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# Early Agriculture and Environment on the Hampshire Chalklands: circa. 800 B.C. - 400 A.D.

A thesis presented for the degree of Master of Philosophy

Peter Lawrence Murphy

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ABSTRACT

FACULTY OF ARTS

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EARLY AGRICULTURE AND ENVIRONMENT ON THE HAMPSHIRE CHALKLANDS: 800 B.C. - 400 A.D.

by Peter Lawrence Murphy

This thesis presents the results of a study of plant remains, principally fruits and seeds, from 10 sites of the Iron Age and Roman periods on the Hampshire Chalklands and from two further sites outside the area.

The geographical and cultural background is outlined and the location of sites with respect to natural resources is considered. The methods of sampling and flotation are critically reviewed, and an examination of the problem of contamination by modern plant material is made. The plant remains recovered are described in detail, and representative specimens are illustrated.

Wild plant communities represented by these fruits and seeds include woodlands, scrub, grasslands, wetlands, heath, and arable weed and ruderal vegetations. These communities and their exploitation are discussed and the natural and humanly-modified environment of early Roman Winchester is examined in greater detail.

Evidence for pre-Roman arboriculture and horticulture, and the range of Roman fruit and vegetable crops are both discussed. Botanical and archaeological evidence concerning arable farming in both periods is reviewed, and the processes involved in cereal production, both in the fields and after harvest are examined in detail.

The nature of agrarian change is examined, after drawing together the data from all sites studied, and presenting it graphically. Probable dates of introduction of new crops are suggested. The assembled data also reveal variation between sites, and some long-term trends. At several of the Iron Age sites wheats, particularly spelt, are the principal crops represented in the samples, but in one case barley is the main crop. This variation may be related to differential emphasis on fodder production. In the 4th century A.D. samples spelt is the main crop at all sites examined. It is suggested that the late Roman trend towards spelt production is more likely to be related to political and economic factors than to environmental factors or to a change in the importance of pastoralism.

In an appendix all finds of Iron Age and Roman crops from Britain known to the author are listed and their significance is discussed.

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## Introduction.

This dissertation presents the results of a study of plant remains, principally fruits and seeds, from 10 sites of the Iron Age and Roman period on the Hampshire chalklands and from two further sites outside the area. The principal aims are to examine changes in crop production over a long period, and to reconstruct past farming methods, mainly from botanical evidence, so far as is possible. In addition the recovery of fruits and seeds of many wild species has made it possible to discuss the nature of the plant communities of the region in prehistory and early history, both 'natural' and modified by man.

These aims, it is felt, may best be achieved by an examination of a large number of closely dated samples from within a small and relatively homogeneous region, so as to minimise variation caused by purely geographical factors. The Hampshire chalklands were chosen as a suitable area for study because they constitute an easily defined region with distinctive characteristics of soil, relief and water supply. Within this area a number of Iron Age and Roman sites have been excavated in recent years, and botanical material was available from several of them. In addition the continuing programme of rescue excavations provided opportunities for the collection of more material, under better-controlled conditions.

Only a very few samples of carbonised plant remains from early prehistoric periods in Hampshire were available for study. These are briefly discussed below, but there is, as yet, insufficient evidence to permit any extended discussion of Neolithic and Bronze Age crops in the area. This study therefore begins with the Iron Age. Occupation at several of the Iron Age sites examined extends into the Roman period, making the study of the two periods together necessary, but in general there is a break in occupation around the beginning of the 5th century A.D., which provides a convenient date at which to conclude the study.

The moderately large number of samples which could definitely be assigned to distinct chronological subdivisions of the two periods examined made possible an examination of change within the Iron Age and Roman periods, not just between them. This gives a more flowing and less disjointed picture of change than that which would be produced by a simple Iron Age/Roman division.

The realisation that crop remains provide a source of information about agricultural activities which can extend the picture produced from more conventional archaeological evidence has in recent years affected the emphasis of palaeoethnobotanical studies to some extent, and the present study has been influenced by this. Quantitative studies of deposits, with a view to reconstructing past farming methods, have been made wherever possible. Since the Hampshire samples have proved inadequate for a full discussion of certain agricultural activities, several samples from Colchester, Essex and Hascombe, Surrey of a more informative nature have been included.

The fruits and seeds of wild plants are discussed in conjunction with evidence from pollen, mollusca and other sources of information, to build up a picture of the environment in and around the settlements. Some aspects of this impinge directly upon agriculture and food supply; others scarcely at all. There is, however, no clear dividing line between archaeologically relevant environmental information and mere 'background noise'.

In the writer's opinion a realistic view of the crops and husbandry of prehistoric and early historic communities can best be built up by means of a series of regional studies, along the lines of the present work. In this way local factors may most easily be distinguished from wider cultural influences, and the nature of ancient agriculture and agricultural change may better be understood. In this sense, therefore, the following study can be seen as merely one of a series.

# CHAPTER 1. THE GEOGRAPHICAL AND CULTURAL BACKGROUND

In order to place the plant remains which form the basis of this study within their proper context this chapter provides an outline of the principal geographical features of the Hampshire chalklands and reviews the cultural and economic background of the pre-Roman Iron Age and Roman period in the area. The geology, geomorphology, relief, drainage, water supply and soils of the region all have direct effects upon crops and farming methods, whilst the settlement patterns of the two periods give, in turn, an idea of the mode of exploitation of these natural resources. Following a general discussion of these factors, the particular sites from which plant remains have been recovered are described. An attempt is also made to examine the nature of the land which they farmed and the economic implications which this may have.

## 1.1 Geology and Geomorphology

The bedrock over much of the Hampshire chalklands today is the Upper Chalk, and older and younger strata are revealed at its boundaries. Earlier rocks exposed in the adjacent area include the Middle and Lower Chalk, the Upper Greensand and the Gault Clay. The Upper Chalk itself was originally covered by Tertiary deposits, a heterogeneous collection of sands and clays of the Eocene and Oligocene periods. In many areas today it is overlain by Pleistocene and Holocene deposits. (Green 1940, 300-302; Hodson and Shelford 1964, 15-36; Fig. 1.1.1.).

A broad east-west asymmetrical anticlinal fold of Miocene date is the dominant geomorphological feature of these chalklands. It is a continuation of the now eroded Wealden dome of Kent, Surrey and Sussex and runs right across the county separating the Tertiary deposits of the London Basin in the north from those of the Hampshire basin to the south. Several subsidiary east-west folds are also present, including the Winchester anticline which brings the Lower

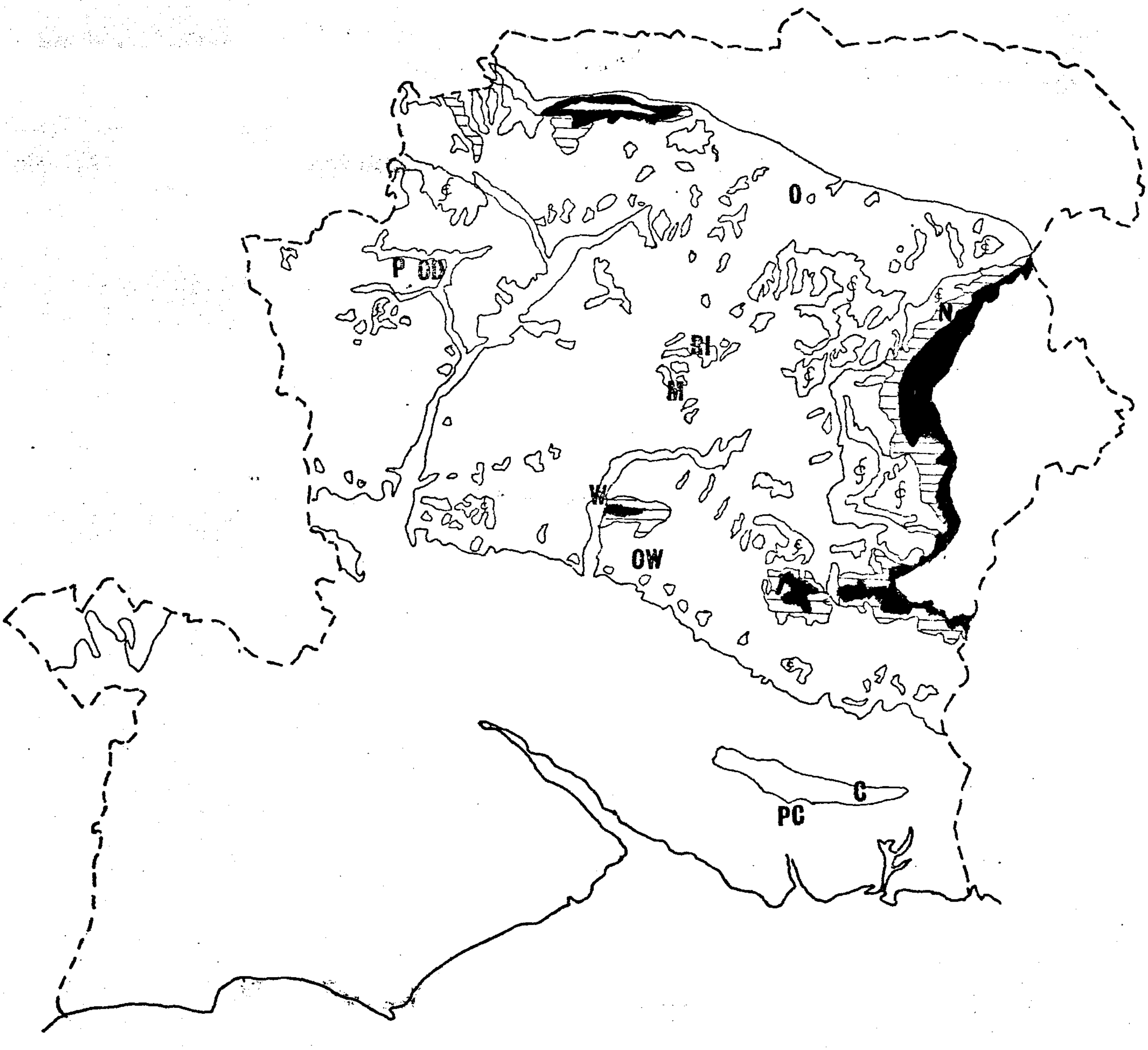



Figure 1.1.1; The Geology of the Hampshire chalklands.

The boundary of the chalk is indicated by a solid line.
Lower Chalk: Black.
Middle Chalk: Cross-hatched.
Upper Chalk: White.
Clay-with-flints: ∮
The sites sampled are indicated as follows in this and in Figs. 1.2.1 and 1.4.1:
C - Crookhorn; PC - Portchester Castle; OW - Owslebury; W - Winchester; P - Portway; OD - Old Down; Rl - Site Rl; M - Site R27, Micheldever Wood; O - Oakridge; N - Neatham.

(Source: Green 1940).

Chalk to the surface near St. Catherine's Hill, and the Portsdown anticline which is responsible for the isolated chalk ridge of Portsdown overlooking Portsmouth Harbour. The northern and north-western boundary of the chalk country, where the Upper Chalk drops sharply beneath the London Basin, is clearly defined by a striking escarpment over much of its length. This ridge runs from near Basingstoke to the boundary with Wiltshire, attaining its maximum height of 974 ft. at the hillfort of Walbury. The ridge is a product of yet another minor but sharp east-west fold, the Kingsclere anticline. The southern boundary of the chalk, to the south of the Winchester anticline, is much gentler than this northern escarpment. The chalk dips under the deposits of the Hampshire basin less steeply as a consequence of the asymmetrical nature of the anticline as a whole.

Although processes of uplift have had a major influence upon the underlying structure and relief of the chalklands, subsequent erosion has modified the landform and determined the extent of exposure of the chalk. Over the main anticline, Tertiary deposits, which survive in the London and Hampshire Basins, have been entirely removed to expose the Upper Chalk. Erosion has proceeded even further in the Wealden district to the East, where the chalk itself has been denuded to expose earlier Cretaceous strata - Greensand and Gault. The present scarp at the edge of the Weald marks clearly the eastern boundary of the main block of the Hampshire Chalklands. On a smaller scale, at the crests of minor folds chalk layers have been eroded away to expose older strata. The crest of the Winchester anticline, for example, consists of exposed Middle and Lower Chalk layers, and along the Kingsclere anticline both Lower Chalk and Upper Greensand are now found at the surface. Over most of the chalk plateau, however, the Upper Chalk survives intact. As it is fairly resistant to denudation it forms a protective layer over the weaker strata beneath, except where dissected by the rivers Test, Itchen and Meon.

This Upper Chalk surface has been further modified by deposition of plateau gravel and brickearth during the Pleistocene glacial periods; by the formation of clay-with-flints in some areas of chalk plateau, particularly in the east; and in the valleys by the accumulation of alluvial deposits. (Green 1940, 307-8; Small 1964, 37-50).

1.2 <u>Relief, drainage and water supply</u>

These processes of uplift and erosion have produced an undulating central plateau, bounded to north, north-west, east and south by more hilly regions and dissected by the main river valleys. (Fig. 1.2.1.).

The northern high chalk region, around the Chute Forest and Kingsclere areas contains many points over 800ft. To the north is the east-west escarpment, whilst the dip slope has been heavily eroded to produce a landscape of steep ridges and deep valleys. The eastern upland is somewhat more dissected than the central plateau, and rises along the ridges to over 600ft. The Upper Chalk is overlain by fairly extensive tracts of clay-with-flints in this area. To the south of the central plateau lies a further high chalk region, not dissimilar to the eastern upland region, but still more dissected. This merges with the eastern extension into Hampshire of the South Downs near the River Meon.

Surrounded by these uplands is the central plateau, an area devoid of steep slopes, something over 400ft. in average elevation. The Upper Chalk is close to the surface over much of this region, and clay-with-flints patches are rare, so the main rivers, the Test and Itchen are the most distinctive features in an otherwise uniform rolling plain. (Green 1940, 308-9).

Although the extreme northern and eastern parts of the chalklands drain into the London Basin and the Weald respectively, the greater part of the area is drained by streams flowing southwards. Apart from the principal rivers, however, the chalklands lack permanent surface streams, and a high proportion of the rain soaks into the soil and thence

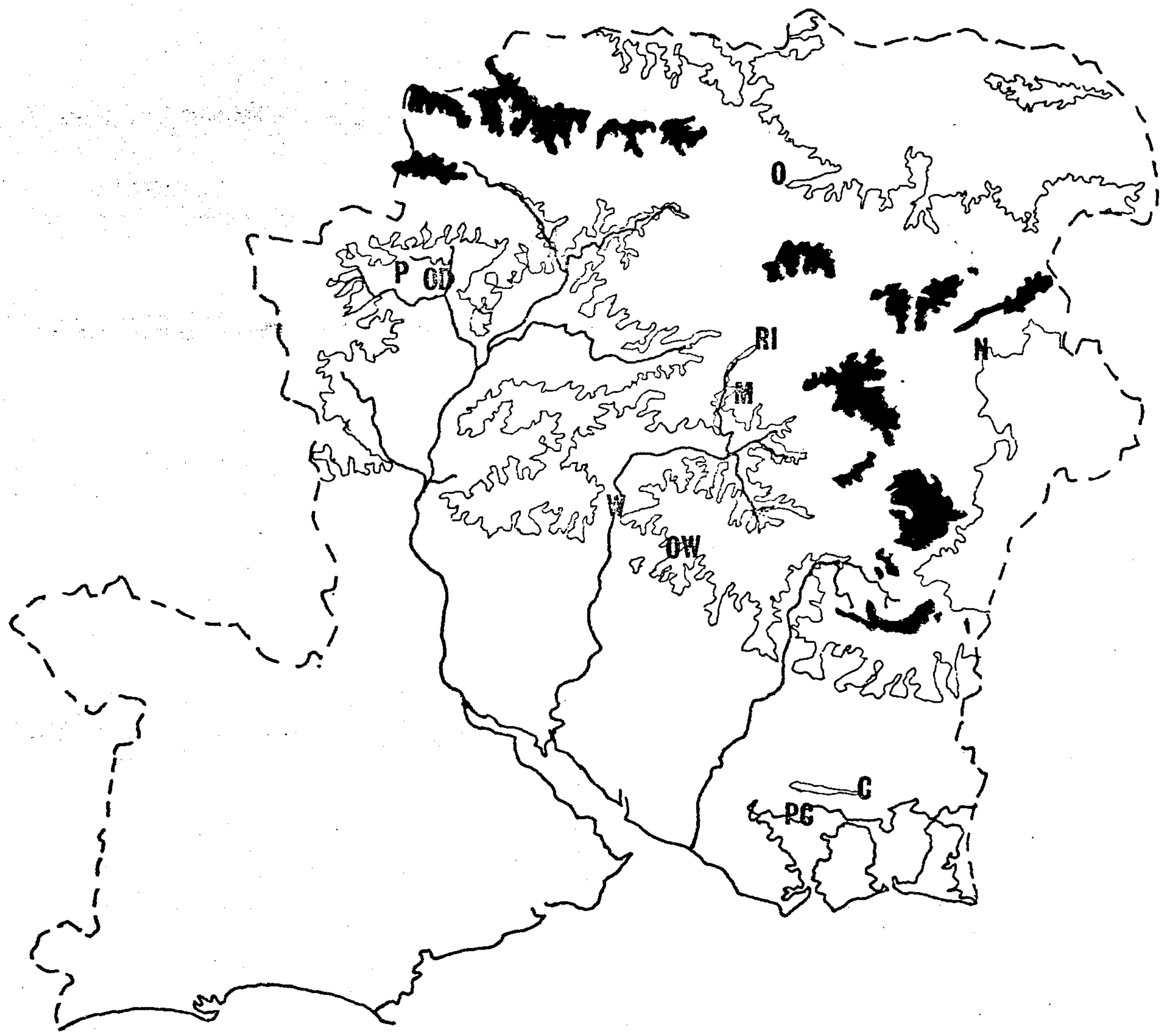



Figure 1.2.1; Relief and rivers of the Hampshire Chalklands.

Land over 600 feet is shown black; the 300 foot contour is also shown.

The sites are indicated by the abbreviations listed in Fig. 1.1.1.

(Source: Green 1940)

into the chalk beneath, emerging eventually at springs and seepage points. Seasonal variations in water table give rise to the presence of winterbournes, streams flowing only during the winter and spring months, in many areas; but in the summer the sole water sources over extensive tracts of the chalklands away from the rivers are deep wells. (Green 1940, 311-3; Bradley *et al* 1964, 93-101). Wells of this type have been in use since the Roman period; the 1st century well at Oakridge, Basingstoke was over 77 feet deep. (Burchard *pers. comm.*).

There is some evidence to suggest that the mean water table is lower today than in antiquity. Certainly the dry valleys which are found all over the more elevated parts of the chalk country are evidence for the former presence of running water on the surface under glacial conditions. (Small 1964, 43-4). It is also clear that many streams formerly broke out higher up their valleys than they usually do today. In particular a study of the Cheriton Brook or Upper Itchen, based on evidence from geology, from Saxon land charters and from the water table depth in a disused well suggested that a drop of some 60ft. had occurred. (Pelham 1964, 102). Pelham and Applebaum (1972, 6) observe that Roman wells at Rushmore on Cranborne Chase, Dorset, excavated by General Pitt-Rivers, were much shallower than modern examples in the same area, and a comparable fall of about 60 ft. in the water table of that area was suggested.

### 1.3 Soils

As the soil type is perhaps the main environmental factor influencing the extent and nature of arable farming in a region where climate is not limiting it seems worthwhile considering soils in some detail. Fortunately fairly comprehensive accounts are given by Green (1940, 325) and Birch (1964, 66-72) from which this review is derived.

Although the Upper Chalk provides a homogeneous parent material over most of the area, variations in slope and elevation, and the presence of areas of clay-with-flints have led to the formation of a variety of soil types. Detailed soil maps of the area are not available at present and even on a single downland slope a variation from a rendzina at the top to brown calcareous soils on the valley floor can be seen. However three main groups of soils may be distinguished.

(1). Clay soils developed from clay-with-flints. These brownearth soils are poorly drained and sticky after rain. Decalcification can occur and potassium and phosphate levels, though well balanced, are often low. The soils are slow to warm and hence microbial activity and nitrification are inhibited. The overall mineral status is inclined to be poor; nor is the humus content high. The heaviest soil of this type is of the Winchester series, found on the highest ground and having a thin A horizon with the clay close to the surface. The deeper, less clayey Carstens series has developed on the more extensive and flatter areas of clay-with-flints, particularly in the Eastern High Chalk Region.

(2) Shallower, light, loamy soils on the Upper Chalk. These are seldom more than 1ft. deep and can contain up to 60% chalk. They are porous and rapidly drained, and are thus easily worked but susceptible to drought. Phosphate occurs at high levels but potassium can be deficient. The rate of nitrification on the other hand is high. The most extensive types are the Andover and Icknield series, both rendzinas. The former develops on arable land and the latter on pasture. Other types are the Stoke series, deeper colluvial soils of the Icknield series; the Ann series, which is similar to the Andover series but contains some material derived from the clay-with-flints; and the Wallop series, a shallow brownearth phase of the Winchester series, formed at the edges of clay-with-flint areas where the underlying chalk becomes mixed with the clay.

(3) Soils of lower elevations and valleys, consisting largely of downwash from the first two groups and deriving their characteristics from the parent soil. The Charity series, derived from glacial sludge with the addition of some colluvial material, is the commonest soil of this type. It is an acid brownearth, which drains freely.

The distribution of these groups is rather complicated, but in general the Andover and Icknield series predominate on the Central Chalk Plateau, with colluvial derivatives in dry valleys. The Winchester and Wallop series soils are found chiefly on the higher areas where clay-with-flints is present, whilst the Carstens series is typical of the more extensive clay-with-flints areas of the Eastern High Chalk region. Group 3 soils are particularly common at the margins of the area.

There is no doubt that human activities, notably forest clearance and farming have had considerable effects upon soil types. The density of Iron Age and Roman settlement, particularly on the Central Chalk Plateau, (see below, 1.5), together with a small amount of pollen evidence, (4.4.), suggests that the area was in fact fairly extensively deforested during the Iron Age or before.

The distribution and extent of Group 1 soils, which is determined largely by the presence of clay-with-flints was probably similar to that of today, although the structure of such soils may not have been so poor in the Iron Age; Evans (1975, 137) has suggested that heavy clay soils are partly a long-term product of agriculture. Large patches of Group 2 soils were also probably in existence in the cleared areas. The greatest changes probably occurred on the slopes, however, where ploughing would have made soils more prone to downwash or to more rapid erosion (ibid, 141). Ultimately the derived soil would have accumulated in the valley floors, enlarging the area available for cultivation in the valley, and at the same time increasing the distinction between the soils of the slopes and the valley floors, as Collis (1970, 254) has suggested may have occurred at Owslebury.

These differences between ancient and modern soil conditions are of degree, not kind, however. Cornwall (1963, 130) observes that buried soils beneath hillfort ramparts are normally indistinguishable from modern soils on the same bedrock and Dimbleby (1965) notes that examples of soil deterioration as a result of early agriculture are much less common in calcareous areas than on acid soil types.

1.4 Modern land use regions

As the whole question of land use in antiquity is discussed at greater length below, the purpose of this brief summary is merely to introduce the main modern land use regions as defined by the Land Utilisation Survey of Britain (Green 1940, 357). Fig. 1.4.1. shows the relations of the sites studied to these regions.

(a) Central arable chalk region. This, the largest single region on the chalk, contains the central chalk plateau, with its western boundary where the poor, thinner rendzina soils of Salisbury Plain begin. The soils of this region are deeper rendzinas - the Andover and Icknield series - and surface streams are absent. Arable farming, in association with large flocks of sheep until recently, has always been important. Since the Second World War continuous cropping of barley has become the dominant form of farming, and there has also been a rise in the importance of dairying (Tavener 1964, 134).

(b) Eastern high chalk region. To the east of the Central Arable region, this more elevated country includes large areas of clay-with-flints, upon which soils of the Carstens and Winchester series have developed. Permanent grass and woodlands are common in this region today, together with arable areas.

(c) Southern high chalk region. This region, extending to the east and west of Winchester, is not unlike the eastern region, but is more dissected, with fewer flat areas.

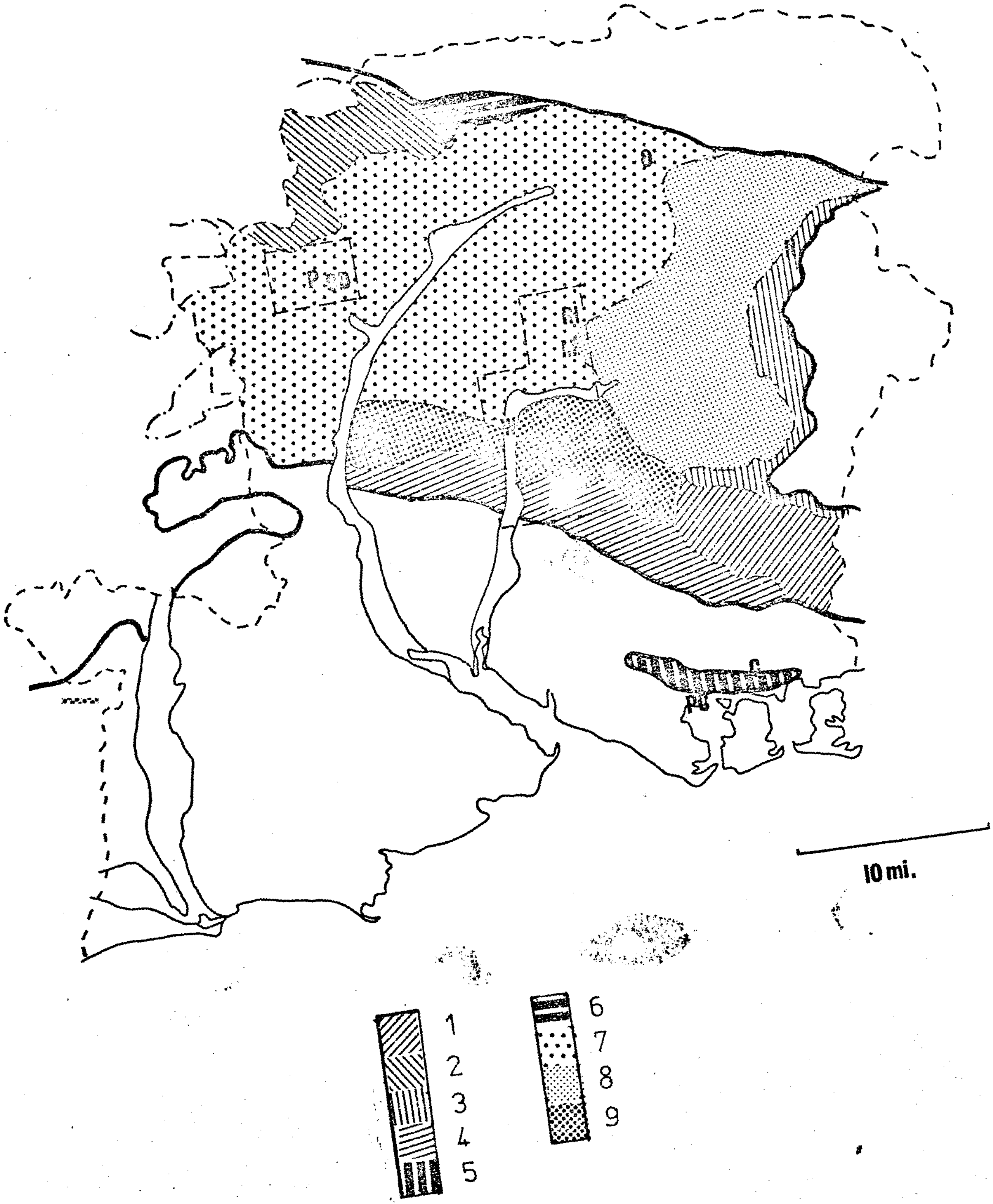



Figure 1.4.1; Modern land use regions on the Hampshire chalklands.

1. South Downs; 2. Chute Forest Region. 3. Lower Chalk Belt.
4. Southern chalk border. 5. Portsdown. 6. Kingsclere.
7. Central chalk arable area. 8. Eastern High Chalk Region.
9. Southern High Chalk Region. (Source; Green 1940).

The sites are indicated by the abbreviations listed in Fig. 1.1.1.

Clay-with-flints patches are rarer, but there are areas of poor soils, formerly cultivated, but now merely scrub.

(d) Southern chalk border. An area transitional between the southern region and the Hampshire basin.

(e) The South Downs. These downs merge into the Southern High Chalk Region around the Meon valley. They have a steep scarp slope bordering the Weald to the north, and a gentler dip slope. The higher elevations are largely permanent pasture, but there are areas of arable on the lower slopes.

(f) Portsdown. An Upper Chalk ridge emerging from the Hampshire basin, and overlooking Portsmouth Harbour. There is Downland pasture on the crest of the ridge and arable on the lower slopes, now being encroached upon for building.

(g) Chute Forest region. The highest area of the Hampshire chalklands, and very much dissected. The utilisation is similar to that of the South Downs, with woods on the clay-with-flints areas.

(h) Kingsclere region. The exposure of Lower Chalk and Upper Greensand along the crest of the ridge has created this fertile strip of deep soils.

From the point of view of the present study, the first three regions and the Portsdown area are of the greatest interest, comprising as they do the larger part of the Hampshire chalklands. Early settlement in general is clustered in the Central Arable Chalk Region, as is discussed further in the following section.

## 1.5 The cultural background

The natural features of the Hampshire chalklands provide suitable conditions for a variety of types of economy and hence of settlement pattern. The chronology, form and distribution of settlements are discussed in this section in order to provide a basis for subsequent discussion of the ways in which the resources of the area may have been exploited in the pre-Roman Iron Age and Roman periods.

Early prehistoric settlement in the area influenced the later use of the land both by modifying the natural vegetation, and by establishing patterns of exploitation which persisted throughout later periods. In particular Bronze Age settlements, and what is known of Bronze Age economy, contain many features which can be paralleled in the Iron Age and later.

Settlements of the Middle and Late Bronze Age, dating from the late 2nd - early 1st millennium B.C. are known from a wide area of Southern England (Cunliffe 1974, 11; Ritchie 1969, 17). They are very diverse in form and size, ranging from small unenclosed groups of circular huts to larger nucleated settlements. Until quite recently no settlements of this date had been excavated in Hampshire, although Perry (1967, 48) drew attention to several sites associated with linear ditches and ditched trackways, probably of this general period, which were visible on air photographs. In recent years, however, more definite evidence of settlement has been forthcoming. At Kimpton a palisade trench stratigraphically earlier than Deverel-Rimbury cremations has been excavated. It is perhaps comparable with the palisades which preceded banks at sites such as Itford Hill, Sussex. (Ritchie 1969, 19). Two pits containing sherds of Deverel-Rimbury globular urns were discovered during building operations at Winnall, near Winchester (Hawkes 1969, 15). More recently a small settlement of two huts with several terraced working floors has been excavated at Chalton, in the S.E. of the area. The metalwork found in the huts places them firmly in the Middle Bronze Age (Cunliffe 1970).

These settlements contain a number of features which indicate that cereal production was of some importance. Probable storage pits are present although they are extremely small. The largest at the Chalton settlement was only 4 feet in diameter and just over 3 feet deep (Cunliffe 1970, 7). Ritchie (1969, 23) considers that post-built granaries and drying racks are detectable at many later Bronze Age settlements in similar areas of Southern England as, for example at Thorny Down, Wilts., where the excavator drew attention to the slight floor space available between the post-holes and suggested that 'pile dwellings or ... barns and granaries' were represented (Stone 1941, 119). Saddle querns occur widely; the pits at Winnall produced two examples (Hawkes 1969, 6).

Evidence about the crops grown is very slight. Hulled and naked six-row barley, emmer and einkorn all occur as pottery impressions at sites of the Middle and Late Bronze Age in Southern England, and hulled barley was the main crop represented in the large carbonised deposit from Itford Hill (Helbaek 1952, 226). Much more extensive sampling for plant remains will be required in order to provide a larger and statistically more reliable collection, and this, of course must wait until more settlements of the Bronze Age are identified and excavated under modern conditions. Crop remains can be recovered from contemporary barrows, however, when settlements are not available for sampling. A carbonised barley rachis internode together with crop weeds, has been isolated from a probable funeral pyre beneath a barrow in Micheldever Wood (Site R4), thus indicating that there was cereal farming in that part of Hampshire in the Early Bronze Age (Murphy, forthcoming b).

'Celtic' field systems were in existence at a very early date. At Barnett Copse, Chalton a Wessex culture cremation was found in a small pit cut into a lynchet thus providing a _terminus ante quem_ for the field system of which the lynchet was a part (Perry 1967, 37).

The pastoral aspect of the economy is represented by stock enclosures and linear earthworks, which in some cases at least, replace 'Celtic' field systems. The former structures, which are found across Southern England including Hampshire, are characteristically small, sub-rectangular earthworks, distinguished by a paucity of habitation debris, by their frequent siting on north-facing slopes and in hollows, and in some cases by a high proportion of <u>Bos</u> bones amongst the faunal remains (Cunliffe 1974, 14; Perry 1967, 44). Major linear earthworks are relatively rare in Central Hampshire, but there is a well-known system in the far west, along the Bourne Valley (Hawkes 1939). This consists of ditches running along the axis of each ridge, with further ditches at right angles running down the valley sides, thus dividing the country into blocks containing downland, hillslopes, riverside meadows and access to the river itself. Subsequently part of this system was overlain by the ditches of a hillfort at Quarley Hill.

The function of the linear earthworks as economic and social divisions was taken by Ritchie (1969, 25) to be 'an indication of the increasingly stable nature of the economy around 1000 B.C.'. Bradley (1971, 77) sees them as a symptom of 'a more acute conception of territoriality', resulting from a shortage of exploitable land caused by population increase, a situation which was resolved only by the more intensive use of arable land. Both authors suggest that the opening of the Iron Age coincided with a marked increase in the importance of arable farming, a change which is perhaps mirrored in the increasing size of storage pits throughout the 1st millennium B.C.

An outline of the chronology of the Iron Age in Hampshire has been produced by establishing associations between distinctive phases of ceramic development and imported continental metalwork. More recently a series of radiocarbon dates has become available. Bronze Age settlements have produced C14 dates of 1180 $\pm$ 180 (Shearplace Hill), 1243 $\pm$ 69 (Chalton) and 1000 $\pm$ 35 (Itford Hill) (Cunliffe 1974, 24), and Cunliffe considers that at such sites as Eldon's Seat, Dorset, the Late Bronze Age Deverel-Rimbury ceramic style continued into the 8th or 7th centuries B.C. A contemporary development in Wessex was the appearance of the Early All Canning's

Cross ceramic group, which includes haematite-coated jars with stamped and incised decoration. A site of this period at Cow Down (Longbridge Deverill, Wilts.) gave a C14 date of 630 ± 155 (ibid, 31). Such very early pottery is not common in Hampshire, although pits producing these ceramics were excavated, and soil samples removed for flotation, at Old Down Farm, Andover. Sixth century pottery would appear to be almost entirely lacking in Hampshire, but the next phase of development is well-represented. This is the All Canning's Cross - Meon Hill ceramic group, centred on Wiltshire, which includes cordoned haematite-coated bowls with foot rings along with coarse shouldered jars. The 'Early' phase at Portway, Andover, which was extensively sampled for plant remains, is of this period. As far as dating is concerned, associations with La Tène II fibulae indicate a 5th to 3rd century date, and three C14 dates from Gussage All Saints, Dorset of 510 ± 80, 450 ± 75 and 420 ± 90 give calendar dates just after the middle of the 1st millennium when calibrated (Wainwright and Switsur 1976). Third to first century ceramic assemblages in Southern England are characterised by the presence of vertical-sided 'saucepan' pots, and there is a particular local variation of this form in the St. Catherine's Hill - Worthy Down style (Cunliffe 1974, 43). C14 dates from Gussage for a saucepan pot phase are 230 ± 75 and 210 ± 75 (Wainwright and Switsur 1976). Features of this period have been sampled for carbonised seeds at Portway, Owslebury and Site R27. The final Iron Age ceramic development in Hampshire has been linked with the name of the Belgic tribe of Atrebates. The sites examined in the present study fall mostly in the area of Cunliffe's 'Southern Atrebatic Wares' (1974, 91), which begin in the 1st century B.C. and continue until the Roman invasion and beyond. Plant remains have been recovered from features of this date at most of the Hampshire sites mentioned above.

Iron Age settlement on the chalklands has been studied by Perry (1967, 1969). Twenty seven hillforts, ranging in size from the diminutive Old Pound (2 acres) to the sprawling fort of Walbury (82 acres) are situated on the chalklands. There is little doubt that this great variation in size and in form reflects a similarly wide range of function. How many of the forts were in use simultaneously remains uncertain, as few have been excavated, but Bury Hill, Danebury and Quarley Hill have produced evidence of activity whilst haematite-coated wares were in use, (Hawkes 1939, 1940; Cunliffe 1971a) and the earliest occupation of Balksbury may be even earlier, perhaps 6th century (Wainwright 1970). Saucepan pots occur at St. Catherine's Hill, (which has given its name to the local variant of the form), Bury Hill and Danebury (Hawkes et al 1930; Hawkes 1940; Cunliffe 1971a), and the latter two forts were maintained in the later Iron Age. In addition to these hillforts the territory of the Atrebates contained three oppida at Selsey, Silchester and Winchester. (Cunliffe 1974, 92).

Many minor settlements of various forms are known (Fig. 1.5.1.). Little Woodbury-type enclosures, which Perry defines as enclosures of 3 to 6 acres with antenna ditches flanking a single entrance and containing pits and 'working hollows', are rather in this area. Meon Hill and Farley Mount are well-known examples; Old Down Farm is the only probable enclosure of this form to have been sampled in the present study. The South Wonston Farm type of site, consisting of an oval enclosure surrounded by a second enclosing ditch, the space between the two ditches being subdivided by radial ditches, is a highly distinctive, but rare, form. Equally distinctive, but more common are the 'Banjos'. These are small sub-circular enclosures around one acre in area, approached by a funnel-like entrance which is flanked by two parallel ditches. These may flare outwards at their ends to form a larger containing enclosure.

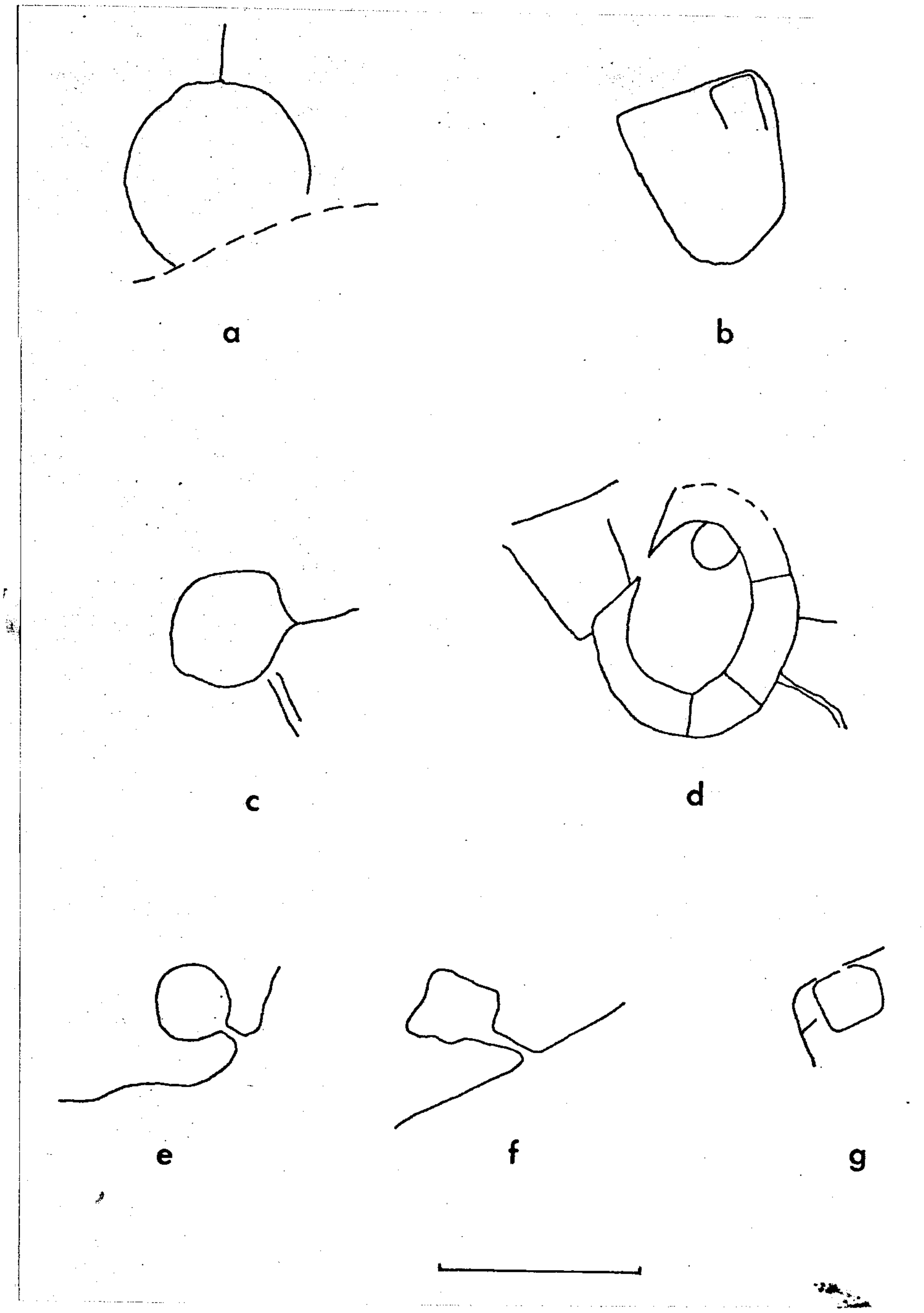



Figure 1.5.1; Principle forms of Iron Age enclosure on the Hampshire Chalklands. Scale 500 feet.

a Waller's Ash Little Woodbury
b. Lower Wyke Fm. B type
c. Warren Farm A. A 1 - 3 acre enclosure.
d. South Wonston Farm.

e. Bramdean Banjos
f. Blagden Copse
g. Gander Down. Small rectilinear enclosure.

Source: Perry (1969, Figs. 1 and 2)

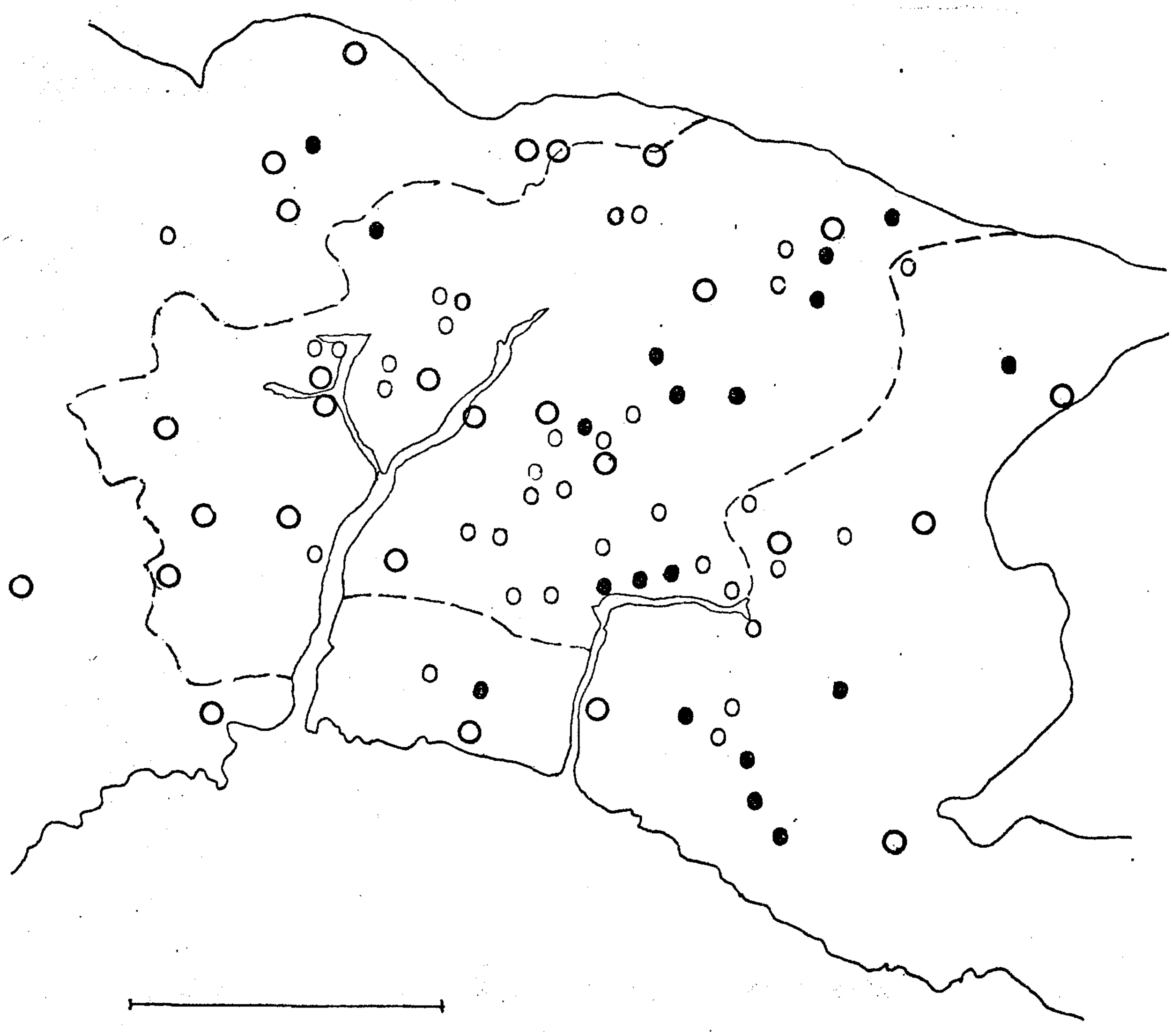


Figure 1.5.2; The distribution of Iron Age hillforts (large circles), enclosures (small circles) and banjos (black dots) on the Hampsire Chalklands. Theboundary of the chalkland is shown by a solid line and that of the Central Chalk Arable Area by a dashed line. Scale: 10 mi. Sources: Green 1940, Perry 1967.

The earliest phase at Owslebury was a banjo. Other enclosures of varying size and miscellaneous form are visible on aerial photographs, including a distinctive type of small rectilinear enclosure. There are also large unenclosed settlements. Although settlements are found all over the chalklands the distribution of sites is by no means uniform. The Lower Chalk Plain - substantially the Central Chalk Arable Area and the Southern High Chalk Region - makes up about 60% of the total area, but contains nearly 80% of known sites, whilst the Eastern High Chalk Region, with its extensive area of clay soils, is about 10% of the area but includes less than 1% of sites. Settlement in valley floors at this period is rare (Perry 1967, 1969).

Major towns were established at Silchester and Winchester in the early Roman period, both on the sites of former Iron Age settlements. Romanised occupation at Silchester is detectable as early as 45-65. The Forum-Basilica was built in the late 1st century, and the street system was somewhat later. Several phases of early earthwork defences are known, but the town wall was not built until the early 3rd century (Boon 1957, 66-83). Early 1st century occupation is also known at Winchester. Here the Forum was constructed about 100 A.D. and extended in the 2nd or 3rd century. (Biddle 1969, 314). The primary defences are late 1st century and the town wall was built after the late 2nd century (Biddle 1970, 284). At both towns occupation continued at least into the late 4th century and probably beyond. Winchester has produced both late Roman 'Germanic' graves and early Saxon pottery (Clark, in Biddle 1970, 295). Roadside urban development of a less organised nature is also found, as at Neatham (Burchard pers. comm.).

The two main towns form, with Mildenhall and Old Sarum, a quadrilateral defined along all four sides and both diagonals by main roads. The Portway, leading SW. from Silchester to

Old Sarum, crosses the Mildenhall-Winchester road near Andover, almost in the centre of the Central Chalk Arable Area. From Winchester roads go south to Bitterne on the Itchen and S.W. towards Wickham and the Portsdown area (Margary 1955, 81-4).

These southern roads link Winchester with the two coastal forts at Portchester and Bitterne. The former was constructed in the years 285-290 on a site with slight traces of earlier Roman occupation (Cunliffe 1975, 422), whilst the fortified settlement at Bitterne was not walled until c. 350-370 (Cotton and Gathercole 1958, 7).

The most obvious innovation in the countryside was the villa. Perry (1967, 176) describes 26 villas in the area, most of which were investigated to some extent in the last century. A few show continuity of site from Iron Age settlements but apparently undergo much more intensive development after the mid 3rd century. True courtyard villas developed by 300 A.D. The 'aisled house' form of villa, again developing in the late 3rd century, is more common. Most appear to have been built on virgin sites, but the Sparsholt example, at least, was preceded by earlier Roman and Iron Age occupation (Johnston 1972, 1). These villas are found in groups, as in the extreme SW. of the chalklands and around the Andover area. It has been suggested that this Andover group represents a single estate centred on the large Clanville villa NW. of the town (Applebaum 1972, 32) and it seems possible that a similar situation existed in the Basingstoke area (Applebaum 1954, 127).

Minor settlements of various kinds are known, many of which bear broad resemblances to the enclosed settlement sites of Cranborne Chase (Perry 1967, 180). Detailed survey in the Chalton region suggests that such small farm-stead sites, originating in the Iron Age, were occupied right through the 1st and 2nd centuries A.D., but were

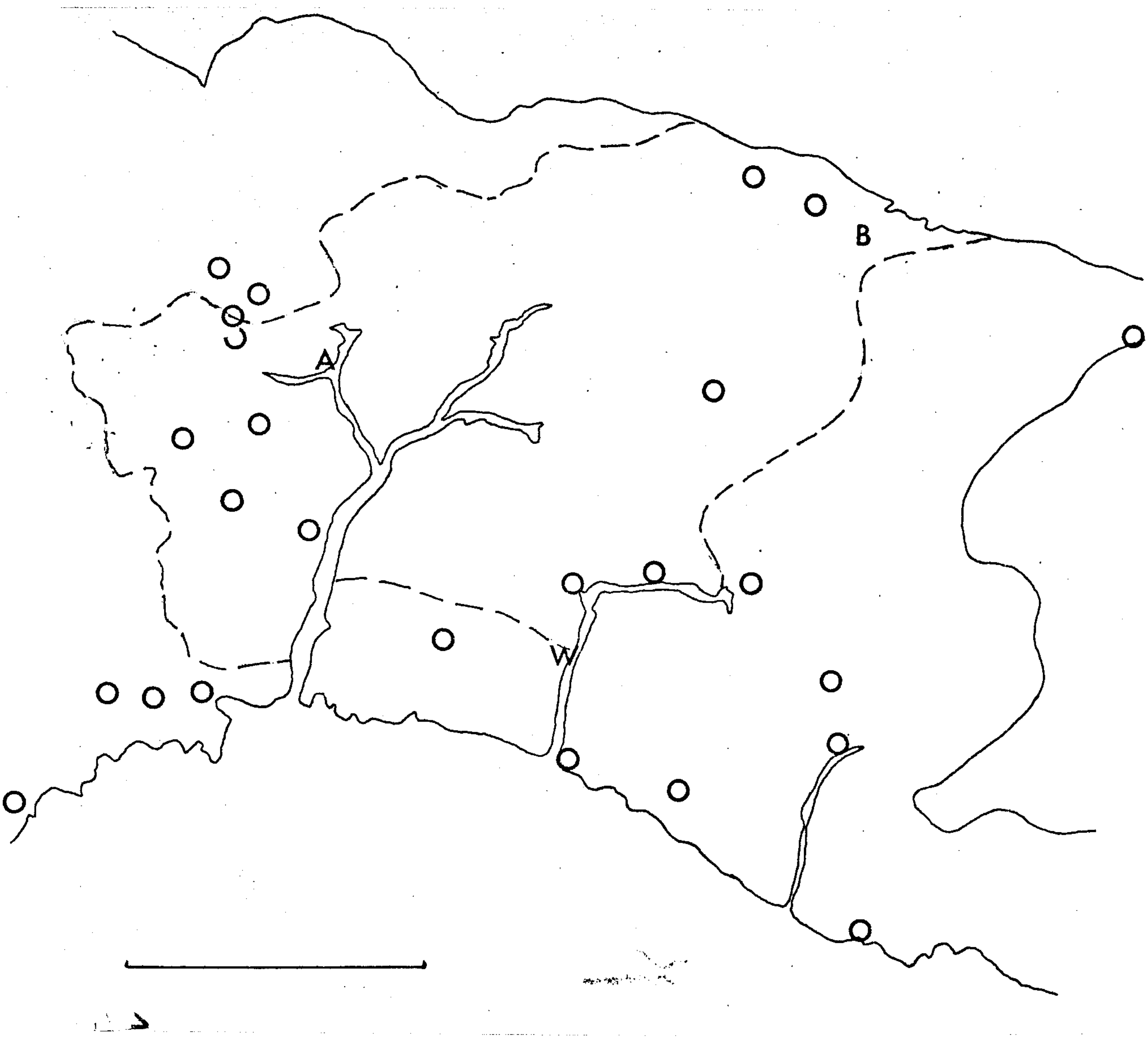



Figure 1.5.3; The distribution of Roman villas on the Hampshire Chalklands. The boundary of the chalk is indicated by a solid line and that of the Central Chalk Arable area by a dashed line. Scale 10 miles. Sources: Green 1940, Perry 1967.

abandoned in the later Roman period and replaced by larger 'village'-type sites (Cunliffe 1973, 180). This may suggest some change in the economic management of the area. Possible evidence for the extension of the arable during the Roman period is the occurrence of large, elongate, rectangular fields as distinct from smaller, less regular systems around Chalton. A further type of site is represented at Owslebury, where many of the features of a villa are present, including rectilinear enclosures, cess pits and corn driers, but a villa building is apparently absent (Collis 1970).

The distribution of settlement over the chalklands as a whole is not unlike that of the Iron Age. Settlements cluster in the Central Arable Chalk Region, and tend to avoid the Eastern High Chalk Area. There is, however, a clear shift away from the hilltops, and a rise in the number of hillslope settlements. Extensive occupation in the valley floors is detectable for the first time (Perry 1967, 196).

1.6 The sites sampled

Samples from 10 sites within the Hampshire chalklands, and 2 from outside are included in this study. The chronological distribution of samples is shown in Table 1.6.1. Figs. 1.1.1., 1.2.1. and 1.4.1. illustrate the position of the Hampshire sites with respect to geology, relief and modern land use regions. The location of sites in the Andover and Winchester areas is shown in greater detail in Figs. 1.6.1. and 1.6.2.

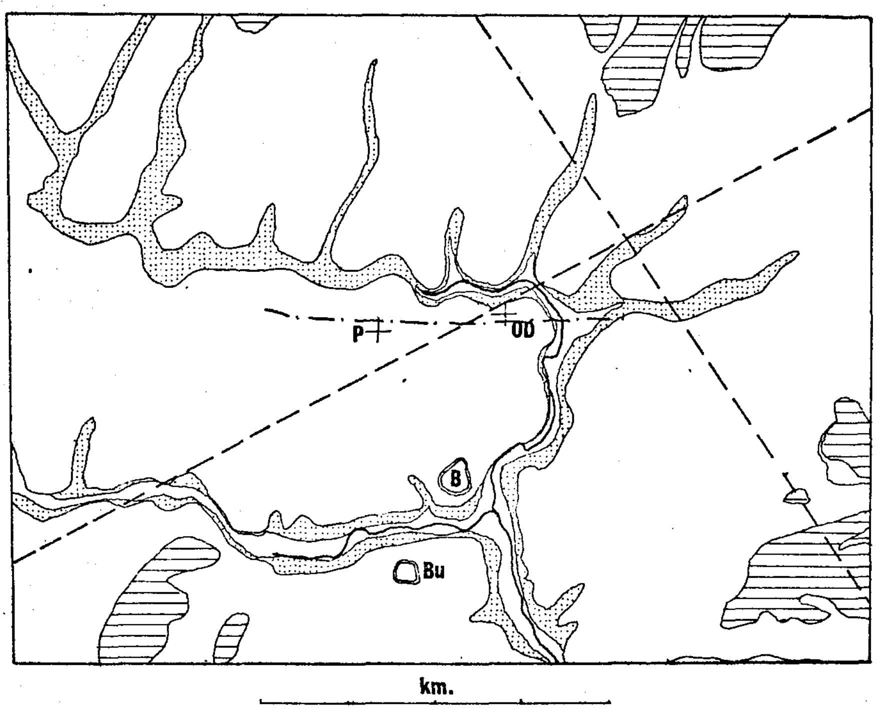



Figure 1.6.1; The location of sites studied in the Andover area.

Valley alluvial deposits are shown stippled and areas of clay-with-flints are cross-hatched. The Upper Chalk is left white.

P - Portway; OD - Old Down Farm; B - Balksbury; Bu - Bury Hill.

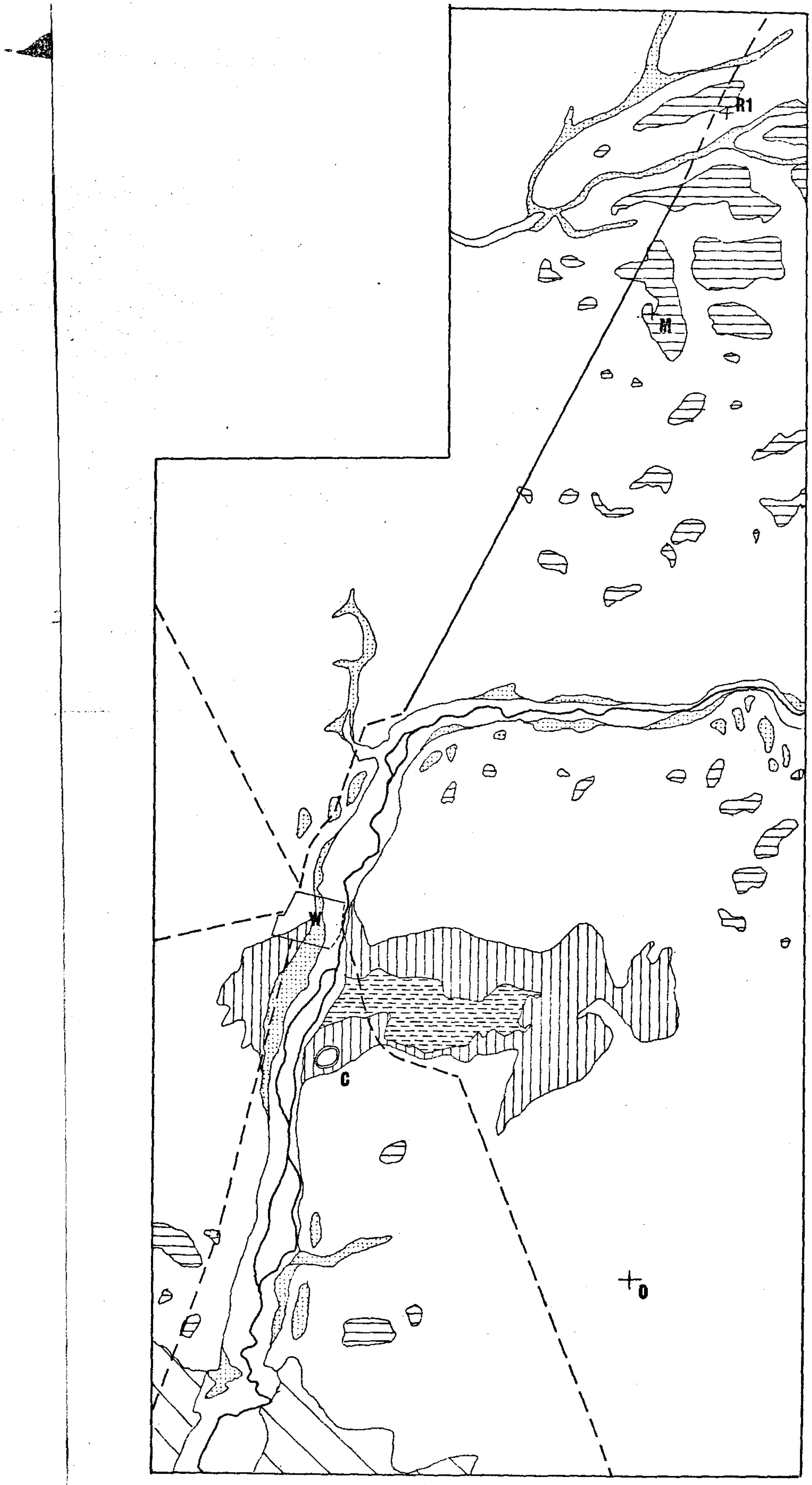



Figure 1.6.2: The location of sites studied ...
Geological key as in Fig. 1.6.1. In addition Middle Chalk is indicated by vertical hatching and Lower Chalk by broken horizontal hatching.
W - Winchester; C - St. Catherine's Hill; O - Owslebury; M - R27; R1 - Site R1.

| Calendar dates | pre-500BC | 500-300 BC | 300-100 BC | 100BC-100AD | 50-100AD | 100-250AD | 250-400AD |
|---|---|---|---|---|---|---|---|
| Ceramic phases | Early All Cannings Cross | Haematite coated | Sauce-pan pots | Atre-batic wares | Early Roman | Middle Roman | Late Roman |
| Old Down Farm | + | ? | ? | + | | | |
| Portway | | + | + | + | + | | |
| Owsle-bury | | | + | + | + | + | + |
| R27 | | | | + | few → | → | → |
| R1 | | | | + | | | |
| Oakridge | | | | | + | | |
| Win-chester | | | | | + | + | + |
| Neatham | | | | | | + | + |
| Crookhorn | | | | | | | + |
| Port-chester | | | | | | | + |

Table 1.6.1.; The chronological distribution of samples of plant remains from the Hampshire sites examined.

Few of these sites have been published; the finds from most are still being examined and in one case excavation is incomplete, and is unlikely to be completed in the near future. Consequently the following brief accounts are largely based upon information provided by excavators in advance of publication, and are inevitably to some extent tentative.

Portway, Andover. SU 342 465

Apart from a few Early Bronze Age sherds, the earliest evidence for occupation was part of an enclosure with numerous pits and postholes, the latter occasionally forming 4-post structures. Haematite-coated 'Meon Hill' ceramics, probably of the 5th century, date this 'Early' phase. The second main phase ('Middle') associated with 'saucepan' pots of 3rd - 1st century BC. date, was represented by an enclosure ditch with storage pits and postholes. Finally some gullies and pits reflect a phase of activity around the Roman conquest. A large rectangular ditched enclosure and an ancillary enclosure also belonged to this 'Late' phase. 'Antenna' ditches leading from the main Late enclosure may have been earlier in date (S. Champion pers. comm.). Samples for flotation were taken from pits, postholes and ditches.

Owslebury, SU 525 246

The earliest phase (I), was a banjo enclosure with its entrance to the NW. It had saucepan pot sherds in its primary silt. Internal pits also produced ceramics of this date, the 3rd - 1st centuries BC. In the late Iron Age and Early Roman periods, a second main phase of activity (II) led to the construction of several ditched enclosures and cemeteries, which were further modified during the period 100-c.250 AD. (Phase III). Finally in the later Roman period (Phase IV) new rectangular ditched enclosures with cess pits and corn dryers were created (Collis 1970 and pers. comm.). Ditches, pits, quarries, hearths and corn-dryers were sampled for plant remains.

R27, Micheldever Wood. SU 526 369

This site, part of a complex of earthworks of probable Iron Age date covering some 30 hectares, was an enclosure of 0.2 hectares, surrounded by a regular V-shaped ditch and external bank with a single entrance. Beehive storage pits, cylindrical pits and several massive pits nearly 3m. deep were the main internal features to survive, though fragments of burnt daub suggested the former presence of insubstantial buildings. The ceramics indicate that the main phase of activity was during the 1st century BC., although Roman pottery in the upper fills of some pits reflects later activity on the site. (Fasham 1976, 10). Soil samples from pits and from the main enclosure ditch were taken for flotation.

Old Down Farm, Andover. SU 355 465

Mesolithic flints and Late Bronze Age pottery indicated earlier use of the site, but the earliest substantial occupation consisted of an open settlement of post-built structures, probably round houses, with pits, associated with 'Early All Canning's Cross' pottery of the 8th century B.C. Subsequently a large rectangular enclosure with V-shaped ditch, internal bank and one or two entrances was built on the site, and in a later phase a smaller enclosure was added to the interior of the SW. corner of this large enclosure. As the site is still being excavated the dates of these phases remain uncertain. There were also small quantities of Late Iron Age/Early Roman pottery, and huts of the Anglo-Saxon period (K. Stubbs pers. comm.). Pits, post-holes and hut gullies were sampled for plant remains.

R1, Stratton Park. SU 539 408

Within the 18th century park the Winchester-Silchester Roman road is preserved as an earthwork which was sectioned at several points. At site R1 the road was on a terrace on a valley slope; it averaged 6.75m. in width and was scantily metalled. Spoil from road-ditch construction sealed a soil surface which produced evidence of ploughing, and contained the cereals discussed below (3.6). The site presents problems of interpretation, however, and these are examined in more detail below (6.7). (Fasham 1976, 17).

Crookhorn Farm, Purbrook. SU 687 075

Excavations at this site, 600m. west of a known villa and 100m. north of the Roman road from Chichester to Bitterne, have revealed a complex of buildings and structures dating from the 2nd to the 4th centuries AD. A tile kiln, aisled building over 20m. long and corn-drying building were the major structures to be investigated. The latter was some 5m. square, containing two flues forming a V-shape in plan, both of which appear to have had transverse T-flues at their ends. They opened onto a series of stoking pits (G. Moore pers. comm.). Several samples containing carbonised cereals from this corn dryer were examined.

Portchester Castle. SU 625 045

The fort appears to have been constructed c. 290 AD. on a site which had been occupied to a small extent in the 1st century. An area of nearly 4000m$^2$ was cleared within the fort to reveal gravel roads, layers of make-up, traces of timber buildings, ovens, hearths and pits, dating from the late 3rd century to the 5th century and beyond (Cunliffe 1975). A small quantity of carbonised cereals was collected from 4th century cess pits.

Winchester. SU 480 295

Samples from three sites within the Roman town, all from the valley bottom on alluvial deposits of the River Itchen, were available for examination. At Brook Street, pits and wells associated with buildings fronting a North-South street were sampled for plant remains (Hassall et al 1972, 349), whilst at Cathedral Green occupation layers dating from before 50AD. to 80 AD. sealed beneath the East-West street and silting layers between re-metallings of the road were examined (Biddle 1970, 311), and samples removed for flotation. Plant remains were also collected during excavations in 1961 at the Cathedral Car Park.

Neatham. SU 742 412

The roadside settlement at Neatham originated in the early 1st century, but expanded into a particularly flourishing community in the 3rd and 4th centuries. The samples studied came from several wells in a late Roman industrial suburb outside the ditched settlement defences. (A.M. Burchard pers. comm.).

Oakridge II. SU 640 435

This was a settlement site with pits and ditches spanning the Late Iron Age and early Roman periods. The only samples examined from the site were of waterlogged layers within a very deep 1st century Roman well. (A.M. Burchard pers. comm.).

Hascombe, Surrey. TQ 004 386

Selective excavation within the 5½ acre hillfort of Hascombe during 1975 revealed that the defences consisted of a single bank and ditch, located the entrance and revealed a number of poorly preserved hearths and irregular pits within the ramparts. The period of activity represented appears, on ceramic grounds to be late Iron Age, possibly 1st century BC. (F.H. Thompson pers. comm.). A single large cereal deposit from a pit was examined.

Colchester, Essex. TL 995/6 250/2

The early Roman town at Colchester, built on the site of an earlier legionary fortress, was largely destroyed during the Boudiccan revolt of 60 AD. At 45-46 High Street ('Curry's Pottery Shop') restricted excavation during partial rebuilding recovered burnt decorated Samian ware from the destruction layers of a timber-framed building with wattle and daub walls. Other buildings destroyed at this time were excavated at the site of the 'Cups' Hotel and in Lion Walk during 1973. (Crummy 1974, 14 and pers. comm.; G.M.R. Davies pers. comm.). These destruction layers all produced obvious deposits of carbonised plant remains which were removed for examination.

1.7 Site catchment analysis

This technique provides a means of relating settlement sites to natural resources and of establishing a 'model' area of exploitation. In particular it highlights differences between the location of sites and can suggest differential emphasis upon the various branches of the agrarian economy by virtue of the proximity of critical resources. Ellison and Harris (1972, 911 - 962) have applied the technique to prehistoric and early historic settlements in Wiltshire and Dorset. These authors adopted an idealised circular catchment area of 2 km. radius for use in the study of their sites, which are very similar to the Hampshire settlements examined here; such an area is likely to include the most heavily worked land. They observe that, in general, the topography of Southern English landscapes is unlikely to distort strongly this idealised circular catchment area, although in at least some cases the area may better be described by a strip, including Downland for pasture, valley slopes for arable farming, and valley floors for use as meadows. However, by drawing a 2km. radius circle around suitable sites, a first approximation to the exploited area may be obtained.

Several of the sites listed above, (1.6), may be examined in this way. However Roman urban settlements are not suitable for such treatment, and the coastal fort of Portchester must also be excluded. Such sites would have received a large part of their raw materials from a much wider area. Site R1, which is not a settlement site, is omitted. Only the smaller, rural settlements are discussed here.

Fig. 1.7.1. shows idealised catchment areas of these sites. They have been plotted onto small portions of the Ordnance Survey Agricultural Land Classification Map (1974), which divides land into 5 categories, four of which occur in this area. These are as follows:

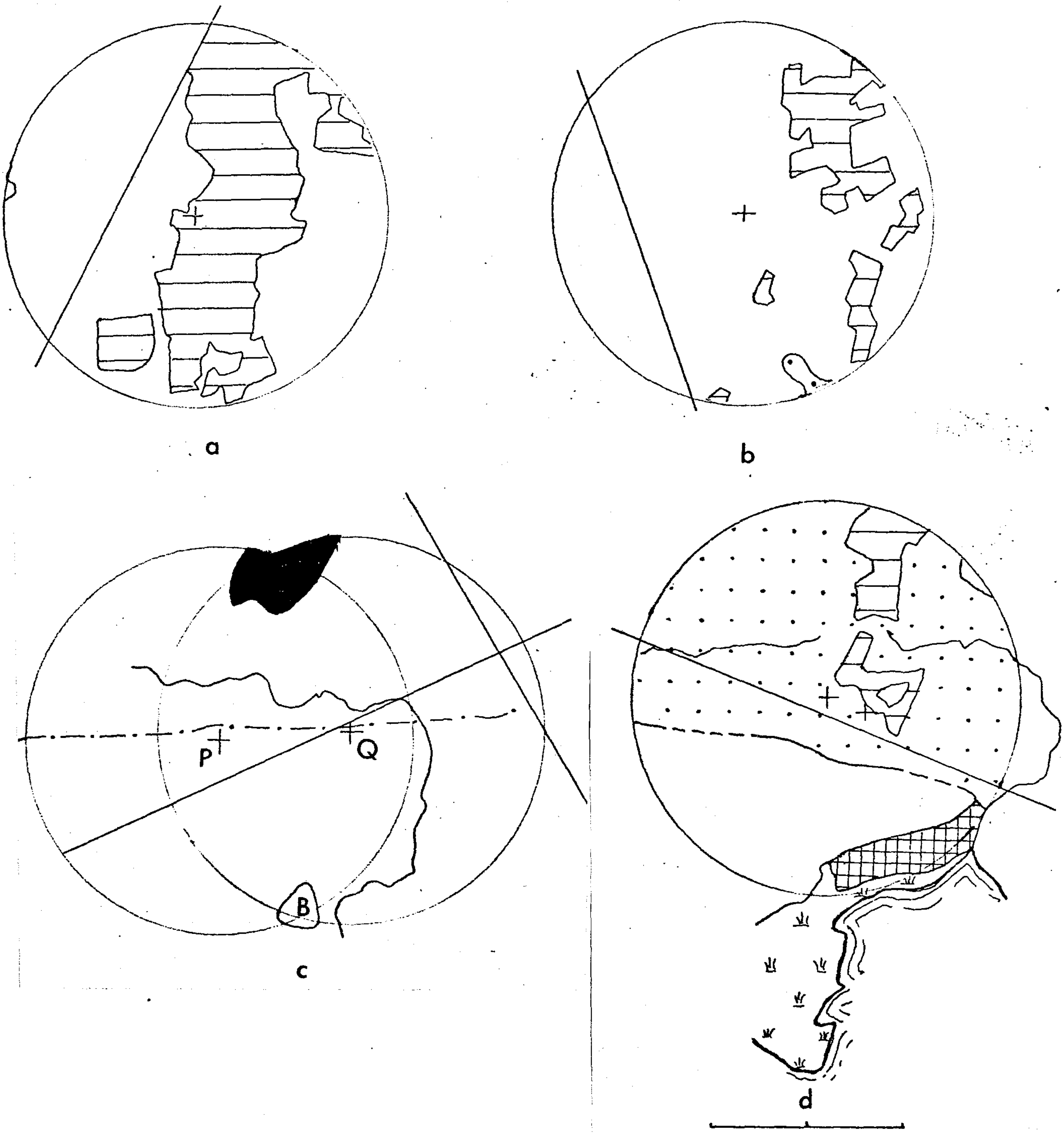
Grade 1; First class arable land. Normally well-drained loams.

Grade 2; High quality arable.

Grade 3; Average quality land. Much the largest category.

Grade 4; Land posing severe limitations to cultivation.

Areas of non-agricultural land, principally built-up areas, are omitted in Fig. 1.7.1., but modern woodlands are shown since they often correspond closely to areas of clay-with-flints soils, the Winchester, Carstens and Clatford series. In addition streams, the coastline, Roman roads and earlier routes are indicated.




<u>Figure 1.7.1</u>: Idealised site catchment areas of (a) Site R27, (b) Owslebury, (c) Portway and Old Down Farm (d) Crookhorn Villa. Scale in km.
Horizontal hatching: Modern woodlands.
Cross-hatched; Grade 1 land.
Black; Grade 2 land.
White: Grade 3 land.
Stipple: Grade 4 land.
Straight lines represent Roman roads and dot-dashed lines pre-Roman tracks.

The catchment areas of the Iron Age sites examined are predominantly composed of Grade 3 arable land, in this case soils of the Andover and Icknield series. Small peripheral patches of Grade 4 land at Owslebury, and Grade 2 at Portway and Old Down are also found.

Mention of these latter two sites draws attention to their very close proximity (Fig. 1.7.1c). Although Old Down Farm was first inhabited several hundred years before Portway, the sites co-existed for at least part of the Iron Age. This must mean either that they were exploiting very restricted areas or that they exploited much the same area in some form of co-operation. The presence of the hillfort of Balksbury within their ideal catchment areas is also to be noted, although until the full excavation of that site is published it is impossible to be sure that it is contemporary with Portway and Old Down. Iron Age settlement is very dense in this area around Andover and this probably reflects the ease with which the fertile light soils of the Andover and Icknield series could be worked using the equipment of the time.

Site R27 includes a very large tract of clay-with-flints within its catchment area (Fig. 1.7.1a), but it is sited towards the edge of the modern Micheldever Wood, where the boundary with lighter soils occurs. Owslebury is in a rather similar position; again, poor upland soils, nowadays wooded, are quite close to the site which itself, however, is situated on Upper Chalk soils (Fig. 1.7.1b).

It is clear that Portway and Old Down have easier access to larger areas of flat and easily worked arable land, whilst R27 and Owslebury, being situated in hillier, more dissected areas, where hilltops are capped with clay and other drift deposits are rather less fortunate. Portway and Old Down are also much more favourably sited with regard to water supply. Both are on the top of a gentle ridge overlooking a river. By contrast there are, today, no surface streams within the catchment areas of Owslebury and R27. The water table in the chalklands, however, has dropped considerably since prehistoric times, (1.2), and the effects of this change are difficult to calculate.

The siting of the Crookhorn Farm villa provides a complete contrast with all four of these sites. Within a 2km. radius are to be found an extensive area of Grade 1 land, facing south; the eastern part of the Portsdown chalk ridge (Grade 3); and a large area of poor Grade 4 land, part of the London Clay and Bagshot Sand region known as the Forest of Bere. Further south, along the coast, is a salt marsh, possibly suitable for grazing (Fig. 1.7.1d). The principal resources of this villa, therefore, seem to lie in the southern half of its catchment area, and it seems possible that its situation is influenced by a desire for proximity to the Bitterne - Chichester road rather than the need to be sited centrally within its chief resources. It is in an ideal position to exploit rich arable land, upland pasture and salt marsh, and to export its produce via a major road.

These 5 sites fall, therefore, into three groups which cut across the Iron Age/Roman transition. Firstly there are the sites of Portway and Old Down, located with easy access to extensive areas of flat, light land suitable for arable farming and adjacent to a river. Secondly come R27 and Owslebury, which are in upland regions with smaller areas of land suitable for arable farming. It seems reasonable to suggest that there may have been a greater emphasis upon the maintenance of flocks and herds at these two sites. Owslebury continued to be occupied on a large scale right through until the 4th century AD. and it is possible that its relatively poor resources, at least as far as cereal production is concerned, were offset by the nearness of the large market at Winchester. Without this nearby market the site might not have survived so long. R27, on the other hand, was a short-lived site, whose period of intensive occupation did not survive the end of the 1st century BC. The villa at Crookhorn, which is the sole representative of a third type of site is located with both maximum production and easy export in mind, and makes an interesting contrast with the late Roman settlement at Owslebury.

## CHAPTER 2. METHODOLOGY

Samples of plant remains recovered from archaeological sites must always be interpreted in the light of the recovery methods employed. Different extraction techniques may have major effects upon the composition of samples; inefficient techniques frequently fail to recover specific fractions of the plant remains from the soil. It is also necessary to ensure that the sampling scheme used produces a collection of samples which truly represent the full range of deposits of plant remains present on the site, in order to maximise the quantity and quality of information about crops and agricultural techniques. For these reasons the recovery methods which have been used in the collection of plant remains for this study are critically reviewed in this chapter.

These fruits and seeds have been collected over a period of years by several excavators using different methods of sampling and recovery under both research and rescue excavation conditions. Only in the cases of site R27 and Old Down Farm has the writer been able to influence or determine recovery and sampling methods.

The problem of the contamination of samples of plant remains from archaeological sites with modern plant material has become more obvious ever since bulk processing of soil became commonplace as a result of the development of flotation machines. The final section of this chapter examines the problem, and suggests some methods of dealing with it.

### 2.1 Sampling

The ideal sampling technique should produce a collection of seed samples from all types of context on a given site. The importance of obtaining samples from the full range of available contexts has been emphasised by Dennell (1972, 1974), who has demonstrated that qualitatively different information is to be had from seed deposits within different archaeological contexts. The collection of samples should thus be as free as possible from bias introduced by the excavator towards one soil type or context.

The simplest way of meeting these requirements is to use a random sampling technique. However, simple random sampling, in which all sample units are given equal weight, is of rather limited application in archaeology. Rare, but important, contexts may fall outside the random sample; an example of such a context would be the single fourth century corn-dryer at Owslebury. For this reason stratified random sampling is preferable (Redman 1975, 150). The sample units within the site are grouped into statistical 'strata', which for practical purposes are simply equated with archaeological contexts, when applying this method. For example, at Site R27 three contexts were available for sampling: pits, postholes and an enclosure ditch. In this case soil samples were taken from the ditch and from 50% of the pits, chosen by lot. For practical reasons the postholes were not sampled; they were filled with a stiff clay which could not be broken down for flotation without destroying any carbonised seeds present.

Probability sampling of this sort is, however, only possible when the total number of sample units, i.e. archaeological features, may be determined (Chenhall 1975, 9). On a site like Old Down Farm, where excavation is likely to continue for a year or more yet, and where clearance of the partly destroyed site is incomplete, another approach was necessary. The available features were stratified by type - pit, posthole, gully, ditch - and soil samples for flotation were removed from a small number of features within each stratum. This method has the merit of including samples from all types of feature present, but is inevitably biased towards that area of the site cleared when samples were taken. This is unavoidable during such rescue excavations, however.

Most of the remaining seed samples were recovered by sampling methods which have been termed collectively 'judgement' sampling. This involves "conscious selection of .... the most productive or most representative samples" (Redman 1975, 149). Samples of this type were taken when the excavator was able to see seeds. This involves the assumption that seeds were not present when he was unable to see them. Examples of such sampling are the waterlogged pit and well samples from Winchester, Neatham and Oakridge, or the corn-dryer deposit from Crookhorn Farm.

The criterion for collection at Owslebury was essentially of this type. Samples were taken when charcoal was visible in the soil. Probably soils devoid of visible charcoal do not contain significant amounts of carbonised cereals, but the overall sampling method is nevertheless based upon a judgement, with all the risks of bias which this involves.

Full details of the specific sampling methods used at each site are given in Chapter 3.

After selecting the features to be sampled it was necessary to decide upon a suitable soil volume to be retained from each layer. Some of the problems associated with sample size selection are illustrated by a brief study which was made on the Hascombe grain sample (see below for details of this sample). An entire layer, just over 30,000 cc. of carbonised material was available for study. The idea was to determine the minimum volume which had to be sampled in order to give a good picture of the deposit as a whole. Three criteria were examined;

(1) The number of different types of component in the sample e.g. wheat glume base, oat caryopsis, <u>Chenopodium</u> seed etc.

(2) The wheat: oat ratio.

(3) The wheat: barley ratio.

Sampling continued until these values became more or less constant. The results are shown graphically in Fig. 2.1.1. It will be seen that new components had ceased to be found after 300 cc. had been sorted through (Fig. 2.1.1b), and that

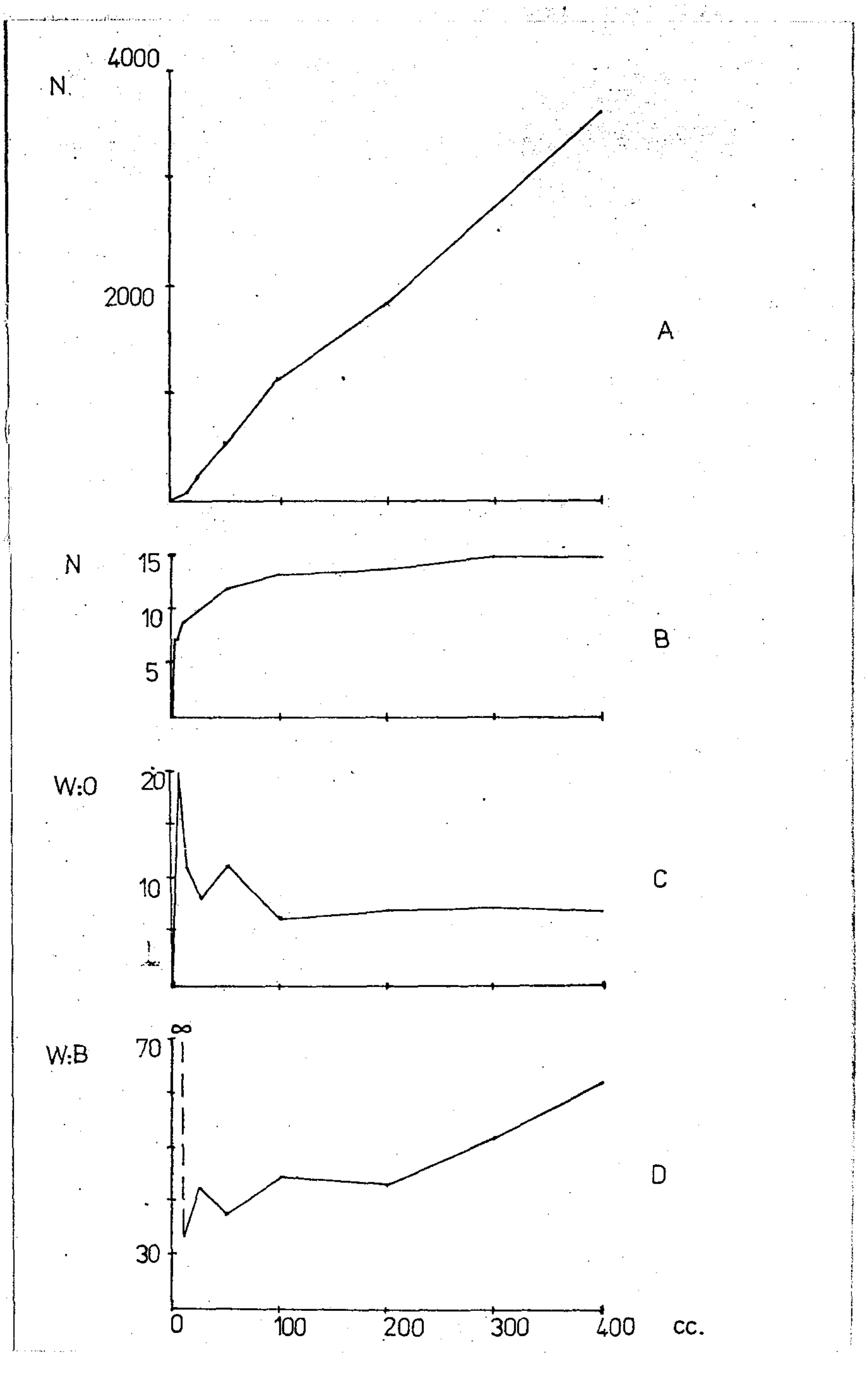



Figure 2.1.1; Graphs illustrating some statistical studies of the Hascombe grain deposit.

A. Number of components isolated per volume of deposit sorted.
B. Number of types of component isolated per volume of deposit sorted.
C. Wheat:Oat ratio against volume sorted.
D. Wheat:Barley ratio against volume sorted.

In each case the volume of deposit sorted is indicated along the horizontal axis.

the rate of increase was slight after 100 cc. It seems probable that very large quantities of material would have to be sorted through in order to increase further the number of components.

The wheat:oat ratio, after initial violent oscillations, had settled down to a steady level after 100 cc. had been sorted, but the wheat:barley ratio had not stabilised after sorting 400 cc. Barley is a rare component of the sample, and clearly a large sample would be required before a steady value could be obtained (Fig. 2.1.1c, d).

This exercise demonstrates several simple but useful points;

(1) In order to reveal all types of object in the layer, or a very large proportion of them, it is necessary to sample only a relatively small proportion of the total material - in this case only approximately 1%.

(2) The proportions of the main cereals can be revealed by a similarly small sample of the whole.

(3) The true proportions of minor components will be revealed only by sorting a much larger proportion of the material. Normally the effort involved in doing this will not be justified by the results.

This deposit is unusual in one important respect, however: its homogeneity. Fruits and seeds are not normally evenly distributed throughout a layer, but are clustered. To be sure of adequately representing the seeds present in a layer a very large soil sample may be required in these circumstances. On the other hand to represent adequately the full range of seed deposits present on the site a large number of samples is required and practical considerations therefore limit the possible size of soil sample.

A suitable sample volume will vary from site to site, but for the open chalkland sites included in this study a volume of about 10,000 cc. (one bucketful) per layer proved to be appropriate. The volumes of flot produced from this soil volume are not too large to prevent the processing of a reasonable number of samples.

## 2.2 Flotation

The principal aims of the present study can be divided into two; the determination of the importance of different crop plants, and the reconstruction of agricultural activities. It should be emphasised that different levels of recovery efficiency (i.e. flotation efficiency) are required for the achievement of these aims. When one is simply concerned to establish the relative proportions of different cereal grains in a deposit, 100% recovery efficiency is simply not necessary, even assuming it were possible. The proportions of crops will be unaffected by recovery efficiency, unless certain species are occurring at very low frequencies. On the other hand, when the aim is to determine the relative proportions of, say, weed seeds, chaff and cereal grains in a deposit with a view to assessing the significance of that deposit in terms of agricultural activities, recovery efficiency is very important. This is because, unlike the cereal grains of different species, components of such varying size and shape are likely to be affected differentially by poor flotation techniques. In other words samples collected by inefficient flotation methods are useful in some aspects of the study of ancient farming, but must not be used for others. Hence the importance of assessing recovery efficiency is that it enables one to decide just what may legitimately be deduced from a given sample or collection of samples.

The technology of flotation has undergone rapid development over the last few years and as a result the material discussed in this study has been collected by a variety of flotation methods. It is not intended to describe in detail the flotation machines now available; accounts are to be found in the references given and a brief review of these techniques is given in Renfrew, Monk and Murphy (1976). However before attempting any interpretation of the plant remains recovered it is necessary to consider the biases introduced by these different methods of recovery, and to assess their comparability. Flotation was used to extract carbonised seeds from soil samples in all cases except the very pure samples from Colchester and Hascombe.

The samples from Owslebury, the earliest of the sites to be excavated, were collected by the simplest flotation method. Large amounts of soil were poured into water in an oil drum. The suspension was stirred, and the flot collected in a plastic strainer. Finally low-floating material was collected by pouring the water through the strainer (Collis undated, 3). This technique simply represents the scaling up of small-scale manual flotation such as has been widely used on excavations.

At Portway a flotation machine was constructed. This relied upon water flow and agitation to break down the sample, and was based upon the machines of French (1971) and Williams (1974). The flotation unit itself was virtually identical to Williams' 'Siraf' machine. As a convenient water supply was not available the water in the system was recycled. In addition a finer collecting mesh (250 microns) was used.

At Old Down Farm, R27 and R1 a second form of flotation machine was used, based upon the 'Cambridge' machine (Jarman, Legge and Charles 1972). This attempts to improve recovery by injecting bubbles of air, via a compressor, into a flotation medium consisting of water with additives designed to make carbonised material more hydrophobic and aerophilic. The additives used on these sites were paraffin and detergent. The machines actually employed were the models described by Lapinskas (1974), which adds to the Cambridge system a through-flow of water, and a machine constructed by the writer, similar in all essentials to Lapinskas' machine.

Three main methods of flotation were used, therefore. The questions of relative efficiency and comparability are clearly of some importance.

Manual flotation has one major advantage over machine flotation. It is a much more easily controlled method; it is immediately obvious whether flotation is proceeding satisfactorily. Unfortunately much of this control is lost when flotation is carried out on a large scale, and efficiency is likely to drop due to the difficulty of ensuring adequate agitation to break up the soil. The absence of smaller weed seeds such as Tripleurospermum, Chrysanthemum and Papaver from the Owslebury flot may well be a consequence of these problems, although the rather coarse collecting mesh used is probably partly to blame.

Machine flotation is not immune to problems of differential recovery of various sizes of seed. An experiment using the M3 machine showed that recovery of cereals and peas from a particular deposit was in the range 72-91%; small vetches had a recovery rate of about 14%; and small grass caryopses and elder seeds, admittedly present in small numbers, were not recovered at all. These are results obtained from a near ideal sample - ashy, dry soil from a hearth - using a sophisticated machine (Green 1975, 43). This result supports the view that it is the small seeds which would be lost by inefficient flotation techniques. Fortunately such seeds do not, in general, have great economic significance, although poor recovery of them makes it impossible to attempt any reconstruction of crop processing activities.

Recovery experiments can, unfortunately, yield only rather limited information. It can be argued that the figures given above refer only to the particular deposit examined, and have no general applicability. On any of the sites discussed in this study there is a wide range of soils; from pure ash and charcoal layers, through various brown loam soils with different proportions of chalk, charcoal, humus and clay, to pure chalk rubble. Each of these has its own flotation characteristics. Given this great variability perhaps the best way to gain an overall view of recovery efficiency is simply to examine the seeds recovered and to determine the percentage which consists of the sensitive indicators of efficiency; the small weed seeds and chaff. The assumption underlying this approach is that, given a large enough number of samples, there should be <u>in situ</u> roughly the same ratio of Cereals:chaff: weed seeds on sites of a similar type. The combined percentage compositions of all seed deposits from Portway, R27 and Old Down Farm are given in Table 2.2.1.

| | Cereal grains | Large grasses | Large vetch | Weeds >2mm. | Weeds <2mm. | Chaff |
|---|---|---|---|---|---|---|
| Portway | 29 | 12 | 1 | 13 | 15 | 30 |
| R27 | 55 | 16 | 1 | 7 | 12 | 9 |
| Old Down | 19 | 7 | 1 | 10 | 57 | 6 |

Table 2.2.1. Percentage composition of seed deposits from Portway, Old Down and R27.

The results are surprisingly diverse. The least reliable figures, based on only 21 samples, are those from Old Down Farm. Two 'high weed seed' samples have depressed the cereal percentage (see below), but allowing for this it seems that recovery efficiency comparable to that at Portway has been achieved. At R27, on the other hand, the overall percentage of material in the smaller size classes is low, and the percentage of cereal grains relatively high. In spite of the fact that a more sophisticated machine was used at R27 it seems that recovery of small components was better at the other two sites, if the initial assumption is correct. It is not unlikely that soil type has had an important effect here. Portway and Old Down are both on relatively light, well drained chalky loams with some clay, but R27 is on a heavy soil derived from the clay-with-flints, most unsuitable for flotation. When comparing the composition of samples from these three sites it is thus necessary to bear this differential recovery rate in mind.

The waterlogged samples from Winchester, Neatham and Oakridge were treated rather differently. The flotation method used for the samples from the first two sites was the now standard paraffin/water flotation technique fully described by Coope and Osbourne (1967). It is difficult to assess the absolute efficiency of this method due to the difficulty of searching effectively through the non-floating residue for seeds. It is, however, very clear that the larger size-groups, including fruitstones, are likely not to float, and probably the smallest seeds suffer from the same problem. Manual sorting through the residue is the only solution, but unfortunately this is only really effective in recovering fruitstones, as the smaller seeds evade detection.

2.3 Sorting

Since limitations to the amount of soil which can be floated have largely been removed by the development of flotation machines, the sorting of flot has become the weak link in the sample processing chain. Sorting is a slow process and is likely in future to be the factor limiting the number and size of samples which may be processed. It is also a tedious and tiring process. This has an importance beyond the discomfort of the worker; the tiring nature of the work inevitably causes a reduction in efficiency after a time, leading to variability in the extraction of fruits and seeds.

The sorting method used has been to grade the dried, carbonised flot gently in a rack of sieves, ranging from 5mm. mesh size down to 400 microns. The very largest material can then be sorted by eye, fractions down to 1.5mm. under a large sorting lens, and finer fractions under the low power of a stereoscopic binocular microscope. The advantage of this method is that only one size class is looked for at a time; there is no danger of missing beans whilst looking for small weed seeds and vice versa. If only part of the flot is to be examined it is sub-divided before grading.

Only a portion of the fine fraction of the larger samples from Owslebury was sorted through; the amount sorted is recorded in Table 3.2.0. In addition many of the samples from that site had been sorted before they were received by the writer.

## 2.4 Contamination

The contamination of carbonised seed samples with modern weed seeds and other plant material falls into two main categories; contamination occurring in situ and that introduced during and after the excavation of the sample. There is also a possibility of cross-contamination involving carbonised seeds occurring between samples during excavation and flotation.

The use of clean sampling techniques and the protection of soil surfaces and flotation machines from aerially-borne seeds helps to minimise the more obvious forms of contamination. It is also a simple matter to determine whether cross-contamination between samples is occurring during flotation. There are two main ways in which material might be exchanged between samples in such a system as the M3 flotation machine.

Firstly it is possible that floating material might by accident fail to be caught in the sieves, and enter into the circulating flow of water. To eliminate this possibility two extra 250 micron sieves were attached to the machine; one at the spout leading from the sedimentation trough into the sediment tank, and one over the end of the uptake hose in the reservoir (see Lapinskas 1974 for the location of these parts).

The second possible form of contamination is a consequence of the need to process large numbers of samples. Totally cleaning out the flotation tank between each sample is extremely time consuming. It was therefore decided to carry out an experiment to determine whether running successive samples without emptying the tank introduced an unacceptable level of cross-contamination between samples.

A soil sample was floated in the normal fashion, collecting flot until the residue in the 3mm. mesh sieve appeared clean and no more flot was apparent in the water flowing from the tank. A clean 200 micron sieve was then placed under the spout and the machine run with no sample in it for 10 minutes, to check whether flot had indeed ceased to rise. This was then replaced by a further clean sieve. The air-bubbler was turned on and left on for approximately 5 minutes, reproducing the normal running cycle but without the introduction of a new sample. The material collected was dried and weighed, and the total 'contaminant' flot expressed as a percentage by weight of the preceding sample flot. The procedure was repeated 9 times, using samples of all soil types from site R27; heavy clay, chalk lumps, brown loams and charcoal-rich soils. Table 2.4.1. summarises the results.

Despite the presence of carbonised seeds in about half of the samples floated, none was recovered by 'between sample' flotation. Charcoal fragments up to 2 - 3 mm. were recovered in small numbers, indicating that in theory, carbonised seeds could be exchanged between samples, however. In only one case is the total 'between sample' flot greater than 2% by weight of the preceding sample, and in fact the computed values for potential percentage cross contamination are made artificially high by the high proportion of silt in the 'between sample' flot.

This experiment demonstrates that cross contamination is possible, (though it was not in fact observed for carbonised seeds), but that under the conditions of operation employed, this cross contamination hardly exceeds 2% by weight of the preceding sample. Since this percentage includes all components of the sample, and carbonised seeds never make up a significant amount of the total sample on this site, the degree of cross contamination of seeds between samples can be considered negligible.

| Sample no. | W1 | W2 | W3 | $\frac{W2+W3}{W1} \times 100$ | Sample contents | 'Contaminant' sample contents |
|---|---|---|---|---|---|---|
| 609 | 5.043 | 0.005 | 0.023 | 0.55% | roots<br>c3 | roots<br>c3 |
| 612 | 6.361 | 0.005 | 0.010 | 0.23% | c123<br>ce | c23 |
| 613 | 7.332 | 0.011 | 0.011 | 0.15% | c123<br>ce, ch, ws | c23 |
| 619 | 3.980 | 0.006 | 0.022 | 0.70% | c123 | c23 |
| 621 | 2.174 | 0.005 | 0.039 | 2.02% | c123<br>ce, sn | si, c3 |
| 623 | 3.652 | 0.005 | 0.064 | 1.80% | c123<br>ce, ws, sn | si, c23 |
| 579 | 6.106 | 0.025 | 0.063 | 1.03% | c123<br>sn | si, c23 |
| 2887 | 7.916 | 0.012 | 0.027 | 0.49% | c123 | c23 |

Table 2.4.1; The results of an experiment to investigate cross-contamination during flotation.

W1; Weight of flot, in grams, recovered from soil sample by flotation.

W2; Weight of flot, in grams, recovered by running machine empty for 10 minutes after removal of soil residue.

W3; Weight of flot, in grams, recovered by running machine and bubbler unit for 5 minutes after removal of W2 from collecting mesh.

The material in the flot is described as follows:-

ce cereal grains (carbonised)
ch chaff ( " )
ws weed seeds ( " )
sn snail shells
si relatively large amounts of silt
cl charcoal > 5mm.
c2 charcoal > 1mm.
c3 charcoal 400 microns - 1mm.

Despite such precautions the problems of in situ contamination remain. The light calcareous soils of the chalk, upon which most of the sites examined in this study are situated, are in general well-drained and fully aerobic. Root penetration, as a consequence can be very deep. Tansley (1939, 528) notes that many characteristic chalkland herbs have unusually large root systems to compensate for the prevailing scarcity of water. This presents problems when samples of such soils are flotated to extract their carbonised seeds, since the flot often consists almost entirely of root debris and uncarbonised weed seeds. An example of this problem is given in Table 2.4.2., which shows the results of flotation of soil from cremation pits and the ditch of a Bronze Age barrow on Easton Down, Hants. A few carbonised seeds were extracted, but the flot was chiefly composed of the uncarbonised specimens listed in this Table. The samples had been excavated carefully from what appeared to be archaeologically undisturbed deposits.

The means by which modern plant material may be introduced into archaeological layers have been discussed by Keepax (1976), who distinguishes four main agencies:

(1) Ploughing. This will introduce plant debris from the soil surface into the lower part of the topsoil. Sites such as Portway, Old Down Farm and Owslebury, on thin chalk soils, which until recently have been under the plough, are particularly vulnerable to this form of contamination.

(2) Root holes and drying cracks. The deeply penetrating root systems of chalkland plants have already been mentioned. Sites in woodland, such as R27, are even more susceptible to root disturbance.

(3) Earthworms. These are probably the principal factor in the introduction of contaminants into aerobic soils. Small seeds may be carried down into deep layers in the worms' gut; larger material can penetrate when earthworm burrows collapse. The intentional use by worms of flax seed husks, an oat grain and a pear seed for lining aestivation chambers represents a still more direct source of contamination (Darwin 1881).

(4) Ants. Certain species collect seeds which produce food bodies (elaiosomes) on their external surfaces (Step 1946, 163).

Other burrowing animals of all sizes no doubt accidentally introduce seeds into archaeological deposits.

Some or all of these sources of contamination are likely to be in operation on any site. Contamination cannot be eliminated, but it can be allowed for. In particular the examination of samples of topsoil can focus attention upon individual species which may penetrate more deeply so as to contaminate the deposit.

Topsoil samples from Portway and Old Down were examined in an attempt to clarify the problem. When the samples were taken (July 1975) both sites were out of cultivation. A brief inspection of the standing flora showed that the commonest plants included:

| | | | |
|---|---|---|---|
| *Papaver rhoeas* | *Polygonum aviculare* | *Knautia arvensis* | *Anthemis arvensis* |
| *Centaurea nigra* | *Poterium sanguisorba* | *Vicia sativa* | *Medicago lupulina* |
| *Avena fatua* | *Bromus spp.* | *Poa spp.* | *Arrhenatherum elatius* |

These represent a mixed flora, comprising grassland species and relics of cultivation.

The soil type of both sites appeared to be a form of rendzina, though the soil horizons were not clear due to recent ploughing. In each case a humic 'topsoil' merged imperceptibly into a chalky 'subsoil'.

The upper turf layer was stripped away, the topsoil divided into two equal parts and a 20cm. square soil core taken down to the chalk. At Portway the topsoil was some 30cm. deep and at Old Down about 18cm. deep; the subsoil in each case was some 10cm. deep. The core at Portway was sited, by chance, directly above a post-hole of the settlement, which was also sampled. 500cc. of soil from each sub-division of the two cores was floated in water and seeds collected in a 250 micron mesh. The results appear in Table 2.4.3.

In each case contamination decreased as depth increased, as did the number of species. However, in the Portway post-hole there were still 10 seeds of 6 species, at a depth of 75cm. from the surface. Taking both sites together the most deeply penetrating species include Veronica hederifolia, V. polita, Lapsana communis, Medicago lupulina, Polygonum aviculare and Atriplex patula; these are all fruits and seeds lacking protuberances which might inhibit penetration, and all are durable forms. Only the latter two look anything like carbonised specimens, but are in fact weathered, uncarbonised seeds. The cereal grain from the subsoil at Old Down is presumably derived from a nearby feature by worm action.

As a result of this study seeds of Polygonum and Atriplex in the carbonised cereal deposits were scrutinised with particular care, in order to detect and discount modern contaminants. These normally contain shreds of internal tissue derived from the cotyledons.

As the number of seeds in a unit of soil shows a steady decrease with increasing depth it seems reasonable to assume that relatively recent contamination accounts for their presence in this case. That not all uncarbonised seeds present in aerobic soil need be of recent origin, however, is shown by a cache of seeds of C. album found in a small pit at a Blackfoot Indian site of 16th century date. These seeds were not carbonised but "dull and lustreless", though with no signs of internal tissue (Johnston 1962). Seeds can survive in arable soil for very long periods. Interestingly enough, seeds of A. patula, P. aviculare and Veronica spp. are mentioned by Thurston (1960, 73) as having remained viable for 58 years in arable soil. The period of survival in a recognisable state is presumably even longer than the duration of viability. Ødum (1967, 63) was even able to germinate seeds from Mediaeval deposits; their survival seems due to damp conditions and oxygen deficiency.

| Species | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 132 | 135 |
|---|---|---|---|---|---|---|---|---|---|---|
| *Polygonum convulvulus* | 7 | | | | | | 1 | 2 | 1 | |
| *Polygonum aviculare* | | | | | | | 1 | | | |
| *Rumex* spp. | | | | | | 1 | | | | |
| *Atriplex patula* | 3 | 6 | 1 | 1 | | 2 | 4 | | 3 | |
| *Chenopodium album* | | | | | | | | 1 | | |
| *Melandrium* sp. | 2 | | | | | 1 | | 1 | | |
| *Stellaria media* | 3 | | | 1 | 9 | 1 | | 7 | 1 | |
| *Caryophyllaceae* indet. | | | 1 | | | 1 | 1 | | | 1 |
| *Brassica/Sinapis* sp. | 4 | | | | | | 2 | 1 | | |
| *Papaver rhoeas* | | | | | | | | | | 1 |

Table 2.4.2; Modern fruits and seeds recovered by flotation from archaeological deposits from Site R7, a Bronze Age barrow on Easton Down, Hants.

Samples 101, 102, 104, 107 and 108 are from cremations.
Sample 135 is from an early pit sealed by the mound.
Sample 105 is from the barrow ditch.
The remaining samples come from adjacent features, possibly of the Iron Age.

Old Down Farm

| Species | Topsoil(1)to9cm | Topsoil(2)to18cm | Subsoil |
|---|---|---|---|
| *Triticum cf. spelta* | - | - | 1 |
| *Lapsana communis* | - | 4 | 1 |
| *Polygonum aviculare* | 11 | 2 | 5 |
| *Atriplex cf. patula* | 15 | 12 | 12 |
| *Sonchus asper* | - | 1 | - |
| *Stellaria media* | - | 2 | - |
| *Brassica* sp. | 1 | - | - |
| *Trifolium* sp. | - | 1 | - |
| *Compositae* indet. | 2 | 3 | - |
| Indeterminate. | 6 | 1 | - |

Portway

| Species | Topsoil (1)to15cm | Topsoil (2)to30cm | Subsoil | Posthole |
|---|---|---|---|---|
| *Veronica hedaerifolia* | - | - | - | 1 |
| *Veronica polita* | 2 | - | - | 2 |
| *Lapsana communis* | 5 | 3 | - | 3 |
| *Atriplex cf. patula* | 3 | 1 | 3 | 1 |
| *Polygonum aviculare* | 45 | 55 | 10 | 1 |
| *Medicago lupulina* | 1 | 2 | 1 | 2 |
| *Stellaria media* | 3 | - | - | - |
| *Sherardia arvensis* | 1 | - | - | - |
| *Umbelliferae* indet. | 2 | - | - | - |
| Indeterminate | 5 | - | - | - |
| Barley straw | + | - | - | - |

Table 2.4.3; Modern fruits, seeds etc. recovered by flotation from samples of subsoil and topsoil at Portway and Old Down Farm.

continued overleaf...

The topsoil is divided into two portions:

At Old Down Farm, Topsoil (1) signifies the portion from the soil surface to a depth of 9cm., and Topsoil (2) from 9 to 18 cm.

At Portway, Topsoil (1) is from the soil surface to a depth of 15 cm. and Topsoil (2) from 15 to 30 cm.

The numbers of seeds are those recovered from soil volumes of 500cc. in each case.

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Despite such examples as these the writer is inclined to disregard all uncarbonised seeds from chalk soils. There can never be any definite evidence of their antiquity, and it seems that they are far more likely to be relatively modern contaminants. There are, of course, a few exceptions to this. An example is the cess pit at Owslebury which, though dry, produced uncarbonised fruitstones of a species of _Prunus_ and a complete spikelet of a hulled wheat, both apparently preserved by impregnation with mineral salts. It is also possible that seeds of _Sambucus nigra_ may survive in a recognisable state for very long periods. They were, for example, the only seeds present in samples of peaty soil beneath the Roman deposits at Brook Street, Winchester, where the possibility of contamination may be ruled out.

However, although one can discount most uncarbonised seeds from aerobic soils with some confidence, it is not necessarily safe to assume that all carbonised seeds are ancient. Keepax (1976) notes that modern grain lost during harvesting may fall to the ground and become carbonised during stubble burning. It could then become incorporated into archaeological deposits by one of the agencies discussed above. One would, however, expect to find at least small quantities of carbonised grain or straw in topsoil samples if this was happening on any given site. Contamination can never be totally eliminated. However, if recovery techniques are critically examined extraneous contamination can be reduced to a minimum; and if topsoil samples are inspected some idea of the _in situ_ contamination can be gained. By these means modern intrusive plant material can be detected and separated from the ancient fruits and seeds.

# CHAPTER 3. THE PLANT REMAINS EXAMINED

## 3.1 Introduction

Before describing in detail the fruits, seeds and other macroscopic plant remains examined in this study it seems useful to consider briefly the process of identification in rather more general terms, both to describe the means by which identifications were made and to review some problems of identification.

(a) The cereals. The identification of carbonised cereals is discussed at length by Renfrew (1973) and Van Zeist (1970, 49), to name only two of the more recent accounts. In addition the early papers of Helbaek (1952, a,b), in which the differentiation of the various species of 'glume wheats' on the basis of grain and chaff morphology is discussed, proved to be of considerable assistance. All identifications, however, were ultimately made by comparison with modern reference material. The condition of cereal grains has often made approximate identification necessary, with varying degrees of confidence and precision. The following terminology is used throughout;

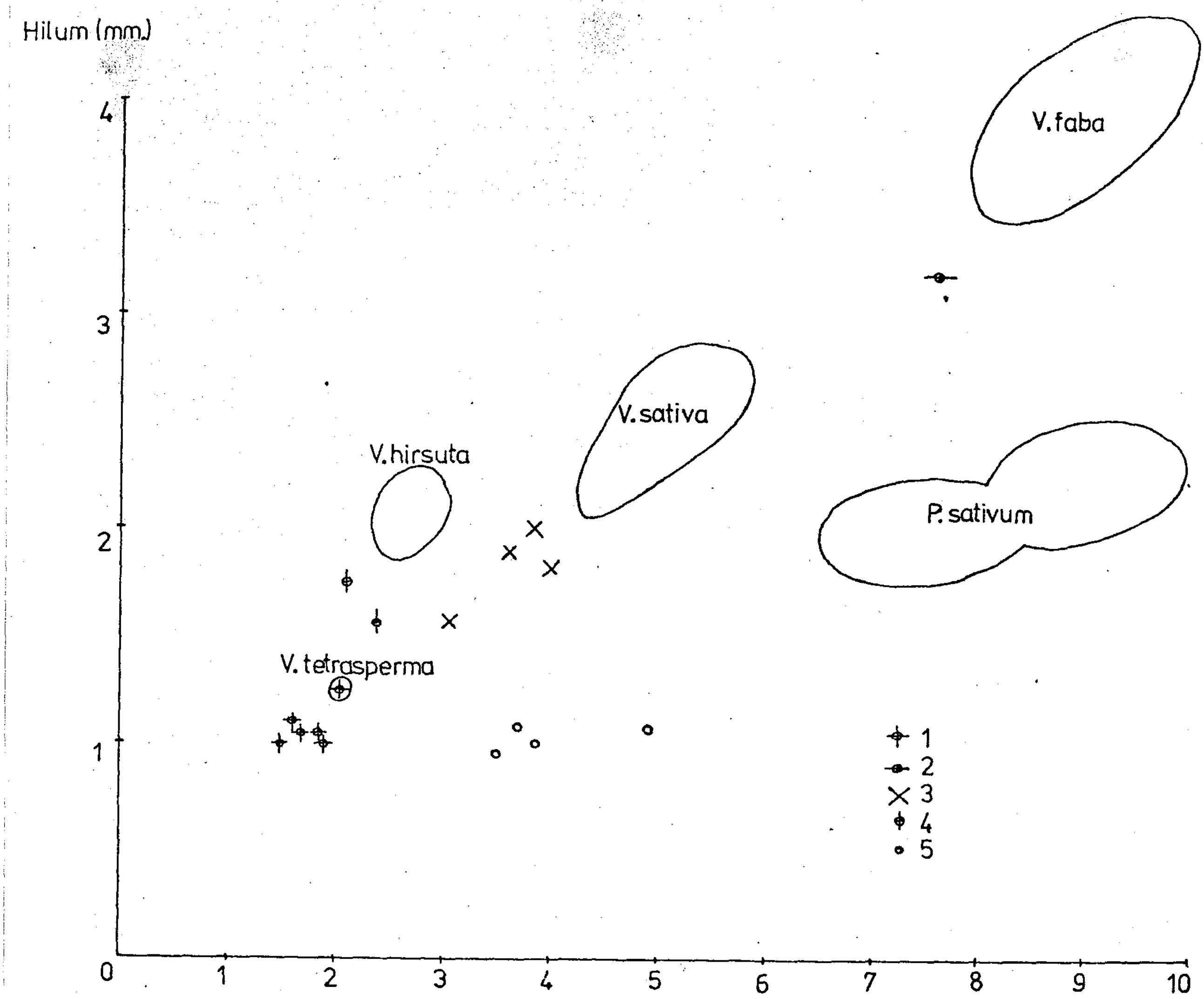
| | |
|---|---|
| Cereal *indet.* | Unidentified cereal grain, or fragment comprising more than half of a grain. Smaller fragments are not normally noted. |
| *Hordeum* sp. | Barley grain, either too puffed to be identified as hulled or naked; or hulled symmetrical grain which could be from two- or six-row barley. Normally the latter, although the description in the text should clarify this. |
| *Hordeum vulgare* | Barley grains, both median and lateral, hulled unless otherwise specified. |
| *Triticum* sp. | Wheat grains, either eroded and damaged, or of indistinct form. |
| *Triticum aestivum*<br>*Triticum spelta*<br>*Triticum dicoccum* | Wheat grains characteristic of these three species. It should be emphasised that an identification based upon grain morphology alone is always tentative; spikelet fragments are required for certain identification. Only very distinctive grains have therefore been identified to species in the absence of chaff. |

Measurements of length (L), breadth (B), and thickness (T) have been made and the indices L:B (100 x L/B) and T:B (100 x T/B) calculated. The simple ratios have been multiplied by a factor of 100 throughout in order to give integral figures. They are perhaps the simplest and most objective means of describing the shapes of grains. Obviously only grains in good condition have been measured, and as a rule very small samples have been ignored from this point of view. Sample variance ($s^2$) is given in the case of the larger samples.

(b) Legumes. The identification of these seeds depends almost entirely upon the relationship between maximum cotyledon length and hilum length, and individual species in a mixed deposit of legumes can only be reliably identified if both features survive, apart from those species with a distinctive overall form e.g. *Lens esculenta*. Figure 3.1.1. illustrates this relationship for modern reference material and for carbonised seeds examined in this study. It is apparent that the two dimensions decrease roughly to the same extent during carbonisation, so the overall proportions of the seeds of these species remain approximately the same.

Carbonised seeds lacking hilums are unfortunately much more common. Spherical eroded seeds are described tentatively as large vetch (*Vicia* sp. (1)) or small vetch (*Vicia* sp. (s)).

(c) Other species, wild and cultivated. Identifications were usually made by initially following the key of Katz, Katz and Kipiani (1965) or consulting the illustrations of Beijerinck (1947), unless the family or genus in question was immediately obvious. Also useful at this stage were the illustrated articles of Van Zeist (1974) and Knorzer (1973b) and the identification manuals of Bertsch (1941) and Parkinson and Smith (1914). Though these were useful for suggesting possibilities, positive identification was made only by comparison with modern reference material.




<u>Figure 3.1.1</u>; The relationship between hilum length and cotyledon length in carbonised and fresh specimens of the common legumes.
1. Specimens of *Vicia tetrasperma* from Portway.
2. Specimens of *Vicia faba* var. *minor*. from Fingringhoe, Essex. (Murphy, forthcoming a).
3. Specimens of *Vicia sativa* from Owslebury.
4. Specimens of *Vicia hirsuta* from Owslebury and Portway.
5. Specimens of *Pisum sativum* from Owslebury.

The solid lines enclose areas within which the dimensions of modern reference specimens fall.

The sole exception to this was the case of the grass caryopses from waterlogged deposits, which were identified using Körber-Grohne's key (1964). There were too few of these to justify the time which would have been spent in the process of chemically treating caryopses from the reference collection. Nomenclature is that of Clapham, Tutin and Warburg (1962), where appropriate, and the abbreviations sp. (species) and cf. (confer - compare) are used in the sense described by Dickson (1970, 250).

(d) Explanation of the arrangement of data. Fruits and seeds of cultivated and exploited plants from each site are described separately and the following information is included in each section.

(1) Grid reference of site. All sites are described in section 1.6, and the locations of the Hampshire sites are shown in the maps Figs. 1.1.1; 1.2.1; 1.3.1; 1.6.1 and 1.6.2.

(2) Soil type and the means of preservation of the botanical material.

(3) Brief description of the archaeological contexts from which the samples come.

(4) The sampling method (see 2.1 for general remarks).

(5) The flotation method (see 2.2 for more detail and discussion).

(6) Table listing all fruits, seeds etc. recovered and identified.

(7) Detailed description of the fruits and seeds of cultivated plants and of those wild plants which were probably exploited. The weed seeds from all sites are described collectively in the final section 3.14.

So far as is possible Tables 3.2.0 - 3.13.0 are drawn up in a uniform manner.

The following abbreviations are used in these Tables:

| | | | |
|---|---|---|---|
| a | achene | indet | indeterminate |
| ca | caryopsis | m | mericarp |
| cn | culm node | ns | nutshell |
| cs | cone scale | nu | nutlet |
| cy | cypsela | ps | pseudocarp |
| end | endocarp | ri | rachis internode |
| fb | floret base | s | seed |
| frag | fragment | spf | spikelet fork |
| fr | fruit | spk | spikelet |
| fs | fruitstone | tu | tuber |
| gb | glume base | | |

In each table vertical columns correspond to the sample numbers and horizontal rows to particular organs of the different species. Cereals appear in the upper rows, with legumes and other cultivated plants below them. Caryopses of weed grasses follow, with fruits and seeds of other weeds below this, the order of families being that of Clapham, Tutin and Warburg (1962). Deviations from this overall order have been made in the interests of clarity, where cereals are relatively unimportant or absent, or where cultivated plants in general are in the minority. Each Table includes an 'Indeterminate' row where unidentified fruits and seeds are listed. The lowest row gives information about the sorting of each sample, where appropriate. Unless otherwise indicated it can be assumed that the fruits and seeds listed were produced by sorting right the sample in question. Some samples from Owslebury had been sorted, and seeds extracted, (the residue being discarded), before the writer received them. Such samples are indicated by a letter 'S'.

The tables frequently consist of more than one sheet. Table 3.2.0, for example, which lists fruits and seeds recovered from samples from Owslebury consists of seven sheets. These correspond to samples from the six site phases and sub-phases together with a sheet of undated samples.

3.2 Owslebury SU 525 246

Soils and preservation. The soil is derived from the Upper Chalk, upon which the site stands. Preservation is normally by carbonisation, although a few seeds survive in a mineralised state, in samples Q350 and Q439 from late Roman cess pits.

Contexts. The site is subdivided into areas designated by letters L,Q,N, R,S,T.

| Storage pits | Cess pits | Pit complexes | Quarries | Ditches | Post holes | Corn dryer/ hearth |
|---|---|---|---|---|---|---|
| Q 49,317 | 106,113,117 289,296,325 346,350,431 439 | 387,418 441,449 452 | 146,147 186,223 247,254 255 | 110,128 135,167 184,256 270,278 285,291 321,354 429 | | |
| L 5,11,18,20 99,100,113 196,203,226 234,240,251 256,260,264 265 | | | 166,224 | 75,114 210 | | 160 |
| R 160,166,170 184,217,233 282,288,296 369 | | 49,81,93 97,129 138,213, 232,168 | 203 | 108,40 230,378 31,44,283 216 | 279 | |
| S 15,33,514 536 | | 153 | | 6,14,18, 19,20,29, 36,41,42, 46,48,50 53,58,62 100,101,104 118,205,280 302,313,239 332,361,363 378,556,616 620 | | 264 |
| T | | | | 7,12,32,108 | | |

Sampling. Samples were taken when charcoal was visible in the soil. No constant sample size was used, and it is now impossible to reconstruct the volumes sampled. 128 dated samples containing carbonised fruits and seeds were recovered, as well as 4 undated ones.

Flotation. Samples were floated in water in an oil drum on the site (see Collis, undated), using manual agitation.

| | L | L | L | L | R | R | R | R | R | R | R | R | S | S | S | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample number | 114 | 118 | 166 | 166J | 93 | 97D | 108H | 129H | 138D | 168 | 213E | 369 | 15 | 33 | 42 | 153 |
| Cereal ca | 2 | 20 | 3 | 60 | 2 | 1 | 1 | | 2 | 1200 | 3 | 3 | 8 | 1 | 2 | 38 |
| Hordeum sp. ca | 1 | | 1 | | | | | 1 | | | | 2 | 5 | | 1 | |
| Hordeum vulgare ca | | | | 9 | | | | | | 192 | 3 | | | | | 12 |
| Triticum sp. ca | | | 1 | | | | | | | 97 | | | 1 | 1 | | 8 |
| Triticum spelta-type ca | | | | 8 | | | | 1 | | 210 | 3 | 1 | | | | 4 |
| Triticum dicoccum-type ca | 1 | | | | | | | 1 | | | | | | | | 2 |
| Triticum aestivum ca | | | | | | | | | | | | | | | | |
| Avena sp. ca | | | | 3 | | | | | | 1 | | | | | | 1 |
| Secale cereale ca | | | | | | | | | | | | | | | | |
| Triticum spelta spf | | | | | | | | | | | | | | | | |
| Triticum dicoccum spf | | | | | | | | | | | | | | | | |
| Triticum spelta gb | | | | | | | | | | | | | | 1 | | 1 |
| Triticum dicoccum gb | | | | | | | | | | | | | | | | |
| Triticum sp. gb | | | | | | | | | | | | | | | | |
| Hordeum sp. ri | | | | | | | | | | | | | | | | |
| Avena cf. fatua fb | | | | | | | | | | | | | | | | |
| Cereal cn | | | | | | | | | | | | | | 1 | | |
| Vicia faba minor s | | | | | | | | | | | | | | | | 1 |
| Vicia sativa s | | | | | | | | | | | | | | | | |
| Vicia hirsuta s | | | | | | | | | | | | | | | | |
| Vicia sp. s | | | | | | | | | | | | | | | | |
| Pisum sativum s | | | | | | | | | | | | | | | | |
| Leguminosae s | | | | | | | | | | | | | | | | |
| Sambucus nigra s | | | | | | | | | | | | | | | | |
| Pyrus malus fs | | | | | | | | | | | | | | | | |
| Prunus sp. fs | | | | | | | | | | | | | | | | |
| Corylus avellana ns | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus ca | | | | 3 | | | | | | | | | 2 | | | 1 |
| Arrhenatherum tuberosum tu | | | | | | | | | | | | | | | | |
| Gramineae (s) ca | | | | 60 | | | | | | | | | | | | |
| Gramineae (l) ca | | | 1 | | | | | | | 1 | | 1 | | | | |
| Ranunculus sp. a | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. s | | | | | | | | | | | | | | | | 1 |
| Agrostemma githago s | | | | | | | | | | | | | | | | |
| Valerianella dentata s | | | | | | | | | | | | | | | | |
| Chenopodium sp. s | | | | | | | | | | | | | | | | |
| Chenopodium album s | | | | | | | | | | | | | | | | 1 |
| Atriplex patula/hastata s | | | | | | | | | | | | | | | 1 | 8 |
| Chenopodiaceae s | | | | | | | | | | | 1 | | | 1 | | 1 |
| Rumex sp. nu | 1 | | | 5 | | | | | 2 | | 1 | | | 1 | | |
| Polygonum convolvulus nu | | | | | | | | | | | | | 1 | | | |
| Polygonaceae nu | | | | | | | | | 6 | | | | 1 | | | |
| Galium aparine fr | | | | | | | | | 1 | | | | | 1 | | 1 |
| Indeterminate | | | | | | | | | | 1 | | | 1 | | | |
| % fine fraction sorted | S | S | S | S | 100 | 100 | 10 | S | 100 | 25 | 100 | 25 | 15 | 25 | 100 | 25 |

Table 3.2.0: Fruits, seeds etc. identified in samples from Owslebury.
Sheet 1: Phase 1(i). 3rd. century B.C.

Table 3.2.0: Fruits, seeds etc. identified in samples from Owslebury.
Sheet 2: Phase 1(ii). 2nd. century B.C.

| | | L | L | L | L | L | L | L | L | L | L | L | L | L | R | R | R | R | R | R | ? | ? | R | ? | S | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample number | | 11 | 18 | 20 | 99 | 100 | 113 | 203 | 226 | 234 | 251 | 256 | 260 | 265 | 160 | 166 | 170 | 184 | 217 | 233 | 282 | 283 | 296 | 104 | 205 | 50 |
| Cereal | ca | 20 | 20 | 40 | | 30 | 2 | 20 | 40 | 1 | 30 | 40 | 4 | 110 | 12 | 2 | 8 | 10 | | 60 | 7 | 13 | 30 | 1 | 1 | 60 |
| Hordeum sp. | ca | 5 | | | 1 | 2 | | | | | | | | | 9 | | 3 | | | | | | | | | 14 |
| Hordeum vulgare | ca | | 10 | 11 | | | 4 | | 6 | | 8 | 22 | | 38 | | | | 5 | 5 | 48 | 4 | 3 | 13 | 2+ | | |
| Triticum sp. | ca | | 1 | | 1 | | | | 3 | | | 7 | | 7 | 6 | 1 | 2 | | | | | | 4 | | | 22 |
| Triticum spelta -type | ca | 3 | | 5 | | 8 | | | | | 6 | | | 3 | 1 | | | | | 24 | | | 1 | | | |
| Triticum dicoccum -type | ca | | | | | | | | | | | 2 | | 21 | 3 | | | 6 | | | 3 | 2 | 3 | | | |
| Triticum aestivum | ca | | | | | | | | | | | | | | | | | | | | | | | | | |
| Avena sp. | ca | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secale cereale | ca | | | | | | | | | | | | | 4 | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | | | | 2 | | | | | | | | | | | | | | | | | | 3 | | 2 |
| Triticum dicoccum | gb | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum sp. | gb | | | 2 | | | | | | | 1 | | | | | | | 1 | | | | | | | | |
| Hordeum sp. | ri | | | | | | | | | | | | | | | | | | | | | | | | | |
| Avena cf. fatua | fb | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cereal | cn | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia faba minor | s | | | | | | 37 | | | | | | | | | | | | | | | | | | | |
| Vicia sativa | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia sp. | s | | | 1 | | | | | | | | | | | | | | | | | | 1 | | 1 | | |
| Pisum sativum | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leguminosae | s | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrus malus | fs | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prunus sp. | fs | | | | | | | | | | | | | | | | | | | | | | | | | |
| Corylus avellana | ns | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | 1 | | 8 | | 1 | 1 | | 8 | | | 17 | | | 1 | 3 | | 1 | | 2 | 1 | | | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| Gramineae (s) | ca | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gramineae (l) | ca | | | | | | | | | | | | | | | | | | | 1 | | | 1 | | | 1 |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | 1 | | | | 4 | | | 7 | | | | | |
| Agrostemma githago | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | | | | | | | | 6 | 1 | | | | | | | | 1 |
| Atriplex patula/hastata | s | | | | | 2 | | | | 2 | | | | | | | 14 | 15 | | 2 | 7 | | | | 9 | 21 |
| Chenopodiaceae | s | | | 14 | | | | | | | 5 | | | | | | 2 | 13 | | 2 | | | | | | 3 |
| Rumex sp. | nu | | 5 | 4 | | | | 8 | 12 | | 3 | 1 | | 14 | | | 1 | 1 | | 11 | 5 | | 1 | | | |
| Polygonum convolvulus | nu | | 2 | 5 | | 6 | | 2 | 2 | 1 | 7 | 9 | | 11 | 2 | | | 98 | | 2 | 9 | | | | | |
| Polygonaceae | nu | | 1 | | | 8 | | 2 | | 1 | 20 | 8 | | 1 | 1 | | | 3 | | | | 4 | | | | |
| Galium aparine | fr | | 9 | 19 | | 9 | 2 | 2 | 13 | | 24 | 12 | | 17 | 4 | | 2 | 32 | 2 | 7 | 4 | | 1 | | | 1 |
| Indeterminate | | | | 2 | | | | | | 1 | | | | | | | | | | 1 | | 1 | | | | |
| % fine fraction sorted | | 10 | 50 | 50 | S | 50 | S | S | S | S | 25 | 100 | 100 | S | 25 | S | 25 | 50,10 | 100 | 20 | 10 | 50 | 10 | 50 | 50 | 33 |

| | | L | L | L | L | N | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | T | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample number | | 196 | 224 | 240 | 264 | Bur. | 6A | 18J | 19 | 20 | 29 | 41 | 58 | 62 | 100 | 101 | 329 | 361 | 363 | 514 | 536 | 556 | 12F | 323 |
| Cereal | ca | 4 | 70 | 19 | 40 | | 80 | 350 | 75 | 5 | 19 | 270 | 2 | 6 | 5 | 110 | 3 | 2 | 10 | 2 | 4 | 6 | 1 | 13 |
| Hordeum sp. | ca | 1 | | | | 1 | | | 14 | | | | | 1 | | 33 | 2 | | | | | | | |
| Hordeum vulgare | ca | | 25 | 17 | 13 | | 11 | 1190 | | | 31 | 663 | 508 | | | | | 14 | 10 | 2 | 2 | | | 11 |
| Triticum sp. | ca | | | 3 | | | | 16 | 13 | 1 | 3 | 2 | 4 | 1 | 2 | 45 | | | 15 | | | | | 5 |
| Triticum spelta -type | ca | | 7 | | 7 | | 30 | | 4 | | | | | | | 17 | | | 2 | 2 | | | | |
| Triticum dicoccum -type | ca | | | | | | | | 2 | | | | | | | 1 | | | 1 | | 2 | | | |
| Triticum aestivum | ca | | | | | | | | 2 | | | | | | | | | | | | | | | |
| Avena sp. | ca | | 1 | | | | | 1 | | | | | | | | | | | | | | | | 1 |
| Secale cereale | ca | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | | | | | 1 | | | 1 | | | | | | | | | 2 | | | | | 2 |
| Triticum dicoccum | gb | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum sp. | gb | | | | | | | 1 | | | | | | | | 4 | | | | | 1 | | | 1 |
| Hordeum sp. | ri | | | | | | | | | | | | | | | | | | | | | | | |
| Avena cf. fatua | fb | | | | | | | | | | | | | | | | | | | | | | | |
| Cereal | cn | | | | | | | | | 1 | 1 | | | | | | | | | | | | | 1 |
| Vicia faba minor | s | | | | | | | | | | | | | | | 4 | | 1 | | | | | | |
| Vicia sativa | s | | | | | | | | | | | | 1 | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia sp. | s | | 16 | 1 | 3 | | | 1 | | | | | | | | | | | | | | | | |
| Pisum sativum | s | | | | | | | | | | | | | | | | | | | | | | | |
| Leguminosae | s | | | | | | | | 1 | | | | | | | | | | | | 1 | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrus malus | fs | | | | | | | | | | | | | | | | | | | | | | | |
| Prunus sp. | fs | | | | | | | | | | | | | | | | | | | | | | | |
| Corylus avellana | ns | | + | | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | | | | 1 | 1 | | 1 | 1 | | | | | 6 | | | 6 | | 1 | 1 | | 1 |
| Arrhenatherum tuberosum | tu | | 1 | | | | | 1 | | | | | | | | | | | | | | | | |
| Gramineae (s) | ca | | | | | | | | | | | | | | | | | | | | | | | |
| Gramineae (l) | ca | | | | | | 1 | 1 | 1 | | | | | | | 4 | | | | | | 1 | 1 | 5 |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | 3 | | | | | | | | | | | | | | | | |
| Agrostemma githago | s | | | | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | s | | | | | | | 1 | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | | | | | | | 1 | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | | 19 | | 5 | | | | | | 4 | | 9 | [illegible] | 2 | | 2 | | 1 |
| Chenopodiaceae | s | | | | | | | 8 | | 1 | | | | | | 10 | | | | | | | | |
| Rumex sp. | nu | | | | | | | | | 3 | | | | | | 1 | | | | | 3 | | | 1 |
| Polygonum convolvulus | nu | | | | | | 2 | | | 1 | | 1 | | | | 1 | 1 | | | | 1 | 13 | | 2 |
| Polygonaceae | nu | | 1 | | | | | 2 | | | | | | | | | | | | | | | | |
| Galium aparine | fr | | | | 1 | | 1 | 1 | 1 | | | 1 | | | 1 | | | 2 | | 1 | 1 | 5 | | 1 |
| Indeterminate | | | | | | | 1 | 1 | | | | | | | | | | | | | 2 | | | |
| % fine fraction sorted | | S | S | 25 | 50 | S | S | 20 | 100 | 50 | 25 | S | 50 | 50 | 25 | 50 | 100 | 50,20 | 50 | 5 | 25 | 50,25 | 100 | 100 |

Table 3.2.0: Fruits, seeds etc. identified in samples from Owslebury.
Sheet 3: Phase II(i). 1st. century B.C.

| | | L | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | R | R | R | R | S | S | S | S | S | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample number | | 5 | 110A | 110C | 135A | 167Q | 184N | 184Q | 256 | 278 | 354 | 387A | 387G | 387J | 387T | 418H | 441G | 449K | 40L | 203 | 230A | 378 | 118 | 313G | 313J | 378F | 616 | 620 |
| Cereal | ca | 190 | | 1 | 1 | | 140 | 1 | 2 | 38 | 450 | 45 | 300 | 60 | 110 | | 4 | 3 | 1 | 3 | 75 | 3 | 19 | 40 | 20 | 3 | 57 | |
| Hordeum sp. | ca | | | 1 | | 1 | | | | | | | | | | | 1 | | | 1 | 11 | | | 2 | | | | |
| Hordeum vulgare | ca | 254 | 3 | | | | 68 | | 2 | 14 | 442 | 7 | 69 | 13 | 53 | | | | | | | | 8 | | | | 110 | 4 |
| Triticum sp. | ca | 6 | 4 | | | | 18 | | | | 23 | | 8 | | | | | | | | 17 | | | | 6 | 4 | 3 | |
| Triticum spelta-type | ca | 90 | 2 | | | 2 | | | | 15 | 14 | 17 | 60 | 33 | 79 | 4 | 2 | 1 | | | 6 | | 3 | 6 | | | | |
| Triticum dicoccum-type | ca | 9 | | | | | | | | | 4 | | | 6 | 18 | | | | | | | | | | | | | |
| Triticum aestivum | ca | 1 | | | | | | | | | | 1 | 11 | 3 | 8 | | | | | | 1 | | | | | | | |
| Avena sp. | ca | 2 | | | | | | | | | | | | | 3 | | | | | | | | | 2 | 2 | | | |
| Secale cereale | ca | 4 | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | | | | | | | | | | | | | 3 | | | | | | 3 | | | | | 7 | | |
| Triticum dicoccum | gb | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum sp. | gb | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hordeum sp. | ri | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Avena cf. fatua | fb | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cereal | cn | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia faba minor | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia sativa | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pisum sativum | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Leguminosae | s | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 1 | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrus malus | fs | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prunus sp. | fs | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Corylus avellana | ns | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | | | | | | | | | | | | | | | | | | 1 | | 2 | | 2 | 2 | | 2 |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gramineae (s) | ca | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gramineae (l) | ca | 14 | | | | | 1 | | | | | | 3 | | | | | | | | | | 3 | | 19 | 2 | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | 11 | | | | | | | |
| Brassica/Sinapis sp. | s | 3 | | | | | | | | | | | | | 4 | | | | | | | | | | | | | |
| Agrostemma githago | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | | | | | | | | | | | | | | | | | | 4 | 4 | | | |
| Chenopodiaceae | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rumex sp. | nu | 3 | | | | | | | | | | | | | | | | | | | | | | | 1 | | | |
| Polygonum convolvulus | nu | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Polygonaceae | nu | 3 | | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| Galium aparine | fr | 3 | | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| Indeterminate | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| % fine fraction sorted | | 100 | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | 100 | 100 | 25 | 25 | 50 | 100 | 100 | 25 | 100 |

Table 3.2.0: Fruits, seeds etc. identified in samples from Owslebury.
Sheet 4: Phase II(ii). 1st. century A.D.

Table 3.2.0: Fruits, seeds etc. identified in samples from Owslebury.
Sheet 5: Phase III. c. 100 A.D. - 250 A.D.

| | | L | Q | Q | Q | Q | Q | Q | Q | R | R | R | R | R | R | S | S | S | S | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample number | | 750 | 49 | 254 | 270 | 285G | 291 | 317 | 321 | 311 | 44A | [illegible]1 | 42 | 232 | 283C | 14 | 56 | 280B | 332F | 332[illegible] | 7 |
| Cereal | ca | 60 | 20 | 270 | 1 | 110 | 150 | 40 | 150 | 5 | 340 | [illegible]30 | 15 | 2 | 1 | 900 | 200 | 4 | 1 | 1 | 10 |
| Hordeum sp. | ca | 3 | | | | | | 4 | | 3 | | | | | | | | | 1 | | 1 |
| Hordeum vulgare | ca | | 12 | 93 | | 133 | 38 | | 64 | | 102 | 89 | 15 | 2 | | 637 | 110 | | | | |
| Triticum sp. | ca | 3 | 6 | 5 | | | 26 | 27 | 22 | 2 | 11 | 15 | | 1 | | 260 | 14 | 2 | | | 2 |
| Triticum spelta | ca | | | 45 | 1 | | 32 | | | | 215 | | 5 | | | 38 | | 3 | | | 4 |
| Triticum dicoccum | ca | | | 4 | | | 4 | | | | | | | | | 2 | | | | | |
| Triticum aestivum | ca | | | | | | | | | | 2 | | | | | | | | | | |
| Avena sp. | ca | 1 | | | | 2 | | | | | | | | | | 3 | | | | | |
| Secale cereale | ca | | | | | | 2 | | | | 2 | | | | | 18 | 2 | | | | |
| Triticum spelta | spf | | | | | | | | | | | | | | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | | | | | | | | | 45 | | | | | 70 | 25 | | | | 1 |
| Triticum dicoccum | gb | | | | | | | | | | | | | | | 2 | | | | | 1 |
| Triticum sp. | gb | | | | | 1 | | | | | | | | | | | | | | | |
| Hordeum sp. | ri | | | | | | | | | | | | | | | | | | | | |
| Avena cf. fatua | fb | | | | | | | | | | | | | | | | | | | | |
| Cereal | cn | | | | | | | | | | | | | | | | | | | | |
| Vicia faba minor | s | | | | | | | | | | | | | | | | | | | | |
| Vicia sativa | s | | | | | | | | | | 2 | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | 1 | | | | | | | | | | |
| Vicia sp. | s | | | | | | | | | | | | | | | | 4 | | | | |
| Pisum sativum | s | | | | | | | | | | | | | | | | | | | | |
| Leguminosae | s | | | 3 | | | 4 | | | | 1 | 1 | | | | 16 | 1 | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | 2 | | | | | | | |
| Pyrus malus | fs | | | | | | | | | | | | | | | | | | | | |
| Prunus sp. | fs | | | | | | | | | | | | | | | | | | | | |
| Corylus avellana | ns | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | 1 | | | | | | | | | | | | | 6 | | | | | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | 1 | 1 | | | | 1 | | | | | |
| Gramineae (s) | ca | | | | | | | | 1 | | | | | | | | | | | | |
| Gramineae (l) | ca | 1 | 2 | 3 | | 1 | 1 | | 1 | | 3 | | | | | 10 | 3 | | | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | 1 | | | | | | | | 2 | | | | |
| Agrostemma githago | s | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | s | | | | | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | | | | | | | | | | 5 | | | | | |
| Chenopodiaceae | s | | | | | | | | | | | | | | | 1 | | 1 | | | |
| Rumex sp. | nu | | | | | | | | | | 1 | 1 | | | | 1 | 2 | | | | |
| Polygonum convolvulus | nu | | | | | | | | | | | | | | | 1 | | 1 | | | |
| Polygonaceae | nu | | | 1 | | | | | | | | | | | | | | | | | |
| Galium aparine | fr | 1 | | | | | | | | 2 | | 1 | | | | 3 | | | | | 1 |
| Indeterminate | | | | | | | | 1 | | | | | | | | | | | | | |
| % fine fraction sorted | | S | S | S | S | S | S | S | S | S | 50,80 | 10 | 25 | 25 | 100 | 33,5 | 10 | 50 100 | 100 | | 100 |

Table 3.2.0: Fruits, seeds etc. identified in samples from Owslebury.
Sheet 6: Phase IV. c. 250 A.D. - 400 A.D.

| | | L | L | L | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | Q | R | S | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample number | | 160 | 210A | 210Z | 106 | 113 | 117 | 188F | 146 | 147 | 186 | 223 | 247 | 255 | 289 | 296 | 325 | 346 | 350 | 429K | 431A | 439 | 439A | 439B | 452 | 216H | 264F | 3[illegible]H |
| Cereal | ca | 20 | 2 | 80 | 2 | 1 | | | | | | 750 | 90 | 450 | 130 | 350 | 350 | 210 | 9 | 40 | 40 | | 20 | 80 | 40 | 6 | 3 | 40 |
| Hordeum sp. | ca | | | [illegible] | | | | 2 | | 2 | | | | | 2 | | | | | | | | 1 | | | 2 | 2 | 1 |
| Hordeum vulgare | ca | 6 | 2 | | | | | | | | 4 | 42 | 18 | 89 | | 15 | 13 | 4 | | 4 | 6 | | | [illegible] | 5 | | | |
| Triticum sp. | ca | | | 22 | | 2 | 1 | | 10 | 2 | 11 | 276 | 5 | 51 | | 80 | 93 | 70 | | 4 | | | 8 | | | 1 | 3 | 13 |
| Triticum spelta -type | ca | 30 | 2 | | 1 | | | | 3 | | 12 | 152 | 45 | 32 | 35 | 69 | 92 | 28 | 7 | 11 | 6 | | | 12 | 7 | | | |
| Triticum dicoccum -type | ca | 4 | | | | | | | | | | 30 | 4 | 22 | 2 | 12 | 20 | 2 | | 1 | | | | | | | | |
| Triticum aestivum | ca | | | | | | | | | | 1 | 9 | | 11 | | 3 | 8 | 2 | | | | | | | | | | |
| Avena sp. | ca | 1 | | | | | | | | | | 3 | | | 2 | 10 | 23 | 10 | 1 | | | | | | | | | |
| Secale cereale | ca | 1 | | | | | | | | | | 1 | | | | | 2 | 1 | | | | | | | | | | |
| Triticum spelta | spf | | | 1 | | | | | | | | | | | 2 | | | | 1 | | | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | | | | | | | | | | 8 | | | 116 | 576 | 20 | 41 | | | 1 | | | 2 | | | | 1 |
| Triticum dicoccum | gb | | | | | | | | | | | 1 | | | 10 | | | | | | | | | | | | | |
| Triticum sp. | gb | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | |
| Hordeum sp. | ri | | | | | | | | | | | | | | 5 | 7 | | 1 | | | | | | | | | | |
| Avena cf. fatua | fb | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| Cereal | cn | | | | | | | | | | | 1 | | | 1 | 7 | 1 | | | | | | | | | | | |
| Vicia faba minor | s | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | |
| Vicia sativa | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia sp. | s | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | |
| Pisum sativum | s | | | | | | | | | | | 57 | | | | 16 | | | | | | | | | | | | |
| Leguminosae | s | | | | | | | | | | | | 3 | 4 | | | | | | | | | | | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrus malus | fs | | | | | | | | | | | | | | | | | | 8 | | | 1 | | | | | | |
| Prunus sp. | fs | | | | | | | | | | | | | | | | | | 5 | | | | | | | | | |
| Corylus avellana | ns | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | 1 | | | | | | | | 5 | | | 4 | 5 | 5 | 3 | | | | | | | | | | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gramineae (s) | ca | | | | | | | | | | | | | | | 28 | | | 1 | | | | | | | | | |
| Gramineae (l) | ca | | | | | | | | | | | 14 | 3 | 2 | 15 | | 27 | 14 | 6 | | 1 | | | 1 | | | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Agrostemma githago | s | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| Valerianella dentata | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | | | | | | | | | | | 1 | | 1 | | | | | | | | | |
| Chenopodiaceae | s | | | | | | | | | | | 2 | | | | | | | | | | | | | | | | |
| Rumex sp. | nu | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | 2 |
| Polygonum convolvulus | nu | | | | | | | | | | | | 1 | | 1 | | | | | | | | | | | | | 1 |
| Polygonaceae | nu | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | |
| Galium aparine | fr | | | 1 | | | | | | | | 1 | | | | | | | | | | | | | | | | |
| Indeterminate | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| % fine fraction sorted | | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | S | 100 | 50 | 50 |

| Sample number | | R 157P | R 279 | S 46 | S 48 | S 53 |
|---|---|---|---|---|---|---|
| Cereal | ca | 1 | 1 | 1 | 1 | 57 |
| Hordeum sp. | ca | 2 | | | | |
| Hordeum vulgare | ca | | | | | 177 |
| Triticum sp. | ca | | | | | |
| Triticum spelta | ca | 1 | 1 | | | 3 |
| Triticum dicoccum | ca | | | | | |
| Triticum aestivum | ca | | | | | |
| Avena sp. | ca | | | | | |
| Secale cereale | ca | | | | | |
| Triticum spelta | spf | | | | | |
| Triticum dicoccum | spf | | | | | |
| Triticum spelta | gb | | | | | |
| Triticum dicoccum | gb | | | | | |
| Triticum sp. | gb | | | | | |
| Hordeum sp. | ri | | | | | |
| Avena cf. fatua | fb | | | | | |
| Cereal | cn | | | | | |
| Vicia faba minor | s | | | | | |
| Vicia sativa | s | | | | | |
| Vicia hirsuta | s | | | | | |
| Vicia sp. | s | | | | | |
| Pisum sativum | s | | | | | |
| Leguminosae | s | | | | | |
| Sambucus nigra | s | | | | | |
| Pyrus malus | fs | | | | | |
| Prunus sp. | fs | | | | | |
| Corylus avellana | ns | | | | | |
| Bromus mollis/secalinus | ca | | | | | |
| Arrhenatherum tuberosum | tu | | | | | |
| Gramineae (s) | ca | | | | | |
| Gramineae (l) | ca | 1 | | | | |
| Ranunculus sp. | a | | | | 1 | |
| Brassica/Sinapis sp. | s | | | | | |
| Agrostemma githago | s | | | | | |
| Valerianella dentata | s | | | | | |
| Chenopodium sp. | s | | | | | |
| Chenopodium album | s | | | | | 2 |
| Atriplex patula/hastata | s | | | | | |
| Chenopodiaceae | s | | | | | |
| Rumex sp. | nu | | | | | |
| Polygonum convolvulus | nu | | | | | |
| Polygonaceae | nu | | | | | |
| Galium aparine | fr | | | | | |
| Indeterminate | | | | | | |
| % fine fraction sorted | | S | S | 50 | 50 | S |

Table 3.2.0: Fruits, seeds etc. identified in samples from Owslebury.
Sheet 7: Undated samples.

Botanical descriptions.

(a) Barley

The barley grains in these samples are mostly of a hulled six-row variety, Hordeum vulgare L. emend. Lam. A few specimens retain their lemmas and in some cases the basal part of the lemma awn is present, but finer features such as rachillas and spicules have not survived. The grains often retain the characteristic angular cross-section of hulled caryopses, but even puffed specimens have longitudinal lines on their dorsal sides marking the angles which formerly existed. Both straight grains from median spikelets and twisted specimens from lateral spikelets are present (Fig. 3,2.1 a,b). A small number of grains in sample S104 may be of naked barley, Hordeum vulgare var nudum, being much more rounded with traces of transverse wrinkling and with a thin raised line running along the ventral groove. These specimens are, however, poorly preserved and are only tentatively identified.

Measurements have been made of both median and lateral grains from the larger samples of better-preserved specimens and these appear in Table 3.2.1. Length (L), breadth (B) and thickness (T) are recorded, as are the indices derived from L, B and T.

Barley rachis internodes were recovered only from a few of the samples from site Q, always in association with large quantities of wheat chaff. In general they are in poor condition. A few bear traces of marginal pubescence, of indeterminate length. Although no intact specimens were found they seem to have been in the order of 3mm. long and are fairly slender. As no conspicuously broad internodes are present, it seems that a lax-eared barley is represented (Fig. 3.2.2 a,b).

Table 3.2.1.

*Hordeum vulgare*. Dimensions in mm. and indices. (N ≥10).

| | | L | B | T | L:B | T:B | |
|---|---|---|---|---|---|---|---|
| S 18J | N = 50 | | | | | | |
| min. | | 4.5 | 2.2 | 1.6 | 150 | 66 | |
| mean | | 5.64 | 2.88 | 2.34 | 201 | 83 | |
| max. | | 6.5 | 3.4 | 3.0 | 250 | 100 | |
| $s^2$ | | 0.270 | 0.076 | 0.109 | - | - | |
| S 41 | N = 50 | | | | | | |
| min. | | 4.3 | 2.0 | 1.6 | 166 | 70 | |
| mean | | 5.54 | 2.75 | 2.26 | 202 | 82 | - 1st century BC |
| max. | | 6.6 | 3.3 | 3.0 | 245 | 100 | |
| $s^2$ | | 0.289 | 0.077 | 0.098 | - | - | |
| S 58 | N = 50 | | | | | | |
| min. | | 4.9 | 2.3 | 1.9 | 159 | 68 | |
| mean | | 5.59 | 2.83 | 2.38 | 198 | 82 | |
| max. | | 6.6 | 3.3 | 3.0 | 227 | 100 | |
| $s^2$ | | 0.143 | 0.071 | 0.116 | - | - | |
| Q 354 | N = 40 | | | | | | |
| min. | | 4.8 | 2.0 | 1.8 | 157 | 66 | |
| mean | | 5.67 | 2.93 | 2.62 | 195 | 92 | |
| max. | | 6.9 | 3.6 | 3.1 | 275 | 120 | |
| $s^2$ | | 0.190 | 0.128 | 0.127 | - | - | |
| L 5 | N = 41 | | | | | | - 1st century AD |
| min. | | 4.3 | 2.1 | 1.7 | 154 | 74 | |
| mean | | 5.51 | 2.66 | 2.34 | 208 | 87 | |
| max. | | 7.1 | 3.2 | 3.1 | 288 | 104 | |
| $s^2$ | | 0.512 | 0.108 | 0.137 | - | - | |
| Q 285G | N = 32 | | | | | | |
| min. | | 4.5 | 2.3 | 2.0 | 145 | 67 | |
| mean | | 5.25 | 2.91 | 2.63 | 186 | 92 | |
| max. | | 6.2 | 3.5 | 3.2 | 207 | 120 | |
| $s^2$ | | 0.197 | 0.072 | 0.127 | - | - | |
| R 44A | N = 13 | | | | | | |
| min. | | 4.5 | 2.0 | 1.8 | 170 | 75 | - 100-250 AD |
| mean | | 5.25 | 2.70 | 2.36 | 197 | 88 | |
| max. | | 6.2 | 3.2 | 2.9 | 248 | 109 | |
| S 14 | N = 50 | | | | | | |
| min. | | 4.8 | 2.4 | 1.9 | 166 | 66 | |
| mean | | 5.62 | 2.85 | 2.30 | 197 | 80 | |
| max. | | 7.0 | 3.5 | 2.9 | 232 | 93 | |
| $s^2$ | | 0.233 | 0.081 | 0.066 | - | - | |
| Q 255 | N = 16 | | | | | | |
| min. | | 4.2 | 2.0 | 1.5 | 183 | 60 | |
| mean | | 5.26 | 2.61 | 2.09 | 216 | 87 | 250-400 AD |
| max. | | 5.8 | 3.0 | 2.3 | 238 | 100 | |
| S 53 | N = 27 | | | | | | |
| min. | | 4.2 | 2.2 | 1.7 | 166 | 66 | |
| mean | | 5.42 | 2.77 | 2.27 | 196 | 82 | Undated |
| max. | | 6.4 | 3.5 | 3.0 | 222 | 96 | |
| $s^2$ | | 0.317 | 0.131 | 0.087 | - | - | |

(b) Wheats

A large proportion of the grains in the samples are of a rather indistinct form and cannot be identified to species. However, it is possible to distinguish three main forms which correspond to distinct wheat species. Grains typical of spelt, Triticum spelta L., with blunt apices and broad, flat ventral sides are predominant in most samples. Grains of emmer, Triticum dicoccum Schübl. whilst in general tapering towards both ends and having a distinctive triangular cross section, sometimes markedly asymmetrical, are in practice impossible to separate totally from those of spelt, as grains intermediate in form are common. This problem is discussed in full by Helbaek (1952 a,b). Much more easily distinguished are the shorter plump grains of bread and club wheats, Triticum aestivum L. and Triticum aestivum L. grex. aestivocompactum Schiem. However, although grains of these two "species" are easily separated from those of spelt and emmer, the taxonomic distinctions between them are not sufficient to permit a total separation from a mixed population of grains. Van Zeist (1970, 53) describes them as T. aestivum sensu lato., and this nomenclature is used here.

Measurements of spelt-type and emmer-type grains appear in Tables 3.2.2. and 3.2.3. It is possible that selection of the more slender grains of emmer for measurement from a mixed spelt/emmer population may have distorted the metrical distributions of both species to some degree. In Table 3.2.4 appear the measurements and indices of bread/club wheat grains from sample Q 387K. Although both very short, rounded forms such as these and more elongate grains with their maximum widths just above the embryo occur in the samples, only the former are present in large enough numbers to make measurement worthwhile. Clearly carbonisation has had an effect in the production of such plump grains, but it is interesting to note that Jessen and Helbaek (1944, 37) suggest that grains of this type represent extinct short-grained forms of club wheat.

The wheat glume bases confirm the relative importance of spelt. The wide, strongly-nerved glume bases of this species, in which only the ventral vein is prominent, are always in the majority (Plate 1). Measurements across the glume base (Helbaek's Dimension B) have been made and are displayed in Figs. 3.2.4 and 3.2.5. The modal width at the level of the articulation is in the region of 1.20 - 1.30 mm. in all of the samples, and would be quite typical of spelt. Figs. 3.2.4 and 3.2.5 may be compared with similar graphs given by Helbaek (1952a, 218 and 1952b, 102) and Morrison (1959, 17). Typical glume bases of emmer are much less common. Intact spikelet forks are hardly present at all, and none are measurable. Sample Q350, however, produced a complete spikelet of spelt or emmer, not carbonised but in a mineralised sub-fossil state. It is very distorted and difficult to identify with confidence.

Table 3.2.2.

*Triticum spelta* and *spelta*-type grains. Dimensions and indices. (N ≥ 10).

| Sample | | L | B | T | L:B | T:B | Date |
|---|---|---|---|---|---|---|---|
| L 5 | N = 12 | | | | | | 1st century AD |
| | min. | 4.5 | 2.8 | 2.2 | 160 | 73 | |
| | mean | 5.60 | 3.11 | 2.60 | 182 | 84 | |
| | max. | 6.7 | 3.5 | 3.0 | 207 | 93 | |
| Q354 | N = 11 | | | | | | 1st century AD |
| | min. | 5.0 | 2.6 | 2.1 | 158 | 70 | |
| | mean | 5.52 | 2.85 | 2.73 | 181 | 86 | |
| | max. | 6.8 | 3.4 | 3.0 | 212 | 93 | |
| R 44A | N = 31 | | | | | | 100-250 AD |
| | min. | 4.0 | 2.1 | 1.7 | 159 | 73 | |
| | mean | 5.49 | 2.84 | 2.49 | 194 | 88 | |
| | max. | 6.7 | 3.5 | 3.0 | 244 | 100 | |
| | $s^2$ | 0.05 | 0.12 | 0.09 | - | - | |
| L 160 | N = 12 | | | | | | 250-400 AD |
| | min. | 4.6 | 2.4 | 2.2 | 167 | 80 | |
| | mean | 5.41 | 2.90 | 2.63 | 185 | 90 | |
| | max. | 6.2 | 3.3 | 3.0 | 197 | 100 | |
| Q 223 | N = 40 | | | | | | 250-400 AD |
| | min. | 4.7 | 2.5 | 2.0 | 146 | 70 | |
| | mean | 5.61 | 3.01 | 2.57 | 187 | 86 | |
| | max. | 6.5 | 3.5 | 3.2 | 233 | 100 | |
| | $s^2$ | 0.25 | 0.063 | 0.09 | - | - | |
| Q 296 | N = 16 | | | | | | 250-400 AD |
| | min. | 4.2 | 2.5 | 2.0 | 148 | 70 | |
| | mean | 5.29 | 3.05 | 2.67 | 173 | 87 | |
| | max. | 6.4 | 3.5 | 3.1 | 213 | 107 | |
| Q 325 | N = 31 | | | | | | 250-400 AD |
| | min. | 4.1 | 2.3 | 2.0 | 147 | 61 | |
| | mean | 5.44 | 2.93 | 2.55 | 187 | 87 | |
| | max. | 6.5 | 3.6 | 3.1 | 240 | 108 | |
| | $s^2$ | 0.27 | 0.11 | 0.10 | - | - | |

Table 3.2.3.

*Triticum dicoccum* - type grains. Dimensions in mm. and indices. (N ≥ 10).

Q 255 N = 10

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 4.3 | 2.0 | 2.0 | 190 | 83 |
| mean | 5.72 | 2.70 | 2.52 | 213 | 93 |
| max. | 7.0 | 3.0 | 3.0 | 238 | 100 |
| $s^2$ | 0.051 | 0.014 | 0.013 | - | - |

Table 3.2.4.

*Triticum aestivum (sensu lato)* - type grains. Dimensions and indices. (N ≥ 10).

Q 387K N = 10

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 3.3 | 2.5 | 2.3 | 105 | 74 |
| mean | 3.92 | 3.05 | 2.76 | 130 | 91 |
| max. | 4.2 | 3.9 | 3.0 | 140 | 100 |
| $s^2$ | 0.092 | 0.143 | 0.044 | - | - |

(c) Oats

The characteristic elongate, blunt ended caryopses of oats were found sporadically throughout the samples (Fig. 3.2.1 i,k). In general they are in poor condition; the surface of the grain with its hairs is rarely preserved. To determine whether wild or cultivated species of oats are represented it is necessary to inspect the floret bases to determine the mode of fracture from the pedicel. Unfortunately the only surviving floret base, from sample Q 223, is damaged. It is, however, probably of a species of wild oat, most likely Avena fatua L., (Fig. 3.2.2), as the distinctive 'sucker mouth' form of fracture seems to be represented. In Table 3.2.5 the dimensions and indices of oat grains from sample Q 346, the largest and best preserved sample of Avena caryopses are listed.

Table 3.2.5.
Avena sp. Q 346 N = 11

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 4.3 | 1.3 | 1.1 | 220 | 64 |
| mean | 5.56 | 1.91 | 1.61 | 294 | 85 |
| max. | 6.7 | 2.6 | 2.0 | 346 | 100 |
| $s^2$ | 0.617 | 0.132 | 0.069 | - | - |

(d) Rye

Grains of rye, Secale cereale L., are rather rare in these samples. 18 grains were, however, found in sample S14; this is the largest group. The grains are generally in very poor condition, having germinated before carbonisation. Although this has left them somewhat shapeless they can be distinguished from wheat grains by their elongate shape and large T:B ratio, so far as this can be determined. The best preserved specimen (Fig. 3.2.1j) has the typical asymmetry and blunt apex of rye grains. Measurements and indices of these caryopses from S14 are given in Table 3.2.6.

In some other samples a few isolated grains are tentatively identified as being of rye.

Table 3.2.6.

Secale cereale. Dimensions and indices. S14 N = 5

| L | B | T | L:B | T:B |
|---|---|---|---|---|
| 5.1 | 1.9 | 2.0 | 268 | 105 |
| 5.9 | 2.1 | approx2.0 | 280 | approx 95 |
| 5.3 | 2.0 | " 2.0 | 265 | " 100 |
| 5.6 | 1.0 | " 2.0 | 294 | " 105 |
| 5.5 | 1.6 | " 1.7 | 343 | " 106 |

(e) Horse bean

These beans, *Vicia faba* L. *var. minor*, are sufficiently distinctive to be identifiable even though their hilums have not survived. Although isolated specimens occur scattered throughout the samples only one large deposit, from sample L113, was found. It consists of 15 entire seeds and numerous fragments. They are large, oblong and laterally flattened with noticeable cheeks on either side of the former position of the hilum (Fig. 3.2.3 a,b). Most are somewhat distorted, but a measurement of length could be made of 12 specimens. The mean length is 8.6 mm., with a range from 7.5 - 9.6 mm. These are unusually large seeds.

(f) Vetch

The commonest seeds of the *Leguminosae* in these samples are of vetches, *Vicia sativa* L. Most are sub-spherical or slightly angular, and in no case has the hilum survived intact. Occasionally the loss of the hilum has left a smoother area which enables an approximate measurement of the size of this feature to be made (Fig. 3.2.3.e). These dimensions appear in Table 3.2.7.

Isolated cotyledons and eroded seeds, probably belonging to this species are very common.

Table 3.2.7. Dimensions in mm. of seeds of Vicia sativa

| | Length (mm). | Hilum length (mm). |
|---|---|---|
| L 224 | 3.6 | approx. 1.9 |
| | 3.8 | " 2.0 |
| | 4.0 | " 1.8 |
| R 44A | 3.05 | " 1.6 |

(g) Smaller vetches and tares

In general these proved impossible to identify, as the hilums had totally disappeared and the seeds are very eroded. In one case, however, a seed from R44A was identified as of *Vicia hirsuta* (L) S.F. Gray. It is 2.4 mm. in diameter with a very narrow hilum, about 1.6 mm. in length.

(h) Peas

The peas, *Pisum sativum* L. *var. arvense*, occur in quite large numbers in samples Q 233, Q 296 and S14. They have large triangular scars marking the former positions of their radicles and although the hilums are missing, small oval hollows mark their place and shape in a few cases (Fig. 3.2.3 c,d). Dimensions of these hollows and of the peas themselves appear in Table 3.2.8.

Table 3.2.8. Dimensions in mm. of peas, Pisum sativum.

| | Length (mm) | Hilum length (mm) |
|---|---|---|
| Q 296 | 3.8 | approx. 1.0 |
| | 3.5 | " 0.95 |
| Q 223 | 4.9 | " 1.1 |
| | 3.7 | " 1.1 |

(i) Fruits, nuts etc.

Elderberry (Fig. 3.2.3h).

Two seeds of elder, *Sambucus nigra* L., were found carbonised in sample R 232. They are flattened oval in shape with coarse, transversely ridged surfaces, 2.3 and 2.9 mm. in length. Uncarbonised seeds of this species are not uncommon in the samples, but they are not included in the sample lists as their antiquity is clearly questionable.

Apple (Fig. 3.2.3g).

Mineralised, sub-fossil apple seeds, *Malus sylvestris* L., were found in samples Q350 and Q439. All are fragmentary, and the mode of preservation appears to have caused distortion.

Cherry (Fig. 3.2.3f).

Five uncarbonised fruitstones, probably of the cherry, *Prunus avium* L., were identified from sample Q 350. They are preserved in a similar state to the apple 'pips', and like them are rather distorted. Four specimens have the following dimensions; 5.5 x 4.6 mm., 7.0 x 4.9 mm.; 5.5 x 4.8 mm. and length 5.9 mm.

Carbonised fruit

Sample L224 produced an entire carbonised fruit, a small "berry" or drupe with five sepals attached to its base.

*Corylus avellana* L.

Carbonised nut-shell fragments in samples L 224 and Q 317/319 are probably from this species.

(j) Weed seeds

The weed seeds recovered are listed in Table 3.2.0 and described below, (3.14).

Figure 3.2.1; Owslebury - Cereal caryopses.

a,b. *Hordeum vulgare*. S18J.
c. *Triticum spelta*. Q 223.
d. *T. spelta* (sprouted) Q 106
e. *Triticum dicoccum* Q387K
f. *Triticum dicoccum* Q 223
g,h. *Triticum aestivum* s.l. Q 387K
i,k *Avena* sp. S 14.
j. *Secale cereale* S14.
l. *Bromus mollis/secalinus*. S 14.

Figure 3.2.2; Owslebury - Cereal chaff.

a. *H. vulgare* rachis internodes Q 296.
b. " Q 289.
c. *Triticum spelta* spikelet fork Q 325.
d. *Triticum spelta* glume base Q 223
e. *Avena cf. fatua* flower base. Q 223

Figure 3.2.3; Owslebury - Legumes and fruitstones.

a,b. *Vicia faba* var. *minor* L 113.
c. *Pisum sativum* Q 223
d. *Pisum sativum* Q 296.
e. *Vicia sativa* R 44A
f. *Prunus cf. avium* Q 350
g. *Pyrus malus* (*Malus sylvestris*) Q 350
h. *Sambucus nigra* R 232.

Figure 3.2.4: Owslebury. Site Q - wheat glume base widths.

Figure 3.2.5: Owslebury. Samples R44A and S14 - wheat glume base widths.

In Figs. 3.2.1. - 3.2.3 the scale is always in millimetres.

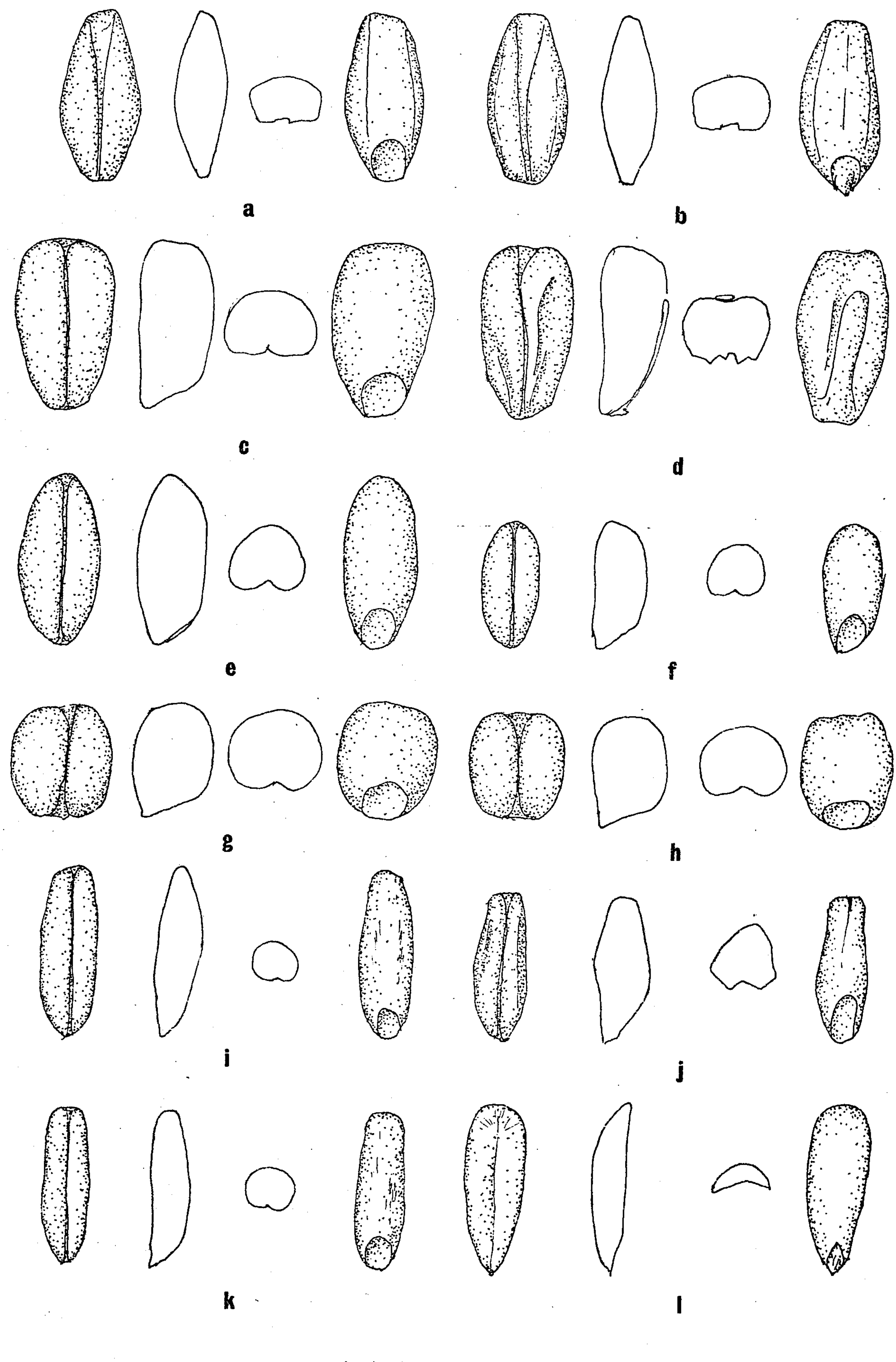



Figure 3.2.1.

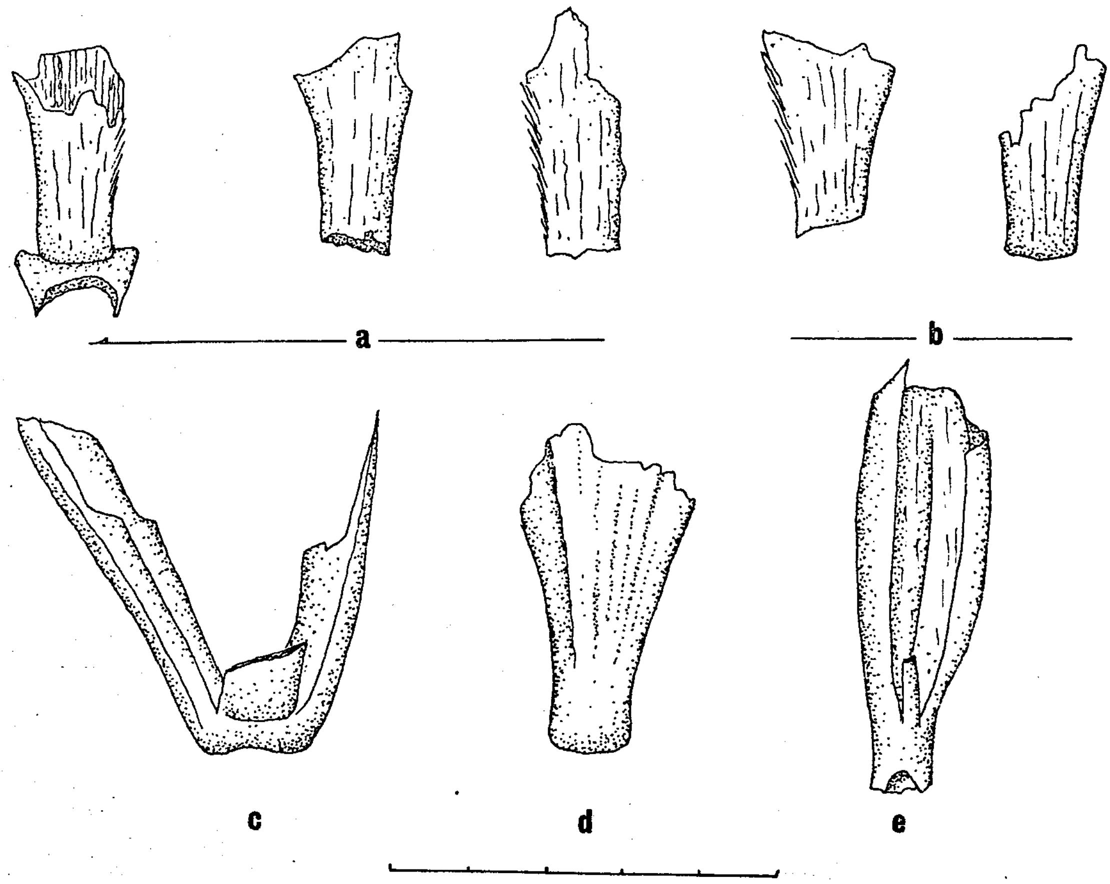



Figure 3.2.2.

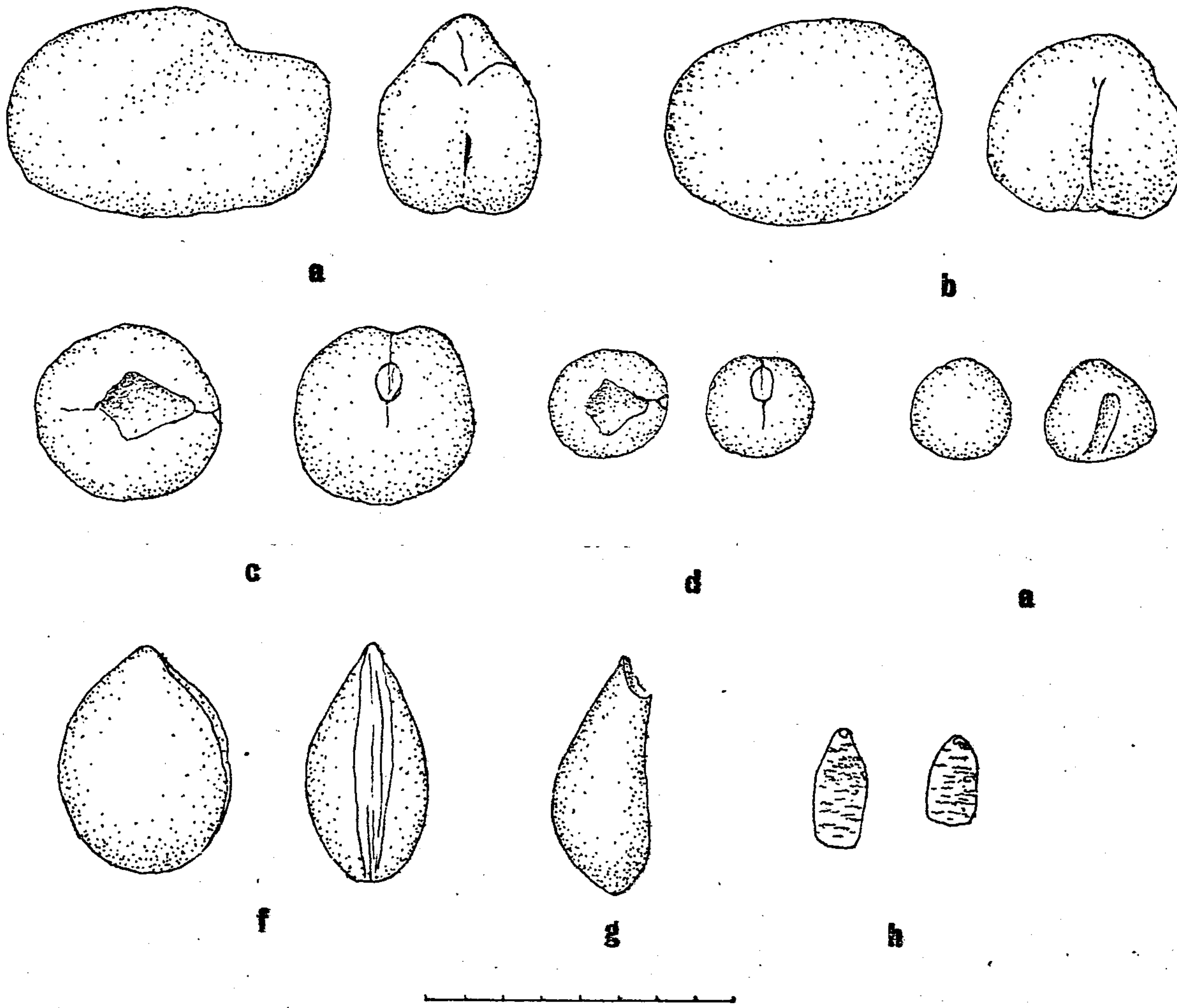
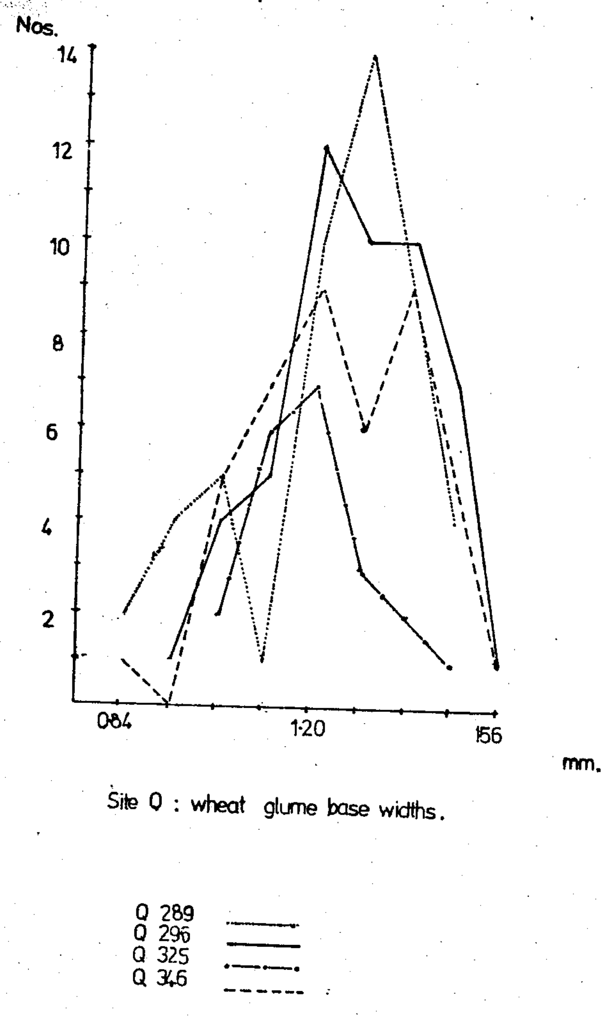



Figure 3.2.3.




Site Q : wheat glume base widths.

Figure 3.2.4.

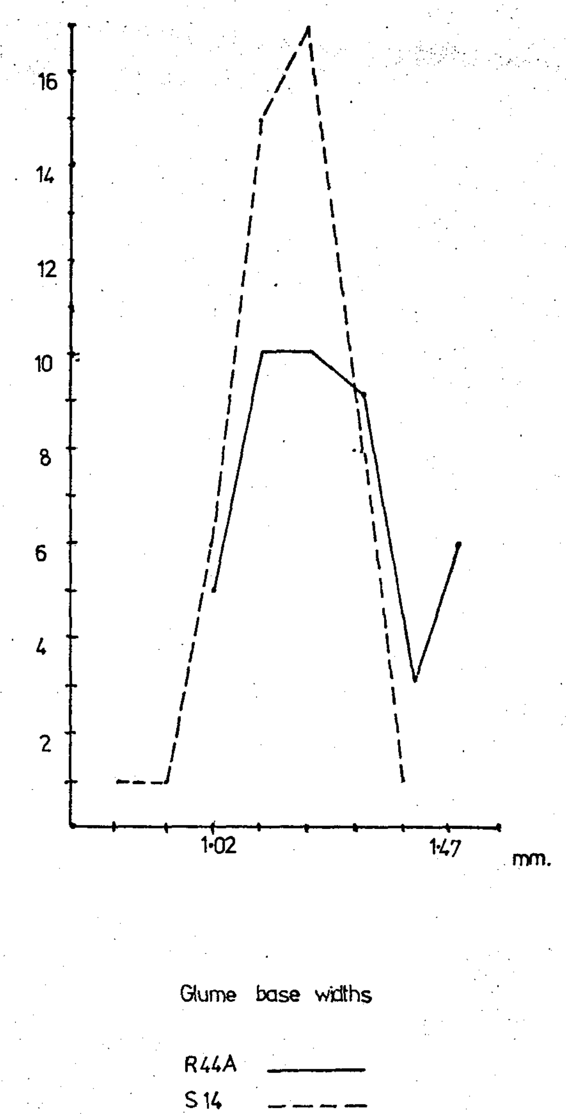



Figure 3.2.5.

a

b

Plate 1. Owslebury- carbonised spelt glumes and vetches.
a. Triticum spelta. Glume bases
b. Vicia cf. sativa. Typical vetch seeds in poor condition.
Scales in millimetres.

3.3 Portway, SU 342 405

Soils and preservation. The soil is derived from the Upper Chalk. The fruits and seeds are all carbonised, apart from a few impressions in pottery.

Contexts. Most of the fruits and seeds recovered came from storage pits. There are also samples from postholes, gullies, ditches, pit complexes and other irregular pits and hollows.

| | |
|---|---|
| Storage pits: | 68, 84, 146, 169, 196, 197, 375, 414, 470, 473, 491, 532, 561, 563, 569, 576, 578, 584, 588, 625, 656, 673, 685, 688, 845, 885. |
| Pit complexes etc.: | 448, 451, 1009, 1078, 1195. |
| Postholes: | 73, 91, 141, 143, 192, 194, 195, 206, 480, 564, 571, 572, 574, 575, 581, 652, 678, 694, 697, 975, 1094, 1112, 1120, 1214. |
| Gullies: | 297, 539, 560. |
| Ditches: | 442, 587, 567, 544. |

Sampling. Samples were taken from each layer of the excavated features within the enclosure ditches, apart from a few features which were omitted due to oversight or pressure of time. A constant sample volume of 10 litres (one bucketful) was used. 79 dated samples of plant remains were recovered, together with 50 which belong either to the 'Early' or 'Middle' phases and 20 samples which were not associated with dateable archaeological material.

Flotation. A 'Siraf' type of water flotation machine was used (Williams 1973).

| Feature number | | 68 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 196 | 196 | 196 | 197 | 197 | 197 | 197 | 197 | 197 | 197 | 197 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | D | C | E | F | G | H | I | J | K | L | C | D | F | B | B1 | B2 | C | D | F | G | L |
| Cereal | ca | 1 | 3 | 4 | 2 | 7 | 4 | 6 | 12 | 19 | 1 | 67 | 1 | 2 | 2 | 2 | 2 | 1 | 3 | 2 | 2 | 26 |
| Hordeum sp. | ca | | | | | | | | | 1 | | | | | | 1 | | 1 | | | 1 | |
| Hordeum vulgare | ca | | | | | | | | 5 | | | | | | | | | | | | | 2 |
| Triticum sp. | ca | | 1 | 4 | 2 | 8 | 1 | 9 | | 34 | 1 | 29 | | | 1 | 1 | | 1 | | 3 | 1 | 18? |
| Triticum spelta -type | ca | | | | | 1 | | 4 | 5 | | | | | | | 1 | | | 7 | | | 8 |
| Triticum dicoccum -type | ca | | | | | | | | | | | | | | | | | | | | | |
| Triticum aestivum | ca | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | 2 | | 1 | 2 | 8 | | | | | | | | | | | | 1 |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | 1 | 5 | 8 | 29 | 6 | 15 | 11 | 25 | 54 | 7 | | 1 | 4 | | | 6 | 4 | | 2 | 52 |
| Triticum dicoccum | gb | | | | | 1 | | | 2 | 6 | 6 | 1 | | | | 1 | | | 1 | | | 1 |
| Triticum sp. | gb | | | | | | | | | | | | | | | | | | 15 | 7 | 7 | |
| Hordeum sp. | ri | | | | 1 | 1 | | | | 2 | 5 | | | | | | | 1 | | | | |
| Cereal | cn | | | | 1 | 3 | | 4 | 4 | 6 | | 7 | | | | | | | 6 | 2 | | 26 |
| Vicia sp. (l) | s | | | | | | | | | | | | | | | | | | | | | 2 |
| Vicia sp (s) | s | | | | | | | | | | | | | | | | | | | | | 7 |
| Vicia tetrasperma | s | | | | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | 1 | | 26 | 2 | 21 | 6 | 7 | | 2 | | | | | | | | | | |
| Gramineae (s) | ca | | | | 1 | | | | | | | | | | | | | | | | | |
| Gramineae (l) | ca | | | 2 | | 17 | | 14 | 12 | 31 | 4 | | | | | 2 | | 1 | | | | 6 |
| Arrhenatherum tuberosum | tu | | | | | | | 1 | | | | | | | | | | | | | | |
| Ranunculus sp. | a | | | | | | | 1 | | | | | | | | | | | | 1 | | 15 |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | | 1 | | |
| Stellaria cf. media | s | | | | | 1 | | | | 4 | 1 | | | | | | | | | 3 | | 3 |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | 1 | | | | | | | | | | 1 | | |
| Atriplex patula/hastata | s | | | | | 2 | | | | 1 | | | | | | | | | | | 2 | 2 |
| Atriplex cf. hastata | s | | | | | | | | | | | | | | | | | | | | | |
| Chenopodiaceae | s | | | 1 | | | | | | | 2 | | | | | | | | | | | 2 |
| Rumex sp. | nu | | | | | | 1 | | 2 | 5 | | | | 1 | | | | | | | | |
| Rumex cf. crispus | nu | | | | | | | | | | | | | | | | | | | | | 1 |
| Rumex cf. acetellosa | nu | | | | | | | | | | | | | | | | | | | | | |
| Polygonum aviculare | nu | | | | | | | | 5 | 2 | | | | | | | | | | | | |
| Polygonum convolvulus | nu | | | | 1 | 1 | | 3 | 1 | 4 | 1 | 6 | | | | 2 | | | | | | |
| Polygonaceae | nu | | | | | 5 | | | 1 | | | | | | | 1 | | | | 1 | | 4 |
| Lithospermum arvense | nu | | | | | 3 | 2 | 8 | 7 | 5 | 1 | 4 | | | | 1 | | 4 | 6 | 2 | | 43 |
| Hyoscyamus niger | s | | | | | | | | | | | | | | | | | | 1 | | | |
| Plantago lanceolata | s | | | | | | | | 2 | | | | | | | | | | | | | |
| Galium aparine | fr | | | 1 | | 1 | | 2 | | | 1 | 2 | | | | | | | 4 | 3 | 1 | 15 |
| Galium sp. | fr | | | | | | | | | | 2 | | | | | | | | | | | |
| Sambucus nigra | s | | | | | | 1 | | | | | | | | | | | | | 1 | | |
| Valerianella dentata | fr | | | 1 | | 3 | | | | 48 | | | | | | | | | | 2 | | 5 |
| Centaurea cf. scabiosa | cy | | | | | | | | | | | | | | | | | | | | | 1 |
| Cirsium/Carduus sp. | cy | | | | | | | | | | | | | | | | | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | 4 | | | | | | | | | | 1 | | 2 |
| Anthemis/Chrsanthemum sp. | cy | | | 1 | | | | | | | | | | | | | | | | | | |
| Indeterminate | | | | 1 | 1 | 3 | 1 | 6 | 3 | 3 | | 2 | | | 2 | | | | 2 | | | 14 |

| Feature number | | 197 | 197 | 197 | 442 | 448 | 451 | 470 | 470 | 470 | 470 | 473 | 473 | 578 | 578 | 578 | 578 | 581 | 673 | 673 | 688 | 688 | 688 | 688 | 975 | 1195 | 1195 | 1195 | 1195 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | K | L | M | C | I | F | B | C | D | E | A | C | A | D | E | G | U | C | D | A | B | C | D | U | B | D | E | F |
| Cereal | ca | 3 | 5 | 1 | 2 | | 2 | 1 | 7 | | 4 | 1 | 1 | 4 | 8 | 53 | 1 | 7 | 25 | 2 | 1 | 62 | | 6 | 6 | | 2 | 1 | 4 |
| Hordeum sp. | ca | | | | | | | | 1 | | | | | 1 | 1 | | | | | | | | | | | | | 1 | |
| Hordeum vulgare | ca | | | | | | | | | | | 2 | | | | | | | | | | 10 | | | | | | | 1 |
| Triticum sp. | ca | 2 | 1 | | | | | | 6 | | 4 | | | 2 | | 7 | | | 5 | 2 | | | | | 1 | | | 1 | 3 |
| Triticum spelta -type | ca | | | | | | | | | | | | | | 8 | 90 | | | 41 | | | 56 | | 8 | 1 | | | | |
| Triticum dicoccum -type | ca | | 1 | | | | | | | | | | | | | | | | 1 | | | | | | | | | | |
| Triticum aestivum | ca | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | | | | | | | 6 | | | 1 | | | 8 | 1 | 1 | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | 1 | | | 2 | | | | 1 | | | | | | |
| Triticum spelta | gb | 1 | | | | | 8 | | | | 7 | | | 7 | 3 | 198 | | | 28 | | | 675 | 48 | 13 | | | 3 | | |
| Triticum dicoccum | gb | | | | | | | | | | 1 | | | 1 | 1 | 10 | 1 | | 4 | | | 168 | 5 | 8 | | | | | |
| Triticum sp. | gb | | | | | 1 | | | | | | 1 | | 11 | 5 | | 3 | | 45 | | | | | 17 | | 3 | | 1 | 2 |
| Hordeum sp. | ri | | | | | | 2 | | | | | | | | | | | | | | | 18 | 5 | | | | | | |
| Cereal | cn | | | | | | | | | | | | | | 1 | 4 | | | 2 | | 1 | 5 | | | | | | | |
| Vicia sp. (l) | s | | | | | | | | | | | | | 1 | | | | | 1 | | | | | | | | | | |
| Vicia sp (s) | s | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | |
| Vicia tetrasperma | s | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | | | | | | | | | | | 6 | | 47 | | | 17 | | | 354 | 1 | 5 | | | | | 2 |
| Gramineae (s) | ca | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gramineae (l) | ca | 1 | | | | 2 | 1 | | 2 | | 1 | | | | 3 | 6 | | | 13 | | | | 3 | 10 | | 1 | | | 2 |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | | | | 6 | | | | | | | 1 |
| Ranunculus sp. | a | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | | | | 8 | | 1 | | | | | |
| Stellaria cf. media | s | | | | | | | | | | 1 | | | | | 1 | | | | | | 2 | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |
| Chenopodium album | s | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | 1 | | | | | | | | | 1 | | | 1 | | | 4 | | 1 | | | | | |
| Atriplex cf. hastata | s | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodiaceae | s | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rumex sp. | nu | | | | | | | | 1 | | | | | | | 1 | | | | | | | | | | | | | |
| Rumex cf. crispus | nu | | | | | | | | | | | | | 4 | | | | | | | | | | | | | | | |
| Rumex cf. acetellosa | nu | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | |
| Polygonum aviculare | nu | 1 | 1 | | | | | | | | | | | | | 1 | | | | | | 4 | | | | | | 1 | |
| Polygonum convolvulus | nu | | | | | | | | | | | | | | | 1 | | | | | | 28 | | | | | | | |
| Polygonaceae | nu | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | |
| Lithospermum arvense | nu | | | | | | | | | | 11 | | | 1 | | 18 | | | 1 | | | 5 | | | | | | | |
| Hyoscyamus niger | s | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plantago lanceolata | s | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | |
| Galium aparine | fr | | | | | | 2 | | 3 | | | | | | 1 | 1 | | | 1 | | 2 | 384 | 2 | 2 | | | | | 1 |
| Galium sp. | fr | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | fr | | | | | | | | | 1 | 1 | | | | 1 | | | | | | | 1 | | | | | | | |
| Centaurea cf. scabiosa | cy | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| Cirsium/Carduus sp. | cy | | | | | | | | | | | | | | | | | | | | | 3 | | 4 | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anthemis/Chrsanthemum sp. | cy | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeterminate | | | | | | | | | 1 | | 3 | | | 2 | 2 | 11 | | | | | | | | | | | | | |

Table 3.3.0: Fruits, seeds etc. identified in samples from Portway.
Sheet 1: Early phase. 5th. - 3rd. century B.C.

Table 3.3.0: Fruits, seeds etc. identified in samples from Portway.
Sheet 2: Early or middle phase.

| Feature number | | 73 | 91 | 141 | 169 | 169 | 375 | 375 | 375 | 375 | 375 | 375 | 375 | 375 | 480 | 532 | 532 | 532 | 560 | 563 | 563 | 569 | 569 | 569 | 569 | 569 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | U | U | U | B | D | A | B | C | D | E | F | G | H | U | A | D | E | U | B | D | A | B | C | D | E |
| Cereal | ca | 1 | 5 | | | 2 | 2 | 6 | 4 | | 2 | 4 | 2 | | 96 | | 5 | 7 | 1 | | | 2 | 19 | | | 1 |
| Hordeum sp. | ca | | | | | | | | | | | | | | 13 | | [illegible] | [illegible] | | | | | 1 | | | |
| Hordeum vulgare | ca | | | | | | | | | | | | | | | | 3 | 1 | 1 | | | | | | | |
| Triticum sp. | ca | | | | | 1 | | 9 | | | | | | | 9 | | 1 | | | | | | | 1 | | |
| Triticum spelta -type | ca | | | 1 | 1 | | | | 5 | 2 | | 4 | | | | | | 6 | | 2 | | | 37 | | | |
| Triticum dicoccum -type | ca | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum aestivum | ca | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | | | | | | | | | 3 | | | | | | | 1 | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | 1 | | | | | | 1 | | | | 1 | 1 | | 3 | 7 | 34 | | | | | 5 | 2 | | |
| Triticum dicoccum | gb | | | | | | | | | | | | | | | | | 2 | | | | | | | | |
| Triticum sp. | gb | | | | | | | | | | | | | | | | | 28 | | | 1 | | | | | |
| Hordeum sp. | ri | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cereal | cn | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia sp. (l) | s | | | | | | | | 1 | | | | | | | | | | | | | | | | | 1 |
| Vicia sp (s) | s | | | | | | | | | | | 4 | | | | | | | | | | | | | | |
| Vicia tetrasperma | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | | | | | | 1 | | | | | | | | | 26 | | | | | | | | |
| Gramineae (s) | ca | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gramineae (l) | ca | | | | | | | | | | | 1 | | | | 1 | 1 | 9 | | | | | | | 1 | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stellaria cf. media | s | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| Atriplex cf. hastata | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodiaceae | s | | | | | | | | 1 | | | | | | | | | | | | | | | | | |
| Rumex sp. | nu | | | | | | | | | | | 2 | | | | | | | | | | | | | | |
| Rumex cf. crispus | nu | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rumex cf. acetellosa | nu | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| Polygonum aviculare | nu | | | | | | | | | | | 2 | | | | | | | | | | | | | | |
| Polygonum convolvulus | nu | | | | | | | | | | | | | | | | | 2 | | | | | | | | |
| Polygonaceae | nu | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lithospermum arvense | nu | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hyoscyamus niger | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plantago lanceolata | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Galium aparine | fr | | | | | | | | 1 | | | 2 | | | | | | | | | | | 2 | 1 | 2 | |
| Galium sp. | fr | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | fr | | | | | | | | 3 | | | 1 | | | | | | | | | | | | | | |
| Centaurea cf. scabiosa | cy | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cirsium/Carduus sp. | cy | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | | | 2 | | | | | | | | | | | | | | |
| Anthemis/Chrsanthemum sp. | cy | | | | | | | | | | | 2 | | | | | | | | | | | | | | |
| Indeterminate | | | | | | | | | 4 | | | 3 | 1 | | | | | | | | | | | | | |

| Feature number | | 569 | 569 | 569 | 569 | 569 | 576 | 576 | 576 | 576 | 576 | 587 | 625 | 625 | 656 | 685 | 685 | 685 | 685 | 685 | 694 | 1029 | 1078 | 1078 | 1094 | 1112 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | G | K | L | M | O/P | C | D | E | G | H | C | B | C | P | A | C | D | E | F | U | B | A | D | B | U |
| Cereal | ca | 1 | 1 | 28 | | | 96 | 1 | | | 17 | 4 | 8 | | 1 | 1 | 22 | 16 | 27 | 4 | | 5 | | 1 | 3 | |
| Hordeum sp. | ca | | | 1 | | | 15 | 1 | | 2 | | | 1 | | | | 4 | 2 | 1 | | | 1 | | | | |
| Hordeum vulgare | ca | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum sp. | ca | | | 7 | | | 12 | | | | | 3 | | | | | | 9 | 9 | 3 | 1 | 1 | 1 | | | |
| Triticum spelta -type | ca | | | 32 | | | | | 3 | 1 | 21 | | 6 | | | 1 | 29 | | 4 | | | | | | | |
| Triticum dicoccum -type | ca | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum aestivum | ca | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | 1 | | | | | | | | | | | | 2 | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | 1 | | | 1 | 2 | | | 3 | 6 | 9 | | 23 | | | 3 | 9 | 2 | | | | | | | |
| Triticum dicoccum | gb | | | 3 | | | | | | | | | | | | | 1 | | 1 | | | | | | | |
| Triticum sp. | gb | | | | | | | | | | | | 1 | | | | 3 | | 3 | | 1 | | | | | |
| Hordeum sp. | ri | | | | | | | | | | | | 2 | | | | | | | | | | | | | |
| Cereal | cn | | | 19 | 1 | 1 | 9 | | | | 17 | | | | | | | 9 | 7 | | | | | | | |
| Vicia sp. (l) | s | | | | | | 2 | | | | | | | | | | | 6 | | | | | | | | |
| Vicia sp (s) | s | | | | | | | | | | | | | | | | 6 | 36 | 160 | 97 | | | | | | |
| Vicia tetrasperma | s | | | | | | | | | | | | | | | | | 3 | 1 | 1 | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | 2 | | | | | | | |
| Bromus mollis/secalinus | ca | 1 | | 12 | | | 2 | | 1 | | | | | | | | | 2 | 4 | | | 1 | | | | |
| Gramineae (s) | ca | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Gramineae (l) | ca | 5 | | 10 | | | | | | | 6 | 1 | 1 | 3 | 2 | 1 | 8 | 13 | 8 | | | | 1 | | | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | | | | | 1 | | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | 1 | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stellaria cf. media | s | | | | | | | | 1 | | | | | | | | | 1 | 12 | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | 1 | | | | | | | |
| Chenopodium album | s | | | | | | 1 | | | | | | | | | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | 1 | | | | | | | | | | | | | | | | 1 | | | | 2 | | |
| Atriplex cf. hastata | s | | | | | | 8 | | | | | | | | | | | | | | | | | | | |
| Chenopodiaceae | s | | | | | | 4 | | | | | | | | | | | | | | | | | 2 | | |
| Rumex sp. | nu | | | | | | | | 2 | | | | | | 1 | | 3 | | | | | | | | | |
| Rumex cf. crispus | nu | | | 2 | | | | | | | | | | | | | | | 1 | | | | | | | |
| Rumex cf. acetellosa | nu | | | | | | | | | | | | | | | | | | | | | | | | | |
| Polygonum aviculare | nu | | | 6 | 1 | | | | 2 | | 52 | | 2 | | 1 | | 1 | | 1 | | | | | | | |
| Polygonum convolvulus | nu | | | 14 | | | 1 | | | | | | | | | | 4 | 3 | 1 | | | | | 1 | | |
| Polygonaceae | nu | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| Lithospermum arvense | nu | | | 1 | | | 32 | | | | 1 | | | | | | 1 | | | | | | | | | |
| Hyoscyamus niger | s | | | | | | | | | | | | | | | | | | | | | | | 14 | | |
| Plantago lanceolata | s | | | | | | | | | | | | | | 2 | | | | | | | | | | | |
| Galium aparine | fr | 2 | | | | | 23 | | | | 12 | | | | 1 | 1 | 5 | 5 | 17 | 2 | | 2 | | 1 | | 1 |
| Galium sp. | fr | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | fr | | | | | | | | | | | | | | | | | | 1 | | | | | | | |
| Centaurea cf. scabiosa | cy | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cirsium/Carduus sp. | cy | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anthemis/Chrsanthemum sp. | cy | | | | | | | | 24 | | 1 | | | | 1 | | | | | | | | | | | |
| Indeterminate | | | | | | | 1 | | | | 3 | 1 | | | | | 7 | 1 | 8 | | | | | | | |

Table 3.3.0: Fruits, seeds etc. identified in samples from Portway. Sheet 3: Middle phase. 3rd. - 1st. century B.C.

| Feature number | | 414 | 414 | 414 | 414 | 414 | 414 | 414 | 414 | 567 | 584 | 584 | 584 | 584 | 588 | 588 | 588 | 588 | 588 | 845 | 845 | 845 | 845 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | B | F | H | J | K | K1 | L | M | B | C | D | E | F | B | C | D | E | F | A | D | E | F |
| Cereal | ca | 1 | 2 | 5 | 1 | 3 | 1 | 2 | I | 34 | 3 | 1 | 6 | 2 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 6 | |
| Hordeum sp. | ca | | | | | | | | | 3 | | | | | | | | | | 1 | | 1 | |
| Hordeum vulgare | ca | | | | | | | | | | | 2 | 6 | 1 | 1 | | | | | | | | |
| Triticum sp. | ca | | 2 | | | | 2 | | | 29 | | | | | | | | 1 | | | | | |
| Triticum spelta -type | ca | | 3 | 6 | | 4 | | | | 17 | | 3 | 11 | | 2 | | | | | | | 5 | |
| Triticum dicoccum -type | ca | | | | | | | | | | | | | | | | | | | | | | |
| Triticum aestivum | ca | | 1 | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | 3 | | | | | | | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | 4 | 20 | 6 | | | | 1 | 4 | | 2 | | 6 | | | | 1 | 4 | | 1 | | 1 |
| Triticum dicoccum | gb | | | | | | | | | | | | | | | | | | | | | | |
| Triticum sp. | gb | | | | | | | | | | | | | | | | | | | | | | |
| Hordeum sp. | ri | | | | | | | | | | | | | | | | | | | | | | |
| Cereal | cn | | | | | | 1 | | | | | | | | | | | | | | | | |
| Vicia sp. (l) | s | | | | | | | | | | | | | | | | | | | | | | |
| Vicia sp (s) | s | | 11 | 13 | | | | | | | | | | | | | | | | | | | |
| Vicia tetrasperma | s | | | | | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | | 3 | |
| Bromus mollis/secalinus | ca | | 1 | | | | | | | | | 1 | | | | | | | | | | 1 | |
| Gramineae (s) | ca | | | | | | | | | | | | | | | | | | | | 1 | 2 | |
| Gramineae (l) | ca | | | 3 | 1 | | 1 | | | | | 1 | | | | | | | | | | | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | | | | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | | | | | |
| Stellaria cf. media | s | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | | 4 | | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | | 1 | | | | 12 | 4 | | | | | | | | | | |
| Atriplex cf. hastata | s | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodiaceae | s | | | | | | | | | | | | 17 | 1 | | | | | | | | | |
| Rumex sp. | nu | | | | | | | | | | | | | | | | | | | | | | |
| Rumex cf. crispus | nu | | | | | | | | | | | | 3 | | | | | | | | | | |
| Rumex cf. acetellosa | nu | | | | | | | | | | | | | | | | | | | | | | |
| Polygonum aviculare | nu | | | | | | | | | | | 4 | 2 | | | | | | | | | | |
| Polygonum convolvulus | nu | | | | | | | | | | | | 16 | | | | | | | | | | |
| Polygonaceae | nu | | | | | | | | | 1 | | | | | | | | | | | | | |
| Lithospermum arvense | nu | | | | | | | | | | | | | | | | | | | | | | |
| Hyoscyamus niger | s | | | | | | | | | | 5 | 9 | 135 | 5 | | | | | | | | | |
| Plantago lanceolata | s | | | 1 | | | | | | | | | | | | | | | | | | | |
| Galium aparine | fr | | | | | | | | | | 5 | 4 | 62 | 1 | | | 1 | 1 | | | | | |
| Galium sp. | fr | | | | | | | | | | | | | | | | | | | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | fr | | | | | | | | | | | | | | | | | | | | | | |
| Centaurea cf. scabiosa | cy | | | | | | | | | | | | | | | | | | | | | | |
| Cirsium/Carduus sp. | cy | | | | | | | | | | | | | | | | | | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | | | | | | | | | | | | | | |
| Anthemis/Chrsanthemum sp. | cy | | | | | | | | | | | | | | | | | | | | | | |
| Indeterminate | | | | | | | | | | | | 3 | 8 | | | | | | | | | | |

Table 3.3.0: Fruits, seeds etc. identified in samples from Portway. Sheet 4: Late phase. 1st. century A.D.

| Feature number | | 143 | 146 | 209 | 209 | 209 | 491 | 491 | 544 | 561 | 561 | 561 | 561 | 885 | 885 | 885 | 885 | 885 | 885 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | U | B | A | C | G | B | C | C | D | D2 | E | F | A | B | C | D | E | F |
| Cereal | ca | 1 | 1 | | 1 | 1 | 4 | 3 | 4 | 3 | 1 | 1 | | 1 | | 1 | 1 | 3 | |
| Hordeum sp. | ca | | | | | | | 1 | 2 | 1 | | | | | | 2 | 2 | 3 | 1 |
| Hordeum vulgare | ca | | | | | | | | | | | | | | | | | | |
| Triticum sp. | ca | | | 1 | | | | | | | | | | | | | | | |
| Triticum spelta -type | ca | | | | | 2 | | 3 | 1 | | | | | | 1 | | | | |
| Triticum dicoccum -type | ca | | | | | | | | | | | | | | | | | | |
| Triticum aestivum | ca | | | | | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | | | | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | | | | | | 3 | 1 | | | | | | | 1 | | | 2 |
| Triticum dicoccum | gb | | | | | | 1 | | | | | | 1 | | | | | | |
| Triticum sp. | gb | | | | | | | | | | | | | | | | | | |
| Hordeum sp. | ri | | | | | | | | | | | | | | | | | | 1 |
| Cereal | cn | | | | | | | | | | | | | | | | | | |
| Vicia sp. (l) | s | | | | | | | | | | 1 | | | | | | | | |
| Vicia sp (s) | s | | | | | | | | | | | | | | | | | | |
| Vicia tetrasperma | s | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | | | | | 1 | | | | | | | | | 1 | | |
| Gramineae (s) | ca | | | | | 1 | | | | | | | | | | | | | |
| Gramineae (l) | ca | | | | | 1 | | 1 | 1 | 1 | 1 | 1 | | | 1 | 2 | | | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | |
| Stellaria cf. media | s | | | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | | 2 | | | | | | | | | | | |
| Atriplex cf. hastata | s | | | | | | | | | | | | | | | | | | |
| Chenopodiaceae | s | | | | | | | | | | | | | | | | | | |
| Rumex sp. | nu | | | | | | 1 | | | | | | | | | | | | |
| Rumex cf. crispus | nu | | | | | | | | 1 | | | | | | | | | | |
| Rumex cf. acetellosa | nu | | | | | | | | | | | | | | | | | | |
| Polygonum aviculare | nu | | | | | | | 1 | | | | | | | | | | | |
| Polygonum convolvulus | nu | | | | | | | | | | | | | | | | | | |
| Polygonaceae | nu | | | | | | | | | | | | | | | | | | |
| Lithospermum arvense | nu | | | | | | | | | | | | | | | | | | |
| Hyoscyamus niger | s | | | | | | 14 | 5 | | | | | | | | | | | |
| Plantago lanceolata | s | | | | | | | | | | | | | | | | | | |
| Galium aparine | fr | | | | | | 4 | | | | | | | | | | | | |
| Galium sp. | fr | | | | | | | | | | | | | | | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | 1 | |
| Valerianella dentata | fr | | | | | | | | | | | | | | | | | | |
| Centaurea cf. scabiosa | cy | | | | | | | | | | | | | | | | | | |
| Cirsium/Carduus sp. | cy | | | | | | | | | | | | | | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | | | | | | | | | | |
| Anthemis/Chrsanthemum sp. | cy | | | | | | | | | | | | | | | | | | |
| Indeterminate | | | | | | 1 | | | | | | | | | | | | | |

Table 3.3.0: Fruits, seeds etc. identified in samples from Portway. Sheet 5: Undated samples.

| Feature number | | 192 | 194 | 195 | 206 | 294 | 294 | 297 | 539 | 564 | 571 | 572 | 574 | 575 | 652 | 678 | 697 | 1009 | 1076 | 1120 | 1214 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | U | U | U | U | A | B | U | U | C | U | A | U | U | H | E | U | A | A | A | U |
| Cereal | ca | | | 2 | 1 | 1 | | 2 | 1 | 40 | | 7 | 4 | 1 | 1 | 72 | | 9 | 1 | 1 | 1 |
| Hordeum sp. | ca | | | 1 | | | | | | 3 | | | 12 | | | | | | | | |
| Hordeum vulgare | ca | | | | | 1 | 44 | | | | 1 | 12 | 12 | | | 3 | | | | | |
| Triticum sp. | ca | | | | | | | | 1 | 12 | | | | | | | 1 | 5 | | | |
| Triticum spelta -type | ca | | 1 | | | | 1 | | | | | | | | | 105 | | | | | |
| Triticum dicoccum -type | ca | | | | | | 1 | | | | | | | | | | | | | | |
| Triticum aestivum | ca | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | 1 | | | | | | 9 | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | | | | | | | | 42 | | | | | | 131 | | | | | |
| Triticum dicoccum | gb | 1 | | | | | | | | 4 | | | | | | 33 | | | | | |
| Triticum sp. | gb | | | | | | | | | | | 1 | | 1 | | | | | | | |
| Hordeum sp. | ri | | | | | | | | | 3 | | | | | | 4 | | | | | |
| Cereal | cn | | | | | | | | | | | | | | | 5 | | | | | |
| Vicia sp. (l) | s | | | | | | | | | | | | | | | 8 | | 1 | | | |
| Vicia sp (s) | s | | | | | | | | | | | | | | | | | | | | |
| Vicia tetrasperma | s | | | | | | | | | | | | | | | | | | | | |
| Vicia hirsuta | s | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | | | | | | | | | | | | | 25 | | | | | |
| Gramineae (s) | ca | | | | | | | | | | | 3 | | | | | | | | | |
| Gramineae (l) | ca | | | | | | | | | 2[illegible] | | | | | | 5 | | 2 | | | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | | | |
| Stellaria cf. media | s | | | | | | | | | | | | | | | 2 | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | | | | | | | 16 | | | | | | | | | | | |
| Atriplex patula/hastata | s | | | | | | | | | 7 | | | | | | | | | | | |
| Atriplex cf. hastata | s | | | | | | | | | | | | | | | | | | | | |
| Chenopodiaceae | s | | | | | | | | | 10 | | | | | | | | | | | |
| Rumex sp. | nu | | | | | | | | | | | | | | | | | 1 | | | |
| Rumex cf. crispus | nu | | | | | | | | | | | | | | | | | | | | |
| Rumex cf. acetellosa | nu | | | | | | | | | | | | | | | | | | | | |
| Polygonum aviculare | nu | | | | | | | | | | | | | | | 6 | | [illegible] | | | |
| Polygonum convolvulus | nu | | | | | | | | | | | | | | | 1 | | 1 | | | |
| Polygonaceae | nu | | | | | | | | | | | | | | | | | | | | |
| Lithospermum arvense | nu | | | | | | | | | 4 | | | | | | 19 | | 3 | | | |
| Hyoscyamus niger | s | | | | | | | | | | | | | | | | | | | | |
| Plantago lanceolata | s | | | | | | | | | 1 | | | | | | | | | | | |
| Galium aparine | fr | | | | | | | | | 32 | | | | | | 2 | | 2 | | | |
| Galium sp. | fr | | | | | | | | | | | | | | | | | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | | | | | | | |
| Valerianella dentata | fr | | | | | | | | | 1 | | | | | | | | | | | |
| Centaurea cf. scabiosa | cy | | | | | | | | | 3 | | | | | | | | | | | |
| Cirsium/Carduus sp. | cy | | | | | | | | | | | | | | | | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | | | | | | | | | | | | |
| Anthemis/Chrsanthemum sp. | cy | | | | | | | | | 1 | | | | | | | | | | | |
| Indeterminate | | | | | | | | | | | | | | | | 14 | | | | | |

## Botanical descriptions

### (a) Barley

Carbonised caryopses and rachis internodes occur in small numbers in the samples. In Table 3.2.0, '*Hordeum* sp.' is used to indicate either poorly preserved grains or straight grains which could be derived from median spikelets of six-row barley or from two-row barley. However, as all the larger samples contain twisted, asymmetrical grains from lateral spikelets there can be little doubt that six-row barley, *Hordeum vulgare*, is the sole species present. Grains from both median and lateral spikelets are illustrated in Fig. 3.3.1. These specimens come from the largest and best-preserved sample of barley, 294B, in which the ratio of identifiable median to lateral grains is 10:4, a considerable deviation from the expected 1:2 ratio, but presumably merely fortuitous. The grains, though slightly puffed and eroded, are clearly from hulled barley; both lemma and palea have burnt off but the cross section is rather angular and the grains display none of the transverse wrinkling characteristic of naked barley. The poor condition and small size of most samples has made measurement largely impossible, except for the few samples which appear in Table 3.3.1.

The rachis internodes are very variable in size, build and pubescence. Typical specimens are illustrated in Fig. 3.3.2. and details of all specimens appear in Table 3.3.2. Sample 688B contains specimens of all three distinguishable types. Type A, slender internodes 2.8 - 3.25 mm. in length and apparently hairless is from a lax-eared form, as is Type B, rather thicker, 2.7 - 3.05 mm. long and strongly pubescent along the margins. The apparent absence of hairs on Type A is perhaps due to poor preservation. Type C is rather similar to B, apart from being much shorter; the only measurable specimen is 1.95 mm. long. This may be from a dense-eared barley but could be from the lower part of an ear of which Type B formed the middle. In a fresh ear of the six-row lax-eared barley 'Senta' the second, third and fourth internodes were 1.4, 1.9 and 2.2 mm. long respectively and internodes from the middle of the ear were around 3.5 mm. long. Considerable variation is therefore to be expected. However, whatever the precise identification of these Type C internodes, lax-eared, six-row hulled barley is the main form represented in these samples.

Helbaek (1952a, 215) found that carbonised internodes of lax-eared barley (2.75 - 3.48 mm. long) were generally less noticeably hairy in the large sample from Itford Hill. In contrast several such internodes in the Portway samples are extremely hairy. Slender internodes with heavily pubescent margins are also reported by Van Zeist (1970, 50).

Table 3.3.1. Dimensions in mm. and indices of barley grains

| Sample | | L | B | T | L:B | T:B | |
|---|---|---|---|---|---|---|---|
| 84J N=3 | min. | 4.0 | 1.5 | 1.3 | 187 | 73 | |
| | mean | 4.80 | 2.30 | 1.80 | 221 | 82 | Early phase |
| | max. | 5.6 | 3.0 | 2.2 | 267 | 87 | |
| 584E N=3 | min. | 4.3 | 2.5 | 1.9 | 172 | 69 | |
| | mean | 4.63 | 2.63 | 2.03 | 176 | 78 | Middle phase |
| | max. | 5.0 | 2.9 | 2.2 | 184 | 88 | |
| 294B N=21 | min. | 4.5 | 2.0 | 1.6 | 179 | 64 | Undated |
| | mean | 5.29 | 2.64 | 2.24 | 204 | 83 | Undated |
| | max. | 6.2 | 3.3 | 3.1 | 250 | 100 | Undated |
| | s2 | 0.240 | 0.135 | 0.137 | - | - | Undated |
| 572A N=3 | min. | 5.0 | 2.3 | 2.0 | 206 | 85 | Undated |
| | mean | 6.10 | 2.90 | 2.50 | 211 | 86 | Undated |
| | max. | 7.0 | 3.4 | 2.9 | 217 | 87 | Undated |
| 574U N=3 | min. | 5.2 | 3.0 | 2.5 | 162 | 81 | Undated |
| | mean | 5.36 | 3.06 | 2.66 | 175 | 87 | Undated |
| | max. | 5.5 | 3.2 | 2.9 | 183 | 96 | Undated |

Table 3.3.2. Barley rachis internodes.

| Sample No. | | N | Build | Length(mm.) | Pubescence | Inter-glume hairs |
|---|---|---|---|---|---|---|
| 84F | | 1 | - | - | glabrous | - |
| 84G | | 1 | thick | 3.05 | slight | + |
| 84K | | 2 | slender | - | strong | - |
| 84L | | 5 | thick | 3.0 | slight | - |
| 197C | | 1 | - | - | glabrous | - |
| 451F | | 1 | thick | 2.9 | slight | - |
| 564C | | 3 | slender | c.3.0 | glabrous | - |
| 625C | | 2 | - | - | strong | - |
| 673C | | 2 | slender | 3.2 | slight | - |
| 678E | | 4 | - | - | slight | - |
| 688B | A | 6 | slender | 2.8-3.25 | glabrous | - |
| | B | 5 | thick | 2.7-3.05 | strong | - |
| | C | 1 | thick | 1.95 | strong | + |
| 688C | | 5 | - | - | slight | - |
| 885F | | 1 | - | - | glabrous | - |

(b) Wheats

Wheat caryopses and spikelet parts of the glume wheats are common in most samples. Many of the caryopses are poorly preserved and of those which survive in a reasonable condition some are of a rather indistinct type; it is these specimens which comprise the '*Triticum* sp.' of Table 3.3.0. From the remaining grains three main types may be distinguished. The first and by far the most numerous type of grain is broad with a blunt apex and more pointed embryo. The ventral side is flat and the ventral furrow very narrow. This type of grain may be identified as of spelt, *Triticum spelta* L. Much less common are grains of emmer, *Triticum dicoccum* Schübl., which taper at both ends, again have fairly flat ventral sides, but are distinctively triangular and sometimes asymmetrical in cross section. There are a very few grains with rather steeply placed embryos, blunt at both embryo and apex, with their maximum width just above the embryo. These are probably of bread wheat, *Triticum aestivum sensu lato*. Dimensions of spelt-type grains appear in Table 3.3.3. and all three types of grains are illustrated in Figs. 3.3.3. and 3.3.4.

The proportions of spelt and emmer are borne out by the surviving spikelet parts. In these samples intact spikelet forks are rather rare, and the forks of emmer which do survive have without exception lost their internodes. The spelt forks are rather better preserved and often include the basal part of their internodes, pointing upwards. There are a few one-grained spikelets from the apex of the ear, which are much narrower. Dimensions of forks are given in Table 3.3.4.

Detached glume bases are far more common than spikelet forks. They display the characteristic features of the two species discussed above, and typical specimens are illustrated in Fig. 3.3.5. From the larger samples up to 50 specimens, where possible, were extracted for measurement and the ranges of dimensions obtained are shown in Table 3.3.5. Spelt glume bases are clearly in the majority.

Table 3.3.3. Triticum spelta and spelta-type grains. Dimensions and indices ($N \geqslant 10$).

| | | | | | | |
|---|---|---|---|---|---|---|
| 578E | N=17 | | | | | |
| | L | B | T | L:B | T:B | 'Early' phase |
| min. | 4.3 | 2.2 | 2.0 | 141 | 66 | |
| mean | 5.11 | 2.90 | 2.54 | 177 | 88 | |
| max. | 6.7 | 3.5 | 3.0 | 203 | 104 | |
| $s^2$ | 0.37 | 0.11 | 0.10 | - | - | |
| 673C | N=11 | | | | | |
| | L | B | T | L:B | T:B | |
| min. | 5.0 | 2.5 | 2.0 | 159 | 67 | |
| mean | 5.22 | 2.94 | 2.50 | 179 | 83 | |
| max. | 5.5 | 3.1 | 3.0 | 216 | 97 | |
| 688B | N=10 | | | | | |
| | L | B | T | L:B | T:B | |
| min. | 3.6 | 2.3 | 2.0 | 128 | 71 | |
| mean | 4.66 | 3.02 | 2.44 | 156 | 82 | |
| max. | 6.1 | 3.5 | 2.6 | 182 | 104 | |
| 678E | N=15 | | | | | |
| | L | B | T | L:B | T:B | Undated |
| min. | 4.5 | 2.5 | 2.3 | 155 | 72 | |
| mean | 5.53 | 2.95 | 2.56 | 187 | 86 | |
| max. | 6.1 | 3.1 | 3.1 | 208 | 100 | |
| $s^2$ | 0.22 | 0.80 | 0.26 | - | - | |

Table 3.3.4. Spelt and emmer, spikelet fork widths (mm.).

| Sample number | Spelt | Emmer |
|---|---|---|
| 84I | 2.2 | - |
| 84J | 2.0,2.5 | - |
| 84K | 2.0,2.7,1.8* | 1.4 |
| 197I | 2.1 | - |
| 564C | 2.2 | - |
| 567B | 2.3,2.4 | - |
| 576C | 2.1 | - |
| 578E | 2.0 | 1.6 |
| 673C | 2.5 | 1.8,1.8 |
| 678E | 2.0,1.9, 2.1,1.5* | 1.5 |
| 688B | 2.0,2.2 | - |

* One grained spikelets.

Table 3.3.5. Spelt and emmer, glume base widths (mm.). Large samples only.

| Sample number | Spelt | Emmer |
|---|---|---|
| 84L | 0.90-1.36 | 0.76-0.88 |
| 532E | 0.90-1.30 | 0.76 |
| 578E | 0.90-1.34 | 0.78-0.88 |
| 673C | 0.92-1.42 | 0.84-0.86 |
| 678E | 0.92-1.22 | 0.78-0.84 |
| 688B | 0.90-1.36 | 0.72-0.90 |
| 688C | 0.90-1.56 | 0.80-0.90 |

(c) Vetches

The preservation of small vetch seeds in these samples is very poor, and most consist of featureless, cokey spheres. In this condition identification is impossible, and one can only note the size of the seeds. 2mm. was chosen as an arbitrary dividing line; vetch seeds above this are described as large, those below as small. However a small number of seeds in the larger samples have well preserved surfaces and intact hilums. Most are of Vicia tetrasperma (L) Schreb., the smooth tare. The relative size of seed and hilum is appropriate for this species, although the hilums are oval, rather than wedge-shaped as described by Helbaek (1964, 161). One specimen has a much longer and thinner hilum, and appears to be of Vicia hirsuta (L) S.F. Gray.

There is no definite sign of cultivated vetch, although the larger specimens in the Portway samples are of approximately the right size to be of this species.

Table 3.3.6. Dimensions of seeds and hilums of Vicia species.

| Sample number | Seed dimensions(mm). | Hilum length(mm). | Species |
|---|---|---|---|
| 197K | 2.1 | 1.25 | V. tetrasperma |
| 685D | 1.85 | 1.05 | " |
| | 1.70 | 1.05 | " |
| | 1.90 | 1.0 | " |
| 685E | 1.5 | 1.0 | " |
| 685F | 1.6 | 1.1 | " |
| 685E | 2.1 | 1.8 | V. hirsuta |

(d) Culm fragments

Carbonised culm nodes of cereals - the distinctive part of the straw - were reasonably common in the samples. There are also a few culm bases with buttress roots (see Fig. 3.3.6).

(e) Pottery impressions

Fragments of briquetage from FN 885, Layers B and E, have impressions of chaff on their surfaces. These are unfortunately rather eroded, and as a reconstruction of the material was to be carried out it was not possible to fracture the clay to obtain fresh surfaces. Glumes of wheat species appear to form the bulk of these poorly preserved impressions.

Several grain impressions could be identified on a large storage jar from FN 414K (Plate 2). These are as follows:-

| | | |
|---|---|---|
| Exterior | Hordeum sp. (hulled) | Oblique dorsal view. Breadth c. 2.9mm. |
| Interior | Triticum spelta/dicoccum | Lateral view of two spikelets. |
| | Hordeum sp. (hulled) | Ventral view. Length c.6.3mm. Breadth c. 3.1mm. |
| Body of fabric | Hordeum sp. (hulled) | Oblique dorsal view. |
| | Hordeum sp. (hulled) | Partial ventral view. Folds of palea visible |

Other impressions on the pot were not identified.

(f) Weed seeds

All weed seeds recovered are listed in Table 3.3.0 and described in section 3.14.

Figure 3.3.1; Portway - Barley caryopses.
*Hordeum vulgare* from sample 294 B.

Figure 3.3.2: Portway - Barley rachis internodes.

a. 84G
B. 84K
c. 84L
d. 451F
e. 564C
f. 673C
g,h,i. 688B.

Figure 3.3.3: Portway - Spelt caryopses.

a. 678E
b. 578E.
c,d. 673C.

Figure 3.3.4: Portway - Emmer and bread wheat caryopses.

a. *Triticum dicoccum* 197L
b. " 673C
c. " 578E
d. *Triticum aestivum* s.l. 414F
e. " 375F

Figure 3.3.5; Portway - wheat chaff.

a,b,c. *Triticum spelta* glume bases. 688B
d. *Triticum dicoccum* glume bases 84K
e. " 192U
f. *Triticum dicoccum* spikelet fork 84K.
g. " 673C.
h. *Triticum spelta* spikelet fork 688B.
i. " 578E.

Figure 3.3.6; Portway - *Bromus* caryopses

Figure 3.3.7; Portway - culm bases and tubers.

a,b. Cereal culm bases. c. Tubers of *Arrhenatherum tuberosum*

The scale in all illustrations is in millimetres.

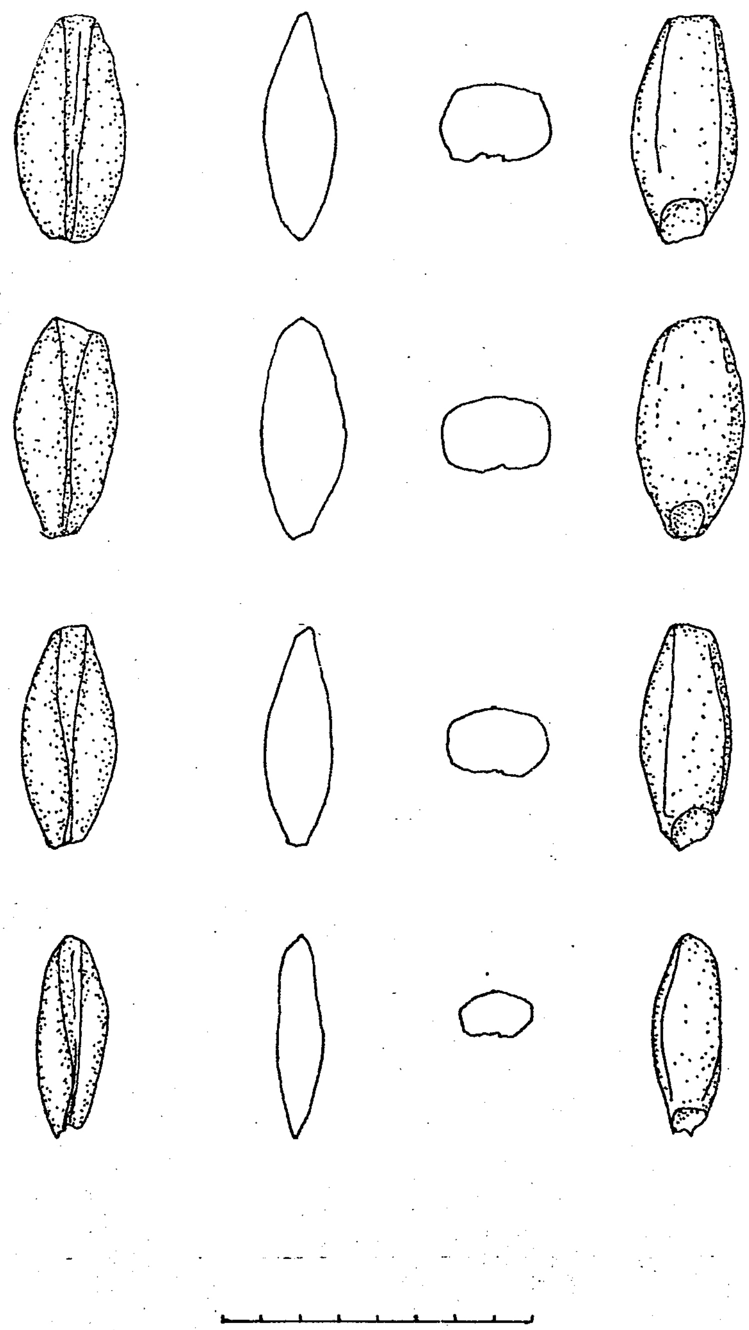


Figure 3.3.1.

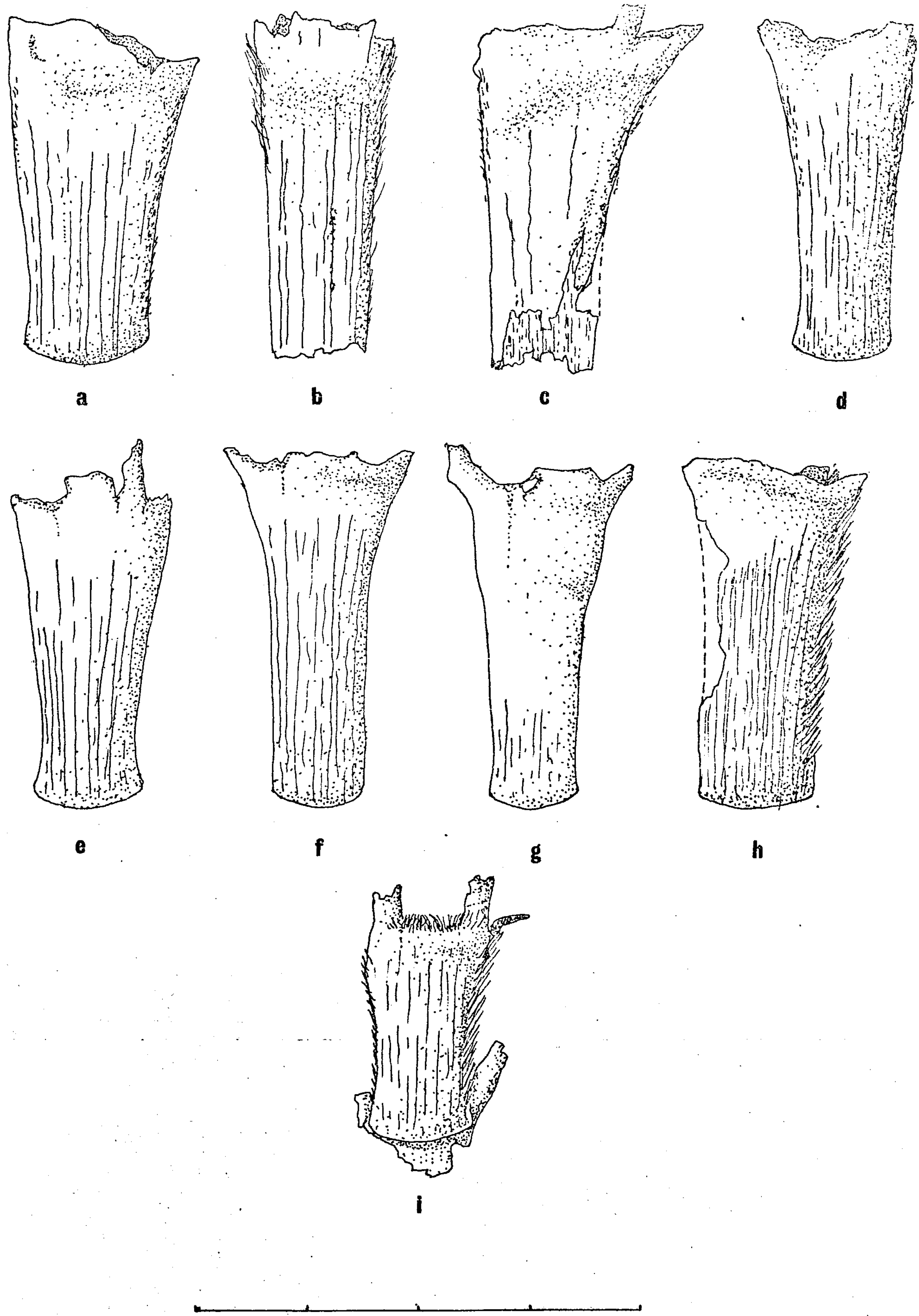



Figure 3.3.2.

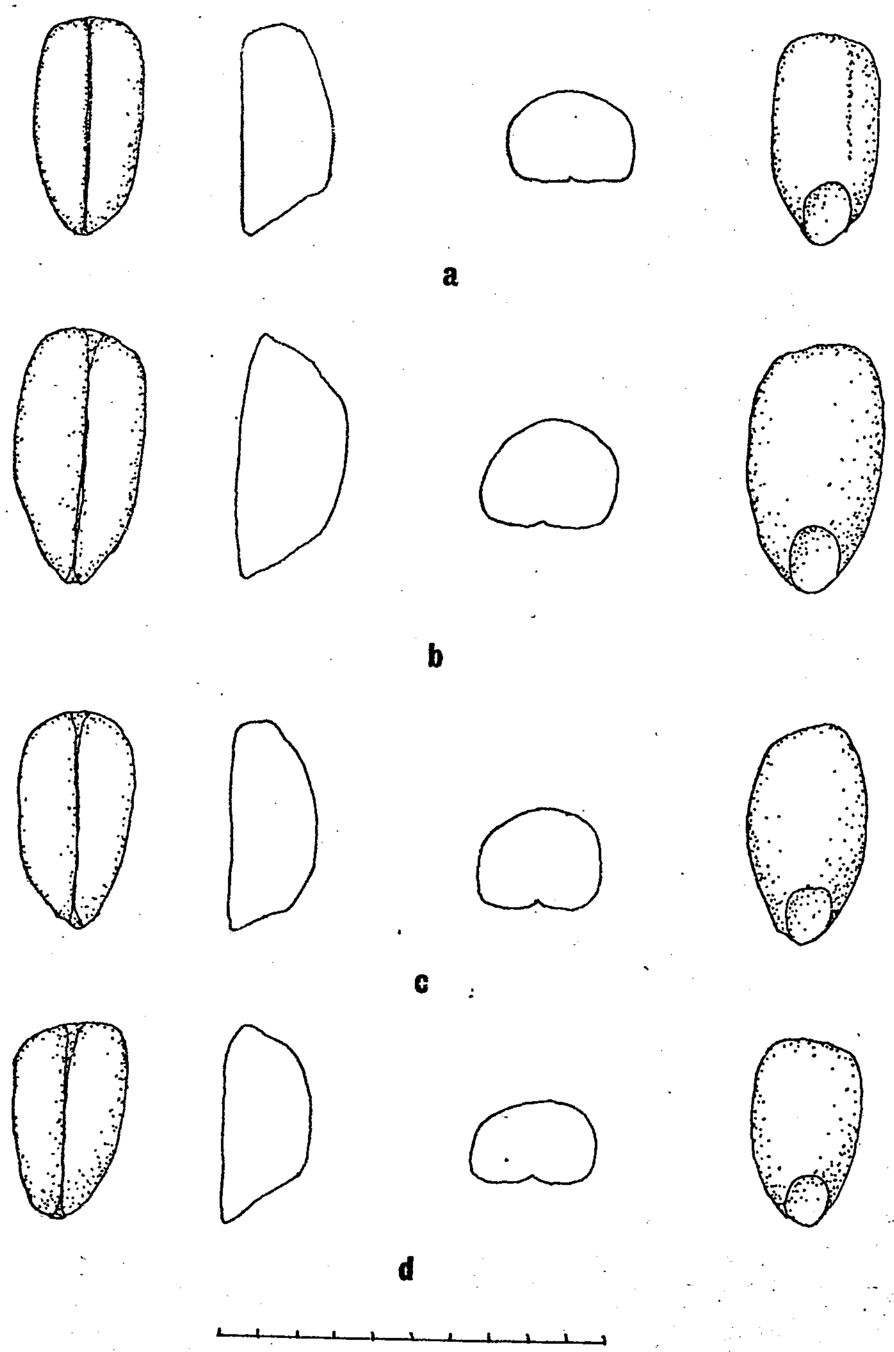



Figure 3.3.3.

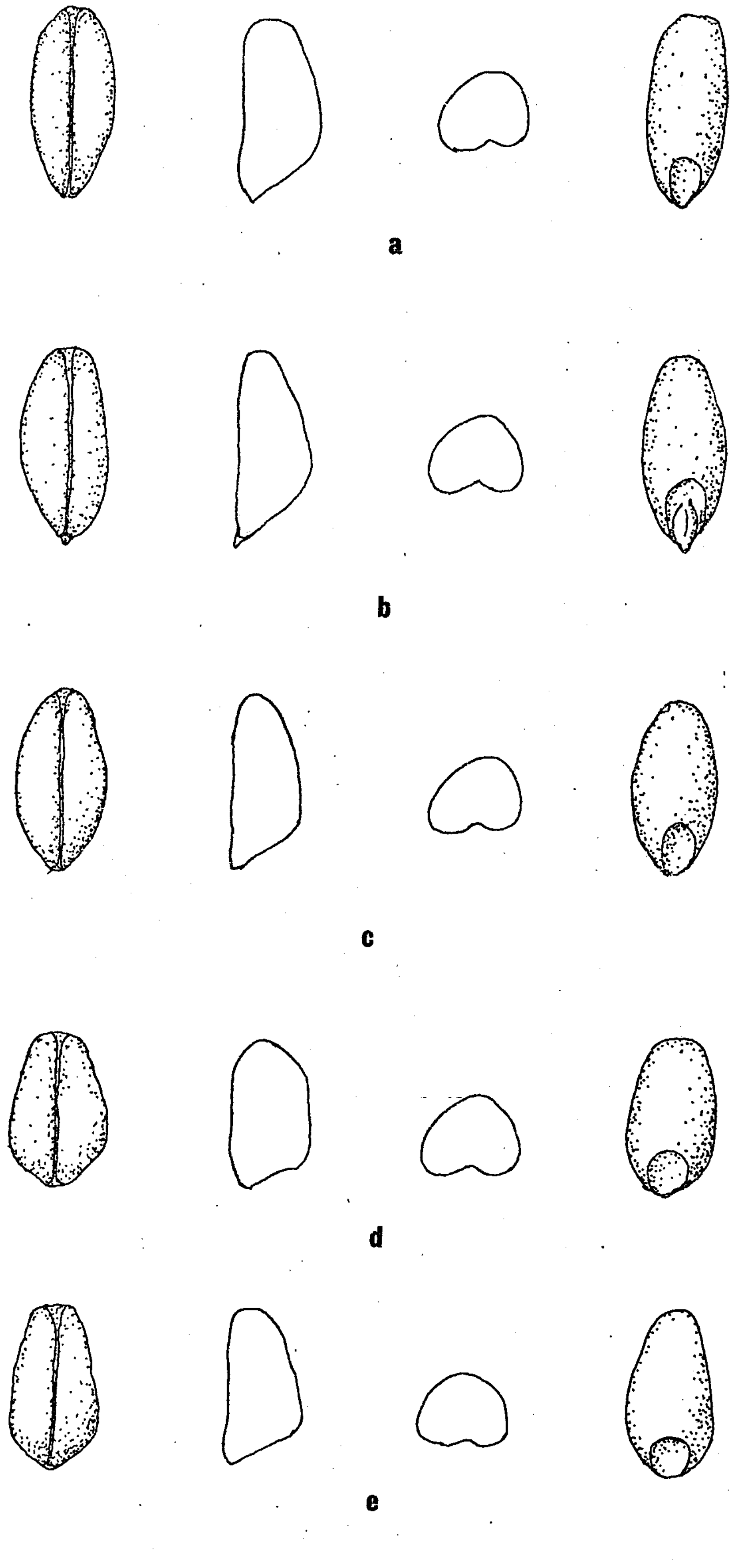



Figure 3.3.4.

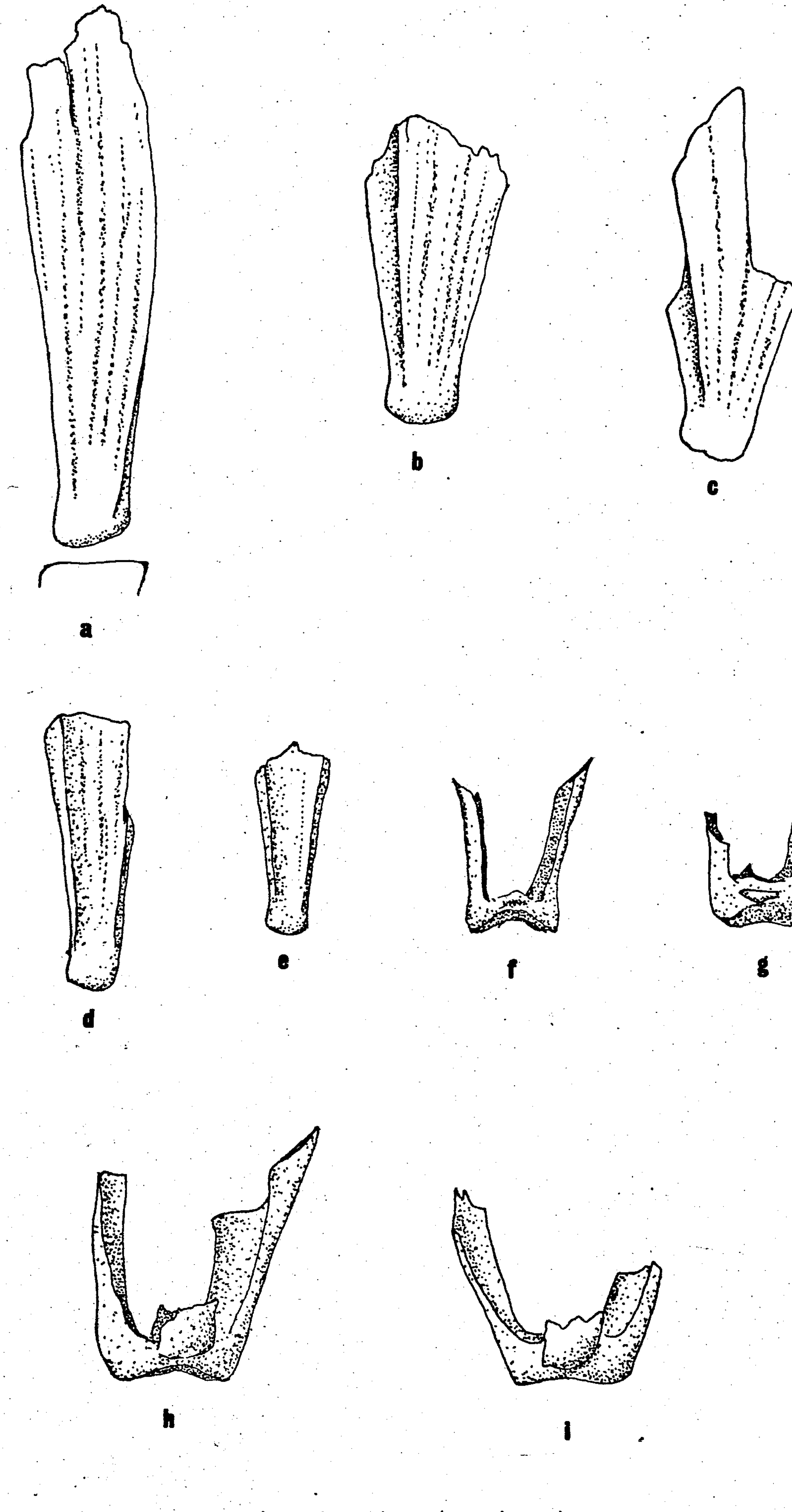



Figure 3.3.5.

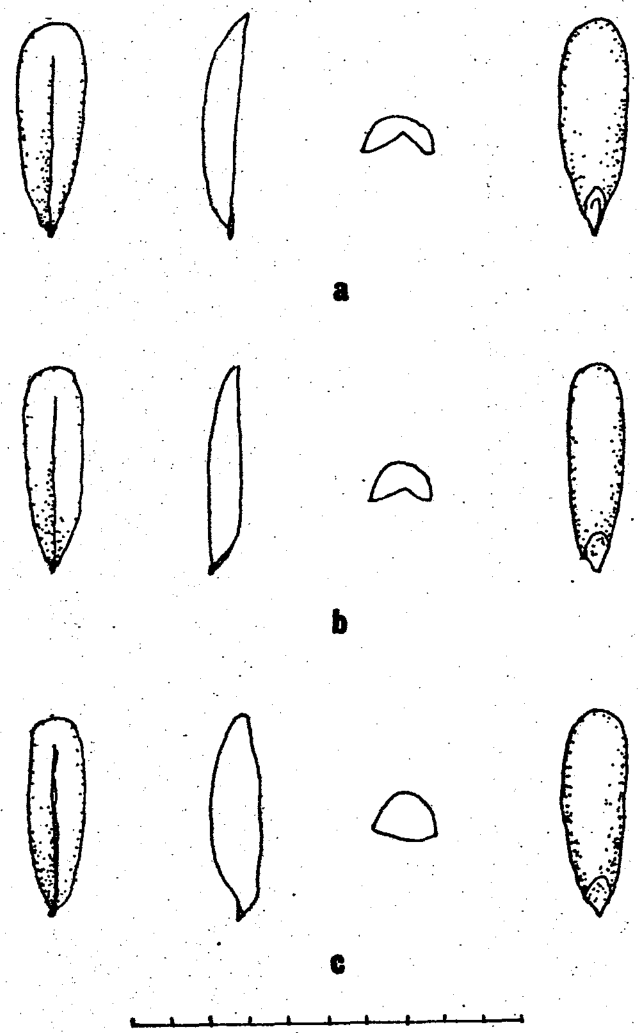



Figure 3.3.6.

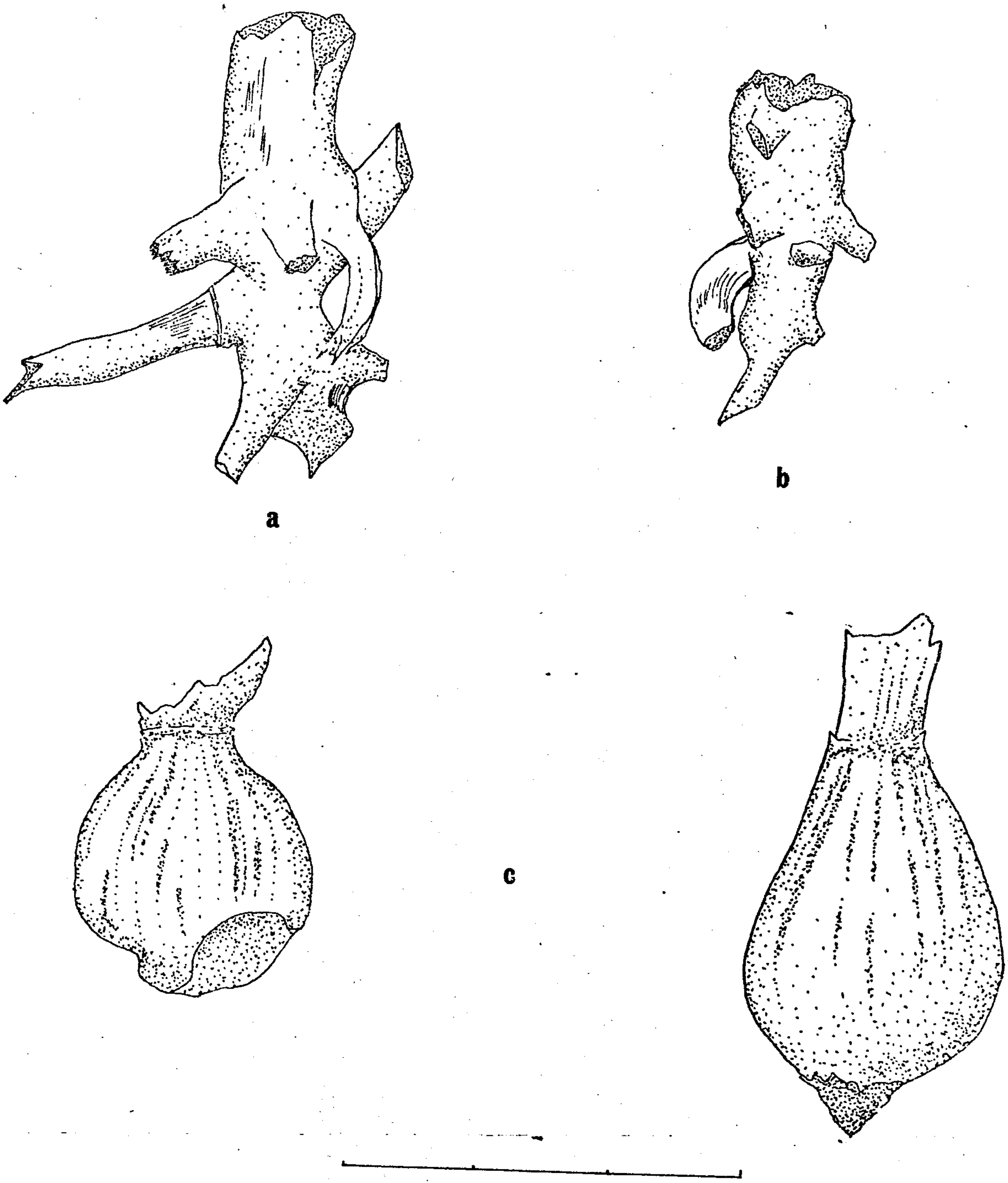
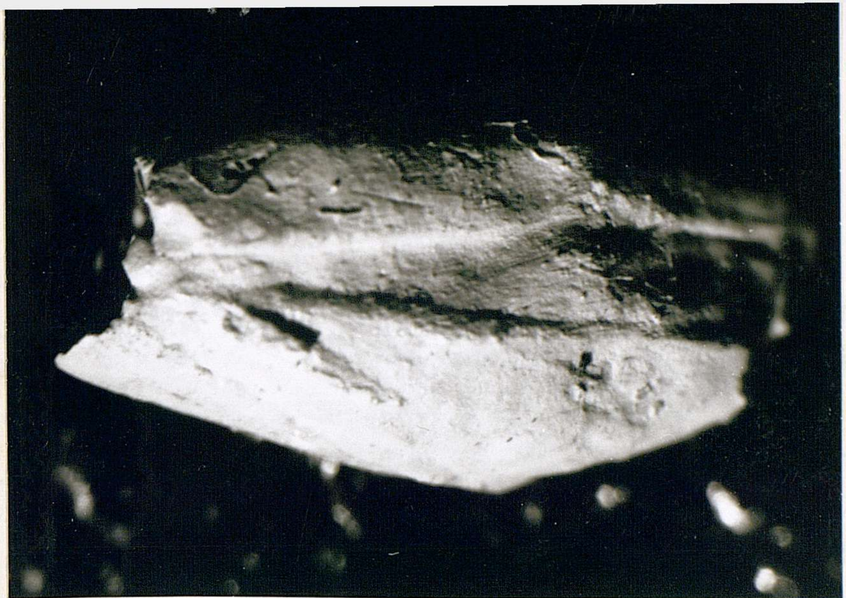



Figure 3.3.7.



a

b

c

Plate 2. Portway: Grain impressions in pottery. The photographs are of latex casts taken from a storage jar from FN 414K. Scales in millimetres.

a. Hordeum sp.(hulled). Ventral view.

b. Hordeum sp.(hulled). Oblique dorsal view.

c. Triticum sp. Two spikelets, lateral view.

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Soils and preservation. The soil is derived from the Clay-with-flints overlying the Upper Chalk. The material is all carbonised.

Contexts. The enclosing ditch, 2, was sampled at two points. The internal postholes were shallow, clay filled and ill-defined against the clay subsoil and as flotation of their fills proved very difficult they were not sampled. The bulk of the samples come from the pits. Of the 20 or so excavated 12, (8, 14, 51, 98, 140, 293, 295, 298, 300, 319, 321, 415), had samples removed from each layer and 'promising' layers from other pits were also sampled. All samples except those from Feature 2 are therefore from storage pits. There are 141 samples of 1st century BC date and 6 from the upper layers of pits which are associated with Romano-British pottery of various dates.

Sampling. A fixed sample volume of 10l. (one bucketful) was taken from the above contexts.

Flotation. The samples were floated in the M3 froth flotation machine (Lapinskas 1975).

| Feature number | | 2A | 2G | 2G | 2G | 5 | 5 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | 107 | 489 | 504 | 552 | 6 | 6 | 38 | 39 | 41 | 41 | 47 | 64 | 83 | 83 | 92 | 113 | 113 | 181 | 50 | 50 | 53 | 54 | 54 | 55 | 56 | 67 |
| Sample number | | 507 | 598 | 611 | 631 | 501 | 503 | 529 | 530 | 502 | 532 | 533 | 537 | 511 | 538 | 539 | 513 | 542 | 534 | 512 | 647 | 655 | 516 | 652 | 653 | 654 | 664 |
| Cereal (indet.) | ca | | 1 | 3 | | | 2 | 10 | 2 | 22 | 3 | | 12 | 6 | 7 | 8 | 7 | 3 | 1 | 8 | 1 | 17 | 3 | 5 | 5 | 7 | 1 |
| Hordeum sp. | ca | | | | | | | | 1 | | 1 | 2 | 4 | | 2 | | | | | 2 | | 2 | | 2 | 1 | | |
| Hordeum vulgare | ca | | | | | | | | | 83 | | | | 19 | | 25 | 19 | 29 | | | | | | | | 5 | |
| Hordeum vulgare var. nudum | ca | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum sp. | ca | 1 | | | | 1 | | 2 | | 12 | | 1 | 6 | | | | 2 | | 1 | 1 | | 7 | 2 | 1 | 1 | 4 | |
| Triticum spelta - type | ca | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum dicoccum - type | ca | 1 | | | | | | | | | | | | | 1 | | 1 | | | | | | | | | | |
| Triticum aestivum sl. | ca | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Avena sp. | ca | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum spelta | spf | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Triticum dicoccum | spf | | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| Triticum spelta | gb | 1 | | 1 | | | | | | | | | | | | | | | | | | 1 | | | | 1 | 1 |
| Triticum dicoccum | gb | | | | | | | | | | | | | | | | 1 | | | | | | | | | | |
| Triticum sp. | gb | 1 | | | | | | | | 12 | | | 1 | | | | | | | | 1 | | | | | | 1 |
| Hordeum sp. | ri | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cereal | cn | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Vicia sp. (l) | s | | | | | | | | | | | | 2 | | | | | | | | | | | | | | |
| Vicia sp. (s) | S | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Medicago sp. | s | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| Leguminosae | s | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosa sp. | fs | | | | | | | | | | | | | | | | | | | | | | | | | | |
| cf. Prunus avium | fr | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anisantha sterilis | ca | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bromus mollis/secalinus | ca | | | | | | 1 | | | | | | 1 | | | | 2 | | | 2 | | 6 | 2 | | 1 | 1 | 5 |
| Gramineae (l) | ca | | 1 | | | | | | | | | | | | | | | | | 1 | | 1 | | | 1 | 1 | |
| Gramineae (s) | ca | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |
| Arrhenatherum tuberosum | tu | | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| Ranunculus sp. | a | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Papaver sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thlaspi arvense | s | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stellaria media | s | | | | | | | | | | | | | | | 2 | 1 | | | | | | | | | | |
| Silene alba | s | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Caryophyllaceae | s | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | 1 | | | | | | | | | | | | | | | | | | | | | |
| Chenopodium album | s | | | 1 | | | | | | | | 1 | | | | | | | | | | 1 | | | 1 | | |
| Atriplex patula/hastata | s | | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| Chenopodiaceae | s | | | | 1 | | | | | | | | | | | | | 1 | | | | | | | | | |
| Malva sylvestris | nu | | | 1 | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Rumex sp. | nu | | | | | | | 1 | 1 | 1 | | | | 1 | | | | 1 | | | | | | | | | 1 |
| Polygonum convolvulus | nu | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Polygonaceae | nu | | | | | | | | 1 | | | | | | | | | | | | 1 | | | | | | |
| Hyoscyamus niger | s | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Galeopsis tetrahit | nu | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plantago lanceolata | s | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Galium aparine | fr | | | 2 | | | | | | | | 1 | 3 | | 1 | | | | | | | | 1 | | | | |
| Sambucus nigra | s | | | | | | | | | | | | | | 1 | | | | | | | | | | | | |
| Valerianella dentata | fr | | | | | | | | | | | | | | | | 2 | | | | | | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| Chrysanthemum leucanthemum | cy | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Anthemis/Chrysanthemum sp. | cy | | | | | | | | | | | | | | | 1 | | 1 | | | | 1 | | | | | |
| Lapsana communis | cy | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sonchus cf. asper | cy | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeterminate | | | | | | | | | | | | | 1 | | | 1 | | 1 | | | | 2 | | | | 2 | 1 |
| % sorted (where < 100%) | | | | | | | | | | | | 25 | | | | | | | | | | | | | | | |

Table 3.4.0: Fruits, seeds etc. identified in samples from Site R27. 1st. century B.C. samples are listed first; the six Romano-British samples appear separately at the end.

Botanical descriptions.

(a) Barley

Hulled six-row barley, Hordeum vulgare L. emend. Lam., is the main species present. A large number of the grains are badly puffed, but where they are well preserved the angular cross-section of the hulled grains is usually clear (Fig. 3.4.1 a,b). There are also a few specimens of naked barley (Fig. 3.4.3). Grains from both median and lateral spikelets are represented. A few of the hulled grains retain more or less intact lemmas, including in one case the base of the lemma awn (Fig. 3.4.1 c) but lemma bases have not survived. Measurements of Length, Breadth and Thickness, together with the indices derived from these dimensions, taken from the larger samples of well-preserved grains appear in Table 3.4.1.

The rachis internodes are poorly preserved, but two main forms may be distinguished (Table 3.4.2). These are a slender glabrous type from a lax-eared barley (Fig. 3.4.2 a-d) and a much shorter, broader form with strong pubescence along the margins (Fig. 3.4.2 e). This could be from the basal part of an ear of lax-eared barley, or possibly from a dense-eared variety. The almost total absence of pubescence on the slender internodes in these samples may be partly a consequence of poor preservation, as faint traces of hairs are visible on a few specimens.

(b) Wheats

Although there are many wheat grains of rather indistinct form, grains with blunt apices and very broad, flat ventral sides, entirely typical of spelt, Triticum spelta L. are clearly the commonest type (Fig. 3.2.1 e,f). Grains of emmer, T. dicoccum Schubl., tapering at either end and asymmetrically triangular in cross section, are rather more uncommon (Fig. 3.2.1. g,h). Bread wheat-type grains, T. aestivum sensu lato, short and plump, with their maximum width just above the embryo, occur in only a few samples in small numbers (Fig. 3.2.1 d). These wheat grains are rather poorly preserved, and only a few samples were suitable for measurement (Tables 3.4.3 and 3.4.4).

The wheat glume bases are almost entirely of spelt. They are broad and stout, strongly veined, with a prominent ventral vein (Fig. 3.4.2 g). Measurements of the widths of larger groups are given in Table 3.4.5, together with dimensions of the few emmer glume bases (Fig. 3.4.2 f). Some intact spikelet forks were found in samples from pit 14; they are illustrated in Fig. 3.4.2 h, i, and their dimensions appear in Table 3.4.6.

(c) Oats

Only one reasonably large sample of oat caryopses, again from pit 14, was found. They are elongate, and quite puffed along the ventral furrow, and have the characteristic blunt apex and hairy surface of oat grains (Fig. 3.4.1 j). No floret bases survive, and in their absence it is impossible to determine whether a wild or cultivated species of *Avena* is represented. Dimensions and indices of this one sample appear in Table 3.4.7.

(d) Vetches

Sub-spherical seeds with eroded, cokey surfaces but no trace of the hilum are probably of the genus *Vicia*. More precise identification is impossible, although the range of size, 2.1 - 3.3 mm., suggests that more than one species, possibly including the cultivated vetch, is represented.

(e) Poppy

These reniform seeds, 0.8 - 0.9 mm. in length, were found sporadically in the samples. Although definite identification has proved to be impossible the seeds appear to be too large and the polygonal reticulation too coarse for them to be of the common wild species, and they are probably of *Papaver somniferum*, the opium poppy (Fig. 3.4.3).

(f) Wild rose

A single carbonised fruitstone of wild rose, *Rosa* sp., was found. It is 4.9 mm. long with three main facets, and is bilaterally symmetrical.

(g) Elderberry

A few seeds of elder, Sambucus nigra, 2.8 - 3.0 mm. in length, flattened oval in shape with coarse transverse ridges.

(h) Cherry?

A fruitstone, largely obscured by the carbonised remains of mesocarp tissue, about 5.5mm. long and smooth surfaced, may be of Prunus avium L., the wild cherry.

(i) Weed seeds

All weed seeds recovered are listed in Table 3.4.0 and described in section 3.14.

Table 3.4.1. Hordeum vulgare. Dimensions in mm. and indices. (N $\geqslant$ 10 only).

(Only the 1st century BC phase produced grain and chaff suitable for measurement).

8/41/502 N=17

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 5.0 | 2.3 | 2.0 | 172 | 73 |
| mean | 5.54 | 2.90 | 2.55 | 191 | 88 |
| max. | 6.4 | 3.2 | 3.2 | 203 | 100 |
| $s^2$ | 0.172 | 0.045 | 0.117 | - | - |

8/113/542 N=14

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 4.5 | 2.0 | 1.7 | 166 | 76 |
| mean | 5.56 | 3.01 | 2.68 | 185 | 88 |
| max. | 6.5 | 3.5 | 3.4 | 225 | 97 |

14/136/697 N=16

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 3.9 | 2.0 | 1.5 | 162 | 67 |
| mean | 5.08 | 2.51 | 2.03 | 204 | 81 |
| max. | 5.8 | 3.0 | 2.5 | 250 | 95 |
| $s^2$ | 0.257 | 0.111 | 0.076 | - | - |

Table 3.4.2. Barley rachis internodes

| Sample number | N | Build | Length(mm.) | Pubescence |
|---|---|---|---|---|
| 14/202/729 A | 3 | Slender | 3.8 | Glabrous |
| B | 2 | Broad | 2.1 | Strong marginal hairs |
| 14/111/695 | 1 | Slender | frag. | Glabrous |
| 14/136/697 | 1 | " | > 3.3 | " |
| 140/207/562 | 2 | " | frag. | " |
| 293/412/2865 | 1 | " | " | " |
| 311/615/708 | 1 | " | " | " |
| 311/669/707 | 1 | " | " | " |
| 319/520/601 | 1 | " | " | " |
| 415/651/728 | 1 | " | " | Traces of hairs |

Table 3.4.3. Triticum spelta. Dimensions and indices

415/575/643 N=8

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 5.0 | 2.9 | 2.5 | 171 | 86 |
| mean | 5.58 | 3.00 | 2.81 | 186 | 94 |
| max. | 6.2 | 3.2 | 3.0 | 207 | 100 |

Table 3.4.4. Triticum dicoccum. Dimensions in mm. and indices

415/575/643 N=6

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 4.7 | 1.8 | 1.8 | 172 | 93 |
| mean | 5.10 | 2.47 | 2.41 | 210 | 98 |
| max. | 6.0 | 2.9 | 2.8 | 261 | 104 |

Table 3.4.5. Triticum spp. Glume base widths (mm.)

| | | | |
|---|---|---|---|
| 14/202/729 | T. spelta | 1.00-1.20 mm. | N=4 |
| | T. dicoccum | 0.80 mm. | N=1 |
| 14/363/703 | T. spelta | 1.21-1.32 mm. | N=4 |
| | T. dicoccum | 0.62 mm. | N=1 |
| 140/207/562 | T. spelta | 0.90-1.44 mm. | N=17 |
| 140/218/560 | T. spelta | 0.98-1.28 mm. | N=5 |
| 298/306/3206 | T. spelta | 1.06-1.30 mm. | N=3 |
| 298/314/3213 | T. spelta | 1.14-1.36 mm. | N=3 |
| 319/520/601 | T. spelta | 0.98-1.52 mm. | N=7 |
| | T. dicoccum | 0.80 mm. | N=1 |
| 415/651/728 | T. spelta | 0.94-1.30 mm. | N=5 |

Table 3.4.6. Triticum spp. Spikelet fork widths. (mm.)

| | | | |
|---|---|---|---|
| 14/111/695 | T. spelta | 2.8 mm. | N=1 |
| 14/202/729 | T. dicoccum | 1.9-2.1 mm. | N=4 |

Table 3.4.7. Avena sp. Dimensions in mm. and indices

14/136/697 N=6

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 4.8 | 1.5 | 1.2 | 250 | 75 |
| mean | 5.36 | 1.68 | 1.48 | 288 | 89 |
| max. | 5.8 | 2.0 | 1.8 | 320 | 100 |

Figure 3.4.1; Site R27 - cereal caryopses.

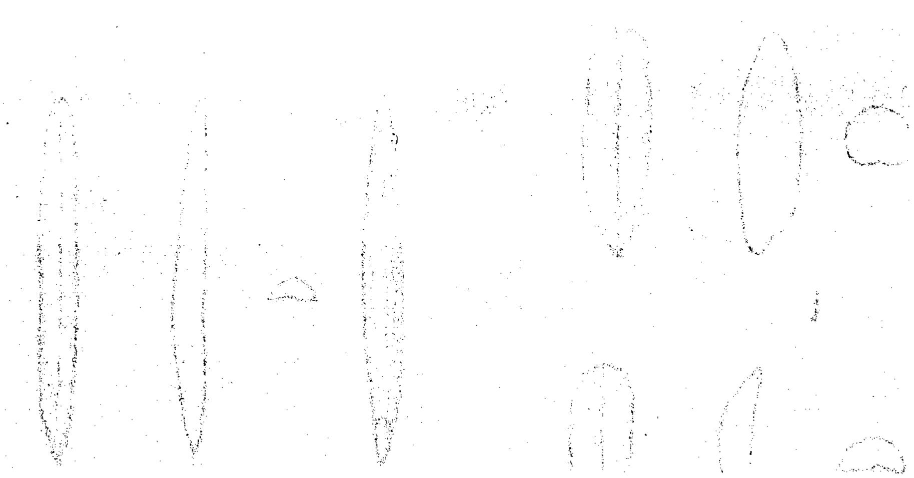
a,b. *Hordeum vulgare* 8/41/502.
c. " 14/130/697.
d. *Triticum aestivum* s.l. 415/575/643.
e,f. *Triticum spelta* 319/520/607.
g. *Triticum dicoccum* 8/83/538
h. " 319/521/602.
i. *Anisantha sterilis* 14/136/697.
j. *Avena* sp14/136/697.
k. *Bromus mollis/secalinus* 14/136/697.

Figure 3.4.2; Site R27 - cereal chaff.
a. *Hordeum vulgare* rachis internode. 140/207/562
b. " " "
c. " " 14/130/697.
d. " " 14/202/729.
e. " " "
f. *Triticum dicoccum* glume base. 51/77/518.
g. *Triticum spelta* glume base. 140/207/562.
h. *Triticum dicoccum* spikelet fork 14/202/729
i. *Triticum spelta* spikelet fork. 14/111/695.

Figure 3.4.3; Site R27 - naked barley and opium poppy.

a. *Hordeum vulgare* var. *nudum*. 14/363/732.
b. " " 51/52/517.
c. *Papaver* cf. *somniferum* 319/520/601
d. " " 14/136/ 697.

Scale throughout in millimetres.



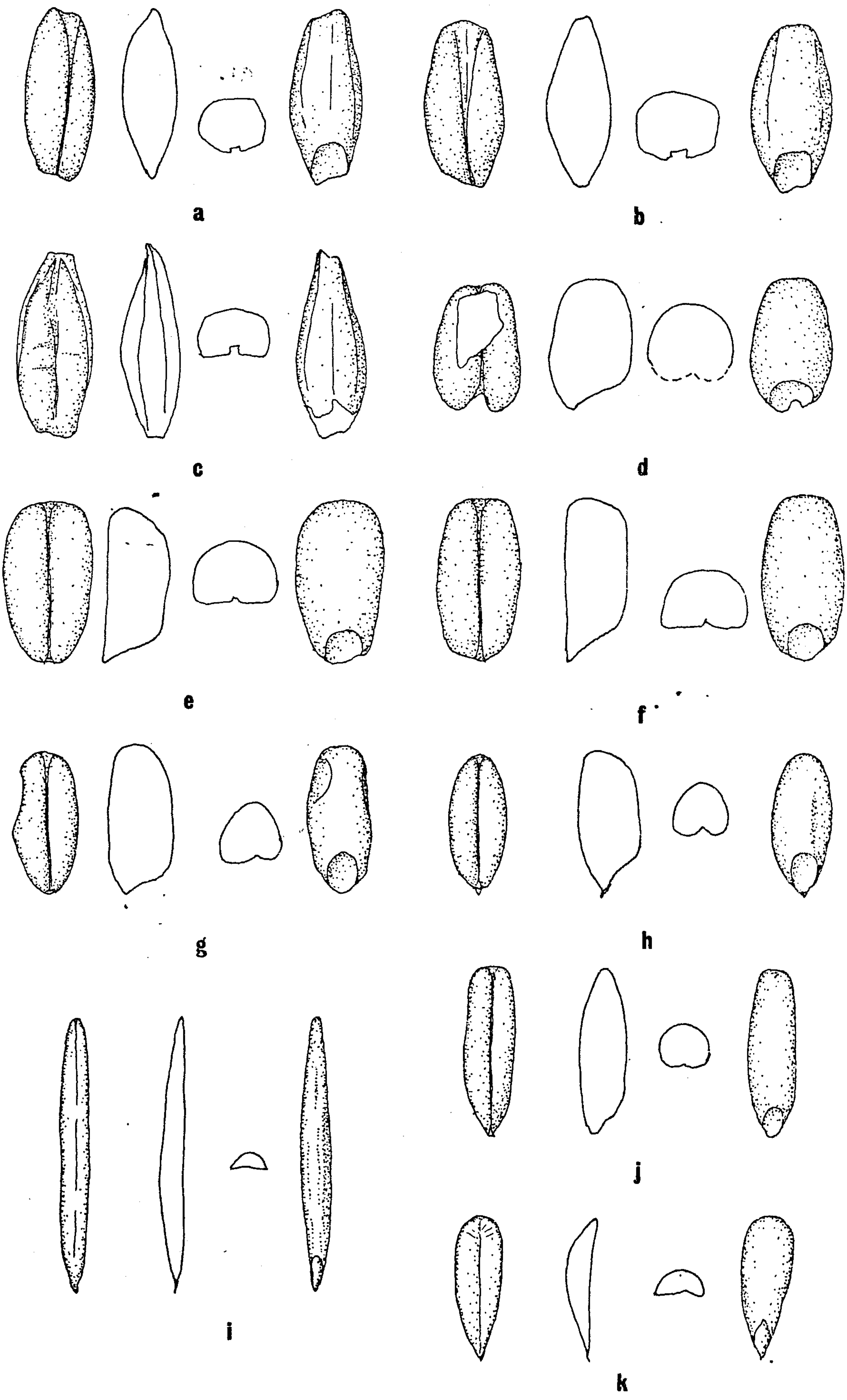



Figure 3.4.1.

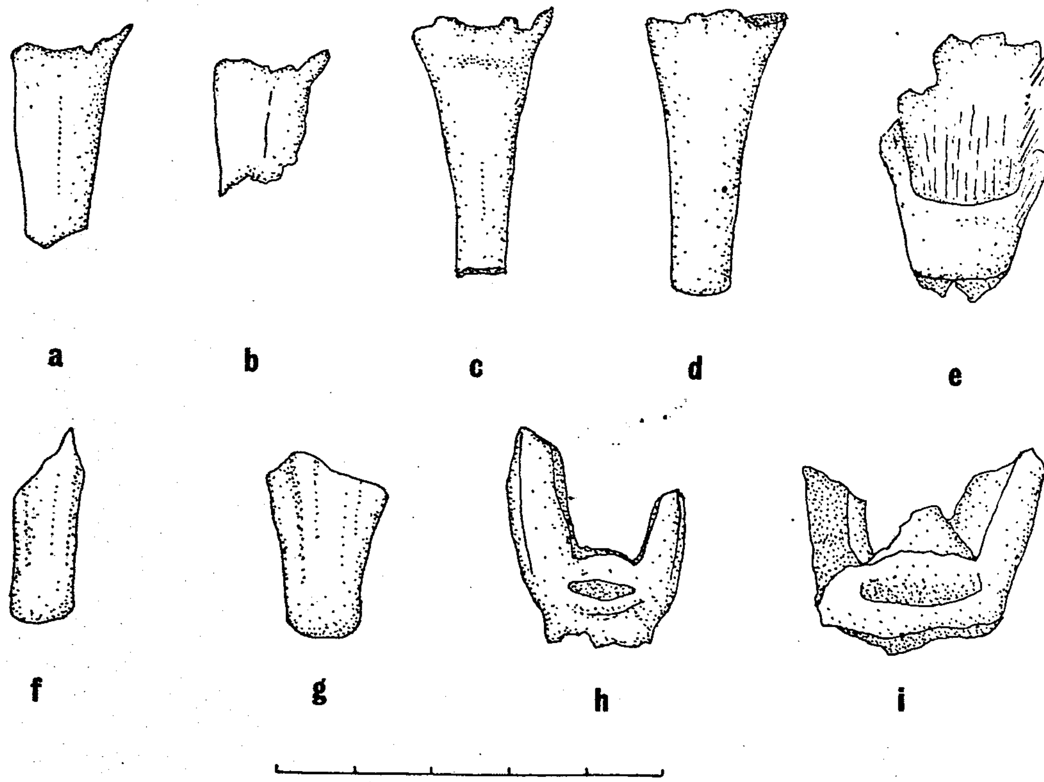



Figure 3.4.2.

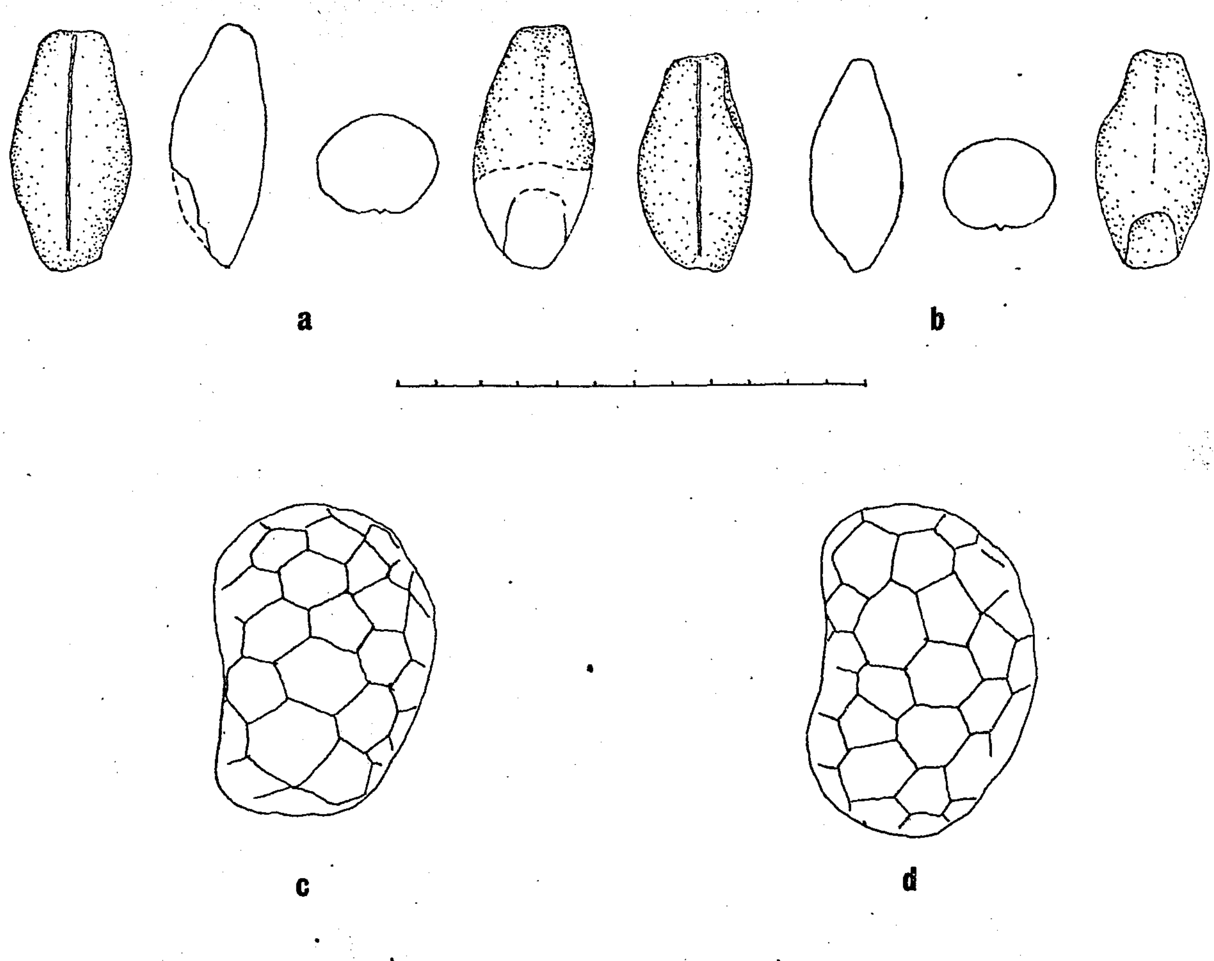



Figure 3.4.3.

3.5 Old Down Farm. SU 355 465

Soil and preservation. Light loams and heavier clays on the Upper Chalk. The material is all carbonised.

Contexts

Circular hut gully; 104.

Postholes; 63, 69, 121, 196, 201, 228, 280, 281.

Pits (partial sample); 567, 238.

Pits (total sample); 160, 239, 240, 243, 451, 567.

Nearly all the seeds recovered are from the pits.

Sampling. As the nearby sites of Portway and Balksbury were so extensively sampled, and as time and resources were limited it was decided to sample on a small scale merely to establish in broad terms whether the cereal deposits from Old Down presented any distinctive differences from these two sites. A constant sample volume of 101. (one bucketful) was taken for flotation from each layer of the above contexts. Altogether 21 samples containing carbonised seeds etc. were recovered.

Flotation. Froth flotation machine, virtually identical to the M3 machine (Lapinskas 1974).

Table 3.5.0; Fruits, seeds etc. identified in samples from Old Down Farm.

| Feature | | 104 | 104 | 160 | 160 | 160 | 201 | 238 | 239 | 239 | 240 | 240 | 240 | 240 | 240 | 240 | 243 | 243 | 243 | 451 | 567 | 567 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer | | C | D-E | 367 | 436 | 437 | 314 | 331 | 362 | 363 | 422 | 469 | 470 | 471 | 473 | 475 | 347 | 371 | 371 | 520 | 581 | 582 |
| Cereal | ca | 2 | 1 | | 1 | | 1 | 4 | 3 | 2 | 4 | 1 | | 1 | 1 | | 2 | 1 | 2 | | 3 | 7 |
| Hordeum sp. | ca | | | | 1 | | | | | | | 1 | | | | | | | | | | |
| Triticum sp. | ca | 1 | 1 | 1 | 1 | | | 3 | | | 2 | 1 | | | | | 1 | | 1 | 1 | | 5 |
| Triticum spelta-type | ca | | | | | | | | 2 | 4 | | | | | | | | | | | | 1 |
| Triticum dicoccum-type | ca | | | | | | | | | | | | | | | | | | | | | 2 |
| Triticum sp. | spf | | | | | 1 | | | | | | | | | | | | | | | | |
| Triticum spelta | gb | | | | | | | 1 | | | | 12 | | | | 1 | 2 | | 1 | | | |
| Triticum dicoccum | gb | | | 1 | | | | | | | | | | | | | | | | | | |
| Triticum sp. | gb | | | | | | | | | | 1 | 1 | | | | | | | 1 | | | |
| Cereal | cn | | | | | | | | 1 | | | 3 | | | | *+ | 1 | | | | | |
| Vicia sp. | s | | | | | | | | | | | | | | | | | | | | 2 | |
| cf. Medicago sp. | s | | | | | | | | | | | 16 | | | | 2 | | | | | | |
| Leguminosae | s | | | | | | | | | | | | | | | | | | | | 1 | |
| Bromus mollis/secalinus | ca | | | | | 1 | | | 1 | | | 12 | | 1 | | | 2 | | | | 2 | |
| Anisantha sterilis | ca | | | | | | | | | | | 2 | | | | | | | | | | |
| Gramineae | ca | | | | | | | | 1 | 1 | | 7 | | | 1 | | | | | | | |
| Ranunculus sp. | a | | | | | | | | | | | 1 | | | | | 1 | | | | | |
| Brassica/Sinapis sp. | s | | | | | | | | | | | | | | 2 | | | | | | | |
| Stellaria media | s | | | | | | | | | | | 4 | | | | | 1 | | | | | |
| Silene alba | s | | | | 1 | | | | | | | | | | | | | | | | | |
| Caryophyllaceae | s | | | | | 1 | | | | | | | | | | | | | | | | |
| Chenopodium sp. | s | | | | | | | | | | | | | | | | | | | | 3 | |
| Atriplex patula/hastata | s | | | | | | | | | | | 2 | | | | 2 | | | | | 20 | |
| Chenopodiaceae | s | | | | | | | 1 | | | | | | | | | | | | | 36 | 1 |
| Rumex sp. | mu | | | | | | | | | | | 10 | | | | | | | | | | 2 |
| Rumex acetellosa | nu | | | | | | | | | | | 3 | 1 | | | | | | | | | |
| Polygonum aviculare | mu | | | | | | | | | | | 4 | | | | | | | | | 1 | |
| Polygonum convolvulus | nu | | | | | | | 3 | | | | 2 | | | 1 | | | | | | 4 | |
| Polygonaceae | nu | | | | | | | 1 | | | 1 | 13 | | | | | | | 1 | | | |
| Lithospermum arvense | mu | | | | | | | | | | | | | | | | | | | | 4 | |
| Plantago lanceolata | s | | | | | | | | | | | 1 | | | | | | | | | | |
| Galium aparine | fr | | | | | | | | 1 | | | 3 | 1 | | | 1 | 1 | | | | 2 | 2 |
| Galium sp. | fr | | | | | | | | | | | 1 | | | | | | | | | | |
| Valerianella dentata | fr | | | | 1 | | | | | | | | | | | | | | | | | |
| Cirsium/Carduus sp. | cy | | | | | | | | | | | 1 | | | 5 | | | | | | | |
| Tripleurospermum maritimum | cy | | | | | | | | | 1 | | | | | | | | | | | | |
| Anthemis/Chrysanthemum sp. | cy | | | | | | | | 1 | | | 5 | | | | 4 | 1 | | | | | |
| Chrysanthemum leucanthemum | cy | | | | | | | | | | | 2 | | | | 1 | | | | | | |
| Carex sp. | mu | | | | | | | | | | | | | | | 1 | 1 | | | | | |
| Indeterminate | | | | | | 1 | | | | 1 | 1 | 8 | 2 | | 3 | 2 | 2 | | 2 | | 5 | 7 |

Botanical descriptions

(a) Wheats

Although most wheat caryopses in the samples are poorly preserved it is clear that at least two species are represented. Broad grains, with flat ventral sides and blunt apices, of spelt, Triticum spelta L., (Fig. 3.5.1 c,d) and a few more slender grains, pointed at either end, probably of emmer, Triticum dicoccum Schübl. (Fig. 3.5.1 b), both occur in the samples. Spelt-type grains are more common, and there are no grains which can confidently be identified as of the free-threshing bread or club wheats.

Sample 160 367 produced a narrow, weakly nerved glume base, 0.78 mm. wide at the articulation point, quite typical of emmer (Fig. 3.5.1 h). Spelt glume bases, however, are much more common. The twelve strongly nerved bases in sample 240 469 were 1.04 - 1.10 mm. wide (Fig. 3.5.1 i, j). A poorly preserved spikelet fork of spelt or emmer was also found (Fig. 3.5.1. g).

(b) Barley

Only two definite grains of barley could be identified, and only one of these is at all well preserved. It is certainly of hulled barley, as the slightly angular cross section survives despite puffing, and it appears rather asymmetrical. It is probably a lateral grain of six-row hulled barley, Hordeum vulgare L.

(c) Straw

Several samples contain carbonised culm nodes, the distinctive part of the straw, but sample 240 475 contains relatively large amounts of this material (Fig. 3.5.1 k), including a culm base with adventitious roots.

(d) Brassica sp.

In addition to the seeds recovered by flotation, a mass of carbonised seeds of a species of Brassica, about 7cc. in volume, was found adhering to the inner surface of the base of a pot from the bottom layer of pit 621. The seeds are 0.9 - 1.2 mm. in diameter, and roughly spherical with coarsely reticulate surfaces. Fine pits are visible in the interspaces of the reticulum, but it is unclear whether the pits cover the reticulum itself.

(e) Weed seeds

The weed seeds recovered are listed in Table 3.5.0 and described in section 3.14.

Figure 3.5.1; Old Down Farm - Cereal caryopses, chaff and straw.

a. *Hordeum vulgare* 240/469
b. *Triticum dicoccum* 567/582
c. *Triticum spelta* 239/362.
d. " "
e. *Bromus mollis/secalinus* 239/362.
f. *Anisantha sterilis* 240/469.
g. *Triticum* sp. spikelet fork. 160/437.
h. *Triticum dicoccum* glume base. 166/367.
i. *Triticum spelta* glume base. 240/469
j. *Triticum spelta* glume base. 240/475.
k. Cereal culm node 240/469.

Scale in millimetres.

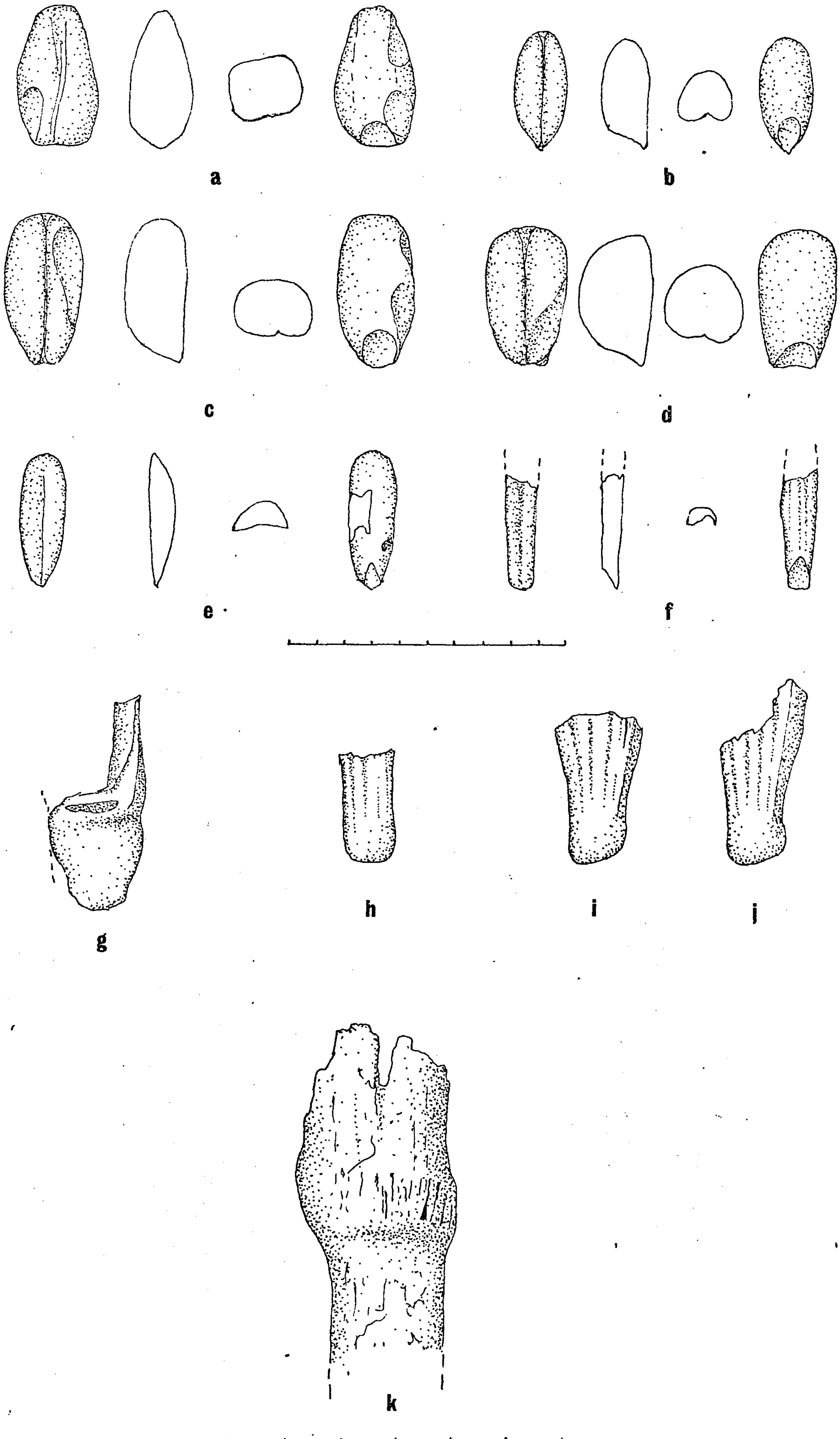



Figure 3.5.1.

3.6 R1. SU 539 408

Soil and preservation. The soil is developed from the Clay-with-flints, and the fruits and seeds isolated are all carbonised.

Context. Buried soil sealed beneath Roman road.

Sampling. A total of 0.68 $m^3$ of the buried soil, comprising seven samples in all (500-506) was taken for flotation.

Flotation. M3 froth flotation machine (Lapinskas 1974).

| Sample number | | 500 | 501 | 502 | 503 | 504 | 505 | 506 |
|---|---|---|---|---|---|---|---|---|
| Cereal | ca | 3 | 8 | 1 | 1 | 2 | 1 | 4 |
| Triticum aestivum s.l. | ca | 12 | 14 | 1 | 3 | 12 | | 4 |
| Triticum sp. | ca | 2 | 4 | 1 | | | | 4 |
| Hordeum vulgare var. nudum | ca | | | | | 1 | | |
| Hordeum vulgare indet. | ca | 1 | | | | | | |
| Hordeum sp. | ca | | 1 | | | 1 | | 1 |
| Bromus mollis/secalinus | ca | | 5 | | | 2 | | 1 |
| Ranunculus sp. | a | | | | | | | 1 |
| Galium aparine | fr | | | | | 1 | | |
| Chenopodium album | s | 1 | | | | | | |
| Polygonum aviculare | nu | 1 | | | | | | |
| Rumex sp. | nu | 1 | | | | | | |
| Brassica sp. | s | 1 | | | | | | |
| Tripleurospermum maritimum | cy | 1 | | | | | | |
| Indeterminate | | 2 | 1 | | | | | |

Table 3.6.Q; Fruits, seeds etc. identified in samples from Site R1, Stratton Park.

Botanical descriptions

(a) Wheat

The carbonised wheat caryopses in these samples are almost without exception small, rounded and plump, (Fig. 3.6.1 a - f), although there are a few slightly more elongate caryopses in rather poor condition. They are of bread wheat, Triticum aestivum L, or club wheat, Triticum aestivum L. grex. aestivo-compactum Schiem., probably the latter, though as Van Zeist notes (1970, 53) the distinction between the two types is seldom clear-cut. Twenty four specimens which appeared to be relatively undistorted were measured; their dimensions in mm. and indices appear in Table 3.6.1.

| | L (length) | B (breadth) | T (thickness) | L:B | T:B |
|---|---|---|---|---|---|
| min. | 3.0 | 2.0 | 1.9 | 114 | 74 |
| mean | 4.13 | 3.11 | 2.69 | 133 | 87 |
| max. | 4.9 | 3.5 | 3.5 | 154 | 104 |
| $s^2$ | 0.225 | 0.116 | 0.117 | - | - |

Table 3.6.1. Dimensions and indices of grains of T. aestivum s.l.

(b) Barley

The barley grains are in poor condition, although two asymmetrical specimens establish the presence of six-row barley. One of these grains is rather rounded in cross section, with a thin raised line running along its ventral groove, and a rather patchily preserved surface showing signs of fine transverse wrinkling (Fig. 3.6.1 h). These are all characteristics of naked barley, Hordeum vulgare L. var. nudum.

(c) Weed seeds

The weed seeds recovered are listed in Table 3.6.0 and described in section 3.14.

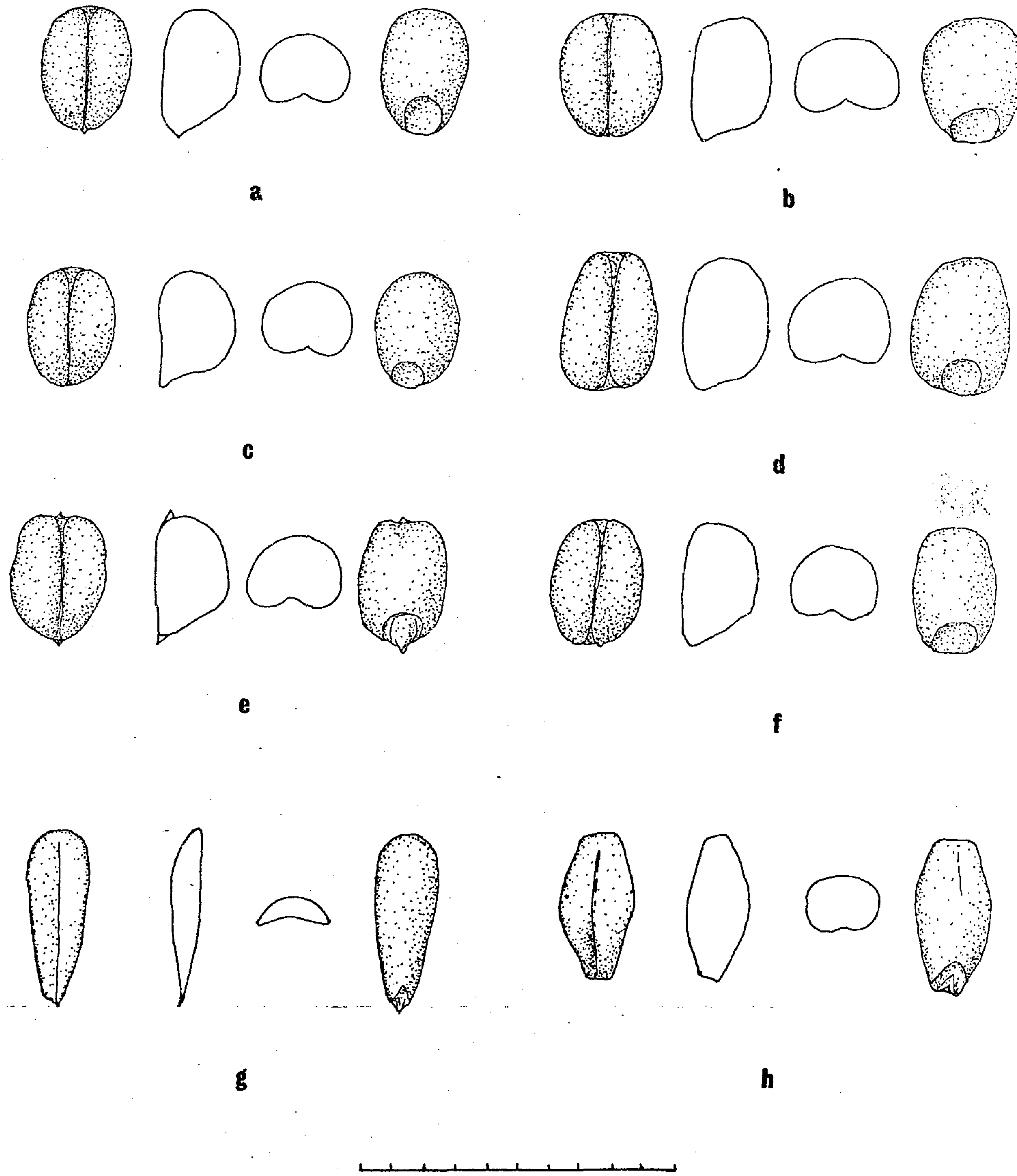



Figure 3.6.1; Site R1 - cereal caryopses.

a - f. *Triticum aestivum* s.l.
g. *Bromus mollis/secalinus*
h. *Hordeum vulgare* cf. var. *nudum*. Scale in millimetres.

## 3.7 Crookhorn Farm, Purbrook

Soil and preservation. The site is close to the junction of the Upper Chalk of Portsdown and the Tertiary deposits of the Hampshire basin. Soils are variable. The material is all carbonised.

Context and samples. The samples are all from the corn drying building.

| Sample no. | Volume | Context |
|---|---|---|
| CR/1/74 | 600cc. | Stokehole |
| 32 | 100cc. | Above stoke pit, inside south wall |
| 33 | 200cc. | South stoke pit |
| 35 | 200cc. | South flue, sealed under collapsed wall |

Flotation. Charcoal and carbonised seeds were extracted by simple water flotation in a plastic bowl.

| Sample | | Stokehole | 32 | 33 | 35 |
|---|---|---|---|---|---|
| Cereal | ca | 76 | 5 | 5 | 4 |
| Hordeum vulgare | ca | 13 | | | |
| Triticum sp. | ca | 161 | 8 | 6 | 3 |
| Triticum spelta | ca | 273 | | | |
| Avena sp. | ca | 5 | | | |
| Triticum spelta | spf | 9 | | 1 | |
| Triticum spelta | gb | 21 | | 1 | 11 |
| Triticum dicoccum | gb | | | | 1 |
| Bromus sp. | ca | 2 | | | |
| Agrostemma githago | s | 1 | | | |
| Rumex sp. | nu | 1 | | | |
| Atriplex/Chenopodium sp. | s | 1 | | | |

Table 3.7.0: Fruits, seeds etc. identified in samples from Crookhorn Farm

Botanical descriptions

(a) Wheat

The generally poor condition of the wheat grains makes measurement impossible, but the blunt apices and flat, broad shape of these grains are typical of spelt. Confirmation of the predominance of spelt is given by the glume bases, which with one exception are rather broad and strongly veined, and by the spikelet forks which have their internodes pointing upwards in all cases. The exceptional glume base is much narrower with only the two marginal veins prominent. It is of emmer wheat. Some of these specimens were well enough preserved to be measured.

| | Width in mm. at the articulation point | |
|---|---|---|
| | Glume bases | Spikelet forks |
| CRI/1/74 Stokehole sample | 1.02-1.44 | 2.3-2.9 |
| Sample 33 | - | 2.5 |
| Sample 35 | 1.04-1.42<br>0.76 (emmer) | - |

Table 3.7.1. Dimensions of glume bases and spikelet forks

(b) Barley.

The small number of barley grains from the Stokehole sample are of a six-row hulled variety. There are two twisted grains from lateral spikelets, one of which retains the base of its lemma awn. In general, however, the grains are poorly preserved.

(c) Oats

The characteristic hairy surface of these oat caryopses is patchily preserved. In the absence of flower bases it is impossible to assess, with such a small sample, whether wild or cultivated oats are represented.

(d) Weed seeds

All weed seeds recovered are listed in Table 3.7.0 and described in section 3.14.

3.8 Portchester Castle. SU 625 045

Soils and preservation. The fort is at the head of Portsmouth Harbour, on a promontory of brickearth overlying chalk and marl, and the soil is thus clayey. Only carbonised material was collected during the excavation, though it is possible that anaerobically preserved fruits and seeds were in fact present as well.

Context. The carbonised grain examined came from two mid-4th century cesspits, numbers 63 and 65.

Sampling. The cereal grains were picked from the soil by hand.

| Sample number | | 63(5) | 63(6) | 65(5) | 65(12) | 65(15) | 65(18) |
|---|---|---|---|---|---|---|---|
| Hordeum vulgare | ca | | 11 | 1 | 3 | 2 | |
| Triticum sp. | ca | 1 | 1 | | 2 | | |
| Triticum spelta/dicoccum | ca | 7 | 7 | 4 | 5 | 6 | 2 |
| Avena sp. | ca | 1 | | 2 | | | |
| Triticum sp. | gb | | 2 | | | | |

Table 3.8.0: Fruits, seeds etc. identified in samples from Portchester Castle.

Botanical descriptions

(a) Wheats

The better preserved grains appear to be of spelt or emmer, Triticum spelta or T. dicoccum, but are not particularly distinctive in form. The fragments of glumes in sample 63(6) although badly preserved have the strongly nerved appearance of spelt glumes, but definite identification is impossible from this material. The sample is too small to make measurement worthwhile.

(b) Barley

The grains bear traces of the lemma and palea in most cases, and one specimen, from 65(12) retains its lemma base, apparently of the 'spurium' form. Straight grains from median spikelets are in the majority, but the twisted grains from lateral spikelets demonstrate that the species represented is Hordeum vulgare, hulled six-row barley.

(c) Oats

The three oat caryopses present may be of a wild or cultivated species of Avena.

3.9 Hascombe, Surrey. TQ 004 386

Soil and preservation. The site lies on a Greensand ridge, and the soil is well-drained and aerobic. The material is carbonised.

Context. The basal layer of a peculiar, kidney shaped rock-cut pit consisting of almost pure charcoal and carbonised grain mixed with burnt rock chips.

Sampling. This entire layer, where exposed, was bagged and retained. It amounts to approximately 30,600 cc. Four 100 cc. sub-samples (1-4) were removed for examination.

Flotation. The high levels of charcoal in this layer made flotation unnecessary and fruits, seeds etc. were extracted after dry sieving.

| Sub-sample | | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|---|
| Cereal | ca | 43 | 56 | 18 | 37 | 154 |
| Hordeum vulgare | ca | 9 | 2 | 1 | | 12 |
| Triticum spelta and T. dicoccum | ca | 540 | 376 | 397 | 502 | 1815 |
| Avena sativa and A. fatua | ca | 84 | 45 | 53 | 73 | 255 |
| Triticum spelta | spk | 1 | | | | 1 |
| Triticum dicoccum | spk | 3 | 1 | 1 | | 5 |
| T. spelta and T. dicoccum | spf | 105 | 61 | 103 | 72 | 341 |
| T. spelta and T. dicoccum | gb | 118 | 36 | 85 | 56 | 296 |
| Hordeum vulgare | ri | 9 | 2 | 1 | | 12 |
| Avena sativa | fb | 8 | 6 | 6 | 2 | 22 |
| Avena fatua | fb | 1 | | 2 | | 3 |
| Bromus mollis/secalinus | ca | 12 | 8 | 8 | 16 | 44 |
| Gramineae indet. | ca | 26 | | 12 | 17 | 55 |
| Polygonum convolvulus | nu | 35 | 11 | 48 | 7 | 101 |
| Rumex sp. | nu | 1 | 4 | 1 | | 6 |
| Polygonaceae indet. | nu | 8 | 4 | 2 | 1 | 15 |
| Chenopodium album | s | 158 | 92 | 152 | 109 | 511 |
| cf. Brassica sp. | s | | 1 | 1 | | 2 |
| Euphorbia cf. platyphyllos | s | 1 | | | | 1 |
| Indeterminate | | 2 | | | 2 | 4 |

Table 3.9.0: Fruits, seeds etc. identified in samples from Hascombe, Surrey.

Botanical description

(a) Wheats

The deposit consists of emmer, Triticum dicoccum Schübl. and spelt, Triticum spelta L. with a rather restricted range of other cereals and weed seeds. Typical caryopses of both species may be isolated (Fig. 3.9.1 a,b,d), but most grains are of a rather indictinct form. There are also a few immature emmer caryopses (Fig. 3.9.1 c) and drop-shaped emmer grains.

The spikelet forks and glume bases are more distinctive. Forks of emmer (Fig. 3.9.2 a) with descending internodes attached or, more often, missing are much more common than spelt forks (Fig. 3.9.2 b) with their ascending internodes. In samples 2 and 3 there are 81 emmer forks and only 15 spelt forks, besides unidentified specimens. Glume bases of spelt are rather more common; sample 3 contains 24 spelt glume bases and 28 emmer bases. This reflects the greater fragility of spelt forks. In a few cases entire spikelets survive intact in their lower portion.

(b) Barley

Grains from median and lateral spikelets of six-row hulled barley are present in small amounts (Fig. 3.9.1 e,f). One grain, still encased in its lemma, has a distinct horse-shoe bevel at the lemma base (Fig. 3.9.2 d). This is the normal type of lemma base in lax eared barleys (Renfrew 1973, 78), and the slender rachis internodes in the sample (Fig. 3.9.2 e,f) confirm that a lax eared variety is represented.

(c) Oats

Elongate caryopses of oats with well preserved hairy surfaces are common. There is considerable variation in size, reflecting the presence of primary, secondary and tertiary grains of wild and cultivated oats (Fig. 3.9.1 g,h). It appears that cultivated oats, Avena sativa L. are more common than wild oats, Avena fatua L. 22 floret bases of A. sativa with wide basal fracture surfaces are present in the samples, as against 3 of the distinctive 'sucker mouth' floret bases of A. fatua.(Fig. 3.9.2 g,h). One entire oat floret has survived and sample 3 contains fragments of twisted oat awn.

(d) Weed seeds

The weed seeds recovered are listed in Table 3.9.0 and described in section 3.14.

Table 3.9.1

Triticum dicoccum N = 50

| | L(length) | B(breadth) | T(thickness) | L:B | T:B |
|---|---|---|---|---|---|
| min. | 4.5 | 2.0 | 2.0 | 166 | 77 |
| mean | 5.59 | 2.81 | 2.51 | 199 | 89 |
| max. | 6.5 | 3.4 | 3.0 | 250 | 105 |
| $s^2$ | 0.154 | 0.080 | 0.054 | - | - |

Table 3.9.2

Avena sativa (with a small proportion of A. fatua) N = 50

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 3.9 | 1.5 | 1.0 | 200 | 55 |
| mean | 6.11 | 2.06 | 1.78 | 297 | 86 |
| max. | 8.0 | 2.9 | 2.3 | 276 | 100 |
| $s^2$ | 0.691 | 0.058 | 0.084 | - | - |

Table 3.9.3

Hordeum vulgare N = 8

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 4.9 | 2.5 | 1.9 | 166 | 76 |
| mean | 5.50 | 2.93 | 2.47 | 189 | 84 |
| max. | 6.4 | 3.4 | 3.1 | 220 | 94 |

Table 3.9.4

Bromus mollis/secalinus N = 13

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 4.3 | 1.5 | 0.7 | 262 | 55 |
| mean | 5.26 | 1.80 | 1.11 | 294 | 62 |
| max. | 6.0 | 2.1 | 1.5 | 400 | 87 |

Measurements have not been made in the case of T. spelta due to the difficulty of extracting undoubted specimens.

Table 3.9.5. Dimensions in mm. of the cereal chaff

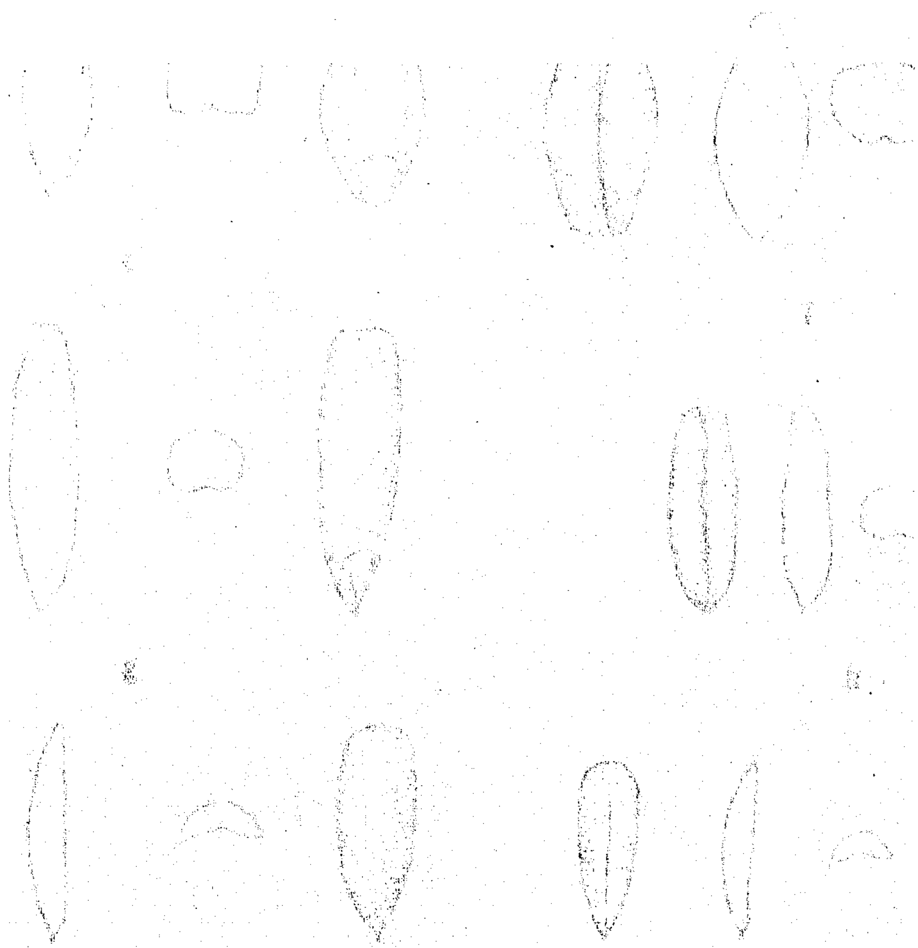
| | Glume base width | Spikelet fork width |
|---|---|---|
| Triticum dicoccum | 0.70 - 0.95 | 1.5 - 2.4 |
| Triticum spelta | 0.90 - 1.44 | 2.0 - 2.7 |

Hordeum vulgare Rachis internode lengths; 2.8; ca. 2.6 mm.

Figure 3.9.1; Hascombe - cereal grains.
a,b. Triticum dicoccum
c. Triticum dicoccum (immature grain).
d. Triticum spelta
e,f. Hordeum vulgare
g,h. Avena sp.
i,j. Bromus mollis/secalinus

Figure 3.9.2; Hascombe - cereal chaff.
a. Triticum dicoccum spikelet fork
b. Triticum spelta spikelet fork.
c. Titicum dicoccum spikelet.
d. Hordeum vulgare caryopsis showing lemma base
e,f. Hordeum vulgare rachis internodes.
g. Avena fatua flower base
h. Avena sativa flower base
i. Avena sativa floret.

Scales in millimetres.



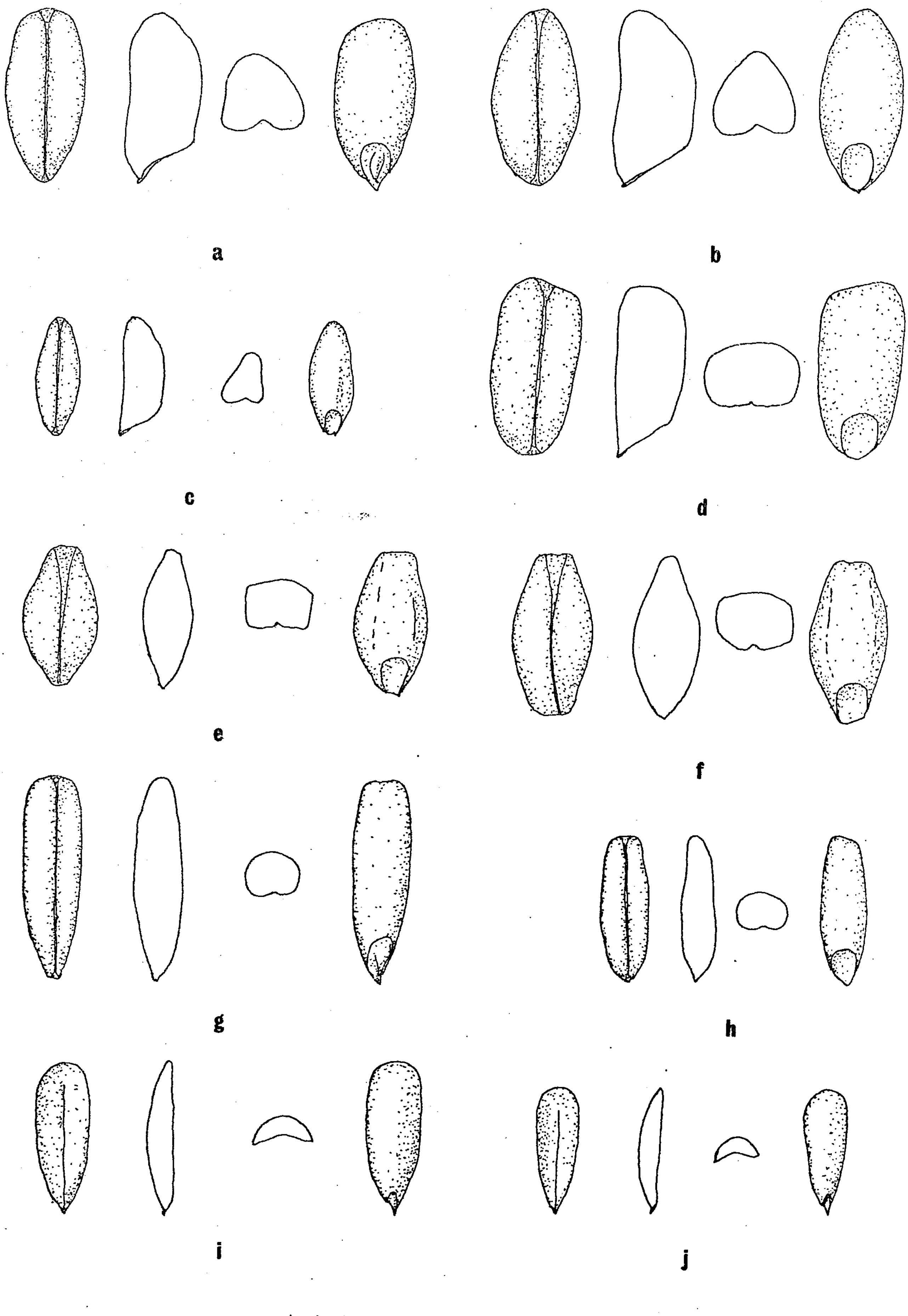



Figure 3.9.1.

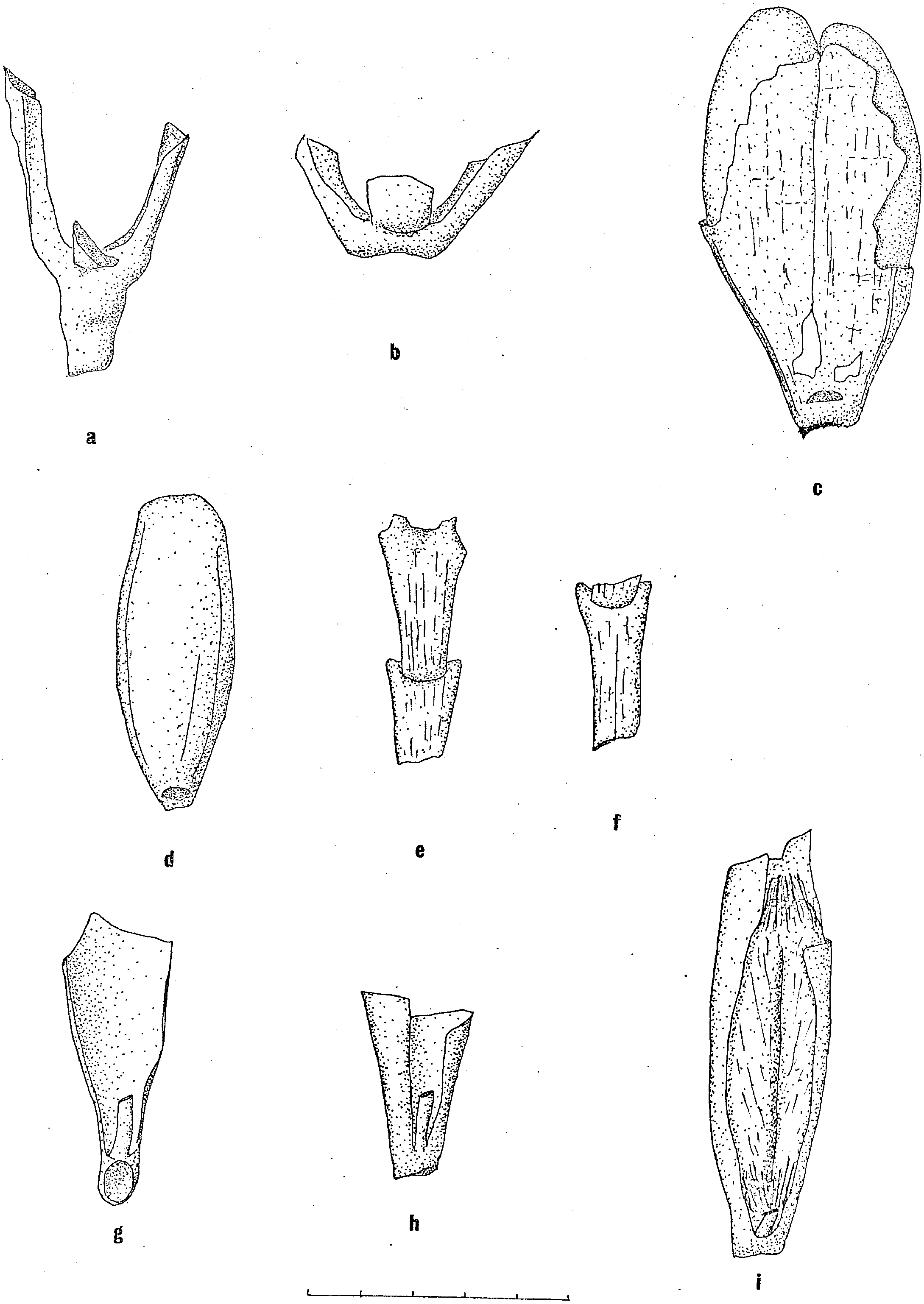



Figure 3.9.2.

3.10 Colchester. TL 995/6 250/2

Soils and preservation. Glacial clays and brickearth. The material comes from thick layers of charcoal and is itself carbonised.

Contexts. (1) 45-46 High Street. Samples 3 and 4 come from burnt debris overlying a clay floor; 6 lay in a depression in this floor, with 5 just above it. Samples 1 and 2 came from the burnt debris, but were recovered before controlled excavation began.

(2) Cups Hotel. Samples 950 and 957 were found lying on the floor of a burnt building.

(3) Lion Walk. All samples were once more from a floor.

Sampling. The deposits had distinct boundaries and were collected entire.

Flotation. There was so little soil in these samples that flotation proved to be unnecessary, and the fruits and seeds could be isolated after dry sieving.

| | | Sample number. | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Pinus pinea | n | | 27 | | | | |
| " | cs | 8 | 3 | | | | |
| Ficus carica | ps | 1 | | 8-9 | 11 | | |
| Coriandrum sativum | f | | | | | ca. 900 | ca. 7700 |
| " | frag. | | | | | | ca. 8000 |
| Anethum graveolens | m | | | | | 12 | 194 |
| Pimpinella anisum | m | | | | | | 101 |
| " | s | | | | | | 34 |
| Apium graveolens | m | | | | | | 9 |
| Torilis sp. | m | | | | | | 1 |
| Umbelliferae indet. | m(1) | | | | | 1 | 31 |
| Hordeum cf. vulgare | ca | | | | | | 1 |
| Triticum spelta | gb | | | | | | 2 |
| Setaria viridis | ca | | | | | | 1 |
| Cereal indet. | ca | | | | | | 1 |
| Linum usitatissimum | s | | | | | | 1 |
| Lens esculenta | s | | | | | 2 | 6 |
| Vicia faba var. minor | s | | | | | | 1 |
| Papaver somniferum | s | | | | | | 42 |
| Brassica/Sinapis sp. | s | | | | | | 1 |
| Camelina sativa | s | | | | | 1 | 26 |
| Thlaspi arvense | s | | | | | | 3 |
| Spergula arvensis | s | | | | | | 6 |
| Atriplex sp. | s | | | | | | 2 |
| Chenopodium cf. album | s | | | | | | 11 |
| Chenopodium hybridum | s | | | | | | 1 |
| Galium sp. | f | | | | | | 1 |
| Polygonum convolvulus | nu | | | | | | 2 |
| Polygonum sp. | (2) | | | | | 2 | 46 |
| Rumex acetellosa | nu | | | | | | 1 |
| Rumex cf. crispus | nu | | | | | | 1 |
| Plantago lanceolata | s | | | | | | 1 |
| Myosotis arvensis | nu | | | | | | 1 |
| Compositae indet. | cy | | | | | 1 | 2 |

**Notes and abbreviations.**
(1). Besides some damaged specimens of the Umbellifers already identified, this group includes at least one further species of Umbellifer. The fruits are plump, but mostly eroded so that the ribs and vittae are rather obscure.
(2) Nutlets and perianths soaked in tar and distorted.

Table 3.10.0: Fruits, seeds etc. identified in samples from Colchester.
Sheet 1: 45 - 46 High Street. ('Curry's Pottery Shop).

| | | 'Cups' Hotel | | Lion Walk | | |
|---|---|---|---|---|---|---|
| | | 950 | 957 | 3725 | 3726 | 3767 |
| Triticum dicoccum | ca | 534 | | | | |
| Triticum aestivum sl. | ca | 114 | | | | |
| Hordeum vulgare | ca | 17 | | | | |
| Cereal fragments. | | (1) | | | | |
| Vicia/Pisum sp. | s | 1 | | | | |
| Linum usitatissimum | s | | 28,600 | | | |
| Camelina sativa | s | | 18 | | | |
| Thlaspi arvense | s | | 1 | | | |
| Brassica/Sinapis sp. | s | | 6 | | | |
| Agrostemma githago | s | 12 | | | | |
| Caryophyllaceae indet. | s | 2 | | | | |
| Bromus mollis/secalinus | ca | 12 | | | | |
| Avena sp. | ca | 1 | | | | |
| Gramineae indet. | ca | 3 | | | | |
| Phoenix dactylifera | f | | | 22 | | 1 |
| Prunus cf. domestica. | f | | | | 1 | |
| Indet. | | | 3 | | | |

(1) Cereal fragments equivalent to approx. 2000 caryopses.

Table 3.10.0: Fruits, seeds etc. identified in samples from Colchester. Sheet 2: 'Cups' Hotel and Lion Walk.

Botanical descriptions

(a) Cereals

Sample 950 from the 'Cups' Hotel consists of carbonised wheat with various impurities and very little admixed charcoal. The main species represented is emmer (T. dicoccum Schübl.) with rather smaller amounts of bread wheat (T. aestivum L.). 100 wheat grains were extracted for measurement and distributions of length, length:breadth indices (L:B) and thickness:breadth indices (T:B) are shown in Fig. 3.10.1. It is immediately apparent that the grains are very small, not exceeding 5.6mm. in length, with most lying between 4 and 5 mm. The distribution of L:B is essentially trimodal. The first mode, at 170, is associated with bread wheat, the second at 190-200 with emmer grains and the third, at 240 with underdeveloped grains of emmer. These are slender and have values of T:B greater than 100, that is they are thicker than broad (Fig. 3.10.2 and Van Zeist 1970 p.52).

This sample also contains a small number of six-row hulled barley grains Hordeum vulgare L. emend. Lam. with the following dimensions and indices, and at least four grains of naked barley, H. vulgare var. nudum.

Table 3.10.1. Dimensions and indices of H. vulgare caryopses from sample 950 N = 12

| | L | B | T | L:B | T:B |
|---|---|---|---|---|---|
| min. | 3.5 | 1.6 | 1.0 | 195 | 61 |
| mean | 4.1 | 1.9 | 1.4 | 216 | 72 |
| max. | 4.6 | 2.3 | 1.9 | 231 | 86 |

These grains are extremely small, and like the wheat grains are distorted very little. They are, however, similar to the wheat grains in being covered with hairline cracks and a great deal of fragmentation has occurred.

An exceptionally well-preserved barley grain, with a section of the rachis including the collar came from Curry's Pottery Shop 6 (Fig. 3.10.2). This grain is not quite symmetrical and is probably a grain from a lateral floret of 6-row barley. The rachilla is short, 2.2mm. including its hairs, which are of the 'long' type. The palea length is uncertain as it is broken and eroded near its tip, but it is certainly well over 5mm. long, and so the rachilla is less than half the length of the palea. Clearly this is a different variety from the Late Bronze Age and Early Iron Age barleys from Itford Hill and Fifield Bavant which had long rachillas, about half the length of the paleas (Helbaek 1952, 215). The lemma base of the Colchester barley is a bevelled type. On its removal no trace of the lodicules remained. The section of rachis comprises a collar of shallow cup type, with three rachis segments bearing quite long hairs on their margins. The first rachis segment is of medium curvature, about 1.7 mm. in length.

This sample also produced two glume bases of spelt Triticum spelta L. Their widths at the articulation point are 1.10 and 1.01 mm.

(b) Legumes

Samples 5 and 6 from Curry's Pottery Shop both produced circular flattened seeds of lentils (Lens esculenta Moench.) (Plate 5). These specimens are small, ranging in diameter from 2.5-3.0 mm. One cotyledon of a horse bean (Vicia faba L. var. minor) occurred in the latter sample. It has lost its testa, and is 7.4 mm. in length. A seed of vetch or pea came from sample 950 from the 'Cups' Hotel. The loss of the hilum makes definite identification impossible.

(c) Oil and fibre seeds

Sample 957 from the 'Cups' Hotel consists almost entirely of seeds of flax (Linum usitatissimum L.). These seeds with their characteristic 'beaks' are very much flattened in this case. Their small size suggests that they may be of a fibre-producing rather than an oil-producing variety.

Table 3.10.2. Dimensions of flax seeds (mm.) N = 50

| | L | B |
|---|---|---|
| min. | 2.7 | 1.5 |
| mean | 3.22 | 1.77 |
| max. | 3.8 | 2.0 |
| $s^2$ | o.052 | 0.024 |

In association with this flax, and also in samples 5 and 6 from Curry's Pottery Shop occurred seeds of Gold of Pleasure (Camelina sativa (L). Crantz.). This plant frequently occurs as a weed in flax fields (Hjelmqvist 1950 p. 258) and has been cultivated as an oil crop in its own right. The Colchester seeds are 1.25 - 1.6mm. in length, 0.75-0.9 mm. in breadth and have the typical prominent radicle and pitted surface of this species.

(d) Vegetables, pot-herbs and flavourings

Coriander (Coriandrum sativum L.) is the major component of samples 5 and 6 from Curry's Pottery Shop. The entire fruits are globular, with pronounced ribs, the spaces between them being roughly patterned. Each contains two 'seeds' of flattened hemispherical shape, varying in length from 1.4 - 2.5 mm. (Plate 6).

Mericarps of dill (Anethum graveolens L.) are quite common in these samples. They are between 2.6 and 4.2 mm. long, having 3 fairly prominent ribs on the body of the seed and two further ribs merging into the lateral wings (Plate 5).

Entire fruits, mericarps and naked seeds of anise (Pimpinella anisum L.) occur in sample 6. They are very variable in length, the mericarps being between 2.9 and 5.95mm. long. The state of preservation is good; the ribs of the fruits and the short stiff hairs between them are well-preserved (Plate 6).

In addition to these Umbellifers used as seasonings, small compact fruits with ribs and wings reduced to a minimum belonging to celery (Apium graveolens L.) were also found. Only one could be measured and was 1.0 x 0.6mm. Whether these represent wild or cultivated plants (var. dulce (Mill) D.C.) is impossible to say from the seeds alone (Plate 11).

The opium poppy (Papaver somniferum L.) is represented by small reniform seeds 0.7-0.9 mm. long and 0.6-0.75 mm. broad. They are distinguished from seeds of Corn poppy both by their size and their coarser surface patterning (Plate 11).

(e) Soft fruits and nuts

Phoenix dactylifera L., Dates

Carbonised dates were found in two samples from the Lion Walk excavations 3725 and 3765. They are complete with fruitstones and where intact are separate, showing no signs of having been pressed into masses. Where the fruits are fractured measurements of these furrowed elongate 'stones' have been made, together with measurements of entire fruits (Plate 3).

Table 3.10.3. Dimensions of dates (mm.)

| | Fruits | | | Fruitstones | | |
|---|---|---|---|---|---|---|
| | Length | Breadth | Thickness | Length | Breadth | Thickness |
| | - | 24 | 13 | - | 7 | 5 |
| | - | - | - | 26 | 8 | 5 |
| | - | - | - | 27 | 7 | - |
| | 50 | 25 | - | 28 | 7 | - |
| | - | 25 | 21 | - | 7 | 6 |
| | 49 | 27 | 12.5 | | | |
| | 49 | 29 | 21 | | | |
| | - | 29 | 21 | | | |
| 3725 | - | 26 | 19 | | | |
| | - | 25 | 21 | | | |
| | 49 | 25 | 19 | | | |
| | 51 | 26 | 23 | | | |
| | - | 28 | 19 | | | |
| | 46 | 27 | 20 | | | |
| | 56 | 28 | 21 | | | |
| | 54 | 25 | 22 | | | |
| | 51 | 27 | 22 | | | |
| 3767 | - | 23 | 26 | | | |

As both fruits and 'stones' are rather eroded and the former are of irregular shape, measurements are given only to the nearest mm.

Ficus carica L., Figs.

Entire carbonised figs came from three samples from Curry's Pottery Shop (Plate 3). They have wrinkled surfaces and short blunt stalks, and in fractured specimens the achenes can be seen embedded in the tissues of the receptacle. This tissue has become a tarry matrix in which the achenes are firmly fixed, though it proved possible to extract one. This is slightly pointed at one end, but was damaged during extraction so no measurements can be made. Measurements of the entire figs are given below and it will be seen that they are rather globular, unlike dried figs. Sample 4 consists of at least 11 figs compressed together into a solid mass, either in the course of preparation for food or during the destruction of the building.

Table 3.10.4. Dimensions of whole figs (mm.)

| 'Length' | 'Breadth' | 'Thickness' |
|---|---|---|
| 22.0 | 28.1 | 27.0 |
| 19.0 | 21.5 | 21.9 |
| 21.0 | 21.4 | 21.9 |
| 25.1 | 23.9 | 19.3 |

The remaining specimens were too distorted to make measurement useful.

Prunus sp., Plum or bullace.

A complete but fragmentary fruit of the plum or bullace comprises sample 3726 from Lion Walk. The fruit stone is covered by a cokey mass representing the remains of the mesocarp, but is fractured across its centre where it is 10.5 mm. broad by 7.2 mm. thick. This is a large stone, (though expansion may have occurred during carbonisation) and is probably of the plum (*P. domestica* L.) rather than the bullace (*P. insititia*).

Pinus pinea L., Stone pine

This species, the Stone Pine, is represented both by cone scales and the nuts themselves (Plate 4). The apical parts of the scales in fresh material consist of rounded waxy-surfaced protuberances which form the outer surface of the cone, and these features are well preserved in the carbonised specimens. The nuts are elongate, rounded at their ends with one end broader than the other. In cross section they vary from rounded triangles to rounded quadrilaterals, and light flutings run along their length.

Table 3.10.5. Dimensions of pine nuts (mm.)

| Length | Breadth (Maximum) |
|---|---|
| 16.0 | 9.0 |
| 13.3 | 5.9 |
| 13.5 | 7.9 |
| 14.4 | 7.8 |
| 13.0 | 7.9 |
| 14.2 | 8.2 |
| 12.4 | - |

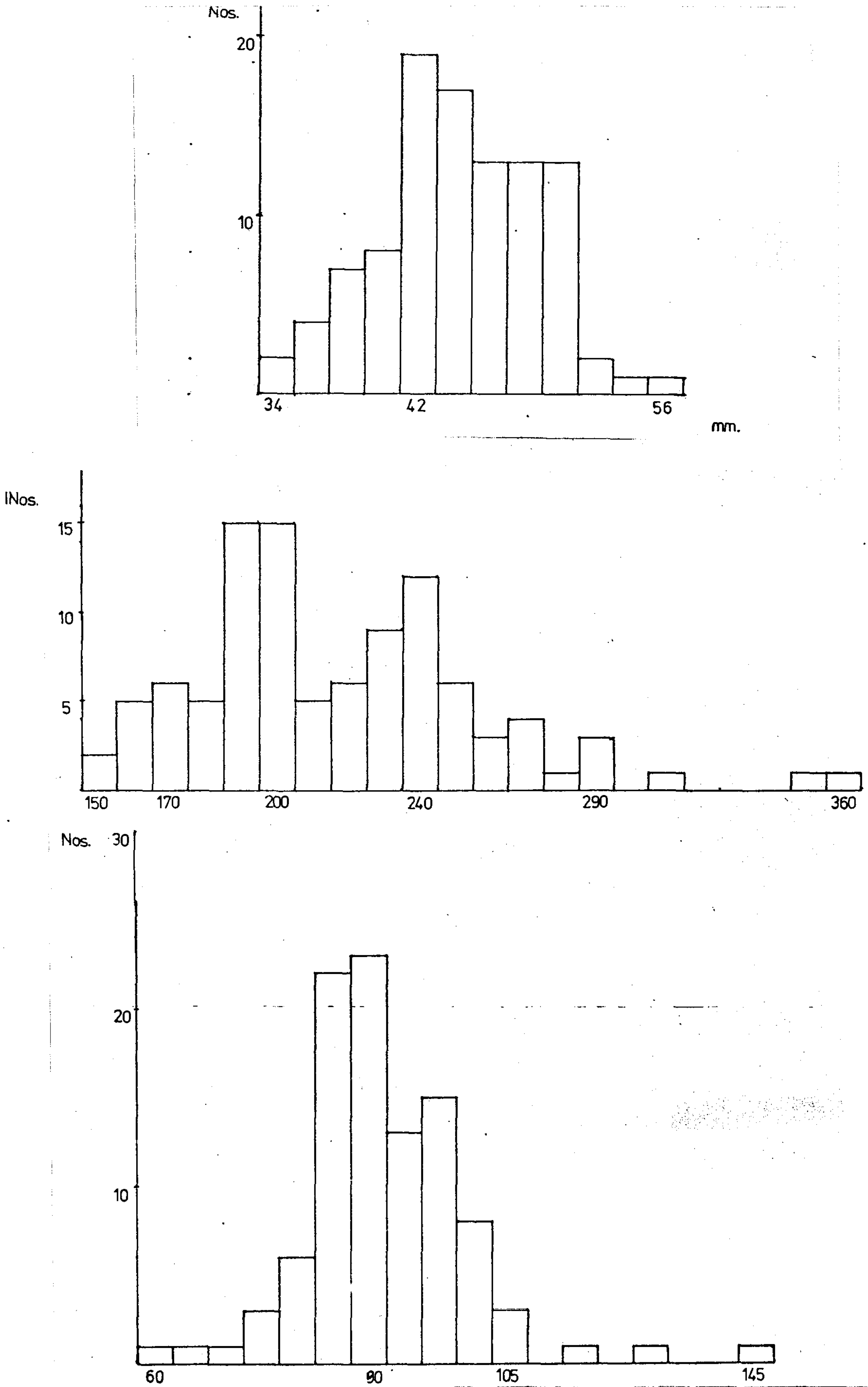
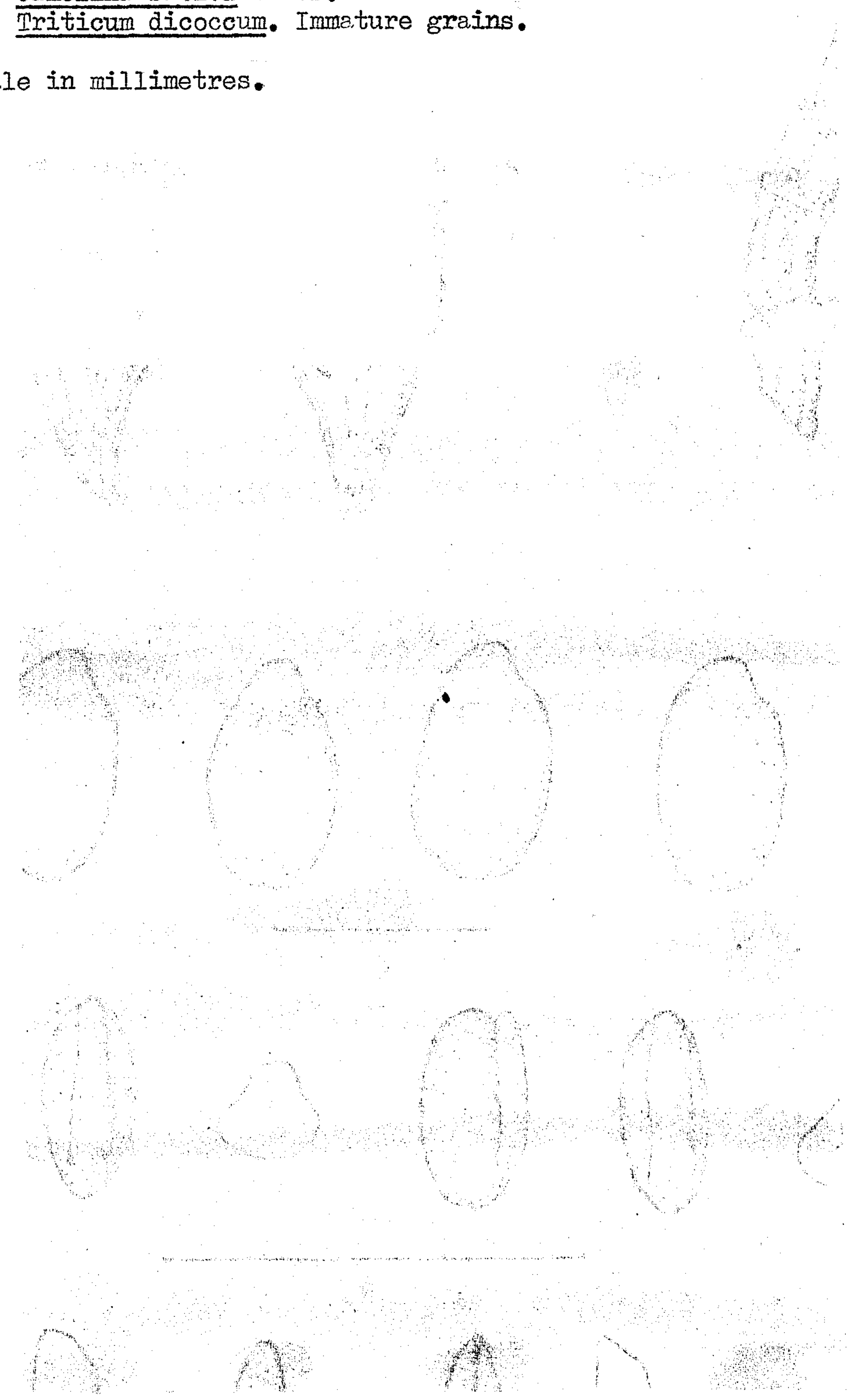



Figure 3.10.1; Histograms showing the distribution of length (top), L:B (middle) and T:B (bottom) of wheat grains in sample 950, 'Cups' Hotel, Colchester.
The numbers of grains (N) in each size class appear in the vertical axis of each graph.

Figure 3.10.2; Colchester - crop plants.

a. *Hordeum vulgare* Caryopsis and section of rachis.
b. *Linum usitatissimum*. Seeds
c. *Camelina sativa* Seeds.
d. *Triticum dicoccum*. Immature grains.

Scale in millimetres.



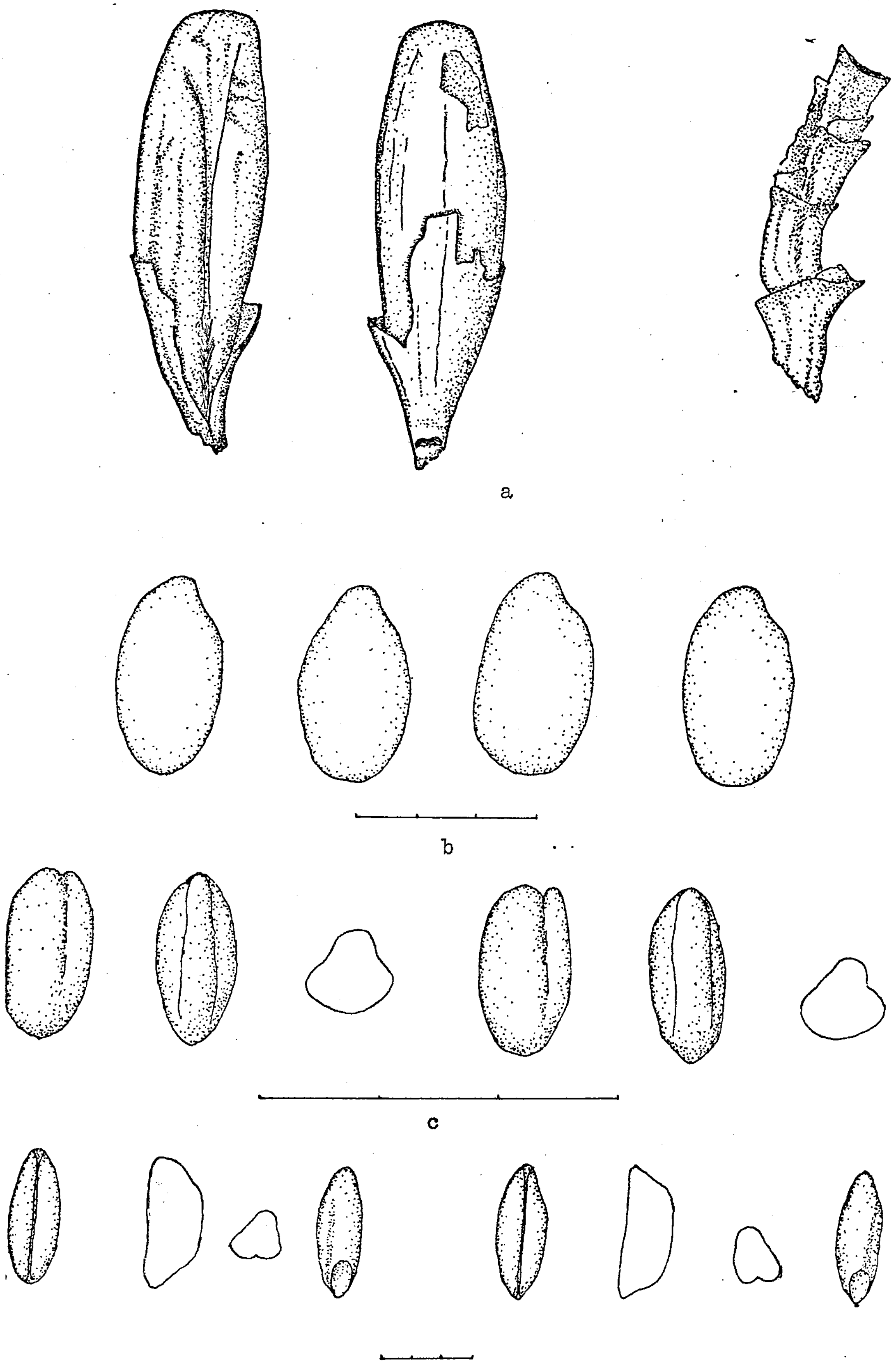



Figure 3.10.2.

Plates 3 - 6. (on following pages).

Carbonised fruits and seeds of crop plants from Colchester and Neatham.

Plate 3. Colchester - carbonised dates and figs.
- a. Phoenix dactylifera. Fruits and (bottom right) fruitstone. Sample 3725, Lion Walk.
- b. Ficus carica. 'Fruits'. Sample 4, 'Curry's' Pottery Shop.

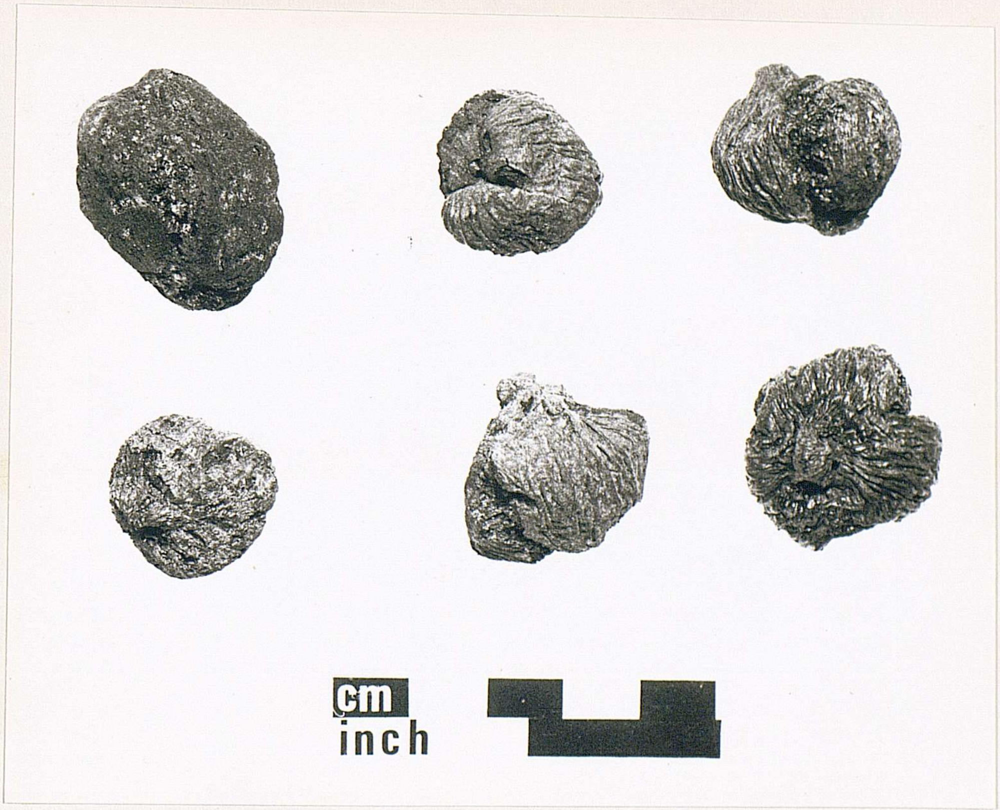
Plate 4. Colchester - carbonised pine-nuts.
Pinus pinea. Nuts (left) and cone scales (right). Sample 2, 'Curry's Pottery Shop'.

Plate 5. Colchester - carbonised lentils and dill.
- a. Lens esculenta. Seedds. Sample 6, 'Curry's Pottery Shop'.
- b. Anethum graveolens. Mericarp. Sample 6, 'Curry's Pottery Shop'.

Plate 6. Colchester and Neatham - flavouring plants.
- a. Coriandrum sativum. (left) Carbonised fruit from sample 6, 'Curry's Pottery Shop', (right) fruit from waterlogged deposits at Neatham. Sample TR2/FNE/SS3.
- b. Pimpinella anisum. Carbonised fruits. Modern specimen on right.

Scales of all plates in millimetres.


a




b

Plate 3.


Plate 4.

a

b

Plate 5.

a

b

Plate 6.

3.11 Winchester. SU 480 295

Soils and preservation. Alluvial deposits above the Upper Chalk, as well as organic occupation layers. These soils are damp and contain anaerobically preserved seeds.

Contexts and samples

(1) Brook Street

| Sample | Context | Date | Soil Volume | Remarks |
|---|---|---|---|---|
| 380 | 'natural layer' | ? | 1000 cc. | (Peat-like deposits |
| 381 | " | ? | 1000 cc. | (Highly calcareous |
| 305 | pit | 2nd c. | 950 cc. | Wet organic soil |
| 361 | " | " | 1010 cc. | " |
| 388 | " | " | 1000 cc. | " |
| 412 | well | 1st c. | 830 cc. | " |

(2) Cathedral Green

| Sample | Context | Date | Soil volume | Remarks |
|---|---|---|---|---|
| 449 | 1st pre-street occpn. | to AD 50 | 1300 cc. | Chalky moist soil |
| 448 | " | c.AD 50 | 1120 cc. | " |
| 445 | " | " | 990 cc. | Chalky organic soil |
| 444 | " | AD 50-60 | 950 cc. | X " |
| 447 | " | " | 1310 cc. | Brown soil and pebbles |
| 427 | " | " | 1000 cc. | Dark, organic soil |
| 443 | " | C.AD 50 | 600 cc. | XChalky soil |
| 442 | 2nd pre-street occpn. | AD 60-70 | 1400 cc. | Dark organic soil |
| 430 | 2/3rd pre-street occpn. | c.AD 70 | 1400 cc. | " |
| 433 | 3rd pre-street occpn. | AD 70-80 | 700 cc. | " |
| 423 | Silt between streets | AD 110-150 | 1051 cc. | (Brown silt with gravel (and iron panning |
| 435 | " | " | 1100 cc. | ( |
| 446 | Timber bedding | AD 200-300 | 1000 cc. | X Stiff buff clay |

X indicates sample dry when received.

(3) Cathedral Car Park, 1961

A few large botanical specimens - walnuts and stone-pine cones - were picked by hand from Roman well 2, dating between AD 250-300 (samples 83, 98 and 378). Other samples from the site produced no seed remains.

Flotation. Paraffin/water flotation (Coope and Osbourne 1967). The non-floating residue was washed through a 3mm. mesh sieve in order to search for large fruitstones, which failed to float. All samples except CG 446 produced seeds. Heavy iron panning probably reduced flotation efficiency.

| Sample number | | 380 | 381 | 412 | 305 | 361 | 388 |
|---|---|---|---|---|---|---|---|
| Ranunculus cf. repens | a | | | 2 | | | |
| Ranunculus sp. | a | | | 5 | | | |
| Papaver cf. rhoeas | s | | | | 1 | 1 | 7 |
| Papaver sp. | s | | | | | | 2 |
| Silene alba | s | | | | 1 | 1 | |
| Agrostemma githago | s | | | | | | 2 |
| Cerastium cf. arvense | s | | | 2 | | | |
| Stellaria cf. media | s | | | | | 2 | |
| Stellaria sp. | s | | | 1 | | | 4 |
| Arenaria serpyllifolia | s | | | 1 | | | |
| Caryophyllaceae | s | | | | 2 | | 1 |
| Hypericum cf. perforatum | s | | | 1 | | | |
| Atriplex patula/hastata | s | | | | 1 | | |
| Chenopodium album | s | | | | 1 | | |
| Chenopodiaceae | s | | | | | | |
| Linum catharticum | s | | | 1 | | | |
| Potentilla cf. erecta | a | | | 1 | | | |
| Potentilla sp. | a | | | 2 | 1 | | |
| Malus sylvestris | fs | | | | 1 | 63 | 3 |
| [illegible] | | | | | | | |
| Rubus fructicosus | fs | | | | 94 | 7 | |
| Rubus idaeus | fs | | | | | | 1 |
| Rubus sp. | fs | | | | | | 3 |
| Prunus spinosa | fs | | | | 7 | 202 | 13 |
| Prunus insititia | fs | | | | | 30 | |
| Prunus domestica | fs | | | | | | 46 |
| Prunus avium | fs | | | | | | 4 |
| Prunus sp. | fs | | | | | | 12 |
| Coriandrum sativum | fr | | | | | | 1 |
| Apium graveolens | m | | | | | 2 | 2 |
| Aethusa cynapium | m | | | 1 | | | |
| Daucus carota | m | | | | | 1 | |
| Umbelliferae | m | | | 1 | | | 10 |
| Rumex crispus | nu | | | 3 | | 1 | 1 |
| Rumex crispus | nu per | | | 2 | | | |
| Polygonum persicaria | nu | | | | | 1 | |
| Urtica dioica | nu | | 2 | 2 | 9 | 1 | |
| Urtica urens | nu | | | | 1 | | 3 |
| Corylus avellana | ns | | | + | | + | |
| Primula [illegible] | fs | | | 1 | | | |
| Prunella vulgaris | nu | | | 1 | | | |
| Labiatae | nu | | | | | 2 | |
| Galium sp. | fr | | | 1 | | | |
| Sambucus nigra | s | 4 | 3 | | 1 | 11 | 2 |
| Sambucus ebulus | s | | | | | 1 | |
| Scabiosa columbaria | fr | | | 1 | | | |
| Senecio sp. | cy | | | | | 1 | |
| Cirsium cf. palustre | cy | | | 3 | | | |
| Hypochoeris sp. | cy | | | 3 | | | |
| Compositae | cy | | | | | | |
| Juncus sp. | s | | | 29(4) | 15(2) | | 1 |
| Carex sp. | nu | | | 2 | | | |
| Cyperaceae | nu | | | 2 | | | |
| Alopecurus geniculatus | ca | | | 1 | | | |
| Bromus cf. mollis | ca | | | 1 | | | |
| Poa sp. | ca | | | 10 | | | |
| Gramineae | ca | | | 12 | | 1 | |
| Vitis vinifera | s | | | | | | 1 |
| Ficus carica | a | | | | | | 4 |
| Indeterminate | | | | 7 | 1 | 1 | 2 |

Table 3.11.0: Fruits, seeds etc. identified in samples from Winchester.
Sheet 1: Brook Street.

| Sample number | | 449 | 448 | 445 | 443 | 444 | 447 | 427 | 442 | 430 | 433 | 423 | 435 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ranunculus cf. repens | a | | | | | | | | 6 | | | 2 | |
| Ranunculus cf. acris | a | | 2 | | | | | | | | | 2 | |
| Ranunculus sp. | a | | 2 | | | | | 2 | 21 | 1 | | | 1 |
| Papaver rhoeas | s | | 5 | 3 | 1 | | | | 17 | 2 | 7 | 2 | 3 |
| Papaver cf. somniferum | s | | | 20 | | 3 | 32 | | | | 3 | 2 | 4 |
| Papaver cf. argemone | s | | | | | | | | | | 3 | | |
| Papaver sp. | s | 17 | 34 | | | | 10 | 29 | 3 | 1 | 12 | | |
| Chelidonium majus | s | | | | | | | | | 4 | | | |
| Capsella bursa-pastoris | s | | | 1 | | | | | 5 | | | | |
| Brassica/Sinapis sp. | s | | 1 | 1 | | | | | 1 | | | | |
| Thlaspi arvense | s | | | 1 | 1 | | 2 | | 12 | | | | |
| Cruciferae | s | | | | | | | | | 15 | 4 | | |
| Silene alba | s | | 1 | | | | | 4 | 4 | 2 | 3 | 1 | 1 |
| Stellaria cf. media | s | | | | | | | 4 | 13 | | 28 | | |
| cf. Cerastium arvense | s | | | | | | | | | 1 | | | |
| Arenaria serpyllifolia | s | | | | | | 1 | | 8 | | 17 | 1 | |
| Caryophyllaceae | s | | | | | | | | 3 | | | 2 | |
| Potentilla cf. erecta | a | | | | | | | | | | | 1 | |
| Potentilla sp. | a | | | | | | | | | | 1 | 2 | 1 |
| Aphanes arvensis | a | | | | | | | | 1 | 11 | 1 | 3 | |
| Conium maculatum | fr | | | | | 1 | 7 | 6 | 2 | | 1 | | |
| Aethusa cynapium | fr | | | | | | 1 | | | | | | |
| Atriplex patula/hastata | s | | | | | | | | 2 | 1 | | 2 | |
| Chenopodium album | s | | | 1 | | | 3 | 14 | 84 | | 42 | 1 | |
| Chenopodium sp. | s | | | 6 | | 1 | 15 | | 2 | | | | 1 |
| Chenopodiaceae | s | | 7 | 4 | 1 | | 2 | 2 | 4 | | 6 | | |
| Rumex cf. crispus | nu | | | | | | | | | | 1 | | |
| Rumex cf. acetellosa | nu | | | | | | | | | | | 2 | 1 |
| Polygonum aviculare | nu | | | | | | | 1 | 3 | | 2 | 12 | |
| Urtica dioica | nu | 3 | 21 | 73 | 1 | 17 | 135 | 63(4) | 47 | 9 | 41 | 16 | 13 |
| Urtica urens | nu | | 1 | | | | | | 1 | | 7 | | |
| Galeopsis tetrahit/speciosa | nu | | 2 | 4 | | | 3 | 6 | 3 | | 1 | | |
| Stachys cf. sylvatica | nu | | 1 | | | | 1 | | | | | | |
| Lycopus europaeus | nu | | | | | | | | | 17 | | | |
| Mentha cf. aquatica | nu | | | | | | | | | 5 | | | |
| Labiatae | nu | | | | | 1 | 2 | 1 | | | 1 | | |
| Galium cf. aparine | fr | | | | 1 | | | 1 | | | | | |
| Galium sp. | fr | | | | | | 1 | | | | | | |
| Sambucus nigra | s | | 1 | 2 | | 1 | 1 | 1 | 1 | | 10 | 2 | |
| Cirsium cf. vulgare | cy | | | | | | | | 3 | | | | |
| Sonchus asper | cy | | | | | | | | 9 | 1 | | | |
| Lapsana communis | cy | | | | | | | | 6 | | | | |
| cf. Chrysanthemum sp. | cy | | | | | | | | | | 1 | | |
| Compositae | cy | | 1 | | | | | | | 1 | 1 | | |
| Juncus sp. | s | 1 | 4 | 14 | 1 | 9 | 13 | 1 | 3 | 10(4) | 9 | 42(4) | 59(2) |
| Carex sp. | nu | | | | | | 1 | 2 | | 2 | | 2 | |
| Eleocharis sp. | nu | | | | | | | | | | 1 | 4 | |
| Cyperaceae | nu | | | | | | | | | | | 3 | |
| Triticum spelta | gb | | | 1 | | | | | | | | | |
| Gramineae | ca | 1 | 2 | | | | | 2 | 2 | 27 | 2 | 4 | 1 |
| Indeterminate | | 2 | | 1 | | | 1 | 5 | 10 | 5 | 3 | 13 | 2 |

Table 3.11.0: Fruits, seeds etc. identified in samples from Winchester.
Sheet 2: Cathedral Green.

Botanical descriptions

Economic plants

Papaver somniferum L. Opium poppy.

Seeds of this species occurred in the samples from Cathedral Green. They are larger than seeds of P. rhoeas, being 0.8-1.0 mm. long and of a distinct reniform shape with coarse surface reticulation. Most specimens are crushed.

Malus sylvestris Mill. Apple. (Plate 7).

Although the apices were often damaged it proved possible to measure 20 of the rounded seeds from Brook Street. They are 5.6-8.0 mm. in length with L:B ratios in the range 133-177. There are also several seeds of a noticeably more elongate form, with a concave curve towards their apices. Length 8.0-10.2 mm., L:B 191-210 (N=4). These were at first thought to be of Pyrus communis, but closer examination showed that they have the clearly 'fibrous' surfaces characteristic of apple seeds.

Rubus fructicosus agg. Bramble (Plate 7).

Very variable fruitstones, triangular to oval in shape, and with very coarse reticulation. The Brook Street specimens are 2.5-3.4 mm. long.

Rubus idaeus L. Raspberry (Plate 7).

The single specimen from Brook Street is 2.05 mm. long and slender with a concave ventral side.

Prunus spinosa L. Sloe.

Small, rounded fruitstones with very coarse surfaces. Length 7.0-10.4 mm., L:B 96 - 142 (N=100). See also Fig. 3.11.1.

Prunus domestica ssp. insititia (L) Schneid. Bullace.

These fruitstones are larger, more pointed and less coarsely surfaced than those of P. spinosa. Length 8.0-11.3 mm., L:B 115 - 163. The dimensions and indices are shown in Fig. 3.11.1 for comparison with those of the sloe stones.

Prunus domestica sensu lato. Plum.

The 26 plum stones from Brook Street are rather small. Length 13.2 mm. (12.2 - 15.6), L:B=128(116 - 141).

Prunus avium L. Cherry.

Both rounded and more elongate smooth-surfaced cherry stones are present in very small numbers at Brook Street.

Coriandrum sativum L. Coriander.

A single fragment of one of the large globular fruits of this species, with prominent ridges and sinuate patterning between them came from sample 388 at Brook Street.

Corylus avellana L. Hazel.

Nut shell fragments, one of which includes part of the roughened area of attachment to the involucre. The overall shape or size of the nuts cannot be reconstructed.

Vitis vinifera L. Grape (Plate 7).

The seed from BS 388 has a characteristic scar on the dorsal face, and two deep furrows on the ventral. It is rather crushed and distorted.

Ficus carica L. Fig.

Achenes of figs, again from BS 388, with well-marked dorsal ridges and prominent hilar areas, 1.5-1.6 mm., in length.

Triticum spelta L. Spelt.

A single carbonised glume base of this species came from Cathedral Green, sample 445. Its width at the articulation point is 1.15 mm., and it is strongly nerved.

Juglans regia L. Walnut.

A single nut from sample 378, Cathedral Car Park. The kernel is missing and the two halves of the endocarp are separate. The less distorted of the two has the following dimensions: Length 2.3 cm., Breadth 2.1 cm., Thickness 1.0 cm.

Pinus pinea L. Stone pine.

Samples 83 and 98 contain the remains of one and two entire pine cones respectively. There is no trace of the nuts, these presumably having been removed for consumption, but the woody cone scales survive in good condition, except towards their bases where only strands of vascular tissue remain to attach the scales to the axis of the cone.

Weed seeds

All weed seeds are listed in Tables 3.13.0 and described in section 3.14.

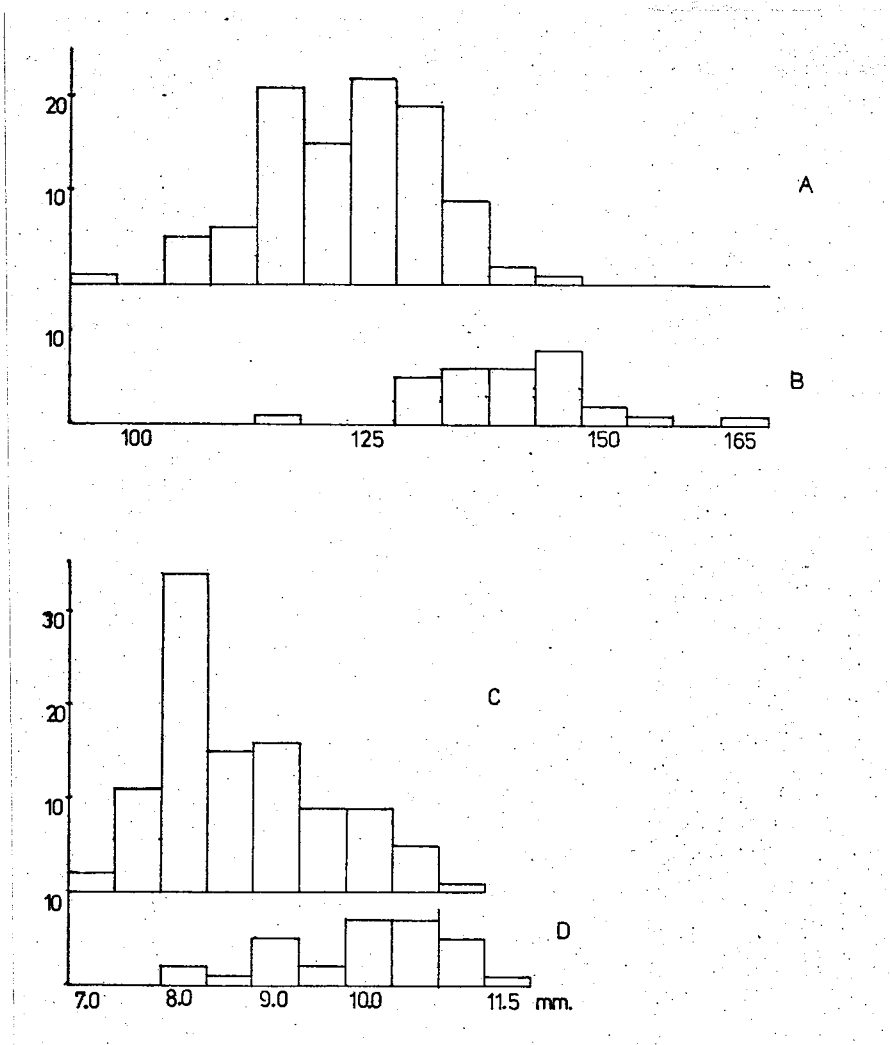


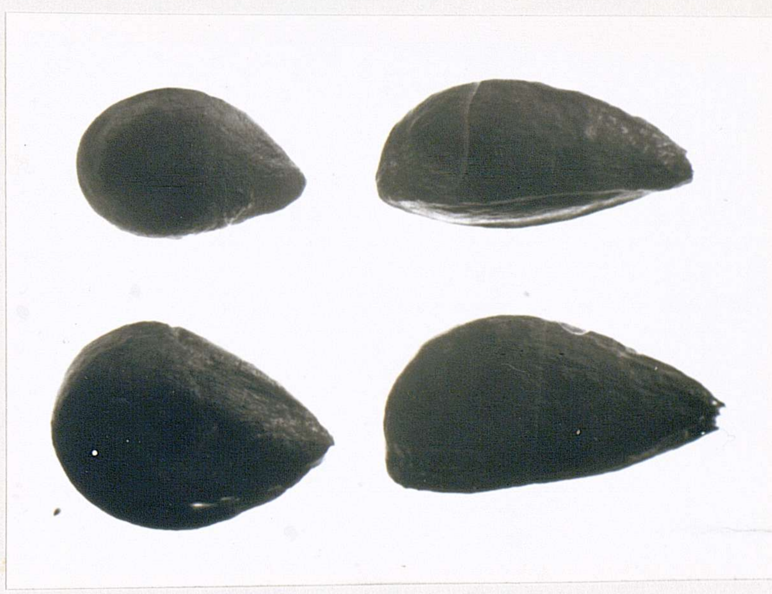

Figure 3.11.1; Brook Street - Dimensions in mm. and indices of fruitstones.

A. Prunus spinosa. L:B ratio.
B. Prunus domestica ssp. insititia L:B ratio.
C. Prunus spinosa Length (mm).
D. Prunus domestica ssp. insititia. Length (mm).

Values of L and L:B appear in the horizontal axes, with numbers of specimens in the vertical axes.

a

b



c

Plate 7. Winchester: Stones and seeds of soft fruits from waterlogged layers.
a. Rubus idaeus (top left), Rubus fructicosus (bottom left) and Sambucus nigra (right). Samples 361 and 388, Brook Street.
b. Vitis vinifera. Sample 388, Brook Street.
c. Malus sylvestris . Sample 361, Brook Street. Scales in millimetres.

3.12 Neatham. SU 742 412

Soils and preservation. The site is on a gravel terrace overlying the Upper Chalk. The seeds in these samples are anaerobically preserved.

Contexts. Four wells dating from the 3rd - 4th centuries AD; features FNE, FNF, FNG and FN 64. (SS1 = Soil sample 1 etc.).

Sampling.

| Sample no. | Volume | Remarks |
|---|---|---|
| TR2/FNE/SS1 | 250cc. | Largely fruitstones and fine silt |
| SS2 | 700cc. | Decayed amorphous plant material |
| SS3 | 500cc. | Moss and wood common |
| TR2/FNG/SS1 | 400cc. | Similar to FNE/SS2 |
| SS2 | 300cc. | " |
| SS3 | 300cc. | Almost entirely fruitstones |
| SS4 | 400cc. | Similar to FNE/SS2 |
| SS5 | 300cc. | Grey soil |
| TR2/FNF/SS1 | 300cc. | Grey soil and charcoal ) |
| FN 64 A | 500cc. ) | ) |
| B | 600cc. ) | - Black soil and charcoal) - No seeds |
| C | 200cc. ) | ) |
| D | 300cc. ) | ) |

Flotation. Paraffin/water flotation. (Coope and Osbourne 1967). In addition the non-floating fraction was washed through a 3mm. mesh sieve in order to extract the larger fruitstones, which often did not float.

| Feature | | TR2/FNG | | | | | TR2/FNE | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample number | | SS1 | SS2 | SS3 | SS4 | SS5 | SS1 | SS2 | SS3 |
| Ranunculus cf. repens | a | | | 5 | 1 | | 3 | 2 | |
| Ranunculus cf. lingua | a | | | | | | 1 | | |
| Ranunculus sp. | a | | 1 | | | | 3 | | |
| Papaver rhoeas | s | 1 | 2 | 1 | | | 1 | | |
| Cruciferae | s | | | | | | | 3 | |
| Viola sp. | s | | | | | | 4 | | |
| Cerastium cf. arvense | s | | | | | | | | 1 |
| Chenopodium sp. | s | | | | | | | | 1 |
| Atriplex patula/hastata | s | | | 1 | | | | | |
| Potentilla sp. | a | | 23 | 17 | 1 | 2 | 80 | 13 | 2 |
| Malus sylvestris | fs | | | 1 | 1 | | | 1 | 1 |
| Pyrus/Malus sp. | fs | | | | | | | | 3 |
| Rubus fructicosus | fs | 121(2) | 117(2) | 84 | 1 | 16 | 219(10) | 23(2) | 28 |
| Prunus spinosa | fs | 2 | 82 | 94 | 13 | | 70 | 7 | 2 |
| Prunus insititia | fs | | 22 | 15 | 4 | | 12 | | 4 |
| Prunus domestica | fs | | 4 | 12 | 3 | | 20 | | |
| Prunus avium | fs | | 6 | 3 | 3 | | 33 | 2 | |
| Prunus sp. | fs | | 18 | 12 | 6 | | | | |
| Rosa sp. | fs | | 18 | 5 | | | 86 | 6 | |
| Crataegus monogyna | fs | | | 17 | 15 | | 162 | 12 | 7 |
| Coriandrum sativum | fr | | | | | | | | 2 |
| Umbelliferae | fr | | | 1 | | | 2 | | 1 |
| Rumex cf. crispus | nu | | | 2 | | | | | |
| Polygonum aviculare | nu | | | | | | | | 1 |
| Urtica dioica | nu | 4 | 5 | 1 | | 1 | 4 | 1 | 1 |
| Corylus avellana | ns. frag. | | | | + | | | + | + |
| Juglans regia | end. frag | | | | | | + | | |
| Vaccinium myrtillus | s | | 54 | 2 | 2 | 1 | 32 | 10 | 2 |
| Prunella vulgaris | nu | | | | | | | 1 | 1 |
| Sambucus nigra | s | | | | | | | | 1 |
| Lapsana communis | cy | | | | 1 | | | | |
| Compositae | cy | | | | | | | | 1 |
| Juncus sp. | s | 17 | 5 | | 1 | 1 | 1 | 1 | 4 |
| Typha latifolia | s | | | | | | | 1 | |
| Cyperaceae | nu | | 1 | 1 | | | 1 | | |
| Gramineae | ca | | 2 | 1 | 4 | | 3 | 2 | 4 |
| Indeterminate | | | 4 | | | | 6 | 1 | 4 |

**N.B. 121(2) etc.; This indicates that only half the flot was sorted through for this species, as it was very common. 121 fruitstones were recovered, and it is estimated that about 240 were present overall.**

Table 3.12.0: Fruits, seeds etc. identified in samples from Neatham.

Botanical descriptions

Economic plants

Rosa sp. Rose.

The large number of specimens from Neatham could not be identified to species. They are bilaterally symmetrical or rather irregular in shape, with sharp angles between the facets, 4.0 - 5.5 mm. in length.

Crataegus monogyna Jacq. Hawthorn.

The 159 fruitstones are ovoid in shape with broad longitudinal rilling, 5.4 - 8.1 mm. long.

Malus sylvestris Mill. Apple.

These four rounded seeds, 7.0 - 8.4 mm. long are all flattened and somewhat distorted.

Rubus fructicosus agg. Bramble.

As at Brook Street, these fruitstones are very variable in size, (2.6 - 3.4 mm.), and shape. All are coarsely reticulate.

Prunus spinosa L. Sloe.

Similar to the Brook Street specimens. 5.7 - 11.2 mm. long, L:B 83 - 142 (N=272).

Prunus domestica ssp. insititia (L) Schneid.

Larger, more pointed and less coarsely surfaced than the stones of P. spinosa. Length 7.2 - 12.7 mm., L:B 114 - 174 (N=57). See Fig. 3.12.1 for distribution of dimensions and indices of these two species.

Prunus domestica s.l. Plum.

Three forms of plum stone can be distinguished in the Neatham samples (Fig. 3.12.2).

| | | | | |
|---|---|---|---|---|
| Type 1 | (N=13) | L.14.05mm. | (12.5-15.9mm.). | L:B 128.5 (119-134) |
| Type 2 | (N=11) | L.16.6mm. | (15.2-18.2mm.). | L:B 143.8 (130-160) |
| Type 3 | (N=5) | L.22.0mm. | (19.5-25.4mm.). | L:B 164.6 (155-170) |

Type 1 is similar to the stones found in the Brook Street samples, being rather small and rounded. Type 3 is a very large flat stone, pointed at the ends and with a prominent wing. Type 2 is intermediate.

Prunus avium L. Cherry.

Two forms, both with smooth surfaces, occur in these samples.

1 Length 7.1 - 8.8 mm. L:B 96 - 118

2 Length 7.5 - 11.2mm. L:B 132 - 165

These may represent wild and cultivated fruits.

According to Bertsch and Bertsch (1949, 114) wild cherries can have fruitstones of a rather round form, with modal L:B ratio around 120, whilst cultivated forms tend to be more elongate, L:B above about 135.

Coriandrum sativum L. Coriander (Plate 6).

An almost intact fruit of this species, 4.05 mm. long comes from sample FNE/SS3. It has prominent ridges and a sinuate pattern between them.

Vaccinium myrtillus L. Bilberry (Plate 8).

Bilberry seeds are numerous in these samples. They have straight spines and curved ventral sides, with fine linear reticulation. They are 0.9 - 1.2 mm. long.

Corylus avellana L. Hazel.

Fragments of woody nutshell of this species occur in a few samples.

Juglans regia L. Walnut (Plate 8).

This species is represented by a single fragment of the grooved, pitted endocarp.

Weed seeds

All weed seeds recovered are listed in Table 3.12.0 and are described in section 3.14.

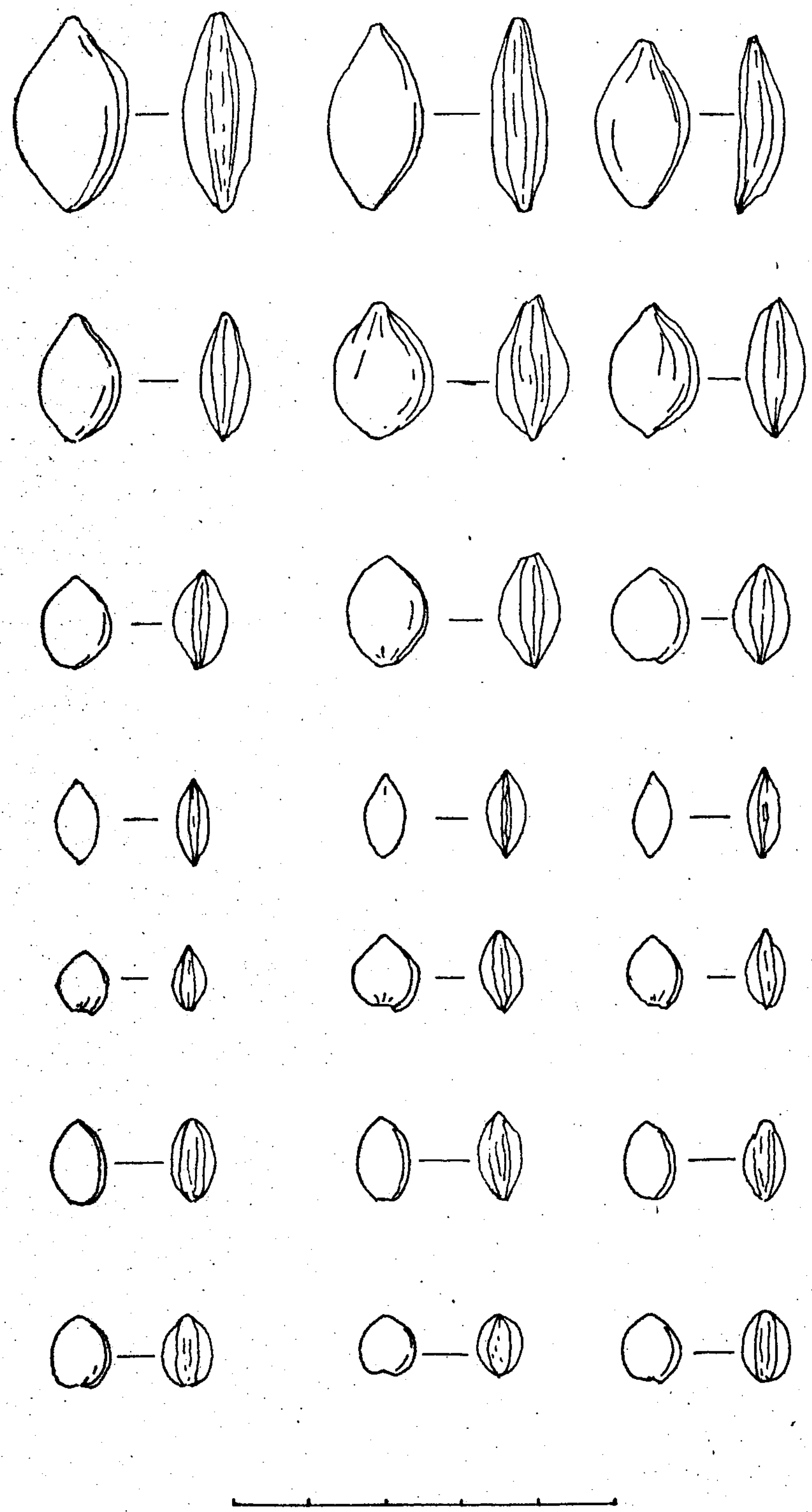


Figure 3.12.1; Neatham - Prunus fruitstones.
Type 3 ⎫
Type 2 ⎬ Prunus domestica s.l.
Type 1 ⎭
Prunus domestica ssp. insititia
Prunus spinosa
Prunus avium (elongate)
Prunus avium (round)
Surface detail is not shown. Scale in centimetres

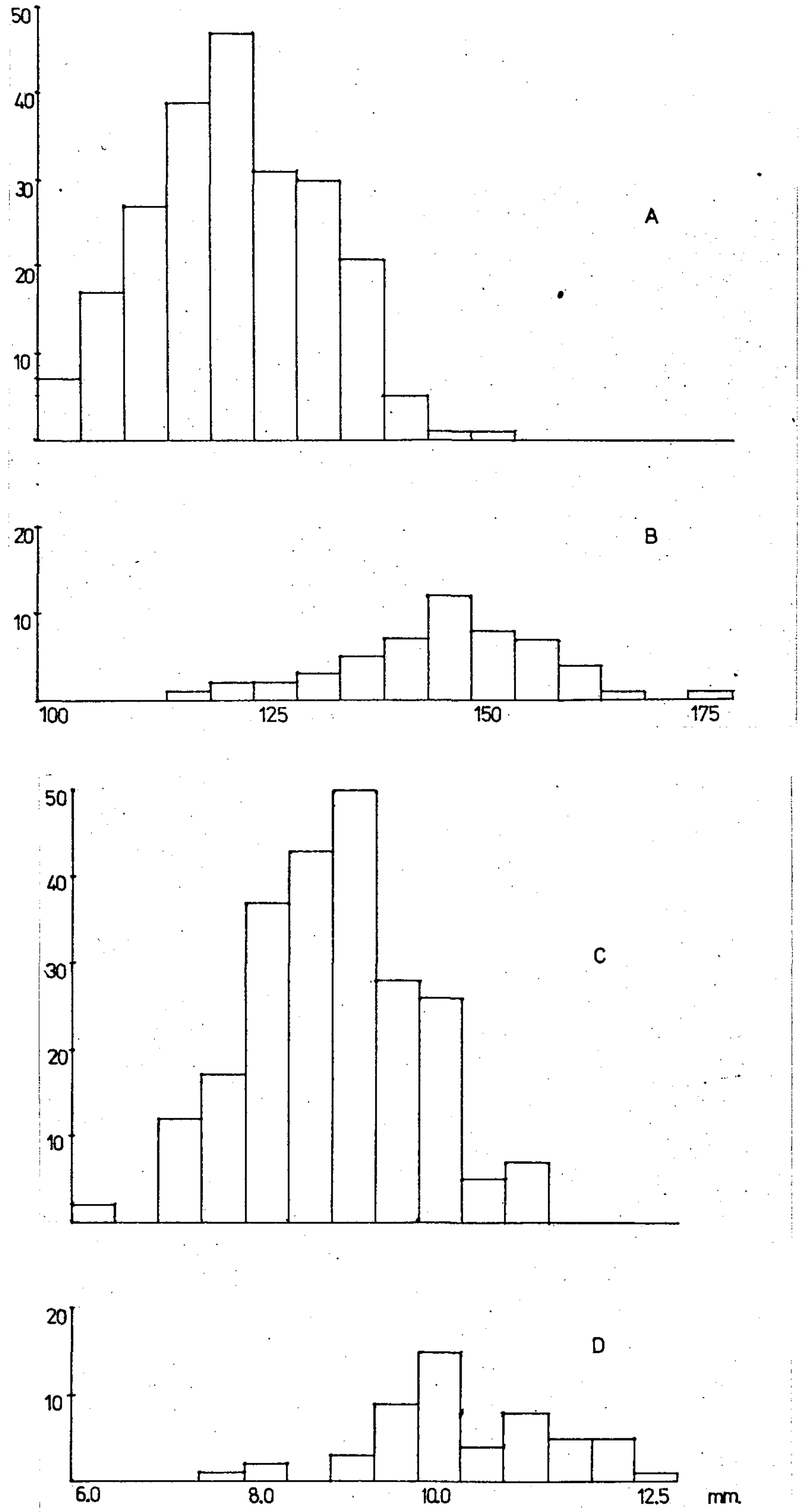



Figure 3.12.1; Neatham - Dimensions in mm. and indices of fruitstones.

A. Prunus spinosa L:B ratio.
B. Prunus domestica ssp. insititia. L:B ratio.
C. Prunus spinosa Length (mm.)
D. Prunus domestica ssp. insititia. Length (mm.)

Values of L and L:B appear in the horizontal axis, with numbers of specimens in the vertical axis.

a

b

Plate 8. Neatham - walnut and bilberry from waterlogged layers.
a. Juglans regia. Endocarp fragment. Sample TR2/FNE/SS1.
b. Vaccinium myrtillus . Seed. Sample TR2/FNG/SS2.
Scales in millimetres.

3.13 Oakridge. SU 640 435

Soils and preservation. The site is on the Upper Chalk, but the samples examined come from below the water table, and consist almost entirely of anaerobically preserved organic matter.

Context. Initial silting of a Romano-British well, 87 feet in total depth. The samples are from depths between 76 and 77 feet.

Sampling. Three large samples of material were taken. Of these only the sample from depth 76 feet was at all prolific in its seed content and consequently rather more of it was sorted through (900 cc. as opposed to 600 cc. for each of the others).

Flotation. The samples consisted almost entirely of waterlogged wood chips and twigs with only a little fine silt by way of mineral soil. In these circumstances flotation was found to be impractical as a means of extracting fruits and seeds. Instead the samples were placed on a 3mm. mesh sieve and the finer fraction washed through into a 250 micron mesh sieve under the tap. The remaining fraction was sorted through for large fruitstones.

| Sample depth | | 76' | 76'8" | 76'-77' | Total |
|---|---|---|---|---|---|
| Ranunculus cf. repens | a | 0 | 1 | 0 | 1 |
| Ranunculus sp. | a | 1 | 0 | 0 | 1 |
| Cruciferae indet. | s | 3 | 1 | 0 | 4 |
| Aethusa cynapium | fr | 1 | 0 | 0 | 1 |
| Rumex cf. crispus | nu | 1 | 0 | 0 | 1 |
| Rumex acetellosa | nu | 1 | 0 | 0 | 1 |
| Urtica dioica | nu | 49 | 1 | 2 | 52 |
| cf. Ballota nigra | nu | 3 | 0 | 0 | 3 |
| Sambucus nigra | s | 6 | 2 | 0 | 8 |
| Cirsium sp. | cy | 1 | 1 | 0 | 2 |
| Gramineae indet. | ca | 1 | 0 | 0 | 1 |

Table 3.13.0: Fruits, seeds etc. identified in samples from Oakridge.

## 3.14 Wild plants

To avoid duplication of descriptions so far as is possible, fruits and seeds of wild plants from all sites are described in this section. Fruitstones and nuts of those wild species which were almost certainly exploited, have already been described above. This is not to say, however, that some of the remaining species in this section were not utilised to some extent.

Fruits and seeds from waterlogged deposits are indicated by a letter 'W', and carbonised specimens by a letter 'C', both in brackets. A range of lengths taken from well-preserved specimens is given for each species. This is followed by a brief description which points out the main distinctive features which led to identification or those which prevent specific identifications being made. The descriptions are not intended to be complete or exhaustive. The following abbreviations are used for the sites; PW - Portway; OW - Owslebury; R27 - Site R27, Micheldever Wood; ODF - Old Down Farm; CO - Colchester; HA - Hascombe; OA - Oakridge; NE - Neatham; CG - Cathedral green; BS - Brook Street.

The order of families is that of Clapham, Tutin and Warburg (1962).

Ranunculus sp. Buttercup (Plate 10. Fig. 3.14.1).
PW 1.5 -2.5 mm. R27 2.0 mm. (C)
BS 2.6 - 2.9 mm. (W)
Carbonised achenes of the various buttercup species are not easy to distinguish from one another. In the PW samples rounded D-shaped achenes with coarse punctate surfaces and clear margins of elongate cells, and specimens with curved spines, lenticular and without margins, both occur. The former type, distinctive even when fragmentary as in samples from OW and R1 may be of R. repens, but complete differentiation would be made possible only by detailed studies of surface structure, using scanning electron microscopy (Williams 1975). D-shaped achenes with margins also occur at BS, CG and NE in a very eroded state, preserved in waterlogged conditions. The rostella have not survived.

Ranunculus cf. acris L. Meadow buttercup.
CG 2.3 mm. (W)

Achenes bi-convex. Finely punctate, though abraded.

Ranunculus cf. lingua L. Greater spearwort.
NE 2.6 mm. (W)

A single achene from Neatham is tentatively referred to this species. Rather more slender than R. repens.

Papaver rhoeas L. Field poppy.
CG 0.7 - 0.95 mm. BS 0.95 mm. (W)

Small, rounded to reniform seeds with surface reticulation, composed of polygonal 'cells'.

Papaver cf. argemone L. Long prickly headed poppy.
CG 0.8 mm. (W)

Elongate, reniform with regular reticulation in longitudinal rows.

c.f. Chelidonium majus L. Greater celandine.
CG 1.0 mm. (W)

Oval seed with regular reticulation. The unusually small size of this specimen makes the identification somewhat uncertain.

Brassica/Sinapis sp. Cabbage/Mustard (Plate 10. Fig. 3.14.1).
PW 0.95 - 2.0 mm. OW 1.0 - 1.3 mm. CO 1.6 - 1.9 mm.
R27 1.2 mm. HA 1.5 mm. (C)

The pitted, near spherical seeds of these Crucifers are invariably in poor condition, usually eroded and sometimes lacking surface layers of the testa. Identification to species depends upon close study of surface patterning (Berggren 1962) and seeds in these samples have therefore not been closely identified. See above (3.5) for a large deposit of Brassica seeds.

Thlaspi arvense L. Field penny cress (Plate 11).
CO 1.6 mm. R27 1.4 mm. (C). CG 1.9 - 2.1 mm. (W).

Flattened oval seeds with very distinctive concentric ridges.

Capsella bursa-pastoris (L) Medic. Shepherd's purse.
CG 0.9 - 1.05 mm. (W)

Oval seeds with radicle. Length nearly twice width. Finely tuberculate surface.

Viola sp.
N 1.6 mm. (W)

Pointed ovoid seeds with large hilum. Cell pattern unclear.

Hypericum perforatum L. St. John's Wort.

Half a seed in Brook Street, sample 412. Cylindrical, with pointed end and rows of regular reticulation.

Stellaria media (L) Vill. Chickweed (Fig. 3.14.1).
PW 0.8 - 0.95 mm. R27 0.75 - 0.8 mm. ODF 0.6 -0.8 mm. (C)
BS 1.1 - 1.2 mm. CG 1.0 - 1.4 mm. (W)

Rounded flattened seeds with rows of hemispherical and stretched-out tubercules. The tubercules are sometimes more rounded and higher. 12 specimens from sample PW 685E show a wide range of variation in tubercule characteristics. Variability in testa patterning is characteristic of this species (Clapham, Tutin and Warburg 1962, 242).

Silene alba (Mill) Krause. White campion.
ODF 1.2 mm. (C) BS 1.6 mm. CG 1.5 - 1.7 mm. (W)

Incompletely circular and compressed with concentric rows of low, rounded tubercules.

Agrostemma githago L. Corn cockle (Plates 9, 11).
OW 2.8 mm. (C)

Large, coarsely tuberculate seeds; very distinctive even when the testas are lost, as in the case of the specimens from Colchester and Crookhorn, or when crushed, as at Brook Street.

Arenaria serpyllifolia L. Thyme leaved sandwort.
BS 0.3 - 0.5 mm. CG 0.3 - 0.5 mm. (W)

Small, symmetrically reniform seeds with regular fine tubercules.

Spergula arvensis L. Cornspurrey (Plate 11).
CO 0.85 mm. (C)

Smooth lenticular seeds with prominent wing running around the circumference.

Chenopodium album L. Fat hen (Plates 9, 10. Fig. 3.14.1).
OW 0.95 - 1.05 mm. PW 0.90 - 1.1 mm. HA 0.9 - 1.1 mm. R27 0.8 - 1.2 mm. ODF 1.0 - 1.1 mm. (C) CG 1.2 mm. BS 1.2 mm. (W)

Flattened circular seeds. Radicle not prominent. Central circular scar from which come faint radial striations on the otherwise smooth and glossy testas.

Chenopodium hybridum L. Goosefoot (Plate 11).
CO 1.5 mm.

The single specimen from Colchester has a pattern of deep pits on its testa. The radicle is not very obvious.

Atriplex patula and hastata L. Orache (Plate 10, 11 Fig. 3.14.1).
PW 1.2 - 1.8 mm. OW 1.1 - 1.7 mm. R27 1.2 - 1.5 mm. ODF 1.0 - 1.6 mm. (C) BS 1.7 mm. (W)

Flattened circular seeds with a prominent radicle visible around the edge, and with fine surface sculpturing particularly under the tip of the radicle and towards the centre of the seed. The area of this sculpturing is very variable, but a few specimens from PW are similar to seeds of A. hastata collected on the tidal banks of the River Itchen in surface detail. Probably A. patula is the commoner species in these samples, but definite separation has rarely proved possible.

Malva sylvestris L. Mallow (Plate 10).
R27 2.0 mm. (naked seeds 1.6 mm.) (C)

Nutlets shaped like the segments of an orange, which the original schizocarp resembles. One specimen retains the reticulate rugose curved surface, but most have lost the nutlet coat and survive as smooth naked seeds.

Linum catharticum L. Purging flax (Plate 13).
BS 1.2 mm. (W)

Small specimen in BS 412 is oval and flattened, with a small beak.

Medicago sp. Medick (Fig. 3.14.1).
R27 1.6 - 2.1 mm. (C)

These small seeds of the Leguminosae proved difficult to identify confidently. These specimens are oval with the prominent radicle visible for rather more than half the length of the cotyledons. The hilum is missing.

Potentilla cf. erecta (L) Rauschl. Tormentil.
NE 1.6 - 1.8 mm. BS 1.6 mm. CG 1.7 mm. (W)

Fruits with straight ventral sides and noticeable ridges are tentatively referred to this species. Many fruits of this genus in the samples were indeterminate in form and could not be closely identified.

Aphanes arvensis agg. Parsley piert.
CG 0.9 - 1.2 mm. (W)

Small flattened fruits pointed at their apices and with an asymmetrically set point of attachment at the base. Knorzer (1973) notes that fruits of A. microcarpa are smaller than 1mm. in length. Both 'species' may be present.

Conium maculatum L. Hemlock.
CG 2.2 - 3.1 mm. (W)

These fruits have lost their outer fruit case with its ribs. Knorzer (1973 Plate 5) illustrates a fruit in this state, showing its characteristic cell pattern.

Apium graveolens L. Wild celery.
BS 1.05 mm. (W)

Small, plump fruits with flat ventral sides and prominent longitudinal ribs.

Aethusa cynapium L. Fool's parsley.
OA 3.5 mm. (W)

The very broad ribs of this species are often only loosely attached to the oval, domed body of the fruit.

Daucus carota L. Wild carrot.

The damaged specimen from BS 361 has lost its spines, but the outline of the wings remains sinuate. The fruit is flattened and oval in overall shape.

Torilis sp. Hedge parsley.
CO 2.2 mm.

The body of the fruit is ovoid, but the spines which emerge from the furrows are very eroded.

Euphorbia cf. platyphyllos L. Broad spurge.
HA 1.8 mm.

Ovate globular seed with a basal hilum and thin central groove.

Rumex spp. Docks (Plate 10. Fig. 3.14.1).
PW 1.8 - 2.0 mm. R27 1.6 - 2.0 mm.; 1.2 mm. ODF 1.8 mm. (C)

In the absence of perianths tentative identifications are given, based on nutlet morphology alone. At Owslebury two nutlet forms were distinguishable; both have faces with only one axis of symmetry, but one has a broad rounded base and is 1.6 - 1.7 mm. long, whilst the other has its style end much more drawn out, with very sharp angles between the faces, and is 1.4 - 1.6 mm. long. The former type may be tentatively identified as R. crispus L.

Rumex crispus L. Curled dock.
BS 1.9 - 2.1 mm. (C)

Some of the nutlets from waterlogged samples at Brook Street retain the perianth.

Rumex acetosella agg. Sheep's sorrel.
CG 1.0 mm. (W) CO 0.95 mm. PW 1.0 mm. (C)

Small trihedral nutlets with rounded angles. Nutlets of other Polygonaceae which have lost their outer surfaces and have become eroded often appear misleadingly like nutlets of this species.

Polygonum convolvulus L. Black bindweed (Plate 11. Fig. 3.14.1).
CO 2.5 mm. OW 2.1 - 3.0 mm. PW 2.1 - 3.2 mm. R27 2.2 - 3.0 mm. ODF 2.4 - 2.5 mm. HA 2.2 - 3.0 mm. (C) CG 2.8 - 3.0 mm. (W)

Large trihedral nutlets. The faces rough and with two axes of symmetry, and rounded glossy angles between them. Frequently puffed into a sub-spherical shape where carbonised.

Polygonum aviculare agg. Knotgrass (Plate 11. Fig. 3.14.1).
PW 1.7 - 2.2 mm. ODF 2.0 mm. (C)

Although the nutlets are frequently puffed into a tear-shape, three faint lines remain to mark the angles between the unequal, roughened faces.

Polygonum persicaria L. Redshank.
BS 2.7 mm. (W)

Circular, glossy black nutlet with pointed apex.

Urtica dioica L. Stinging nettle (Plate 13).
BS 0.9 - 1.2 mm. CG 0.95 - 1.3 mm. (W)

Flattened fruits, pointed at one end and sometimes with a slightly rough surface.

Urtica urens L. Small nettle (Plate 13).
CG 1.7 - 2.0 mm.

Larger than U. dioica, with a slight keel on one surface.

Primula sp. L. Cowslip? (Plate 13).
BS 1.6 mm. (W)

Angular conical seed with small but prominent surface projections.

Lithospermum arvense L. Corn Gromwell (Plate 10. Fig. 3.14.1).
PW 2.4 - 3.2 mm. ODF 2.8 - 3.0 mm. (C)

Large, distinctive, bilaterally symmetrical warty nutlets with their basal scars puffed into small domes during carbonisation. Frequently they are rather grey in colour externally, but contain carbonised tissue where fractured.

Myosotis c.f. arvensis (L) Hill Forget-me-not (Plate 11).
CO 1.6 mm. (C)

Ovoid, acute nutlet. This particular specimen is rather flattened, and shows little sign of a keel.

Hyoscyamus niger L. Henbane (Plate 10. Fig. 3.14.1).
PW 1.3 - 1.5 mm. R27 1.4 mm. (C) CG 1.3 - 1.8 mm. (W)

Compressed, rounded four-sided seeds with an incision in one side, and very characteristic surface reticulation, composed of raised sinuate lines.

Mentha cf. aquatica L. Water mint.
CG 0.85 - 0.9 mm. (W)

Oval nutlets with pitted surfaces and large triangular hilums.

Lycopus europaeus L. Gipsywort (Plate 13).
CG 1.2 - 1.7 mm. (W)

Quadrilateral nutlets with thickened margins.

Prunella vulgaris L. Self heal (Plate 13).
BS 1.8 mm. (W)

Oval nutlets with median groove on ventral side. Prominent hilum. Epidermis peeling to give the illusion of a slight peripheral wing.

Stachys cf. sylvatica L. Hedge groundwort.
CG 1.8 - 2.0 mm. (W)

Nutlets with small hilum. Triangular in cross section, blunt ended.

Galeopsis tetrahit L. or speciosa Mill. Hemp nettle (Fig.3.14.1).
CG 2.8 - 3.5 mm. (W) R27 2.05 - 2.2 mm. (C)

Very large nutlets with prominent hilum. Katz et al (1965, 77) describe G. tetrahit as having nutlets 2.5 - 3.0 mm. G. speciosa 3.0 - 3.25. Both species probably present at CG.

Plantago lanceolata L. Ribwort plantain (Plate 11. Fig. 3.14.1).
CO 2.1 mm. PW 1.8 - 2.3 R27 2.3 - 2.5 (C)

Elongate, elliptical seeds domed on the dorsal side and with a prominent hilum in the concave ventral side.

Galium aparine L. Goosegrass (Plate 9. Fig. 3.14.1).
PW 1.2 - 3.05 mm. OW 1.3 - 2.5 mm. R27 1.6 - 3.2 mm.
ODG 2.0 - 2.1 mm. (C)

The half fruits of this species are large and roughly spherical with a large aperture in a slightly flattened portion of the surface. No trace of the hooked bristles survives carbonisation.* The size range is considerable, but no more so than that of modern specimens; specimens from a single plant were found to vary in length from 1.9 - 3.6 mm. This variability is also mentioned by Helbaek (1955, 688).

* The surface is finely corrugated in the case of well-preserved specimens.

Valerianella dentata (L) Poll. Corn salad (Plate 10. Fig. 3.14.1).
PW 1.4 - 1.7 mm. R27 1.5 - 1.8 mm.

The ovoid fruits are enclosed in the calyx which has one prominent tooth giving the structure acuminate ovoid shape overall. Roughly lens-shaped in cross section.

Sambucus nigra L. Elder (Plate 7).
BS 2.9 - 4.1 mm. CG 2.7 - 4.7 mm. (W)

Seeds vary in shape from ovate to more angular, but all have prominent coarse transverse ridges.

Sambucus c.f. ebulus L. Danewort.
BS 2.95 mm. (W)

Wide in relation to length; otherwise similar to S. nigra.

Scabiosa columbaria L. Small scabious (Plate 13).
BS 2.9 mm. (W)

Fruit roughly square in cross section, with ribs visible on each face. Persistent calyx teeth.

Senecio sp.
BS 2.1 mm. (W)

Cylindrical ribbed fruit with annulus at apex.

Tripleurospermum maritimum (L) Koch. Scentless mayweed (Plate 10. Fig. 3.14.1).
R27 1.8 mm.

These fruits are usually very poorly preserved and unmeasurable. They have one broad and two narrow faces, transversely wrinkled with two depressions (glands) at the apex of the broad face. The three ribs separating the faces have often broken away, leaving longitudinal concave scars.

Chrysanthemum leucanthemum L. Ox-eye daisy (Plate 10. Fig.3.14.1).
R27 1.8 mm.

Cuneate cypselas with rounded apices and the residue of the style surviving. There are up to ten ribs running the length of the fruit.

In addition to these definite specimens of C. leucanthemum there are cypselas with very square apices, and sometimes with traces of a raised rim around the apex, rather like Anthemis. They do not correspond closely to any fruits of that genus in the reference material available however, and are listed in the Tables as Anthemis /Chrysanthemum sp.

Cirsium/Carduus sp. Thistles (Plate 10. Fig. 3.14.1).
PW 3.9 - 4.2 mm. (C)

Elliptical, smooth but eroded cypselas, rather compressed and truncated obliquely at the apex. No distinctive features survive on these carbonised specimens as the surfaces are worn smooth.

Cirsium cf. vulgare (Savi) Ten. Spear thistle.
CG 3.5 mm. (W)

Rather plump smooth cypsela, flattened.

Cirsium cf. palustre (L) Scop. Marsh thistle.
BS 3.1 - 3.2 mm. (W)

Traces of longitudinal ribs.

Centaurea cf. scabiosa L. Greater knapweed (Plate 10. Fig. 3.14.1).
PW 3.2 - 3.6 mm. (C)

Cypselas of this genus are very distinctive as their point of attachment is not at the base, but to one side, so that they are notched near the base. Fresh specimens are slightly flattened and lightly banded longitudinally, but the carbonised ones are roughly circular in cross section and quite smooth. The apices are not noticeably narrowed and the basal notch is relatively small.

Lapsana communis L. Nipplewort (Plate 10).
R27 3.3 mm.

Curved, strongly ribbed lanceolate cypselas tapering markedly towards the base, which is usually damaged, making measurement impossible.

Hypochoeris sp.

Small, tapering, ribbed cypsela with a few teeth towards the pappus end.

Sonchus cf. asper (L) Hill. Spiny sow thistle.
R27 2.3 mm. (C) CG 2.45 mm. (W)

Only the central part of the fruit survives, with three ribs on each face, but the compressed shape, smooth ribs and inter-rib spaces and very prominent annulus make identification possible.

Juncus spp. Rushes.

Small seeds of rushes are common in most waterlogged samples. However it proved difficult to make truly confident identifications to species using light microscopy, and precise identifications are therefore not given in the Tables.

Typha latifolia L. Reedmace (Plate 12).
NE 0.95 mm. (W)

Small fruit of rough cylindrical shape, tapering at one end and truncated at the other.

Carex spp. Sedges.
CG 1.6 mm. (W) ODF 1.4 mm. (C)

Trihedral and biconvex nutlets of this genus always lacked their utricles, and were generally in poor condition in the waterlogged samples. They have therefore not been identified to species. The carbonised nutlets from ODF are biconvex with short pointed styles and broad pedicels; these could not be identified either.

Setaria viridis (L) Beauv. Green bristle grass.
CO 1.8 mm. (C)

The above dimension is of the naked caryopsis, distinguished by its large radicle shield. When first extracted the roughened lemma survived, but this crumbled during examination.

Anisantha sterilis (L) Nevski Barren brome (Figs. 3.5.1, 3.9.1).
R27 Length 7.5-8.6mm. Breadth 1.1-1.2mm. Thickness 0.6-0.9mm. (C)

Extremely elongate caryopses, the dorsal sides rounded but with longitudinal striations and the ventral sides deeply grooved.

Bromus mollis and B. secalinus L. Brome or lop grass (Figs. 3.3.6 etc.).

| | | | L | B | T | L:B | T:B |
|---|---|---|---|---|---|---|---|
| R27 14/363/703 | N=10 | | | | | | |
| | | min. | 4.3 | 1.0 | 1.0 | 240 | 55 |
| | | mean | 4.9 | 1.8 | 1.1 | 272 | 64 |
| | | max. | 5.5 | 2.0 | 1.3 | 293 | 73 |

OW: Overall length range 5.2-5.5 mm.

| | | | L | B | T | L:B | T:B |
|---|---|---|---|---|---|---|---|
| PW 688B | N=50 | | | | | | |
| | | min. | 4.2 | 1.4 | 0.9 | 215 | 50 |
| | | mean | 4.9 | 1.8 | 1.3 | 279 | 73 |
| | | max. | 6.0 | 2.1 | 1.8 | 357 | 100 |
| HA | N=13 | | L | B | T | L:B | T:B |
| | | min. | 4.3 | 1.5 | 0.7 | 262 | 55 |
| | | mean | 5.3 | 1.8 | 1.1 | 294 | 62 |
| | | max. | 6.0 | 2.1 | 1.5 | 400 | 87 |

These dimensions and indices are taken from the largest group of carbonised Bromus caryopses from each site. The apices are rounded and the caryopses longitudinally folded in the better preserved specimens (Fig.3.3.6.a,b). Fig.3.3.6. c illustrates the more frequent state, in which the caryopses are rather puffed. In both cases the glossy dorsal surface and distinctive pattern of radiating lines of cells at the apex distinguishes these caryopses from those of oats, even when puffed.

From Brook Street comes a single caryopsis of *Bromus cf. mollis* preserved in waterlogged conditions. It is 5.0 mm. long. The hilum extends almost to the rounded apex. The pericarp has clear longitudinal cells with mottled pigmentation. Lines of cells radiate from the end of the hilum.

*Avena* spp. Wild oats (Figs. 3.2.1, 3.4.1 etc.)

These are discussed above, where they are compared directly with cultivated species.

*Alopecurus geniculatus* L. Marsh foxtail (Plate 12).
BS 1.3 mm. (W)

Hilum short, deeply pigmented, at base of fruit. Mottled pigmentation. Tubular appendage at apex of caryopsis.

*Poa* sp. Meadow grass.
BS 1.0 mm. (W)

Small caryopses with inconspicuous pale coloured hilums.

*Smaller carbonised grass caryopses*

In general these have not been closely identified. They are listed as *Gramineae* (s) to distinguish them from poorly preserved *Avena* and *Bromus* caryopses (*Gramineae* (1)).

Figure 3.14.1; Carbonised weed seeds from all sites.

a. Ranunculus sp. Portway 84J.
b. Brassica/Sinapis sp. Hascombe.
c. Stellaria media Portway 84J
d. Atriplex patula/hastata. Portway 84J.
e. Chenopodium album. Hascombe
f. Polygonum convolvulus Portway 84K.
g. Polygonum aviculare Portway 84K.
h. Rumex sp. Portway 84K.
i. Hyoscyamus niger Portway 584E.
j. Valerianella dentata Portway 84K.
k. Galeopsis tetrahit. R27. 14/70/515.
l. Lithospermum arvense Portway 84K.
m. Galium aparine R27. 319/601.
n. Plantago lanceolata Portway 84J.
o. Vicia hirsuta Portway 685E.
p. cf. Medicago sp. R27. 8/64/537.
q. Tripleurospermum maritimum Portway 84K.
r. Chrysanthemum leucanthemum Portway 84K½
s. Cirsium/Carduus sp. Portway 688B.
t. Centaurea sp. Portway 578D.

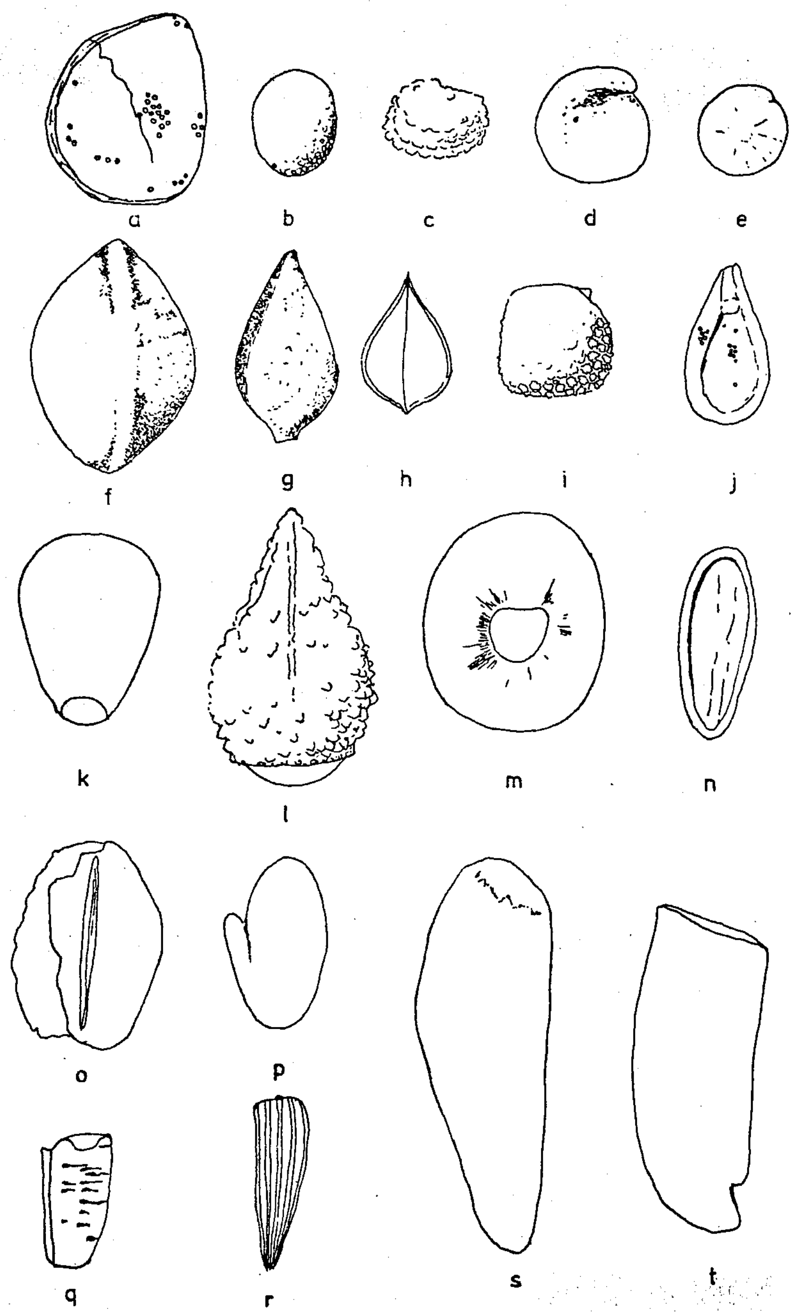



Figure 3.14.1.

Plates 9 - 12. Fruits and seeds of wild plants (on following pages)

Plate 9. Owslebury - carbonised weed seeds. (left to right)
*Galium aparine*. Fruit. Sample Q223.
*Chenopodium album*. Seed.
*Agrostemma githago*. Seed.
Scale in millimetres.

Plate 10. Portway and R27 - carbonised weed seeds.
a. (left to right) from top down
*Lithospremum arvense*. Sample 197L, PW.
*Ranunculus* sp. Sample 197L, PW.
*Centaurea* cf. *scabiosa*. Sample 197L, PW.
*Cirsium/Carduus* sp. Sample 688B, PW.
b. (left to right)
*Hyoscyamus niger*. Sample 584E, PW.
*Malva sylvestris*. Sample 2/504/611, Site R27.
*Atriplex patula/hastata*. Sample 197L, PW.
*Rumex* sp. Sample 84K, PW.
c. (left to right)
*Tripleurospermum maritimum*. Sample 14/136/697, R27.
*Chenopodium album* Sample 197F, PW.
*Valerianella dentata*. Sample 197L, PW.
*Papaver* cf. *somniferum*. Sample 14/136/697, R27.
*Lapsana communis*. Sample 14/136/697.
*Chrysanthemum leucanthemum* Sample 14/136/697.
Scale in millimetres.

Plate 11. Colchester - carbonised weed seeds.
a. (left to right) from top down
*Agrostemma githago*. Cups Hotel, Sample 950.
*Thlaspi arvense*. Curry's Pottery Shop, Sample 6.
*Spergula arvensis* "
*Camelina sativa* "
*Myosotis* cf. *arvensis* "
*Polygonum convolvulus* "
*Polygonum aviculare* "
b. (left to right)
*Bromus mollis/secalinus*. Cups Hotle, 950.
*Plantago lanceolata*. Curry's Pottery Shop, 6.
*Apium graveolens*. "
*Atriplex patula/hastata*. "
*Papaver somniferum* "
*Chenopodium hybridum* "
Scales in millimetres.

Plate 12. Winchester and Neatham - reedmace and marsh foxtail from waterlogged deposits.
a. *Typha latifolia*. Seed. Sample TR2/FNE/SS2, Neatham.
b. *Alopecurus geniculatus*. Sample 412, Brook Street.
Scales in millimetres.

Plate 13. Winchester - seeds of wild plants from waterlogged deposits.
a. *Primula* sp.
*Prunella vulgaris* Brook Street, Sample 412.
*Scabiosa columbaria*
*Linum catharticum*
b. *Lycopus europaeus* Cathedral Green, Sample 430.
c. (left) *Urtica urens*. Brook Street, Sample 305.
(right) *Urtica dioica*. "

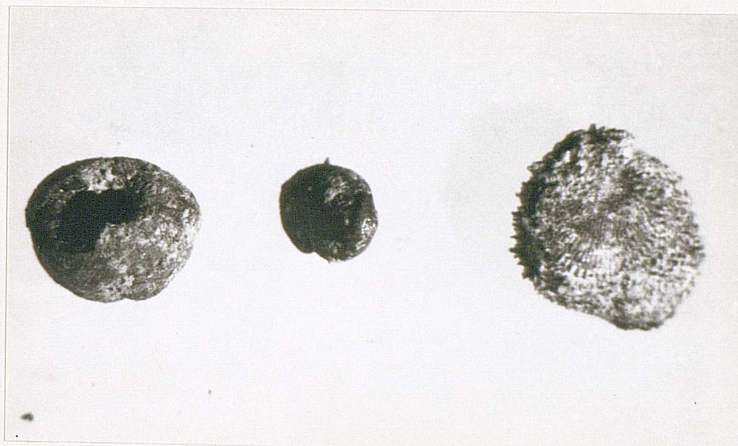
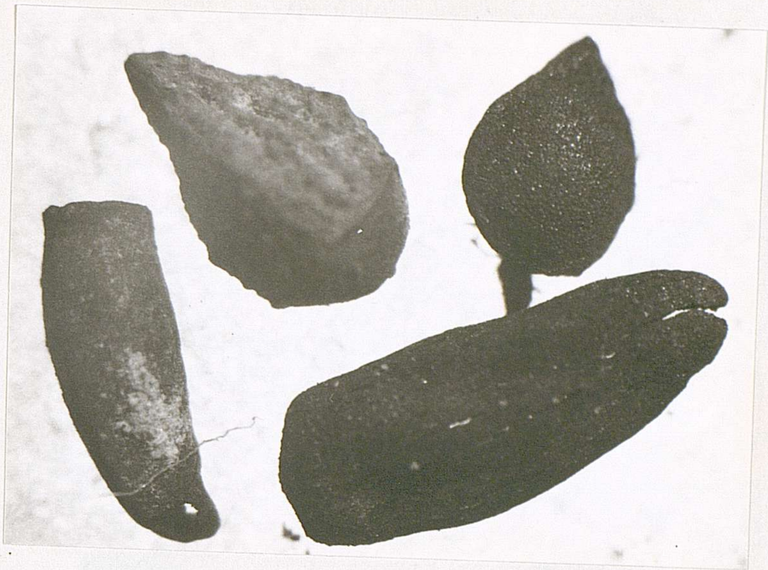
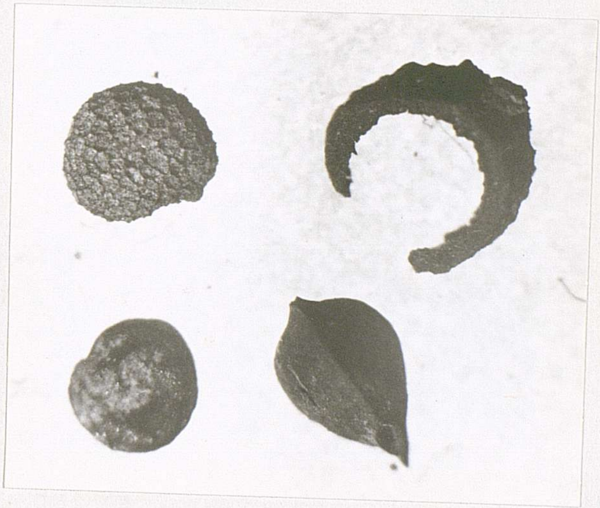


Plate 9.



a



b

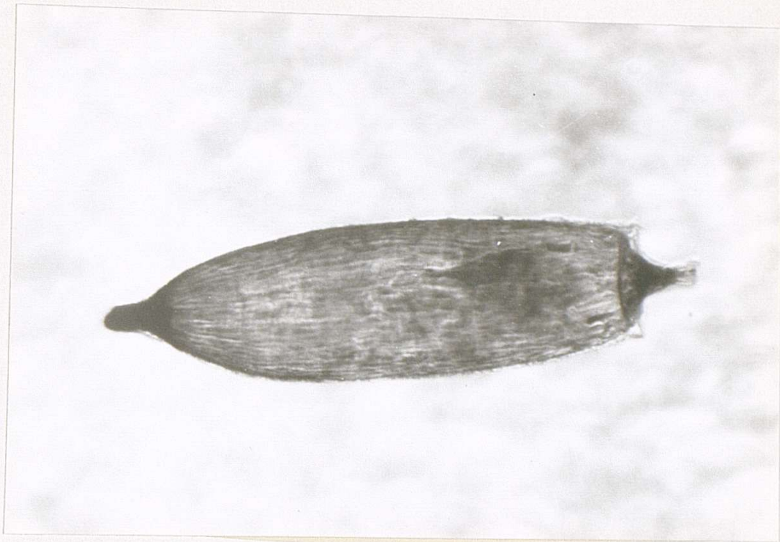
c

Plate 10.

a

b

Plate 11.



a

b

Plate 12.

a

b

c

Plate 13.

## CHAPTER 4. WILD PLANT COMMUNITIES

The waterlogged, anaerobic deposits of the low-lying sites included in this study, (Winchester, Neatham and Oakridge), have produced a range of fruits and seeds of wild species which makes possible an attempt at the reconstruction of the vegetation of local areas. In addition the weed flora of arable fields - one particular vegetation type - is well-represented in the carbonised seed samples. In this chapter the probable nature of wild plant communities in the vicinity of the settlements is therefore discussed and some attempt is made to assess the ways in which these vegetation types may have been exploited. Other sources of environmental information, particularly snails and pollen are used to amplify the picture given by the seeds. Finally this information is integrated in a discussion of the environment of early Roman Winchester, from which both pollen counts and a fairly large number of seed assemblages are available.

Before drawing any conclusions from the seed deposits it is necessary to consider the ways in which they came to be formed and the effects which this has upon interpretation.

### 4.1 Formation and interpretation of seed assemblages

Both the characteristics of the plants and seeds and the nature of formation of the sediments must be examined before interpreting seed assemblages in terms of former plant communities.

The dispersal characteristics of seeds are particularly relevant. Despite their adaptations for dispersal the vast majority of seeds shed come to rest relatively close to the parent plant. Those individuals carried by the wind can achieve extensive distribution, but even here the range is limited. A study of the spread of fruits of *Senecio jacobea,* for example, showed that 60% of the cypselas fell to earth around the base of the plants and that the distribution fell off asymptotically with distance, so that only 0.005%

travelled 40 m. from the parent plant (Salisbury 1961, 100). Ballistic mechanisms have an even shorter range; the most violent, such as lupins, propel seeds only about 6 m. Transportation by animals in their digestive tracts, on their coats or on mud on hooves is a significant means of dispersal and carriage by birds is still more extensive in range. Human activities, in the transfer of vehicles and foodstuffs from place to place, are similar in effect to those of animals. Transport by running water is obviously likely to be of particular importance for aquatic and riparian species (ibid., 102-143). In general however these dispersal mechanisms are operating over a relatively short range. The greater proportion of fruits and seeds in an assemblage will normally be derived from a restricted area and thus will give a picture of the locality. This presents a contrast with pollen analysis, which yields a regional picture (Watts and Winter 1966). A recent study of a modern seed assemblage in a sump at York has emphasised that the specific dispersal characteristics of certain species may well act so as to distort this pattern, however. In an almost treeless central urban area, seeds of birch and ash, wind-borne types, were abundant (Williams 1975, 93).

The actual number of fruits or seeds of a given species present in a sample may reflect its importance, but for at least two reasons is likely to be unreliable. Firstly seed production varies widely between species. Some rarely produce seed at all, whilst at the other extreme are such types as Juncus inflexus which produces an average of over 200,000 seeds per plant (Salisbury 1961, 22). Secondly differential preservation in the sediment must be considered. Clearly fruits and seeds with durable coats such as the endocarp of fruits of the Rosaceae, the woody nutshells of hazel and the tough testas of the Chenopodiaceae, are far more likely to survive than delicate structures like grass caryopses, which only exceptionally survive in an identifiable state.

There are also problems of interpretation attached to the fact that features of the environment which are significant to one organism may be totally irrelevant so far as humans are concerned. To a small plant the cracks in a pavement where soil is available are more important than the pavement itself, for example. This problem of interpretation has been considered in some detail for beetle death assemblages at York (Kenward 1975), and underlines the need for caution in environmental interpretation.

It is noticeable that in the vicinity of human dwellings rather similar sorts of weed and ruderal vegetations tend to develop. The species characteristic of such vegetations are tolerant of a wide range of conditions and they are often copious seed producers with highly efficient dispersal mechanisms. This means that on practically any site a large percentage of the seeds will be of these types - docks, nettles, orache, goosefoots, shepherd's purse and the common *Compositae*, irrespective of soil type and period. One could give many examples of this. At the Mesolithic site of Starr Carr such species occurred with swamp and mire plants and woodland types (Clark 1971, 58); seeds of calcareous grassland plants were associated with those of synanthropic species at Silbury Hill (Williams 1975); heather roots and fruitstones of *Empetrum* were found together with *Urtica* nuts in a deposit from a Late Bronze Age cooking trough in the Orkneys (Murphy 1975); and seeds of ruderals and weeds occurred along with food debris in a Medieval sewer at Plymouth (Dennell 1970). Ideally it would be desirable to have access to seed assemblages from outside settlement areas, but contemporary with them, for the sake of comparison, but it is often only the particular conditions prevailing within the settlement which ensure the preservation of any seeds. Usually preservation is due to waterlogging, and this may lead to the over-representation of a further group - the wetland and aquatic species. Finally there is the added complication of the remains of edible wild fruits and nuts being introduced into the deposit as food debris.

This brief consideration of the characteristics of plants and seeds themselves indicates that interpretation is by no means straightforward. Different natural and artificial dispersal methods ensure that wild species which could never have grown in a common habitat come together in the archaeological deposits. An outline scheme for this accumulation process is presented in Fig. 4.1.1.

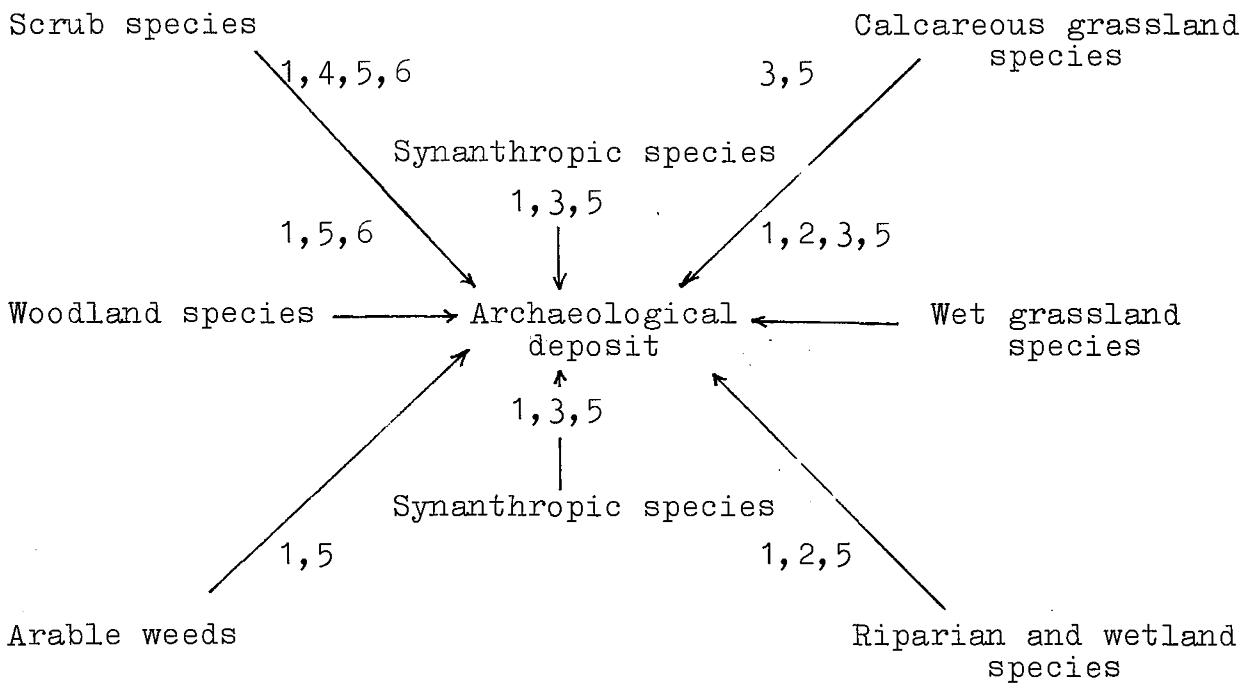



Fig. 4.1.1; Methods of accumulation of seeds in an archaeological deposit.

The principal means of inclusion are likely to have been as follows:-

1. Incorporation of fruits and seeds from plants growing in the immediate vicinity of the accumulating deposit, simply by natural processes of dispersal.
2. Incorporation via water transport.
3. Incorporation via animals on hooves or in excreta.
4. Incorporation following bird transport.
5. Incorporation following accidental human transport e.g. with crops, timber and firewood and reeds and rushes.
6. Incorporation by disposal of food refuse.

The proportion of species from these different habitats found in a particular deposit also depends on the nature, origin and rate of accumulation of the sediment itself. Four main categories of deposit containing anaerobically preserved fruits and seeds may be distinguished in the present study.

Firstly there are calcareous peaty soils such as those from Wolvesey Palace or sample 380 from Brook Street, which are essentially natural formations, owing little to human activities. They are to be found all along the valley floors of the main rivers on the chalklands. Unfortunately seeds survive rather poorly in these deposits, which may suggest that they were subject to periodic drying, and consequent humification.

The organic component of 'occupation' layers, the second category, from which nearly all of the Cathedral Green samples come, is also normally completely humified (Limbrey 1975, 328). The survival of seeds in these layers from Winchester is presumably attributable to the damp conditions and to the fine-grained nature of the sediments which would tend to exclude oxygen and thus inhibit the agents of humification on this low-lying site. The accumulation of such deposits would be continuous but very disturbed, and it comes as no surprise that seeds of weed and ruderal species are common.

The primary fillings of wells represent another form of slow, continuous accumulation, but under much less disturbed conditions, and make up a third category of deposit. Hence the well sample, BS 412, contains fruits and seeds of plants from a variety of habitats from a wide area, but shows very little sign of direct or intentional human contributions.

In their secondary use for refuse disposal, as at Neatham, wells contain seed assemblages which are very similar to those of rubbish and cess pits, such as samples 361 and 388 from Brook Street. These rubbish deposits make up a final category of deposit, formed by rapid and deliberate deposition of material containing debris from all kinds of cultivated and otherwise exploited plants. The rapid filling reduces the chances of seeds of wild plants from distant or minor habitats becoming incorporated into the sediment.

Differences between these types of deposit go a long way towards explaining differences in their seed assemblages.

## 4.2 Data presentation

The constraints discussed in 4.1 invalidate quantitative reconstruction of vegetation, but not quantitative analysis designed to present the data in a form enabling comparison between sites. The writer has followed Van Zeist's method of calculating sample frequency, and mean percentage. (Van Zeist 1974, 236). To give an example, fruitstones of Prunus spinosa are present in 7 of the 8 samples from Neatham. The sample frequency for the species is therefore 7/8 x 100 = 87%. The mean percentage is calculated by determining for each sample what percentage is made up by P. spinosa stones, summing these percentages and dividing by 7. Subsequently the calculated mean percentages have been arranged in percentage groups, again following Van Zeist, as follows:

| | |
|---|---|
| 'present' and < 1% | 1 |
| 1-5% | 2 |
| 5-10% | 3 |
| 10-25% | 4 |
| 25-50% | 5 |
| 50-75% | 6 |
| > 75% | 7 |

The two figures give a measure of the frequency of occurrence of seeds of each species in the samples from a site, and also the relative numerical importance of each species within samples. Strictly speaking a constant soil sample volume is desirable in such analyses, but the samples received were not so large that material could be discarded in the interests of equality.

Van Zeist goes on to depict the former vegetation represented by his seed assemblages in phytosociological terms. Such schemes have, however, been infrequently used in the study of vegetation in this country, and in any case Braun-Blanquet himself has remarked that "it requires a good imagination to reconstruct from such a jumbled mixture of species a definite association" (Braun-Blanquet 1932, 336). Bearing this in mind the vegetational reconstruction presented here is founded on fairly broad ecological groups, using Tansley (1939) as a basis. However, Tansley does not discuss weed and ruderal vegetations, so the discussion of these is based on Van Zeist (1974). Ten ecological groups, and three specific attributes are distinguished, and the distribution of the species identified within these groups is shown in Tables 4.2.1 - 4.2.4. The vegetation types represented are discussed in the following section. For the purposes of the analysis all samples from each site are treated as though they were contemporary.

| % group | Sample frequency | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 17 | Scabiosa columbaria | + | | | | | | | | | | ⊕ | | | | | | | |
| 1 | 17 | Linum catharticum | + | | | | | | | | | | + | | | | | | | |
| 1 | 17 | Hypericum perforatum | + | | | + | + | + | | | | | + | | | | | | | |
| 1 | 17 | Daucus carota | + | | | | | | | | | | + | | | | | | + | |
| 1 | 17 | Primula veris | + | | | | | | | | | | + | | | | | | | |
| 2 | 17 | Cerastium cf. arvense | + | | | + | | | | | | | | | | | | | | |
| 1 | 17 | Arenaria serpyllifolia | + | | | | | | | + | | | | | | | | | | |
| 1 | 17 | Prunella vulgaris | + | + | | | | | | + | | | | | | | | | | |
| 1 | 17 | Potentilla cf. erecta | + | + | | | | | + | | | + | | | + | | | | | |
| 1 | 17 | Bromus mollis | + | | | | | | | + | + | | | | | | | | | |
| 2 | 17 | Ranunculus repens | | + | | | | + | | + | + | | | | | | | | | |
| 2 | 33 | Apium graveolens | | + | | | | | + | | | | | | | | | | + | |
| 2 | 17 | Cirsium cf. palustre | | + | | + | + | + | + | | | | | | | | | | | |
| 1 | 17 | Polygonum persicaria | | + | + | | | | + | + | + | | | | | | | + | | |
| 5 | 50 | Juncus spp. | | + | + | | | | + | | | | | | | | | | | + |
| 1 | 17 | Alopecurus geniculatus | | + | + | | | | | | | | | | | | | | | |
| 3 | 50 | Malus sylvestris | | | | + | + | + | | | | | | | | + | | | | |
| 5 | 33 | Rubus fructicosus | | | | + | + | + | | | | | | | | + | | | | |
| 1 | 17 | Rubus idaeus | | | | + | + | + | | | | | | | | + | | | | |
| 5 | 50 | Prunus spinosa | | | | + | + | + | | | | | | | | + | | | | |
| 3 | 17 | Prunus insititia | | | | + | + | + | | | | | | | | + | | | | |
| 1 | 17 | Prunus avium | | | | + | + | + | | | | | | | | + | | | | |
| – | 33 | Corylus avellana | | | | + | + | + | | | | | | | | | + | | | |
| 5 | 83 | Sambucus nigra | | | | + | + | + | | | + | | | + | | + | | | | |
| 1 | 17 | Sambucus ebulus | | | | + | | | | | + | | | | | + | | | | |
| 2 | 50 | Papaver rhoeas | | | | | | | | + | + | | | | | | | | | |
| 1 | 33 | Silene alba | | | | | | | | + | + | | | | | | | | | |
| 2 | 17 | Agrostemma githago | | | | | | | | + | | | | | | | | | | |
| 1 | 17 | Stellaria cf. media | | | | | | | | + | + | | | | | | | + | | |
| 1 | 17 | Aethusa cynapium | | | | + | | | | + | + | | | + | | | | | | |
| 1 | 17 | Atriplex spp. | | | | + | | | + | + | + | | | + | | | | + | + | |
| 1 | 17 | Chenopodium album | | | | | | | | + | + | | | + | | | | + | + | |
| 2 | 17 | Rumex cf. crispus | | | | | | | | + | + | | | + | | | | + | + | |
| 4 | 67 | Urtica dioica | | | | + | + | + | | + | + | | | + | | | | | + | |
| 3 | 34 | Urtica urens | | | | | | | | | + | | | + | | | | | + | |

Table 4.2.1; Brook Street, Winchester. Ecological groups and possible utilisation

explanation overleaf...

In this and in the following tables the groups distinguished are indicated thus:

A. Dry grassland
B. Moist grassland
C. Juncetum effusi
D. Hedgerows
E. Scrub
F. Woodland
G. Riparian and wetland
H. Arable weed
I. Waste places
J. Heath
K. Often found on calcareous soil (calcicoles ringed)
L. Nitrophilous
M. Rarely found on calcareous soil (calcifuges ringed).

Potential uses:

N - edible soft fruits
O - edible nuts
P - edible seeds
Q - edible leaves, roots or stems
R - species used for litter, thatch etc.

There are, of course, numerous other uses for wild species, including dyes, fibres and medicines, but the contexts examined provide no evidence at all for such forms of exploitation.

Table 4.2.2; Cathedral Green, Winchester. Ecological groups and possible utilisation.

For explanation see Table 4.2.1.

| % group | Sample frequency | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 33 | *Arenaria serpyllifolia* | + | | | + | | | | | | | | | | | | | | |
| 2 | 33 | *Aphanes arvensis* | + | | | | | | | + | | | | | | | | | | |
| 1 | 17 | *Rumex acetellosa* | + | | | | | | | + | | + | | | + | | | + | + | |
| 1 | 8 | *Potentilla cf. erecta* | + | + | | | | | + | | | + | | | + | | | | | |
| 2 | 17 | *Ranunculus cf. acris* | + | + | | | | | | | | | + | | | | | | | |
| 2 | 17 | *Ranunculus cf. repens* | | + | | | | + | | + | + | | | | | | | | | |
| 2 | 8 | *Mentha cf. aquatica* | | + | + | | | | + | | | | | | | | | | + | |
| 4 | 8 | *Lycopus europaeus* | | | | | | | + | | | | | | | | | | | |
| 2 | 17 | *Eleocharis* sp. | | | | | | | + | | | | | | | | | | | + |
| 4 | 100 | *Juncus* spp. | | + | + | | | | + | | | | | | | | | | | + |
| 2 | 67 | *Sambucus nigra* | | | | + | + | + | | | + | | | + | | + | | | | |
| 1 | 17 | *Stachys cf. sylvatica* | | | | + | | + | | | | | | | | | | | | |
| 2 | 67 | *Papaver cf. rhoeas* | | | | | | | | + | + | | | | | | | | | |
| 2 | 8 | *Papaver cf. argemone* | | | | | | | | + | | | | | | | | | | |
| 3 | 33 | *Thlaspi arvense* | | | | | | | | + | + | | | | | | | | | |
| 2 | 17 | *Sonchus asper* | | | | | | | | + | + | | | | | | | | | |
| 2 | 8 | *Lapsana communis* | | | | | | | | + | + | | | | | | | | | |
| 2 | 50 | *Galeopsis tetrahit* | | | | | | | | + | + | | | | | | | | | |
| 2 | 8 | *Rumex cf. crispus* | | | | | | | | + | + | | | + | | | | + | + | |
| 2 | 33 | *Polygonum aviculare* | | | | | | | | + | + | | | | | | | + | + | |
| 2 | 8 | *Chelidonium majus* | | | | + | | | | | + | | | | | | | | | |
| 2 | 58 | *Silene alba* | | | | + | | | | + | + | | | | | | | | | |
| 3 | 25 | *Stellaria media* | + | | | + | | | | + | + | | | | | | | + | | |
| 3 | 17 | *Galium cf. aparine* | | | | + | | | | + | + | | | | | | | | | |
| 3 | 50 | *Chenopodium album* | | | | | | | | + | + | | | + | | | | + | + | |
| 1 | 25 | *Atriplex* spp. | | | | + | | | + | + | + | | | + | | | | + | + | |
| 5 | 100 | *Urtica dioica* | | | | + | + | + | | | + | | | + | | | | | + | |
| 2 | 25 | *Urtica urens* | | | | | | | | | + | | | + | | | | | + | |
| 2 | 17 | *Capsella bursa pastoris* | + | | | + | | | | + | + | | | + | | | | + | | |
| 2 | 42 | *Conium maculatum* | | | | | | + | | | + | | | + | | | | | | |
| 1 | 8 | *Aethusa cynapium* | | | | + | | | | | + | | | + | | | | | | |
| 2 | 8 | *Cirsium cf. vulgare* | | | | + | | | + | | + | | | + | | | | | | |
| 2 | 42 | *Hyoscyamus niger* | | | | | | | | | + | | | + | | | | | | |

| % group | Sample frequency | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 12 | Cerastium cf. arvense | + | | | + | | | | | | | | | | | | | | |
| 2 | 50 | Ranunculus cf. repens | | + | | | | + | | + | + | | | | | | | | | |
| 1 | 12 | Ranunculus cf. lingua | | + | | | | | + | | | | | | | | | | | |
| 1 | 25 | Prunella vulgaris | + | + | | | | | | | + | | | | | | | | | |
| 2 | 87 | Juncus spp. | | + | + | | | | + | | | | | | | | | | | + |
| 1 | 12 | Typha latifolia | | | | | | | + | | | | | | | | | | | + |
| 2 | 50 | Malus sylvestris | | | | + | + | + | | | | | | | | + | | | | |
| 6 | 100 | Rubus fructicosus | | | | + | + | + | | | | | | | | + | | | | |
| 4 | 87 | Prunus spinosa | | | | + | + | + | | | | | | | | + | | | | |
| 2 | 62 | Prunus insititia | | | | + | + | + | | | | | | | | + | | | | |
| 2 | 62 | Prunus avium | | | | + | + | + | | | | | | | | + | | | | |
| 2 | 50 | Rosa sp. | | | | + | + | + | | | | | | | | + | | | | |
| 4 | 62 | Crataegus monogyna | | | | + | + | + | | | | | | | | + | | | | |
| – | 37 | Corylus avellana | | | | + | + | + | | | | | | | | | + | | | |
| 2 | 12 | Sambucus nigra | | | | + | + | + | | | | | | + | | + | | | | |
| 1 | 50 | Papaver rhoeas | | | | | | | | + | + | | | | | | | | | |
| 2 | 12 | Lapsana communis | | | | + | | | | + | + | | | | | | | | | |
| 1 | 12 | Atriplex spp. | | | | + | | | + | + | + | | | + | | | | + | + | |
| 2 | 12 | Chenopodium album | | | | + | | | | + | + | | | + | | | | + | + | |
| 1 | 12 | Rumex cf. crispus | | | | + | | | | + | + | | | + | | | | + | | |
| 2 | 12 | Polygonum aviculare | | | | | | | | + | + | | | | | | | + | | |
| 2 | 87 | Urtica dioica | | | | + | | + | | | + | | | | | | | | + | |
| 2 | 87 | Vaccinium myrtillus | | | | | | + | | | | | | | (+) | + | | | | |

Table 4.2.3; Neatham. Ecological groups and possible utilisation.

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ranunculus cf. repens | | + | | | | + | | + | + | | | | | | | | | |
| Sambucus nigra | | | | + | + | + | | | | | | + | | + | | | | |
| Rumex cf. crispus | | | | | | | | + | + | | | | | | | + | + | |
| Rumex acetellosa | + | | | | | | | + | | + | | | + | | | + | | |
| Urtica dioica | | | | | | + | | | + | | | + | | | | | + | |
| Aethusa cynapium | | | | + | | | | + | | | | + | | | | | | |

Table 4.2.4; Oakridge, Basingstoke. Ecological groups and possible utilisation.

For explanation see Table 4.2.1.

4.3 The plant communities

Woodland. Buried soils beneath earthworks, notably in the Avebury area, and soils from the floors of some dry valleys on the chalk, have both produced snail faunas nowadays characteristic of woodlands (Evans 1972, 360), thus confirming that prior to the neolithic the chalklands were forested, and the forest was "all pervasive, blanketing valley and hilltop alike" (ibid. 361). Clearance in Wiltshire during the neolithic seems to have been quite widespread; seven sites show definite evidence for the replacement of woodland by open country, apparently both arable and pasture land. Regeneration was prevented, probably by grazing. Studies of Iron Age lynchets have shown that in at least one case clearance continued during lynchet formation. At Fyfield Down, Wilts. a buried soil beneath a lynchet produced a shade-loving snail fauna whilst the body of the lynchet contained snails more characteristic of open country (Fowler and Evans 1967, 296).

Unfortunately studies of this type have not been made on the Hampshire chalklands. There are, however, a few pollen diagrams from the general area. At Wareham, Dorset evidence for human activities in the form of the appearance of Plantago pollen early in Zone 7 suggests very early initiation of clearance, but most diagrams from Hampshire have so far not covered Zone 8 (Seagrief 1959; 1960; Godwin 1940), except for the diagrams of pollen from archaeological deposits at Winchester (E. Isenberg, unpub.), which are discussed in more detail below. These indicate fairly extensive deforestation by the early Roman period in the Winchester area. How far such a picture may be extrapolated right across the county remains uncertain for the moment, although purely archaeological evidence, such as the large acreages of field systems visible even today (see below 6.1), suggests widespread clearance.

Something of the nature of former woodlands may be deduced from a study of modern woods in the area. Ignoring modern plantations, woodlands as mature plant communities fall into three main types on the chalklands.

(1) Chalk escarpment beechwoods. 'Fagetum calcicolum'

(2) Beechwood on loam. 'Fagetum rubosum'

(3) Mixed beech and oakwoods. (Tansley 1939, 358-407).

The woodland type in a given area depends upon soil pH and slope, the latter in turn affecting soil depth and drainage. The beechwoods of escarpment and valley sides (hangers), are on shallow rendzina soils, well drained and quite alkaline, pH 7.2 - 8.4. On the brownearth loams of the chalk plateau the soil, though still shallow, is deeper and varies considerably in acidity. Towards the edges of the plateau, soils as alkaline as pH 7.7 may be encountered, but the soils derived from the clay-with-flints may be as acid as pH 5.2 - 4.1 (see above, 1.3, for details). This variability leads to a mixed woodland type. True plateau beechwoods occur on the more alkaline soils of the westward extension into Hampshire of the South Downs, whilst on the more acid soils oak is at an advantage to beech.

Scrub communities are seral stages in the succession from grasslands of various kinds to woodland. Like them they are influenced by soil, slope and moisture. The mature escarpment woodlands develop from a chalk scrub in which hawthorn or juniper is the dominant species, and in which a variety of other common shrub species is normally found. On the flatter, more acid plateau areas gorse and bramble, with other species, form a scrub from which plateau beechwoods ultimately develop, and immature oakwood on clay-with-flints appears to be derived from a scrub composed of similar species (Tansley 1939, 296; 372; 390). All these scrub vegetations are indicators of unstable conditions and represent a vegetation type occurring whilst rapid changes in the distribution of grassland and woodland - clearance and recolonisation - took place (Williams 1975, 79). In particular Dimbleby (1967) notes that sloe and hawthorn would have formed extensive scrub areas on chalk soils after clearance and abandonment.

Tables 4.2.1 - 4 show the presence and abundance of typical scrub species in the samples studied. They include apple, bramble, raspberry, sloe, bullace, wild cherry, hazel, elder, rose and hawthorn, and are particularly common in the samples from Brook Street and Neatham. By contrast nuts of the woodland dominants are entirely lacking in the waterlogged samples, and apart from a probable carbonised acorn cotyledon from Owslebury, in samples from other sites as well. Since many of the waterlogged samples are largely composed of food debris, including remains of cultivated plants as well as these edible wild species this probably represents differential exploitation, but it seems very likely that scrub communities rather than woodlands proper predominated in the vicinity of the settlements.

Grasslands. Calcareous grassland has been in existence at least since the neolithic, as the plant remains from the rendzina turves in the body of Silbury Hill demonstrate (Williams 1975). This plant community in its strict sense is found on the thinner rendzina soils of valley sides and the summits of narrow ridges, where the pH of the top few inches of soil is about 7.5. Water supply is a limiting factor, and many characteristic species have very deep root systems. The maintenance of this grassland type is primarily attributed to grazing. Once grazing pressure is released a succession through scrub to woodland occurs. The main agents are often sheep, although rabbits can exert a considerable effect (Tansley 1939, 525-552).

Floristically the formation is unusual in the large number of species which are exclusive, or almost so, being rarely found elsewhere. Such calcicoles are very useful in the present kind of study, where the association of only a few can establish the presence of the vegetation type. Tansley gives species lists for this type of vegetation derived from 62 chalk grassland areas in Southern England; he includes the following characteristic herb species which were of high constancy:

| | | | | |
|---|---|---|---|---|
| Carex flacca | | Linum catharticum | | + |
| Poterium sanguisorba | x | Lotus corniculatus | x | |
| Plantago lanceolata | x | Leontodon hispidus | x | |
| Cirsium acaule | x | Scabiosa columbaria | x | + |
| Thymus serphyllum | x | Pimpinella saxifraga | x | |

Species marked 'x' are to be seen today on St. Catherine's Hill, just south of Winchester, and those marked '+' occur in sample 412 from Brook Street, a first century sample. Also found in this sample were Primula sp. (cf. veris) and Prunella vulgaris, which occurred with medium constancy but low exclusiveness in the areas examined by Tansley. Other species of chalk grassland in the Winchester samples are Hypericum perforatum and Cerastium arvense.

The alluvial deposits of river valleys develop a characteristic grassland flora distinct from the valley-side chalk grassland. It is considerably affected by human management, either pasture or mowing, and in this sense is another artificial plant community. Besides the effects of human activity, the high water table with the possibility of periodic flooding and the calcareous nature of the sediments in the Hampshire area also influence the flora. Tansley (1939, 572) gives species lists derived from two studies of riverside grasslands on calcareous soils; the species from these lists occurring in the Winchester and Neatham samples are indicated in Tables 4.2.1 - 4.

On very wet, flat meadows a further type of grassland which Tansley terms Juncetum effusi is found (Tansley 1939, 573). Various species of rush, including Juncus effusus, may be locally dominant in this grassland, which is very close in nature to marsh. Amongst the herb and grass species found between the rush tussocks are Alopecurus geniculatus, Mentha cf. aquatica and Polygonum persicaria, all three of which occur in the Winchester samples. Just to the south of the town today, these three species are to be seen in drainage ditches in the valley bottom near St. Cross Hospital.

Wetlands. Species normally found in aquatic and riparian habitats, as opposed to the damp grassland types just discussed, are relatively rare in the samples. Sample 430 from Cathedral Green contains nutlets of Lycopus europaeus in association with those of Mentha cf. aquatica. This sample is of an occupation layer, and the presence of these two species may well be related to their accidental inclusion in bundles of rushes gathered for thatching and floor covering. The fruit of Typha in well FNE at Neatham may relate to a phase of slow silting.

Heathlands. Seeds of heath species, as might be expected, are very rare in these samples from the chalklands, and the numerous seeds of Vaccinium myrtillus, the bilberry, in the Neatham samples are therefore of some interest. V. myrtillus is typically found on acid soils as part of a lower shade-tolerant layer beneath Calluna vulgaris. The Neatham site is on a gravel terrace overlying and surrounded by the Lower Chalk, and the nearest area of heath today is on the Greensand of Woolmer Forest, several miles to the SE. Townsend (1883, 207) gives the Woolmer Forest area as the nearest occurrence of bilberry today. The possibility that areas of drift may formerly have existed nearer the site, supporting heath vegetations, should not be overlooked, but it seems more likely that the bilberries were gathered in Woolmer Forest and carried to Neatham.

Arable weeds. Fruits and seeds of a range of weeds have been recovered from a number of sites.

| | OD | R27 | PW | OW | CG |
|---|---|---|---|---|---|
| *Ranunculus cf. repens* | + | + | + | + | + |
| *Papaver rhoeas* | | | | | + |
| *Papaver cf. somniferum* | | + | | | + |
| *Papaver cf. argemone* | | | | | + |
| *Brassica/Sinapis* sp. | + | + | + | + | + |
| *Thlaspi arvense* | | + | | | + |
| *Capsella bursa-pastoris* | | | | | + |
| *Stellaria media* | + | + | + | | + |
| *Silene alba* | + | + | | | + |
| *Agrostemma githago* | | | | + | |
| *Chenopodium album* | + | + | + | + | + |
| *Atriplex patula/hastata* | + | + | + | + | + |
| *Rumex* spp. | + | + | + | + | + |
| *Rumex cf. acetellosa* | + | + | + | | + |
| *Polygonum aviculare* | + | + | + | | + |
| *Polygonum convolvulus* | + | + | + | + | |
| *Lithospermum arvense* | + | | + | | |
| *Galeopsis tetrahit* | | + | | | + |
| *Malva sylvestris* | | + | | | |
| *Hyoscyamus niger* | | + | + | | + |
| *Plantago lanceolata* | + | + | + | | |
| *Medicago* sp. | + | + | | | |
| *Vicia* spp. | + | + | + | + | |
| *Aphanes arvensis* | | | | | + |
| *Galium aparine* | + | + | + | + | + |
| *Valerianella dentata* | + | + | + | + | |
| *Cirsium/Carduus* sp. | + | + | + | | + |
| *Tripleurospermum maritimum* | + | + | + | | |
| *Chrysanthemum leucanthemum* | + | + | + | | + |
| *Centaurea cf. scabiosa* | | | + | | |
| *Sonchus asper* | | + | | | + |
| *Lapsana communis* | | + | | | + |
| *Bromus mollis/secalinus* | + | + | + | + | |
| *Anisantha sterilis* | + | + | | | |
| *Avena cf. fatua* | | + | | + | |
| *Arrhenatherum elatius* | | + | + | + | |
| *Carex* sp. | + | | | | + |

Table 4.3.1; Fruits and seeds of arable weeds from Old Down Farm, Site R27, Portway, Owslebury and Cathedral Green, Winchester.

Seeds from OD, R27, PW and OW are carbonised; those from CG are all waterlogged (except *G. aparine*).

The weed seeds from the first four sites are all carbonised and were found in direct association with carbonised cereals. This is not true of the Cathedral Green seeds, which have survived in anaerobic conditions, but since a carbonised spelt glume base was found in sample 445 at this site, and as such a wide range of typical arable weeds is represented it seems likely that this seed assemblage is related to farming activities of some sort.

It is interesting to note that there is very little sign of widespread qualitative change in the arable weed flora as a result of Roman introductions in these samples. Five species, *Papaver rhoeas*, *Papaver cf. argemone*, *Capsella bursa-pastoris*, *Agrostemma githago* and *Aphanes arvensis* are found in the Roman samples from Owslebury, and Winchester, but not in the samples from the pre-Roman sites. This is a small proportion of the total range, and in any case this negative evidence need not necessarily imply that these species were absent from the Iron Age fields of Hampshire. With the exception of *P. argemone* these species are all known from pre-Roman contexts elsewhere in the country (Godwin 1975).

Van Zeist (1974, 343) discusses the two main weed floras of cereal crops, using the terminology of the plant sociologists. The main weed vegetations represented in the Hampshire samples are of the class *Secalietea*, the weed associations of winter crops, of which *Agrostemma*, *Polygonum convolvulus*, *Bromus secalinus* and *Sinapis arvensis* are common components. The Crookhorn stokehole sample in which spelt is found with *Bromus*, *Agrostemma*, *Avena*, *Rumex* and *Chenopodiaceae* is a good example of a sample containing seeds of plants of this association. Weeds of root crops and summer cereals, the order *Polygono-Chenopodietalia*, are present only sparsely. Characteristic species include *Thlaspi arvense* and *Sonchus arvensis*. In the carbonised Hampshire material *Thlaspi* was found only once, in sample 311/566/628 from site R27, a sample composed predominantly of barley; likewise, an uncertain species of *Sonchus*, occurs in a barley sample, 14/136/697. Both species are represented only by single specimens. Although no sharp division may be drawn between these two weed vegetations the characteristic weeds of winter crops are clearly much more abundant, and the implication is that autumn sowing was the normal course of both Iron Age and Roman farming in the area, although some barley was probably spring sown.

The nature of the weed flora represented is also affected by soil type, and characteristic species of chalk fields, Centaurea scabiosa, Lithospermum arvense, and Valerianella dentata (Salisbury 1961, 258), are not uncommon. The appearance of nitrophilous species and the predominance of annuals may be related to the use of manure on the fields (Warington 1924). Specialised crops have their distinctive weed floras, two of which are illustrated by the samples from Colchester. Flax was associated with seeds of Camelina sativa, Thlaspi arvense and Brassica or Sinapis (these common flax weeds are discussed by Hjelmqvist 1950), and coriander with fruits of a wide range of wild and cultivated Umbellifers.

As arable weeds are so informative about a variety of agricultural practices, further reference to the nature and proportion of the weed seed component of carbonised cereal deposits is made below (Chapter 6).

Ruderals. The high nitrate and base content of the soil in the neighbourhood of settlements and its frequent disturbance, combine to produce several rather ill-defined vegetation types of which Van Zeist (1974, 359) distinguishes two main 'orders'. Both are characteristic of dunghills, but include species also found as arable weeds. In Tables 4.2.1 - 4 such species appear in the 'Waste places' and 'Nitrophilous' columns. Vegetations of the Sisymbrietalia are composed of species such as Urtica urens, Chenopodium rubrum, C. glaucum, C. album, C. ficifolium, Atriplex patula, A. hastata, Poa annua, Capsella bursa-pastoris and Solanum nigrum, and Artemisitalia vulgaris vegetations include Cirsium vulgare, Conium maculatum, Aethusa cynapium and Urtica dioica. Cathedral Green in particular has produced a number of species which indicate the presence of such vegetation types, and this accords with the excavator's impression that the soil at this site contained quantities of dung (S. Keene pers. comm.). All the waterlogged samples produced seeds of at least some of these ruderal species.

It is worth mentioning that these arable weed and ruderal associations were derived from studies carried out on the Continent. However there seems little reason to doubt that the results of such studies, which refer to synanthropic species are applicable to this country.

## 4.4 The Environment of Early Roman Winchester

As a fairly large number of seed samples from several sites within the Roman town was available for examination, and as pollen samples had been taken simultaneously, it is possible to describe the nature of the vegetation in and around Venta in more detail than either line of evidence would allow on its own.

The town is situated near the point where the east-west Winchester anticline is cut through by the River Itchen, which flows southwards. Up- and downstream the river valley is broad, but a projecting spur of Upper and Middle Chalk, partly covered with gravel, has narrowed the flood plain of the Itchen and created an area suitable for settlement and convenient for a river crossing. The pre-Roman Iron Age settlement developed mainly on the chalk spur, but the early Roman town spread down towards the river and onto the peaty alluvial deposits adjacent to it (Cunliffe 1964, 1; Fig. 4.4.1).

Samples were taken for pollen analysis at Cathedral Green, Wolvesey Palace and Brook Street, but only a few samples of relevant date from the latter two sites proved to contain enough well-preserved pollen to make the determination of percentages worthwhile. Only three of Erwin Isenberg's (unpublished) pollen analyses are thus discussed here: their percentage composition may be summarised as follows:

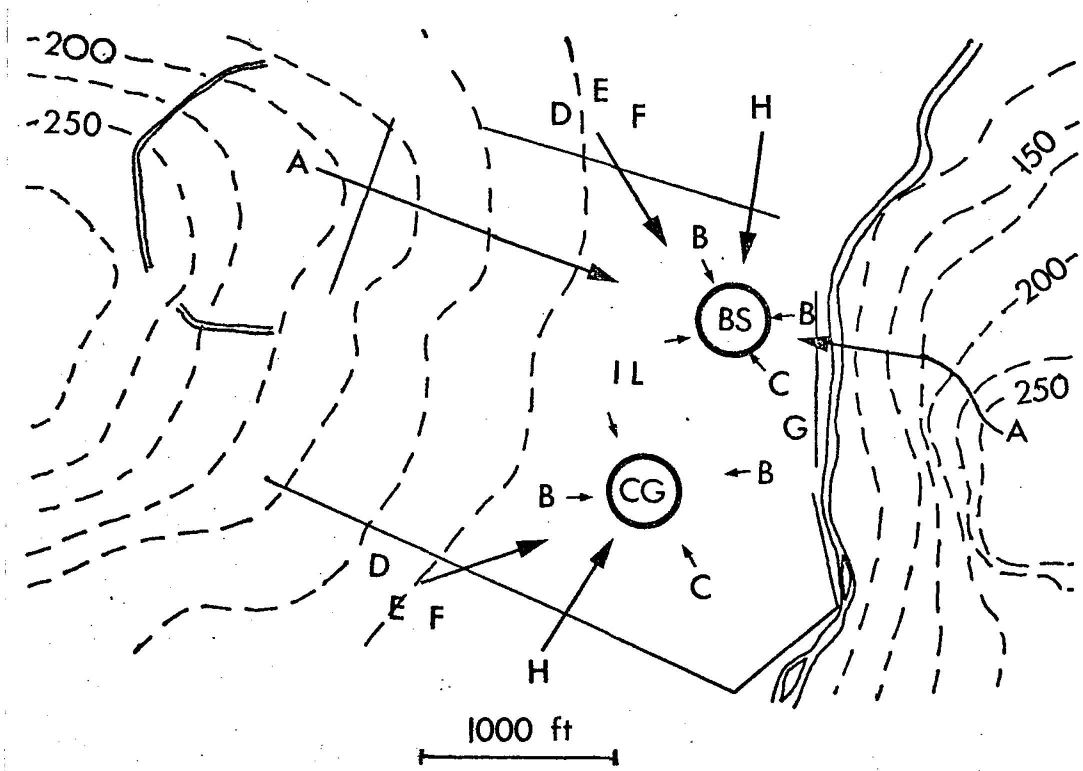



Figure 4.4.1; Diagram suggesting possible sources for the seeds which comprise the assemblages at Brook Street (BS) and Cathedral Green (CG), Winchester.
Contours at 25 foot intervals. The River Itchen, the Roman City Walls and the Iron Age Ditch are all indicated.
Ecological groups as in Table 4.2.1:

| | |
|---|---|
| A Dry grassland. | F Woodland |
| B Moist grassland. | G Riparian and wetland |
| C. Juncetum effusi | H Arable weed |
| D Hedgerows | I Waste places |
| E Scrub | L Nitrophilous plants. |

For full explanation see text.

| | Wolvesey Palace 574 | | Brook Street 380 | Brook Street 388 |
|---|---|---|---|---|
| Grains counted | | 392 | 240 | 620 |
| Tree pollen | approx. | 70 | 24.9 | 4.8 |
| Herb pollen | " | 17 | 31.8 | 61.3 |
| Gramineae | " | 10 | 14.2 | 14.4 |
| Cerealia | | - | 29.1 | 19.5 |
| Indeterminate | " | 3 | - | - |

Table 4.4.1; Pollen analyses from Roman Winchester.

The Wolvesey Palace sample is from a peat-like deposit overlying the alluvial chalk brash of the valley floor, which contained pre- or early-Flavian pottery. Sample BS 380 is from a similar 'natural' peaty deposit in the valley bottom, which is sealed by a series of deposits of chalk concretions nearly 2m. below the probable early Roman ground surface (S. Keene pers. comm.). There are considerable problems attached to the interpretation of sample 574, not the least being that some 35% of the total pollen count, that is, half the arboreal pollen, is of grains of Pinus. Isenberg suggests that the deposit may be of geological origin, as non-tree pollen is very limited and cereal pollen absent, although he observes that more recent contamination cannot be ruled out. Derivation from peat of Boreal date could certainly give a pollen spectrum of this type (cf. Seagrief 1959), but it is necessary to consider a variety of possible disturbing factors in such samples (Bottema 1975). Overall it seems best to discount this anomalous sample; contamination is a very serious possibility.

Sample BS 380, although pre-Roman in date, and containing no artefacts, was certainly formed in the vicinity of arable fields. It contains nearly 30% cereal pollen together with that of herb plants normally associated with human activity including Cruciferae, Compositae, Rumex, Chenopodium and Plantago lanceolata. Arboreal pollen accounts for nearly 25% of the total, but 8% of this is of Corylus, a species typical of disturbed scrub rather than mature woodland. It is clear, therefore, that the area had been extensively deforested before the early Roman town developed, and that farming was well-established. This activity is, perhaps, to be associated with the Iron Age settlement, although definite evidence for the date of the deposit is not forthcoming. Certainly such a picture would be consistent with the evidence for widespread cereal farming on the chalklands during the Iron Age. The macroscopic plant remains have little to add to this picture as conditions were unsuitable for preservation. Only two species, with durable seeds, Sambucus nigra and Urtica dioica, survived in samples 380 and 381 from this pre-Roman peaty deposit, although it is interesting that both are nitrophilous plants characteristically found in disturbed habitats.

The third pollen analysis, of sample 388, from a second century rubbish or cess pit at Brook Street shows a somewhat different picture. Tree pollen accounts for less than 5% of the total, and grass, cereal and particularly herb pollen make up the bulk of the sample. Isenberg considers that it represents "a typical milieu of well balanced agriculture with field crops and meadows", and it seems likely that the area around the Roman town was almost completely deforested and in agricultural use. Indeed, the seed samples from Cathedral Green can be taken as evidence for agricultural activities within the town itself during the 1st century. The arable weed seeds present are likely to have been brought into the town with harvested crops, and a carbonised glume base of spelt wheat from CG 445 indicates the nature of at least one local crop, and suggests that grain drying may have been carried on within the town. There is evidence for this later in the Roman period; a probable fourth century corn dryer has been excavated at Middle Brook Street (Bennet-Clark 1954). The high levels of pollen of the Cruciferae in sample BS 388 may well, as Isenberg suggests, be derived from crop plants, but unfortunately the macroscopic plant remains do not elucidate this point. Seeds of Brassica or Sinapis, cabbage or mustard-like Cruciferous plants, in the samples could unfortunately not be more closely identified with any confidence. Samples 305, 361 and 388, all from 2nd century pits at Brook Street have produced fruits and seeds of other crops; soft fruits such as apples, plums, cherries, figs and grapes, and herbs including coriander, all of which are discussed below. Wild fruits and nuts from areas of scrub, such as brambles, sloe, bullace, elder and hazel were also apparently gathered.

Besides arable farming the maintenance of flocks and herds is reflected in the seed samples. As noted above (4.3) seeds of dung-hill species are abundant in the Cathedral Green samples and this may imply that manure was stored or was allowed to accumulate in the settlement area.

The chalk grassland species from the 1st century well, sample 412, at Brook Street, which are probably derived from the valley slopes reflect a vegetation type which before the introduction of rabbits was maintained almost entirely by sheep (see above 4.3), which would have grazed on the valley side pastures. In addition to sheep walks there were the pastures and meadows of the valley, the moist grasslands well represented in the Brook Street samples. The valley pastures have always been important for the maintenance of cattle in a region where the relatively low rainfall, about 30 inches annually and in particular the paucity of surface streams, has meant that the area of lush grassland is rather restricted. Although water meadows are a much more recent innovation, the near-constant temperature of the spring-fed river, about 10$^{o}$C, would have encouraged early spring growth and permitted the maintenance through the winter of larger herds of cattle (Pelham 1964, 104). One possible method of obtaining further information about grassland exploitation may be by the application of the technique of inspecting herbivore tooth residues for grass phytoliths. (Armitage 1975).

Although these agricultural activities dominate the picture other distinctive plant communities are in evidence.

The exploitation of fruits and nuts of scrub species has already been noted. Such plants would be found in disturbed, abandoned land in and around the town. Undisturbed natural woodland, which the pollen evidence suggests was composed largely of oak, was certainly much less common in the immediate area.

By the riverside grew the aquatic and riparian species, such as are still to be seen up- and downstream from the modern town. These seeds need not, however, shed any light on the level of the water table at this date. The presence of fruits and seeds of such species in occupation layers, as at Cathedral Green, has been interpreted at the Roman town of Silchester as reflecting the gathering of rushes, and accidentally other waterside species, for floor covering (Reid 1901).

Synanthropic grass and herb species, then as now, grew in the derelict sites and roadsides in the town.

## CHAPTER 5. ARBORICULTURE AND HORTICULTURE

These more specialised aspects of the agrarian economy are examined in this chapter. Both have been seen as Roman introductions, but it is of interest to consider whether any trace of indigenous development of arboriculture and horticulture is to be seen in Iron Age Britain. Roman fruit and vegetable crops are also discussed, and some attempt is made to assess the importance of these forms of production in the economy of the Hampshire chalklands and in that of Lowland Britain as a whole. For convenience all fruits are discussed under 'arboriculture' and 'vegetables' and herbs under 'horticulture'. The cucumber, Cucumis sativa, is an exception to this, being treated as a 'vegetable'.

### 5.1 Pre-Roman arboriculture

Evidence for the cultivation of fruits and nuts in the pre-Roman Iron Age is very slight, though this in itself need not imply that cultivated trees and shrubs were entirely a Roman innovation. Walnut pollen has been found in buried soils beneath hillfort ramparts (Dimbleby 1967, 36) and a carbonised plum stone occurred in Late Iron Age deposits at Maiden Castle (Salisbury and Jane 1940, 310). Introduced cultivated trees were therefore not entirely unknown in pre-Roman Britain.

Applebaum has even suggested that the vine may have been introduced by the Belgic peoples, though the sole evidence to suggest this is the use of a vine leaf motif on certain coins (1972, 117). This may, however, merely be a formal device, and there is certainly no palaeobotanical evidence for the presence of the vine in the Iron Age.

Fruitstones are preserved principally in waterlogged deposits in this country, but most Iron Age settlements are situated on well-drained, aerobic soils. The best-known exceptions to this - the lake villages of Glastonbury and Meare - produced large numbers of fruitstones and nuts, all of wild species: Prunus spinosa, Rubus fructicosus, Rubus caesius, Sambucus nigra, Quercus sp., and Corylus avellana

(Reid 1916). The Hampshire Iron Age sites examined in this study have produced a similar, but more restricted range of species, which survived in a carbonised state.

| | Portway | Owslebury | R27 |
|---|---|---|---|
| Sambucus nigra | + | + | + |
| Prunus cf. avium | − | − | + |
| Rosa sp. | − | − | + |
| Corylus avellana | − | + | − |

Table 5.1.1; Carbonised fruitstones and nuts from Hampshire Iron Age sites.

It seems probable, though it cannot be proven, that the fruits of all these species were collected for food when in season. This reliance upon wild plants need not, however, represent 'simple' gathering. It is by no means impossible that some form of management was practised. Dimbleby (1967, 35 and 146) has suggested that as early as the Mesolithic, the growth and nut production of hazel, a light-demanding shrub, may have been encouraged by the selective removal of other tree species. Such 'shade husbandry' or analogous forms of management could well have been practised in the Iron Age, but would leave little or no archaeological trace.

Some slight evidence for earlier prehistoric woodland management comes from the trackways of the Somerset levels. Hazel rods, 3-4 m. long and 23 - 28 mm. in diameter at the butt end formed part of the Blakeway Farm Track. Godwin (1960, 17) suggested that they had been grown in close stands, possibly coppice. More recently a study of tree-rings made by M. Pettit (in Coles, J; Hibbert, F.A. and Orme B.J. 1973) has shown that similar rods from the Sweet Track have wide growth rings during their first 2-4 years. This could be taken as evidence for coppicing; such rods could be the result of cutting back forest growth. However tree-ring patterns resulting from modern coppicing have not been examined in detail, and so comparative data is unavailable.

If coppicing was practised in the Neolithic it is very likely to have continued through into later prehistoric periods. Withies were certainly used in the Iron Age settlement of Glastonbury, in the manufacture of baskets and other wicker objects (Bulleid and St. George Gray 1917, Plate LVIII). At Glastonbury and elsewhere iron pruning hooks and billhooks are quite common (ibid. Fig. 140; Plate LX), although the distinction between these tools and sickles is by no means clear-cut.

It is possible to argue by analogy that various forms of woodland management could have been practised in the Iron Age, but there is no definite evidence to suggest that they were. Certainly evidence for the processes of planting and cultivation involved in true orchard husbandry is entirely lacking.

## 5.2 The Roman crops

The remains from Silchester (Reid 1901), Winchester (3.11), Neatham (3.12) and Owslebury (3.2) give a good idea of the range of fruits and nuts utilised in Roman Hampshire. A few more unusual crops, including dates, almond, and chestnut are absent from these Hampshire samples, but all the more common orchard crops known from Roman Britain are present. A more extensive list of finds of fruitstones and nutshells from Roman contexts throughout Britain is given in Appendix 1. Table 5.2.1 isolates those crops known from Hampshire.

| | Silchester | Winchester | Neatham | Owslebury |
|---|---|---|---|---|
| *Malus sylvestris* | + | + | + | + |
| *Prunus domestica* | + | + | + | − |
| *Prunus domestica ssp. insititia* | + | + | + | − |
| *Prunus avium* | + | + | + | + |
| *Ficus carica* | + | + | − | − |
| *Vitis vinifera* | + | + | − | − |
| *Mespilus germanica* | + | − | − | − |
| *Morus nigra* | + | − | − | − |
| *Corylus avellana* | + | + | + | + |
| *Juglans regia* | − | + | + | − |
| *Pinus pinea* | − | + | − | − |

Table 5.2.1; Cultivated fruits and nuts from Roman sites in Hampshire. (Silchester; Reid 1901, 1902, 1905, 1907).

Some or all of the fruits of bullace and raspberry, and the hazelnuts may be from wild plants. Certainly some of the cherry stones from Neatham are wild (see above 3.12).

These crops fall naturally into three groups. Firstly there are those species whose wild forms are indigenous to this country - apple, (*Malus sylvestris*), plum, (*Prunus domestica*), cherry, (*Prunus avium*), bullace, (*Prunus domestica* ssp. *insititia*), raspberry, (*Rubus idaeus*) and hazel (*Corylus avellana*). (Godwin 1975). Although it is necessary to avoid frost pockets when cultivating these crops, good reliable yields may be obtained (Roach 1964; Min. Ag. Fish. 1974b; Grubb 1949), and these fruits and nuts are therefore suitable for commercial production.

A second group includes species which may be grown in this country, but whose commercial importance is limited for one of several reasons. Figs, *Ficus carica*, will produce crops when planted in protected positions, for example along walls with southern exposures, but the young growing shoots are extremely vulnerable to spring frosts (Condit 1947, 103). The walnut, *Juglans regia*, is also sensitive to frosts when in flower, as are the almond and sweet chestnut, which are not, however, present in the Hampshire samples (Howes 1948, 196 and 187). The medlar and mulberry have remained of minor importance for different reasons; medlars are unpalateable until half rotten or 'bletted' and mulberries are extremely soft and easily damaged when ripe (Masefield *et al* 1969, 62 and 94). Because of extreme frost sensitivity and difficulties of handling this group of species is unlikely to have attained any commercial importance, although on a purely domestic level could give good yields in mild years.

Finally there are the probable or certain imports. Dates, which were found in samples from Lion Walk, Colchester (3.10) are a Mediterranean and Near Eastern crop. It seems likely that in the future it may be possible to trace the origin of such imports by means of the amphorae in which they were packed. Callender (1965, 39 and Fig. 20:4) illustrates and discusses a greyish black rilled amphora from Avenches which contained carbonised dates when found. He notes its similarity to a small carrot-shaped amphora, Form 189, apparently of Claudian-Neronian date from Colchester (Hawkes and Hull 1947, 253). It may be merely coincidental that both this amphora form and carbonised dates are known from Early Roman Colchester, but an association between the two seems possible. However, even if the dates and the amphora were to be definitely connected the origin of the amphora type is at present unknown.

Another probable imported crop is the stone-pine, Pinus pinea., cone scales and kernels of which were found at 'Curry's Pottery Shop', Colchester (3.10) and at Winchester (3.11). The tree will grow in this country, but is rare; the only specimen which the writer has seen is that at Kew Gardens. However the association of cone scales with the nuts means either that they were locally grown or that whole cones were imported. Probably the latter is more likely, though in Italy today the cones are picked during the course of winter and spread out in the sun during the summer to open the scales and facilitate the extraction of the nuts. The kernels are usually removed before export (Howes 1948, 165). Whether imported or locally grown the nuts were clearly uncommon and valued. They have also been found in association with a rich 2nd century cremation at Mucking, Essex (Wilson 1973, 305) and in London (Norman and Reader 1906, 217).

Finally it is worth noting that even fruits which can be grown in this country may in addition have been imported. Davies (1971, 131) describes an amphora from Brough-on-Noe inscribed (PRUN/‾A) which might have contained preserved plums, for example.

The vine, Vitis vinifera, has not been included in any of the above categories, as so much dispute surrounds its status as a crop. Remains of the plant have been recovered from London and Gloucester, besides Silchester and Winchester (Fullbrook-Leggatt 1933; Kennard and Warren 1903; Lyell et al 1906; Medland 1894-5), but only the Gloucester find provides convincing evidence for local cultivation. This comprised large quantities of grape skins and 'pips' which were interpreted as the residue from grape pressing. Whether this reflects domestic or commercial activities is impossible to say.

Certainly wine production has a very long history in this country. Vine-growing is recorded by Bede (Eccl. Hist. 1,i) and grape 'pips' occur in small numbers in deposits at Saxon Southampton (M. Monk pers. comm.). Cultivation continued throughout the Middle Ages, declining after 1300, with an interruption during the post-Mediaeval 'Little Ice Age' (Lamb 1966, 174 and 190). By the late 18th century it had restarted in Hampshire, where it continues today (Vancouver 1810, 255).

Lamb has used the presence or absence of vineyards in England to follow climatic deterioration and amelioration during the Middle Ages. Certainly the commercial cultivation of the crop is very closely linked to climatic factors. It will only produce adequate yields in areas free from late spring frosts, and it requires sufficient sun and warmth and not too much rain during the summer. During autumn further sunshine is required to complete the ripening process. Winters must not be too severe. The average minimum May temperature which may be tolerated is $+1^{o}C$; average temperatures of $+18^{o}C$ in July and $+10^{o}C$ in October are necessary (Lamb 1966, 189). However, details of the Romano-British climate are insufficiently understood for one to be able to assess the feasibility of large-scale grape cultivation. In spite of Tacitus' statement to the contrary (Agricola, xii) vines do seem to have been cultivated in Britain, but the scale of activity remains uncertain. As Ernle (1919, 18) has warned in another context, it seems most unwise to attempt to deduce climatic information from such slight evidence as the presence of this crop provides, unless corroborative evidence is available from other sources.

The less exacting temperate fruit and nut trees were certainly of greater importance than these more 'exotic' types. Their fruits are far more frequently found. Table 5.2.2. shows the proportions of different cultivated species in the samples from Neatham and Winchester, as a percentage of the total number of fruitstones and nuts of cultivated forms at each site.

| | Winchester | Neatham |
|---|---|---|
| Malus sylvestris | 55 | 7 |
| Prunus domestica | 37 | 42 |
| Prunus avium | 3 | 50 |
| Vitis vinifera | 1 | - |
| Ficus carica | 1 | - |
| Juglans regia | 1 | 1 |
| Pinus pinea | 2 | - |

Table 5.2.2; Percentages of cultivated species of fruits and nuts in samples from Winchester and Neatham.

Apples, plums and cherries are by far the commonest cultivated fruits in these samples, even though they contain few seeds per fruit, and this simple calculation favours many-seeded fruits such as figs.

Deposits of this type present problems of interpretation not encountered with cereals, however. The chief problem is that although cereals are likely to become carbonised and thus preserved at their sites of production during grain drying prior to further processing, the fruitstones are usually encountered in waterlogged rubbish pits and wells at their sites of consumption, often in towns. These contexts give no clue as to the location and scale of fruit production.

By historical analogy, however, one may suggest that fruit production is unlikely to have been of great commercial importance on the Hampshire chalklands. In the early 19th century, Vancouver noted that very few apples were grown beyond those required for domestic consumption, largely because the thin chalky soils of the area are unsuitable for large-scale fruit growing (1810, 289). Nowadays fruit production is concentrated in the southern part of the Hampshire basin where deeper loam soils are to be found. The proximity of this area to Southampton - the major market of the region - has encouraged the development of market gardening, including some orchards (Green 1940, 364). The importance of easy access to a large market is, of course, considerable and despite the relatively unfavourable soil type it is possible that orchards were established on a commercial basis in and around the Roman towns.

In Roman Britain as a whole it seems unlikely that arboriculture ever became the important component of agriculture which it was in the contemporary Mediterranean area. In Italy two staple foods were obtained from trees; olive oil, which in temperate regions with plenty of good, permanent pasture would have been replaced by animal fats, and wine, the place of which was filled by beer, brewed from barley or wheat in Britain (White 1970, 224 and 272). The development of arboriculture in the Mediterranean region has been seen to reflect increasing agricultural stability (Renfrew 1973, 25), but the failure of true arboriculture to appear in pre-Roman Britain is more a consequence of the absence of suitable potential domesticates, and the adequate supplies of animal fats and cereals, than any inherent instability. The continued influence of these factors and the unsuitability of the British climate for olive, or, possibly, vine production would have ensured a relatively minor role for orchard husbandry in Roman Britain.

## 5.3 Systems of cultivation

Roman orchards and vineyards were regularly planned. Vines were normally arranged in rows, supported on stakes, yokes, trellises and frameworks, or even on living trees. The normal spacing between plants was about a metre, and the rows were between 1.5 and 3m. apart. Variation in spacing was in part related to land utilisation. Commonly the intervening spaces were sown with cereal and legume crops and wider spacing was necessary where the plough, rather than the hoe, was the main tool of tillage. Orchard trees were also arranged in rows, with around 10m. between each row; this permitted easy intercultivation with annual crops (White 1970, 231 - 237, 247). Intercultivation is a Mediterranean technique of husbandry but it may have been used in Romano-British orchards, although traditionally the land between the rows of trees has been used as pasture in this country (Roach 1964, 60).

There is every reason to believe that the accounts of the Roman agricultural writers accurately reflect the techniques in common use in Italy. An excavated vineyard at Pompeii, for example, closely resembles Columella's description of contemporary plantations with rows of supported vines and fruit trees between them. Both vine-stocks and stake-cavities were detected during excavation. They were arranged in parallel rows with sporadic tree-root cavities between the lines. Carbonised olives were associated with these inter-row root cavities (Jashemski 1973).

Such easily interpreted features have not been excavated in this country. In aerial photographs, though, planting holes are sometimes visible. To the south of the main villa complex at Ditchley, Oxon., for example, are two enclosures with a total area of about 4 acres. Within them darker patches which may represent the sites of planting holes dug into the clay subsoil are visible in the air photographs (Ralegh-Radford 1936, 52). Unfortunately none of these was excavated. Similar dark dots on the air photograph of the villa at Cromwell, Notts. have been interpreted as possible tree-holes (Applebaum 1972, 220). No regular pattern is discernable, however, and this interpretation must remain provisional in the absence of excavation.

At North Thoresby in Lincolnshire a network of ditches has been tentatively identified as a vineyard (Webster and Petch 1967). These ditches, some 2m. wide, about 1m. deep and spaced about 8m. apart, cover an area of around 12 acres. Quantities of domestic refuse, perhaps the residue from compost or manure, were present in their fills. The late 3rd century date of these features coincides with the edict of Probus (277 AD) permitting the cultivation of vines throughout the empire, but the absence of positive evidence for the crop, the rather unfavourable soil type and aspect and the very wide spacing of the ditches casts some doubt upon the interpretation of the complex, as the excavators acknowledge. At any rate, it does seem to represent some form of plantation or orchard on a fairly large, and presumably commercial, scale.

The Roman agricultural writers devote a good deal of space to vineyard and orchard management, and it seems likely that the techniques they describe were introduced into this country. Having transplanted the young vines or saplings from nursery beds into the trenches or planting holes, continued cultivation was necessary to control growth and in particular to encourage the development of sound, fruit-bearing shoots. Distinctive forms of hoe were used in successive cultivation processes; in particular the two-bladed drag-hoe (Bidens) (White 1970, 237-9, Manning 1970, 19-20).

Pruning, to control growth, and grafting of young scions onto established root stocks also requires a characteristic tool - a specialised form of billhook (White ibid.). Two billhooks from Colchester, shaped somewhat like meat-cleavers with points on the distal ends of their blades were probably used in such activities (Hawkes and Hull 1947, Plate CIV, 31 and 32). Small pruning hooks, some with right-angle bends to the blades, but normally curved like pre-Roman sickles are also known. However, as Applebaum remarks 'the lack of distinction (between reaping hooks and pruning hooks) makes it impossible to trace Roman fruit-growing by the incidence of such finds' (1972, 77).

5.4 Horticulture: problems of interpretation.

As Renfrew remarks, (1973, 195) the failure of edible organs such as leaves, stems and roots to survive in the palaeobotanical record has led to them being little considered in discussions of diet; and horticulture, although an important part of the agricultural system, has been rather neglected. Horticultural crops have however a major role in adequate nutrition; they are rich sources of carotene, from which the body can synthesise vitamin A, and of vitamin C as well as a variety of minerals (Masefield *et al* 1969, 199). The use of flavourings and herbs to enliven diets based upon cereals, and, in the winter, dried and salted meats, is not to be underestimated.

The identification of fruits and seeds of horticultural crops poses several problems. It is unfortunate that so many important crops belong to the genus *Brassica*. The identification of *Brassica* species from their seeds largely depends upon the meticulous examination of surface detail (Berggren 1962) but the surface of carbonised or anaerobically preserved specimens is usually in poor condition. Indeed *Brassica* seeds can frequently be indistinguishable from those of *Sinapis*. Consequently precise identifications are rarely possible.

Many of the remaining crops are Umbellifers. Fruits of wild forms are often impossible to distinguish from cultivars of the same species, since breeding and selection has concentrated upon the improvement of roots, stems or leaves. Frequently fruit size and shape is quite unaffected by domestication.

It is also, unfortunately, impossible from a purely palaeobotanical point of view, to determine which were the most important crops, or even which ones were grown at the site where they were found except where climatic considerations rule out local cultivation.

These problems of interpretation and of identification make the discussion of horticulture difficult.

## 5.5 Pre-Roman Horticulture?

In discussing the nature of Iron Age 'vegetable' crops it is helpful to abandon the idea of a clear division between crops and weeds, and to think much more of a range of degrees of human response to potential food plants, along the lines proposed by Harlan and de Wet (1965, 18). Between domesticated crops and noxious weeds they propose a series of categories, as follows:-

Domesticated crops → Encouraged weed crops → Tolerated weeds → Discouraged weeds → Noxious weeds.

There is a distinct possibility that any vegetable crops of the Iron Age would not nowadays be recognised as such, having been replaced by new and superior plants of similar type, and thus relegated to the status of tolerated or discouraged weeds. Salisbury (1961, 271-4) discusses a number of herbs and green leaf vegetables which were formerly cultivated but are now found in a wild, or rather feral, state. To take only one example, the potherb Alexanders, Smyrnium olusatrum, went almost completely out of cultivation when replaced by celery in the 15th century. One must therefore be prepared to consider modern 'weeds' as possible former cultivars, many of which have been exploited on a more casual basis in more recent times. Knorzer, for example, does not hesitate to call Daucus carota, Brassica campestris and Valerianella spp. vegetable crops in the Iron Age of the Rhineland (1975, 303). As far as the Hampshire Iron Age sites are concerned, seeds of a number of species which produce edible organs and seeds have been recovered. These are listed in Table 5.5.1.

| | Edible leaves | Edible fruits and seeds |
|---|---|---|
| Vicia spp. | | + |
| Medicago sp. | | + |
| Anisantha sterilis | | + |
| Bromus spp. | | + |
| Brassica/Sinapis sp. | + | + |
| Stellaria media | | + |
| Chenopodium album | + | + |
| Atriplex patula/hastata | + | + |
| Malva sylvestris | + | |
| Rumex spp. | + | + |
| Polygonum convolvulus | | + |
| Plantago lanceolata | | + |
| Valerianella dentata | + | |
| Lapsana communis | + | |

Table 5.5.1: Seeds of wild plants producing edible leaves etc. from Hampshire Iron Age sites.
For details of potential utilisation see Renfrew 1973, 164ff. and Brenchley 1920, 191ff.

Some or all of these species may have been exploited, possibly as crops in the full sense of the word.

Very occasionally seeds of undoubted cultivated herbs and flavourings have been found in carbonised deposits of Iron Age date. Helbaek (1952, 222) has reported finding seeds of Papaver somniferum in the large grain deposit at Fifield Bavant; probable seeds of this species were also found in Late Iron Age deposits from Site R27, Micheldever Wood (3.4). In both cases only a few seeds were present and these may merely be contaminants of the cereal crops. The fruit of coriander, Coriandrum sativum, reported from a Late Bronze Age site at Minnis Bay, Kent, has now proved to be a modern contaminant (Connolly 1941; Connolly in Greenfield 1971, 48). This species is therefore likely to be a Roman introduction (see below).

The find of carbonised seeds of a species of Brassica adhering to the base of a pot from Old Down Farm is of particular interest since it provides definite evidence for the exploitation of a wild or cultivated vegetable crop in the Iron Age (see 3.5 and Plate 14). The pot itself is of unusual form, burnished and with a relatively narrow neck.

Plate 14: Mass of carbonised <u>Brassica</u> seeds attached to the base of a pot from Old Down Farm.

2 cm. scale.

It seems more likely to be a storage jar than a cooking pot and it is therefore not possible to determine whether the seeds were intended for consumption directly, or whether they were being stored for subsequent sowing and the production of green leaf vegetables.

There is no unequivocal evidence for the presence of gardens in the Iron Age. Small enclosures with stone walls at certain Cornish Iron Age villages have been called 'garden plots' (Cunliffe 1974, 189) although this interpretation rests on no firm basis. The spade-dug cultivation plots at Weston Wood in Surrey though perhaps small for cereal growing, seem rather large for vegetable gardens at this date. Each is about 9 x 7 m. and consists of parallel spade-dug furrows cut into the sandy subsoil (Harding 1964, 13).

However, if the species discussed above were merely of the 'encouraged weed crop' category, special evidence for cultivation is unlikely to be found. Such crops could merely be gathered in the fallow fields.

## 5.6 Roman horticulture

The importance of the products of the *hortus* or kitchen garden, in the predominantly vegetarian diet of the early Romans is emphasised by White (1970, 246). Pliny devotes Book XIX of his *Natural History* to horticulture, and describes the crops under cultivation in his time. These are listed in Table 5.6.1; those crops known from Roman Britain are also indicated. Full references to fruits and seeds of horticultural crops from Roman deposits in this country are given in Appendix 1.

| | | | Known from Roman Britain? |
|---|---|---|---|
| 1. Cabbages and Kales | Cabbage | Brassica oleracea | B. campestris only |
| | Kale | " | " |
| 2. Root crops (Cruciferae, Chenopodiaceae, Umbelliferae) | Turnip | Brassica rapa | + |
| | Beet | Beta vulgaris | + |
| | Radish | Raphanus sativus | – |
| | 'Daucos' | Daucus carota | ⊕ |
| | Skirrett | Sium sisarum | – |
| | Parsnip | Pastinaca sativa | ⊕ |
| 3. Bulbs (Liliaceae) | Onion | Allium cepa | – |
| | (Chives) | Allium schoeno-prasum | – |
| | Leek | " var. porrum | – |
| | Garlic | Allium sativum | – |
| 4. Stems (Umbelliferae, Liliaceae) | Celery | Apium graveolens | ⊕ |
| | Alexanders | Smyrnium olusatrum | + |
| | Fennel | Foeniculum vulgare | + |
| | (Angelica) | Angelica arch-angelica | – |
| 5. Cucurbits | Cucumber | Cucumis sativus | + |
| | Gourds | Cucurbita spp. | – |
| 6. Soft fruits | (Strawberry) | Fragaria vesca | ⊕ |
| | (Raspberry) | Rubus idaeus | ⊕ |
| | (Blackberry) | Rubus fructicosus | ⊕ |
| 7. Herbs (Umbelliferae) | Parsley | Petroselinum crispum | – |
| | Dill | Anethum graveolens | + |
| | Chervil | Anthriscus cere-folium | Chaerophyllum aureum from Silchester |
| | Lovage | Levisticum offi-cinale | – |
| | Cumin | Cuminum cyminum | – |
| | Caraway | Carum carvi | – |
| | Coriander | Coriandrum sativum | + |
| | (Anise) | Pimpinella anisum | + |
| 8. Herbs (Labiatae) | Mint | Mentha viridis | – |
| | Pennyroyal | Mentha pulegium | – |
| | (Sage) | Salvia officinalis | – |
| | Marjoram | Origanum vulgare | – |
| | Thyme | Thymus spp. | + |
| | Rosemary | Rosmarinus offici-nalis | – |
| | Basil | Ocimum basilicum | – |
| | Savory | Satureia hortensis | – |
| 9. Other plants producing edible leaves | Lettuce | Lactuca sativa | – |
| | Endive | Chicorium endivia | – |
| | Sorrel | Rumex acetosa | ⊕ |
| | Mallow | Malva sylvestris | ⊕ |
| | Orache | Atriplex hortensis | – |
| | Rocket | Eruca sativa | – |
| | Cardoon | Cynara carduncula | – |
| | Cress | Lepidium sativum | – |

continued....

| | | | |
|---|---|---|---|
| 10. Other plants used as flavourings | Poppy | Papaver rhoeas | + |
| | Opium poppy | Papaver somniferum | + |
| | Mustard | Sinapis alba | + |
| | Capers | Capparis spinosa | - |

Table 5.7.1; Horticultural crops mentioned in Pliny.
+ = Crop known from Roman deposits in Britain
⊕ = Possible crop from Roman deposits in Britain
- = Not known in this country

Crops appearing in brackets are not mentioned by Pliny, but were certainly grown.

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Obviously this list is by no means exhaustive, and the very large number of cultivated and semi-cultivated plants used for medicinal purposes which Pliny mentions have not been included.

Species nowadays thought of as wild were certainly exploited in Britain. Nutlets of Thymus serpyllum, wild thyme, were found in association with the ritual burial of a gull in a temple complex at Springhead, Kent, for example (Penn 1964). Atriplex patula, whose seeds are sometimes found in bulk in cultural contexts also seems to have been utilised. Arthur (1972) mentions a large find of these seeds from Stonham Aspel, Suffolk. 'Hundreds of seeds in a cluster' were found within a Roman building interpreted as a bakery, again at Springhead (Penn 1957). However, the possibility that such deposits are part of the debris from grain cleaning should be borne in mind.

Apart from recording the bare list of species in Table 5.7.1, one can only echo Applebaum's comment that 'we know too little of the Romano-British kitchen garden (1972, 116). It seems unlikely that methods of gardening have changed appreciably since the Roman period. Pliny (XIX,xx) notes that the garden was normally sited adjacent to the house, and in Italy at any rate, sited with irrigation in mind. The soil was dug over in the autumn and again during the winter, so as to allow frost action to break down the soil. Manure was dug well into the soil. Normally such digging would leave little archaeological trace, as one tries to avoid mixing topsoil and subsoil, but the formal garden at Fishbourne is a notable exception to this. Building operations had exposed a stiff clay subsoil, and before planting out garden shrubs, trenches were dug into the clay and filled with marled topsoil (Cunliffe 1971, 123). This gives some idea of the degree of expertise available in landscape gardening. No doubt similar skill was exercised in the kitchen gardens.

It seems probable that horticulture was largely a domestic enterprise in the Roman province, vegetables being produced in small gardens both in country and town.

# CHAPTER 6. FIELD CROPS

The aim of this chapter is to discuss in outline the methods of arable farming which were probably in use on the Hampshire chalklands during the pre-Roman Iron Age and the Roman period, concentrating attention upon those activities which can be reconstructed wholly or partly from palaeobotanical evidence. Probably the simplest way to approach this is to follow the activities of the farming year through in sequence, discussing each in turn, and drawing them together at the end of the chapter. Clearly several lines of evidence are relevant, and the information derived from the carbonised seed deposits is supplemented by that from surviving field monuments, agricultural equipment, tools and buildings in Hampshire and comparable areas of Southern England. In order to interpret this information in terms of a working agricultural system, reference is made to arable husbandry in Classical Italy, as described by the Roman agricultural writers, and to the farming methods in use on the Hampshire chalklands before Victorian innovations had greatly altered traditional techniques.

## 6.1 Fields and tillage

A few discoveries in recent years have indicated that fields and in particular buried arable soils provide an entirely new context from which carbonised cereals may be recovered. A brief discussion of fields and the effects which methods of tillage and in particular plough-types have had upon field forms seems to be required in order to provide a background for the botanical material which has been recovered from such contexts, and a basis for further discussions in the following sections.

The Iron Age plough was an ard, and lacked both coulter and mouldboard. Examples of wooden ploughs from Scandinavian peat bogs, notably from Donnerupland, consist simply of a beam, to which the draught animals were yoked, and which is pierced by a hole through which pass the fore-share, share and the front part of the stilt. Fragments of similar ards have been found in Scotland, at Milton Loch Crannog and Whitereed Moss, and narrow iron shares suitable for use with such implements have been found in Iron Age contexts in the Lowland zone (Manning 1964, 54-5; Payne 1948, Fig. 1). The coulter, which makes an initial vertical cut in the soil was formerly supposed to be a Belgic innovation (Payne 1948, 92) but Manning has more recently pointed out that the supposedly Iron Age coulters are either of Roman date, or are not coulters at all. The so-called Belgic coulter from Bigbury, for example, is now thought to be a form of bill-hook (Manning 1964, 62). In Roman Britain a wide variety of plough types seems to have been in use, including bow-ards, similar to Iron Age examples, coultered ards, and possibly the true mouldboard plough, which can turn a furrow. These plough types are all illustrated by Manning (1964, Figs. 2-4 and Fig. 7).

In order to ensure adequate preparation of the seed bed using an ard, one of several techniques can be employed. Steensberg (1957/8) describes parallel ploughing, using the implement alternately upright and sloping and illustrates the way in which the ridge or scamnum between furrows can be broken down by this method. Fowler (1971, 175) quotes modern experimental work which demonstrates that a useful method of breaking down the soil is to plough along the same groove several times and then to cross-plough at right angles, to break down the ridges. A spacing of about 30cm. between grooves was found to give the best tilth. Archaeological traces of such cross-ploughing, dating from the Neolithic up to the Roman period, and quite possibly beyond, are well known (ibid. Fig. 34). A particularly clear pattern of Iron Age or Roman cross-ploughing marks scored in the chalk has been excavated within a 'Celtic' field at Overton Down, Wilts. (Fowler and Evans 1967, 291).

It is thought that this cross-ploughing technique was the reason for the adoption of the small, square 'Celtic' field form throughout Western Europe (Bowen 1961) at least as far back as the Bronze Age. Such fields survive as earthworks - negative and positive lynchets - formed by the downhill movement of plough soil and its accumulation against fences, walls and other delineating features. (Fowler and Evans 1967, 298). Cross-ploughing seems to have lasted until the Roman introduction of the mouldboard plough; and indeed on the rendzina soils of the chalklands, where shallow ploughing is necessary in order to avoid mixing too much chalk with the thin topsoil, light ploughs probably continued in use throughout the Roman period (Applebaum 1972, 88). Certainly as late as 1620, Markham referred to Hampshire as an area where "the ploughs and instruments would be of the smallest size and of the least timber" (quoted by Fussell 1952, 269).

New plough types, however, together with different systems of land use and tenure do seem to have had effects upon field forms over a wide area. To take a local example, Applebaum (1972, 90-4) describes apparent strip fields close to the villa at King's Worthy, Hants. At Chalton, Hants., long rectangular fields are found on the periphery of systems of smaller irregular fields and do appear to reflect the ordered expansion of the arable area, possibly during the Roman period (Cunliffe 1973, 184), although Fowler (1971, 174) has suggested that organised clearance may go back to an earlier date.

The total acreage under the plough during the Iron Age and Roman periods is now impossible to estimate, but wherever detailed survey has been undertaken a surprisingly large arable area has been revealed. At Chalton, for example, the area of the Roman fields was 'significantly more extensive' than that of the 17th century (ibid.). Systems of fields are, however, inclined to survive best in more marginal areas where later agriculture has been less intensive, as Clark (1952, 99) demonstrated in Denmark. As far as the Hampshire chalklands are concerned the fragmentary systems surviving suggest that fields were originally present over much of the area, with the apparent exception of the Eastern High Chalk Region, the major area of clay-with-flints (Perry 1967, 117; Fig. 6.1.1). It is, however, quite possible that this blank may be seen to be illusory when the results of woodland surveys recently made as part of the M3 programme are published. Fig. 6.1.1. illustrates two fairly typical areas of 'Celtic' fields in Hampshire, and the approximate area of surviving fields is shown in Fig. 6.1.1.c.

The intensity of agriculture and consequent shortage of suitable land in prehistory is illustrated by the fact that quite steep slopes were brought into cultivation in some parts of Southern England, apparently using hoes and spades. Bowen (1961, 21) mentions some very small fields on the slope of a spur, to the south of Kingston, Dorset, which are likely to have been hand cultivated; and Thomas (1960) suggests that some areas of chalk heath may have their origin in the acidification of surface soil caused by an accumulation of plant refuse removed from hand-tilled plots on steep slopes. Unfortunately such activity is impossible to date. Evidence for hand tillage in prehistory comes mostly from an earlier period; sand filled spade-marks of Bronze Age date were excavated at Gwithian, Cornwall (Thomas 1970, 14) and rather later examples of spade-dug plots are known from the occupation site at Weston Wood, Surrey (Harding 1964). The continued importance of hand cultivation through the Iron Age and Roman periods is demonstrated by finds of various tools. Glastonbury, in particular, produced a variety of implements, often with their wooden handles, including spade-handles, adzes/hoes and a form of push-plough, made entirely of wood (Bulleid and St. George Gray 1917 Figs. 79, 107, 131, 140, and Plate LX). In the Roman period a wide range of mattocks, two-tined hoes, iron-shod wooden spades and peat spades were available (Corder 1943, 224; Manning 1970, 19-26). Applebaum (1972, 79-80) also describes the few known rakes and forks from Roman Britain. Wooden implements no doubt continued in use.

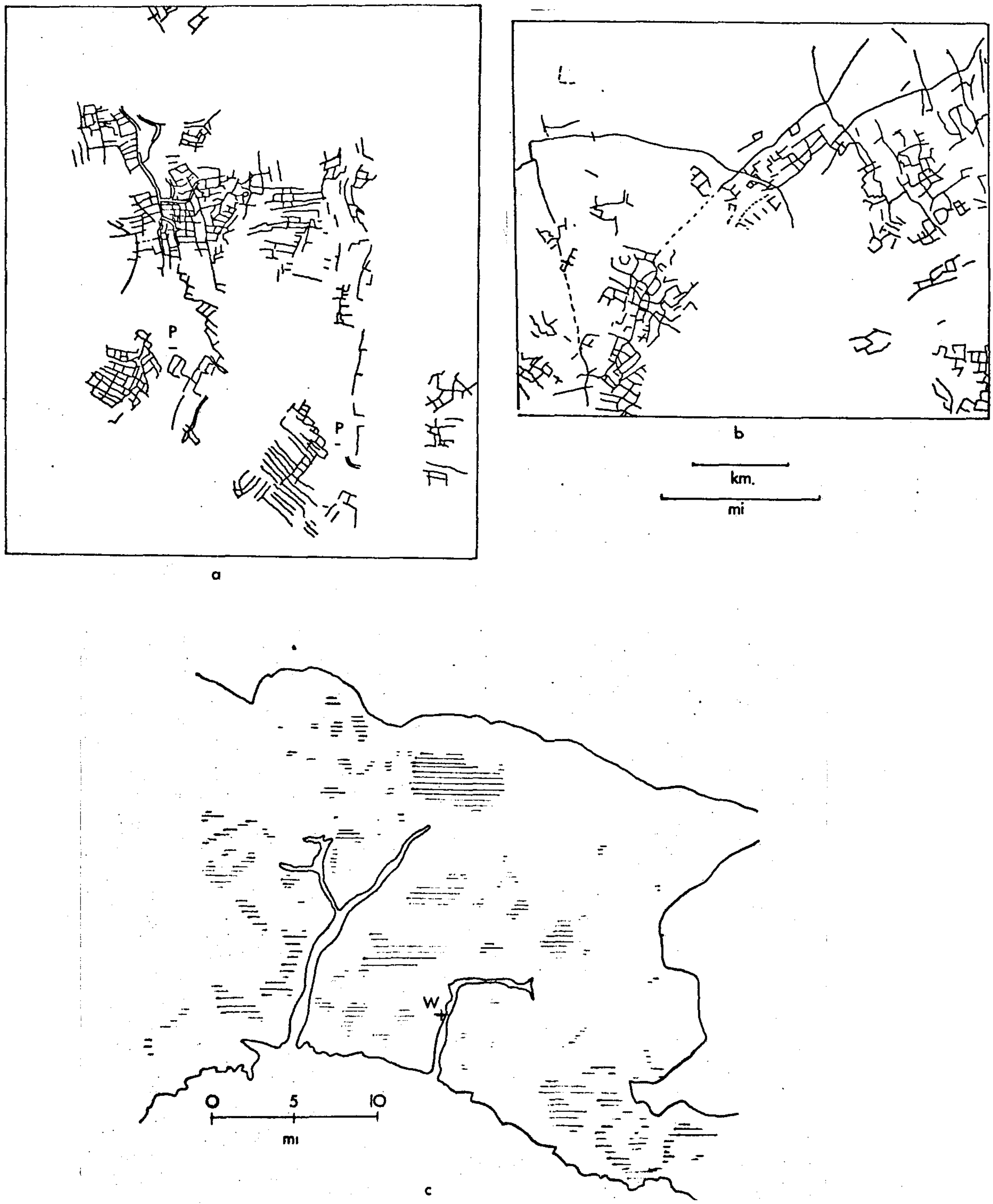



Figure 6.1.1; 'Celtic' fields on the Hampshire chalklands.

a. Field system at Chalton. P - possible pasture areas.
b. Field system at Windmill Hill and Brockley Warren.
c. Approximate distribution of surviving field systems on the Hampshire chalklands.

Sources: Perry 1967, Cunliffe 1973.

This range of tools reflects a variety of functions. The mattocks, hoes, forks and spades could be used in the opening of the surface soil layer and on small plots would have replaced the plough entirely. The seed would have been covered either with rakes or harrows. Hoeing and weeding of the growing crop was also necessary and different weights and forms of tool would have been used in different soils.

6.2 Manuring and marling

As Ernle has emphasised (1919) the availability of manure is normally the chief factor limiting crop yields, and in antiquity domestic animals provided almost the only source of manure. The Roman agricultural writers recommend the use of litter and dung from all kinds of stock, with the possible exception of pigs (White 1970, 125-135), and this was no doubt supplemented with household refuse at all periods. Besides adding nitrogen compounds, potassium and small amounts of phosphate to the soil, animal manure improves tilth and increases its water-holding capacity (Russell 1928, 179-185), an improvement which is particularly important on the light soils of the chalklands. For these reasons sheep have historically been essential in chalkland farming and in this area manure has usually been applied directly by means of a folding flock. The sheep, grazing by day on the Downs, were confined within movable folds in the arable fields at night, where they fed on the stubble of the fallow fields or on the young growing crops (Jones 1960, 5; Vancouver 1810, 135). Controlled grazing of young growing cereals promotes tillering and prevents undue leafy growth which can cause lodging. At the same time the sheep provide a top-dressing of manure, and by trampling improve the soil structure (White 1970, 134). Manure from stalled animals could also have been collected for spreading on the fields; at the Iron Age site of Barley, Aldwick, Herts. the excavator interpreted staining at the edges of shallow pits as evidence for manure storage (Craster 1961, 30), and the prevalence of nitrophilous plant species, suggesting the presence of dunghills, at Cathedral Green, Winchester has been discussed above (4.4).

Direct evidence for the use of manure on fields is harder to come by, although the scatters of eroded potsherd often found within 'Celtic' fields may well be derived from household refuse.

However the weed flora of arable fields is influenced by manuring although the crop and cultivation have a greater effect, and this activity may well be detectable in the species of weed seeds present in carbonised deposits. Studies of the weed flora of the Broadbalk and Hoos fields at Rothamsted, which have borne crops of winter wheat and spring barley respectively each year since 1852, clearly demonstrate this influence. On unmanured plots leguminous weeds were found to be particularly prevalent. This is due to their nitrogen-fixing activities; they are relatively free from competition in nitrogen-deficient soils. On plots receiving farmyard manure, by contrast, an annual flora including Atriplex patula, Stellaria media and Polygonum aviculare was found (Warington 1921). These three species are all common in the carbonised cereal deposits described above.

A further weed species, whose seeds were found in association with cereals at Portway, Site R27 and Old Down Farm, is Hyoscyamus niger, henbane. This is a poisonous plant, containing several toxins (Forsyth 1968, 87), and is also nitrophilous and characteristic of farmyards and dunghills (see above 4.3). It seems possible that seeds of this undesirable contaminant were introduced with manure, although mixing of its seeds with cereals may have occurred at some stage after harvesting.

Marling and chalking were certainly well-known in the pre-Roman period and later. Essentially both improve soil texture and add calcium to the soil surface. Marl does not occur in Italy and Pliny's reports of the use of creta argentaria in Britain and of other sorts of marl elsewhere is essentially a novelty to Roman agriculture (Fussell 1959, 215). The chief value of these top dressings is in terms of long-term soil conditioning, but chalking does appear to have distinct short-term effects as well, on yields of barley in particular (Russell 1916, 632). How far marls were used in the Hampshire chalklands remains, of course, uncertain, although Perry (1967, 134) mentions chalk pits visible in the corners of 'Celtic' fields at Vernham Dean. It is possible that the pits and fields are contemporary.

Applications of wood ash, and stubble burning, represent a rapid method of returning minerals to the soil, although neither adds to soil structure. It is possible that the cereals from Site R1, discussed below, became carbonised during stubble burning.

6.3 Fallowing

Fallowing as part of a crop rotation served two main purposes in the past. Firstly, by repeated ploughings and harrowing the annual and perennial weeds were reduced or eliminated, and crop pests largely removed for lack of hosts. At the same time the land was able to regain its fertility. In particular nitrate levels are increased by a bare fallow (Percival 1934, 25; Russell 1928, 89).

Evidence for some form of fallowing in the Iron Age comes from a long section, of 120 ft., running obliquely up the crest of the ridge of Portsdown, Hants. and cutting through a sequence of overlapping lynchets, a boundary bank and two ditches, all dateable to the Iron Age by associated pottery (Bradley 1967, 55). At no less than six points there were scarps in the natural chalk representing successive field boundaries, but plough soils associated with the earliest fields had been destroyed by later agriculture. However it proved possible to detect three successive surviving lynchets at one point, and to take samples from them for molluscan analysis.

The first two lynchets produced snail faunas characteristic of short scrub and rough grassland. The burrowing snail Pomatias elegans, very typical of scrub habitats (Evans 1972), was common in samples from these lynchets, along with Helicodonta obvoluta, an anthrophobic mollusc nowadays confined to wild habitats resembling natural woodland, though possibly more catholic in the past (ibid.). The final ploughing level contained only P. elegans and Helicella itala, a grassland species (ibid), which implies that the field surface was allowed to revert to grass.

Bradley concludes from his results that the fields were allowed to revert to short scrub or rough pasture between episodes of ploughing, and that after the final ploughing the land was used as pasture, regeneration being prevented by grazing. This, taken with the indications that field boundaries shifted, implies a very flexible and dynamic form of land use.

However this is not fallowing in the sense that the Roman agricultural writers understood it. Constant ploughing of the fallow fields for the purposes mentioned above (see White 1970, 177) was certainly practised by Roman farmers, and would presumably have been introduced into Hampshire if, indeed, the Iron Age farmers of the area were not already using such a method.

### 6.4 Time of sowing

Applebaum (1954, 104) considered that one of the distinctive features of Early Iron Age farming was the beginning of a shift from spring-sown to winter-sown crops. His principal evidence for this view was a reference of Diodorus Siculus to two annual harvests in Iron Age Britain, and the appearance of spelt in the palaeobotanical record.

His second line of evidence may, perhaps, be criticised. It is certainly unwise to be too dogmatic about physiological characteristics of crops deduced solely from morphology. In general it is true that spelt is an autumn-sown crop and emmer spring-sown, but Percival (1921, 188 and 326) describes both black winter emmer and bearded and beardless spring spelts. Winter and spring varieties of barley and bere are also available. However, with these reservations, it seems reasonable to accept that, as in the 19th century in Hampshire, wheats were mostly winter-sown along with some barley and rye, and the bulk of the barley, oats and legumes were spring-sown (Vancouver 1810, 133-169).

The balance between spring and winter sowing is less easy to determine. Certainly yields from winter wheats are invariably higher (Percival 1921, 422), and in this southern part of England, on light soils, climatic considerations are unlikely to have made winter sowing impractical. The evidence of the weed seeds associated with cereal deposits from the area has already been discussed (4.3). Weed species characteristically associated with winter cereals, including Agrostemma githago and particularly Polygonum convolvulus and Bromus spp. are common, whilst species such as Thlaspi arvense and Sonchus arvensis, which are often associated with spring-sown cereals are much rarer. There is no clear-cut distinction between these weed vegetations, but the inference to be drawn from the weed seeds does seem to be that winter sowing was more important than spring-sowing in this area, during both the Iron Age and Roman periods.

## 6.5 Rotations?

Having established that both spring and winter crops were probably being produced one can suggest some possible forms of management. Perhaps the simplest is that employed in the primitive Scottish 'infield', where the arable is cropped continuously. (Applebaum 1954, 106). In the Iron Age and Roman periods the fields could have been divided into two; half producing continuous crops of spelt, manured between harvest and sowing, and half producing barley, emmer and legumes, probably partly spring sown. The scheme is thus:-

| | 'Spring' field | 'Winter' field |
|---|---|---|
| Year 1 | Barley/emmer/legume | Spelt |
| Year 2 | Barley/emmer/legume etc. | Spelt |

The addition of fallowing, for which we have seen there is some slight evidence in Iron Age Hampshire, means that the arable is more conveniently divided into three and a rotation introduced, since simply to introduce fallowing into a two-field system would make the work load uneven from year to year. Something of this form could be involved:-

| | Field 1 | Field 2 | Field 3 |
|---|---|---|---|
| Year 1 | Spelt | Barley/emmer/ legume | Fallow |
| Year 2 | Barley/emmer/ legume | Fallow | Spelt |
| Year 3 | Fallow | Spelt | Barley/emmer/ legume |

This is very similar to the form of rotation traditionally employed in English farming (Percival 1934, 24), which seems to have been introduced or re-introduced into N.E. Hampshire by the 13th century (Fussell 1952, 265).

Perhaps one is unjustified in projecting medieval methods back into prehistory and early history. The evidence from Portsdown (Bradley 1967) certainly suggests a longer period of fallow than one year. This could be seen as reflecting something akin to the Scottish 'outfield', of which only 1/30th was in cultivation at any one time (Applebaum 1954). Alternatively the Portsdown fields may be entirely atypical. Nevertheless it is clear that the arable must have been divided up into blocks of fields with different functions and further study of field systems may well suggest new possibilities.

6.6 Legumes

The use of legumes calls for further discussion. The crops available in Iron Age Hampshire were beans, Vicia faba var. minor, (at Owslebury, 3.2) and vetches, Vicia sativa, (at Owslebury and R27, and possibly at Portway and Old Down Farm, 3.2 - 3.5). To these were added peas, Pisum sativum (at Owslebury, 3.2) by the late Roman period. The lentil, Lens esculenta, which has been found in small amounts as impurities of cereal crops at Caerleon (Helbaek 1963) and Colchester (above 3.10), does not appear to have been cultivated as a field crop in this country, being essentially a Mediterranean plant. Further references to finds of carbonised pulses are given in Appendix 1.

Pulse crops, by means of their root nodules which contain nitrogen-fixing bacteria, act so as to increase nitrogen levels in the soil (Renfrew 1973, 104), a property which has been utilised in the form of legume rotations or as maslin or mixed crops. Of the two forms of exploitation the latter is the more primitive and ensures a yield of at least one component of the crop no matter how adverse the conditions. Renfrew (1973, 25-7) considers that the mixed deposits from certain early Neolithic sites in Central Greece reflect this cropping pattern. Maslin crops were grown as late as the early 19th century in Ayrshire where oats were sown with peas (Aiton 1811, 271) and of course persists in modern primitive agriculture. Rotations involving legumes seem to have been a relatively recent development. Pliny (NH XVIII, 91) mentions several such rotations, using beans and other legumes. However, the Roman systems do not totally eliminate the bare fallow, which means that relatively large acreages must still have lain unproductive for considerable periods (White 1970, 113).

Palaeobotanical evidence is, unfortunately, incapable of indicating which, if any of these farming methods were used in the Iron Age and Roman periods in Hampshire. In particular such techniques as green manuring, where the immature crop is ploughed in, can never be represented. Even where the legume crops were allowed to mature, their association with cereals in carbonised deposits is usually open to several interpretations. To take only one example, Applebaum (1972, 115), has suggested that a deposit of wheat and barley with 15% vetch from the corn-dryer of a villa at Downton, Wilts., may represent a mixture of human food and animal fodder reflecting some form of legume rotation. It is equally possible, however, this is a kind of mixed or maslin crop, or that the vetch is an unintentional contaminant.

## 6.7 The nature of the sown crop

The problem of assessing the significance of mixed deposits of pulses and cereals from domestic contexts is merely a specific example of the general problem of lack of knowledge about the sown crop. Mixing may occur at any time after harvesting and consequently the recovery of mixed deposits need not necessarily imply that maslin crops were being produced. Pure deposits of one crop, or deposits in which one species vastly predominates do seem to be a fairly reliable indication that monocultures were grown, however. Nevertheless, these samples from domestic contexts do not provide a full picture of the crops in the fields and it is only by recovering carbonised material from buried arable soils that such a picture may be drawn.

Fossil plough soils have produced cereal grains by flotation on several occasions. Van Zeist (1970, 66) was able to extract grains of naked barley from a buried arable soil dating to the early second millennium BC at Bornwerd, Netherlands, and Kroll (1975) found cereals in similar contexts at Archsum, Isle of Sylt, Schleswig Holstein. Considering these in conjunction with carbonised deposits from granaries Kroll deduced that mixtures of emmer and barley were cultivated in the Bronze Age, hulled and naked barley in the Iron Age and hulled barley and oats in the Migration and Viking periods. Hulled barley seems to have been grown as a monoculture in the Later Roman Iron Age, as was rye in the Viking period. In this country, soil buried beneath the rampart of the hillfort of Ravensburgh Castle at Hexton, Beds., has produced carbonised grains of both wheat and barley (Bunting, forthcoming) but the find is, unfortunately, not closely dated (J. Dyer, pers. comm.).

It has also proved possible to extract carbonised cereals from a soil buried beneath spoil associated with the construction of the Roman road from Silchester to Winchester at Site R1, Stratton Park (see above 3.6). The archaeological context of this material is unfortunately rather difficult to interpret. The road at this point runs along a terrace, and spoil from the road ditch buried a thin grey, clayey soil which contained the cereals. Beneath this grey soil was a layer of brown loam and chalk particles overlying the chalk bedrock into which parallel unidirectional ploughmarks were scored. It is possible that the terrace represents a long, thin terraced field on which the road was subsequently constructed. This would be a very unusual shape for an

Iron Age field, and unidirectional ploughmarks, though not unknown in the Iron Age (Fowler 1971, 161), are uncommon. It is also difficult to relate the grey soil to the ploughmarks. To score the chalk through this layer the plough would have had to penetrate over 20cm. Bearing all this in mind, Peter Fasham, the excavator of the site has suggested that the plough was used to create a terrace and to clear vegetation specially for the road. This, again, is most unusual, and leaves one with no explanation for the presence of the carbonised cereals. If the terrace is interpreted as a field the cereals can plausibly be seen as the product of stubble-burning. As Fasham remarks, 'the resolution of this matter warrants further work'.

Despite these problems the cereals clearly come from an extra-domestic context and may, provisionally at least, be taken to represent a standing crop. As such they are very illuminating. Only 62 of the extracted grains could be identified. 57 of these are of wheat, the remaining 5 being of barley, probably naked barley. The identified wheat grains are all of free-threshing bread or club wheats, probably the latter; these species are rare in samples from contemporary Late Iron Age and Early Roman settlement sites in the area. At Owslebury and R27 they are present in only 4% and 2% respectively of samples of this date (7.2). They never appear as the dominant species in samples from the Hampshire settlement sites examined. It appears, therefore, that the samples from site R1 may fortuitously represent a minor crop, although it is possible that free-threshing wheats are under-represented in the domestic samples. Since it was not essential to dry them before threshing, the chances of their becoming carbonised may have been reduced. However, the samples from R1 do establish two facts which the domestic samples alone could not;

(1) Free threshing wheats were grown as crops in their own right by the 1st century AD and do not always represent mere contaminants of spelt and emmer.

(2) The crop is over 90% pure with respect to cereal species, and thus appears to be intended as a monoculture rather than a maslin crop. As mentioned above, samples consisting almost entirely of one species may be taken as evidence for the growth of monocultures as opposed to mixed crops.

Examples of such deposits from the settlements sampled appear in Table 6.7.1. Only identifiable grains are included in the determination of percentages; weed seeds, chaff and completely unidentified grains are discounted. Smaller deposits, much less than 100 grains, have not been included in this Table. It need hardly be said that mixed deposits of this size from the settlements are much more common, but mixing could easily have occurred after harvesting.

| Site | Sample number | Context | Date | Period | N. | *Hordeum* spp. | *Triticum* sp. | *T. spelta* | *T. dicoccum* | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| PW | 578E | Pit | 5-3rd c.BC | Iron Age | 97 | – | 7 | 93 | – | – |
| PW | 678E | Pit | Undated | Iron Age | 108 | 3 | – | 97 | – | – |
| R27 | 8/41/502 | Pit | 1st c. BC | Iron Age | 95 | 87 | 13 | – | – | – |
| R27 | 415/575/102 | Pit | 1st c. BC | Iron Age | 112 | 3 | 74 | 12 | 8 | 3 |
| OW | S18J | Ditch | 1st c. BC | Iron Age | 1207 | 98 | 1 | – | – | 1 |
| OW | S41 | Ditch | 1st c. BC | Iron Age | 665 | 99 | 1 | – | – | – |
| OW | S58 | Ditch | 1st c. BC | Iron Age | 512 | 99 | 1 | – | – | – |
| OW | S616 | Ditch | 1st c.AD | Roman | 113 | 97 | 3 | – | – | – |
| OW | Q285G | Ditch | 2nd c.AD | Roman | 135 | 99 | – | – | – | 1 |
| Crook-horn | | Corn dryer | 4th c.AD | Roman | 452 | 3 | 36 | 60 | – | 1 |

Table 6.7.1; Percentage composition of some large carbonised cereal deposits from Portway, Site R27, Owslebury and Crookhorn.

Iron Age samples are grouped together at the top, Roman below.

N - Number of cereal grains in each sample.

Overall these few samples give reasonable evidence for monocultures of spelt and barley having been grown in both the Iron Age and the Roman period, and the samples from Site R1 establish that free-threshing wheats were also grown as fairly pure crops in the first century AD. There is no indisputable evidence for mixed crops.

6.8 Harvesting

The method of harvesting the crop is directly related to the use to which the straw is to be put, and it is therefore of some interest. Before discussing the methods which are likely to have been in use in the Southern English Iron Age and the Roman period it may be useful briefly to review a variety of historically recorded harvesting methods in order to indicate a range of possibilities.

(1) Uprooting. The method of simply pulling the straw from the ground by hand is favoured where crops are dense and tall, in dry conditions where root development is inhibited or where there is a demand for the maximum possible yield of straw for fodder. In Europe uprooting is reported from Sweden, Denmark and Classical Italy, in each case associated with the harvesting of fodder crops (Bohrer 1972, 145-7).

(2) Stripping and plucking. Stripping the ears of spelt with two pieces of wood to extract the grain has been observed as far apart as Asturia in Spain and Georgia in Russia (Steensberg, 1943, 124-5), and reaping boards (mergae) and combs (pectines) were similarly used in Classical Italy (White 1967, 110). Straw cutting was a separate and subsequent process.

(3) Cutting the culm with a sickle just below the ear. A widely used method reported by Diodorus Siculus to have been used in Iron Age Britain (ed. Petrie and Sharpe 1848, ii) and also employed in the Picenum area of Italy (White 1967, 79) and in mediaeval England (Ernle 1919, 12). Time is saved during threshing, although once more the straw must be cut separately, if it is to be gathered.

(4) Cutting the culm at middle height with a sickle. The upper part of the straw is removed with the ears for threshing; the remainder is cut later. This method, practised in the region around Rome leaves stubble for grazing and after threshing gives straw for litter (White ibid).
(5) Cutting the culm at its base with a sickle. During the Roman period in Umbria cereals were cut near the ground and each sheaf was lain down. Subsequently the ears were cut from the sheaves (idem).
(6) Scything. This was a post-mediaeval development in Britain and Scandinavia (Steensberg 1943, 244). Very long straw is produced but grain losses can be heavy.

Stripping and plucking implements are apparently not known from the Iron Age and Roman periods in Britain. Sickles, however, are abundant. The small Iron Age sickle is a result of a continuous development from flint and socketed bronze forms (Curwen 1947). The advent of Iron technology produced sickles which closely resemble Late Bronze Age forms (cf Burgess 1968, Fig. 4 1a; Cunliffe 1974, 268 Fig. 14:2). Later the curved wing-socketed 'leaf knife' form of sickle, common on English Iron Age sites appeared (Steensberg 1943, 184; McGregor and Simpson 1963). The balanced sickle was a Roman innovation. Although more efficient in that the hand does not have to resist the tendency of earlier forms to rotate in the grip, balanced sickles would have been used in much the same way. White (1967, 80) illustrates a variety of such tools with smooth and serrated blades. A further introduction during the Roman period was the two-handled scythe, examples of which are illustrated by Liversidge (1968, 218). White (1970, 182) notes that this tool was used for mowing hay or grass, not cereals.

The brief description of harvesting methods given by Diodorus Siculus and the small size of the Iron Age sickle has led to the assumption that cutting just below the ear was usual in the Iron Age, and that the straw was left in the field to be grazed, or possibly collected later (Applebaum 1954, 105). However some cereal deposits from Owslebury, Portway, R27 and Old Down contain carbonised culm nodes which might be taken as evidence for the collection of straw and grain together, although of course mixing of straw and grain could have occurred after harvesting, before or after carbonisation. The culm nodes are very fragile and their absolute frequency is unlikely to be of any significance, due to destruction during flotation.

In addition a few samples contain carbonised tubers of the onion couch, Arrhenatherum tuberosum, and carbonised culm nodes with their distinctive buttress roots (Fig. 3.3.7). If present in large numbers these might have suggested that uprooting had been used as a harvesting method, but as it is these organs seem more likely to reflect accidental uprooting such as always occurs to a small extent during harvesting. Arrhenatherum tubers have also been found in association with barley, of Bronze Age date, (Allison and Godwin 1949), and it may be suggested that they were deliberately gathered. This is not impossible, but since they are normally associated with straw in the Hampshire samples, unintentional inclusion seems more likely.

The nature of the weed flora can be used in an attempt to determine whether culms were cut high or low, providing an initial assumption is made. One assumes that fruits and seeds of 'small' weed plants - Stellaria media, Tripleurospermum maritimum, Plantago lanceolata, Rumex acetosella, and Thlaspi arvense - are unlikely to have become incorporated into cereal deposits if cutting was high, whilst the presence of 'tall' species - Cirsium/Carduus sp., Bromus mollis/secalinus, and Anisantha sterilis - would have been affected little, if at all, by cutting height. A height of about 20 cm. makes a convenient dividing line between these two groups. All samples containing more than 20 components at Portway and R27 were examined and the frequency of occurrence of culm bases and tubers, seeds of small weeds and seeds of tall weeds, both in samples containing carbonised culm nodes and in those lacking them was noted. The results are shown in Table 6.8.1.

| | Culm nodes present | | Culm nodes absent | |
|---|---|---|---|---|
| | Portway | Site R27 | Portway | Site R27 |
| Culm bases and tubers | 4 | 1 | 0 | 1 |
| Fruits and seeds of small weeds | 13 | 10 | 7 | 7 |
| Fruits and seeds of tall weeds | 16 | 16 | 18 | 20 |

Table 6.8.1; Frequency of association of culm bases, tubers and fruits and seeds of tall and small weed plants in samples containing more than 20 components from Portway and R27.

These figures illustrate three main points;

(1) That culm bases and tubers are almost always associated with straw. Only once - at R27 - were they found without carbonised culm nodes.

(2) That fruits and seeds of small weed plants are rather more often associated with straw than not, at both sites.

(3) That fruits and seeds of tall plants are roughly as common in samples with culm nodes as those without.

Unfortunately the fact that mixing may well have occurred means that these results can lead to no firm conclusions. However, it is clear that at least some of the straw was gathered, and the tendency for tubers, culm bases and fruits and seeds of small plants to be associated preferentially with culm nodes does suggest that this straw was cut close to the ground. It is impossible to say whether this straw-cutting was done before, after, or at the same time as the ears were cut; this point could only be resolved by a study of well-sealed deposits from clearly-defined contexts, where the possibility of mixing could be discounted.

6.9 The drying of cereals

The kiln drying of cereals has been carried out for two main reasons, which are not necessarily mutually exclusive. These are the northern European practice of drying a wet and sometimes unripe crop and the southern one of drying hulled cereals to facilitate threshing. (Clark 1952, 112).

Inadequate sunlight in such regions as the Faroes and Scandinavia means that the barley crop will not ripen, and the grain has to be hardened by drying before threshing (Scott 1951, 196), a technique also formerly practised in Ireland (Estyn Evans 1957, 122). Wherever poor harvest weather is common, in this country at present as far south as Northamptonshire, drying of the grain is often necessary before further processing (Scott ibid). It seems most unlikely that the failure of crops to ripen has ever been a reason for drying in Southern England, although the effects of the climatic deterioration which was in progress at the outset of the Iron Age and again possibly in the later Roman period may have made the harvesting of wet crops necessary and drying desirable. The question of the effects of climatic change is discussed further below (7.4).

There can be little doubt, however, that the principal reason for grain drying in the Iron Age and Roman periods lies in the nature of the crops grown. Helbaek (1952, 232) observed that the threshing of the glume wheats - in this case spelt and emmer - could only easily be done if the ears were first dried or roasted, quoting Pliny (NH XVIII,x,61) who describes this method of treating emmer. Carbonised grain can simply be seen as the product of accidents during this drying process.

It has proved much more difficult, however, to specify the means by which this drying was carried out in the Iron Age. Even the scale of activity remains uncertain. There are several small-scale drying methods, suitable for domestic use, including rolling hot stones amongst the grain, drying in a kettle over the fire and the 'graddan' method of burning the chaff from a small sheaf of ears held in the hand (Scott 1955, 197). Any one of these could have been used, and would leave no archaeological trace. On a rather larger scale it has been suggested that the grain may have been spread on skins which were in turn placed over pre-heated flints, thus providing an explanation for the presence of the very large quantities of burnt flints normally found on Iron Age sites (Cunliffe 1974, 167).

Other possible methods involve the use of cob ovens. These were first described by Bersu at Little Woodbury, where fragments were reconstructed as dome-shaped ovens of cob, 'more than a metre' in diameter and height, strengthened by wattlework and pierced by vents 2 - 5 cm. in diameter (Bersu 1940, 53 and 60 - 3; Brailsford 1949, 159). Unfortunately illustrations of detailed reconstructions of these ovens have not been published. They are evidently distinct from domestic baking ovens such as the 60 cm. diameter clay domes with limestone floors and two compartments from Maiden Castle (Wheeler 1943, 93) or the small 'key-shaped' ovens sometimes reported (e.g. Lowther 1947, 13). However Scott (1955, 205) considers that even these large cob ovens are too small and would generate too high a temperature for grain drying.

Other miscellaneous types of structure have been interpreted as possible dryers. Ritchie (1969, 159) suggests that four-post settings at Maiden Castle and Marnhull, Dorset each containing a hearth within its area, may be drying frames. A rectangular stone-lined pit about 2.4 x 1.9 x 0.9 metres deep, containing carbonised grain and burnt on its inner surface, at Sheepslights, Dorset, may have been some form of dryer, perhaps with a wooden frame to support the grain. It is a unique structure (Calkin 1966, 149).

The sheer quantity of carbonised grain from Iron Age sites in Southern England suggests that drying was both widespread and rather prone to accident. Nevertheless until well-preserved and clearly-defined structures containing grain are excavated, the state and nature of the dried crop will remain obscure.

Roman grain drying ovens are much better known. Although several types were in use, one of the most widespread was the T-shaped oven (Goodchild 1943). These stone- or tile-built structures consisted of a stoke-pit leading into a main flue which met a cross-flue at the far end to make a T-shape. Above these flues were two floors, the space between them being supplied with hot air and smoke from the furnace via vertical flues. The draught, and hence temperature, could be controlled at the entrance to the main flue. Grain placed on the upper floor was not tainted by smoke, nor did it touch the lower floor which was in direct contact with the furnace. These structures were a late Roman development.

At least four such ovens have been excavated in recent years on the Hampshire chalklands, and samples were taken from two of them. These were the Crookhorn Farm double-flued corn dryer, described above, (3.7), and a T-shaped oven of inferior build from Owslebury (Collis 1970, 252). Both dryers were roofed over. The dryers from the Sparsholt villa (Johnston 1972, 3) and Middle Brook Street, Winchester (Bennett-Clark 1954, 319) were fourth century insertions into the Bath suite of the villa and the courtyard of a town house respectively. The latter is of simpler form than the typical T-shaped oven.

| Site | Identified by | Published in | *Hordeum* spp. | *Triticum* sp. | *Triticum dicoccum* | *Triticum spelta* | *Triticum aestivum* s.l. | *Secale cereale* | *Avena* spp. | Spikelet forks | Glume bases | *Bromus* | Smaller weed seeds |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Owslebury, Hants. | Murphy, P.L. | above, 3.2 | + | + | + | +++ | | ? | + | - | | | |
| Crookhorn, Hants. | Murphy, P.L. | above, 3.7 | + | + | + | +++ | | | + | + | + | + | + |
| Falmer, Sussex | Arthur, J.R.B. | Arthur, 1972 | | | | +++ | | | | | | | |
| Downton, Wilts. | Arthur, J.R.B. | Rahtz, 1963 | + | ← | +++ | — | → | | | | | | + |
| Wroxeter, Glos. | ? | Bushe-Fox (1913) | | | | | +++ | | | | | + | |
| Upton St. Leonards, Glos. | Clarke, H.H. | Fowler & Walthew (1971) | | | | +++ (?) | + | | + | + | + | + | + |
| Halstock, Devon. | ? | Large (1969) | | | | | +++ | | | | | | |
| Farmington, Glos. | Murphy, P.L. | unpub. | + | | + | +++ | + | | | + | + | | + |

Table 6.9.1; Contents of some Late Roman Corn Driers.

+++ - principal component of deposit

\+ - minor component.

The contents of the Crookhorn and Owslebury dryers are summarised in Table 6.9.1, together with details of some other corn-dryer deposits from elsewhere in the country. Only material which definitely was excavated from within corn-dryers is included. There are numbers of reports of 'grain' being found in dryers, but few for which identifications are given. Quantitative data are available for still fewer and for this reason the composition of these deposits is not given numerically.

The similarity of these deposits is striking. Species of wheat are always predominant. Barley is represented by a few grains, and the oats, where identifiable, have proved to be wild species. Emmer is even less numerically important, in the Hampshire samples, than barley and the identification of this species in the sample from Owslebury is tentative, being based on grain morphology. This leaves spelt and bread wheat as the most important crops represented, although it is likely that bread wheat is in fact rather less important than these data taken at face value would suggest. The Wroxeter find was identified in 1913 long before Helbaek established that spelt had been grown in Roman Britain, and must therefore be viewed with some reserve, and the Halstock deposit has not yet been fully published. It seems very probable, therefore, that the widespread construction of these dryers is to be associated with the increased cultivation and processing of spelt.

### 6.10 Threshing

Threshing, after drying in the case of the glume wheats, is an activity which in itself need leave little archaeological or botanical trace. The minimum requirement of a flat area of hard, dry ground, roofed if necessary, and animals to tread out the grain is perfectly adequate and was no doubt widely used. 'Lashing' and pounding manually are other possible methods. It has been suggested that in the pre-Roman period the grain was stored in the ear or, lightly threshed, in spikelets and that final threshing may have been a small scale activity carried out as and when grain was required for consumption. Diodorus Siculus' description supports this view: "they gather their harvest by cutting off the ears of corn and storing them in subterraneous repositories; they cull from them daily such as are old and, dressing them, have thence their sustenance". (trans. Petrie and Sharpe 1848,ii). By the Roman period at least, two types of threshing tool were in use; unjointed flails and threshing sledges. The former, of wood and leather are hardly likely to have survived, but the flint teeth fixed on the underside of the tribulum or threshing sledge have a distinctive shape and wear pattern and a possible specimen has been found in Sussex (Curwen 1937). White (1970, 185) notes that the flail would have been used where only the ears had been gathered and animals with or without tribula where appreciable lengths of straw were left.

Strabo, writing of 1st century BC Britain says quite specifically that "they bruise their corn in spacious buildings, as they have no clear sunshine, after bringing thither the sheaves; threshing floors being useless on account of the want of sun and the prevalence of rain" (trans. Petrie and Sharpe 1848, xc). This mention of 'sheaves' conflicts with the account of Diodorus Siculus, but agrees with the palaeobotanical evidence for the presence of straw, at least on occasion low-cut. Threshing in barns during the course of winter was normal practice in English farming until quite recently. However, neither 'spacious buildings' nor threshing floors are known from Iron Age sites, although the large 'working hollows' found on many sites have been interpreted, rather unconvincingly in the writer's opinion, as threshing areas (Bersu 1940, 64). Their irregularity, and their tendency to retain water during excavation, suggests that some other explanation for their function may be more appropriate. Well defined threshing floors are a Roman introduction. The floors at the villa at Ditchley, Oxon. for example, were circular, 9m. and 7.5m. in diameter and surrounded by low stone walls (Radford 1936, 45).

6.11 Winnowing and grain cleaning

The treatment of the crop after harvesting during the Iron Age is poorly understood, largely because of the total lack of artefacts associated with crop processing. The few finds of carbonised bread hardly help to clarify the matter. The composition of small 'buns' from Glastonbury Lake Village, consisting of coarsely ground cereals mixed with impurities of all kinds, led Helbaek to conclude that "cereals were consumed in a very impure state, according to modern standards, with husks and internodes largely unremoved" (1952, 212). On the other hand, Brothwell (1971, 79) found that carbonised bread from an Iron Age site had a very similar structure to experimentally burnt unleavened bread when examined by scanning electron microscopy. Although it seems likely that a certain quantity of weed seeds and chaff was eventually consumed it seems improbable that no attempt was made to remove the worst of the tough glumes and internodes from the hulled wheats which were important crops in the Iron Age.

Certainly several methods of grain cleaning were in use in Classical Italy, and may have been introduced into Britain to replace or supplement the Iron Age methods. The vannus, or winnowing basket, was flat and deep at the back with a flaring mouth towards which it became shallower. When filled with threshed grain it was held by two handles, one on either side, and shaken with an upward and forward motion so as to separate the lighter chaff, dust and weed seeds from the grain (White 1975, 75). A second method involved the use of the ventilabrum, or winnowing shovel. In this case the grain was separated from the chaff by tossing the threshed crop into the air, preferably against a slight breeze (White 1967, 32). Final cleaning of the grain was done, on occasion, with a sieve or cribum. A type of leather sieve for use in the threshing floor is mentioned in Diocletian's price edict, and sieves made of woven rushes are also known (White 1975, 102-4).

In the Iron Age, however, the carbonised grain deposits themselves are the only direct source of information about winnowing and cleaning. Dennell has considered at some length the means by which crop processing activities may be reconstructed from carbonised cereal deposits, and he concludes that "composition, grain size and context are ... three variables which help us to deduce the processing stage at which a given sample became carbonised" (1974, 283). Since practically all the cereal deposits recovered from Iron Age sites on the chalklands come from rubbish deposits in disused storage pits or ditches, archaeological context is of little help. Intact floor levels and ovens are very rarely encountered, and were absent from the sites examined in this study. Nevertheless some attempt to reconstruct an outline of processing activities from the remaining two variables seems worthwhile. Clearly this is only possible where recovery techniques were of a high standard and for this reason the cereal samples from Owslebury are not considered from this point of view.

The composition of samples from Portway, Site R27 and Old Down Farm which contain more than 50 components is expressed in terms of percentages in Tables 6.11.1 - 6.11.3. It would have been desirable to use a larger minimum sample size, but to do so would have reduced excessively the number of samples included. In the Tables the percentages of cereal grains, Bromus caryopses, weed seeds and spikelet parts in each sample are listed and the presence or absence of culm nodes is noted, together with an approximation to the mean grain volume (V). This latter figure, in $mm^3$ is computed from $\sum$ (L.B.T.)/n where L is grain length, B grain breadth, T grain thickness and n the total number of measurable grains in the sample. The percentage composition of these samples is shown diagrammatically in Fig. 6.11.1.

In this figure Bromus caryopses are included in the 'Ch' (chaff) portion since their surface area: volume ratio is closer to that of chaff than of the other weed seeds.

Four main types of sample, with the following characteristics, may be distinguished;

Type A  Samples consisting almost entirely of cereal grains. They rarely contain straw but chaff and weed seeds may be present in small quantities.  Mean grain volume is large, though only two small groups of grains from Portway and three from R27 could be measured.  The statistical significance of these measurements may reasonably be questioned.

Type B  Samples consisting principally of weed seeds. Culm nodes are absent, as is chaff.  Cereal grains are present in small numbers.  The few measurable grains (from PW 584E) have a small mean volume, again these figures are not very useful - the sample is simply too small.

Type C  Samples including large amounts of chaff.  There are no culm nodes, but weed seeds and cereal grains are present.  The grains are unfortunately too damaged to be measured.

Type D  Mixed samples.  These usually contain straw, along with cereal grains, weed seeds and chaff in varying proportion.  The cereal grains are very variable in size.

| Sample number | N. | Cereal (%) | Bromus (%) | Weed seeds (%) | Chaff (%) | Culm nodes | V |
|---|---|---|---|---|---|---|---|
| | | | Type A | | | | |
| 480U | 118 | 100 | - | - | - | - | - |
| 567B | 91 | 91 | - | 1 | 8 | - | 37.3(W)n=6 |
| 569B | 64 | 89 | - | 3 | 12 | - | 45.2(W)n=4 |
| | | | Type B | | | | |
| 584E | 276 | 8 | - | 92 | - | - | 24.7(B)n=3 |
| 685E | 108 | 6 | - | 94 | - | - | - |
| | | | Type C | | | | |
| 84L | 79 | 3 | 5 | 10 | 82 | - | - |
| 688C | 66 | - | 6 | - | 94 | - | - |
| | | | Type D | | | | |
| 84G | 111 | 14 | 39 | 17 | 30 | + | - |
| 84L | 97 | 17 | 46 | 20 | 17 | + | 34.6(W)n=3 |
| 84J | 77 | 29 | 23 | 29 | 19 | + | 19.9(B)n=3, 28.7(W)n=4 |
| 84K | 210 | 26 | 18 | 37 | 19 | + | 36.4(W)n=4 |
| 196C | 120 | 80 | 1 | 12 | 7 | + | - |
| 197I | 234 | 23 | 3 | 51 | 23 | + | 39.4(W)n=5 |
| 564C | 201 | 27 | 11 | 37 | 25 | + | - |
| 569L | 117 | 58 | 19 | 20 | 3 | + | 32.7(W)n=3 |
| 576C | 200 | 61 | 1 | 36 | 2 | + | - |
| 576H | 119 | 32 | 5 | 58 | 5 | + | 26.6(W)n=5 |
| 578E | 455 | 33 | 12 | 8 | 47 | + | 35.3(W)n=15 |
| 673C | 192 | 37 | 16 | 4 | 43 | + | 38.2(W)n=11 |
| 678E | 440 | 41 | 7 | 12 | 40 | + | 41.8(W)n=15 |
| 685D | 106 | 25 | 14 | 52 | 9 | + | - |
| 685E | 268 | 15 | 5 | 77 | 3 | + | - |
| 688B | 1791 | 7 | 20 | 25 | 48 | + | 30.8(W)n=10 |
| 532E | 119 | 12 | 29 | 3 | 56 | - | 46.6(W)n=2 |
| 685C | 98 | 56 | 8 | 29 | 7 | - | - |
| 688D | 77 | 18 | 19 | 11 | 52 | - | - |

Table 6.11.1; Percentage composition of carbonised cereal samples containing more than 50 components from Portway.

Abbreviations:

| | |
|---|---|
| N | Total number of components in each sample |
| Cereal | Percentage of the sample composed of cereal grains |
| Bromus | Percentage of the sample composed of Bromus caryopses |
| Weed seeds | Percentage of the sample composed of fruits and seeds of weeds. |
| Chaff | Percentage of the sample composed of glume bases, spikelet forks, internodes etc. |

continued...

Abbreviations: (cont'd..)

Culm nodes are simply noted as + (present) or −(absent)

| | |
|---|---|
| V | Mean grain volume, computed as described in text ($\sum$ (L.B.T.)/n) |
| (W) | Mean grain volume of wheat grains |
| (B) | Mean grain volume of barley grains |
| n | Number of measurable cereal grains, used in computing V. |

| Sample number | N | Cereal (%) | Bromus (%) | Weed seeds (%) | Chaff (%) | Culm nodes | V. |
|---|---|---|---|---|---|---|---|
| | | | Type A | | | | |
| 8.41.502 | 130 | 90 | - | 1 | 9 | - | 41.8(B)n=17 |
| 8.113.513 | 70 | 87 | 1.5 | 10 | 1.5 | - | 46.8(B)n=13 |
| 14.336.657 | 51 | 90 | 2 | 8 | - | - | - |
| 415.575.643 | 229 | 93 | 1 | 6 | - | + | 47.4(W)n=8; 31.1(B)n=6 |
| | | | Type D | | | | |
| 14.136.697 | 176 | 39 | 17 | 37 | 7 | + | |
| 140.207.562 | 115 | 40 | 19 | 10 | 31 | + | |
| 319.520.601 | 340 | 31 | 46 | 15 | 8 | + | |
| 14.363.703 | 109 | 25 | 50 | 14 | 11 | + | |
| 14.202.729 | 80 | 30 | 10 | 32 | 28 | - | |
| 140.216.563 | 54 | 57 | 13 | 24 | 6 | - | |
| 140.218.565 | 52 | 40 | 27 | 17 | 16 | - | |
| 311.566.628 | 245 | 63 | 2 | 34 | 1 | - | |

Table 6.11.2; Site R27: Percentage composition of carbonised cereal samples containing more than 50 components (N ≯ 50).

Abbreviations as in Table 6.11.1.

| Sample number | N | Cereal | Bromus | Weeds | Chaff | Culm nodes |
|---|---|---|---|---|---|---|
| 240/469 | 113 | 3 | 19 | 67 | 11 | + |
| 567/581 | 180 | 4 | 3 | 93 | - | - |

Table 6.11.3; Old Down Farm: Percentage composition of carbonised cereal samples containing more than 50 components (N ≯ 50).

Abbreviations as in Table 6.11.1.

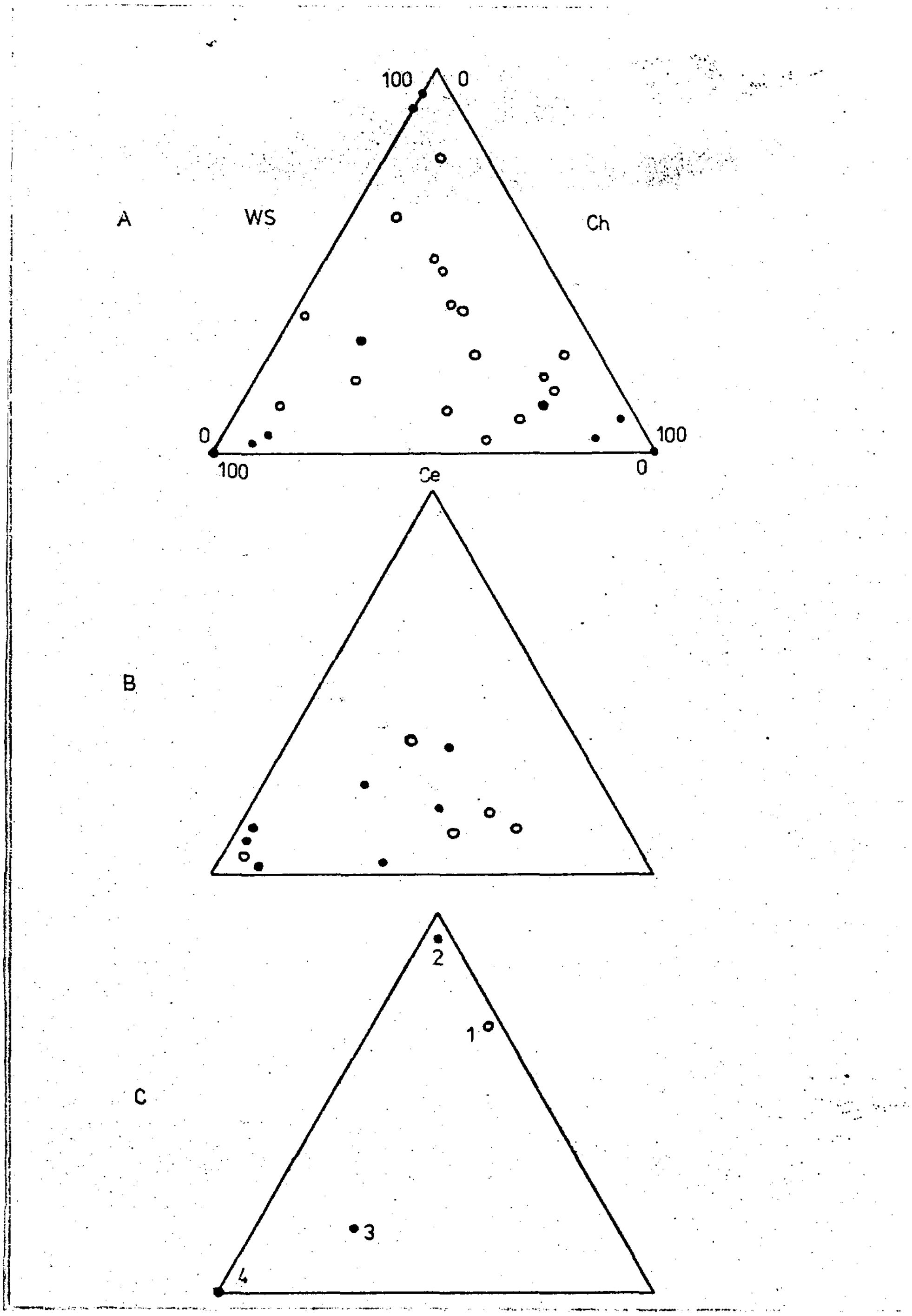



Figure 6.11.1; Triangular graphs to show the percentage composition of some carbonised samples containing more than 50 components.
Ce - %age of cereal grains; Ch - % of chaff: WS - % of weed seeds.
Open circles: Deposits containing culm nodes. Dots: Deposits with no culm nodes.

A. Portway

B. Site R27.

C. 1. Sample 240 469 Old Down Farm
   2. Sample 567 581

   3. Hascombe.
   4. Sample 957, Colchester.

The predominance of these mixed Type D deposits in such rubbish layers from pits is only to be expected. Types A - C also occur in soil samples from pits, but at Portway two of the three Type A samples are derived from other types of feature. Sample 567B comes from a ditch and 480U from a posthole.

The absence of Type B and C deposits from Site R27 is probably a consequence of poor recovery of weed seeds and chaff caused by the unsuitability of the heavy clay soil at this site for flotation. For the same reason the relatively large number of Type A samples may be illusory. Some of these Type A deposits may have been produced from Type D deposits by poor recovery of chaff and weed seeds (see 2.2).

The interpretation of these four types of deposit seems clear enough in broad terms, but the evidence is not strong enough to reconstruct a detailed scheme of crop processing such as that presented by Dennell (1974, 283; Fig. 1). Neither context nor grain size have proved helpful. Nevertheless it is probably valid to interpret Type A deposits as cleaned, fully-processed crops, accidentally burnt, and disposed of in the pits. Type B and C deposits may be taken to represent waste material, which was probably carbonised whilst being deliberately burnt as refuse, or possibly fuel. Type D deposits could be formed in a number of ways. Harvested crops which were carbonised before further treatment could have this type of composition, but so could deposits formed by the mixing of Types A - C, before or after carbonisation.

A further type of deposit, characterised principally by very large size has occasionally been encountered on Southern English Iron Age sites (e.g. at Fifield Bavant: Helbaek 1952). The Hampshire sites studied did not produce deposits of this type and for this reason a large Iron Age cereal sample from Hascombe, Surrey has been included in this study. According to the above scheme it is a Type D deposit. Its percentage composition is as follows:

| N | Cereal | Bromus | Weed seeds | Chaff | Culm nodes |
|---|---|---|---|---|---|
| 3671 | 61 | 3 | 18 | 18 | - |

Table 6.11.4; Hascombe, Surrey: Percentage composition of cereal deposit.
Abbreviations as in Table 6.11.1.

Unfortunately the stage of processing which it had reached when it was carbonised is unclear. There are six intact spikelets of wheat in the portion of the deposit examined which suggests that threshing was not thorough, and the rather large quantity of weed seeds and chaff indicates that winnowing was also incomplete. On the other hand there are not enough spikelet parts for the number of grains, (assuming two-grained spikelets to have been usual in the case of the wheats), so the sample has probably been processed to some extent. Overall, it seems to have been carbonised whilst in an intermediate stage of preparation, partly winnowed, which makes an assessment of its significance rather difficult.

None of the Hampshire Roman sites has produced carbonised deposits capable of yielding information about grain cleaning. The samples from Colchester, however, give a very good idea of the state of fully-processed crops of this period (3.10). They are all from the floors of buildings destroyed during the Boudiccan revolt and their context, together with their composition, leaves little doubt that they were ready for consumption. Despite being at the same stage of preparation they do show interesting differences, which may be summarised as follows:

| Sample no. | Main cultivars | Other cultivars | Weed seeds > 2 mm. | Weed seeds < 2 mm. | Chaff |
|---|---|---|---|---|---|
| 6 | 1 (coriander) | 8 | 3 | 15 | 2 |
| 950 | 2 (emmer, bread wheat) | 2 | 3 | - | - |
| 957 | 1 (flax) | - | - | 3 | - |

Table 6.11.5; Species composition of samples 6, 950 and 957 from Boudiccan layers at Colchester.
The figures simply refer to the number of species represented by each category of material. Full details of all deposits are given in section 3.10. *Camelina sativa* is considered to be a weed in sample 957.

Sample 957 consists of flax seed, with only three identifiable weed species, whose seeds are all less than 2 mm. in length. The gross purity of this sample is over 99%. The absence of capsule fragments suggests seed cleaning by winnowing.

Sample 950, on the other hand, contains a wider range of weed seeds, most of which approach the emmer grains in size. No weed seeds smaller than those of corn cockle were observed. This would seem to suggest that besides seed cleaning by winnowing, (no chaff was found), the grain may have been sieved or otherwise cleaned, thus totally removing the smaller weed seeds. In an attempt to examine this more closely the measurements of the wheat grains were used in the plotting of a scatter diagram (Fig. 6.11.2) of breadth x thickness, an approximation to cross-sectional area, against length, as done by Dennell for emmer and einkorn from the Bulgarian sites of Chevdar and Kazanluk (Dennell 1972, 151-7).

The statistical significance of such detailed metrical studies has recently been questioned by Hubbard (1976), who observes that there is a high degree of overlap in size between grain samples from quite different contexts. Thus it would seem that such scatter diagrams cannot suggest specific <u>means</u> by which crops were cleaned. However it seems useful to present the present data in a form comparable with Dennell's Bulgarian samples.

The result is very ambiguous. If Fig. 6.11.2 were to be used in estimating a possible mesh size, a very fine mesh of about 2.5 - 3.0 $mm^2$ (i.e. about 1.6 mm.) must be envisaged. The sample contains a high proportion of immature emmer grains. Even allowing for a degree of contraction during carbonisation the mesh size indicated would seem to be rather impractical. Hand-picking of such a small seeded crop would seem to be even more difficult. No clear indication of the cleaning method employed therefore emerges.

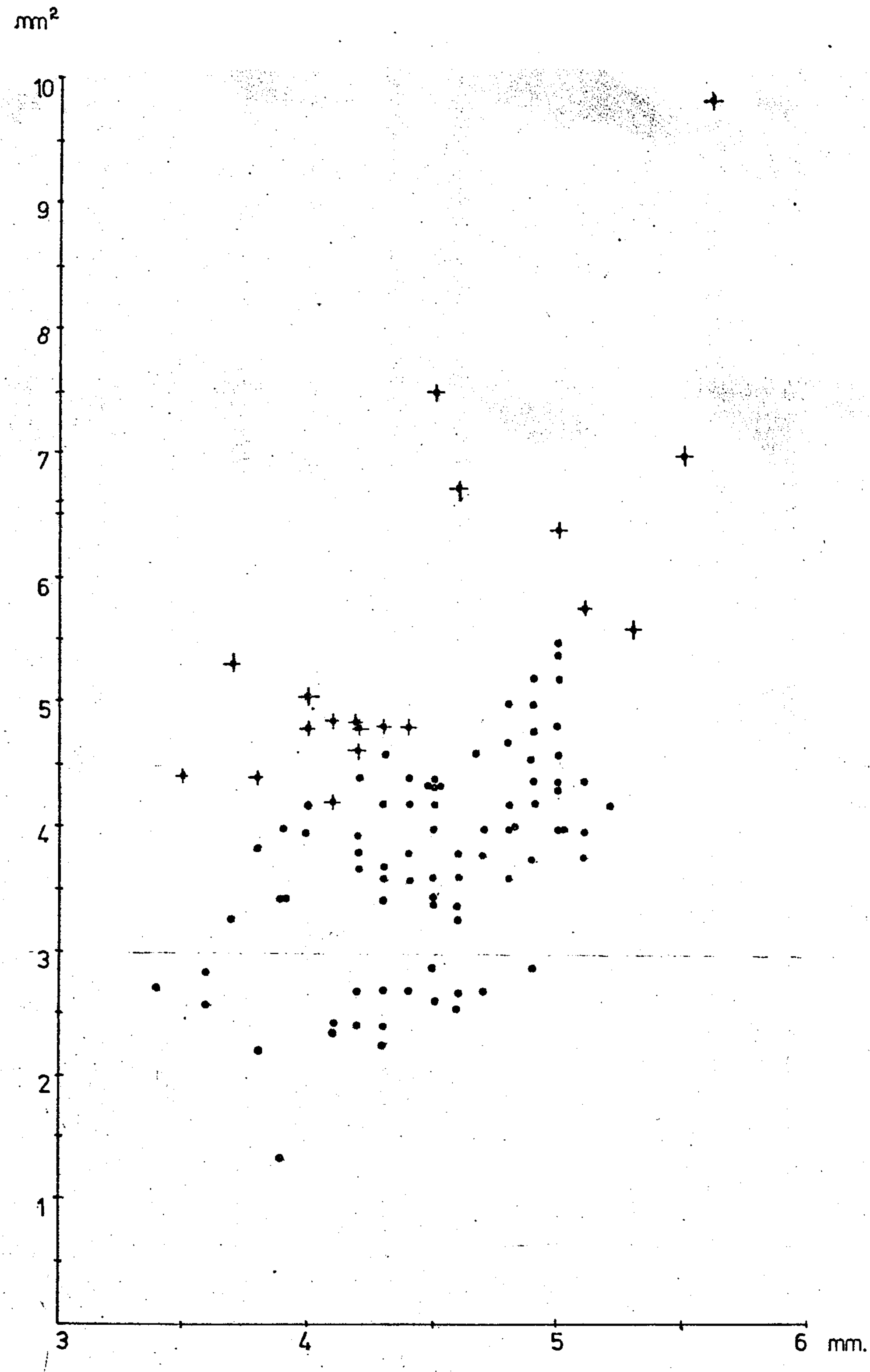



Figure 6.11.2; Scatter diagram to show breadth x thickness ($mm^2$) against length (mm) of wheat grains from sample 950. Crosses represent bread wheat grains, dots emmer grains. 100 grains are included overall.

Sample 6 from 'Curry's Pottery Shop' is most unusual. Although it consists mainly of coriander 'seeds' it also contains seeds of no less than 8 other cultivated plants - herbs, flavourings, cereals, and legumes - together with the remains of a sack. During the 19th century coriander was sown with caraways, but being an annual was gathered in the first year, leaving the caraways in the ground. The crop was cut with sickles and thrashed out on a cloth in the field (Ridley 1912, 384). This method of cultivation could clearly lead to heavy contamination with fruits of other Umbellifers, as in this sample, but even if it is assumed that some similar cultivation method was used in Roman times one is still left with the presence of the seeds of legumes, cereal grains and chaff to explain.

However, the building in which this sample was found has been interpreted as a shop dealing in imported pottery. It seems possible, therefore, that the presence of such a wide range of crop plants, (which also includes figs and stone pine kernels,) can be explained if the proprietor was also selling fruits and seeds for consumption or sowing. In this case sample 6 can be seen as the product of the mixing of a sack of coriander and its weeds with spillage from other crops on the floor of the shop during the fire which destroyed the town in AD 60.

## 6.12 Storage

The examination of carbonised deposits from storage contexts can give information about the nature of the stored crop and its purity and condition. It should be possible to establish whether crops were stored on the ear, or threshed, and whether different cereals were mixed for storage. In addition the presence of potentially nutritious or injurious weed seeds and of fungi and other pests may be of importance from a dietary and pathological point of view. Before discussing such carbonised deposits themselves, however, it is necessary to review the contexts within which they occur.

The large bell-shaped, barrel-shaped and cylindrical pits which are characteristic of Iron Age settlements throughout the Lowland zone (Piggott 1958; Ritchie 1969), have been generally interpreted as storage pits since the early 1940's, when Bersu published his account of the excavations at Little Woodbury, Wilts. (1940, 50). The evidence for such an interpretation was originally derived partly from anthropological parallels, and partly from historical sources. Storage pits have been used by such diverse cultures as those of the Omaha and Hidatsa Indians of North America, Ancient Egypt and Mediaeval Hungary (Bersu 1940, 60-1; Forde 1934, 256). The use of pits in Iron Age Britain is recorded by Diodorus Siculus (trans. Petrie and Sharpe 1848,ii), and archaeological evidence suggests that the origins of pit storage in this country may be sought in the Neolithic (Field et al 1964).

Bersu's original hypothesis involved the use of pits for the storage of grain intended for consumption, whilst seed was stored in above-ground granaries represented by four-post structures some 2-3 m. square (1940, 97). Recent experimental work has demonstrated, however, that seed grain may successfully be stored underground, and that parched grain intended for consumption is prone to spoilage when stored in pits. This is because it no longer respires and carbon dioxide, which is necessary for preservation, does not build up (Reynolds 1974). Consequently the storage of seed grain in pits would seem more practical, whilst grain for food could have been stored above ground, where it would in addition have been more accessible.

In Hampshire storage pits are found throughout the chalklands with the exception of the very highest parts of the Kingsclere anticline and much of the Eastern High Chalk Region (Perry 1967 Fig. 45). Pits were present at all the Iron Age sites sampled in this study, and in most cases the bulk of the samples of carbonised seeds came from them.

Despite this fact, none of the cereal samples from the Hampshire Iron Age sites can confidently be interpreted as a storage deposit in situ. The principal reason for this is that the fillings of these pits are largely rubbish layers and relate to a secondary use for rubbish disposal once the pit had ceased to be used for storage. The carbonised cereals present in these layers need have nothing to do with the cereals which were originally stored in the pit. Only the very basal layer is at all likely to contain carbonised cereals derived from a stored crop. Reynolds (1974, 128) discusses the need to 'fire' pits before re-use for storage in order to destroy algae and fungi along with the residue from last season's crop which cements itself onto the pit walls. He notes that on one occasion grains of barley which had become attached to the wall were carbonised during an experimental 'firing'. However, there is no way of distinguishing grains carbonised by such means from grains introduced with the first load of refuse to be deposited in the pit.

Certain very large carbonised cereal deposits from outside Hampshire have been taken to represent the remains of stored crops. Examples of such deposits include those from Itford Hill and Fifield Bavant, the former principally of barley and the latter of barley and spelt (Helbaek 1952, 209-211). The deposit of rather similar type from Hascombe, Surrey (above 3.9) was found in a completely anomalous feature - a kidney-shaped rock-cut pit, quite unlike a normal Iron Age storage pit. Rather more convincing as probable storage deposits are the barley and wheat sample found at the base of an abortive storage pit and in association with a storage pot at Weston Wood, Albury, Surrey (Harding 1964) or the grain found with the carbonised remains of a sack at Cow Down, Longbridge Deverell, Wilts. (Annable 1961, 32).

If these deposits are indeed examples of the stored crop, storage in an unwinnowed and possibly unthreshed state, on the ear or in spikelets, seems to be indicated by the presence of relatively large amounts of glumes and internodes. It should be emphasised, however, that these deposits were not necessarily carbonised in situ. One of the principal advantages of pit storage, in fact, is its relative safety from fire.

Reynolds has also suggested that food grain may have been stored above ground in leather-hard, but unfired jars (1974, 124-5), although he produced no published evidence to support this suggestion. It seems possible that cereals stored in such containers might create grain impressions on the inner surface of the clay, and that these might be preserved by accidental burning. However, the few grain impressions observed at Portway were found just as often on the outer surface of a storage jar, or in the body of the fabric, as on the inside. These grains were incorporated into the pot during its making, not during its use for storage. Although the point cannot be proven, it seems more likely that the jars examined at Portway were fired before use. Certainly during the later Iron Age, large, wheel-turned, fired pottery vessels were used for grain storage (Frere 1967, 25).

The focussing of interest upon storage pits and four-post granaries has tended to minimise the possible importance of other forms of storage. In particular ricks, the traditional way of storing wheat awaiting threshing in this country, have been largely ignored (Scott 1955). The Iron Age site of All Canning's Cross, Wilts. contained large oblong areas, roughly paved with tabular pieces of hard chalk, flint and sars ens which may tentatively be interpreted as rick stances. Several were associated with burnt areas, and were thought to be paved yards attached to rectangular houses which were subsequently burnt. Three, at least, stood in isolation. They were around 5m. x 3m. in size (Cunnington 1923, 57ff). The possible use of such storage methods should not be ignored.

The first really large-scale granaries to be built in this country were of military origin. Granaries of Roman forts were typically rectangular buildings up to 40 m. or so long, with thick buttressed walls and raised floors (beneath which air could circulate), supported on posts or on low stone walls (Rickman 1971, 213ff). Civil granaries within towns seem to have been of similar construction, as were examples at villas. The granary of the villa at Ditchley, Oxon., for example, was 12 m. square with two internal sleeper walls and external buttresses (Ralegh-Radford 1936, 46). A further form was the Tower granary, again with a raised floor, as for example at Stroud, Hants. (Applebaum 1972, 175). Needless to say, any reasonably dry, cool room may be used for cereal storage.

In the Roman period, as in the Iron Age, the Hampshire sites examined have failed to produce cereal deposits which may confidently be identified as the remains of stored crops. Turning to other areas, however, a number of such deposits may be distinguished; these are included in Appendix 1. Table 6.12.1 gives details of the better-described deposits of this type.

They are, in general, rather similar in character. One or two main crop species make up the bulk of the deposit. Chaff is a very minor component, or is totally absent. Those few weed seeds and fruits which are present are large forms: Avena spp., (wild oats), Bromus spp. (brome grasses), Anisantha sterilis (barren brome), Agrostemma githago (corn cockle), Galeopsis tetrahit (hemp nettle), Vicia spp. (vetches) and Raphanus raphanistrum (wild radish). Other cultivars commonly occur as minor contaminants. It seems clear that, in general, grain was threshed and winnowed before storage, and the only impurities remaining are large components which the techniques of the day could not remove without discarding excessive amounts of the crop itself.

There are a few deposits which do not fit in with this picture. The 'Isca' grain, for example (Helbaek 1964) was obviously carbonised before winnowing. This deposit was found in what is probably only a temporary store, used whilst the grain awaited further processing. The sample composed mostly of coriander (Sample 6) from 'Curry's Pottery Shop' at Colchester is another unusual deposit. Its composition is perhaps best understood by assuming that some form of mixing has occurred (see above 6.11).

In passing it is worth mentioning a further type of carbonised cereal deposit sometimes found at Roman forts in the north of England. These deposits are extremely large; one from the fort granary at Malton, Yorks., consisting of spelt, emmer and barley was 30 cm. thick, though of unspecified area (Arthur 1972); a second from the front of the granary of the fort of Ambleside, consisting of 'wheat' was about 8 m. x 2 m. x 8 cm. (Collingwood 1921) and a third from outside the fort at Papcastle, Cumberland, again of 'wheat', was 12m. x 2m. x 0.7m. (Irwin 1924). These were obviously produced by the deliberate or accidental burning of the contents of the fort granaries. It is a pity that such deposits have not been fully described in a published account; it would be interesting to know the form in which cereals were supplied to the army.

Having considered the composition of the stored crop, we may turn to discuss very briefly its condition. Sprouted cereals, which indicate that crops were stored in damp and warm conditions, are only occasionally found. Helbaek reports finding germinated grain at St. Alban's and Caerleon (1952, 213; 1964, 159). He interprets the latter deposit, however, as reflecting purposeful germination of grain during brewing. A few sprouted grains of a species of wheat, probably spelt, were also recovered at Owslebury (Fig. 3.2.1d). In general, however, the widespread practice of grain drying in both the Iron Age and the Roman period could prevent germination in storage by killing the grain. Thus the rarity of sprouted specimens need not necessarily imply that a high standard of storage conditions was commonplace.

| Site | Context | Container? | Published in | Principal crop(s) | Chaff | Other impurities |
|---|---|---|---|---|---|---|
| Curry's, Colchester (Sample 6) | Room in shop | Sack | Above 3.10 | Coriander | + | +++ |
| Cups Hotel, Colchester (Sample 950) | Room in house | – | Above 3.10 | Bread wheat Emmer | – | + |
| Cups Hotel, Colchester (Sample 957) | Room in house | – | Above 3.10 | Flax | – | + |
| Shipham, Somerset | Room in villa | – | Barton, 1963 | Naked barley | – | + |
| Wilcote, Oxon. | Room in villa | – | Brodribb et al 1968, 109 | Spelt | + | + |
| Fishbourne, Hants. | Room in 'palace' | Jar | Greig 1970, 376 | Lathyrus sp. | – | – |
| Colchester, Essex | Room in house | – | Dunnett 1966 | Wheat | – | – |
| Frocester Ct, Gloucs. | Room in villa | – | Clarke, H.H. 1970 | Barley Spelt Bread wheat | – | + |
| St. Alban's, Herts. | Granary | – | Helbaek 1952 | Spelt, Rye, Barley | ++ | +++ |
| Caerleon, Wales | Wooden hut | – | Helbaek 1964 | Spelt Rye | +++ | +++ |
| Chalk, Gravesend, Kent | Cellar of building | Jar | Arthur & Metcalfe, 1972 | Spelt Barley | – | + |
| N. Leigh, Oxon. | Room in villa | – | Morrison, 1959 | Spelt, Emmer Barley | + | + |

Table 6.12.1; Granary deposits from Roman buildings.

Insect pests and fungal sclerotia are strangely absent from published accounts of carbonised cereal deposits from both periods. They certainly must have occurred, and one must assume that they are generally poorly preserved, or have not been recognised.

Other forms of impurity reported in Iron Age and Roman crops are mostly innocuous. There are exceptions to this, though; Hyoscyamus niger, whose seeds occur in carbonised cereal deposits from Owslebury, Portway and R27 produces three poisonous alkaloids - hyoscine, hyoscyamine and atropine. Agrostemma githago, a very common contaminant of cereals in the past, occurs in several of the carbonised cereal deposits of Roman date from Hampshire. Its seeds contain toxins known as saponins which have haemolytic properties (Forsyth 1968, 47 and 87).

## 6.13 The Farming Year

By way of concluding this chapter it may be useful to draw together the activities which have been examined in the form of a model farmer's year. This is likely to have been similar in both the Iron Age and Roman periods on the chalklands, despite the differences between the two periods. Superior forms of tools were available in the Roman period, and corn-dryers and storage facilities were more elaborate. Several new field crops were available in the later period and there were major changes in the proportions of the different crops produced. These changes are, however, changes of degree. In both periods, as is discussed above (5.3) winter and spring crops appear to have been cultivated, and this in itself dictates to a large extent the timing of farming operations throughout the year. The new tools and processing facilities almost certainly made arable farming more efficient, but none of them can be said to have altered the essential nature of farming in this area.

The combination of spring and winter crops is important from the point of view of an even distribution of labour, and has been seen as a deliberate intensification of agriculture in the Iron Age as a response to population increase (Bradley 1971, 79). Sanders (1943, 12) notes that labour demands for winter wheat production are greatest in the autumn, when the seed bed is being prepared and the crop sown, and again in the harvest month of August. More cultivations are needed for spring barley, but it is spread out over a longer period, including times of relative inactivity so far as the wheat crop is concerned. Only during the harvest do the demands of the two crops coincide. The complementary nature of spring and winter crops becomes more apparent when a possible reconstruction of the yearly cycle is examined. The reconstruction outlined here is derived from accounts of more modern farming given by Vancouver (1810), Percival (1934), Green (1940), Sanders (1943), Fussell (1952) and upon the accounts of the Roman agricultural writers (White 1970), besides the archaeological and botanical information discussed more fully in the earlier sections of this chapter.

Winter cereals of all kinds would have been sown during the months of September and October, possibly on land fallowed for the previous year. Sowing would have been by broadcast, and pure crops, as opposed to mixed or maslin crops, were normally sown. The seed would subsequently have been harrowed in, using branches from trees or specially constructed rakes and harrows. Wild nuts and fruit would have been gathered and processed for storage at this time of year in the Iron Age, and the harvest of the orchard would in addition have been similarly treated in the Roman period.

For much of the winter there was relatively little field work to be done, although the main ploughing of the fields meant for the spring sowing would probably have been done in December. In this otherwise quiet time of the year maintenance work such as hedging, ditching and drainage was done in historical times and the harvest of the preceding August was processed. In the Iron Age and Roman periods it was presumably during the winter that the hulled wheats were dried and all cereals were threshed and winnowed. At this time, too, a portion of the harvest would have been sealed, undried, in storage pits as seed corn in the Iron Age. The stock at this time of year in prehistory would have been folded on the fallow stubbles and probably fed supplementary fodder in the form of hay, silage, straw, vetches or grain. During the Roman period, and possibly earlier, stalling would have been more usual.

In February the first ploughing of last year's wheat stubble in the fallow fields would have been done, and the spring crop fields would have undergone further cultivations. Sowing of spring crops - barley, oats and most legumes - could have begun as early as this month, although early March would perhaps have been a more normal date. By March the winter crops would have been growing well but to discourage excessive leafy growth and to encourage tillering sheep could have been folded on the crop. In the following summer months the flocks could be grazed on the meadows of the river valleys or on the open Down. Weeding of all the cereal crops would have been done between March and July - if it was done at all. Meanwhile throughout the summer months the fallow fields may have received further ploughings, in the Roman period at least. The nature of fallowing and the treatment of the fallow fields in the Iron Age is still rather uncertain.

The cereal harvest itself was probably in August. As has been mentioned above any one of a number of harvesting techniques may have been used. If the culms were cut low the sheaves were presumably stooked before permanent storage, but cutting just below the ear would necessitate the gathering of the ears immediately. A portion of the harvested crop would have been threshed immediately for that year's autumn sowing, or alternatively the seed corn might have been derived from the previous year's harvest.

As a reconstruction this account no doubt suffers from the need to project historical and recent farming methods back into prehistory and early history. The precise timing of operations is certainly arguable. However the general validity of such a calendar seems indisputable, and does serve to place the otherwise isolated activities reviewed above within some context. In the absence of surviving peasant communities in comparable areas any such attempt at reconstruction must rest heavily on historical analogy.

# CHAPTER 7. AGRARIAN CHANGE ON THE HAMPSHIRE CHALKLANDS: 800 BC - 400 AD.

The 432 dated samples, containing plant remains, from the ten Hampshire sites included in this study, range in date from the 8th or 7th century BC to the 4th century AD. From this body of data it is possible to attempt to reconstruct the changes in importance of crops through time, and to follow the introduction of new species within the Hampshire area. This chapter presents such a reconstruction. It falls naturally into three parts. Firstly the data from all sites is presented in a uniform and comparable manner so as to follow the changing proportions of crop plants in samples of different dates. Secondly the reliability of these samples in representing the true relative proportions of crops originally grown is discussed. Finally possible causes for change are examined in the light of environmental, agricultural and economic factors, at both a local and 'national' level.

## 7.1 Methods of data presentation

In a recent paper Hubbard (1975) has discussed two methods of quantifying and synthesising palaeobotanical data. As these methods are to an extent complementary and as neither has as yet been generally accepted, both are used here.

The first method, which may be termed 'Dominance' analysis was first used by Renfrew (1972, 276). The method is to determine the frequency with which each crop occurs as the numerically dominant component of samples, and to express this frequency as a percentage of the total number of samples in each site phase. The importance of a crop in the economy as a whole is considered to be reflected by the percentage of samples in which that crop is 'dominant'. This method is clearly of greatest use when considering the major crops; minor types such as fruits and herbs will tend to be under-estimated, and sometimes not represented at all where they occur in small numbers.

A second method is 'Presence' analysis. Species are simply scored as 'present' or 'absent' in each sample, irrespective of the number of specimens, and the frequency with which each species occurs is expressed as a percentage of the total number of samples in the site phase under consideration. The percentage presence of a given crop species can vary between 0% and 100%, but the frequency presence of one crop does not directly affect that of any other. There is therefore no need for the total percentages of all crops to add up to 100%, as in 'Dominance' analysis.

This 'Presence' analysis has certain advantages. Minor components are given due emphasis, and the 'crude' nature of quantification means that data of uneven quality and nature may reliably be drawn together. On the other hand 'Presence' analysis can mask changes, since single seeds and large deposits would be given equal emphasis. Neither method is perfect, but taken together the two approaches should give a good picture of the changing importance of different crops. In practice, so far as the main cereal crops are concerned, a rather similar picture is obtained from the two methods.

A single practical point may be mentioned here. In the calculation of 'Dominance' percentages the dominant species of the samples may, for one reason or another, not be apparent. For example in small samples there may be equal numbers of wheat and barley grains, or alternatively no identifiable crop plant may be present. Such samples make up the component labelled 'Other' in Tables 7.2.1 - 7.2.5. Only cultivated plants and wild fruits which were almost certainly exploited have been considered in the following analyses.

## 7.2 <u>The analysis</u>

'Dominance' and 'presence' analyses of all samples from the Hampshire sites are presented in Tables 7.2.1. - 7.2.5. In the case of the two sites with several phases - Portway and Owslebury - these percentages are also presented diagrammatically in Figs. 7.2.1 and 7.2.2. The data from all sites is combined in a synthetic form in Tables 7.2.5 and Fig. 7.2.3. In the overall 'Dominance' analysis presented in Table 7.2.5, the so-called 'Other' component is not included in the calculation.

Seven major phases between the earliest Iron Age samples and the latest Roman are distinguished in this final synthesis, and these are discussed in turn below. The chronology of the Hampshire Iron Age and the phasing of the sites examined, upon which these 7 phases are based, is outlined above (1.5). As this chronology is in a provisional state at present, cross-dating between sites is rather difficult to establish with confidence, and consequently phases are not sharply divided. For example the 'Late Iron Age' phase mentioned below includes the very latest saucepan pots of the 1st century BC, as at site R27, as well as pottery influenced by Gallo-Belgic forms of the 1st century AD, at Portway. A greater degree of precision in dating would be possible in some cases, but this would increase the total number of phases and thus subdivide the samples so that fewer would be present in each phase. The results would thus be less statistically reliable. In order to ensure that a reasonable number of samples is included within each phase this less precise dating has been preferred.

1. Early All Canning's Cross, Phase. 8th-7th century BC.

Of the Hampshire Iron Age sites examined this earliest Iron Age ceramic group occurred only at Old Down Farm, from which 17 samples containing carbonised fruits and seeds were recovered. By comparison with later phases this is a small number of samples. However there is no doubt that wheats are the most numerous crops represented. Barley is present in only 3 (18%) of the samples and wheats in 12 (71%). Wheat species are always the dominant crops. Although preservation is poor, spelt, Triticum spelta is the most frequently identified wheat species but emmer, Triticum dicoccum, is present in 2 (12%) of the samples. Free-threshing bread- and club wheats are absent. Legumes and wild fruits are not represented. // Throughout this discussion it should be remembered that 100% separation of spelt and emmer is at present impossible. This problem has been discussed in Chapter 3, where it was emphasised that the identifications made on the basis of grain morphology alone are to some degree tentative. Even the distinction between the spikelet parts of the two species is not as clear-cut as one would wish. In qualitative terms there is absolutely no doubt that spelt is more important, often much more important, than emmer throughout; however the percentages for spelt and emmer in Tables 7.2.1 - 7.2.5 are inevitably based partly upon tentative identifications.

2. All Canning's Cross - Meon Hill, Phase. 5th-3rd century BC.

This second ceramic group is once again represented at only one site: in the 'Early' phase at Portway, from which 49 samples of plant remains were recovered. A very similar picture to that given by the 8th century samples from Old Down is apparent. Wheats are present in 80% of the samples and barley in 39%. Wheats are the dominant crop in 80% of samples, and barley is dominant in only 2%. Spelt is again the commonest wheat, accompanied by emmer, but bread and club wheats are absent. Large vetches, possibly cultivated, appear in 6% of samples, but no other legumes are present. Elderberries, Sambucus nigra, are found in 4% of the samples.

3. Saucepan pot Phase. 3rd - 1st century BC.

Two sites - Portway and Owslebury - have produced samples of plant remains contemporary with 3rd and 2nd century BC saucepan pots. At Portway the 22 samples contained material very similar in nature to the preceding 5th - 3rd century phase at that site. Wheats are present in 73% of samples, and dominant in 77%, whilst barley, though present in 27% is the dominant crop in only 5%. Spelt is again the dominant species of wheat, with emmer second. Grains of bread wheat appear for the first time in this phase, but are present in only 5% of samples.

The 'saucepan' pot phase at Owslebury may be divided into two parts, spanning the 3rd and 2nd centuries BC respectively. Samples from both of these phases show interesting contrasts with the roughly contemporary samples at Portway. Hulled, six-row barley, Hordeum vulgare is dominant in 25% and 52% of samples from the two phases, whilst wheats - mostly spelt with some emmer - are dominant in only 25% and 24% respectively. Oats, probably wild oats, Avena fatua, are common. A sample from the 2nd century BC phase produced a single poorly-preserved grain which has been tentatively identified as of rye. Beans, Vicia faba var. minor, are present for the first time in Hampshire, in 6% and 4% respectively of the 3rd and 2nd century BC samples.

The contrast between these two sites is discussed further below.

4. Late Iron Age. 1st century BC - 1st century AD.

This period, by chance, is the best represented. 192 samples from five sites are available. At Portway and Owslebury the pattern visible in the preceding phases continues through into this one. In the 'Late' phase at Portway, which dates to the 1st century AD, spelt remains the most important crop, although barley increases somewhat in importance to be dominant in 22% of samples. At Owslebury barley remains the most frequently present crop (83%) and the dominant species (55%). Bread wheat appears for the first time at this site, but is present in only 4% of samples. However the seven 1st century AD samples from site R1, Stratton Park, show that free-threshing wheats were grown as crops in their own right despite their rarity in samples from roughly contemporary settlement sites. Bread or club wheats are the dominant species in 6 of these 7 samples. The picture at R27, Micheldever Wood, a 1st century BC site, resembles that at the Late phase at Portway.

Wheats are dominant in 70% of the samples, whilst barley is dominant in only 19%. As usual spelt is the main wheat species, with a little emmer and a few grains of bread wheat. The only legumes are large vetches, present in 3% of samples. Seeds probably of the opium poppy, Papaver somniferum, an interesting new crop plant, are present in 3% of samples. They may merely be contaminants of cereal crops, however. There are also a few samples of Late Iron Age date from Old Down Farm. Wheats are the only crops represented, and only spelt could definitely be established.

5. Early Roman. AD 50 - 100.

Most of the 38 samples from this period come from Owslebury. As might be expected, there is no dramatic change from the Late Iron Age, although there is a clear trend in favour of wheats. For the first time wheats are present more frequently than barley at Owslebury (74% as against 70%) and are also dominant more frequently (55%, 30%). Bread wheat appears as a common component for the first time, being present in 22% of samples, although spelt remains the principal wheat. Rye and oats, probably wild oats, continue to be present in small amounts, but are never important components of deposits.

The remaining 11 samples are from Cathedral Green and Brook Street, Winchester, and contain mostly waterlogged material. The only cultivated plants present in these samples are T. spelta and P. somniferum both of which were known in the Late Iron Age.

6. Mid-Roman. AD 100 - 250.

The same three sites produced samples of this date, but only 25 samples in total, 20 of which are from Owslebury. They show barley recovering its former importance. It is dominant in 55% of samples at that site, whilst wheats are dominant in only 30%. Spelt is still the main wheat crop, with some emmer and bread wheat, Rye is found frequently for the first time; it is present in 20% of samples from Owslebury of this date.

The small number of samples from this period means that the proportions of crops indicated may be less reliable than at other periods, due to the possibility of greater sampling error.

The samples from Winchester have produced a wide range of introduced crops which occur at low frequencies. These are listed in Table 7.2.4.

7. Late Roman. AD 250 - 400.

48 samples from five sites were available from this phase. The principal feature is an increase in the importance of wheats at the expense of barley. At Owslebury wheats are dominant in 74% of samples, whilst barley is dominant in only 11%. Spelt, as usual, is the main wheat, although both emmer and bread wheat are found. Oats and rye continue to be represented. Peas and beans are present in a total of 12% of samples. The samples from Crookhorn Farm also show a predominance of spelt, and an unidentified wheat, probably spelt, is the main crop represented at Portchester Castle.

The waterlogged samples from Neatham demonstrate that much the same range of fruits and nuts was being cultivated as in the earlier Roman periods. Figs and grapes, present in the Mid-Roman samples from Winchester are absent at Neatham, however, but the walnut makes its first appearance in these later samples at both Winchester and Neatham. The stone pine is another novelty in the 3rd century samples from Winchester.

In summary, then, one may distinguish a number of broad trends and some geographical variation. Firstly there are the sites of Old Down Farm, Portway and R27, at which spelt is the main cereal species represented throughout the Iron Age. Emmer, and after the 3rd century BC, bread wheat, are also present. Six row hulled barley is present throughout, but is less frequently dominant. Legumes, other than a few vetches, are absent. By contrast, at Owslebury barley is the dominant species from the earliest phase of the site, and only after the Roman invasion does spelt become more important in the samples. By the 4th century AD it is the main crop represented, and this trend towards spelt is also seen in the composition of late Roman deposits from Crookhorn and Portchester. Beans and vetches are represented in most of the Iron Age phases at Owslebury.

Rye and oats occur as minor crops. Rye is found in a single 2nd century BC sample at Owslebury, and disappears until the Roman period. After the 1st century AD it occurs in up to 20% of samples. Oats, also present in a few pre-Roman samples only becomes fairly common in samples from the 1st century AD onwards. Poor preservation makes it difficult to be sure that cultivated oats are represented, however.

The waterlogged samples from Neatham and Winchester indicate the range of fruits, nuts and herbs cultivated during the Roman period.

These general trends are summarised in Table 7.2.5 and illustrated in Fig. 7.2.3.

| | Site phase | | | | | |
|---|---|---|---|---|---|---|
| | I | | II | | III | IV |
| | 3rd c. BC | 2nd c. BC | 100BC -50AD | 50AD- 100AD | 100- 250AD | 250- 400AD |
| Triticum spp. | 63% | 76% | 74% | 74% | 85% | 92% |
| T. spelta | 44 | 36 | 39 | 55 | 45 | 81 |
| T. dicoccum | 19 | 28 | 17 | 15 | 15 | 33 |
| T. aestivum s.l. | 0 | 0 | 4 | 22 | 5 | 22 |
| Hordeum spp. | 63 | 84 | 83 | 70 | 80 | 74 |
| Avena spp. | 19 | 0 | 13 | 15 | 15 | 26 |
| Secale cereale | 0 | 4 | 0 | 8 | 20 | 15 |
| Vicia faba | 6 | 4 | 9 | 0 | 0 | 4 |
| Vicia (1) | 0 | 12 | 21 | 0 | 5 | 4 |
| Pisum sativum | 0 | 0 | 0 | 0 | 0 | 8 |
| Corylus avellana | 0 | 0 | 4 | 0 | 0 | 0 |
| Prunus sp. | 0 | 0 | 0 | 0 | 0 | 4 |
| Pyrus sp. | 0 | 0 | 0 | 0 | 0 | 7 |
| Sambucus nigra | 0 | 0 | 0 | 0 | 5 | 0 |
| No. of samples | 16 | 25 | 23 | 27 | 20 | 27 |

Presence analysis

| | Site phase | | | | | |
|---|---|---|---|---|---|---|
| | I | | II | | III | IV |
| Triticum spp. | 25% | 24% | 27% | 55% | 30% | 74% |
| T. spelta | 12 | 8 | 18 | 44 | 25 | 48 |
| T. dicoccum | 0 | 8 | 0 | 0 | 0 | 0 |
| Hordeum spp. | 25 | 52 | 55 | 30 | 55 | 11 |
| Vicia faba | 0 | 4 | 0 | 0 | 0 | 0 |
| Pyrus | 0 | 0 | 0 | 0 | 0 | 7.5 |
| Other | 50 | 20 | 18 | 15 | 15 | 7.5 |
| No. of samples | 16 | 25 | 23 | 27 | 20 | 27 |

Dominance analysis

Table 7.2.1; Dominance and presence analyses of samples from Owslebury.
These figures are shown diagrammatically in Fig. 7.2.1.

The following conventions and abbreviations are used in Tables 7.2.1 - 7.2.5.

Triticum spp.; All wheats, including spelt, emmer, bread wheat and wheat grains not identified to species. Presence and dominance frequencies for the three species separately are also indicated.

continued.....

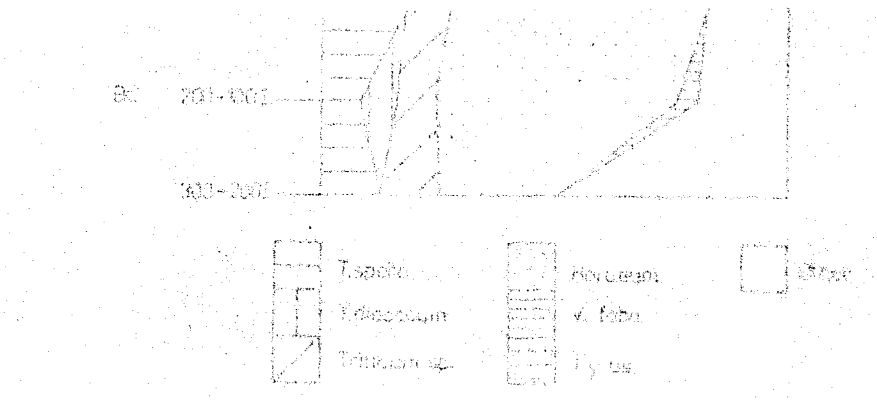
| | |
|---|---|
| *Hordeum* spp.; | All barleys, hulled, naked and indeterminate. |
| *Vicia* sp.(1); | Large vetches, probably *V. sativa* or *V. angustifolia*. |
| Other; | Samples in which no one species is dominant, or in which there are no cultivated plants, merely weed seeds. |

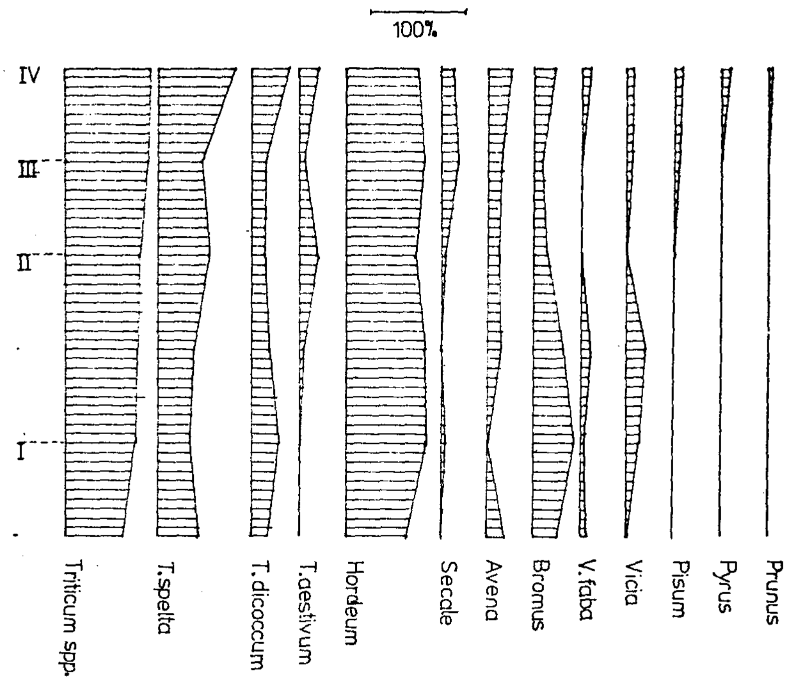
In each column the percentage frequencies of dominance or of presence for each species are indicated. At the foot of every column the number of samples in that particular site phase is recorded.

As mentioned above the percentages of presence need not add up to 100%. Dominance percentages do, however. For example, in the dominance analysis for phase IV above one has

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 74% | + | 11% | + | 7.5% | + | 7.5% | = | 100% |
| *Triticum* | | *Hordeum* | | *Pyrus* | | *Other* | | |

It should be noted that the 48% *T. spelta* is not included in this addition, as it is already included in the figure for *Triticum* spp. i.e. the 74% *Triticum* spp. in this case consists of 26% *Triticum* sp. (unidentified wheat) and 48% *T. spelta*.





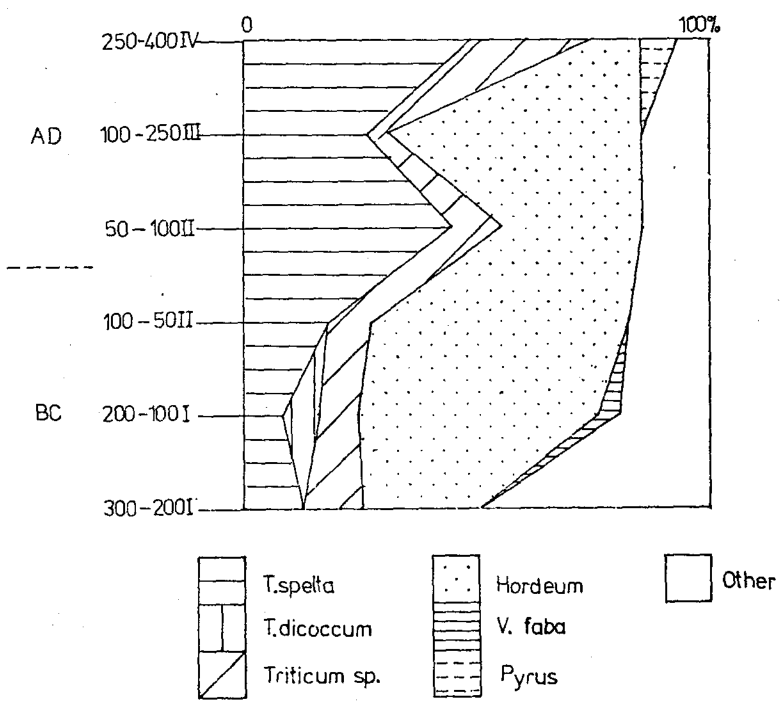




Figure 7.2.1. Owslebury: 'Presence' (a) and 'Dominance' (b) diagrams.
These diagrams are based on the percentages given in Table 7.2.1.
The site phases are as follows;
1. 3rd. c. B.C.- 2nd. c. B.C. 3. 100 - 250 A.D.
2. 100 B.C.- 100A.D. 4. 250 - 400 A.D.

| | Site Phase | | |
|---|---|---|---|
| | Early | Middle | Late |
| | 5th-3rd c. BC | 3rd-1st c. BC | 1st c. AD |
| *Triticum spp.* | 80% | 73% | 50% |
| *T. spelta* | 59 | 68 | 33 |
| *T. dicoccum* | 37 | 0 | 11 |
| *T. aestivum* | 0 | 5 | 0 |
| *Hordeum* spp. | 39 | 27 | 44 |
| *Vicia* (1) | 6 | | 5 |
| No. of samples | 49 | 22 | 18 |

Presence analysis

| | Site Phase | | |
|---|---|---|---|
| | Early | Middle | Late |
| *Triticum* spp. | 80% | 77% | 45% |
| *T. spelta* | 59 | 73 | 28 |
| *T. dicoccum* | 2 | 0 | 11 |
| *Hordeum* spp. | 2 | 5 | 22 |
| Other | 18 | 18 | 33 |
| No. of samples | 49 | 22 | 18 |

Dominance analysis

Table 7.2.2; Dominance and presence analyses of samples from Portway.
For explanation of conventions and abbreviations see Table 7.2.1.

These figures are shown diagrammatically in Fig. 7.2.2.

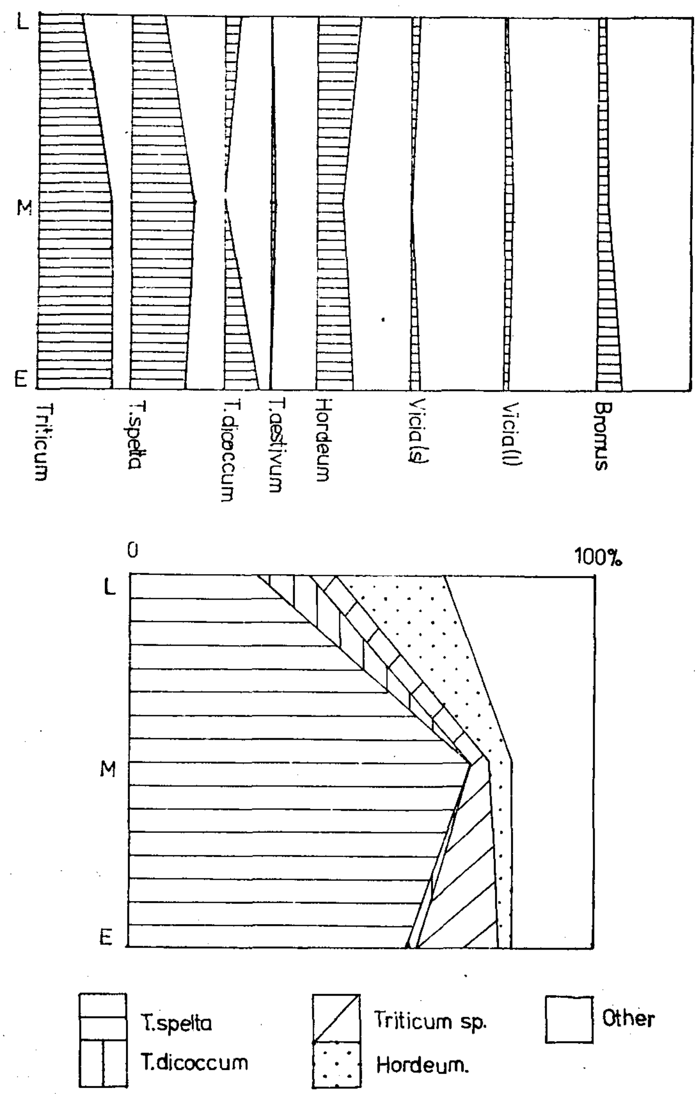



Figure 7.2.2. Portway: 'Presence' (a) and 'Dominance' (b) diagrams.
Based on the percentages given in Table 7.2.2.
The site phases are as follows:
E. Early. 5th. - 3rd. c. B.C.
M. Middle. 3rd. - 1st. c. B.C.
L. Late. 1st. c. A.D.

| | Sites | | | | | |
|---|---|---|---|---|---|---|
| | Old Down Farm | | R27 | R1 | Crook-horn | Port-chester |
| | 8th c.BC | Late IA | | | | |
| *Triticum* spp. | 12 | 3 | 109 | 6 | 4 | 5 |
| *T. spelta* | 5 | 2 | 55 | 0 | 3 | 0 |
| *T. dicoccum* | 2 | 0 | 14 | 0 | 1 | 0 |
| *T. aestivum* s.l. | 0 | 0 | 3 | 6 | 0 | 0 |
| *Hordeum* spp. | 3 | 0 | 70 | 5 | 1 | 4 |
| *Avena* spp. | 0 | 0 | 3 | 0 | 1 | 2 |
| *Vicia* sp. (1) | 0 | 0 | 5 | 0 | 0 | 0 |
| *Sambucus nigra* | 0 | 0 | 3 | 0 | 0 | 0 |
| *Rosa* sp. | 0 | 0 | 1 | 0 | 0 | 0 |
| *Prunus* sp. | 0 | 0 | 1 | 0 | 0 | 0 |
| *Papaver somniferum* | 0 | 0 | 3 | 0 | 0 | 0 |
| No. of samples | 17 | 3 | 141 | 7 | 4 | 6 |

Presence analysis

| | Old Down Farm | | R27 | R1 | Crook-horn | Port-chester |
|---|---|---|---|---|---|---|
| | 8th c.BC | Late IA | | | | |
| *Triticum* spp. | 11 | 3 | 99 | 6 | 4 | 5 |
| *T. spelta* | 4 | 2 | 31 | 0 | 3 | 0 |
| *T. dicoccum* | 2 | 0 | 1 | 0 | 0 | 0 |
| *T. aestivum* s.l. | 0 | 0 | 0 | 6 | 0 | 0 |
| *Hordeum* spp. | 0 | 0 | 27 | 0 | 0 | 1 |
| Other | 6 | 0 | 15 | 1 | 0 | 0 |
| No. of samples | 17 | 3 | 141 | 7 | 4 | 6 |

Dominance analysis

Table 7.2.3; Presence and dominance analyses for samples from sites with one or few phases. Carbonised material only.
Percentages have not been calculated, as the number of samples is usually too small to make this worthwhile.

| | Cathedral Green | | Brook Street | | Cathedral Car Park | Neatham |
|---|---|---|---|---|---|---|
| | 1st c. AD | 2nd c. AD | 1st c. AD | 2nd c. AD | 3rd c.AD | 3rd-4th c. AD |
| Malus sylvestris | 0 | 0 | 0 | 3 | 0 | 4 |
| Rubus fructicosus | 0 | 0 | 0 | 2 | 0 | 8 |
| Rubus idaeus | 0 | 0 | 0 | 1 | 0 | 0 |
| Prunus spinosa | 0 | 0 | 0 | 3 | 0 | 7 |
| Prunus insititia | 0 | 0 | 0 | 1 | 0 | 5 |
| Prunus domestica | 0 | 0 | 0 | 1 | 0 | 4 |
| Prunus avium | 0 | 0 | 0 | 3 | 0 | 5 |
| Coriandrum sativum | 0 | 0 | 0 | 1 | 0 | 1 |
| Sambucus nigra | 7 | 1 | 0 | 3 | 0 | 1 |
| Corylus avellana | 0 | 0 | 1 | 1 | 0 | 3 |
| Vitis vinifera | 0 | 0 | 0 | 1 | 0 | 0 |
| Ficus carica | 0 | 0 | 0 | 1 | 0 | 0 |
| Rosa sp. | 0 | 0 | 0 | 0 | 0 | 4 |
| Crataegus monogyna | 0 | 0 | 0 | 0 | 0 | 5 |
| Vaccinium myrtillus | 0 | 0 | 0 | 0 | 0 | 7 |
| Juglans regia | 0 | 0 | 0 | 0 | 1 | 1 |
| Papaver somniferum | 4 | 2 | 0 | 0 | 0 | 0 |
| Triticum spelta | 1 | 0 | 0 | 0 | 0 | 0 |
| Pinus pinea | 0 | 0 | 0 | 0 | 2 | |
| No. of samples | 10 | 2 | 1 | 3 | 3 | 8 |

Table 7.2.4; Presence analyses of waterlogged samples from Winchester and Neatham.

Percentages have not been calculated as the number of samples is too small to make this worthwhile. The figures given above are simply numbers of samples.

| | Phase | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| *Triticum* spp. | 71% | 80% | 71% | 72% | 55% | 68% | 76% |
| *T. spelta* | 29 | 59 | 49 | 36 | 42 | 36 | 55 |
| *T. dicoccum* | 12 | 37 | 16 | 11 | 11 | 12 | 23 |
| *T. aestivum s.l.* | 0 | 0 | 2 | 5 | 15 | 4 | 13 |
| *Hordeum* spp. | 18 | 39 | 59 | 53 | 50 | 64 | 53 |
| *H. vulgare nudum* | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| *Avena* spp. | 0 | 0 | 5 | 3 | 10 | 12 | 22 |
| *Secale cereale* | 0 | 0 | 2 | 0 | 5 | 16 | 9 |
| *Vicia* sp. (1) | 0 | 6 | 5 | 6 | 0 | 4 | 2 |
| *Vicia faba* | 0 | 0 | 3 | 1 | 0 | 0 | 2 |
| *Pisum sativum* | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| *Sambucus nigra* | 0 | 4 | 0 | 2 | 18 | 12 | 2 |
| *Malus sylvestris* | 0 | 0 | 0 | 0 | 0 | 12 | 9 |
| *Rubus fructicosus* | 0 | 0 | 0 | 0 | 0 | 8 | 18 |
| *Rubus idaeus* | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| *Prunus spinosa* | 0 | 0 | 0 | 0 | 0 | 12 | 16 |
| *Prunus insititia* | 0 | 0 | 0 | 0 | 0 | 4 | 11 |
| *Prunus domestica* | 0 | 0 | 0 | 0 | 0 | 4 | 9 |
| *Prunus avium* | 0 | 0 | 0 | 1 | 0 | 4 | 11 |
| *Rosa* sp. | 0 | 0 | 0 | 1 | 0 | 0 | 9 |
| *Crataegus monogyna* | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| *Vaccinium myrtillus* | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| *Ficus carica* | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| *Vitis vinifera* | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| *Corylus avellana* | 0 | 0 | 0 | 1 | 3 | 12 | 7 |
| *Juglans regia* | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| *Papaver somniferum* | 0 | 0 | 0 | 2 | 10 | 8 | 0 |
| *Coriandrum sativum* | 0 | 0 | 0 | 0 | 0 | 4 | 2 |
| *Pinus pinea* | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| No. of samples | 17 | 49 | 63 | 192 | 38 | 25 | 45 |

<u>Presence analysis</u>

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| *Triticum spp.* | 100% | 97% | 60% | 73% | 67% | 35% | 88% |
| *T. spelta* | 36 | 72 | 40 | 25 | 54 | 29 | 79 |
| *T. dicoccum* | 12 | 2 | 4 | 2 | 0 | 0 | 0 |
| *T. aestivum s.l.* | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| *Hordeum spp.* | 0 | 3 | 40 | 27 | 33 | 65 | 12 |
| No. of samples | 12 | 40 | 45 | 166 | 24 | 17 | 33 |

<u>Dominance analysis</u>

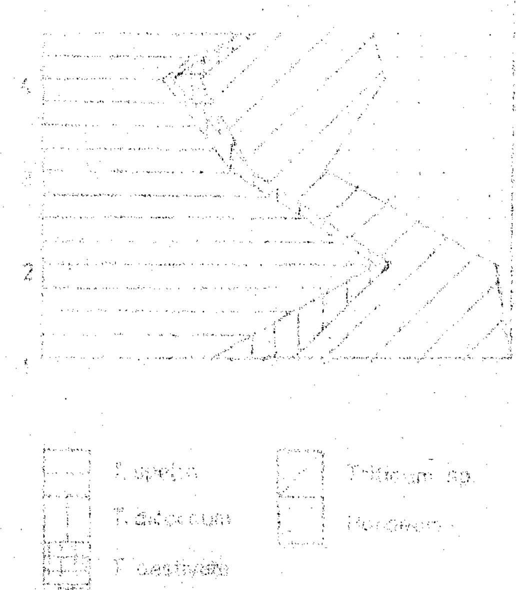
<u>Table 7.2.5</u>; Presence and dominance analyses of samples from all Hampshire sites studied. These figures are shown diagrammatically in Fig. 7.2.3.

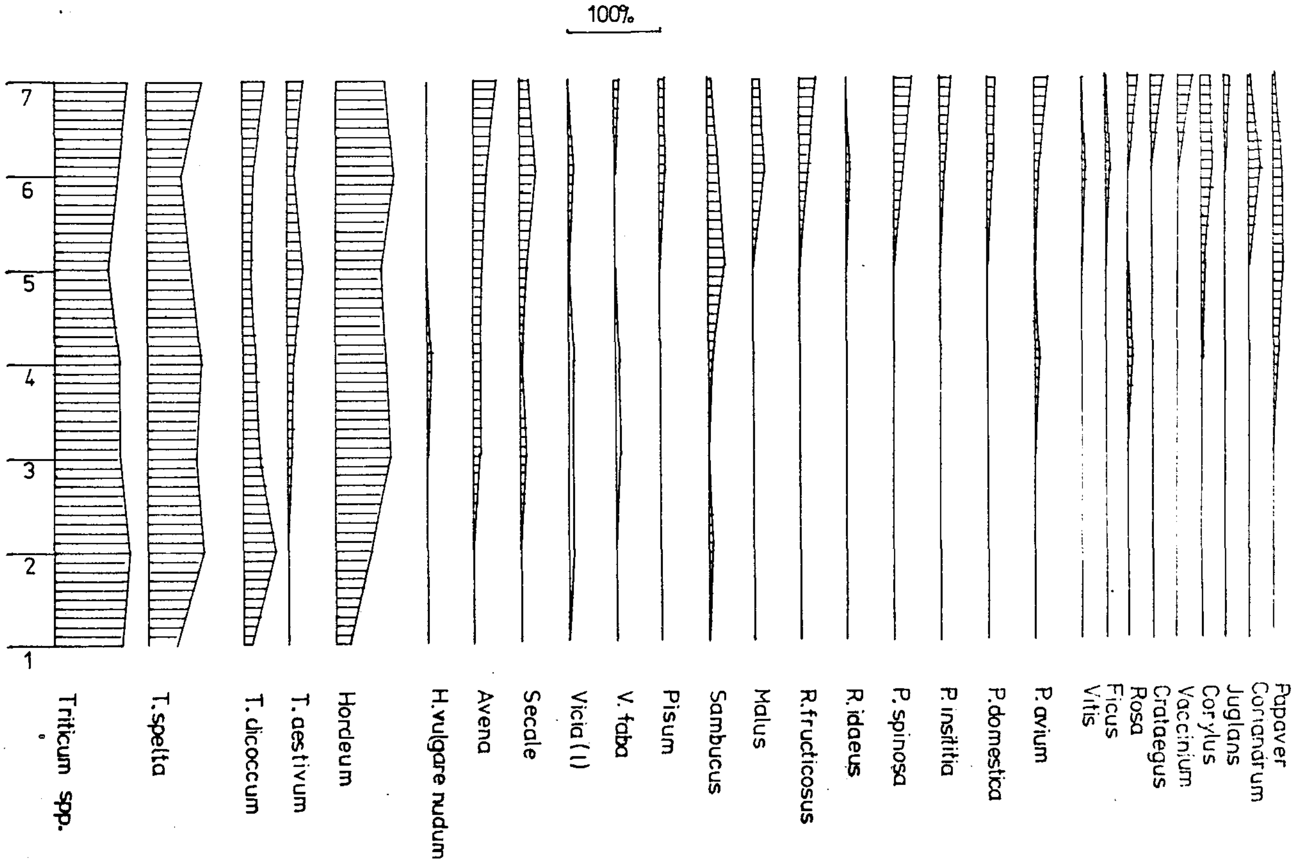
continued.....

This table represents a combination of all data from all ten Hampshire sites. The dominance analysis is slightly different from usual. Only crop plants have been considered and samples in which no species was dominant and in which cultivated plants were entirely absent have been excluded from the calculation; hence the smaller number of samples.

The phases are as follows:

1. 8th - 7th c. BC )
2. 5th - 3rd c. BC ) - approximately
3. 3rd - 1st c. BC )
4. 1st c. BC - 1st c. AD)
5. 1st c. AD (c. post 50 AD)
6. 100 - 250 AD
7. 250 - 400 AD





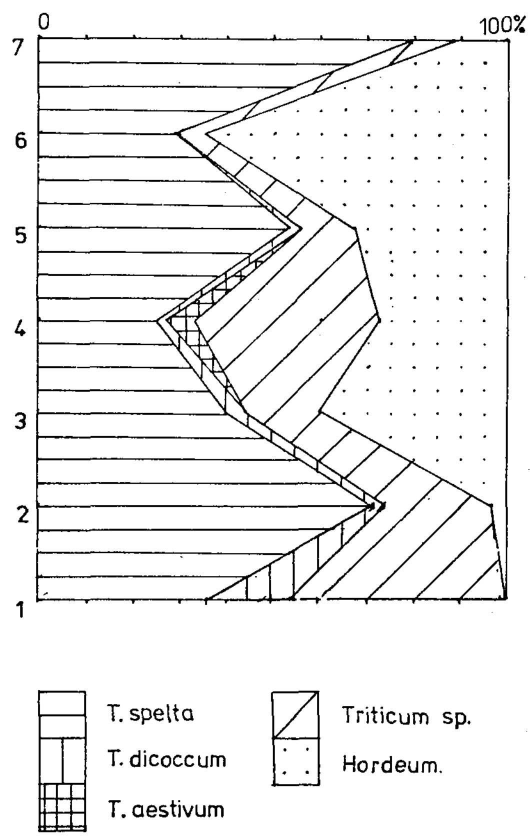




Figure 7.2.3. Hampshire (allsites studied). 'Presence'(a) and 'Dominance'(b) analyses.Based on the percentages given in Table 7.2.5.
The phases are as follows;(approximate dates only)

1.8th. - 7th. c. B.C.
2.5th. - 3rd. c. B.C.
3.3rd. - 1st. c. B.C.
4.1st. c. B.C. - 1st. c. A.D.
5. 50 - 100 A.D.
6. 100 - 250 A.D.
7. 250 - 400 A.D.

## 7.3 Problems of interpretation

The most fundamental problem of interpretation, which underlies all others, can simply be stated as follows: may one assume that the percentage-dominance and percentage-presence of a given species is really related to its importance in the economy as a whole? The answer, surely, is that if any progress is to be made in understanding ancient crop production, this assumption must be made, but it must not be made blindly. Various factors act so as to distort the picture, but if the results of both forms of analysis are considered and if a large number of samples from all available contexts and preservation conditions are examined, then long-term trends may be distinguished with some confidence. In this section some forms of bias most relevant to the present samples are considered. These may be summed up as problems of differential preservation, and problems of differential representation in various contexts.

Perhaps the most obvious bias, so far as the staple crops are concerned, is the fact that those crops which require drying in their preparation are more likely to become carbonised and thus differentially preserved. The preservation of spelt and emmer is therefore more likely than that of bread wheat. The free-threshing wheats, and also naked barley and legumes, are almost certainly under-represented.

Helbaek (1952, 214) has discussed a further problem of differential preservation. In the Roman samples which he examined barley was rather poorly represented, and he suggested that this reflected a change of utilisation from the Iron Age. Barley is indeed not common in the later Roman samples from Owslebury, when compared with the earlier phases at that site, and it is present only at a low frequency in the 4th century samples from Crookhorn and Portchester Castle. Helbaek's explanation for such a change was that barley was an important bread corn in the earlier period, and a clean threshing would therefore have been required. Consequently the crop may have been dried to facilitate threshing, a process which incidentally would increase the frequency of accidental carbonisation. In the Roman period, by contrast, barley might have been used to a greater extent for brewing and animal fodder. Grain intended for brewing cannot be dried as this would kill it and make malting impossible, and there is no need to dry grain required for stock-feed.

Helbaek's suggestion about the use of barley for brewing is certainly possible, though there is little evidence for it. The process of roasting the malt does provide an opportunity for brewers grains to become carbonised, but in fact sprouted barley grains are not reported from Romano-British contexts. Sprouted wheat grains are more common (e.g. Helbaek 1963, 159; Murphy unpub.b), and it is known from literary sources that both wheat and barley were used for brewing, (Dioscurides ii, 88). It seems probable, therefore, that the exclusive use of barley for brewing is unlikely to account for the apparent reduction in importance of this crop during the Roman period.

The possible use of barley for stock-feed in the Roman period does merit further consideration, however. If the crop was so used, production of barley would be directly related to the importance of pastoralism in the economy as a whole, a factor which is discussed further below (7.4).

Differential preservation is also of relevance when considering the importance of fruits and nuts. The carbonised samples examined contain very few fruitstones and nutshells; it is in the Roman samples from waterlogged layers that such remains are common. Thus the relative rarity of traces of such crops in the carbonised Iron Age samples is largely an effect of preservation conditions. It is unfortunate that Iron Age settlements in the valleys are, apparently, so rare; the examination of anaerobic samples from lowland sites would no doubt give a much fuller picture of the exploitation of fruits and nuts in the earlier period.

The problem of context has been discussed by Dennell (1972, 157-8) who observes that in general different contexts are likely to contain quite different proportions of crop and weed species. 'Midden' deposits, for example, will often contain a large proportion of small-seeded cultivars, accidentally discarded with weed seeds and chaff during crop cleaning, whilst hearths and ovens may contain a much higher proportion of large-seeded cultivars. The specific problems associated with the Bulgarian and Near Eastern sites discussed by Dennell are unlikely to apply directly to these Hampshire samples. Cereal species from the Iron Age and Roman sites are all of similar size; there is not the contrast between, say, einkorn and bread wheat. However it is still necessary to consider whether different types of feature tend to contain different species in different proportions for other reasons.

An examination of the composition of samples from all feature-types at the major sites of Portway and Owslebury shows that there is no significant difference in the proportions of different crops between samples from ditches, storage pits, pit complexes and quarries. Rare components, such as rye grains or beans are entirely absent from some feature-types, but this can be seen as merely a consequence of sampling error. These feature-types can all be seen as 'rubbish' contexts, differing principally in their rate of formation. Pits, for example, are likely to have been filled more quickly than ditches, but the fillings of both types of feature include a mixture of waste material.

The cess pits and the corn dryer at Owslebury fall in a different category. Apple 'pips' and cherry stones are found only in the cess pits since conditions suitable for their preservation in a mineralised state apparently occur only in these features. The corn dryer contains no bread wheat or legumes, crops which do not need to be dried.

The post-holes, which were sampled only at Portway, do show interesting differences. Barley is as often the dominant crop as wheat in these features, whilst by contrast wheat is dominant much more frequently in the pits. This can be quantified by calculating 'Dominance' frequencies in which the samples are divided up by feature-type (not by site phase as in section 7.1) and expressed as percentages of the total number of samples from the site. 69% of the samples are from storage pits; 7% in which barley is dominant, 50% in which wheats are dominant and 12% in which there are no identifiable cultivated plants. The postholes provide 18% of the total number of samples, 6% in which wheats are dominant, 6% in which barley is dominant and 6% in which cultivated plants could not be identified. Some factor therefore appears to have been in operation which encouraged the incorporation of barley into the fills of post-holes and of wheats into pits.

This is not the first time that barley has been found to occur relatively more frequently in post-holes than in pits. At the Durotrigian farmstead at Tollard Royal, Cranborne Chase it was observed that wheats were the dominant species in three out of five samples from pits, whilst barley was dominant in two out of three samples from post-holes. It was suggested that this may indicate that wheats were stored in pits and barley in post-built granaries (Wainwright 1968, 114). It is, indeed, difficult to think of a better explanation, although this suggestion must remain for the present unproven.

Just how important this variation is seems difficult to determine. However it must obviously be borne in mind when discussing sites such as R27, where all samples come from pits and ditches, the fills of the postholes being unsuitable for flotation.

7.4 An interpretation

So long as the biases discussed in section 7.3 are considered, it may be accepted that the changes in the relative importance of crops indicated by the samples are in broad terms related to real changes in production.

Such changes require explanation, and the aim of the present section is to discuss those factors which may have influenced the nature of cropping throughout the Iron Age and Roman periods on the Hampshire chalklands. Several aspects, all inter-related, are examined. Environmental features, notably soils and climate, are considered as possible factors influencing the crops produced. The range of crops available at each period is also discussed and probable dates of introduction are suggested. Arable farming cannot be considered in isolation, and the third factor examined is the changing role of pastoralism and the effects it might have had upon crops. Finally supra-regional political and economic factors are considered from the point of view of their possible influence upon crop production.

Soils

The soils of the chalklands, with their three-fold division into clay soils derived from the clay-with-flints, light loamy rendzina soils and colluvial soils of varied composition have been described in Chapter 1., where it was also suggested that such soil types would probably all have existed in the Iron Age in forms not markedly different from those of today.

The effects of these soil types upon the range of crops grown is most clearly seen in detailed crop surveys. The earliest survey of this type, the Acreage Returns of 1801 shows variations in cropping both between the chalklands and the adjacent Tertiary areas and within the chalkland area. Over much of the chalk, where soils of the Andover series predominate, an even balance between the three major grain crops - wheat, barley and oats - is seen. Wheat was rather more important on the Eastern High Chalk Region, where large tracts of the deeper Carstens series soils are found. Nowhere on the chalklands were beans grown in significant amounts; they require a deeper soil than the area provides, in order to produce useful yields. Peas, on the other hand were fairly extensively grown as a green crop, though turnips were more important (Pelham 1954). Rye is not mentioned in this survey. Typically a crop of light acid soils, it was grown in Hampshire in the early 19th century only upon sands in the Avon Valley and along the borders of the New Forest. Elsewhere in the county it was grown in a small scale as early spring fodder, but was not usually allowed to form seed (Vancouver 1810, 157).

This picture of balanced grain farming in the early 19th century, with wheat attaining greater importance only on the clay areas of the east, and beans being of relatively minor importance partly reflects soil conditions and partly the economic conditions of the period.

The crop most suited to chalk soils is certainly barley, both because of its tolerance of soil alkalinity (Hunter 1951, 15) and because the chalk holds and releases water in an ideal manner for it (Tavener 1964, 134). For this reason the area under barley has increased from 21,000 to 150,000 acres in the period 1939-1960 and the crop is now grown continuously in a monocultural system (ibid.). Very high yields of up to 40 cwts. per acre are obtained by these methods. Barley also appears to have been the highest yielding crop in the Middle Ages and in the early 19th century in Hampshire, although wheat could produce yields nearly as good in both periods (Tables 7.4.1, 7.4.2). Needless to say, the absolute levels of yields obtained during these two documented periods may bear little relation to the yields of the Iron Age and Roman periods, but the low relative yields of rye, winter barley and oats as compared with those of wheat and barley may be assumed to have applied to these earlier periods.

However, although barley gives the best yields, and maximum production is obtained from monocultural barley farming, this modern method is only feasible where a supply of wheat is available from outside; a monocultural system was impossible when the region was essentially self-sufficient, since wheat was required for bread-corn. Continuous cropping of barley is also very demanding on the soil, and consistently remunerative yields are only obtained nowadays by means of the application of artificial fertilisers (Tavener ibid). Supplies of manure in antiquity were certainly inadequate to permit such a system.

| Page ref. | Crop | Sown bush./ acre | Yield bush./ acre | Yield per seed | Weight lb/bush. | Yield lb/acre |
|---|---|---|---|---|---|---|
| 131-2 | Wheat | 3½-4 | 24-28 | 7.0 | 57-62 | 1428-1736 |
| 158 | Rye | 1½ | 18 | - | - | - |
| 158-9 | Barley | 4-4½ | 30-35 | 6.6-8.7 | 48-50 | 1440-1750 |
| 160 | Bere (winter) | 4 | 30 | 7.5 | 45 | 1350 |
| 160-1 | Naked barley | 3 | 28 | 9.3 | 60 | 1680 |
| 162-3 | Oats | 6-7 | 30-38 | 5.0-5.4 | 36 | 1368 |

<u>Table 7.4.1</u>; Early 19th century cereal yields on the Hampshire chalklands.

Source: <u>Vancouver, C. 1810. General View of the Agriculture of Hampshire</u>.

| Page ref. | Crop | Sown bush./acre | Yield bush./acre | Yield per seed |
|---|---|---|---|---|
| 4,40-42,148 | Wheat | 2-3 | 5.8-13.0 | 3.8-3.9 |
| " | Barley | 3-6 | 11.0-27.6 | 3.6-4.4 |
| " | Oats | 3-6 | 7.5-16.0 | 2.2-2.6 |

<u>Table 7.4.2</u>; Medieval cereal yields on the manors of the Bishops of Winchester (average figures).

Source: <u>Titow, J.Z., 1972, Winchester Yields: A study in Medieval Agricultural Productivity</u>.

The relevance of these considerations to the Iron Age and Roman periods is clear enough. One would expect that adverse soil conditions and consequent poor yields would ensure that rye would remain a minor crop. This is indeed the case; a single tentatively identified grain is present in a 2nd century BC sample from Owslebury, and only in the Roman period is the crop present more frequently, although it never appears as the dominant crop in a sample. Rye is not represented at any of the other sites. The relative scarcity of beans, Vicia faba var. minor, may also be a consequence of unsuitable soil conditions. Beans are present from the 3rd century BC onwards at Owslebury in small numbers, but are completely lacking from the other chalkland sites. However, as is noted above, the legumes are perhaps likely to be under-represented as they may have been rather less likely to have been dried and thus carbonised.

Turning to the major grain crops, barley and wheats, it appears that factors other than soils were influencing production. At Owslebury during the Iron Age barley is dominant in 25 - 55% of samples at different phases, whilst at Portway the figure is only 2 - 22%. At R27 it is dominant in 19% of samples. The first two sites are on light chalk soils, where barley should be favoured; indeed Portway is situated near the centre of the main area of barley production on the chalklands (Green 1940, Fig. 13). Nevertheless it is not the major crop at that site. R27, however, is sited on a clay-with-flints area to the east, and the high level of wheat in the samples from this site may be at least partly related to the deeper soil of this area, although for reasons mentioned above (7.3) barley may be under-represented in the samples from this site.

In summary, whilst the nature of the soil influenced the types of crops grown, it was not the over-riding factor as far as the staple food crops were concerned during the Iron Age and Roman periods.

Climate and climatic change

The question of the significance of climatic change to early agriculture falls into two parts; firstly when did climatic changes occur, and secondly were these changes of a magnitude and nature capable of having detectable effects upon crop yields?

The first question is the easier of the two to discuss. It is generally accepted that the Sub-Boreal climate of the 2nd millennium BC was relatively mild in Britain and may have been rather dry. On the Somerset levels, peat growth, which is a sensitive indicator of precipitation, had ceased and bog surfaces were dry and heather-clad (Godwin 1960). It has been suggested that soil analysis of Bronze Age features, including the Y-holes at Stonehenge and the ditch and central pit of a barrow at Cassington, Oxon., indicates that the accumulation of wind-borne deposits in a dry climate was occurring (Cornwall 1953, 139), although the need to postulate notably dry conditions has more recently been questioned (Limbrey 1975, 294). The insect fauna from the Wilsford Shaft, a Bronze Age ritual feature in Wiltshire, suggests that the climate was relatively warm, though not significantly different from today's mean temperatures (Osborne 1971), whilst the continuing presence of pollen of _Tilia_, the lime, a thermophilous tree, through pollen zone 7 reinforces this picture of mild conditions (Godwin 1975, 465-472).

Climatic deterioration during the 1st millennium BC at the onset of the Sub-Atlantic period, is clearly indicated by several lines of evidence. Mire stratigraphy in particular has been a useful source of information. The turnover from the slow development of highly humified peat, or even of complete cessation of peat growth, to much more rapid accumulation of unhumified peat is detectable in bogs as a sharp 'recurrence surface'. Such surfaces indicate increased rainfall, and in Scandinavia the main recurrence surface, (Ry III) the so-called 'Grenzhorizont' has been dated to around 600 BC (Godwin 1975, 33). At approximately this time peat deposits of the Somerset levels show clear evidence of flooding with calcareous water from nearby uplands and of revived peat growth after this phase of extreme wetness (Godwin 1960). More recently a new source of information has provided evidence for this deterioration. This is the technique of examining glacier ice from different depths in order to determine the concentration of the oxygen isotope $O^{18}$. In general snow or ice formed in warmer periods will contain more of the isotope; a minimum in $O^{18}$ concentration, dated to approximately 500 - 100 BC, seems to be related to the climatic deterioration indicated by the other lines of evidence. (Dansgaard _et al_ 1969, Johnsen _et al_ 1973, 434).

The climate prevailing during the later Iron Age and Roman periods is rather less well understood. There may possibly have been some slight amelioration. Lamb (1966, 174) considers that conditions were as warm or slightly warmer than those of today, although this view is based almost entirely upon vine cultivation. As is noted above (5.2) grapes were probably being cultivated at Gloucester during the Roman period, though this slight evidence for climatic improvement, unsupported by any other, is no firm basis for any definite conclusions. Moreover a second flooding horizon, dating to around the birth of Christ has been detected in the Somerset levels, and peat continued to accumulate throughout the Roman period in that area (Godwin 1960, 33), so moist conditions certainly continued. There is some evidence for renewed deterioration at the end of the Roman period; in particular a change to wetter conditions once more. A recurrence surface dated to approximately 400 AD, Ry II, has been observed in Swedish bogs (Godwin 1975, 34). Applebaum (1972, 5) considers that precipitation increased steadily throughout the late Roman period, and cites as evidence a number of Roman structures buried beneath peat deposits. He also comments on the apparently higher water table in the chalk during the Roman period, which has been noted above (1.2).

To summarise this rather conflicting information, the onset of the Sub-Atlantic period during the 1st millennium BC was marked by increased rainfall and by a mean annual temperature some 0.5 - 1.0$^{o}$C lower than that of today (Lamb 1966, 173). Temperatures may have increased slightly in the Roman period and conditions may have been similar to today's, although rainfall remained great enough to support ombrogenous peat growth. In the later Roman period new, wetter conditions may have developed.

This picture is unfortunately no more than an outline, and does not provide information about some of the more crucial factors which influence crops. For example Percival (1934, 22) notes that the distribution of rain throughout the year is of greater relevance to crop yields than the overall quantity of precipitation. Heavy rains in the autumn and winter inhibit the growth of young winter-sown plants and rain during the harvest will obviously reduce yield. On the other hand abundant rain is required in the spring and early summer, when the plants are actively growing. Consequently the significance of an indication of increased overall rainfall, such as the above sources of evidence provide, is rather difficult to assess. It would have had very different effects according to its distribution through the year, which may have differed from that of today. In much the same way it is of little help to know that the mean annual temperature dropped or increased. In the case of many fruits, for example, the vital factor is not mean temperature at all, but the frequency with which early spring frosts occur. Despite these problems of interpretation changes in the importance of at least two cereal crops have been related to climatic changes.

The introduction of spelt at the beginning of the Iron Age has been seen as a response to the wet conditions of the period (e.g. by Applebaum 1972, 108). It is present in the very earliest of the Hampshire samples, those dating to the 8th-7th century BC from Old Down Farm, and is the main crop represented in these samples. However spelt was not unknown in earlier prehistoric periods in Southern England; the large spelt deposit from Hembury, Devon is now known to be definitely Neolithic, for example (Field et al 1964, 373). Nevertheless, spelt is commonly present only in later prehistory, and continues as an important crop until the 4th century AD. Its chief advantages are its winter-hardiness; its resistance to fungi of all sorts; its stiff straw which resists 'laying'; the fact that the grain will not readily sprout in the ear in wet seasons; and the short growing season which permits earlier harvesting than other wheats (Percival 1921, 326). In wetter and cooler conditions, therefore, it would be a very useful crop.

The question really is whether the climate of Hampshire, even at its worst, was bad enough to cause spelt growing to be taken up, or whether some other reason must be sought. Rainfall in the county nowadays is moderate, slightly over 700 mm. (30") in most areas though reaching 940 mm. (37") on the uplands. Mean temperatures are generally lower inland than on the coast, but the area enjoys warm, sunny summers and mild winters. Frosts are absent from June to September and near the coast often even in May and October (Barry, 1964, 73-92). As has been noted Lamb has suggested that mean annual temperatures in the late 1st millennium BC may have been some 0.5 - 1.0$^{\circ}$C cooler than those of today. Elsewhere he observes that a change of 1.5$^{\circ}$C is equivalent to the difference between the present climates of Northern France and South Yorkshire (ibid. 192) and this smaller change in mean temperature would presumably have had a proportionally smaller effect. In these circumstances it seems unlikely to the writer that climatic deterioration was the main factor causing spelt growing to become so widespread on the Hampshire chalklands. Although this is inevitably a matter of opinion, it seems more probable that the introduction of spelt to this area was a cultural trait developed under more severe conditions elsewhere or alternatively was quite unrelated to climatic factors.

Applebaum has also suggested that the apparent increase in the importance of oats in the later Roman period is related to climatic deterioration. In his idealised description of a typical Romano-British farm he suggests that "the owner is experimenting with oats, which he finds stand up well to the series of cold, wet years which seem to be becoming increasingly common" (1966, 105). In the Hampshire samples definite evidence for cultivated oats, as opposed to the wild *Avena fatua* is not available. However the general trend is for the genus *Avena* to be much more frequent in later samples. In the 'overall' presence analysis (Table 7.2.5) oats increase from 5% in 3rd-1st century BC samples to 22% of samples of the 4th century AD. If only wild oats were involved one would expect the percentage presence of the genus to remain more or less constant. Nevertheless oats are never the dominant component of a sample. Probably the crop did latterly increase in importance, but to establish a direct causal link between increased rainfall and increased oat production is another matter.

Overall it seems unlikely that climatic factors would ever have been so important in Hampshire as to cause changes in cropping. Possible exceptions to this generalisation are the frost sensitive fruits and nuts discussed above (5.2), although definite evidence that such crops were being *produced* in the area at all is lacking. The cereal crops are much less sensitive, and it seems more likely that the changes observed are primarily related to factors other than climate, although climatic changes could well have modified or reinforced changes in cropping.

However the overall effects of increased rainfall would certainly be less inconvenient, from the point of view of cultivation, on the well-drained upland chalk soils, than on heavier soils, as Applebaum observes (1972, 233). This may well have encouraged the production of cereals, particularly winter cereals, within these upland areas, but there is no reason to suppose that any particular crop would be favoured.

Iron Age and Roman crop introductions

Naturally the date of introduction of new plants has a major effect upon the proportions of the various crops cultivated. Some so-called introductions however were in fact re-introductions, presumably of entirely new varieties, after the original stock had died out. Flax, which is quite common in the Neolithic and Bronze Age is almost unknown in Iron Age deposits, and does not regain its former importance until the early Roman period. Bread wheat is another crop which seems to have been re-introduced after an extinction.

The Iron Age introduction par excellence is, of course, spelt, although as is noted above it was strictly speaking a re-introduction. The 8th century BC spelt from Old Down Farm is certainly the earliest Iron Age record of the crop in Hampshire and may well be the earliest record in Southern England. The grain from Cow Down (Longbridge Deverill), Wilts. may be of comparable date, but identifications have not yet been published (Annable 1961). Bread wheat is another species which was apparently re-introduced during the Iron Age. Hubbard (1975, 200) notes that in both Britain and Holland bread wheat is absent from Bronze Age samples. He records Professor Dimbleby's suggestion that this may reflect the extinction of the Neolithic variety, and its subsequent replacement by a cultivar more suited to growth in N.W. Europe, during the Late Iron Age. The Hampshire samples support this view, and suggest when the re-introduction might have occurred. The crop is absent from the 8th - 7th century BC samples from Old Down Farm, and from 5th - 3rd century samples from Portway. It does appear in 3rd - 1st century BC 'saucepan pot' phase samples from Portway and in 1st century BC samples from Owslebury and R27. By the first century AD bread wheat or club wheat was certainly being grown as a crop in its own right, as the samples from the buried soil at site R1 indicate (Tables 7.2.1 - 7.2.3). An introduction during or just before the 1st century BC therefore seems probable.

Rye and oats present problems of interpretation. Helbaek (1962, 211) was inclined to see oats as mere contaminants of other cereals in the Iron Age, and rye may well have been no more important. Certainly both crops are present in very small amounts even when they do occur, as at Owslebury and R27 for example. In neither case is there any evidence for large-scale cultivation.

Hubbard (1975, 201) has suggested that Bromus may have been cultivated as a field crop in prehistory. His grounds for this view are that the presence curve of Bromus does not correlate well with that of any of the cereals; this implies that Bromus is not closely associated with a cereal crop, as one might expect if it were indeed a weed. Reference to the presence diagrams for Portway (Fig. 7.2.2) or Owslebury (Fig. 7.2.1), however, shows that the curve for Bromus closely follows that of spelt at the former site and those of emmer and spelt at the latter. On this evidence there is no reason to assume that Bromus was anything more than a weed of hulled wheats, at any rate in the Hampshire Iron Age.

Beans, which first appear in the 3rd century BC at Owslebury (Table 7.2.1) may have been an Iron Age introduction or re-introduction; however most of the pre-Iron Age evidence comes from impressions, which would tend to under-represent such a large-seeded crop.

Finally there is some evidence from outside Hampshire for the Roman introduction of cultivated fruits and nuts - notably plums and walnuts - discussed above (5.1).

If these introductions illustrate the innovative side of Iron Age agriculture, then the failure to introduce and exploit such useful crops as millets and peas displays a certain inertia. These crops were all in use in the continental Iron Age (Willerding, 1970; Van Zeist 1972), so why were they not taken up by British Iron Age farmers? Since climatic factors do not exclude them, cultural tradition and agricultural conservatism must be invoked as probable causes.

Roman plant introductions were on a different scale and of a different nature, being only part of a major economic, political and cultural change affecting much of N.W. Europe. To avoid taking too narrow a view of this essentially European phenomenon, the pattern of Roman crop introduction in the three best-documented areas under Roman rule is summarised in Tables 7.4.3 - 7.4.5.

Table 7.4.3; Britain; Pre-Roman Iron Age and Roman crops and subsidiary food sources.

| | | Pre-Roman Iron Age | Roman | |
|---|---|---|---|---|
| Triticum monococcum | Einkorn | + | + | |
| T. dicoccum | emmer | + | + | |
| T. spelta | spelt | + | + | |
| T. compactum/aestivum | bread/club | + | + | -Cereals |
| H. vulgare | 6 row barley | + | + | |
| H. vulgare var. nudum | naked barley | + | + | |
| Secale cereale | rye | + | + | |
| Avena sativa | oats | + | + | |
| Pisum sativum | pea | – | + | |
| Lens esculenta | lentil | – | + | -Legumes |
| Vicia faba var. minor | horsebean | + | + | |
| Vicia sativa | vetch | + | + | |
| Linum usitatissimum | flax | – | + | -Oil plants |
| Camelina sativa | false flax | – | + | |
| Papaver somniferum | opium poppy | + | + | |
| Corylus avellana | hazel | ⊕ | ⊕ | |
| Fagus sylvatica | beechnut | ⊕ | ⊕ | |
| Quercus spp. | acorn | ⊕ | ⊕ | |
| Juglans regia | walnut | + | + | -Nuts |
| Pinus pinea | pinenut | – | + | |
| Prunus dulcis | almond | – | + | |
| Castanea sativa | chestnut | – | + | |
| Anethum graveolens | dill | – | + | |
| Apium graveolens | celery | – | ⊕? | |
| Pastinaca sativa | wild? parsnip | ⊕ | ⊕ | |
| Coriandrum sativum | coriander | – | + | |
| Daucus carota | wild? carrot | – | ⊕? | -Vegetables & herbs |
| Raphanus raphanistrum | radish | – | ⊕ | |
| Smyrnium olustratum | alexanders | – | + | |
| Foeniculum vulgare | fennel | – | + | |
| Pimpinella anisum | anise | – | + | |
| Beta vulgaris | beet | – | + | |
| Cucumis sativus | cucumber | – | + | |
| Olea europaea | olive | – | + | |
| Fragaria vesca | strawberry | – | ⊕ | |
| Ficus carica | fig | – | + | |
| Phoenix dactylifera | date | – | + | |
| Vitis vinifera | grape | – | + | |
| Sambucus spp. | elderberry | ⊕ | ⊕ | |
| Rubus spp. | raspberry & blackberry | ⊕ | ⊕ | -Fruits |
| Prunus spinosa | sloe | ⊕ | ⊕ | |
| P. domestica ssp. insititia | bullace | ⊕ | ⊕ | |
| P. domestica | plum | +? | + | |
| P. avium | cherry | ⊕ | + | |
| Mespilus germanica | medlar | – | + | |
| Morus nigra | mulberry | – | + | |
| Malus sylvestris | apple | ⊕ | + | |

Key: + present
– absent
⊕ present, but wild form

See Appendix 1 for sources and full references

Table 7.4.4; Germany: Pre-Roman Iron Age and Roman crops and subsidiary food sources.

| | | PRIA | Roman |
|---|---|---|---|
| Triticum monococcum | Einkorn | 2,8 | 3,4,8 |
| T. dicoccum | Emmer | 2,5,6,8 | 3,8 |
| T. spelta | Spelt | 2,5,8 | 3,4,8 |
| T. compactum/aestivum | Bread/club | 5,8 | 8 |
| Hordeum vulgare | 6 row Barley | 5,8 | 4,8 |
| H. tetrastichum | | 2 | 3 |
| H.vulgare tetrastichum | | 6 | – |
| H.hexastichum nudum | | 2 | – |
| H.tetrastichum nudum | | 2 | – |
| H. distichon | 2 row Barley | – | 8 |
| Avena sp. | Oats | 6 | – |
| Avena sativa | " | 7 | 7 |
| Secale cereale | Rye | 2,5,8 | 7,8 |
| Setaria italica | Italian millet | 2,5,6 | – |
| Panicum miliaceum | Broomcorn Millet | 2,5,6 | 4,8 |
| Oryza sativa | Rice | – | 1 |
| Pisum sativum | Pea | 2,5,6,8 | 3,4,8 |
| Lens esculenta | Lentil | 5,6,8 | 3,4,8 |
| Vicia faba var. minor | Horsebean | 5,8 | 7,8 |
| Cicer arietinum | Chickpea | – | 1 |
| Linum usitatissimum | Flax | 2,5,6,8 | 7,8 |
| Camelina sativa | False flax | 2,5,6,8 | 4,8 |
| Olea europaea | Olive | – | 1 |
| Papaver somniferum | Opium poppy | 2,8 | 4,8 |
| Cannabis sativa | Hemp | – | 4 |
| Corylus avellana | Hazelnut | 2 | – |
| Fagus sylvatica | Beechnut | – | 4 |
| Juglans regia | Walnut | – | 3,4 |
| Apium graveolens | Celery | – | 4 |
| Sinapis arvensis | Mustard | – | 4 |
| Anethum graveolens | Dill | – | 4 |
| Coriandrum sativum | Coriander | – | 4 |
| Satureia hortensis | Savory | – | 4 |
| Beta vulgaris | Beet | – | 4 |
| Amaranthus lividus | Spinach | – | 4 |
| Pastinaca sativa | Parsnip | – | 4 |
| Fragaria vesca | Strawberry | – | 4 |
| Sambucus spp. | Elderberry | 2,5 | 4 |
| Rubus idaeus | Raspberry | 5 | 4 |
| Rubus fructicosus | Blackberry | 5 | 4 |
| Sorbus spp. | Rowan | – | 4 |
| Prunus spinosa | Sloe | – | 4 |
| Prunus domestica ssp. insititia | Bullace | – | 4 |
| Prunus avium | Cherry | – | 4 |
| Rosa sp. | Rose | – | 4 |
| Ficus carica | Fig | – | 1,4 |
| Vitis vinifera | Grape | – | 7 |

References

1. Knorzer, K-H, 1966
2. " 1971a
3. " 1971b
4. " 1973a
5. Knorzer, K-H, 1973b
6. " 1974
7. Bertsch, K. und F. 1949
8. Willerding, U. 1970

Table 7.4.5; Netherlands: Iron Age and Roman crops and subsidiary food sources.

| | | PRIA | PRIA-RIA (coastal sites) | Roman |
|---|---|---|---|---|
| Triticum dicoccum | Emmer | 1 | 1,2 | 1 |
| T. aestivum | Bread/Club | – | 2 | 1 |
| T. spelta | Spelt | – | – | 1 |
| Hordeum vulgare | 6 row Barley | 1 | 2 | 1 |
| H. vulgare var. nudum | Naked barley | 1 | 1 | 1 |
| Secale cereale | Rye | – | – | 1 |
| Avena sativa | Oats | – | 2 | 1 |
| Panicum miliaceum | Broomcorn millet | 1 | 2 | – |
| Camelina sativa | False flax | 1 | 2 | – |
| Linum usitatissimum | Flax | – | 2 | – |
| Vicia faba var. minor | Horsebean | – | 2 | 1 |
| Vicia sativa | Vetch | – | 2 | 1 |
| Prunus spinosa | Sloe | – | 2 | 1 |
| P. domestica ssp. insititia | Bullace | – | – | – |
| P. avium | Cherry | – | – | 1 |
| Pyrus malus | Apple | 1 | – | – |
| Corylus avellana | Hazelnut | – | 2 | 1 |
| Quercus sp. | Acorn | 1 | – | – |
| Papaver somniferum | Opium poppy | – | 2 | 1 |
| Apium graveolens | Celery | – | 2 | – |
| Daucus carota | Carrot | – | 2 | – |
| Brassica campestris | Field cabbage | – | 2 | – |

References

1. Van Zeist, W. 1970.

2. Van Zeist, W. 1974.

The areas included are Britain, Germany and the Netherlands. Full references to British crops are given in Appendix 1.

The nature of introductions is very similar in all three countries. In general the staple cereal crops were supplemented by Roman introductions only to a small extent. There are a few exceptions to this generalisation. Spelt first appears in Holland at the Roman fort of Valkenberg (Van Zeist 1972, 158) and two-row barley is apparently a Roman innovation in Germany (Willerding 1970). Rye and oats, as major field crops, seem to owe their introduction into Britain to Roman activity. Needless to say the surprising find of rice grains at Neuss (Knorzer 1966) is of little relevance to staple food production.

Iron Age farmers in Germany were producing peas, lentils and horsebeans and the only Roman legume introduction, probably not locally grown, was the chickpea. In Britain and Holland a narrower range of legumes seems to have been exploited in the Iron Age, and several crops were Roman introductions. This also seems to have been true of flax in these two countries.

It is, however, in the range of fruit, nut and vegetable crops that Roman introductions are most clearly seen. The reason for the relative unimportance of such crops in the North West European Iron Age has already been discussed (5.1). Tables 7.4.3 - 7.4.5 serve to emphasise the fact that although the subsistence base seems to have remained largely unaltered as a result of the Roman invasions, two entirely new branches of farming - arboriculture and horticulture in the true sense of the words - owe their introduction to the Romans. These novel aspects of the agrarian economy have been discussed in Chapter 5, above.

<u>The relationship between arable farming and pastoralism</u>

It seems likely that variations in the importance of pastoralism both in space and time, may have had an effect upon the range of crops produced. It is easy to speak of 'chalkland farming' as if all farms at all periods were unspecialised. One of the more interesting results of this study is to suggest that even within such a relatively homogeneous region as the Hampshire chalklands there were variations of emphasis within the Iron Age.

The paraphernalia of grain processing and storage tends to overshadow the importance of the pastoral aspect of the economy of the Iron Age. Settlements and enclosures were certainly carefully designed with the management of stock in mind, however. Sites of the Little Woodbury type have entrances approached by antenna ditches which may reasonably be interpreted as a means of controlling stock during the transfer from pasture to the enclosure. Such arrangements are found over a large area of Wiltshire, as at Gussage All Saints and Little Woodbury itself (Bowen in Rivet 1969, 5) and in Hampshire (Perry 1969, 41). Also in Hampshire occur the 'banjo' enclosures, described above (1.5) which appear to have been used in the herding and corralling of cattle or sheep (Perry 1969, 37). Cunliffe (1974, 175) sees these enclosures as a later Iron Age improvement on the rectangular stock enclosure, which has its origins in the Bronze Age. Certainly the pastoral enclosure of this type on Portsdown Hill, Hants. appeared to date from the earlier part of the Iron Age (Bradley 1969).

Dyked droveways linking enclosures with areas of pasture are known as far back as the Late Bronze Age, as at Plumpton Plain, Sussex (Harding 1974, 29). Besides providing access for traffic these presumably helped to prevent cattle from straying onto the arable fields. Despite Bowen's revision (1969, 22) of Applebaum's (1954) interpretation of the Figheldean Down earthwork enclosures and field systems, it is clear that the folding of animals on the stubble and on young crops was probably a feature of Iron Age agriculture, and the need to control stock whilst this happened may well account for many earthwork enclosures on chalk downland.

Different animals have quite different demands, particularly in terms of fodder, however and in order to establish the likely effects of animal husbandry upon arable farming some knowledge of the relative importance of the different species would be useful. Unfortunately there are very few sites from which quantitative data based on large samples is available. Most Hampshire Iron Age sites have produced a species list including sheep, cattle, pigs, horses, dogs and various wild species such as deer, but reliable quantitative information is rare. At Portsdown 11 of the 17 animals represented were oxen, whilst there were 4 sheep or goats (Bradley 1969, 52), and at Balksbury a ratio of 4 cattle:6 sheep:2 pig:2 horses was observed (Harcourt in Wainwright 1969, 53). To draw any sweeping conclusions from these data would seem unwise. However information from other parts of Southern England suggests that sheep became increasingly more important than cattle during the 1st millennium BC (Cunliffe 1974, 173). Cunliffe links this change with the extension of Downland arable, and the consequent need for larger folding flocks. Sheep as 'the tools of arable husbandry' (Jones 1960, 8) have the merit of easy maintenance; they require less water than cattle and also less feed.

The need to provide feed for all kinds of stock, even sheep, is an important consideration. During the summer months the meadows of the river valleys, which are discussed above, (4.3), would have provided lush grass for cattle whilst sheep could have been folded on the stubbles and on the open Down. During the winter, however, feed would have been needed. Some of this could have come from wild sources; leaves, possibly ensiled, and hay were probably used, as has frequently been suggested (e.g. by Cunliffe 1974, 173). Straw, particularly barley straw, can also be used as fodder. It can provide up to a third of the maintenance requirements of a dairy cow (Min. of Ag. 1974a). Cunliffe suggests that straw in the Iron Age could have been more nutritious, if the crop was harvested in an immature state. However, as is argued above (6.9) to do so is essentially a farming practice of the extreme north, and there is no evidence in the Hampshire samples for the presence of immature grains in a significant quantity. To keep stock fed on a straw-based diet in good condition, protein, vitamin and mineral supplements are required in any case. These could have been provided by cereals, or by brewers grains, as well as beans and vetches. Wet grains, otherwise a waste product of brewing, contain 14% carbohydrate and 3.7% digestible protein, and field beans contain large amounts of carbohydrate, minerals and in particular protein - up to 20% digestible crude protein (Min. of Ag. 1973, 1974c). How far these crops were used in fact as stock feed depends upon the attitudes of Iron Age farmers. If mere survival of the animals through the winter was the aim, then little or no cereals or beans would have been provided. On the other hand differences between the crop spectra of some Hampshire sites can be explained if it is assumed that some production of fodder was involved.

The contrast between Old Down and Portway, on one hand, and Owslebury on the other, is striking. Owslebury, in its early phases is a banjo enclosure, probably designed in the first place with stock management in mind whatever later modifications to the enclosure form were made. Of the other two sites Old Down Farm was initially unenclosed, and only later provided with a rectangular enclosure, whilst Portway was defined by rectangular ditches throughout its history (see above 1.6). At Owslebury barley is the dominant crop throughout the Iron Age, and beans are represented from the earliest, 3rd century BC, phase. At Old Down and Portway barley is a very minor crop in most phases. Wheats are more important throughout and beans are completely absent. These differences in crop spectra may be explained as the result of feeding a larger proportion of crop produce to animals at Owslebury. It may be that this reflects a greater reliance on stock at Owslebury, or more specifically on cattle, with their more exacting fodder demands.

However, another possibility is suggested by an examination of site catchment areas. Idealised 2km. radius circular site catchment areas are illustrated in Fig. 1.7.1. As is noted in section 1.7 both Portway and Old Down are very close to a river valley, where supplies of hay would be abundant. Owslebury nowadays has no surface stream within its catchment area and lush grasslands are much more restricted. Could it be that animals were over-wintered largely on hay at Portway and Old Down and to a greater extent on straw, cereals and beans at Owslebury?

Site R27 does not fit this pattern so neatly. It is a small, sub-circular enclosure on an upland area like Owslebury. Although it contains pits it is not dis-similar in form to the banjo at Owslebury, although a droveway with flanking ditches has not been demonstrated. The crop spectrum is much more like that of Old Down Farm and Portway, however. Wheats are the principal crop; barley is less important, although as we have seen it may be under-represented. Beans are absent.

It is unfortunate that the analysis of the faunal remains from all of these sites is unlikely to be completed in the near future, but it will be interesting to see whether the pattern of variation discernable in the crops is mirrored in the animals.

As the idea that arable farms were to a large extent replaced by large cattle or sheep ranches in late Roman Wessex has been current for a long time, it is worth summarising the evidence which suggested this hypothesis. Collingwood and Myres noted the apparent abandonment of Rotherly and Woodcuts by the mid 4th century, the conversion of villas at Darenth, Chedworth and Titsey wholly or partly to fulling establishments and the apparent existence of a state weaving mill at Winchester. They concluded that pastoralism, notably sheep farming, increased considerably during the 4th century with consequent rural depopulation (Collingwood and Myres 1936, 223-4 and 239-40). The idea was taken further by Hawkes, who re-examined Pitt-Rivers' excavations on Cranborne Chase, noting the early desertion of Woodcuts, the frequent occurrence of rectangular enclosures and larger kite-shaped enclosures both presumably for stock, and drawing attention to the Bokerly 'A' dyke which he suggested was constructed during the 4th century to protect an area of pasture and its enclosed flocks and herds. (Hawkes 1947, 70-1). The appearance of British woollen goods - the Birrus Britannicus and the Tapete Britannicum - on Diocletian's price-fixing edict gave further support to the view that the products of pastoralism were of increasing importance.

In addition to this body of evidence the idea has an inherent plausibility when seen in relation to a variety of causative factors. Rivet (1958, 122) points out that the probable low profitability of cereal production would tend to encourage the conversion of arable farms to pasture. Applebaum (1966, 105) sees the increase of pastoralism as a consequence of climatic deterioration.

Taylor (1967) has suggested however that this swing towards pastoralism may have been exaggerated. The presence of a state weaving-works at Winchester - Venta Belgarum - is deduced from a reference in the Notitia Dignitatum to a 'procurator gynoecii in Britannis Ventensis' i.e. in a town of the name of Venta. Venta Icenorum is another candidate for consideration and its location at Caistor by Norwich in Norfolk, a county containing large areas of land suitable for sheep farming gives it a good case, particularly as artefacts associated with the woollen industry - shears and combs - are found more frequently in East Anglia than elsewhere in the country. (Manning 1966). The evidence for the location of the weaving mill is therefore hardly conclusive either way. Taylor has pointed out that only three of Hawkes' suggested pastoral enclosures are likely to be of 4th century date, and of these one proved to contain a settlement indicative of a mixed farming economy. The Wessex ranch boundaries are to a large extent undated but many belong to much earlier periods than the 4th century. Taylor's conclusion is that there is no evidence for a massive turn towards pastoral farming in the 4th century, though on a smaller scale in local areas the evidence for rural depopulation and new stock enclosures is undeniable. Applebaum (1972, 233) has largely accepted this view.

In spite of this there can be little doubt that certain Roman innovations would have made the maintenance of stock much easier. Wells become common for the first time during the early Roman period, and the introduction of the scythe would have increased the amount of hay available (Bowen 1969, 44). It is also likely that new fodder crops were introduced at this time. It is rather difficult to decide what relevance the fodder crops discussed by the Roman agricultural writers have to Roman Britain, particularly as several of them leave little or no trace. Columella mentions a mixed green forage crop of barley, vetch and various legumes, for example, but this was not normally allowed to produce seed (Columella II, 10). Where vetch seeds have been found in association with cereals, as for example at the villa at Downton, Wilts. (Arthur 1963) there is no guarantee that the association is not purely fortuitous or represents some type of maslin crop for human consumption. In the same section Columella discusses the turnip, which he considers 'a filling food for country people' and a useful winter fodder for cattle. There is a little confusion over the only reported turnip seed from this country (Salzmann 1909) which is described in the report as Brassica campestris. Turnip is strictly speaking B. rapa and one is left in some doubt as to whether to believe the binomial name, which suggests that the wild Bargeman's cabbage is represented, or the English name which suggests the presence of cultivated turnip. Identification of species within this genus is difficult, and perhaps the question should be left open. In any case Applebaum considers that the extensive cultivation of roots was prevented by the shortage of manure (Applebaum

1972, 115). Finally one might mention the grain feeding of pigs, which Applebaum has deduced from the ground plan of the Pitney villa complex (ibid. 182). Much later, of course, grain fed bacon was to become one of the main protein sources, and practically the only meat source of the countryman. William Cobbett (1967, 306) estimated that an average 19th century rural family would require 22 qrs. 3 bushels of barley per year, of which 18 qrs. would be fed to the pig, so this represents a major way in which the barley crop might have been consumed.

As in the Iron Age there is little statistical data available about the nature of stock maintained in Hampshire. Recent work by Ann Grant at Fishbourne and Portchester Castle has however shown that oxen seem to predominate. At Fishbourne ox bones make up 27 - 42% of the total at different site phases, and this represents up to 80% in terms of meat weight; at Portchester about half the animals represented were oxen, with sheep and pig together making up about a quarter (in Cunliffe 1971, 378; 1975, 381). However these sites are atypical, being military and palatial, not agricultural in nature, and the bones represent what was brought to the sites and consumed there, which need not reflect the picture in the countryside. Nevertheless there seems to be little evidence for the vast flocks of sheep which were hypothesised by Collingwood.

Nor do the crop remains from the Roman period in Hampshire support the idea that pastoralism increased in importance. It was suggested above that barley and beans were partly used for stock feed in the Iron Age. If this continued to be the case then the overall trend towards spelt growing in the 3rd - 4th centuries, which is seen at Owslebury and Crookhorn Farm in particular, would suggest if anything a decline in stock-rearing, or at any rate no increase, although the increased oat production may counter-balance this. However it is always possible that barley intended for animal feed was not dried, as Helbaek (1952, 214) has suggested. Such a possibility certainly cannot be dismissed, but it is in the nature of the basic data that it must remain undetectable.

In conclusion it seems that there is no strong evidence for a large-scale swing to sheep farming on the Hampshire chalklands in the Late Roman period. Neither field monuments, faunal remains or botanical remains support the hypothesis.

Political and economic factors

The effects of political intervention, be it by chieftain or state, are likely to have altered crop production both quantitatively and qualitatively. In the Roman period this intervention, in the form of tax, is well known. In the Iron Age, however, the situation is less clear. Obviously one is not dealing simply with subsistence farming in the more fertile areas of Southern England, where a surplus was being produced and was being controlled by an aristocracy. The strict division of Celtic society into the peasants, whom Caesar describes as little better than slaves, the 'knights' and the druids (Rivet 1958, 41) would certainly have been accompanied by a system of rights and dues, by analogy with modern tribal societies. Such a system may actually have caused the surplus production to increase (Sahlins 1974, 139-41).

In concrete terms evidence for this surplus appears in terms of communal structures, such as hillforts, and in luxury imports of various sorts. Imported metalwork, principally weapons and jewellery, is known throughout the Iron Age but trade with the Continent seems to have intensified after 100 BC. In the earlier part of the 1st century BC the major port of Southern England seems to have been at Hengistbury Head, from which coins of Armorican tribes and Roman amphorae with their contents were distributed inland (Cunliffe 1974, 148-9). After the Caesarian conquest of Gaul, trade via Hengistbury seems to have ceased, but cross-Channel trade between Roman Gaul and the Belgic areas of South-East England continued until the conquest of 43AD. Strabo's well-known list of British exports (grain, cattle, gold, silver, iron, hides, slaves and hunting dogs), which paid for these luxuries refers to this latter period, but no doubt would have applied with equal validity in the earlier Iron Age.

Surplus production is a natural consequence of intensive farming methods, and Bradley (1971, 79-81) has suggested that intensification as a response to population increase is a characteristic of Early Iron Age agriculture. He considers that the introduction of spelt at the beginning of the Iron Age was the key to this intensification, as it permits a dual reliance upon both winter and summer crops, with the consequent advantages discussed above (6.9). Indeed the need to intensify could well be seen as a cause of the introduction of spelt. The assumption that winter-sown crops were entirely absent before the Iron Age may, perhaps, be questioned, but there is little doubt that the appearance of spelt would, at the very least, have increased the range of winter crops available. This introduction can, in other words, be seen as having economic rather than climatic causes.

The imposition of a Roman provincial administration did not mark a change from subsistence to surplus, but the channelling of a pre-existing surplus into the _annona_, or Imperial corn tax, which was used to support the army and officials and into the local taxes which supported urban life (Collingwood and Myres 1936, 208). Certainly the need to meet the _annona_ and other taxes remained a dominant feature in the agriculture of the province from first to last. Tacitus records the remedy of abuses of the tax in the late 1st century by Agricola (Agric. xix) and in the 4th century the extensive export of cereals to aid certain Rhineland towns is recorded by several authors. In a well-known passage, translated and quoted by Collingwood (ed. Frank 1937, 113), Ammianus Marcellinus relates that new granaries were constructed to receive "the corn regularly brought from Britain" (_annona a Britannis sueta transferri_). The word '<u>sueta</u>', here translated as 'regularly' implies some habitual export of cereals, though the abnormal circumstances, such as the construction of some 800 purpose-built craft recorded by Zosimus (iii,5) would imply that something more than the normal <u>annona</u> was involved. For Collingwood this was no commercial transaction but an imposition upon the province of Britain quite unrelated to any ability to meet the demand from surplus grain. More recently Frere (1967, 281) has taken the rather different view that by the 4th century the British economy had developed to such an extent that 'the balance of trade was favourable'.

Whether this was true or not the <u>annona</u> itself must undoubtedly have forced the farmer to produce more. Calculations of the percentage of the crop requisitioned are, unfortunately bedevilled by the number of unknown factors. Hawkes' estimate that some 50 - 60% of the harvest may have gone as tax at the sites on Cranborne Chase on the basis of the reduction of the number of storage pits may well be correct. (Hawkes 1947, 79). However difficulties of dating and the absence of evidence of the form of storage and indeed of the commodities stored inevitably place such calculations somewhat in question, as several writers have pointed out. Tacitus records that every fort in Britain was provided with supplies sufficient to last for one year (Agricola xxii) and calculations based on the supposed cereal consumption of the average soldier, and the available storage space in the fort granaries shows that this was quite possible (Davies 1971, 123), although just what this military reserve meant in terms of the total production of cereals is impossible to compute with any confidence.

Cereal production does seem to have become much more intensive during the later Roman period. Besides the literary evidence for increased exports, a number of features combine to suggest that 'production was all important' (Applebaum 1972, 230). The insertion of corn driers into former living quarters in villas (Goodchild 1943, 151) and apparent changes in the nature of land tenure in particular support this view. At several places in Hampshire it has been suggested that small isolated farms, which were usually continuations of Iron Age establishments were abandoned during the course of the Roman period; at Chalton they seem to have been replaced by one or two nucleated 'villages', a trend which may be seen as a concentration of population either under the influence of great landowners, or some form of collectivism (Cunliffe 1973, 183-4). Applebaum presents evidence for the development of large estates to the N.W. of Andover, centred on the Clanville or Weyhill villas (1972, 32) and at Basingstoke, centred on the Newtown villa (1954, 126). This implies concentration of resources and intensification of production, possibly under Imperial direction.

The overall effect, therefore, of the new political and economic structure, particularly in the late Roman period, was to stimulate the quantity of cereal production. The question of interest at present is how far the nature of the cereals produced would be affected. Undoubtedly there was, to some extent, a change of taste. In particular the bread grain of the Roman army seems to have been almost exclusively wheat. Watson (1969, 126) gives examples of barley being issued to entire legions and to recruits failing to meet required standards as a punishment, but in normal circumstances the demand would have been for wheat. Barley and oats were supplied, but as fodder for horses (Davies 1971, 123). Some stimulation of wheat production is therefore likely to have been one effect of the annona. Under Roman influence the taste of the civilian population no doubt turned towards wheaten bread, if indeed, wheat consumption was not already normal.

Transportation of bulk products such as cereals was, of course, no simple matter in antiquity and above the subsistence level there would have been a strong incentive to produce the less bulky crops which could more easily be moved to their place of consumption. Jasny (1941/2) considered that this factor would have encouraged the cultivation of wheat at the expense of barley, the latter being a more bulky crop. Table 7.4.1 shows that in the early 19th century typical crops in Hampshire ranged between 57 - 62 lbs/bushel for wheat and 48 - 50 lbs./bushel for barley; that is to say barley was in the order of 20% more bulky than wheat. Oats, at 36 lb/bushel would have been even more difficult to transport (figures from Vancouver 1810). This refers, of course, to naked grains of wheat, though once thoroughly threshed and winnowed, spelt and emmer grains would be of similar density to those of bread wheat. The long-term trend towards increased surplus production and export may therefore have been another factor encouraging wheat farming, particularly in the 4th century.

Conclusion, with suggestions for further work.

Having discussed the principal factors which probably affected the range of crops produced, it only remains to make some assessment of their relative importance. It was argued above that soil and climate are unlikely to have been the main factors causing one crop rather than another to be produced. Exceptions to this generalisation include the sensitive fruit and nut crops, which are close to their northern climatic limits in this country, and rye which remained an unimportant crop partly at least because it is much better suited to growth on acid, sandy soils than the calcareous soils of the chalklands. Contemporary sites on fairly similar soil types have been shown to have quite different crop spectra, and it has been suggested that climatic deteriorations in Southern England have probably not been of sufficient magnitude to initiate major changes. The effects of soil and climate are, therefore, probably best seen in this part of the country as factors acting so as to modify or reinforce changes initiated by quite different causes.

Introductions have naturally had an effect. The staple crops, however, (spelt, emmer and hulled barley) are present throughout the period studied, from the 8th century BC to the 4th century AD. Bread wheat, which seems to have been re-introduced some time before the 1st century BC is an example of a successful introduction which steadily increased in importance. The same is true of oats, but possibly not of rye if the frequencies of presence of these crops are a reliable indicator. The most striking introductions are the vegetable, fruit and nut crops introduced throughout Western Europe by the Romans. These represent an entirely new branch of agriculture. Roman introductions seem to have had a relatively minor effect upon the staple food crops in Hampshire, however.

The likelihood that part of the produce of arable farming went to feed stock is a factor which has received rather less attention. Postulated variations in the quantity of fodder production can be used to explain differences between the crop spectra of some Iron Age sites. However, the trend towards pastoralism which was formerly believed to have taken place in the late Roman period now seems of lesser importance; consequently it cannot be used to explain crop changes in the 4th century AD.

Probably the main factors influencing staple food crop production however, are economic and political in nature in both periods. Iron Age agriculture appears to have been intensive, relying on both winter and spring-sown crops. The introduction of spelt before the 8th - 7th centuries BC has been seen as a result of the need to increase production in response to rising population. This intensification was so successful that an exportable surplus was being produced by the later Iron Age. The establishment of Roman control and the new tax requirements increased the demand for cereals still further. In particular wheat production was probably stimulated, and by the 4th century, if not before, large amounts of grain were being exported. It has often been asserted that these demands had an overwhelming and steadily increasing effect upon the economy as a whole and upon the nature of production. This seems very likely: Roman tax demands were probably the largest single factor causing the trend towards wheat production, which is reflected in the Hampshire samples from 4th century sites. This trend may well have been reinforced by climatic deterioration, making the sowing of winter crops on heavier soils difficult and therefore encouraging the cultivation of such crops on the lighter chalk soils. There seems to be no firm evidence to suggest that climatic factors were of more than secondary importance, however.

The picture of farming practice and agrarian change which emerges from the present study could be improved and amplified by work along a number of lines. The examination of Iron Age and Roman farming in isolation has unfortunately been imposed by the nature of the available evidence. Collection and examination of botanical material should be made an integral part of future excavations of earlier prehistoric and post-Roman settlements. Despite cultural change, agriculture must have continued, probably in a very conservative manner. It may well emerge that Iron Age and Bronze Age crop production, or that of the Roman and Early Saxon periods differ less than seems to be the case at present, on the limited information available.

Within the Iron Age and Roman periods more information, and information of a different type, could be produced from an examination of new kinds of context and site. There is, for example, only a limited amount of information to be gained from studies of botanical material from pits, postholes and ditches on ploughed-out sites. Wherever sites in a well-preserved condition are excavated, at which ovens, floor levels and intact storage facilities survive beneath hill-wash, for example, the collection of botanical remains is particularly important. Detailed studies of crop processing activities may be made using deposits from such contexts. Low-lying sites of the Roman period, at which seeds of many crop plants not normally preserved in a carbonised state may survive in anaerobic conditions, have been fairly extensively investigated. The same is not true of the Iron Age, and if sites of this period containing waterlogged deposits are encountered, botanical samples should be taken. Remains of crop plants are also present in deposits outside the settlements, as for example at site R1, which has demonstrated the value of flotating buried arable soils. Wherever such soils are excavated, flotation may produce evidence for the nature of the standing crop. It must be admitted that these contexts - well-preserved structures, waterlogged deposits on Iron Age sites and buried arable soils - are relatively rare, but this merely makes their examination more important.

These are some particular recommendations for future work on the Hampshire Chalklands. Elsewhere in the country, it seems to the writer than an understanding of ancient crop production will best be gained by means of a regional approach. A series of fairly detailed regional studies, along the lines of the present dissertation, should produce results of a far more meaningful nature than the haphazard study of botanical remains from odd sites scattered over the country. The limitations of this latter approach are indicated by the very tentative nature of the conclusions which can be drawn from the data summarised in Appendix 1. It is hoped that the contrasting advantages of regional study are apparent in the body of this dissertation.

Appendix 1

A check-list of finds of Iron Age and Roman crops in Britain

The purpose of this appendix is simply to list all finds of fruits and seeds of crop plants of this period known to the writer, and to make a few necessarily tentative remarks about the assembled data. Reference has already been made in the text to many of these finds, but it seems useful to draw them together, particularly as so many have been published since 1970, when data collection for the second edition of '*The History of the British Flora*' ceased (Godwin 1975, 3). Quite a number of reports earlier than 1970 not listed by Godwin also appear here.

Wild species have largely been excluded, in order to limit the length of this appendix. This means that no reference is made to finds of fruitstones of *Sambucus*, *Rubus*, *Prunus spinosa*, *Prunus insititia*, *Crataegus*, *Rosa* or to nuts of *Quercus*, *Corylus* and *Fagus*, all of which were probably exploited and are abundant on many sites. For references to these see Godwin. Interesting ecological studies, such as that of Wilson (1968) have been excluded for the same reason.

Identifications of cereals made before the studies of Jessen and Helbaek (1944) and Helbaek (1952) were published are not included. The numerous identifications of '*Triticum vulgare*' and '*Triticum sativum*' to be found in the earlier literature have been rendered rather dubious by this later work.

As a rule identifications of wood and pollen have been excluded, although exceptions have been made when cultivars are represented only by these forms of evidence. The sweet chestnut, *Castanea sativa*, and the sour cherry *Prunus cerasus* are known only from wood and charcoal. Pollen of '*Humulus*'-type is the only trace of cultivars in the *Cannabiaceae*, either the hop, *Humulus lupulus* or hemp, *Cannabis sativa*.

References to finds of 'seeds' or of 'grain' with no further information, abound in the literature. These have not been included here. Undated deposits, possibly of Iron Age or Roman date, such as that from Wookey Hole, Somerset (Reid 1911) have been ignored.

It need hardly be said that finds will inevitably have been omitted from this list, but it is hoped that no reports of major import have been overlooked.

| | Author | Reference | Site | T. monococcum | T. dicoccum | T. spelta | T. aestivum s.l. | Secale | Avena | Hordeum (hulled) | Hordeum (naked) | Vicia spp. | Vicia faba |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Arthur | (1954,37) | Wickbourne,Sussex | | | + | | + | + | + | | | |
| | Arthur | (1972,7) | Canterbury,Kent | | | + | | + | | | | | |
| | | | Twywell,Northants. | | | + | | | | + | | | |
| | Brailsford | (1949,167) | Little Woodbury,Wilts. | | | | | | | + | + | | |
| | Bunting | (Forthcoming) | Ravensburgh,Herts | | ? | ? | | | | + | | | |
| X | Farrar | (1960,85) | Marnhull,Dorset | | | | | | | | | | + |
| | Evans and Bowman | (1968,146) | Tollard Royal, Wilts. | | ? | ? | | | | + | | | |
| | Greig | (1974,243) | Croft Ambrey,Herefords. | | | ? | | | | | | | |
| | Harding | (1964,14) | Weston Wood, Surrey | | + | | | | | + | | | |
| | Helbaek | (1952,228) | Highfield, Wilts. | | | + | | | | | | | |
| | | | Casterley, Wilts. | | | + | | | | | | | |
| | | | Small Down,Somerset | | + | + | | | | | | | |
| | | | Meare, Somerset | | + | + | | | + | + | | | + |
| | | | Glastonbury,Somerset | | + | + | | | + | + | | | + |
| | | | Wickbourne, Sussex. | | | + | | | | | | | |
| | | | Worth Matravers,Dorset | | ? | + | | | | | | | |
| | | | Portland, Dorset | | | + | | | + | + | | | |
| | | | Hembury, Devon | ? | + | + | | | | + | + | | |
| | | | Winklebury, Wilts. | | | + | | + | | | | | |
| | | | Worlebury, Somerset | | | | | | + | + | | | + |
| | Helbaek | (1955,1) | Thriplow, Cambs. | | | | | | | + | | | |
| | Jessen and Helbaek | (1944,22) | Maiden Castle,Dorset | ? | + | + | + | + | + | + | + | | |
| | | | Prae Wood, Herts. | | | | | | | + | + | | |
| | | | Trevarbath, Cornwall | | + | | | | | | | | |
| | | | Radley, Oxon. | | | | | | | + | | | |
| | | | Ashwell, Cambs. | | | | + | | | | | | |
| | | | Chastleton, Oxon. | | | | | | | + | | | |
| | | | Fifield Bavant,Wilts. | | | + | + | + | + | + | | | |
| | | | Little Solisbury,Wilts | | + | + | + | | + | + | | | |
| | Murphy | (forthcoming) | Fingringhoe, Essex | | | | | | | | | | + |
| | Murphy | (Chapter 3 above) | Portway, Hants. | | + | + | + | | | + | ? | + | |
| | | | Old Down, Hants. | | + | + | | | | + | | + | |
| | | | Owslebury, Hants. | | + | + | + | + | + | + | ? | + | + |
| | | | R27,Micheldever,Hants. | | + | + | + | | + | + | + | + | |
| | | | R1,Stratton Park,Hants. | | | | + | | | ? | + | | |
| | Rahtz and Brown | (1958/9,158) | Blaise Castle Hill, Bristol | | ? | | ? | | | | | | |
| | Renfrew | (1965,10) | Aldwick,Barley,Herts. | | + | | | | + | + | | | |
| | | | Wandlebury,Cambs. | | + | | | | + | + | | | |
| | Renfrew | (1974,210) | Dun Mor Vaul,Scotland | | | | | | | + | + | | |
| | Savory | (1967,74) | Llanbethian,Glamorgan | | | | ? | | ? | ? | | | |

X - Date not absolutely certain. Possibly Romano-British.

A <u>Iron Age: Cereals and legumes</u>

| | | | *T. monococcum* | *T. spelta* | *T. dicoccum* | *T. aestivum s.l.* | *T. compactum* | *Hordeum* (hulled) | *Hordeum* (naked) | Rye | Oats |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Arthur | (1957/8,35) | Lullingstone,Kent. | | + | | | | | | | + |
| | | Falmer, Sussex | | + | | | | | | | |
| | | Lamb's Lea,Sussex | | + | | | | + | | + | + |
| Arthur | (1963,328) | Downton,Wilts. | | + | + | | + | + | | | |
| Arthur | (1969,38) | Goldherring,Cornwall | | | | | | + | + | + | + |
| Arthur | (1972,8 ff) | Twywell, Northants. | | ? | | | | + | | | |
| | | Gt.Casterton,Rutland | | + | | | | | | | |
| | | Bainbridge, Yorks. | | + | | | | + | | | |
| | | Birrens, Dumfries. | | + | + | | | + | | | |
| | | Hailes, Gloucs. | | + | | | | | | | |
| | | Malton, Yorks. | | + | + | | | + | | | + |
| | | Richborough, Kent | | + | + | | + | | | | + |
| | | Thistleton, Rutland | + | + | + | | | | | | |
| | | Iwade, Kent | | + | | | | | | + | |
| | | Chew Valley,Somerset | + | + | + | | | + | | | |
| | | Dorchester, Oxon. | | + | | + | + | + | | | |
| | | Findon, Sussex. | | + | | + | | + | | + | + |
| | | Worthing, Sussex | | + | | | | | | | |
| | | Upchurch, Kent | | | | | | + | | | |
| Arthur and Metcalfe | (1972,140) | Chalke, Kent | | + | | | | + | | | + |
| Barton | (1963/4) | Shipham, Somerset | | ? | | | | | + | | |
| Brodribb et al. | (1968,109) | Shakenoak, Oxon. | | + | | | | | | | |
| Clarke,H.H. | (1970,81) | Frocester Ct.,Gloucs. | | + | | ? | | + | | | + |
| Clarke,H.H. | (1971,48) | Upton St. Leonards," | | + | | + | + | | | | + |
| Clarke,R.R. | (1960,122) | Caistor, Norfolk | | + | | + | | | | | + |
| | | Littleport, Cambs. | | | | + | | | | | |
| Corder | (1951,18) | Gt.Casterton,Rutland | | | | ? | | | | | |
| DOE | (1973,16) | Dalladies,Kincardine | | | | | | ? | | | |
| Field | (1965,198) | Studland, Dorset | | + | | | | | | | |
| Godwin | (1975,410-13) | Stockton, Dorset | | | | | | + | | | |
| | | Caistor, Norfolk | | + | | + | | | | | |
| Helbaek | (1952,228) | Windmill Hill,Wilts. | | | + | | | | + | | |
| | | Rotherley, Wilts. | | + | | | | + | | | |
| | | Wickbourne, Sussex | | + | | | | + | | ? | |
| | | Park St., Herts. | | + | | | | + | | | + |
| | | Verulamium, Herts. | | + | | + | | + | | + | + |
| | | Rivenhall, Essex | | + | | | | | | | |
| | | Halstead, Essex | | + | | | | | | ? | + |
| Helbaek | (1964,158) | Caerleon, Wales | | + | | + | | + | | + | + |
| Hogg | (1968,188) | Pen Llystyn,Caerns. | | + | | | | + | | | |
| | | Cefn Graenog,Caerns. | | + | | | | | | | |

continued...

| Author | Reference | Site | T. monococcum | T. spelta | T. dicoccum | T. aestivum s.l. | T. compactum | Hordeum (hulled) | Hordeum (naked) | Rye | Oats |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Jessen and Helbaek | (1944,25) | Malton, Yorks | | | + | | + | + | | | + |
| | | Birrens, Edinburgh | | | | | | + | | | + |
| | | Casle Cary, Edinburgh | | | + | | + | + | | + | + |
| | | Forth and Clyde Canal, Edinburgh | | | + | | | + | | + | + |
| | | Camp Hill, Glasgow | | | | | | + | | | + |
| | | York Hill, Glasgow | | | | | | + | | | |
| | | Old Kilpatrick, Glasgow | | | + | | | + | | | |
| Large | (1969,181) | Halstock, Dorset | | | | ? | | | | | |
| Morrison | (1959,13) | North Leigh, Oxon. | | + | + | + | + | + | | + | + |
| Murphy | (unpub. b) | Colliton Park, Dorset | | | + | + | | | | | |
| Murphy | (unpub. a) | Farmington, Gloucs. | | + | + | | | + | | | |
| Murphy | (Chapter 3 above) | Owslebury, Hants. | | + | + | + | + | + | + | + | + |
| | | Winchester, Hants. | | + | | | | | | | |
| | | Crookhorn, Hants. | | + | + | | | + | | | |
| | | Colchester, Essex | | + | + | + | | + | + | | + |
| Murphy and Renfrew | (1975,416) | Portchester, Hants. | | ? | ? | | | + | | | + |
| Phillips | (1970,63) | Flaggrass, Cambs. | | + | | | | + | | | |
| | | 7 Lincs. sites | | + | | | | + | | | |
| Smedley | (1965,117) | Wangford, Suffolk | | | | | | + | | | |
| Wheeler | (1968,36) | S. Muskham, Notts. | | | + | | | | + | | |
| Willcox | (pers. comm.) | London | | + | | | | | | | |

B <u>Roman: Cereals</u>

| | | | | Prunus domestica | Prunus avium | Malus sylvestris | Mespilus germanica | Pyrus communis | Cucumis sativus | Vitis vinifera | Ficus carica | Morus nigra | Phoenix dactylifera |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Arthur and Metcalfe | (1972,140) | Chalk, Kent | | | + | | | | | | | |
| | Blackburn | (1932,55) | Langton, Yorks | | + | | | | | | | | |
| | Fullbrook-Legatt | (1933,74) | Gloucester | | | | | | | + | | | |
| * | Haverfield | (1915,16) | Holt, Cheshire | | + | | | | | | | | |
| | Haverfield and Taylor | (1932,174) | Westgate, Kent | + | + | | | | | | | | |
| | Kennard and Warren | (1903,456) | Bermondsey, London | + | | + | | | | + | + | | |
| | Norman and Reader | (1906,217) | London | | | | | | | + | | | |
| | Medland | (1894/5, 155) | Gloucester | | | | | | | + | | | |
| | Murphy | (Chapter 3 above) | Winchester, Hants. | + | + | + | | | | + | + | | |
| | | | Neatham, Hants. | + | + | + | | | | | | | |
| | | | Colchester, Essex | + | | | | | | | + | | + |
| | Reid, C. | (1900,253) | Silchester, Hants. | + | + | + | | | | + | + | | |
| | Reid, C. | (1905,367) | " | | | | + | | | | | + | |
| | Reid, E.M. | (1921,111) | London | | | | | | | | + | | |
| X | Salzmann | (1909,95) | Pevensey, Sussex | | + | | | | | | | | |
| | Willcox | (pers. comm.) | London | + | + | + | | + | + | + | + | + | |
| | Wilson | (1969,231) | Appleford, Berks. | + | | | | | | | | | |
| | Heighes-Woodforde | (1954,98) | Chew Stoke, Somerset | + | + | | | | | | | | |

* - not seen; quoted by Applebaum (1972)

X - Prunus cerasus (wood identification)

C Roman: Cultivated fruits

| | | | *Vicia sativa/angustifolia* | *Lathyrus* spp. | *Vicia faba* | *Pisum sativum* | *Lens esculenta* |
|---|---|---|---|---|---|---|---|
| Arthur | (1963,328) | Downton, Wilts | + | | | | |
| Arthur | (1972,8) | Rockbourne, Hants. | + | | | | |
| | | Steyning, Sussex | | | + | | |
| | | Chew Valley Lake, Somerset. | | | + | | |
| Bean | (1958,98) | Goathill, Dorset | | | | + | |
| Greig | (1971,376) | Fishbourne, Hants. | | + | | | |
| Helbaék | (1952,229) | Verulamium, Herts. | | | + | | |
| Helbaek | (1964,158) | Caerleon, Monmouthsh. | + | + | + | | + |
| Murphy | (Chapter 3 above) | Owslebury, Hants. | + | | + | + | |
| | | Colchester, Essex | + | | + | | + |
| Murphy | (unpub. a) | Colliton Park, Dorset | + | | + | | |
| Reid | (1910,19) | Caerwent, Monmouthsh. | | | | + | |
| Reid | (1908,210) | Silchester, Hants. | | | | + | |
| Salzmann | (1909,94) | Pevensey, Sussex | + | | | | |
| Willcox | (pers. comm.) | London | | | | | + |
| Heighes-Woodforde | (1954,98) | Chew Stoke, Somerset | | | + | | |

D <u>Roman: Legumes</u>

| | | | "*Humulus*" pollen | *Olea europaea* | *Linum usitatissimum* | *Papaver somniferum* | *Camelina sativa* |
|---|---|---|---|---|---|---|---|
| Connolly | (1971,48) | Denton, Lincs. | | | + | + | |
| Helbaek | (1952,228) | Meare, Somerset | | | + | | |
| Kennard & Warren | (1903,456) | Bermondsey, London | | | + | | |
| Murphy | (Chapter 3 | Winchester, Hants. | | | | + | |
| | above) | Colchester, Essex | | | + | + | + |
| Reid | (1901,254) | Silchester, Hants. | | | + | + | |
| Reid | (1905,367) | " | | | | + | |
| Salzmann | (1909,94) | Pevensey, Sussex | | | + | | |
| Walker | (1955,252) | Skelsmergh Tarn, Westm. | + | | | | |
| Walker | (1966,111) | Ehenside Tarn, Westm. | + | | | | |
| Willcox | (pers. comm.) | London | | + | | | |

E Roman: Oil, drug and fibre crops.

| | | | Juglans regia | Pinus pinea | Prunus dulcis | Castanea sativa |
|---|---|---|---|---|---|---|
| Blackburn | (1932,55) | Langton, Yorks. | + | | | + |
| Connolly | (1971,48) | Denton, Lincs. | | | | + |
| Curwen and Ross-Williamson | (1931,31) | Cissbury, Sussex | | | | + |
| Dewar | (1955,60) | Low Ham, Somerset | | ? | | + |
| Lyell | (1912,334) | London | | | | + |
| Murphy | (Chapter 3 above) | Neatham, Hants. | + | | | |
| | | Colchester, Essex | | + | | |
| Norman and Reader | (1906,216) | London | | + | | |
| Pitt-Rivers | (1888,229) | Rotherley, Wilts. | + | | | + |
| | (1887, ) | Woodcuts, Wilts. | | | | + |
| Salzmann | (1909,94) | Pevensey, Sussex | | | | + |
| Willcox | (pers. comm.) | London | + | + | | |
| Wilson | (1973,305) | Mucking, Essex | | + | | |
| Winbolt and Goodchild | (1940,65) | Wigginholt, Sussex | | | + | |

F <u>Roman: Nuts.</u>

| | | | Cucumis sativus | Brassica rapa | Beta vulgaris | Pastinaca sativa | Raphanus raphanistrum | Apium graveolens | Foeniculum vulgare | Smyrnium olusatrum | Anethum graveolens | Coriandrum sativum | Pimpinella anisum | Petroselinum crispum | Chaerophyllum aureum | Sinapis alba | Thymus serpyllum | Daucus carota |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Barton | (1963/4) | Shipham, Som. | | | | | + | | | | | | | | | | | |
| Churchill | (1970, 137) | Welney, Lincs. | | | | | | + | | | | | | | | | | |
| Connolly | (1971, 48) | Denton, Lincs. | | | + | | | | | | | + | | | | | | |
| Godwin | (1975, 223) | Godmanchester, Hunts. | | | | | | | | | | + | | | | | | + |
| Helbaek | (1964, 158) | Caerleon, Mon. | | | | | + | | | | | | | | | | | |
| Kennard &Warren | (1903, 456) | Bermondsey, London | | | | | | | + | | | | | | | | | |
| Murphy | (Chapter 3) | Winchester, Hants. | | | | | | + | | | | + | | | | | | + |
| | | Neatham, Hants. | | | | | | | | | | + | | | | | | |
| | | Colchester, Essex. | | | | | | + | | | + | + | + | | | | | |
| Penn | (1964, 180) | Springhead, Kent. | | | | | | | | | | | | | | | + | |
| Reid | (1901, 254) | Silchester, Hants. | | | | | + | + | | | | + | | | | + | | + |
| | (1905, 367) | " | | | | + | | | | | | | | + | | | | |
| | (1906, 164) | " | | | | | | | | | + | | | | | | | |
| | (1908, 210) | " | | | | | | | | | | | | | + | | | |
| Reid | (1910, 19) | Caerwent, Mon. | | | | | + | | | + | + | + | | | | | | |
| Salzmann | (1909, 94) | Pevensey, Sussex. | | + | | | + | | | | | | | | | | | |
| Willcox | (pers. comm.) | London | + | | | | | | | | + | + | | | | | | |

G <u>Roman: Vegetables and potherbs.</u>

N.B. Several wild species which may have been utilised are included here.

Discussion

The information concerning the major cereal and legume crops which is listed above may conveniently be synthesised in the form of two 'presence' analyses; these simply record the percentages of the 40 Iron Age and 70 Roman sites at which each of these crops is present. The results are shown in Table H. Percentage presence is assumed to reflect the importance of a crop.

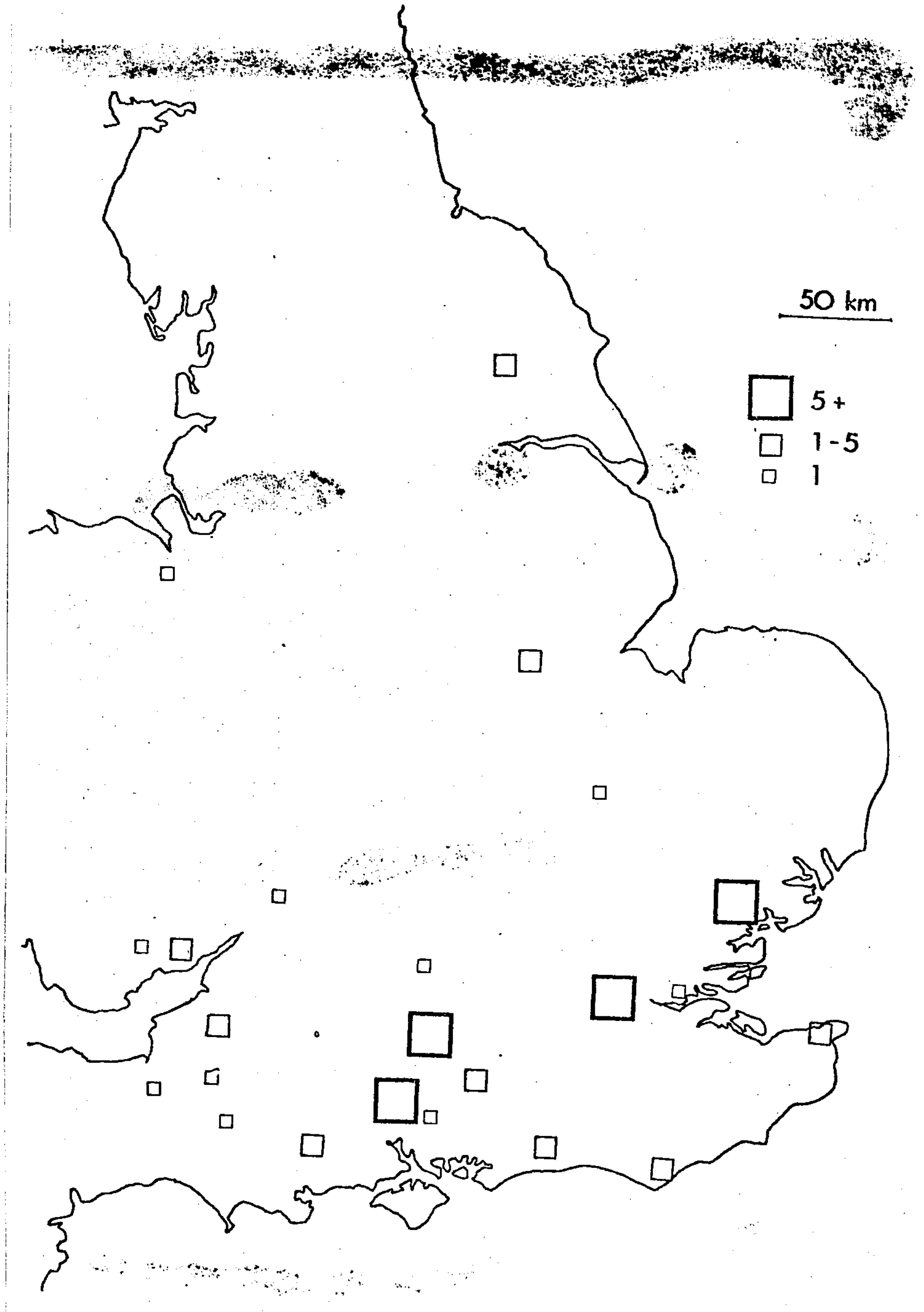
| | Iron Age | Roman |
|---|---|---|
| Triticum monococcum | 5% | 3% |
| Triticum dicoccum | 48% | 27% |
| Triticum spelta | 58% | 63% |
| Triticum aestivum s.l. | 25% | 27% |
| Hordeum (hulled) | 68% | 58% |
| Hordeum (naked) | 23% | 9% |
| Secale cereale | 15% | 17% |
| Avena spp. | 33% | 33% |
| Vicia spp. | 10% | 10% |
| Lathyrus sp. | - | 3% |
| Vicia faba var. minor | 15% | 11% |
| Pisum sativum | - | 6% |
| Lens esculenta | - | 4% |
| Number of sites | 40 | 70 |

Table H; Presence analyses of Iron Age and Roman crops. Bread and club wheats are not distinguished in this analysis - T. aestivum s.l. is used to cover both crops.

The dangers of generalising too boldly from such data are abundantly clear. The picture produced is an average view of Iron Age and Roman crops, which smooths out both regional variation and variation within the two periods, thus masking changes which are at least as interesting as the differences between pre-Roman and Roman crops. Nor is it an unbiased average; an undue proportion of sites producing cereals is from the South and East of Britain, partly as a result of more widespread excavation in this area. In addition, certain periods, particularly the Later Iron Age and the 4th century AD are undoubtedly better represented than others.

So long as these limitations are borne in mind, some broad trends may be distinguished. Einkorn is identified at only a few sites in both periods. Emmer declines in importance between the two periods, whilst spelt increases in frequency slightly. Free-threshing bread and club wheats remain at about the same frequency. Hulled barley declines slightly, and naked barley considerably. Rye, interestingly enough, stays roughly at the same frequency. In this case the method of analysis, based only on presence, masks a change. The crop is represented only by a few grains, but at several sites, in the Iron Age, but in the Roman period more substantial quantities have been recovered. The figures for oats have no significance, as wild and cultivated oats frequently cannot be distinguished, and often are not separated in reports. The principal legumes - vetches and beans - change little in frequency, but the slight decline of the latter crop may be a result of the introduction of peas and possibly the importation of lentils. A species of <u>Lathyrus</u> also seems to have been cultivated in the Roman period; a jar full of seeds was found at Fishbourne (Greig 1971, 376).

Regional variation is difficult to distinguish confidently from these figures. Indeed, to do so, detailed area studies, such as that which forms of body of this dissertation, are necessary. To take a few examples of the problem, the presence of only naked and hulled barley at Dun Mor Vaul (Renfrew 1974, 210) might be taken as indicating a distinctively northern form of cereal farming. However, the type-site of the Southern English Iron Age - Little Woodbury - has produced exactly the same cereals and no others (Brailsford 1949, 167). Welsh sites, such as Caerleon, Pen Llystyn and Cefn Graenog, have not produced a distinctive range of crops. Despite the fact that the latter site is a 'native' settlement, only spelt was identified, and this is the crop which predominates at the two remaining sites, both Roman forts. In summary, it is clear




Appendix; Figure 1; Distribution of sites producing inttoduced and imported Roman crops.

The symbols refer to the number of species recovered at each site.

that there are simply too few samples from these and other sites to draw any firm conclusions about regional variations in cereal production.

In the case of the crops newly introduced by the Romans, marked regional variation is apparent, however. The crops involved are those which appear in Tables C - G above; cultivated fruits, oil, drug and fibre crops, vegetables and potherbs and the new legumes, peas and lentils. Fig. 1 shows the distribution of sites from which remains of such crops have been recovered. This distribution is obviously partly climatic and partly cultural in origin; introduced crops are found mostly in the more Romanised areas and in those with the mildest climate. In fact the two areas coincide for the most part. However this concentration of sites in the south is probably to some extent a result of more extensive excavation in this area. The most northerly site from which introduced crops have been recovered - the villa at Langton, Yorks. - has produced walnuts, chestnut wood and cherry stones (Blackburn 1932, 55), and no doubt the work at York itself, as yet unpublished, will provide further evidence for the consumption, if not the cultivation, of southern crops in the Vale of York.

## Bibliography

All figures have been converted to Arabic numerals, except where they form part of the title of an article. References to Monumenta Historica Britannica, however, are given in Roman numerals since they may only be located by this means.

Abbreviations:

| | |
|---|---|
| Ag. Hist. Rev. | Agricultural History Review. |
| Ant. | Antiquity. |
| Ant. J. | Antiquaries Journal. |
| Arch. | Archaeologia. |
| Arch. Cant. | Archaeologia Cantiana. |
| Arch. J. | Archaeological Journal. |
| Brit. | Britannia. |
| Econ. Bot. | Economic Botany. |
| JAS | Journal of Archaeological Science. |
| J. Ecol. | Journal of Ecology. |
| JRS | Journal of Roman Studies. |
| New Phytol. | New Phytologist. |
| Oxon. | Oxoniensia. |
| P. Cambs. A.S. | Proceedings of the Cambridge Antiquarian Society. |
| PDNHAFC | Proceedings of the Dorset Natural History and Archaeological Field Club. |
| PHFC | Proceedings of the Hampshire Field Club and Archaeological Society. |
| PPS | Proceedings of the Prehistoric Society. |
| PSANHS | Proceedings of the Somerset Archaeology and Natural History Society. |
| PSAS | Proceedings of the Society of Antiquaries of Scotland. |
| SAC | Sussex Archaeological Collections. |
| Sur. A.C. | Surrey Archaeological Collections. |
| TBGAS | Transactions of the Bristol and Gloucester Archaeological Society. |
| TCWAAS | Transactions of the Cumberland and Westmoreland Antiquarian and Archaeological Society. |
| WAM | Wiltshire Archaeology and Natural History Magazine. |

Aiton, W. (1811). A general view of the agriculture of the County of Ayr. Glasgow.

Allison, J. and Godwin, H. (1949). Bronze Age plant remains from Wiltshire: Data for the study of post-glacial history XII. New Phytol. 48:2, 253-4.

Ammianus Marcellinus (1848 ed.). Historia (trans. and ed.) Petrie, H. and Sharpe, J.: Monumenta Historica Britannica, lxxii - lxxv. London.

Annable, F.K. (1961). Fieldwork in Wiltshire 1960 WAM 58, 30-38.

Applebaum, S. (1954). The distribution of the Romano-British population in the Basingstoke area. PHFC 18, 119-138.

Applebaum, S. (1954). The agriculture of the British Early Iron Age as exemplified at Figheldean Down, Wiltshire. PPS 20, 103-114.

Applebaum, S. (1966). Peasant economy and types of agriculture, in Thomas, C. (ed.). Rural Settlement in Roman Britain. CBA Research Report 7. London.

Applebaum, S. (1972). Roman Britain, in Finberg, H.P.R. (ed.). The Agrarian History of England and Wales. Vol. 1 Part II. Cambridge.

Armitage, P. (1975). The extraction and identification of opal phytoliths from the teeth of Ungulates. JAS 2, 187 - 197.

Arthur, J.R.B. (1954). Prehistoric wheats in Sussex. SAC 92, 37-47.

Arthur, J.R.B. (1957/8). British grain in Roman times. Agriculture 64, 35-39.

Arthur, J.R.B. (1963). Carbonised grain and seeds from the corn drying oven, in Rahtz, P.A. A Roman Villa at Downton, Wilts. WAM 58, 303-341.

Arthur, J.R.B. (1969). Carbonised grain, in Guthrie, A. Excavation of a settlement at Goldherring, Sancreed. 1958-61. Cornish Archaeology 8, 5-39.

Arthur, J.R.B. (1972). A synopsis of cereal crop sequences in Great Britain from the Neolithic period to the 17th century. Unpublished typescript.

Arthur, J.R.B. and Metcalfe, C.R. (1972). Appendix A: Plant Remains, in Johnston, D.E. A Roman building at Chalke, near Gravesend. Brit. 3, 112-148.

Aykroyd, W.R. and Doughty, J. (1964). Legumes in Human Nutrition. Rome.

Barry, R.G. (1964). Weather and climate, in Monkhouse, F.J. (ed.). A survey of Southampton and its region, Southampton.

Barton, K.J. (1963-4). Star Roman Villa, Shipham, Somerset. PSANHS. 108, 45-93.

Bean, C.E. (1958). Some Roman sites and miscellaneous finds from the Sherborne district. PDNHAFC 80, 96-8.

Bede (1968 ed.). A History of the English Church and People (trans.) Sherley-Price, L. (revised) Latham, R.E. Harmondsworth, Middlesex.

Beijerinck, W. (1947). Zadenatlas der Niederlandsche Flora Wafeningen.

Bennet-Clark, M.A. (1954). Excavation at Middle Brook Street, Winchester 1953: Interim report. PHFC 18, 315-324.

Berggren, G. (1962). Reviews on the taxonomy of some species of Brassica based on their seeds. Svensk. Bot. Tidskr. 56, 65-133.

Bersu, G. (1940). Excavations at Little Woodbury, Wiltshire: Part 1. The settlement as revealed by excavation. PPS 6, 30-111.

Bertsch, K. (1941). Früchte und Samen Stuttgart.

Bertsch, K. and Bertsch, F. (1949). Geschichte unserer Kulturpflanzen. Stuttgart.

Biddle, M. (1969). Excavations at Winchester 1968: 7th interim report. Ant. J. 49, 295-329.

Biddle, M. (1970). Excavations at Winchester 1969: 8th interim report. Ant. J. 50, 277-326.

Birch, B.P. (1964). Soils, in Monkhouse, F.J. (ed.): A survey of Southampton and its region, Southampton.

Blackburn, K.B. (1932). Report in the vegetable remains from the well, in Corder, P. and Kirk, J.: The Roman villa at Langton, Yorks. Leeds.

Bohrer, V.L. (1972). On the relation of harvest methods to early agriculture in the Near East. Econ. Bot. 26, 145-155.

Boon, G.C. (1957). Roman Silchester. London.

Bottema, S. (1975). The interpretation of pollen spectra from prehistoric settlements (with special attention to Liguliflorae). Palaeohistoria 17, 17-35.

Bowen, H.C. (1961). Ancient Fields. London.

Bowen, H.C. (1969). The Celtic Background, in Rivet, A.L.F.: The Roman Villa in Britain, 1-48. London.

Bradley, C.A.; Macdonald, A.T. and Webber, N.B. (1964). Hydrology and water supply, in Monkhouse, F.J. (ed.): A survey of Southampton and its region, Southampton.

Bradley, R. (1967). Excavations on Portsdown Hill, 1963-5. PHFC 24, 42-58.

Bradley, R. (1971). Economic change in the growth of early hillforts, in Hill, D. and Jessen, M. (eds.): The Iron Age and its hillforts. Southampton.

Brailsford, J. (1949). Excavations at Little Woodbury, Parts IV and V. PPS 15, 156-168.

Braun-Blanquet, J. (1932 ed.). Plant Sociology, trans. Fuller, G. and Conrad, H. New York.

Brenchley, W.E. (1920). Weeds of farm land. London.

Brodribb, A.; Hands, A. and Walker, D. (1968). Excavations at Shakenoak Farm nr. Wilcote, Oxon. Part 1. Sites A and D. Oxford.

Brothwell, D. (1971). Diet, economy and bisocial change in late prehistoric Europe, in Simpson, D.D.A. (ed.): Economy and Settlement in Neolithic and Early Bronze Age Britain and Europe, Leicester.

Buckland, P.C. (1974). Archaeology and Environment in York. JAS 1, 303-316.

Bulleid, A. and St. George Gray, H. (1916). The Glastonbury Lake Village. Glastonbury.

Bunting, A.H. (forthcoming). Report on the carbonised grain from Ravensburgh Castle, Hexton, N. Herts.

Burgess, C. (1968). The Later Bronze Age in the British Isles and North-West France. Arch. J. 125, 1-45.

Bushe-Foxe, J.P. (1913). Excavations on the site of the Roman town at Wroxeter, Shropshire in 1912. Oxford.

Caesar (1974 ed.). The Conquest of Gaul, (trans.) Handford, S.A. Harmondsworth, Middlesex.

Calkin, J.B. (1966). A grain pit at Sheepslights, Worth Matravers. PDNHFC 88, 149-151.

Callender, M.H. (1965). Roman amphorae, with an index of stamps. London.

Chenhall, R.W. (1975). A rationale for archaeological sampling, in Mueller, J.W. (ed.) Sampling in Archaeology. Tucson.

Churchill, D.M. (1970). Post-Neolithic to Romano-British sedimentation in the Southern Fenlands of Cambridge-shire and Norfolk in Phillips, C.W. (ed.): The Fenland in Roman Times. London.

Clapham, A.R.; Tutin, T.G. and Warburg, E.F. (1962). Flora of the British Isles. (2nd edn.). Cambridge.

Clark, G. (1970). Lankhills School, in Biddle, M.: Excavations at Winchester 1969. Ant. J. 50, 292-298.

Clark, J.G.D. (1952). Prehistoric Europe: The Economic Basis. London.

Clark, J.G.D. (1971). Excavations at Star Carr. Cambridge.

Clarke, H.H. (1970). Appendix III: Grain, in Gracie, A.S.: Frocester Court Roman Villa; First report. TBGAS 89, 15-86.

Clarke, H.H. (1971). Analysis of vegetable matter from the corn drier, in Fowler, P.J. and Walthew, C.V.: Archaeology and the M5 Motorway. TBGAS 90, 22-63.

Clarke, R. Rainbird. (1960). East Anglia. London.

Cobbett, W. (1830, 1967 ed.). Rural Rides. (ed. by) Woodcock, G. Harmondsworth, Middlesex.

Coles, J.; Hibbert, F.A. and Orme, B.J. (1973). Prehistoric roads and tracks in Somerset: 3: The Sweet Track. PPS 39, 256-293.

Collingwood, R.G. (1921). Excavations in the Roman fort at Ambleside (fourth year, 1920) and at other sites on the tenth Iter. TCWAAS 21; 3, 1-42.

Collingwood, R.G. (1937). Roman Britain, in Frank, T. (ed.). An economic survey of Ancient Rome. Vol. 3, 7-118. Baltimore.

Collingwood, R.G. and Myres, J.N.L. (1936). Roman Britain and the English settlements. Oxford.

Collis, J.R. (1970). Excavations at Owslebury, Hants.: A second interim report. Ant. J. 50, 246-257.

Collis, J.R. (undated). The excavation of rural settlements. Southampton.

Columella (1955 ed.). On Agriculture and Trees (trans.) Forster, S. and Heffner, E. London.

Condit, I. (1947). The Fig. Waltham, Mass.

Connolly, A.P. (1941). A report of plant remains at Minnis Bay, Kent. New Phytol. 40: 4, 299-303.

Connolly, A.P. (1971). Appendix 1 (e): Plant Remains, in Greenfield, E., The Roman villa at Denton, Lincolnshire. Lincolnshire History and Archaeology, 6, 29-58.

Coope, R.G. and Osbourne, P.J. (1967). Report on the coleopterous fauna of the Roman well at Barnsley Park, Gloucestershire. TBGAS 86, 84-87.

Corder, P. (1943). Roman spade-irons from Verulamium, with notes on examples elsewhere. Arch. J. 100, 224-231.

Corder, P. (1951). The Roman Town and villa at Great Casterton, Rutland. Nottingham.

Cornwall, I.W. (1953). Soil Science and Archaeology from some British Bronze Age monuments. PPS 19, 129-147.

Cornwall, I.W. (1963). Soil, Stratification and Environment, in Brothwell, D. and Higgs, E.S. (eds.): Science in Archaeology. London.

Cotton, M.A. and Gathercole, P.W. (1958). Excavations at Clausentum, Southampton 1951-4. London.

Cras'ter, M.C. (1960). The Aldwick Iron Age Site; Barley, Herts. P. Cambs. A.S. 54, 21-46.

Crummy, P. (1974). Colchester, Recent Excavations and Research. Colchester.

Cunliffe, B.W. (1964). Winchester Excavations 1949-1960 Vol. 1. Winchester.

Cunliffe, B.W. (1970). A Bronze Age settlement at Chalton, Hants. (Site 78). Ant. J. 50, 1-13.

Cunliffe, B.W. (1971). Excavations at Fishbourne. Vol. 1. The Site. Vol. II. The Finds. Leeds.

Cunliffe, B.W. (1971a). Danebury, Hampshire. First interim report on the excavation, 1969-70. Ant. J. 51, 240-252.

Cunliffe, B.W. (1973). Chalton, Hants: The evolution of a landscape. Ant. J. 53, 173-190.

Cunliffe, B.W. (1974). Iron Age Communities in Britain. London.

Cunliffe, B.W. (1975). Excavations at Portchester Castle, Vol. 1. Roman. London.

Cunliffe, B.W. and Phillipson, D.W. (1968). Excavations at Eldon's Seat, Encombe, Dorset. PPS 34, 191-237.

Cunnington, M.E. (1923). The Early Iron Age inhabited site at All Canning's Cross Farm, Wiltshire. Devizes.

Curwen, E.C. (1937). A Tribulum - flint from Sussex. Ant. 11, 93-4.

Curwen, E.C. (1947). Implements and their wooden handles. Ant. 21, 155-8.

Curwen, E.C. and Ross-Williamson, R.P. (1931). The date of Cissbury Camp. Ant. J. 11, 14.

Dansgaard, W.; Johnsen, S.J.; Reeh, N.; Gundestrup, N.; Clausen, H.B. and Hammer, C.V. (1975). Climatic change, Norsemen and modern man. Nature 255, 24-8.

Darwin, C. (1881). The formation of vegetable mould through the action of earthworms. London.

Davies, R.W. (1971). The Roman Military Diet. Brit. 2, 122-142.

Dennell, R.W. (1970). Seeds from a Medieval sewer in Woolster Street, Plymouth. Econ. Bot. 24, 151-4.

Dennell, R.W. (1972). The interpretation of plant remains: Bulgaria, in Higgs, E.S. (ed.). Papers in Economic Prehistory, 149-159. Cambridge.

Dennell, R.W. (1974). Botanical evidence for prehistoric crop processing activities. JAS 1, 275-284.

Department of the Environment (1973). Archaeological excavations 1972. London.

Dewar, H.S.L. (1955). Notes on a new range of buildings and a Roman well at Low Ham. Notes and Queries for Somerset and Dorset 27, 58-61.

Dickson, C.A. (1970). The study of plant macrofossils in British Quaternary deposits, in Walker, D. and West, R.G.: Studies of the vegetational history of the British Isles. Cambridge.

Dimbleby, G.W. (1965). Post-glacial changes in soil profiles. Proceedings of the Royal Society, B161, 355-362.

Dimbleby, G.W. (1967). Plants in Archaeology. London.

Dimbleby, G.W. and Evans, J. (1974). Pollen and land snail analysis of calcareous soils. JAS 1, 117-133.

Diodorus Siculus (1848 ed.). Bibliothecae Historicae, (trans. and ed.) Petrie, H. and Sharpe, J. Monumenta Historica Britannica, i-iii. London.

Dioscurides (1848 edn.). De medica materia (trans. and ed.) Petrie, H. and Sharpe, J. Monumenta Historica Britannica, xc. London.

Dunnett, B.R.K. (1966). Excavations on North Hill, Colchester. Arch. J. 123, 27-61.

Ellison, A. and Harriss, J. (1972). Settlement and land use in the prehistory and early history of Southern England: a study based on locational models, in Clarke, D.L. (ed.): Models in Archaeology. London.

Ernle, Lord. (R.E. Prothero). (1919). English Farming, Past and Present. (2nd edition). London.

Estyn-Evans, E. (1957). Irish Folk-Ways. London.

Evans, A.M. and Bowman, A. (1968). Appendix II. Carbonised grains from Tollard Royal, Berwick Down, Wilts. in Wainwright, G.J.: The excavation of a Durotrigian Farmstead near Tollard Royal in Cranborne Chase, Southern England. PPS 34, 102-147.

Evans, J.G. (1972). Land Snails in Archaeology. London.

Evans, J.G. (1975). The Environment of Early Man in the British Isles. London.

Farrar, R.A.H. (1960). Miscellaneous discoveries and accessions: Carbonised grain from Early Iron Age or Romano-British pits at Allard's Quarry, Marnhull. PDNHFC 82, 85-86.

Fasham, P.J. (ed.) (1976). M3 Archaeology 1975. Winchester.

Field, N.H. (1965). Appendix XI: Grain impression, in Romano-British Settlement at Studland, Dorset. PDNHFC 87, 142-207.

Field, N.H.; Matthews, C.L. and Smith, I.F. (1964). New Neolithic sites in Dorset and Bedfordshire, with a note on the distribution of Neolithic storage pits in Britain. PPS 30, 352-381.

Forde, C. Daryll. (1934). Habitat, Economy and Society. London.

Forsyth, A.A. (1968). British Poisonous Plants. Min. Ag. Fish. and Food. Bulletin 161. London.

Fowler, P.J. (1971). Early prehistoric agriculture in Western Europe: some archaeological evidence, 153-182 in Simpson, D.D.A. (ed.): Economy and settlement in Neolithic and Early Bronze Age Britain and Europe. Leicester.

Fowler, P. and Evans, J.G. (1967). Plough marks, lynchets, and early fields. Ant. 41, 289-301.

French, D.H. (1971). An experiment in water sieving. Anatolian Studies 21, 59-64.

Frere, S. (1967). Britannia: A history of Roman Britain. London.

Fullbrook-Legatt, L. (1933). Glevum. TBGAS 55, 55-104.

Fussell, G.E. (1952). Four centuries of farming systems in Hampshire 1500-1900. PHFC 17, 264-287.

Fussell, G.E. (1959). Marl: an ancient manure. Nature 183, 214-217.

Godwin, H. and M.E. (1940). Submerged peat at Southampton. New Phytol. 39, 303-307.

Godwin, H. (1960). Prehistoric wooden trackways of the Somerset Levels; their construction, age and relation to climatic change. PPS 26, 1-36.

Godwin, H. (1975). History of the British Flora (2nd edn.). Cambridge.

Goodchild, R.G. (1943). T-shaped corn-drying ovens in Roman Britain. Ant. J. 23, 148-153.

Green, F. (1975). Large-seeded legumes of the Old World. Unpublished dissertation, Univ. of Sheffield.

Green, F.H.W. (1940). Hampshire. Part 89 of The Land of Britain. The Report of the Land Utilisation Survey of Great Britain (ed.) Stamp, L.D. London.

Greig, J.R.A. (1971). Seeds, in Cunliffe, B.W.: Excavations at Fishbourne 1961-9 2. Leeds.

Greig, J.R.A. (1974). Appendix 3. Carbonised seeds, in Stanford, S.C. Croft Ambrey, Hereford.

Grubb, N.H. (1949). Cherries. London.

Harcourt, R. (1969). Appendix 1. The Animal remains from Balksbury Camp, in Wainwright, G.J.; The excavation of Balksbury Camp, Andover, Hants. PHFC 26, 21-55.

Harding, D.W. (1974). The Iron Age in Lowland Britain. London.

Harding, J.M. (1964). Interim report on the excavation of a late Bronze Age Homestead in Weston Wood, Albury, Surrey. Sur. A.C. 61, 10-17.

Harlan, J. and de Wet, J. (1965). Some thoughts about weeds. Econ. Bot. 19, 16-24.

Hassall, M.W.C.; Wilson, D.R. and Wright, R.P. (1972). Roman Britain in 1971. Brit. 3, 299-367.

Haverfield, F.J. (1915). Roman Britain in 1914. British Academy 1915, 16.

Haverfield, F.J. and Taylor, M.V. (revised Wheeler, M.). (1932). Victoria County History of Kent, 3. London.

Hawkes, C.F.C. (1940). The excavations at Bury Hill, 1939. PHFC 14, 291-337.

Hawkes, C.F.C. (1940a). The excavations at Quarley Hill, 1938. PHFC 14, 136-194.

Hawkes, C.F.C. (1947). Britons, Romans and Saxons round Salisbury and on Cranborne Chase. Arch. J. 104, 27-81.

Hawkes, C.F.C. and Hull, M. (1947). Camulodunum: First report on the excavations at Colchester 1930-39. Oxford.

Hawkes, C.F.C.; Myres, J.N.L. and Stevens, C.G. (1930). St. Catherine's Hill, Winchester. PHFC 11. Winchester.

Hawkes, S.C. (1969). Finds from two Middle Bronze Age pits at Winnall, Winchester, Hampshire. PHFC 26, 5-18.

Heighes-Woodforde, D. (ed.). (1954). The Excavations at Chew Stoke. Archaeological News Letter, 5, 98-9.

Helbaek, H. (1952a). Early Crops in Southern England. PPS 18, 194-233.

Helbaek, H. (1952b). Spelt (Triticum spelta L.) in Bronze Age Denmark. Acta Archaeologica 23, 97-107.

Helbaek, H. (1955). The Botany of the Vallhagar Iron Age Field, in Stenberger, M. and Klindt-Jensen, J; Vallhagar 2, Copenhagen.

Helbaek, H. (1964). The Isca Grain: A Roman plant introduction in Britain. New Phytol. 63, 158-164.

Helbaek, H. (1955a). Appendix III: The carbonised grain, in Trump, D.H. The Bronze Age Barrow and Iron Age Settlement at Thriplow. P. Cambs. A.S. 49, 1-12.

Hjelmqvist, H. (1950). The Flax Weeds and the origin of cultivated flax. Botaniska Notiser, 103, 257-298.

Hodson, F. and Shelford, P.H. (1964). Geology, in Monkhouse, F.J. (ed.); A survey of Southampton and its region. Southampton.

Hogg, A.H.A. (1968). The grain, in Pen Llystyn: A Roman fort and other remains. Arch. J. 125, 101-92.

Howes, F.N. (1948). Nuts; their production and everyday use. London.

Hubbard, R.N.L. (1975). Assessing the botanical component of human palaeo-economies. Bulletin of the Institute of Archaeology 12, 197-205.

Hübbard, R.N.L.B. (1976). On the strength of the evidence for prehistoric crop processing activities. JAS 3, 257-265.

Hunter, H. (1951). The Barley Crop. London.

Irwin, J. (1924). Report on a bed of wheat found just outside the Roman fort at Papcastle. TCWAAS 24, 371-3.

Jarman, H.N.; Legge, A.J. and Charles, J.A. (1972). Retrieval of plant remains from archaeological sites by froth flotation, in Higgs, E.S. (ed.) Papers in Economic Prehistory, 39-48. Cambridge.

Jashemski, W.F. (1973). The discovery of a large vineyard at Pompeii: University of Maryland excavations 1970. American Journal of Archaeology 77, 27-42.

Jasny, N. (1941/2). Competition amongst grains in classical antiquity. American Historical Review 47, 747-64.

Jessen, K. and Helbaek, H. (1944). Cereals in Great Britain and Ireland in Prehistoric and early Historic Times. Kgl. Dansk. Vidensk. Selsk. Biol. Skrifter, 3 No.2. Copenhagen.

Johnsen, S.J.; Dansgaard, W.; Clausen, H.B. and Langway, C.C. (1972). Oxygen Isotope profiles through the Antarctic and Greenland Ice Sheets. Nature 235, 429-434.

Johnston, A. (1962). Chenopodium album as a food plant in Blackfoot Indian prehistory. Ecology 43, 129-30.

Johnston, D.E. (1972). The Sparsholt Roman villa: Summary of Excavations 1965-72. Southampton.

Jones, E.L. (1960). 18th century changes in Hampshire chalkland farming. Ag. Hist. Rev. 8, 5-19.

Katz, N. Ja.; Katz, S.V. and Kipiani, M.G. (1965). The Definition of fruits and seeds. (trans. British Library Lending Division, Boston Spa 1969). Moscow.

Keepax, C. (1976). Contamination of archaeological deposits by macroscopic biological material (chiefly seeds) of modern origin (with particular reference to the use of flotation machines). Ancient Monuments Laboratory Report 2000 (unpub.).

Kennard, A.S. and Warren, S.H. (1903). On a section of the Thames alluvium at Bermondsey. Geological Magazine 4; 10, 456.

Kenward, H.K. (1975). Pitfalls in the environmental interpretation of insect death assemblages. JAS 2, 85-94.

Knorzer, K.-H. (1966). Über Funde römischer Importfrüchte in Novaesium (Neuss/Rh.). Bonner Jahrbucher 166, 433-443.

Knorzer, K.-H. (1971). Beitrage zur Frühgeschichte des Obstes im Rheinland. Acta Museorum Agriculturae Pragae 6/1-2, 43-53. Prague.

Knorzer, K.-H. (1971). Römerzeitliche Getreideunkräuter von kalkreichen Böden. Rheinische Ausgrabungen 10.

Knorzer, K.-H. (1971). Eisenzeitliche Planzenfunde im Rheinland. Bonner Jahrbucher 171, 40-58.

Knorzer, K.-H. (1973a). Die pflanzlichen Großreste, in Gobel, W. et al; Naturwissenschaftliche Untersuchungen an einer späthallstattzeitlichen Fundstelle bei Langweiler, Kr. Duren. Bonner Jahrbucher 173, 301-315.

Knorzer, K.-H. (1973b). Römerzeitliche Pflanzenreste aus einern Brunnen in Butzbach (Hessen). Saalburg Jahrbuch 30, 71-106.

Knorzer, K.-H. (1974). Eisenzeitliche Planzenfunde aus Frixheim-Anstel, Kreis Grevenbroich. Rheinische Ausgrabungen 15, 405-414.

Knorzer, K.-H. (1975). Ergebrusse paläoethnobotanischer Untersuchungen im Rheinland, in Kölner Romer-Illustrierte 2; Historische Museen der Stadt Köln, Cologne.

Körber-Grohne, U. (1964). Bestimmungsschlüssel für subfossile Juncus-Samen und Gramineen-Früchte, in Haarnagel, W. Probleme der Küstenforschung im Sudlichen Nordseegebiet. 7, 32-47. Hildesheim.

Kroll, H.J. (1975). Ur-und Fruhgeschichtlicher Ackerbau in Archsum auf Sylt: Eine botanische Großrestanalyse. Ph.D. dissertation. Christian Albrechts Universität zu Kiel.

Lamb, H.H. (1966). The changing climate: Selected papers London.

Lapinskas, P. (1974). Flotation machine, in Fasham, P.J. (ed.) M3 Archaeology 1974, 16-18. Winchester.

Large, E.H. (1969). Second interim report on the Roman villa at Halstock. PDNHFC 91, 180-1.

Limbrey, S. (1975). Soil science and archaeology. London.

Liversidge, J. (1968). Britain in the Roman Empire. London.

Lowther, A.W.G. (1947). Excavations at Purberry Shot, Ewell, Surrey. Sur. A.C. 50, 9-46.

Lyell, A. (1912). Appendix 3: Seeds and wood found in various London excavations, in Norman, P. and Reader, F.; Further discoveries relating to Roman London. Arch. 63, 257.

Manning, W. (1964). The plough in Roman Britain. JRS 54, 54-65.

Manning, W. (1966). Caistor-by-Norwich and the Notitia Dignitatum. Ant. 40, 60-2.

Manning, W. (1970). Mattocks, hoes, spades and related tools in Roman Britain, in Gailey, A. and Fenton, A. (eds.); The Spade in Northern and Atlantic Europe. Belfast.

Margary, I.D. (1955). Roman Roads in Britain. Vol. 1. London.

Masefield, G.B.; Wallis, M.; Harrison, S.G. and Nicholson, B.E. (1969). The Oxford Book of Food Plants. London.

McGregor, M. and Simpson, D.D.A. (1963). A group of iron objects from Barbury Castle, Wilts. WAM 58, 394-402.

Medland, M.H. (1894-5). An account of Roman and Medieval Remains found in the site of the Tolsey at Gloucester in 1893-4. TBGAS 19, 142-170.

Ministry of Agriculture, Fisheries and Food. (1973). Brewers' grains. Advisory leaflet 382. London.

Ministry of Agriculture, Fisheries and Food. (1974a). Barley straw for dairy cows. Advisory leaflet 551. London.

Ministry of Agriculture, Fisheries and Food (1974b). Plums. Advisory leaflet 268. London.

Ministry of Agriculture, Fisheries and Food (1974c). The use of beans in stock feeding. Short-term leaflet 55. London.

Morrison, M.E.S. (1959). Carbonised cereals from the Roman villa of North Leigh, Oxon. Oxon. 24, 13-21.

Murphy, P. (unpub. a). Carbonised plant remains from Colliton Park, Dorchester.

Murphy, P. (unpub. b). Carbonised cereals from Farmington Villa, Gloucestershire.

Murphy, P. (forthcoming a). Carbonised Beans from Frog Hall Farm, Fingringhoe, Essex.

Murphy, P. (forthcoming b). Carbonised fruits and seeds from Site R4, a Bronze Age Barrow in Micheldever Wood.

Murphy, P. (1975). Appendix 5: Environment - macroscopic plant remains, in Hedges, J. The excavation of two Orcadian burnt mounds, Liddle and Beaquoy. PSAS 106.

Murphy, P. and Renfrew, J.M. (1975). The carbonised cereals, in Cunliffe, B.: Excavations at Portchester Castle Vol. 1. Roman. London.

Musil, A.F. (1963). Identification of crop and weed seeds. Agricultural Handbook 219, U.S. Dept. of Agriculture. Washington.

Norman, P. and Reader, F. (1906). Recent discoveries in connection with Roman London. Arch. 60, 169-250.

Ødum, S. (1967). The occurrence of henbane (Hyoscyamus niger) and hemlock (Conium maculatum) in the Thommarp excavations, in Thun, E.: Mediaeval Thommarp: Archaeological excavations 1959-60. Lund.

Osborne, P.J. (1969). An insect fauna of Late Bronze Age date from Wilsford, Wilts. Journal of Animal Ecology 38, 555-566.

Pliny (1950 ed.). Natural History (trans.) Rackham, H. London.

Parkinson, S.T. and Smith, G. (1914). Weed seeds, as impurities of agricultural seed. Ashford, Kent.

Payne, F.G. (1947). The Plough in Ancient Britain. Arch.J. 104, 82-111.

Pelham, R.A. (1954). The Agricultural Revolution in Hampshire, with special reference to the acreage returns of 1801. PHFC 18, 139-153.

Pelham, R.A. (1964). Appendix: Hydrology in the past, in Monkhouse, F.J. (ed.): A survey of Southampton and its region. Southampton.

Penn, W.S. (1957). The Romano-British site at Springhead. Excavation of the Bakery, Site A. Arch. Cant. 71, 53-105.

Penn, W.S. (1964). Springhead; The temple ditch site. Arch. Cant. 79, 170-189.

Percival, J. (1921; reprinted 1974). The Wheat Plant. London.

Percival, J. (1934). Wheat in Great Britain. Reading.

Perry, B.T. (1967). Early settlement and agriculture on the Hampshire chalklands. Ph.D. dissertation. University of Reading.

Perry, B.T. (1969). Iron Age enclosures and settlements on the Hampshire chalklands. Arch.J. 126, 29-43.

Phillips, C.W. (1970). V. Economy, in The Fenland in Roman Times. London.

Piggott, S. (1958). Native economies and the Roman occupation of North Britain, in Richmond, I.A. (ed.) Roman and native in North Britain, 1-27. London.

Pitt-Rivers, A. (1887 and 1888). Excavations on Cranborne Chase, Vols. 1 and 2. London.

Rahtz, P. and Brown, J. (1958-9). Blaise Castle Hill, Bristol 1957. Proceedings of the Speleological Society of Bristol University 8. 3, 147-71.

Ralegh-Radford, C.A. (1936). The Roman villa at Ditchley, Oxon. Oxon. 1, 24-69.

Redman, C.L. (1975). Productive sampling strategies for Archaeological sites, in Mueller, J.: Sampling in Archaeology. Tucson.

Reid, C. (1901-9). Notes on the plant remains of Roman Silchester, in yearly excavations reports by W.H. St. John Hope.
1901 Arch. 57:2, 252
1902 Arch. 58:1, 34
1903 Arch. 58:2, 425
1905 Arch. 59:2, 367
1906 Arch. 60:1, 164
1907 Arch. 60:2, 449
1908 Arch. 61:1, 210

Reid, C. (1910). Note, in Ashby, T.; Hudd, A. and King, F.: Excavations at Caerwent, Mon., on the site of the Romano-British city of Venta Silurum in the year 1908. Arch. 62:1, 1-20.

Reid, C. (1911). Note, in Balch, H.E. and Troup, R.D.R.: A late Celtic and Romano-British cave dwelling at Wookey Hole, Somerset. Arch. 62:2, 565-592.

Reid, C. (1916). Plants, wild and cultivated, in Bulleid, A. and St. George Gray, H.: Glastonbury Lake Village 2, 625-630. Glastonbury.

Reid, E.M. (1920-1). Appendix II: Analysis of a sample from the reed-bed under Nos. 4-6 Finsbury Circus, in Lambert, F.: Some recent excavations in London. Arch. 71, 55-112.

Renfrew, J.M. (1965). Appendix IV: Grain impressions from the Iron Age sites of Wandlebury and Barley, in Cras'ter, M.D.: Aldwick, Barley: Recent work on the Iron Age site. P. Cambs. A.S. 58, 10-11.

Renfrew J.M. (1972). Diagram of crops at Sitagroi, in Renfrew, A.C.: The emergence of civilisation, 276. London.

Renfrew, J.M. (1973). Palaeoethnobotany: The prehistoric food plants of Europe and the Near East. London.

Renfrew, J.M. (1974). Appendix H. A report on the cereal grains at Dun Mor Vaul, in Mackie, E.: Dun Mor Vaul. Glasgow.

Renfrew, J.M.; Monk, M. and Murphy, P. (1975). First aid for seeds. Rescue Publication No. 6. Hertford, Herts.

Reynolds, P.J. (1974). Experimental Iron Age Storage Pits: An interim report. PPS 40, 118-131.

Rickman, G. (1971). Roman granaries and store buildings. Cambridge.

Ridley, H.N. (1912). Spices. London.

Ritchie, A. (1969). Settlements and economy in Britain during the first millennium BC. Ph.D. dissertation. University of Edinburgh.

Rivet, A.L.F. (1958). Town and Country in Roman Britain. London.

Roach, F.A. (1964). Apple production in England: Its history from Roman times to the present day. Journal of the Royal Agricultural Society of England. 125, 47-72.

Russell, Sir E.J. (1916). Chalking: A useful improvement for clays overlying chalk. Journal of the Board of Agriculture 23, 625-632.

Russell, Sir E.J. (1928). A student's book on soils and manures (2nd ed.). Cambridge.

Sahlins, M. (1974). Stone Age Economies. London.

Salisbury, Sir E. (1961). Weeds and Aliens. London.

Salisbury, Sir E. and Jane, F.W. (1940). Charcoals from Maiden Castle and their significance in relation to vegetation, and climatic conditions in pre-historic times. J. Ecol. 28:2, 310-325.

Salzmann, L.F. (1909). Excavations at Pevensey 1907-8. SAC 52, 83-95.

Sanders, G. (1943). An outline of British crop husbandry. Cambridge.

Savory, H.N. (1967). Recent archaeological excavation and discovery in Glamorgan. Morgannwg 11, 74.

Scott, Sir L. (1951). Corn drying kilns. Ant. 25, 196-208.

Seagrief, S.C. (1959). Pollen diagrams from Southern England; Wareham, Dorset and Nursling, Hants. New Phytol. 58, 316-325.

Seagrief, S.C. (1960). Pollen diagrams from Southern England: Cranes Moor, Hants. New Phytol. 59, 73-91.

Small, R.J. (1964). Geomorphology, in Monkhouse, F.J.: A survey of Southampton and its region. Southampton.

Smedley, N. (1956). Archaeology in Suffolk, 1956. Proceedings of the Suffolk Institute of Archaeology and Natural History. 27:2, 112-119.

Steensberg, A. (1943). Ancient Harvesting Implements. Copenhagen.

Steensberg, A. (1957/8). Parallel ploughing with alternately sloping and upright ard in Columella. Folk-Liv 21, 157-62.

Step, E. (1946). Bees, wasps and allied insects of the British Isles. London.

Stone, J.F.S. (1941). The Deverel-Rimbury settlement at Thorny Down, Winterbourne Gunner, S. Wiltshire. PPS 7, 114-133.

Strabo (1848 ed.) Geography (trans. and ed.) Petrie, H. and Sharpe, J. Monumenta Historica Britannica, iii-vii. London.

Tacitus (1970 ed.) Agricola and Germania (trans.) Mattingly, H. (revised) Handford, S.A. Harmondsworth, Middlesex.

Tansley, A.G. (1939). The British Isles and their vegetation. Cambridge.

Tavener, L.E. (1964). Land use and agriculture, in Monkhouse, F.J. (ed.): A survey of Southampton and its region. Southampton.

Taylor, C.C. (1967). Late Roman Pastoral Farming in Wessex. Ant. 41, 304-6.

Thomas, A. (1960). Chalk, heather and man. Ag. Hist. Rev. 8, 57-65.

Thomas, C. (1970). Bronze Age spademarks at Gwithian, Cornwall, in Gailey, A. and Fenton, A. (eds.): The spade in Northern and Atlantic Europe. Belfast.

Thurston, J.M. (1960). Dormancy in weed seeds, in Harper, J.L. (ed.): The Biology of Weeds. Oxford.

Titow, J.Z. (1972). Winchester Yields: A Study in Medieval Agricultural Productivity. Cambridge.

Townsend, F. (1883). Flora of Hampshire, including the Isle of Wight. London.

Turner, J. (1970). Post-Neolithic disturbance of British Vegetation, in Walker, D. and West, R.G.: Studies in the vegetational history of the British Isles, 97-116. Cambridge.

Vancouver, C. (1810). General View of the Agriculture of Hampshire and the Isle of Wight. London.

Wainwright, G.J. (1968). The excavation of a Durotrigian Farmstead near Tollard Royal on Cranborne Chase, Southern England. PPS 34, 102-147.

Wainwright, G.J. (1969). The excavation of Balksbury Camp, Andover, Hants. PHFC 26, 21-55.

Wainwright, G.J. and Switsur, V.R. (1976). Gussage All Saints - A chronology. Ant. 50, 32-39.

Walker, D. (1955). Studies in the post-glacial history of British Vegetation. Skelsmergh Tarn and Kentmere, Westmoreland. New Phytol. 54, 222.

Walker, D. (1966). The Late Quaternary history of the Cumberland lowland. Philosophical Transactions of the Royal Society B 251, 1.

Warington, K. (1924). The influence of manuring on the weed flora of arable land. J. Ecol. 12, 111-126.

Watson, G.R. (1969). The Roman Soldier. London.

Watts, W.A. and Winter, T.C. (1966). Plant macrofossils from Kirchner Marsh, Minnesota - a Palaeoecological Study. Bulletin of the Geological Society of America, 77, 1339-1360.

Webster, D. and Petch, D.F. (1967). A possible vineyard of the Romano-British period at North Thoresby, Lincolnshire. Lincolnshire History and Archaeology 2, 55-61.

Wheeler, H. (1968). A Romano-British native site at South Muskham. Transactions of the Thoroton Society of Nottingham 72, 32-7.

Wheeler, R.E.M. (1943). Maiden Castle, Dorset. Oxford.

White, K.D. (1967). Agricultural Implements of the Roman world. Cambridge.

White, K.D. (1970). Roman Farming. London.

White, K.D. (1975). Farm Equipment of the Roman World. Cambridge.

Willcox, G. (pers. comm.) Provisional list of cultivated plants from Roman deposits at London.

Willerding, U. (1970). Vor- and frügeschichtliche Kulturpflanzenfunde in Mitteleuropa. Neue Ausgrabungen und Forschungen in Niedersachsen. Band 5, 287-375. Hildesheim.

Williams, David. (1973). Flotation at Siraf. Ant. 47, 288-292.

Williams, Dorian (1975). The Neolithic Flora of the Silbury Hill Site. M.Sc. Thesis. University of Bradford.

Williams, Dorian (1975a). Appendix 2. A note on the seed remains, in Kenward, H.K.: Pitfalls in the environmental interpretation of insect death assemblages. JAS 2, 85-94.

Wilson, D.G. (1968). Plant remains from a Roman well at Bunny, Notts. Transactions of the Thoroton Society of Nottingham. 72, 42-49.

Wilson, D.R. (1973). Roman Britain in 1972. 1. Sites explored. Brit. 4, 271-323.

Winbolt, S.E. and Goodchild, R.G. (1940). The Roman Villa at Lickfold, Wigginholt. 2nd report 1939. SAC 81, 55-67.

Van Zeist, W. (1970). Prehistoric and early historic food plants in the Netherlands. Palaeohistoria 14, 41-173.

Van Zeist, W. (1974). Palaeobotanical studies of settlement sites in the coastal areas of the Netherlands. Palaeohistoria 16, 223-371.

Zosimus (1848 ed.). Historiae Novae (trans. and ed.) Petrie, H. and Sharpe, J.: Monumenta Historica Britannica, lxxv-lxxix. London.