				5
c.f. *Hordeum* sp					4
Avena sp	Oat	1			8
c.f. *Avena* sp					3
Cereal indet					18
Total:		1	1	0	65

[77] Moore 1986.

Table 8 continued

		F143	F157	F145	F147
	Feature No	**F143**	**F157**	**F145**	**F147**
	Context No:	144	158	146	161
	Sample No:	72	134	74	73
					76
Chaff					
Triticum spelta (glume bases)	Spelt Wheat	4			23
Hulled wheat (glume bases)				2	132
Hulled wheat (spikelet forks)		1			48
Triticum sp (rachis internode base)	wheat	1			
Triticum sp (awns – carbonised & silicified)			<50		<50
Avena sp (floret base – wild)	oat				1
Avena sp (awns)				1	6
Cultivated Plants					
Vicia faba L.	Celtic/Horse Bean				7
Weeds					
DISTURBED GROUND/ARABLE					
POLYGONACEAE					
Rumex spp #	Dock	4			17
RUBIACEAE					
Galium aparine L.	Cleavers				2
ASTERACEAE					
Lapsana communis L.	Nipplewort				1
GRASSLAND/MEADOW					
POLYGONACEAE					
Rumex spp *#	Dock	4			17
FABACEAE					
Lathyrus/Vicia spp *	Vetch			1	15
Trifolium c.f. *dubium* Sibth *	Leser Trefoil				4
Trifolium/Medicago spp*	Clover/Medick	7			17
APIACEAE					
Pimpinella c.f. *major* (L.)Huds. *	Greater Burnet-Saxihage	3			
PLANTAGINACEAE					
Plantago lanceolata L *	Ribwort Plantain	1			1
ASTERACEAE					
Leontodon spp *	Hawkbit	1			
CYPERACEAE					
Carex #	Sedge	2	1		1
POACEAE					
Bromus c.f. *racemosus/hordaceus**/*secalinus* sp #	Smooth/soft/rye Brome				6
c.f. *Bromus* sp	Brome				2
Cynosurus cristatus L.	Crested Dog's-tail	3			1
Poa spp	meadow grass	4			6
Poaceae indet	grass	3			15
DAMP GROUND/ MARSH/BANKSIDE					
JUNCACEAE					
Juncus spp	Rush	2			
CYPERACEAE					
Carex spp #	Sedge	2	1		
Schoenus nigricans L.	Black Bog-rush		3		24
Indet		1			2
Total:		37	5	1	136

#: occurring in more than one habitat group
*: species typical of *Cynosurus cristatus – Centaurea nigra*

TABLE 9. KENN MOOR: PLANT MACROFOSSILS FROM FEATURES IN TRENCH K.

	Feature No:	**F205**					**F208**	**F210**		**F215**
	Context No:	**206**	**207**	**212**	**229**	**230**	**217**	**211**	**228**	**219**
	Sample No:	138	139	94 95 129	136	137	126 127	92 93 130 131	132 133 135	128
CHARRED PLANT REMAINS										
Cereals										
Triticum sp	Wheat	29	20	28	56		8	12	55	5
Triticum sp (sprouted)			1						1	
c.f. *Triticum* sp			10	5			11			
Triticum sp (tail grain)		22			7				3	
Triticum/Hordeum sp	Wheat/Barley	36	17	6	41			6	11	1
Hordeum sp	Barley		20	6	27			7	19	
Hordeum sp (hulled)			3				1		3	
Hordeum sp (hulled/straight)			1							
Hordeum sp (straight)						2				2
Hordeum sp (tail grain)		7	6							
c.f. *Hordeum* sp		6	4		20	2		2		
Avena sp	Oat	9	7	7	37	1	1	10	25	
c.f. *Avena* sp		2	2						9	
Avena/Bromus spp	Oat/Brome			2						
Cereal indet		33	27	14	38	1	1	8	39	2
Total:		144	118	68	226	6	22	45	165	10
Chaff										
Triticum spelta (glume bases)	Spelt Wheat	20	153	28	6	2	10	7	117	3
Hulled wheat (glume bases)		66	212	25	17		8	13	33	2
Triticum spelta (spikelet forks)			6	2					1	
Triticum sp (rachis internode base)		1				1			2	
Hulled wheat (spikelet forks)		51	166	20	34	2	2	1	33	2
Triticum sp (awns - carbonised & silicified)		t+	t+	100+	t+	<50		<50	<100	
Hordeum sp (rachis internode)	Barley		2						1	
Hordeum sp (rachis internode base)			2							
Avena sp (floret base)	oat		2							
Avena sp (awns)		2	9	10	27			<20	3	4
Cereal sprouts		1	1							
Cereal culm nodes		3	3						3	

Table 9 continued

	Feature No:			**F205**			**F208**	**F210**		**F215**
	Context No:	**206**	**207**	**212**	**229**	**230**	**217**	**211**	**228**	**219**
	Sample No:	138	139	94	136	137	126	92	132	128
				95			127	93	133	
				129				130	135	
								131		
Cultivated Plants										
FABACEAE										
Vicia faba L.	Celtic/Horse Bean	1	1+h	3h	1+2h		1		2	
Weeds										
DISTURBED GROUND/ARABLE										
RANUNCULACEAE										
Ranunculus sardous Crantz #	Hairy Buttercup				31				1	
CHENOPODIACEAE										
Atriplex spp	Orache	23	6		17	3		3	5	
Chenopodium album L.	Fat Hen	5			1				4	1
C. ficifolium Smith	Fig-leaved Goosefoot	5								
C. polyspermum L.	Many-seeded Goosefoot	14			6			1		
Chenopodium sp	Goosefoot				3					
CARYOPHYLLACEAE									1	
Agrostemma githago L.	Corncockle									
Cerastium spp	Chickweed							1		1
Silene latifolia/dioica	White/Red Campion		1							
Stellaria media (L.)Villars	Common Chickweed		2							
POLYGONACEAE										
Fallopia convolvulus (L.)A.Love	Black-bindweed		1		1					
Polygonum aviculare L.	Knotgrass	14	1	1	22		1	2	1	
Polygonum lapathifolia (L.)Gray	Pale Persicaria		1							
Rumex spp #	Dock	80	119	40	139	6	10	39	221	21
BRASSICACEAE										
Brassica c.f. *nigra* (L.)Koch #	Black Mustard	10	8		30			4	2	
Raphanus raphanistrum ssp *raphanistrum* (pod frags)	Wild Radish		1		1					
Thlaspi arvense L.	Field Penny-cress									
PRIMULACEAE										
Anagallis arvensis L.	Scarlet Pimpernel	3		1	23			1		

Table 9 continued

	Feature No:	F205					F208	F210		F215
	Context No:	**206**	**207**	**212**	**229**	**230**	**217**	**211**	**228**	**219**
	Sample No:	138	139	94 95 129	136	137	126 127	92 93 130 131	132 133 135	128
RUBIACEAE										
Galium aparine L.	Cleavers	9	4		2			2	1	
VALERIANACEAE										
Valerianella dentata (L.)Pollich	Narrow-fruited Cornsalad						1			
ASTERACEAE										
Anthemis cotula L.	Stinking Chamomile	1						8	5	
Cirsium c.f. *arvense* (L.)Scop #			1							
Lapsana communis L.	Nipplewort		1		10				10	
Tripleurospermum sp	Mayweed	1					2		1	
POACEAE										
Bromus c.f. *racemosus/hordaceus/secalinus* sp #	Smooth/soft/rye Brome	7	24	9	32		8	8	138	
c.f. *Bromus* sp #	Brome		6			1				
GRASSLAND/MEADOW										
RANUNCULACEAE										
Ranunculus acris/repens/bulbosus *	Meadow/Creeping/Bulbous Buttercup	5	3	2	21		2	5	26	
R. sardous Crantz #	Hairy Buttercup				31				1	
Ranunculus spp	Buttercup				12					
POLYGONACEAE										
Rumex spp *#	Dock	80	119	40	139	6	10	39	221	21
PRIMULACEAE										
Primula veris/elatior*	Cowslip/Oxlip									
FABACEAE										
Lathyrus c.f. *nissolia* L.	Grass Vetchling		3							
Lathyrus/Vicia spp *	Vetch	28	22	8	73	2	7	9	18	3
Medicago lupulina L. *	Black Medick	4	3	2	5				2	
Trifolium c.f. *dubium* Sibth *	Lesser Trefoil	46	74	13	60	2	15	332	1027	13
Trifolium sp *	Clover		1							
Trifolium/Medicago spp *	Clover/Medick	134	311	125	368	4	13	152	545	7

Table 9 continued

	Feature No:	F205					F208	F210		F215
	Context No:	**206**	**207**	**212**	**229**	**230**	**217**	**211**	**228**	**219**
	Sample No:	138	139	94 95 129	136	137	126 127	92 93 130 131	132 133 135	128
APIACEAE										
Pimpinella c.f. major (L.)Huds. *					1				2	
LAMIACEAE										
Origanum vulgare L.	Wild marjoram							1		
Prunella vulgaris L. *	Selfheal	6	4	4	11		5	12	73	
PLANTAGINACEAE										
Plantago lanceolata L *	Ribwort Plantain	9	20	5	28	2	1	5	93	
P. major L. *	Greater Plantain	1	2		5			4	1	
SCROPHULARIACEAE										
Euphrasia/Odontites spp *	Eyebright/Bartsia	8	18	3	85	1	2	17	33	7
Rhinanthus minor L. *	Yellow-rattle	1	4	2	18				7	
RUBIACEAE										
Galium c.f. *verum* L. *	Lady's Bedstraw	1							12	
ASTERACEAE										
Centaurea nigra L. *	Common Knapweed	2	1	3	5			2	18	
Centaurea spp *	Knapweed		14		2				11	
Cirsium c.f. *arvense* (L.)Scop #	Creeping Thistle		1							
Crepis spp	Hawk's-beard		1							
Hypochaeris radicata L.*	Cat's-ear				1					
Leontodon spp *	Hawkbit				8				4	
Leucanthemum vulgare Lam. *	Oxeye Daisy	1		1	1		1	1	4	
Picris hieracioides L. *	Hawkweed Oxtongue	1			6				4	
Picris sp	Oxtongue								3	
Senecio spp *	Ragwort				16			1	1	
CYPERACEAE										
Carex c.f *caryophyllea* Latour *	Spring Sedge	4	4		12				2	
Carex c.f. *flacca* Schreber *	Glaucous Sedge	9	6							
Carex spp #	Sedge	34	101	39	80			15	86	
POACEAE										
Bromus c.f. *racemosus/hordaceus***secalinus* sp #	Smooth/soft/rye Brome	7	24	9	32		8	8	128	
c.f. *Bromus* sp #	Brome		6			1				
Cynosurus cristatus L. *	Crested Dog's-tail	30	17		11		3	22	157	4

Table 9 continued

	Feature No:	F205					F208	F210		F215
	Context No:	**206**	**207**	**212**	**229**	**230**	**217**	**211**	**228**	**219**
	Sample No:	138	139	94 95 129	136	137	126 127	92 93 130 131	132 133 135	128
Danthonia decumbens (L.)DC. *	Heath-grass	1		3	13			2	14	
Poa spp *	Meadow-grass	22	34	6	45	1	9	36	26	9
Poaceae indet		80	163	25	75	4	11	142	824	18
Poaceae indet (stem frags)		46		10	170			14	75	4
DAMP GROUND/MARSH/BANKSIDE										
RANUNCULACEAE										
Ranunculus flammula L.	Lesser Spearwort	2	1	1	3					
PORTULACEAE										
Montia fontana L.	Blinks	2	12							
BRASSICACEAE								4		
Brassica c.f. *nigra* (L.)Koch #	Black Mustard	10	8		30				2	
LAMIACEAE										
Lycopus europaeus L.	Gipsywort								1	
SCROPHULARIACEAE										
Veronica beccabunga L.	Brooklime		2		48					
ASTERACEAE										
Senecio c.f. *aquaticus* Hill	Marsh Ragwort							2		
JUNCACEAE										
Juncus spp	Rush		3					1		
CYPERACEAE										
Carex paniculata L.	Greater Tussock-sedge	1	6	2	53			2	33	
Carex spp #	Sedge	34	101	39	80			15	86	
Cladium mariscus (L.)Pohl	Great Fen-sedge		4	1	7				1	
Eleocharis palustris/uniglumis spp	Spike Rush	8	12				2	7	19	1
Schoenoplectus lacustris (L.)Palla	Commom Club-rush	2	4	4				6	6	
Schoenus nigricans L.	Black Bog-rush	500+	500+	89	258	17	6	99	548	8
Indet			6	4						
Total: (excluding *Schoenus nigricans*)		661	1033	404	1851	43	100	957	4069	97

Table 9 continued

	Feature No:	F205					F208	F210		F215
	Context No:	**206**	**207**	**212**	**229**	**230**	**217**	**211**	**228**	**219**
	Sample No:	138	139	94 95 129	136	137	126 127	92 93 130 131	132 133 135	128
MINERALISED PLANT REMAINS										
RANUNCULACEAE										
Ranunculus sp	Buttercup								72	
CHENOPODIACEAE										
Atriplex spp	Orache								1	
Chenopodium spp	Goosefoot								16	
POLYGONACEAE										
Rumex spp	Dock								31	
BRASSICACEAE										
Brassica/Sinapis spp	Mustard/Rape/Cole etc								8	
APIACEAE										
Apiaceae indet	carrot family								5	
PRIMULACEAE										
Primulaceae indet	primrose family								4	
LAMIACEAE										
Prunella vulgaris L.	Selfheal								10	
PLANTAGINACEAE										
Plantago lanceolata L.	Ribwort Plantain								1	
Plantago major L.	Greater Plantain								7	
SCROPHULARIACEAE										
Odontites/Euphrasia spp	Bartsia/Eyebright								29	
Rhinanthus minor L	Yellow-rattle								6	
ASTERACEAE										
Centaurea sp	Knapweed								23	
Cirsium/Carduus sp	Thistle								1	
CYPERACEAE										
Carex spp	Sedge								24	
Eleocharis palustris/uniglumis	Spike Rush								21	
POACEAE										
Bromus sp	Brome								1	
Poaceae indet	Grass								32	
Indet									60	

#: occuring in more than one habitat group

*: species typical of *Cynosurus cristatus - Centaurea nigra*

varying quantities, with glume bases of *Triticum spelta* confirming the presence of spelt wheat. Oat grains are present in ten samples but, unlike those from the corn-drier ditch, the floret bases were not well enough preserved to confirm whether these represent the wild or domesticated variety. Brome caryopses also occur in many samples and it seems likely that the oats and brome were collected as crop weeds, as suggested for the assemblages from the corn-drier.

Many of the weeds recovered from the drier ditch were also found in these deposits. Indeed, of the twenty-six species of arable weeds identified, 61 per cent also occurred in the ditch fills surrounding the kiln. Additional species, not found associated with the corn-drier, but typical of cultivated land include the annuals, field penny-cress (*Thlaspi arvense*), scarlet pimpernel (*Anagallis arvensis*), and cleavers (*Galium aparine*).

The vast majority of the charred weed assemblage, however, consists of plants of grassland and meadow habitats. 59 per cent of these are grasses and herbaceous plants typical of *Cynosurus cristatus-Centaurea nigra* grassland (MG5, knapweed and crested dogtail meadows[78]). This hay-meadow community is a dicotyledon-rich grassland with either a tight low-growing sward or fairly lush growth up to 60 cm in height with grasses including soft brome (*Bromus hordaceus*), crested dog's tail (*Cynosurus cristatus*), heath grass (*Danthonia decumbens*) and species of meadow grass (Poa spp) identified in this assemblage. Dicotyledons, the flowering annuals and perennials frequently comprise a substantial proportion of the herbage, with typically high percentages of leguminous plants such as the large numbers of clovers/medicks recovered here. Although many of these were too badly preserved to identify to species, the distinctive veined pattern on the fruits of black medick (*Medicago lupulina*) confirmed the presence of this species. The abundant, very small leguminous seeds were determined as lesser trefoil (*Trifolium dubium*) on comparison with the modern reference material. It seems likely, however, that many other species of clovers and medicks are also represented here. Other commonly occurring species in this community include common knapweed (*Centaurea nigra*), buttercups (*Ranunculus* spp), selfheal (*Prunella vulgaris*), ribwort plantain (*Plantago lanceolata*), oxeye daisy (*Leucanthemum vulgare*), and yellow rattle (*Rhinanthus minor*), all recovered in these deposits.

Today the *Centaureo-Cynosuretum* is the typical species-rich grassland of grazed hay-meadows on circum-neutral brown soils throughout Lowland Britain. This community is now becoming increasingly rare due to agricultural improvement, and it is estimated that 95 per cent of these meadows have been lost in the last forty years. The traditional management of these hay-meadows allowed grazing of stock on the grassland until the end of April after which the animals would be removed and a light dressing, traditionally of farmyard manure, would be applied and the hay crop allowed to develop. The hay would then be cut in June and the stock allowed to graze again on the stubble. Ellenberg[79] has shown that a delicate balance exists in the maintenance of these meadows. If they are mown more than twice a year the species richness, especially of taller plants declines, and, if dung is not brought back to the meadow, the soil can become very impoverished.

This hay-meadow-type community would not tolerate flooding with salt water and would require reasonable drainage conditions. There is, however, also an element of damp ground/marsh/bankside plant species in the assemblage recovered from these features, which suggests there may have been some gradation into poorer drained areas with more marshy ground or channels allowing these species to thrive. The areas of peat to the south and east of the settlement would have provided suitable habitats for species of sedge including great fen-sedge (*Cladium mariscus*) and black bog-rush (*Schoenus nigricans*), and banks of streams or channels would have allowed common club-rush (*Schoenoplectus lacustris*), brooklime (*Veronica beccabunga*), and blinks (*Montia fontana*) to thrive.

[78] Rodwell 1992.
[79] Ellenberg 1982.

If drainage conditions were suitable, land would have been available around the settlement for hay-meadows. This type of grassland is interesting as it grows on land that is also suitable for arable farming, indicating both activities may have been carried out locally. The hay is likely to have been cut and transported to the settlement for use as fodder, or the macrofossils recovered could represent the remains of grazed hay, transported in the guts of stock, subsequently used as fertiliser to manure the fields. If animals were also fed on straw, weeds of arable land would be added to the dung heap, such a nutrient-rich substrate in turn providing an ideal habitat upon which weeds such as members of the Goosefoot family (*Chenopodium* spp) would have grown prolifically.

When the two shallow, flat-bottomed pits were excavated, the base of Pit F205 was seen to contain a thin layer of yellow to olive-green crumbly silty clay with the appearance of cess, but no further evidence to confirm this was forthcoming once the sample was processed. However, two samples from Pit F210 (Layer 228) contained conglomerated lumps of cess-like material with an assemblage of mineralised seeds. Mineralisation occurs where there is replacement of the organic structure by mineral salts, chiefly carbonates and phosphates in solution. This often occurs in latrines and cess pits which have high concentrations of phosphates and water to dissolve the minerals and permeate the organic material. This suggests that some cess was being deposited into this pit at some point but, in view of its shallow nature, it seems unlikely that this was the primary function of these features. The mineralised seeds and fruits identified are all species which were also recovered charred from these features typical of hay meadow and arable habitats. There is no indication of food plants, such as soft fruits and berries, which are often associated with cess material.

The Banwell enclosure complex: Trench I (Table 10)

Ditch 2

Three layers were sampled from the top (3) and base (35) of this ditch as well as from the thin black horizon (17) between the two. The base of the ditch produced an abundance of plants typical of a freshwater environment with a range of aquatic, swamp, and marsh plants often found on ditch or stream/river sides. Aquatics, those plants which would have grown either rooted in the muds or free-floating in the water, include water crowfoot (*Ranunculus* subg *Batrachium*), water-cress (*Rorippa nasturtium-aquaticum*), and horned pondweed (*Zanichellia palustris*). Taller swamp plants which inhabit the areas at the edge of the water include water plantain (*Alisma plantago-aquatica*) and common club-rush (*Schoenoplectus lacustris*). Many of the plants recovered are more typical of the marshy area which often exists some distance from the water, but which would nearly always be moist. Species such as sedge (*Carex* spp), water mint (*Mentha aquatica*), common fleabane (*Pulicaria dysentrica*), gipsywort (*Lycopus europaeus*), and fool's watercress (*Apium nodiflorum*) would have grown in such conditions. There is also a small background element of a group of plants which are more typical of disturbed ground and are often associated with cultivated land. These include members of the Goosefoot family (Chenopodiaceae) such as red/oak-leaved goosefoot (*Chenopodium rubrum/ glaucum*) and orache (*Atriplex* spp), as well as chickweed (*Cerastium* sp), fool's parsley (*Aethusa cynapium*), and prickly sow-thistle (*Sonchus asper*). A few charcoal fragments were noted, as well as charred wheat grain, a single oat awn, and a few charred vetch (*Lathyrus/Vicia*) seeds. A further group recovered, also represented by low numbers, is more typical of grassy places and includes buttercup (*Ranunculus acris/repens/ bulbosus*), hedge bedstraw (*Galium mollugo*), and yellow rattle (*Rhinanthus minor*).

The thin black lens (17) produced a much smaller assemblage of macrofossils, predominantly rush seeds (*Juncus* spp) with evidence from a limited number of species of freshwater plants similar to those recovered from the base of the ditch. Many fragmented remains of hemp agrimony (*Eupatorium cannabinum*), a plant found in all sorts of wet places were also found. A single heather (*Erica* sp) flower was present.

TABLE 10. BANWELL MOOR: PLANT MACROFOSSILS FROM DITCHES F2, F4 AND F6 IN TRENCH I.

		DITCH F2				DITCH F4			DITCH F6				
	Context No	**35**	**17**	**3**	**30**	**31**	**5**	**48**	**38**	**29**	**29**	**7**	**HABITAT**
	Sample No	**11**	**10**	**5**	**9**	**10**	**3**			**7**	**8**	**2**	
WATER LOGGED PLANT REMAINS													
Sphagnum sp (leaves)	Bog-moss				3	1							
CHARACEAE													
Chara spp	Stonewort							83		15	247		A
RANUNCULACEAE													
Ranunculus acris/repens/bulbosus	Buttercup	41			2	5		1	1		4	1	DG
R.lingua L.	Greater Spearwort	5				2		1		11	11		M
R. sardous Crantz	Hairy Buttercup	1											CDW
R. sceleratus L.	Celery-leaved Buttercup					37		2		156	22		MPR
R. subg. *Batrachium* (DC.)A.Gray	Water Crowfoot	399	1		50	197		5	37	379	24		APR
FUMARIACEAE													
Fumaria spp	Fumitory	1											CDH
URTICACEAE													
Urtica dioica L.	Common nettle	2			1	5			1	1		1	DGHWp
Urtica urens L.	Small nettle	1				1							CDI
CHENOPODIACEAE													
Atriplex spp	Orache	48			1	1							CDn
Chenopodium album L.	Fat-hen	4											CDn
Chenopodium sp	Goosefoot	3											
Chenopodium ficifolium Smith	Fig-leaved Goosefoot					1							CD
Chenopodium polyspermum L.	Many-seeded Goosefoot	1											CD
Chenopodium rubrum/glaucum	Red/Oak-leaved Goosefoot	6			1	1			4				CD
Chenopodiaceae indet		24			1	4		1		25	1		

Table 10 continued

		DITCH F2				DITCH F4			DITCH F6				
	Context No	**35**	**17**	**3**	**30**	**31**	**5**	**48**	**38**	**29**	**29**	**7**	**HABITAT**
	Sample No	**11**	**10**	**5**	**9**	**10**	**3**			**7**	**8**	**2**	
CARYOPHYLLACEAE													
Cerastium spp	Chickweed	4			1					2			CDG
Lychnis flos-cuculi L.	Ragged-robin									1			GMSw
Stellaria media (L.)Villars	Common Chickweed	1											CD
POLYGONACEAE													
Persicaria lapathifolia (L.)Gray	Pale Persicaria					1							CDow
Persicaria maculosa Gray	Redshank	3				2							CDo
Rumex spp	Dock	80	1		1					2		2	
CLUSIACEAE													
Hypericum spp	St. John's Wort							1					
BRASSICACEAE													
Brassica nigra (L.)Koch	Black Mustard	2										2	DRWs
Coronopus squamatus (Forsskaol)Asch	Swine Cress	8											DTo
Rorippa nasturtium aquaticum (L.)Hayek	Water-cress	797				5							BRM
Rorippa c.f. *microphylla* (Boenn)	Narrow-fruited Water-cress	17											MPR
ERICACEAE													
Calluna vulgaris (L.)Hull (leaves)	Heather				1	2							EWo
C. vulgaris (seed)					5								
C. vulgaris (flower)						1							
Erica cinerea L (leaf)	Bell Heather				5	5							Ed
E. cinerea (seeds)					14	3							
Erica tetralix L. (leaf)	Cross-leaved Heath			1	4	1							EFw
E. tetralix (seed)					2								
Erica sp (flower)			1										

Table 10 continued

		DITCH F2				DITCH F4			DITCH F6				
	Context No	**35**	**17**	**3**	**30**	**31**	**5**	**48**	**38**	**29**	**29**	**7**	**HABITAT**
	Sample No	**11**	**10**	**5**	**9**	**10**	**3**			**7**	**8**	**2**	
ROSACEAE													
Potentilla spp	Cinquefoil	2											
Rubus sect *Glandulosus* Wimmer&Grab	Bramble					1				1		1	DHSW
FABACEAE													
Ulex sp (spine)	Gorse				1	1					1		EGWo
APIACEAE													
Aethusa cynapium L.	Fool's Parsley	6											C
Apium nodiflorum (L.)Lag	Fool's Watercress	2											PM
Hydrocotyle vulgaris L.	Marsh Pennywort					1				1	1		FM
Torilis sp	Hedge-parsley	1											CGHW
SOLANACEAE													
Solanum dulcamara L.	Bittersweet												DHS
MENYANTHACEAE													
Menyanthes trifoliata L.	Bogbean					6		24		27	18		F
LAMIACEAE													
Ballota nigra L.	Black Horehound	4								4			HW
Lycopus europaeus L.	Gipsywort	11				2		5	5	12	4		FRw
Mentha aquatica L.	Water Mint	1109	1		32	125		36	36	301	94		MPw
Prunella vulgaris L.	Selfheal								1				DG
Lamiaceae indet		3				2							
HIPPURIDACEAE													
Hippuris vulgaris L.	Mare's-tail					1							APR
PLANTAGINACEAE													
Plantago major L.	Greater Plantain	12				11				2	3		CDGTo
SCROPHULARIACEAE													
Rhinanthus minor L.	Yellow Rattle	2											G
Veronica beccabunga L.	Brooklime					1							BPR

Table 10 continued

		DITCH F2				DITCH F4			DITCH F6				
	Context No	**35**	**17**	**3**	**30**	**31**	**5**	**48**	**38**	**29**	**29**	**7**	**HABITAT**
	Sample No	**11**	**10**	**5**	**9**	**10**	**3**			**7**	**8**	**2**	
RUBIACEAE													
Galium mollugo L.	Hedge Bedstraw	65											GH
CAPRIFOLIACEAE													
Sambucus nigra L.	Elder	1			1	1				3			DHSWn
DIPSACACEAE													
Dipsacus fullonum L.	Wild Teasel					1				2			DRW
ASTERACEAE													
Bellis perennis L.	Daisy				2								G
Cirsium spp	Thistle	22											DGMW
Cirsium/Carduus spp	Thistle	21				1							DGMW
Eupatorium cannabinum L.	Hemp-agrimony		7+ freq f	few f		4	few f	1		1	2		w
Leontodon spp	Hawkbit	1											G
Picris echioides L.	Bristly Oxtongue	1											DHWc
Pulicaria dysenterica (L.)Bernh.	Common Fleabane	18											MHP
Sonchus asper (L.)Hill	Prickly Sow-thistle	29				2			8				CD
Sonchus oleraceus L.	Smooth Sow-thistle									1			CDW
Taraxacum sect. *Ruderalia*	Dandelion		1									1	DG-d&w
Tripleurospermum inodorum (L.)Schultz-Bip	Scentless Mayweed					1							CD
ALISMATACEAE													
Alisma plantago-aquatica L.	Water Plantain	1013	3		579	454	1	24	63	388	21		APR
POTAMOGETONACEAE													
Potamogeton spp	Pondweed		1			24		28		192	60		APR
ZANNICHELLIACEAE													
Zannichellia palustris L.	Horned Pondweed	4											APR
LEMNACEAE													
Lemna spp	Duckweed	1	1		23	19		5	6	55	7		A

Table 10 continued

		DITCH F2				DITCH F4			DITCH F6				
	Context No	**35**	**17**	**3**	**30**	**31**	**5**	**48**	**38**	**29**	**29**	**7**	**HABITAT**
	Sample No	**11**	**10**	**5**	**9**	**10**	**3**			**7**	**8**	**2**	
JUNCACEAE													
Juncus spp	Rush		abun	500+	200+	abun	abun	64	6	77	abun	500+	GMRw
CYPERACEAE													
Carex spp (biconvex)	Sedge	51				4				21	7		GM
Carex spp (trigonous)		16				11		12		18	5		
Carex spp									7			3	
Carex paniculata L.	Greater Tussock-sedge							14		3			BFMw,Ww
Carex pendula Hudson	Pendulous sedge							17		6	9		Wwh
Eleocharis palustris/uniglumis	Spike-rush	7				24				17			MPw
Schoenoplectus lacustris (L.)Palla	Common Clubrush	5				3			7	11			BPRshal
POACEAE													
Festuca spp	Fescue									3			
Glyceria spp	Sweet-grasses	110				24		1	3	9			BMPR
Poa spp	Meadow-grass	10			6	1		13		40	8		G
Poaceae indet	Grass	18			5	7		21	7	13		5	
SPARGANIACEAE													
Sparganium erectum L.	Branched Bur-reed									2	1		MPR
TYPHACEAE													
Typha sp	Bulrush	1		1		13	4	171	1	220	530	7	PR
IRIDACEAE													
Iris pseudacorus L.	Yellow Iris	f											FRNw
Indet					5	13		1		5			

Table 10 continued

		DITCH F2				DITCH F4			DITCH F6				
	Context No	**35**	**17**	**3**	**30**	**31**	**5**	**48**	**38**	**29**	**29**	**7**	**HABITAT**
	Sample No	**11**	**10**	**5**	**9**	**10**	**3**			**7**	**8**	**2**	
CHARRED PLANT REMAINS													
Cereals													
Triticum sp (grain)	Wheat	1											
Avena sp (grain)	Oat				1								
Avena sp (awn)	Oat	1											
Cereal/Poaceae (culm node)						2							
Weeds													
Atriplex spp	Orache				1								CDn
Bromus spp	Brome				1								CD
Lathyrus/Vicia spp	Vetch	2			1								DG
Poaceae indet	Grass				1								
Charcoal fragments		few	few		freq	freq		freq		occ	occ		
OTHER REMAINS													
Caddis fly larvae					occ	freq			occ				
Cladoceran ephyppia	Water-flea egg cases	abun	freq	few	freq	abun	few		freq	abun	abun		
Foraminifera				200+			abun					abun	
Insects		abun			occ	abun	few	freq	abun	abun	freq		
Molluscs		few	few	200+	200+	few	abun					abun	
Ostracods							500+						

The top of the ditch (Layer 3) was also dominated by rush seeds with a few fragments of hemp agrimony and bulrush (*Typha* sp). A single leaf of cross-leaved heather (*Erica tetralix*) was present.

Ditch F4

Three samples were recovered from this ditch, two from the base of the ditch (Layers 30 and 31) and one from the top (Layer 5). Layers 30 and 31 produced assemblages of plant macrofossils similar to those in Ditch F2, with a predominance of plants typical of a freshwater ditch and adjacent marshy area. Seeds of rushes, not found at the base of F2 were present here, as well as duckweed (*Lemna* sp), a free-floating aquatic which often forms extensive carpets on the surface of the water. A limited number of disturbed ground plants is again present, including fig-leaved goosefoot (*Chenopodium ficifolium*), orache (*Atriplex* spp), scentless mayweed (*Tripleurospermum inodorum*), and prickly sow-thistle (*Sonchus asper*). Charcoal fragments also regularly occur, although most are too small for identification (less than 2 mm overall dimensions). A single charred oat, and a few charred weed seeds were also recovered. A further small assemblage of plants from Layers 30 and 31 belongs to the heather family and includes the leaves, seeds, and flower of heather (*Calluna vulgaris*), leaves and seeds of bell heather (*Erica cinerea*), and cross-leaved heather (*Erica tetralix*). A number of leaves of *Sphagnum* were also recovered, as well as single spines of gorse (*Ulex* sp) from each layer. These plants are typical of heath and bog communities. This group of plants is unlikely to have grown in the locality of the enclosure and may have been collected for domestic use, such as animal feed or bedding.

The top of the ditch, as in Ditch 2, produced a very small assemblage of macrofossils dominated by rush seeds and the fragmented remains of hemp agrimony, with occurrences of bulrush and water plantain.

Ditch F6

Samples were recovered from the basal fill of this ditch (48), the dark horizon which represents a continuation of the buried landsurface (29), and the overlying alluvium (7). All the samples from the lowest levels in this ditch are again dominated by the freshwater aquatic, bankside, and marsh plants present in the other ditch fills, though some variations in species composition can be seen. Oospores of stoneworts, a group of non-flowering algae which grows entirely submerged in still or slowly running water occur in F6. Duckweed continues to be present and is also indicative of still waters. Bulrush seeds are present in greater quantities, as well as bogbean (*Menyanthes trifoliata*), a plant of swamps and shallow waters.

The top of the ditch (Layer 7) was again dominated by seeds of rushes, as well as bulrush, with a limited group of plants likely to have been growing nearby including dandelion (*Taraxacum* sect. *Ruderalia*), dock (*Rumex* spp), and common nettle (*Urtica dioica*).

The Banwell enclosure complex: Trench II

The lower buried landsurface (Table 11)

The earliest undulating landscape lay at a depth of 0.7–0.9 m (4.25–4.45 m OD) and was associated with a shallow depression (F281) containing saltworking debris, together with a second dump of burnt material (240/247) associated with a spread of stone rubble. Although limited, the macrofossils are typical of disturbed ground (*Taraxacum, Urtica dioica* and *Stellaria media*). Single occurrences of water crowfoot (*Ranunculus* subg. *Batrachium*) are suggestive of freshwater ditches. The water crowfoot group contains thirteen species, only one of which, brackish water-crowfoot (*Ranunculus baudotii*), is often found near the sea.

The residues also contained hard, black amorphous lumps which appeared to contain the compressed remains of organic material. Plant impressions could be detected and a number of fruits of great fen-sedge (*Cladium mariscus*) were recovered. It is thought that this material is burnt peat and may relate to the fuel used in the saltmaking process. The occurrence of other

TABLE 11: BANWELL MOOR: PLANT MACROFOSSILS FROM LATE IRON AGE SALTERN IN TRENCH II

	Context no	**259**	**259**	**279**	**247**	**Habitat**
	Sample no	164	165	199/ 200	150	
WATERLOGGED PLANT REMAINS						
CHARACEAE						
Chara spp (oospores)	Stonewort			4	27	A
RANUNCULACEAE						
Ranunculus subg *Batrachium*	Water Crowfoot	1	1		2	A, P, R
URTICACEAE						
Urtica dioica L.	Common nettle	3	3			D, G, H, W, p
CHENOPODIACEAE						
Atriplex sp	Orache	1				C, D, n
CARYOPHYLLACEAE						
Stellaria media (L.)Villars	Common Chickweed	3	2			C, D
POLYGONACEAE						
Rumex sp	Dock	1				
ROSACEAE						
Filipendula ulmaria (L.)Maxim	Meadowsweet	1				w
Rubus sect. Glandulosus. Wimmer & Grab	Bramble			1		D, H, S, W
ASTERACEAE						
Anthemis cotula L.	Stinking Chamomile				1	C, D, d
Taraxacum sect. Ruderalia	Dandelion			1		D, G, d, w
POTAMOGETONACEAE						
Potamogeton spp	Pondweed				1	A, P, R
JUNCACEAE						
Juncus spp	Rush				3	G, M, R, w
CYPERACEAE						
Carex spp	Sedge				1	G, M, R, w
POACEAE						
Poa/Phleum spp	Meadow-grass/Cat's-tail	1			1	G
	Total	11	6	6	36	
CHARRED PLANT REMAINS						
FABACEAE						
Trifolium/Medicago spp	Clover/Medick	1				G
SCROPHULARIACEAE						
Odontites/Euphrasia spp	Bartsia/Eyebright	1				C, D
Veronica beccabunga L.	Brooklime	82	11			M, P, R
POTAMOGETONACEAE						
Potamogeton sp	Pondweed	1				A, P, R
CYPERACEAE						
Cladium mariscus (L.)Pohl	Great Fen-sedge	22	7		1	F, R, w
POACEAE						
Poaceae indet	Grass	4	2			
	Total	111	21	0	1	
Other remains						
Burnt clay		abun	abun	abun		
?Burnt peat		vfreq	vfreq	vfreq		
Charcoal		few	few	few	few	

charred remains in the residue, including further examples of *Cladium*, brooklime (*Veronica beccabunga*), and pondweed (*Potamogeton* sp) are also likely to have originated from the fuel and suggest the use of *Cladium* peat. Only small quantities of charcoal fragments were noted and suggest that wood was not a major source of fuel.

Later Romano-British ditch fills (Table 12)
The ditch assemblages (F208 Layer 238; F212 Layer 239; F218 Layer 225) are dominated by an abundance of plants typical of a freshwater environment very similar to those recovered from the ditches in Trench I. They include a range of species of aquatic, swamp, and marsh environments frequently found on ditch or stream/riversides. These include water crowfoot (*Ranunculus* subg. *Batrachium*), water plantain (*Alisma plantago-aquatica*), horned pondweed (*Zanichellia palustris*), mare's-tail (*Hippuris vulgaris*), gipsywort (*Lycopus europaeus*), rushes (*Juncus*), and sedges (*Carex*). The presence of duckweed (*Lemna* spp), a floating aquatic, particularly notable in F208 suggests still water conditions. Ditch F208 does not appear to have the black horizon which sealed the other ditches and this suggests that this was still open when the black horizon was forming. The upper fill of this ditch (Layer 211), a light-blue/grey silty clay, was sampled and produced a similar, but more limited assemblage of freshwater and disturbed ground species as recovered in the lower fills of the other ditches.

A further group of plants represented is typical of disturbed ground, which was also noted from the ditch fills in Trench I. These plants include fool's parsley (*Aethusa cynapium*), red/oak-leaved goosefoot (*Chenopodium rubrum/glaucum*), chickweed (*Stellaria media*), and prickly sow-thistle (*Sonchus asper*). Other species such as thistles (*Cirsium/Carduus* spp), greater plantain (*Plantago major*), and buttercup (*Ranunculus acris/repens/bulbosus*) are typical of grassy places.

The lower fill of F218 (Layer 225) also contained charred plant remains. The charred remains include low numbers of grains of wheat, barley, and oats with a few glume bases of *Triticum spelta* confirming the presence of spelt wheat. The weed seeds include arable weeds such as dock (*Rumex* spp) and bartsia/eyebright (*Odontites/Euphrasia*), but also species more typical of grassy places, such as ribwort plantain (*Plantago lanceolata*) and selfheal (*Prunella vulgaris*), with others from wet marshy habitats including spike-rush (*Eleocharis palustris/uniglumis*), lesser spearwort (*Ranunculus flammula*) and common club-rush (*Schoenoplectus lacustris*).

TABLE 12. BANWELL MOOR: PLANT MACROFOSSILS FROM LATER ROMANO-BRITISH DITCHES IN TRENCH II.

		Ditch F208		Ditch F212		Ditch F214		Ditch F218	
	Context No	**238**	**211**	**239**	**229**	**224**	**215**	**225**	**HABITAT**
	Sample No	141 142	137	143 144	138	134 135	133	136 139 140	
WATERLOGGED PLANT REMAINS									
CHARACEAE									
Chara spp	Stonewort		14		1		1		A
RANUNCULACEAE									
Ranunculus acris/repens/bulbosus	Buttercup	1		4		48		3	D, G
Ranunculus flammula L.	Lesser Spearwort			1		20			M, P, R, w
R.lingua L.	Greater Spearwort							1	M
R. sardous Crantz	Hairy Buttercup					29		2	C, D, W
R. subg. *Batrachium* (DC.)A.Gray	Water Crowfoot	93	4	153	10	124	7	1400	A, P, R

Table 12 continued

		Ditch F208		Ditch F212		Ditch F214		Ditch F218	
	Context No	**238**	**211**	**239**	**229**	**224**	**215**	**225**	**HABITAT**
	Sample No	141 142	137	143 144	138	134 135	133	136 139 140	
URTICACEAE									
Urtica dioica L.	Common nettle	2		1			1	7	D, G, H, W, p
BETULACEAE									
Betula pendula Roth	Silver Birch								E, W, l, a
Betula sp	Birch								S, W
CHENOPODIACEAE									
Atriplex spp	Orache	4							C, D, n
Chenopodium album L.	Fat-hen								C, D, n
Chenopodium ficifolium Smith	Fig-leaved Goosefoot	1						22	C, D
Chenopodium rubrum/glaucum	Red/Oak-leaved Goosefoot	66							C, D
Chenopodiaceae indet		2				10			
CARYOPHYLLACEAE									
Cerastium spp	Chickweed		2			10		2	C, D, G
Stellaria graminea L.	Lesser Stitchwort								E, G, S, l
Stellaria media (L.)Villars	Common Chickweed	1						7	C, D
POLYGONACEAE									
Polygonum aviculare L.	Knotgrass					20			C, D
Rumex conglomeratus Murray	Clustered Dock	4							B, G, w
Rumex spp	Dock	4	2	1		20		2	
BRASSICACEAE									
Brassica nigra (L.)Koch	Black Mustard								D, R, W, s
Capsella bursa-pastoris (L.)Medikus	Shepherd's Purse	2							C, o
Coronopus squamatus (Forsskaol)Asch	Swine Cress			12		7			D, To
ROSACEAE									
Potentilla erecta (L.)Raeusch	Tormentil					1			E, G, a
Rubus sect *Glandulosus* Wimmer & Grab	Bramble			1		30		1	D, H, S, W
APIACEAE									
Aethusa cynapium L.	Fool's Parsley					131		40	C
Anethum graveolens L.	Dill					7			C, D
Apium nodiflorum (L.)Lag	Fool's Watercress	3							P, M
Berula erecta (Hudson)Cov.	Lesser Water-parsnip			1					M, P, w
Conium maculatum L.	Hemlock	1				30		35	B, w
c.f. *Foeniculum vulgare* Miller	Fennel					8			D, o, s
Oenanthe fistulosa L.	Tubular Water-dropwort	1							M, P, w
Umbelliferae indet		1							
SOLANACEAE									
Hyoscyamus niger L.	Henbane							1	B, w

Table 12 continued

		Ditch F208		Ditch F212		Ditch F214		Ditch F218	
	Context No	**238**	**211**	**239**	**229**	**224**	**215**	**225**	**HABITAT**
	Sample No	141 142	137	143 144	138	134 135	133	136 139 140	
LAMIACEAE									
Ballota nigra L.	Black Horehound							9	H, W
Lamium album L.	White Dead-nettle							133	
Lycopus europaeus L.	Gipsywort	25							F, R, w
Mentha aquatica L.	Water Mint								M, P, w
Mentha sp	Mint	2							
HIPPURIDACEAE									
Hippuris vulgaris L.	Mare's-tail	143			17				A, P, R
CALLITRICHACEAE									
Callitriche sp	Water-starwort								A
PLANTAGINACEAE									
Plantago major L.	Greater Plantain	2		2		2		3	C, D, G, To
SCROPHULARIACEAE									
Odontites/Euphrasia spp	Bartsia/Eyebright		1			4			C, D
Rhinanthus minor L.	Yellow Rattle				1				G
CAPRIFOLIACEAE									
Sambucus nigra L.	Elder		1		1	3		4	D, H, S, W, n
VALERIANACEAE									
Valerianella dentata (L.)Pollich	Narrow-fruited Cornsalad					3			C, D
ASTERACEAE									
Bidens cernua L.	Nodding Burmarigold	2							M, P, R
Bidens tripartita L.	Trifid Burmarigold	1							M, P, R
Bidens spp	Bur-marigold	1							M, P, R
Cirsium palustre/arvense	Marsh/Creeping Thistle	1					1	3	G, M, P, w, W, o
Cirsium spp	Thistle								D, G, M, W
Cirsium/Carduus spp	Thistle	2		1		1		12	D, G, M, W
Eupatorium cannabinum L.	Hemp-agrimony		frags		vfreq				w
Leontodon spp	Hawkbit	2							G
Senecio aquaticus Hill	Marsh Ragwort	3							M, P, R, w
Sonchus asper (L.)Hill	Prickly Sow-thistle	7				4			C, D
Sonchus oleraceus L.	Smooth Sow-thistle								C, D, W
Taraxacum sect. *Ruderalia*	Dandelion		1				1		D, G d&w
ALISMATACEAE									
Alisma plantago-aquatica L.	Water Plantain	353	6	4		1		26	A, P, R
Alisma sp	Water Plantain	24		21	3		1	1800	
JUNCAGINACEAE									
Triglochin maritimum L.	Sea Arrowgrass					1			G, M, s
Triglochin sp	Arrowgrass	1				1			
ZANNICHELLIACEAE									
Zannichellia palustris L.	Horned Pondweed	65				1			A, P, R
LEMNACEAE									
Lemna spp	Duckweed	98	1	8	12		5	1	A
JUNCACEAE									
Juncus spp	Rush	<50	79	200+	50+	100+	200+	37	G, M, R, w

Table 12 continued

		Ditch F208		Ditch F212		Ditch F214		Ditch F218	
	Context No	**238**	**211**	**239**	**229**	**224**	**215**	**225**	**HABITAT**
	Sample No	141 142	137	143 144	138	134 135	133	136 139 140	
CYPERACEAE									
Carex spp		12		3		43	1	3	G, M, R, w
Eleocharis palustris/uniglumis	Spike-rush	1		3		8	1		M, P, w
Schoenoplectus lacustris (L.)Palla	Common Club-rush	3				6			B, P, R shallow
Schoenoplectus tabernaemontani (C.Gmelin)Palla	Grey Club-rush					3			B, P, R, s
Schoenoplectus spp	Club-rush					3			
POACEAE									
Glyceria fluitans (L.)R.Br.	Floating Sweet-grass	121							M P, R shallow
Glyceria notata Chevall	Plicate Sweet-grass	2							M, P, R shallow
Glyceria spp	Sweet-grasses							2	B, M, P, R
Poa/Phleum spp	Meadow-grass/Cat's-tail	10	2	5		1	1	1	G
Poaceae indet	Grass	17		1					
TYPHACEAE									
Typha sp	Bulrush		3	1	4			7	P, R
Indet		1		1			3	2	
	Total (minimum)	1137	116	424	99	680	273	3565	
CHARRED PLANT REMAINS									
Cereals									
Grain									
Triticum sp	Wheat					234	2	4	
Triticum c.f. *dicoccum*	Emmer wheat								
Triticum sp (tail grain)						25			
c.f *Triticum* sp						23		3	
Hordeum sp	Barley					27		1	
Hordeum sp (straight)						3			
Hordeum sp (hulled)	Hulled Barley					5			
Hordeum sp (hulled/straight)						9			
Hordeum sp (sprouted)						2			
Hordeum sp (tail grain)						19			
c.f. *Hordeum* sp						3			
Avena sp	Oat					161		1	
c.f *Avena* sp						11	2		
Cereal indet						105		4	
	Total					629	4	13	
Chaff									
Triticum spelta (glume base)	Wheat					337		2	
Triticum sp (glume base)						895	13	29	
Triticum spelta (spikelet fork)						27	1		

Table 12 continued

		Ditch F208		Ditch F212		Ditch F214		Ditch F218	
	Context No	**238**	**211**	**239**	**229**	**224**	**215**	**225**	**HABITAT**
	Sample No	141	137	143	138	134	133	136	
		142		144		135		139	
								140	
Triticum sp (spikelet fork)						210	3	8	
Triticum sp (rachis internode base)						29		3	
Triticum dicoccum (spikelet fork)	Emmer					16			
Triticum dicoccum (terminal internode)	Emmer					1			
Triticum sp (free-threshing internodes)	Hexaploid bread wheat					11			
Triticum/Hordeum sp (awns - silicified)	Wheat/Barley					abun			
Hordeum sp (rachis internode)	Barley					6		2	
Hordeum sp (rachis internode base)						129		2	
Hordeum sp (rachis internode with several segments)						5			
Avena sativa (floret base)	Cultivated Oat					5			
Avena fatua (floret base)	Wild oat					5			
Avena sp (floret base)	Oat					8			
Avena sp (pedicels)						6			
Avena sp (awn)						13			
Cereal indet (rachis base)						20			
Cereal embryo						5	1		
Cereal/Poaceae (culm node)						few			
Cereal/Poaceae (culm node - silicified)						few			
Weeds									
RANUNCULACEAE									
Ranunculus acris/repens/bulbosus	Buttercup					6		1	D, G
Ranunculus flammula L.	Lesser Spearwort							1	M, P, R, w
Ranunculus sardous Crantz	Hairy Buttercup					16			C, D, W
CHENOPODIACEAE									
Atriplex spp	Orache					4			C, D, n
POLYGONACEAE									
Fallopia convolvulus (L.)A.Love	Black-bindweed					2			C, D
Polygonum aviculare L.	Knotgrass					3			C, D
Rumex conglomeratus Murray	Clustered Dock					3			B, G
Rumex sp	Dock					50	1	10	
BRASSICACEAE									
Brassica nigra (L.)Koch	Black Mustard					66	1		D, R, W, s
Coronopus squamatus (Forsskaol)Asch	Swine Cress					1			D, To
PRIMULACEAE									
Anagallis arvensis L.	Scarlet Pimpernel					1			C, W

Table 12 continued

		Ditch F208		Ditch F212		Ditch F214		Ditch F218	
	Context No	**238**	**211**	**239**	**229**	**224**	**215**	**225**	**HABITAT**
	Sample No	141 142	137	143 144	138	134 135	133	136 139 140	
FABACEAE									
Lathyrus/Vicia spp	Vetch					53			D, G
Medicago lupulina L.	Black Medick					7			G, R
Trifolium/Medicago spp	Clover/Medick					69	1	25	C, D
Trifolium c.f. *dubium* Sibth	Lesser Trefoil					6			G, o
Vicia faba L.	Celtic/Horse Bean					12			
APIACEAE									
Aethusa cynapium L.	Fool's Parsley					1			C
Bupleurum rotundifolium L.	Thorow-wax					1			C
LAMIACEAE									
Prunella vulgaris L.	Selfheal						1	3	
PLANTAGINACEAE									
Plantago lanceolata L.	Ribwort Plantain					7		1	G
Plantago major L.	Greater Plantain					3			C, D, G, T, o
SCROPHULARIACEAE									
Odontites/Euphrasia sp	Bartsia/Eyebright			1		3	3	3	C, D
RUBIACEAE									
Galium aparine L.	Cleavers					15			C, H, S, o
VALERIANELLIACEAE									
Valerianella dentata (L.)Pollich	Narrow-fruited Cornsalad					3			C, D
ASTERACEAE									
Centaurea c.f. *nigra* L.	Common Knapweed					1			D, G
Centaurea sp	Knapweed					5			
Hypochaeris radicata L.	Cat's-ear					1			G, W
Leontodon sp	Hawkbit					2			G
Picris hieracioides L.	Hawkweed Oxtongue					1			D, G, o
JUNCACEAE									
Juncus spp (capsules with numerous seeds attached)	Rush					37			G, M, R, w
CYPERACEAE									
Carex spp	Sedge					18	1	7	G, M, R, w
Cladium mariscus (L.)Pohl	Great Fen-sedge								F, R, w
Eleocharis palustris/uniglumis	Spike-rush					2	1	2	M, P, w
Schoenoplectus lacustris (L.)Palla (nutlets)	Common Club-rush					34	1	1	B, P, R, shallow
Schoenoplectus lacustris (inflorescence with many nutlets attached)						1			

Table 12 continued		Ditch F208		Ditch F212		Ditch F214		Ditch F218	
	Context No	**238**	**211**	**239**	**229**	**224**	**215**	**225**	**HABITAT**
	Sample No	141 142	137	143 144	138	134 135	133	136 139 140	
POACEAE									
Bromus hordaceus/secalinus	Brome					28		2	
Cynosurus cristatus L.	Crested Dog's-tail					27		1	G
Poa/Phleum spp	Meadow-grass/Cat's-tail							2	
Poaceae indet	Grass					67	4	14	G
Poaceae indet (stem fragments)						freq			
Indet						14		4	
Charcoal fragments				few	abun	vfreq			
OTHER REMAINS									
Caddis fly larvae		freq							
Cladoceran ephyppia	Water-flea egg cases	abun	freq	few					
Foraminifera			few						
Insects		abun							
Leech coccoons		vfreq							
Molluscs		freq	freq						
Ostracods		vfreq	few						

Habitats.
A: Aquatic. B: Bankside. C: Cultivated/Arable. D: Disturbed. E: Heath/Moor. F: Fen/Bogs. G: Grassland. H: Hedgerow. M: Marsh.
P: Ponds, ditches - stagnant/slow flowing water. R: Rivers/streams. S: Scrub. T: Paths/Gateways. W: Woodland.
d: dry soils. l: light soils. n: nitrogen rich soils. o: open habitats. p: phosphate rich soils. s: coastal. w: wet soils.
f = fragments.

Ditch F214 (Table 12)

The lower fill of F214 (Layer 224) was different to that in the other ditches. Whereas in most of the ditches the sediment appeared to have accumulated naturally, the lowest excavated fill of F214, comprising a black organic rich silty clay, seemed to have been dumped into the ditch. This black clay contained an assemblage of freshwater, disturbed ground, and grassland species similar to the other ditch fills with a few additional species. These included bramble (*Rubus* sect Glandulosus), dill (*Anethum graveolens*), and possible fennel (*Foeniculum vulgare*) — the latter were very poorly preserved. The presence of these species represents domestic use of these herbs with the blackberries also possibly used for culinary purposes.

In addition to the waterlogged plant remains there was also a large deposit of charred macrofossils including cereal grains, chaff, and a large assemblage of weed seeds. The cereals are dominated by wheat grains, represented by both the oval, parallel-sided grains characteristic of spelt (*Triticum spelta*) and the more rounded grains typical of the free-threshing bread wheats (*Triticum aestivum* type). Numerous glume bases and spikelet forks confirm the dominance of spelt wheat, with a number of spikelet forks of *Triticum dicoccum* showing the presence of emmer wheat. Free-threshing internodes confirm the presence of a hexaploid bread wheat type. Hulled

TABLE 13. BANWELL MOOR: PLANT MACROFOSSILS FROM THE LATER ROMANO-BRITISH BURIED SOIL IN TRENCH II.

	Context No Sample No	243 145	204 130	203 128	HABITAT
WATERLOGGED PLANT REMAINS					
CHARACEAE					
Chara spp	Stonewort		5	50+	A
RANUNCULACEAE					
R. subg. *Batrachium* (DC.)A.Gray	Water Crowfoot	1		8	A, P, R
BETULACEAE					
Betula pendula Roth	Silver Birch			1	E, W, I
Betula sp	Birch			1	S, W
CHENOPODIACEAE					
Chenopodium album L.	Fat-hen		1		C, D, n
CARYOPHYLLACEAE					
Stellaria graminea L.	Lesser Stitchwort		1		E, G, S, I
Stellaria media (L.)Villars	Common Chickweed	2	1	8	C, D
POLYGONACEAE					
Rumex spp	Dock			3	
BRASSICACEAE					
Capsella bursa-pastoris (L.)Medikus	Shepherd's Purse		1	1	C, o
LAMIACEAE					
Mentha sp	Mint		1	1	
HIPPURIDACEAE					
Hippuris vulgaris L.	Mare's-tail			16	A P R
CALLITRICHACEAE					
Callitriche sp	Water-starwort			1	A
ASTERACEAE					
Eupatorium cannabinum L.	Hemp-agrimony			few	w
LEMNACEAE					
Lemna spp	Duckweed	5	1		A
JUNCACEAE					
Juncus spp	Rush	100+	100+	100+	G, M R, w
CYPERACEAE					
Schoenoplectus spp	Club-rush			1	
TYPHACEAE					
Typha sp	Bulrush	1		1	P, R
	Total (minimum)	109	115	182	
CHARRED PLANT REMAINS					
Triticum sp	Wheat		2		
c.f *Triticum* sp			2		
Avena sp	Oat			1	
	Total		4	1	
Chaff					
Triticum sp (glume base)	Wheat		5		
Triticum sp (spikelet fork)			2		
Triticum sp (rachis internode base)				1	
Hordeum sp (rachis internode base)	Barley		1		

Table 13 continued	Context No Sample No	243 145	204 130	203 128	HABITAT
Weeds					
RANUNCULACEAE					
Ranunculus acris/repens/bulbosus	Buttercup		1		D, G
POLYGONACEAE					
Rumex sp	Dock		2		
FABACEAE					
Trifolium/Medicago spp	Clover/Medick		11		C, D
LAMIACEAE					
Prunella vulgaris L.	Selfheal		1		
PLANTAGINACEAE					
Plantago lanceolata L.	Ribwort Plantain		1		G
CYPERACEAE					
Carex spp	Sedge		2		G, M, R, w
Cladium mariscus (L.)Pohl	Great Fen-sedge	1			F, R, w
Eleocharis palustris/uniglumis	Spike-rush		1	1	M, P, w
Schoenoplectus lacustris (L.)Palla (nutlets)	Common Club-rush		2		B, P, R shallow
Indet			2		
Charcoal fragments			vfreq		

Habitats.
A: Aquatic. B: Bankside. C: Cultivated/Arable. D: Disturbed. E: Heath/Moor. F:Fen/Bogs. G: Grassland. H:Hedgerow. M: Marsh.
P: Ponds, ditches - stagnant/slow flowing water. R: Rivers/streams. S: Scrub. T: Paths/Gateways. W: Woodland.
d: dry soils. l: light soils. n: nitrogen rich soils. o: open habitats. p: phosphate rich soils. s: coastal. w: wet soils.
f = fragments.

barley grains, several of which had sprouted, with accompanying rachis internodes and oat grain and chaff illustrate the presence of these additional crops. The oat floret bases confirm the presence of both domesticated and wild oats. In addition to the charred remains there was an abundance of silicified awns of wheat/barley as well as a few cereal/grass culm nodes. These silicified remains suggest burning in high temperature oxidising conditions and may indicate the use of this cereal chaff as a fuel. Many of the weed seeds recovered are typical of cultivated ground and are likely to have been growing with the cereal crops and therefore would have been collected at harvest. These include black bindweed (*Fallopia convolvulus*), brome (*Bromus* spp), docks (*Rumex* spp), and narrow-fruited cornsalad (*Valerianella dentata*). Other species commonly occurring are more typical of grassy places, including buttercup (*Ranunculus* spp), clovers/medick (*Trifolium/ Medicago*), ribwort plantain (*Plantago lanceolata*) and hawkbit (*Leontodon* spp). The vetches recovered were in poor condition having mostly lost their outer surface and diagnostic hilum so identification to species was not possible. However many species of vetch are also typical of grassy places and could have been collected as hay for animal fodder. The presence of *Vicia faba* (celtic/horse bean) is more likely to represent an additional cultivated crop.

The upper buried landsurface (Table 13)
This second buried landsurface was marked by a very dark blue/black layer (203) which, at the northern end of the trench, formed a fairly thin and ephemeral horizon gradually becoming thicker and darker towards the southern end of the site where it overlay a mid-blue/brown horizon (204)

representing the upper zone of the underlying alluvium (205). Along most of the trench this horizon appears to represent a fairly stable ground surface although in places it slumps into the tops of the largely silted up ditches. Both layers had substantial samples taken from them (28.1 kg/33 litres from 203 and 30.2 kg/36 litres from 204). Despite the large size of the initial sample the floats produced were relatively small (180 and 170 ml respectively), although a similar, more limited assemblage of largely freshwater and disturbed ground species to that found in the ditch fills is again present. These include water crowfoot, water mint, duckweed, and stonewort as well as chickweed, fat hen, and docks. Layer 203 yielded a few charred remains with 204 producing a greater range of species, notwithstanding still relatively small totals, as well as a few very small fragments of charcoal. The charred remains are similar to the midden debris in Ditch F214 with wheat and barley chaff, as well as weeds of grassland and damp places. The black horizon was also sampled in the top of F212 (Layer 229). This produced a small assemblage including water crowfoot, mare's tail, hemp agrimony (*Eupatorium cannabinum*), duckweed, and rushes as well as abundant small fragments of charcoal.

THE POLLEN *By* Heather Tinsley

No pollen was preserved at Kenn Moor. At Banwell Moor, three pollen monoliths were examined in Ditches F2 and F6 in Trench I, and Ditch F212 in Trench II, with a fourth monolith sampling the upper part of the alluvial sequence including the two buried landsurfaces between F208 and F212 in Trench II. All samples were prepared for analysis using standard techniques.[80] Samples were counted at a magnification of x400 with x1000 magnification used for critical determinations. The aim was to count at least 500 land pollen grains per sample. Spores were counted outside this total as were any degraded or crumpled grains which could not be identified. The pollen preservation and concentration in F6 was good, though in the buried land surfaces in F2, F212, and between F208 and F212 preservation was generally rather poor and full counts were not achieved. In addition to pollen, the presence of algal zygospores was noted, and charcoal fragments with long axes greater than 50 microns in length were counted. Plant nomenclature follows Stace.[81] The taxonomic level to which pollen grains can be identified varies, some can be identified to species level, others to family and others to group; this report follows the conventions used by Bennett.[82]

Banwell Moor, Ditch F6 (FIG. 19 and Table 14)

The stratigraphy in F6 was as follows:

0.000–0.160 m — topsoil
0.160–1.045 m — mid-blue/brown silty clay (Layer 7)
1.045–1.060 m — transition between Layers 7 and 28 (base of Layer 7)
1.045–1.060 m — dark organically rich blue/grey silty clay (Layer 28)
1.060–1.110 m — organically rich black slightly silty clay (Layer 29)
1.110–*c.* 1.20 m — mid-blue/grey silty clay (Layer 38)
c. 1.20–? — dark organic rich silty clay (Layer 48)

Samples for pollen analysis were taken at the following intervals: 0.68–0.69 m, 0.89–0.90 m, 1.02–1.03 m, 1.04–1.05 m, 1.06–1.07 m, 1.09–1.10 m, 1.125–1.135 m, and 1.14–1.15 m. One

80 Moore *et al.* 1991.
81 Stace 1991.
82 Bennett 1994.

additional sample was taken from a bulk bag of black organic clay sediment (Layer 48) from below the level of the base of the monolith tin. This was extracted in the field from under water in the bottom of the ditch, and the context is assumed to be the earliest ditch fill at this site. The exact depth of this sample in relation to the bottom of the monolith is not known.

The results are presented in the accompanying pollen diagram (FIG. 19) and in Table 14. The data in the pollen diagram are expressed as percentages of total land pollen excluding aquatics (TLP).

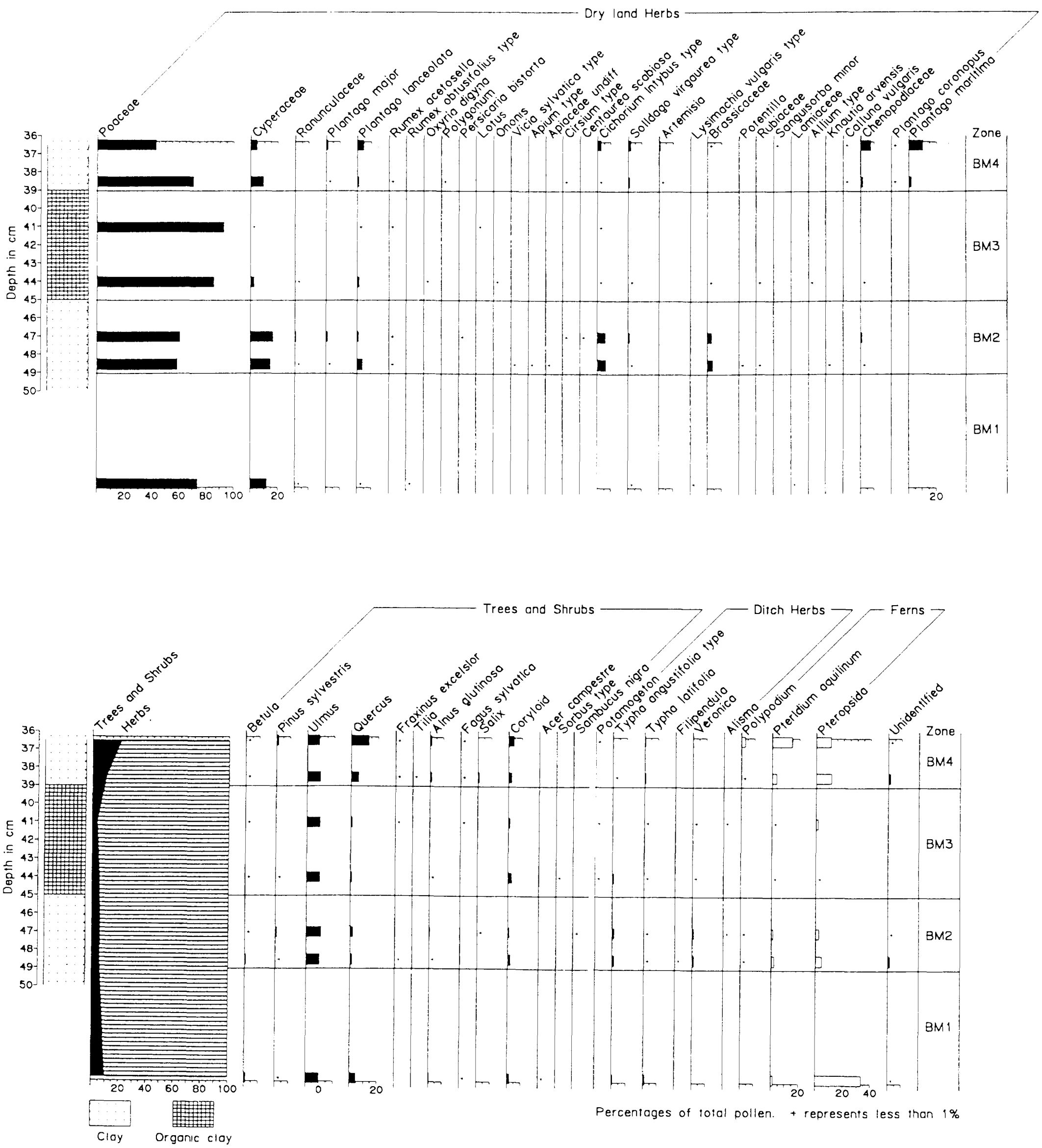


FIG. 19. Banwell Moor. Pollen diagram from F6.

TABLE 14: BANWELL MOOR: POLLEN FROM UPPER FILL OF F6

		Sample depth	**0.68-0.69 m**	**0.89-0.90 m**
		Context	7	7
		Pollen grains counted	47	51
		Traverses	10	10
Trees		*Pinus* (pine)	2	0
		Quercus (oak)	4	4
		Alnus (alder)	4	3
		Coryloid (hazel)	2	4
Herbs		Poaceae undiff. (grasses)	7	23
		Cyperaceae (sedge)	1	3
	d	*Plantago lanceolata*	3	2
	d	*Plantago major*	2	0
	d	*Plantago media*	1	0
	d	*Solidago virgaurea* type	1	4
	d	*Cichorium intybus* type	1	1
	d	Ranunculaceae	1	0
		Ericaceae	2	0
	*	*Plantago maritima*	5	3
	*	Chenopodiaceae	6	6
Degraded grains			1	3
Charcoal particles			2	2
Ditch F218			very low	very low
Pollen preservation			poor	poor

d: indicators of disturbance and pastoralism
*: halophytic conditions

The diagram has been zoned to give a series of local pollen assemblage zones, Banwell Moor 1–4 (BM 1–4). Table 14 summarises the results from the samples from the upper grey clay (Layer 7) where pollen concentrations were so low that they could only be assessed and so are not included in the diagram. The spot sample from the basal ditch fill is shown on the pollen diagram below the bottom of the depth scale.

Local pollen assemblage zone BM 1: Layer 48
The pollen assemblage from this, the earliest ditch fill, was entirely dominated by non-tree pollen, principally Poaceae (grasses), 74 per cent TLP, and Cyperaceae (sedges), 12 per cent TLP. Tree pollen comprised <10 per cent TLP, principally *Quercus* (oak) at 4.8 per cent. *Betula* (birch), *Pinus* (pine), *Alnus* (Alder), *Fagus* (beech), *Corylus (*hazel), and *Acer* (maple) all occurred at values of 2 per cent or less. A range of weed types, indicative of pastoral agriculture or disturbed edges of pathways and fields, was noted,[83] including Ranunculaceae (buttercup family), *Plantago lanceolata* (ribwort plantain), *Rumex obtusifolius* type (broad-leaved dock and other types), *Solidago virgaurea* type (aster, daisy and related types), all at values of < 1 per cent TLP. Pollen of *Typha angustifolia* type (lesser bulrush, bur reed) and *Typha latifolia* (bulrush) was also found in this assemblage, both of which were probably growing in the ditch itself, which may also have been the habitat for *Lysimachia* (loosestrife) and *Menyanthes* (bogbean) (both <0.6 per cent). Fern spores (largely undifferentiated) were common in this assemblage. Abundant fragments of charcoal were recorded.

83 Behre 1986.

Local pollen assemblage zone BM 2: Layer 38

In this assemblage the grasses had fallen to 65 per cent TLP whilst the sedges had risen slightly. Tree pollen remained low (< 6 per cent TLP). Weed pollen types increased in this zone which is characterised by peaks in *Cichorium intybus* type (dandelion and related types) (5.9 per cent) and Brassicaceae (cabbage family) (2.9 per cent); buttercup, ribwort plantain, aster type, *Rumex acetosella* (sheep's sorrel), *Persicaria bistorta* (knotweed), *Cirsium* (thistle), *Centaurea scabiosa* (greater knapweed), and *Artemisia* (mugwort) were all present at values < 1 per cent TLP. According to Behre,[84] *Cichorium intybus* type is associated with grazed environments, whilst the Brassicaceae may be linked with a variety of man-managed habitats — fields of summer cereals and root crops, fallow land, paths, and trampled areas. In the light of the lack of cereal pollen in this assemblage, it seems most likely that at this site the Brassicaceae peak represents disturbed or trampled habitats. The whole suite of weed taxa suggests significant disturbance and exploitation of the surrounding area in this zone. The ditch types, bulrush and lesser bulrush, noted in Zone BM 1 were still present and occasional grains of *Alisma* (water plantain) and *Veronica* type (speedwell family e.g. brooklime) may also be attributable to plants from this habitat. In contrast to Zone BM 1, fern spores were present in low numbers and only occasional charcoal fragments were noted.

Local pollen assemblage zone BM 3: Layer 29

In this zone the pollen assemblage was entirely dominated by the pollen of grasses (>85 per cent TLP). Tree pollen percentages remained < 6 per cent TLP. Weed pollen types continued to be represented but at lower frequencies than in the previous zone. The ditch types noted in Zones BM 1 and BM 2 were still present. This assemblage suggests a decrease in the intensity of disturbance in the surrounding area compared to the previous zone. Fern spores were again present only in low numbers (<2 per cent TLP). Charcoal fragments were recorded quite frequently.

Local pollen assemblage zone BM 4: Layer 28

The uppermost pollen assemblage showed an increase in tree pollen, principally oak which reached 13 per cent TLP in the top sample. Hazel comprised 3–4 per cent TLP and pine, alder, ash, beech, and *Ulmus* (elm) were all present at low frequencies. The non-tree pollen was still dominated by grasses but these had begun to decline in this zone. Some herbaceous taxa, most notably the plantains, reached markedly higher values than in earlier zones. *P. maritima* (sea plantain), reaches a peak of 10 per cent TLP. Sea plantain can be identified reliably to a group which includes *P. maritima* and *P. arenaria.*[85] *P. arenaria* is not native to Britain and, according to Stace,[86] has a scattered distribution confined to southern Britain and focused on East Anglia. *P. maritima*, however, is a common native plant growing in saltmarshes and short turf near the sea. A few grains of *Plantago coronopus* (buck's-horn plantain), another species which occurs mostly near the sea, were also found. In the uppermost sample from this zone there was also a small peak in pollen of Chenopodiaceae (goosefoot) (7.6 per cent), whose family is very large. Some members such as *Salicornia* spp. (the glassworts), *Suaeda* spp. (the sea-blites), and some *Atriplexes* (the oraches) are halophytes but many others are not, and unfortunately members of the family cannot be distinguished on the basis of pollen type. The occurrence of sea plantain, buck's-horn plantain and the Chenopodiaceae peaking all together possibly suggests increasing marine influence in Zone BM 4. At the same time small peaks occurred in ribwort plantain, dandelion type and other indicators of pastoralism. Five grains of cereal type pollen were recorded in this assemblage, but these may be attributable to *Glyceria* (sweet grass) which is commonly found in ditches (*Glyceria* pollen grains show the same morphological features as some of the cereals). For this reason these have not been separated from the Poaceae in the pollen

84 Behre 1986.
85 Moore *et al.* 1991.
86 Stace 1991.

diagram. A few grains of bulrush and pondweed were also noted which suggests that freshwater communities persisted into this zone. Fern spores increased to frequencies similar to those in Zone BM 1. Charcoal fragments were recorded quite frequently.

It is interesting to note that all samples below 0.91 m contained quadrangular fossils, between 35 and 40 microns in diameter, which were identified as zygospores of the Zygnemataceae (unbranched filamentous green algae).[87] These algae are common in shallow, stagnant water where they form slimy green masses on the surface. A few species inhabit salt water lakes, but there are no marine representatives.[88] These zygospores, which are distinctive, were quite frequent in Zones BM 1, 2, and 3, but only occurred occasionally in Zone BM 4. Clearly they represent part of the freshwater ditch flora at this site.

The two samples examined from above 0.9 m in the upper clay (Layer 7) could not contribute to the pollen diagram as the pollen concentrations were very low and the pollen poorly preserved. The results are shown in Table 14. The pollen assemblages in the two samples were very similar. Both were dominated by herbaceous pollen, principally grasses, with small peaks in Chenopodiaceae (10 per cent) and sea plantain (5 per cent). A range of other weed pollen types was also noted, including ribwort plantain, buttercup, and dandelion type. The pollen counts are so low that no reliable ecological interpretation can be made, though the assemblage seems to be similar to that of Zone BM 4.

Interpretation

The stratigraphy of this site suggests that the ditch infilled with water-deposited sediments (the grey clays) and organic sediments (the darker clays). The grey clays could either have originated by fluvial erosion of the ditch sides and surrounding land due to the action of drainage water, or have been deposited as a result of tidal incursions. The high percentage of fern spores in Zone BM 1 tends to support the interpretation that the basal ditch sediments contain eroded terrestrial soil (fern spores are often characteristic of the lower horizons of soils, and they are generally more resistant to decay than pollen grains). The abundant charcoal fragments must also have been washed into these basal ditch sediments. The black organic clay is most likely to be the result of plants colonising the ditch bottom where their remains accumulated within the ditch-bottom muds.

The pollen accumulating in these ditch sediments will have three possible sources, and elements attributable to all three can be identified in the assemblages described above.

1. The vegetation growing in the ditch itself.
2. The vegetation growing in the fields around the ditch.
3. The vegetation growing in the wider region, this will include pollen blown and washed into the ditch.

A freshwater ditch flora can be recognised in all four local pollen assemblage zones, notably taxa such as the bulrushes, water plantain, pond weed, and bogbean. *Veronica* (speedwell family, including species such as brooklime) may also have grown here. Poaceae pollen, which is present in high frequencies throughout the diagram, encompasses the pollen of all non-cultivated grasses including the common reed *Phragmites communis*, which may also have grown along the margins of the ditch. The zygospores of the Zygnemataceae indicate the presence of filamentous green algae suggesting very slow moving or stagnant water. These zygospores were frequent in the lower assemblages, but only one was found in the uppermost sample. It appears that fresh water persisted in the ditch throughout the accumulation of much of this sedimentary sequence, but the increase in

87 van Gel and Grenfell 1996.
88 Kadlubowska 1984.

frequency of halophytic taxa in the upper clay (7) suggests a change in the ditch environment towards the top of the sequence. These halophytic pollen types, which are found in Zone BM 4, may have blown into the site or been carried in by water and should not necessarily be interpreted as evidence for saltmarsh immediately around the ditch, or even of brackish water in the ditch. However, pollen from halophytic communities does appear to have been reaching the site when the upper sediments were accumulating.

In Zone BM 1 the vegetation growing on the land drained by the ditch was dominated by grasses and sedges. This area may have been subject to limited grazing, as the weed types which are present at low frequencies are largely those associated with pastoral activity such as ribwort plantain and buttercup. These same taxa are also typical of reclaimed marsh grassland which tends to be rather weedy.[89] By Zone BM 2 the intensity of pastoral use of the area had increased. This is suggested by the higher percentages of pollen of weeds of pastoralism and by a whole range of indicators of disturbance. The intensity of pastoral activity seems to have declined in Zone BM 3; weed types are still present and their diversity is quite high, but overall percentages are lower and the grasses are overwhelmingly dominant. The start of Zone BM 4 coincides with the change from organic rich sediments to grey clay. Weeds of pastoralism increase again, in particular dandelion and ribwort plantain, and suggest increased grazing activity and human influence. Equally, there is the suggestion that marine influences are beginning to be felt in the area.

The low tree-pollen frequencies which occur throughout the pollen diagram suggest that there was very little woodland in the local area during the period in which these sediments accumulated. Oak is the main tree pollen type noted and the source of this, and the other tree pollens, must have been the higher land around the North Somerset Levels. The increase in tree pollen, particularly oak, which occurs in local pollen Zone BM 4 must reflect some regeneration of woodland in this wider area.

In summary, over the period of time in which this ditch fill accumulated, Banwell Moor appears to have been used as grazing land, though the intensity of use seems to have varied. The pollen evidence suggests that at the time of accumulation of the lowest fill sampled, the area was already reclaimed from saltmarsh and there is no convincing evidence of halophytes. By the time of the accumulation of the upper grey clay, halophytic communities were growing in the wider area, though freshwater aquatic taxa were still present at, or close to, the site.

Banwell Moor: the buried landsurfaces (Tables 15–17)

The upper buried landsurface in Trenches I and II was sampled in two further monoliths, as it crossed ditches F2 (Table 15) in Trench I and F212 in Trench II (Table 16). Both the upper and lower buried landsurfaces in Trench II were sampled in a fourth monolith between F208 and F212 (Table 17). In all the samples preservation was poor and an assessment only was carried out. As a result any ecological interpretations must be treated with caution.

There is an increase in the concentration of pollen associated with the dark horizons. In F2 the peak in pollen concentration is clear and lies in the 10 mm thick dark horizon (Layer 17). However, in the other two monoliths the relationship is less clear cut, though pollen concentrations do rise in the lower part of the dark horizon in F212. In the monolith which contains both buried surfaces (Table 17) pollen concentrations do not peak until just below the darkest sediments of the upper buried surface, though higher concentrations of pollen are clearly associated with the lower buried land surface as well. The pollen assemblages found in all the samples are very similar to those from Ditch F6. The taxa present are dominated by grasses with a range of indicators of disturbance that are suggestive of pastoralism; these are particularly prominent in the lower buried surface.

[89] Rodwell, pers. comm.

TABLE 15. BANWELL MOOR: POLLEN FROM DITCH F2.

			0.74-0.75 m	0.78-0.79 m	0.81-0.82 m
		Sample depth	**0.74-0.75 m**	**0.78-0.79 m**	**0.81-0.82 m**
		Context	3	17	35
		Pollen grains counted	110	612	112
		Traverses	5	5	10
Trees		*Pinus* (pine)	5	3	0
		Quercus (oak)	10	6	3
		Alnus (alder)	10	1	0
		Coryloid (hazel)	9	13	1
		Tilia (lime)	2	0	0
		Fraxinus (ash)	2	0	0
Herbs		Poaceae undiff. (grasses)	29	460	41
		Poaceae Hordeum type	3	2	0
		Cyperaceae (sedge)	15	30	28
	d	*Plantago lanceolata*	4	4	2
	d	*Plantago major*	3	3	0
	d	*Plantago media*	0	5	0
	d	*Solidago virgaurea* type	2	2	5
	d	*Cichorium intybus* type	0	9	16
	d	Brassicaceae	0	4	4
	d	*Rumex acetosella*	0	0	2
	d	Ranunculaceae	0	1	0
		Silene type	0	4	1
		Cirsium type	0	0	0
		Apiaceae Heracleum	0	1	0
		Fabaceae undiff.	1	0	0
	*	*Plantago maritima*	1	0	0
	*	*Plantago coronopus*	6	0	0
	*	Chenopodiaceae	6	5	2
Ditch herbs		*Typha angustifolia* type	1	54	7
		Typha latifolia	1	1	0
Ferns and mosses		Undifferentiated	17	13	7
		Pteridium aquilinum	24	13	7
		Polypodiaceae	3	6	0
		Sphagnaceae	2	0	0
Degraded grains			6	6	0
Charcoal particles			14	183	21
Pollen concentration			low	high	low
Pollen preservation			poor	fairly good	poor

d: indicators of disturbance and pastoralism
*: halophytic conditions

Tree pollen percentages are low indicating an open environment. The ditch herbs are represented at low frequencies, though Layer 17 in F2 has quite significant frequencies of bulrush/bur reed pollen (10 per cent). Those taxa which could indicate halophytic conditions, *Plantago maritima, Plantago coronopus*, and the Chenopodiaceae, occur as occasional grains but there is no convincing evidence associating them with the clays immediately above any of the dark horizons, and hence, no real suggestion from the pollen evidence of increasing marine influences above these surfaces.

One explanation for the colour of these dark horizons could be the presence of charcoal found in high concentration in the dark horizons in both F2 and F212, whereas charcoal counts from

TABLE 16. BANWELL MOOR: POLLEN FROM DITCH F212.

		Sample depth	**0.70-0.71 m**	**0.71-0.72 m**	**0.74-0.75 m**	**0.78-0.79 m**	**0.83-0.84 m**
		Context	213	229	229	239	
		Pollen grains counted	44	39	68	73	122
		Traverses	10	10	10	10	10
Trees		*Pinus* (pine)	2	0	4	1	1
		Ulmus (elm)	1	0	0	0	0
		Quercus (oak)	4	0	1	4	0
		Alnus (alder)	0	1	0	0	0
		Carpinus (hornbeam)	1	0	0	0	0
		Coryloid (hazel)	5	0	0	2	4
		Sorbus type (rowan)	1	0	0	0	0
		Sambucus (elder)	0	0	0	0	1
		Tilia (lime)	0	0	0	0	0
		Fraxinus (ash)	2	0	0		
Herbs		Poaceae undiff. (grasses)	19	26	28	13	49
		Poaceae Hordeum type	1	0	0	1	0
		Cyperaceae (sedge)	1	3	6	11	14
	d	*Plantago lanceolata*	0	0	0	2	9
	d	*Plantago major*	0	0	0	0	0
	d	*Plantago media*	0	5	0	0	0
	d	*Solidago virgaurea* type	0	1	3	3	4
	d	*Cichorium intybus* type	3	8	21	19	18
	d	*Polygonum aviculare* type	0	0	0	2	5
	d	Brassicaceae	0	0	1	6	7
	d	*Rumex acetosella*	0	0	0	0	0
	d	Ranunculaceae	0	0	0	0	1
		Silene type	0	0	0	1	1
		Cirsium type	0	0	0	0	2
		Apiaceae *Heracleum*	0	0	0	0	0
		Fabaceae undiff.	0	0	0	0	2
		Erica	0	0	0	1	0
		Calluna	2	1	0	1	0
	*	*Plantago maritima*	0	1	0	0	0
	*	*Plantago coronopus*	0	0	0	0	0
	*	Chenopodiaceae	2	1	0	4	3
Ditch herbs		*Typha angustifolia* type	1	0	1	1	0
		Typha latifolia	1	1	0	0	0
		Veronica type	0	0	0	1	0
		Alisma	0	0	1	0	0
Ferns and mosses		Undifferentiated	4	12	15	9	11
		Pteridium aquilinum	6	4	3	6	3
		Polypodiaceae	1	0	7	2	6
		Sphagnaceae	1	1	0	0	1
Degraded grains			2	7	4	3	9
Charcoal particles			33	141	215	71	31
Pollen concentration			low	low	low	low	moderate
Pollen preservation			v. poor	v. poor	v. poor	v. poor	poor

d: indicators of disturbance and pastoralism
*: halophytic conditions

TABLE 17. BANWELL MOOR: POLLEN FROM UPPER AND LOWER BURIED LANDSURFACES BETWEEN F208 AND F212.

		Sample depth	**0.53-0.54m**	**0.55-0.56m**	**0.57-0.58m**	**0.61-0.62m**	**0.89-0.90m**	**0.91-0.92m**	**0.93-0.94m**
		Context	**209/213**	**210**	**210**	**243**	**244**	**244**	**276**
		Pollen grains counted	18	8	19	96	17	115	86
		Traverses	10	10	10	10	10	10	10
Trees		*Betula* (birch)	0	0	1	0	0	0	0
		Pinus (pine)	2	0	0	2	1	3	1
		Ulmus (elm)	0	0	0	0	0	0	0
		Quercus (oak)	*0*	*0*	*0*	*5*	*0*	*1*	*4*
		Alnus (alder)	0	1	0	2	1	2	1
		Carpinus (hornbeam)	0	0	0	0	0	0	0
		Coryloid (hazel)	2	1	0	2	1	4	1
		Salix (willow)	0	0	1	1	0	0	0
		Sorbus type (rowan)	0	0	0	0	0	0	0
		Sambucus (elder)	0	0	0	0	0	0	0
		Tilia (lime)	0	0	0	0	0	0	0
		Fraxinus (ash)	2	0	0	0	0	0	0
Herbs		Poaceae undiff. (grasses)	8	4	8	25	4	18	4
		Poaceae Hordeum type	1	0	0	0	0	0	0
		Cyperaceae (sedge)	0	0	0	4	2	6	5
	d	*Plantago lanceolata*	1	1	1	2	2	38	27
	d	*Plantago major*	0	0	0	0	0	0	0
	d	*Plantago media*	0	0	0	0	0	0	0
	d	*Solidago virgaurea* type	0	0	2	3	1	5	1
	d	*Cichorium intybus* type	0	0	2	20	2	24	41
	d	*Polygonum aviculare* type	0	0	0	8	1	0	0
	d	Brassicaceae	0	0	0	10	0	1	0
	d	*Rumex acetosella*	0	0	0	0	0	0	0
	d	Ranunculaceae	0	0	0	0	0	0	0
		Silene type	0	0	0	1	0	0	0
		Cirsium type	0	0	0	0	1	0	0
		Spergula type	0	0	0	0	0	0	3
		Scutellaria type	0	0	0	0	0	0	3
		Succisa pratensis	0	0	1	0	0	0	0
		Rosa type	0	0	0	0	0	0	2
		Apiaceae *Heracleum*	0	0	0	0	0	0	0
		Fabaceae undiff.	0	0	0	0	0	0	0
		Erica	0	0	0	0	0	0	0
		Calluna	0	0	0	1	0	1	0
	*	*Plantago maritima*	0	0	0	0	0	0	0
	*	*Plantago coronopus*	0	0	0	0	0	0	0
	*	Chenopodiaceae	1	0	3	11	2	4	0
Ditch herbs		*Typha angustifolia* type	2	0	0	0	0	0	0
		Typha latifolia	1	1	0	0	0	0	0
		Veronica type	0	0	0	0	0	0	0
		Alisma	0	0	0	0	0	0	0
Ferns and mosses		Undifferentiated	4	9	14	27	15	42	21
		Pteridium aquilinum	1	4	2	10	6	27	9
		Polypodiaceae	2	1	1	6	7	10	13
		Sphagnaceae	0	0	0	2	2	3	0
Degraded grains			7	6	4	8	5	16	28
Charcoal particles			16	46	6	98	20	77	62
Pollen concentration			v. low	v low	v. low	moderate	low	moderate	low
Pollen preservation			v. poor	v. poor	v. poor	poor	v. poor	poor	v. poor

d: indicators of disturbance and pastoralism *: halophytic conditions samples on either side of the buried land surface are low. In the monolith from between F208 and F212 a peak of charcoal concentration occurs just below the upper dark horizon, at the same level as the highest pollen frequencies, and a second peak occurs in the lower buried land surface associated with the saltern. If these are all true buried soils, it maybe that there has been some disturbance of the upper surface in places which could account for both the distribution of charcoal and of pollen, and also for the rather diffuse nature of the dark horizon at some locations.

Overall, all the dark horizons seem likely to be buried soils and to represent periods of stabilisation of the land surface. The environment of these stable periods appears to have been one of open grassland or meadow which was subject to some disturbance, probably by grazing with some burning occurring in the area.

THE SNAILS *By* Paul Davies (Tables 18–19)

Contexts at Banwell Moor, Kenn Moor, and Puxton were sampled for snails wherever macroscopic inspection suggested they were present, and sieved through a 0.5 mm mesh.

Banwell Moor buried landsurfaces

The snail assemblage from the late Iron Age landsurface at Banwell comprises roughly equal numbers of *Hydrobia ventrosa* and *Hydrobia ulvae*, indicative of quiet creeks in a brackish saltmarsh (see Table 18). Snails from the saltern debris (279) in the shallow depression (F281) are also indicative of brackish conditions surrounding the mound, with the aquatic species once again dominated by *Hydrobia ventrosa* and *Hydrobia ulvae*. Large numbers of terrestrial species, notably *Vertigo pygmaea*, *Pupilla muscorum* and *Vallonia pulchella*, were also recovered which are indicative of rather drier conditions presumably on the saltern itself.

The preservation of snails in the upper buried landsurface at Banwell was poor (Table 18). The dark horizon (Layer 17) in Ditch F2 produced a small (but wholly freshwater) assemblage, while the buried landsurface to the south-east of the enclosure in Trench I produced seventeen examples of *Cepaea nemoralis/hortensis* and single *Helix aspersa*, both terrestrial snails with wide vegetated habitat preferences including grassland.

Banwell and Puxton enclosure complex

Preservation of snails in the ditches and gullies at Banwell, Kenn, and Puxton was generally good. A small assemblage of sixty snails was recovered from Gully F156 at Puxton, of which fifty-nine were Succineidae and one *Cepaea hortensis/nemoralis*. The former are terrestrial marsh species that prefer damp, freshwater, places alongside aquatic plants. The lower fills of Ditches F2 and F4 at Banwell Moor contained slightly contrasting snail assemblages (no snails were recovered from F6) (Table 18). Layer 35 in F2 produced a mixed assemblage of freshwater and terrestrial snails, with the former dominated by *Bithynia tentaculata* and *Anisus leucostoma*; there were no brackish species. The lower fill of F4 (Layer 30) produced a large and mixed assemblage of 17 per cent brackish species (notably *Hydrobia ventrosa*), 41 per cent freshwater species (notably *Anisus leucostoma* and *Armiger crista*), and 42 per cent terrestrial species. Layer 31 produced a far smaller assemblage, though this wholly comprised the brackish species *Hydrobia ventrosa*. The lower fill of Ditch F218 in Trench II yielded a mixed assemblage of 53 per cent freshwater species (dominated by *Armiger crista*, *Anisus leucostoma* and *Lymnaea peregra*), 43 per cent terrestrial species dominated by *Vallonia* sp. and just 4 per cent brackish species (*Hydrobia ventrosa*). Layer 215 in Ditch F214 produced a small assemblage dominated by *Anisus leucostoma* and *Lymnaea truncatula*, suggesting a largely silted-up ditch, with a poor (?muddy) wet-ground surface. Overall, the assemblage suggests predominantly freshwater,

TABLE 18. BANWELL MOOR: SNAILS FROM TRENCHES I AND II.

	Ditch F2			Ditch F4			Ditch F6
Context	***3***	***17***	***35***	***5***	***30***	***31***	***7***
Valvata cristata	-	-	2	-	17	-	-
Hydrobia ventrosa	173	-	-	308	61	13	500+
Hydrobia ulvae	1	-	-	150	-	-	400+
Ovatella myosotis	-	-	-	2	-	-	-
Bithynia tentaculata	-	2	20	-	16	-	3
Physa fontinalis	-	-	2	-	-	-	-
Lymnaea truncatula	-	-	4	-	16	-	3
Lymnaea peregra	-	-	-	-	1	-	-
Anisus leucostoma	-	1	19	-	45	-	3
Armiger crista	-	-	10	-	54	-	2
Succineidae	-	-	3	-	7	-	-
Cochlicopa lubrica	-	-	-	-	1	-	-
Vertigo pygmaea	-	-	-	-	12	-	-
Pupilla muscorum	-	-	-	-	7	-	-
Vallonia costata	-	2	-	-	3	-	-
Vallonia sp.	-	-	10	-	78	-	-
Trichia hispida	-	-	-	-	2	-	-
Cepaea nemoralis/hortensis	-	1	-	-	-	1	-

	Late Iron Age Saltern			F208	F218	220
Context	***279***	***244***	***243***	***211***	***225***	
Valvata cristata	-	-	-	-	-	-
Hydrobia ventrosa	28	42	1	120	10	1,432
Hydrobia ulvae	13	50	-	84	-	43
Ovatella myosotis	3		-	49	-	-
Bithynia tentaculata	-		5	-	-	-
Physa fontinalis	-		-	-	-	-
Lymnaea truncatula	-		1	-	2	3
Lymnaea peregra	3		-	-	21	5
Anisus leucostoma	-		4	-	36	4
Armiger crista	1		-	3	79	1
Carychium minimum	1		-	-	-	-
Cochlicopa lubrica	4		-	-	7	-
Vertigo pygmaea	14		1	-	7	9
Pupilla muscorum	18		-	-	1	20
Vallonia costata	1		-	-	6	-
Vallonia pulchella	10		1	-	20	32
Vallonia excentrica	9		-	-	5	10
Vallonia sp.	-		-	-	56	-
Oxychilus sp.	-		-	-	1	-
Trichia hispida	1		-	-	9	-
Cepaea/Arianta	-		1	-	-	-
% brackish	41	100	n/a	99	4	95
%freshwater	4	-	n/a	1	53	0.5
% terrestrial	55	-	n/a	-	43	4.5

probably well-vegetated, ditches with little water movement. There may have been some brackish influence. The terrestrial molluscs indicate open dry grassland adjacent to the marshy ditch edge.

Snails from the upper fills of ditches F2, F4, and F6 (Layers 3, 5, and 7) at Banwell all produced large brackish/estuarine assemblages dominated by *Hydrobia ventrosa* and *Hydrobia ulvae*. Layer 7 produced a tiny number of freshwater examples, though in such a low proportion that they could easily have been washed in from elsewhere or eroded out of earlier sediments. Ditch F208 in Trench II at Banwell was the only one not to be sealed by the dark horizon, suggesting that it was open during the flooding episode that buried the later Romano-British landscape. The snail assemblage was dominated by *Hydrobia ventrosa*, *Hydrobia ulvae* and *Ovatella myosotis* suggesting an open, muddy, estuarine ditch.

Kenn Moor enclosure complex

At Kenn Moor snail assemblages were recovered from Ditches F7, F13, F112, F159, and F302, and Gullies F15 and F27 (Table 19). The sample taken from towards the bottom of Ditch F13 (0.6 m) contained a relatively high proportion of the slum species *Anisus leucostoma* which lives in ponds, ditches, and marshes and is resistant to its habitat drying out. *Bathyomphalus contortus* and *Lymnaea peregra* live in diverse habitats, while *Bithynia tentaculata* prefers quiet waters. There are noticeably few ditch or slow-moving water species. Overall, the evidence suggests an open ditch with slow-moving water, prone to drying. The sample from higher up (0.5 m) shows a decline in slum species while *Bithynia tentaculata*, *Valvata cristata*, and *Planorbis planorbis* all increase, indicating a greater flow of water in a well-vegetated ditch. At 0.45 m *Bithynia tentaculata* is dominant, which along with *Planorbis planorbis* suggests that there was still a body of freshwater along with thick vegetation. *Anisus leucostoma* may indicate muddier conditions at the edges. The assemblage from 0.4 m shows a marked change in the molluscan assemblage, with *Gyraulus laevis* appearing for the first time, indicating a well-vegetated environment. The rest of the assemblage comprised the catholic species *Lymnaea peregra* and *Bathyomphalus contortus*.

The snail assemblage from Gully F15 was dominated by *Bithynia tentaculata*, *Lymnaea peregra*, *Anisus leucostoma* and *Bathyomphalus contortus* indicating a quiet body of fresh water, while that from Gully F27 was dominated by *Bithynia tentaculata* and *Lymnaea peregra*. Overall, it would appear that, when open, these gullies served a drainage function.

A very small assemblage was recovered from the bottom of Ditch F7, which included *Planorbis planorbis*, with *Lymnaea peregra*, and *Bithynia tentaculata*, indicating freshwater conditions. The small assemblage from F302 in Trench D was dominated by *Lymnaea peregra* and *Anisus leucostoma*. There was a very small number of brackish snails (*Hydrobia ulvae* and *Hydrobia ventrosa*), which could have been transported to the site through occasional storm flooding or on the feet of sea birds, or may have been eroded out of the natural alluvium.

The small assemblage from Ditch F112 in Trench J was dominated by *Anisus leucostoma* and *Segmentina nitida*, indicating areas of still or stagnant freshwater that was prone to drying. The single example of *Lymnaea palustris* supports an essentially freshwater environment, though *Lymnaea peregra* can live in fresh or brackish conditions. Once again there was a small number of *Hydrobia ventrosa*. The assemblage from Ditch F159, that lay on a different orientation to the rest of the Roman landscape, was once again dominated by *Anisus leucostoma*, with a lesser number of *Segmentina nitida* suggesting still or stagnant freshwater. This is supported by the single example of *Sphaerium corneum* which had the two valves still attached. Once again a slight brackish element might be indicated by the small number of *Hydrobia ventrosa*.

A large snail assemblage was also recovered from the palaeochannel adjacent to the corn-drier complex at Kenn Moor. The assemblage from below the layer (44) of stone rubble contained a relatively high percentage of *Lymnaea peregra* which can tolerate a very wide range of habitats, including slightly brackish conditions. However, the smaller numbers of *Bithynia tentaculata* and

TABLE 19. KENN MOOR: SNAILS.

	F13	F13	F13	F13	F15	F27	F61	F61	F61	F7
Context number	14	14	14	48	16	28	2	59	59	41
Depth	0.1 m	0.15 m	0.2 m	0.3 m					g	
Weight	0.8 kg	1.1 kg	2.25 kg	1.6 kg	2.1 kg	1 kg	0.8 kg	2 kg	1.7 kg	2.3 kg
Valvata cristata	0	2	25	2	0	0	0	0	0	0
Hydrobia ventrosa	0	0	0	0	0	0	0	0	0	0
Hydrobia ulvae	0	0	0	0	0	4	40	13	15	3
Bithynia tentaculata	0	13	55	12	13	0	0	1	3	0
Lymnaea truncatula	0	0	1	0	0	0	0	0	0	0
Lymnaea palustris	0	0	0	02	1	0	1	0	0	0
Lymnaea stagnalis	0	0	0	0	0	4	62	0	79	3
Lymnaea peregra	11	3	34	36	12	0	7	8	7	6
Planorbis planorbis	0	4	9	0	2	0	43	2	4	1
Anisus leucostoma	0	4	9	43	9	0	3	126	1	0
Bathyomphalus contortus	4	3	31	30	7	1	11	0	0	0
Gyraulus laevis	9	0	0	0	0	0	0	0	0	0
Segmentina nitida	0	0	0	1	0	0	1	0	0	0
Sphaerium corneum	0	0	1	0	1	0	0	0	0	0
Pisidium casertanum	0	0	0	1	0	0	0	0	0	0
Pisidium personatum	0	0	0	1	0	0	0	0	1	0
Succinea family	0	0	0	1	0	0	0	2	0	0
Pupilla muscorum	0	0	0	0	0	0	0	1	0	0
Cepaea sp	0	0	0	0	0					
Total	24	32	207	128	45	9	176	153	110	13

	F302	F112	F159
Context number	305	129	160
Weight	1.4 kg	1.1 kg	2.0 kg
Valvata cristata	0	0	0
Hydrobia ventrosa	1	5	4
Hydrobia ulvae	3	0	0
Bithynia tentaculata	0	0	5
Lymnaea truncatula	0	0	0
Lymnaea palustris	0	1	0
Lymnaea stagnalis	0	0	2
Lymnaea peregra	7	1	4
Planorbis planorbis	0	0	0
Anisus leucostoma	6	6	37
Bathyomphalus contortus	2	0	1
Gyraulus laevis	0	0	0
Segmentina nitida	0	4	12
Sphaerium corneum	0	0	1
Pisidium casertanum	0	0	0
Pisidium personatum	0	0	0
Succinea family	0	0	0
Pupilla muscorum	0	0	0
Cepaea sp	0	0	0
Total	20	17	65

Planorbis planorbis suggest a slow flow of fresh water in a well vegetated channel. Slum species (*Anisus leucostoma* and *Lymnaea truncatula*) were a small part of the assemblage. The assemblage from towards the centre of the channel contained a high percentage of *Bathyomphalus contortus*, along with *Bithynia tentaculata*, *Lymnaea peregra*, *Armiger crista*, and *Planorbis planorbis*. Some *Aplexa hypnorum* and *Planorbis corneus* were also present indicating clean, flowing freshwater. Though two brackish species were present (*Hydrobia ulvae* and *Hydrobia ventrosa*), they accounted for just eleven individuals out of the total sample of *c.* 3,000.

As might be expected from what was obviously a largely silted-up watercourse, the assemblage from the sediments over-lying the spread of stone rubble (Layer 2) contained a relatively high proportion of the slum species *Anisus leucostoma*. The smaller numbers of *Planorbis planorbis* and *Valvata cristata* could also have lived in rather marshy conditions or small bodies of slow moving/stagnant water, though there was still a significant number of snails preferring more open bodies of water notably *Bithynia tentaculata*. A small number of land snails were also present in the mollusc assemblage from the palaeochannel, notably *Pupilla muscorum* and *Vallonia pulchella*, along with smaller numbers of *Trichis hispida* and *Vertigo pygmaea*. These species indicate short-turved, slightly damp grassland.

Discussion

The Banwell, Kenn Moor, and Puxton assemblages are overwhelmingly freshwater, and suggestive of ditches with a range of environments: open to well-vegetated, slow-moving to stagnant, and liable to dry out revealing muddy sides. The catholic freshwater species *Lymnaea peregra* and *Bathyomphalus contortus* were dominant, though a number of more habitat-specific species were also present in significant numbers. *Anisus leucostoma* prefers stagnant and drying ponds, ditches and marshes, while *Bithynia tentaculata* prefers better water conditions in slow rivers and ditches; it never occurs in small closed stagnant ponds.[90] A very small number of brackish and saltmarsh species were also identified in a number of the field ditches. The significance of this brackish component can be put into perspective by contrasting it with that from the upper fills of the Banwell ditches which were dominated by *Hydrobia ventrosa*. Clearly, during their active lives, the areas around the settlements at Banwell, Kenn Moor, and Puxton represented a very different environment, with no direct tidal access.

ANIMAL BONES *By* Sheila Hamilton-Dyer

Introduction

Small animal bone assemblages were recovered from Banwell and Kenn Moor. The bone from most features was collected by hand, though some layers were sieved, particularly Pits F205, F210 and Ditch F208 in Kenn Moor Trench K, and F214 in Banwell Moor Trench II. The bones from topsoil contexts and surface cleaning of stratified deposits have been included in the analysis as the general appearance of these fragments is similar to material from secure Romano-British contexts: most are cattle or sheep-sized fragments and do not differ substantially from the rest of the material. Ovicaprid bones were checked for goat[91] though none were identified, whereas several sheep bones were positively identified and it is assumed that most, or all, ovicaprid bones are of sheep. Many small fragments, particularly of limb shaft, ribs, and vertebrae were difficult to identify to species, and so these have been classed as cattle-sized and sheep-sized only. Other material could not

90 Boycott 1936, 140.
91 Boessneck 1969; Payne 1985.

be identified even to this level and has been recorded as mammalian only. Recently broken bones have been joined where possible and counted as single fragments. The few measurements follow von den Driesch[92] and are in millimetres unless otherwise stated.

Banwell Moor

A total of 183 bone fragments was recovered for analysis, from 31 layers. Preservation is moderate, but adequate for observation of butchery and other surface features. Six bones were recovered from the late Iron Age saltern in Trench II (4 sheep and 2 cattle). One of the cattle bones, a jaw, had been cut. The 77 bones recovered from around the enclosure in Trench I are mostly of cattle and sheep (12 identified bones each), and fragments of this size. There are more sheep-sized fragments than cattle-sized (23 and 17 fragments respectively), mainly due to the presence of some broken limb shaft fragments in Layer 17 (F2) which are probably from a single bone. There are also two horse teeth, a pig phalanx, and a watervole jaw. Although no dog was identified, three other bones had been gnawed. There are 95 fragments from the late Roman contexts in Trench II, mainly of cattle and sheep (11 and 22 respectively), with similar numbers of cattle-and sheep-sized fragments (30 and 27 respectively). Other bones include two of pig and one each of horse and hare (or perhaps cat). A fragment of human femur came from the top of Ditch F214. Although no dog bones were identified, a canine presence is suggested by gnawing on eleven bones, while the single pig bone has the appearance suggestive of partial digestion.

Kenn Moor (Table 20)

A far larger assemblage was recovered from Kenn Moor, where a total of 2,002 bone fragments came from 78 contexts. Several hundred of these were very small scraps of unclassified mammalian bone recovered from the sieved samples. The majority of the faunal material was recovered from Trench K, particularly from Pits F205 and F210. The condition of the bones varies, with 28 per cent of the fragments eroded and 20 per cent burnt. Charred and calcined fragments are particularly noticeable in the assemblage from Trench K at 26.2 per cent. In the other trenches only 7.5 per cent of the bones are affected. The incidence of gnawed bones, at 43 (2 per cent), is lower than at many sites. Surface preservation on all but the most eroded and gnawed bones was usually sufficient for observation of fine details such as knife marks. Species identification was impeded by the high incidence of fragmentation: 63 per cent of the bones were between 10–50 mm in size and only twenty-five bones (1.2 per cent) were over 100 mm. This also reduced the amount of metrical and other information available. The high fragmentation is also illustrated by the anatomical element distribution; many fragments are of limb shaft which could not be certainly attributed to element or species, and small fragments of rib. Skull fragments are poorly represented but jaws and loose teeth are common. Of the fifteen cattle and nine sheep jaws only two contain teeth. Teeth also represent seventeen of the twenty-five horse bones recovered.

The overall species distribution is broadly similar for all features, with cattle dominant, sheep of secondary importance, and much lesser amounts of horse and pig, while remains of other mammals and birds are very few. All of the fish, small mammal, and amphibian bones were retrieved from the sieved samples.

The total number of bones from all contexts in Trenches A–J amounted to just 612 fragments, 30 per cent of the overall total. Most contexts contain less than thirty bones, some only one or two. Bones identified to species number 142, mainly of cattle and sheep, with horse and pig also present. Bird bones are present; one fragment (Trench G, Layer 108) could be identified as goose, two could

[92] von den Driesch 1976.

TABLE 20. KENN MOOR: ANIMAL BONES – ANATOMICAL DISTRIBUTION (ALL CONTEXTS).

	Horse	**Cattle**	**Sheep/ Goat**	**Pig**	**Cattle sized**	**Sheep/ pig sized**	**Total**
skull	0	6	1	1	7	1	16
maxilla/premaxilla	0	1	1	0	0	0	2
jaw	3	15	9	2	1	0	30
loose teeth	17	54	25	6	0	0	102
atlas	0	0	0	0	0	0	0
axis	0	0	0	0	0	0	0
other vertebrae	0	0	0	0	10	12	22
ribs	0	4	0	1	60	26	91
scapula	1	11	5	0	1	0	18
pelvis	2	2	4	0	0	0	8
humerus	0	3	5	0	0	0	8
radius	0	3	9	1	0	0	13
ulna	0	4	2	0	0	0	6
femur	0	3	1	0	0	0	4
tibia	0	4	15	0	0	0	19
astragalus	0	2	5	0	0	0	7
calcaneum	0	2	2	1	0	0	5
other carpal/tarsal	0	5	6	0	0	0	11
metacarpus	0	6	3	1	0	0	10
metatarsus	0	12	11	1	0	0	24
phalanges	2	9	4	1	0	0	16
shaft fragments	0	0	0	0	186	168	354
other	0	1	0	1	121	6	129
Total	25	147	108	16	386	213	895

not be positively identified but are probably of fowl. Sieving in Trench I recovered an amphibian bone from Gully F145 and several more from Ditch F147. Butchery marks were observed on nine bones in Trenches A–J. These include a cattle scapula with a long defleshing knife cut along the spine and a horse acetabulum probably cut while disarticulating the femur. Other marks were chops on various bones including sheep tibia, cattle humerus, and cattle-sized ribs. Ageing information is sparse; only one jaw contains teeth and most bone fragments do not include the epiphysial surface. Most of the fragments with information are mature fused bones, but Ditch F147 in Trench I contained two bones of a calf foot. Similarly, few bones are sufficiently complete for measurement but a complete cattle metacarpus (Trench J, Ditch F129) offers an estimated withers height of 1.072 m (based on factors recommended by von den Driesch and Boessneck).[93] The bone is slender, the index of length against distal breadth is only 0.27 suggesting that the bone is of a cow.[94] Similar small animals have been recorded from the region, for example at Frocester Court.[95]

Most of the assemblage in Trench K derives from the two square pits, F205 and F210, whose contents were extensively sieved. The assemblages from both are numerically dominated by small fragments (<100 mm long) of unclassified mammal bone recovered from the sieving. The general

93 Driesch and Boessneck 1974.
94 Howard 1963.
95 Noddle 1979.

impression of the bone material is that the two groups are very similar, dominated by cattle and sheep, with small numbers of pig bone. The cattle bone in Pit F210 includes three bones of calf one of which is from a neonate. The assemblage from Pit F210 contains a few bones of other species; two horse teeth, a dog jaw, and three bones of domestic fowl. The fish bones are all very small. In both pits eel and stickleback are present, and in Pit F205 there are three vertebrae of a small flat-fish, probably flounder. Woodmouse and short-tailed vole occur in both assemblages, while in Pit F210 shrew and mole are also present. The bones are well preserved and show little sign of erosion and only a few bones have gnawing damage. In Pit F205 a sheep astragalus and calcaneum and three small fragments have eroded surfaces consistent with dog digestion. The amphibian bones are reported by Gleed-Owen below.

There is a conspicuous amount of burning in both groups; in comparison with all other material from Kenn Moor 34 per cent of fragments in these pits are burnt, whereas less than 1 per cent of bone is affected from all other contexts. The proportion of burnt fragments is not the same in the two pits; in Pit F205 almost half the fragments (48 per cent) are affected, while in Pit F210 the amount is much less (12 per cent) though still higher than for other features. Charred and calcined bone is prone to fragmentation,[96] and the results could be biased in favour of the small fragments recovered from sieved samples. However, this is not the case as burnt fragments are equally present in the unsieved material, and many of the smallest fragments in the sieved samples are not burnt. Like much of the other bone the burnt fragments are mainly of unclassified mammal bone and cattle- and sheep-sized fragments. Burnt ungulate bone identified to species includes sheep foot, jaw, and limb bones, a cattle fibula and ribs, and a pig tooth. In addition to these there are several burnt amphibian and small mammal bones. The occurrence of these animals in pits is usually explained as accidental, the animals having fallen in and died *in situ*, but these two features are, however, less than 0.5 m deep and seem unlikely to have proved an obstacle to small animals; nor was there any sign of *in situ* burning.

It seems likely, therefore, that the material in these two pits is of similar origin, and from mixed sources. Some bone is burnt, a few fragments were exposed long enough for dogs to have gnawed/swallowed, though most is in good condition and was probably buried soon after being discarded. Given the shallow depth of the two pits, it is unlikely that their primary use was for cess or rubbish disposal, and it is probable that they were filled with refuse when no longer required for their original function.

Less bone was recovered from other contexts in Trench K. The topsoil contained 255 bone fragments which appeared to be of the same size and appearance as those from secure contexts, but may contain later material. Of the 65 identified to species 27 are of cattle skull and loose teeth and are probably from one head. One of the fragments of cattle scapula has several butchery marks common in Roman assemblages; the spine has been removed, there are knife marks down the length of the blade and a number of bone slivers have been removed from the bone at the articular end.[97] The only evidence of deer was also recovered from this context, in the form of three small sawn offcuts of red deer antler.

The single fragment recovered from Gully F231 is a horse jaw. The canine tooth indicates that this was a male animal and the molar crown heights suggest an age of about twelve years at death.[98] The third premolar has an uneven wear pattern which may have resulted from wearing a bit. Few of the large mammal bones from Ditch F208 were identified to species, three fragments each of cattle and sheep, and one of horse. One of the cattle bones is of a neonate. A puppy femur was recovered from the sieved material, the second of the two dog bones from the site. Sieving also recovered a small mammal phalanx and twenty-five fish bones, probably all stickleback.

96 McKinley 1994.
97 Maltby 1989.
98 Levine 1982.

Discussion

At both Banwell and Kenn Moor, the identified mammal remains are almost entirely of the domestic ungulates cattle and sheep with some pig and horse. There is no evidence for exploitation of wild mammals (apart from the three antler fragments from Kenn and a possible hare bone from Banwell) and there are very few bird bones. The fish represented here are small but edible and could be human food remains. From an environmental point of view they do not give positive evidence of marine or freshwater conditions. Sticklebacks are usually associated with freshwater streams but can be found in brackish, even coastal, waters. In a similar manner flounder can be found in freshwater bodies some distance from the sea and eels are found in both salt and fresh water. Fish bones are rarely reported from Romano-British excavations, other than major urban and military sites such as Silchester,[99] Dorchester,[100] and York.[101] Their recovery is largely dependent on sieving, and all of the fish, amphibian, and small mammal bones at Kenn Moor were recovered from such samples. This gives a more complete picture of the species present than at unsieved sites, and similar work in the future may reveal that many rural sites do have a fish component in the assemblage, albeit a minor one.

Comparing the relative proportions of cattle, sheep, and pig with those on the tripole graph given by King,[102] the figures for Kenn Moor overall, and for Trench K specifically, lie within the area of overlap between villas, Romanised, and un-Romanised settlements. The only other published assemblage of animal bone from a Roman site on the Severn Estuary Levels is at Rumney Great Wharf on the Gwent Levels,[103] which lies wholly within the polygon for un-Romanised settlements. Urban and military material tends to have more cattle and pig, while rural settlements have more sheep. It should be remembered, however, that such broad analysis can be used only as a guide and both of these assemblages are small. In addition, the local geography may play a considerable part in influencing the stock proportions, and the low-lying pasture at both sites is more suitable for raising cattle than sheep and pigs. Rural assemblages also tend to have relatively high percentages of horse, over 10 per cent of the horse/cattle total.[104] The individual feature totals are too small to analyse at Kenn Moor, but the overall figure is 15 per cent, consistent with a rural assemblage. This is still much lower than the very high percentage (59 per cent) at Rumney (from an admittedly small assemblage) where a military interpretation of the site has been offered.[105]

AMPHIBIAN BONES *By* Chris Gleed-Owen

The wet sieving of midden material in the pits F205 and F210 in Kenn Moor Trench K produced fourteen amphibian bones: three *Bufo bufo* (common toad), five *Bufo* sp., two *Rana* sp. (frog), and four Anura indet.

MARINE MOLLUSCS

There were very few marine molluscs recovered from Kenn Moor and none from Banwell. The shells comprised one complete limpet, two complete and three fragments of oyster shell.

99 Hamilton-Dyer (n.d.).
100 Hamilton-Dyer 1993.
101 Jones 1988.
102 King 1988.
103 Hamilton-Dyer 1994, 197–200, 207.
104 Maltby 1994.
105 Fulford *et al.* 1994, 206–11.

THE POTTERY *By* Jane Timby

The excavations at Kenn Moor produced some 2,800 sherds (*c.* 22.3 kg), while the assemblages from Banwell and Puxton were much smaller (304 and 38 sherds respectively). In addition, a small collection of pottery from an earlier excavation on the Manor Farm site in Kenn was also scanned. The material was sorted into fabrics and quantified by sherd count, weight, and rim estimated vessel equivalence (eve) for each context. The following fabrics are based on macroscopic observations aided with the use of a binocular microscope (x20 magnification). Site codes: BM: Banwell Moor; KM: Kenn Moor (see Table 21); PX: Puxton

Description of fabrics

Native wares

L1: Limestone-tempered
Fabric: Moderately soft brown ware with a grey core. The paste contains a scatter of sub-rounded limestone fragments up to 1.5 mm across. Smooth soapy fabric. *Form:* Handmade closed form. *Sites:* BM, KM.

L2: Calcite-tempered with limestone
Fabric: Black with brownish core or reddish brown to black throughout. The matrix contains a moderate frequency of finely crushed calcite and irregularly-shaped grey limestone inclusions up to 1.5–2.0 mm in size. Occasional rounded grains of brown iron. Cf. Meare fabric 2b.[106] *Form*: Handmade jar; globular bowl with burnished finish. *Sites*: BM, KM.

L3: Calcite-tempered
Fabric: Reddish-brown to black exterior with a black core and interior. The paste contains a moderate frequency of ill-sorted angular calcite, the largest fragments reaching 1 mm in size. No other macroscopically visible inclusions. Cf. Meare fabric 2c;[107] Peacock (1969) Group 3. *Form:* Handmade globular bowl with a burnished finish. *Site*: BM.

L4: ?Limestone-tempered
Fabric: A white, leached fabric with numerous surface voids. The cream fabric is mottled with red/brown patches and red or black iron grains. The voids are suggestive of a decayed calcareous temper. A possible similar fabric from Meare is suggested to have contained a fine argillaceous temper which was readily susceptible to leaching.[108] *Form:* Handmade ?necked bowl. *Site*: BM.

L5: Limestone-tempered
Fabric: Dark greyish-brown in colour. Tempered with a common frequency of rounded fragments of white, decaying limestone up to 1.5 mm across. The larger fragments are surrounded by numerous fine white calcareous specks in a black background. *Form:* Handmade bowl with a slightly expanded rim. *Site*: BM.

G1: Grog-tempered
Fabric: A soft, friable brownish-black fabric. The clay is poorly wedged and contains a scatter of fine quartz and coarser grits and occasional sub-rounded grey pellets (?grog/clay pellets). *Form*: Handmade closed form. *Sites*: KM.

106 Rouillard 1989, 183.
107 Rouillard 1989, 184.
108 Rouillard 1989, fabric 4a.

Oxidised wares

SVW/O1: Severn Valley ware
Fabric: Cf. Webster 1976.[109] SVWs are notoriously susceptible to soil conditions and can deteriorate very quickly. All sherds with a soft orange fabric not distinctive in any other way have been subsumed into this category. *Forms*: The only recognisable featured sherds include a flat rimmed bowl (KM 102), a tankard (KM 138), and a jar (KM 108). *Source*: Lower Severn Valley. *Sites*: BM, KM, PX.

O2: Oxidised ware
Fabric: A moderately hard, red-brown fabric with a greenish-grey core and a laminar fracture. The smooth soapy paste shows no macroscopically visible inclusions although a scatter of very fine quartz is visible at x20. *Forms:* Wheelmade vessels; no featured sherds. *Source:* Unknown. *Sites*: KM.

O3: South-west white-slipped ware
Fabric: An orange sandy ware, usually with a white surface slip although this is absent with most of the Kenn Moor sherds. *Forms*: No featured sherds but generally found as small flagons and beakers dating to the later second to third centuries. *Sites*: KM.

O4: Midlands grog-tempered ware
Fabric: Booth and Green 1989.[110] *Form*: Handmade storage jars. Present only as body sherds. Third to fourth century. *Sites*: KM.

Grey wares

R1
Fabric: A dark-blue/grey fabric with smooth surfaces. At x20 the matrix shows a sparse scatter of very fine, sub-angular, quartz with occasional larger grains. *Forms:* Wheelmade jars. *Source:* ?North Somerset/Congresbury Ware. *Sites*: BM, KM, PX.

R2
Fabric: A harder-fired sandier version of R1. Probably from the same source as R1/R11/R17. *Forms:* Jars, jugs, plain-rimmed dishes. *Source:* ?North Somerset/Congresbury Ware. *Sites:* KM.

R3
Fabric: Fine, pale grey, very finely micaceous fabric with a slightly powdery feel. The paste contains a sparse scatter of very fine quartz sand, only occasional grains are visible, and a scatter of rounded pale argillaceous inclusions, ?clay pellets, up to 1 mm across in size. *Forms:* Jars, colanders, flanged bowls. *Source:* ?North Somerset/Congresbury Ware. *Sites*: BM, KM.

R4
Fabric: Pale grey, slightly micaceous. As R3 but with slightly more, fine, rounded quartz sand giving a gritty feel. *Forms*: Wheelmade vessels, mainly everted rim jars. Also plain-rimmed dishes, jugs, and beakers. *Source:* ?North Somerset/Congresbury Ware. *Sites:* BM, KM.

R5
Fabric: Pale to darker grey. As R4 but with a common frequency of fine quartz sand. Occasionally clay/ferruginous pellets. *Forms:* Everted rim jars, jugs, plain-rimmed dishes, and tankards. *Source:* ?North Somerset/Congresbury Ware. *Sites:* BM, KM.

[109] Webster 1976.
[110] Booth and Green 1989.

R6
Fabric: Fine pale grey ware with a distinctive red-brown or sandwiched brown/grey core. Finely micaceous clay with a scatter of fine quartz sand. Probably related to R3. *Forms:* Jars, jugs, plain-rimmed dishes. *Sites:* KM.

R7
Fabric: A grey or brown slightly gritty miscellaneous category. The paste contains a scatter of ill-sorted rounded quartz, the grains often standing proud of the softer matrix. *Forms:* Jars and plain-rimmed dishes. *Sites:* BM, KM.

R8
Fabric: A dark grey-black sandy ware. The paste contains a moderate frequency of ill-sorted sub-angular to rounded, quartz sand up to 1.5 mm across, accompanied by rare rounded clay-pellets. *Forms:* Jars imitating BB1 forms, plain-rimmed dishes, colander. *Sites:* BM, KM, PX.

R9
Fabric: A grey sandy ware. Pale to dark grey fabric containing a moderate to common frequency of fine, rounded quartz sand. Distinctive sandy texture. A slightly coarser handmade storage jar fabric (S1) is included here. *Forms:* Jars, flanged bowls, and a single tankard (FIG. 21.3). *Sites*: BM, KM, PX.

R10 = R8

R11
Fabric: Dark grey, very well-fired hard fabric, almost vitrified. Dark grey core or sandwiched red-brown and grey. Probably a harder fired version of R1. The paste contains a scatter of fine sub-angular quartz sand. *Forms*: Closed vessels, jars, jugs. *Source:* ?North Somerset/Congresbury Ware. *Sites:* BM, KM.

R12
Fabric: A hard grey sandy ware with a moderate frequency of fine quartz sand, fine white limestone, and dark grey pellets. *Form:* Closed form and dishes. *Sites:* BM, KM.

R13
Fabric: A brown, orange, or grey ware with a grey inner core characterised by a moderate scatter of rounded argillaceous inclusions and fine ill-sorted quartz sand. *Forms:* Jars. *Sites*: BM, KM, PX.

R14
Fabric: A fine or sandy grey ware characterised by distinct presence of white mica flecks (muscovite). Quartz sand varies from sparse to common. Possibly related to Gloucester TF 5.[111] *Form:* Closed forms. *Sites:* BM, KM.

R15
Fabric: A grey or pale brown ware with a grey core. Smooth slightly laminar, fabric characterised by a moderate frequency of rounded, pale coloured, argillaceous inclusions and a scatter of fine quartz sand. Probably related to R3–5. *Forms*: Closed vessels, plain-rimmed dish. *Sites*: BM, KM.

R16=R11

[111] Ireland 1983, 96–124.

R17
Fabric: A very hard, granular grey ware with a red-brown sandwiched core. The paste contains a common frequency of ill-sorted rounded to sub-angular quartz. A coarser version of Fabric R11. *Forms:* Closed forms. *Source:* ?North Somerset/Congresbury Ware. *Sites:* BM, KM.

R18
Fabric: A mottled grey reddish-brown ware with a grey core. The paste is characterised by black organic voids and black inclusions ?charcoal. A hard fabric with a slightly sandy texture. *Forms:* Jug. *Sites*: KM.

R19
Fabric: Dark grey surfaces with a pinkish-brown core and buff inner core. The paste contains a scatter of fine-medium rounded quartz, red iron and occasional, rounded argillaceous inclusions. *Form*: ?bowl. *Sites*: BM.

R20
Fabric: Fine ware with sandy texture. A fine paste, with mica. Black surfaces with a brown core. *Form*: thin-walled wheelmade forms including necked bowls. Probably early Roman. *Sites*: BM.

Traded wares

DORBB1: Dorset Black-burnished ware
Fabric: Williams 1977; Holbrook and Bidwell 1990. A small number of South-West slipped vessels are also present alongside the more common Wareham-Poole harbour wares. *Forms:* Plain-rimmed dishes, flanged conical bowls and jars. *Sites*: BM, KM, PX.

Oxfordshire industries
Fabric: Young 1977.
OXCC: Oxfordshire colour-coated ware. *Forms:* Recognisable forms include Young bowls/dishes types C51, C45, beakers. *Date*: A.D. 240–400+.
OXMO1: Oxfordshire colour-coated mortaria. *Date*: A.D. 240–400+.
OXMO2: Oxfordshire white-slipped mortaria. *Date*: A.D. 240–400+.
OXMO3: Oxfordshire whiteware mortaria. Forms Young M22. *Date*: A.D. 240–400+.
Sites: KM.

NFCC: New Forest colour-coated ware
Fabric: Fulford 1975. *Forms:* Mainly found as beakers. Date: A.D. 300–400. *Sites*: KM.

SAMCG: Samian: Central Gaulish ware
Forms: Dragendorff forms 31, 33, 37. *Sites*: KM, PX.

SAV: Savernake ware
Fabric: Annable 1972. *Forms:* Handmade storage jars. No featured sherds. A long-lived form dating from the first century onwards. *Sites*: KM.

Miscellaneous

Single examples occurred of the following:

AH: Probably a sherd from an Alice Holt/Farnham industry storage jar.[112] *Sites*: KM.
Q1: A fine oxidised white-slipped sherd, probably flagon.
WW1: Miscellaneous, medium sandy whiteware. Source unknown. *Sites*: BM.

Banwell Moor

The later Iron Age wares are all limestone or calcite-tempered fabrics (L1–L5). Similar fabrics are well documented from the region and are recorded, for example, by Peacock in his characterisation of Glastonbury ware,[113] from Meare Village east,[114] Chew Park,[115] and Butcombe.[116] Recognisable forms include handmade globular bodied bowls, with rounded or slightly carinated shoulders and simple rims (FIG. 20.1–2). Bases appear to be flat (FIG. 20.3) . The exterior surfaces are roughly burnished. One body sherd shows possible vertical scoring on the edge of the break (FIG. 20.4) for which no immediate local parallel can be found. Although the bowls can be broadly compared with late Iron Age material from the Somerset Levels, for example Rouillard 1987 form BD2, the Banwell examples appear to be a little squatter and less globular. Whether this is a local or a chronological trait is difficult to ascertain at present. A split fragment of a beaded rim bowl/jar also came from Layer 250 indicative of a first-century A.D. date.

The late Iron Age sherds came from a variety of contexts and several appear to be redeposited in later Roman horizons including the upper buried landsurfaces in Trenches I and II, and Ditch F218. Many of the sherds, however, were associated with the saltern and lower buried landsurface in Trench II (Layers 240, 247, and 259) and were unaccompanied by Roman wares proper.

Illustrated sherds

FIG. 20.1. Bowl with a rounded profile. Reddish-brown upper exterior becoming blacker towards the base. The surfaces exhibits traces of a worn burnish. Fabric L3. Layer 259.

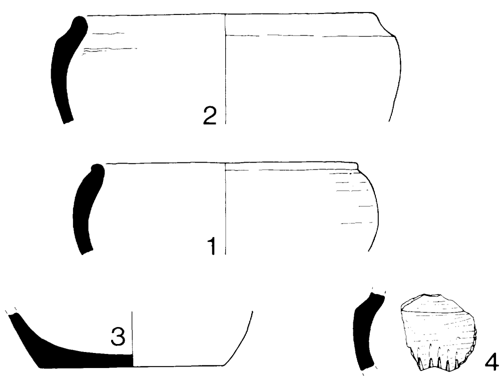


FIG. 20. Banwell Moor. Late Iron Age pottery. Scale 1:4. *(Drawn by Jane Timby)*

[112] Lyne and Jefferies 1979.
[113] Peacock 1969.
[114] Rouillard 1989, 183.
[115] ApSimon 1977, 195.
[116] Fowler 1968.

FIG. 20.2. Bowl with a slight shoulder carination and simple rim. Mid-brown to black in colour with a roughly burnished surface. Fabric L2. Layer 259.
FIG. 20.3. Base sherd, probably from a bowl. Smoothed exterior surface, ?originally burnished. Fabric L.2. Layer 259.
FIG. 20.4. Body sherd from a bowl with a slight shoulder carination. A black fabric with a burnished exterior and traces of vertical scoring on the lower part of the vessel. Fabric L3. Layer 259.

Most of the Roman fabrics can be dated to the third century, though R20, a thin-walled sandy ware with black surfaces, may be later first-century in date. Sherds of this were recovered from the lower fill of enclosure ditch F6 along with a single limestone-tempered sherd (Fabric L4). Further probable redeposited finds came from Ditches F214 and F218 and the upper buried landsurface: other pottery from these contexts suggests a third-century date. Most of the Roman wares are grey sandy fabrics probably from the nearby Congresbury kilns. Traded wares were poorly represented with just seventeen sherds of Dorset BB1 and a single sherd of Oxfordshire colour-coated ware. The form repertoire is limited to jars with everted flaring, or slightly thickened, rounded rims, bowls, straight-sided dishes, and a single sherd of a colander.

Kenn Moor (Table 21)

In terms of detailed analysis the Kenn Moor material presents some problems as a high proportion of the sherds are in poor condition (small pieces with abraded edges). Most of the colour-coated sherds have lost their surfaces and several of the wares characterised by finer, softer fabrics are poorly preserved. Featured sherds are limited and the typological range appears very restricted. Part of the reason for the overall poor condition of the assemblage is accounted for by the fact that 51 per cent by weight (46 per cent by sherd count) derives from the topsoil. The remaining 49 per cent comes from cut features or layers. Of the thirty negative features producing pottery only eight produced in excess of twenty sherds and five between ten and twenty sherds, thus limiting the validity of any detailed chronological assessment.

Table 21 summarises the overall quantities of each defined fabric at Kenn Moor. Grey wares account for 61 per cent by weight of the total assemblage. These proved particularly difficult to discriminate and many of the apparent visual and textural differences are probably due to firing or post-depositional change, rather than source. It is likely that most of the greywares derive from the local area, notably the Congresbury kilns.[117]

The second most common ware encountered is Dorset black burnished ware (BB1) which accounted for 31 per cent by weight. The majority of this appears to derive from the Wareham-Poole Harbour area although a small amount of the South-Western slipped variety was present.[118] At Gatcombe, Dorset BB1 was the commonest fabric present with 49.8 per cent compared to 31.6 per cent for the grey wares (Congresbury kiln ware).[119] Dorset BB1 was also the dominant coarseware fabric at Lamyatt Beacon, Catsgore, and Bradley Hill. Only at the former site were grey wares present in a significant amount but even then only 33 per cent compared to 65 per cent BB1.[120] This undoubtedly reflects the different geographical position of the two sites in relation to the two industries.

The only foreign import present is a small quantity of samian. All examples came from the later

[117] Usher and Lilly 1964, 172–4.
[118] Holbrook and Bidwell 1990.
[119] Branigan 1977.
[120] Leech 1986.

TABLE 21. KENN MOOR: SUMMARY OF POTTERY FABRICS.

Code	**Description**	**No**	**No %**	**Wt (gms)**	**Wt %**	**EVE**	**EVE %**
O1	Severn Valley ware	56	2	367	2	19	1
O2	oxidized ware	20	*	135	*	0	*
O3	South-west white-slipped	10	*	27	*	0	*
O4	?Midland grog-tempered	5	*	51	*	0	*
R1	local grey ware	64	2	552	2.5	18	1
R2	local grey ware	76	3	650	3	56	3
R3	fine grey ware	310	11	2006	9	201	10
R4	slightly sandier R3	364	13	3540	16	246	12.5
R5	gritty sandy version R4	188	6.5	1895	8.5	215	11
R6	hard fired grey ware	135	5	794	5	75	4
R7	sand and clay pellets	38	*	356	1.5	24	1
R8	black sandy ware	73	2.5	501	2	13	*
R9	medium grey sandy ware	125	4	812	3.5	92	4.5
R11	well-fired greyware	149	5	1496	6.5	147	7.5
R12	grey sandy with limestone	29	1	122	*	0	*
R13	brown/greyware sand & clay pellets	15	*	131	*	10	*
R14	micaceous sandy ware	12	*	86	*	3	*
R15	grey ware with clay pellets	14	*	254	1	26	1
R17	hard granular ware	13	*	82	*	0	*
R18	charcoal-tempered greyware	2	*	21	*	15	*
BB1	Dorset black-burnished ware	949	33.5	6847	30.5	645	32.5
OXCC	Oxfordshire colour-coat	52	2	303	1	49	2.5
OXMO1	Oxon colour-coated mortaria	3	*	22	*	4	*
OXMO2	Oxon white-slipped mortaria	1	*	54	*	16	*
OXMO3	Oxon white ware mortaria	3	*	62	*	9	*
OXWW	Oxon white ware	5	*	14	*	3	*
NFCC	New Forest colour-coat	8	*	40	*	35	2
SAM	samian	25	1	172	*	8	*
SAV	Savernake ware	5	*	140	*	0	*
G1	native grog-tempered	4	*	29	*	0	*
L1	native limestone-tempered	2	*	21	*	0	*
L2	native calcite-tempered	1	*	5	*	6	*
misc	miscellaneous	18	*	144	*	10	*
Pmed	Post-medieval wares	52	2	192	*	25	1
Total		2827	100	22264	100	1970	100

phases of the industry and probably date to the later second or early third centuries. Other fine wares in the assemblage come from the British sources, in particular the New Forest and Oxfordshire industries. A small number of whiteware, white-slipped, and colour-coated mortaria are also present from the latter. Oxfordshire wares are the more common accounting for 1.6 per cent (count) of the assemblage compared to 0.3 per cent for the New Forest products. Both wares were better represented at Gatcombe where the difference was not quite so marked, 4.8 per cent (Oxon) compared to 3.3 per cent (NF).[121]

[121] Branigan 1977.

Illustrated sherds
FIG. 21.1. Everted rim handmade jar. Fabric L2. F130, (164).
FIG. 21.2. Narrow-necked everted rim jar. Fabric R6. F159, (160).
FIG. 21.3. Tankard. Fabric R9. F147 (148).
FIG. 21.4. Large everted rim jar. Fabric R5. F147 (148).
FIG. 21.5. Wide-mouthed jar with a slight shoulder carination. Fabric R5. F205 (207).
FIG. 21.6. Flanged rim dish. Fabric R9. F205, (207).
FIG. 21.7. Bifid rim jug with burnished line decoration. Fabric R11. F208 (209).
FIG. 21.8. Everted rim bowl with a lid-seating. Fabric R3. F208 (209).
FIG. 21.9. Everted rim jar. Fabric R4. F208 (213).
FIG. 21.10. Plain-rimmed dish. Fabric BB1. F208 (213).
FIG. 21.11. Brownish-orange colour-coated beaker. Fabric NFCC. F208 (213).
FIG. 21.12. Everted rim BB1 jar. F210, (211).
FIG. 21.13. Black-slipped South-Western BB1 flanged dish. F210 (211).
FIG. 21.14. Plain-rimmed dish. Fabric R4. F210 (211).
FIG. 21.15. Everted rim large jar. Fabric R4. F210 (211).
FIG. 21.16. Jug, Fabric R6. F210 (211).
FIG. 21.17. Grey ware colander. Fabric R3. F215 (216).

Manor Farm, Kenn

The material removed from the section placed across one of the ditches in the Manor Farm relict landscape mirrored the same general range of fabrics found at Kenn Moor. The latest datable wares in the collection, New Forest colour-coated sherds, are unlikely to have been deposited much before A.D. 330+.

Puxton

A small assemblage of 37 sherds (351 g) was recovered from Puxton. Most of this came from the topsoil with just one sherd of Dorset BB1 from Ditch F158 and two very small undiagnostic body sherds from Ditch F160. Most of the topsoil finds can be paralleled at Banwell and Kenn. The group is dominated by sherds of Dorset BB1 and local grey wares suggestive of a date in the third century onwards. A sherd of late samian would also suit a late second-/early third-century date.

General discussion

None of the sites reported here appear to have been occupied before the late Iron Age. Banwell shows clear evidence of activity in the late Iron Age and into the first century A.D., but was subsequently abandoned. At Kenn Moor a very small number of grog-, limestone- and calcite-tempered wares could indicate first-century A.D. activity somewhere in the locality but, as they are likely to represent redeposited finds, the evidence is equivocal.

The pottery assemblage from all the sites examined suggests renewed occupation possibly from the later second century/early third century, but with the main focus of activity from the mid-third century. The Kenn Moor assemblage is the most informative. Grey wares dominate and most of these undoubtedly originate from either the Congresbury, Brue Valley, or other North Somerset kilns. Similar grey wares feature across the region, for example at Chew Valley,[122] Butcombe, and Gatcombe.[123] Unfortunately the third and fourth centuries are a period notoriously conservative in

[122] Rahtz and Greenfield 1977.
[123] Branigan 1977.

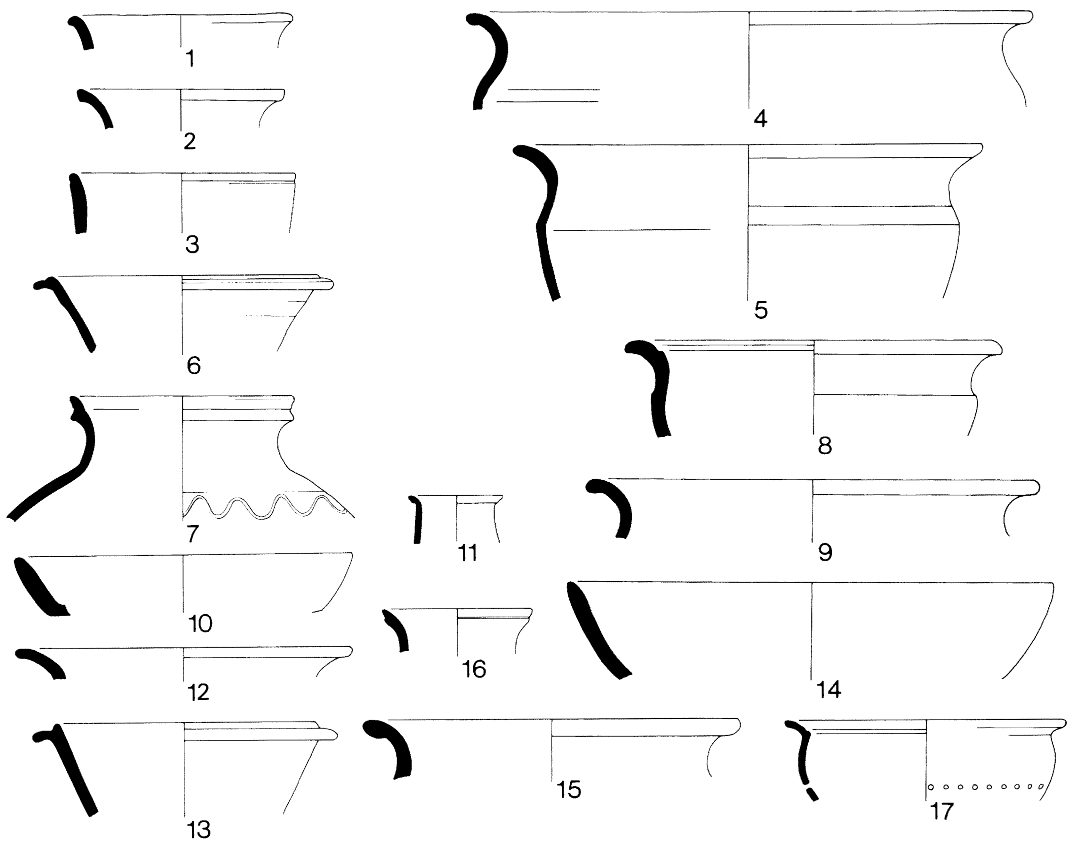


FIG. 21. Kenn Moor. Romano-British pottery. Scale 1:4. *(Drawn by Jane Timby)*

pottery styles and this is reflected in the large number of everted rim jars at Kenn Moor. Other popular forms include plain-rimmed and flanged dishes and bifid rim jugs. The latter are a distinctive product of the region and the examples from Kenn can be paralleled with the well groups from Chew Valley and Pagan's Hill. In the former report it was noted that a significant difference between the jugs from the two groups was the absence of vertical burnishing or scoring on the Pagan Hill vessels, perhaps suggestive of a slightly earlier date (earlier fourth century as opposed to mid-fourth century).[124] The Kenn Moor sherds do not generally show the vertical burnishing, although in some cases the evidence may have been lost.

The BB1 form repertoire at Kenn Moor is surprisingly restricted and common second- to early third-century forms, such as flat or grooved rim dishes, are absent. A similar absence was noticed at the farmstead at Bradley Hill, north of Ilchester,[125] taken to indicate a lack of occupation of this date at the site. This leaves the problem of explaining the samian and other early wares at Kenn Moor. It could be argued that the absence may be reflective of marketing or field sample bias. Alternatively, it could be suggested that the Kenn Moor assemblage represents two periods of

[124] Rahtz and Greenfield 1977.

[125] Leech 1981.

occupation with a break in the late second to mid-third century. This would account for the smattering of earlier wares of late first-/second-century date (Fabrics G1, L1, L2, SAM, SAV, and O3 amongst others) and the dominance of later third- to early fourth-century wares. The generally small size of the present assemblage, its condition, and the generally conservative nature of the wares prevent further pursuit of this theory at present.

Most of the wares found at Kenn Moor can be paralleled at nearby sites such as Henley Wood, Chew Valley, and Gatcombe, which in fact all show a wider diversity of products. The generally homogeneous character of the Kenn Moor assemblage may in part reflect a slightly more restricted chronological range compared to other nearby sites and perhaps its rural nature. Most rural establishments tend to show a dominance of jar forms, especially storage jars. The absence of products of the late Roman colour-coated industries from Puxton and the single sherd from Banwell, along with the absence of late wares belonging to the Dorset BB1 industry, such as conical flanged bowls, may reflect a date of abandonment at both sites before the fourth century. However, it should be stressed that the Puxton assemblage is very small, and that an absence of fine wares could be related to socio-economic factors.

It is possible, on the basis of the absence of certain fabrics characteristic of the later fourth century, that occupation at Kenn Moor did not continue much after the mid-fourth century. In particular, late Roman shelly wares, present on most other late Roman sites in the region, for example, Henley Wood Roman temple,[126] Bradley Hill,[127] Gatcombe,[128] Brean Down, Lamyatt Beacon,[129] and Ilchester,[130] are absent. However, it should be noted that only a single sherd of shelly ware was present in an assemblage of 25,000 sherds from the agricultural settlement at Catsgore, north of Ilchester, known to be occupied until at least A.D. 400,[131] while just a 'handful' of sherds was recovered from the temple site at Henley Wood.[132] Although it might, therefore, be suggested that Kenn Moor had been abandoned by *c.* A.D. 360/70, the evidence is at present equivocal.

COINS *By* Norman Shiel

Just one coin, of Tetricus I (270–273) was recovered from an excavated context (Kenn Moor Ditch F312). A total of thirty-three bronze coins were recovered through metal-detecting in Field 16. All were very worn and/or showed signs of severe corrosion and most cannot be closely identified. A total of ten coins date to the late third century, including two of Claudius II (268–270), one probably of Victorinus (268–270), five of Tetricus I (270–273), one of Carausius (287–293), and one barbarous radiate. Ten coins date to the first half of the fourth century including six of Constantine I (307–337), one of Maxentius (as Caesar 306), and two of Constantine II (337–340); the latest identifiable coin is of the *Fel.Temp.Reparatio* series minted after 346 but no later than *c.* 355–360.

IRON OBJECTS FROM KENN MOOR *By* David Richards

Fragments of nine iron nails were recovered, notably from the midden-material in Pits F205 and F210. One had a lump of slightly vesicular slag adhering to the head (F145/Layer 146). This represents a meagre ironwork assemblage for a Romano-British rural settlement, especially

[126] Watts and Leach 1996.
[127] Leech 1981, 238.
[128] Branigan 1977.
[129] Leech 1986.
[130] Leech 1982, 143.
[131] Leech 1982; Ellis 1984.
[132] Watts and Leach 1996, 99.

considering the volume of midden-type material that was sieved. In particular, the lack of nails is puzzling considering the abundance of burnt clay/daub indicating the probable presence of timber buildings. The answer may in part lie in the severe corrosion which many of the pieces have suffered from, as far from being anaerobic, conditions in the cut features were strongly aggressive.

BRONZE OBJECTS FROM KENN MOOR (FIG. 22) *By* Stephen Rippon

Fragments of two bronze brooches were recovered during the metal-detector survey, along with a possible knife fitting.[133]

1. Field 16: Cast tapering hollow rectangular 'box' of copper alloy, with moulded rib decoration at each end. Widest end solid with two protruding attachment points. Single slot on each of the narrower faces, rear face heavily damaged. 45 mm long, 17–23 mm wide, 12–14 mm thick. Roman or medieval. Possibly a knife or razor handle[134] (FIG. 22.1).
2. Field 16: Fragment of Colchester-derivative Dolphin brooch, mid-first to early second century (FIG. 22.2).
3. Field 28: Fragment of bow brooch, including foot knob, probably first to second century.

LEAD OBJECTS FROM KENN MOOR (FIG. 23) *By* Stephen Rippon

A total of twenty-five pieces of lead (402 g) was recovered during the metal-detector survey of Field 16, whose distribution corresponds exactly to that of the Roman pottery and coins. Most of the pieces comprised the waste products from lead and tin working (see below), while five pieces were recognisable objects.

1. Conical weight, basal diam. 27 mm, height 31 mm, central hole 3 mm diam. 57 g. (FIG. 23.1).
2. Roughly made conical weight, basal diam. 20 mm, height *c.* 13 mm (apex broken), central hole 3 mm diam. 14 g. (FIG. 23.2).
3. Roughly made conical weight, basal diam. 25 mm, height 17 mm, flat apex 11 mm diam., central hole 5 mm diam. 32 g. (FIG. 23.3).
4. Roughly made flat-conical weight, basal diam. 35 mm, height 10 mm, central hole 9 mm diam. 'Lip' rises around central hole to height of 3 mm. 43 g. (FIG. 23.4).
5. Fragment of lead sheet, rectangular shape 31 mm long and 24 mm wide with two of the corners folded.

It is difficult to find parallels for the four weights. None contained evidence of an iron shaft from the apex and so are unlikely to have been used as plumb-bobs, hanging weights, or in a steel-yard.[135] One of the Kenn weights (No. 4) is similar to the slightly conical examples recovered from Bath,[136] Thornwell Farm near Chepstow in South-East Wales,[137] and Prestatyn in North Wales.[138] The other Kenn examples are more cone-shaped, similar to an example from Caerleon.[139] The

[133] I would like to thank John Creighton for his identifications.
[134] Crummy 1983, 110.
[135] cf. Colchester: Crummy 1983, 101, no. 2510. Gorhambury: Neal *et al.* 1990, 155, nos 920–1. Marshfield: Blockley 1985. Portchester: Cunliffe 1975, 232. Uley: Woodward and Leach 1993, 192.
[136] Cunliffe 1988b, 57.
[137] Hughes 1996, 77.
[138] Blockley 1989, 104–6, no. 10.
[139] Evans and Metcalf 1992.

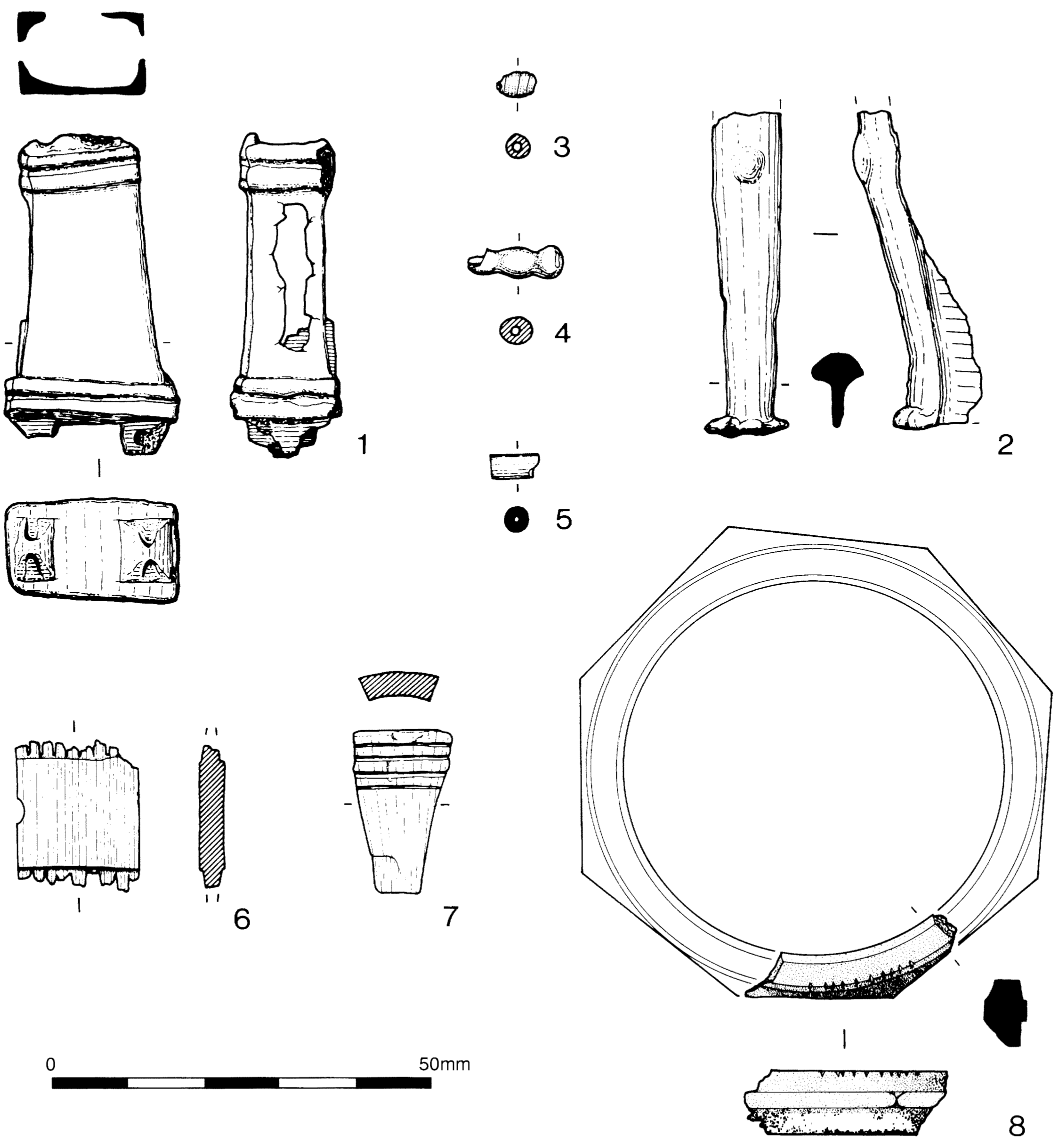


FIG. 22. Kenn Moor. Bronze, bone, glass, jet, and shale small finds. Scale 1:1. *(Drawn by Steve Allen)*

holes suggest that they may have been used as fishing-weights. Lead fishing-weights were certainly used in great numbers during the medieval period, with a great variety of shapes and sizes, including roughly conical forms.[140]

140 Steane and Foreman 1988; 1991, fig. 12.5.

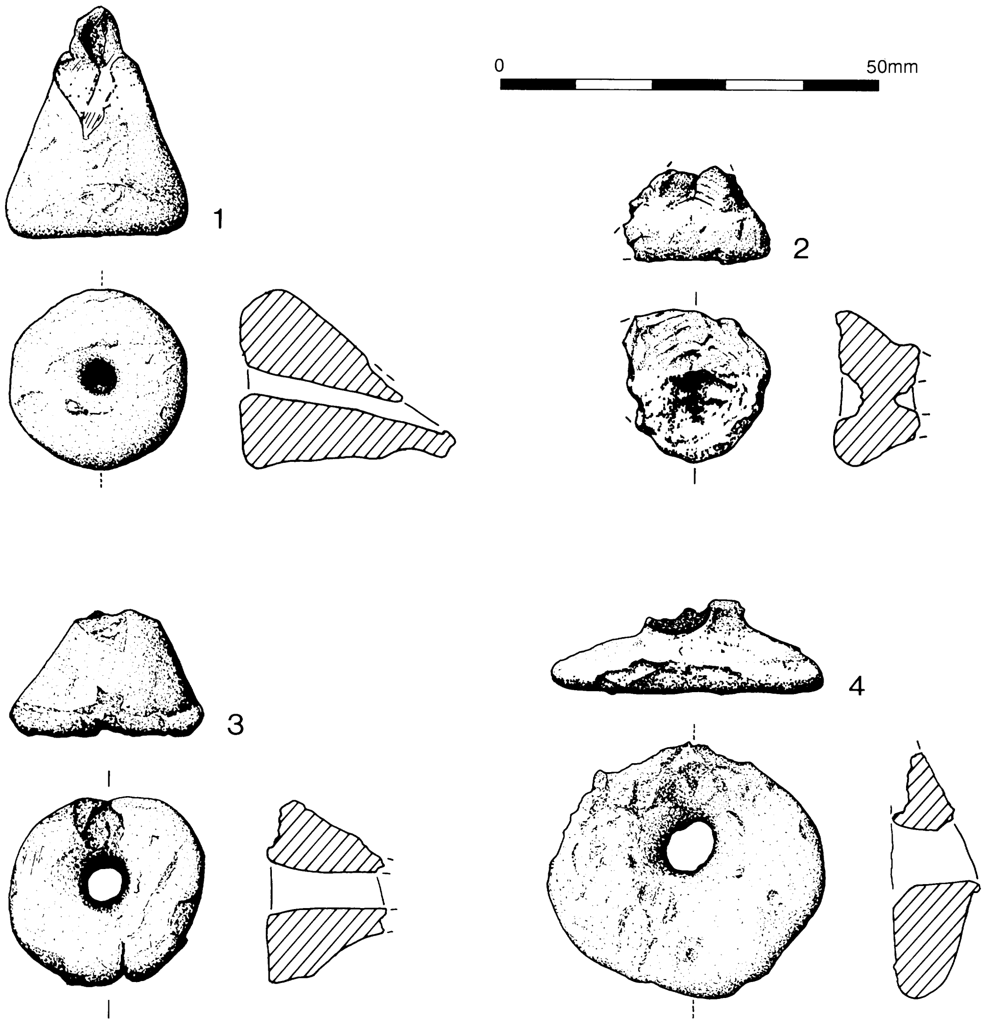


FIG. 23. Kenn Moor. Lead weights. Scale 1:1. *(Drawn by Sean Hawken)*

GLASS AND JET BEADS FROM KENN MOOR (FIG. 22) *By* Steven Allen

1. Wound green glass bead. 5 mm long, 3 mm diam. Third to fourth century.[141] F208, Layer 209 (FIG. 22.3).
2. Segmented green glass bead, incomplete. 12 mm long, 3–5 mm diam. Third to fourth century.[142] F208, Layer 209 (FIG. 22.4).

[141] Guido 1978.
[142] Guido 1978.

3. Cylindrical jet bead, incomplete. 7 mm long, 3 mm diam. Third to fourth century.[143] Layer 222 (FIG. 22.5).
4. Blue glass bead, rectangular in section, with parallel groves on two opposing sides, and tapering at one end. 9 mm long, 3 mm wide, 2.5 mm thick. F210, Layer 228.
5. Very small fragment of blue glass, probably derived from bead similar to 4. F210, Layer 228.
6. Very small fragment of blue glass, probably derived from bead similar to 4. F205, Layer 206.

OBJECTS OF BONE AND SHALE FROM KENN MOOR (FIG. 22) *By* Steven Allen

1. Bone or antler comb fragment. Central part of a tooth plate from a double-sided composite comb. Part of a rivet-hole present on one edge. Probably third century or later.[144] 21 mm long, 16 mm wide, 3 mm thick. Teeth range from 5 to 6 per 10 mm. F61, Layer 2 (FIG. 22.6).
2. A small fragment of a bone pin. 25 mm long, 4.5 mm wide, 2.5 mm thick. F61, Layer 2.
3. A small fragment of a bone pin. 13 mm long, 3.5 mm wide, 4.5 mm thick. Topsoil in Trench K.
4. Fragment of a bone pin, including point which has been burnt. 43 mm long, 3 mm wide, 3 mm thick. Layer 229 (F205 Trench K).
5. Two joining fragments of worked bone object. Four cut grooves towards intact end as it currently survives. From a cylindrical object, possibly a knife handle.[145] 22 mm long, 133 mm wide, 4 mm thick. Topsoil in Trench K (FIG. 22.7).
6. Shale bracelet fragment. Part of an (?)annular bracelet with a medial rib cut to form a polygon around its circumference, some shallow notched decoration. Roman, possibly third to fourth century. 30 mm long, 8 mm wide, 5 mm thick. Layer 108, Trench G (FIG. 22.8).

METALWORKING DEBRIS FROM KENN MOOR *By* J.R.L.Allen

A total of 18 pieces of lead and tin working debris was recovered from metal-detecting in Field 16 (total weight 173 g) and examined as hand specimens. Of these, twelve pieces were pure lead (180 g), two pieces lead/tin alloy (3 g), four pieces of lead/tin alloy with a high tin content (52 g), and one piece of pure tin (<1 g). Most pieces were droplets formed from molten metal flowing or splashing onto irregular surfaces, while the most interesting item was a small funnel of lead which had formed at the mouth of a mould. Another fragment appears to have been cut by a chisel-headed hammer. A small fragment of furnace or crucible lining was also recovered from this area, with traces of copper or copper alloy. It is impossible to determine whether this represents smelting or foundry waste, though the latter is most likely; copper ores are known from the Mendips, though it is improbable that they would have been transported to Kenn. There is no evidence of copper and tin being worked into bronze (all the tin recovered was alloyed with lead), though the small size of the assemblage must be acknowledged. An assemblage of non-ferrous foundry waste has been recovered from another Romano-British settlement on the Severn Estuary Levels, at Oldbury in South Gloucestershire,[146] which included evidence for both lead and tin working, though no alloys.

A small amount of iron-working debris, including tap slag and furnace lining, was recovered from a variety of stratified layers at Kenn Moor. A small fragment (14.2 g) of sheet tap slag was found from low down in Ditch F40 (Layer 45), while a slightly larger piece (17.0 g) came from the upper fill (Layer 5). A piece of tap slag (17.1 g) was also recovered from the nearby undisturbed

[143] Guido 1978.
[144] MacGregor 1985.
[145] cf. Uley: Woodward and Leach 1993.
[146] Allen and Fulford 1992; see also Allen and Rippon 1997b.

spread of material in Trench F (Layer 79). Four fragments of burnt sandy clay (13.5 g), possibly furnace lining, were collected from F11 to the east of the corn-drier mound. In Trench C, a fragment of heavily burnt clay (1.2 g), probably from the lining of a furnace, and a large piece of tap slag (18.8 g) were recovered from two of the gullies (F15 and F17). Five fragments of iron-working slag (17.1 g total) were also recovered from one of the shallow ditches (F157) in Trench G, associated with a large amount of charcoal. The head of an iron nail, with adhering vesicular slag, was found in the small gully (F145) in Trench I.

QUERNSTONES FROM KENN MOOR *By* J.R.L. Allen

1. Fieldwalking Field 16: fragment of upper quernstone of pebbly quartzite, Quartz conglomerate, Upper Old Red Sandstone.
2. Fieldwalking Field 16: fragment of upper quernstone, possibly later used as a sharpening stone. Probably a Carboniferous Sandstone.
3. Fragment of upper quernstone, from surface of corn-drier mound in Trench 4 (Layer 4). Later third to fourth century. Sandstone from the Upper Old Red Sandstone.
4. Fragment of lower quernstone, forming part of the spread of stone rubble in Trench G (Layer 108). Later third to fourth century. Pebbly quartzite, Quartz conglomerate, Upper Old Red Sandstone.

BURNT CLAY (FIG. 24) *By* Stephen Rippon

Saltern debris[147]

The lower buried landsurface (244) and saltern deposits in Banwell Trench II were associated with a large amount of burnt debris including amorphous lumps of semi-burnt clay. In addition, there were two categories of featured burnt clay; briquetage and oven fragments. Most of the briquetage comprised very small fragments of a soft-to-medium-fired, very pale grey-brown fabric, with frequent-to-abundant chaff tempering, and very occasional grains of sand. None of the fragments was sufficiently large to say whether they were from vessels, pedestals, or tanks.

There was also a number of amorphous fragments of very pale orange/brown clay, but with smoothed surfaces that tended to have a white/pale yellow colouration probably derived from contact with salt water and subsequent heating (FIG. 24). Fragments of what appear to be substantial pedestals (at least 0.2 m diameter: FIG. 24.6), bars (FIG. 24.2), and wedges (FIG. 24.5) were noted. The most substantial fragment, 0.13 m thick with two smoothed surfaces, may be from the oven wall (FIG. 24.1). A discrete dump of such fragments was recovered from the lower buried ground surface (244), while others were recovered from Layers 259/279 in F281 (the saltern). These appear to be from an oven or kiln-like structure used to evaporate the water from brine.

Daub

A large amount of burnt clay was recovered from contexts throughout the excavations at Banwell and Kenn Moor. Typically, it consisted of a soft, slightly pinkish-orange to pinkish-grey fabric, with occasional tempering (fine sand, quartz 1–2 mm, vegetable matter). Many fragments showed a colour graduation from orange, through deep red to dark grey denoting burning, while occasional fragments bore the impression of wood, notably roundwood *c.* 3–6 mm diameter. One fragment bore the impression of a larger fragment of cut timber such as from a door or window frame (FIG. 24.7).

[147] I would like to thank Elaine Morris for commenting on this material.

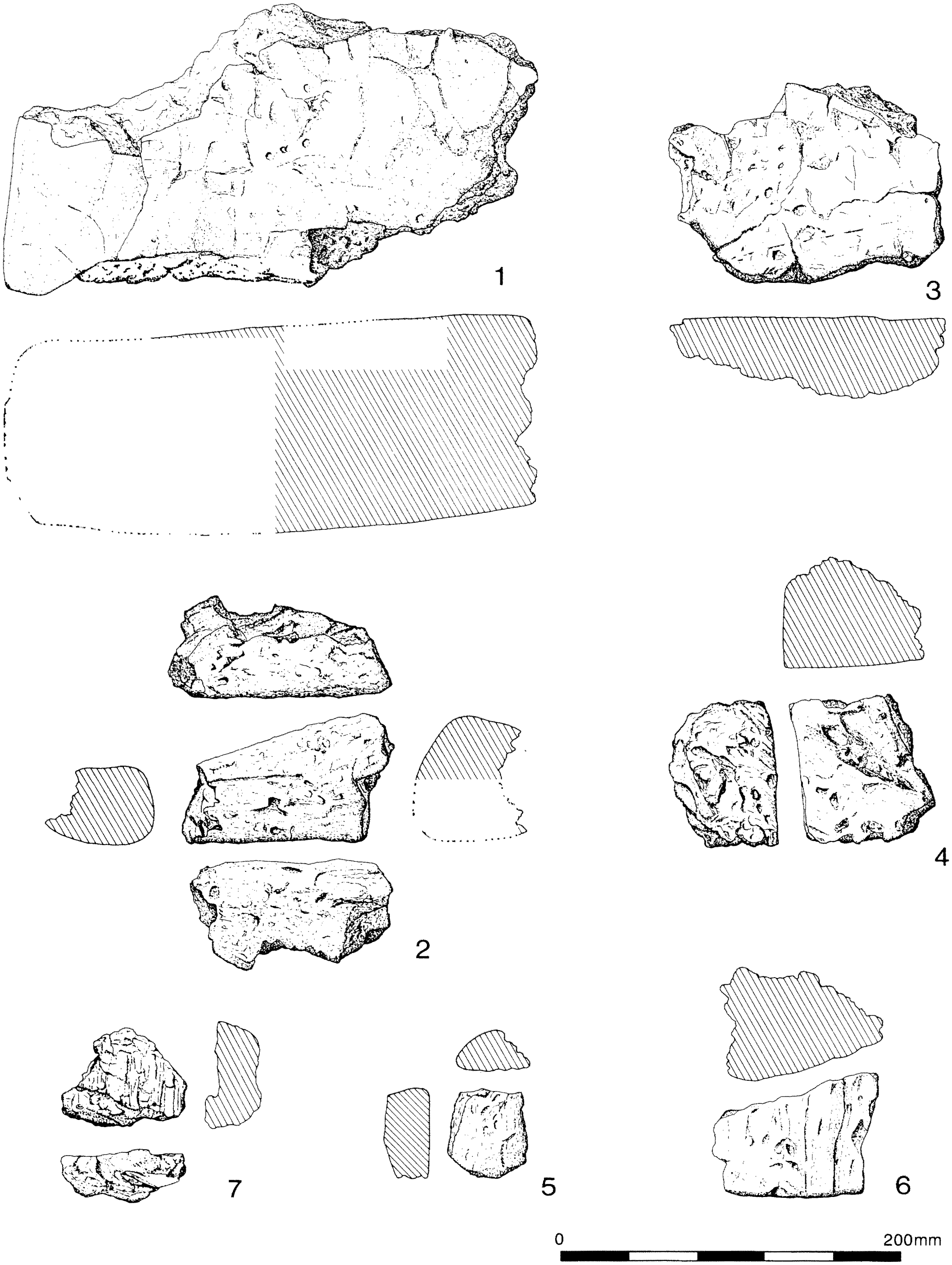


FIG. 24. Burnt clay objects from Banwell Moor (late Iron Age oven, Nos 1–6) and Kenn Moor (daub, No. 7). Scale 1:4. *(Drawn by Sean Hawken)*

DISCUSSION: ROMANO-BRITISH EXPLOITATION OF THE NORTH SOMERSET LEVELS

Coastal marshlands represent a distinctive type of landscape which can be utilised in a number of ways: *exploitation* of the natural resources, *modification* of the local drainage system in order to improve agricultural productivity, and finally a wholesale *transformation* of the landscape through the construction of a sea wall and subsequent digging of a drainage system (reclamation). The latter represents a major investment of resources in restructuring the landscape, and would not have been undertaken lightly. This clearly reflects how different communities perceived the relative values of natural wetland resources and the opportunity to increase agricultural production, and is seen most clearly in the Central Somerset Levels where half of the coastal marshland was reclaimed while the other half was left as an intertidal marsh and reserved for salt production.[148] The fieldwork reported here aimed to investigate these strategies towards landscape utilisation, and in particular when the decision was taken to reclaim the saltmarshes.

A RECONSTRUCTION OF THE LANDSCAPE (FIG. 25)

Analogy with the Welsh side of the Severn Estuary suggests that the Romano-British shoreline along the North Somerset coast is likely to have been eroded away. At Magor Pill, on the Gwent Levels, for example, it has been calculated that the Iron Age and Roman coast lay at least 800 m out into the Estuary.[149] The coast between Uphill and Middlehope may well have been protected by a belt of natural sand dunes, as is the case today: Roman occupation horizons stratified within the dune sequence at Weston-super-Mare certainly establish their existence to the south of Worlebury by the early first millennium A.D.[150] There is no evidence for dunes along the coast between Middlehope and Clevedon, and there cannot have been a continuous natural barrier as several freshwater rivers flowing off the adjacent uplands must discharge their waters into the Severn Estuary. It would appear, therefore, that if the North Somerset Levels were to be protected from tidal inundation, there must have been a set of sea walls and sluice gates along this stretch of coast.

The discovery of a saltern at Banwell, along with palaeoenvironmental analysis of the pre-late Roman sediments at Banwell and Kenn Moor, prove that the Levels were an intertidal landscape during the late Iron Age, but by the third century A.D. these estuarine conditions were replaced by a freshwater environment. In certain circumstances such a change could be brought about through natural causes, notably a fall in relative sea level, though for a number of reasons this is unlikley to be the sole explantion in the case of the North Somerset Levels. The late Roman environmental assemblages from Banwell, Kenn, and Puxton suggest an almost wholly freshwater environment in the drainage ditches with just occasional influxes of slightly brackish water; such conditions could not have prevailed unless tidal waters were prevented from penetrating up the river system. The presence of cereal cultivation at Banwell and Kenn does not in itself prove reclamation, since experiments have shown that arable agriculture is possible on saltmarshes so long as the crops are not inundated at the seedling stage; barley is most tolerant of brackish water, but wheat, oats, and broad beans much less so.[151] However, the weeds associated with cereals at Banwell and Kenn are far more habitat-specific, and all point to a wholly freshwater, and therefore, reclaimed landscape. The same is true of the hay meadows at Kenn Moor which would not have tolerated flooding by salt water. Finally, it is extremely unlikely that the villa at Wemberham, with its under-floor heating and mosaic pavements, would have been built in a landscape liable to flood, suggesting

[148] Rippon 1997a, 65–77.
[149] Allen and Rippon 1997a, 356 and see Fulford *et al.* 1994; Rippon 1996a.
[150] Rippon 1997a, 35.
[151] Rhoades *et al.* 1992, table 13; Korber-Gröhne 1981; van Zeist 1974.

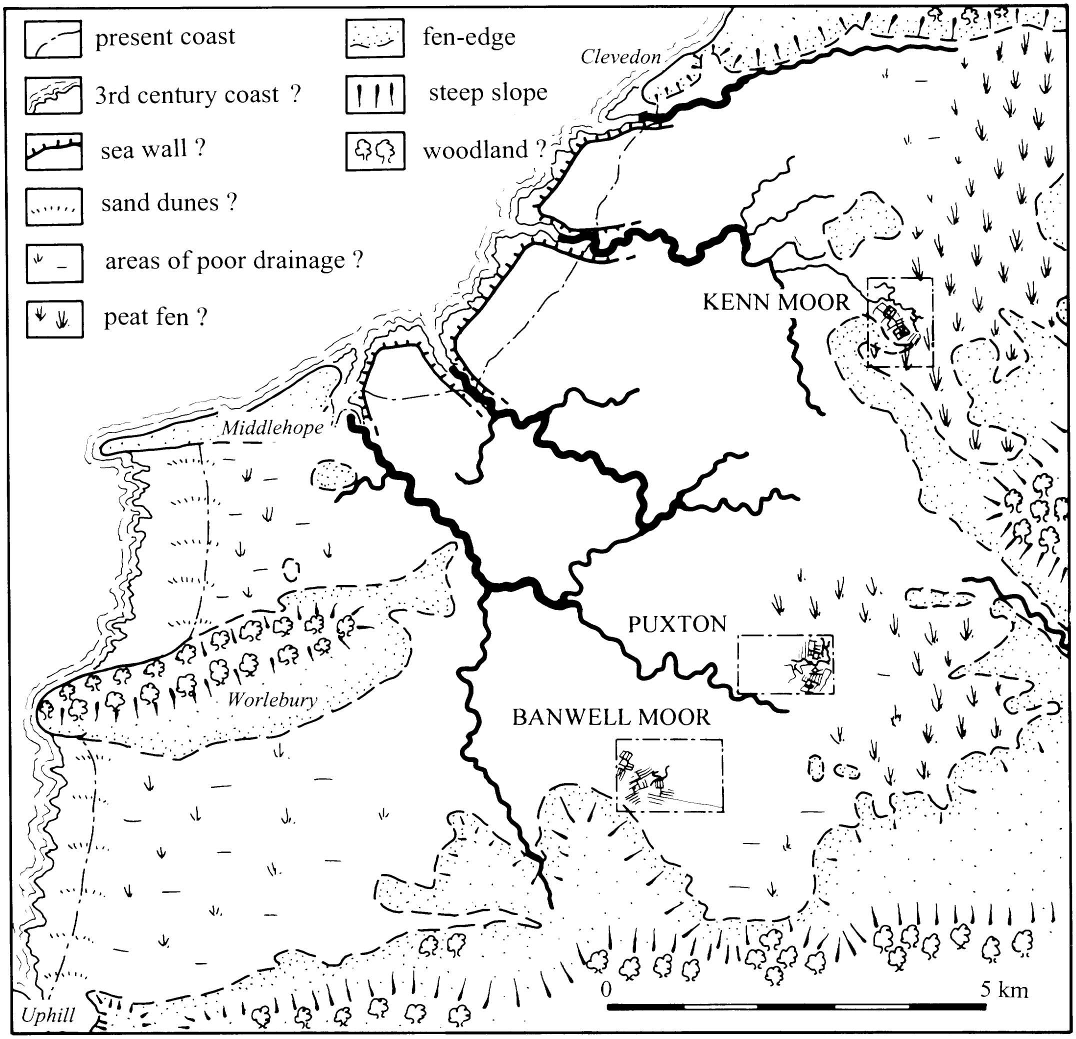


FIG. 25. Reconstruction of the North Somerset Levels during the later third century A.D. The coastline would have been at least 800 m further out into the Estuary, and was probably fringed by sand dunes between Uphill and Middlehope. The stretch of open coast between Clevedon and Middlehope must have been protected by embankments whose precise position is unknown. The major rivers must either have been embanked, or would have discharged their waters under the sea walls through sluice gates. Most of the land so protected from tidal inundation would have been alluvial pasture and meadow though with some arable. Areas of freshwater peat probably occupied the lowest-lying backfens, and an area of very poor drainage also probably existed behind the sand dunes. On the surrounding dryland areas most of the Levels were fringed by gently rolling foothills where most of the good arable land was probably situated. These areas backed onto steep-sided limestone hills which may have been wooded.

that rather than being an area of land that was drying out during a period of falling relative sea level, the North Somerset Levels must have been protected by flood banks during the later Roman period.

It appears, therefore, that the North Somerset Levels were protected from tidal inundation during the later Roman period, representing a conscious decision to replace the natural resources with an agricultural landscape. The date of this transformation of the landscape appears to be the mid-third century A.D. After the late Iron Age activity at Banwell there is a marked hiatus in the ceramic sequence until the late second/early third century, with just a handful of possibly first-century sherds at Banwell, all in residual contexts. However, the vast majority of the pottery from both Banwell and Kenn, along with the smaller assemblages from Manor Farm (Kenn) and Puxton, all dates from the mid-third century with early third-century forms of BB1 notably absent. The small assemblage of twenty-one dated coins from Kenn Moor corresponds with the pottery evidence in that the earliest example dates to the late 260s. The small amount of late second-/early third-century pottery could have been heirlooms (notably the samian), or may suggest a slightly earlier phase of occupation which has left few traces. At Kenn Moor, fragments of an earlier system of ditches and gullies were recovered both in the earthwork survey and excavation, most notably F159 in Trench J which aligns with F13 in Trench C and the shallow gullies F133/169 in Trench I. This pottery and coin evidence relates to the settlement of the reclaimed marsh, which could conceivably have occurred some considerable time after its reclamation. However, the palaeoenvironmental evidence from later third-century contexts at Banwell, in particular, points to a largely treeless landscape with weedy pasture that is more suggestive of a recently reclaimed landscape than one that had been embanked for several centuries. Thus, the main episode of drainage on the North Somerset Levels, as represented by the relict landscapes at Banwell, Kenn, and Puxton, appears to be later third-century.

The thin layer of alluvium that blankets the late Roman ground surface over most of the North Somerset Levels makes it difficult to reconstruct the landscape in detail. The environmental evidence from Banwell and Puxton suggests extensive areas of pasture and meadow on alluvial soils derived from the earlier saltmarshes, though with some arable cultivation probably close to the settlements (see below). The lowest-lying areas of the Levels were probably covered by peat, though its extent has probably been diminished through desiccation and peat-cutting. Areas of particularly poor drainage probably existed behind the sand dunes where the discharge of freshwater run-off from the adjacent high ground was seriously impeded. The Levels were fringed by low-lying foothills that would have afforded good arable land, and it is here that the highest settlement density, including most of the local villas, is found (FIG. 2). These foothills were backed by steep-sided limestone hills, where most of the oak woodland recorded in the Banwell pollen diagram was probably located.

THE AGRARIAN ECONOMY

Reclamation represents a major investment, both in terms of manpower and resources, and even when embanked such areas remained vulnerable to flooding. Therefore, in order to have embarked upon this high-cost and high-risk approach to landscape utilisation, there must have been a high return on the investment. The evidence from North Somerset not surprisingly suggests that the newly reclaimed land was quickly used for mixed agriculture. The overall densities of material retrieved through fieldwalking and metal-detecting at Kenn point to a three-fold zonation of activity around that settlement. An area of intense midden dumping clearly existed in the south-west corner of Field 16, and this appears to relate to the farmstead complex that extends into Field 5. Excavation of features in Trench K suggests that this very high density of material, including the large amounts of burnt bone, represents the dumping of midden debris and sweepings in part of the settlement that had been abandoned. The fall-off of material to the east of this farmstead complex was very abrupt (not a single sherd was recovered from Field 2), whereas to the west an area within a radius of *c.* 200–300 m appears to have been quite heavily manured, possibly indicating arable fields or the improvement of pasture and meadow. Once tidal flooding of the marshes had ceased, due to reclamation, manuring would have helped maintain soil fertility, and as such represents another form of investment in this landscape. Unfortunately, these fields had been ploughed flat before the earliest air photographs were taken, so the character of any fields in this area is not known. Beyond this zone manuring was far less intense, perhaps indicating an area of permanent pasture.

Cereal remains were recovered from both Banwell and Kenn, and the associated weed seeds suggest that they were grown locally rather than on the adjacent drier soils beyond the fen-edge. The wheat was largely spelt with some emmer and bread wheat, while both two- and six-row hulled barley were present. At Kenn most samples from around the corn-drier contained more barley than wheat, though in the smaller assemblages from elsewhere around the site barley and wheat were present in roughly equal numbers. At Banwell wheat was dominant, perhaps because it was more suited to the lower-lying, and presumably wetter, ground there. Oats were present at both sites. At Kenn it was impossible to say whether they were wild or cultivated though at Banwell cultivated oats were positively identified. Horse/celtic beans were also cultivated, while bramble, dill, and possibly fennel may have been used for culinary purposes. The stone structure excavated at Kenn Moor is a simple example of a corn-drier, of a type found throughout late Roman Britain. The function of such structures has been reviewed above and Jones concluded that parching spikelets of spelt wheat and barley prior to milling or storage may have been its primary function. Very few grains were sprouted, which rules out its use for malting.

The palaeoenvironmental evidence at both Banwell and Kenn also points to abundant pasture and hay meadow. Hay was cropped at Kenn from meadows, while vetch, another fodder crop, is present at Banwell. The Romano-British animal bones at Banwell contained roughly equal numbers of cattle and sheep bones (78 cattle and cattle-sized bones, 76 sheep and sheep-sized bones), in contrast to Kenn Moor where cattle are clearly dominant (533 cattle and cattle-sized bones compared to 213 sheep and sheep-sized bones). However, what is not clear is whether these bones reflect the composition of the livestock raised around these settlements, or bought at a local market. If the former is the case, then the explanation for the difference may lie in the landscape. At just *c.* 4.8–5.1 m OD, the Roman ground surface at Banwell Moor was lower than at Kenn Moor (*c.* 4.9–5.2 m OD) and Puxton (*c.* 5.0–5.2 m OD), and so may have been more poorly drained.

Although the weed species and crop-processing debris found at both Banwell and Kenn suggest cultivation at both sites, at Banwell the pollen and plant macrofossil evidence indicates that this arable was very limited compared to Kenn Moor. The enclosure in Banwell Moor Field 4, in particular, may have been used primarily for stock management. The few scraps of pottery and animal bone, along with moderate quantities of stone and burnt clay, may indicate some sort of structure, maybe a stockman's or shepherd's hut, though the low level of settlement-indicative metals in the soil, lack of domestic debris, and absence of beetles associated with human occupation does not suggest permanent occupation. Weed pollen of species favouring disturbed and trampled ground, along with *Aphodius* beetles that are associated with herbivore dung, would also suggest a role in livestock management. There is no evidence for cereals in the pollen record (apart from a few grains in Zone BM 4 and these cannot positively be distingished from Glyceria), and while some species of the Brassicaceae, Chenopodiaceae, nettle and thistle families may indicate cultivated or otherwise disturbed ground, just a single grain of wheat, a grain and awn of oat, and a few charred vetch seeds were recovered.

THE NON-AGRARIAN ECONOMY

Small amounts of iron slag and furnace lining were recovered from a number of features in the Kenn Moor enclosure complex (Trenches B, C, and G), while the head of a nail with slag adhering was recovered from Trench I. The presence of furnace lining and tap slag suggests that iron smelting was being carried out. Lead/tin working debris and a single piece of furnace/crucible lining with copper/copper alloy working residue occur in a discrete concentration in Field 16. Apart from the four weights, most if not all of the lead appears to be foundry waste in the form of driblets, off-cuts, and sheet fragments. Metalworking is also a common activity on Romano-British sites further up the Severn Estuary, such as Oldbury.[152]

THE MARSHLAND COMMUNITIES

The settlements at Banwell, Kenn, and Puxton appear to have been of low status, judging by the poor range of material culture. The pottery assemblages are markedly impoverished, with a far smaller proportion of regional imports compared to other sites in the region (e.g. Gatcombe and Henley Wood, both in Somerset). A wide range of contexts was excavated by hand, and bulk samples of the midden deposits were wet sieved, yet no vessel glass and very few items of personal adornment were recovered (one fragment of shale bracelet, six glass/shale beads, three fragments of bone pins, and two brooch fragments both from metal detecting). Just one coin was recovered through excavation, and none were found through wet sieving, though thirty-three were discovered through metal detecting.

These communities also do not appear to have been exploiting the natural wetland resources. A very small number of marine molluscs were recovered from Kenn Moor and none from Banwell, which can be contrasted with the possible villa at Lakehouse Farm (near Brent Knoll in the Central Somerset Levels: FIG. 1) where cockles, limpets, mussels, oysters, and whelks were recovered. The bone assemblages from Banwell and Kenn contained no indication of wildfowling, and there are relatively few fish bones, though the latter are generally rare on Romano-British rural sites.[153]

The low status of these settlements as indicated by the material culture, along with the limited access of natural resources in the region and potentially specialised economy of the settlement at Banwell, raises the question of whether these communities were pioneering farmers who colonised the newly reclaimed marshland, or were tenants of villa-based estates whose owners may well have been responsible for the initial act of reclamation. Reclamation is a costly activity. Medieval sources show that it required considerable amounts of manpower and materials in order to construct the sea walls and sluice-gates in the first place and then maintain those flood defences and drainage ditches.[154] Reclamation is also a high-risk undertaking as the threat of flooding is ever present, and so the scale of investment in water management seen around the Severn suggests considerable economic confidence. By the third century the North Somerset Levels were ringed by villas such as at Locking, Banwell, and Wraxall, and possible examples at Congresbury and Clevedon.[155] It may have been one or more of these estate-owners who decided to undertake the reclamation of the North Somerset Levels. Alternatively, the work may have been undertaken by the owner of the villa at Wemberham, significantly located at the very centre of the Levels. All the relict landscapes on the North Somerset Levels are morphologically similar: several small clusters of paddocks, enclosures and slightly raised platforms, within a complex of larger rectangular fields. The tendency is for a broadly coaxial plan with a common alignment of the major boundaries, though there is no sign of large-scale planning like that seen on the Wentlooge Level; the North Somerset Levels appear to have been drained in a piecemeal fashion in a similar way to the Fenland. Therefore the settlement and drainage-system morphology clearly suggests that the

[152] Allen and Fulford 1987; Allen and Rippon 1997.
[153] Grant 1989, 135–46.
[154] e.g. Rippon 1996a, 68–72.
[155] Rippon 1997a, 80–91.

enclosure of the recently embanked marshland was a piecemeal process undertaken by individual farming communities, rather than a coordinated attempt at drainage on the part of some central authority.

ABANDONMENT AND POST-ROMAN FLOODING

The dating evidence from settlements on the North Somerset Levels suggests that their occupation was not a very long-lived enterprise. At Banwell there is no pottery that necessarily dates to the fourth century, while at Kenn Moor the coin and pottery assemblages do not continue after the mid-fourth century. This confirms the impression gained from a number of sites on the Severn Estuary Levels that these coastal marshes were abandoned well before the end of the Roman period.[156]

After their abandonment, parts of the late Roman landscapes at Banwell Moor and Kenn Moor were sealed with *c.* 0.1–0.2 m of alluvium marking a return to intertidal conditions. As is to be expected, the depth of post-Roman alluvium is greater towards the coast, for example *c.* 0.5 m at Rust Bridge (1.6 km west of Kenn Moor),[157] and *c.* 0.2–0.6 in Kingston Seymour.[158] Only Banwell produced palaeoenvironmental material from these post-Roman sediments. The pollen and plant macrofossils suggest that the site lay at the very inland limit of tidal flooding, while the snails and foraminifera inidicate an environment around Mean High Water Neap Tide level. The relict landscapes at Kenn Moor and Puxton survive because they largely lay beyond the limits of these flood waters, whereas at Banwell the Roman landscape was buried under a thin layer of sediments. Even so the consolidation of ditch sediments caused this relatively thin blanket of overlying alluvium to subside, thus creating earthworks.

This episode of tidal flooding suggests that the coastal barrier (either natural or man-made) had been breached. This may have been due to the cumulative effect of gradually rising relative sea level overcoming increasingly inadequate sea defences, but this is very unlikely since sea level rise was a relatively slow process and embankments could easily be heightened. It is also possible that a sudden storm breached the coastal barrier, as has recently occured on the west Somerset coast at Porlock, though once again the damage could have been repaired. Therefore, in both cases these natural processes may account for the sealing of the Romano-British landscape with estuarine alluvium, but not why it was allowed to happen: human communities had been maintaining the drainage system and flood defences for around a hundred years so why were they abandoned now? It is interesting to note that local pollen zone BM 4, which corresponds to the intial period of flooding, also sees a marked rise in tree pollen. Since this is largely oak, which would have grown on the adjacent dryland areas, it appears that during the latest Roman period the landscape of north-east Somerset as a whole was being used less intensively.

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[156] Rippon 1997a, 124–7.
[157] Hume 1992.
[158] Lilly and Usher 1972, 39.

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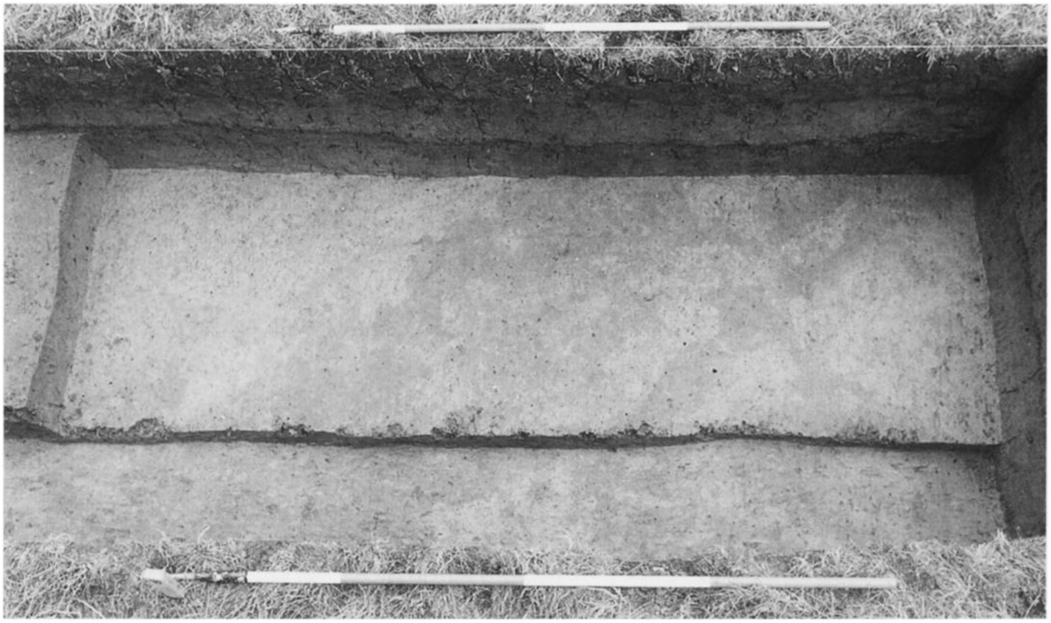
PLATE I

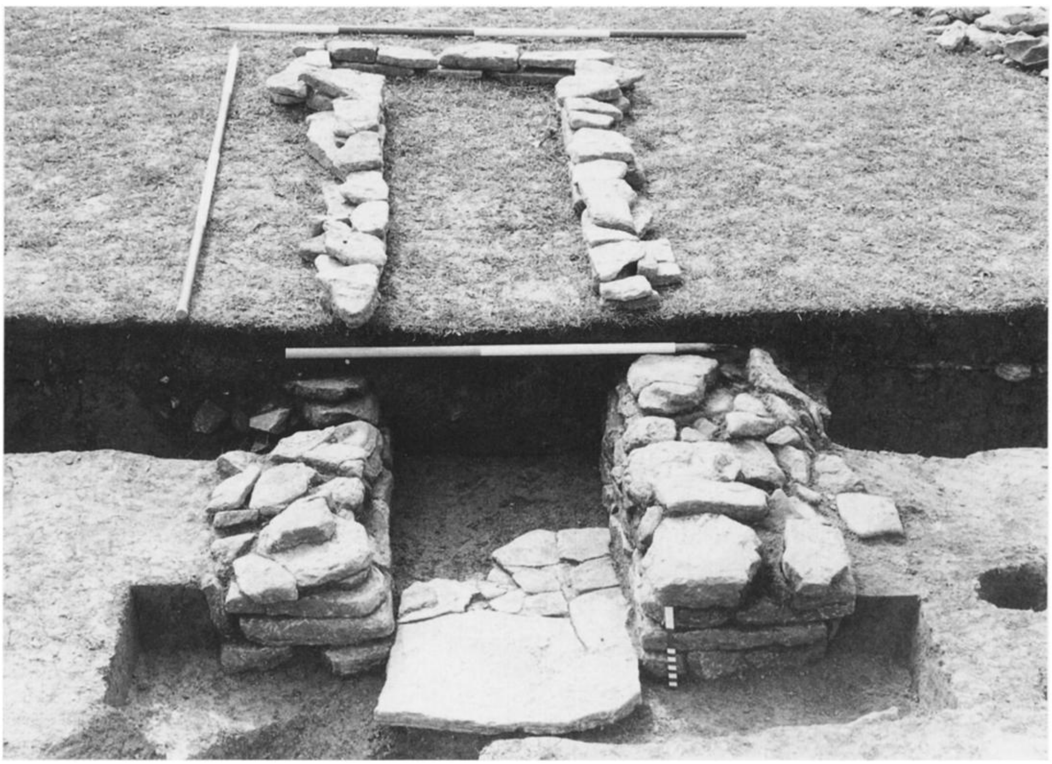
Aerial view of Banwell Moor, looking NW. Trench I lies centre right in 'Twenty Acre' Field. Part of the relict landscape is showing as a vegetation mark in the pasture bottom left. (p. 73)

PLATE II

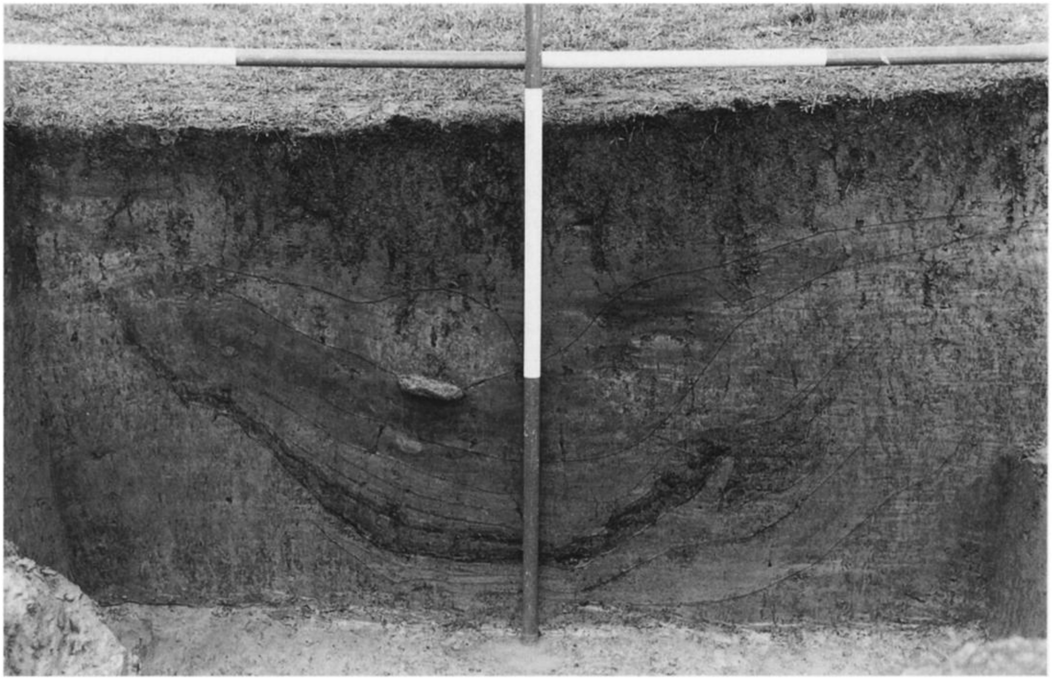
Aerial view of Kenn Moor (centre) looking NW towards Clevedon and the Severn Estuary (top). Parts of the relict landscape can be seen as earthworks (Fields 6–8: centre) and soil marks (Field 9: centre bottom). Trenches G–J (Field 5 can be seen centre right). (p. 81)



A. Southern end of Banwell Moor Trench II, showing box section through the modern topsoil/ploughsoil (top), sterile late/post-Roman alluvium, and the dark later Romano-British buried soil. One of the third-century ditches (F218) cuts diagonally across the trench and is sealed by the buried soil. (pp. 78–81)



B. Kenn Moor, Trench A: corn-drier, looking west. The plan of that part of the structure that was not excavated was established through probing. (p. 93)



A. Kenn Moor, Trench A: box section across Ditch F7 on the eastern side of the corn-drier mound, looking south. (p. 95)

(Crown copyright: RCAHMS)

B. Dullatur: aerial view of the excavations from the south, looking towards Dullatur House at centre top and The Lane, the tree-lined avenue. (p. 249)

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