UNIVERSITY OF SOUTHAMPTON

CHARACTERISATION AND DISTRIBUTION OF BEEHIVE QUERNS IN EASTERN ENGLAND

VOLUME 1 OF 2

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Thesis submitted for examination for
the degree of Doctor of Philosophy

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September 1989

CONTENTS

LIST OF FIGURES

TABLES

LIST OF PLATES

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ABSTRACT

FACULTY OF ARTS

ARCHAEOLOGY

Doctor of Philosophy

CHARACTERISATION AND DISTRIBUTION OF BEEHIVE QUERNS IN EASTERN ENGLAND

by Caroline Jane Ingle

The lithological and typological anlalysis of early rotary querns ('beehive') querns in eastern England has demonstrated that, despite the wide geographical area covered, relatively few rock types (and hence production areas) are represented, and that there is, in general, a close relationship between lithology and quern design. For a few rock types macroscopic examination is sufficient to enable a source rock to be suggested, but for others thin-section petrological analysis is necessary to distinguish between a number of outcrops of similar lithological character. The main sources for the area considered are Millstone Grit, Spilsby Sandstone (Lower Cretaceous), Folkestone Beds, and Hythe Beds, and the region lies at the eastern limit for the distribution of Old Red Sandstone at this date. The existing typological classification requires revision to accomodate a number of forms encountered during this research which have been assigned names to fit in with the existing terminology.

The results contribute another aspect to the economy of this period and have demonstrated that, from their introduction in the Middle Iron Age, the production of rotary querns was highly organised but also operated on several levels. A small number of quarry sites produced a high proportion of querns that were subsequently transported large distances, others had a smaller output and more local distribution.

PREFACE

It was initially intented that the current research programme would be implemented in Cumbria but for a number of reasons, it was not possible to continue in the area and the research has, instead, been conducted in the east Midlands and East Anglia. The results of a short feasibility study in Cumbria have been published as a short note in the Transactions of the Cumberland and Westmoreland Antiquarian and Archaeological Society, but as the results and data are also relevant to the final work, the details of the querns examined in Cumbria (numbers CJ 1-50) are reproduced here in Appendices 1 and 4, and they are also referred to in various discussions throughout the text.
The present work has also used a number of geological samples collected from the Bristol area in connection with a short petrological study in that region.

ABBREVIATIONS

References to the museum collections examined are given in an abbreviated form throughout the text as follows;

Aylesbury Mus.	Buckinghamshire County Museum, Aylesbury
Bedford Mus.	Bedford Museum
Cambridge Mus.	Cambridge University Museum of Archaeology and Anthropology
Canterbury Mus.	Museum of Canterbury, and The Roman Pavement Museum
Colchester Mus.	The Castle, Colchester
Folkestone Mus.	Folkestone Museum and Art Gallery
Grantham Mus.	Grantham Museum
Hertford Mus.	Hertford Museum
Ipswich Mus.	Ipswich Museum and High Street Art Gallery
Kings Lynn Mus.	The Lynn Museum, Kings Lynn
Leicester Mus.	Jewry Wall Museum, Leicester
Letchworth Mus.	Letchworth Museum
Lincoln Mus.	Lincoln Museum
Luton Mus.	Luton Museum and Art Gallery
Maidstone Mus.	Maidstone Museum
Moyses Hall Mus.	Moyses Hall Museum, Bury St Edmunds
Northampton Mus.	Northampton Central Museum and Art Gallery
Norwich Mus.	Norwich Castle Museum
Peterborough Mus .	Peterborough Museum and Art Gallery
Saffron Walden mus.	Saffron Walden Museum
St Albans Mus.	Verulamium Museum, St Albans
St Ives Mus.	The Norris Museum, St Ives

Scunthorpe Mus.	Scunthorpe Borough Museum and Art Gallery
Southend Mus.	Southend-on-Sea Central Museum
Stamford Mus.	Stamford Museum
Thetford Mus.	The Ancient House, Thetford

The museum of the Department of Archaeology, University of Nottingham
Lincolnshire Archaeological Trust
Canterbury Archaeological Trust
Milton Keynes Archaeological Unit
Oxfordshire Archaeological Unit
Archaeology Section, Essex County Council

Museums in Cumbria and north-east England

Barrow Mus.	Furness Museum, Barrow in Furness
Carlisle Mus.	Carlisle Museum and Art Gallery
Kendal Mus.	Kendal Museum of Lakeland life and Industry
	Kendal Museum of Archaeology and Natural History
Penrith Mus.	Penrith Museum.
Whitehaven Mus.	Whitehaven Museum and Art Gallery
Durham Mus.	Old Fulling Mill, Museum of Archaeology, Durham
Newcastle Univ.Mus.	Museum of Antiquities, University of Newcastle

ACKNOWLEDGEMENTS

I would like to thank the curators and other member of staff at the museums and archaeological units visited during the course of this research for their help and co-operation. I am particularly grateful for permission to sample a large proportion of the material for thin-sectioning without which this project would not have been possible. I am also grateful to Liz Wright, Peter Keller and David Peacock for further information regarding, and visits to. the quern quarries in South-Yorkshire, Folkestone and Lodsworth respectively. and also to Mr.Mike Dugdale and Peter Keller for access to the roughouts from the Folkestone foreshore.

Geological samples were kindly loaned by Liz Wright and Ian Whitbread and I would also like to thank Dr. R. Merriman and Mr. K.Siddiqui of the British Geological Survey for assistance and hospitality given on visits to Keyworth, and Mr Francis Dimes, and Mr Robin Sanderson of the Geological Museum, London, for discussion regarding the identification of some of the greensand material, and reidentification of a number of quernstones from Harrold, Beds. I am also grateful for continued access to material in the teaching collection of the University of Bristol. Department of Geology.

Many individuals have contributed valuable advice during the course of this work and I would like to thank these and in particular Liz Wright, Don Spratt, Peter Keller, David Buckley, Hilary Major, David Peacock and Tim Champion, for numerous quern discussions over the past three and a half years.

Finally, thanks are due to my supervisors in the Archaeology Department at Southampton, David Peacock and Tim Champion, for help and advice in all aspects of the research programme and other members of this department for their general support and encouragement.

CHAPTER 1: INTRODUCTION

1.1 General

In 1954 Crawford wrote that "no study has been made of querns from a geological point of view, and one such is ovedue. This enquiry should begin at both ends - a petrological examination of existing querns and fragments thereof in museums, and also of certain localities where quern-quarries are known or suspected to exist" (CRAWFORD, 1954; 100). However as recently as 1980 Hayes, Hemingway and Spratt were able to state that although "typological studies of querns in Britain date back some 40 years......... little lithological work has been published" (HAYES et al, 1980; 297). Since then the results of a number of petrologically based researches have appeared, e.g, by Hayes et al (1980) in North East Yorkshire, Ingle (1984; 1987) in the Bristol area and Cumbria, Peacock (1987) on the quern quarry at Lodsworth, Sussex, Wright (1988), on quarries in the Sheffield area, Heslop (1988) in Cleveland and Keller (1988) in Kent. Other unpublished regional studies include those of Hurcombe (1980), Jecock (1981) and King (1988) and that of Parkhouse (1977) on Anglo-Saxon Rhenish basalt querns.

The present study is also a primarily geological investigation, and is not, nor is it intended to be, a comprehensive survey of beehive quern finds in the geographical area selected. Instead, research has been directed initially to the provenancing of the raw materials from which the querns were manufactured and their subsequent distributions, the results of which are then discussed in relation to the typology and archaeological contexts of these artefacts. The typology of British querns was established by Curwen in two articles in <u>Antiquity</u> in 1937 and 1941 but although it has received a number of minor revisions there has been no general reassessment of its continuing validity despite the large number of quern finds made in the past 50 years.

The remainder of this chapter is divided into three sections; a review of previous typological work, a brief summary of potential sources of raw materials and their exploitation for querns and millstones and finally methodology. The main section is also divided into two parts, the first mainly lithological, arranged chronologically by geological periods, the second archaeological, e.g typology, distribution, dating and context.

1.2 The development of British querns

Despite the increasing number of studies in recent years the main reference work on the typology of British beehive querns (and indeed British querns in general) remains the two articles by Curwen published in *Antiquity* in 1937 and 1941. The developmental series defined there has to date seen little modification and is still used as the basis for classification of current quern finds. It is therefore valid to briefly summarise the typological series arrived at by Curwen before proceeding to an assessment of subsequent quern research. Curwen's classification was based on a number of criteria; chronological development, geographical distribution and, in one instance, the material used in manufacture. The classes are defined primarily by the characteristics of the upper stones which possess more diagnostic features than the lower stones although differences between lower stones of different classes can, in most cases, also be recognised.

The first article (1937) produced the following stages in the development of the rotary quern in Britain;

1) Pre-Roman types
2) Romano-British domestic types
3) Flat querns
4) Pot querns

1: Pre-Roman

Three distinct pre-Roman types were recognised, all generally 30-35 cms in diameter and "excessively thick" (15-20 cms):

a) Wessex : in which the upper stones usually have some form of hopper, a lateral handle socket, wide feed and a concave grinding surface.

b) Sussex : in which the upper stones also have a concave grinding surface, flat top and radial handle slot.

c) Hunsbury : "apparently derived from the Wessex type" and taller than both Wessex and Sussex upper stones these stones are "cheese shaped, bee-hive or conical" with a well defined hopper, narrow feed and flat grinding surface, " a product of the northward spread of the Iron Age B culture".

The lower stones of both Sussex and Wessex types are "conical, the slope of the grinding surface being commonly about 20 degrees". Hunsbury lower stones are usually comparatively thick and have a flat grinding surface (CURWEN, 1937; 140-142).

The Hunsbury class was dealt with in greater detail in the second article (CURWEN, 1941). Upper stones of this class average 30 cms in diameter at the base (grinding surface), and are generally 15-25 cms tall and 17.5-20 cms in diameter at the top. "The latter is usually flat, and surrounds a basin-like cavity (hopper)" which is 10-12.5 cms in diameter and 7.5-10 cms deep. Lower stones are unpierced and 12.5-15 cms thick. This class differs from the other two pre-Roman types in possessing a flat grinding surface and, presumably, in the method of mounting, the feedpipe being much narrower than in the Wessex and Sussex types (CURWEN, 1941; 16-19).

2: Romano-British

The Romano-British querns were seen as developing from the Sussex type stones resulting in "neater and lighter forms" with a general increase in diameter, decrease in thickness and some flattening of the grinding surface. Curwen identified two chronologically separated types; the flat topped, early Romano-British, similar in appearance to the Sussex upper stones, but up to 37.5 cms in diameter, and and the later Romano-British, projecting hopper, type, up to 50 cms in diameter, which has a slightly concave grinding surface and a convex upper surface with a raised flange around the hopper. The corresponding lower stones of the projecting hopper type are pierced, a feature thought to be introduced at some stage during the development of the earlier Romano-British form, as was the practice of cutting grooves on the grinding surface (CURWEN, 1937; 142-145).

3: Flat Querns

The flat querns of Curwen's classification are "those in which the slope of the grinding surfaces does not exceed 2 or 3 degrees", although such a definition also includes the Hunsbury style querns. Curwen recognised two groups of flat querns, the first of which were termed "disc type, late or post Roman" and were thought to be derived from the Romano-British domestic querns. "These consist essentially of two thin discs of stone, both with central perforations", the upper sometimes possessing a raised lip around the feed. Handle sockets where present are vertical and the grinding surfaces have a slope of only a few degrees. The second group was named "flat 'Beehive' (Roman legionary type?) and its Scottish derivatives". These flat beehive types, considered to have developed from the Hunsbury types, have lateral handle sockets and includes the Puddingstone querns. Querns of this type were generally thought to belong to the first two centuries AD and are thought to have developed, with some decrease in thickness, into the Scottish derivative types, which have a vertical handle socket (CURWEN, 1937; 148-50).

Puddingstone querns

In his second article in 1941 Curwen discussed the puddingstone querns as a separate and distinct type (distinguished by their lithology despite morphological similarities to the other flat beehives) still thought, from their general appearance, to have derived "at least in part, from the Hunsbury type". "The upper stones are bun-shaped, or conical with convex sides, and some show a rather characteristic carination an inch or more above the base. They lack the distinctive flat summit, and the hopper, which may be bag-shaped or funnel-shaped, tends to merge with the short and rather narrow feed-pipe, which is always circular". Lower stones are very rounded. Curwen suggested that the uniformity of the rock used and the form indicated a single production centre; "moreover the distribution suggests the use of Watling Street as a trade-route" (CURWEN, 1941; 20-22).

4: Pot querns

The final group, the pot querns, are the latest development of the sequence and none are dated earlier than the Medieval period.

Modifications of Curwens classification/typology

Curwen's classification has undergone only minor modification by subsequent researchers, recent studies tending to concentrate on the provenancing of the raw materials used.

Phillips, 1950

In 1950 Phillips published a "survey of the distribution of querns of Hunsbury or allied types" (PHILLIPS, 1950) the main results of which were, as far as the typological classification is concerned, to subdivide Curwens Hunsbury class into;

" i. those with moulded rims, and

ii. those without, "

and to describe two allied groups;

a; Yorkshire types, distinguished by possessing a handle socket that does not pierce the feedpipe or hopper, and

b; East Anglian type, a term and class synonymous with Curwens "Puddingstone type", in that the querns of this type are made of puddingstone "probably obtained in the form of small boulders, and which is apparently far harder to shape" resulting in querns that are "usually flatter and wider, and altogether more bunshaped than the Hunsbury or Yorkshire types" (PHILLIPS, 1950; 76).

Phillips considered the Yorkshire types to be directly derived from the Hunsbury type with the latter developing from at least "a common ancestor" (PHILLIPS, 1950; 76).

Caulfield, 1977

Caulfield has suggested the replacement of the terms "Hunsbury" and "Yorkshire" by "pierced" and "unpierced" (with respect to the handle sockets) as these querns are found beyond their respective type areas. (CAULFIELD, 1977; 105). However, strictly speaking, the "unpierced" category would include the Yorkshire type of Phillips and the Flat Beehive (including puddingstone) types of Curwen, a rather unwieldy group containing a great variety of styles and covering a large geographical area. At present the retention of the original terminology is proposed, (and will be followed here), the name for each class allocated according to the area in which they are the predominant type whilst recognising that they are not restricted only to their type area. Thus while most East Anglian querns are to be found in that region they also occur as far afield as Lincolnshire and Kent.

One group of querns not discussed by Curwen are the beehive querns found in Ireland. These appear to be confined to the northern half of Ireland and are of similar form to either the flat beehives of northern England (when a horizontal handle socket is present) and Curwen's "Scottish derivatives" (those with a vertical handle socket). Lower stones are generally 10-15 cms thick and over 30 cms in diameter. They "resemble upper stones in their shape and in the central boring for the spindle which usually has a funnel and pipe form" (CAULFIELD, 1977; 117). Some stones are oval rather than circular, a feature that appears to be a regional trait. The upper stones are either circular, circular with a projection for the handle or oval with markedly rounded sides (tending to hemispherical stones). Diameters usually lie in the range 28-36 cms and they are 9-19 cms thick with a flat grinding surface, and either funnel-shaped or dished hopper. A number of the querns are decorated; they are probably contemporary with the beehives of northern England but most are stray finds or "old finds whose exact find context is not known" (CAULFIELD, 1977; 108-124).

Jecock, 1981

There has been one further, tentative, addition to this classification put forward by Jecock as a result of research on the querns of Wessex. In this work Jecock suggested the possibility of a Hampshire type, most closely related to Curwens Wessex type but differing, for example, in the shape of the hopper and in posessing an overall asymmetry. These stones are flat topped with a handle slot rather than a socket (similar to Sussex type upper stones) and like the Wessex type have Middle Iron Age associations. The study identified only three definite examples of the type however from Balksbury and Winnall Down, Hants, and three other possible examples including one from Wiltshire (JECOCK, 1981; 10-11).

Thus at the present time the following classification exists for early British (Beehive) querns;

1; Wessex (Curwen; 1937)
2; Sussex (Curwen; 1937)
3; Hampshire (Jecock; 1981)
4; East Anglian/Puddingstone (Curwen; 1941, Phillips; 1950)
5; Hunsbury (Curwen; 1937, 1941)
6; Yorkshire (Phillips; 1950)
7; Flat Beehives (Curwen; 1937)

This list is largely a geographical classification; not all classes are necessarily in contemporary use (dating for many remains at present uncertain); neither does the order of listing indicate chronological development.

Dating

"Nationally, the traditional view that beehive querns came into the British Isles with 'Iron Age B' has remained within standard literature until relatively recently" (HESLOP, 1988; 60). Earlier dates have now been put forward in several areas for a number of stones, for example, a 'Wessex' style lower stone of Devonian quartz grit from the earliest phase at Gussage All Saints (giving a date possibly as early as the fifth century) (WAINWRIGHT, 1979; 89) A possible early Iron Age date is suggested for an upper stone found at the bottom of the enclosure ditch at Thorpe Thewles "from a phase producing an overall mean date of 450 BC" (HESLOP, 1988; 61). In general querns from the north of England (to a greater extent than those further south) are associated with late material, often Roman, giving very late Iron Age dates at the earliest. Elsewhere the dates suggested for the initial adoption of rotary querns are placed within the Middle Iron Age, for example, at Ancaster Quarry, Lincs, (fourth to third century BC) (MAY, 1976a), Danebury, Hants, where the earliest finds are from ceramic phase 5 (probably fourth century BC) (CUNLIFFE, 1984; 418) and Winnall Down, Hants where rotary querns first occur in Phase 4 contexts, "contemporary with the appearance of the saucepan pottery styles whose period of currency Cunliffe and others have dated to after 300 BC" (JECOCK in FASHAM, 1985; 80).

1.3 Previous petrological studies

Much of the area covered by the present study, notably East Anglia, lacks stone of sufficient quality even for building purposes for which there may be less stringent requirements regarding, for example, texture and hardness than for grinding. Thus the movement of raw materials for querns and/or the finished items has been a necessity. Only a limited range of rock types are suitable for the manufacture of querns, important considerations in the selection of the raw material including the nature of the material to be ground, the length of use-life of different rocks, the amount of grit produced during grinding and the grade of flour required. Studies of contemporary metate manufacture in Mesoamerica have allowed the assessment of the relative importance of various factors in the selection of materials for these grinding stones. One basic criterion is a rough texture, "its importance testified by the practice of resharpening; a number of ethnographic accounts of resharpening grinding stones report resharpening frequencies ranging from once every five days to once every year" and millstones are sometimes resharpened every day (HORSFALL, 1987). The need for a rough cutting surface also led to the practice of cutting grooves in the grinding surface to ensure a cutting rather than crushing action on the grain. The optimum texture of a grinding stone also depends on the grain being processed; grains with a high moisture content are more efficiently ground by an open textured stone such as vesicular basalt. The texture of the stone also partially controls the fineness of the resulting flour, a finer product usually produced by a more homogenous textured rock in which the grains are strongly cemented (HORSFALL, 1987). In addition further constraints operate during the manufacturing stage; the jointing characteristics of a rock will affect the ease with which blocks can be obtained and their size, and the texture and composition, will determine the ease of working and brittleness. "That suitable pieces of rock were not readily found no doubt accounts for so many abandoned, usually unfinished, millstones in millstone quarries" (TUCKER, 1977).

In the case of post-Medieval millstone manufacture, although there are many rocks from which millstones could be produced, some sources were favoured; "although stone from local quarries was often used for coarse work such as fodder grinding, there grew up a recognition of certain quarries or quarrying areas, as providing especially good millstones and stones from these quarries were transported long distances" (TUCKER,1977),and different types of stone might be employed for the grinding of different grains (JOBEY, 1986). A similar situation can be expected for earlier periods but, with less exacting requirements (stones were not, for example, subject to the same

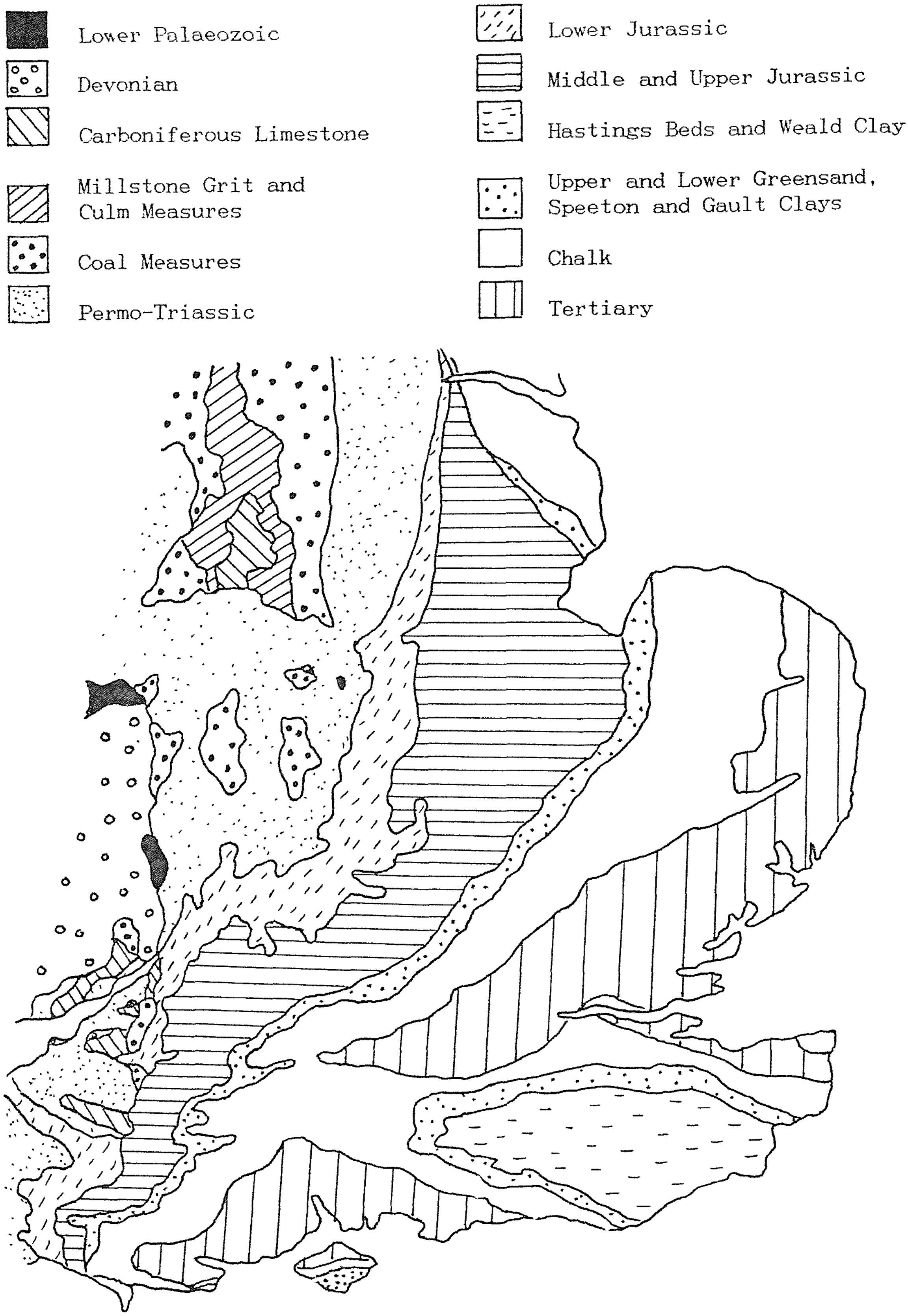


FIG. 1 Outline solid geology of central and eastern England

stresses as those in mechanical mills) more sources were possibly considered suitable, and stones may in general have been. moved shorter distances. Again, certain quarries were no doubt considered superior to others, as has already been shown by the different scales of production demonstrated in North-East Yorkshire by Hayes et al (1980).

"Only certain portions of even sandstone rocks are available for millstones and hence our native stones of this kind occur only in certain localities and these often widely apart" (BUCKMAN, 1866). Whereas in some areas local sources may be more than adequate elsewhere the movement of suitable materials is a necessity; small scale distributions of some lithologies need not imply a general lack of contact with more distant communities, but merely an abundance of local resources within a region.

Provenancing studies of querns have, until recent years, tended to be on a relatively small scale and most commonly related to the finds from individual sites. In the past decade more work has been undertaken on a regional scale, for example in southern England by PEACOCK (1987) and in Yorkshire by HAYES et al (1980) and currently the Yorkshire Quern Survey. The following section considers the potential sources (hard, indurated rocks capable of being worked into grinding stones) within and beyond the study area and the evidence to date for their exploitation in quern/millstone manufacture. (Fig. 1)

1. <u>Lower Palaeozoic</u>

Lower Palaeozoic rocks crop out in only small areas within the present study area, for example, the Pre-Cambrian igneous rocks and conglomeratic sediments at Lickey and Nuneaton, Leics, the Mountsorrel complex and the Cambrian quartzites of the Lickey Hills and around Hartshill, Leics, (BENNISON & WRIGHT, 1969; 67-8). Further west lie the outcrops of fossiliferous sandstone of Silurian Age of the west Midlands and South Wales, for example, at Tortworth near Bristol (BENNISON & WRIGHT, 1969; 81). None of these has been recorded among quern finds from the study area.

2: Devonian

Rocks of Devonian and later date are far better represented than earlier periods in central, eastern and southern England but Devonian rocks are confined to the west of this area. In south Devon and Cornwall beds of Devonian age comprise limestones, grits and slates Devonian outcrops are confined to the west of that area. Devonian beds in South Devon and Cornwall are of limestones, grits and slates. The continental facies of the Devonian known as "Old Red Sandstone" is exposed in northern and central Scotland, South Wales and the Welsh Borders and in the Bristol area; it is virtually absent from the Midlands and only sparsely represented in northern England.

An earlier petrological study by the author was concerned with the provenancing of a number of quernstones (mainly Roman in date), from the Bristol area. The querns were all of sandstones, mainly sublitharenites, from the Upper Old Red Sandstone of either the Bristol or Forest of Dean outcrops. The lateral and vertical variations in lithology within the Devonian sandstones across this region are sufficient to account for the textural and compositional differences observed among the querns (INGLE, 1982; 1984). Subsequent investigations by Barford (1984) suggested the possibility of a number of quern quarries in Portishead Beds (Upper Devonian) along the Failand Ridge, Bristol (BARFORD, 1984).

3. Carboniferous

Carboniferous outcrops cover large areas of north, central and western England. In the south-west these comprise mainly argillaceous units containing some arenaceous and cherty beds, succeeded by the Culm of Upper Carboniferous age. In the Mendip-Bristol-South Wales region and central-northern England (the Pennines) the lower Carboniferous is represented by a mainly limestone succession containing laterally impersistent sandstone units at some horizons. The overlying Namurian (Millstone Grit) is poorly represented in the west (Mendip to South

Wales) but strongly developed in the Pennines, where it contains thick sandstone units. These in turn are overlain in all these areas by the Coal Measures which, like the limestone, contain subordinate, local sandstone units. In northern England these divisions are less well developed and Carboniferous deposits are variable in character; limestone, argillaceous, deltaic and estuarine deposits all occuring.

The limestones have not been widely, if at all, exploited for querns but sandstones of the Namurian and Coal Measures, particularly the former, have been extensively used for both querns and millstones, and sandstones within the Carboniferous Limestone appear to have been worked to some extent in the Bristol area. Much work is currently underway into the querns and quern "factories" of the Carboniferous sandstones of the Pennines and north-East England (WRIGHT, 1988; HESLOP, 1988).

The study of querns in North-East Yorkshire by Hayes, Hemingway and Spratt (1980) identified a number of examples made from Pennine Millstone Grit, the Brimham Grits, which crops out in a narrow belt between Harrogate and Ripon. A number of other querns found in this area were of slightly younger Yoredale Sandstones; a unit well developed in the Wensleydale and Swaledale areas (HAYES et al, 1980; 308).

A second regional study by Wright (1986, 1988) concentrated on the quern quarries of South Yorkshire: Wharncliffe, a site first investigated by Leslie Butcher (BUTCHER, 1970) which covers nearly 200 acres, extending for 1 mile along the outcrop and comprising a large number of working areas of various sizes (producing beehive and two types of flat quern), Den Bank and Ringstead Crescent and Stanton Moor, Derbyshire. Different styles are recognised among the products of these sites (WRIGHT, 1986; 1988).

Whitbread's study in Leicestershire (WHITBREAD, 1979) considered the possibility of the outcrop of Millstone Grit at Melbourne (a southerly inlier of the main Pennine outcrop) as the source for at least some of the querns found in that county. The ten examples thin-sectioned (Iron Age to Medieval in date) formed a lithologically homogenous group; none matched samples from Melbourne, indicating their transportation from further afield.

The exploitation of the Millstone Grit is also evidenced in Cumbria where querns of this lithology are found mainly in the south-east of the county. Raw material for these could have been obtained either from the north-west Pennines, the Lancashire Fells or even more locally from an isolated outcrop in the south of the region; in the parish of Urswick a field named "Quernbarrow" was stated by Dobson to contain a patch of Millstone Grit that he considered to be the source for most of the querns found in Furness (DOBSON, 1904; 201-203; INGLE, 1987).

Carboniferous sandstones were certainly worked to some degree, probably not on a large scale, in the Bristol area (INGLE, 1982). Barford noted possible quarries in the Brandon Hill Grit (the local equivalent of the Millstone Grit) around Long Ashton and in the Upper Cromhall Sandstone (Carboniferous Limestone Series) at Hotwells and Cabot Hill, Bristol) (BARFORD; 1984).

4. Permo-Triassic

Permian beds (generally relatively soft units) crop out from Durham to Nottingham and in north-west England where the main exposure lies in the Vale of Eden. The basal breccia in the Vale of Eden is overlain by the Penrith Sandstone, for the most part comprising a coarse grained, millet seed sandstone which is soft in parts but harder in the north where it is cemented by silica (BENNISON & WRIGHT, 1969). Triassic deposits form the solid geology of much of the Midlands where they are divided into the Lower Mottled Sandstone, Bunter Pebble Beds, Upper Mottled Sandstone, Keuper Sandstone and Keuper Marl. The outcrop continues southwards to the Vale of Gloucester and widens south of Berkely through to Somerset, although interupted around Bristol and the Mendips by the high ground formed by Carboniferous rocks (BENNISON & WRIGHT, 1969; 273-5).

Few querns from southern England have been referred to the Permo-Trias although rocks of this age were more commonly used in Cumbria. Querns of this type occur in the east and north-east of the region (INGLE, 1987; 13-17) with a possible source in the area of Lazonby, which by the nineteenth century was well known for millstone production although millstones were also worked at Barn Ghyll near Whitehaven (HUGHES, 1972; 136). Two querns from the Roman villa at Gatcombe, Avon are suggested to be of local Triassic, Butcombe, sandstone (BRANIGAN, 1977).

5. Jurassic

The Lower Jurassic (Lias) crops out in a belt of varying width from Whitby, Yorkshire through western Lincolnshire and Northamptonshire to Gloucestershire and Somerset reaching the south coast at Lyme Regis; it comprises largely argillaceous rocks. The Middle Jurassic (Great and Inferior Oolite) follows the line of this outcrop but the beds vary in lithological character along the exposure. In the Cotswolds the Middle Jurassic comprises limestones of varying character, grits, freestones and rubbly limestones. Further north the Series becomes more sandy and ferruginous, the Northamptonshire Sand and Ironstone, which are overlain by the Lower Estuarine Series, sandy silts and clays of deltaic origin succeded to the north by fissile sandy limestones (the Collyweston Slate). The Collyweston Slate is, in turn, a transitional bed to the Lincolnshire Limestone which first appears in Northamptonshire but thickens northwards to form a west-facing scarp (BENNISON & WRIGHT, 1969; 288-311: EDWARDS, 1966; EDMUNDS & OAKLEY, 1947). The Upper Jurassic consists of a mixture of clays, limestones and shales of which the uppermost beds are the Purbeck and Portland Limestones.

A number of quarries in Jurassic rocks producing Yorkshire type querns have already been identified, several of them by Hayes et al in

North-East Yorkshire. These are in various rock types; at Spaunton Moor in Crinoid Grit, Bransdale, also in Crinoid Grit (but to date producing only Roman roughouts), and Goathland in Channel Sandstone where there is evidence of quern manufacture from the Iron Age to the Medieval period (HAYES et al, 1980; 304-6).

6. Cretaceous

It is the Cretaceous Series which produces the largest area of outcrop in south-east England, in particular the chalk which crops out in East Yorkshire (Humberside), Lincolnshire, Norfolk, Suffolk, the Chilterns and Salisbury Plain to Weymouth and also encircles the Weald. However, it is two of the more minor, lower, divisions that have been widely exploited for the production of querns in both southern and eastern England. In the Weald the lowermost division of the Cretaceous, the Wealden Beds is succeeded by the Lower Greensand in which four separate units are recognised; the Atherfield Clay, Hythe Beds (containing both calcareous and siliceous facies), Sandgate Beds (in which the Bargate Beds are locally developed) and the Folkestone Beds (dominantly quartzose sands, locally cemented by calcite or silica, often sparsely fossiliferous). Further the west there is again a four-fold division. Lower Greensand beds also crop out from north Berkshire, through Oxfordshire, where they include the Faringdon Sponge Gravels, and Bedfordshire (e.g. the Woburn Sands) but for the most part comprise soft, loosely consolidated sands. The Upper Greensand follows the line of outcrop of the Lower Greensand, again comprising largely soft poorly consolidated sand units. The lower Cretaceous beds of Norfolk, Lincolnshire and Yorkshire accumulated in a separate depositional basin and cannot be assigned the same terminology as those of southern England. In Lincolnshire the lowermost unit is the Spilsby Sandstone which is succeeded by the Claxby Ironstone, Tealby Series and Fulletby Beds (SWINNERTON & KENT, 1949).

There are large numbers of querns from southern England that have already been identified as Cretaceous Greensand and a number of quarries have also been located in both the Upper and Lower Greensand, the most recently published being that at Folkestone (KELLER, 1988).

Upper Greensand

The site at Pen Pits, Penslewood, Somerset, was first described by Pitt-Rivers in the late nineteenth century. The quarries comprise a large number of circular or trench shaped hollows covering 700 acres. The Upper Greensand here is divided into three layers; the upper too soft and the lowest too brittle to be worked for querns. During quarrying the upper sand layer was removed to obtain suitably sized blocks which were then extracted by making use of natural joints (PITT-RIVERS, 1884). The quarries occupy only a small area of the greensand escarpment, a site suggested by Crawford to have been selected due to the location of established routeways (CRAWFORD, 1953; 100).

Many of the querns from Danebury were identified as local Upper Greensand: "the common use of Upper Greensand querns at Danebury is not easy to understand considering its basic unsuitability for the job of grinding and must be put down to availability of raw material and proximity of sources" (CUNLIFFE, 1984; 415). Some are still attributed to this source although many have now been reidentified by Peacock as Hythe Beds from Lodsworth, West Sussex (PEACOCK, 1987; 78-9).

Lower Greensand

Crawford discussed two Lower Greensand quern quarries, the first, at Coles Pits, Faringdon, Oxon, on an outcrop of greensand that here forms a small tongue of high ground. The workings again comprise numerous pits, on average deeper than those of Pen Pits, which probably date to the Medieval period (as evidenced by abandoned millstones) and may originally have covered a greater area than remains today (CRAWFORD, 1955; 162-5). At Waverley, Surrey querns were worked in pits from the concretionary ironstone in the Folkestone Sands (CRAWFORD, 1953; 105).

Lower Greensand was exploited on a large scale at Lodsworth, West Sussex where roughouts of Sussex style rotary querns attest to the manufacture of rotary querns from the Middle Iron Age through the Roman period. Saddle quern roughouts have not been identified at the quarry although finds from the surrounding area demonstrate the use of the rock in earlier periods. The rotary querns attained a very wide distribution and although finds are concentrated in Sussex, Surrey and Hampshire (the only counties in which saddle querns of this lithology have so far been recorded) examples are known from as far north as Northamptonshire (PEACOCK, 1987). Peacock has suggested that production was "..in the hands of specialists who controlled the rock bed (or who may have been controlled) and facilities were available for the wide exchange of their querns", exchange that may also have been in the hands of specialists (PEACOCK, 1987; 76).

Other Wealden outcrops have also been suggested as the source of raw materials for querns found in that area. Tomalin (HANWORTH & TOMALIN, 1977) divided material from several sites in the Weybridge area into a number of provisional petrological subgroups (based on macroscopic analysis) for which various nearby outcrops have been suggested as sources (HANWORTH & TOMALIN, 1977; 83-5).

7. Tertiary

The main outcrop of Tertiary deposits in England occurs in the London Basin extending north-east into and across Essex to Manningtree and Harwich. Much of it is overlain by glacial deposits. For the most part these are soft and unconsolidated but within the Woolwich and Reading Beds boulders and larger concretions of cemented sandstone (Sarsen) and conglomerate (Puddingstone) occur. These are found scattered over both the past and present area of Tertiary outcrops. The conglomerates occur in a number of localities; in Hertfordshire (Hertfordshire Puddingstone), near High Wycombe (Bradenham Puddingstone) (JONES, 1980; 73), Essex (between Colchester and Chelmsford), and around Chelsham, Surrey, whilst flint breccia varieties are found in, e.g., Hampshire and Sussex. Sarsen stones are most common at the present day in Berkshire and Wiltshire (JONES, 1980; 73).

Wake, in a study of Norfolk querns, recognised two varieties of puddingstone among the examples from that area, "one a dark grey and the other a reddish brown", but this distinction does not seem to have been made in other studies of puddingstone querns. Wake, like Curwen, suggested that although "erratics of this stone are found in Norfolk, ... it seems likely that the querns were imported into this area probably by means of the Icknield Way" (WAKE, 1942).

The puddingstone querns were also considered in a regional study by Hurcombe (1981) of Iron Age and Roman querns of Norfolk, Suffolk, Essex and Hertfordshire. Most puddingstone examples found in this country are usually assumed to be of Hertfordshire Puddingstone from Hertfordshire (there is only one locality in that county, at Radlett, where Puddingstone is reported to occur in situ) but there are also some deposits in Essex and a type of puddingstone is known to have been quarried for querns at Worms Heath, Chelsham, Surrey (HURCOMBE, 1981; CRAWFORD, 1953). This latter quarry is located in an outcrop of Oldhaven Beds (a pebble bed at the top of the Reading Beds) and contains numerous pits which, however, cover a smaller area than Coles Pits, Oxon. The evidence for quern manufacture here, however, appears to be slight; "I cannot now find my authority for the fact, but I am sure that I have come across a reference to the discovery of querns here" (CRAWFORD, 1953; 105). Rudge's survey showed a very large distribution area for Puddingstone querns, mostly found east of the Icknield Way and on or east of the chalk outcrop (RUDGE, 1965)

8. Igneous Rocks

Within the present study area there are only small outcrops of igneous rocks, for example, in the Mountsorrel complex in Leicestershire. Further afield more extensive exposures occur in south-west England, Northumberland (e.g. in the Cheviots) and Cumbria.

In Cumbria the granites, of which there are several distinct intrusions and outcrops, were certainly exploited on a considerable scale for local querns. These querns are of various types of granite and distributed mainly in the west of the region although some have been found in the north-east. Given the distribution and the range of lithologies compared to local outcrops it appears that many of these querns were probably made from suitable erratics, possibly from both Scottish and Cumbrian sources, such as are common, for example, on Walney Island (INGLE, 1982). Shap granite, which crops out only in a small area around Shap in east Cumbria, has also been recorded from Yorkshire (but not as yet in Cumbria) again most probably demonstrating the exploitation of erratic material (HAYES et al, 1980; 308). To the east querns of Cheviot lava have been noted on excavations in Northumberland (JOBEY, 1978) but only in quite small numbers possibly representing only small scale working of this source.

In addition to those of British sources considerable work has been undertaken on the querns manufactured from Rhineland lavas, for example, by Crawford et al (1955), Parkhouse (1976, 1977), and Kars (1980), the latter two dealing with quern production and trade during Saxon and Medieval periods. Querns of this lithology were being exported to Britain by the first century AD and are especially suited to milling, being vesicular (and thus maintaining a sharp cutting edge), hard and relatively light (RAHTZ, 1981).

1.4 Methodology

The study area for the present research comprises the counties of; South Humberside, Lincolnshire, Leicestershire, Northamptonshire, Bedfordshire, Buckinghamshire, Hertfordshire, Cambridgeshire, Norfolk, Suffolk and Essex (Fig. 2), although beyond this area some material in both Kent and, to a lesser extent, Oxfordshire, has also been examined for comparative purposes. In order to obtain a representative sample of quern finds the primary data base consists of the beehive querns in the main museums within this region and in, some instances, also those

—·—· main study area

– – – – additional counties subjected to more limited investigation

FIG.2 Extent of the study area and locations of the collections examined

currently retained by the county archaeological unit. Some flat, Roman querns are also included, again mainly for comparative purposes. Information relevant to both typology and provenancing of the raw material used has been recorded to allow, for example, a reconsideration of the current typology and if necessary its modification, an assessment of the extent to which lithological variation is reflected in differences in form and to determine whether specific production centres are producing a limited range of forms, as is suggested, for example, from work on the quarries at Wharncliffe and elsewhere in South Yorkshire (HAYES et al, 1980: WRIGHT, 1986) or whether there are other factors operating to control the choice of quern design in an area regardless of source and the distance of the find-spot from this.

To avoid confusion over individual museum numbering systems, with the same numbers occuring in more than one collection and many querns lacking any reference code, the querns examined have been numbered sequentially as they have been seen. These reference numbers are pre-fixed "CJ" (to indicate the authors personal numbering system) and will be used throughout the text; cross-references to the museum code numbers can be found in Appendix 1. A large proportion of these querns are complete or nearly so and, with the exception of the most fragmentary, have been drawn, in plan and section, at a scale of 1:5; these drawings are reproduced in Appendix 4. Additional published examples, mainly from outside the current study area, have provided the second main source of data. The most useful of these in the context of the present study are those originally published with an illustration and some lithological data.

1.4.1 Quern recording

In addition to the drawings and photographs of each quern the following measurements and descriptive data have been recorded for each stone (Fig. 3);

Upper Stones
A: Diameter
B: Thickness
C: Top diameter
D: Collar/rim width
E: Collar depth
F: Hopper diameter
G: Hopper depth
H: Height of handle socket above grinding surface
I: Diameter of feed
J: Notch to accomodate spindle, width (w) and depth (d)

Lower Stone
K: Diameter
L: Thickness
M: Diameter of spindle hole
N: Depth of spindle hole
O: Diameter of base

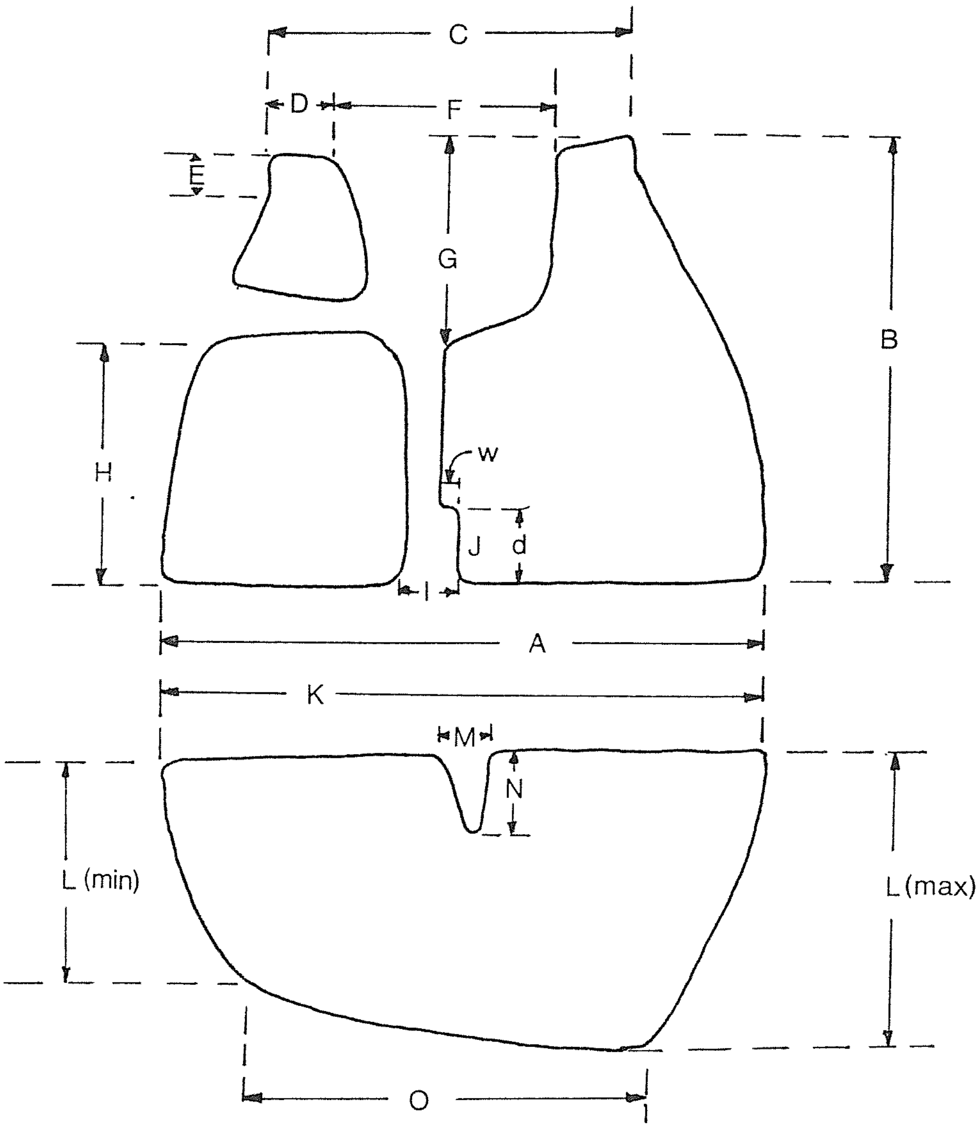


FIG.3 Measurements of quern morphology

1: Upper stones

Diameter of base and top,

Width and shape (flat or rounded),

Height : maximum and minimum where appropriate and the position of these relative to the handle socket. Many asymmetrical querns, for example, show a greater thickness opposite the handle socket indicating a greater amount of wear beneath the handle,

Shape, diameter and depth of the hopper,

Dimensions and shape of the handle socket at the outer edge of the quern,

Position of the handle socket , the vertical distance from grinding surface to the base of the handle socket at the outer surface,

Depth of the handle socket or the position of opening (e.g. at the base of the hopper or the top of the feed) in pierced stones,

Diameter and shape of the feed at the grinding surface,

Dimensions, diameter and depth, of a separate spindle hole if present, or more commonly seen a notch in the side of the feed, and its position with respect to the handle socket (generally opposite the handle side,

Shape (flat, concave or convex) of the grinding surface and its diameter if different to that overall,

Dimensions of a collar/moulded rim if present,

Convexity of the sides (whether straight, slightly or very rounded in profile, i.e., the general shape of the stone,

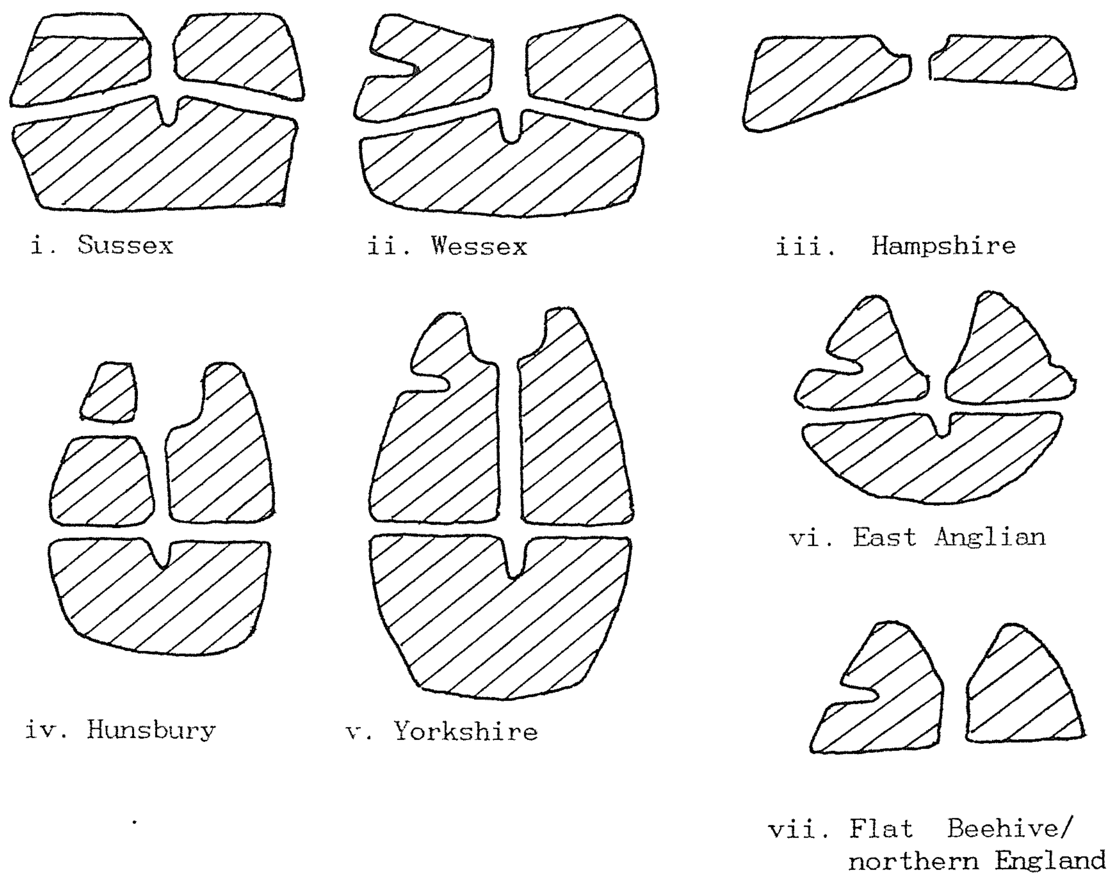
Presence and dimensions of a notch in the base of the hopper beneath the handle socket opening,

Presence of any metal fittings or decorative features.

Several of these characters involve a subjective assessment, for example, the shape of the hopper or convexity of the sides but this permits easier comparison of form attributes with respect to lithology to assess potential relationships between form and geology. Five main categories of hopper shape are used (see Fig. 4 for idealised profiles of each);

a) cup-shaped, which have near vertical sides and a wide funnel-shaped

a) Typological classes of querns



b) Hopper shapes

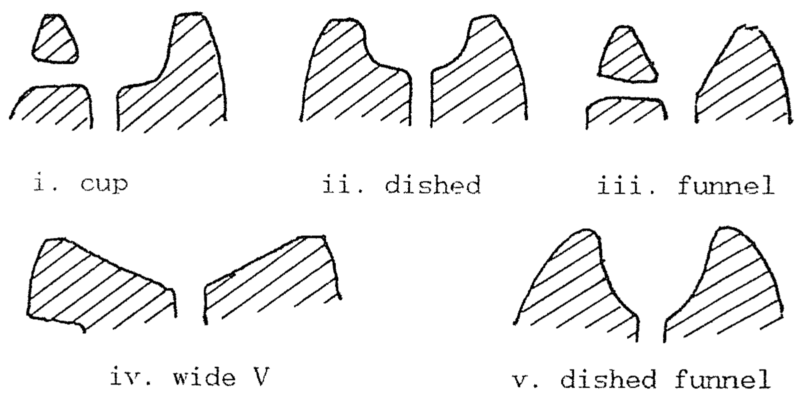


FIG.4 Idealised cross-sections of a) the typological classes of querns and b) the five categories of hopper shape

base and a distinct angle between sides and base. These are generally well shaped with a neat pecked finish although the base may be more roughly finished than the sides.

b) dished, in which the sides and base are concave with no abrupt angle between the two. These tend to be slightly smaller than cup or funnel shapes,

c) funnel-shaped,

d) wide V-shaped, of large diameter, generally over 15 cms, but relatively shallow, 5-6 cms,

e) dished-funnel, a characteristic shape among the puddingstone querns (and rare in other rock types) in which the hopper is relatively deep (the depth exceeding the diameter unlike the other types). The upper part of the sides are straight forming a deep funnel or cone shape and the lower sides and base are dished.

However, although many hoppers are readily assignable to one of these five groups others exhibit a combination of features giving hybrid terms. Thus dished-cup shaped hoppers exist in which the angle between the base and sides is less marked than in the cup-shaped forms, there are intermediate types between funnel and wide-V examples and some generally funnel-shaped hoppers show a slight dishing of the sides.

2; Lower stones

Diameter,

Shape (flat, concave or convex) of the grinding surface and its diameter if different to that overall,

Shape, diameter and depth of the spindle hole (including the diameter at the base if a pierced stone),

Shape (flat, concave or flat) and diameter of the base,

Thickness: for those of flat or concave base the maximum and minimum thickness at the outer edge and at the centre (for those of concave base the vertical height from the base at the outer edge of the quern), for those with a convex base the thickness at the centre and the maximum and minimum thickness of the edges

Quern Shape

Quern shape is described here in very general terms, e.g. conical (for those in which the sides in section appear nearly straight), discoid (which have approxiamately vertical sides and a flat top), hemispherical and bun-shaped. Hayes et al (1980) attempted to use a more objective system to describe the shape of the Yorkshire querns, suggesting three categories of low, medium and tall which are distinguished using height to base ratios (HAYES et al, 1980; 303). However this ratio depends not only on the original height but also on the amount of wear. Since, in determining possible correlation between lithology and form it is the original shape that is important the results of applying such terms based only on these ratios may be misleading. Thus it is felt that at present the more general descriptive terms which convey some idea of, for example, the angle of inclination of the sides relative to the horizontal and the convexity of these are more useful and will permit valid groupings of similarly shaped querns despite differences in height due to differential wear. The classification of Hayes et al would appear to have greater validity when applied to roughouts and completed but unused querns and has been applied by Wright to the products of the south Yorkshire quern quarries (WRIGHT, 1988).

Among the Yorkshire style querns in the Sheffield area Wright has noted that the handle sockets tend to be placed at a distance one third to two fifths of the height of the quern from the top (WRIGHT, 1986; 40-45). Such a height would permit easy working (which is not possible if the handle is placed too high) and a considerable use-life before a replacement handle socket was required. This generalisation allows the reconstruction (albeit within rather wide error limits) of heights of used querns of this type. It is possible that a similar positioning ratio occurs in at least the Hunsbury-style querns but any height reconstructions using this must remain very tentative until sufficient near-completed roughouts have been found to check the ratio for this quern type. If this, or a similar, ratio is also applicable to the Hunsbury style querns (and it is very rarely exceeded among the querns examined), many of those examined appear to have undergone considerable wear indicating a long use-life with a loss of up to 15 cms from the original height. Similar principles possibly apply to other forms although again roughouts from which to determine the range of quern heights and handle positions are as yet not known. Considerable wear is indicated for those querns in which a handle socket has been partially worn away by grinding but further than such a general statement it is generally difficult to assess the height reduction due to use subsequent to manufacture.

Quality of Working

The quality of manufacture, i.e. the shaping and finishing /dressing of the quern is also described using a subjective terminology. The degree of shaping can vary from those stones that are very irregular and appear to have been fashioned from a suitably sized and shaped boulder with little subsequent working and which still appear rough and boulder-like (although the internal features, e.g, the hopper and the feed may be neatly worked) to very well shaped and regular, circular stones with even surfaces finished by quite fine pecking. Hayes et al used three terms to describe the "quality of sculpture"; exceptionally well sculptured, well shaped and roughly made (HAYES et al, 1980; 303). Generally the better, more regularly shaped stones will show a better finish than the roughly shaped examples although this is not always the case.

1.4.2 Petrological analysis

Wherever possible (the main exception being the querns of puddingstone) a sample has been taken from each quern; this has not been possible at some museums or in the case of complete stones. Many of these are only small samples to obtain a fresh surface to enable correct identification of the rock. The same rock can weather very differently depending on the type of soil and conditions of deposition and, conversely, rocks from two sources can present similar weathered surfaces but appear quite distinct when freshly exposed. A large number of the querns examined were sampled for thin-sectioning for more detailed petrological analysis and comparison with potential source rocks. Not all rock types have been subjected to this level of analysis which has, with the exception of the Puddingstone querns, concentrated on the more productive sources as represented among finds from the study area and in particular in identifying and distinguishing between the various greensand sources. Thus the relatively poorly represented rock types, the igneous rocks and limestones, have been compared to possible sources in hand specimen only.

Thin section analysis has involved petrographic description and modal analysis using 500 point counts, dividing the constituents into ten mineral groups. Two different groupings were used, the first for the glauconitic sandstones and the second for the remaining sandstones. In the former the mineral groups comprised; monocrystalline quartz, polycrystalline quartz, chert, other rock fragments, fresh glauconite, altered glauconite/limonite, fossil detritus, clear crystalline calcite, other minerals and voids. For the other sandstones they are; monocrystalline quartz, polycrystalline quartz, microcline and perthite, other feldspar, lithic fragments, muscovite, biotite, kaolinite, other minerals and voids. The void category is particularly important for the quartzitic sandstones, particularly Millstone Grit, in which, in addition to original voids, much of the friable clay matrix has been weathered out. This problem is exacerbated by the necessity of taking samples from the most exposed and hence weathered outer edges of the quern. This loss of material gives an overall low count for all mineral groups when compared with counts from unweathered samples.

Grain size analyses were undertaken on a number of samples but the results are more likely to be misleading than useful. Most of the sandstones show variations in grain size visible across the quern, particularly those of Millstone Grit, many of which exhibit graded bedding from medium to coarse and pebbly sand grade. The results of grain size analysis thus depend partly on the location of a suitable "corner" on the quern to remove as a sample and may be misrepresentative of the quern as a whole; it would not be possible on most of the material to take several samples from various points in order to obtain a representative selection. Similarly, to some extent the composition of Millstone Grit is dependent on the grain size, mica, for example, being more common in the finer grades, and again a sample may not fully represent the overall composition of the quern. In consequence of this the Carboniferous sandstones have only been subdivided into three subgroups defined by general composition.

As a result of these analyses and comparison with potential sources the quern samples have been assigned to one of twelve lithological groups : Carboniferous Sandstone/Millstone Grit (three types), Spilsby Sandstone, Folkestone Beds, Hythe Beds, Devonian/Old Red Sandstone, puddingstone, limestone, granite, fine grained quartzitic sandstone and 'other'. It is generally (with the exception of the Hythe Beds querns from Lodsworth identified by Peacock and puddingstone) not possible to assign the published examples to the same categories although the amount of petrological information varies greatly. For example, it has not been possible to separate the majority of published Millstone Grit querns into the three subtypyes of that lithology defined here.

1.4.3 Comparative Data

Two main sources for comparative samples have been used; direct sampling at outcrop and the British Geological Survey collection at Keyworth, Nottinghamshire. Using the latter enabled rapid coverage of most of the country, although the collection is more comprehensive for some areas and outcrops than others, and comparison with a large number of samples and outcrops to determine those that are possible sources and that merit more detailed study. In particular the collection gave over 300 comparative thin-sections of Millstone Grit from the Southern Pennines, the Melbourne outcrop and a few from the

Bristol area. For the Millstone Grit additional comparisons were made with samples from; Wharncliffe, although not from the scheduled main working area), Ringstead Crescent, Den Bank and Stanton Moor collected and kindly lent by M.E. WRIGHT); the Melbourne outcrop (collected by I. WHITBREAD) and the Bristol area. The Geological Survey samples provided a full coverage of the rest of the southern Pennines. The greensands are not as well represented among the collection at Keyworth and more sampling was undertaken at outcrop; from the quarry at Lodsworth, the Folkestone area and the Lincolnshire Wolds. Comparisons for the Devonian sandstones were made with sections and hand specimens from the Bristol-Forest of Dean-South Wales area, in the Geological Survey collection, from sampling in and around Bristol, and with a small number of samples in the Teaching Collection of the Department of Geology, University of Bristol.

Thin sections and samples from the Keyworth collection will be referred to throughout by their Geological Survey number and hence are prefixed "E"; those currently held by the Geological Museum, London are prefixed "MR". Geological samples collected at outcrop have been numbered sequentially and are prefixed "CJ" and suffixed "/G".

CHAPTER 2: DEVONIAN (OLD RED SANDSTONE)

2.1 General

A total of 36 of the querns examined, including 12 upper and 20 lower stones, have been identified as Devonian sandstone. A high proportion (23) of these are flat, Roman types, from two sites in particular; Magiovinium, Bucks and Odell, Beds. There seems to be little change in general form among the lower stones from the 'beehives' of the later Iron Age to the early Roman types, although some of the former are very thick and later examples tend to show increased diameter and decreased thickness. As with lower stones of other lithologies there are thus a number of lower stones of intermediate form that cannot be positively placed with either the thick beehive or the thinner flat types.

a) Upper Stones (Plate 1)

Only two of the upper stones are of definite beehive type, both from Hunsbury, Northants, and of Wessex form; CJ 143 and 149 (Plate 1) These have a markedly concave grinding surface and a lateral unpierced handle socket but lack a real hopper, although the upper surface in each case is somewhat concave. There are two flatter upper stones that may be of relatively early date; CJ 497 (unprovenanced, Northampton Museum) and CJ 727 (Magiovinium, Bucks). These differ from the other, probably later, upper stones from Magiovinium in their possesion of a small dished hopper. In other respects they bear some similarity to the Sussex querns having a wide flat top and nearly vertical sides but possess a less concave grinding surface and a handle slot that does not extend the full radius of the quern (it is generally 8 to 9 cms long). The remaining upper stones from Magiovinium, e.g. CJ 735, 729, 730, 732, are flat topped but lack hoppers; they are all incomplete and none preserve evidence for handle attachment.

PLATE 1: left; CJ 149, Old Red Sandstone, Hunsbury, Northants.
right; CJ 150, Millstone Grit subtype 1, Hunsbury, Northants.
Northampton Mus.

PLATE 2: CJ 283 (upper) and CJ 284 (lower), Breedon-on-the-Hill, Leics. Millstone Grit subtype 1. Leicester Mus.

b) Lower stones

1: Unpierced

The lower stones are more problematical. The only certain pre-Roman (on the basis of context not form) examples examined are again those found at Hunsbury, CJ 77, 84 and 182; all are unpierced. CJ 84 is a small, thick example (29 cms in diameter and 14 cms thick) which has a relatively short spindle hole of large diameter (5 cms) and, in common with all the Old Red Sandstone lower stones, a slightly convex grinding surface. The base, in most of the lower stones, is also usually slightly convex and the sides near vertical giving a larger base diameter relative to that of the grinding surface than is seen in the thick, early, stones of, for example, Millstone Grit.

CJ 77 is of similar shape to CJ 84 but of much larger diameter (41 cms) greater than that of most beehive querns and also exceeding that of many Old Red Sandstone lower stones from Roman contexts. It has a second hole, of similar proportions to the spindle hole, drilled from the base. A similar feature is seen in CJ 202 (unprovenanced, Leicester Museum) which is of smaller diameter (27 cms). The presence of such a large stone from a presumed pre-Roman context demonstrates the pitfalls of assigning examples to certain periods on the basis of size alone. Of similar form to CJ 77 and 84 are CJ 492 (Desborough, Northants) which may be of pre-Roman date and several stones from Roman sites; CJ 421 (unprovenanced, Northampton Museum) comparable in diameter to CJ 77 but possessing a slightly flatter base and nearly vertical sides, CJ 734 (Magiovinium), 35 cms in diameter and CJ 724 and 726 (Magiovinium). These Roman examples are thinner than the two stones from Hunsbury but they exhibit a range of thickness which must be in part attributable to wear.

CJ 182 (Hunsbury) and CJ 661 (Odell, Beds) are of more unusual design for this rock, bearing more similarity to some of the later Iron Age/early Roman querns of Hythe Beds sandstone from the Lodsworth quarry (see Chapter 5). The grinding surface is convex with a marked 'lip' around the spindle hole (particularly in CJ 182) and the base concave and more roughly finished than the sides and upper surface. Both of these stones are unpierced.

2: Pierced

There are two types of pierced lower stone, which are possibly all of Roman date, distinguished by the shape of the spindle hole. In the majority (five out of the seven examples) this is hourglass shaped; CJ 468 where the two drillings from grinding surface and base are slightly offset (unprovenanced, Aylesbury Museum), CJ 493 (Northampton), CJ 502 (Kings Sutton, Northants), CJ 538 (unprovenanced, Peterborough Museum) and CJ 664 (Odell, Beds). These show a range of diameters, the smallest, CJ 538 at c. 36 cms, and a maximum thickness of 8 cms. There are two examples pierced by a cylindrical spindle hole; CJ 617 (Biggleswade, Beds) and CJ 720 (Magiovinium), the latter a very large example with a wide spindle hole 5-6 cms in diameter.

2.2 Petrology of the quernstones

Eight of these Old Red Sandstone querns were thin sectioned: CJ 77, 143, 149, 182, 202, 492, 497 and 658. They are of variable grain size, fine to very coarse and pebbly, containing a high proportion of polycrystalline quartz and lithoclasts. Most are of coarse grade with at least scattered pebbles; none are truly conglomeratic. CJ 149 is creamy grey in colour, coarse to very coarse grained, CJ 497 of similar colour, medium to coarse grained with some patchy orangey brown staining but the remaining samples are all iron stained, ranging from pinkish grey to red-brown in colour.

In thin-section the samples demonstrate some variation in composition and texture but all contain a high proportion of quartzitic lithoclasts. CJ 77 is a coarse grained and pebbly sandstone containing pebbles of pink veined quartz. The dominant detrital components are mono- , and polycrystalline quartz and quartzitic lithoclasts, including schist and chert. Intergranular space is partially filled by broken lithic material, mostly very small quartz grains and a largely quartz cement. The other samples are all of similar composition (including CJ 149 and 497) but vary in the proportions of quartz and rock fragments. In all samples micas and feldspar are only very minor constituents; there is a small but variable amount of ferric oxide (haemetite) cement (Table 1).

2.3 The outcrop of Old Red Sandstone (Devonian)

The Devonian/Old Red Sandstone in central and southern Britain is exposed in the Mendips, the Bristol area, and South Wales-Welsh Borderland/Shropshire of which the Bristol-South Wales area is already known as a source for both querns and more recent millstone manufacture (BARFORD, 1984: INGLE, 1984: TUCKER; 1973, 1971). The succession comprises for the most part a thick sequence of mainly coarse clastic rocks, variable in both composition and thickness across the outcrop.

a) North Devon-Mendip-Bristol

1: General

The Devonian succession in Devon includes a number of arenaceous units, for example the red and grey quartzose grits of the Foreland Grits, and the sandstones, flaggy sandstones and conglomerates of the Hangman Grits but much of the succesion is made up of fine grained deposits (BENNISON & WRIGHT, 1969: 167-8). Rocks of this age exposed in the Mendips are similar to the Portishead Beds to the north.

Devonian rocks crop out at a number of localities in and around Bristol, in particular along the ridge of high ground which runs from Stoke Bishop to Shirehampton, across the Avon Gorge to Failand-Portishead-Clevedon and around the Bristol coalfield. A maximum thickness of 1800 metres is recorded for the succession but this has been reduced by erosion to only some 90 metres in the area of

Percentage of main detrital components:

	Monocrystalline Quartz	Polycrystalline Quartz	Feldspar	Lithic Fragments
DEVONIAN				
CJ 658	37.5	16	–	32.5
CJ 202	48.5	14.5	–	30.5
CJ 149	49	18.5	–	14.5
CJ 497	58.5	16	–	12
MG/1				
CJ 145	60	9	8.5	–
CJ 215	76	4	6.5	–
CJ 255	60	1.5	14	–
CJ 275	53	7	15	–
MG/2				
CJ 62	70	2.5	2	6.5
CJ 68	55.5	2	0.5	14
CJ 252	58	4	trace	9
CJ 259	54	1	0.5	10.5
MG/3				
CJ 539	70	0.5	trace	–
CJ 273	76.5	1	–	–
CJ 125	79	–	–	–
CJ 364	83	1	trace	–

TABLE 1: Modal analyses of the Devonian and Carboniferous sandstones

Berkely (KELLAWAY & WELCH, 1955a; WALLIS, 1927). In this area the Devonian succession is divided into Lower (Black Nore Sandstone) and Upper (Portishead Beds) units separated by the Woodhill Bay Conglomerate, a relatively thin but persistent polygenetic conglomerate containing pebbles of quartz, quartzite, jasper and mica schist.

2: Lower Old Red Sandstone

The Black Nore Sandstone is exposed in the lower Trym valley north of the Avon, in the Failand to Portishead ridge and along the coast from Portishead to Clevedon. It comprises a fairly thick series of dull purplish red, green or mottled soft sandstones and subordinate siltstones that are generally calcareous. The unit includes some intraformational conglomerates and pedogenic limestones, the cornstones, at some horizons. At Kilkenny Bay, Portishead the exposed beds are characteristic of the unit as a whole; laminated and false bedded sandstones (some pebbly) with some siltstones and conglomerates and cornstones within the higher beds. Massive cross bedded sandsones are the most prominent type, of fine to medium grade, calcareous and quartzitic with muscovite (PICK, 1964; 202).

Sample CJ 109/G from the exposure on the south bank of the River Avon, is a grey-brown, conglomeratic lithic arenite containing moderate to well rounded pebbles of quartz and fine grained rock fragments (ferruginous and grey fine grained sandstones and siltstones) in a matrix of medium sand, mainly of subangular to subrounded grey-brown and pinkish quartz. CJ 98/G from Kilkenny Bay, Portishead, is a sublitharenite comprising over 80% quartz (as mono- and polycrystalline grains and chert) and approxiamately 15% lithoclasts as subangular to subrounded grains. Other samples from Portishead show a wide range of both grain size and colour (grey or greenish grey to reddish brown) but all are to some extent calcareous.

3: Upper Old Red Sandstone

The Portishead Beds is a thick unit (over 300 metres) of red, green and mottled compact sandstones and pebbly and conglomeratic sandstones which crop out at Shirehampton, Stoke Bishop and along the Failand-Portishead-Clevedon ridge. The conglomeratic and pebbly units are generally lens and wedge bedded; cross bedding is common.

Wallis (1927) described the following main constituents of the rocks:
a) Quartz, 0.04 to 4 mm in diameter, in which inclusions are frequent and (as with the degree of rounding) increase with grain size. These include green, vermicular chlorite, apatite, tourmaline, zircon rutile with larger grains containing numerous black markings that are often arranged in streams. Both augen and cataclastic quartz occurs, often showing slightly strained extinction.
b) Lithoclasts of various types including fine grained quartz schist (common at all horizons), fine grained sandstone, rounded chert and minor amounts of quartz porphyry.
c) Mica, including muscovite and brown and green biotite generally as bent flakes exhibiting undulose extinction.
d) Feldspar, not common, but including fresh microcline (the most abundant type), orthoclase and albite (generally at least partially altered) occur. (WALLIS, 1927; 173-8)

The majority of the sandstones contain scattered grains of calcite and dolomite. Cryptocrystalline silica and fine feldspar are the chief cementing materials in the coarser sandstones with some quartz occuring in optical continuity with the detrital quartz (WALLIS, 1927; 770-1).

Samples were collected from a number of exposures in the area: Kilkenny Bay, Abbots Leigh-Snakes Well Wood, Shirehampton and Stoke Bishop. The Portishead samples are reddish/pinkish grey to reddish brown in colour and show the complete range in grain size, from fine to pebbly/conglomeratic sand grade.
a: Kilkenny Bay. CJ 93/G comprises dominantly monocrystalline quartz containing numerous inclusions, e.g., dark specks, and showing mainly unstrained extinction. There is a subordinate amount of

polycrystalline quartz and chert, ferruginous and micaceous rock fragments, scattered feldspar, and some silica cement but the matrix consists largely of very fine grained quartz.

b: Abbots Leigh. CJ 92/G is a pale orangey-grey to grey pebbly sandstone contaning well rounded quartz pebbles, averaging 1.5 cms in diameter, and lesser amounts of lithoclasts in a coarse grained quartzitic and non-calcareous matrix.

c: Snakes Well Wood. CJ 95/G shows a similar compositon but a more variable grain size and contains a higher proportion of polycrystalline quartz than CJ 92/G and CJ 93/G. Partial ferric oxide grain coatings are common. Other samples from this exposure are similar to those from Abbots Leigh and Stoke Bishop.

d: Stoke Bishop. The two samples from Stoke Bishop are grey, fine to medium grained pebbly sandstones with patches of orangey-brown ferric oxide staining. Sample MR 10256, Geological Museum (London), from Stoke Bishop is also similar to that from Abbots Leigh. It is a pinkish medium to coarse grained sandstone with pink veined quartz pebbles up to 1.5 cms in diameter.

4: Woodhill Bay Conglmerate.

CJ 99/G, Portishead, also shows quartz (mono- and polycrystalline) to be the dominant detrital material. The degree of rounding increases with grain size; many grains show at least a partial ferric oxide coating.

b) South Wales-Forest of Dean-Shropshire

1: General

West of the River Severn, in the Forest of Dean, the Old Red Sandstone attains a maximum thickness of over 1800 metres in the Mitcheldean area. Rocks of this age crop out around the basin of Carboniferous rocks and extends to the Cardiff region in the west and Hereford in the north. The series is again divided into Upper (Quartz Conglomerate and Tintern Sandstone) and Lower units.

2: Lower Old Red Sandstone

In the Forest of Dean area several divisions are recognised within the lower Devonian succession. The lowermost unit, the Downton Castle Sandstone, comprises approxiamately 15 metres of mainly buff, feldspathic sandstone and is overlain by the Raglan Marl Group, Thornbury Beds (red brown sandy marls containing subordinate sandstones), St Maughans Group (interbedded marls and sandstones in roughly equal proportions in which conglomerates and cornstones are developed at some levels) and the Brownstones (generally dingy purple grey, micacaeous sandstone with some bands of red and green marl, usually calcereous) (WELCH & TROTTER, 1961: 31-35). In Shropshire the Lower Old Red Sandstone rocks are similar to those of the Bristol region and are generally calcereous.

3: Upper Old Red Sandstone

The Upper Old Red Sandstone, approxiamately 120 metres thick is a sequence of arenaceous continental type sediments, soft buff and yellow sandstone with some marl partings and local lenses of pebbly deposits. The lower part of the unit contains well developed conglomeratic bands that occur either as a single bed or as two or three bands separated by softer sandstones containing pebbles . These conglomerates are laterally persistent and have been mapped as a separate unit, the Quartz Conglomerate; the remaining sandstones are termed the Tintern Sandstone Group (WELCH & TROTTER, 1981: 49). Together these two units are the equivalent to the Portishead Beds; although well defined to the north of Bristol the two units merge southwards to become the pebbly sandstones of the Portishead Beds (KELLAWAY & WELCH, 1955a; 6).

Quartz Conglomerate. The Quartz Conglomerate is thickest in the area of Symonds Yat. The rock, a maximum of 30 metres thick, containing pebbles of vein quartz (or, more rarely, quartzite) and more minor amounts of jasper and decomposed igneous rock in a sandy matrix with a siliceous cement, is extremely hard, forming high ground and often bare crags. Weathering of the crags along the joints produces a scree of fallen blocks on the slopes below (WELCH & TROTTER, 1961; 49-50: KELLAWAY & WELCH, 1955b). MR 13011 (Geological Museum, London), a sample from Whitchurch, Hereford bears some similarity to material from the Portishead Beds (e.g. MR 10256, Geological Museum, London) but differs in colouration, being more pink in colouration and in containing a higher proportion of lithic fragments. MR 10778 (Geological Museum, London) from Mamhilad, Monmouthshire, is similar in texture to some of the pebbly sandstones from the Bristol area but lacks the red colouration the sample is creamy grey although a pinkish hue is imparted by the pinkish-red veining of the quartz pebbles.

Tintern Sandstone Group. This consists of a series of yellow brown sandstones with hard siltstones, red sandy micaceous mudstones and at some horizons thin layers of dark green sandstone containing large flakes of mica (KELLAWAY & WELCH, 1955a: 7).

In Shropshire the Upper Old Red Sandstone, up to 150 metres thick, is represented by mainly red marls containing cornstones in the lower part and sandstones and lens bedded conglomeratic deposits (the Farlow Sandstones) in the upper part.

2.4. Quern and millstone quarrying of the Old Red Sandstone

Previous research (TUCKER, 1971: WISDOM, 1981: BARFORD, 1984: INGLE, 1982, 1984) has shown that rocks from outcrops in both the Forest of Dean and Bristol areas have been exploited for quern and millstone manufacure and outcrops further west also appear to have been utilised, e.g. at Whitton, South Wales (WELFARE in JARRETT & WRATHMELL, 1981; 222). Tucker (1971) discussed the working of the Quartz Conglomerate at Penallt, Monmouthshire, on the River Wye for millstones. The rock is also known locally as 'Breccia', 'Jackstone' and 'Puddingstone' and in this area often forms crags up to 7.5 metres high (WELCH & TROTTER, 1961; 53). Millstones were worked at numerous localities in the area, some of these quarries in the modern sense but others not now recognised as such, where easily available blocks were utilised: "no doubt also much building stone was merely taken from the hillside over which huge blocks of pudding-stone lie scattered at random" (TUCKER, 1971: 229).

Previous work by the author on the petrology of Roman quernstones from the Bristol area (INGLE, 1982, 1984) and by Barford on possible local quarries (BARFORD, 1984) has also suggested a number of working sites in that region. Some of the quernstones from the Gatcombe Park villa, Avon, for example, are of pinkish grey to reddish brown, fine to coarse grained sandstone and pebbly sandstones, comparing very well to the Old Red Sandstone of the area, particularly exposures on the Failand-Portishead ridge. Of the four quern fragments from Filwood Park, Bristol, two are of Old Red Sandstone similar to material from the Failand ridge: a further two are of Carboniferous sandstones. It is difficult to prove that these came from a Bristol rather than Forest of Dean (Quartz Conglomerate) source. The latter, although usually more conglomeratic, is generally of the same lithology, and both units accumulated in the same depositional basin. As a result some of the Quartz Conglomerate is virtually indistinguishable from parts of the Portishead Beds, especially the more pebbly horizons. Most of the querns do appear to be of pebbly rather than conglomeratic sandstones and it seems likely that such a close source as, for example, the Failand ridge would be exploited for use in the immediate area at least but it is equally possible that other outcrops were in contemporary use.

Barford has suggested a number of sites in the area where quern manufacture may have taken place although at present direct evidence in the form of roughouts is lacking. Many of the outcrops of relevant units now lie in built up areas, in particular in Stoke Bishop, Shirehampton and also Sneyd Park resulting in the loss of any potential evidence. Secondly, although a large number of quarry sites were found, these generally cannot be assigned a date and many are likely to be more recent features, opened for the aquisition of building materials; however, the use of a site for more than one purpose and at more than one period is an equally valid possibilty. It is probable that "some were caused by, or initiated by, the extraction of stone for the manufacture of querns" (BARFORD, 1984: 13). A further problem noted by Barford in identifying quarry sites in the Devonian sandstones is that the rock does not flake; shaping is presumed to have been achieved mainly by pecking, producing less readily recognisable debris. Signs of quarrying along the outcrop between Portishead and Failand were noted but only one dubious roughout recorded (BARFORD, 1984; 16).

On current evidence, there is insufficient data to determine from which part of the outcrop the querns found within the present study region were derived; certainly the Bristol area is the closest and the range of lithotypes exhibited by the querns could all be found within the area. There does not appear to be any particular correlation between details of form and variations in lithology.

2.5 The distribution of Old Red Sandstone Querns (Fig.8)

Within the study region a high proportion of querns of this lithology examined are from the predominantly Roman sites at Magiovinium, Bucks and Odell, Beds. For the collection in Oxforshire considered the Old Red Sandstone querns are from Roman contexts; beehive querns are of other rock types. In addition to these are the five stones from Hunsbury (presumed to be Late Iron Age at the latest (RCHM, 1985; microfiche), one from Northampton (CJ 493, context unknown), one from Blackgrounds, Kings Sutton, Northants (CJ 502, where there is a prehistoric and Roman settlement producing pottery mainly of the third and fourth centuries AD, one from Desborough (also an Iron Age and Roman settlement) and CJ 617 from Biggleswade, Beds. With the probable exception of the Hunsbury stones these could all be of Roman date; there is little, on the basis of form, to argue for an earlier, Iron Age, date although as has already been suggested large and relatively flat stones are not necessarily of Roman date.

At Odell fragments of Old Red Sandstone querns were recovered mostly from contexts dated to the late 1st to 4th centuries AD although there is one piece from a late first century BC to early first century AD date context identified as possible Old Red Sandstone; although settlement began here in the later Iron Age there are in fact few quern fragments of mid first century AD date or earlier. In contrast to the other pieces of Old Red Sandstone it is of a fine grained rock but too small a fragment to determine the form. The piece is described as part of a flat-topped quern, 35 cms in diameter and 4.5 cms thick at the edge with a conical grinding surface and a large splayed hopper (ODELL SITE ARCHIVE, BEDFORD MUSEUM). Fragments of querns of this lithology have also been recovered at King Harry Lane, St Albans, a site first settled c. 60 AD (A.MIDDLETON, pers.comm.). With the exception of the Hunsbury examples Old Red Sandstone does not, therefore, seem to appear in the area covered by this study until the Roman period.

Querns made from Devonian rocks are, as might be expected, more commom further west, although again most of the published examples are from Romano-British sites, for example: Cattybrook (BENNETT, 1980) and Gatcombe (BRANIGAN, 1977; INGLE, 1982), Avon; Andoversford (RAWES, 1980), Brockworth (RAWES, 1981), Frocester Court (PRICE, 1983) and Kingscote (EAGLES & SWAN, 1972) Gloucestershire; Silchester (FULFORD, 1984: 118-9), Catsgore (LEECH, 1982; 128, Fig.90) and Chew Park (RAHTZ & GREENFIELD, 1977), Somerset. The forms of these querns are comparable to those from Magiovinium and Odell. Upper stones may or may not possess a handle slot which does not extend he full radius of the quern, e.g. an example from Cattybrook (BENNETT, 1980; nos. 3,4, Fig.15) and/or a small dished hopper. The lower stones all have a convex grinding surface (although the degree of slope varies) and usually a convex base if unpierced, more nearly flat if pierced. In some examples the grinding surfaces are grooved. .

Of earlier date is the thick, unpierced lower stone of coarse quartz grit, of probable Devonian origin, found at Gussage All Saints, Dorset. This is similar in form to, but thicker than CJ 84 and recovered from a Phase 1 context (EIA) (BUCKLEY in WAINWRIGHT, 1979: 92. Fig.69. no. 2157). A fragment of red sandstone, possibly Old Red Sandstone from Little Sombourne, Hants, might also be of early date (NEAL, 1980). .The upper stone of possible Middle Iron Age date from Bury Wood Camp, Wilts, is 38 cms in diameter and 14.3 cms thick with a hopper 8.5 cms in diameter but it is not clear from the published description whether the stone had a handle socket or slot (GRANT KING, 1967). Another possible example of this lithology is a fragment which appears to be part of a fairly flat quern from an Iron Age period 2 (Middle Iron Age) context at Ashville Trading Estate, Abingdon, Oxon (PARRINGTON, 1978: 88-9).

There are, in addition to these, several examples described as, for example, red sandstone or conglomerate that may be of Devonian origin. These include a pierced lower stone with convex upper and lower surfaces and an hourglass shaped spindle hole made from red conglomeratic sandstone found at Ilchester, Somerset (LEACH, 1981: Fig. 105, no. 39) and un unpierced lower stone with convex base from Somerton, Somerset (LEECH, 1981).

The earliest form of rotary querns of Devonian sandstones could therefore be the Wessex types as seen at Hunsbury, although few of these have been published to date. By the early Roman period the commonest form appears to be one similar in some respects to the Sussex type upper stones; flat topped with a handle slot, the latter generally 8-9 cms in length and not extending to the hopper, a small dished hopper (absent from later examples) and only slightly concave grinding surface. Some examples of these appear in the study region. The main distribution area, however, lies beyond the scope of the current project and these suggestions can only be tentative until a larger body of evidence is examined.

CHAPTER 3: CARBONIFEROUS SANDSTONES

Within the study area most of those querns identified as Carboniferous sandstones are of Millstone Grit. However within this region there are a few made from Coal Measures sandstones and in the Bristol area, for example, both the Carboniferous Limestone and Coal Measures contain sandstone units that have been used for quern manufacture (INGLE, 1982; 1984).

3.1 Carboniferous outcrops (Fig.1)

3.1.1 The Pennines

a) Lower Carboniferous

The Lower Carboniferous of the Pennines, although comprising predominantly limestones, contains a number of sandstone units, for example, the Astbury Sandstone and the Yoredale Sandstones. The former does not appear, on present evidence to have been worked for querns although the Yoredale sandstones are represented among querns in Yorkshire (HAYES et al, 1980).

b) Namurian (Millstone Grit)

The Namurian forms the middle division of the Carboniferous Series; its fullest development is seen in the Pennines where it attains a maximum thickness of 1800 metres in the Skipton and Burnley area. These sandstones have been exploited for millstones until recent times at numerous localities (giving the unit its more commonly used name, Millstone Grit, and has possibly already received greater attention in quern/millstone studies than any other rock group in this country.

As a whole the series comprises a sequence of interbedded mudstones, shales and sandstones, the latter pebbly to conglomeratic in parts. In the southern Pennines the outcrop is now divided into two parts by the limestone of the Derbyshire Dome, and there is a small outlier further south around Melbourne, Derbyshire. The sandstones are mainly of medium grade and two main facies occur; the more widely occuring and so-called 'typical' Millstone Grit, strongly feldspathic and generally unfossiliferous, and the protoquartzites, non-feldspathic and of more restricted development occuring only in the southern Pennines, mainly the south-west. "Modal analyses indicate that both lithologies are variable, but that in their proportions of two major components - lithoclasts and total feldspar - they remain mutually exclusive" (CHISHOLM et al, 1988; 43). Many of the sandstones units are lens shaped and of only local development.

1. Protoquartzites. These rocks, sometimes referred to as crowstones in the past although this term has been applied to more than one lithofacies, are sublitharenites in which the composition is similar to that of quartz arenites, as the lithoclasts are mainly quartzose. The latter include quartzites, chert, mylonite, volcanic material and lesser amounts of labile detrital grains. The matrix comprises clay grade material, illite, muscovite and kaolinite; feldspar is a very minor constituent (TREWIN, 1969: EVANS et al, 1968; 83: AITKENHEAD, 1985; 91)

2. Feldspathic sandstones. The protoquartzites are virtually absent from the eastern Pennines where the entire thickness of Namurian sandstones comprises the feldspathic type, having an average feldspar content of 14%. The lowest division, the Kinderscout Grit Group (which includes the Shale and Kinderscout Grits) is thickest in its type area around Kinder Scout where, for example, the Lower Kinderscout Grit is described as "an immature, coarse, gravelly and markedly feldspathic sandstone .. .... comparing closely with sandstones higher in the Millstone Grit Series" (STEVENSON & GAUNT, 1971; 254). In north Derbyshire the Kinderscout Grit is usually a coarse grained and/or pebbly unit, white, buff or yellow blotched with red or purple (FROST & SMART, 1979; 14-20: SMITH et al, 1967; 64-7: GIBSON et al; 1908). The next major division, the Middle Grit Group, includes the Ashover, Roaches and Chatsworth/Rivelin Grit. The Ashover Grit is generally pale buff to grey (although in places stained by ferric oxide) and

most prominent in central Derbyshire. The Chatsworth Grit is, on the whole, less coarse with rare pebbles; in the south-east it consists of two sandstone units separated by shales, the upper forming a series of crags from Baslow south to Gardoms Edge (SMITH et al, 1967). The uppermost division here is the Rough Rock Group, of which the Rough Rock is the main sandstone unit. In the area around Chapel en le Frith, for example, it is a pale grey to buff, well consolidated, medium to coarse grained sandstone (STEVENSON & GAUNT, 1971; 262). "The Rough Rock, though extensively defeldspathized in places to a quartzitic sandstone cemented by secondary silica, elsewhere is closely similar to the subarkosic arenites above" (EVANS et al, 1968; 91).

The sandstones are poorly to false bedded and-thin-sections show a high degree of diagenetic compaction with patchy interlocking of quartz grains, common presence of authigenic kaolinite clay, dominance of fresh microcline among detrital feldspar, generally subangular to subrounded grains, poor to moderate sorting and variation in grain size (STEVENSON& GAUNT, 1971; 247-8; EVANS et al, 1968;89). Perthite, orthoclase and plagioclase are also present, the latter two variably altered. Muscovite and biotite generally occur only in accessory amounts as do lithic fragments, e.g., chert and metamorphic fragments. Heavy minerals include zircon, rutile, apatite and tourmaline (AITKENHEAD et al, 1985; 91).

c) Coal Measures

Sandstone units in the lower parts of the Coal Measures exhibit a similar composition and texture to the Millstone Grit sandstones, but also include fine grained, quartzitic, ganisteroid sandstones.

3.1.2. Bristol-South Wales

a) Lower Carboniferous

In this area the Lower Carboniferous contains three main arenaceous facies, the Lower, Middle and Upper Cromhall Sandstones in the Bristol area and the equivalent Drybrook Sandstones west of the Severn. The

Middle Cromhall Sandstone merges with the Upper to the north of Bristol. These units comprise quartzitic sandstones in which haematization is common. Sp. 2361 (University of Bristol, Dept. of Geology. Teaching Coll.) from Tyndalls Park Avenue, Bristol, is a conglomeratic sandstone containing well rounded pebbles of quartz in a matrix of more granular quartz grains. These arenaceous rocks grade from impure quartzitic sandstones to pure quartzites in places, some containing a small proportion of calcite matrix (KELLAWAY, 1967; 127). There is one quern from Gatcombe (INGLE, 1982; Q9) which is possibly of Cromhall Sandstone but these sandstones were not apparently used to any great extent, even locally, for quern manufacture.

b) Middle Carboniferous

The rocks lying between the Carboniferous Limestone and the Coal Measures of the Upper Carboniferous are not comparable to the Millstone Grit of central and northern England, although they have sometimes been referred to as Millstone Grit, reflecting their stratigraphical position rather than lithology. Exposures are generally small and this unit, the Quartzitic Sandstone Group, appears to attain·its maximum thickness in the area of Bristol (KELLAWAY & WELCH, 1955a; 19). The basal chert is overlain by a group of hard, quartzitic sandstones succeeded by mudstones and sandstones. They crop out in an area from Long Ashton to Clifton and central Bristol. The most massive sandstones, the Brandon Hill Grit, are seen at, for example, Brandon Hill, Bristol, where there are approxiamately 180 metres of reddish grits with calcareous bands, and Royal Fort. Both sandstones and conglomerates occur, the majority comprising 95% quartz with minor amounts of chert and fine-grained quartzites; detrital feldspar is absent. An interlocking mosaic texture is common and silica is the dominant cement (KELLAWAY, 1967; 128-9: KELLAWAY & WELCH, 1955b).

Sample CJ 110/G from Brandon Hill is a medium grained, pale grey quartz arenite containing a small proportion of ferric oxide grains. CJ 111-4/G from Long Ashton, Bristol, are pebbly medium grained sandstones and conglomerates. Thin-sections show a quartz arenite composition, over 95% quartz, dominantly monocrystalline showing unstrained extinction and minor amounts of chert and other quartzitic lithic fragments. Both rounding and sorting are good; mica and feldspar are absent. Samples from Tyndalls Park Avenue, Bristol, are of similar composition; dominantly monocrystalline quartz in an interlocking mosaic with occasional small grains of chert and micaceous siltstone (INGLE, 1982).

Several querns from the Bristol area have been identified as this lithology (INGLE, 1984), for example, a fragment of an upper stone from Filwood Park (INGLE, 1982; no. ST 6), one quern from Gatcombe Park villa (INGLE, 1982; Q 9) and F 5853 (City of Bristol Museum and Art Gallery), approxiamately one third of an upper stone which has a short handle slot (similar in form to some of the Old Red Sandstone upper stones, e.g. CJ 497, 727) and slightly concave grinding surface (INGLE, 1982; Appendix D), from Sea Mills, Bristol. A comparable lithology has not been found among querns from the present study area.

c) Coal Measures

The main sandstone unit within this sequence in the Bristol area is the Pennant Sandstone which lies between the Upper and Lower Coal Measures and is exposed at, for example, Bristol, the Somerset Coalfield, Temple Cloud and Portishead. The sandstones are lithic arenites, comprising approxiamately 50 % lithoclasts, mainly of mica schist and micaceous siltstone, with quartz as the second main detrital component. These sandstones have been quite widely used for honestones and building stones but few querns have been attributed to this source.

3.2 Quern and Millstone quarrying of the Carboniferous rocks

The Peak District of Derbyshire has, for centuries been well known for its millstone manufacture; numerous partly completed discarded millstones testify to the widespread exploitation of these rocks. Despite the large area of outcrop of Millstone Grit and other Carboniferous sandstones not all are equally suited for use as millstones: "there are only a few restricted outcrops that provide the necessary well cemented massive sandstone" (RADLEY, 1964). Tucker, in a study of this Peak industry noted that all the principal Millstone Grit sites catalogued are on the Chatsworth/Rivelin Grit although other beds of the Series were used. In addition Tucker recorded four sites on the Limestone and two, Alton and Stone Edge quarries, where the rock used worked was the Crawshaw Sandstone of the Lower Coal Measures. (TUCKER, 1977; 44). The series of craggy edges mentioned above that run northwards from Gardoms Edge and include those of Baslow, Curbar, Froggatt and Stanage, are among those formed of Chatsworth Grit. Many partly finished millstones still lie at numerous localities below the crags; abandonment that may have been a consequence, for example, of the discovery of flaws in the stone (HARRIS, 1971).

More recently the Carboniferous outcrop (and particularly the Millstone Grit) has also come under greater scrutiny with respect to quern manufacture. The work begun by the late L.H. Butcher at Wharncliffe (BUTCHER, 1970), is now being continued by E. M. Wright as part of a programme of research into early quern production and distributon in South Yorkshire (WRIGHT, 1986, 1988) and work elswhere in Yorkshire (HAYES et al, 1980) and continued by the Yorkshire Quern Survey) and Cleveland (HESLOP, 1988) has identified a number of other Carboniferous sources and quern quarries. Among the querns from North-East Yorkshire Hayes et al (1980) identified two Carboniferous Pennine sources, the Brimham Grits (Namurian) from a narrow belt between Ripon and Harrogate, and Yoredale Sandstones of the Wensleydale and Swaledale areas (HAYES et al, 1980; 308).

3.3 Quernstones in the study area

Of the 700 querns examined from the main study area there are 212 of Carboniferous sandstones of which six (two upper and four lower stones) are definitely flat, Roman types and the remainder probably all beehives querns. Of these there are 133 upper and 72 lower stones (one is indeterminate). For the beehive types this lithology forms the highest percentage of the querns from Leicestershire and Northamptonshire. On present evidence it is absent from Hertfordshire, Norfolk and Suffolk and there is only one, unprovenanced, example from Essex now in Saffron Walden museum (and therefore possibly originally from the north-west of the county).

3.3.1 Typology

1: Upper Stones

Most of the upper beehive querns, 102 examples, fall into Curwens Hunsbury class (Plates 2,3) but there are a smaller number of Yorkshire/unpierced type (11 stones); the remaining 20 upper stones are either of another or very irregular form or lack the diagnostic feature of handle socket. They range in diameter from 25.5 to 37.5 cms (the majority are 26 to 33.5 cms) and in present height from 10 to 29 cms. The majority of pierced upper stones, despite considerable variation in details of form, all possess the main characteristics of the class. They are generally tall and conical in shape with only slightly rounded sides ending in a flat top, usually 14 to 20 cms in diameter, sometimes with a moulded rim. The hopper, generally cup shaped, ranges from 7 to 15 cms in diameter (mostly 11 to 14 cms) and 7 to 12 cms in depth. Funnel and dished shapes, e.g. CJ 113, 186, 270, and intermediate shapes between these also occur. The handle socket in most instances pierces the base of the hopper (or top of the feed) but there are a few examples where it opens out onto the feed, e.g. CJ 216, 213, 509, 269, and one example (CJ 261) where it pierces the side of the hopper; this stone also has a second, unpierced, handle socket.

Most of these querns are single handled although there are fifteen stones with two handle sockets and two with three. Of the double handled examples fourteen have both sockets at the same level on the stone suggesting contemporary use, e.g. CJ 52, 85, 98, 161, 247, 245, 113, but in the other examples the higher placed handle socket appears to be a replacement after excessive wear has rendered the first socket unusable, e.g. CJ 270, 271, 256. In both stones with three handle sockets, CJ 298 from Horncastle, Lincs and CJ 54 from Hunsbury, Northants, the three handles are set at approximately the same height and spaced evenly around the stone. The handle sockets of all these querns tend to be of fairly standard size, approximately 6 cms by 4 cms, but vary in shape, most being rectangular although oval examples are found. Circular handle sockets are rare. The grinding surface is generally flat or very slightly concave. The feed is circular, 2.5 to 3 cms in diameter and there is sometimes a separate spindle hole, or more commonly a notch in the side of the feed presumably to accomodate the spindle. A number of querns still retain an iron sleeve in the feed. A large proportion of the upper stones are at least slightly asymmetrical, having been worn more on the side of the handle, a feature probably due to an oscillatory rather than full rotary action.

2: Lower stones (Plate 1)

The lower stones, having fewer characteristic features, exhibit less variation in shape. They range from 27 to c. 36 cms in diameter, and 8 to 19 cms in thickness. Like the upper stones a large number are asymmetrical, again probably as the result of wear. The sides taper in towards the, usually, slightly convex base which averages 25 cms in diameter, both sides and base being well shaped and finished by pecking. They are generally unpierced, the spindle hole 1.5 to 2.5 cms in diameter and 2.5 to 8 cms deep, usually tapering to its base. A few stones are more disc like in general profile, the base being of only slightly smaller diameter than the grinding surface. A few examples appear to have a second spindle hole drilled from the base, but completely pierced stones are rare; examples of the latter include CJ 237 and 536. The grinding surface is flat, or exhibits very slight concavity or convexity. CJ 88 has a raised lip around the spindle hole, and resembles querns of Hythe Beds sandstones whist CJ 195 has a convex grinding surface and base but this may be a later (Roman) stone.

3.3.2 Lithology

From an initial macroscopic examination of the quern samples it is apparent that more than one sandstone is represented; there is a wide variety of colouration, grain size and degree of weathering. The general colour ranges from a dark reddish brown through pinkish grey to grey and yellowish brown and the grade from medium to coarse and pebbly. Graded bedding is present in many of the querns but with no consistent orientation relative to the grinding surface. Macroscopic examination show the main detrital components to be quartz, colourless to pink or orange stained, variable amounts of pink and white feldspar, and scattered opaques in a generally creamy white matrix with some ferruginous cement and patchy iron staining. A number of samples are distinguished in hand specimen by the presence of reddish or orangey brown spots due to the patchy occurrence of ferric oxide.

A combination of hand specimen and microscopic analysis shows three different lithologies differentiated by their general composition (Table 1). These were originally termed Millstone Grit sub-types 1, 2 and 3 (abbreviated to MG/1, MG/2 and MG/3, terms which will also be used in the following text) although subsequent analysis of comparative data suggests that at least some of the third type may be of a Lower Coal Measures sandstone; the original terminology is retained here for convenience.

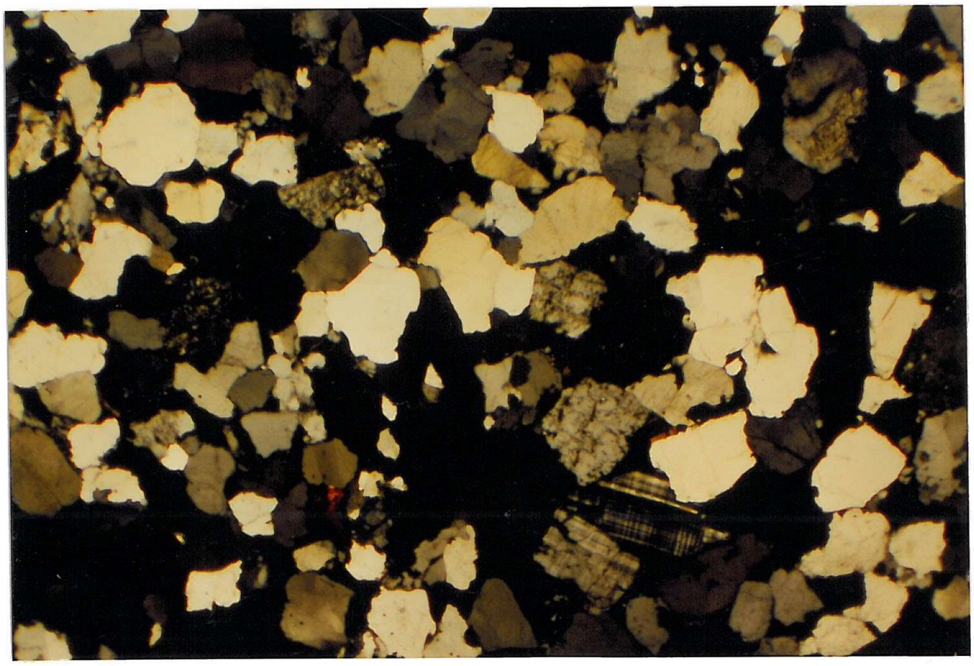
1: MG/1. Feldspathic Sandstone (Plate 4)

This is numerically by far the best represented type, with a total of 168 examples; 66 lower, 96 upper and 1 indeterminate beehive type, and 5 flat, Roman, stones. The rock is usually pinkish grey in colour and thin sections show;

1. 57-74% quartz, dominantly monocrystalline (the proportion of

PLATE 3: CJ 162, Hunsbury, Northants. Millstone Grit subtype 1.
Northampton Mus.

PLATE 4: Photomicrograph of CJ 59, Hunsbury, Northants.
Millstone Grit subtype 1. Crossed polars. x 25.



polycrystalline grains increasing with grain size) and mostly clear with few inclusions, the most common being microscopic particles, frequently aligned, but also including prismatic zircon, green tourmaline and monazite. Many of the grains exhibit slightly strained extinction as a result of compactional diagenesis. Grain outlines now appear irregular due to quartz overgrowths in optical continuity with the detrital grains.

2. 2-14% feldspar of which microcline (generally very fresh) is the dominant type, perthite and microperthite, subordinate orthoclase and minor plagioclase. The latter two are seen in all stages of alteration to kaolinite and sericite.

3. 0-2% lithic fragments, usually quartzitic and including chert.

4. Micas in minor but variable amounts, the proportion generally increasing with decreasing grain size. These are predominantly muscovite, occuring as small flakes bent between more resistant grains, and as tiny flakes scattered in the matrix.

5. A clay grade matrix, much of which has generally been lost by weathering but including kaolinite, with patchy silica and ferric oxide cement.

Variations in grain size are to some extent reflected in the composition, for example, the micas are more common in the finer grades. The variations in composition exhibited by these samples do not at present appear to justify subdivision of the group. As many of the querns show graded bedding the detailed composition of the sample will be in part dependent on the location on the quern from which it is taken. Similarly, even considerable variations of a number of samples need not imply different sources as a single quarry may expose rocks showing a wide range of grain size, texture and composition.

2: MG/2. Sublitharenite (Plate 5)

This lithology is represented by 16 querns, all of beehive type; 12 upper and 4 lower stones. The rock is generally grey to pinky grey brown in colour and medium grained; coarse varieties are not found. 14 of these querns have been thin sectioned and show:

PLATE 5: Photomicrograph of CJ 218, Oadby, Leics. Millstone Grit subtype 2. Crossed polars. x 25.

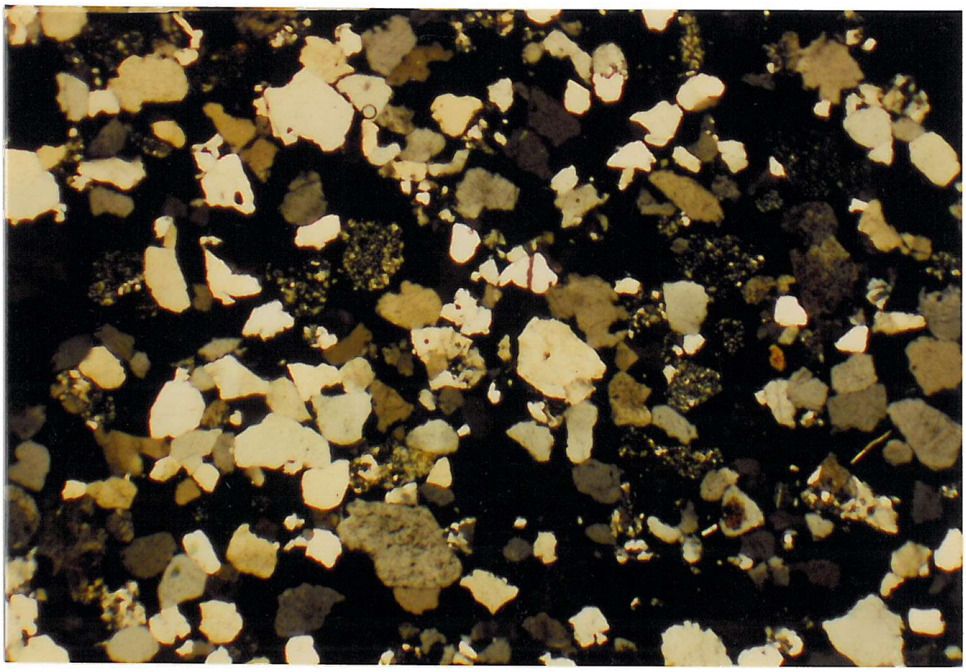
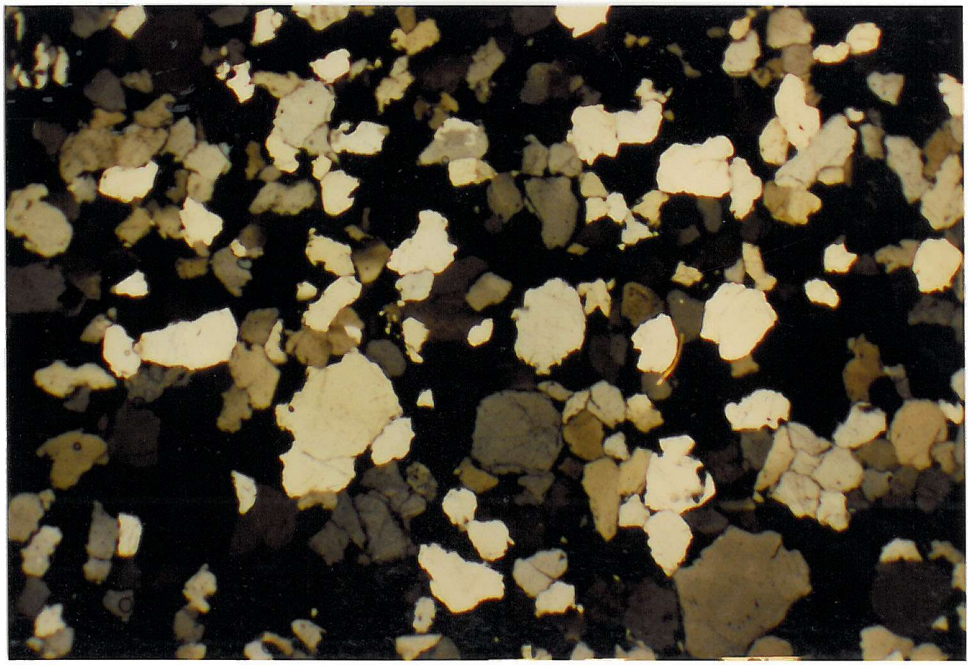


PLATE 6: Photomicrograph of CJ 230, Owston, Leics. Millstone Grit subtype 3. Crossed polars. x 25.



1. 60-72.5% quartz, as with type 1 mostly monocrystalline, showing slightly strained extinction and few inclusions. Silica overgrowths in optical continuity with the detrital quartz again impart an irregular outlines to the grains. Polycrystalline quartz, mainly from an igneous source, is present in only minor amounts.

2; 6-14% lithic fragments, generally siliceous and including chert, quartzite and metamorphic grains showing moderate rounding.

3; Feldspar, present in only minor amounts, generally turbid and altered orthoclase but with occasional fresh plagioclase.

4; A minor proportiion of micas, mainly muscovite as small flakes.

5; The matrix/cement includes secondary silica, ferric oxide and clay grade material.

3: MG/3. non-feldspathic quartzitic sandstone (Plate 6)

This group was originally included with the Millstone Grit from its general characteristics of colour and grain size but is distinguished from the other two subtypes by the scarcity of both detrital feldspar and lithic fragments, although the matrix may contain degraded feldspar. There are 28 beehive querns of this type (24 upper and 4 lower stones) and one probably flat, Roman, lower stone. Twenty five have been thin-sectioned and these exhibit;

1. 68-88% quartz, dominantly monocrystalline with only a minor proportion of polycrystalline grains. Grains are generally clear with few inclusions except microscopic particles, and subrounded where the original grain outlines can be seen, although these are generally obscured by silica overgrowths.

2. There are occasional grains of feldspar, lithic fragments (siliceous) and micas. The matrix comprises patchy ferric oxide (goethite/limonite), quartz and clay grade material.

Samples of this lithology are generally well size sorted, although the degree of sorting varies, and of medium to coarse grade.

3.4 Comparisons with outcrops

3.4.1 Petrology of the Carboniferous Sandstones

Initial comparisons showed that the quern samples are generally dissimilar to the Carboniferous sandstones of the Bristol-South Wales area but are similar to the sandstones of the Millstone Grit series and to other sandstones of Carboniferous age from the Pennines. Subsequent comparisons were thus concentrated on this latter source and the querns compared with samples of Carboniferous sandstones from across the south and central Pennines using the British Geological Survey collection and samples collected from Melbourne and the known quern quarries at Wharncliffe, Den Bank, Ringstead Crescent and Stanton Moor (collected by M E Wright). Each subtype identified among the querns will be discussed in turn below.

1: Millstone Grit Subtype 1 (MG/1)

This is the most difficult group for which to determine the source area as it is comparable with the feldspathic types of Millstone Grit that comprise the whole sandstone sequence of the east and north Pennines and the upper part of the sequence in the south, and also with a number of the sandstone of the Lower Coal Measures (e.g., the Crawshaw Sandstone) and Carboniferous Limestone (e.g., the Astbury sandstone). The querns have been compared with several hundred samples from the area covered by the Geological Survey 1;50,000 sheets 99, 100, 110, 111, 112, 124, 125, and 141.

Kinderscout Grit Group

In the south-east Pennines sandstones of this group are poorly developed although their exploitation for millstones is recorded at, for example, Shiningcliff Wood and Crich Chase (GIBSON et al, 1908; 179). Further north the Group again consists mainly of shales but in the central Pennines this division includes the Mam Tor Beds, Shale Grit and Kinderscout Grit, the latter comprising one or more leaves of massive sandstone, typically coarse and pebbly, separated by finer beds/shales. E 33242, of Kinderscout Grit from Stoke Hall Quarry, Derbys., is a medium grained sandstone containing predominantly monocrystalline quartz, feldspar and scattered mica (muscovite). E 33232, Lamb Inn, Chinley, Derbys, of Upper Kinderscout Grit, is medium to coarse grained and poorly sorted with a higher proportion of polycrystalline quartz, feldspar and alteration products of feldspar. E 33226, Shale Grit, Breck Edge, Derbys., is also a poorly sorted sandstone containing both mono- and polycrystalline quartz and E 33224, Kinder Bank, Derbys, (Shale Grit), a coarse sandstone containing some quartzitic rock fragments and fresh perthite. Millstones were worked in situ from large landslipped blocks of Lower Kinderscout Grit at Cluther Rocks on the west slope of Kinder Scout (STEVENSON & GAUNT, 1971; 354).

Middle Grit Group

In the southern Pennines this group includes two thick sandstone units, the Ashover and Chatsworth Grit, the latter being the more persistent when traced northwards.

1: Ashover Grit. The Ashover Grit (the equivalent of the Roaches Grit west of the Pennines) in the south consists of an uppermost persistent sandstone and at least three lower sandstone units. They are coarse feldspathic sandstones, pale grey to brown blotched with pink and pebbly in places. In North East Derbyshire the Ashover Grit comprises a variety of sandstone types, but generally similar in character to the Chatsworth Grit (MAYHEW, 1966). Fresh specimens are light grey, buff or slightly purple in colour, weathering reddish brown; they vary from fine grained to conglomeratic. Finer grades tend to be more micaceous whereas the feldspars are more conspicuous in the coarser material, the latter comprising 5-17% of the rock (MAYHEW, 1966).

Northwards the Ashover Grit shows a thick development of medium to coarse grained sandstone, which becomes finer grained and thins further north. This sandstone is generally subarkosic, medium grained (although both finer and coarser grades occur locally) and light in colour unless stained by ferric oxide; inclusions of the latter impart a speckled appearance. This sandstone has been one of the most important sources of building stone in the Pennines, "over wide areas consisting of massive compact sandstone, generally finer grained than the overlying Chatsworth Grit yielding strong freestone valuable for building, grindstones and pulpstones" (AITKENHEAD et al, 1985; 84-85: SMITH et al, 1967; 239). Robin Quarry, Cocking Tor, was worked for both walling stones and millstones; the top 3 metres of the exposed sandstone is flaggy and was discarded, the basal 3 metres are of coarse grained sandstone and were worked for the millstones. Samples from the quarry comprise 67-76% quartz, c.5-13% feldspar (largely orthoclase), 1-7% biotite with minor lithic fragments and a matrix of mainly kaolinite and patchy ferric oxide (SMITH et al, 1967; 239, 271). This unit was also worked for millstones at Stanton to the north-west of Matlock (AITKENHEAD et al, 1985; 139). CJ 68/G, Ashover Grit, Stanton Moor, Derbyshire, is a creamy grey, coarse grained sandstone comprising 68% quartz, also dominantly monocrystalline, 3% feldspar and 1% mica.

Further north the Ashover Grit is largely absent, the lowest sandstone unit of this Group here termed Heyden Rock. This is a fairly minor sandstone in the central Pennines area but is more extensively developed further west. West of Sheffield only the upper beds of this unit are seen, here tending to be flaggy and fine grained (EDEN et al, 1957; 18).

2: Chatsworth Grit. The Chatsworth Grit in its type area is represented by two main sandstones, of which the upper is the most prominent and forms high moorland (SMITH et al, 1967; 68). It "exhibits marked lithological variations. In its coarser development, it is a compacted. hard, gravelly, medium to coarse sandstone with subrounded to rounded particles of moderate sphericity, sporadically interlocking, with minor secondary silicification and with variable intergranular matrix" (STEVENSON & GAUNT, 1971; 259). The detrital components include dominantly clear quartz, monocrystalline and polycrystalline, microcline, minor kaolinized and sericitised orthoclase and traces of plagioclase (STEVENSON & GAUNT, 1971; 259-61). This lithology compares well with other sandstones of the Middle Grit Group, for example, the Rushtonhall and Roaches Grits (EVANS et al, 1968; 89). In the central Pennines the Chatsworth Grit forms one of the most constant sandstone horizons of the Millstone Grit in the region. The coarse development of this, sometimes pebbly is massive and attains a thickness of 30 metres. In places it is stained red but elsewhere, for example, in the east it is yellow brown in colour and forms crags, e.g. Froggatt, Stanage and Curbar Edges, many of which have been worked for millstones as have the outcrops on Burbage Moor and around Hathersage (STEVENSON & GAUNT, 1971; 181) and Mow Cop where the rock was valued for its ability to retain a sharp cutting edge (EVANS et al, 1968; 264). At Millstone Edge millstones were produced mainly from the large loose blocks found below the escarpment (STEVENSON & GAUNT, 1971; 354). E 33258 from Grey Millstone Quarry shows a medium to coarse sandstone in which the dominant mineral is quartz exhibiting slightly strained extinction and silica overgrowths, feldspar (mainly fresh microcline and partially altered orthoclase) and bent mica flakes with a patchy ferric oxide cement. Samples of Chatsworth Grit from the area show a composition of 75-87% quartz, 4-15% feldspar, 0-2% lithic fragments and up to 7% mica, including that in the matrix (STEVENSON & GAUNT, 1971; 261).

The same sandstone unit is known as Rivelin Grit to the west of Sheffield and as Huddersfield White Rock further north. In the Sheffield area the Rivelin Grit is of similar character to the Chatsworth Grit to the south, a generally massive sandstone forming craggy edges, for example, along the Rivelin valley where it is coarse and feldspathic with gravelly bands (EDEN et al, 1957; 18-19). Millstone manufacture is evidenced, for example at New Millstone Edge on the south side of the Rivelin valley (EDEN et al, 1957; 18). Quern manufacture has been recorded by Wright (1986, 1988) in Rivelin Grit at Ringstead Cresent, and Den Bank, Yorks. CJ 64/G from Den Bank, West Sheffield is coarse grained, creamy to yellowish grey in colour with 74% quartz, including a fairly high proportion of polycrystalline grains, 3% feldspar, mostly microcline but with some altered orthoclase, a clay grade matrix and in part a ferric oxide cement. CJ 63/G of Upper Rivelin Grit from Ringstead Crescent shows an MG/3 type composition.

Rough Rock Group

The main sandstone unit of the uppermost division is the Rough Rock. In north Derbyshire the unit attains a maximum thickness of 12 metres, varying from a siltstone with sandy bands to a hard flaggy sandstone (SMITH et al, 1967; 76). Similar lithologies are seen in the central southern part of the outcrop, the unit being predominantly argillaceous in its lower part, with coarse grained sandstone above, 10-15 metres thick. The sandstones are on the whole finer grained than the Roaches and Chatsworth Grits of the area, although coarse developments do occur (AITKENHEAD et al, 1985; 90).

In the central Pennines the Rough Rock consists of a single massive sandstone of varied thickness, generally strongly feldspathic. It is generally pale grey to buff in colour, medium to coarse grained and in places pebbly. Samples E 35263-5, Cown Edge Quarry, Derbys, comprise 70-84% quartz, mainly monocrystalline, 7-14% feldspar of which microcline is the predominant type, and minor lithic fragments in a clay grade matrix (STEVENSON & GAUNT, 1971; 262). E 33264, Cown Edge Quarry, Derbys., is a medium grained quartzitic sandstone and E 33266, Goyt Bridge, Derbys., medium to coarse grained and poorly sorted containing both mono- and polycrystalline quartz. Similar lithologies are seen in the Rough Rock west of Sheffield. The Rough Rock in the Barnsley district is described as a generally massive grit with a flagstone base (MITCHELL et al, 1947; 7).

Lower Coal Measures sandstones

Many of the sandstone units of the lower Coal Measures are comparable in lithology to those of the Namurian. One of the most prominent is the Crawshaw Sandstone, worked for millstones at Alton and Stone Edge quarries (TUCKER, 1977; 44). In the south east Pennines the Crawshaw

Sandstone is up to 33 metres thick, and comprises mainly medium to coarse grained and feldspathic sandstones, although these generally decrease in grade upwards and in places are of ganisteroid composition (FROST & SMART, 1979; 26). Samples from Nab Quarry, Holymoorside, Derbyshire, show a rock very similar to many of the Millstone Grit sandstones, buff in colour with scattered brown ferric oxide specks and of medium grade (SMITH et al, 1967; 277). E 31070, from Nab Quarry, is a medium to coarse grained sandstone in which the dominant detrital is monocrystalline quartz with significant amounts of feldspar (microcline, perthite and orthoclase) in a clay grade matrix. The Woodhead Hill Rock of the central Pennines is again feldspathic sandstone, containing 72% quartz, 14.5% feldspar, a clay matrix and minor amounts of mica (AITKENHEAD et al, 1985; 93).

In the Sheffield area the Crawshaw Sandstone again contains coarse massive sandstones similar to the Rivelin Grit, and from which grindstones have been produced at, e.g., Walkley (EDEN et al, 1957; 173). To the north west of Sheffield there are two local developments of sandstone in the Lower Coal Measures, the Loxley Edge Rock and the Wharncliffe Rock, both very variable in lithological character. The Loxley Edge Rock is fine grained in the Little Don valley but coarsens southwards to the east side of the Don valley. Similarly, the Wharncliffe Rock also increases rapidly in thickness and in the Don valley, is a massive grit forming a line of crags along the east side of the valley extending for 1.5 miles south from Deepcar station. Beyond this point, due to faulting, the crags are continued by the Loxley Edge Rock (MITCHELL et al, 1947; 12). Manufacture of both beehive and flat querns is well attested at Wharncliffe (BUTCHER, 1970: WRIGHT, 1986, 1988).

Samples from Wharncliffe show both a feldspathic and MG/3 type composition. CJ 65/G of Grenoside Sandstone is feldspathic and similar to CJ 66/G from Stanton Moor, comprising 62% quartz (polycrystalline grains are sparse), 5% feldspar (dominantly fresh microcline with perthite, lesser amounts of orthoclase and rare plagioclase), 3% mica with some patchy ferric oxide cement and a clay grade matrix.

2: Millstone Grit subtype 2 (MG/2)

Initial analysis of quern samples of this type showed that they do not compare with the majority of the Namurian sandstones but are similar to the protoquartzites of the southern part of the outcrop, in particular the areas covered by the Geological Survey, 1:50,000 Sheets 110, 111, 123, 124, and 141. The greatest development of these rocks occurs west of the Derbyshire Dome and comprises a number of separate sandstone units, for example, the Minn Sandstones, which is composed largely of "highly mature stable components arranged in a quartzitic texture ..... clastic components are closely packed" (EVANS et al, 1968; 88-9). E 31176, a sample of Minn Sandstone from Shirkley Wood, Staffs, is fine to medium grained and comprises monocrystalline quartz and siliceous rock fragments (e.g. quartzite, chert, granulite) patchily cemented by silica; matrix material includes kaolinite and ferric oxide. E 32430, Stanley Sandstone, Endon, Staffs, is a medium grained, fairly well sorted sandstone; like E 31176 the detrital quartz, mainly monocrystalline, shows silica overgrowths and the lithoclasts are mainly of quartzite but include, e.g., chert.

Other sandstone units in this area of the south and west Pennines including the Hurdlow, Lum Edge and Ipstone Edge Sandstones are of very similar lithology and this lithofacies is also seen at the smaller outcrop around Melbourne, Derbyshire. Some samples from this exposure, e.g., E 32622, from near Bleak House, Melbourne, and E 32628 from a locality near Derby Hills House, Derbyshire, do compare well with the quern samples of this subtype. No direct evidence for quern manufacture is as yet known from any of these outcrops, and they appear to have been little used for later millstones.

3: Millstone Grit subtype 3

Few samples of either Millstone Grit or other Carboniferous sandstones are of a lithology comparable to the quern samples designated MG/3. Parts of the Rough Rock in the western Pennines (Cheshire) are defeldspathized, leaving quartz rich sandstones with a secondary silica cement (EVANS et al, 1968; 91), for example, E 31164, a medium grained sandstone in which monocrystalline quartz is the dominant detrital component; there is a small proportion of clay grade matrix.

CJ 63/G, Upper Rivelin Grit, Ringstead Crescent, South Yorkshire, is a grey, medium to coarse grained sandstone comprising 72% quartz (almost entirely monocrystalline with few inclusions except dark specks), rare feldspar (including partially sericitised plagioclase), minor mica (mostly musccvite as bent flakes but also occuring in the matrix) and at least in part a matrix of kaolinite and other clay grade material. Silica overgrowths on the quartz grains form a patchy cement. This exposure is thus very similar to MG/3 in composition.

This lithotype also occurs in sandstones of the Lower Coal Measures, for example, Wharncliffe Rock at Wharncliffe, South Yorkshire. CJ 66/G from this locality is a yellowish grey brown medium to coarse grained sandstone similar in composition to CJ 63/G (Ringstead Crescent); 79.5% quartz (subangular with few inclusions and almost entirely monocrystalline), rare feldspar and lithic fragments and minor muscovite and biotite. There is a patchy quartz cement and clay grade matrix.

3.4.2 Conclusions

The preceding section has demonstrated how widespread in outcrop these lithologies are, in particular MG/1. The possible sources for MG/2 covers a smaller but still large area whilst sandstones of similar lithology to querns of subtype 3 (MG/3) are of far more restricted development. The only comparable samples seen are of Rivelin Grit and Wharcliffe Rock from known quern quarries in South Yorkshire and north Derbyshire, and a single sample of Rough Rock from the west Pennines, although it is possible that there are other similar small outcrops elsewhere not encountered in the sampling programme. Certainly not all querns identified as MG/3 correspond in form to the known roughouts and finished products from these quarries. The site at Ringstead Crescent has been destroyed by housing development and the relatively few known roughouts from the site are in the earlier stages of manufacture (WRIGHT, 1986; 17); thus it is not possible to compare the products of this quarry with querns of MG/3 lithology from the present study area. Wright has suggested, however, that stones worked at Ringstead Crescent would have been tall examples and probably similar to those produced at Wharncliffe. Only a few of the MG/3 querns encountered in this project compare closely with the known products of this latter quarry, for example, CJ 251, Sharnford, Leics, CJ 253 Saltby, Leics, CJ 310, unprovenanced, Lincoln Museum, and possibly CJ 266, Ratcliffe, Leics. The rest exhibit a very wide range of shape and, with two exceptions (CJ 367, Swaffham, Norfolk and CJ 539, Hail Weston, Cambs), possess pierced handle sockets. On this evidence it seems unlikely that many of the querns of MG/3 lithotype were made at either of these quarry sites. Conversely there are also examples of upper stones with unpierced handle sockets of Millstone Grit subtype 1, e.g. CJ 264, Rothley, Leics, and CJ 271, Cropston, Leics, 739, possibly Lincs, of similar form to CJ 251, 253 and 310.

As a group the MG/3 querns are not typical of the Hunsbury class, many possessing funnel shaped hoppers; CJ 76, 161, 180, 187, 211, 277, 298, 307, 367, 491, 512, 523, 539 and 743. There are three collared upper stones, CJ 491 and 743 which both have a large rounded collar (similar to CJ 241 of MG/1) and CJ 187 which is more typical of the Hunsbury form. CJ 298 is decorated with 3 grooves, one in and two just below the rim of the stone, in addition to having three handle sockets. CJ 76, 307 and 539 are all rather irregularly shaped. The lower stones are all unpierced. CJ 204 and 122 are slightly atypical, being of larger diameter than is usual among the Millstone Grit beehive querns, and possessing roughly finished bases of only slightly diameter than the grinding surface. Both are of finer grained sandstones than the majority of MG/3 quern samples.

At present the source of these Millstone Grit subtype 3 querns remains unidentified; many are possibly from other defeldspathised outcrops of Millstone Grit. As with all three lithotypes there is no reason to suppose that there was a single source for each type. On the evidence of more recent millstone manufacture suitable beds are so widespread that there may have been a large number of small working areas, many of which are likely to have been destroyed by later working for millstones or other purposes. The MG/3 querns do not appear to have a particularly more northerly distribution than the other Millstone Grit types (Fig.5) as one might expect with a Yorkshire source, the other types most likely coming from Derbyshire . Examples are most common, as with all the Millstone Grit querns, in Leicestershire with several examples in Lincolnshire (more than of other Millstone Grit types) but are also found in Bedfordshire, Norfolk, Cambridgeshire and Northamptonshire.

For Millstone Grit subtypes 1 and 2, from both macroscopic and microscopic analysis, there do not appear to be any grounds for selecting any particular outcrop from among the many of comparable lithology to the quern samples as the source or sources for these querns. The quern samples can be compared with geological samples from different localities and horizons. Although there are a number of the MG/1 querns with a red-brown spotting of the rock this is also a characteristic found at many localities and thus not diagnostic. Similarly, the form variations of querns of this red-brown spotted rock, when compared with the other MG/1 querns do not in themselves suggest a single source: both spotted and unspotted types exhibit a considerable and comparable range of variation. Within the study area the querns of MG/1 lithology are concentrated in Leicestershire (as is also true of the Carboniferous sandstone querns as a whole) but are also found in Northamptonshire, Buckinghamshire, Cambridgeshire, Lincolnshire, South Humberside and Bedfordshire (Fig.5). No beehive querns of this lithology were encountered further east and south although the rock attained a much wider distribution as flat querns during the Roman period.

Comparable problems exist for the precise provenancing of the MG/2 querns. Similar lithologies can be found in, for example, the Minn Sandstones, Stanley Grit, Lum Edge Sandstone and some units of the Melbourne outcrop but, on purely petrological grounds, given the variability of units at each locality, it is not possible to determine from which source or sources the querns were derived. Certainly Melbourne is the closest to the known distribution of these querns, which in the study area are concentrated towards west Leicestershire, although there are only a small number of this rock type in total and may not be fully representative of the true distribution (Fig.5). However, of the six querns from Breedon-on-the-Hill (the site closest to the outcrop) examined only one is of this type, the others being of MG/1. Equally, the extent to which this material occurs within, for example, the Derbyshire and Nottinghamshire querns is not known at present.

As with other lithologies, and perhaps to an even greater extent given the difficulty of precise identification of sources resulting from the inherent nature of the outcrops, the question of provenance can only be solved by a programme of intensive field work and location of manufacturing debris; thin-section analyses can only narrow down the possibilities. It is possible that a large number of quarry sites have been destroyed by later quarrying or, for example, industrial or housing development.

3.5 The distribution of Carboniferous sandstone querns (Fig.5)

Dating

The Carboniferous sandstones account for 31.5% of the total number of beehive querns examined. A number of these are certainly from Iron Age sites but in many cases are from sites occupied during both the Iron Age and Roman period and for which the context is too imprecisely (or not at all) recorded to determine their date. Of probable Iron Age date in Leicestershire are the six stones (five of MG/1 and one of

FIG. 5 Distribution of Millstone Grit beehive querns

MG/2) examined from the hillfort at Breedon-on-the-Hill, the single upper stone from Enderby, where the main occupation belongs to the early and middle Iron Age, and the three stones from Burrough Hill, Leics, where the querns were found in pits, features which also yielded Ancaster-Breedon ware and some wheel turned and Roman pottery (LIDDLE, 1982). CJ 117 from Belton Castle was recovered from the ditch of this circular earthwork, the site having produced both Iron Age and Roman material (LIDDLE, 1984). Other possible Iron Age examples are CJ 197 and 218 from Oadby, Leics, where Belgic occupation is attested and CJ 279 and 277 from Thurcaston, Leics, which has produced both hand made pottery suggesting prehistoric occupation and evidence of Roman pottery production (LIDDLE, 1986).

The Lincolnshire examples are mostly undated but there are two stones from Ancaster Quarry which should date to the Middle Iron Age; they are not thought to have been associated with the Roman building on the site (J.MAY, pers.comm.). Both are lower stones, one (CJ 760) thick and unpierced, the second (CJ 758) relatively flat and pierced by a cylindrical spindle hole. There is one upper stone from Denton (CJ 307) a site that has produced Late Iron Age wheel turned pottery (MAY, 1984). It is of general Hunsbury form but rather irregularly shaped.

The Millstone Grit querns of Northamptonshire are on the whole better dated. The precise context for the two stones from Grendon is not now known but the site here consists of a complex of ditches and pit alignments for which an Iron Age date has been suggested (BROWN, 1980). There are two Millstone Grit querns from Northampton; CJ 487 and 489 from Blackthorn , a short lived occupation site which produced pre-Belgic pottery (WILLIAMS, 1974). CJ 490, from Desborough, found during ironstone quarrying, may relate to the Iron Age and Roman settlement recorded there. The large collection of Carboniferous sandstone querns from Hunsbury is presumed to be of Middle to Late Iron Age date, the hillfort thought to have been abandoned prior to the Roman conquest (RCHM, 1985; microfiche).

In Buckinghamshire CJ 713 and 714 were recovered during excavations at Bancroft Mausoleum, Milton Keynes, and probably relate to the Iron Age occupation on the site. A Middle Iron Age date is suggested for the two examples (CJ 186, 187) from Harrold, Beds (EAGLES & EVISON, 1970), whilst the lithology is only represented at the later site at Odell by flat Roman style querns.

Thus there are a number of sites, e.g. Hunsbury, Burrough Hill, Breedon on the Hill, Belton Castle, Tilton, that could indicate an early (Middle Iron Age) date, but need not necessarily do so. There are a few Millstone Grit beehive querns from Middle Iron Age sites, e.g. Harrold and Enderby, and a later, pre-Roman Iron Age date is indicated for those from Moulton Park (Northampton), Denton and Oadby.

There are a large number of additional published examples, this being the most common rock type found among beehive querns in Nottinghamshire, Derbyshire and South Yorkshire and examples are also recorded in Warwickshire, Northamptonshire, Oxfordshire and Staffordshire. Quarries are known at Wharncliffe, Den Bank and Ringstead Crescent (although the production of beehive querns is only certain at Wharncliffe on present evidence) in south Yorkshire and Stanton Moor, north Derbyshire (WRIGHT, 1986 1988). Carboniferous sandstones were also exploited in the Ripon-Harrogate and Swaledale-Wensleydale areas (HAYES et al, 1980). At Thorpe Thewles, Cleveland, Middle Iron Age beehive querns of both Millstone Grit and Coal Measures sandstones were found, the former more common in the earlier phases of the site and the latter predominant in the first centuries BC and AD (HESLOP, 1988;62-3). In Northumberland, the Fell Sandstones were an important source and to the west Millstone Grit, probably from the Pennines, was worked for querns found in south-east Cumbria (INGLE, 1987).

Two complete querns of Millstone Grit were recovered at Willington, Derbyshire. One upper stone (WHEELER, 1979; Fig.56, no.1) has a rather rounded profile, funnel-shaped hopper and corresponding hemispherical lower stone, the second (WHEELER, 1979; Fig.56, no.3) is more typically Hunsbury shaped, flat topped with a thick symmetrical unpierced lower stone. The site shows two phases of occupation, the first dating to the eighth to seventh centuries BC and the second to the fourth to first centuries BC. The first pair of quernstones were found in association with Iron Age assemblage II of the site, which also produced scored ware similar to that found on other sites in the Middle Trent valley and dated to between the fourth and second centuries BC with a possible extension into the 1st century BC. The second pair were found in only loose association with an Iro. Age sword (WHEELER, 1979). Also from the county, for example, is a stray find of a Hunsbury form upper stone at Midway (LEAHY, 1979). There are two upper and one lower stone from Fisherwick, Staffs, of Millstone Grit. One of the upper stones is of typical Hunsbury form and collared, but the second shows more similarity to many of the Spilsby Sandstone upper stones, having a flat top but more funnel shaped hopper. The site was in use between the fourth century BC and the second century AD but the context of the querns is not stated (SMITH, 1979; Fig. 17).

At Baldock, Herts, the single example of a beehive, Yorkshire style quern (with unpierced handle socket), described as grey sandstone and which may be of Carboniferous sandstone, is from a late first century BC context (STEAD & RIGBY, 1986; 180, no. 787). There are two upper stones (STEAD & RIGBY, 1986; 180, nos. 797, 798) of Millstone Grit of a form which is rather intermediate between the beehives and the flat stones (being of relatively small diameter and slightly thicker than flat type upper stones), one dated to AD 25-50 and the second to the second century AD. The rest of the Millstone Grit querns from the site are flat Roman types (STEAD & RIGBY, 1986; 182). There are few beehive querns of Carboniferous sandstones in the South Midlands. Possible examples were found at Checkenden, Oxon which produced several fragments of this lithology from the Middle to Late Iron Age enclosure that may be quern pieces (CHAMBERS, 1986). A thick, possibly Wessex style upper stone from Danebury, Hants, 42-44 cms in diameter, from a phase 7 context was also identified as Millstone Grit (CUNLIFFE, 1987; 416, no. 8:31) although it is possible that this material was obtained from closer outcrops.

Beehive querns of Carboniferous sandstone thus appeared during the Middle Iron Age and certainly by the later Iron Age there were large numbers in use over the east Midlands, north-east England and beyond, continuing in use if not production into at least the earlier Roman period. Exploitation of these rocks for quern manufacture continued into and increased during the Roman period which saw an expansion of the area in which they are now found which extends as far south east as Kent. Flat Roman querns of Millstone Grit have been found at, for example, Caistor St Edmund (GREGORY & GURNEY, 1986), Feltwell (GURNEY, 1986; 22) and Scole (ROGERSON, 1977) Norfolk; Heybridge (WICKENDEN, 1986), Little Waltham (DRURY, 1978), Gestingthorpe (DRAPER, 1985; 76-7) and Nazeingbury (HUGGINS, 1978), Essex; Abingdon (PARRINGTON, 1978; 89), Appleford (HINCHCLIFFE & THOMAS, 1980; 83) and Farmoor (LAMBRICK & ROBINSON, 1979; 60), Oxon; Baldock, Herts (STEAD & RIGBY, 1986; 179-182); Bexley (TESTER & CAIGER, 1954), West Wickham (PHILP, 1973; 52) and Orpington (TESTER, 1969), Kent; and Little Horwood, Mursley and Saunderton, Bucks (KING, 1982). There are also possible examples in Wiltshire from Knap Hill and Westbury (JECOCK, 1981; 45, 47). Other Carboniferous sandstones used during the Roman period include the Cromhall Sandstones and Brandon Hill Grit, for example, for some of the querns from Gatcombe, Avon (BRANIGAN, 1977), and Pennant Sandstone at Frocester Court villa, Glocs (PRICE, 1983), but these attained only a very local distribution and Carboniferous sandstones appear to have remained subordinate in importance to the Old Red Sandstone in this area.

CHAPTER 4: JURASSIC

This group include the limestone querns (which form quite a low proportion of the total) and possibly a small group of sandstone examples whose source is as yet indeterminate but for which a Jurassic origin has been suggested.

4.1 Limestone

4.1.1. Typology

There are a total of thirteen querns of limestone, including one flat, Roman, example, (CJ 671) but with only three exceptions (CJ 331, Claydon, Suffolk, CJ 642, Great Chesterford, Essex and CJ 671, Odell, Beds) they are all from a relatively resticted geographical area in north-east Leicestershire and south-west Lincolnshire. The Odell quern is of unusual form and Roman in date, that from Great Chesterford a relatively flat (but quite small diameter) pierced lower stone, also possibly Roman, and CJ 331 from Claydon is an upper stone of puddingstone/East Anglian form with a handle groove and circular, unpierced; handle socket.

Nine of the remaining limestone querns are upper stones, the tenth a lower stone. The largest single collection is the group of four from Ancaster Quarry, Lincolnshire, comprising one lower stone and three upper stones, the latter showing considerable variations in form. CJ 744 is fairly typical of the Hunsbury class; it has an approximately cup shaped hopper and the handle socket pierces the top of the feed. CJ 757 is also basically of Hunsbury form but has a wider flat top than is usual in querns of that class and a shallow, somewhat dished, hopper; the handle socket pierces the feed. CJ 752 is rather more irregular and asymmetrical with a wide, generally flattened but uneven, top and a dished funnel-shaped hopper pierced in the side by the handle socket. Of the other examples, CJ 217 from Sproxton, Leics, is similar to CJ 744 in that the handle socket pierces the feed and this feature is also seen in CJ 302 from Woolsthorpe, Lincs. CJ 232 is more typically Hunsbury shaped as is CJ 267, Harston, Leics, except that the latter has a rather rounded top. In CJ 228, Waltham-on-the-Wolds, Leics, the handle socket pierces the side of the hopper and the stone in general is rather rounded, irregular and boulder like. CJ 522 from Wyville, Lincs, has a wide and slightly irregular top, a small dished funnel-shaped hopper and the handle socket pierces the top of the feed.

4.1.2 Lithology

Exploitation of the Ancaster Stone for quern manufacture at Ancaster Quarry, is evidenced by the presence among the excavated finds of a number of partially worked roughouts in addition to the querns described above. Although they were being manufactured here limestone is not the only lithology represented among querns found during excavation which also produced examples of Millstone Grit and Spilsby Sandstone. The limestone querns found within the study region are of variably shelly (e.g. CJ 217, 228, 232, 331, 642) and oolitic (e.g. CJ 267 - also shelly, 302, 752) limestone; none has been thin-sectioned.

4.1.3. Outcrop of Jurassic limestones

Limestones of the Jurassic Series crop out widely in an area of eastern England from the south coast in Dorset through Northamptonshire to Lincolnshire and Yorkshire, the harder beds forming a distinct escarpment. The lowest beds, the Liassic, comprise mainly clays and soft rocks and it is the Middle Jurassic that provides hard, feature forming rocks that have been extensively used for building stone. In Northamptonshire the lower part of the Middle Jurassic, the Inferior Oolite, comprises the Northamptonshire Sand and Ironstone, Lower Estuarine Beds and the Lincolnshire Limestone. The latter is composed of a variety of oolitic limestones, sandy and fissile near the base of the unit (the Collyweston Slate) but the main bed consisting of a a variety of hard, massive, oolitic limestones that are greyish blue when fresh, weathering yellow or buff on exposure and which can be worked as freestone in places. Northwards from Kettering the bed thickens to over 100 feet between Grantham and

Lincoln; to the south of Stamford the Lower Lincolnshire Limestone consists of massive oolites that have been quarried for building stone. The Upper Lincolnshire Limestone is more uniform in character, consisting mainly of coarse, shelly, current bedded oolite, thin-bedded in parts but more frequently massive, that provides the most durable oolitic building stone. The oolite may be shelly or pure and in some places is raggy due to the crystalline calcite content. The beds have been given various local names, for example, Ancaster Stone which was the limestone worked for querns at the Ancaster Quarry site, Clipsham Stone and Barnack Rag. (MARTIN & OSBORN, 1976: KENT, 1980). The Great Oolite (upper Middle Jurassic of Lincolnshire and Northamptonshire as a source of building stone unfavourably with that of the Cotswolds, consisting mainly of fine grained non-oolitic rocks interbedded with oolitic freestones, massive rubbly limestones and shelly, flaggy limestones. The beds contain thin marls in parts and although it has been used as a building stone it is generally somewhat fissile (KENT, 1980: SWINNERTON & KENT, 1976; 37-50).

4.1.4 Quern sources

The limestone querns found in Leicestershire and Lincolnshire are thus all conceivably from the Ancaster area; although they do differ in form considerable variations are also seen among the querns found at Ancaster Quarry. Alternatively it might be argued that these differences point to independent local manufacture, especially taking into consideration the extent of the outcrop and occurence of hard beds within this. In this case it is perhaps surprising that the limestone querns are found in such a relatively small area; one might expect to find occasional examples along the length of the exposure. Lithologically these querns could have been worked at Ancaster but the identification of a precise source remains unresolved at present; on current evidence. The other three examples, from Odell, Great Chesterford and Claydon are more likely to have been manufactured elsewhere, possibly fairly close to their findspot.

4.2 Sandstones

4.2.1 Typology

a) Upper Stones

There is one group of sandstone querns from the study area whose source remaims undetermined at present but for which a Jurassic source has been suggested. There are 16 of this rock type, 14 of which are from Hunsbury, one from Corby, Northants and the last from Felsted, Essex. The group from Hunsbury comprises seven upper and seven lower stones. As a group the 16 are of larger diameter than Hunsbury style querns of other lithologies, particularly the lower stones which are not as well shaped and finished as the upper stones. These upper stones from Hunsbury are, with one exception, of pierced/Hunsbury form but none is really characteristic of the class. CJ 112 has a collared top but dished cup shaped hopper and handle socket that pierces the top of the feed as does CJ 147. CJ 181 is a very large example again with a pierced feed, but a funnel-shaped hopper and narrow, generally rounded top. CJ 157 has a funnel-shaped hopper pierced by one handle socket just above the base and a second, unpierced handle socket on the opposite side of the quern set at a slightly higher level. CJ 141 is in general an irregularly shaped, boulder like quern with a narrow funnel-shaped hopper pierced at the base by the circular handle socket. CJ 139 is an approxiamately rectangular upper stone with a similarly shaped hopper, pierced at the base by the handle socket set into one of the short sides. CJ 175 has a narrow, rounded top, a small, funnel-shaped hopper and an unpierced handle socket set very low down the side of the stone. The other two examples are better shaped and finished: CJ 318, is a well shaped and neatly finished upper stone of large diameter which has a wide, flat top and large deep hopper pierced in the side by the handle whilst CJ 495 is rather more bun shaped with quite steeply inclined sides and funnel hopper.

There is one other upper stone of Jurassic sandstone, of different lithology to this main group, CJ 111 from Hunsbury, which has a rounded top and funnel-shaped hopper.

b) Lower Stones

The lower stones are generally of Hunsbury type (i.e. similar to the thick unpierced lower stones of Millstone Grit) and are all unpierced, ranging in diameter from 33 to 43 cms and in thickness from 10.5 to 21 cms. Three stones are now asymmetrical, CJ 101, 127 and 170, and 59 is slightly so. CJ 118 has irregularly shaped and rough sides and base, the latter of similar diameter to the grinding surface and CJ 126 and CJ 179 are roughly hemispherical with rounded bases.

4.2.2 Lithology

Lithologically all but CJ 111 are of the same rock type, fine grained grey to pinkish or orangey grey quartzitic sandstones. Thin-sections show a well sorted sandstone of average grain size 0.1 mm, and comprising 80-90% quartz, subangular, clear and monocrystalline with only a trace of lithic fragments, feldspar and scattered mica. The dominant cement is silica occuring as overgrowths in optical continuity with the detrital quartz. These do not compare with any of the Carboniferous sandstones (they are coarser grained than the ganisters) nor Cambrian quartzites examined. A large number of saddle querns from Bedfordshire and north Buckinghamshire also appear to be of the same or similar rock type which is reported to be a common type of erratic found on sites in the area (R. WILLIAMS, pers.comm.). The querns certainly have the appearance that little effort has been made to attempt more than a rough shaping (more so for the lower than upper stones) without further shaping and/or finishing and thereby reduction of weight. This suggests that these have not travelled far from their original source and place of manufacture, this being either a local, posibly Jurassic, outcrop or locally occuring erratic boulders. One possible exception to this is the Felsted quern, CJ 318, which, comparing as it does with the Hunsbury rather than puddingstone form was most probably brought to Essex as a finished quern; this need not imply that it was worked at the same locality or in the same area as the examples of this rock type from Hunsbury.

CJ 111 is of a medium grained calcite cemented sandstone in which the dominant detrital component is moderately rounded monocrystalline quartz, and was probably obtained from outcrops local to the Hunsbury hillfort. Jurassic sandstone were worked at a number of localities in north-East Yorkshire, but here too attained only a local distribution (HAYES et al, 1980).

4.3 Distribution and dating

The manufacture of beehive rotary querns of Jurassic limestone at Ancaster Quarry appears to date to the 2nd century BC at the latest: the site was occupied from the fourth to the second century BC but rotary querns may not have been in use at the beginning of occupation here as the site has also produced saddle querns. The latter may have been the sole type in use during the earliest period of occupation or the two types of quern may have been in conteporary use throughout the life of the settlement. Pre-Roman Iron Age dates are also suggested for the querns from Sproxton, Leics, where preliminary investigations of a cropmark enclosure revealed a hearth, Iron Age and Roman pottery and a possible circular building and deep storage/rubbish pits with associated Ancaster-Breedon ware (McWHIRR, 1977), and Harston, a small agricultural settlement largely destroyed by ironworking which has produced Ancaster-Breedon ware (LIDDLE, 1982). No other information is available for the other two limestone querns from Lincolnshire and the remaining Leicestershire examples are probably stray finds. Owles (1976b) recorded a quern from an Iron Age site at Claydon, Suffolk but it is not clear from the report whether this is the limestone quern now in Ipswich Museum.

There are further examples of limestone querns from western and southern England, the largest collection being that from Maiden Castle, Dorset, where there are limestone querns from contexts of Middle to Late Iron Age and Roman date (WHEELER, 1943; 323-9). A single upper stone of rather indeterminate form from a Middle Iron Age) context at Winnall Down, Hants,5 has been identified as possibly Purbeck Limestone (FASHAM, 1985; 79, 80, no. 6). Other limestone examples have been found at Gussage All Saints, Dorset, which produced a relatively large, upper stone (40 cms in diameter) also of Purbeck Limestone (WAINWRIGHT, 1979; 94, no. 2244), Little Sombourne, Hants, of Bembridge Limestone from the Isle of Wigh (NEAL, 1980; quern no.10), Portland, Dorset, an upper stone of Wessex form made from Lower Oolite, possibly Portland Stone, and two lower stones of Dorset Lias (BAILEY 1985; 82, Fig.17, no.4, 3, 1), and Rudston, Yorks of Cave Oolite (STEAD, 1980 121). Most examples have thus been found within a relatively small area, mainly in Dorset and south-west Hampshire.

There are few recorded saddle querns of limestone but examples are known from, e.g., Aldermaston Wharf, Berks, of Middle Jurassic oolite (BRADLEY et al, 1984) and Budbury, Bradford on Avon (WAINWRIGHT, 1970; quern no.14). Limestone was also occasionally used for querns during the Roman period, e.g., possibly CJ 642 the lower stone from Great Chesterford, Essex, and CJ 671, Odell,Beds of Great Oolite. Other, published, examples include a lower stone from Brancaster, Norfolk of the 2nd or 3rd century AD (HINCHCLIFFE, 1985; 64, Fig.42, no.147), a relatively small diameter upper stone with a dished hopper from Wakerley, Northants (JACKSON & AMBROSE, 1978; 230, no.98), and a large flat upper stone from Feltwell, Norfolk (GURNEY, 1980; 22, no.46). Examples of this date have also been found in south-west England, for example, an upper stone roughly made from oolitic limestone recovered from a Romano-British building at Bourton on the Water, Glocs, (DONOVAN, 1934; quern no.1) and a possibly mechanically operated millstone of Ham Stone from Ilchester, Somerset (LEACH, 1982; Fig.47, no.407).

CHAPTER 5: CRETACEOUS

A total of 161 of the querns examined are of glauconitic sandstones of Cretaceous age from a number of sources; of these 10 are flat Roman types, the rest beehive or probable beehive, a number particularly lower stones, being of intermediate form and size between the two types. The main sources identified among these stones are the Wealden Lower Greensand, both siliceous and calcareous varieties, and the Spilsby Sandstone of lower Cretaceous age from Lincolnshire.

The glauconitic sandstones (Greensands) of the Cretaceous have a widespread outcrop in Britain south east of a line joining the Humber and Severn; in the Weald, central Southern England, the Chilterns, Norfolk and Lincolnshire. There is considerable lithological variation both within and between different beds with rapid vertical and lateral changes in composition and degree of induration. These units as a whole comprise a series of argillaceous and glauconitic sandy beds in part better consolidated and forming harder sandstones. In the area from southern England to Norfolk there are two units of greensand lithology, the Lower and Upper Greensands, separated by a series of clays but in Lincolnshire there is a single glauconitic sandstone unit, the Spilsby Sandstone, which is homotaxial with the Lower Greensand (JUKES BROWN, 1887).

5.1 Lower Greensand

5.1.1. The Weald

The Lower Greensand, deposited in a shallow marine environment, crops out as a belt of varying width around the Weald and is here divided into four units;

Folkestone Beds
Sandgate Beds
Hythe Beds
Atherfield Clay

of which the oldest unit, the Atherfield Clay can be disregarded with respect to quern sources, comprising mainly argillaceous deposits and containing no potential source material. The remaining units comprise mainly arenaceous deposits with lesser amounts of finer grade material and local developments of chert, ironstone and calcareous deposits. Fresh rock surfaces often have a greenish tinge resulting from the occurence of glauconite in these beds but weathered surfaces are more usually orangey brown in colour due to the alteration of glauconite to limonite.

a) Hythe Beds

The Hythe Beds, continuous in exposure around the Weald, consist of a number of rock types with a marked distinction between those east and west of the river Arun. In Kent, east of the River Arun, they generally occur as alternating beds of Rag and Hassock each up to 0.6 metres thick. The Rag is a hard, sandy limestone, bluish grey in colour containing over seventy percent calcium carbonate material with scattered sub-angular to angular quartz grains and better rounded generally fresh glauconite. The carbonate material includes both organic fragments (echinoderms, brachiopods, foraminifera, bryozoa) and fine grained calcite cement (DINES et al, 1969;56-8). Dearnly described ragstone beds from the quarries at Chilmington Green, Kent, as consisting "of a granular mosaic of calcite grains in which coarser and finer portions are very irregularly distributed apparently bearing no relation to the original bedding. .... Distributed throughout the calcite mosaic are organic fragments including foraminifera and shells, the latter generally replaced by coarsely crystallised calcite. Glauconite occurs as scattered grains (average 0.2 mm)" (SMART et al, 1966; 70-1). The percentage of both quartz (which frequently shows corrosion by calcite) and glauconite varies. Siliceous deposits occur locally, for example, E 16916, from Chart Edge, which shows 45% cryptocrystalline and chalcedonic quartz cement.

The Ragstone, although widely used for honestones (ELLIS, 1969) has only been identified in two querns in the present study, one from

Witham, Essex (CJ 505), and the second (CJ 655) from Odell, Beds. Two querns from Harrold, Beds were identified as probably Kentish Rag by Ellis (EAGLES & EVISON, 1970) but they are very dissimilar to samples of Rag from the outcrop between Chart and West Malling, Kent. All the samples from this exposure examined were of fine grained sandy limestones with only 2-10.5% quartz and on average 85% carbonate material, as both abraded fossil detritus and fine grained calcite. However, the two querns from Harrold, CJ 184 and 185, are of medium grained calc.reous sandstones, with 60% quartz and 38% calcite, the latter occuring mostly as medium to coarse grade clear sparry cement with only minor amounts of organic debris, very unlike any samples of Kentish Rag.

Further west the beds become more arenaceous, white, cream or pale grey and faintly green in colour, with subordinate beds of chert, for example the Sevenoaks Stone, which comprises thin bands of brown chert up to 30 cms thick. Stone bands are absent in the Dorking and Guildford area where the Hythe Beds comprise greenish grey sands but reappear to the south in the region of Midhurst and Petworth. The stone bands here are predominantly of soft sandstone but local developments of chert occur, mainly in the upper 3.5 metres of the unit (KIRKALDY & WOOLDRIDGE, 1938; 140). Within this area lies the quern quarry at Lodsworth, West Sussex identified by Peacock (1987) where both saddle and rotary querns were produced and which was in use from the Iron Age through the Roman period. Rotary querns (Sussex forms, both thick 'beehives' and flat stones) worked here have a wide distribution over central southern England and as far north as Northamptonshire. (PEACOCK, 1987). The greensand here is "a hard. medium grained, greenish grey or brownish grey, silicified, glauconitic, quartz sandstone with characteristic swirls and stringers of dark cherty material rich in glauconite" (PEACOCK. 1987; 62). Thin-sections show approxiamately 58% quartz, angular to subangular, dominantly monocrystalline but a small proportion of polycrystalline grains, 29.5% cryptocrystalline silica cement and 8% glauconite, fresh to slightly altered. Sample E 33463 from an old quarry on the east side of Blackdown, Sussex also shows a similar composition to the rock from Lodsworth. To the south-east the stone bands die out , the beds become finer grained and resemble the overlying Sandgate Beds (GALLOIS, 1965, 32).

b) Sandgate Beds

The Sandgate Beds are again of varied lithology. In the eastern Weald they are generally greenish grey argillaceous sands and dark grey glauconitic silty mudstones. To the west of Dorking the lower part, containing layers and lenses of pebbly calcareous sandstone, is termed the Bargate Beds (GALLOIS, 1965; 32). These beds vary in both composition and hardness: soft, shelly and argillaceous varieties occur. In the Godalming area the stone bearing beds are 12 metres thick, individual stone bands ranging from 15 cms to 1 metre in thickness; in places these beds have been worked for building stone. In the Dorking-Leith Hill area of Surrey both fine and coarse varieties occur containing a high proportion of calcereous material as cement and detrital fragments, the latter including derived Jurassic ooliths (HAYWARD, 1932; 19): derived ooliths are also seen in the outcrop at Chilworth near Guildford (CHAPMAN, 1894; 683). South of Guildford the Beds are generally fine grained and contain doggers of "hard, blue-hearted calcareous sandstone" the Bargate Stone (KIRKALDY, 1933). The Bargate Stone at Littleton Lane quarry, near Guildford, shows rounded to subangular quartz and chalcedony with scattered glauconite and numerous, often silicified, shell fragments in a ferrugino-calcareous cement (CHAPMAN, 1894). Coarse and fine varieties both occur in the area around Churt, Surrey, differing mainly in the proportion and size of organic debris, which is greater in the coarser stone, and siliceous doggers with chalcedonic quartz cement are also found (RICHARDSON, 1947; 167-9). To the south the proportion of glauconite and organic fragments decreases, the Bargate Stone consisting mostly of quartz grains in a calcareous matrix (KIRKALDY, 1933; 292). In the Midhurst area the Bargate Beds comprise fine grained calcareous stone bands and doggers in glauconitic loamy sands, again with some beds of cherty sandstone (THURRELL et al, 1968).

c) Folkestone Beds

The Folkestone Beds, the uppermost division of the Lower Greensand of the Weald, consists predominantly of loosely consolidated quartzitic and glauconitic sands with bands of pebbles and clay. Doggers of hard ferruginous sandstone (carstone) are developed locally usually of fine to medium grade but with local variations in particular at the eastern end of the outcrop (GALLOIS, 1965; 34). These beds are exposed in a narrow outcrop around the Weald, generally forming a minor scarp. At the type locality of Folkestone these glauconitic sands contain both calc reous and siliceous stone bands which thin rapidly inland. Further west stone bands are less common although locally developed siliceous beds do occur, mainly in the area between Ightham and Sundridge; calc reous stone bands are only found in the Folkestone area (GALLOIS, 1965; PADGHAM, 1970).

Within the type area the lithology is extremely variable and can change rapidly both laterally and vertically through the beds. Erosion of the cliffs may thus alter, to some extent, the composition of rocks exposed, which may differ at the present day to those worked for quern manufacture. The Folkestone Beds here are 18 metres thick and form low cliffs to the east and west of Folkestone harbour. Price recognised four subdivisions of the unit at Copt Point: a basal layer of nodular masses of grit including phosphatic nodules, 1 metre of loose sand, a thick sequence of loose yellowish sand containing seams of coarse calc reous sandstone from which the Folkestone Stone was extracted (and which in places also contains siliceous stone bands) and approxiamately 60 cms of dark greenish clayey sandstone (PRICE, 1875; 139).

The stone bands of the Folkestone Beds differ considerably in lithology from those of the Hythe Beds. The Rag is essentially a sandy limestone characterised by a high proportion of organic material which is present in lesser but variable amounts in the Folkestone Beds. The latter are usually medium to coarse grained and contain a substantial proportion of detrital quartz. Quartz, predominantly monocrystalline, comprises 25-75% of the rock which contains varying amounts of glauconite, generally fresh in the calc reous bands but showing greater alteration to limonite in many of the siliceous sandstones. The calcite cement occurs as large plates up to 6 mm in diameter: siliceous cement occurs predominantly as chalcedonic quartz but also in botryoidal and agate forms (WORRALL, 1954: 192-4).

The calc reous sandstones occur as both doggers and tabular masses of greater extent. Padgham has described the highest stone band as a series of coalesced doggers up to 45 cms thick. Thin-sections show angular to subrounded and moderately well sorted quartz grains averaging 0.4 mm in diameter, rounding increasing with grain size, and most grains partially corroded by the calcite cement. Lithic fragments include grains of degraded, partially glauconitized, siltstone forming up to 7% of the rock. Glauconite comprises up to 10% as subrounded grains some of which are distorted and fragmented and also as infilling of foraminiferal tests. Organic debris contributes approxiamately 1% of the detrital component but can be much higher in some samples (PADGHAM, 1970).

At Copt Point sandstone beds occur at intervals in the cliffs; samples demonstrate the variability of the lithology. E 28888 from the Sulphur Band is of dark grey glauconitic phosphate rock that weathers yellowish brown and contains narrow pyrite veins: no querns examined are of comparable lithology. E 28887 is a medium grained glauconitic sandstone containing subangular to rounded quartz and glauconite (with some glauconite infilling fossil shells) in a matrix of pyrite and a nearly isotropic aggragate of clay minerals. E 28886, E 28885 and E 28884 are of similar composition, 46.5-51% quartz, 2-12% chert, 0.5-8.5% lithic fragments (mainly siltstone), 6.5-11% glauconite and 16.5-36% calcite cement with a minor proportion of fossil detritus (SMART et al, 1966; 96). E 28882 from an exposure near Harveys Grammar School, Folkestone, comprises 52% moderate to well rounded quartz, dominantly monocrystalline and clear showing only minor corrosion by calcite, 3% glauconite, generally fresh and rounded, 1% lithoclasts, partially glauconitised siltstone, and minor amounts of chert and feldspar in a medium to coarse grained sparry calcite cement which forms 42% of the rock.

Additional samples were collected from the outcrops either side of Folkestone harbour. Those from the west of the harbour are all calc.reous, those from the east include siliceous rocks. These samples can be divided into three groups, the first containing those with a predominantly siliceous cement and the other two, with mainly calc.reous cement, distinguished by relative proportions of clear calcite to calcereous organic debris.

a) Calcite matrix; high bioclastic content. The samples with a very high proportion of organic debris were all from the west of the harbour, CJ 1/G, 3/G, 5/G, 29/G, 30/G, 32/G. CJ 3/G is creamy grey to greenish grey in colour, weathering grey brown and patchily highly glauconitic. In thin section it bears some resemblance to the ragstone but is of coarser grade. It contains scattered quartz grains (18%), 18% glauconite irregularly distributed throughout the rock, 48.5% organic detritus and 13% clear calcite cement. A smaller number of samples showed a slightly lower proportion of fossil material, CJ 71/G and 72/G from Mill Point, Folkestone, CJ 33/G from Sandling Junction and again all from west of CJ 6/G from Copt Point. The first three of these samples comprise 8-46% quartz, 1-10.5% glauconite, 9-20.5% organic debris and 35-42.5% calcite. CJ 6/G is a medium grained, greenish grey sandstone containing 52% quartz, generally moderately to well rounded, 4.5% glauconite, 14% organic debris of patchy occurence and 30% calcite with subordinate amounts of glauconitised siltstone and chert.

b) Calcite matrix; low bioclastic content. The second group of calcite cemented types has a low fossil content, e.g., E 28882 and CJ 2/G from between Mill Point and the harbour, Folkestone, CJ 4/G from West Cliff, Folkestone and CJ 90/G from Copt Point. The first three of these show 43.5-56% quartz, 4-12% glauconite, 1-6.5% organic debris and 33-38.5% calcite. CJ 90/G, medium grained and pale grey patchily speckled green, is similar in composition but with a slightly higher quartz content (60%), less organic material (1%, comparable with E 28882) and a slightly lower proportion of calcite (32%. E 28885 is also of similar composition but with a small proportion of silica cement.

c) Silica cement/matrix. Two samples collected from Copt Point have a predominantly silica cement, CJ 7/G comprising 16% detrital quartz, 5% glauconite, 7% calcite and 71% silica cement and CJ 8/G containing 42% detrital quartz, 1.5% glauconite, 2.5% calcite and 53% silica cement. Silica cemented bands do also occur to the west of the harbour.

Inland soft sands become increasingly predominant as the stone bands die out. In the area around Sevenoaks and Tonbridge the Folkestone Beds comprise mainly current bedded, ferruginous sands, the upper layers containing fine grained sandrock locally cemented into hard sandstones, the Ightham Stone, a hard green chert, around Sevenoaks and the Oldbury Stone, a brown quartzite (DINES et al, 1969). Around the rest of the Weald the Folkestone Beds are poorly consolidated sands and do not yield material suitable for querns.

5.1.2. Central Southern England

A variety of rock types are again seen in the Lower Greensand within and around the Hampshire basin, both argillaceous and arenaceous. The formation attains it maximum thickness of 180 metres on the Isle of Wight, thinning to the north, east and west. As in the Weald it is divided into four units, Atherfield Clay, Ferruginous Sands, Sandrock Series and Carstone.Small outcrops occur around Seend, Wilts, and Faringdon, Oxon. The Geological Museum notes the use of quartzose sand for the manufacture of querns at the former locality and Crawford (1953) recorded a quarry at Faringdon used for quern manufacture in the Medieval period, although no earlier working is evidenced there (CRAWFORD, 1953; 102-5).

5.1.3 Bedfordshire to Norfolk

Lower Greensand beds crop out continuously from Bedfordshire to Norfolk along the base of the chalk scarp. They are similar in lithological character to much of the Folkestone Beds of the Weald comprising for the most part sands and poorly consolidated sandstones. In Bedfordshire the unit consists predominantly of ironstone, the Woburn Sand and at Leighton Buzzard the Silver Sand is exploited for glass manufacture. In Cambridgeshire there are up to 21 metres of largely brown and yellow current bedded sands with ironstone concretions. To the north, in Norfolk, the sands at the base of the formation (the Snettisham Sands) are overlain by the Snettisham Clay and Carstone, the latter used locally for building stone (GEOL.MUS.). There is only one quern examined that may be from this source, CJ 494, Desborough, Northants, of ochrey-brown weathered friable sandstone which demonstrates the general unsuitability of this outcrop for querns.

5.1.4 Lincolnshire

Outcrop

The Lower Cretaceous or Neocomian beds of the Lincolnshire Wolds are of the same age as the Wealden and Lower Greensand of southern England but accumulated in a separate depositional basin and so differ in character to the beds further south (JUKES-BROWN, 1887). Of relevance to the present study is the lowermost unit, the Spilsby Sandstone, 25 metres of fine to medium grained and mainly poorly cemented sandstone, which forms a prominent feature above the low-lying ground underlain by the Kimmeridge and Oxford Clays to the west.

The Spilsby Sandstone of uppermost Jurassic and lowermost Cretaceous age crops out at the base of the Lincolnshire Wolds between Caistor and East Keal. To the south the beds are not exposed but merge with the Sandringham Sands of north-west Norfolk (KELLY, 1977). Pleistocene erratics (which may up to 4 metres in maximum dimensions) of the Spilsby Sandstone are distributed across East Anglia and are found as far south as London; "they are glauconitic, often shelly sandstones, generally cemented by coarse calcite crystals up to 10 mm in diameter" (KELLY & RAWSON, 1983; 70). Their greatest concentration occurs in south-west Norfolk between Kings Lynn and Thetford, the distribution thinning to the south and east. They are not found in the Fens (possibly due to covering by later fen deposits) and a gap in the distribution between Market Harborough and Peterborough may reflect a lack of published finds rather than a true absence (KELLY & RAWSON, 1983; 70-2).

The Spilsby Sandstone was originally thought to extend from East Keal to Elsham and Ingham included samples from this entire length for his study on the petrology of the Spilsby Sandstone (INGHAM; 1929). The sandstone exposed at Elsham is isolated from the main outcrop but, on the basis of its comparable lithology, was originally mapped as Spilsby Sandstone by the Geological Survey. Subsequent work has shown that this sandstone is in fact a discrete stratigraphical unit of Upper Jurassic Kimmeridge age and has been renamed the Elsham Sandstone (PENNY & RAWSON, 1969; 198 : KENT & CASEY, 1963; 57-61). Much of the small exposure (approxiamately 1 square mile) is covered by drift. Kent & Casey describe the rock as a coarse grained, often gravelly sandstone with abundant fossil material that appears to be little abraded, the fossils occuring in the more calcareous parts of large cemented masses that either weather out or are quarried from the soft sand (KENT & CASEY, 1963; 58-9).

The Spilsby Sandstone comprises mainly arenaceous deposits and attains its maximum thickness in the southern Wolds, thinning northwards to 6.5 metres at Woods Hill Quarry, Nettleton. It is divided into three lithological units, the basement beds (a thin seam of phosphatic nodules and fossil casts), the glauconitic sands and the ferruginous grit. The middle division is the thickest and most variable in lithology, consisting largely of greenish yellow sand and soft sandstone ranging from fine gravel to fine sand and in places silt. Glauconite is found throughout. Irregular masses of hard calcareous sandstone occur at some levels with whole layers similarly

PLATE 7: The Lodsworth quarry, West Sussex.

PLATE 8: Calcareous dogger in the Spilsby Sandstone, Nettleton, Lincs. Viewed north.

cemented towards the base of the unit and these provide a local building stone. It wase "not uncommon to find a sand pit and sandstone quarry close together in the same bed or even one pit combining the functions of both" (USSHER,1888; 88). The variable quality and hardness of the sandstone is evidenced by the present state of the local churches; much of the stone used is now soft and crumbly. (SWINNERTON & KENT, 1949; 59-60 : JUKES-BROWN, 1887). "Its want of durability imparts to many of them, of no great antiquity, a very ruinous and dilapidated appearance" (JUDD, 1867).

At the northern end of the outcrop the Spilsby Sandstone is exposed at the top of the west facing and relatively steep scarp slope. In Woods Hill Quarry, Nettleton, it consists of " yellow to greenish, slightly ferruginous, coarse grained quartz sands and poorly consolidated sandstones.......Large (up to 1 metre long) intensely hard calcareous doggers occur in the top half metre" (KELLY & RAWSON, 1983; 68). These doggers can be seen weathering out at the top of the west facing scarp slope (Plate 8). In the central part of the outcrop the sandstone forms more lowlying ground in which there are few exposures at the present day, the majority occuring in road cuttings or in small quarries, most probably of fairly recent date and worked for local building stone. Slightly higher ground is again found at the southerly end of the outcrop in the area of East Keal, there small 'crags' up to 1 metre in height can be seen in a number of fields.

Petrology

Inghams study of the petrology of the Spilsby Sandstone was based on 40 samples from along the outcrop, and included the Elsham Sandstone, at that time thought to belong to the same unit. The unweathered rock is described as a grey calcareous grit, frequently containing fossil remains. The majority of sand grains are fairly angular, angularity increasing with grain size, moderately coarse and of quartz, pebbles tending to occur in bands. Calcite forms 22-36% of the rock, much of which is lost during weathering resulting in friable sandstone or sand at outcrop, some rock remaining coherent as a result of secondary limonitisation. Thin-sections demonstrate the dominant detrital component to be quartz with subordinate glauconite, phosphatic material and feldspar (orthoclase, generally turbid, and well rounded, fresh microcline) and a minor proportion of lithoclasts (e.g quartzite, chert, quartz schist) but show little variation in composition laterally or vertically through the outcrop (INGHAM, 1929; VERSEY & CARTER, 1936).

Samples collected between Nettleton and Keal showed similar compositions despite a fairly wide range in grain size. They comprise approxiamately 60% quartz, generally monocrystalline and subangular (although both angular and better rounded grains occur), 1.5 to 3% glauconite, generally fresh, 0.1-5% lithoclasts (chert, sometimes oolitic, and other fine grained quartzitic fragments) and 30-36% calcite as large crystals. There is a small proportion of recognisable fossil detritus, bivalve moulds are the most common fossil seen in hand specimen, and occasional feldspar. Quartz grains show some corrosion by calcite. Many of these samples are quite badly weathered and friable, the only hard specimens coming from the Keal and Nettleton areas, the latter coarser grained than the samples from the southern part of the exposure.

5.2 Upper Greensand

Upper Greensand beds crop out around the Weald, in Hampshire, Dorset and Somerset and follow the line of outcrop of the Lower Greensand from Bedfordshire to Norfolk. In the Weald they comprise poorly consolidated sandstone, a sandy series with small amounts of clay and silt (the malmstone, comprising a hard fine grained variety known as firestone and a softer friable grey sandstone termed hearthstone) and clayey sandstones none of which are comparable to any of the querns examined (GALLOIS, 1965; 36-8: SOWAN, 1975; 573-4). In the Isle of Wight, these beds consist of a speckled, light greenish to blue grey sandstone which contains hard nodules, the cornstones, at some levels. Chert developments occur as regular courses and scattered concretions in the higher beds (CHATWIN, 1982; 75). Further west, in west Dorset, this series is represented by grey sands again containing cornstones. The main outcrop runs from Abbotsbury north to Mosterton then north east to the Vale of Wardour. The beds are thickest in the south where the lower beds comprise,fine clayey sands, containing lenticular masses of compact grey calcereous sandstones, in the lower part passing upwards into soft grey and greenish sands with an uppermost layer, 0.5-1 metre thick, of rubbly glauconitic sandstone. A higher bed of calcereous grit has been quarried at a number of places around Maiden Newton for building stone (CHATWIN, 1960; 49). East of the Vale of Wardour the Upper Greensand comprises mostly sand containing scattered doggers and a development of chert beds around Shaftesbury (CHATWIN, 1960; 50). There is a narrow outcrop of the series extending from the Vale of Warminster to the Vale of Pewsey which includes, towards the east, the Potterne Rock, a single bed approxiamately 0.6 metres thick of hard grey sandy limestone that has been quarried for building stone (JUKES-BROWN, 1905: CHATWIN, 1960; 52) whilst at the south-west of this exposure lies the quern quarry at Pen Pits, Somerset, (PITT-RIVERS, 1884). A sample from Maiden Bradley, to the north of Pèn pits, shows a highly calcareous rock reminiscent of the Ragstone of the Weald. In Cambridgeshire the Upper Greensand is a thin unit, mostly less than 0.5 metres in thickness, of sandy and chalky marl.

5.3 The Greensand Querns

There are 161 querns of greensand (of which 148 are of general beehive form) but it is immediately obvious that not all are of a single rock type and similarly, that a considerable range of styles is represented (Plate 10, 13: Fig. 7). A large proportion, 59, are of general Hunsbury form and there are 6 of possible Hunsbury type which are fragmentary and lack handle sockets, but some have more parallels with querns from southern England and a number are of a form differing from any of the typolgical classes described by Curwen (or subsequent

FIG. 6 Distribution of greensand beehive querns

other authors) although two of these have been recognised among recently recovered roughouts from Folkestone (KELLER, 1988, 1989). The initial lithological distinction (with one exception) is between the siliceous and calcareous types, all the silica cemented querns except CJ 761 being of a consistent texture and composition, comparable in this and in form to the products of the quarry at Lodsworth, West Sussex identified by Peacock (PEACOCK, 1987). The final silica cemented example differs from these in detrital composition, grain size and nature of the cement (chalcedonic and other microcrystalline quartz rather than the chert of the Lodsworth material) and hence will be dealt with in a later section.

5.3.1. Chert cemented Hythe Beds

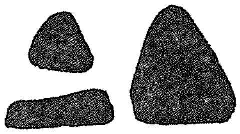
a) Typology

1: Upper Stones. In contrast to most lithologies, this rock type is far better represented by lower than upper stones in the study area with only three of the latter examined, two from Odell, Beds (CJ 190 and 191) and one, CJ 472, from Desborough, Northants. All three upper stones are rather thin examples of the Sussex type (Fig.4 i) their diameters range from 32 cms (CJ 190) to over 36 cms (CJ 191). All are asymmetrically worn, the maximum thickness now on the handle socket side of the stone, a contrast to the general situation in the Hunsbury types where the greatest wear (i.e minimum thickness) is usually on the handle side. Unusually for the Sussex type CJ 472 has only a slightly concave grinding surface and is possibly a relatively late example.

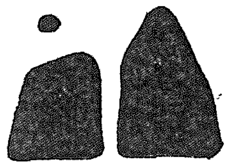
2: Lower stones. The lower stones range in diameter from 28.5 to 35.25 cms and in present thickness from 7.75 to 16 cms, the thickest two recovered at Hunsbury. Five of the stones are pierced, 7 are unpierced and one is too fragmentary to determine this feature. One unpierced example, CJ 67 (Hunsbury), has a virtually flat grinding surface; in the other examples the grinding surface is convex often with a raised 'lip' around the spindle hole. Only one of the pierced stones has a flat grinding surface, CJ 613 from Puddlehill, Beds. In

Scale 1:10

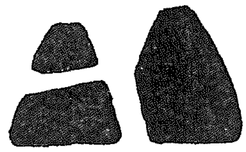
Spilsby Sandstone:



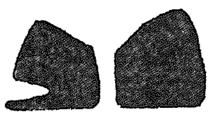
a: CJ 151



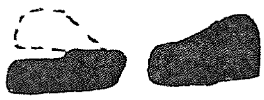
b: CJ 370



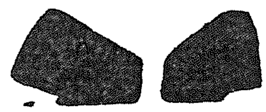
c: CJ 550



d: CJ 315

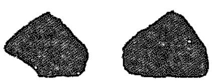


e: CJ 516



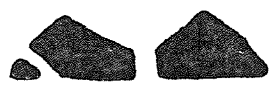
f: CJ 290

Folkestone Beds:

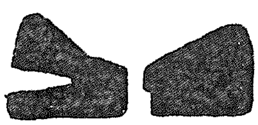


g: CJ 672

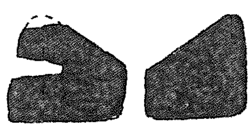
h: CJ 685



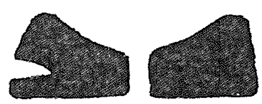
i: CJ 688



j: CJ 155



k: CJ 350



l: CJ 686

FIG. 7: Morphology of the Spilsby Sandstone and Folkestone Beds querns

general, in the pierced stones, the spindle hole has an hourglass shaped profile in cross section, but there are two exceptions, CJ 470 from Aylesbury where the spindle hole is cylindrical and CJ 613 where the upper portion is cylindrical below which it funnels out towards the base of the stone. The base diameter tends to be only slightly smaller than that of the grinding surface, exhibiting a range of 26 to 32.5 cms. The base is generally more roughly finished than the sides (which are well shaped and have a pecked finish) and either slightly concave or flat. In two instances the degree of concavity of the base is comparable to the convexity of the grinding surface; CJ 178, Claycoton, Northants, 470, Aylesbury, Bucks, and CJ 500, Yardley Hastings, Northants.

Despite the variations in form these stones all fall into Curwen's Sussex class and are within the range of forms already identified by Peacock as products from the Lodsworth quarry. This lithology includes five definite Roman querns: CJ 196 from Odell, a lower stone similar in form to CJ 189 from Harrold, Beds but slightly larger in diameter, thiner and unpierced; CJ 500, a lower stone from Yardley Hastings, Northants similar to CJ 470, pierced with a concave base and convex grinding surface; CJ 601, a lower stone from Verulamium, pierced by an hourglass shaped spindle hole and, more unusually, with a slightly convex base; CJ 667, a fragment of an upper stone from Odell, which has a flat grinding surface and possibly a handle slot that did not extend the the full radius of the quern; and CJ 762, a lower stone from a Roman context at Gravelly Guy, Stanton Harcourt, Oxon.

b) Petrology (Plate 9: Table 2)

Eleven of these querns were thin sectioned; CJ 67, 100, 108, 165, 189, 196, 500, 613, 762. These demonstrate a very consistent composition and texture with little variation between samples, comprising on avarage, 51.5% monocrystalline detrital quartz, 36.5% chert cement and 7% glauconite with a minor proportion of lithic fragments (usually quartzitic and including chert), calcite and polycrystalline quartz. A number of other querns of this material have been examined including

PLATE 9: Photomicrograph of CJ 189, from a churchyard near Harrold, Beds. Hythe Beds from Lodsworth. Crossed polars. x 25.

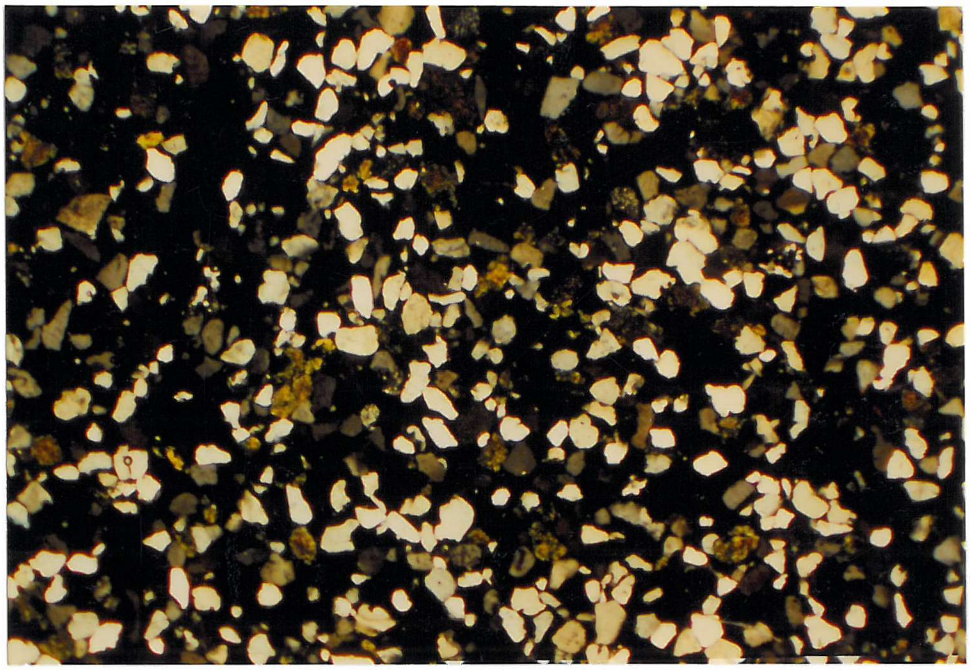


PLATE 10: left: CJ 155, Folkestone Beds, Kent 2 form, Hunsbury, Northants.
right: CJ 156, Spilsby Sandstone, Hunsbury 2 form, Hunsbury, Northants. Northampton Mus.

further rotary querns from Gravelly Guy, Oxon, and a saddle quern lower stone from Little Butser Hill, which lies within the known distribution area for this material at this period (PEACOCK, 1987).

5.3.2 Calc reous cemented Hythe Beds

There are only two querns of calc reous Hythe Beds, one fragment of an upper from Witham, Essex, fragmentary but probably of similar form to many of the upper stones of Folkestone Beds (see below) and possibly of Iron Age date and CJ 655 from Odell, Beds from a Roman context.

5.3.3. Sandgate Beds

There are two querns from Odell, Beds, of a greensand identified at the Geological Museum, London, as Bargate Stone: CJ 657 and 670. Both stones are rather flat and of large diameter and have flat grinding surfaces. CJ 657 is from a Saxon context but considered to be residual material and CJ 670 is from a context dated to the second half of the 1st century AD (ODELL SITE ARCHIVE). They are of highly fossiliferous, orangey brown weathering calcareous sandstone but no other querns of similar lithology were encountered in the study area.

5.3.4. Folkestone Beds and Spilsby Sandstone

The remaining greensand querns are, with the one exception mentioned above, calcite cemented. Although they all bear some similarities of, for example, grain size and general compostion they are divisible into two groups, one group exhibiting a much more consistent lithology than the second, for which two distinct sources were indicated. In total there are 135 examples of which 4 are definitely flat, Roman types.

1: Spilsby Sandstone

The querns of this source comprise the larger group, 102 examples including two Roman stones of which there is one lower and 80 upper stones, one indeterminate fragment and one unfinished upper stone.

a) Petrology (Table 2)

These querns are very consistent in lithological composition despite

	Quartz	Lithic Fragments	Glauconite	Fossil material	Silica cement	Calcite cement
HYTHE BEDS (LODSWORTH)						
CJ 100	53	1	6	–	32	–
CJ 165	51	trace	8.5	–	38	–
CJ 189	50	trace	7	–	42	–
SPILSBY SANDSTONE						
CJ 110	60	trace	2	1	–	32
CJ 128	64	–	3.5	0.5	–	31.5
CJ 185	61	trace	1.5	–	–	38
CJ 194	66	1	1.5	0.5	–	31
FOLKESTONE BEDS						
CJ 103	29	1	10.5	35	–	24.5
CJ 155	58	1.5	3.5	5	–	32
CJ 565	32	2	13	14.5	–	38
CJ 697	49	1	6	12	–	31.5
CJ 761	60	–	5.5	0.5	32	1
CJ 192	63	0.5	3	1	–	30

TABLE 2: Modal analyses of the Cretaceous greensands

variation in grain size from medium to very coarse grade sandstones, and all have a calcite cement. In hand specimen fresh surfaces are pale creamy grey in colour, speckled black; quartz grains are colourless to pink stained. Weathered samples are more friable and orangey brown in colour as a result of the oxidation of the glauconite. In thin-section (Plate 11) they are seen to comprise approxiametely 57-62% monocrystalline quartz, 0.5-5.5% polycrystalline quartz, 1-3.5% generally fresh glauconite and 30-38% clear calcite, but relatively little fossil debris. The quartz is dominantly clear with slightly corroded margins and subangular to subrounded. Lithic fragments (including chert) and feldspar (mainly fresh microcline and plagioclase) are minor but consistent constituents (Plate 11).

Although these are similar to some of the samples of Folkestone Beds (two examples from Odell, Beds, having been previously identified as such) they do differ, for example, in their general appearance in hand specimen. In this group the glauconite (usually present in smaller amounts than in the Folkestone Beds) appears very dark to black in hand specimen but is distinctly green in the Folkestone Beds samples. In thin-section the consistency in composition even with varying grain size is also very atypical of the Folkestone Beds where rapid compositional changes can be seen even across the width of a thin section. It is, however, characteristic of the Spilsby Sandstone, to which this group of querns is comparable from both macroscopic and microscopic analysis, which is therefore considered to be the source for these querns.

On present evidence the exact source cannot be pinpointed closer than the Spilsby Sandstone outcrop, given that the composition changes little over its entire length and that, as yet, little direct evidence in the form of, e.g., roughouts, has been found to demonstrate quern manufacture at any point of the exposure. The single unfinished quern of this lithology is from Nettleton (CJ 311) at the northern and of the Wolds, although the exact provenance is unknown. Certainly at the present day the rock is better exposed at the northern and southern

PLATE 11: Photomicrograph of CJ 184, Harrold, Beds. Spilsby Sandstone.
Crossed polars. x 25.

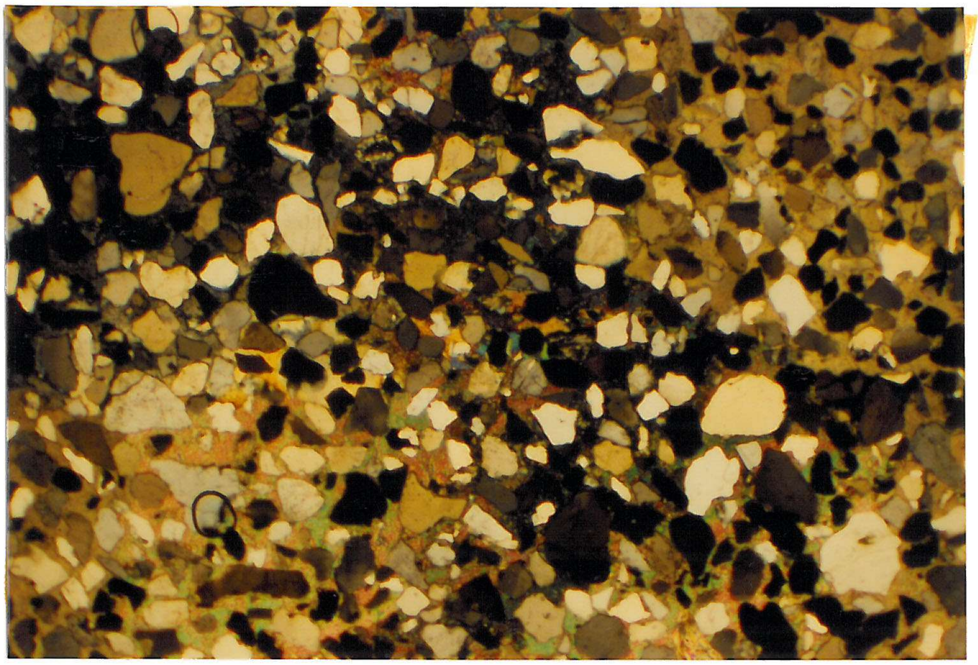
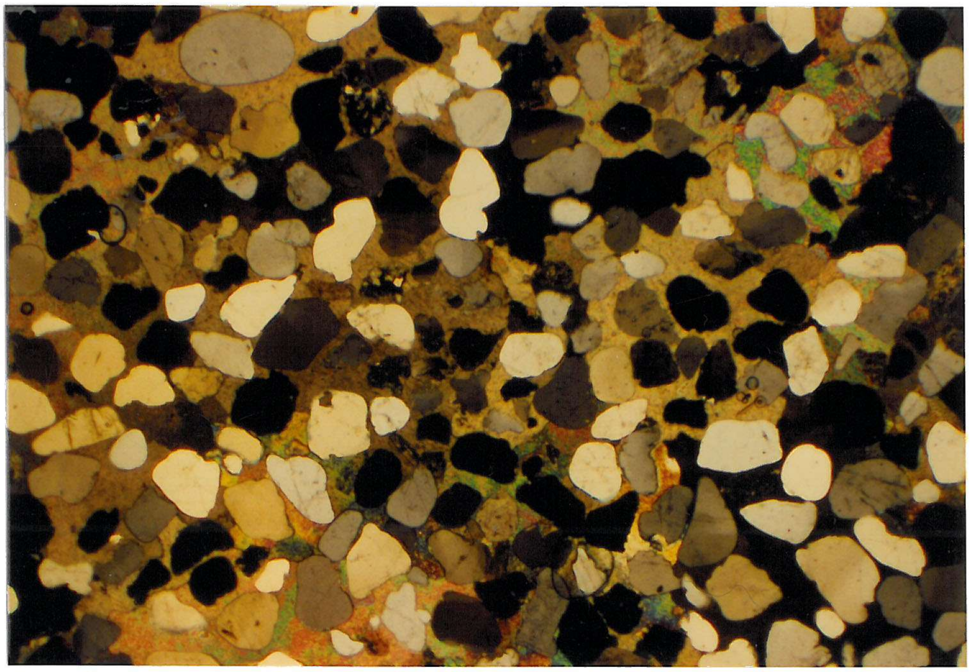


PLATE 12: Photomicrograph of CJ 192,, Odell, Beds. Folkestone Beds.
Crossed polars. x 25.



ends of the outcrop and is most prominent in the north, the central part comprising a more lowlying and undulating topography in which the present outcrops demonstrate a soft, rather friable sandstone. On these grounds the more northerly exposures might be considered the most likely source, where the doggers exposed at the top of the scarp might have provided a more readily accessible source of raw material than is found elswhere along the outcrop. The existence of a smaller number of querns of slightly finer grained material might also suggest some working in the southern part of the outcrop, samples collected from this end of the outcrop being of finer grade from those around Nettleton. There do not seem to be any grounds for distinguishing different sources on the basis of quern form and it is of course possible, or likely, that the outcrop was worked at several places.

b) Typology

Upper Stones

Typologically most of the upper stones of this lithology fall within Curwens Hunsbury class (Plate 10) although there are a number that do not fit in with this classification (Fig.7, a-f) Of the 80 upper stones 57 have pierced handle sockets, 12 have unpierced sockets and 12 are too damaged for determination of this characteristic. Four of those with pierced sockets also have an unpierced handle socket: CJ 293 and CJ 289 in which the second handle socket is at a slightly higher level on the stone than the first, pierced socket; CJ 233 where the second socket is at a lower level than the pierced socket; and CJ 443 in which both sockets are at a similar level. Considering only those that are generally of Hunsbury form, the range in diameter is generally similar to that shown by the Millstone Grit Hunsbury style querns possibly closest to those of MG/3 lithology but there is little difference between all three Carboniferous sandstone types. Similarly, the dimensions of the hoppers compare well with those of the Millstone Grit examples; the majority are between 9 and 15 cms in diameter and from 6.5 to 11.5 cms deep.

These querns fall into the 'Hunsbury' class in that they possess a pierced handle socket but otherwise, as a group (although not in each individual case) differ from the 'typical Hunsbury' form (as represented by many of Millstone Grit) in three respects:

1. Many possess a rounded rather than a flat top, and collared examples are rare, although there is one stone with a collar from Hunsbury, CJ 131. A significant number do have a flat top, but these do not appear to show any particular geographical distribution, examples occuring in Northamptonshire, Leicestershire, Lincolnshire, Norfolk and Cambridgeshire.

2; In most examples the hopper is funnel-shaped. The few exceptions are; CJ 153 in which it is slightly dished, CJ 304 which has a small, dished hopper and in which the handle socket pierces the feed, CJ 308 which has a very irregularly shaped hopper and CJ 309 and CJ 533 in which it is slightly dished. In addition to these there are a number of stones where the hopper is relatively deep and tends towards a more cone shaped cross section.

3; The handle socket is generally oval or circular in shape at the outside of the quern, although more rectangular forms do also occur.

The twelve upper stones with only unpierced handle sockets are of two forms. Three are of Yorkshire/unpierced type; CJ 554, Wood Walton, Cambridgeshire, CJ 366, Baconsthorpe, Norfolk, and CJ 357, unprovenanced, Ipswich Museum (Fig.7.d)
The remaining nine are all from
Lincolnshire; CJ 290, 294, 301, 315, 510, 511, 513, 516 and 525. They differ in having a relatively wide funnel-shaped hopper and wide top (Fig.12, CJ 513) and resemble in some respects querns of Folkestone Beds (see below). CJ 554 appears has some features in common with this group and CJ 300 which lacks a handle socket may be of this type.

Lower stones

The 18 beehive type lower stones exhibit considerable variation in form. Some are thick and similar to lower stones of Millstone Grit, for example, CJ 64, 128, 146, 152, 194 (asymmetrically worn), 227, 311, 326, 344, 518 and 528. These are unpierced but a number have a hole drilled from both upper and lower surfaces, e.g. CJ 64, 128, 227 and 326, that do not meet. In the case of CJ 128 they are quite offset. In CJ 227 the drilling in the current base is larger than the spindle hole and cone-shaped and it is possible that this stone was begun as an upper stone. A similar situation may have occured for CJ 326, 152 and 528. In CJ 152 and 528 the two drillings meet but are slightly offset. CJ 517 and 738, from Dragonby, Lincs, are unpierced but the shape of the grinding surface resembles that of the Lodsworth lower stones (slightly convex with a raised lip around the spindle hole) although unlike the Lodsworth stones they have a convex base. No beehive upper stones were seen with the necessary corresponding concave grinding surfaces, although there are two upper stones, both probably from Ancaster (CJ 747 and 759) which are rather intermediate in form between the beehive and flat types and have a concave grinding surface. The remaining five lower stones are pierced with a flat grinding surface. The spindle hole is either cylindrical or widens towards the base of the stone. The diameters of these lower stones compare closest with those of Millstone Grit subtype 3 being slightly higher than those of MG/1 and MG/2. However as Millstone Grit types 2 and 3 are each represented by only 4 querns this comparison may not be supported by a larger body of data.

2: Folkestone Beds

The remaining greensand querns, although they exhibit greater variation in composition than any of the other greensand lithologies, all appear to be from one source, identified as the Folkestone Beds in and/or around Folkestone. They are all medium to coarse grade sandstones containing conspicuous amounts of glauconite easily visible in hand specimen and imparting a greenish hue to the fresh rock. Some samples are very green due to the high proportion of this mineral present. These querns differ from those of Spilsby Sandstone in containing a higher proportion of glauconite and fossil detritus, although the actual amount present varies considerably between samples. The querns of this lithological class are also grouped together on the basis of their form. Two different designs are represented (Plate 10, 13) although at present there does not appear to be any reason to differentiate the two on lithological criteria.

a) Petrology (Plate 12: Table 2)

In hand specimen samples from these querns vary in colour from a pale creamy grey speckled with green glauconite to greenish grey, weathering a more orangey brown. Thin sections show a range of composition: 29-68% quartz, 3-16% glauconite, 1-35% organic debris and 24.5-38% calcite. A few samples show a patchy silica cement but there is only one quern sample which exhibits a predominantly siliceous cement, in which the proportions of detrital minerals are comparable to the calcite cemented samples.

It is possible to group the quern samples into the same classes as the Folkestone Beds samples:

1. Calcite Cement, high bioclastic content. The thin-sectioned examples of this class are querns CJ 696, 694 and 697, all from Folkestone, in which the proportion of calcite cement exceeds that of fossil detritus and CJ 565 from Guilden Morden, Cambs, which has in part a silica cement and a lower proportion of detrital quartz than the three Folkestone querns (32% compared with 43-54%). CJ 694 has a very high glauconite content, 16.5%, more than double that of the other samples in this category, whilst both CJ 694 and CJ 696 have a relatively low calcite content. Two samples not thin-sectioned, CJ 442 and 350, probably also belong to this category. There is only one quern sample in which there is a greater proportion of bioclastic material than clear calcite, CJ 103 from Hunsbury which comprises 29% quartz, 10.5% glauconite, 35% organic debris and 24.5% calcite.

2. Calcite cement, low bioclastic content. This group includes three thin-sectioned examples, CJ 155 (Hunsbury), CJ 192 (Odell, Beds) and CJ 560 (Isle of Sheppey), of which the latter differs from the other two in having a relatively low proportion of quartz (45.5% compared to 63.5-68%), and a higher glauconite content (15% compared to 3 and 3.5%) with little bioclastic material. The degree of rounding of

detrital grains (particularly quartz) is on average higher in CJ 155 and CJ 192 than in CJ 560. CJ 343 which has not been thin sectioned possibly also belongs to this group.

3. Silica cement. Only one quern examined is of this type, a fragment probably from a pierced lower stone from Stansted, Essex, which has a clastic component similar to some of the calcareous types but 32% silica cement and only 1% calcite cement.

For the calcite cemented examples the two subgroups discussed above are not distinguished by form, both are represented among the two distinct styles of quern described below. Similarly, the two lithological subgroups occur within the same exposure and the thin-section of CJ 103 shows a change from a high to low proportion of bioclastic material across the slide. Distinction between the two types may thus be unimportant.

b) Typology

Upper stones

There is a total of 31 beehive (thick) querns of Folkestone Beds examined within the survey area, typologically divisible into two groups, one occuring both in the southern part of the main study area (i.e. the south east Midlands and southern East Anglia) and the second, to date, only seen in Kent.

Group A (Fig.7, g-i)

The first type are rather discoid in cross-section, relatively thin compared to the true beehive types, and have nearly vertical sides, bearing more similarity in this respect to the Wessex and Sussex types of southern England. They have a large diameter top, a wide, relatively shallow V-shaped hopper, and a narrow feed (in contrast to the wide feeds of the two southern quern forms, the Sussex and Wessex types). The handle socket is generally circular in section and, with two exceptions, does not pierce the hopper or feed. In CJ 103, the handle pierces the side of the hopper, and in CJ 442 there appears to be an accidental piercing of the feed, the opening at the feed being so small that it cannot be a functional feature. The examples of this style are from Hunsbury, Northants (CJ 103 and 155), Witnesham (CJ 343) and East Bergholt (CJ 350), Suffolk, Essex (CJ 442, unprovenanced, Colchester Museum), Guilden Morden, Cambs (CJ 565), Wilbury Camp, Herts (CJ 584), Maidstone Museum (CJ 702), and Isle of Sheppey, Kent, (CJ 560). There is also an unfinished example from Folkestone, Kent, CJ 697. CJ 675, Canterbury, Kent, is less characteristic but probably also belongs to this group whereas CJ 689 is rather intermediate between groups A and B.

Group B (Fig.7, j-l)

Querns of the second group are similar to those of group A in that they possess a V-shaped hopper, narrow feed, flat grinding surface and unpierced handle socket but differ in having more steeply inclined sides, resulting in a proportionally smaller diameter top and overall more 'bun shaped' appearance. Examples of this type are at present confined to Kent, where they are known from, for example, Ashe, Canterbury and Folkestone. The majority of 'beehive' upper stones in the collection at Canterbury Museum are of this type. A few of these stones have grooved grinding surfaces, but the grooving tends to be shallower and more irregular than that seen on later Roman querns, with more and narrower grooves, e.g. CJ 673, 685, arranged more or less radially rather than grouped into the distinct wedges that are seen on later examples. Grooving is seen on only one quern from Group A, and may reflect a slightly later date for these Group B querns, perhaps with a copying from Roman stones.

Lower stones

There are only five lower stones of this lithology (including one Roman example, CJ 680), all rather different in form, possibly in part a reflection of chronological variation. CJ 682 is unpierced, and resembles the Midlands (Hunsbury) types with only a very short (and possibly unfinished) spindle hole and roughly convex base. CJ 683 has a convex grinding surface and slightly convex base, is relatively thin and is possibly quite late in date; it is also unpierced. CJ 695 is pierced with a flat grinding surface, resembling a number of examples from Lincolnshire, and has a cylindrical spindle hole and rough, generally flattened base. CJ 761 from Stansted is another, fragmentary, pierced stone with a flat grinding surface.

A comparison of diameters and thicknesses of querns of both groups, A and B, shows the average diameter of Group A to be slightly less than that for Group B. For thickness the used, worn examples of Group B fall at the lower end of the range for the Folkestone Beds querns whole with a maximum extant thickness of 9 cms. CJ 696, which appears to be an unfinished upper stone of this type, is 10.75 cms in height. For Group A the minimum height at present is 8.5 cms for CJ 442 (an overall small quern in Colchester Museum). CJ 565 is 9 cms thick but in this example a significant amount of wear is indicated by the replacement of the original unpierced handle socket by a handle slot in the top of the stone. The maximum thickness of a Group A used quern is 15.5 cms, the unfinished example from Folkestone (CJ 697) standing at 19.25 cms; the latter also exhibits the largest diameter of the group at 37 cms. In the case of hopper diameter and depth, the measurements for group B cluster very closely; in finished querns they are 16-18 cms in diameter and 4-5.5 in depth. Some of the used Group A querns some show relatively shallow hoppers, CJ 442, 192, 686 range from 17.5 to 19 cms in diameter and from 4 to 4.5 cms in thickness. The remaining examples of both groups are larger, 18-27 cms in diameter and 6-7.5 cms thick.

Only two of the querns of Group B form were thin-sectioned. Both are calcite cemented with a relatively high bioclastic content, and are similar in composition to CJ 697 of Group A form which does, however, have a higher glauconite content than the other two. There does not appear to be any particular lithological distinction between the two forms and within Group A in particular there is a great deal of compositional variation.

Source

The identification of a source at Folkestone on petrological grounds has been independently substantiated by the recent work of Mr. P. Keller and Mr. M. Dugdale on the manufacture of quernstones at Folkestone (KELLER, 1988, 1989). Over 130 examples of partially completed quern roughouts have to date been collected from the foreshore at Folkestone from just below the site of the Roman villa east of Copt Point. Both forms, A and B, are represented in various stages of completion and these roughouts also appear to exhibit at least some differences in composition although none have as yet been thin-sectioned. Keller has recognised three forms of upper stone among the roughouts, the first Group A as defined above , "steep sided, cylindrical in form with wide, funnel shaped hopper and narrow, circular spindle hole. The grinding surface is either flat or slightly concave. A socket hole for a handle is provided in the side" (KELLER, 1988; 60). This type is so far the commonest form found on the foreshore. The second type is nearly hemispherical with a wide shallow recessed hopper and narrow circular spindle hole, and there is one example of this form in Canterbury Museum, CJ 675. The final type is hemispherical to bun shaped with a funnel shaped hopper. Among the roughouts illustrated (KELLER, 1988; 66) it is the closest to Group B form Folkestone Beds querns from Canterbury; there is an unfinished example of this form from Folkestone villa (CJ 696). Pottery from excavations on the cliff is of native type and dated to the period 10-80 AD. Excavation also revealed a layer of greensand dust which could represent stoneworking debris. Slumping of the cliffs has tended to obscure the picture but these deposits probably represent a native settlement predating the villa that extended further east (KELLER, 1988; 65). The evidence recovered indicates large scale production on the site, probably using material in the form of suitably sized boulders collected from Copt Point, and possibly initially related to the native settlement in the first centuries BC and AD, although some finds of Folkestone Beds querns in the present study area suggest an earlier initial date for production. Neolithic and later saddle querns of this rock have been recorded at Wingham and Dossett Court, Upper

PLATE 13: left: CJ 672, Ashe, Kent. Kent 1 form, Folkestone Beds.
right: CJ 673, Baenlly Corner, Kent. Kent 1 form, Folkestone Beds. Canterbury Mus.

PLATE 14: Boulders of Folkestone Beds sandstone on the foreshore at Copt Point, Folkestone, Kent. Viewed east.

Deal,Kent. Production appears to have declined after the 1st century AD (KELLER, 1988; 65).

Querns of this material are found all over east Kent, but on present evidence are far less common in the west of the county. At Maidstone Museum there is only one quern of Folkestone Beds sandstone; the remaining beehive stones are of Puddingstone. A number of querns similar in some respects to the Group A Folkestone Beds querns but made from Spilsby Sandstone have already been noted above.

5.4 Distribution and dating

5.4.1. Spilsby Sandstone (Fig. 6)

Distribution

The Spilsby Sandstone accounts for over 50% of the beehive querns from Lincolnshire and South Humberside, roughly 25% in Cambridgeshire and Suffolk and lesser but significant proportions of those found in Bedfordshire, Hertfordshire and Norfolk. Beehive querns of this lithology have not yet been identified in Buckinghamshire and there are only sporadic examples in Leicestershire, Essex, Hertfordshire and Buckinghamshire.

The main distribution from Lincolnshire thus seems to be to the south; the two recorded to date in Nottinghamshire are from localities near to the border with Lincolnshire (M.E. WRIGHT pers comm.). There are four examples in Leicestershire, the two provenanced stones from the north east of the county, thirteen from Cambridgeshire mostly from the northern part, and in Northamptonshire, which contains the south-western limit of the distribution, all but three examples were found at Hunsbury. To the east there are four stones from Bedfordshire (at two sites, Harrold and Odell) and two in Hertfordshire (both from Aldwick in the north of the county). There appears to be a secondary area of concentration in eastern East Anglia, with six querns of this lithology in Norfolk, ten in Suffolk and a single example from Essex (unprovenanced, but in Colchester Museum and possibly from the east of the county). At present none is known from further south or south-west. The extent of the occurence of this lithology among querns north of the Humber is not known at present; there appear to be at least a few examples of querns of this source but identification remains tentative at present (M.E.WRIGHT, pers.comm.).

It might be argued that the East Anglian examples were made from erratic blocks of the Sandstone rather than 'imported' into the area as finished articles. There are two factors pointing against this;

1. The known distribution of glacial erratic blocks of Spilsby Sandstone shows a concentration in south-west Norfolk with a fall off in to the east and south. Thus the concentrations of erratics are lowest in the parts of the region where querns of this lithology are found.

2. The shape of the Spilsby Sandstone querns from East Anglia and variations in form in these correspond closely to those of the Lincolnshire examples. It might be resonable to expect these to resemble more the other querns in East Anglia (mainly the Puddingstone types which could be reproduced in other materials as is demonstrated by the Claydon quern) if they were being manufactured in the area.

There are two unpierced (Yorkshire) style querns of Spilsby Sandstone in East Anglia both slightly unusual in shape. CJ 357, unprovenanced, Ipswich Museum, is very tall and has a generally rounded but irregularly finished top and shallow, wide funnel-shaped hopper. The upper and lower portions of the feed are slightly offset, and the stone has a general appearance of not having been quite finished. CJ 366, Baconsthorpe, Norfolk, has quite a wide rimmed flat top and funnel-shaped hopper. Although they cannot be said to be of 'typical' Yorkshire form this typological class does exhibit a range of variations and these two examples do not really fall outside this.

There are two other unpierced/Yorkshire examples, CJ 554, Wood Walton, Cambs, which is similar to CJ 366 in possessing a wide rimmed, flat top and is very worn with a second, also unpierced, handle socket and CJ 525 from Helpringham Fen, Lincs, similar in form to 554. This general design, a distinct flat and fairly wide rimmed top with funnel-shaped hopper and pierced or unpierced handle socket does appear to be confined to a relatively small geographical area. Five of the eight examples are from Cambridgeshire (Wood Walton, Eynesbury, Alconbury and two unprovenanced stones) with, two from southern Lincolnshire (Tallington and Helpringham) and there is one 'outlier' from Baconsthorpe, Norfolk. There are similar stones which may possibly come into this category from Hunsbury (CJ 82, 156, 163, 171) and in Leicester Museum, CJ 226 (unprovenanced) but none from central and northern Lincolnshire. As with the other types there is insufficient evidence for dating these; they are most likely contemporary with the Hunsbury forms.

Therefore the evidence, athough by no means conclusive, does argue for the manufacture of all the Spilsby Sandstone querns in Lincolnshire and subsequent trade/distribution from here to East Anglia.

Dating

The majority of the Spilsby Sandstone querns, the Hunsbury stones being the main exceptions, are chance finds, particularly those of Suffolk and Norfolk; few are dated at all closely. The sixteen examples from Hunsbury can be dated no more closely than the fifth century BC to the first century AD, the date for the site as a whole. In Lincolnshire many of the Spilsby Sandstone querns are stray finds, for example, CJ 289 (Billingborough), CJ 290 (Dalby), CJ 293 (Nocton) found with sherds of "Iron Age 'A'" type (E.M.A.B.,12, 1978), CJ 294 (North Hykeham), CJ 300 (Stallingborough), CJ 311 (Nettleton) and CJ 513 (Broughton). Others are from sites for which more evidence is known or from the same general locality as known sites but for which no context is now known, e.g., CJ 308, Ownby by Spittal, the site of a Romano-British settlement, the finds from which include La Tene III brooches (MAY, 1984; 21); CJ 508, 510, 521, South Ferriby which has produced material over an area that indicates an important settlement at the crossing of the Humber established by the Late Iron Age (MAY,1976; 1984; 22); CJ 514, 515, Old Winteringham, a site of early Roman foundation which has produced has also produced 2 Iron Age coins (MAY, 1984; 21); CJ 526, 527, Tallington, a parish that has produced considerable evidence of Iron Age and Roman occupation at a number of sites in the form of enclosures on the banks of the River Welland (SIMPSON, 1966); and CJ 742, Denton, a late Iron Age settlement producing wheel made pottery (MAY, 1976b; 168).

There are two sites in particular in Lincolnshire and South Humberside where more contextual information is known. The first of these is Ancaster Quarry, a Middle Iron Age settlement occupied from the 4th to the 2nd century BC and succeeded by the settlement at Ancaster Gap in the Late Iron Age. The site excavated at Ancaster Quarry includes a building and ditches of Roman date but none of the querns were associated with these features (MAY, pers.comm.). The collections at Lincoln Museum and Nottingham University Museum include a number of querns labelled only 'Ancaster' that may be from either site: a number of querns definitely from the later settlement were also examined. There are two querns from Ancaster Quarry of Spilsby Sandstone; CJ 749, half of a Hunsbury form upper stone and CJ 753, three-quarters of a fairly thick, pierced, lower stone. There are five beehive querns from Dragonby, South Humberside, all of Spilsby Sandstone but there is still some doubt as to their precise date/ period of use. Two forms are represented, Hunsbury and the flatter, more discoid type with a wide funnel-shaped hopper. CJ 516 is from a cobbled area which also produced two Iron Age coins and 13 Roman sherds and is therefore probably of Roman date. CJ 517 came from among a group of lava and Millstone Grit quern fragments in a transition layer. CJ 518 is from a short length of ditch which produced a Late Iron Age group of pottery with 22 sherds assigned to the late pre-Roman Iron Age. CJ 519 is from a probably early Roman feature and CJ 738 from a Romano-British well with finds of the second to fourth century AD.

All of the Cambridgeshire Spilsby Sandstone querns are chance finds. The two Hertfordshire lower stones are both from Aldwick and were recovered from an Iron Age pit into which they appear to have been deliberately thrown although they were not broken and little if at all worn. The site is an unfortified agricultural settlement established at the beginning of the second century BC and which possibly continued past the Roman conquest although belgic influence is almost absent (CR'ASTER, 1961). With the exception of the Hunsbury querns there are three examples of this lithology in Northamtonshire, one found at the Beanfield estate site, Corby, which has produced generally Roman material (RCHM, 1979), the second, also from Corby although the precise locality is not known, and the third from Polebrook. The Spilsby Sandstone querns from Suffolk and Norfolk almost without exception are stray finds with little if any associated material. CJ 361 is from Saham Toney, Norfolk, where a settlement was initially established on the Peddars Way during the late Iron Age (BROWN, 1986).

The most securely dated examples of this rock type are those from Harrold and Odell, Bedfordshire. From the Middle Iron Age site at Harrold, CJ 185 is from an unstratified context but CJ 184 was found in a pit containing pre-Roman Iron Age material including sherds of combed ware (EAGLES & EVISON, 1970). There are two Spilsby Sandstone querns from the Late Iron Age and Roman settlement at Odell, CJ 193 from a context dated to the second half of the first century AD and CJ 194 dated to the first century AD (ODELL SITE ARCHIVE). Thus the only certain pre-Roman examples of this lithology from the study region are from Hunsbury, Ancaster and Harrold.

Other published material adds little to this list as the rock has not generally identified among quernstones One example is a large flat stone from Brancaster Roman fort, Norfolk (HINCHLIFFE, 1985; 64, Fig.42, no.146) and one other possibility is an upper stone from Maxey East Field, Cambs. This latter stone is incomplete, 33 cms in diameter and a maximum of 15.5 cms thick with a funnel to cone shaped hopper. The handle socket appears to be circular and pierces the base of the hopper. The rock is described as a "matrix supported calc ,reous sandstone ...... with calcite cementing subangular-subrounded, well sorted quartz and lithic fragments of quartz or granodiorite". It was found in a mid first century AD context. A second upper stone of similar lithology from phase 8 (late first to late second century AD) is rather similar to the second Lincolnshire form (which resemble Folkestone Beds Group A querns) (PRYOR et al, 1985; 170-3).

The presence of two different forms of beehive quern in Spilsby Sandstone was discussed in an earlier section. The first, and more numereous, is basically of Hunsbury type; the second, resembles Folkestone Beds Group B examples, possessing a wide top, only slightly inclined sides and wide funnel-shaped hopper (Fig.7, a-f). This second form on present evidence, occurs only in Lincolnshire and South Humberside but alongside the more typical (Hunsbury) form. Of the ten examples two are unprovenanced, with single examples from Dalby, North Hykeham, Broughton, Stallingborough, Helpringham Fen, South Ferriby and Dragonby. Those from Dalby, Stallingborough, Helpringham and North Hykeham are presumably stray finds, that from Broughton was recovered from a rockery, CJ 510 from South Ferriby may relate to the late Iron Age settlement, leaving the example from Dragonby as the only fairly securely dated stone, recovered from a cobbled area which was probably at least early Roman. As with some of the Folkestone Beds (Group B) it may be that this form is a slightly later introduction than the Hunsbury style but at present there is far too little evidence to support the argument either way. Two presumably quite early Roman stones from the second Ancaster site (CJ 747 and 759) certainly could have been derived from this form; they are of relatively small diameter with nearly vertical sides, a wide very shallow 'hopper' and unpierced lateral handle socket although they have a slightly concave grinding surface. A similar stone to CJ 747 and and CJ 759 is CJ 301 from Stainsby, Lincs, for which no date is known. This also quite thin with a concave top and grinding surface and lateral unpierced handle socket.

Lower stones

Two lower Roman stones were examined, CJ 508, South Ferriby, which has a convex grinding suface, a base of similar diameter to the grinding surface and a cylindrical, pierced spindle hole, and CJ 515 from the villa at Old Winteringham which also has a cylindrical spindle hole. A number of other lower stones (among them at least some of Iron Age date) are also pierced; CJ 542, 555, 576 and 753, in which the spindle hole is cylindrical, and CJ 152 and 528 which have a hole drilled from both upper and lower surfaces. In the latter two examples the spindle hole (the drilling from the grinding surface) similar shape to those of the unpierced stones, but the drilling from the base is a deep cone shape. These may represent an original intention to shape the stone into an upper quern. The deliberately pierced lower stones (i.e. those with cylindrical spindle holes) on present evidence seem to be of early date and limited geographical distribution. There are as yet none from from Suffolk, Norfolk and Essex (where any lower stones are scarce) or the northern part of the main distribution area; the examples currently known are CJ 542, Eynesbury, Cambs, CJ 555 and 576, Aldwick, Herts, CJ 529, unprovenanced, Peterborough Museum, and CJ 753, Ancaster Quarry, Lincs. Of these the first is undated, those from Aldwick ascribed to the Middle Iron Age (CR'ASTER, 1961) and that from Ancaster also dated to the Middle Iron Age. Thus the feature appears to be an early rather than a late one, but which possibly continued into, or was reintroduced in, the Roman period.

5.4.2 Lodsworth Hythe Beds (Fig.6)

The quernstones of siliceous Hythe Beds sandstone (from Lodsworth) within the present study region lie within the northern part of the distribution of products fron the quarry at Lodsworth mapped by Peacock (PEACOCK, 1987). There are examples from Northamptonshire, Bedfordshire, Buckinghamshire and Hertfordshire, albeit in relatively small numbers and to the west there are small but significant numbers of Roman querns of this litholcgy from Oxfordshire, e.g., from Gravelly Guy. They have not yet been found in any further north, the querns from Brigstock, Northants, being the most northerly example to date (M.E.WRIGHT, pers.comm.). The majority of stones of this rock are found in southern England, particularly Sussex, Surrey and Hampshire but also Bedfordshire, Buckinghamshire and Hertfordshire and there is one example to date from Gloucestershire (PEACOCK, 1987; 78). The earliest dated examples are from Danebury, of fourth 4th century BC at the earliest (CUNLIFFE, 1984; 413, no. 8:25) A considerable number of saddle querns of this rock have also been recognised in Hampshire, Surrey and Sussex (PEACOCK, 1987; 77).

5.4.3. Folkestone Beds (Fig.6)

The Folkestone Beds querns examined are largely confined to Kent with only a few scattered examples outside the county, from the southern part of the study region. Those from Kent are found mainly in the eastern half of the county. There are two stones from Hunbury, and single examples from Odell, Beds, Guilden Morden, Cambs, Wilbury Camp, Herts, East Bergholt and Witnesham, Suffolk and Colchester Museum (unprovenanced). There is no other contextual information for the Hunsbury two which can therefore only be dated within the duration of the hillfort; they may, therefore, be of Middle or Late Iron Age date. Similarly; the upper stone from Wilbury Camp can only be dated to the period fifth to first century BC (APPLEBAUM, 1949), and hence also appears to belong to the pre-Roman Iron Age as does the Odell upper stone which is from a context dated to the early to mid first century AD, although the amount of wear indicated suggests a considerably earlier date of introduction to the site (ODELL SITE ARCHIVE).

At present the earliest working of roughouts from Folkestone Beds at Folkestone remains undated, pottery recovered from the same cliff section is belonging to the period 10 to 80 AD (KELLER, 1988; 1989), although the finds from Hunsbury and Wilbury Camp, for example, would seem to suggest quern manufacture here from a much earlier date, as do finds of saddle querns of this lithology in Kent. There is one unfinished upper stone of Group A form from the Roman villa site at Folkestone, again for which a context is not recorded. CJ 675 which is also of similar form was found at White Hall Road, Canterbury and is dated to the mid first century AD. In general the Group A form is uncommon among quern finds in Kent, the majority being of type B, although it is well represented among the roughouts at Folkestone.

The Group B form Folkestone Beds querns come mainly from excavations of Roman sites; it is possible that this style is of slightly later date than type A although the evidence is at present insufficient to support any conclusion. Even within Kent the material seems to have been largely superceded by other rock types for quern manufacture during the Roman period, and among 'beehive' types the western half of the county has produced large numbers of Puddingstone querns and few examples of greensand. At Fordcroft, near Orpington, a Romano-British site occupied from the second half of the first century AD the numerous quern fragments are predominantly of Millstone Grit and imported lava (TESTER, 1969). There is some continued use of Folkestone Beds, for example, this lithology is represented at the lithologies used for querns at Baston Manor, Hayes together with lava and Millstone Grit (PHILP, 1973).

5.4.4. Upper Greensand

Querns of Upper Greensand have been identified at several sites, mainly in southern England. Beehive querns of this source are recorded from, e.g., Appleford, Oxon, two of Sussex form (HINCHCLIFFE & THOMAS; 1980; 82, nos. 9, 10); Boscombe Down, Wilts, two upper stones of Wessex form associated with Middle Iron pottery (RICHARDSON, 1951; querns no.3,4), Danebury, again as Wessex style upper and lower stones from phases 6 and 7 (CUNLIFFE, 1984; 414, 8:26: 416, 8:30); Hengistbury Head, Dorset of late Iron age to Romano-British date (CUNLIFFE, 1987; microfiche); and Hermitage, Berks, an upper stone of Sussex style, the site as a whole belonging to the 3rd to the 2nd century BC (WOOD, 1959). Flat querns of this lithology are recorded at, for example, Camerton, Somerset (WEDLAKE, 1958; querns 1, 5, 6, 7), Sanderstead, Surrey (LITTLE, 1964; quern no.1) and Neatham, Hants (MILLETT & GRAHAM, 1986; quern no. 515) and saddle querns at, e.g., Boscombe Down, Wilts (RICHARDSON, 1951; quern no.1) Danebury, Hants, (CUNLIFFE, 1984; microfiche) and Maiden Castle, Dorset, where there is also a single rotary stone of Wessex form of this rock (WHEELER, 1943; 323, no. 4).

5.4.5. Other Greensand querns

In addition to these examples there are numerous published querns identified as either "Lower Greensand" or simply "greensand" for which a more precise source is as yet unknown. These have been found mainly in Southern England, and include saddle querns from Bishopstone, Sussex (BELL, 1977; Fig.59, no.2,3), Aldermaston Wharf, Berks (BRADLEY et al, 1980; quern no.2), Allards Quarry, Marnhull, Dorset (WILLIAMS, 1950; quern no.39), Farmoor, Oxon (LAMBRICK & ROBINSON, 1979; 60, Fig.31, no.27, 28) and Little Woodbury, Wilts (BRAILSFORD, 1949). Rotary querns of greensand from an undetermined source include stones from Belbury Camp (JECOCK, 1981; 30, nos.5,6), Allards Quarry (WILLIAMS, 1950; querns 40, 41, 42, 43), Hengistbury Head (CUNLIFFE, 1987; 170, nos.18, 20, 21) and Pamphill, Dorset (FIELD, 1966), Rucstalls Hill, Basingstoke, Hants (OLIVER & APPLIN, 1973; quern no.45), Somerton (LEECH, 1981; querns no.6,8) and Catsgore, Somerset (LEECH, 1982; 129, no.5, 9, 11, 12), Ufton Nervet, Berks (MANNING, 1974; quern no. 7, 8), and Elsted, Sussex (REDKNAP & MULLETT, 1980; 218, Fig.13, 55-61).

There are also scattered examples of querns of other rock types that are probably of Cretaceous origin, in particular those stones identified as carstone. Saddle querns of this lithology include examples from Hayes Common, Kent (PHILP, 1973; querns 147-50), Sanderstead, Surrey of Wealden ironstone (LITTLE, 1964; quern no. 1,2), and Studland, Dorset, of local heathstone (FIELD, 1965; quern no.1, 3). Two rotary querns from Rucstalls Hill, Basingstoke, Hants, are described as slightly ferruginous gritstone (OLIVER & APPLIN, 1978; quern no. 43, 44) and there is a rotary quern of carstone from Bexley, Kent (TESTER & CAIGER, 1954).

Peacocks work (PEACOCK, 1987) has re-identified a number of stones originally published as "greensand" or "Upper Greensand" (e.g., some of those from Danebury) as products of Hythe Beds from Lodsworth. This suggests that a major petrological investigation of all of these greensand querns is overdue. This is one area in particular that would benefit from the application of thin-section analysis to identify lithological groups among the querns and comparable sources. Many querns have in the past been assigned to the nearest greensand outcrop but recent research by Peacock and others indicates that, in general, this is far from the case. A regional petrologically based study of southern England might instead point to relatively few quarries producing a high percentage of the greensand querns found in this region.

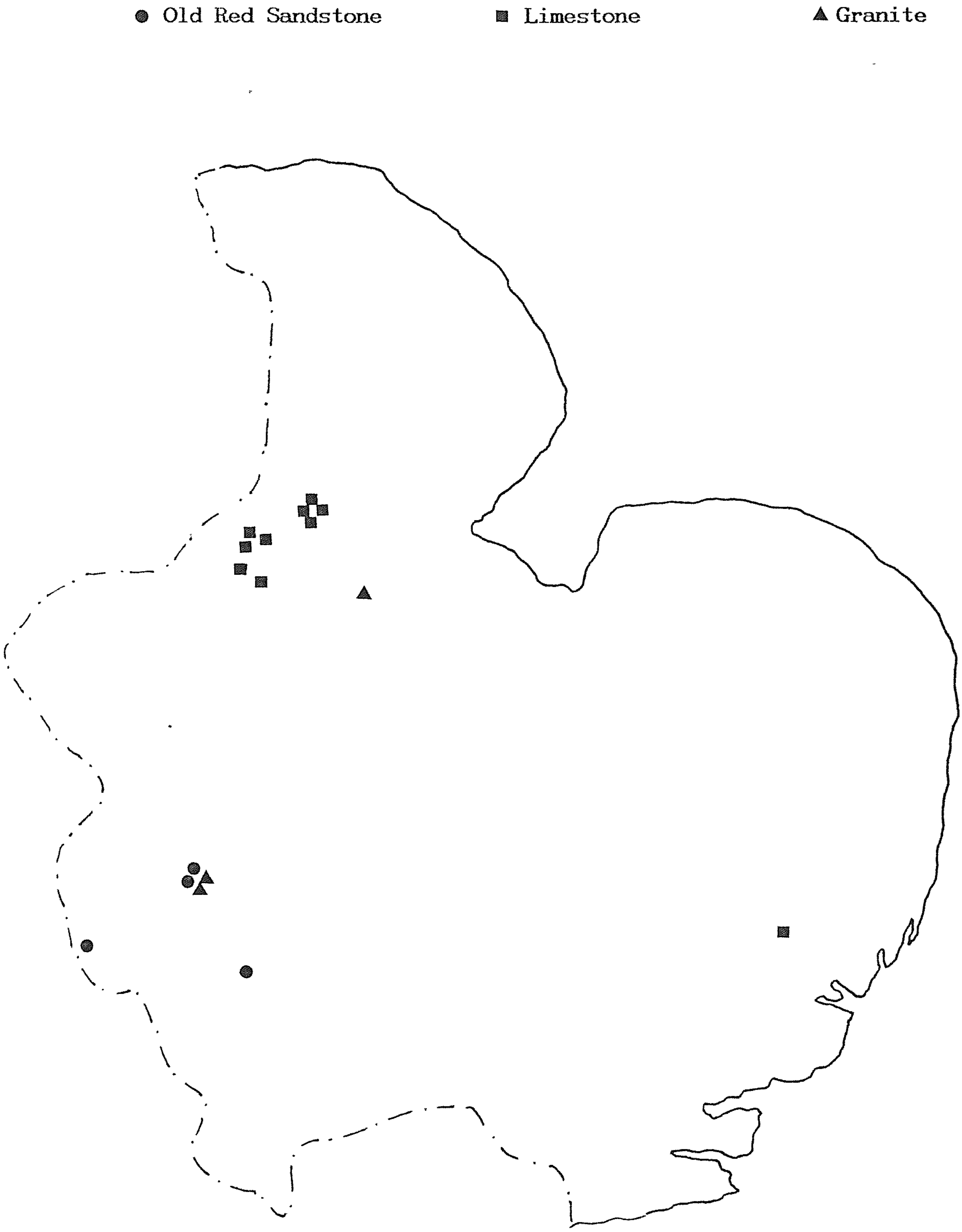


FIG. 8: Distribution of beehive querns of Old Red Sandstone, Limestone, and granite.

CHAPTER 6: TERTIARY

6.1 Puddingstone

Numerically the greatest proportion of querns of Tertiary rocks encountered in the study area are of flint conglomerate, puddingstone, a general lithology readily recognisable in hand specimen and hence not subjected to microscopic analysis, the majority, at least, probably of Hertfordshire Puddingstone, of the Reading Beds.

6.1.1 Outcrop

For the most part the Reading Beds comprise mottled plastic clays and light coloured sands with thin layers of flint pebbles. In places the sands are indurated and cemented by silica into large irregular masses, the sarsen, boulders of which are scattered over a wide area of southern England. The pebble beds that are similarly cemented form lumps of conglomerate, e.g., the Hertfordshire Puddingstone, and some boulders are only patchily conglomeratic (SHERLOCK, 1960; 28-31). "Sarsen conglomerates are common to the north-west of London (Hertfordshire Puddingstone)......and further west towards High Wycombe (Bradenham Puddingstone).....In some areas, particularly in Hampshire and Sussex, sarsen conglomerates containing angular rather than rounded flint pebbles (flint breccias) are common" (SUMMERFIELD & GOLDIE, 1980; 78). The distribution of sarsen and puddingstone boulders covers a far wider area than the present outcrop of Reading Beds, reflecting the original extent of the latter. The main outcrop of Hertfordshire Puddingstone at the present day is at Radlett, Herts. Puddingstone outcrops are also noted by Rudge between Colchester and Chelmsford, generally a rather soft variety but including some firmer deposits that have been used in the building of local churches (RUDGE, 1965; 247). Rudge suggested a source in north-west Essex for the puddingstone querns, where there "is a very extensive outcrop of puddingstone and boulders of it lie scattered in the surrounding countryside" (RUDGE, 1965; 27).

Further south Crawford recorded a quern quarry in Tertiary deposits at Worms Heath, Chelsham, Surrey, where a pebble bed at the top of the Oldhaven Beds was worked (CRAWFORD, 1953; 105). Beyond Britain Rudges survey records 44 puddingstone querns at Rouen Museum from the provinces around the mouth of the River Seine (RUDGE, 1965).

The suggestion of a single quarrying site has arisen from more than one author, the regularity of form thought to indicate that all these querns were made within a fairly small area. The lithology is not seen among flat, Roman type querns, Hurcombe concluding that the rock was unsuitable for this use because of the size and shape of the available boulders of raw material (HURCOMBE, 1981). Similarly, King noted a general range of forms corresponding to the "currant bun" shape, distinguishing these querns from those of other rock types as only a limited range of forms were produced (KING, 1982).

6.1.2. Puddingstone querns

The present survey includes 254 examples of Puddingstone, of which fragmentary material represents a higher proportion of the total than for other rock types. Due to its limited outcrop and highly distinctive lithology it is more readily recognised as worked, quern material on excavations than more commonly occuring sandstones, comparing in ease of recognition with the imported Rhenish lavas. Among fragmentary material Puddingstone may thus be slightly overrepresented compared to some other rock types and the relative proportions of different rock types may not be truly representative. Lithologically these querns show some variation in pebble size and in matrix and pebble colouration, although all contain well rounded pebbles of flint set in a siliceous matrix.

Of the total number 71 are lower stones, 164 are upper stones and 19 are too fragmentary to determine. They show a very widespread distribution but are concentrated in Hertfordshire, Norfolk, Suffolk, Essex, Cambridgeshire, Bedfordshire and Buckinghamshire. There are significant numbers in Northamptonshire and Kent and more scattered examples in Leicestershire and Lincolnshire. Taking the number of puddingstone querns in relation to the total number of beehive querns examined per county, the highest proportions occur in Hertfordshire Norfolk and Essex (85-90%) with a reduction in percentage away from these counties. Although Oxfordshire does not fall within the scope of the present survey an examination of material at the Oxford Archaeological Unit suggested that there are probably also a significant number from that county.

Upper Stones

From an initial examination the upper stones do appear to be remarkably consistent in form, an overall 'bun' shaped with a deep dished-funnel shaped hopper (the shape of which is almost unique to the rock type) and a flat to slightly concave grinding surface. They may possess a circular unpierced handle socket and/or handle groove.

A few examples varying from this 'typical' shape are immediately apparent. CJ 348, unprovenanced in Ipswich Museum, lacks a distinct hopper at the present day and has a wide feed, 4 cms in diameter. The handle socket, now worn onto the grinding surface, is sub-rectangular in cross-section and 7 cms long. The stone also has a handle groove placed 4 cms above the grinding surface of the stone, at a height corresponding with the top of the handle socket which it may post-date. The rock contains rather small black-rimmed pale coloured pebbles which are somewhat atypical in colouring. CJ 392, Erpingham, Norfolk, is the pierced puddingstone quern which most closely approaches the Hunsbury form. Although it is generally of East Anglian 'bun' shape it has a flat top, cup-shaped hopper and rectangular handle socket. It is of grey weathering puddingstone containing yellowy orange dark rimmed pebbles. CJ 448, unprovenanced, Colchester Museum, is another of puddingstone similar to CJ 348; it has rather small, light coloured pebbles. In shape it tends towards the Hunsbury style, flat topped, with an almost cup-shaped hopper, although this is deep and relatively narrow at 6.5 cms in diameter and 11 cms in depth.

The sub rectangular handle socket pierces the base of the hopper. There is a second example from Colchester Museum, CJ 444, which is flat topped with a small diameter, deep, cone shaped hopper and handle groove but no handle socket. CJ 353, Ipswich Museum, also has a pierced handle socket.

There is a single example of an upper stone of the form of Group B Folkestone Beds querns, CJ 645, an unprovenanced stone in Saffron Walden Museum. This is of a conglomerate which is atypical of most Puddingstone querns, although there are a number of a similar material among the collection at Maidstone Museum, containing small pebbles and a more easily weathered matrix unlike the very homogenous 'typical' puddingstone in which the pebbles are generally lost before the matrix. CJ 707, Maidstone Museum, is also rather flat topped and of similar rock to CJ 645. The stone is rather tall compared to most upper stones of puddingstone with a handle socket that is only 2 cms deep and possibly was never quite finished. CJ 698, from Hadlow, Kent, is the only puddingstone example with a handle slot in the top of the stone although the quern is otherwise of similar shape to other querns of this lithology. The rock comprises generally small, dark pebbles in a creamy buff matrix. The handle slot is 5 cms wide at the outer edge tapering to 3 cms at the hopper and is 4 cms deep, thus of different proportions to those of the Sussex style querns.

It is possible to divide the remaining upper stones into two groups differing in general form although several examples appear to be intermediate between the two;

Group 1: The largest of the groups are the 'typical' (East Anglian) form, those often referred to as bun-shaped in the literature, which may or may not possess a handle socket and/or groove. These usually have a narrow feed but in some cases there is now a wide 'feed' which may be the result of wear such that the quern has been ground down to the base of the hopper.

Group 2: The second type is rather flatter in which the feed merges with the hopper, the latter showing little or no dishing as in the first group. This group includes CJ 354 (unprovenanced, Ipswich Museum), CJ 411 (Great Snoring, Norfolk), CJ 561 (Great Staughton, Cambs) and possibly CJ 614 (Ravenstone, Bucks). The two types do not have different geographical distributions.

The upper stones range in diameter from 21 to 37.5 cms clustering between 24.5 and 31.5 cms. The maximum extant height is 17.5 cms but the majority are between 8.5 and 15 cms tall. King suggested that the larger diameter stones were possibly a western variation (KING, 1982) but of the 17 examples in this study over 32 cms in diameter eight are from Norfolk, two from Kent, three from Essex, two from Suffolk, one from Hertfordshire and one from Bedfordshire. Hoppers are generally of 6.5-10 cms in diameter and in most instances the depth exceeds the diameter. On present evidence the differences in form do not appear to relate to geographical distribution, but there is insufficient dating for most of these to enable an assessment of chronological variation.

Lower stones

The lower stones are also generally consistent in form, 'bun' shaped, tending to hemispherical in some cases, with a flat or slightly convex grinding surface and, usually, an unpierced spindle hole 3-3.5 cms in diameter.

6.1.3. Distribution and Dating

In this lithology, as with the greensands, and perhaps to an even greater extent, many of the querns are chance finds, or examples for which a general provenance is the only available data. This is excusively the case for the puddingstone querns examined in Suffolk. Elsewhere for many querns other finds are known in the same locality, e.g. parish, although the proximity and original relation of these to the quern (if any) and hence their potential relevance with respect to the latter are not known. In Lincolnshire contexts are known for the puddingstone querns from Dragonby, although two are from unstratified contexts and two were associated with fragments of imported lava. In Norfolk Puddingstone quern fragments were recovered from both phases

FIG. 9: Distribution of the Puddingstone querns.

of occupation at Scole, a Romano-British settlement of the late first to late third century AD (ROGERSON, 1977; Fig.64, no.5,6), at North Creake from an area in which Roman material has been recorded, and at Saham Toney, a Romano-British settlement established in the later Iron Age (BROWN, 1986).

In Essex puddingstone querns have been found at the Roman towns at, e.g., Kelvedon and Great Chesterford (CJ 449, 450, 571) and finds from or from the vicinity of Roman settlements are also known in Buckinghamshire, e.g., Magiovinium, Yewden. There are also two puddingstone querns from Ravenstone, Bucks, which may relate to the short-lived rectangular enclosure of late 2nd to early 1st century BC date in the parish (MYNARD, 1970). Northamptonshire examples include CJ 503 from Duston, a site that has produced belgic pottery but no pre-belgic material and a Roman coin series covering the period 1st to 4th centuries AD (RCHM 1985). One example of relatively early date could be CJ 577 from Cherry Hinton War Ditches, Cambs, a small single ramparted site which has produced material of the 4th to 3rd and 1st centuries BC and was resettled in the Romano-British period although it is not certain to which phase of occupation the puddingstone quern belongs (WHITE, 1964 a and b).

Thus for the Puddingstone querns, the dating of their initial introduction and use remains very tentative. They do seem to be common in Roman contexts, perhaps more so than beehive querns of other lithologies, which may in part be attributable to the ease of recognition of small fragments, but few can be firmly assigned to the late Iron Age and as yet definite Middle Iron Age examples are unknown. The published finds from Baldock include Puddingstone examples of mid/late first century AD, upper first to third century, upper mid third century, late third century and upper third or fourth century dates. There is a single beehive quern, of sandstone, of late 1st century BC date from the excavation (STEAD & RIGBY, 1986; 180, Fig.78, no. 787). At Odell 39 pieces of Puddingstone were recovered of which six are from contexts dated to the first half of the first century AD, the rest found mainly in second century contexts but occuring up until the fourth century. Other published finds add little more to this picture; those of Hockwold-cum-Wilton are either Late Iron Age or early Roman date (GURNEY, 1986; quern no.81: SALWAY, 1967), those from Radwell, Herts, are described as Romano-British (KING, 1982) and those from Brickwall Hill, Herts, (KING, 1982) and Puddlehill, Beds, belong to the first century BC or AD (MATTHEWS, 1976). Elsewhere, puddingstone querns are mainly of first or second century AD date, including one from Period 2 at Colchester which predates the destruction of AD 60/1. (BUCKLEY & MAJOR in CRUMMY, 1983; 73-5). At Wendons Ambo the puddingstone fragments were recovered from Roman contexts, although there are quern pieces of sandstone from Iron Age features (HODDER, 1982; 41).

The published examples tend to reinforce rather than greatly extend the distribution mapped in this study for example, stones from Amwell Parva (KING, 1982), Berkhamstead (THOMPSON & HOLLAND, 1976), Watford, a fragment of 1st to 3rd century AD date, (KING, 1982) and Welwyn , one fragment dated 1st to 2nd century AD (KING, 1982) in Hertfordshire; Charing (GROVE, 1959) and Faversham, associated with late pre-Roman Iron Age pottery (PHILP, 1968), in Kent; Briar Hill, Northants (BAMFORD; 1985; 100, Fig.50); Gestingthorpe, Essex, from the earliest phase of this Late Iron Age and Roman site (DRAPER, 1985; 75, no. 427); and Foston, a stray find, (MARJORAM, 1974) in Lincolnshire. Few puddingstone saddle querns are documented but one possibility is a fragment from Little Waltham, Essex (DRURY, 1978; 112, no.11:10).

At present, there are no examples from contexts earlier than the first century BC. Most stones do exhibit considerable amounts of wear and imply a long period of use prior to discard, but there is still insufficient evidence to place their introduction before the mid second century BC, somewhat later than the earliest extant dates for beehive querns of other lithologies. It may be significant that they appear to be absent at Hunsbury, although Phillips noted one example from here there are none now labelled as such at Northampton Museum

(PHILLIPS, 1950) despite their forming quite a high percentage of the beehive querns in the rest of the county.

6.2 Sarsen

Sarsen has not been identified among the querns of the present study area but this lithology has been used for both saddle and rotary querns in, for example, southern England. It appears to have been more commonly used for saddle than rotary querns and examples of the former are recorded from Baldock, Herts (STEAD & RIGBY, 1986; 179, no.788), Bishopstone, Sussex (BELL, 1977; rubber no.1), Carshalton, Surrey (ADKINS & NEEDHAM, 1985; querns 409, 410), Danebury, Hants (CUNLIFFE, 1984; microfiche) Maiden Castle, Dorset, of Neolithic date (WHEELER, 1943; 322, no.1), Newhaven, Sussex (BELL, 1976), Pewsey, Wilts (THOMPSON, 1971), Rucstalls Hill, Hants (OLIVER & APPLIN, 1978; quern nos.40, 41) and Winnall Down, Hants, (FASHAM, 1985; 80, no.2). Jecock lists a small number of rotary stones of sarsen, for example, a beehive upper stone Wessex type from Durrington Walls, and other stones from Clatford Bottom, Clyffe Pypard, Rushall Down and, possibly, Westbury, Wilts (JECOCK, 1981; 45, no.111:44, no.106: 46-48).

CHAPTER 7: IGNEOUS ROCKS

7.1 Querns in the study area

General

There are seven querns in this category, mostly of granitic rock but including one example of a basic igneous rock. Geographically they show no particular concentration; there are four examples from Northamptonshire, one from Leicestershire, one from Lincolnshire and the seventh is from Norfolk (Fig.8). None of the granitic types (for which there is more than one source) have been thin-sectioned. CJ 123 (Hunsbury, Northants) and CJ 231 (unprovenanced, Leicester Museum) are probably of Mountsorrel Granodiorite, from the Mountsorrel Complex, Leicestershire. CJ 121 (also Hunsbury) is possibly from the same locality, as could be CJ 498 (Northampton). CJ 526 (Hacconby, Lincs) is also of pink granite but from a different source whilst CJ 485 (Spratton, Northants) is of a white granite and most likely made from a glacial erratic. CJ 362 (unprovenanced, Norwich Museum) is of basaltic composition and again was probably made from an erratic boulder. .

Typology

As expected with differing sources, the forms of these querns are equally varied. CJ 123 and CJ 121 are basically of Hunsbury form although CJ 123 has a rather rounded top and funnel-shaped hopper. CJ 231 is a rounded, almost hemispehrical in profile, irregularly-shaped (generally boulder-like) upper stone. It has an unpierced horizontal handle socket entering the stone at an oblique angle to the outer surface (instead of perpendicular as is more usual) and a funnel-shaped hopper. CJ 498 is more like the Puddingstone type B querns possessing a nearly vertical sided hopper/feed and generally flat grinding surface. CJ 526 is of unusual shape, generally of flattened bun shape with a concave grinding surface and a deep narrow handle slot which does not extend to the feed; the stone lacks a true hopper. The single lower stone, CJ 485, is of typical Hunsbury

(Midlands) form and unpierced with a slightly convex base and a flat grinding surface.

Sources

The nearest outcrop from which these could be obtained is the Mountsorrel complex of Leicestershire which comprises a gabbro intruded by firstly a diorite and then granodiorite. The main outcrop, covering 6 square kilometres, is of granitic textured biotite granodiorite, generally light reddish brown in colour (LOWE, 1926). Although a few of the querns are probably derived from this oucrop the others are of different sources and probably from locally available erratics.

7.2 Additional, Published examples

The exploitation of granitic rocks for rotary querns although common in the Lake District (INGLE, 1987) is rare in the Midlands and southern England, the proportion of querns (both saddle and rotary) of this lithology increasing again in the south-west. There are scattered saddle querns of various granites from, for example, Bishopstone, Sussex (BELL, 1977; Fig.59, no.2), Aldermaston Wharf, Berks (COWELL et al, 1978: BRADLEY et al, 1980; quern no.1), West Harling, Norfolk (CLARK & FELL, 1953; quern C) and Totnes, Devon (HOULDER, 1963; quern nos. 19, 20, 22). Beehive rotary querns are recorded from Orpington, Kent (TESTER, 1969), Old Winteringham, Lincs (STEAD, 1976; 229, quern no. 229), Shipton Gorge, Dorset (FARRAR, 1956), and Thurlestone, Devon (GREENE, 1970).

In a preliminary investigation of beehive querns in Cumbria (INGLE, 1987), out of 33 examples examined from six museums in the county 25 are of granitic rock, both grey and pink types. The design of these querns is variable and several source rocks are represented; two of the upper stones (CJ 31 and 25) are decorated with radial grooves over the outer surface of the quern. Although there are several potential sources of granite within the region, the distribution and lithological variation suggests that the majority were worked from erratic material, probably from both Cumbrian and Scottish sources.

Other igneous and aLso metamorphic rocks, also represented as both saddle and rotary querns. There are, for example, saddle querns of, altered gabbro at Burghfield, Berks (BRADLEY et al, 1980), quartz porphry at Dainton (SYLVESTER, 1980; Figs. 8.2, 8.3) and Newton Abbott, (GALLANT & SYLVESTER, 1985; quern nos.3,4), Devon, volcanic dolerite at Feltwell, Norfolk (GURNEY, 1986; quern no.41), syenite at Ryton on Dunsmore, Warwicks (BATEMAN, 1977; Fig.116, no.4), and local lava at Totnes, Devon (HOULDER, 1963; quern no.23). Beehive forms are more common in South-West England and are recorded from, for example, Corton Denham, of rhyolite (JECOCK, 1981; 31, no.10), and Puncknowle, of porphyritic rhyolite, (BAILEY, 1985; 82, Fig.17, no.2) Dorset, Newton Abbott, (GALLANT & SYLVESTER, 1985; quern nos.1,2) and Stoke Gabriel, Devon of quartz porphyry (MASSON PHILLIPS, 1966).

7.3. Imported Lava

The final igneous rock type seen in this region in large numbers, although not as beehive querns, and which hence lies beyond the scope of this study is Rhenish lava, querns of which are first introduced into the area study region from the 1st century AD.

CHAPTER 8: A REVIEW OF THE TYPOLOGY OF THE BEEHIVE QUERNS

8.1 Introduction

Some comment on the typology of beehive querns has already been given for each lithology; to a large extent the form seems to be related to rock type although there are many exceptions to this. "There would appear to be good grounds for viewing the rotary quern phenomenon in Iron Age Britain as one with a great deal of regionality in form" (JECOCK, 1981; 4). Most of the querns examined in the present study can be fitted into the series of development outlined by Curwen (1937, 1941) and subsequent authors, but a small proportion cannot be thus assigned and require a revision of the current typology. This chapter will consider each class of beehive quern encountered in a geographical order; the forms not discussed by Curwen have been assigned names to fit in with the existing terminology, i.e., they are named after the area in which they are predominant although they may also be found beyond their type areas. The existing classification was outlined in chapter 1; it is based on diagnostic features of the upper stones but the problem of the classification of lower stones is one that has not really been approached in the same detail as for upper stones. Although some discussion follows in the following section on associated lower stones the latter are dealt with separately in the final section of this chapter.

8.2 The typological classes of beehive (upper) stones (Fig.12)

8.2.1 Sussex (Fig.12, CJ 190)

As defined by Curwen Sussex type upper stones are 30-35 cms in diameter and 15-20 cms thick with a concave grinding surface, a handle slot that extends from the outer edge of the quern to the feed cut into the flat upper surface and an oval or circular feed (CURWEN, 1937; 140-2: JECOCK, 1981; Fig.1). Within the study area Sussex forms are of only limited occurrence. The only upper stones of this class examined are from Odell, Beds, (e.g. CJ 190, 191) and Desborough, Northants (CJ 472), which lacks the markedly concave grinding surface as does CJ 667 from Odell. CJ 190 is 34-35 cms in diameter and a maximum of 12.5 cms thick. It has a small dished hopper and handle slot 2.5 cms deep and 5 cms wide. CJ 191, also fragmentary, is approxiamately 36 cms in diameter, and 7.75 cms in maximum thickness; the handle slot has the same dimensions as that of CJ 190. CJ 472 is 33 cms in diameter and 6.5 cms thick with a small dished hopper and oval feed. All three stones are of Hythe Beds from Lodsworth and are possibly quite late in the developmental sequence between the thick beehives and flatter Roman Sussex style querns.

The rotary querns identified as products of the Lodsworth quarry are all of Sussex form. The early Roman types, although larger and flatter, can still be termed 'Sussex' stones on the basis of overall shape and handle socket form. The use of a handle slot ended by the mid 2nd century AD and the later Roman period saw the adoption of a rectangular feed and a flanged hopper (PEACOCK, 1987; 71).

Lower stones

An initial division between the lower stones of central southern England and those of the Midlands, South East England and Northern England is readily made using the grinding surface as the determining characteristic, convex in the south and flat to the east and north. Distinguishing betwen the Sussex and Wessex forms is less easy. As a broad generalisation, an examination of extant data suggests that the latter (lower stones associated with Wessex upper stones) have a tendency to rather rounded sides and a convex base whereas the Sussex types have straight, slightly inclined and neatly tooled sides and flat to slightly concave and more roughly finished base. Among the examples of lower stones made from Lodsworth Hythe Beds (which could presumably all be termed 'Sussex' as all the upper stones identified as this lithology are of that class) all have a convex grinding surface, often with a marked lip around the spindle hole, well finished sides that are inclined towards the base and usually slightly concave base. The earlier, thicker examples are unpierced.

Within the study area there are a few examples of this type. The thickest two lower stones of Hythe Beds CJ 100 and CJ 108, both from Hunsbury,Northants are typical 'Sussex' forms. CJ 100 is 32 cms in diameter and 16 cms thick, CJ 108 31 cms in diameter and 15.5 cms thick. There are two other lower stones of this lithology from the same site, CJ 165 which is somewhat thinner although of similar diameter (probably due to greater wear) and CJ 167 which has a rather flat grinding surface, showing slight concavity towards the outer edge and shallow dishing around the spindle hole. A further relatively thick example is CJ 715 from Furzton, Bucks although only an edge fragment survives, and thus it is not possible to determine whether the stone is unpierced or pierced. These stones compare well with lower stone identified as Hythe Beds from the Lodsworth quarry rock from, e.g., Burpham and Hascombe Camp, Surrey (PEACOCK, 1987; Fig.3, nos. 4, 6).

There are two flatter, unpierced, Hythe Beds (Lodsworth) lower stones of larger diameter from the present study, CJ 189 from Harrold, Beds (found in a nearby churchyard and so possibly not related to the Middle Iron Age settlement, given the proximity of the later site at Odell) and CJ 196 from an unstratified context at Odell which is 35 cms in diameter. There is a similarly shaped stone of Old Red Sandstone, CJ 182 from Hunsbury, Northants. Further afield a similar lower stone from Gussage All Saints, of Lower Greensand, is illustrated by Wainwright (1979, 91), 38 cms in diameter and a maximum 6 cms thick.

Pierced lower stones from the Lodsworth source include examples from Claycoton (CJ 178), Burrough Hill (CJ 473), Northampton (CJ 488) and Yardley Hastings (CJ 500), Northants; Aylesbury, Bucks (CJ 470); Verulamium, Herts (CJ 601) and Odell (e.g. CJ 660) and Puddlhill (CJ 613), Beds. Of these, one or two are of atypical form compared to other lower 'Sussex' stones, in particular CJ 613 from Puddlehill which has a flat grinding surface and should therefore, perhaps, be considered with the Midlands forms (those associated with the Hunsbury type upper stones). Also uncharacteristic, certainly of the earlier forms, is CJ 601, from Verulamium, which has a convex base and which thus resembles a number of Old Red Sandstone lower stones. Not all of these pierced stones are large. CJ 473 is only 32 cms diameter and a maximum of 12.5 cms thick with an hourglass shaped spindle hole and flat base. CJ 488 is rather thick, 12.5 cms, has a diameter of 34.5 cms, and, like CJ 473, possesses an hourglass shaped spindle hole; it is dated to the first half of the 1st century AD (WILLIAMS, 1974; 41, no. 233).

Upper stones of Sussex form from other sources also occur, although generally a variety of greensand. At Martin, Hants, an example of this form of fossiliferous greensand dated to the first half of the 1st century AD was found found with pottery of "Durotrigian nature". There are in addition two flatter examples of the same material, one definitely of Sussex form, the other of similar profile but lacking a diagnostic handle slot/ socket. A third quern from the site (also a piece lacking a handle socket but otherwise of similar form) is of silicified greensand of the Hythe Beds, and possibly, therefore from Lodsworth (DAMPNEY, 1984; Fig. 139, no.129), as might be the example of Lower Greensand, from Weybridge, Surrey, (HANWORTH & TOMALIN, 1977; Fig.50, no. IV). Rucstalls Hill, Basingstoke, Hants has yielded a very thick example of Late Iron Age date made from ferruginous gritstone and two fragmentary unpierced lower stones have also been recovered (OLIVER & APPLIN, 1978; quern no.43). There are 15 examples of Sussex upper stones from Danebury, Hants, most of which have been identified as Hythe Beds from Lodsworth (PEACOCK, 1987; 78-9) but one of which is described as Upper Greensand and a second as unspecified greensand. All have funnel shaped hoppers (CUNLIFFE, 1988; microfiche). Among the querns from Winnall Down, Hants, the profile of one illustrated upper stone (FASHAM, 1985; 79, no. 8) suggests a Wessex form, the stone having rather rounded sides, a funnel-shaped hopper and a slightly convex top but it also has a handle slot cut into the upper surface. The stone, of Middle Iron Age date, is 37 6cms in diameter, 13 cms thick and of greensand from Lodsworth (PEACOCK, 1987; 79).

In Dorset there are two Sussex upper stones from Gussage All Saints, of Lower Greensand illustrated by Jecock and a third of Lodsworth Hythe Beds which has one normal Sussex type handle slot and a second that does not extend the full radius of the stone. All three stones are from phase 3, 1st century BC to 1st century AD (WAINWRIGHT, 1979; quern no.2261: JECOCK, 1981; quern no.26, 27). An upper stone from Maiden Castle, Dorset, (WHEELER, 1943; 327, no.23) found associated with pottery of the second quarter of the 1st century AD is generally of Sussex form, although the handle socket/slot does not survive on the fragment. It has nearly vertical sides and a concave grinding surface but the top is not quite flat; the stone is of hard sandy limestone. A second example from the site (WHEELER, 1943; 327, no.24) also lacks evidence for handle attachment but is flat topped with a small funnel shaped hopper and thus of general Sussex profile; it is dated to the late Iron Age and is of ironshot quartz grit, probably from the Bagshot Series. Excavation at Hengistbury Head, Dorset, produced approxiamately one quarter of an upper stone of flat topped Sussex form, of maximum thickness 7.5 cms and made from Upper Greensand (CUNLIFFE, 1987; Fig.110, no.3, 9).

Further north there are two upper stones of characteristic Sussex form from Appleford, Oxon, both recovered during machine clearance and identified as Upper Greensand, possibly from Wiltshire (HINCHLIFFE & THOMAS,1980; 82, no.10). Finally, Wakerley, Northants, produced an upper stone of Millstone Grit (of Derbyshire or Yorkshire source) from an unstratified context, for which the handle slot is depicted as extending the full radius of the stone (indicating a Sussex form, unusual in this lithology), although the stone is broken around the feed (JACKSON & AMBROSE, 1978; 229, no.97).

Dating

The chronology of this class was discussed briefly in Chapter 5, and was also dealt with by PEACOCK (1987). The earliest example of Lodsworth rock is from a ceramic phase 5 context at Danebury, thus dating to the 4th century BC at the earliest (CUNLIFFE, 1984). The style continues in use, although altering in dimensions, into the earlier Roman period. The development from thick stones in the Middle Iron Age to larger, thinner examples in the later Iron Age and earlier Roman period appears to have been a gradual, and probably uneven, one but "a somewhat subjective assessment suggests that Roman querns are thinner than Iron Age ones" (PEACOCK, 1987; 70). It is possible that is some areas or for certain purposes the earlier styles continued in use and at present the dating of most of these querns is too imprecise to assess changes within the Iron Age. The rate of change most likely varied within the distribution region. Peacock has noted a number of differences between Iron Age and Roman forms, for example, handle slots are always found on Iron Age examples, and the presence of a hopper may possibly be an early feature, but the period of use of a hopper may vary within the distribution area of the Sussex querns (PEACOCK, 1987; 71).

For those Sussex style querns not manufactured at Lodsworth no single lithology predominates and these are thus possibly 'copies' of those emanating from the main production centre (i.e. Lodsworth) of this form. Dated examples of other rock types appear to belong to the later Iron Age but these are few in number and may not represent the true situation. For example, the two from Gussage All Saints are dated to the latest phase of the site (WAINWRIGHT, 1979; 94-6, 2262, 2270), that from Martin (DAMPNEY, 1984; Fig.139, no. 129) belongs to the early 1st century AD and a Late Iron Age date can also be assigned to the examples from Maiden Castle (WHEELER; 1943, no.23, 24), Hengistbury Head (CUNLIFFE, 1987; Fig.110, 3,9), and Rucstalls Hill (OLIVER & APPLIN, 1978). The stone of Millstone Grit from Wakerley, Northants is from an unstratified context and, although the site was first settled in the Late Iron Age, it is unclear whether the site was occupied in the Roman period. There is, however, evidence of Roman agriculture and industrial working and the quern may therefore be of either Iron Age or Roman date (JACKSON & AMBROSE, 1978).

8.2.2 Hampshire

There are two forms that are apparently related to, and bear some similarity, to the Sussex class. The first of these was proposed and termed Hampshire by Jecock (1981). These are asymmetrical stones which have both a hopper and handle slot but Jecock recorded only three definite examples, from Balksbury and Winnall Down, and three other possible examples. The illustrated example, that from Balksbury (JECOCK, 1981; Fig.9, no. 69) has a rather dished hopper, a shape not generally found among the Sussex style querns, although there is one example from Hengistbury Head (CUNLIFFE; 1987, 169, Fig. 9). Many of the Sussex upper stones do have a funnel shaped hopper, including examples from Hengistbury Head (CUNLIFFE, 1987; 169-70, Fig.120, 121), Burpham and Holmbury Camp, Surrey (PEACOCK, 1987; Fig.3, no. 4, 5), Appleford, Oxon (HINCHLIFFE & THOMAS, 1980; 80, Fig.35, nos. 9, 10), Danebury (CUNLIFFE, 1984; 413, nos. 8:24, 8:25) Winklebury Camp, Hants (SMITH, 1977; quern no.7).

There are too few examples of the Hampshire type at present to determine whether this is a definite geographical (or even chronological) variant or simply a minor variation of the Sussex type that occurs occasionally but which does not justify a separate class. At present it is possibly best to regard the Sussex class as divisible into three sub types; those without a hopper, those with a funnel-shaped hopper and those with a dished hopper. Further finds should enable the validity of different classes for these to be assessed. At present there are no recorded lower stones associated with upper stones of Hampshire type.

8.2.3 South-West (Fig.12, CJ 497)

The second variant of Sussex types (although the similarity to these need not imply derivation from the Sussex types) is more common and differs from the latter in that the handle slot does not extend to the feed or hopper. In other respects the upper stones of this class are very similar to Sussex type upper querns; they have near vertical sides slightly splayed to the grinding surface, a flat top and a concave grinding surface. A number of these were encountered in the present study, all of which are of Old Red Sandstone. The term "South-West" is proposed for these querns which appear to be most common in Gloucestershire, Avon and Somerset, but also occur in South Wales, Wiltshire, Dorset, Warwickshire. Compared to the beehive type querns these tend to be rather flat (and may not really belong in the beehive group) with, usually, a small dished hopper. Within the study area querns of this type are known from Northamptonshire (CJ 497), Bedfordshire (CJ 669, Odell) and Buckinghamshire (CJ 727, Magiovinium). There are several other pieces of upper stones from Magiovinium that may be of this type but which lack the diagnostic feature of a handle slot; CJ 735, 729, 730 and 732. These are all of relatively late date, Roman in the case of those from Magiovinium and CJ 669 from Odell belonging to the late 2nd to 4th century AD. The two upper stones of Old Red Sandstone from Hunsbury (and hence probably of earlier date) are of Wessex form and this South-West class could be a chronological rather than geographical variant of the Sussex types, intermediate between the Wessex Old Red Sandstone stones and the later, flat Roman stones of large diameter.

The present study has been concentrated on beehive querns in the museums visited with only a cursory examination of flat querns in most of the collections considered. The absence of this type elsewhere in the study region may reflect, at least in part, this random sampling of flatter querns, although they do appear to be resticted to the more south-westerly parts of the area. Published examples are of a number of rock types.

At Ryton-on-Dunsmore, Warwicks, an upper stone of this form (BATEMAN, 1977; 36, no.8) was recovered from a sandpit near the excavated area of this Romano-British settlement. The stone, of quartzitic sandstone, is flat topped with a concave grinding surface (less so than in most Sussex forms) and small funnel-shaped hopper. From Cattybrook, Avon, there are two almost identical upper stones of Quartz Conglomerate, probably from the Forest of Dean, approxiamately 35 cms diameter and 6.5 and 8 cms thick. Both have a flat upper surface and a small dished hopper and both were recovered unstratified after excavation of a small Romano-British farmstead occupied from the late 1st to the early 3rd century AD (BENNETT, 1980; Fig.15, no. 3, 4). Also from the county is an upper stones from Sea Mills, Bristol, 38 cms in diameter and 5cms thick at the edge with a pecked concave grinding surface and sub-rectangular feed but no hopper. The quern is of grey brown weathered medium grained sandstone, pinkish grey when fresh (INGLE, 1982; F 5853).

Examples from Somerset are again mainly of Devonian sandstones. Fb 6408 from Herriotts Bridge, Chew Valley, is 35 cms in diameter and 4.5 cms thick with peripheral radial grooves on the slightly concave grinding surface; there is no hopper. A second example, HB 159/6 is slightly larger at 37 cms in diameter and 7.5 cms thick with a rather rounded top but no hopper; the rock is a medium grained quartzitic sandstone (INGLE, 1982). From the medieval site at St Cross Nunnery, Chew Valley, comes one upper stone of this type in pinkish grey, pebbly medium grained sandstone (probably Old Red Sandstone) 33 cms diameter and 5.5 cms thick. The stone is fragmentary and broken around the feed (INGLE, 1982; no. NM 182). There is one example from Chew Park, CP 285/3, which is 41 cms in diameter, and a maximum of 6.5 cms thick. It has a raised rim around the small dished hopper and is of pinkish grey coarse grained sandstone, probably Old Red Sandstone (INGLE, 1982). Other querns from the site are fragmentary and lack evidece for handle slots (RAHTZ & GREENFIELD, 1977; 201-203). Excavation of the Romano-British farm at Catsgore, established in the early second century AD yielded one example of this type made from breccia. The quern is 9 cms thick and lacks a real hopper but has a shallow recessed area around the feed (LEECH, 1982; Fig.90, no.2).

There is a single stone probably of this type from Gussage All Saints, Dorset, illustrated by Jecock which has both a Sussex type handle slot and a second handle slot that does not reach the feed. It is of Lodsworth Lower Greensand and has no hopper although there is a slight funnelling of the feed (WAINWRIGHT, 1979; 95, no.2261: PEACOCK, 1987; 78: JECOCK, 1981; Fig.9, no.26). Maiden Castle, Dorset, also produced one upper stone of this form made of coarse oolitic limestone and associated with pottery of the 4th century AD; it has no hopper (WHEELER, 1943; 327, no.25). The other querns from the site are mainly of Wessex type. One example originally of Wessex form has a handle socket worn onto the grinding surface and a "south-western" style handle slot cut at right angles to this into the top of the stone; it is of soft, slightly ferruginous oolite and is dated to the end of the first century BC (WHEELER, 1943; 326, no.16). It is possible that this stone demonstrates the adoption of different features at a later date which might argue for this style of handle slot appearing later than the Wessex querns. There are at least two South-west style upper stones from Hengistbury Head, Dorset, but many of the other quern pieces recovered lack a handle slot or socket. One stone, (CUNLIFFE, 1987; 169, no.1) of greensand is of relatively large diameter at 40 cms, and has a maximum thickness of 6 cms and a funnel shaped hopper. The upper surface is neatly tooled with radiating striations and the edges pecked with diagonal tooling. The second example, (CUNLIFFE, 1987; 169, no.10) made from Old Red Sandstone, is of similar diameter and a maximum of 3.7 cms thick. Again it is carefully tooled with a very shallow 'hopper' or recessed area around the feed. One stone ferruginous gritstone (CUNLIFFE, 1987; 169, no.11) has a similar profile but lacks any evidence for a handle slot or socket as does a second example (CUNLIFFE, 1987; 169, 14) also of similar profile but thicker, a maximum of 9.7 cms. Where datable the contexts for all these stones are Roman. The site has also produced a number of Sussex style upper stones which are generally fairly thin, and have similar profiles, hence the difficulty of assigning fragments to the correct class without the evidence of a handle slot (CUNLIFFE, 1987).

There are two upper stones of South-west type from Danebury, Hants, type illustrated in CUNLIFFE (1984), one (quern 8:26) of Upper Greensand which is 37 cms in diameter with a very concave grinding surface and the second (quern 8:27) of Hythe Beds from Lodsworth (PEACOCK, 1987; 78-9). Neither has a hopper although there is a slight funnelling of the feed in the first of these. There is a total of six of this type from the site, all of greensand, three identified as Lodsworth rock (PEACOCK, 1987; 78-9), two as Upper Greensand and the one of an unspecified greensand. One (8:26) is undated but the remaining five are from ceramic phase 7, (CUNLIFFE, 1984; microfiche). The single upper stone of this form from Nettleton, Wilts, is 37 cms in diameter and 6 cms thick of grey to grey-brown fine grained quartzitic sandstone (INGLE, 1982).

A few stones of this general form have also been recorded from futher afield, for example, an upper stone from Scarcliffe Park, Derbyshire, which has a markedly concave grinding surface and short handle slot but no hopper; the lithology is not published (LANE, 1973). A second quern from Sewing Shields, Northumberland, has a short handle socket, funnelled feed and concave grinding surface and is made from coarse grained sandstone (HAIGH & SAVAGE, 1984).

Dating

The dating of this form is again rather imprecise in many cases but where datable they appear to be from relatively late contexts, compared to the majority of beehive querns, and are often of Roman date. In southern England, for example, at Maiden Castle the single stone of this form is associated with late Roman pottery (WHEELER, 1943; 329) at Hengistbury Head the stones of this form are probably from Roman contexts (CUNLIFFE, 1987) and at Gussage All Saints the single possibile example is dated to phase 3, the later Iron Age (WAINWRIGHT, 1979). In the west country most South-West type upper stones are from Romano-British settlements, e.g. Cattybrook (BENNETT, 1980) and Sea Mills, Avon (INGLE, 1982), and Catsgore (LEECH, 1982), Somerset. Herriotts Bridge, Somerset, which has produced at least two upper stones of this type, was a small agricultural settlement established in the Iron Age and which continued in use until the third century AD. HB 159 is from a context dating to the late 1st-2nd century AD, Fb 6408 is probably an unstratified find from the excavation (INGLE, 1982; Appendix D: RAHTZ & GREENFIELD, 1977; 202-3, quern nos. 1, 17).

Further west, fom Whitton, South Glamorgan, comes a single unstratified example of this form of Old Red Sandstone (possibly from a source quite near to the site) from a site that has yielded querns mainly of Rhineland lava. This quern has a dished hopper in the base of which are cut two slots to hold the rynd bridge (WELFARE, in JARRETT & WRATHMELL (Eds), 1981; 222, no.5). In the south Midlands dates are again Roman, at Magiovinium and Odell, the single example from Northampton CJ 497, being undated.

The lack of early dates for this class might also be unrepresentative of the class as relatively few early rotary querns are as yet known from the Somerset-Avon-Gloucester area. Fragments of querns from Cadbury Camp, Tickenham include a rather roughly finished thick lower stone 34 cms in diameter and 15 cms thick with an almost flat grinding surface, of pale pinkish grey medium grained quartzitic sandstone that could be of Devonian origin and a rather thin asymmetrical upper stone (of which approxiamately one quarter survives) of general Sussex or South-Western profile but on which no trace of a handle socket survives. It comprises a pebbly, dark pinky grey, medium to coarse grained sandstone probably derived from the local Devonian outcrops. There is a thick upper stone of general Wessex form (on which no handle socket is preserved) from Cadbury Camp, which has a concave grinding surface and slightly concave upper surface of medium to coarse grained quartzitic sandstone, which could be of local Devonian or possibly Carboniferous origin (INGLE; 1982).

Lithological distribution.
This South-west form is represented by two main lithologies types

although there are also a few examples of other rock types. The first of these is Old Red Sandstone, most probably from the Bristol-South Wales area, examples of which are recorded from Northampton, (CJ 497), Magiovinium, Bucks, St Cross Nunnery and Chew Park, Somerset, Sea Mills and Cattybrook, Avon and Whitton, South Wales. These are all from Roman sites and posess a small hopper, which in most cases is dished. The second main group is of greensand, examples of which have been found at, for example, Danebury, Hants (CUNLIFFE, 1984; 414, 8:26, 8:27), and Gussage All Saints (WAINWRIGHT, 1979; no.2261) and Hengistbury Head (CUNLIFFE, 1987; Fig. 120, no.1).

Other querns of this type made from, as yet, unidentified sandstones have been found at Ryton-on-Dunsmore, Warwicks, (possibly Old Red Sandstone) (BATEMAN, 1977; Fig.16, no.8), Catsgore, Somerset, of breccia (LEECH, 1982; Fig.90, no.2), Nettleton, Wilts, Herriots Bridge, Somerset (INGLE, 1982), and Sewing Shields, Northumberland (HAIGH & SAVAGE, 1984). These in general lack a hopper, although this feature is seen for example at Hengisbury Head, and the apparent correlation between Devonian sandstones and the presence of a hopper (and a corresponding absence of a hopper in other lithologies) may not be substantiated by a larger body of data.

8.2.4 Wessex (Fig.12, CJ 149)

The second major southern form, apparently contemporary with the Sussex type, were termed by Curwen 'Wessex' types. These are,on average, of similar dimensions to the Sussex stones, 30-35 cms in diameter and 15-20 cms thick. They have a concave grinding surface, lateral unpierced handle socket and either flat or slightly concave top with or without a hopper. Few of these were encountered during the present study, which lies outside the main distribution area of this form. There is one quern from Stainsby, Lincs, (CJ 301) that resembles this form but is of small diameter and very worn. The two other examples are both from Hunsbury. CJ 143 is 32 cms in diameter and 15.5 cms thick with a slightly oval feed, sub-rectangular handle socket and slightly concave top with a flattened rim. CJ 149 (Plate 1) is slightly larger, 35.5 cms in diameter, and also has a concave top and sub-rectangular handle socket of the same dimensions as that of CJ 143.

Beyond the present study area the Wessex types are most common in central-southern England, and are found in Oxfordshire, Wiltshire, Hampshire, Dorset and Somerset; there are also possible examples from Avon. A stone from Farmoor, Oxon (LAMBRICK & ROBINSON, 1979; 60, no. 32) of "fine/medium grained non calcereous grey-green subarkose with some ?glauconite and small fragments of phosphatic material" is similar to the Hunsbury examples although the shape of the handle socket is not stated. It is rather a small stone at 28-29 cms diameter and 12.5 cms thick and is an unstratified find from this Early Iron Age to Roman site (LAMBRICK & ROBINSON, 1979; 61).

In Wiltshire upper stones of this type are recorded from, for example, Little Woodbury, Boscombe Down, Highfield Pits and Fyfield Bavant. The Wessex type upper stone from Little Woodbury (BRAILSFORD, 1949; 162, fig. 8) has rather rounded sides and top and a slightly dished hopper. It is of glauconitic sandy limestone, suggested to be Kentish Rag although similar lithologies can be found at closer outcrops (BRAILSFORD, 1949; 163). Boscombe Down, produced two examples of this form, similarly shaped and both of glauconitic calcareous sandstone identified as Upper Greensand of local origin. The first (JECOCK, 1981; Fig.8, no. 100), of large diameter, 49 cms, and a maximum of 17 cms thick, is from a pit containing Middle Iron Age pottery. Like the second stone (JECOCK, 1981; fig.8, no.101) it is flat topped with a shallow dished hopper. There is a single example from Highfield Pits which has a quite markedly concave upper surface. The stone, 36 cm in diameter and 16 cms thick, is of glauconitic sandstone of Upper Greensand origin and Iron Age in date (JECOCK, 1981; fig.8, no.113). The Wessex style upper stone from Fyfield Bavant, (JECOCK, 1981; fig.8, no.112) is 40 cms in diameter and 14 cms thick with a shallow concave upper surface and short handle socket. This is also Iron Age in date and of greensand (JECOCK, 1981; 45, no.112).

Hampshire examples are known from, e.g., Danebury and Twyford Down, Winchester. The former, of Upper Greensand, is of quite large diameter (40 cms), has rounded sides and top, a dished hopper and large diameter feed (CUNLIFFE, 1984; 416, no. 8:30). That from Twyford Down in contrast lacks a hopper in the concave upper surface (CURWEN, 1937; 141, Fig.9).

Most of the upper stones of this class from Dorset have a slightly concave upper surface but no hopper although there are, for example, two from Portland that do possess a hopper. The first, from Kingbarrow Quarry (JECOCK, 1981; fig.8, no.65), 44 cms in diameter and 17 cms thick, is of oolitic limestone; it has rounded sides and top and a wide shallow hopper. The second, from Southwell, Portland, of Portland stone also has a large, shallow hopper (JECOCK, 1981; 38, no.57). A third example from Portland (and like the previous two undated) has a concave upper surface (without hopper) and is again of limestone (JECOCK, 1981; 38, no.58). An upper stone from a phase 3 context at Gussage All Saints, of coarse quartz grit (probably Devonian), is flat topped with a funnel-shaped hopper. The handle socket has been worn onto the grinding surface and replaced by a handle slot (WAINWRIGHT, 1979; 32: fig.8, no.22). Three of the four examples of this style from Maiden Castle, all of Middle Iron Age date, are of oolitic limestone and have a concave top. The first (WHEELER, 1943; 323, Fig.114, no.6) is very similar in design to CJ 143, the second (WHEELER, 1943; 324, Fig.115, no.11), has a more concave top than usual and the third (WHEELER, 1943; 324, Fig.115, no.16) is a worn example in which the socket, now worn onto the grinding surface, has been replaced by a "South-west" style handle slot. The fourth Wessex style quern from the site (WHEELER, 1943; 323, Fig.114, no.9) which has rather rounded sides and a funnel-shaped hopper is of dolomitic conglomerate, probably from the Mendips and also belongs to the Middle Iron Age. Like the latter, an example from Corton Denham (JECOCK, 1981; fig.8, no.10) is also somewhat atypical of the Wessex class and resembles that from Gussage All Saints. It is of rhyolite, relatively small in diameter, 30 cms, and 9 cms thick with a large funnel-shaped hopper rather than concave top. Two final examples from the county are more typical of the class, both having a concave upper surface. The first from Puncknowle (found unstratified on this Roman site) is of Lower Oolite, possibly Portland Stone (BAILEY, 1985; 82, no.4) and the second, from Studland, (dated to the second quarter of the first century AD) of ferruginous sandstone, the local Heath Stone (FIELD, 1965; quern no.1).

Three examples from Somerset have a concave top; two illustrated by Curwen from Ham Hill, one of which has a nearly flat grinding surface (CURWEN, 1937; 141, Fig.10, 147, Fig.24), and one from Glastonbury with rather rounded sides (CAULFIELD, 1977; Fig.22, A).

Lithology and distribution

The Wessex form, although discuused by Jecock, has not received as much attention as the Sussex class particularly as regards its lithology. A large number of these querns have been identified as greensand (either Upper, Lower or unspecified) but as yet no detailed petrological study has been undertaken. Thus a similar situation as for the Sussex types may prevail whereby one major greensand source provided the raw material for the majority of these querns rather than the current apparent situation of the exploitation of a larger number of outcrops on a smaller scale.

Two main lithologies are represented among the Wessex type upper stones, greensand and limestone, not necessarily each of a single type. Greensand examples with hoppers are found in Wiltshire, e.g., at Little Woodbury (BRAILSFORD, 1949;162) and Boscombe Down (JECOCK, 1981; Fig.8, 100, 101), and Hampshire, e.g., at Danebury, (CUNLIFFE, 1984; 416, 8:30) and possibly Winnall Down where one stone, from a Middle Iron Age context (FASHAM, 1985; 79, no.8), is of general Wessex profile but has a handle slot. Stones with a concave upper surface but lacking a hopper, occur in Wiltshire, e.g., at Highfield Pits and

Fyfield Bavant both of Iron Age date (JECOCK, 1981; 45) and possibly Dorset, e.g., Studland (FIELD, 1965, quern no.1). The limestone examples nearly all possess a concave top with no hopper, e.g. upper stones from Portland (JECOCK, 1981; no.58), Maiden Castle (WHEELER, 1943; 326, no.11, 16, 325, no.6) and Puncknowle, Dorset (BAILEY, 1985; 82, no.4) but there is one example with a hopper, from Portland, Dorset (JECOCK, 1981; Fig.8, 56).

The lithological differences among the querns of this class appear to be largely geographical. In the eastern part of the distribution area of Wessex querns, in Hampshire and Wiltshire, the lithology is mainly greensand although there are a few examples of other sandstones, e.g. sarsen at Durrington Walls (JECOCK, 1981; 45, no.11). In the western part of the distribution the dominant rock type is limestone although there are also smaller numbers made from Devonian sandstone, e.g., at Gussage All Saints (WAINWRIGHT, 1979; 84, no.2251) and other locally obtainable rocks. Further north the evidence is at present too scanty to determine either the dominant form or lithology of the earliest rotary querns but it is possible that this may prove to be Wessex types of Devonian sandstones. Examples of this form from Somerset and Avon include a stone from Nightingale Valley, Bristol of Old Red Sandstone (INGLE, 1982) and two upper stones probably made in this area reached Hunsbury, Northants (CJ 143 and 149).

On this evidence too the presence of a hopper appears to be a feature of the eastern part of the distribution area. There is one example mentioned above from Dorset but by far the majority are from Wiltshire and Hampshire. A few stones that have a concave top but no hopper are recorded from Wiltshire, e.g., Fyfield Bavant and Highfield Pits (JECOCK, 1981; 45, no. 112, 113) but this style occurs mainly in Dorset and, on the currently limited evidence, Somerset and Avon. Stones with a concave top but no hopper appear be the most numerous Wessex types and to have the largest distribution area; the hopper may thus be only a local variant found in parts of Wiltshire and Hampshire. The differences in form and lithology do not appear to be chronological, both types appearing in the Middle Iron Age, e.g., Boscombe Down, Highfield Pits (JECOCK, 1981; Fig.8, 100, 101, 113) and Maiden Castle (WHEELER, 1943; 326, no.11, 16), and occuring throughout the later Iron Age, e.g, at Danebury, Hants (CUNLIFFE, 1984; no. 8:309, Studland (FIELD, 1965; quern no.1) and Maiden Castle , (WHEELER, 1943; 325, 326). As for elsewhere in the country, and for other quern types, it is difficult to determine when these forms went out of use, no doubt gradually over a considerable time span and at least some were still in use in the earlier centuries AD.

Lower Stones

Lower stones belonging to this class are again more problematical although as a generalisation the lower stones associated with Wessex style upper stones are relatively thick with convex bases and grinding surfaces and more rounded sides than the Sussex lower stones. From Gussage All Saints there is a thick example of coarse quartz grit from phase 1, 31 cms in diameter and a maximum of 19 cms thick. There is a slight lip around the spindle hole, the latter 4.5 cms in diameter and 5.5 cms deep, and both the sides and base have a pecked finish (WAINWRIGHT, 1979; 92, fig.69, no.2157). This stone closely resembles CJ 84 from Hunsbury, Northants, of Devonian sandstone. There are several lower stones from Maiden Castle, presumably corresponding to the Wessex style upper stones found here, illustrated in WHEELER (1943; 323-326), e.g., no.5, of limestone, which has rather rounded sides and base and a marked lip around the spindle hole, no.7 of fine calcereous grit which has a slightly convex base, and other examples of possible Dolomitic Conglomerate from the Mendips, oolite, no.12, impure limestone (probably from the local Jurassic outcrops), coarse ferruginous grit and limestone (WHEELER, 1943; 323-329)

Excavation at Catsgore, Somerset, produced a lower stone with a very rounded base, of Greensand, from the early second century AD occupation. (LEECH, 1982; Fig. 90, 1). From Danebury there are two examples probably of this class, the first (CUNLIFFE, 1984; 417, no.8:34) which has a convex grinding surface and slightly convex base and a second (CUNLIFFE, 1984; 417, no.8:37) of similar shape but much thicker. Most of the lower stones from Hengistbury Head appear to be of the later Sussex type, and have pierced spindle holes, but there is one thick unpierced example of gritstone from a possible Iron Age context. This resembles the lower stone from Gussage All Saints described above in that it has large diameter spindle hole with a lip but the sides are less rounded and the base flat and slightly rough (CUNLIFFE, 1987; 170, Fig.121, no.22). Further west there are two lower stones from Puncknowle, Dorset, one (BAILEY, 1985; 82, no.1) quite thick with a roughly rounded base of local Upper Lias and the second (BAILEY, 1985; 82, no.2) of porphyritic rhyolite which is also, thick with a lip around the spindle hole and has a slightly rounded base and sides; both are unstratified finds (BAILEY, 1985; 80).

8.2.5 Kent

Two other forms have now been identified in southern England, both made mainly from Folkestone Beds sandstone and both of which have already been discussed in Chapter 5. One of these forms appears to be confined to Kent but the second is found both in Kent and, in small numbers at present, in the south Midlands and southern East Anglia. Unlike the other querns of southern England both types have a flat grinding surface. As both appear to have been manufactured in Kent they have been termed Kent 1 and 2, although the latter, despite their common occurence among the roughouts from Folkestone, are as yet poorly represented among the quern finds from the county. The Kent 2 class is thus, at present, represented by relatively few used examples and these are widely scattered.

Kent 1 (Fig.12, CJ 673: Plate 13)

The first of these Kent forms is somewhat bun-shaped in general appearance, although the sides are not as rounded as in the puddingstone querns and, compared to other beehive types, the stones are relatively flat. They have a narrow rounded rim and wide funnel- or V-shaped hopper, flat grinding surface and lateral unpierced handle socket, generally circular in cross-section although an oval example is seen in CJ 672. In two instances among the querns of this type examined the grinding surface was grooved, in both cases in a similar pattern of 'harps,' to that seen on some flat Roman querns but using narrower and more closely spaced and slightly irregular grooves. This grooving was slightly better executed on CJ 685 than on CJ 673 but again is not as regular as that seen on the later flat querns. CJ 685 also posesses a rynd slot at the base of the hopper; this is generally a late feature where seen but probably predating the position of a rynd slot on the grinding surface. A similarly placed rynd slot occurs on, for example, the Old Red Sandstone upper stone from Whitton, South Glamorgan (JARRETT & WRATHMELL, 1981; Fig.84, no.5). The examples seen in Folkestone and Canterbury Museums were mainly recovered from excavations in those towns (the former from the villa) and are all of Folkestone Beds. There is a single unfinished upper stone from Folkestone villa (CJ 696) and this type (Kent 1) is present in small numbers among the roughouts recovered from the foreshore although they are not as common as the Kent 2 form discussed below (KELLER, 1988). CJ 672 is a rather bun shaped example which has a smaller and somewhat more dished hopper than usual, and a replacement handle sock There are a few examples of querns of similar design but different lithologies, e.g. CJ 439 and 645 of puddingstone, both unprovenanced in Colchester and Saffron Walden museums respectively. There is also an upper stone from Richborough, Kent (CURWEN, 1941; 21, fig.19) that bears some resemblance to this class. These examples where datable all have Roman associations.

Kent 2 (Fig.12, CJ 560: Plate 10)

The second Kent form has more nearly vertical sides, is generally flat topped (although the width of the rim varies) and has a wide V-shaped hopper (ususally of larger diameter than the hoppers of Kent 1 type querns) and a generally circular lateral unpierced handle socket. There is one stone from Hunsbury (CJ 103) where the handle socket pierces the side of the hopper and one, CJ 442 (unprovenanced, Colchester Museum), where there appears to be an accidental piercing of the feed. Both querns of this type in Cambridge University museum have had replacement handle sockets, in the case of CJ 560, Isle of Sheppey, a second lateral socket and in CJ 565, Guilden Morden, a handle slot set in the top of the stone. CJ 697 is an unfinished upper stone from Folkestone villa with a partially drilled feed and CJ 702, (unprovenanced, Maidstone Museum) which is still very rough, may also be unfinished. Two finished example of this type from Kent were examined, CJ 686 from Canterbury, which has a grooved grinding surface, the grooves being more wider spaced than those on the two grooved examples of Kent 1 form, again arranged in wedges, and CJ 560 from the Isle of Sheppey. This form is the most commonly recognised among the roughouts from the Folkestone foreshore (KELLER, 1988; 60).

There is a single example of a variant on this second type 675, which also has slightly inclined sides, flat rim and unpierced handle socket but which has a large shallow hopper. A few examples of this style are recognised among the roughouts from the Folkestone foreshore (KELLER, 1988; 60, type 2 upper stones).

Like Kent 1 querns these stones are mainly found in fairly late contexts, generally Late Iron Age dates for both querns and roughouts in Kent although some of those found further afield are perhaps assignable to earlier dates, e.g., the two examples from Hunsbury and CJ 584 from Wilbury Camp, Herts (APPLEBAUM, 1949) although as there are no recorded contexts for these, they may equally have come from the later phases of these sites. CJ 192, Odell, is from an early to mid first century AD context (ODELL SITE ARCHIVE).

Lower stones

There are few lower stones of this lithology, and which might therefore be termed 'Kent' types; CJ 682, 683, 695. Of these CJ 682 is an unpierced example with a generally flat grinding surface and convex/rounded base, CJ 683 (recovered from a garden in Worth, Kent) an unpierced stone which has a convex, grooved, grinding surface and convex base and CJ 695 is a thicker example with a flat grinding surface pierced by a cylindrical spindle hole, and a roughly finished slightly convex base. CJ 695 was recovered from excavations on Folkestone Roman villa, CJ 682 from a floor surface at the Rosemary Lane Car Park site, Canterbury, dated to the late 2nd or 3rd century AD (BENNETT et al, 1982; 184-5). Keller has recognised two forms among the roughouts from Folkestone. The first are pierced and "are essentially circular discs of varying thicknesses with flat or flattish upper and lower surfaces", the second, unpierced "has a pronounced rounded, convex base" (KELLER, 1988; 62).

8.2.6 Lincolnshire (Fig.12, CJ 513)

A second group possessing similar features to the Kent 2 upper stones are found in Lincolnshire, also of greensand but here of Spilsby Sandstone from the Lincolnshire Wolds. These are unpierced upper stones but differ in profile from the Yorkshire/unpierced upper stones that also occur in this area. CJ 290 has a rather rounded top, nearly vertical sides and wide V-shaped hopper with two lateral handle sockets set at the same level in the stone, both worn onto the, grinding surface. CJ 294 is a very large example and CJ 315 quite small. They differ from the Yorkshire types of this lithology in that the diameter of the top is larger in proportion to that of the grinding surface and so are more discoid in profile, and thinner than the tall Yorkshire forms. CJ 510 is similar to the incomplete Kent 2 quern (CJ 697), and CJ 513 and 516 are similar to, e.g., CJ 584 from Wilbury Camp, Herts. CJ 516 has one handle socket worn onto the grinding surface replaced by a second on the opposite side of the stone. Probably later than these but possibly derived from them are two upper stones from Ancaster, CJ 747 and 759. These two are of similar diameter to the 'Lincolnshire' type querns described above but slightly thinner and lacking a hopper although the upper surface in each case is concave. Unlike the Lincolnshire forms they have concave grinding surfaces and so also bear some resemblance to the Wessex forms. CJ 511 is a rather small Lincolnshire example, similar in form to three upper stones from Hayton, North Humberside (JOHNSON, 1978; 84-5, Fig.17 and 18) and, like those, rather intermediate between the Kent 2 and Kent 1 form, the diameter of the top being relatively small compared to that of the grinding surface.

Dating

For the most part these Lincolnshire style querns are unprovenanced (CJ 315 and 511) or stray finds (CJ 290, Dalby, CJ 294, North Hykeham and CJ 513, Broughton, found on a rockery (WILSON, 1970). CJ 510 is a chance find from South Ferriby and could be of late Iron Age date and CJ 516, Dragonby, from a gully that yielded both Iron Age and Roman sherds and is probably of early Roman date. The two Ancaster examples are from the later site here, and so could belong to the later Iron Age or Roman period. There are few other published examples but one possibility from Maxey, Cambs, which has a comparatively small diameter hopper (14 cms) and is of calcite cemented sandstone weathering yellow brown buff. This might be of Spilsby Sandstone and again a relatively late date is suggested, the later first century AD at the earliest (PRYOR et al, 1985; Fig. 117, no.2).

In view of the close similarity between these Lincolnshire types and some of the Kent 2 forms it is debateable whether a separate class name is justified. However they are easily distinguished on the basis of lithology and have discrete (and large) distribution areas and separate names are thus recommended at present. Most of the Spilsby Sandstone (Lincolnshire form) examples occur as finished stones in Lincolnshire (of Spilsby Sandstone), only one unfinished example having been recorded to date from the northern end of the Lincolnshire Wolds (CJ 311), whilst roughouts of Folkestone Beds (Kent 2 forms) occur at Folkestone in Kent and quern finds of this type have been found in Kent, Suffolk, Essex, Cambridgeshire, Hertfordshire, Bedfordshire and Northamptonshire.

Lower Stones

There are no lower stones definitely associated with upper stones of Lincolnshire form. Lower stones of Spilsby Sandstone are generally thick and unpierced with a flat grinding surface (similar to those of Millstone Grit) but a number of pierced examples are also recorded.

8.2.7 East Anglian (Fig.12, CJ 623)

This is probably the class for which the lithology is most closely related to typology although as already mentioned there are a number of variations of form among the puddingstone querns and the situation is not as straightforward as it might initially appear. Curwen initially described the puddingstone querns and 'flat beehive querns' as a single class, which was thought to be derived from the Hunsbury types and to belong to the first two centuries AD. The puddingstone querns were subsequently discussed as a separate class (CURWEN, 1941), defined by lithology rather than by form as with the other classes suggested. The class was named East Anglian by Phillips (1950) a term fits better with the remaining existing terminology and so which will be retained

The "typical", most characteristic, form of these East Anglian querns is described as "bun-shaped". The stones have rather rounded sides, a relatively small diameter top with a narrow rounded rim and a relatively deep dished funnel-shaped hopper leading to a narrow feed. They are consistent in the quality of shaping and finishing which is more uneven than other rock types, probably due to the nature and hardness of the raw material. The method of handle attachment varies; upper stones may have a lateral handle socket (in nearly all cases circular and inclined slightly downwards, a handle groove placed a few centimetres above the grinding surface, both or neither.

On first appearance a collection of puddingstone querns appears to conform to these criteria, an impression also conveyed by the relative uniformity of the rock but in fact, as already discussed in chapter 6 a great many variations from this 'typical' form exist. A few examples in puddingstone, for example, while retaining the general profile of the class, possess pierced handle sockets that should possibly place them in the Hunsbury class. There is one upper stone also of the usual shape which has a handle slot cut into the top of the stone, CJ 698, from Hadlow, Kent.

The inclination and degree of rounding of the sides varies considerably from almost conical stones such as CJ 401, Gressenhall, Norfolk to very rounded stones that are nearly hemispherical, e.g., CJ 377, East Runton, Norfolk which resembles CJ 231, an unprovenanced upper stone of granite (possibly Mountsorrel granodiorite) in Leicester Museum, CJ 433 unprovenanced, Colchester Castle Museum, and CJ 575, Castle Camps, Cambs. Similarly, the hopper varies in the degree of dishing from cone or funnel- shaped examples, e.g., CJ 208 CJ 376 (East Raynham, Norfolk), CJ 444 (unprovenanced, Colchester Museum, also unusual in having a flat rim), CJ 624 (Odell, Beds which has a relatively shallow funnel-shaped hopper) and CJ 708 (Maidstone Museum, which is similar to CJ 624) to those in which the sides of the hopper are markedly dished, e.g., CJ 339 (Butley, Suffolk), CJ 456 (Hambledon, Bucks) and CJ 567 (Littleport, Cambs). Most stones have narrow, rounded rims but there are a few examples that have a flat top; CJ 444 and 448 (both unprovenanced, Colchester Museum) and CJ 707 (unprovenanced, Maidstone Museum). The presence of a number of very flattened bun-shaped puddingstone upper stones in which the hopper funnels down to the grinding surface and there is no distinct feed has already been noted (Chapter 6). Examples of this type include CJ 354 (Norwich Museum), CJ 411 (Great Snoring, Norfolk), CJ 561 (Great Staughton, Cambs), CJ 614 (Ravenstone, Bucks), CJ 621 (Bedford Museum). There are also some of more typical bun shape that have no distinct hopper and feed (CJ 207, Sproxton, Leics, CJ 353, Ipswich Museum, CJ 382, Briston, Norfolk, CJ 394, Hockwold-cum-Wilton, Norfolk, CJ 618, Blunham, Beds and CJ 703, Maidstone Museum. None of these differences appear to be regional in distribution and seem to occur only in small numbers.

The characteristic dished-funnel shaped hopper tends not to occur in other lithologies but there is one notable exception, CJ 331, from Claydon, Suffolk, of limestone, which is of 'typical' East Anglian form and has a handle socket and handle groove. Other upper stones of similar general profile include an example fom Maxey, Cambs, of probable Jurassic sandstone, Iron age to mid first century AD in date

(PRYOR et al, 1985;263, no.38), and a stone from Orpington, Kent of pebble conglomerate (therefore possibly of puddingstone) from this first to fourth century AD site (TESTER, 1969; 69, fig.11) Some similarities are seen to upper stones of Curwens "flat beehives" from northern England, e.g., from Randylands milecastle (CURWEN, 1937; 147, fig.28) and Newstead (CURWEN, 1937; 147, fig.30).

Lower stones

The East Anglian lower stones are also of distinctive form and, again, in general "bun shaped" although slightly flattened compared to most upper stones. The base of these stones is generally rounded albeit somewhat irregularly in many cases and nearly as well finished as the upper stones. The grinding surface may be flat or very slightly concave or convex. The diameter varies between 24 and 38 cms and most are unpierced with a narrow tapering spindle hole although pierced examples have been found at Long Buckby, Norfolk (CJ 476), Duston Northants (CJ 503) and Maxey, Cambs (CJ 535).

Dating

The chronology of this class has been discussed in some detail in chapter 6 ; at present none is dated earlier than the late Iron Age, and it is possible that these East Anglian querns were introduced somewhat later than the other beehive types.

8.2.8 Hunsbury

Given the geographical area of the study region this class (defined in Chapter 1) naturally encompasses the largest proportion of the querns examined. These stones are distinguished from the Yorkshire types by the presence of a pierced handle socket but are otherwise of similar profile, although the class includes a number of stones that may be flatter and more irregular than the "typical" Hunsbury style and in which the handle opens onto the feed or the sides of the hopper.

A certain degree of correspondence between lithology and form has already been noted, the two best represented lithologies among querns of this class being Millstone Grit and Spilsby Sandstone. However the form occurs in many other rock types. As a group (but not in each individual case) those Hunsbury style querns of Spilsby Sandstone differ in certain features to Hunsbury upper stones of Millstone Grit. The upper stones can thus be divided into three groups using as the main criteria the shape of the rim and hopper, although this is not necessarily the best subdivision to apply, and may not have any archaeological significance. (Fig.10)

Hunsbury type 1

Hunsbury type 1 upper stones, of which there are a total of 61 from the present study, have a flat, sometimes moulded rim (collar) and cup shaped hopper (Plate 2, 3). The most "typical" examples are mainly of Millstone Grit types 1 and 2 (MG/1 and MG/2), 50 stones, of which the MG/2 examples in particular are very consistent in form. There are 27 examples of this type from the Hunsbury hillfort (10 of which are collared) and the majority of the remaining 23 examples are from elswhere in Northamptonshire and Leicestershire. Lesser numbers are found in Lincolnshire; CJ 287, Heighington of Millstone Grit subtype 1, CJ 509, Belton Leggett of MG/3, CJ 520 of MG/1 and CJ 744 and 757 of limestone from Ancaster Quarry. CJ 744 is slightly less regularly shaped than usual and has a small hopper and the handle socket pierces the top of the feed. There are few Hunsbury type 1 querns from other counties reflecting the small total number of Hunsbury style upper stones found in those counties but examples are recorded in Buckinghamshire (CJ 710, Weston Underwood, MG/1) and Cambridgeshire (CJ 531 of MG/1). CJ 392 from Erpingham, Norfolk, of puddingstone has a generally East Anglian profile but a flat top and a cup-shaped hopper. The fine grained sandstones are also represented among this form, e.g., CJ 147 from Hunsbury. Other Millstone Grit upper stones of this form are recorded from Midway (a stray find) (LEAHY, 1979), Willington, (WHEELER, 1979; 145, no.3) and Stanton Moor (WRIGHT, 1986; 39, Fig.8) Derbyshire and Fisherwick (SMITH, 1979; Fig.17,A) and Shenstone, (HODGKINSON & CHATWIN, 1940; Fig.49, Staffs, of which those

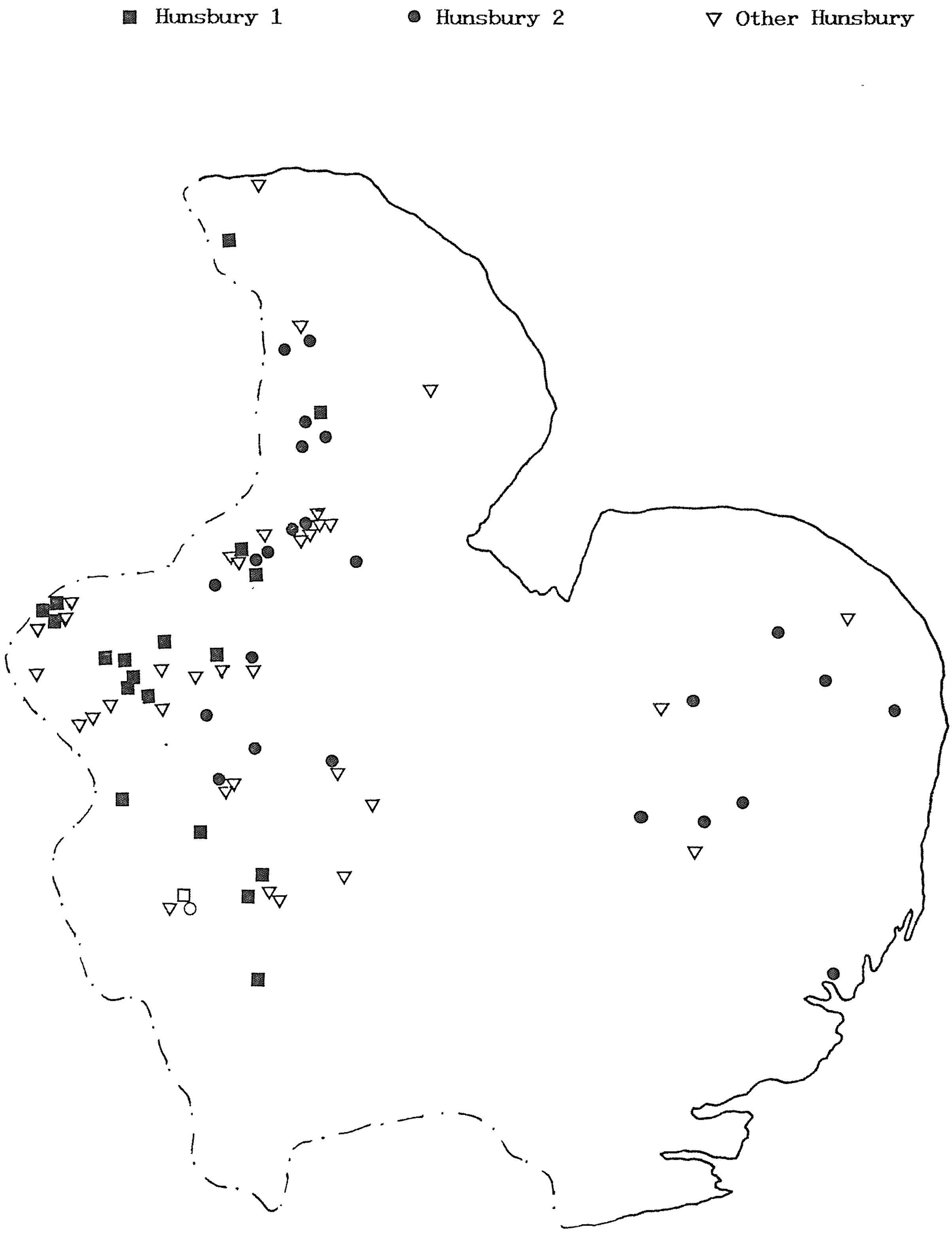


FIG. 10: Distribution of upper stones of Hunsbury form.

from Midway, Stanton Moor and Fisherwick have a collared top.

Hunsbury type 2

The second main group comprises those querns with rounded top and a funnel-shaped hopper (Plate 10), a total of 57 examples. These occur mainly among upper stones of Spilsby Sandstone and are found in Northamptonshire (six at Hunsbury), Lincolnshire, Suffolk, Norfolk, Essex (CJ 443) and Cambridgeshire covering the whole area of Spilsby Sandstone distribution with a total of 40 examples in this lithology. Only one has a moulded rim, CJ 306, from Ancaster, Lincs. Most other lithologies are represented but by relatively few querns. MG/1 examples include CJ 114 and 245 from Breedon-on-the-Hill (the latter with a rather irregularly shaped hopper), CJ 158, Hunsbury, in which the hopper is slightly dished and the handle socket pierces the top of the feed, CJ 240, Goadby Marwood, Leics, which has a large and very rounded collar, CJ 714, Bancroft, Bucks and CJ 743, Barleythorpe, Leics, also with a very rounded collar. MG/3 is represented by CJ 125 from Hunsbury, a double handled example which lacks a hopper distinct from the wide feed, CJ 298, Horncastle, a decorated example (see below) and CJ 491, Desborough, Northants again with a large rounded collar. There is a single example of this form of granite, CJ 123, Hunsbury, and two of fine grained sandstone; CJ 139, a rather rectangular stone from Hunsbury and CJ 157 also from Hunsbury with one pierced and one unpierced handle socket.

Other Hunsbury querns

There are a further 66 Hunsbury style querns which fall into neither of the two classes described above. A third, possible, but more minor group has a flat top and funnel-shaped hopper. Many of these are examples of Spilsby Sandstone from, e.g., Hunsbury (CJ 82, 156, 171), Corby, Northants (CJ 183), Leicester Museum (CJ 226), Knipton, Leics (CJ 233), Lincoln Museum (CJ 305) Tallington (CJ 527), Alconbury (CJ 549), Eynesbury (CJ 550), Cambridge Museum (CJ 572, 533) and Ancaster Quarry (CJ 749). These show a more restricted distribution, than that of the Spilsby Sandstone querns and Hunsbury style querns as a whole; they are absent from north Lincolnshire, South Humberside and East Anglia. Other lithologies are also represented, e.g., MG/1 at Hunsbury, CJ 59, 97 (with a pierced feed), 144 and 163, Tilton, Leics (CJ 239), and Leicester Museum (CJ 244, a collared example); granite by CJ 121; MG/2 by CJ 269, Aston Flamville, Leics which is collared and in which the handle socket pierces the feed; MG/3 by CJ 187, a collared upper stone, from Harrold, Beds; and limestone at Wyville, Lincs (CJ 522), Burton Stather, Lincs (CJ 512) and Ancaster Quarry, CJ 752.

In most of these the rim is 2-3 cms in width but a number have a relatively large diameter top and a very wide rim, the hopper being a similar size to, or smaller than, normal. This variation of Hunsbury type querns is seen in several rock types, for example, CJ 59 (MG/1), Hunsbury, which has only a small funnel-shaped hopper, CJ 183 (Spilsby Sandstone), Corby, Northants which has a cone shaped hopper, CJ 522 (limestone), Wyville, Lincs, CJ 512 (MG/3), Burton Stather, Lincs, and CJ 752 (limestone) Ancaster Quarry which has a slightly dished funnel hopper pierced in the side by the handle socket.

There are also a smaller number of more irregularly shaped upper stones. Most of these appear to have been boulders selected for their suitable size that have received little subsequent shaping. No single lithology or area is represented, examples including CJ 76, 136 and 141 from Hunsbury of MG/3, MG/1 and fine grained sandstone respectively, CJ 224, Wigston Magna, Leics of MG/1, CJ 228, Waltham on the Wolds, Leics of limestone and CJ 307, Denton, Lincs of MG/3. There are more regularly shaped but very rounded stones from Leicester Museum (CJ 225) of MG/1, Owston, Leics (CJ 230) of MG/3, Coleby, Lincs (CJ 304) of Spilsby Sandstone and Erpingham, Norfolk (CJ 392) of puddingstone. The individual variations appear on present evidence to occur in small numbers and to be randomly distributed; they are not such as to suggest the definition of subgroups. They may, for example, reflect different individuals involved in manufacture or variations in the texture and/or structure of the raw material exerting some degree of influence on the shape of the finished artefact, for example, the presence of minor flaws.

Distribution (Fig.10)

To some extent the groups outlined above are confined to certain geographical areas and correlate to certain lithologies but there are still significant numbers of exceptions in each group. It is possible to consider individual features, of all the Hunsbury style upper stones, in turn to determine whether these demonstrate any particular geographical or, if there is sufficient dated material, chronological significance.

1. Handle socket shape. There are three major categories of handle socket shape, circular, oval and rectangular. All three types occur within all the major lithological groups but for each category certain rock types predominate. (Fig.11)

1. Rectangular. Rectangular handle sockets are most common in Millstone Grit type 1 upper stones (at least 55 examples).In addition there are five of Millstone Grit type 2, eight of Millstone Grit type 3 and ten of Spilsby Sandstone. These ten are from Hunsbury and Corby, Northants, Harrold, Beds, Knipton, Leics, Hilborough, Norfolk, Alconbury and Eynesbury, Cambs, and Leicester and Peterborough Museums (three unprovenanced examples). Within the distribution area of Hunsbury style querns of the present study rectangular handle sockets are therefore concentrated in Leicestershire and Northamptonshire with a few in adjacent parts of the surrounding counties and two found further afield at Belton Leggett, South Humberside (CJ 509) and Hilborough, Norfolk (CJ 363) of MG/3 and Spilsby Sandstone respectively. Among Spilsby Sandstone Hunsbury type querns all the examples with rectangular handle sockets thus lie in the southerly part of the distribution area for that lithology.

2. Oval. Oval handle sockets are represented by roughly equal numbers of Millstone Grit and Spilsby Sandstone querns, 26 and 29 examples respectively. There are a few additional examples of fine grained quartzitic sandstone and limestone. Millstone Grit examples are found

in Northamptonshire, Leicestershire and Lincolnshire. The Spilsby Sandstone examples are most common in Lincolnshire and East Anglia with three examples in Cambridgeshire, seven in Northamptonshire (including five from Hunsbury) and one in Bedfordshire (Harrold). They thus have quite a widespread distribution over much of the study area.

3. Circular. Circular handle sockets show a generally complementary distribution to rectangular sockets. They are most commonly found among Spilsby Sandstone querns (21 examples) although lesser but significant numbers occur in querns of Millstone Grit (8 examples) and there a few examples among querns of other rock types, e.g., CJ 757 of limestone. Those of Spilsby Sandstone are scattered across the distribution area of this lithology with litle apparent concentration. However they are not particularly common in Lincolnshire when compared to the numbers that possess an oval socket. Only five of the twenty one examples are from the county, CJ 299, Ingham, CJ 304, Coleby, and CJ 305, 314 and 315 all unprovenanced stones in Lincoln Museum. There are none known as yet from South Humberside. The Millstone Grit examples are also scattered, for example, stones of MG/1 from Breedon-on-the-Hill (CJ 113), Leics, Northampton (CJ 487) and Bancroft (CJ 714), Bucks; of MG/2 from Aston Flamville (CJ 269) and of MG/3 from Barleythorpe, Leics (CJ 743), and Grantham Museum (CJ 523).

A plot of the find spots for these three types of sockets (Fig.11) shows that whereas the latter two, circular and oval, are found all over the study area the rectangular are generally restricted to the western parts of that area.

A number of upper stones have two handle sockets; two (CJ 54, Hunsbury of MG/2 and CJ 298, Horncastle, Lincs of MG/1) have three sockets. Again this feature appears to be unrelated to lithology, occuring in most rock types. MG/1 examples have been found at Hunsbury (CJ 52, 85, 93), Northants, Breedon on the Hill (CJ 245), Beeby (CJ 247) and Sutton Cheney (CJ 254) in Leics, and Weston Underwood, Bucks

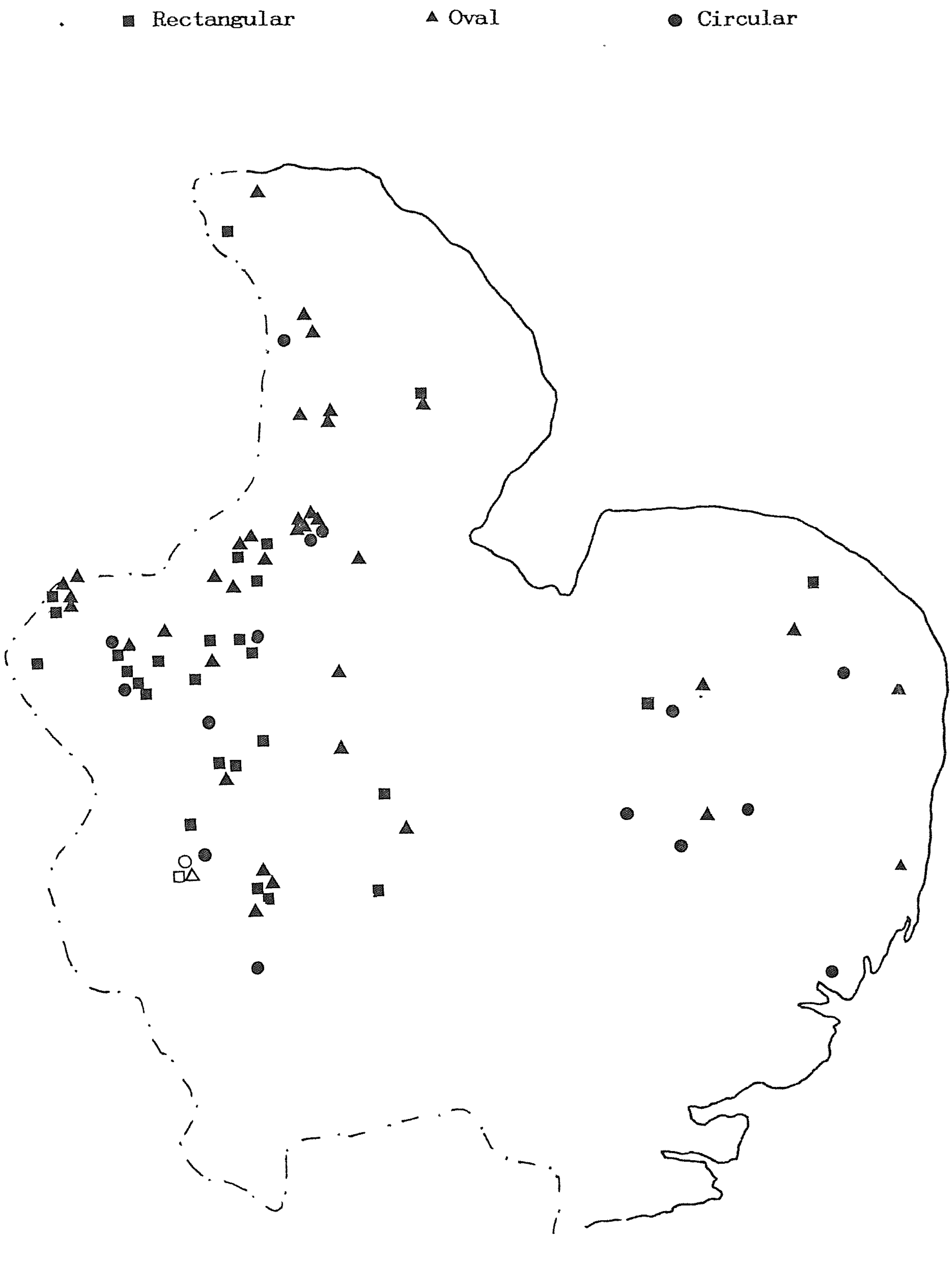


FIG.11: Hunsbury form upper stones: distribution of oval, rectangular and circular handle sockets

(CJ 710). There are double handled upper stones of MG/3 from Hunsbury (CJ 125, 161) and Desborough (CJ 491), Northants, Belton Leggett, South Humberside (CJ 509) and of Spilsby Sandstone from Corby (CJ 177), Northants, Harrold (CJ 184), Beds, Icklingham (CJ 328) and Bucklesham (CJ 338), Suffolk, Hilborough (CJ 363), Norfolk and Leicester Museum (CJ 272). In each of these stones the two sockets are at the same height and thus their contemporary use is indicated. As with many other individual features there is a widespread distribution for this characteristic, although double handle sockets are absent from Spilsby Sandstone querns from Lincolnshire and are not seen among the stones of limestone, the fine grained sandstones or granite (for which there are few examples) nor puddingstone. CJ 55, Hunsbury, has an unpierced socket at the same level as the pierced socket, as does CJ 443 (Colchester Castle Museum). CJ 233, Knipton, Leics, has an unpierced socket which is now very close to the grinding surface and second socket that pierces the base of the hopper.

2. Hopper shape. A consideration of the shape of the hopper of these Hunsbury style querns demonstrates a similar, somewhat confused situation, even taking only the two main categories of cup and funnel-shaped. These are only the extremes at the end of a continuous series of variation, in which, however, the intermediate stages are represented by relatively few querns. Cup-shaped hoppers are found mainly among the Millstone Grit querns, a distribution concentrated in the western parts of the study area, particularly in Leicestershire and Northamptonshire. Funnel-shaped hoppers, in addition to being the dominant types elsewhere, also overlap in distribution with the cup-shaped hoppers in the west of the study area the west.

3. Collar/moulded rim. The presence of a collared or moulded rim is probably a purely decorative feature present on quite a large number of stones, all of Hunsbury type and mostly of Millstone Grit. This includes nine examples from Hunsbury (CJ 52, 85, 90, 95, 97, 98, 119, 140, 160). Where a moulded rim occurs on querns of other lithologies it tends to be narrower and less distinct, for example, CJ 121

(granite), CJ 112, 147 (fine grained sandstone), CJ 131 (Spilsby Sandstone) all from Hunsbury, CJ 306, Ancaster (Spilsby Sandstone) and CJ 232, limestone (Leicester Museum). This feature occurs mainly, as expected given the dominant lithology, in Leicestershire and Northamptonshire but there are a few examples outside this area to the south at, e.g., Weston Underwood, Bucks and in Bedfordshire. Published examples from Fisherwick, Staffs (SMITH, 1979; Fig. 17), and Midway, Derbyshire (LEAHY, 1979) extend this distribution to the west. This feature is not generally seen among the Spilsby Sandstone or limestone querns. Among the Carboniferous sandstones collars occur in all three subtypes roughly in proportion to the total numbers of each of these. There are two of MG/2, CJ 252, Leicester and CJ 238, Evington, Leics) and two of MG/3 (CJ 187, Harrold, Beds and CJ 211, Oakham, Leics). The absence of moulded rims further east may be more apparent than real given the small number of Hunsbury style querns of Carboniferous sandstone found in this area.

Thus, whichever feature is isolated there emerges a relationship between form, distribution and lithology for a high proportion of examples but there are always a significant number of exceptions. The occurence of querns with cup-shaped hoppers, moulded rims and rectangular handle sockets is more limited than other types and thus the distinction between Hunsbury type 1 and types 2 and 3 does appear to be a valid one. The latter two might best be regarded as a single group with two sub-types defined by a flat or rounded rim. Within group 1 there does not appear to be any geographical significance of the moulded rim present on many of this type and it is a feature found also, albeit only in small numbers, among the other two groups.

Dating

The dating of the Hunsbury querns has been discussed under the relevant lithology chapters. Unfortunately there are no sites that have produced large numbers of beehive querns with closely dated contexts which might enable an assessment of changes in various features, a similar problem to that encountered among the Sussex

Scale; 1:10

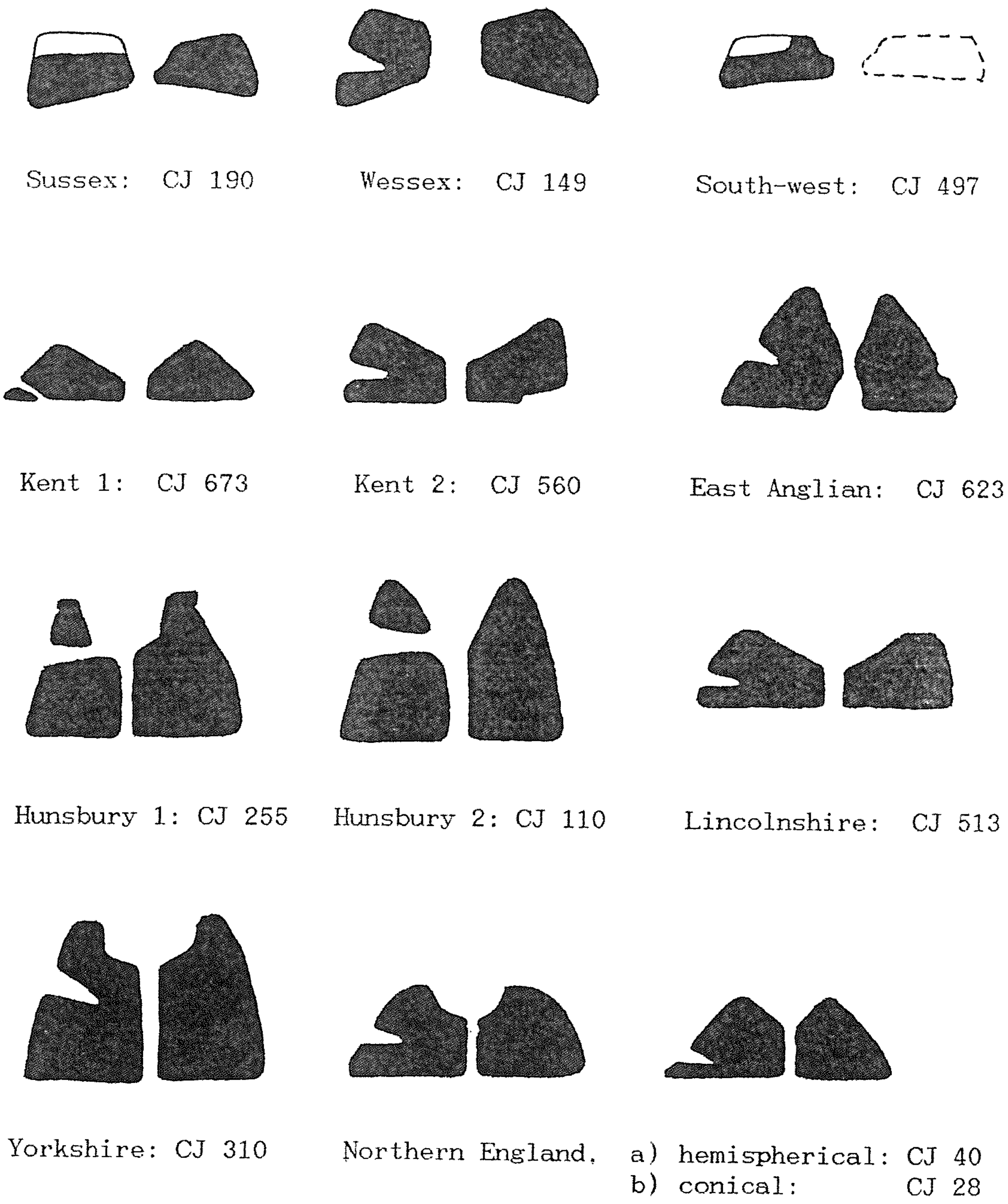


FIG. 12 Revised typological classes of beehive querns

querns; "with a span of seven centuries, typological change, at least in details of design, is to be exected, but the problem of detecting and dating subtle chronological differences is not easy" (PEACOCK, 1987; 69). For many of the features discussed above there are some indications of geographical significance and these seem to be closely related to lithological distribution. Although features are not exclusive to certain rock types they are predominant in some of these and thus the extent of distribution of each tends to correspond.

Lower stones

The associated lower stones are, in general, of one form, but one that is also found with Yorkshire style upper stones, and, to a lesser extent, with upper stones from northern England. They are thick, with a flat grinding surface, inclined sides and flat to slightly convex base which is, on average, 23 cms in diameter. Both the sides and basee are usually neatly shaped and finished by pecking. The lower stones found associated with Yorkshire type upper stones can attain a greater thickness, but as this feature is influenced by wear it can be difficult to distinguish between the two groups.

8.2.9 Yorkshire (Fig.12, CJ 310)

The collections of querns examined for the present study include only a small number (fourteen) of certain Yorkshire type. No one lithology dominates this group, comprising the tall beehives with an unpierced handle socket, which exhibits considerable variation in form. The single example of granite is an unprovenanced quern in Leicester Museum (CJ 231), which very atypical of the class as defined by Phillips (1950; 76). It is irregularly shaped and finished, tending to be rather hemispherical (in appearance still looking like a little-worked boulder) with a shallow dished hopper and lateral handle socket. CJ 175, of fine grained sandstone, is also atypical, conical with only slightly rounded sides, a narrow rounded rim and a funnel shaped hopper. The handle socket is set quite close to the grinding surface of this thick (17 cms) stone which resembles a number of upper stones from northern England, e.g., CJ 45, 13, 22, 28, 36, 38, and also CJ 367 from Swaffham, Norfolk. The limestone example (CJ 302) from Woolsthorpe, Lincs, is of more usual form although with a somewhat rounded rim; it has a cup shaped hopper and lateral handle socket just below the base of the hopper.

The Yorkshire/unpierced querns of this study do not form a homogenous group either typologically or lithologically. The upper stones which most closely resemble the products of the known Yorkshire quern quarries are CJ 251, Sharnford, Leics, a very worn example, CJ 253, Saltby, Leics, which, in contrast, has seen little wear and is still 28 cms thick, CJ 266, CJ 310 and CJ 364, all of MG/3. The other examples of unpierced upper stones of this lithology in the study area vary from the "typical" shape, generally in minor aspects. CJ 367, Swaffham, Norfolk, for example, resembles CJ 175, and has a narrow rounded rim and a funnel-shaped hopper. CJ 277, Leicester Museum, is flat rimmed with a funnel-shaped hopper and CJ 539, Hail Weston, Cambs, is of large diameter and irregularly shaped with a narrow funnel-shaped hopper and steeply inclined handle socket. There are a few examples of MG/1 (none of MG/2). CJ 270 (Garthorpe, Leics) is rather bun shaped and has a funnel-shaped hopper the base of which is now worn onto the grinding surface. CJ 264 (Rothley, Leics) is of fairly typical shape with an inclined handle socket and CJ 271 (Cropston, Leics), CJ 547 (Alconbury, Cambs) and CJ 739 (Nottingham University Museum) are all of fairly typical Yorkshire form.

The Yorkshire form is not particularly common among querns of Spilsby Sandstone but a number of examples were examined. CJ 289 (Billingborough, Lincs), CJ 292 (Saxby by Spridlington, Lincs) and CJ 443 (Colchester Museum) all have an unpierced and pierced handle socket, which in each case are at a similar level; their profiles resemble that of the Spilsby Sandstone Hunsbury type querns. CJ 357 (Ipswich Museum) is a tall stone, probably little if at all worn (24 cms thick) with a narrow rounded rim and a shallow funnel-shaped hopper, in which the upper and lower parts of the feed are slightly offset. CJ 366 (Baconsthorpe, Norfolk) is flat topped and, unlike the "typical" Yorkshire upper stones, has a funnel-shaped hopper. CJ 525 (Helpringham Fen, Lincs) is similar but more worn as is CJ 554 (Wood Walton, Cambs) in which the original handle socket has been worn onto the grinding surface and a second inserted opposite at a slightly higher level.

For the Yorkshire querns recent and continuing work on quarry sites in Yorkshire and Cleveland raises the possibility of assessing the extent to which the details of quern design relate to individual quarries groups of quarry sites. The products of the quarries around Sheffield researched by ME Wright do suggest the existence of distinguishing characteristics; the querns from Den Bank and Wharncliffe have a similar base diameter but different top diameter resulting in differing degrees of curvature and inclination of the sides. It is possible that there is in fact a continuous series between these two extremes and not two separate groups and it is not yet known whether the difference has any chronological significance (WRIGHT, 1986; 38-40).

Heslop has noted the possibility of variation in handle socket shape related to the area of manufacture, for example, deep sockets occur in North Cleveland and accurately drilled circular sockets in the North Yorkshire querns. Similarly, an approxiamate correlation between general profile and production site is also indicated; very high quality querns produced at one Coal Measures outcrop were recorded at Thorpe Thewles, Hart, Cleveland and Trimdon Station, Durham (HESLOP, 1988; 63-4).

Dating

The dating of this form, as for others, is uncertain for a high proportion of the material, many having being found in secondary contexts in walls or field edges. Early dates are suggested for querns Thorpe Thewles, Cleveland, where two Yorkshire upper stones were recovered from an early site phase and where the earliest beehive quern was found at the bottom of the enclosure ditch "from a phase producing an overall mean date of 450 BC" (HESLOP, 1988; 61). Wright (1986) also suggests the possibility of an early date for a tall upper stone from near the hillfort of Wincobank. The rampart is dated to the late sixth or early fifth century BC but the site was possibly occupied into the first century AD and a later date for the quern is thus equally possible (WRIGHT, 1986; 12). Elsewhere late Iron Age or early Roman associations are more usual, e.g., at Percy Rigg, Kildale, Roxby Low Moor, Levisham Moor and Pale End Kildale (HAYES, 1974; 26-7). Hayes et al suggested that in north-east Yorkshire beehive querns do not appear before the Late Iron Age and continued in use well into the Roman period (HAYES et al, 1980; 306-7). The problem may be at least in part due to a scarcity of sites of Middle to Late Iron Age in the area of these quern finds, and in north-east Yorkshire the quern finds have been used to show the extent of late Iron Age occupation (WRIGHT, 1986; HAYES et al, 1980).

8.2.10 Flat beehives/northern England

The beehive querns found north and west of Yorkshire were classed together by Curwen (1937; 148) as "Flat 'Beehive' (Roman Legionary Type?)" from which were developed the Scottish derivatives, which have a vertical handle socket . This group covers a large geographical area and a wide variety of quern types and lithologies. These querns all tend to be thinner than the tall Hunsbury and generally taller Yorkshire beehives but the degree of rounding of the sides and the shape and size of the hopper varies; all have an unpierced lateral horizontal handle socket. A number of very tall examples do occur within the area that on general form would fit more logically into the Yorkshire class. CJ 34, for example, recovered from a dyke at Drigg, Cumbria is very typical of the Yorkshire class, 31 cms in diameter and 25 cms tall with a top diameter of 16 cms, with a dished hopper and rectangular handle socket. It is of medium to coarse grained grey quartzitic sandstone, possibly Carboniferous. CJ 22, Penrith Museum, of orange to red medium grained sandstone resembles CJ 175 and 367. It is rather conical and 17 cms thick, with a slightly flattened narrow rim, funnel-shaped hopper and a circular handle socket now only 2 cms from the grinding surface. CJ 38, Seawood, Aldingham, Cumbria, also very similar to this latter example, 18 cms tall and 32 cms diameter.

Most of these northern beehives are bun/hemispherical to conical in shape and have a flat or slightly concave grinding surface, funnel-shaped or dished hopper and a narrow feed. On the basis of their general profile they can be assigned to a number of subgroups:

1. Hemispherical (Fig.12, CJ 40)

There are a few examples of this form from Cumbria, for example, CJ 45 from Bramley Farm, Cockermouth of pink granite. This fairly well shaped and finished upper stone, 27 cms in diameter and 12 cms thick, has a funnel-shaped hopper, dished near the base, and a circular handle socket. CJ 40, Barrow Museum, of white granite, is larger at 33 cms in diameter and 14.5 cms thick; it also has a dished funnel-shaped hopper but oval handle socket. Possibly also belonging to this small group is CJ 31 (Whitehaven Museum) a rather flattened bun shaped upper stone of grey granite decorated with 12 radial grooves running from the hopper to the base of the stone. One handle socket has been worn onto the grinding surface and a second, sub-rectangular in cross section, inserted at a slightly higher level.

Additional, published examples of this form include stones from Boonies, Dumfrieshire, (CAULFIELD, 1977; fig.22, G) Barlockhart, Kirkudbrightshire (CURWEN, 1937; 147,fig.33) and possibly five stones from Castlecary, Stirlingshire (CURWEN, 1937; 147, figs.31, 32), Hartburn, (JOBEY, 1973; 42, fig.13, no.1), Gubeon Cottage (JOBEY, 1957) and Belling Law (JOBEY,1977; 30, fig.12, no.1).

2. Conical (Fig.12, CJ 28)

This second type is more common. Querns of this group usually possess a funnel-shaped hopper and occur in a number of rock types. CJ 32, of granite in Whitehaven Museum, is 28 cms in diameter, 12.5 cms tall and has two handle sockets, one a replacement socket at a higher level than the first but both oval in cross section. CJ 44, Barbon Beck, Cumbria, is an asymmetrical upper stone (showing maximum wear opposite the handle socket) with a circular handle socket, made of coarse to very coarse and pebbly Millstone Grit. A very similar profile is seen in CJ 50, Tebay, Cumbria, which is 30 cms in diameter and 13.5 cms thick, and has a circular handle socket; it is also of coarse grained Millstone Grit. The second upper stone from this site, of first to early second century AD date, is more fragmentary but of the same type and lithology. The characteristic low placing of the handle socket (seen also in CJ 22, 175 and 367) is also seen in CJ 42 (found near Low Borrow Bridge fort), which is of medium to coarse grained grey quartzitic sandstone, probably Millstone Grit, and CJ 21 (Penrith Museum), a rather oval stone of medium grained grey brown quartzitic sandstone.

The handle socket is set relatively higher in the stone in the several examples, e.g., CJ 19, 35, 36, 37, 39 and 43, all from Cumbria. CJ 19, Penrith Museum, (of red medium grained sandstone, probably local Triassic), is unusual in having a marked flat rim, raised collar and subrectangular handle socket. CJ 36 (Barrow Museum, of coarse granite) has a rather more rounded profile than most examples probably due to the nature of the rock. CJ 37, Stainton, of medium to coarse grained reddish brown sandstone, is an oval and asymmetrical stone which has a very small rectangular handle socket, CJ 39 (Barrow Museum, of grey granite) is a flattened example 8.5 cms thick also with a rectangular handle socket and CJ 43 (Barbon Beck, of grey quartzitic and micaceous medium grained sandstone) is a very well shaped and neatly finished upper stone with two roughly opposed handle sockets. CJ 17 in Penrith Museum lacks a handle socket but probably also belongs to this class.

There are a number of querns from Northumberland that would also fit into this latter category, for example, CJ 2, 4, 5, 6, 7, 8, 10, 12 and 13. CJ 2 (Durham University Museum) is of pebbly sandstone, 31.5 cms diameter with a slightly convex grinding surface whilst CJ 4 (Newcastle University Museum) is of pinkish grey fine to medium grained sandstone, and has a more cone shaped hopper. CJ 6, like CJ 19 has a raised collar and CJ 7, also with the trace of a collar, has two handle sockets, one of which has been worn onto the grinding surface and of coarse grained to pebbly sandstone. CJ 8 is a more flattened example which has a rectangular handle socket. CJ 10 is also rather flat and irregularly shaped and like CJ 7 has two handle sockets, one a replacement but inserted only a short distance above the level of the original although on the opposite side of the stone. The upper surface of CJ 13 is decorated with seven irregularly spaced radial grooves. CJ 15 probably also belongs in this group but is a rather flattened, and irregularly shaped example.

Further examples are recorded from Newstead, Roxburghshire, (CURWEN, 1937; Fig.30), Southshields Roman fort (of Carboniferous sandstone) (ALLASON-JONES & MIKET, 1984) and Huckhoe, Northumberland which has produced three upper stones of this type, all of sandstone and dated between the first and third centuries AD (JOBEY, 1959).

A number of upper stones that may merit a separate category have more rounded sides and top but the examples described above suggest a continuous variation from markedly conical upper stones to those that are more hemispherical in form. Examples of this more intermediate type are recorded, for example, from Brampton, Cumbria, one of yellow sandstone with a rather dished hopper, a second of hard red sandstone of similar shape, and a third of pinkish granite with a funnel-shaped hopper (HODGSON, 1953; figs.1-3). From Ravenglass, there is a single example of coarse granite thought to be of south-west Scottish origin which is of similar form, having a dished hopper and feed that widens towards the grinding surface (POTTER, 1979; no.106). There are also examples from Northumberland, for example, from Gubeon Cottage, of first to second century AD date (JOBEY, 1957), Huckhoe, (JOBEY, 1959; fig.14, no. 5), Marden, two examples, (JOBEY, 1963; 31, fig.7, nos.1.2) Burradon, of sandstone from a Roman context (JOBEY, 1970; fig.12, no.2), Tower Knowe, of coarse grained sandstone (JOBEY, 1973; 73, fig.7, no.2), Belling Law of Cheviot Agglomerate (JOBEY, 1977; 30, fig.12, no.1) and Kennel Hall Knowe, two stones, one of coarse grained sandstone and the second of Cheviot lava (JOBEY, 1978; 18, fig.6, nos.5,6).

As yet there has been insufficient work on the querns of northern England to determine the validity of these sub-groups or to assess the extent to which they relate to lithology, distribution or date, although, as with the other typological classes, there does, even on the present limited evidence, appear to be some correlation between form and lithology, and hence geographical distribution.

8.3 Decoration on the querns

A small number of the querns examined, in addition to the collared examples already mentioned, possess features that do not appear to have a functional purpose. This decoration is more common outside the study area, particularly in north-west Wales and Ireland. In the study area the most common type of decoration seen is concentric grooving, either a single groove cut into the top of the rim or, in two cases, one in the rim and two just below. A single groove is seen in three upper stones from Leicestershire; CJ 259, unprovenanced of MG/2, CJ 256 from Cattethorpe of MG/1 and CJ 283 also of MG/1 from Breedon on the Hill which are all very typical of the Hunsbury class in general design. A probable further example of this type from Pickhill, North Yorkshire is described as having "an inscribed line in the flat berm around the hopper"; the shape of the quern is not stated but it is probably of Yorkshire type (HESLOP, 1988; 63). The two stones with three grooves are very different from one another in overall shape. CJ 298 of MG/3 from Horncastle, Lincs is a conical upper stone with a deep funnel-shaped hopper, slightly dished at the base and pierced just above the base by three handle sockets oval to sub-square in cross section. CJ 250 (unprovenanced, Leicester Museum) of MG/1 is a flatter upper stone, 34.5 cms in diameter and 14.5 cms thick with a slightly dished funnel-shaped hopper. The sub-rectangular handle socket pierces the feed.

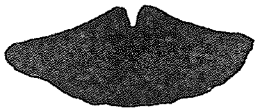
A second type of linear grooved decoration, in which the grooves are arranged radially over the upper surface of the stone is found on a small number of upper stones from northern England. There are twelve fairly evenly spaced radial grooves on an unprovenanced granite quern at Whitehaven Museum (CJ 31) and seven more irregularly cut and spaced radial grooves on CJ 13 (Newcastle University Museum). CJ 25 (Carlisle Museum) has seven shallow grooves, also radially arranged but grouped over two thirds of the upper surface; some are very faint and the decoration may originally have been present over the rest of the surface. Radial decoration on a flat quern from a native Romano-British settlement at Scarcliffe Park, Derbyshire, is described by Lane (1973).

The area covered by this study produced only one example of curvilinear decoration of a type also seen in Ireland. CJ 280 (unprovenanced, Leicester Museum) is a collared Hunsbury type upper stone of type 1 Millstone Grit lightly incised below the collar with a spiral decoration.

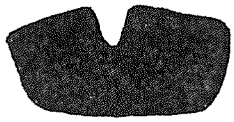
8.4 Lower stones (Fig.13)

The typological discussion of the prece ding section has been based almost entirely on upper stones, although lower stones found associated with each class have been considered in some detail. The naming of the various typological classes established by Curwen and added to by others are based almost entirely on the features of the upper stones. "The characteristics of a lowerstone are less varied than those of an upper stone and less vulnerable to the whims of fashion; in consequence they are less susceptible to detailed analyses and are less likely to be sensitive as chronological indicators" (WELFARE, 1985; 163). Thus, although corresponding lower stones for a specific class of beehive upper stone may in general be of one form, it is not always clear to which class any new (and, in some cases existing) finds should be assigned. Similarly, there is a continuous series of forms between the thick beehive and flat stones and in many

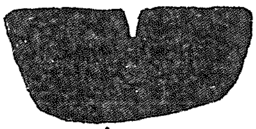
i. CJ 189
Hythe Beds



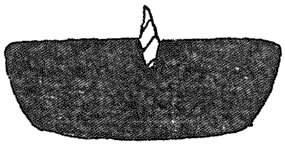
ii. CJ 517
Spilsby Sandstone



iii. CJ 84
Old Red Sandstone

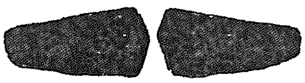


iv. CJ 142
MG/1



v. CJ 146
Spilsby Sandstone

vi. CJ 555
Spilsby Sandstone



vii. CJ 601
Hythe Beds

viii. CJ 538
Old Red Sandstone

FIG.13: Lower stones.

instances stones are not easily assigned to the correct category. A more valid classification for lower stones may thus be one based on the prescence/absence of certain features, for example, the shape of the grinding surface (flat, concave or convex), sides (vertical or inclined, straight or rounded in profile), base (flat, concave or convex) and spindle hole (perforating the stone or not), in which the size of the stone is a secondary consideration. In the case of some stones it may also be possible to suggest the typological class, as defined in the preceeding sections.

The lower stones can, on these criteria, be divided into a number of classes, although these will not necessarily correspond to those of the upper stones and lower stones associated with, for example, Wessex style upper stones may not all fall into a single group. Using the features given above the following main categories can be distinguished, each then subdivided using secondary characteristics. The first division, as it is one that seems to be significant among the upper stones, is between those with flat and those with convex grinding surfaces; concavity is not generally observed but where seen it is so slight as to justify inclusion with stones having a flat grinding surface. The second division, which on present evidence appears to be of some chronological significance, is between those with an unpierced spindle hole and those that are fully pierced. This gives four main classes which will be discussed in turn.

8.4.1 Unpierced Stones

1. Convex grinding surface

The occurrence of querns of this group appears to correspond in geographical distribution to that of the Wessex and Sussex type upper stones, as might be expected from the presence of an angled grinding surface. Examples from the study area are thus few in number. Six are recorded from Hunsbury, Northants; CJ 100, 108, 165, of Hythe Beds sandstone from Lodsworth (although the fourth lower stone of this lithology from the site has a rather undulating but overall flat grinding surface) and CJ 84, 77 and 182 of Old Red Sandstone. There are another two of Hythe Beds (CJ 189 and 196) from Odell, Beds, two of Spilsby Sandstone, (CJ 517 and 738) from Dragonby, Lincs, one of Folkestone Beds, (CJ 683) from Worth, Kent, two of MG/1 from Odell, Beds (CJ 195) and Kyme, Lincs (CJ 295) and a further eight of Old Red Sandstone from Leicester Museum (CJ 202, unprovenanced), Kings Lynn Museum (CJ 421), Desborough, Northants (CJ 492), Northampton Museum (CJ 493, unprovenanced), Magiovinium, Bucks (CJ 724, 726, 734) and Odell (CJ 661). These are not all of the same design and can be divided on the basis of the shape of the sides and base.

a: Flat or slightly concave base

In some instances the sides of these stones in profile are virtually straight but slightly inclined from the vertical giving a base diameter several centimetres smaller than that of the grinding surface. The base is more roughly finished than the sides and slightly concave, the spindle hole generally of small diameter, 2.5-3 cms. This category include the examples from Hunsbury and Odell, and are therefore mainly of Hythe Beds sandstone but examples of other lithologies do occur, for example, CJ 182 (Hunsbury) and 661 (Odell) both of Old Red Sandstone, and CJ 83 (Hunsbury) of MG/1. (Fig.13 i)

Nearly all of the unpierced lower stones from the Lodsworth quarry are of this form and were discussed briefly with the Sussex upper stones. Examples of this type and lithology are recorded from, for example, Danebury (CUNLIFFE, 1984; 417, no.8:38, 413, no.8:24) and Winnall Down (FASHAM, 1987; 80, nos.9, 10), Hants, Holmbury, Hascombe (THOMPSON, 1979; 292-3, nos. 2, 3, 6, 7, 8) and Burpham (PEACOCK, 1987; 68, Fig.8, no.4) Surrey, and Iver, Bucks (PEACOCK, 1987; 78).

The type is less common in other lithologies but, as within the study area, a few examples do occur elsewhere. There are examples of this form of fine calcareous grit, coarse ferruginous sandstone and local Jurassic limestone from Maiden Castle, Dorset (WHEELER, 1943; 326, fig.115, no.13, 327, fig.116, nos.17,19) and of Lower Greensand of undetermined source from Silchester, Hants (FULFORD, 1984; 119, fig.40, no.4) and Gussage All Saints, the latter a rather a large (38 cms diameter) and thin example (WAINWRIGHT, 1979; 91, fig.68, no.2153). A similar stone, of gritstone, is also recorded from Hengistbury Head, (CUNLIFFE, 1987; 170, fig.121, no.22).

b: convex base

This second subgroup shows a grinding surface of similar profile to that described above, convex, sometimes with a marked lip around the spindle hole. Within the study area stones of this type have ben found at Dragonby and Kyme, Lincs, Hunsbury and Desborough, Northants, Magiovinium, Bucks, Odell, Beds and Worth, Kent; there are further unprovenanced examples in Leicester and Kings Lynn museums. These show a much wider distribution and more lithological variation than those with concave bases. They generally have vertical or near-vertical but rounded/slightly convex sides; the base is usually of similar diameter to the the grinding surface, or only slightly smaller.

The two examples of MG/1 lithology demonstrate these characteristics. CJ 195 is 31.5 cms in diameter and has very neatly tooled sides but a more roughly finished base and narrow spindle hole, 2.75 cms in diameter. CJ 295, 36 cms in diameter, has a larger spindle hole (4 cms in diameter), neatly tooled sides and grinding surface and rougher base. CJ 683 of Folkestone Beds shows an almost identical profile. The spindle hole is narrow and the base only roughly finished but the grinding surface is grooved, the groves fairly regularly arranged although narrow and quite widely spaced. The two examples made from Spilsby Sandstone differ from these as both posess a lip around the spindle hole and have a very rounded, rough base (Fig.13 ii) The remaining stones of this group, although geographically scattered, are all of Old Red Sandstone. They bear more resemblance to those of MG/1 described above than to the two of Spilsby Sandstone (Fig.13 iii). CJ 84 from Hunsbury is the smallest and thickest example, 29 cms in diameter and 13 cms thick, with a large spindle hole, 5 cms in diameter. The stone is well shaped and finished with pecked edges but a slightly rougher base, 26.5 cms diameter. CJ 77 is of similar profile but larger, over 40 cms in diameter, also with a large diameter spindle hole. The remaining examples are also relatively thin, for example, CJ 421, approxiamately 42 cms diameter and 11.5 cms thick, CJ 492 roughly 34 cms in diameter and 8.5 cms thick, CJ 724, 37 cms in diameter, 10 cms thick and CJ 726, 37 cms in diameter and 7.75 cms thick; all have narrow spindle holes.

Published examples of this general type are also quite widely distributed. There is a single example from Ryton-on-Dunsmore, Warwicks, of coarse grit (possibly Millstone Grit) which, like the two stones of this type from Dragonby, has a very rough rounded base, short, irregularly shaped sides and a narrow spindle hole (BATEMAN, 1977; 36, fig.16.1). From Danebury, Hants, there are two examples, one of which resembles, for example, CJ 492. The second is a much thicker example which is more like CJ 84 (CUNLIFFE, 1984; 417, no.8:34, 8:37). One lower stone from Gussage All Saints, Dorset of coarse grit, probably Devonian, has sides which are inclined towards the base giving a proportionally smaller base diameter than usual and a large spindle hole, 4.5 cms in diameter and 5.5 cms deep (WAINWRIGHT, 1979; 92, fig.69, no.2157). Of the two examples from Puncknowle, Dorset, one, of local Upper Lias, is now a rather thin stone, 9 cms thick and 33 cms in diameter, in which the base is very roughly finished and the second a thick stone (18 cms) of quite small diameter (28 cms) with a lip around the narrow spindle hole, made from porphyritic rhyolite (BAILEY, 1985; 82, nos. 1, 2).

Many of the lower stones from Maiden Castle, Dorset fall into this category. Several bear some resemblance to the two lower stones of this category from Dragonby, having very rounded sides, but they have a somewhat flattened base. A number of lithologies are represented, e.g, limestone conglomerate, possibly dolomitic from the Mendips, oolite and fine calcareous grit (WHEELER, 1943; 325, fig.114, nos. 5, 8,10, fig. 115, no. 15). Two other stones from the site (one of local

Jurassic limestone and the second of Upper Greensand) are basically of this form although the sides are slightly straighter and more nearly vertical resembling more the Lodsworth Hythe Beds lower stones (WHEELER, 1943; 327, fig.116, nos.18, 20). A similar example, of Hythe Beds from Lodsworth, was found at Danebury, Hants (CUNLIFFE, 1984; 417, fig.7.57, no.8:38 : PEACOCK, 1987; 78-9).

This second sub-type therefore appears to encompass a number of variations, for example, the thick examples typified by CJ 84, and stones from Danebury (CUNLIFFE, 1984; no.8:37) and Gussage All Saints (WAINWRIGHT, 1979; no. 2157), thinner stones with nearly vertical sides and convex bases such as CJ 202, 724, 295 and those with very rough rounded to hemispherical bases and sides. A fourth category, best represented at Maiden Castle (WHEELER, 1943; 327, no. 19, 21) shows a generally flat base and as such appears intermediate in form between the three types mentioned above and those, mainly from Lodsworth source, which have a flat to concave bases.

To a certain extent the two types, those with a flat or concave and those with a convex base, do show separate geographical distributions. The distribution of lower stones with concave bases corresponds roughly to that of Sussex type upper stones; lithologically most of these stones are of Hythe Beds sandstone. Unpierced lower stones with convex bases are found beyond this distribution area, the thicker and presumably earlier of these within the distribution area of Wessex type upper stones whereas the thinner examples are more widely scattered. The more intermediate types are found in both areas.

<u>2. Flat grinding surface</u>

The next major group is of those unpierced lower stones which have a flat grinding surface; these occur in the geographical area represented among upper stones by East Anglian, Hunsbury and Yorkshire types, the Flat beehives of northern England, and the Scottish and Irish beehive querns. Most of the lower stones examined in the present study are therefore of this type.

a: Thick stones, slightly convex base (Fig.13 iv, v)

Many of these have already been discussed in some detail in previous chapters under the relevant lithological headings. They are usually 30-35 cms in diameter and 10-20 cms thick; the grinding surface is generally flat but may show either slight convexity or concavity. The spindle hole is narrow, 2.5-3 cms in diameter, and usually between 4 and 8 cms deep. The sides are slightly rounded and taper towards the base which is slightly convex and generally 8-10 cms smaller in diameter than the grinding surface. Many of the stones are symmetrical although a significant number are markedly asymmetrical. They are usually well shaped with a pecked finish of the same standard on both the base and sides. The majority of the Millstone Grit stones are of this type as are those of Spilsby Sandstone and the single example of granite. Two of the puddingstone lower stones probably belong to this class, CJ 646 from Wendons Ambo, Essex, and an unprovenanced, asymmetrical stone, CJ 704 in Maidstone Museum. A number of these lower stones have been drilled fom both the current grinding surface and base, in some instances both surfaces appear to have ben used for grinding.

Beyond the study area examples are documented from, for example, Staden (MAKEPEACE, 1983; 82, fig.6, no.3) and Willington, two stones of medium grained Millstone Grit (WHEELER, 1979; 145, fig.56, nos.2, 3), Derbyshire, Thurmaston, Leics (CURWEN, 1941; 17, fig.11), Fisherwick, Staffs, of Millstone Grit (SMITH, 1979; Fig.17) and Thorpe Thewles, Northumberland, one of pale grey sandstone and a second of micaceous grey sandstone from the Coal Measures (HESLOP, 1987; 83, fig.54, no.4, 86, fig.56, no.18). Many of the lower stones from Yorkshire also fall within this category (WRIGHT, 1986, 1988: HAYES et al, 1980).

There are a number that differ in small aspects from this description but which may not justify separate groupings. In a small number of flatter stones the sides are more nearly vertical and the base generally flat and rough, notably CJ 204, Wigston Magna, Leics, and CJ 122, Hunsbury of MG/3. CJ 218, Oadby, Leics, of MG/2 and CJ 117, Belton Castle, Leics, of MG/1 show a more rounded base than usual. The lower stones from the study area of fine grained sandstone are basically of this type but all are much more roughly shaped and finished than those of other lithologies. Again they do not seem to merit a separate group but can be seen as less accomplished examples of this type. Similarly, one example of this form in puddingstone is rather irregular, CJ 591 (unprovenanced, Verulamium Museum). Two lower stones from South Shields, of Carboniferous sandstone (ALLASON-JONES & MIKET, 1984; 357, no.78), and Hartburn, Northumberland (JOBEY, 1973; 42, fig.13, no.4) are large and asymmetrical with roughly flattened bases. One example from Ryton-on-Dunsmore, Warwicks (possibly of Millstone Grit) is, like the Hunsbury examples of fine grained sandstone, very large and irregular (BATEMAN, 1977; 36, fig.16.2).

This subtype is therefore found over most of the Midlands, Yorkshire and northern England. Many of the Yorkshire stones are thicker than those found either to the north or south but as this depends so much on the amount of wear is not really a valid criteria to use to determine separate groups.

b: bun-shaped stones

The second type of thick unpierced stones with a flat grinding surface are the bun-shaped lower stones which have a very rounded to hemispherical bases. This category is represented within the study area almost exclusively by the querns of puddingstone (although, for example, CJ 218 of MG/2 may belong to this class) and the distribution therefore corresponds to that of puddingstone lithology. Beyond this region, however, the type is also found in northern England in other rock types at, e.g., Randylands milecastle, Cumbria (CURWEN, 1937; 147, fig.28), Belling Law, Northumberland, of sandstone (JOBEY, 1977; 30, fig.12, no.3), Kennel Hall Knowe, Northumberland, of coarse grained sandstone (JOBEY, 1978; 18, fig.6, no.7), Hartburn, Northumberland (JOBEY, 1973; 42, fig.13, no.4) and Camerton, Somerset, of sarsen (WEDLAKE, 1958; 243, fig.56, no.2). Among the puddingstone querns examples drilled from both upper and lower surfaces occur.

8.4.2. Pierced Lower Stones

On the whole the pierced stones seem to be of later date than the unpierced type although early examples do occur and this feature was probably adopted over a considerable time span with both types in use in any area for a considerable period. As with the unpierced lower stones they can be divided into those with flat and those with convex grinding surfaces; in this case however the distinction appears to be of less geographical significance with comparatively few examples of the former.

<u>1. Flat grinding surface</u> (Fig.13 vi)

Within the study area there are a number of this form of several rock types; puddingstone, limestone, Millstone Grit type 1, Hythe Beds (Lodswrth), Spilsby Sandstone and Folkestone Beds. Three shapes of spindle hole occur,

a) a cylindrical piercing of the stone, although the spindle hole may funnel out slightly towards the base of the stone,

b) a symmetrical hourglass piercing, or

c) an asymmetrical houglass-shaped piercing, in which the drilling from the upper surface is of similar shape (relatively narrow and tapering slightly downwards) and dimensions as the spindle hole in unpierced lower stones but that from the base is larger and generally cone-shaped, for example, that in CJ 152.

This third type may be related to those unpierced stones which have a second, larger, drilling from the base which does not meet the spindle hole, e.g., CJ 326, and it is possible that at least some of these were originally begun as upper stones.

a) Cylindrical spindle hole

Within the study area cylindrical spindle holes occur in stones of several lithologies. There are examples of limestone from Great Chesterford, Essex (CJ 642), Ancaster, Lincs (CJ 755); of MG/1 from Leicester Museum (CJ 235, unprovenanced), Ancaster Quarry, Lincs (CJ

758), Northampton (CJ 489) which has a funnel-shaped depression in the base around the spindle hole, and possibly CJ 51; of Hythe Beds (Lodsworth) from Puddlehill, Beds (CJ 613), also with a funnel-shaped depression in the base and Odell, Beds (CJ 660); of Spilsby Sandstone from Aldwick (CJ 555 and 576) Herts, Eynesbury, Cambs (CJ 542) and CJ 753, Ancaster Quarry; and of Folkestone Beds, from Folkestone, Kent (CJ 695). CJ 535 (unprovenanced, Peterborough Museum) of MG/1, has a pierced spindle hole which tapers to the base where it it opens onto a small funnel-shaped depression. There is one lower stone of Cheviot Agglomerate, from Tower Knowe, Northumberland, which has slightly rounded sides and roughly flattened base (JOBEY, 1973; 73, fig.7, no.4). and is similar to the two stones from Aldwick, Herts.

b) asymmetrical hourglass-shaped

The third shape of spindle hole is rare among the pierced stones which have a flat grinding surface. CJ 60 is possibly an example of this although the two drillings are slightly offset (both surfaces could have been used for grinding) as is CJ 134 also from Hunsbury and of MG/1. There are several examples of puddingstone, e.g., 609, Leagrave, Beds, CJ 476, Long Buckby, Northants, CJ 628, Odell, Beds and CJ 503, Duston, Northants.

c) Symmetrical hourglass-shaped spindle hole

Within the study area this type occurs in CJ 152, Hunsbury, CJ 326, Emswell, Suffolk and CJ 528, Tallington, Lincs, all of which are made from Spilsby Sandstone.

2: Convex grinding surface

There are few examples of pierced lower stones with a convex grinding surface compared to the number of unpierced stones considered within the study area mainly due to their predominance among later flat querns. Those seen are from Billingborough, (MG/1, CJ 524) and South Ferriby, Lincs (CJ 508, Spilsby Sandstone); Canterbury, Kent (CJ 687, MG/1); Odell (CJ 663, MG/1, CJ 664, Old Red Sandstone) and Biggleswade (CJ 617, Old Red Sandstone), Beds; Moulton Park, Northampton (CJ 488, Hythe Beds), Burrough Hill, (CJ 473, Hythe Beds), Yardley Hastings, (CJ 500, Hythe Beds), Northampton (CJ 493, Old Red Sandstone), Kings Sutton (CJ 502, Old Red Sandstone) and Claycoton (CJ 178, Hythe Beds), Northants; Aylesbury (CJ 470, Hythe Beds) and Magiovinium (CJ 720, Old Red Sandstone), Bucks; Verulamium, Herts (CJ 601, Hythe Beds) and Fairsfield, Notts (CJ 746, MG/1). There are also unprovenanced examples from Peterborough Museum (CJ 536, MG/1 and CJ 538, Old Red Sandstone), Newcastle University Museum (CJ 741, MG/1) and Aylesbury Museum (CJ 469, Hythe Beds, CJ 468, Old Red Sandstone).

These can also be subdivided according to the shape of the spindle hole, in this case either hourglass-shaped or cylindrical, but, in addition, the shape of the base varies.

a) hourglass-shaped spindle hole (Fig. 13 vii, viii)
This is seen among lower querns of three lithologies within the study region; MG/1, Hythe Beds and Old Red Sandstone. Of the four examples of MG/1, two, CJ 524 and 741, are flat based, the other two, CJ 536 and 663, have convex bases. Only one Hythe Beds example, CJ 601, Verulamium, has a convex base; the remaining stones from this source have a concave base, CJ 178, 469, 473 and 488. The converse situation occurs among those of Old Red Sandstone, most possessing a convex base (CJ 502, 538, 664 and, to a lesser extent, CJ 493), and there is only a single example among those examined that is flat-based, CJ 468.

b) cylindrical spindle hole.
In this region cylindrical spindle holes occur in querns of four rock types; Millstone Grit, Old Red Sandstone, Hythe Beds and Spilsby Sandstone. The base may be flat (as in CJ 720 of Old Red Sandstone and CJ 687 of MG/1), concave (as in CJ 470 and 500, both of Hythe Beds) or convex (as in CJ 617 of Old Red Sandstone and CJ 508 of Spilsby Sandstone). A further possible example with a flat base has been found at Danebury, although this could appear pierced due to wear, (CUNLIFFE, 1984; 417, no. 8:35) and two stones illustrated from excavations at Baldock, Herts, both of Millstone Grit, (STEAD & RIGBY,

1986; 81, Fig.79, no. 803, 811) are of this form.

Dating

Curwen viewed the piercing of the lower stone as a late feature enabling the adjustment of the distance between the upper and lower stones, hence controlling the coarseness of the flour. It was thought to have been introduced at some stage during the development of the flat topped Romano-British upper stones, i.e. to have first appeared during the Roman period (CURWEN, 1937; 144-5). There may or may not be a functional significance of the piercing. With a fully pierced stone the adjustment of the relative height of the upper and lower stone is possible but there is no evidence to suggest that this was the determining factor for piercing or that any of the pierced stones were used in this fashion. On the contrary Welfare cites an example from Vindolanda in which "the eye in the lower stone of a complete quern found in the vicus was filled with lead, the stump of the iron spindle being still embedded within it" (WELFARE, 1985 163). Peacock has shown that among the products of the Lodsworth quarry the appearance of pierced lower stones does not correspond with the Roman conquest but is alredy present at some sites in the later Iron Age, e.g. Bishopstone, Sussex (PEACOCK, 1987; 71-2).

Similarly, among the examples given above early dates are suggested for a number of pierced stones. Of those with flat grinding surfaces in the present study area a number could be of early date, in particular those of Ancaster Quarry, where nearly all the lower stones of all three lithologies represented on the site are pierced. The exception among those examined is CJ 760 of coarse Millstone Grit, in which holes drilled from both upper and lower surfaces nearly meet but are slightly offset. A Middle Iron Age date is suggested for all these querns (MAY, 1976a, 1984). Puddlehill saw a long period of occupation from the earlier Iron Age into the Roman period but for much of this is believed to have been used for stock control. The rectangular enclosure to which the quern may relate was constructed in the early third century BC and there was subsequently a return to a use for livestock at around 100 BC (DYER, 1976).

The two examples from Aldwick were recovered from pits dated to the Middle Iron Age, the site as a whole thought to have been established in the second century BC possibly continuing into the Roman period. (CR'ASTER, 1961). The two lower stones of this type from the Hunsbury hillfort, CJ 60 and 134, possibly begun as upper stones, also suggests a Middle to Late Iron Age date. CJ 489 is of later Iron Age date, recovered from a pit at Blackthorn, Northampton, a probably short lived double-ditched enclosure of the second or first century BC that has produced only pre-belgic pottery (WILIAMS, 1974).

Of slightly later date is CJ 660 from Odell from a context dated to the first half of the first century AD, fairly early in the sites history. CJ 628, a puddingstone lower stone with an hourglass-shaped spindle hole is from a context of the later mid first century AD. Similarly, the puddingstone examples from Leagrave and Duston are from sites established in the later Iron Age but where occupation continued into the Roman period; there are no precise contexts for the quern finds (KENNET, 1972). There are two examples from Roman sites, CJ 695 from Folkestone villa and CJ 642 from Great Chesterford.

The earliest pierced lower stones examined are therefore those from Ancaster, Lincs, Aldwick, Herts, and Puddlehill, Beds, all of which have a flat grinding surface. There are also later finds from Kent and Essex, Complete piercing of lower stones appears, on present evidence, to be rare among early (beehive) rotary querns in Leicestershire, where there is only one representative (CJ 235) although it is seen among Millstone Grit querns at Ancaster Quarry, Hunsbury (although in both examples from this site the presence of a 'pierced' spindle hole may be due to an accidental piercing) and Blackthorn, Northampton.

Pierced stones with a convex grinding surface appear on the whole to be later than those possessing a flat grinding surface. Stones of this profile with cylindrical spindle holes are recorded from Roman sites at Magiovinium (CJ 720), Canterbury (CJ 687), Yardley Hastings, Northants (CJ 500) and possibly Aylesbury (FARLEY et al, 1981). An example from South Ferriby, South Humberside (CJ 508) is probably of Late Iron Age or later date. Other, published, examples found in the area are also of Roman date, for example, stones from Colchester, Essex of lava and of late Roman date (BUCKLEY & MAJOR in CRUMMY, 1983; Fig.78, no. 2061) and two from Baldock, Herts, one unstratified and the other from a mid third century AD context (STEAD & RIGBY, 1986; Fig.79, no. 803, 811). Beyond the study area there are, for example, lower stones of this form made from Hythe Beds at Lodsworth from the Roman palace at Fishbourne and Porchester Castle (probably late Roman) (PEACOCK, 1987; 68) and Silchester, of late second or third century date (FULFORD, 1984; 119, no.1). There are also six stones of local Carboniferous sandstone from South Shields Roman fort (ALLASON-JONES & MIKET, 1984; 354-61), two examples from Hengistbury Head, Dorset, one of Upper Greensand and the second of Greensand from a Late Iron Age context (CUNLIFFE, 1987; 170, no.17, 18) and a single example from the Romano-British village at Catsgore, Somerset, dated to the period late 2nd to mid 4th century AD (LEECH, 1982; Fig.90, no.7).

A similar range of dates is shown by those stones which have an hourglass-shaped spindle hole and a convex grinding surface. Late Iron Age examples are recorded from Burrough Hill (Daventry), Northants and Moulton Park, Northampton. The latter site which produced late pre-belgic and belgic pottery, originated in the late first century BC and continued in use into the earlier centuries AD (WILLIAMS, 1978). Of Roman date are the stones from, e.g., Odell, an example of Millstone Grit type 1 of third century AD date and one of Old Red Sandstone dated to the second half of the second century, and Claycoton, Northants (PEACOCK, 1987; 80). Also of this form are lower stones from Baldock, Herts, one example of possible third century date (STEAD & RIGBY, 1986; 181, fig.79, no.804), Brancaster Roman fort, Norfolk, of Spilsby Sandstone (HINCHLIFFE, 1985; 64, fig.42, no.146), Hengistbury Head, Dorset, two stones of greensand from Roman contexts and one of Upper Greensand of the final Iron Age (CUNLIFFE, 1987; 169, fig.120, no.2; 170, fig.121, nos. 21, 19) and Ilchester, Somerset, possibly of Old Red Sandstone (LEACH, 1982; 220, fig.105, no.39).

The above examples represent only a small random sample of the available material; it suggests that among the pierced lower stones with a convex grinding surface the shape of the spindle hole is not related to lithology or provenance and at present both types (cylindrical and hourglass-shaped spindle holes) appear to have been in contemporary use. However, a larger body of data may demonstrate that in fact different forms are found predominantly in, for example, certain areas or rock types.

CHAPTER 9: THE ARCHAEOLOGICAL CONTEXT OF THE QUERNS

9.1 Introduction: the nature of the quern record

In the preceding chapters the querns have been examined in terms of their lithology and typology and in virtual isolation from their finds context. However, in addition to providing, in many instances, a date for their use the nature of the context in which they occur is equally significant in assessing the results of the petrological study. The distribution patterns are influenced by many factors, for example, the scale of archaeological investigation in any area, to a certain extent the date of this, querns having been rather neglected artefacts in the past, and, in the case of querns and quern fragments, the ease of recognition of a particular lithology. The local geology may also to some extent affect the pattern indirectly; for example, in some areas querns (roughouts and completed artefacts) have been incorporated into structures (walls etc.) in which they are fairly readily recognised. In terms of excavation the area, both its extent and intra-site location, of a settlement investigated may influence the number and nature finds.

Caulfield commented on the fact that "beehive querns have never been found on an Irish excavation", nor do they occur on sites as chance finds as is the case with many in other parts of Britain: "the most commonly recorded context for these beehive querns in Ireland is from bogs", with a few from rivers and others "picked up in fields not associated with any monument" (CAULFIELD, 1977; 124). This certainly contrasts with the present study area and much of the rest of England where a high proportion of excavations yield at least fragmentary quern material and the incidence of apparently unassociated querns is more likely the consequence of the nature of the find spot or, in the case of older finds subsequent loss of relevant information. Many querns from older excavations are poorly reported, which, together with the loss of labelling in storage, means that although many now unprovenanced museum querns were in fact excavated many now appear to be chance finds; the lack of published details prevents reidentification of most.

9.1.1. The contexts of the quern finds

Not all querns are found from sites; many are chance finds and quern finds can be divided into three groups with respect to the nature of their context:

1. Those recovered from excavations and for which a context is thus recorded. This latter item of data is of variable detail and there are,

   a) those querns from, generally, more recent excavations whose context is well recorded and for which a date can be assigned, albeit for a secondary use in many cases, and

   b) finds from older excavations not recorded in sufficient detail to allow precise dating, or for which the relevant information has been subsequently lost (for many such querns all that is known is that they derive from specific sites) or those from unstratified contexts on excavations.

2. Chance finds for which a provenance is known. Again these fall into two categories;

   a) those that have some, generally loosely, associated material by which a provisional date may be suggested, or have been recovered during agricultural or industrial work, e.g., ploughing, drainage, quarrying, or other construction work, from which there are no other finds but which are from their original context and

   b) those that are from a more recent context, and that have thus been removed some distance, albeit probably fairly short in most instances, from their original depositional site, for example, those incorporated into stone walls, doorsteps, rockeries, etc. For most the present locality will be very close to the original, but there remains the possibility that a few may have been transported longer distances, e.g. CJ 251 which was recovered from a load of topsoil.

3. The final category contains querns for which there is, at present, no recorded information. These examples generally form

part of the older museum collections and are, to a large extent, a consequence of the difficulties of satisfactorily labelling these artefacts; tied-on or adhesive labels are easily lost and ink or paint obscured or lost by weathering or abrasion when the object is moved. In some cases the querns have been arbitrarily renumbered at some date in the past but a record of relevant data for these numbers subsequently lost. There is generally a high probability that these querns have been found fairly local to the museum in question but this is more likely in the case of smaller than larger, county, museums that draw on a larger area. However, the closure of small museums and the transfer of collections to other locations will again increase their distance from the original find-spot. Long distance removal from their point of origin appears to unusual, although the Cambridge University Museum of Archaeology and Anthropology contains a number of examples from beyond the county, Luton Museum has a puddingstone quern from Thetford, Norfolk, and the collection at Norwich Castle Museum includes a complete quern of Millstone Grit from Cheshire. Unprovenanced querns must therefore be used with caution; a quern of a lithology atypical of the area in which it was found may be an isolated case of trade beyond the normal areas or simply have been collected from some more distant locality than usual.

The present chapter is concerned primarily with the first two groups; the contexts of the querns and their associated settlements, features and artefacts will be discussed by geographical area. It is not however, intended to be a full discussion of the development of the Iron Age in those areas considered and every site of relevant date, but will look at a range of sites from each county to assess the type of site and nature of contexts from which the querns are recovered, the relationship between these and distribution, lithology and fragmentation patterns of the quern finds and whether these change through time. Also important in an assessment of the results are those sites which have to any extent been excavated but which have produced no quern finds. These may either be sites which do not represent settlement, e.g., stock enclosures or religious sites, although these may also yield some querns or quern fragments, or settlements that obtained flour or bread elsewhere or had no material to grind and thus which had no need for its own milling equipment. Equally, on sites that have, as is usually the case, only been partially excavated, the area investigated may be one that was not involved in milling and into which no fragments or discarded querns were incorporated into secondary contexts. Similarly, therefore, the area excavated will influence the type of context (primary or secondary) and perhaps size and even lithlogy (if different types were used for different purposes or at different dates) of the quern finds.

9.1.2 Factors influencing the nature of the quern record

As with other artefacts a number of factors operate to control the nature of the quern record, e.g., the lithological and form distributions and patterns of fragmentation, and which need to be borne in mind, for example, when assessing the archaeological significance of particular finds. The querns examined vary considerably in their degree of fragmentation from complete, undamaged querns, through large pieces to very small fragments of as little as a centimetre in diameter in the case of some lava pieces. The physical charcteristics of querns recovered from both excavation and fieldwork may, thus, depend on several factors:

1. The nature of the recovery process, for example, whether the quern is from an excavation or is a chance find. An initial examination of much of the available material seems to indicate that whereas the majority of querns from excavations are fragmentary and include relatively few complete examples the majority of chance finds tend to be complete or nearly so and in many cases appear to still have a potentially long use life. More detailed examination shows this picture to be more complicated.
2. The nature of the context, i.e., the type of the site and the particular area within the site from which the quern originates.
3. The quern form, whether it is a saddle, beehive or flat rotary

quern.

4. The quern lithology as some rock types are more easily recognised as probable querns than others.

5. The potential for reuse, which may affect the degree of fragmentation, and hence the ease of recognition as a quern.

1. Process of recovery

It might be argued that chance finds, for example, those found during ploughing, are more likely to be complete as these will be more readily recognisable as artefacts than smaller fragments. Complete querns would attract attention as being obstacles to ploughing and requiring removal at least to the field edge whereas smaller pieces of similar size to other stones within the top- and subsoil will, like the latter, be ignored. The second main category of chance finds, those incorporated into walls, gateways or gardens are a consequence of this process and operate a greater selection on complete querns. Those found in, e.g., gardens and farmyards have, to a large extent, been chosen for their decorative qualities and as such only the more complete examples are generally removed from their find-spot. Less complete stones may have been built into drystone walls. The recovery of querns for their decorative effect might also explain the relative deficiency of lower stones among chance finds.

The lack of associated finds may in large part also result from this process; fragmentary pots and other artefacts are likely to go unseen or be ignored. Unless the original findspot is sufficiently well recorded and the area investigated for (or already known to have produced) other surface finds the quern will remain an apparently isolated find. It may thus be that because so few have been carefully investigated and for others the exact provenance is not known only a few of the chance finds were in fact without associated material; similarly without such investigation there remains the possibility that some at least were deposited at some distance from the settlement at which they were used and if so this is one aspect that requires explanation. However, at present it is impossible to determine to what extent, if any, this is the case, unlike the situation for beehive querns in Ireland. Related to this is the difficulty of relating these chance quern finds to other material recovered from the area at an earlier or later date without a precise locality for the quern find. For a large number only the parish name is now recorded but in many parishes there are several sites which were occupied over the potential life span of the quern and to which it may relate.

On excavations the possibility of the occurrence of querns or quern fragments is, or should, be appreciated and there should thus be a higher chance that fragments as well as more complete examples should be recovered if present. Also, if many of the chance finds are in fact ploughed or dug from settlements then it might be expected that excavated sites will also yield at least some complete stones although there are several factors affecting this, for example, the number of querns in use at any one time over the settlement (related to the number of households), the length of time for which the site was occupied (if over a long period we might expect a larger proportion of broken and worn out querns discarded or reused) and the nature of the termination of the settlement - whether the 'current' querns are, since they are most likely valuable artefacts, removed to the new settlement or for some other reason left behind. The awareness for quern fragments is perhaps on the whole greater now than in the past and modern excavations tend to show a large proportion of fragments although this can also be influenced by, for example lithology.

2. Nature of the context

Chance finds may be recovered from a primary context, i.e. they are removed from a settlement or other deposit as a result of agricultural or industrial work, or secondary, for example, those found along field boundaries, in walls, farmyards, gardens. For reasons already suggested above, those from secondary contexts are more likely to be complete; the fragmentation of those from a primary context is influenced by the same factors those operating on an excavation, discussed below.

On excavated sites, where usually only a fairly small proportion of the total settlement area is investigated, the proportion of complete to fragmentary material will depend in part on the function(s) of that part of the settlement investigated. An area involved in milling is probably more likely to yield complete stones, either in situ for working if these have not, for any reason been removed at the time the settlement was abandoned or in store if replacements and spares are kept. Worn or slightly broken stones not wanted or unsuitable for reuse are probably most likely to be found in discard contexts close to the milling area. On other sites discarded querns or pieces may be incorporated into other structures, e.g., foundations, hearths or pavements. If only fragments are found in secondary on site contexts it may be that the area in question was not involved in milling; but the possibility of removal of all useful querns (which for a small farmstead site could be only a single pair) also exists. Discard patterns, the size and intra-site distribution of quern fragments is in turn influenced by the potential for re-use.

3. Quern Form

The main question regarding quern form in this context is whether certain types are more likely to survive intact and/or resist breakage during use. It is arguable that beehive forms are less easy to reuse as a result of their shape; flat or saddle querns are better suited with only minor modification to walling/paving stones than complete beehive stones. Conversely the beehives are more suited for use as decorative features in walls, rockeries, etc. and although flat querns are also used in this context saddle querns would not be expected to be used in this fashion, or if so used they are probably less easily recognised. The shape may also predispose certain types to breakage during manufacture, transport and use. The thinner flat querns are more likely to break in use than beehives, and secondly, because of their reduced original thickness compared to the beehives perhaps need replacing more frequently. Larger querns will result in, possibly a greater number of fragments increasing the chances of finding at least some representative pieces; if the beehive types remain complete the chances of finding one during excavation of only a small area of a site are thus small.

This does not explain the relatively large numbers of comparatively unworn beehive stones (those that from the position of the handle socket relative to the grinding surface have a potentially long use-life remaining) found in the study region. It is possible that these were replaced for various reasons by the flat stones, including the greater efficiency of the latter. If this is so presumably they are no longer considered to be as valuable and so are unlikely to be discarded in ritual context, arguing against deliberate deposition of most of these stones beyond their use site.

4. Quern lithology

There are two aspects under this heading, the first, the possibility of overrepresentation of one or more lithologies if a single quern is broken and the pieces distributed across several contexts. Secondly, on excavations and in fieldwork certain rock types are more readily recognised as quern fragments than others, the Rhenish lava and Puddingstone being the two types most easily identified and most commonly associated with querns regardless of their size and presence or absence of worked surfaces. Other lithologies, particularly on sites within or close to their area of outcrop are more likely, as small pieces, to be discarded as stray stones if they show no or only poorly defined worked surfaces; querns and quern fragments recovered from spoil heaps on sites are not particularly uncommon. Therefore, on an excavation where only pieces and fragments of querns survive some types may be retrieved and others discarded. A higher proportion of lava and puddingstone fragments present are likely to be are recovered than other lithologies and, also important in assessing the significance of the completeness of finds, the average size of pieces might be expected to be smaller for these types and other lithologies will be overrepresented as regards the number of complete querns in proportion to pieces.

5. Potential for reuse

It could be argued that as a consequence of the materials from which they are made a quern will be expected to be put to some secondary use when worn out or having suffered breakage that rendered it inadequate for grinding. However, not all querns, whether by virtue of form, lithology or environment and geography may be equally useful.

1. Form. It has already been suggested that beehive querns are less likely to be reused than flat or saddle querns for building although lower stones might be far more suitable than upper stones. Upper stones will probably be more liable to breakage and there thus may be more of these in existence. Saddle querns even when broken can still be used for grinding small quantities, of, for example, herbs, whereas broken beehive types are far less suitable for this. It may not be worth the effort of modification involved to reuse some stones on any given situation; this will thus affect the distribution pattern for complete/fragmentary material and it is possible that for certain forms a higher proportion of querns will remain complete or as originally broken.

2. Lithology. It is possible that some rock types are preferred for certain uses other than grinding whereas others may not be wanted. Re-use may also be dependent on the local geology and availability of lithic raw material. Sites with abundant close sources of stone may find primary aquisition preferable to reuse, although this in turn could depend on the purpose for which the material is required, the suitability in terms of shape of the querns or quern fragments available and hence the amount of modification of this required for its reuse. In this case one might expect a higher proportion of discarded larger pieces than on a settlement where raw material is scarcer and it is greater advantage to modify on site material, discard contexts yielding generally smaller fragments.

The total number of querns and the relative number of quern types from a site may be misrepresented if only numbers of fragments are counted; pieces of a single quern may be reused in several different contexts over an area, e.g. as at Magiovinium, Bucks, or in several areas across a site. It may not be readily recognisable that they are from the same quern, particularly as pieces may have weathered differently and some, for example, may have been burnt.

9.1.3 Use-life and wear

The querns also differ in the amount of wear; an assessment of the degree of wear that any quern has undergone involves an assumption of its original height, based on the present height of the quern compared to the maximum known heights for querns (or nearly completed roughouts) of similar design. Such comparisons although they can provide only a rough guide show a continuous range of wear (or of remaining potential use-life). Some the querns are still tall and the base of the handle socket over 10 cms above the grinding surface whereas at the other extreme there are many examples in which the handle socket has been partially worn away during grinding, and in some instances a replacement socket has been cut at a higher level on the stone. For querns showing this partial loss of a handle socket the actual length of use-life will vary according to the quern form; some of Yorkshire type may initially have been double the height of examples of Wessex type. The length of use-life is also influenced by the lithology, the type of material being ground and the frequency of redressing of the stone. The amount of wear undergone by the lower stones is more difficult to assess but again a very thick stone suggests a relatively short working life. At the other end of the scale it is more difficult to assess whether some of the thinner stones are excessively worn or are of slightly later date and made somewhat thinner.

9.2. Beehive querns in Eastern England

The study region for the purpose of the present discussion is divided into three regions; in addition the areas beyond are also dealt with briefly, discussion based on published material only.

9.2.1 East Midlands

This first region comprises the counties of Leicestershire, Northamptonshire and the former county of Lincolnshire, now Lincolnshire and South Humberside. Within this area, as appears to be the case elsewhere in the country, rotary querns are unknown during the early Iron Age. Querns recorded from early Iron Age contexts are all of saddle type, e.g., two examples of fine grained sandstone from the destruction levels of the early fort at Rainsborough, Northants (AVERY et al, 1967; 283). Rotary querns were first introduced to the region during the Middle Iron Age and may have been used in conjunction with saddle querns at some sites (replacing these or not used at all at others) the latter being common finds in contexts of this and later dates. Many of these early rotary querns have been found associated with sherds of scored Ancaster-Breedon ware. Dates for this pottery range from the fifth century BC to the first century AD (LIDDLE, 1982; 22).

Middle Iron Age

Lincolnshire and South Humberside. The main collections of querns from excavated sites in in these counties are those from Ancaster Quarry and Dragonby. The querns from Ancaster Quarry, have been discussed in some detail in previous chapters. The site lies on Jurassic Limestone, close to the Jurassic Way overlooking an east-west river gap in the escarpment. Only part of this site has been investigated but it appears to have been undefended, excavated features including two huts and some four-post structures. The pottery compares with that from Breedon, Leicestershire, and includes a large amount of scored ware. The querns recovered demonstrate the use of three separate sources, limestone, probably from an outcrop very close to the settlement, Spilsby Sandstone from the Lincolnshire Wolds to the north-east and Millstone Grit from the Pennine. The presence of roughout and partially complete querns of limestone in pits indicates that the local limestone was being worked on site, blocks probably having been cut to the required size before being brought to the settlement. From here the finished articles may also have been traded to other nearby communities. Compared to other sources the scale of exploitation appears to have been relatively small and limestone querns are not widely distributed.

Several saddle querns have been recovered from the site, including one specimen, originally roughly rectangular, that had been broken into squarish pieces and incorporated into the base of an oven in one of the huts (MAY, 1976a; 136). The saddle querns are generally of fine grained sandstones and metamorphic rock. The rotary querns are generally all of beehive type and fairly complete but include one pierced, relatively flat lower stone of Millstone Grit, although it of comparable diameter to the other beehive stones from the site. Almost all of the material, both complete and fragmentary, was recovered from pits on the site.

Similar sites to Ancaster Quarry certainly existed but none has yet been investigated in detail, e.g., Barrowby Down, Helpringham, Counthorpe, Crowland and Tallington (MAY, 1976a;14) A beehive upper and lower stones and numerous sherds of Iron Age pottery were found after deep ploughing at Barrowby (E.M.A.B., 1959). Similar pottery and querns are known from elsewhere in the county, e.g., at Tallington, Lincs, an area that has also yielded a complete quern, CJ 526 and 527) of Spilsby Sandstone comprising complete and relatively thick upper and lower stones that appear to have been litle used, and which were found during ploughing. A number of enclosures of Romano-British date are known in the parish of Tallington, one of which has yielded both scored pottery and fragments of wheelmade Romano-British wares. These enclosures probably represent a series of small farmsteads that continued in native tradition into the early Roman period. The quern may have originated from one of these and despite the similarity of querns and associated pottery may be of slightly later date than those from Ancaster Quarry (TODD, 1973; 95). From Denton also in the south-west of the county there are two complete upper stones, one of Millstone Grit subtype 3 and the second of Spilsby Sandstone, both stray finds although a Late Iron Age settlement is recorded in the parish (MAY, 1976b; 168) from which these may be derived.

Finds of all types suggest a significant increase in wealth in the region from at least the third century BC, possibly partly attributable to the salt industry which was particularly active in the area of Ingoldmells. There have, as yet, been no detailed investigation on these sites but querns are recorded from the area, for example, a Lincolnshire style beehive upper stone made from siliceous grit found on the beach just to the south of the salt manufacturing site at Ingoldmells which has produced Iron Age pottery and briquetage debris (Lincoln Mus.Archive). A Romano-British quern of unspecified form and scored pottery are also reported from the Iron Age saltern site at Helpringham (MARJORAM, 1973; E.M.A.B., 1977), and CJ 525, a complete upper stone of Spilsby Sandstone (possibly Lincolnshire form) is also from the area. Two beehive querns are known from the general area of a third saltern site at Billingborough, Lincs; CJ 289, a worn, complete but asymmetrical Hunsbury form upper stone of Spilsby Sandstone and CJ 524, half of a pierced lower stone of feldspathic Millstone Grit which may be of relatively late date (possibly Roman).

Hillforts of this date are rare in Lincolnshire but there are a few sites of uncertain date that may fall into this category, e.g., the double ditched enclosure at Honington Finds from the site are all of Roman date although flint artefacts and a saddle quern are recorded from the surrounding fields; there is no material of certain Iron Age date (MAY, 1976a; 141). Possibly also related to this site is a stray find of a beehive quern from a field at Honington (WHEELER, 1978). Scored pottery and rotary querns have not been recorded from the three other possible hillforts, none as yet excavated, at Round Hills, Ingoldsby,(where the only surface finds are of Medieval and post-Medieval date), Careby Camp (Bourne) and Yarborough Camp (MAY, 1976b; 143: WHITWELL, 1982).

Stray finds from the county are numerous. Querns with no recorded associated material are known from, for example, Mareham on the Hill, a sandstone quern similar to the Hunsbury type (MARJORAM, 1973; 38), Hemswell, an upper stone (WILSON, 1972; 10), Barlings, a stone recorded outside the farmhouse at Abbeys Farm, Low Barlings (WHEELER & FOWKES, 1982), Glentham, a puddingstone quern, Benniworth, Donington, upper and lower Puddingstone stones (MAY, 1965) and Broughton, an upper flattened beehive stone of Millstone Grit found on a rockery and presumably ploughed up (WILSON, 1970; 10).

Many of the other querns examined in these counties are presumably stray finds as they lack information other than provenance. These are generally complete, or represent at least one-quarter of the stone and include representatives of all the lithologies present among beehive querns in these counties, for example, stones from: Ingham, CJ 299, a complete but worn Hunsbury form upper stone, Stallingborough, CJ 300, Woolsthorpe, CJ 302, a complete, worn upper stone of limestone, Coleby, CJ 304, a complete, moderately worn Hunsbury upper stone of Spilsby Sandstone, Hurdletree Bank, CJ 291, a quarter of a puddingstone quern, Heighington, CJ 287, a complete, well made upper stone of Millstone Grit subtype 1 probably fairly worn, Kyme, CJ 295, a complete unpierced lower stone of MG/1, Nettleton, CJ 311, an unfinished upper stone of Lincolnshire form and Waddingham, CJ 317, a complete upper of puddingstone possibly relatively little worn.

For a few querns there is a small amount of loosely associated material, for example, at Nocton sherds of scored Iron Age pottery (WHITWELL, 1972) and an upper stone of Millstone Grit (WHEELER, 1978) are reported, although the quern may be CJ 293 of Spilsby Sandstone. Iron Age sherds and an upper beehive quern (a stray find, probably CJ 312 of Spilsby Sandstone) have also been found at Bracebridge Heath (WHITWELL & WILSON, 1968; 21) and finally, at Thoresway fragments of three beehive querns of unspecified form and lithology and native type pottery and Samian wares were recovered (BEEBY, 1977).

Leicestershire. In Leicestershire the main excavations on sites of this date have been at the hillforts of Breedon-on-the-Hill (the second type site for Ancaster-Breedon ware) and Burrough Hill. The hillfort at Breedon-on-the-Hill, covering an area of 15 acres, is situated on Carboniferous Limestone overlooking the Trent vally near Melbourne. The ramparts show two phases of rampart construction but the site has produced very little Late Iron Age material (TODD, 1973; 8: WHITWELL, 1982; 17-19). Excavation has investigated only a relatively small area of the site (LIDDLE, 1982; 19). The site has produced both saddle and rotary querns, the six of saddle type published by Wacher (1964, 1977) being of varied lithology. Two, incorporated into the second phase of the defences, are of igneous porphyroid rock from Charnwood Forest. In addition there is one described as buff coloured arkosic sandstone and suggested to be Spilsby Sandstone (although this is a non-feldspathic rock), one possibly of Millstone Grit, one of micaceous arkosic sandstone (possibly from Derbyshire) and the fourth of sandstone from the Building Stones Formation (WACHER, 1964, 1977; 132-5). Over 40 beehive querns are reported from the site, suggesting a large population; the seven examined are all of Millstone Grit, rotary querns replacing saddle types during the Middle Iron Age (LIDDLE, 1982;19). Many of the stones have been recovered during quarrying of the site. Of the seven examined five are upper and two lower stones; CJ 113, 114, 245, 274 283, 286, 284. They are of varied design and include one complete quern, CJ 283 and 284, of which the upper stone is collared and decorated by a groove cut into the rim. Three of the stones are broken, CJ 286, 245 and 274. CJ 245, of MG/2, half of an upper stone was found at the western entrance (KENYON, 1950), CJ 286 comprises two fragments of an upper stone and CJ 274 is broken at the top of the stone.

Burrough Hill was roughly contemporary with Breedon, occupied from the Middle Iron Age; pottery from the site comprises scored Ancaster-Breedon ware, wheel turned pottery and early Roman sherds suggesting occupation up until the mid 1st century AD. The excavation here was on a smaller scale than that at Breedon-on-the-Hill and included several pits, some containing Ancaster-Breedon ware and Hunsbury style querns (LIDDLE, 1982; 22). The three querns from the site examined (precise contexts unknown) are all of Millstone Grit subtype 1 and include a complete quern (CJ 281) 282) which appears little worn and could possibly even be unused. The upper stone is characteristic of the Hunsbury 1 form and collared, the lower stone the lower is thick and symmetrical. CJ 220 is a fragment (approxiamately one sixth) of a Hunsbury style upper stone, possibly quite worn and found just outside the hillfort (MUS.RECORD). Other, unexcavated, hillforts or possible hillforts in the county include Robin a Tiptree Hill, Tilton, (LIDDLE; 1982; 22). CJ 239, from Tilton is a complete and relatively little worn upper stone.

In addition to these are a number of smaller earthwork sites, but few have as yet yielded querns. For example, Belton Castle is a small nearly circular earthwork similar to that at Round Hills, Ingoldsby. Iron Age and Roman material were reported from the site in 1954 and half a lower beehive quernstone was found in the ditch, CJ 117, a thick, unpierced stone of MG/1. Four other sites, Thorpe Arnold, Bardon, Thurlaston and Ridlington are all without finds of pottery and undated (LIDDLE, 1982; 22). At Ridlington (SK 837031) half a rotary quern topstone was found during field drainage but the type of quern is not published (LIDDLE, 1983; 90).

Small agricultural settlements are known in larger numbers and have produced both scored wares and beehive querns. Enderby, situated on Keuper Marl, was occupied in the early and middle Iron Age, initially as an open but later as an enclosed settlement (CLAY, 1983; 77-9). Excavation in 1985 revealed two houses, an enclosure ditch and two smaller ditches and a ditch system to the south-east. CJ 275 from the site is a broken (half the stone survives) and fairly worn upper stone of MG/1. At Eaton, a site destroyed by ironstone working, there is evidence for a hut floor containing pottery similar to that from Harston, Leics, (Ancaster-Breedon ware) and a complete quern of MG/1, CJ 115 and 116 was also recovered here, the lower stone broken but the upper a complete and tall Hunsbury example (LIDDLE, 1982; 25).

There is one, cmplete but very worn upper stone of limestone from an Iron Age pit at Harston (CJ 267) in the north-east of the county, from a site that also produced Ancaster-Breedon ware (LIDDLE, 1982; 25: KENYON, 1950). The site, discovered and subsequently destroyed by ironstone working, lies close to the upper basin of the River Witham by which there is access to the Ancaster Gap; the quern may have been obtained from the Ancaster Quarry settlement via this route, although it is also possible that they were obtained from a nearer limestone outcrop. A fourth site at Sproxton, a site excavated by an "untrained group", comprises a rectangular enclosure with annexe that contained stone hearths and deep storage pits and associated Ancaster-Breedon ware; early Roman pottery has also been recovered from the site. A possible early Roman date is suggested for the hearths and a quern fagment was only a surface find (LIDDLE, 1982; 25). Two querns from Sproxton were examined, CJ 207 and 217. CJ 207 is a rather flattened bun shaped but complete upper stone of puddingstone retrieved from the vicarage garden at Sproxton. CJ 217 is a fairly worn but complete Hunsbury style upper stone of limestone. Scored wares are also known from later sites, e.g., Whitwell, SK 928075, where occupation began during the earlier part of the 1st century AD (DRAGE, 1976; 57-8) and may in some areas have continued in use later in that century. No querns are reported from Whitwell where Iron Age pottery was found in a series of gullies and pits over half an acre (DRAGE, 1976; 57-8).

As with other counties stray finds are also numerous. A few have some loosely associated material, for example, those from Garthorpe, a sandstone saddle quern and upper double handled beehive quern (CJ 270) and 2nd to 3rd century pottery (WHEELER, 1978; 7: McWHIRR, 1976; 62); Groby, three fragments of beehive quern found in a field immediately south of a Romano-British site, in an area from which a scatter of Roman pottery was previously recorded (WHEELER, 1978; 8: LIDDLE, 1986; 92); Evington, an upper Hunsbury style quern found while digging sewer trenches, Sileby, a lower stone with spindle found in the bank of a brook, earlier finds including Roman pottery from downstream and a quern fragment from upstream (LIDDLE, 1980; 97) and, possibly, Stoney

Stanton (CJ 241 of MG/3 and CJ 246 of MG/1), found during quarrying in the area of a Late Iron Age and Roman settlement.

There are also isolated finds from, for example, Aston Flamville (CJ 269), an upper stone (WHEELER, 1978; 5) found during preliminary work for the M 69 although examination during grading work produced no other finds; Owston (CJ 230) (MAY, 1959; 3); Thurnby (CJ 203) (MAY, 1959; 3); Loughborough, an upper Hunsbury style quern found in the side of a ditch (MAY, 1959; 3); Swepstone, an upper stone of hard brown sandstone recovered during ploughing (LIDDLE, 1980; 97); Pickworth (McWHIRR, 1972; 76); Knipton (CJ 233) an almost complete fairly worn upper stone of Spilsby Sandstone found in a rectory garden, Cranoe (CJ 200), half of an upper stone of Spilsby Sandstone found on a ploughed field, and Rearsby, CJ 216, a fairly worn Hunsbury form upper stone from Beedle gravel pit. As in Lincolnshire a large proportion of these stray finds are complete and, although some exhibit considerable wear, many are still thick with a fairly long potential use-life.

Northamptonshire. A large number of sites of this date are known in Northamptonshire, many probably short-lived, but the distribution reflects commercial activity and intense fieldwork by two individuals. (BROWN & TAYLOR, 1978; 78). In 1972 Hall and Hutchings documented 62 pre belgic Iron Age sites in the area between the Nene and Ouse surveyed, most represented by ploughed out scatters of pottery. Exacavation of these sites generally show hut circles or post hole circles and many can be interpreted as individual farmsteads (HALL & HUTCHINGS, 1972).

Hunsbury

The hillfort at Hunsbury has produced the largest single collection of quernstones within the region of which 124 are now available for examination in Northampton Museum. However, most of these are now labelled "probably Hunsbury" and it is possible therefore that a few not originally from the site are among these. In addition several appear to have been lost; contemporary reports note over 150 beehive quern finds and the list compiled by Phillips (1950) includes two of puddingstone, now missing from the collection. The hillfort lies on Northampton Sand, close to the junction of the Jurassic Way with the River Nene, and was largely destroyed by 19th century ironstone quarrying. Large numbers of artefacts were salvaged but without stratigraphic recording (FELL, 1936: WHITWELL, 1982; 18). Most of the material is from the interior, largely from pits of which over 300 were recorded by Dryden (RCHM, 1985) but some were also found during working of the surrounding areas. The earliest pottery is dated to the 5th century BC and occupation is attested throughout most of the Iron Age. However, there is little belgic material from the hillfort although Belgic sites are relatively common there in the surrounding areas (RCHM, 1985; microfiche).

The total of 124 querns examined comprises 69 of MG/1, 6 of MG/2, 5 of MG/3, 16 of Spilsby Sandstone, 4 of Hythe Beds (Lodsworth), 2 of Folkestone Beds, 5 of Old Red Sandstone, 14 of fine grained sandstone (possibly Jurassic) 2 of granite and one of probably local Jurassic sandstone. The collection thus contains representatives of all the main lithological groups among the beehive querns in the study region with the exceptions of puddingstone and limestone. These rock types occur, for the most part, as querns of their 'typical' form and thus, virtually all the typological classes present in the study area are also represented. There are four, probably Sussex lower stones (but no upper stones of Sussex form are known from the hillfort), CJ 67, 100, 108 and 165 of Hythe Beds; two Kent 2 upper stones, CJ 103 and 155 of Folkestone Beds; Hunsbury style upper and lower stones of Millstone Grit, Spilsby Sandstone, granite, Jurassic and other sandstone; Yorkshire type upper stones of Millstone Grit and two Wessex form upper stones of Old Red Sandstone. Lower stones are in general thick and unpierced with a flat grinding surface, the exceptions being those of Hythe Beds and Old Red Sandstone which have a convex grinding surface and concave and convex bases respectively. This suggests that most if not all the querns arrived at the hillfort as finished articles having been manufactured in the style predominant in the area in which the respective quarries were located.

In addition to the wide range of lithology and typology represented the second curious feature of the collection is the very high proportion of complete, or nearly so, and apparently little worn stones. A total of 86 of the stones are complete or have suffered only minor damage to the top of the stone (which should not have affected the grinding capabilities), two have lost part of the top, 24 are broken but over three-quarters of the stone remains and there are eight halves of stones (and one complete stone in two halves) and one stone of which only a third remains. They contrast in this respect with finds from large scale excavations at other hillforts, e.g., Danebury, which shows a high percentage of fragmentary material. This in part no doubt reflects the methods of recovery, which at Hunsbury was largely by salvage rather than excavation. Under these conditions complete objects are more easily recognised and, perhaps given the volume of material available for retrieval, considered to be more worth collecting than more framentary artefacts, querns by virtue of their size presenting greater problems of transport and storage than pottery or metal objects. A number of stones are thought to have been removed by workmen at the quarry in the 19th century and these too are probably likely to have been fairly complete but there is no means to assess the volume of discarded material. It is arguable that under the prevailing conditions broken querns more likely to have been missed as "stones" than, for example, metal items. However, the recovery method does not detract from the fact that this comparatively small hillfort contained at the time of its abandonment a large number of complete stones (possibly complete pairs although it is not possible to definitely match upper and lower stones) not removed when the occupants left whereas at, e.g., Danebury extensive occupation of the hillfort interior has recovered very few complete stones but a large quantity of fragmentary material. The important factor at Hunsbury is thus not the proportion of complete to fragmentary stones but the absolute number of complete finds relative to those from other sites (in terms of the nature or status of these) which presents the hillfort as a very unusual site. Knight suggested that, in view of the meagre evidence for non-subsistence activities obtained from settlements elsewhere in the region the hillfort may have served as an industrial centre for exchange and possibly a residence for an elite (KNIGHT, 1984; 186).

An assessment of the amount of wear based on the position of the handle socket with respect to the grinding surface relative to its overall height and taking into consideration the style of the quern suggests that of the upper stones approxiamately nineteen have suffered little wear, twenty-six are moderately worn and eighteen are very worn. This does not suggest stones that have been brought onto the site for redistribution unless there was a far greater range of original heights among these querns than is suggested for the products of, e.g., Wharncliffe or Folkestone, which exhibit a restricted range of height/thickness among the products of a single quarry, or querns of one style. It is far more difficult to assess wear of the lower stones but given that most are of the thick, unpierced Midlands form the present range of thicknesses again suggest wide variation in the amount of wear suffered. It may suggest the abandonment of the beehive querns at the termination of occupation here and that establishment of a focus of settlement in the area possibly at Duston (RCHM, 1985) was associated with other changes in the economy, including the increasing importance of a new quern type, in this case possibly the puddingstone querns, which are rare at Hunsbury itself. Also unusual in view of the suggested initiation date for the hillfort is the rarity of saddle querns, although Knight notes the existence of a small number of possible stone rubbers; this may also result in part from the relative ease of recognition of different quern types, and saddle querns and rubbers would be less easily recognised as artefacts by, for example, the quarry workers.

In addition to Hunsbury a number of other Middle Iron Age sites are known in Northamptonshire but relatively few have been excavated (many are known from surface finds) and they are generally lacking in associated quern finds. Scored wares are also known from later Iron Age sites, e.g., Strixton, Bozeat, Twywell, Upton and Geddington (HALL, 1971; 17-19: BROWN & TAYLOR, 1978; 82: JACKSON, 1979). Thorpe Achurch is an unexcavated Iron Age site comprising a central street lined by enclosures and containing at least nine huts which could be termed a hamlet (BROWN & TAYLOR, 1978; 82). The excavated features at Hardwick Park, Wellingborough also belong to this period and are part of a larger settlement complex of shifting occupation from the Middle Iron Age through the Roman period whilst salvage excavation at Rushton indicated a Middle Iron Age farmstead (EVERSON; 1976); again there are no reported quern finds.

The site at Briar Hill saw rather piecemeal recovery of evidence and survey observation during building operations. The site forms part of the settlement pattern of the hillside below Hunsbury hillfort and Bamford suggests that it may be related to the latter; whether one of a number of individual farmsteads clustered around a focal point or part of an integrated system of farming and stock management. There are several fragments of rubbing stones and a single, small, fragment of an upper rotary Puddingstone quern recovered from a Saxon context (BAMFORD, 1985; 93-4). From the hillfort at Burrough Hill, Daventry comes a single complete lower stone of Hythe Beds sandstone, CJ 474. This is within the diameter range of beehive querns of this lithology (32 cms) but of rather a late style, having a convex grinding surface and is pierced by an hourglass shaped spindle hole. Knight has reported querns from Chelveston, Cogenhoe, Corby, Earls Barton, Easton Maudit, Irchester and Mears Ashby (KNIGHT,1984) although the types and lithology are not specified; and the lack of querns from other sites investigated would appear to result from the small scale of excavated rather than a genuine absence.

To the north of the county the long-lived settlement at Brigstock yielded large quantities of coarse pot and unusually large numbers of querns which it is suggested were used for grinding charcoal (HALL, 1982). Pottery from the area covers the period from the fifth to the first century BC (JACKSON, 1983; 19-22). The querns include at least one piece of Hythe Beds sandstone (M.Wright; pers.comm.). Draughton, to the north-east of Northampton may represent only short-lived settlement of ironstone miners. It has produced pottery of scored type and some decorated in Hunsbury style but no querns are reported (BROWN & TAYLOR, 1978; 82: GRIMES, 1958, 21-3: WHITWELL, 1982; 20). The iron producing site at Wakerley (HALL, 1982) was initially settled in the second century BC and used into the Roman period although it may not have been occupied during its later phases. There is a single quern from an Iron Age context, (JACKSON & AMBROSE, 1978; Fig.63, no.96), approxiamately one sixth of an upper stone (possibly very worn) of medium grained, grey-brown gritty sandstone suggested to be from the local Estuarine Series. A second, unstratified, fragment (JACKSON & AMBROSE, 1978; Fig. 64, no.97), preserves part of te handle socket set into the top of the stone and has been identified as Pennine Millstone Grit. The stone is relatively large (44.3 cms in diameter) and may be of comparatively late date. Also illustrated, from a Roman context, is a fragment from an upper stone of oolitic limestone whose profile resembles that of the South-western style querns (JACKSON & AMBROSE, 1978; Fig.64, no.98). Several other fragments of querns, mainly from Roman contexts, were also recovered (JACKSON & AMBROSE, 1978; 228-230).

Stray finds are represented by most lithologies found in the county, by querns of, for example, Millstone Grit from Brixworth (CJ 484), a complete and possibly little worn Hunsbury style upper stone and Rothwell (CJ 563), a complete, thick and unpierced lower stone; Spilsby Sandstone from Polebrook (CJ 496), an almost complete but very worn Hunsbury form upper stone; Hythe Beds from Yardley Hastings (CJ 500), one third of a pierced lower stone; Old Red Sandstone from Kings Sutton (CJ 502) a complete, pierced lower stone; and of puddingstone from Long Buckby (CJ 476), a complete lower stone, Blackgrounds, Chipping Warden (CJ 479), half of an upper stone and Little Houghton (CJ 483) half of a lower stone.

Late Iron Age

Lincolnshire and South Humberside. The later Iron Age in Lincolnshire/South Humberside was a period of increased density of population and greater material wealth in the area (O'BRIEN, 1979). Settlement at both Ancaster Gap and Dragonby was initiated by the second century BC and there is a third large nucleated settlement at Old Sleaford and many smaller sites, all undefended, established in the later Iron Age and which continued in occupation through the Roman period. Present evidence suggests two concentrations of settlement, in the Ancaster area in the south and in the Dragonby - North Ferriby area in the north (MAY, 1976a).

Dragonby lies on Lincolnshire Limestone, 6 miles from the confluence of the Trent and the Humber and comprises a complex ditch system enclosing an approxi mately rectangular area of 8 ha. Two areas of 0.5 and 0.2 hectares were excavated but only two circular huts were found within these areas. Several styles of pottery occur, the earliest hand made and burnished or decorated with stamped and rouletted decoration, succeeded by a phase showing a higher proportion of wheel-turned vessels showing greater standardisation of fabric, dated to the 1st century BC and related to earlier Aylesford types from Kent and Essex. These are in turn succeeded by Gallo-Belgic wares from at least the earlier 1st century AD. Despite the generally later date than Ancaster Quarry, although there is some overlap of occupation, the site has produced a significant number of saddle quern fragments in addition to a large collection of pieces (over 165) from rotary querns, the majority of them from flat types. The saddle querns are of Spilsby Sandstone and various fine grained sandstones (some feldspathic and possibly Millstone Grit) the latter most probably obtained as erratic material. The rotary querns are, with only a few exceptions, very fragmentary and include only five of certain beehive type; CJ 516, a Lincolnshire form upper stone, CJ 519 a broken upper stone of Hunsbury 2 form, CJ 518 a symmetrical unpierced lower stone, and CJ 517 and 738 two similar lower stones which have a convex grinding surfaces, rounded, near vertical sides and convex base. CJ 518 is from a Late

Iron Age context, CJ 516 and 517 from, probably, early Roman contexts, CJ 517 from a layer that also yielded pieces of Rhenish lava and Millstone Grit and CJ 738 from a late Roman well. There are a few fragments of puddingstone from the excavation, two from the topsoil and two from contexts that also contained fragments of lava querns; they may thus be of Roman date. The flat querns are predominantly of Rhenish lava and Spilsby Sandstone but there are also a significant number of Millstone Grit and some of other lithologies (for some of which sources have not yet been identified) including limestone, dolomitic sandstone and biotite granite (MAY, 1984; 21: MAY, 1976a; 182-191;: MAY, 1976b; 170-2).

The settlement at Ancaster Gap is of "unknown but sizeable extent" and similar in character to that at Dragonby. It is situated 400 meters from the settlement at Ancaster Quarry in the gap overlooked by the latter BC (MAY, 1984; 21). Evidence for the earlier phases of occupation is obscured by that of later Romano-British period but there are some marked contrasts to the quarry site, for example, the complete absence of storage pits (MAY, 1976 BAR; 166). Querns from the Ancaster Gap settlement include AC 66.QB amd AC 65.GM both fragments of lava, AC 69 DN, half a lower stone of Millstone Grit, CJ 747 of Spilsby Sandstone a complete and possibly very worn upper stone of rather intermediate form between the beehive and flat stones, tending to the Lincolnshire form but having a concave grinding surface and possibly CJ 759, also of Spilsby Sandstone and complete which is of similar form to CJ 747.

The third large settlement of this date is that at Old Sleaford which is also overlain by extensive later occupation (MAY, 1976 BAR; 168); the full extent of the site is unknown at present. The finds again suggest a rich material culture and a large collection of coin moulds demonstrates the presence of a mint here, possibly a tribal capital (MAY, 1984; 21), but no querns from the site were examined. A number of smaller settlements are also known but many of both the major and minor settlements listed by May have not been excavated the two types distinguished by the range and density of artefacts recovered as surface finds (MAY, 1984; 18). There are two querns from the area of Denton which has produced wheel turned pottery of the Late Iron Age (MAY, 1976 BAR; 168). CJ 307 is a complete, but rather boulder like upper stone of general Hunsbury form and made from Millstone Grit subtype 3. CJ 742, also complete and of Hunsbury form, is of Spilsby Sandstone and very worn. A late Iron Age origin is also attested for Lincoln but there is only a single beehive quern thought to be from the city, CJ 315, a complete, worn upper stone of Lincolnshire form. No querns are as yet known from the site at Kirmington where Iron Age occupation again underlies an extensive Romano-British settlement (MAY, 1976a; 181).

For a number of other sites querns are known from the same general area but precise localities are now unknown. CJ 308 from Owmby is a complete upper stone of Hunsbury form, probably only moderately worn of Spilsby Sandstone. The Romano-British site at Owmby has also yielded large numbers of pre-Roman coins and air photographs show enclosures and other features of uncertain date (MARJORAM, 1974; 20: WHITWELL, 1982; 16, 30: MAY, 1976b; 174). There is no evidence for Iron Age occupation within the walled Roman town at Horncastle but Late Iron Age wheel made pottery is recorded from the Bain valley to the south and 11 coins are also known from the area (MAY, 1984; 21). CJ 298 from the area is an almost complete three handled upper stone of Millstone Grit subtype 1 decorated with three grooves cut into the collar. The settlement at South Ferriby may have been comparable to that at Dragonby (MAY, 1976b; 174), finds from the area indicating a large and important site now lost to river erosion but which originally probably controlled the crossing of the Humber and which (MAY, 1984; 22). There are three querns of Spilsby Sandstone from the area, CJ 521, 510 and 508. CJ 521, half an upper stone of probable Hunsbury 2 form shows little wear, CJ 510 a slightly damaged upper stone of Lincolnshire form also shows relatively little wear and CJ 508 is a damaged pierced lower stone of large diameter and fairly late style, which has a convex base and grinding surface and cylindrical spindle hole. Settlement at Old Winteringham was established in the mid 1st century BC although the main occupation appears to have been during the Roman period. Excavation produced a total of 18 quern finds 10 of which are of lava and 2 of which are from saddle querns. These include an upper and probable lower stone of Spilsby Sandstone (CJ 514, 515), the former comprising half the stone and probably very worn, the latter approxiamately one third of the stone (STEAD, 1976; 18-19, 229-232).

One smaller settlement of this date with no known associated querns is that at Colsterworth, a D-shaped enclosure that has produced mainly belgic pottery of the mid 1st century AD (WHITWELL, 1982; 20-1). Other settlements include those at Ludford where the evidence comprises mainly a large number of coins recovered as surface finds after ploughing together with some other metalwork and possibly undated cropmarks (MAY 1984; 21), Hibaldstow, Salterford and Sapperton. Some of the settlement at Tallington is also of this date.

Leicestershire. During the later part of the Iron Age Lincolnshire formed part of the territory of the Corieltauvi (formerly known as the Coritani) that also included parts of Leicestershire, Nottinghamshire and northern Northamptonshire. As in Lincolnshire, wheel turned pottery first appears in this county during the first century BC, accompanied by an increase in the degree of economic specialisation and greater links with the south-east. Pottery of the type seen in the middle phases at Dragonby is generally absent (although it is seen at Ratbybury in the first century BC) and the Ancaster-Breedon wares are replaced by Gallo-Belgic types. Sites producing the latest Iron Age pottery include Burrough Hill, Thurmaston, Frisby-on-the-Wreake, Eaton, Market Harborough and Croxton Kerrial, the last an unexcavated square ditched farmstead enclosure of Iron Age type covering half an acre where occupation, initiated in the late Iron Age, continued into the early Roman period (McWHIRR, 1978; 87-88). At other sites the presence of Iron Age material may be largely obscured by a far greater volume of Roman material. Querns are recorded from few of these sites although three examples from Thurmaston are illustrated by Curwen (CURWEN, 1941; Fig. 11, Fig.16), a double handled Hunsbury style upper stone and its associated thick, unpierced lower stone and a puddingstone upper stone of East Anglian form.

At Leicester the settlement established by the end of the 1st century BC was succeeded by the Roman town of Ratae Coritanorum. A number of querns found in Leicester were examined; CJ 198, approxiamately one quarter of a moderately worn lower stone of Hunsbury type made from feldspathic Millstone Grit, CJ 249, a complete, collared upper stone also of MG/1 and Hunsbury 1 form, only moderately worn but now slightly asymmetrical, CJ 252, a complete and probably relatively little worn Hunsbury style upper stone of MG/2, CJ 263, of feldspathic Millstone Grit, a complete and very worn upper stone ground down to the base of the hopper and CJ 265, half of a very worn upper stone of MG/1. Of these CJ 263 was found in a field south-west of New Parks House but may have been dumped here from elsewhere in Leicestershire and CJ 249 was found 1.5 metres deep on the site of New Parks School.

Roman setlements similar to those of Lincolnshire are known at, e.g. Goadby Marwood, Medbourne and High Cross but with as yet no evidence for pre-Roman occupation. There is one beehive quern from Goadby Marwood, CJ 240, a complete, upper stone of feldspathic Millstone Grit and Hunsbury 2 form with a large rounded collar and funnel-shaped hopper which may suggest earlier occupation here.

Northamptonshire. The coin evidence from the county suggests that the Nene Valley lay within Catuvellaunian territory, the boundary with the Corieltauvi located in the uplands between the Nene and Welland rivers. Belgic material occurs from the end of the first century BC or beginning of the first century AD (HALL & HUTCHINGS, 1972; 3). The absence of these styles at Hunsbury suggests its abandonment at about this time, when it may have been replaced by the settlement at Duston where the coin finds indicate a major settlement (TODD, 1973). Only one quern from the Roman town was available for examination, CJ 503, a complete lower stone of Puddingstone pierced by an hourglass shaped spindle hole. The piercing may not have been an important aspect of its use as it has been plugged by iron. A puddingstone quern is also recorded from the Romano-British site at Newton Bromswold, where settlement evidence covers several acres (HALL & HUTCHINGS, 1972; 14).

There are some indications that, as elsewhere in the East Midlands, nucleated settlements were developing in the earlier 1st century AD, the development continuing into the Roman period (RCHM, 1985). At Corby Iron Age and Roman pottery have been recovered over much of the area developed for the New Town and iron working may have been carried out at one or more localities. Three querns from the area were examined, CJ 177, 183 and 495. CJ 177, of Hunsbury 2 form is a complete upper stone of Spilsby Sandstone, very worn and asymmetrical. It is a stray find from the Beanfield Estate site which has produced Roman material at various times over a wide area during building construction (RCHM, 1979). CJ 183 is a complete, symmetrical and possibly little worn upper stone of general Hunsbury of Spilsby Sandstone. The third quern, CJ 495, of fine grained sandstone is a rather bun shaped and probably very worn upper stone.

There are five querns of five different lithologies from Desborough area where an Iron Age and Roman settlement was found during ironstone mining (SP 79898270) but their relationship to this site if any is not known. CJ 472, of Lodsworth Hythe Beds sandstone, is a complete Sussex style upper stone although the grinding surface in this case is nearly flat. CJ 490, of feldspathic Millstone Grit, is a broken and damaged Hunsbury form upper stone, CJ 491 of Millstone Grit subtype 3 half of a double handled Hunsbury style upper stone in two pieces, CJ 492 a slightly damaged lower stone of Old Red Sandstone of which approxiamately 80% of the stone survives, and CJ 494 a complete but very asymmetrical and moderately worn Hunsbury form upper stone of probable local greensand. Several Iron Age sites and enclosures, at least one of which has been destroyed by gravel quarrying are known in

Grendon parish (BROWN, 1980; 166: RCHM, 1979) and there are two querns of Millstone Grit subtype 1 from the area, CJ 486, a nearly complete collared Hunsbury 1 form upper stone which appears little worn and CJ 501, approxiamately half of an unpierced lower stone.

Several Iron Age or Romano-British sites are also known in the parish of Brixworth (BROWN, 1981; 201: RCHM, 1981). CJ 484 of MG/2 from Brixworth is a complete and probably relatively little worn, symmetrical Hunsbury 1 form upper stone and possibly from the Romano-British settlement at Yardley Hastings, is CJ 500 of Lodsworth Hythe Beds, broken pierced lower stone of which approxiamately one third remains. Other settlements of this date known have as yet produced no querns and include Knuston, a site covering 15 acres where stripping of the topsoil exposed a complex of enclosures of Iron Age and Romano-British date which produced late belgic pottery of a similar type to that from Irchester (HALL & HUTCHINGS, 1972; 3, 14), and Rushton, another site discovered by fieldwalking although some excavation followed exposure by quarrying (JACKSON, 1976; 84-7).

Of two enclosures investigated at Moulton Park, Northampton, one was associated with pre-Belgic and belgic pottery (late 1st century BC to early 1st century AD) and the second with only belgic material (first half of the 1st century AD). Although one enclosure was nearly fully excavated the second was only partially investigated. The single published quern find, CJ 488, is of Hythe Beds sandstone and nearly complete, and was found in a house gully (WILLIAMS, 1974; Fig.25, no.233). The double ditched enclosure at Blackthorn, Northampton, probably saw only short-lived occupation; the site may represent only a single family unit. Excavation produced a complete quern of Millstone Grit subtype 1. The upper, CJ 487, is of Hunsbury 1 form, complete and probably only moderately worn. The lower stone, CJ 489, is also complete and still fairy thick. Both stones were found together in a pit and may have been discarded at the time of settlement abandonment (WILLIAMS, 1974; Fig.36).

Thus at present there are a number of querns from several sources found in the general area of known Late Iron Age settlements in the county but relatively few have been recovered from excavation, reflecting the large proportion of sites recognised predominantly from fieldwork. Chance finds of puddingstone from Titchmarsh (CJ 481), Little Houghton (CJ 483) and Chipping Warden, are from parishes which contain several Iron Age or Iron Age/Roman settlements. In consequence it cannot be proved whether they relate to the Late Iron Age settlements or to earlier sites in the same general area. The suggestion, for example, that puddingstones are a relatively late introduction into the county, is difficult to support, despite their common occurence in the county, due to the general lack of dated finds.

9.2.2 East Anglia

Middle Iron Age

There have been few excavations of sites of Middle Iron Age date in Cambridgeshire. Occupation in circular triple banked enclosure of Wandlebury, in the Gogmagog hills, is thought to have been permanent although no houses were found during excavation. The pottery shows affinities with that of the Chilterns, possibly reflecting contacts via the Icknield Way, but no querns are reported from the site (HARTLEY, 1957: TAYLOR, 1977; 37-9). A second defended site in the Gogmagog hills has been excavated at War Ditches, Cherry Hinton, a smaller single ramparted site established slightly earlier than or at the same time as Wandlebury, and hillfort resettled in the Roman period when rectangular replaced circular structures in the interior (TAYLOR, 1977; 40). The quern from the site examined, CJ 577, from excavation in 1949/51, is a fragment of puddingstone (DARBY, 1938: WHITE, 1964a and b). A third fortified site at Stonea, in a lowlying position has been subjected to limited excavation and fieldwalking which yielded some Iron Age pottery although there was a predominance of Roman finds; no querns have been published (TAYLOR, 1977; 40).

The more common form of settlement appears to have been open or with low banks, e.g., Bellus Hill, Abington Piggotts. There is a concentration of sites in the Cam valley above Cambridge, a large number of which were destroyed largely by coprolite mining before detailed investigation, e.g., Foxton, Barrington, Hauxton Mill, Trumpington and Barton. It appears that these were generally sizeable settlements. Abington Piggotts, also destroyed in the 19th century consisted of several hut circles and produced a large quantity of pottery, a quern and coin of Cunobelin. The type and lithology of the quern (which was not encountered during this survey) is not published (TAYLOR, 1977; 35).

A number of sites are also known in the Ouse valley, mostly single farmsteads comprising small enclosures, e.g., Alconbury, Buckden, Brampton (where there are two Iron Age huts) and Arbury Camp, the latter an unenclosed site which may have been only a stock enclosure (TAYLOR, 1977; 37). Three beehive querns are known from Alconbury, CJ 547 of Millstone Grit subtype 1, just over half of a very worn upper stone of Yorkshire type which is a stray find from Weybridge Farm; CJ 549 of Spilsby Sandstone, a complete, and probably fairly worn upper stone of Hunsbury form similar to CJ 527 from Tallington; and a pierced lower stone of granite with a flat grinding surface thought to be Roman in date (GARROOD, 1952; no.7) CJ 575 from Castle Camps is a nearly complete upper stone of Puddingstone possibly quite worn as little remains of the feed.

Settlement at Fengate during the Iron Age was in a small village like settlement,of which over 60 buildings have been examined, many used for storage and animal shelters. Few querns have been published but these include one almost complete upper stone recovered from an eaves drip gully on the Catswater subsite (Middle to Late Iron Age) identified as Lincolnshire limestone. This is a rather flat example, which has a flat grinding surface, unpierced handle socket and funnel-shaped hopper (PRYOR & CRANSTONE, 1978: PRYOR, 1984; 161).

Scored ware comparable to Ancaster-Breedon ware has been found, for example, at Maxey, although in this area this type of pottery may have continued in use later than 100 BC. Excavation in the East Field uncovered features of middle and late Iron age date only in the eastern part of the area investigated but a large amount of evidence for Roman activity. A number of querns are recorded from this excavation, three of definite beehive type. One upper stone is of Hunsbury 2 form (PRYOR et al, 1985; 7 Fig.116, 1, p.176) of which approxiamately half survives in two pieces. The lithlogy is described as matrix supported calcareous cemented sandstone and which could be Spilsby Sandstone although no source is suggested; it was found in a gully of phase 7 (Roman) date. The second beehive quern (PRYOR et al, 1985; Fig. 117, no.2, p.171) is very worn upper stone of Lincolnshire form, of which roughly half the stone survives. It is also of calcareous sandstone and was incorporated into a structure of Roman date; there is a second joining piece of this quern (Find no.3911) from a Phase 8 (Roman) pit. A fragment from a puddingstone upper stone was recovered from a ditch containing a fill of Roman date (op.cit., 171). The two illustrated flat querns are more fragmentary than the two beehive examples, and both are of arkosic arenites, and could thus be Millstone Grit although again no source is suggested. There is one complete Puddingstone lower stone from Maxey in Peterborough Museum (CJ 535). From excavations further to the west (Maxey Bardyke Field) (PRYOR et al, 1985; 263, Fig.178, no.38) comes a fragment of a rather bun shaped upper stone whose lithology is not positively identified but which is suggested to be possibly a Jurassic sandstone. The stone at present has only a short feed and the stone may have suffered considerable wear. Finds from the linear ditch, enclosures and pits demonstrate activity during the Iron Age up to the mid first century AD, the pottery including scored wares (PRYOR et al, 1985).

As with other counties stray finds are fairly numerous and generally without associated material. Three querns, for example, are recorded from the area of Wood Walton, CJ 551, 554 and 552. The first of these, CJ 551 (GARROOD, 1952; 51, no.3), a broken upper beehive stone is of Millstone Grit subtype 1 and was found in a field at Castle Hill Farm. CJ 554 (GARROOD, 1952; no.4) is a complete but very worn upper stone of Spilsby Sandstone and CJ 552, a lower stone of feldspathic Millstone Grit, possibly the lower stone of CJ 551, is complete and unpierced. From Barham there is an upper stone of Hunsbury form, of unspecified litholgy but probably complete which was found acting as a doorstep (GARROOD, 1952, 52). There are two stray finds from Eynesbury, CJ 542, a pierced and relatively thin lower stone, which is complete but possibly very worn and CJ 550, a complete Hunsbury form upper stone which has seen only moderate wear. Chance finds of Puddingstone querns are also common and include stones from Great Staughton, approxiamately one third of an upper stone of rather flattened bun shape (there are also fragments of flat querns of Old Red Sandstone from the same site), Melbourn, CJ 556, Littleport, CJ 567, a complete upper stone also possibly only moderately worn, Rampton, CJ 543, a complete upper stone in which the handle socket has been partly worn away by grinding, Houghton, a complete unpierced lower stone, and Staploe, CJ 620, a fragment.

In Norfolk settlements are generally open and of unknown extent. In the past they have often been found during the course of commercial extraction. Early sites include Micklemoor Hill, West Harling, first occupied in the Late Bronze Age and from which there are three saddle quern fragments from the enclosure, two of possible Millstone Grit and one of granite (CLARK & FELL, 1953; 33-4). The early Iron Age to Roman site at Wangford, Suffolk, has produced fragments of querns of lava, quartzite, sandstone and puddingstone although the forms of querns and their contexts are not published (BRISCOE, 1957).

Stray finds from Suffolk and Norfolk are numerous, the majority of the querns examined in these two counties falling into this category. From Norfolk there are puddingstone querns from, for example, North Creake, CJ 390, a complete, moderately worn, upper stone, and CJ 428, complete upper stone also moderately worn; Erpingham, CJ 392, a complete upper stone, bun-shaped but otherwise of Hunsbury form; Yaxham, CJ 393, a complete, worn, upper stone, Aylsham, CJ 396, a moderately worn but complete upper stone and Reymerstone, CJ 398, a complete upper stone on which most of the iron band for handle attachment survives. Beehive querns of other lithologies are less common but many of these are also stray finds, for example, CJ 365, Haveringland, a complete and possibly relatively little worn, tall, Hunsbury 2 form upper stone of Spilsby Sandstone, and CJ 370, Norwich, a complete and possibly relatively little worn upper stone of Hunsbury 2 form found reused in the foundation of 19th century houses in the city. A rotary quern of sandstone, whose shape is not described, but which is thought to be derived from the Lower Greensand formation of Kent is also reported from Mundford (R.R. CLARKE, 1957).

There are fewer examples from Suffolk but again these are predominantly of Spilsby Sandstone and Puddingstone. Puddingstone querns have been found at Brandon, CJ 320, a complete unpierced lower stone (BALKWILL, 1980; 47), Wherstead, CJ 332, an almost complete upper stone found on a stream edge during work on the Tattingstone bypass (OWLES, 1976a; 102), Great Waldingfield, an upper stone (MARTIN et al, 1984; 325), Acton, CJ 336 an almost complete upper stone of flattened bun shape found in a garden (OWLES, 1972b; 205) and Lakenheath, CJ 564, a complete upper stone. Spilsby Sandstone querns have been recovered at Bardwell, CJ 325, an almost complete but very worn upper stone found in the ploughsoil (MARTIN et al, 1984a; _73), Emswell, CJ 326, a complete and still thick lower stone which retains the iron spindle, Bucklesham, CJ 338, a complete, worn and slightly asymmetrical double handled upper stone, and Great Barton, CJ 327, a complete, worn and asymmetrical upper stone of Hunsbury 2 form. The two stones of Folkestone Beds from the county are also apparently stray finds, CJ 350 from East Bergholt, complete and probably only moderately worn and CJ 343 from Witnesham, complete and possibly fairly worn which was found lying by a ditch at a farm (OWLES, 1972a; 107).

In Essex Some 125 early and middle Iron Age sites were known the 1980's, many finds of this date the result of commercial extraction, of brickearth and gravel, and a many known from surface scatters. (DRURY, 1980; 47). The hilllforts in the county probably belong to this period, for example, those at Ambresbury, Wallbury, Danbury and Asheldham, but these vary in size, shape and defensive form. Few have been investigated in any detail and reported quern finds are rare. Excavations at Danbury produced only small amounts of occupation evidence showing use of the site in the Iron Age and Roman period; a quantity of early and late Iron Age pottery was recovered (MORRIS & BUCKLEY, 1978). Ambresbury Banks, excavated in the late 19th century and again in 1959-61 has also produced both early and late Iron Age pottery, Asheldham Camp was observed during gravel extraction and has yielded pottery from early, middle and late Iron Age and Loughton Camp has produced early material comparable to that from Ambresbury Banks. (MORRIS & BUCKLEY, 1978; 22-3).

The fort at Witham on the River Blackwater has produced finds of mainly Middle Iron Age date. From excavation at the Ivy Chimneys site in Witham come two pieces of quernstones, one of Kentish Rag, CJ 505 (possibly from a Middle Iron Age context) similar to the stones of Kent 2 form, possibly very worn and of which approxiamately one sixth of the stone survives, the second, CJ 506, one quarter of an upper stone of Puddingstone from a 3rd or 4th century context. Other early settlements have been excavated at Mucking/Linford, Rawreth and Heybridge. At Heybridge aerial photographs show farmsteads and an extensive pattern of land division of late Iron Age and Roman origin. Excavation of the site, part of which was destroyed by gravel extraction, produced finds and a variety of features of Middle Iron Age date but no querns are published. The Late Iron Age saw the establishment of a considerable settlement. There are some abraded fragments of Rhenish lava from Roman levels and three amorphous fragments of Millstone Grit from the site (WICKENDEN, 1986). At Orsett Cock intensive excavation uncovered features of Bronze Age, Iron Age and Saxon date. The site lies on flat land of the River Thames and during the early and middle Iron Age was a small farming settlement, similar sites existing at, e.g., Gun Hill. A small circular pit or posthole contained large numbers of burnt fragments of Puddingstone querns but the feature contained no other dating evidence. There are also fragments of lava from Medieval and Saxon contexts suggested to have been originally Roman in date (MILTON, 1987; 21, 31).

Little Waltham, situated on the western bank of the River Chelmer, has produced evidence for Mesolithic and Neolithic activity and resettlement in the Middle Iron Age (Phase 2 on the site), occupation continuing into the Roman period. The open settlement of the mid 3rd to 2nd century BC was replaced by an enclosed one containing at least two circular huts. Romano-British evidence comprises mainly field boundaries and associated features. The querns are all from either Phase 2 or 5 (Roman) contexts; none are recorded from intervening phases. Those of Phase 2 are all identified as saddle querns or rubbing stones and are of various rock types, grey flint, hard sandstone (possibly Jurassic), hard greenish grey compacted gritstone, calcereous sandstone, and are probably all of glacial erratics. There is also oné fragment of puddingstone included among the published saddle quern pieces. Of the total of 10 saddle quern pieces five are from a wall trench, two from a possible posthole and two from two separate pits. From Phase 5 come an upper stone fragment of probable Millstone Grit and several fragments of Rhenish lava (DRURY, 1978a; 110-112).

The main period of Iron Age occupation at Wendons Ambo belongs to the period from the 3rd to the 1st century BC although there is some earlier occupation and settlement probably continued into the 1st century AD although 'Belgic' influence is absent and the earlier phases of Roman occupation show little evidence of widespread contacts (HODDER, 1982; 64) Excavation produced both saddle and rotary querns, the latter including CJ 646, one third of an unpierced lower stone of puddingstone which was found in the base of a drying oven (op.cit, no.f). Of the two saddle querns, both of which are fragmentary and of sandstone, one is from a small pit and the second unstratified from the ploughsoil (op.cit, Fig.64, no. a, b). There are two rotary querns of sandstone (op.cit., Fig.64, no. c, d), the first from an Iron Age pit, the second, a fragment from a flat quern, again from the ploughsoil, and a fragment of puddingstone (op.cit., Fig.64, no.e) from a disturbed Roman context.

There are a few provenanced stray finds, mainly of puddingstone, from the county, for example, CJ 431, from Castle Hedingham, an almost complete upper stone, CJ 441, Great Yeldham, a complete and possibly relatively little worn lower stone, CJ 638, Langley Lower Green, an almost complete lower stone and CJ 649, Thaxted, a complete upper stone, probably fairly worn. One chance find of a different rock type is CJ 318 from Felsted, a complete upper stone of Hunsbury form that may be fairly worn, of a quartz arenite, possibly sarsen.

Late Iron Age

In the later Iron Age Cambridgeshire lay largely within the territory of the Catuvellauni although the northern part fell within the area of the Corieltauvi. Sites of this date include St Ives, a small native farm established in the 1st century BC on the River Ouse and mainly of pastoral character (GREEN, 1959) There are two puddingstone querns from the area, CJ 540, a rather damaged lower stone which is still moderately thick found in Meadow Lane, St Ives, and CJ 559, a complete lower stone. The settlement at Little Paxton was established in the Late Iron Age and subsequently deserted until the 1st century AD occupation then continuing into the 4th century. Greenfield noted finds of parts of millstones, largely of pebbly and coarse grits suggested to be Millstone Grit (GREENFIELD, 1969; 52-3). CJ 558 is a fragment of a puddingstone quern from the area and there are two more examples illustrated by Garrood (1952) from Ray House Farm Gravel Pit, Little Paxton, the first (GARROOD, 1952; 51, no.2) of "Grit" is of Hunsbury form and considerably worn and the second (op.cit, 52, no.8) is damaged large diameter lower stone pierced by a cylindrical spindle hole and described as hard gritty sandstone Of slightly later date is the initially military site at Grandford, March, first occupied AD 65-75. Numerous fragments of querns are reported from the excavation of an area outside the fort, including many pieces of saddle querns of Millstone Grit and a complete upper rotary quern of banded puddingstone. Puddingstone rotary querns are well represented among the finds and there are also probable examples of Niedermendig lava (POTTER & POTTER, 1982; 81, 82).

Also of this date, between between Tydd St Giles and Old Warden (at TL 203789) is a site found during construction of the gas pipeline which has produced a dense scatter of Romano-British pottery and other occupational debris. The finds indicate a building or settlement in the vicinity of the pipeline and include a fragment from a saddle quern of Hertfordshire Puddingstone (CATHERALL et al, 1984; 14-15). A quern of unspecified type and lithology is reported from the Romano-British settlement at Orton Longeville (DAKIN, 1961; 67). At Shelford, excavation of the cropmark site showed a circular hut in a rectangular enclosure with associated fields and storage areas that continued in use for much of the Roman period; mixed agriculture is indicated but no querns are reported (TAYLOR, 1977).

In western Norfolk there is a concentration of finds of late Iron Age date in the area around Snettisham-Heacham and Methwold-Feltwell-Hockwold, possibly in part a result of a concentration of fieldwork in the area. From Heacham, an area that has produced a scatter of Iron Age and Roman pottery, are two fragments of puddingstone upper stones, CJ 408 and 409. At Leylands Farm, Hockwold-cum-Wilton excavation of a settlement covering 13 hectares suggests Roman occupation succeeding Iron Age or native occupation but there are no features of certain prehistoric date (GURNEY, 1986; 49). From the 1957 excavation at Leylands farm come an upper stone of Puddingstone from a pit, complete but burnt and chipped at the edges and two fragments of lava quern (GURNEY, 1986; 72). Excavation in 1961-2 at Hockwold-cum-Wilton produced several fragments of millstone of unspecified lithology reported as probably of Roman date and part and a fragment of Herfordshire Puddingstone querns, both unstratified (one of which may be CJ 406). Salway also recorded a chance find of a complete upper stone of Puddingstone at Grange Farm at some date prior to the excavation which produced two unstratified fragments of puddingstone and other fragments, probably Roman, of unspecified lithology (SALWAY, 1967; 70). A number of other querns from the area were also examined, CJ 394, a complete but worn upper stone of Puddingstone, from Hockwold-cum-Wilton, possibly that from Grange Farm, CJ 416 and 417, two fragments of puddingstone querns from the Hockwold area, CJ 418 a complete lower stone from the Hockwold-Weeting area and CJ 413 a fragment of puddingstone from Weeting.

Excavation at Denver revealed a probably industrial area beside the Roman road known as the Fen Causeway. The main activity appears to be salt production with salterns spread along 2.5 kms beside the road (which is itself dated from the 1st century AD) (GURNEY, 1986; 83: GREGORY, 1982). A number of querns are recorded from the site, one of beehive type, a fragment of Hunsbury form of medium grained sandstone from the ploughsoil. There is also a fragment of a flat upper stone of conglomerate, a fragment of a lower stone of lava and a fragment of an upper stone of lava. Querns from excavation at the Romano-British settlement at Scole, situated next to the Roman road from Colchester to Caistor St Edmund, are of lava, three upper and one lower fragments, found in all phases of occupation, Millstone Grit, two pieces of upper stones and half of a lower stone from phases 3 and 4) and puddingstone, two halves of two upper stones (CJ 373 and 374) from phases 1 to 3 (ROGERSON, 1977; 148-9). A third roadside settlement at Saham Toney beside the Peddars Way was initially established in the Late Iron Age and appears to have become a market for local farmsteads. There are three querns from the site, CJ 361, a complete but very worn and asymmetrical Hunsbury 2 form upper stone of Spilsby Sandstone and CJ 414 and 415 each one third of an upper stone of puddingstone (BROWN, 1986).

Other settlements of this date in west Norfolk include: Thornham, in a strongly defended enclosure built on the site of an earlier settlement in the 1st century AD where Iron Age occupation is attested by a scatter of sherds from hand made vessels (GREGORY & GURNEY, 1986; 5-6); Warham Burrows, a rectangular ditched enclosure constructed in the Late Iron Age producing mainly hand made pottery; Warham Camp, a bivallate fort which has produced Romano-British material but which possibly also saw occupation in the Late Iron Age and Wighton, a square defended enclosure possibly built in the 1st century AD and used until the mid 2nd century AD. A quern is reported from the south of Wighton, amidst a scatter of casual finds and coins, but the form and lithology are not reported, nor are any quern finds from the other sites (GREGORY & GURNEY, 1986; 15). The two querns examined from Great Snoring, CJ 410, a fragment of an upper stone of puddingstone and CJ 411, half of a flattened bun shape upper stone also of puddingstone, may relate to the Romano-British building and and pottery in the parish (GREGORY & GURNEY, 1986; 2) but again, there appear to be no precise localities now known for the querns. Despite the current lack of quern finds from many of the known settlement sites excavation at Caistor St Edmund in the gateway of the Romano-Celtic temple produced a fragment of a rotary quern, 5 cms thick and probably of flat type (GREGORY & GURNEY, 1986; 47).

There are few excavated sites of this date in Suffolk. Occupation is attested at Claydon where roadworks revealed a section of Iron Age material sealed by a Roman layer (OWLES, 1975b; 213-4), and there is one quern, CJ 331, from Claydon, a virtually complete but very worn upper stone of East Anglian form of limestone. Observation of building trenches at Hollesley Bay indicated Iron Age occupation in the same area as the later Romano-British settlement occupied from the 1st to the 4th century AD. The area available for excavation lay on the extreme southern fringes of the site where occupation was scarce and, possibly as a consequence of this, no querns are reported (MOWAT, 1975). At Knodishall finds from the ploughsoil include a base of Samian ware, fragments of roofing tile and fragments of a puddingstone quern(s) (OWLES, 1972c; 287), and also from the area is CJ 329, a complete upper stone of Spilsby Sandstone of Hunsbury form.

In Essex finds of late Iron Age pottery and to a lesser extent coins and other artefacts are well distributed throughout the county and point to extensively occupied landscape. Excavation and fieldwork have demonstrated that the majority of Roman rural settlements had Iron Age predecessors on the same site or immediately adjacent (DRURY & RODWELL, 1980; 71). At Sheepen, Colchester, belgic finds occur sporadically over most of the 32.5 sq.kms defended by large dykes (DUNNETT, 1975); querns appear to be rare and none from the area were encountered in Colchester Castle Museum.

At Little Waltham belgic types of pottery first appear in the second half of the 1st century BC as fine wares alongside earlier types. Although at Mucking there appears to be continuity of land use, here the period saw landscape changes and the unenclosed middle Iron Age settlement was overlain by part of an extensive rectilinear field system (DRURY, 1978a) which may explain the lack of quern finds for these middle phases. The later Iron Age and Romano-British farmstead at Nazeingbury, which contained one circular and one presumed rectangular building, has produced a lump of puddingstone (presumed to be from a quern) from a Late Iron Age ditch, fragments of lava and fine grained sandstone, an edge fragment of Millstone Grit and a fragment of fine grained well cemented metasandstone with signs of use as a quern (HUGGINS, 1978; 106-7). Late Iron Age occupation is also attested at the predominantly Roman site at Gestingthorpe, which yielded fragments from both lava and puddingstone querns (DRAPER, 1985; 75-7). One complete quern (op.cit, 75, no.427) of Puddingstone was recovered, and there are fragments from at least ten other puddingstone querns, five unstratified, three from carbonised a spread and one from a building (p.75). There are also a number of flat querns; approxiamately one quarter of a Millstone Grit stone with a grooved grinding surface, a complete and unworn upper stone of lava and fragments from at least seven other lava querns, all of which were unstratified (p.75). Fragmentary Millstone Grit and lava querns were also found at Heybridge (WICKENDEN, 1985) whilst at Gun Hill, West Tilbury, which shows a similar time span for occupation, fragments of puddingstone and lava have been recovered (DRURY & RODWELL, 1973; 90).

There are also a number of Roman sites that have produced fragments of Puddingstone querns, e.g., Great Chesterford from which there are two querns. The first of these, CJ 571, half of an upper stone of Puddingstone and the second CJ 642, a rather thin, pierced lower stone of fairly small diameter and still posessing a flat grinding surface. There are two fragments of Puddingstone upper stones from the small town at Kelvedon (CJ 449 and 450) which also saw some pre-Roman Iron Age occupation and the finds also include a fragment of an upper stone of lava and several rubbing stones of sarsen and Millstone Grit (RODWELL, 1988; 89-90).

9.2.3 South-East Midlands

The final part of the main study area comprises the three counties of Bedfordshire, Buckinghamshire and Hertfordshire.

Middle Iron Age

Bedfordshire. There are two hillforts of recognised early date in Bedfordshire, Mowsbury Camp, Ravensden, and Sandy Lodge but neither have any published evidence of internal structures or is conclusively dated (SIMCO, 1973; 10). The remaining hillforts in the county fall into three groups; the Icknield Way forts at Maiden Bower, Sharpenhoe Clapper and Ravensburgh Castle, Ouzel forts of Danesborough and Craddocks Camp (near Heath n Reach) on the greensand and the three Sandy forts at Sandy Lodge, Galley Hill and Caesars Camp (DYER, 1976; 9). Many of the forts along the Icknield Way, with the exception of Ravensburgh show only a short period of occupation and evidence of destruction a little after 400 BC. Ravensburgh is described by Dyer as the largest and strongest fort in eastern England and it is thought to have have gained control of the territory of the other Icknield forts in the Chilterns in the Middle Iron Age (DYER, 1976; 10). Smaller settlements, farmsteads and small nucleated hamlets with mixed agricultural economy, are numerous but, as elsewhere, relatively few have been investigated in detail. Aerial photographs also show a large number of sites that may belong to this period, e.g., Bromham but much of the evidence for this perid comes from the excavations at Harrold and Puddlehill (DYER, 1976; 12).

The hilltop settlement at Puddlehill was occupied from the Late Bronze Age to the Roman period. The earliest evidence belongs to the 7th century BC and a change in character in the Early Iron Age is followed by a break in occupation until the the Middle Iron Age when the stock enclosures were replaced by a rectangular enclosure containing grain storage pits, probably indicating a rise in importance of cereal production. However by 100 BC there was a return to cattle (DYER, 1976; 13). One rotary quern from excavation on the site, CJ 613, mistakenly described as Old Red Sandstone in the published report, was recovered from the base of a storage pit. This is a relatively flat lower stone of Hythe Beds, probably from Lodsworth, of which half survives, which has a flat grinding surface and is pierced by a cylindrical spindle hole. There is a second fragment of rotary stone from the same pit but lithology and form are not specified (MATTHEWS,1976). Other quern finds from the site are of saddle querns.

The small rural settlement at Harrold shows some parallels with Puddlehill (which lies on chalk) although it is situated on the gravels of the River Ouse. The length of occupation here is uncertain, the site having produced pottery mainly of local manufacture including vessels with scored surfaces although both Harrold and Puddlehill have produced some early belgic wares (EAGLES & EVISON, 1970). Of the five querns recovered during excavation only two are from stratified contexts, CJ 184 and 186, both of pre-Roman date. CJ 184 (op.cit., 34, no.B), an upper stone of Spilsby Sandstone of which half survives, is still fairly tall and of Hunsbury 2 form with two handle sockets and vel) was found with sherds of combed ware. CJ 186 (op.cit., 34, no.

A), a very worn broken Hunsbury form upper stone, of feldspathic Millstone Grit was found in one of the huts. CJ 185 (op.cit., 34, no.D), half of a possible lower stone of Spilsby Sandstone, CJ 187 (op.cit., 34, no.E), a complete but very worn Hunsbury type upper stone of Millstone Grit type 3 and a possible saddle quern of the same lithology as the latter are all unstratified from the excavation. Also published with these is CJ 189 (op.cit, 34, no.C) an unpierced lower stone of Lodsworth Hythe Beds of which two thirds remains and which is relatively thin, possibly quite worn. This stone, however, was found in a nearby churchyard and may not relate to the Harrold settlement; it could have come from Odell where querns of this type and lithology are common (EAGLES & EVISON, 1970; 30-34).

Rescue excavation of several cropmark sites of Bronze Age to Roman date at Willington on sand and gravel showed Iron Age material concentrated in a large double enclosure, possibly a stock enclosure, with a smaller enclosure for domestic buildings. It is possible that the site saw only seasonal occupation with a degree of transhumance, in which case little quern material would be expected. There is fragmentary evidence for the Roman period, a ditch that produced early Roman pottery also yielded fragments of an upper Puddingstone quern; finds from this area suggesting a 1st century AD date (PINDER, 1986).

Stray finds from the county are predominantly, as might be expected, of puddingstone, for example, from Leagrave, CJ 602, one third of an unpierced lower stone and CJ 609 a lower stone pierced by an hourglass shaped spindle hole, Luton, CJ 603, a complete, probably only moderately worn upper stone, Great Barford, CJ 615, one third of a fairly worn upper stone, Blunham, CJ 618, a worn, complete upper stone in which the handle socket has been worn onto the grinding surface, Cardington, CJ 622, a complete and unpierced lower stone and Caddington, CJ 612, an unpierced lower stone broken horizontally from which the grinding surface has been lost and which might have broken in manufacture.

Buckinghamshire. As yet there is relatively little evidence for the Middle Iron Age in Buckinghamshire. Traces of settlement of this date were found during excavations at George St, Aylesbury, from which were also recovered a fragment of a saddle quern of Millstone Grit and pieces of two Iron Age pots; the presence of a hillfort here was demonstrated by excavations adjacent to St Marys church in 1983 (ALLEN & DALWOOD, 1983; 16). The subrectangular enclosure of the 2nd or 3rd century BC Ravenstone produced mainly finds of pottery (MYNARD, 1970) although there are also two quern fragments from the area, CJ 614, half of rather flattened bun shaped upper stone and CJ 711 a complete and still fairly thick lower stone both of puddingstone.

Stray finds are generally of Millstone Grit and puddingstone, and include those from Newport Pagnell, CJ 709, a complete upper stone; Foscott Pit, near Buckingham, CJ 471, an almost complete, Hunsbury form upper stone of MG/1; Weston Underwood, CJ 710, an almost compete Hunsbury 1 form upper stone of MG/1; Bierton, CJ 458, a complete, unpierced lower stone of puddingstone; Weston Turville, CJ 461, one quarter of an upper stone of puddingstone; and Latimer, part of an upper stone of puddingstone found during forestry clearance. CJ 712, two thirds of worn upper stone of puddingstone was found during excavation on the Medieval site at Shenley.

Hertfordshire. Two different sites of this date excavated in Hertfordshire are those at Wilbury Camp and Aldwick. The early to late Iron Age fortified settlement at Wilbury Camp is situated on the edge of the Hitchin gap, where the Icknield Way descends to cross the River Hiz. The original enclosure was never completed although occupation continued, following burning of the initial revetment, new defences were constructed during the final stages of the early Iron Age or early middle Iron Age. These were also subsequently burnt and later occupation of the site in an unenclosed settlement began in the Middle Iron Age and continued into the later Iron Age (APPLEBAUM, 1949). One quern from the site was available for examination, CJ 584, an almost complete upper stone of Folkestone Beds and Kent 2 form. The stone is probably fairly worn, the handle socket 4 cms above the grinding surface and there are faint traces of an earlier handle socket now virtually worn away on the grinding surface. There is also at least one complete saddle quern from the site (MUS. RECORD) but the context, and hence a more precise date for these querns is not known.

At Aldwick, Barley, exacavation on this undefended enclosure initiated in the early Iron Age uncovered one house, a large number of pits and a granary. In addition to 11 saddle querns (made predominantly from glacial erratic material) there are two thick pierced lower rotary querns (CJ 555 which is almost complete and 576, a complete example) from pits producing apparently early to middle Iron Age material. Both are of Spilsby Sandstone, have a flat grinding surface and base and are pierced by a cylindrical spindle hole.

Provenanced stray finds are not numerous among the museums visited, many of the stones examined being unprovenanced, but include CJ 582, from near Weston, two halves forming a complete upper stone, possibly quite worn and CJ 587, one quarter of a fairly worn upper stone found in a wood at Easneye, Ware, both of puddingstone.

Late Iron Age

Bedfordshire. In Bedfordshire it has been suggested that the development of tribal units in the later part of the Iron Age resulted from or at least was contemporary with the rise of the hillfort Ravensburgh, the coin distribution suggesting "unity .....developed along the Icknield Way", and by the end of the 1st century BC the Catuvellauni were well established in eastern Bedfordshire, the west of the county remaining something of a "cultural backwater" (DYER, 1971; 14-16).

The main excavated site of this period is at Odell, the successor to Harrold, which continued in occupation throughout the Roman period and where "the indication is of an agriculture based upon a single-family unit engaged in a mixed cereal and pastoral economy" (DIX, 1979; 216).

The early pottery is belgic in character, and later ceramic developments show influence by trade and expansion from the south by the end of the 1st century BC. The early farm represented structurally by, e.g., roundhouses, occupied the same site until the end of 1st century AD when it was removed a short distance to a more open position, where the houses were initially circular and later rectangular (DIX, 1979). There is a large collection of quern material from the excavation, largely fragmentary, from over 110 quernstones, representing at least 57 upper and 29 lower stones, in addition to pieces from 18 millstones, 7 saddle querns and 3 rubbers, a remarkably large collection given the size and nature of the settlement. Although some pieces had been used, for example, as post packing the majority had been discarded as rubbish and the collection shows little evidence of re-use (ODELL SITE ARCHIVE). Puddingstone and Millstone Grit are numerically the best represented lithologies, the latter occuring mainly as flat querns. There is also a significant number of stones of Hythe Beds sandstone and Old Red Sandstone and a few examples of other rock types, including Spilsby Sandstone (a beehive upper and lower stone), Folkestone Beds (one upper stone of Kent 2 form), Bargate Beds (two fragments of flat upper stones of late 1st century AD date and two from Saxon contexts), Great Oolite (a flat upper stone from a fill of mid 1st century AD date) and flint conglomerate (three fragments at least two of which are from saddle querns). The collection includes very few complete examples, the most complete finds being either lower stones, e.g., CJ 633 (puddingstone) and CJ 194 (Spilsby Sandstone) or the beehive types of which, in most cases, at least half of the stone survives. Some of the Old Red Sandstone examples are represented by half of the stone, e.g., CJ 664, but the majority of Millstone Grit finds are relatively small fragments, and the apparent number of querns of this lithology may thus be over-represented. The querns thus testify to long distance contacts to the north, south and west, although the relative importance of the different sources did not remain static throughout the period of occupation. Millstone Grit, contributing only a small proportion of the querns from contexts dated to first half of the 1st century subsequently increases in significance and accounts for over three-quarters of finds of 4th century AD date. Conversely, Old Red Sandstone, represented by approxi mately one-eighth of the stones of the 1st century AD, forms a very small percentage of the total in the 2nd and 3rd centuries and there are none from contexts dated to the 4th century AD. Querns of Hythe Beds sandstones show a similar decrease in proportion from approxiamately one third in the 1st century to one-eighth in the 4th century. Puddingstone comprises from one-quarter to a half during the 1st to 3rd centuries but is absent in the 4th century.

A number of other sites have also been excavated, for example, at Bromham, where rescue excavation revealed a small farming community first settled in the mid first century BC which grew into a large settlement by the end of the second century AD. The majority of the finds are from a large ditch complex; few working areas were found (TILSON, 1973: SIMCO, 1973; 10). There is a single nearly complete bun shaped and unpierced lower stone of puddingstone dated to the early 1st century AD. two pieces (TILSON, 1973; 61-2, no. 315, 317) of Millstone Grit and one (op.cit., no. 316) of "green sandstone" all of pre-conquest date. No. 315 is fairly flat but the other two not particularly thick; they may all be fairly worn. Of Roman date are two thirds of a flat quern of red/brown sandstone found in the fill of a stokehole of a corn oven, dated to AD 150-170 (op.cit, no.319) and one third of a large diameter, thin, flat quern of Millstone Grit of 4th century date (op.cit., no.318). No querns are reported from rescue the Late Iron Age settlement at Wyboston (SIMCO, 1973; 10).

Other evidence for Late Iron Age settlement comes from, e.g., Eastcotts where a series of pits and associated occupation layers containing pre-conquest pottery were found during excavation for field drainage (KENNETT, 1971; 85); Elstow, from excavation at an Iron Age and Romano-British site where pottery kilns were active between 43 and 300 AD (KENNETT. 1969); and Clapham, where evidence for occupation in the late Iron Age includes traces of three kilns, and in the early Roman period is attested by a rectangular enclosure (KENNETT, 1971;

85). Many other sites are recorded from fieldwalking or casual finds at, for example, Kempston (pottery found during gravel extraction), Milton Earnest (patches of slag and early or middle Iron Age pottery) and Oakley (pottery groups associated with burnt daub) (SIMCO, 1973; 16-21). The multiperiod site at Radwell in the parish of Felmersham shows features of early and late Iron Age date although the principal surviving feature is a Romano-British farmstead. A complete lower stone of puddingstone was found near one of the ditches and fragments of Millstone Grit were also recovered both from features of 3rd to 4th century date (HALL, 1973); CJ 610, a complete upper stone of puddingstone from the Felmersham area may be related to this site.

Buckinghamshire. The Late Iron Age in Buckinghamshire is generally poorly represented among quern finds. Excavations at Walton Court, Aylesbury, prior to housing development produced querns from an area in use from the Late Iron Age to the 4th century AD that have been identified as New Red Sandstone and Millstone Grit. (FARLEY et al, 1981; 72-3). Two other stones from Aylesbury were also examined; CJ 469, an almost complete, pierced lower stone of Hythe Beds, fairly thin and possibly quite worn and CJ 470, also of Hythe Beds, a pierced lower stone with a convex grinding surface and base, still fairly thick and having a cylindrical spindle hole.

Excavations at various times at Magiovinium have produced several quern finds. The finds from a water pipe trench that crossed the corner of the 5.5 acre ditched enclosure to the south east suggest construction probably related to military consolidation after the Boudiccan rebellion. The earliest civilain occupation on the site belongs to the 1st century AD. Published finds include one quarter of an upper stone of South-western form of quartz conglomerate, probably upper Old Red Sandstone and, from the same area, a rubber of micaceous sandstone (WOODFIELD, 1977; 399). Eight querns were recovered from excavations here in 1978-80, of which one is of Hertfordshire Puddingstone (an unpierced lower stone) found in a pit, one is an upper of Hunsbury form (but with a markedly concave grinding surface) and the remaining six are, generally flat type querns. These six include two lower (one unpierced and one pierced by a cylindrical spindle hole) and four upper stones, one of which has a shallow dished hopper. The six are described as coarse grit or coarse pebbly grit suggested to be from Snettisham, Norfolk (NEAL, 1987; 55), although no other querns known to the author have been assigned to this source and the stones in question are all of a form comparable to querns from more recent excavations on the site which are of Old Red Sandstone. Further excavations here in 1987 have yielded querns of East puddingstone and Millstone Grit but predominantly of Old Red Sandstone. All of the puddingstone querns examined relating to the site (CJ 737, 455 and 467) are complete or very nearly so. Querns of other rock types, many of which were incorporated into buildings or paved areas. are more fragmentary. The most complete are two lower stones (CJ 720, pierced and CJ 724, three quarters of the an unpierced stone) of Old Red Sandstone. Although no further joins can be made a large proportion of the pieces are from one context and it may be that relatively few stones are in fact represented (COLLARD, pers.comm.).

Excavations in Milton Keynes in advance of development has produced querns from a number of sites. The site at Bancroft saw Bronze Age occupation, an enclosure and circular buildings of Iron Age date, Belgic ditches and cemetery and a Roman mausoleum. CJ 713 is an almost complete, asymmetrical unpierced lower stone, still fairly thick on one side, of Millstone Grit subtype 1, CJ 714 half of a double-handled upper stone of Hunsbury form also of Millstone Grit subtype 1 and CJ 717, from trial trenches, around Bancroft is a fragment of puddingstone. Other fragments of Millstone Grit and Old Red Sandstone were also recovered. The settlement at Furzton belongs to the late Iron Age (dated to circa 100 BC) but has produced no belgic type pottery. There are several querns from the site including CJ 715, a thick edge fragment of a lower stone of Hythe Beds, probably of Sussex type and relatively little worn and CJ 716, a fragment from a saddle quern of igneous rock (erratic). Further fragments are known from other excavations in Milton Keynes but many are unstratified and only two complete segments are published by Mynard (1987; 144-5); the two predominant lithologies reported are Old Red Sandstone and Millstone Grit. CJ 454, a slightly damaged unpierced lower stone of Puddingstone is a stray find from Milton Keynes village.

The querns from Yewden villa, near Hambledon, include several examples of puddingstone, CJ 457, half of an upper stone, CJ 459, half of a worn upper stone and CJ 460, a worn but otherwise complete upper stone. Also from Hambledon is CJ 456, an almost complete upper stone of puddingstone, possibly relatively little worn, which, when found, was being used as a door weight at the back of the Old Post Office in Hambledon in a house pulled down in the 1920's (MUS RECORD).

Hertfordshire. Excavation covering 1.5 hectares at Baldock, Hertfordshire, produced a large collection of saddle, beehive and flat querns from a settlement occupied from the mid 1st century BC to the 4th century AD, although there were no traces of houses from the earliest phase of occupation in the excavated area. Of the 5 saddle querns there is one complete example, probably of sarsen, reused in a building, and 4 fragments, one of white sandstone, two of calcareous sandstone and one of greywacke. There is a one half of an upper stone of Yorkshire/unpierced form of grey sandstone, which is probably very worn which was recovered from a ditch and is dated to the late 1st century BC. Also of beehive form are several pieces of puddingstone. Two upper stones, half of each remaining (STEAD & RIGBY, 1986; 180 nos.780 and 791) are both probably moderately worn; one further example (op.cit., no.792) is illustrated and four other fragments are recorded. Of the puddingstone lower stones, half remains of no.794, a thick and unpierced example and there are six other fragments. No. 794 is of mid to late 1st century AD date and the rest probably from 3rd century contexts. Also examined were CJ 588, one third of a lower stone and CJ 581, a complete but worn upper stone. There are two pieces of upper stones of Millstone Grit that are rather intermediate in form between beehive and flat types (op.cit., 180, no.797 and 798). They are of relatively small diameter and thick for flat stones; no.

797, half of which survives, having a small hopper, was reused as packing. Other fairly thick flat type Millstone Grit stones, both upper and lower stones, of relatively small diameter compared to most flat querns are generally fragmentary (op.cit., nos. 799, 800, 801, 802, 803, 804). One (no.797) is dated to AD 25-50 and three to the mid 3rd century but the rest are undated. Flatter Millstone Grit querns are also fragmentary (op.cit., no. 805, 806, 807, 808, 809, 810, 811), the largest piece comprising half of the stone. Those from stratified contexts are dated to the late 2nd century Ad or later. The only other lithology represented is imported Rhenish lava of which there is one half of an upper stone (op.cit., no. 795) and six other fragments. The degree of fragmentation here thus seems to be related to lithology, the only complete flat quern having been used, probably when worn, as a building stone, a function that required little modification. The puddingstone querns, on the whole, survive as larger pieces than the flat type querns, of which little over half remains of any lithology, and few of the querns were shown to have been re-used (STEAD & RIGBY, 1986; 179-82).

Rescue excavation of Iron Age features at Dellfield, Berkhamstead, uncovered remains of four shaft furnaces and cremation burials in addition to two pieces of rotary querns of Hertfordshire puddingstone (THOMPSON & HOLLAND, 1976; 143). Seventeen fragments of quernstones were recovered from excavations at Braughing in 1971-2 on the late Iron Age and Roman settlement, including three saddle querns and two rubbers. Of the saddle querns one, of local erratic material was complete, from a 1st century BC to mid 1st century AD context, and two, one of erratic material and the other of Millstone Grit, were unstratified. Rotary querns from the site are of Rhenish lava, Millstone Grit and Puddingstone. The four puddingstone examples are all fragmentary and two were used in a cobbled surface probably of 2nd century AD date, which also contained two of the five fragments of lava querns. A further piece of lava was from a 3rd century AD context. There are three fragments of Millstone Grit, two unstratified and the third from a posthole dated to the first half of the second century AD (POTTER & TROW, 1988; 89-92).

There are a large number of quern finds from St Albans although many now have no precise context. CJ 599 is half a rather flattened bun shaped upper stone of puddingstone from Prae Wood. CJ 597, 598, 600 and 601 are all from Verulamium, 597 a large fragment of a probable lower stone, 598 a fragment and 600 half of a lower stone, all of Puddingstone and CJ 601 three pieces comprising a complete pierced lower stone of Hythe Beds sandstone. From the Park St villa comes CJ 596, a quarter of an unpierced lower stone of puddingstone, and also from St Albans but without a more precise provenance are CJ 593 (half an upper stone of puddingstone) and CJ 604, a complete upper stone of puddingstone. Other finds published by FRERE (1984) include a fragment of an upper stone of flat type of granite (AD 130-140), part of a flat upper stone of Millstone Grit from the extra mural area (AD 360-370), a fragment of lava (AD 155-60), a fragment of Millstone Grit (mid 2nd century AD) and pieces of lava from 3rd and 4th century contexts (FRERE, 1984; 80-81).

9.2.4. South Midlands

Middle Iron Age

Few querns have been published from hillforts in the region, e.g., Chastleton Camp, Oxon. Madmarston Camp, one of number of small hillforts on the fringes of the Cotswolds saw occupation in the Iron Age, followed by desertion and reoccupation in the later Romano-British period; there is no evidence of Late Iron Age occupation. The Iron Age economy appears to have been mainly pastoral and only one quern fragment has been found, the form and lithology not specified. From the early Iron Age promontory hillfort at Grimsbury Castle, Berkshire, there is a piece from a possibly Sussex style upper stone, lacking the diagnostic handle socket, identified as Upper Greensand (WOOD, 1959).

Several smaller sites have been investigated in greater detail, for example, the floodplain site at Farmoor,near Stanton Harcourt, Oxon, which is principally pastoral in character and was probably short-lived. The early Iron Age is represented by a group of storage or rubbish pits but in the middle Iron Age three farmsteads comprising small ditched enclosures and circular houses with subsidary yards or stock pens were constructed on the open floodplain. Other small enclosures, probably for stock were also built on the edge of the gravel terrace and there was subsequently some occupation during the Roman period (LAMBRICK & ROBINSON, 1979: LAMBRICK, 1978). Despite the nature and short life of the site both saddle and rotary querns were recovered during excavation. Two pieces illustrated, probably from a saddle quern, have been identified as fossiliferous medium grained calcareous sandstone but not of local Faringdon greensand; both are from Middle Iron Age contexts. There is one complete Wessex type upper stone (LAMBRICK & ROBINSON, 1979; 60-1, no. 32), probably only moderately worn, of fine to medium grained, non-calcareous grey-green subarkose containing some glauconite and phosphatic material (also not of local origin) which is from an unstratified context and three fragments of flat querns (op.cit., 60-1, nos. 29, 30, 31), one of pebbly arkosic sandstone which was unstratified, one of arkosic grit, which "closely resembles Millstone Grit (Carboniferous) of Yorkshire") and one of medium grained pink arkosic sandstone, the latter two both of late Roman date. There are also two more fragments of possible Millstone Grit (LAMBRICK & ROBINSON, 1979; 60-1).

Other Iron Age sites are known at Ashville, Abingdon, Appleford, Barton Court Farm, Mount Farm, Berinsfield, Claydon Pike, Faiford/Lechlade, Mingies Ditch, Stanton Harcourt and Northmoor. In the middle Iron Age in this region is the second gravel terrace densely occupied by mixed farming communities and the floodplain and damper parts of the first gravel terrace colonized. Excavation at Ashville, Abingdon revealed a complex of pits, ditches and postholes of mainly Iron Age date. During the middle Iron Age the site comprised a large number of house sites and a few irregular enclosures that yielded pottery comparable to that of other sites in the upper Thames valley. In the later Iron Age this hamlet was abandoned and replaced by a rectangular field with boundary ditches and a few associated pits. Fourteen pieces probably from saddle querns are of Corallian limestone and there are three pieces from rotary querns, which are too small to determine their form. One of these rotary fragments is of Iron Age date, and made from coarse grit which is not obviously feldspathic (thought to be Old Red Sandstone from south Wales or adjacent areas) and there are two pieces of Millstone Grit, one unstratified and the second of Roman date although all three pieces now appear to be from relatively flat querns (PARRINGTON, 1978; 88-89: LAMBRICK, 1978).

The Iron Age and Roman settlement, in use from 800 BC to 200 AD, excavated at Gravelly Guy, Stanton Harcourt has produced a large collection of quern material, much of it fragmentary and predominantly from saddle querns. These are generally from Iron Age contexts and of local Corallian rocks, some complete and apparently deliberately placed in the base of pits. The smaller number of rotary querns, from Roman contexts, are of flat types, also fragmentary, and of Hythe Beds sandstone or Old Red Sandstone (LAMBRICK, pers.comm.) The single Hythe Beds sandstone quern from the site thin-sectioned compares very well in texture and composition to querns of this lithology from the study area.

At Appleford salvage excavation during gravel extraction of a 20 hectare cropmark site uncovered features and artefacts suggesting occupation throughout the Iron Age and Roman period. Full scale excavation in 1973 revealed, e.g., a series of Middle Iron Age enclosures associated in their last phase with a series of possible field boundaries amd a Romano-British trackway and enclosure system first laid out in the 2nd century AD. The site probably saw a mixed cereal/stock economy as at Ashville and Mount Farm. Two Sussex style upper stones, both of which have been identified as Upper Greensand, were recovered during machine clearance. One is complete but fairly worn and the the second, less worn, comprises half of the stone. Five fragments of flat querns were also recovered, all of Millstone Grit, four from the trackway ditch and the fifth from the ploughsoil (HINCHLIFFE & THOMAS, 1980; 80-83).

From the middle and later Iron Age earthwork enclosure at Checkenden there are possible quern fragments of Millstone Grit and one large fragment probably from a quern thought to be Lower Greensand (CHAMBERS, 1986). Excavation at Aldermaston Wharf prior to gravel extraction revealed Late Bronze Age features, a middle Iron Age field system, two distinct phases and areas of Late Iron Age occupation and a late 3rd to 4th century bathhouse. There are three fragments of querns from features of 1st century AD date, all of Tertiary (Glauconitic) sandstone which crops out in Berkshire, north Hampshire and Wiltshire (COWELL et al, 1978) indicating connections with the southern counties.

. Late Iron Age

Of later Iron Age date are the quern fragments from the small farmstead at Monks Farm, Berinsfield; one piece of Puddingstone, several fragments of probable Old Red Sandstone, three of Hythe Beds and one of probable local Jurassic sandstone, most if not all belonging to the 1st or 2nd century AD. For Oxfordshire as a whole some sites at least show some discontinuity of structural and artefactural evidence between the Middle and later Iron Age but continuity from the latter into the Roman period, as in Lincolnshire, including initiation of nucleated settlements the establishment of which may be connected with the abandonment of hillforts. With such an abandonment the defended valley enclosures possibly took over as regional centres.

The site excavated at Middleton Stoney a farmstead was first established in the 1st century AD but the querns were all recovered from Medieval and post-Medieval contexts. The two fragments illustrated are of lava and coarse pebbly sandstone (RAHTZ & ROWLEY, 1984; 41). At Alchester excavation uncovered ditches of an extensive drainage work dated to the 1st to late 2nd century AD. From here there is one fragment of a Puddingstone quern from the early phase ditches (FOREMAN & RAHTZ, 1984). Other Roman flat type querns have been recovered from the Roman pottery kilns at the Churchill Hospital Site in Oxford. These are mainly of Millstone Grit and Old Red Sandstone although there is at least one fragment each of lava and Hythe Beds.

The mainly Late Iron Age settlement at Ryton-on-Dunsmore, Warwicks, was sporadically occupied from the Late Broze Age to the Roman period. The middle and late Iron Age population made use of the existing enclosure and added two more, the site taking on the form of a small stock enclosure with possibly domestic work such as corn grinding being carried out. Various querns have been found on the site during excavation and others in nearby fieldwalking and sandworking. There are two thick Midlands type, unpierced lower stones, one complete and moderately worn, the second almost complete and rather irregularly shaped and boulder like. Both are probably of Millstone Grit, the former unstratified and the latter from a shallow pit that also contained several Iron Age sherds including one with scored decoration (BATEMAN, 1977; 36, Fig.16, nos.2, 9). There is another fairly thick lower stone (op.cit., 36, Fig.16, no.1) with a convex grinding surface which is almost complete and of similar form to some Old Red Sandstone lower stones. It is of coarse grit and was recovered from the surface of a pit that contained mainly native Romano-British wares of the 1st or 2nd century AD. A South-west type upper stone, of which a quarter remains, of coarse quartzitic sandstone (possibly also Devonian sandstone) was an unstratified find (op.cit., 36, Fig.16, no.8). The finds also include saddle quern fragments, one of Coal Measures sandstone reused as a packing stone, two of syenite from pits and one of local sandstone, also from a pit (op.cit., 36). Salvage and excavation at Stretton on Fosse, on a site with probable Iron Age occupation, uncovered pits, structures and burials. The quern finds are, however from Roman contexts and comprise fragments of Millstone Grit, a rubbing stone of bedded micaceous sandstone Millstone Grit quern (GARDNER et al, 1980).

At Ufton Nervet, Berks, excavation of three enclosures and associated trackways and a section of Roman road showed the earliest enclosure to have been built shortly before the conquest; it contained no buildings. The second was built shortly after the Conquest. A fragment of a lower stone of later 1st century AD date of poorly cemented, well rounded quartz and glauconite sandstone and a fragment of an upper stone of the same lithology but of unidentifiable form and several fragments of the same stone type with worked surfaces were recovered (MANNING, 1974).

9.2.5 Kent

Kent is the second county which lies outside the main study area but in which querns were examined, here at three museums, Canterbury, Folkestone and Maidstone, largely to follow the distribution of the Folkestone Beds querns. The county exhibits greater cultural similarity with Eastern than southern England, but the period 600-100 BC (Early to Middle Iron Age) is one that saw mainly local developments in pottery (CUNLIFFE, 1982). Hillforts, all of which are found east of the River Medway, were built from the 4th century BC, for example, Oldbury controlling the crossing of the Medway at Tonbridge where no trace of interior structures of more than sporadic occupation have been found (JESSUP, 1970) and Holwood Park, Keston. Smaller settlements are also known at Dumpton Gap, where many finds of Iron Age date were found in an extensive settlement (including a quern of gritstone) in the first decade of this century when the cliffs were being turned into a housing development (JESSUP, 1970), and Castle Quarry, Greenhithe, a relatively small Iron Age and Romano-British settlment established in the Middle Iron Age (DETSICAS, 1960). Larger sites, some possibly qualifying as oppida, are known at e.g, Bigbury and Quarry Wood, Loose, and there was also an important settlement at Canterbury. For most of these sites there are no published quern finds if any were recovered, possibly, as in other counties, as consequence of generally limited excavation.

There are a large number of sites and casual finds of the Late Iron Age and Romano-British period, many probably small farmsteads represented by rectilinear or circular enclosures surrounding a hut, for example, Borden, Chislet, Greenhithe and Faversham (DETSICAS, 1983). At Faversham a farmstead was established in the later half of the 1st century BC, initially as a sub-rectangular enclosure the ditches of which were largely silted by the mid 1st century AD, and Roman construction was initiated in the later half of the 1st century AD. A piece of Puddingstone quern was found in the region of a pit that contained late Belgic pottery (PHILP, 1968; 85). Two sites at West Wickham have yielded quern fragments of Folkestone Beds sandstone. At Fox Hill a small excavation of seven small ditches, six irregular pits and one posthole irregularly scattered over a limited area and dated to the period AD 80-140 produced fragments of flat querns of Millstone Grit, Folkestone Beds and lava. At Elm Farm, dated to the mid 1st century AD the quern fragments are all of Folkestone Beds (PHILP, 1973; 61-7). Total excavation of the late pre-Roman Iron Age farmstead at Farningham Hill, produced pottery dating to the period 50 BC to 50 AD, and eight definite quern fragments, seven of probable greensand and one of dense ironstone. One of the greensand pieces is probably from a saddle quern, the rest from rotary querns but these are too fragmentary to determine the form; they may possibly represent as little as a single quern (PHILP, 1984; 29, 36-7).

The open settlement at Joydens Wood near Bexley, suggested to qualify description as a village, dates to the 2nd to 4th century AD and has yielded fragments of lava, Millstone Grit, ferruginous grit or Carrstone and sandstone, probably from the Lower Greensand. None of the pieces were large enough to determine size but all are probably from flat type rotary querns (TESTER & CAIGER, 1954). The site at Fordcroft, Orpington, was occupied from the later half of the 1st century to the 4th century AD and has produced fragments of Millstone Grit and lava and a piece of granite for which a Devonshire origin has been suggested. There is also a complete upper stone of pebble conglomerate with handle socket of East Anglian form (TESTER, 1969;

69). Excavation of the bath building at Baston Manor, Hayes (of 1st to 4th century AD date) produced native types of pottery and greensand querns, and imported pottery and querns. All of the quern finds are fragmentary, a total of 15 pieces representing at least seven separate rotary querns of Millstone Grit, lava and Folkestone Beds (PHILP, 1973). Excavation on the Roman fort at Reculver produced some prehistoric finds but no trace of the known pre-Belgic settlement. Fragments of lava and an upper rotary quern (possibly fairly complete) of sandstone with a concave grinding surface and lateral handle socket are recorded (PHILP, 1959).

Querns have been recovered from a number of excavations in Canterbury. Investigations at Rosemary Lane Car Park, where the earliest evidence of occupation dates to the mid 1st century AD produced three small and one large fragment of Puddingstone from the make-up of a street dated to the late 1st or early 2nd century AD. A nearly complete, unpierced lower stone (CJ 682) now fairly thin and of sandstone was recovered from a floor surface of the 3rd or late 2nd century (BENNETT et al, 1982, 184- 5, no. 116). There are also a fragment of puddingstone (op.cit., 184-5, no.120), a fragment of an upper stone of grey coarse limestone fabric (op.cit., 184-5, no. 119) and several other pieces of querns of unspecified type and lithology (BENNETT et al, 1982; 184-5). Several querns found in Canterbury were examined. From Whitehall Building Site come CJ 674, a quarter of an upper stone of Kent 1 form in which the handle socket has been worn onto the grinding surface dated to the 1st century AD; CJ 675, a quarter of a worn upper stone of Kent 2 form of mid 1st century AD date and CJ 679, one third of an upper stone of Kent 1 form (possibly part of CJ 674), all three of Folkestone Beds. There are three stones from Burgate, CJ 676, one third of a worn upper stone of Kent 1 form; CJ 685 a complete, but worn upper stone of Kent 1 form with a rynd slot in the base of the hopper and grooved grinding surface; and CJ 688 an almost complete upper stone of Kent 1 form, again all of Folkestone Beds (BENNETT et al 1982; 34). CJ 691 from St Georges Street is a fragment of an upper stone of puddingstone, CJ 677 from St Margeret Street Baths, of Folkestone Beds, is one third of an upper stone of Kent I form; and from from Stodmarsh Road there are two querns, CJ 681 a complete, worn upper stone of puddingstone in three pieces, and CJ 687 of Millstone Grit subtype 1, an almost complete, lower stone of relatively large diameter and pierced by a cylindrical spindle hole. The single example from Dame John Gardens, CJ 686, is a complete upper stone of Kent 2 form of Folkestone Beds, fairly worn, in which the base of the handle socket is now only 2 cms above the grinding surface. Also from Canterbury, built into the city walls, is CJ 690, a complete lower stone of puddingstone. These excavations, many conducted in the 1950's **(BENNETT et al,1982)** have produced mainly either complete, albeit generally worn, stones or large pieces, although more fragmentary material has also been recovered from recent investigations, for example, CJ 692 and CJ 693 from Linden Grove and St Johns, Canterbury, respectively.

Stray finds examined are predominantly of puddingstone from the western part of the county, although many of the querns of this lithology in Maidstone Museum are unprovenanced. Puddingstone querns have been found in eastern Kent but appear to be far less common here. CJ 699 an unpierced lower stone of puddingstone was found in Newlands Sand Pit near Charing in an area that had previously produced sherds of belgic pottery (GROVE, 1959). Other chance finds include, CJ 560 from the Isle of Sheppey is a complete but very worn upper stone of Kent 2 form of Folkestone Beds; CJ 672 a complete, worn upper stone of Kent 1 form of Folkestone Beds from Ashe; CJ 700, from Southfleet, a complete and possibly relatively little worn lower stone of puddingstone: and CJ 698, from Hadlow, a complete upper stone of puddingstone of generally East Anglian form but possessing a handle slot cut into the top of the stone.

9.2.6 Southern England

Southern England lies outside the scope of the present study but, as the area investigated archaeologically, there is a large number of published sites and querns, and, compared to other regions, quite a lot of research has already been undertaken on the early rotary querns of the area, including that of Peacock (1987). What follows is a brief survey of some of the published material which demontrates the lithologies and forms of querns in use in this area durind the middle to late Iron Age and, in many cases, the earlier Roman period and the nature of the contexts and sites from which they are recovered.

Middle Iron Age

The hilltop settlement at Bishopstone, Sussex, occupied from the 3rd millennium BC to the 6th century AD, comprised a small farming settlement in the Iron Age, initially open but later enclosed. Saddle querns and a rubber from Neolithic contexts are of silicified sandstone (probably sarsen) and fine grained Carboniferous sandstone. There is one complete quern (upper and lower stones) of Hythe Beds from Lodsworth (PEACOCK, 1987; 81) of Iron Age date. The upper stone is complete but possibly quite worn and now thin and of Sussex type but only half remains of the pierced lower stone which is moderately worn and has a roughly flat base amd convex grinding surface. Also from this phase is a broken lower saddle quern of banded granite from an Early Iron Age ditch and part of a saddle quern of siliceous sandstone, possibly lower Greensand, from an Early Iron Age pit. There are three fragments of flat type quern from Romano-British contexts, all of Lower Greensand, two reused as packing, the third from a pit (BELL, 1977; Fig. 59 and 82). The 6th to 1st century BC unenclosed settlement at Slonk Hill, Shoreham which produced evidence of domestic occupation, agriculture and metaLworking, yielded no querns although there is one piece from an upper stone of glauconitic sandstone, 37 cms in diameter, from the Roman settlement established here sometime after the mid 1st century AD (HARTRIDGE, 1978).

In Surrey, numerous quern fragments were found during the excavation at Holmbury hillfort in 1930 and also during further investigations in 1970. A complete upper (showing little to only moderate wear) and fragmentary lower stone both of Sussex form, and a thick lower stone from the northern ditch of the hillfort (all of Hythe Beds sandstone from Lodsworth) are suggested to be of 1st to 2nd century BC date (PEACOCK, 1987; 81: THOMPSON, 1979). A second fort in the area, Hascombe was also excavated by Winbolt who again found fragments of beehive querns. From the 1970's excavations there are pieces from at least seven querns. One (THOMPSON, 1979; 292, no.3), an almost complete lower stone is thick, unpierced and possibly relatively little worn. It was found in a pit in association with clay sling bullets, slingstones and carbonised grain; three joining fragments of an upper stone were also recovered from the same pit. Six joining fragments of a relatively thick upper stone, damaged around the edges (op. cit., 292, no.4) but of Sussex form upper stone were found in pit with pottery and fragments of triangular loomweights. A third pit produced seven fragments of two lower stones (op.cit., 293, no.7 and 8). All the querns are of Hythe Beds from Lodsworth and dated to c.50 BC (THOMPSON,1979; 291-3: PEACOCK, 1987; 81). No querns are reported from a third hillfort excavated in the area at Anstiebury (THOMPSON, 1979). The hillfort at St Georges Hill, Surrey, which may be situated to exploit the local iron ore, has produced two lower quernstones. One, complete, fairly thin and pierced of Sussex form, (HANWORTH & TOMALIN, 1977; 82, 84) is possibly also of Hythe Beds, whilst the second, a Sussex lower stone has been identified as Hythe Beds from Lodsworth (HANWORTH & TOMALIN, 1977; 82-4: PEACOCK, 1987; 81).

Excavation at the small farming settlement at Atwood near Sanderstead, Surrey, in use from the Early Iron Age to the Roman period, produced both saddle and rotary querns. The five pieces of saddle quern represent a lower stone of Wealden Ironstone and an upper stone of Ightham Stone dated to the 3rd or 2nd century AD. Of rotary form are a segment of an upper stone of glauconitic sandstone (identified as Wealden Upper Greensand), one half of a stone and a few fragments of lava and an upper and lower stone of conglomerate, the upper of rock similar to that found on Worms Heath (LITTLE, 1964). Excavaton of Iron Age occupation on the eastern bank of the River Wey at Brooklands uncovered evidence for settlement possibly dating from the 6th century BC and occupied until the Roman conquest, the excavated area forming only part of a larger Iron Age settlement. Of Iron Age date are three quern fragments of Kentish Rag, the largest from a lower stone recovered from a pit and there is also one small fragment from a lower stone of Hythe or Bargate Beds also from a pit (HANWORTH & TOMALIN, 1977; 81-2).

Stray finds from the county are both complete and fragmentary, for example, fragments of quern from surface collection near Ham, two pieces of upper stone and three from a lower stone. The rock has been identified as glauconitic quartz arenite that resembles parts of the Lower Greensand of the Leith Hill district (FIELD, 1983). There is a complete quern from Burpham of Sussex type and still quite thick (probably little worn) which was found in a sand pit from which no other material was reported; it is considered to be of Iron Age date and has been identified as Lodsworth Hythe Beds sandstone (HANWORTH & TOMALIN, 1977; 82, 84: PEACOCK, 1987; 80). One further example is the lower half of a quern of Bargate Stone from Ockham suggested to be of 2nd century BC date which was found during deep ploughing (BIRD et al, 1980).

In Hampshire large scale excavation at Danebury has produced a total of 592 quern fragments of both saddle and rotary querns. Many are of greensand some of which, identifed variously as upper and lower Greensand, have subsequently been reidentified by Peacock as Hythe beds from Lodsworth (PEACOCK, 1987; 78-9: CUNLIFFE, 1984). The other commonest rock types are Tertiary sandstones and gritstones. These fragments represent at least 54 saddle and 29 rubbing stones, and 82 lower and 32 upper rotary querns; in addition there are 232 fragments mainly from rotary stones which are too fragmentary to recognise the type. The collection includes a complete quern (CUNLIFFE, 1984; 413, no. 8:24) of Lodsworth Hythe Beds of which the upper stone is still thick and symmetrical, the lower stone thinner and more asymmetrical, A second upper stone of Hythe Beds from Lodsworth (op.cit, 414, no.8:27) is an almost complete upper stone, still moderately thick, but like querns of South-western form possesses a handle slot which does not extend the full radius of the stone. A second quern of similar design (op.cit., 414, no.8:26) is of Upper Greensand. There are also several examples of Wessex form (op.cit., 416, 8:30, 8:31, 8:32) which show varying amounts of wear, the handle socket in one case, no. 8:30, partly worn onto the grinding surface. Of a total of six Wessex style querns from the site four are identified as greensand (one as Hythe Beds from Lodsworth) and two as Millstone Grit (CUNLIFFE, 1984; 412-419: PEACOCK, 1987; 78).

A different type of settlement, at Winnall Down, has also been the subject of large scale excavation, investigation concentrating on this one enclosure which, however, forms only part of the settlement history of the area; only part of the Roman element of the site was excavated. An open settlement of the late Bronze Age was replaced in the Early Iron Age by a D-shaped enclosure, which was abandoned from the 3rd century BC, and replaced by an open settlement covering the same area during the Middle Iron Age. By the Roman period this settlement was in turn succeeded by an arrangement of enclosures linked by a trackway (FASHAM, 1985). There are a total of 140 quern fragments from the excavation, of both saddle and rotary types, the latter first appearing during phase 4 on the site (Middle Iron Age) contemporary here with the appearance of saucepan pottery. Jecock has suggested that here the Wessex and Hampshire forms co-existed during the 3rd and 2nd centuries BC and were possibly used into the 1st century whereas dateable examples of Sussex types here belong to the 1st centuries BC and AD. Saddle querns are predominantly of sarsen, the rotary querns of greensand (much of which is from Lodsworth), carrstone, sandstone and limestone. In addition to the recognised quern fragments there are a large number of stone fragments (greensand, carrstone, sarsen and chert) that may also have belonged to querns. Of the total of 140 pieces, the largest proportion of which are from Phase 4 contexts, 15 are from saddle querns and 23 from rotary querns (JECOCK in FASHAM, 1985; 77-80). The illustrated finds include a complete, moderately worn Sussex style upper stone of Hythe Beds (Lodsworth) from a phase 4 pit (op.cit., 79, no.7); an almost complete Sussex upper stone of Hythe Beds from a phase 4 pit (op.cit., no.8); one half of an upper stone of limestone from a pit (op.cit., no.6); a complete and worn unpierced lower stone, possibly of Lodsworth Hythe Beds (op.cit, no.10); an almost complete unpierced lower stone, still fairly thick, of Lodsworth rock (and Sussex type) from a phase 4 pit (op.cit., no.9) and a fragment from a thin, possibly Sussex form, upper stone from an enclosure ditch of phase 6 (op.cit.,no.12). Of the saddle querns illustrated there are two complete examples of Hythe Beds (Lodsworth) (op.cit., nos.1, 4), two large pieces of sarsen (op.cit., no.2), and an unidentified sandstone (op.cit., no.3) and fragments of Lodsworth greensand and metaquartzite (op.cit., nos.5, 11).

The initially kite shaped but later sub-rectangular enclosure at Rucstalls Hill, Basingstoke, Hants, occupied from the Iron Age through the Roman period has produced three incomplete rotary querns from Iron Age contexts. A thick upper stone of Sussex form was found with a thick unpierced lower stone in a context of Phase 1B (3rd to 1st century BC date) whilst the third example, a thinner, unpierced, lower stone belongs to the earlier phase of Iron Age occupation (OLIVER & APPLIN, 1978; querns no. 42, 43, 44). There are also two sarsen pebbles from phase 1B which may have been used as quern rubbers (OLIVER & APPLIN, 1978). Excavation at the plateau fort of Winklebury Camp, Basingstoke, initially settled in the early Iron Age and finally abandoned in the 1st century BC, produced two unstratified Sussex type upper stones of greensand and an unpierced lower stone of 'Sussex' form (SMITH, 1977). One upper stone (op.cit., quern no.6) very asymmetrical and half remains of the second, thick upper stone (op.cit., quern no.7).

From Middle Farm, Chilbolton, Hants, there is one quarter of an upper stone of Jecocks Hampshire type, of greensand, found in association with saucepan pottery. The settlement was initially open during the 6th to 4th century BC but later enclosed during the 3rd to 1st century BC (SCHADLA-HALL, 1984; Fig.76). Excavation at a smaller oval ditched enclosure at Little Sombourne produced pottery of the 5th to 1st century BC and fragments of querns of red sandstone (possibly from Devon) and a rotary quern of Bembridge Limestone (which crops out on the Isle of Wight) (NEAL, 1980; quern no.7, 10). Quern fragments of red sandstone representing two querns were also found in a single feature at a small domestic Iron Age site at Portsdown excavated in advance of roadworks, the investigation uncovering postholes forming no clear pattern, hearths and pits (BRADLEY & LEWIS, 1968).

In Wiltshire the early promontory fort at Budbury, Bradford on Avon produced only saddle quern fragments of quartzite, other sandstone and shelly limestone (WAINWRIGHT, 1970). Bury Wood Camp, occupied from the early to the middle Iron Age has yielded quern fragments of rotary types, of which one upper stone, (GRANT-KING, 1967: not illustrated) could, from the description, be of Wessex type, and which has been identified as Old Red Sandstone. Five other pieces of Old Red Sandstone of possible beehive type broken in antiquity are also recorded (GRANT-KING, 1969). The main period of occupation at the hilltop enclosure at Odstock dates to the early Iron Age. Some 40 fragments of conglomeratic and coarse grained sandstone and probable Upper Greensand that are presumed to be from querns were recovered, and some pieces of grinding stones were used in the building of hearths (BORTHWICK & CANHAM, 1984).

Smaller enclosed sites show similar quern lithologies and fragmentation patterns. There is a saddle quern of sarsen from Pewsey Hill, probably first settled sometime in the early Iron Age (THOMPSON, 1971); saddle querns of glauconitic sandy limestone, arkosic sandstone and glauconitic chert and an upper rotary stone of glauconitic sandy limestone (suggested to be Kentish Rag) from Little Woodbury (BRAILSFORD, 1949); and saddle querns of glauconitic calcareous sandstone and ferruginous sandstone and rotary types of glauconitic sandstone from Boscombe Down (RICHARDSON, 1951). All of these lithologies are assignable to the local Upper Greensand. The two

Wessex type upper stones from Boscombe Down are probably both fairly worn and in one the end of the handle socket has been worn onto the grinding surface and a handle slot cut into the top of the stone (RICHARDSON, 1951; Fig.19, no.4,3) Both have a shallow hopper and are from a pit that produced middle Iron Age pottery. There is also a broken upper stone of glauconitic calcareous sandstone, flat topped with a small hopper, and part of a pierced lower stone with a convex grinding surface and cylindrical spindle hole, the latter of Roman date (op.cit., Fig.19, no. 1,2).

In the area excavated at Hengistbury Head, Dorset, the Middle Iron Age (400-100 BC) is not well represented, there is a large collection of material of late Iron Age date, when the settlement developed as a "port of trade" and occupation continued into the Roman period with no apparent break (CUNLIFFE, 1987). There are 112 possible quern fragments from the excavation, 45% of these of foreign stone. 73 are definitely from querns and a maximum of 63 stones are represented; 7 saddle and 29 upper and 14 lower stones with 13 of rotary type but otherwise indeterminate form. Two stones (op.cit., 169, nos. 1, 2) are paired to give a complete quern, of which at least the lower stone is complete, both are of greensand. The remaining stones are more fragmentary, and roughly one quarter to one sixth of the stone remains in many cases with the exception of a pierced lower stone of Roman date of greensand (op.cit., no.21) and a thick, Iron Age, unpierced lower stone of gritstone which may be complete (op.cit., no.22). Half remains of a generally Wessex shaped upper stone (op.cit., 169, no.14) which has a small residual hopper but rather wide flat top for the class. The stone is relatively thick compared to stones from elsewhere of similar diameter and from a Roman context; it may be relatively unworn.

At Maiden Castle rotary querns were again introduced during the middle Iron Age. There are a few saddle querns recorded of sarsen and flint conglomerate from Neolithic layers and of chert and Dorset Upper Greensand from Early Iron Age contexts. Many of the early rotary querns are of limestone but dolomitic conglomerate from the Mendips, Upper Greensand and ironshot quartz are also represented. The published finds are generally complete or very nearly so and the amount of wear is variable. For example, four stones (WHEELER, 1943; 323-4, nos. 5, 6, 9, 11) are complete and still fairly thick, three (op.cit., nos.8, 10, 16) are almost complete and two thirds remains of three lower stones (op.cit, 10, 15, 20) whilst a further example (op.cit., no.21) is almost complete but in several pieces. The original handle socket of no. 16, an upper stone of Wessex form has been worn onto the grinding surface and replaced by a slot cut into the top of the stone. The four examples of flat querns illustrated are all fragmentary, a maximum of three-quarters remaining of one upper stone (op.cit, no.27) and all appear to have been only moderately worn (WHEELER, 1943; 321-9).

Excavation at Gussage All Saints, occupied from the first millenium BC until the latter part of the 1st century AD, produced mainly fragmentary quern material. There are a total of 149 quern pieces two thirds of which are of greensand. Most of the rotary querns are from phase 2 and 3 contexts. There is a complete, thick and probably little worn lower stone of Wessex form of Devonian quartz grit from the bottom of a pit assigned to the earliest Iron Age phase on the site (WAINWRIGHT, 1979; 91, no.2157). Also complete is an upper stone of Wessex form, very worn in which the handle socket has been replaced by a slot and which is also of quartz grit, probably Devonian, from a phase 3 context (op.cit., 94, no.2261).

The settlement at Allards Quarry,Dorset, occupied from the 4th century BC until the the 1st century AD, and subsequently resettled in the 3rd century AD has produced a saddle quern of glauconitic sandstone with a chalcedonic matrix, and rotary querns of glauconitic sandy limestone. There is one almost complete upper stone of Sussex form from a pit (and two further examples of this type lacking the handle sockets), a very thick lower stone of Wessex type also from a pit, a worn asymmetrical unpierced 'Wessex' type lower stone and a possible pierced lower stone (WILLIAMS, 1950; querns no.40, 41, 42, 43). There is also one quern not illustrated of quartz conglomerate from the Forest of Dean or Bristol area (WILLIAMS, 1950).

Stray finds are recorded from, for example, West Knighton, a possibly complete, pierced lower stone of Wessex type, of indurated ferruginous sandstone probably from the local Reading Beds (FARRAR, 1952); Kingsdown, Pamphill, half of a pierced lower stone from found during ploughing, (FIELD, 1966); and Portland, a complete quern comprising an considerably worn upper stone of Wessex form, and a thick, unpierced lower stone of 'Wessex' type; both are of Portland Stone (PUTNAM, 1970).

Late Iron Age

Quern finds of late Iron Age date from Sussex are again predominantly of greensand, e.g., those from Elsted, West Sussex a 1st to late 3rd century farmstead that also produced a scatter of Iron Age pottery. Excavation on this plough damaged site produced nine fragments all from fairly flat rotary querns, possibly all of Sussex form, several of which.are unstratified from the ploughsoil (REDKNAP & MULLETT, 1980; 218, Fig.13). At Newhaven excavation of a Romano-British settlement bounded by a ditch yielded pottery that is a combination of latest Iron Age and Roman types, five pieces of possible rubbing stones of Lower Greensand and sarsen and segments of rotary querns (flat types) of Lower Greensand and a few pieces of lava (BELL, 1976) Lancing Down has yielded six fragments from three querns of Wealden sandstone. excavation here revealing traces of a small wooden structure, possibly a Late Iron Age shrine that preceeded the Romano-British temple (BEDWIN, 1981).

In Surrey pieces of Hythe Beds sandstone querns have been recovered from, for example, Woking Park Farm where excavation revealed postholes of a timber building, a ditched enclosure and possibly a trackway dated to the 1st to the 4th century AD and produced two fragments of an upper and lower quern stone. The lithology of the upper stone is described as similar to that of querns from Holmbury suggesting Lodsworth to be the source (HAWKINS, 1984), and Black Close Farm, Woking, which saw domestic and industrial use in the 1st and 2nd centuries AD (HAWKINS, 1985).

Excavation at Martin, Hampshire, demonstrated occupation initiated in the early 1st century AD, the majority of the pottery described as Late Iron Age Durotrigian but there is little Roman material. The four querns recovered are fragmentary but probably all of relatively thin Sussex types and all of silicified or fossiliferous greensand. They were found in four separate pits (DAMPNEY, 1984; Fig.139). The Romano-British site excavated at Little Sombourne, Hants, fragmentary querns of greensand from the Midhurst-Petworth area, and therefore possibly from Lodsworth, (two pieces of the 1st to 4th century AD), Old Red Sandstone (mid 3rd century) and other greensand (two undated pieces) from the Romano-British site (TEST VALLEY ARCH.COMM., 1984). From Barton Stacey, a small ditched enclosure representing a Late Iron Age and Romano-British rural settlement there are fragments of Lodsworth Lower Greensand, many of them burnt, from two upper stones of Sussex type (DACRE & WARMINGTON, 19849.

There are also querns of greensand from the Roman small towns of Neatham and Silchester , where there is no positive evidence of an Iron Age predecessor in the excavated area. There are eight fragments from flat type rotary querns published by Millet & Graham (1986), two identified as Upper Greensand (both pierced lower stones), five of unspecified greensand and one as ferruginous sandstone, probably carstone (MILLETT & GRAHAM, 1986; 132-138). Excavations on the defences at Silchester produced pieces from both pierced and unpierced lower stones and upper stones of Lodsworth greensand and Old Red Sandstone. One fragment of a lower stone of Lodsworth rock, of late 2nd to early 3rd century AD date from the mouth of a road drain is of pierced Sussex type (FULFORD, 1984; 119, no.1). A fragment of a fairly thick Sussex form upper stone from the same context is also of Lower Greensand (op.cit., no.2). There are three querns from a disturbed context at the South Gate, a fragment from a worn upper stone of Old Red Sandstone (op.cit., no.4); a fragment of an unpierced Sussex lower stone of Lodsworth greensand (op.cit. no.3); and a fragment of a flat grooved lower stone of probable greensand (op.cit, no.5). Seven other fragments of greensand were also found (FULFORD, 1984; 118-20).

At Studland, Dorset, the earliest phase of settlement is represented by circular huts of the pre-Roman Iron Age, occupation culminating in rectangular houses of the 4th century AD. There are two broken, Wessex type upper stones, one of probable 2nd century AD date of which half remains (FIELD, 1965; quern no.1) and one dated to the second half of the 1st century AD, which is suggested to have been broken in manufacture (op. cit., no.2), both of ferruginous sandstone, the local Heath Stone. One saddle quern of the same material and a piece of a flat type upper stone of Dorset greensand were also found. (FIELD, 1965). From the earliest, Roman, occupation spreads (later 1st century AD) at South Grove, Dorchester, there is an almost complete upper stone, broken horizontally in manufacture, but originally probably of Wessex style of impure shelly limestone (MARTIN, 1982). Wessex type stones are recorded from Puncknowle, Dorset, where the main period of occupation seems to belong to the 4th century AD and may have been of a religious nature. The four querns are all unstratified finds, a complete but probably worn lower stone of Upper Lias found ploughed out of the north side of the knoll (BAILEY, 1985; 82, no.1); half of a fairly thick unpierced Wessex type lower stone, probably little worn of porphyritic rhyolite (op.cit., no.2); an almost complete Wessex type unpierced lower stone, of West Dorset Lias, also ploughed up (op.cit., no.3); and one quarter of an upper stone of Wessex type, probably only moderately worn of Lower Oolite, possibly Portland, from debris under a field wall (op.cit., no.4).

The majority of published rotary quern finds from Somerset, Avon and Gloucestershire are from Romano-British sites and there is little definite Iron Age material. Of Iron Age date are one-third of a thick lower stone from Cadbury Camp, Tickenham, Avon, of probable Old Red Sandstone, but which retains no trace of the spindle hole, and a fragment of an upper stone also of Old Red Sandstone from the same locality. Possibly also of this date is one half of a thick (14.5 cms) upper stone from Nightingale Valley, Long Ashton, Avon, which may be of Wessex form although no handle socket remains, of probable Carboniferous sandstone from the Bristol area (INGLE, 1982; F4214, F4182, F2376). The 4th century AD Romano-British farmstead at Bradley Hill, Somerton, Somerset, built on a site earlier occupied from the pre-Roman Iron Age to the end of the 1st century AD, yielded one unpierced and possibly complete lower stone of conglomerate and other fragments of greensand (two), Pennant Grit (two) and one pierced lower stone of greensand. The majority of these were recovered from a building of Romano-British date (LEECH, 1981). Catsgore, described as a Romano-British village and which comprised at least five and possibly a maximum of twelve separate farms was occupied from the early 2nd century AD into the early 5th century. A total of 23 quern fragments were recovered from excavation, and in addition there is one rubber of Ham Hill Stone from the surface of a ploughed field in the area of one building. Two of the rotary examples, a lower and upper stone, are described as thick stones, the first part of a rather bun-shaped lower stone of greensand (LEECH, 1982; 129, no.1) thought to belong to the early 2nd century occupation, and the second, one quarter of an upper stone of breccia of South-western form with a small hopper and slightly concave grinding surface (op.cit., no.2). Five querns are described as "small querns with a sloping grinding surface", three of which are of probable Old Red Sandstone, one of greensand and the other of unidentified sandstone. All are fragmentary and in form are Roman flat types. The large flat types recovered are also fragmentary, some having a grooved grinding surface. Six out of the nine illustrated are of greensand, two of sandstone and one of Old Red Sandstone. A few other fragments of greensand were also recovered, one or two reused as mortars, some incorporated into buildings or pavements and others found, for example, in pits (LEECH, 1982; 128-30). Further excavation here in 1979 produced two more quern fragments of sandstone conglomerate, possibly Mendip Old Red Sandstone, one from the fill of a well and the second reused as a sharpener for metal tools (ELLIS, 1984; 29).

Excavation of the Roman town at Ilchester where finds indicate Iron Age origins produced quern finds of Old Red Sandstone with the exception of a fragment of possible millstone of Ham Stone. There is one complete lower stone pierced by an hourglass shaped spindle hole (LEACH, 1982; 220, Fig.105, no.39) but the flatter stones are all fragmentary (LEACH, 1982; 217, 220, 222). The extensive settlement at Camerton established towards the end of the early Iron Age and occupied throughout the Roman period yielded several querns when excavated. There is a complete unpierced lower stone of medium grained calcareous sandstone, probably Upper Greensand of Wiltshire, that was built into a Roman building wall, and a second complete unpierced lower stone from a 3rd century AD level in a ditch, of medium grained light coloured sandstone. Other pieces are of calcareous or other sandstones or sarsen and include a lower saddle quern, identified as probable Old Red Sandstone from the Mendips, from a pit that contained Neolithic pottery (WEDLAKE, 1958; 244).

Old Red Sandstone is also the predominant lithology in Gloucestershire and Avon, querns of this source found on farmsteads and small settlements. At Wycomb, Andoversford, Glocs, excavation prior to M 40 construction uncovered a large ditch with late Roman material and features of early Roman date. Three fragments of quernstone were found near an oven, all probably of Quartz Conglomerate from the Forest of Dean, although the form is not specified in the published report (RAWES, 1980). From a small settlement at Haymes, near Cheltenham, occupied from the 1st to the 4th century comes pottery of largely native character and pieces of eleven querns (types not stated) of Forest of Dean quartz conglomerate) (RAWES, 1986). At Brockworth, an area of 2 hectares produced evidence for occupation including two native type round huts and five pieces of querns of quartzitic sandstone probably from the

Forest of Dean (RAWES, 1981). Excavation at Bourton on the Water on a site if 2nd to 4th century AD date produced two pieces of quern, part of a flat upper stone of Millstone Grit probably belonging to the 3rd century and roughly half of a relatively flat upper stone of oolite that was found unstratified in the field prior to excavation (DONOVAN, 1934; quern no.1,2). At Frocester Court Villa excavation in the western corner of an Iron Age and early Romano-British enclosure which was probably constructed the turn of the 1st century AD produced six fragments of rotary quern and two of saddle types. The rotary stones are all identified as Pennant Sandstone and the saddle querns are described as fine to medium grained micaceous sandstone (PRICE, 1983; quern nos. 11-18). Not all of the querns ahve been found at settlements; at Portway, Gloucester,a site interpreted as a wayside shrine built in the mid 2nd century AD which also showed evidence of pottery manufacture on site yielded twelve pieces of querns, mostly of Forest of Dean sandstone conglomerate (RAWES, 1984).

Limited excavation and observation at the small Romano-British farmstead at Cattybrook, Avon, occupied from the late 1st to the early 3rd century AD showed a possibly materially poor settlment. There is one quarter of a moderately worn lower stone of quartz conglomerate from the Forest of Dean (BENNETT, 1980, Fig.15, no.1) no.1, fig.15), a quarter of a flat upper stone, unstratified from the excavation, also of conglomerate (op.cit., no.2), and two upper stones (a quarter of each surviving) both of South-western form and of quartz conglomerate, found unstratified during a later stage of the destruction of the site (BENNETT, 1980; Fig.15, no.3,4). At Chew Park, Avon, evidence for Iron Age occupation comprises house circles and ditches whilst the Roman period is represented by a timber building of the 1st century AD, industrial activity in the 3rd century and a later stone villa. All of the quernstones are fragmentary, generally a quarter to half of the stone, and of Old Red Sandstone. The upper stones appear to be mostly of South-western type or later flat types for which no handle socket remains, and the lower stones unpierced Wessex types (RAHTZ & GREENFIELD, 1977; 201-3).

CHAPTER 10: DISCUSSION

10.1 Lithological distribution of querns in the study area

Petrological analysis of over 670 beehive type querns across a large part of eastern England has demonstrated that here at least a relatively small number of sources account for a high percentage of the quern finds. Leaving aside the definite Roman examples (although the rest include, on form, a number of intermediate types) there are a total of 12 of Old Red Sandstone, 206 of Millstone Grit (of which 163 are of the feldspathic variety), 52 of Wealden Greensands (of which 17 are of Hythe Beds from Lodsworth and 31 of Folkestone Beds), 100 of Spilsby Sandstone, one of other Lower Greensand (giving a total of 152 of Cretaceous greensands), 254 of Puddingstone, 12 of Old Red Sandstone, 12 of limestone, 7 of igneous rock (mainly granite) and 17 of other sandstones. Millstone Grit thus accounts for 31.5% of the total, puddingstone 39% and the greensands 23% of the area under study but the importance of each source varies across the region.

The greatest concentration of Spilsby Sandstone, as would be expected from the area of the outcrop, is in Lincolnshire where 41 out of the 63 querns examined in the county are of this source, and it also accounts for a high proportion of the collections in South Humberside. From here the main distribution appears to be to the south, the two recorded to date from Nottinghamshire are from localities close to the border with Lincolnshire and there are possibly (although the identification is as yet tentative) a few from North Humberside (WRIGHT; pers.comm.).The two provenanced examples out of the four from Leicestershire are from the north-east of the county, whilst in Northamptonshire which sees the south-western limit of the distribution there are only three examples outside Hunsbury. In Bedfordshire examples are from two sites (Harrold and Odell) and there are only two from Hertfordshire (Aldwick in the north of the county). On present evidence the lithology is absent in Buckinghamshire and the southern and western limits of distribution shown in figure 6 is not just a reflection of the geographical extent of research area. The gap in the mapped distribution in north Cambridgeshire may be largely a consequence of the lack of provenanced examples in Peterborough museum. It is unlikely, for reasons already discussed in Chapter 5, that the querns of Spilsby Sandstone found in East Anglia were manufactured from erratic blocks occuring in that region; most, if not all, were probably brought to the area as completed items.

For the querns of Hythe Beds from Lodsworth source the study area falls at the northern extent of the distribution described by Peacock, with examples of the earlier form (thick, Sussex types) from Northamptonshire, Bedfordshire and Buckinghamshire, albeit in small numbers. To the west of this they are also found in Oxfordshire, in small but significant numbers, the few examples seen here being flat types from Roman contexts from Gravelly Guy, Stanron Harcourt. CJ 601 is a large and late lower stone of this rock from Verulamium. Two stones of calcereous Hythe Beds from Witham, Essex, and Odell, Beds, point to a source in East Kent.

The Folkestone Beds querns are largely confined to Kent. The few scattered examples occuring outside this county have been in the southernmost part of the study region; two at Hunsbury, single examples from Odell, Beds, Guilden Morden, Cambs, Wilbury Camp, Herts, East Bergholt and Witnesham, Suffolk and an unprovenanced stone in Colchester Castle Museum. Those from Kent have, to date, been found mainly in the eastern half of the county. All of the querns of this lithology were probably worked at Folkestone, where roughouts of comparable designs to the querns examined have been recovered (KELLER, 1988).

On present evidence Millstone Grit occurs predominantly in the western part of the area, particularly in Leicestershire but also in Northamptonshire, notably at Hunsbury where it is the most numerous lithology, and there are smaller numbers from Bedfordshire (Harrold and Odell in the north of the county), north Buckinghamshire, Camridgeshire, Norfolk (two examples of MG/3, one unprovenanced and the other from Swaffham) and Lincolnshire and a single, unprovenanced, example in Saffron Walden Museum, Essex. The lithology is, at present, absent among beehive querns in Hertfordshire, Suffolk, Kent and the southern parts of Bedfordshire and Buckinghamshire. The total numbers of lithological subtypes 2 and 3 are as yet too small to draw firm conclusions regarding their distributions; at present querns of MG/2 appear to be restricted to the west of the area, in Leicestershire, whilst examples of MG/3 have not yet been found in the southern part of the region under consideration and MG/1 is not yet recorded east of Cambridgeshire. The study area lies to the east and south-east of the production areas for these querns and the lithology is, as anticipated, predominant in Nottinghamshire, Derbyshire and South Yorkshire. Although it is possible that at least some of the querns of Millstone Grit type 3 come from the known quern quarries in South Yorkshire, the exact source of most of the Millstone grit querns remains unproven; they were almost certainly manufactured in the southern Pennines, probably at several localities.

Puddingstone is possibly the most widely distributed rock type - particularly in Hertfordshire, Essex and Norfolk comprising only slightly smaller proportions in Suffolk (approxiametly 75% of th beehive type querns examined), Buckinghamshire, Bedfordshire and Cambridgeshire and occuring in smaller but significant numbers in, Lincolnshire and South Humberside (the northernmost examples found at Dragonby), Northamptonshire (excepting Hunsbury), Oxfordshire and Kent, apparently concentrated in the western part of the latter county. It is possible that a few, at least, of the Kent examples were made from sources in that county, some of the querns differing slightly in lithology from the majority of examples, but most are probably assignable to the Hertfordshire Puddingstone. It is also possible that the puddingstone querns as a group are of slightly later date than many of other lithologies.

The limestone querns, with the exception of CJ 331, Claydon (of East Anglian form and CJ 642 from Great Chesterford, probably of later date) are confined to a small area of south-west Lincolnshire and north-east Leicestershire. Manufacture of querns from the local Middle Jurassic Ancaster Stone is evidenced at Ancaster Quarry, and some of the other finds of this general lithology may also have been worked here. The querns from igneous sources have an apparently random distribution, there are a few possibly from the Mountsorrel complex to the south-east of the outcrop, in Leicester Museun and from Hunsbury. Those of Old Red Sandstone are largely confined to the west of the area. Most are from Northamptonshire with single examples from Leicester Museum (unprovenanced) and Peterborough Museum (unprovenanced) and flat stones from, e.g., Magiovinium of Roman date. Of the 17 examples of fine grained quartzitic sandstones 15 are from Hunsbury, Northants, and point to a local, possibly erratic source, and the other two examples from Cambridgeshire and Essex may also have been worked from erratics, the latter possibly introduced to the county as a finished article.

The main areas of overlap for the distributions of different lithologies lies in Northamptonshire, Bedfordshire, north Buckinghamshire and Cambridgeshire where querns of Spilsby Sandstone, Millstone Grit, Folkestone Beds, Pudingstone and Hythe Beds (Lodsworth) are all found. In Northamptonshire, at Hunsbury, examples of Old Red Sandstone also occur during the Middle to late Iron Age although this lithology is absent further east at this date. There are a number of possible interpretations of these overlaps;

1. They may be a result of the relative expansion and contraction in the area supplied by different factory sites, i.e. at any one time the area obtained querns from only one source resulting in an apparent exploitation of two or more rock types when beehive distributions as a whole are considered,

2. The settlement may be equidistant from two or more sources, and have been in a position, whether social or economic, to obtain items from these throughout the period of beehive quern production.

3. Sources may be unequally valued, and products from one source (generally at a greater distance) may more highly rated and 'priced' than those from elsewhere, in which case the lithology in use thus reflects the relative 'cost' of each type and wealth or status of the individual or settlement procuring them,

4. The discovery of new sources may result in the introduction of a new lithology to a site, although it would appear to be the case that outcrops worked for rotary querns were also exploited for saddle querns at an earlier date.

5; A change in the grain or product to be ground or in the type of product required (for example, differing grades of flour) may alter the requirements in grinding equipment and the relative value of different sources.

A number of these are inter-related and no doubt several factors operated to affect the patterns of exploitation; an assesment of these requires both provenanced and dated examples. There are a number of sites within the region where querns of several rock types are found, most notably at Hunsbury, although at many the dating of the quern finds is 'too imprecise to permit consideration of possible chronological factors affecting distribution.

10.2 Dating

The discussion in the earlier chapters has shown that Millstone Grit attained the maximum extent of its beehive quern distribution shortly after the introduction of this quern type with examples at Ancaster, Hunsbury, Harrold and the same appears to be true of the main area of Spilsby Sandstone distribution with examples again from Harrold and Hunsbury. Dating of the distribution of querns of these two lithologies in East Anglia is more problematical and there is insufficient evidence at present to determine whether these arrived later than those to the west; the forms are certainly consistent with those of the main distribution that occur from the middle Iron Age but equally these forms also occur in relatively late contexts as at, for example, Odell and Dragonby. Local sources were also in use at the same time e.g., limestone at Ancaster and quartzite at Hunsbury. An early appearance is also suggested for Folkestone Beds (although there are very few examples in total from this region) particularly for the two examples from Hunsbury and CJ 584 from Wilbury Hill, although a precise context (and therefore date) for these is not known. The Hythe Beds quernstones, apart from the four found at Hunsbury, appear to be generally of slightly later date.

Similarly, as has been shown in Chapter 9, the lithlogy (or lithologies) of beehive quernstones found on any site appears to bear little relationship to the nature, or perhaps status, of the site, but instead seems to be determined by its geographical location. Of the localities mentioned above, both Harrold and Hunsbury have yielded querns of Spilsby Sandstone and Millstone Grit and both lie towards the southern limit of distribution of these rock types at this date. However, whereas the hillfort at Hunsbury has been described as one of the richest Iron Age sites in the British Isles (RCHM, 1985; microfiche), the site at Harrold has been interpreted as only a small small rural settlement practising a mixed economy from which the pottery is of mainly local origin.

Although a lack of dating evidence for many querns, both saddle and rotary types, does not allow changes in form and patterns of exploitation of source rocks to be followed in detail, a change in the use of raw materials is apparent from the earliest saddle querns of the Neolithic period to the flat rotary querns of Roman and later date.

10.2.1 Saddle Querns

A cursory examination of published material from southern and eastern England suggests that saddle querns of all dates are predominantly of rock from local outcrops or glacial erratics. Neolithic examples include silicified sandstone (possibly Carboniferous and/or sarsen) at Bishopstone, Sussex (BELL, 1977), sarsen and flint conglomerate at

Maiden Castle, Dorset (WHEELER, 1943, 322-3), Folkestone Beds and gritty limestone at Wingham, East Kent (GREENFIELD, 1960), Coal Measures sandstone at Barford, Warwicks (OSWALD, 1967) and red sandstone (possibly from Mendip) at Camerton, Somerset (WEDLAKE, 1958). Examples of Bronze Age date in southern England include those from from Winnall, Hants, of probable sarsen (FASHAM, 1985; 79-80), West Meon, Hants, of Sussex ironstone (LEWIS & WALKER, 1976), Carshalton, Surrey, two of probable sarsen and one of glauconitic sandstone from the lower Greensand of the Weald (ADKINS & NEEDHAM, 1985), Aldermaston Wharf, Berks, of weathered granite, ferruginous sandstone, Old Red Sandstone and Corallian limestone (BRADLEY et al, 1980) Burghfield, Berks of altered gabbro (BRADLEY et al, 1980) and Hayes Common, Kent, of carstone (PHILP, 1973; nos. 147-150).

Of Iron Age date from southern England are saddle querns and rubbing stones from from Bishopstone, Sussex, a broken lower stone of banded granite from a Early Iron Age ditch and part of a lower of siliceous sandstone, possibly Lower Greensand (BELL, 1977); Odstock, Wilts, of coarse grained conglomeratic material, other coarse sandstone and probable Upper Greensand from an enclosure dated to the fifth to fourth century BC (BORTHWICK & CANHAM, 1984); Pewsey Hill, Wilts, of sarsen (THOMPSON, 1971); Winnall Down, Hants, of greensand, sarsen, carstone and other sandstone (FASHAM, 1985; 79-80); Danebury, Hants, the majority of greensands including Hythe Beds from Lodsworth with others of sarsen, chert and calcareous sandstone (CUNLIFFE, 1984; microfiche); Boscombe Down, Wilts, nine pieces of glauconitic and calcareous sandstone and one of local Upper Greensand (RICHARSON, 1951); Maiden Castle, Dorset, of chert and Upper Greensand (WHEELER, 1943; 322-3); Gussage All Saints, Dorset, mainly of Lower Greensand but including some of Tertiary sandstone and Upper Greensand (BUCKLEY in WAINWRIGHT, 1979; 89-97); and Frocester Court, Glocs, of fine to medium grained micaceous sandstone (PRICE, 1983).

In the east and the Midlands Iron Age examples are recorded from, for example, Tydd St Giles, of Hertfordshire Puddingstone on a site producing mainly Romano-British material (CATHERALL et al, 1984); Mickemoor Hill, West Harling, Norfolk, of Carboniferous grit and biotite granite (CLARK & FELL, 1953); Little Waltham, Essex of flint, possible Jurassic sandstone, greenish grey compacted gritstone, possibly Lower Paleozoic and Hertfordshire Puddingstone dated to the period mid third to later second century BC (DRURY, 1978a; 110-3); Feltwell, Norfolk, a fragment of a saddle quern of volcanic dolerite from the Roman bath-house (GURNEY, 1986); Ryton-on-Dunsmore, Warwicks, of Coal Measures sandstone, local sandstone and Leicestershire syenite, two of the Middle Iron Age date and two unstratified (BATEMAN, 1977; Fig.16); Ancaster, Lincs, of fine grained sandstone and schistose metamorphic rocks; Dragonby, South Humberside, mainly of fine grained sandstone; Gravelly Guy, Oxon, mainly of local Corallian sandstones; Aylesbury, Bucks, of Millstone Grit (ALLEN & DALWOOD, 1983); Breedon-on-the-Hill, Leics, of porphyroid igneous rock, arkosic sandstone, Triassic skerry (Building Stones Formation) and Millstone Grit (WACHER, 1964; 1977) and Aldwick, Herts, nine saddle querns made glacial erratics, two of flint and one made from a septarian nodule (CRA'STER, 1961).

Thus, in general, the lithologies identified among the beehive querns appear poorly represented among saddle querns from the same area, beyond which there is also considerable variety in the raw materials used. The use of the Hythe Beds from the Lodsworth quarry for the manufacture of saddle querns has been demonstrated by Peacock (1987) although these show a more restricted distribution than the later rotary types with examples from, e.g., Balksbury, Chalton, Danebury, Owselbury, Southampton, Winnall Down and Fareham, Hants, Farnham and Hilbury Camp, Surrey and Harting Beacon and Worthing, Surrey. The earliest of these is from Harting Beacon (6th or 5th century BC) and saddle querns of this lithology are present at Danebury by the mid 5th century but during the late Bronze and early Iron Ages the rock was carried a maximum of 65 kms from the quarry and generally less than 40 kms (PEACOCK, 1987; 75-8). Millstone Grit and other Carboniferous sandstones were probably worked at sites that were subsequently used for beehive quern manufacture. In Bedfordshire and Buckinghamshire many of the saddle querns are of fine to medium grained sandstone, which occurs fairly widely as erratic boulders in parts of these counties. Finds in East Kent indicate the exploiation of the Folkestone Beds for saddle querns in that area and, similarly, the Spilsby Sandstone occurs as saddle querns in parts of Lincolnshire and South Humberside, for example, at Dragonby although not apparently at Ancaster. Despite the large numbers of beehive querns of puddingstone, this rock appears to have been only rarely used for saddle querns but there are two examples reported, from a site near Tydd St Giles, Cambs (CATHERALL et al, 1984), and Little Waltham, Essex, a small fragment (DRURY, 1978; 113). Similarly, limestones appear to have been rarely used, although examples have been recorded at, Becford, Worcs, a saddle of probable Jurassic oolite and rubber of limestone thought to be from the drift (OSWALD, 1972) and Abingdon, Oxon, where excavation produced possible saddle quern fragments of Calcereous Grit or limestone from the local Corallian (PARRINGTON, 1978; 88).

Some rock types used fairly widely, such as the sarsens in southern England, are not found to the same extent among the rotary querns from the same area, whilst others occur only occasionally and appear to be a very local exploitation, e.g., Corallian sandstones in Oxfordshire (as at Gravelly Guy), carstones (e.g. in Kent) and flint. Individual sites can exhibit quite a wide variety of rock types as at Ancaster, Lincs, where there are finds of quartzite, Millstone Grit, igneous/metamorphic rock, and other erratic material, Little Waltham, Essex and Aldermaston Wharf, Berks.

10.2.2 Beehive rotary querns

With the introduction of rotary querns sometime in the middle Iron Age there seems to be an increased level of organisation of quarrying. A number of sources utilised in the early Iron Age and probably earlier were now exploited on a larger scale and large scale distributions were established for the main sources, namely the Folkestone Beds, Lodsworth Hythe Beds, Millstone Grit, Spilsby Sandstone and probably Old Red Sandstone, although the puddingstone cannot be shown at present to have been worked rotary querns at this time. There are probably also a number of other sources whose products do not reach the region under present consideration, for example the Carboniferous sandstones in Northumberland and Cleveland. During the Middle Iron Age the rock types recorded over large areas of the region are;

1. Folkestone Beds, e.g., at Wilbury Camp, Herts, and Hunsbury, Northants, although many of the querns from here may belong to the later Iron Age, but with few examples of this date present from Kent and the distribution is apparently confined to the southern part of the study region.
2. Millstone Grit, e.g., at Breedon-on-the-Hill, Leics, Hunsbury, Northants, Harrold, Beds, Ancaster Quarry, Lincs, and possibly Burrough Hill (the context of the querns is not known), Enderby, Eaton and Sproxton, Leics, Willington, Derbyshire (WHEELER; 1979), Blackthorn, Northampton, and Bancroft, Bucks.
3. Spilsby Sandstone, e.g., at Hunsbury, Northants, Harrold, Beds, and Ancaster, and possibly Tallington, Lincs.
4. Hythe Beds (Lodsworth), e.g., at Hunsbury. There is also a piece of an upper stone of glauconitic sandy limestone, the calcareous Hythe Beds from an Iron Age context at Ivy Chimneys, Witham, Essex.
5. Old Red Sandstone, within the study area only at Hunsbury at this period.

These same sources are also exploited on much the same scale, in the later Iron Age by which time the puddingstone is also in widespread use, although the date of its first introduction remains uncertain. Hythe Beds (Lodsworth) querns are possibly more common at this time in the study area with examples from Odell, Beds, Grendon, Corby, Desborough, Moulton Park (Northampton), Claycoton and Yardley Hastings, Northants, and Verulamium, Herts. These stones tend to be slightly thinner and larger than early examples (although CJ 190 from Odell is quite a thick and small upper stone) but their precise date is uncertain. At this date or slightly later other Old Red Sandstone stones are introduced, flatter than those from Hunsbury and of South-West rather than Wessex form, for example, upper stones from Desborough and Kings Sutton, Northants, and Biggleswade and Odell, Beds. These attained a wider distribution than Wessex style upper stones of this lithology.

Hunsbury, Northants.

The largest single collection within the area is that from Hunsbury hillfort, Northants, 124 stones now in Northampton Museum which were examined although over 150 were reported to have been recovered from the site. All of the main sources are represented, although over half of the collection is of Millstone Grit (of all three subtypes, but including only six of MG/2 and 5 of MG/3). Sixteen are of Spilsby Sandstone, four of Hythe Beds (Lodsworth), two of Folkestone Beds, five of Old Red Sandstone, fourteen of fine grained quartzitic sandstone, two of granite and one of probable local Jurassic sandstone. In most cases, the design of the stone is that characteristic of the rock type, e.g., the upper stones of Devonian sandstone are of Wessex form.

It has previously been suggested that the site was a centre for the "importation" of blanks that were finished on site and redistributed or traded from there to surrounding areas; Knight has suggested that the hillfort operated as a centralized non-subsistence production centre. of which querns were one of the finished articles "exported" (KNIGHT, 1984). The consistency with which the form corresponds to rock type among these querns certainly sees to argue for most, if not all, of the shaping and finishing of the stones before their arrival at Hunsbury. The hillfort thus acquired finished products from several widely spaced sources in Yorkshire/Derbyshire, Lincolnshire, Avon/Gloucestershire/South Wales, Kent, Sussex, locally in Northamptonshire, and possibly Hertfordshire, as Phillips records two examples of puddingstone from the site (PHILLIPS, 1950). In addition, on the evidence of other manufacturing/finishing sites the incidence of failed material and roughouts would have been high, the stones being prone to fracture during the drilling of feedpipes and handle sockets, and. if the site was used for working of querns from imported rough-outs one would expect a significant number of broken and discarded failures. However virtually all of the recorded and reported finds are complete, and finished, mostly showing signs of wear, a considerable amount in many instances, for example, in those cases where the handle socket has been worn onto the grinding surface. This does not negate the possibility of the site acting as a redistribution/trading centre for querns brought originally as completed items.

The proportions of the different rock types at Hunsbury do differ to those among beehive type querns in the surrounding areas. For example, in the rest of Northamptonshire where 11 of the 34 beehive querns examined are of puddingstone. However, with the exception of limestone and Folkestone Beds, all the main lithologies are again represented in the county as is the case in the neighbouring county of Bedfordshire although Buckinghamshire to the south has produced no examples of Spilsby Sandstone to date and Cambridgeshire lies beyond the limits of the Hythe Beds distribution. In all three counties puddingstone forms a high percentage of the beehive querns; 64% in Bedfordshire, 72% in Buckinghamshire and 49% in Cambridgeshire in contrast to the situation at Hunsbury. This apparent dichotomy may be a consequence of the different time spans represented by the beehive querns from Hunsbury on the one hand and those from the rest of Northamptonshire and the other three counties on the other. If as has been argued, the puddingstone querns are a late Iron Age introduction, this would explain their scarcity at Hunsbury, and the distribution patterns among beehive querns in the rest of Northamptonshire and the surrounding counties over the same period as occupation at the hillfort might show a similar proportion of lithologies as the at Hunsbury. As yet too few examples are sufficiently well dated to determine whether this is in fact the case.

Given the method of retrieval of these querns it is not possible at present to determine whether the hillfort acquired querns from all of the sources represented among the collection throughout its history. The collection does point to a unique position, due at least in part to its geographical location, of the hillfort demonstrating access to widely separated sources (and similar long distance contacts are demonstrated by other classes of artefact from the site) but also the use of local materials possibly either through an inability, for whatever social or economic reason, to obtain sufficient raw material from the long distance sources or even simply for a specific purpose to which they were equally or better suited.

The beehive querns from Harrold, Beds, both indicate sources to the north in Derbyshire/South Yorkshire (Millstone Grit) and Lincolnshire, but there is no evidence here for more local aquisition of materials or use of outcrops in southern England. At the later site at Odell, 2.5 kms to the east, there is continued use of Spilsby Sandstone and Millstone Grit, the introduction of three other main rock types, Hythe Beds, puddingstone and Old Red Sandstone, and some acquisition of material from other outcrops, e.g., the Bargate Beds of the Weald. Beehive querns are represented at Odell by a broken Spilsby Sandstone upper stone of Hunsbury 2 form, an upper stone of Kent 2 form of Folkestone Beds (CJ 192), several thin examples of Sussex form of Hythe Beds (Lodsworth) and a large number of puddingstone of "typical" profile. The Millstone Grit querns (all of the feldspathic variety) are fragmentary and of flat types, although there are a few relatively thick unpierced lower stones. The form of the Old Red Sandstone upper stones is uncertain due to the absence on most pieces of handle sockets. They include CJ 669, a flat topped stone of relatively small diameter that might have been of South-west type. The lower stones of Old Red Sandstone include both pierced and unpierced examples, the former including CJ 661 which resembles many lower stones of Lodsworth rock and has straight, nearly vertical sides and a slightly concave base.

The relative proportions of different lithologies represented at

Odell (in terms of numbers of querns) varies over the period of occupation but as is the case for Harrold, the querns from this relatively small farming settlement demonstrates long distance contacts with several sources. In contexts dated to the first half of the first century AD puddingstone and Lower Greensand (mainly Hythe Beds) form roughly one third each of the total with the remaining third divided fairly equally between Millstone Grit, Old Red Sandstone and other rock types. Succeeding centuries saw an increase in the proportion of Millstone Grit and a decrease in the amount of Old Red Sandstone and Hythe Beds, and, after the second century, of puddingstone. Finally, both puddingstone and Old Red Sandstone are absent from fourth century AD contexts when Millstone Grit is by far the most prominent lithology, comprising over three-quarters of the total, whilst the Hythe Beds contribute only a small proportion.

Desborough, Northants has produced five querns all of different material although again exact provenances and dates are not known for these. CJ 472 is of Hythe Beds, a rather thin (possibly due to wear) upper stone. There are three Hunsbury style upper stones; CJ 490 of MG/1 is a fairly typical collared Hunsbury upper stone, CJ 491, of MG/3 has a very rounded collared rim, and CJ 494 is of a worn example of yellow brown weathered sandstone (relatively soft and friable) possibly of local greensand. The fifth quern is an unpierced lower stone of Old Red Sandstone, approxiamately 34 cms in diameter, which has a convex base and grinding surface. They are all possibly from the Iron Age and Roman site found during ironstone quarrying; as at Hunsbury widely dispersed sources are indicated, from some considerable distance to the north, south and west of the site in addition to locally. These may not have all been used at any one time, the three beehive upper stones are likely to be earlier in date than the Lodsworth and Old Red Sandstone stones suggesting a change of contacts fron north (possibly via Hunsbury) to the west and south.

In Lincolnshire several sources are evidenced among the quern finds from Ancaster Quarry in the south-west of the county where beehive querns of Millstone Grit (subtype 1), Spilsby Sandstone and local limestone have been found although contemporary use of all three throughout the period of settlement has not yet been demonstrated. They should all date to the Middle Iron Age (fourth to second century BC) but they need not necessarily have been in use from the time of initial settlement and excavation has also produced a number of saddle querns of metamorphic rocks and fine grained sandstones (possibly all made from erratics). There are two upper stones from Denton, also in south-west Lincolnshire, the first, of MG/3, rather boulder-like is of very irregular shape and the second of Spilsby Sandstone is also rather rounded. There are two stones from Billingborough, CJ 289, a Hunsbury 2 style upper stone, and CJ 524, a large pierced lower stone of MG/1 that may be of later date.

In Leicestershire most localities have produced only a single quern; where more occur these tend to be of different subtypes of Millstone Grit rather than totally different lithologies. Of the seven stones from Breedon-on-the-Hill examined six are of MG/1 and one of MG/2. Oadby has produced two unpierced lower stones of of MG/1 (CJ 197) and MG/2 (CJ 218). From Stoney Stanton there are two querns of MG/1 and MG/3, the former (CJ 246) of Hunsbury 1 style and the latter (CJ 241) a relatively large unpierced lower stone, both found during quarrying, and from Wigston Magna there is an irregularly shaped MG/1 upper stone (CJ 224) and a large lower stone of MG/3 (CJ 204). Two different lithologies are represented at Sproxton, by CJ 217 of limestone similar in form to two of those from Ancaster (CJ 744 and 757) CJ 207, a fragment of puddingstone of typical East Anglian type.

Excavation in Milton Keynes, Bucks, has also resulted in finds of querns of differing lithologies, but as is the case in Northampton individual sites have generally yielded querns of a single rock type. For example, from Bancroft villa there is an upper and lower stone of MG/1 of which the upper stone (CJ 715) is double handled, and worn, and the lower stone is thick, asymmetrical and unpierced. There is a small edge fragment of a thick lower stone of Lodsworth Hythe Beds from Furzton and puddingstone is represented by CJ 454, from Milton Keynes but otherwise unprovenanced and CJ 712 recovered from the Medieval site at Shenley.

Elsewhere, although several querns are recorded it is either uncertain whether they are from the same site or are chance finds. In the north Northamptonshire a number of querns are from Corby but in this instance they are not necessarily from the same site; the RCHM records 5 Iron Age and several Iron Age/Roman sites in the parish and, with one exception, it is not known to which of these the querns relate. CJ 177, a very worn upper stone, is from Beanfield Estate and was found during building work in an area that has produced Roman material during various periods of construction work. Also of Spilsby Sandstone from Corby is CJ 183. The third example from the area, CJ 495, is of quartzite and resembles stones of Kent 1 form in general profile but has a pierced handle socket. The three thus indicate a northerly or local source.

There are two localities in Cambridgeshire where more than one lithology is represented among the querns examined but all are stray finds. There are two stones from Alconbury, 547 (MG/1), a Yorkshire style upper stone in which the handle socket has been worn onto the grinding surface and CJ 549 (Spilsby Sandstone) of Hunsbury 3 form. The same two rock types are seen in three stones from Wood Walton, CJ 551 and 552 of MG/1 a complete quern of which the upper stone is damaged and the lower stone is a thick unpierced example, and CJ 554 of Spilsby Sandstone.

Although there are numerous examples of puddingstone and several of Spilsby Sandstone in East Anglia the only localities where both types are recorded to date are Baconsthorpe and Saham Toney in Norfolk, the latter a roadside settlement that probably originated in the Late Iron Age and to which the querns may relate (BROWN; 1986). From here there are two fragments of puddingstone and an asymmetrical and very worn upper stone of Spilsby Sandstone, of Hunsbury 2 form. From

Baconsthorpe there is a lower stone of puddingstone and a tall, Yorkshire form upper stone of Spilsby Sandstone. These may reflect the contemporary acquisition of material from both sources or, the supplanting of one rock type by the other but, as in most cases elsewhere, none of these querns are sufficiently well dated to determine which of these two alternatives is the case.

Some change in the pattern of exploitation is suggested in the later Iron Age in, for example, Bedfordshire and Northamptonshire. Earlier, beehive types are mainly from the north (Millstone grit and Spilsby Sandstone) whereas a number of later Iron Age sites have material from Sussex (Lodsworth) and the west (Old Red Sandstone); puddingstone also forms a high proportion of the total collection of beehive querns of the later Iron Age. The general absence of finds of puddingstone from earlier sites is difficult to understand if it was in use; like lava it is a material easily recognised on excavations for its use for querns and, for most areas, its obviously "foreign" character is such that where it does occur on later sites small fragments with no apparent worked surfaces are kept because of the probability that they represent querns. Thus, whereas one might expect small abraded pieces of sandstone to pass un-noticed (and even large pieces have been recovered from spoil-heaps) puddingstone should stand a slightly higher chance of recovery and the absence could therefore be genuine. It is equally true that there have been few excavated sites with evidence of this period in the main distribution area for this lithology with, perhaps, a resultant bias in the chronological data, but it is equally true that for excavated sites occupied from the Middle/Late Iron Age through the Roman period (e.g., Baldock, Herts) the earlier beehive querns are generally of other lithologies. At Baldock the only beehive quern from a pre-Roman context is a fairly worn example of grey sandstone and of Yorkshire form, whereas the more numerous puddingstone finds are from contexts of mid first to 3rd century AD date. If they are not generally of later date the puddingstone querns show a rather anomalous distribution compared to the other beehive querns, overlapping in many area with the distributions of those of Millstone Grit, Spilsby Sandstone, Hythe Beds and to some extent Folkestone Beds, whereas these lithologies, which all appear to have been use over roughly the same period of time show relatvely little overlap in their distribution areas.

Thus it is mainly in Northamptonshire, north Buckinghamshire and north Bedfordshire on this evidence that settlements acquired querns from distant sources to the north and south, a logical situation given that these areas are fairly centrally placed with regard to the relavant outcrops, with the possibility that the southern source at Lodsworth was more important in the later Iron Age than earlier. In addition southern East Anglia has also produced material from outcrops to the north and south, in this case from Lincolnshire and Kent. Elsewhere, the querns generally show acquisition from local outcrops (e.g. limestone) or the closest major production centre.

10.2.3 Flat rotary querns

The Roman period saw several changes in the exploitation patterns established in the Middle Iron Age, and the introduction of new quern types, the flat, disc like rotary querns. The expansion of the distribution area of Hythe Beds querns was acompanied by changes in form to larger and thinner stones, but still of general Sussex form, which began in the later Iron Age appears to continue into the early Roman period. This quarry contributed a high proportion of the quernstones from Odell, Bedfordshire and this lithology also occurs, for example, at Verulamium. Elsewhere in southern England manufacture of querns from other greensands continued.

Flat querns of both Millstone Grit and Old Red Sandstone also attain a far greater distribution than beehive querns of the same lithology, although within eastern England the latter is by far the most important. Old Red Sandstone is the best represented lithology at Magioivinium where most of the flat querns are of this type although recent excavation also produced one fragment of Millstone Grit. Flat querns of Millstone Grit, mainly fragmentary are recorded at, for example, Gestingthorpe (DRAPER, 1985; 76-7) and Little Waltham (DRURY, 1978), Essex, Maxey, Cambs (PRYOR et al, 1985), Appleford (HINCHLIFFE & THOMAS, 1980; 82-3), Farmoor (LAMBRICK & ROBINSON, 1979; 61) and Abingdon (PARRINGTON, 1978; 64), Oxon, Bromham, Beds (TILSON, 1973; Fig.31), Baldock (STEAD & RIGBY, 1986; 179-82) and Verulamium (FRERE, 1984; 80-1), Herts and Canterbury, Kent.

The other lithology of major importance at this date is Rhenish lava, first introduced into Britain in the early Roman period and which occurs widely in eastern England, for example, at Dragonby, South Humberside, Colchester (CRUMMY, 1983; 73-4) and Gestingthorpe (DRAPER, 1983; 75), Essex and Baldock, Herts (STEAD & RIGBY, 1986; 182), and is also found further afield, e.g., at Whitton, South Glamorgan (WELFARE in JARRETT & WRATHMELL, 1981; 219-225).

Two sources which decrease significantly in production at this time are the Spilsby Sandstone and Folkestone Beds; these are still worked to provide flat querns for areas local to the quarry sites (the former up until the Medieval period) but are no longer taken long distances. Similarly limestone is still used at a number of localities, for example, Maiden Castle, Dorset (WHEELER, 1943; 329), Wakerley, Northants (JACKSON & AMBROSE, 1978; 228) and Brancaster, Norfolk (HINCHLIFFE, 1985; 62, 64), at the latter two localities represented by only single examples. Other lithologies were occasionally worked for local use, e.g., Pennant Sandstone at Catsgore, Somerset (LEECH, 1982; 129), local Bracklesham Sandstone at Hengistbury Head, Dorset (CUNLIFFE, 1987; microfiche) and Ham Stone at Ilchester, Somerset (LEACH, 1982; Fig.107, no.47). The extent to which puddingstone was used into the Roman period is as problematical as its date of introduction; unlike other beehive types they are found in significant numbers in Roman contexts up to the third century at least, e.g. as at Odell, Beds and Baldock, Herts (STEAD & RIGBY, 1986).

10.3 Production, distribution, use and discard

The picture that emerges for beehive querns in this area is that the sources exploited for these querns, in terms of distribution areas and relative importance, are different to those for the prece ding saddle and succeeding Roman flat querns. The areas over which the different lithologies are found appear to be constant throughout the period of use for these querns styles, altough it is possible that the proportions of any lithology in an area may have undegone slight changes, but the determination of minor changes in the patterns of exploitation during the Iron Age is at present inhibited by the imprecise dating of most of these beehive querns.

Some of the factors influencing the selection of materials have already been mentioned. The type of material required, its hardness and texture, will depend on, for example, the material to be ground and the nature (e.g. fineness) of the product desired. One requirement for an efficient cutting action during grinding is a sharp texture, and in this context the frequency at which the stone has to be resharpened, which in turn will affect the use-life, may also be important. The use-life will also depend on the cementing strength of the rock (the resistance to attrition), grain size (with finer grained stones tending to last longer) and uniformity of texture and cement, more homogenous stones wearing more evenly and with greater efficiency (HORSFALL; 1987). The combination of such factors can render a more distant source far more desirable than a closer one depite the added transport distance involved, although other social rather than purely economic factors may also be significant. In a study of recent metate manufacture in Guatemala both users and manufacturers were observed to recognise the different rock types (various types of basalt, andesite and limestone), preferring those that release less grit and require least frequent resharpening. Even among the most favoured vesicular basalt two grades are recognised, the "black" containing fewer vesicles than the "white", of which the former is considered yo be better as it lasts longer (HAYDEN, 1987c).

In the current area such appears to be the case to a certain extent during the Iron Age; although there are many rocks that are capable of being worked as querns as is demonstrated by the few examples of these types found (the fine grained sandstones, limestones and possibly more local sandstones from, e.g. the greensands outcrop) for the most part settlements in the area have used more distant sources in the Pennines, Lincolnshire and southern England. However at this time, the factor of distance appears to operate against efficiency of different rock types. Thus, whereas the Millstone Grit is a more efficient material than greensand under the criteria listed above (particularly use-life) this rock does not achieve the extensive distribution to East Anglia and parts of southern England seen from the Roman period, where, during the Iron Age the greensands are the principal source for quernstones. A preliminary survey of beehive querns in Cumbria demonstrates a similar situation there, in that the three main sources, Triassic sandstone, Millstone Grit and granites (probably mostly from erratic material) show generally discrete distributions. Certain localities were better situated to receive products from more than one quarry, the most remarkable of these at Hunsbury acquiring querns from sources to the west, east, south and north, although primarily from the latter; and where the other finds from the site suggest that quern collection too, results from something more than geographical siting of the hillfort.

For the most part the rocks seen among the beehive querns of the study region are of a similar texture, comprising mainly medium to coarse grained sandstones, which vary in composition (both of cement and detrital component), resulting in rocks which differ in hardness and resistance to wear. The puddingstone shows an anomalous composition compared to the other lithologies in use at this time. Although a sedimentary rock with distinct grain and cement texture this lithology shows a homogenous composition (flint pebbles in a siliceous matrix) and thus, whereas in the sandstones a rough surface is to some extent renewed by the differential weathering and wear of grains and cement/matrix (maintaining a cutting rather than purely crushing action) the puddingstone tends to polish with use. Most examples when found have a very smooth grinding surface polished at the edge and would thus be incapable of cutting grains. This polishing is seen to some extent in granite querns but would seem to conflict with the desired situation as represented by other rocks in use in the Iron Age and Roman (and later) periods. One of the main advantages of the Rhineland lava (in addition to its relatively light weight) lies in the presence of vesicles that with wear maintain sharp cutting edges on the grinding surface. Given this marked contrast and the presence of other lithologies in the area covered by the puddingstone querns it is possible that it was deliberately selected for some purpose and that different factors are operating in its selection to those for other rock types, for example, it may have been specifically worked to produce a certain type of product (finer flour) or to grind a specific material (type of grain). More accurate dating is required to determine whether the puddingstone querns are contemporary with the other beehive querns in its distribution area, which may indicate the contemporary use of different rocks for different purposes, or whether there is a chronological change in distributions indicating another reason for the introduction puddingstone, e.g., the adoption of new grain types.

Hayes et al have recognised three levels of quern production represented among the beehive quern finds from North-East Yorkshire which reflect the varying suitability of the different materials for grinding. The most highly rated source for the area appears to have been Millstone Grit from the Pennines (transported up to 90 kms from the factory site) followed in order of preference by local Jurassic sandstones (found in an area up to 15-20 kms from the quarry) with even an more restricted occurence of the Corallian sandstones closer to their source. In the east Midlands the first of these three levels , long distance, is the most easily recognised. Long distance trade/distribution is, as has been shown, seen for several lithologies; Millstone Grit, Spilsby Sandstone, Puddingstone, Folkestone Beds (on a smaller scale) and Hythe Beds. The second level is probably represented by limestone (although it is possible that these were worked at several localities close to the sites on which they are found) and local acquisition by the fine grained quartzitic sandstones and igneous rocks, the latter, at least, probably utilising erratic material, and one example of local greensand (CJ 494).

A similar exploitation pattern has been demonstrated for Iron Age querns in Bohemia where Waldhauser (1981) has shown that, although several rock sources were used for quern manufacture, two sources in particular (quartz porphry at Žernoseky-Oparno and phonolith at Kunětická-Hora) were preferred and products of these lithologies were traded up to 115 kilometres from the quarry (WALDHAUSER, 1981; map 2) although here some were traded as partly finished artefacts. Other rock types, including arkosic sandstone, granite and limestone are of more restricted geographical occurence. Similarly, the different quern forms identified show distinct distributions which to a large extent correspond with the lithological distributions (op.cit., map 3).

The majority of querns in the study area are thus from a few sources that did achieve widespread distributions, and there are relatively few accounted for by local manufacture. There does not appear to be any relation between the nature of the site and the lithologies in use, although within the study area it is only Hunsbury that has produced Old Red Sandstone querns of Wessex type, and the four stones of Lodsworth Hythe Beds from this site may be of slightly earlier date than most other finds of that lithology in the region.

Heslops work in Cleveland has shown that the querns from Thorpe Thewles can also be divided into groups defined by the source rock and hence distance of necessary transport but here the distinction appears to be chronological. Querns of rock from the more distant source (Millstone Grit) are predominant among the examples from the middle Iron Age whilst in the first centuries BC and AD Coal Measures sandstones, available closer to the site, account for the higher proportion. "It is possible that the replacement of querns from one source with querns from another reflects no more than a change in the external relations between this site and the respective quern producing communities" (HESLOP, 1988; 63). Here, the later Iron Age querns show a wider range of rocks and forms than previously, and are generally of poorer quality, developments which are contemporary with, for example, a decrease in the long distance trade in metalwork, the appearance of "complex, nucleated settlement types" and "the decline of high-status sites (hillforts and defended promontories) that would have been responsible for controlling and re-distributing the Mode 1 querns", the latter being those from the long distance source (HESLOP, 1988; 63). No similar general decline for the long-distance sources in observable in eastern England in the later Iron Age; the distributions of Old Red Sandstone and Hythe Beds, appear have undergone a slight expansion at this date. The extent to which puddingstone querns replaced those of Millstone Grit, Spilsby Sandstone and perhaps Folkestone Beds in East Anglia and the south-east Midlands, or were used alongside these, remains to be determined. If, as has been suggested, the puddingstone lithology was adopted for a specific purpose, the rapid expansion of this more local source may be unrelated to the long distance trade network.

In other parts of England the appearance of rotary querns during the Middle Iron Age coincides with a number of other social and economic changes, for example, in southern England in particular, the rise of a number of hillforts at the expense of others and, further east, the appearance of nucleated settlements and enclosures in lowland areas where hillforts are uncommon. Economic specialisation also develops at this time, for example, in pottery and salt production, ironworking and agriculture. The evidence points to the standardisation of a wide range of items produced largely for exchange (BRADLEY, 1984). The changing patterns of quern production can be viewed as another part of the general economic development of this period. The later part of the Iron Age also sees a number of changes, for example, the renewed contacts between south-east England and the continent and the possible relocation of a number of settlements, in many cases, to more lowlying positions, e.g., Ancaster Quarry to Ancaster Gap, and Hunsbury possibly to Duston, and the establishment of new sites that continued in occupation through the Roman period. Again there are some indications of changes in quern production, but on the whole these probably occured slowly over a considerable period of time. For example, it is possible that both the Kent 1 and Lincolnshire forms belong to this period and the Sussex forms show a gradual development to thinner stones, but one major change may have been the introduction and widespread distribution of the puddingstone querns.

Various methods of acquisition are recorded from both modern and ancient quarries. Haydens study of contemporary metate manufacture in San Mateo, Guatemala (HAYDEN, 1987c) demonstrated similar methods of acquisition as those at, e.g., Wharncliffe and Lodsworth. The source here comprises a bedrock outcrop and stream bed containing blocks washed down from the former (which is unworkable in winter) from which full-time specialists aquire raw material every few days. The blocks are roughed out at the source and then transported to the workers home for finishing. At Mayen, Germany, quarrying for rotary querns took place along the edge of the lava flows, using only the upper layers and progressing forward with the re-covering of the lower lava by production waste and overburden; early querns were completed on site but from the Roman period material was removed for finishing on the nearby settlement with the trading of partly finished articles; final finishing was undertaken at, e.g. Dorestad and Southampton (CRAWFORD et al, 1955; 71-3: PARKHOUSE, 1976, 1977: KARS, 1980).

The Lodsworth quarry saw two "separate and distinct systems of production and distribution", corresponding to the two types of quern, saddle and rotary. The former were "procured by direct access to the quarry site of quern makers living in neighbouring communities", which accounts for the dissimilarities of form in the saddle querns of this lithology, the relatively small distribution area and the absence of saddle quern roughouts at the quarry. For rotary querns, which are "of a standard design" Peacock suggests that "production was now in the hands of specialists who controlled the rock bed", and that the "long-distance exchange" may also have been "in the hands of specialists, at least from the later Iron Age" (PEACOCK, 1987; 75-6). On site working of the querns is also attested in the South Yorkshire quarries, for example, at Wharncliffe where "the impression gained is that suitably massive blocks of material were selected from among the large rock debris and worked where they lay". Similarly, "at Rivelin are many signs of beehive quern manufacture representing upper and lower stones in all stages of production" (WRIGHT, 1988; 69-70). At Folkestone, suitably sized blocks were selected on the foreshore and removed to the clifftop settlement for final working (KELLER, 1988, 1989). Such an apparently random method was also employed for more recent millstone manufacture. In the Peak district Tucker notes three main categories of working locations; in open areas (or more rarely conventional quarries) on the lips of edges or the base of the crags where there were loose pieces of rock or where blocks could be relatively easily detached; in delves on flat or slightly sloping ground material; and on open moorland where individual stones were somestimes found that provided a suitable block. In all cases the evidence shows that the millstones were completed in situ (TUCKER, 1977). This is also the case at Penallt, Monmouthshire, where again the stones were worked in a variety of situations, some in conventional quarries but others in more open areas (TUCKER, 1971). At Pen Pits the quern quarry corresponds more to the second of these techniques, the working area comprising a series of circular hollows and trenches over an area of high ground of greensand covering an estimated 700 acres. The rock lies at a depth of 1.2-1.5 metres below the overlying sand and, once reached, was followed laterally by the detachment of blocks (PITT-RIVERS, 1884). The actual methods of extraction and working of the puddingstone and Spilsby Sandstone is not known as quarry sites in these rocks remain to be found; for the latter this probably involved a similar approach to Pen Pits whereby the harder doggers are removed from the softer surrounding sandstone.

The general correspondence of form features with lithology for all rock types suggests that the stones were completed at or near the quarry (the latter being the case with the working of limestone querns at Ancaster) and subsequently traded as finished items. There is no evidence to indicate finishing of querns on sites far removed from the source. Small stylistic variations encountered within a typological class are probably best explained as the products of different workers or as a response to differences in the nature and texture of the raw material, for example, the presence of flaws or the size and shape of the original block.

More apparent within the study area is the fact that the quality of both shaping and final finishing tends to vary with the lithology rather than the nature of the site on which the quern is found. In general querns of Millstone Grit subtypes 1 and 2 are very well shaped with a fairly fine pecked finish giving a relatively smooth outer surface. The outer edges of the upper stone and sides and base of the lower stones are treated in the same manner although the inside of the hopper, though carefully and regularly shaped, may lack the final pecking. Spilsby Sandstone Hunsbury type querns tend to be equally well shaped although on these there is little sign of pecking; this may be a result of post-depositional weathering roughening the surface which in most cases is now quite friable. Querns of Hythe Beds also demonstrate careful and regular shaping with vertical tooling on the upper stone and sides of the lower although the base of the latter is generally left rough, either flat or slightly concave. The few Wessex types examined also showed a pecked finish and are well shaped whilst those of Folkestone Beds are well shaped but tend to have a, slightly roughened surface with no evidence for a tooled finish, probably for the same reason as those of Spilsby Sandstone. The puddingstone querns are all very regularly shaped but the outer surfaces tend to remain somewhat rough, probably due more to the nature of the rock than the skill of the craftsmen, and other features (handle socket, hopper feed and handle grooves) are all neatly made. Limestone examples are in general less regularly shaped, with less surface finishing whilst the small group of querns of fine grained sandstone are all rather large and irregular; upper stones do have a pecked surface whereas the lower stones are generally left rough. Examples of other rock types are very variable in their quality.

Decorated querns are not very common in the present study area and all the examples are of Millstone Grit. There is only one with curvilinear decoration; the others having either the single groove in the rim or one in the rim and two below it on the outer surface of the quern. Of the latter type are CJ 250, unprovenanced from Leicestershire and CJ 298 from Horncastle, also unusual in posessing three presumably contemporary handle sockets. Decorated examples are not documented in the south of England but are found in the north where the decoration generally takes the form of radial grooves on the upper surfaces of the upper stones, and in Ireland, north Wales and Anglesey where both linear and curvilinear types occur (GRIFFITHS, 1951: CAULFIELD, 1977).

The relatively high proportion of decoration on the Irish examples may indicate a different status for the quern here which in some way helps to account for the different circumstances of finds; a similar situation need not be expected elsewhere in Britain. However there are a number of both saddle and rotary querns from excavated sites that do appear to have been deliberately placed in, for example, pits altho ugh the querns are little if at all worn. Examples include the early rotary stone of Devonian quartz grit from the bottom of a pit at Gussage All Saints and there are usable saddle querns from the ditch at Goldington, Beds. At the latter numerous saddle quern pieces were used in the construction of two cist burials, the problem here being to determine whether these were deliberately selected because they are querns or were already broken and simply used as convenient pieces of stone for the purpose. Other rotary querns, apparently perfectly usable, have been recovered from pits at other sites, e.g. Aldwick, Herts and Hunsbury, Northants.

The question of method of discard again raises the question of the "value" of querns to the people using them; they have often been disregarded in the past as common domestic items of less interest and significance than e.g. pottery and metalwork. However it is probably because they are an essential piece of equipment in addition to the skills required for their manufacture that they may have attained a higher value; the better sources are not widely distributed and the cost of obtaining them in terms of e.g. time and distance of transport imparts a higher value than if they could be obtained within a few kilometres of every settlement. The standard of both shaping and finishing varies considerably but, in general, the "quality" of the quern does not appear to be related to the size and status of the site, and high quality examples are known from both hillforts, e.g., Breedon-on-the-Hill, Leics, and Hunsbury, Northants, and small single family farmsteads, e.g. Tallington, Lincs, HarroLd, Beds, and Aldwick, Herts. Although one might not expect that complete usable querns would be casually discarded, broken querns simply become either an inconveniemt piece of stone to be discarded or a piece of raw material to be put to some other use. In either case complete or fragmentary querns would not be expected at any distance from the site of use unless deliberately removed to a new occupation site or for deliberate discard elsewhere. This would appear to be the case for the areas discussed in previous chapters, whereby excavations of settlements show generally fragmentary material. The relatively high proportion of complete or nearly complete beehive querns might be explained by a number of reasons. It is possible that with the introduction of, presumably, more efficient flat types many of the beehive querns were replaced by the new forms before their use-life was ended by either breakage or wear. Secondly it is possible that recovery methods, especially for stray finds, have acted selectively in favour of the more complete examples and, finally, their form may render them less suitable for reuse in many circumstances.

10.4 Conclusion

The results of both a petrological and typological analysis of beehive querns in eastern England have shown that during the middle and later Iron Age quern manufacture was an organised industry and that, far from the situation envisaged in the past whereby individual settlements aquired raw material from the nearest available source, there existed a relatively small number of quarry sites where querns were manufactured to a standard design and subsequently traded/exchanged over large distances. This is also the case in the north-east and central-southern and south-east England as has been shown by the work of Peacock (1987), Hayes et al (1980), Wright (1986, 1988) and Heslop (1988), and a similar situation can be envisaged for the more western parts of the country although this remains to be proved. Most of the beehive types investigated appear to be of roughly contemporary introduction, first appearing during the middle Iron Age, and continuing in use until, and to some extent, into the Roman period. Curwens typological classification remains valid to a certain extent although the Hunsbury class (and other beehive types with the exception of the puddingstone querns) is contemporary with, rather than a development from the Wessex and Sussex types. Additional groups have also been added to this classification, the Kent and Lincolnshire forms. The presence of two distinct styles of a single lithology, for example, Hunsbury and Lincolnshire form stones of Spilsby Sandstone, may point to developments in design during the Iron Age but as yet too few querns are sufficiently well dated to assess chronological developments within the Iron Age. The exploitation patterns seen among these beehive querns is in marked contrast to that existing for the production of saddle querns in the Early Iron Age and earlier, when although some stones were worked from rocks that were later to become the main sources, these attained only local distribution and away from these querns were manufactured from other local outcrops or local erratics. Changes also occured during the Roman period which saw the introduction of new styles of quern and the increase in importance of some sources, e.g, Millstone Grit and Old Red Sandstone, at the expense of others, e.g., Folkestone beds and

Spilsby Sandstone.

Petrological analysis has enabled the identification of a number of these sources, but the limitations of the technique in this particular context must also be appreciated. The accuracy with which a source can be pinpointed depend largely on the source rock itself, its area of outcrop and lithological character, and it is important to eliminate those outcrops which do not compare with the quern samples as well as to isolate potential sources. Thin-section analysis in the present study has proved to be of greater value when applied to querns of greensand than those of Millstone Grit. For samples of Millstone Grit comparisons can be made with a very large number of exposures over a large area, and a single exposure may show a wide range of lithotypes. However, the distinction between the different greensands used for quern manufacture, particularly the calcareous greensands which appear very similar in hand specimen, is readily recognised in thin-section and petrological analysis of these rocks has also allowed fairly close pinpointing of the original source. In the case of the Folkestone Beds the source could be narrowed down to the Folkestone area, a conclusion verified by the discovery of roughouts on the foreshore here. In all cases, however, the factory sites can only be conclusively proved by the location of manufacturing debris and as yet the quarrying site(s) for the Spilsby Sandstone remains to be located.

A similar combined petrological and typological approach in south-west England and the west Midlands remains to be undertaken. As yet none of the main sources for the Wessex style querns has been identified, although some appear from the results of this study, to have been made from Old Red Sandstone in the Bristol-South Wales area, and even within the current study region there remain a large number of querns and quern fragments, which it was not possible to examine within the available time, to be fitted into the typological, geological and chronological framework for beehive querns in the area established by this research programme in order to assess the validity of the conclusions drawn.

BIBLIOGRAPHY

ADDYMAN, P. 1973 Late Saxon settlements in the St. Neots area. Proc.Cambs.Antiq.Soc. 64. 45-99.

ADKINS, L. & NEEDHAM, S. 1985 New research on a Late Bronze Age enclosure at Queen Marys Hospital, Carshalton. Surrey Arch. Coll. 76. 11-50

AGER, D.V. & WALLACE, P. 1966 The environmental history of the Boulonnais, France. Proc.Geol.Ass. 77. 385-417.

AITKENHEAD, N., CHISHOLM, J.I. & STEVENSON, I.P. 1985 The geology of the country around Buxton, Leek and Bakewell. Mems.Geol.Surv. U.K.

ALDSWORTH, F. 1984 Romano-British quern fragment from Alfoldean Slinfold. Sussex Arch.Coll. 122. 221.

ALLASON-JONES, L. & MIKET, R. 1984 The catalogue of small finds from South Shields Roman Fort. Soc.of Antiq.of Newcastle upon Tyne Monograph no.2.

ALLEN, D & DALWOOD, C.H. 1983 Iron Age occupation, a middle Saxon cemetery and twelfth to nineteenth century urban occuation; Excavations in George Street, Aylesbury, 1981. Records of Bucks. 25. 1-60.

ALLEN, J.R.L. 1960 The Mam Tor sandstones: a "turbidite" facies of the Namurian deltas of Derbyshire, England. J.Sed.Pet. 30. 193-208.

" 1965 Upper Old Red Sandstone (Farlovian) Palaeogeography in South Wales and the Welsh borderland. J.Sed.Pet. 35. 167-195.

AMBROSE, T. 1981 Lincolnshire and South Humberside Archaeology in periodic literature, 1975-79 Lincs.Hist. & Arch. 16. 83-4.

AMER, M. 1987 A study of Medieval hand querns in England. Unpublished Undergraduate Dissertation. University of Southampton.

ANWYL, E. 1908 The querns of Anglesey. The Antiquary. 44. 7-10.

APPLEBAUM, E.S. 1949 Excavations at Wilbury Hill, an Iron Age hillfort near Letchworth, Hertfordshire, 1933. Arch.J. 106. 12-45.

ARTHURTON, R.S. & WADGE, A.J. 1981 Geology of the Country around Penrith. Mems. Geol. Surv. U.K.

ASHTON, C.A. 1974 Palaeontology, stratigraphy and sedimentology of the Kinderscoutian and lower Marsdenian (Namurian) of North Staffordshire and adjacent areas. Ph.D. Thesis. Univ. of Keele.

AVERY, M., SUTTON, J.E.G. & BAILEY, C. 1967 Rainsborough, Northants, England: excavations 1961-65. Proc.Prehist.Soc. 33. 207-306

BAILEY, C. 1985 The Romano-British site at Walls, Puncknowle, Dorset. Proc.Dorset Nat.Hist.Arch. Soc. 107. 55-86.

BAKER, F.T. 1954 The prehistoric settlement of Lincolnshire. M.A. Thesis. Univ. of Nottingham.

BALKWILL, C.J. (Ed) 1980 Archaeology in Suffolk 1977. Proc.Suffolk Inst.Arch. 34. 147-150.

BAMFORD, H.M. 1985 Briar Hill excavation 1974-1978. Northampton Deveplopment Corporation.

BARFORD, P. 1984 Some possible quern quarries in the Bristol area - a preliminary survey. Bristol & Avon Arch. 3. 13-17.

BARLEY, M.W. (Ed) 1959 East Midlands Arch. Bulletin

BATEMAN, J. 1977 A late Bronze Age cremation cemetery and Iron Age/Romano-British enclosures in the parish of Ryton-on-Dunsmore, Warwickshire. Trans.Birm. Warwicks.Arch.Soc. 88. 9-48.

BEDWIN, O. 1979 Excavations at Harting Beacon, West Sussex Second Season, 1977. Sussex Arch.Coll. 117. 21-35.

" 1981 Excavations at Lancing Down, West Sussex 1980. Sussex Arch.Coll. 119. 37-56.

" 1984 Aspects of Iron Age settlement in Sussex. in (Cunliffe, B. & Miles, D., Eds.) Aspects of the Iron Age in Central Southern Britain. 46-51

BEEBY, B.M. 1974 East Midlands Arch. Bulletin no.10

" 1977 East Midlands Arch.Bulletin no.11

BELL, M. 1976 The excavation of an early Romano- British site and Pleistocene landforms at Newhaven, Sussex. Sussex. Arch.Coll. 114. 218-305.

" 1977 Excavations at Bishopstone. Sussex Arch. Coll. 115.

BENNETT, J. 1980 A Romano-British settlement at Cattybrook, Almondsbury, Avon. Comm.for Rescue Arch. in Avon Glocs.& Som. Occasional Paper no.5.

BENNETT, P., FRERE, S. & STOW, S. 1982 Excavations at Canterbury Castle. The Archaeology of Canterbury v.1. Kent Archaeological Society, Maidstone.

BENNETT, R & ELTON, J. 1898 History of Corn Milling. V.1 Handstones, Slave and Cattle Mills. London.

BIRD, D, CROCKER, A. & G. & McCRACKEN 1980 Archaeology in Surrey 1976-8. Sussex Arch.Coll. 72. 231-253.

BLOCKLEY, K & DAY, M. 1983 Marshfield 1982. Interim report on the excavation of an Iron Age and Romano-British settlement. Avon County Council Planning Dept.

BORTHWICK, A. & CANHAM, R. 1984 Excavation within a hilltop enlosure of the Early Iron Age , Bodenham Hill Plantation, 6dstock, Wilts. in (CatheralL et al, Eds) The southern feeder: the arcaheology of a gas pipeline. 153-169.

BRADLEY, R. 1984 The social foundations of prehistoric Britain: themes and variations in the archaeology of power. Longman, London.

BRADLEY, R. & LEWIS, E. 1968 Excavations at the George Inn, Portsdown. Proc.Hants.Field Club & Arch.Soc. 25. 27-50.

BRADLEY, R., LOBB, S., RICHARDS, J. & ROBINSON, M. 1980 Two late Bronze Age settlements on the Kennet Gravels: excavations at Aldermaston Wharf and Knights Farm, Burghfield, Berkshire. Proc. Prehist. S6c. 46. 217-95.

BRADSHAW, J. 1972 Stowting. Arch.Cant. 87. 231-2.

BRAILSFORD, J. 1949 Excavations at Little Woodbury. Part IV, supplementary excavation 1947. Part V The Small finds. Proc.Prehist.Soc. 15. 156-68.

BRANIGAN, K. 1967 Romano-British rural settlement in the western Chilterns. Arch.J. 124. 129-159.

" 1977 Gatcombe Roman villa. B.A.R. Brit. Ser. 44.

" 1985 The Catuvellauni. Alan Sutton, London.

BRISCOE, G. 1957 Combined early Iron Age and Romano-British site at Wangford, West Suffolk. Proc. Cambs. Antiq.Soc. 51. 19-30.

BROMEHEAD, C., EDWARDS, W., WRAY, D. & STEPHENS, J. 1933 The Geology of the country around Holmfirth and Glossop. Mems. Geol. Surv. U.K.

BROWN, A. (Ed) 1980 Archaeology in Northamptonshire 1979 Northants.Arch. 15. 165-179.

" 1981 Archaeology in Northamptonshire 1980 Northants.Arch. 16. 200-207.

BROWN, F & TAYLOR, C. 1978 Settlement and land use in Northamptonshire: a comparison between the Iron Age and the Middle Ages. in (Cunliffe, B. & Rowley, T., Eds.) Lowland Iron Age Communities in Europe. B.A.R. Int.Ser. (Supplementary) 48. 77-90.

BROWN, R.A. 1986 The Iron Age and Romano-British settlement at Woodcock Hall, Saham Toney, Norfolk. Britannia. 17. 1-58.

BUCKLEY, D.G. (Ed) 1980 Archaeology in Essex to AD 1500. C.B.A. Res.Rep. 34.

BUCKMAN, J. 1866 On the materials of Roman querns. The Wilts.Mag. 9. 291-294.

BUTCHER, L.H. 1957 Archaeological remains on the Wharncliffe-Greeno uplands, South Yorkshire. Trans. Hunter Arch.Soc. 7. 38-9.

" (Ed) 1970 Wharncliffe. in (Butterworth, A.) A Prehistoric Society Archaeological Field Guide. 36-7. Sheffield City Museums.

CASEY, R. 1939 The upper part of the Lower Greensand around Folkestone. Proc.Geol.Ass. 50. 362-78.

CATHERALL, P.D., BARNETT, M. & McCLEAN, H. (Eds) 1984 The Southern Feeder: the archaeology of a gas pipeline. British Gas Corporation, London.

CAULFIELD, S. 1977 The Beehive Quern in Ireland. J.Roy.Soc.Antiq.Ireland. 107. 104-138.

CAULFIELD, S. 1980 Quern replacement and the origin of the brochs. Proc.Soc.Antiq.Scotland. 109. 129-39.

CHALLIS, A.J. & HARDING, D.W. 1975 Later prehistory from the Trent to the Tyne B.A.R. Brit.Ser. 20 (i) and (ii)

CHAMBERS, R. 1986 The Devils churchyard: an Iron Age enclosure at Checkenden, Oxon, 1979-81. Oxoniensia. 51. 25-30.

CHAPMAN, F. 1894 The Bargate Beds of Surrey and their microscopic contents. Q.J.Geol.Soc.Lond. 50. 677-730.

CHATWIN, C.P. 1960 The Hampshire Basin and adjoining areas. 3rd.Ed. British Regional Geology. H.M.S.O.

CHERRY, J. 1981 Prehistoric finds from Middle Bank Farm, Corney. Trans.Cumb. & West.Antiq.Arch.Soc. 81. 157.

CHILDE, V.G. 1943 Rotary querns on the Continent and in the Mediterranean Basin. Antiquity. 17. 19-26.

CHISHOLM, J.I., CHARSLEY, T.J. & AITKENHEAD, N. 1988 Geology of the country around Ashbourne and Cheadle. Mems.Geol.Surv.U.K.

CLARK, J.G.D. & FELL, C.I. 1953 The Early Iron Age settlement at Micklmoor Hill, West Harling, Norfolk and its pottery. Proc.Prehist.Soc. 19. 1-40.

CLARKE, R.R. 1939 The Iron Age in Norfolk and Suffolk. Arch.J. 96. 1-119.

" 1957 Archaeological discoveries in Norfolk 1949-54. Norfolk Arch. 31. 395-416

CLAY, P. 1983 An excavation at Enderby SK551002: interim report. Trans.Leics.Arch.Hist.Soc. 58. 75-90.

" 1985 An excavation at Grove Farm, Enderby. Trans.Leics.Arch.Hist.Soc. 59. 86-7.

" 1986 A watching brief and salvage excavations at Hemington Fields, Castle Donington SK 457301. Trans.Leics.Arch.Hist.Soc. 60. 80-1.

COLLIS, J. 1977 An approach to the Iron Age. in (Collis, J., Ed) The Iron Age in Britain - a review. Univ. of Sheffield, Sheffield.

COWELL, R., FULFORD, M. & LOBB, S. 1978 Excavations of prehistoric and Roman settlement at Aldermaston Wharf 1976-77. Berks.Arch.J. 69. 1-36.

COWPER-REED, F. 1898 Note on a large boulder at Wimpole Hall, Cambridgeshire. Geol.Mag. 35. 267-8.

CRA'STER, M.D. 1961 The Aldwick Iron Age settlement, Barley, Hertfordshire. Proc.Cambs.Antiq.Soc. 54. 22-46.

CRAWFORD, O.G.S. 1953 Querns and quern quarries. in (Crawford, O.G.S.) Archaeology in the field. 98-106. London

CRAWFORD, O.G.S. & RODER 1955 The quern quarries of Mayen in the Eifel. Antiquity. 29. 68-76.

CRUMMY, N. 1983 The Roman small finds from excavations in Colchester 1971-9. Colchester Archaeological Report 2.

CUNLIFFE, B. 1968 Early pre-Roman Iron Age communities in Eastern England. Antiq.J. 48. 175-91.

" 1973 The Regni. Duckworth, London.

" 1978 Iron Age communities in Britain. 2nd Ed. Routledge and Kegan Paul.

" 1982 Social and economic development in Kent in the pre-Roman Iron Age. in (Leach, P., Ed) Archaeology in Kent to AD 1000. C.B.A. Res.

Rep. 48. 40-50.
" 1984 Danebury: an Iron Age hillfort in Hampshire. Vol.1 and 2. C.B.A. Res. Rep. 52.
" 1987 Hengistbury Head, Dorset: volume 1 the prehistoric and Roman settlement 3500 BC - AD 500. Univ.of Oxford Comm.for Arch. Monograph no. 13.

CUNLIFFE, B. & MILES, D. 1984 Aspects of the Iron Age in Central Southern Britain. Univ. of Oxford Comm. for Arch. Monograph no. 2.

CURWEN, E.C. 1937 Querns. Antiquity. 11. 133-51.
" 1941 More about querns. Antiquity. 15. 15-32.
" 1956 Tangier quern quarry. Antiquity. 30. 174

DACRE, M.W. & WARMINGTON, B.R. 1984 Barton Stacey. in (Catherall et al, Eds) (Eds) The Southern Feeder . 81-97.

DAKIN, G.F. 1961 A Romano-British site at Orton Longueville, Huntingdonshire. Proc.Cambs.Antiq. Soc. 54. 50-67.

DAMPNEY, I.S.L. 1984 Report on the excavation near Martin, Hampshire. in (Catherall et al, Eds) The Southern Feeder. 172-191.

DARBY, H.C. (Ed) 1938 The Cambridge region.

DARVILL, T.C. 1987 Prehistoric Britain. Batsford.

DETSICAS, A.P. 1966 An Iron Age and Romano-British site at Stone Castle Quarry, Greenhithe. Arch.Cant. 81. 136-90.

DETSICAS, A.P. 1983 The Cantiaci. Alan Sutton, Gloucester.

DINES, H., BUCHAN, S., HOLMES, S. & BRISTOW, C. 1969 Geology of the country around Sevenoaks and Tonbridge. Mems.Geol.Surv.U.K.

DIX, B. 1979 Odell: a river valley farm. Current Arch. 66. 215-8.

DOBSON, J. 1904 Urswick field names. Barrow.Nat.Field Club. 17. 201-3.

DONOVAN, H. 1934 Excavation of a Romano-British building at Bourton on the Water, Gloucestershire 1934. Trans.Bristol Gloc.Arch.Soc. 56. 99-128.

DRAGE, C.J. 1976 Excavations on Iron Age, Roman and Medieval sites at Whitwell (Rutland) - Interim report. Trans.Leics.Arch.Hist.Soc. 51. 57-8.

DRAPER, J. 1985 Excavations at Hill Farm, Gestingthorpe, Essex. East Anglian Arch. 25.

DRURY, P.J. 1978a Excavations at Little Waltham 1970-1.

C.B.A. Res. Rep. 26. Chelmsford Exc.Comm.Rep. 1

" 1978ab Little Waltham and pre-Belgic Iron Age settlement in Essex. in (Cunliffe, B. & Rowley, T. Eds) Lowland Iron Age communities in Europe. B.A.R. Int Ser. (Supplementary) 48. 43-76.

" 1980 The early and middle phases of the Iron Age in Essex. in (Buckley, D.G., Ed) Archaeology in Essex to AD 1500. C.B.A. Res. Rep. 34. 47-54.

DRURY, P. & RODWELL, W. 1973 Excavations at Gun Hill, West Tilbury. Essex Arch.Soc.Trans. 5. 48-112.

" 1980 Settlement in the later Iron Age and Roman period. in (Buckley, D.G., Ed) Archaeology in Essex to AD 1500. C.B.A. Res. Rep. 59-75.

DUNNETT, R. 1975 The Trinovantes. Duckworth, London.

DURY, E.H. 1963 The East Midlands and the Peak. Nelson.

DYER, J. 1976 The Bedfordshire region in the First millenium BC. Beds.Arch.J. 11. 7-16.

EAGLES, B.N. & EVISON, V.I. 1970 Excavations at Harrold, Beds 1951-53 Beds.Arch.J. 5. 17-55.

EAGLES, B. & SWAN, V. 1972 The Chessalls, a Romano-British settlement at Kingscote. Trans.Bristol Gloc.Arch.Soc. 91. 60-91.

EARLE, T. & ERICSON, J. 1977 Exchange systems in prehistory. Academic Press, London.

EASTWOOD, T., GIBSON, W., CANTRILL, T. & WHITEHEAD, T. 1923 The Geology of the Country around Coventry. Mems.Geol.Surv.U.K.

EDEN, R., STEVENSON, I.P. & EDWARDS, W. 1957 Geology of the country around Sheffield. Mems.Geol.Surv.U.K.

EDWARDS, W. & TROTTER, F.M 1954 The Pennines and adjacent areas. 3rd.Ed. British Regional Geology. H.M.S.O.

EDWARDS, W.N. 1967 Geology of the Country around Ollerton. Mems.Geol.Surv.U.K.

EHRENREICH, R. 1985 Trade, technology and the ironworking community of the Iron Age of southern Britain. B.A.R. Brit.Ser. 144.

ELLIS, P. 1984 Catsgore, 1979. Further excavation of the Romano-British village. Western Arch.Trust, Excavation monograph no.7.

ELLIS, S.E. 1969 The petrography and provenance of Anglo-Saxon and Medieval English honestones with notes on some other hones. Bull.Brit. Mus. (Nat.Hist.)Mineralogy 2, no.3. 135-88.

EVANS, J. 1872 The Ancient stone implements, weapons and ornaments of Great Britain.

EVANS, W.B., WILSON, A.A., TAYLOR, B.J. & PRICE, D. 1968 The geology of the country around Macclesfield, Congleton, Crewe and Middlewich. Mems.Geol.Surv.UK.

EVERSON, P. 1976 Iron Age enclosures at the Queensway Health Centre site at Hardwick Park, Wellngborough. Northants.Arch. 11. 89-99.

FARLEY, M 1978 Archaeological notes from Buckinghamshire County Museum. Records of Bucks. 20. 656-65.

FARLEY, M., NASH, D. & 1981 A Late Iron Age and Roman site at Walton Court, Aylesbury. Records of Bucks. 23. 51-75.

FARRAR, R. 1952 An unusual quern stone of Wessex type from West Knighton. Proc.Dorset Nat.Hist.Arch.Soc. 74. 85.

" 1956 Further finds at "Chisels" Shipton Gorge SV 484919. Proc.Dorset Nat.Hist.Arch.Soc. 78. 73.

FASHAM, P. 1985 The prehistoric settlement at Winnall Down, Winchester: excavation of MARC 3 site R17 in 1976 and 1977. Hants. Field Club and Arch.Soc. Monograph 2. M3 Arch. Rescue Comm.Rep. 8.

FELL, C. 1936 The Hunsbury hillfort, Northants: a new survey of the material. Arch.J. 93. 57-100.

FIELD, D. 1983 Ham: the Edwards collection. Surrey Arch.Coll. 74. 169-84.

FIELD, N.H. 1965 Romano-British settlement at Studland, Dorset. Proc.Dorset Nat.Hist.Arch.Soc. 87. 142-207.

" 1966 Two Romano-British sites near King Down, Pamphill. Proc.Dorset Nat.Hist.Arch.Soc. 88. 116.

FORD, T. & MASON, M. 1967 Bibliography of the geology of the Peak District (to 1965). Mercian Geologist. 2.133-244.

FOREMAN, M. & RAHTZ, S. 1984 Excavations at Faccenda chicken farm near Alchester 1983. Oxoniensa. 49. 23-46

FOSTER, P.T. & 1975 Two Iron Age sites near Wellingborough, HARPER, R. Northamptonshire. Northants Arch. 10. 138-44.

FOWLER, P.J. 1960 Excavations at Madmarston Camp, Swalcliffe 1957-8. Oxoniensa. 25. 3-48.

FOX-STRANGEWAYS, C. 1905 The geology of the country between Derby, Burton-on-Trent, Ashby de la Zouch and Loughborough. Mems.Geol.Surv.U.K.

FRANK, B. 1976 Grinding wheat with querns. Ryedale Historian. 8. 9.

FRERE, S.S. 1984 Verulamium excavations. Vol.III. Oxford Comm.for Arch. Monograph 1.

FRIEDMAN, G. 1958 Determination of sieve size distribution from thin-section data for sedimentary petrological studies. J.Geol. 66. 394-416.

FRIENDSHIP-TAYLOR, R.M. 1974 Excavation of the Belgic and Romano-British site at Quinton, Northants. J.Northants.Mus. & Art Gallery. 11. 1-59.

FROST, D.V. & SMART, J.G.O. 1979 The geology of the country north of Derby. Mems.Geol.Surv.UK.

FULFORD, M. 1984 Silchester: excavations on the defences 1974-80. Britannia Monograph Ser. 5.

GABEL, C. 1967 Analysis of prehistoric Economic patterns Holt, Rinehart and Winston, New York.

GALLANT, L. & SYLVESTER, R. 1985 An excavation on the Iron Age hillfort at Berry Down, Newton Abbott. Devon Arch.Soc.Proc. , 43. 39-50.

GALLOIS, R.W. 1965 The Wealden district. 4th.Ed. British Regional Geology. H.M.S.O.

GARDNER, P, HALDON, R. & MALHAM, J. 1980 Prehistoric, Roman and Medieval settlement at Stretton-on-Fosse: excavations and salvage 1971-6. Trans.Birm. & Warwicks.Arch.Soc. 90. 1-36.

GARROD, J. 1952 Some Huntingdonshire querns. Trans.Cambs. Huntingdons.Arch.Soc. 7. 50-3.

GEORGE, T.J. 1916 Early man in Northamptonshire with particular reference to the late Celtic period as illustrated by Hunsbury Camp. J.Northants. Nat.Hist.Soc.Field Club. 18. 182-9.

GIBSON, W., POCOCK, T.I., WEDD, C.B. & SHERLOCK, R.L. 1908 The geology of the southern part of the Derbyshire and Nottinghamshire Coalfield. Mems.Geol.Surv.UK.

GILLIGAN, A. 1919 The petrography of the Millstone Grit of

Yorkshire. Q.J.Geol.Soc.Lond. 75. 251-94.

GOULD, J. 1965 Excavations in advance of road construction between Shenstone and Wall, Staffordshire. Lichfield & Staffs.Arch. Hist.Soc.Trans. 6. 1-18.

" 1967 Excavations at Wall, Staffordshire. 1964-6. Lichfield & Staffs.Arch. Hist.Soc.Trans. 8. 1-40.

GRANT KING, D. 1967 Bury Wood Camp: excavations in the area of the south-west opening. Wilts.Arch Nat.Hist.Mag. 62. 1-15.

" 1969 Bury Wood Camp: excavation in the north-east and north-west areas. Wilts.Arch. Nat.Hist.Mag. 64. 21-50.

GREEN, H. 1959 A Romano-British farm at St Ives. Proc. Cambs.Antiq.Soc. 52. 23-9.

GREENFIELD, E. 1960 A Neolithic pit and other finds from Wingham, East Kent. Arch.Cant. 74. 58-72

" 1969 The Romano-British settlement at Little Paxton, Huntingdonshire. Proc.Cambs.Antiq.Soc. 62. 35-57.

GREENSMITH, J.T. 1957 Lithology with particular reference to cementation of Upper Carboniferous sandstones in northern Derbyshire, England. J.Sed.Pet. 57. 405-16.

" 1978 Petrology of sedimentary rocks. 6th Ed. Allen and Unwin.

GREGORY, T. 1982 Romano-British settlement in West Norfolk and on the Norfolk Fen edge. in (Miles, D, Ed) The Romano-British countryside. B.A.R Brit.Ser. 103(ii)

GREGORY, T. & GURNEY, D. 1986 Excavations at Thornham, Warham, Wighton and Caistor, Norfolk. East Anglian Arch. 30.

GRIFFITHS, W.E. 1951 Decorated rotary querns from Wales and Ireland. Ulster J.Arch. 14. 49-61.

GRIMES, W.F. 1946 An early Iron Age site at Draughton, Northamptonshire. J.Northants.Nat.Hist.Soc.Field Club. 31. 25-31.

" 1958 Settlements at Draughton, Northants, Colsterworth, Lincs and Heathrow, Middlesex in (Frere, S., Ed) Problems of the Iron Age in Southern Britain. 21-8.

GURNEY, D. 1986 Settlement, religion and industry on the Roman Fen edge: three Romano-British sites in Norfolk. East Anglian Arch. 31.

HAIGH, D. & SAVAGE, M. 1984 Sewingshields. Arch.Ael. Ser.5. 12. 33-147.

HAINS, B.A. & HORTON, A. 1969 Central England. 3rd Ed. British Regional Geology. H.M.S.O.

HALL, D.N. 1971 Pre-Roman sites at Bozeat and Strixton, Northants. Beds.Arch.J. 6. 17-22

HALL, D.N. 1973 Rescue excavations at Radwell Gravel pits 1972. Beds.Arch.J. 8. 67-91.

HALL, D.N. 1982 The countryside of the south-east Midlands and Cambridgeshire. in (Miles, D., Ed) The Romano-British countryside: studies in rural settlement and economy. B.A.R. Brit.Ser. 103. 337-50.

HALL, D.N. & HUTCHINGS, N. 1972 The distribution of archaeological sites between the Nene and Ouse valleys. Beds.Arch.J. 7. 1-16.

HALL, D.N. & NICKERSON, N. 1967 Excavations at Irchester 1962-3. Arch.J. 124. 65-99.

HANWORTH, R. & TOMALIN, D.J. 1977 Brooklands, Weybridge: the excavation of an Iron Age and Medieval site 1964-5 and 1970-1. Res.Vol. of the Surrey Arch.Soc. 4.

HARRIS, H. 1971 The Industrial Archaeology of the Peak District. David and Charles.

HARTLEY, B.R. 1957 The Wandlebury Iron Age hillfort excavations of 1955-6. Proc.Cambs.Antiq.Soc. 56. 1-27.

HARTRIDGE, R. 1978 Excavations at the prehistoric and Romano-British site on Slonk Hill, Shoreham Sussex. Sussex Arch.Coll. 116. 69-142.

HAWKES, C.F.C. 1943 The early Iron Age settlement at Fengate, Peterborough. Arch.J. 100. 188-223

HAWKES, S. 1969 Finds from two Middle Bronze Age pits at Winnall, Winchester, Hampshire. Proc.Hants.Field Club & Arch.Soc. 26. 5-18.

HAWKINS, N. 1984 Excavation of a Romano-British occupation site at Woking Park Farm, Old Woking (TQ 025565). Surrey Arch.Coll. 75. 161-75.

" 1985 Excavation of a Romano-British and later site at Black Close, Mayford, Woking. Surrey

Arch.Coll. 76. 69-76.

HAYDEN, B. (Ed) 1987a Lithic studies among the contemporary highland Maya. Univ. of Arizona Press.

HAYDEN, B. 1987b Past to present uses of stone tools in the Maya highland. in (Hayden, B., Ed) Lithic studies among the contemporary highland Maya. 160-234.

" 1987c Traditional matate manufacturing in Guatemala using chipped stone tools. in (Hayden, B. (Ed) Lithic studies among the contemporary highland Maya. 8-119.

HAYDON, W. 1919 Milling. The Millstone. 1. 4-10 & 33-38.

HAYES, R.H. 1974 Querns: a survey of quern finds in North-East Yorkshire. Rydale Historian. 7. 22-44.

" 1976 Further notes on North Yorkshire querns. Rydale Historian. 8. 3-8.

HAYES, R.H., HEMINGWAY, J.E. & SPRATT, D.A. 1980 The distribution and lithology of beehive querns in Northeast Yorkshire. J.Arch.Sci. 7. 297-324.

HAYWARD, H. 1932 The geology of the Lower Greensand in the Dorking-Leith Hill District, Surrey. Proc.Geol. Ass. 43. 1-31.

HESLOP, D. 1987 The exacavation of an Iron Age settlement at Thorpe Thewles, Cleveland 1980-1982. C.B.A. Res.Rep. 65.

" 1988 The study of beehive querns. Scottish Arch.Rev. 5. 59-65.

HESTER, S.W. 1932 The Millstone Grit succession in North Staffordshire. Summ.Prog.Geol.Surv. Gt.Brit. for 1931, part II. 34-48.

HIGHLEY, D. 1975 The economic geology of the Weald. Proc. Geol.Ass. 86. 559-69.

HINCHLIFFE, J. 1985 Excavations at Brancaster 1974 and 1977. East Anglian Arch. 23.

HINCHLIFFE, J. & THOMAS, R. 1980 Archaeological investigations at Appleford. Oxoniensa. 45. 9-111.

HINGLEY, R. 1984 Towards social analysis in archaeology: Celtic society in the Iron Age of the Upper Thames valley (400-0 BC). in (Cunliffe, B. & Miles, D., Eds) Aspects of the Iron Age in Southern Britain. Univ.Oxford Comm. Arch. 72-88.

HINGLEY, R. & 1984 Aspects of Iron Age settlement in the

Upper Thames valley. in (Cunliffe, B. & Miles, D. Eds) Aspects of the Iron Age in Central Southern Britain. Univ. Oxford Comm. for Arch. monograph no. 2. 52-71.

HODDER, I. 1982 Wendons Ambo: the excavations of an Iron Age and Romano-British settlement. The Arch.of the M 11, vol.2. Passmore Edwards Museum.

HODGKINSON, H.R. & CHATWIN, P.B. 1960 The Roman site at Shenstone, Staffordshire Trans. & Proc.Birm.Arch.Soc. 63. 1-32.

HODGSON, K.S. 1953 Four querns from the Brampton area. Trans.Cumb. & West.Antiq.Arch.Soc. 53. 209-11.

HOLDSWORTH, B.K. 1963 The palaeontology, stratigraphy and sedimentology of Namurian rocks in the Longnor, Hollingsclough, Morredge region of North Staffordshire and South-West Derbyshire. Ph.D. Thesis. Univ.of Manchester

" 1964 The crowstones of Staffordshire, Derbyshire and Cheshire. N.Staffs.J.of Field Studies. 4. 89-102.

HOLLAND, S.M. 1975 Pollen analytical investigations at Crosby Warren, Lincs in the vicinity of the Iron Age and Romano-British settlement at Dragonby. J.Arch.Sci. 2. 353-63.

HORE, K.D. 1962 Shoreham: quern stone. Arch.Cant. 77. 202.

HORSFALL, G.A. 1987 Design theory and grinding stones. in (Hayden, B., Ed) Lithic studies among the contemporary highland Maya. 332-378.

HOULDER, C. 1963 A Neolithic settlement on Hazard Hill, Totnes. Proc.Devon Arch.Expl.Soc. 21. 2-31.

HUDSON, R.G. & COTTON, G. 1943 The Namurian of Alport Dale, Derbyshire. Proc.Yorks.Geol.Soc. 25. 142-73.

HUGGINS, P. 1978 Excavation of Belgic and Romano-British farm with Middle Saxon cemetery and churches at Nazeingbury, Essex 1975-6. Trans.Essex Arch.Soc. 10. 29-117.

HULL, E. & GREEN, A.H. 1864 On the Millstone Grit of North Staffordshire and the adjoining parts of Derbyshire, Cheshire and Lancashire. Q.J.Geol. Soc.Lond. 242-67.

HUMPHRIES, D.W. 1953 The lithology and conditions of deposition of the Lower Greensand of the South-West Weald. Ph.D. Thesis. Univ. of London.

" 1964 The stratigraphy of the Lower Greensand of the South-West Weald. Proc.Geol.Ass. 75. 39-59.

HURCOMBE, L. 1981 Iron Age and Roman rotary querns in Norfolk, Suffolk, Essex and Hertfordshire. Unpublished Undergraduate Dissertation. Univ.of Southampton.

INGHAM, F.J. 1929 The petrography of the Spilsby Sandstone. Proc.Geol.Ass. 40. 1-17.

INGLE, C.J. 1982 A petrological study of some quernstones from the Bristol region. Unpublished Undergraduate Dissertation. Univ.of Bristol.

" 1984 A petrological study of some quernstones from the Bristol region. Bristol & Avon Arch. 3. 8-12.

JACKSON, D.A. 1973 Excavations at North Lodge, Eaton, Northamptonshire 1969. Northants.Arch. 8. 31-8.

" 1975 An Iron Age site at Twywell, Northamptonshire. Northants.Arch. 10. 31-93.

" 1976 Two Iron Age sites north of Kettering, Northamptonshire. Northants.Arch. 11. 71-88.

" 1979 A Middle Iron Age site at Geddington. Northants.Arch. 14. 10-16.

" 1981 Archaeology at an ironstone quarry in the Harringworth-Wakerley area 1968-79. Northants.Arch. 16. 14-33.

" 1982 Great Oakley and other Iron Age sites in the Corby area. Northants.Arch. 17. 3-23.

" 1983 The excavation of an Iron Age site at Brigstock, Northamptonshire 1979-81. Northants.Arch. 18. 7-13.

JACKSON, D.A. & AMBROSE, T.M. 1978 Excavations at Wakerley, Northants 1972-5. Britannia. 9. 115-242.

JACKSON, D.A., HARDING, D.W. & 1969 The Iron Age and Anglo-Saxon site at Upton, Northants. Antiq.J. 49. 202-21.

JARRETT, M.G. & WRATHMELL, S. (Eds) 1981 Whitton: an Iron Age and Roman farmstead in South Glamorgan. Univ.of Wales Press, Cardiff.

JECOCK, M. 1981 The production and distribution of prehistoric rotary querns in Wessex. Unpublished Undergraduate Dissertation. Univ.of Southampton.

JESSON, M. & HILL, D. (Eds) 1971 The Iron Age and its hillforts. Univ. of Southampton Monograph Series no. 1.

JESSUP, R.F. 1930 The archaeology of Kent. Methuen.

JESSUP, R.F. 1970 South-East England. Thames & Hudson.

JOBEY, G. 1957 Excavations at the native settlement Gubeon Cottage, Northumberland. Arch.Ael. ser.4. 35. 163-79.

" 1959 Excavations at the native settlement at Huckhoe, Northumberland 1955-7. Arch.Ael. 37. 217-78.

" 1962 An Iron Age homestead at West Brandon, Durham. Arch.Ael. Ser.4. 40. 1-34.

" 1970 An Iron Age settlement and homestead at Burradon, Northumberland. Arch.Ael. Ser. 4. 43. 51-96.

" 1971 Excavations at Brough Law and Ingram Hill. Arch.Ael. Ser. 4. 49. 71-95.

" 1973 A Romano-British settlement at Tower Knowe, Wellaugh, Northumberland. Arch.Ael. Ser.5 1. 55-79.

" 1977 Iron Age and later farmsteads on Belling Law, Northumberland. Arch.Ael. Ser. 5. 5. 1-38

" 1978 Iron Age and Romano-British settlements on Kennel Hall Knowe, North Tynedale, Northumberland. Arch.Ael. Ser. 5. 6. 1-28.

" 1986 Millstones and millstone quarries in Northumberland. Arch.Ael. 5th Ser. 14. 49-80.

JOHNSON, S. 1978 Excavations at Hayton Roman fort, 1975. Britannia. 9. 57-114.

JOHNSTON, D. 1974 The Roman settlement at Sandy, Bedfordshire. Beds.Arch.J. 9. 35-54.

JONES, C.M. 1980 Deltaic sedimentation in the Roaches Grit (Namurian R2b) in the South- West Pennines. Proc.Yorks.Geol.Soc. 43. 39-67.

JUDD, W. 1867 On the strata which form the base of the Lincolnshire Wolds. Q.J.Geol.Soc.lond. 23. 227-50.

JUKES-BROWNE, A.J. 1887 The geology of part of East Lincolnshire. Mems.Geol.Suev.U.K.

" 1905 The geology of the country south and east of Devizes. Mems.Geol.Surv.U.K.

KARS, H. 1980 Early Medieval Dorestad; an archaeo-petrological study. Part 1: general introduction, the tephrite querns. Berichten van di Rijksdienst voor het Oudheidkundig

Bodermonderzoek. 30. 393-422.

KEEPING, H. 1882 On some sections of Lincolnshire Neocomian. Q.J.Geol.Soc.Lond. 38. 239-44.

KELLAWAY, G. 1967 The Geological Survey Ashton Park borehole and its bearing on the geology of the Bristol district. Bull.Geol.Surv.Gt.Brit. 27. 49-153.

KELLAWAY, G. & WELCH, F. 1955a The Upper Old Red Sandstone and Lower Carboniferous rocks of Bristol and the Mendips compared with those of Chepstow and the Forest of Dean. Bull.Geol.Surv.G.B. 9. 1-21.

" 1955b Bristol and Gloucester District. 2nd Ed. British Regional Geology. H.M.S.O.

KELLER, P. 1982 Rescue excavations in Folkestone from 1973. Kent Arch.Rev. 69. 207-14.

" 1988 The evidence for ancient quern production at Folkestone: an interim note. Kent Arch.Rev. 93. 59-68.

" 1989 The Folkestone quern stones. Current Arch. 10, no.7. 236-7.

KELLY, S.R.A. 1977 The bivalves of the Spilsby Sandstone formation and contiguous deposits. Ph.D. Thesis. Univ.of london.

KELLY, S.R.A. & RAWSON, P.F. 1983 Some late Jurassic - mid Cretaceous sections on the East Midlands shelf, England, as demonstrated on a Field Meeting, 18-20 May 1979. Proc.Geol.Ass. 94. 65-73.

KEMPE, D.R. & HARVEY, A.P. 1983 The petrology of archaeological artefacts Clarendon Press, Oxford.

KENNETT, D. 1969 Bedfordshire Archaeology 1966-69. Beds.Arch.J. 4. 84-86.

" 1971 Bedfordshire Archaeology 1970-71. Beds.Arch.J. 6. 81-88.

" 1972 Bedfordshire Archaeology 1971-72. Beds.Arch.J. 7. 89-97.

KENT, P.E. 1980 Eastern England from the Tees to the Wash British Regional Geology. H.M.S.O.

KENT, P. & CASEY, R. 1963 A Kimmeridge sandstone in North Lincolnshire. Proc.Geol.Soc.Lond. 1606. 57-62.

KENYON, K. 1950 Excavations at Breedon-on-the-Hill 1946. Trans.Leics.Arch.Soc. 26. 17-82.

KING, D. 1982 Petrology, dating and distribution querns and millstones: the results of research in

Bedfordshire, Buckinghamshire, Hertfordshire and Middlesex. Unpublished Undergraduate Dissertation. Univ. of London.

KIRKALDY, J.F. 1933 The Sandgate Beds of the Western Weald. Proc.Geol.Ass. 44. 270-311.

KIRKALDY, J.F. & WOOLDRIDGE, S.W. 1938 Notes on the Geology of the country around Haslemere and Midhurst. Proc.Geol.Ass. 49. 135-47.

KNIGHT, D. 1984 Late Bronze Age and Iron Age settlement in the Nene and Great Ouse basins. B.A.R. Brit.Ser. 130.

LAMBRICK, G. 1978 Iron Age settlements in the Upper Thames valley. in (Cunliffe, B. & Rowley, T., Eds) ?p Lowland Iron Age communities in Europe. B.A.R. Int.Ser.(Supplem.) 48.

LAMBRICK, G. & ROBINSON, M. 1979 Iron Age and Roman riverside settlements at Farmoor, Oxfordshire. C.B.A. Res.Rep. 32.

LANE, H.C. 1973 Field surveys and excavation of a Romano-British rural native settlement at Scarcliffe Park (SK 512710) East Derbyshire. Derwent Arch.Soc.Res.Rep.1.

LEACH, P. 1982 Ilchester: volume 1 Excavations 1974-1975. Western Arch.Trust. Excavation Monograph 3.

LEAHY, K. 1979 Some prehistoric finds from the Burton-upon-Trent area. Derbys.Arch.J. 99. 52-7.

LEECH, R. 1981 The excavation of a Romano-British farmstead and cemetery at Bradley Hill, Somerton, Somerset. Britannia. 12. 177-252

" 1982 Excavations at Catsgore, 1970-1973, a Romano-British village. Western Arch. Trust Excavation Monograph 2.

LEEDS, E.T. 1936 Chastleton Camp, Oxfordshire: a hillfort of the Early Iron Age. Antiq.J. 11. 382-98.

LEWIS, H.P. & REES, W.I. 1926 Some grindstones from the Coal Measures of Yorkshire. Geol.Mag. 63. 13-27

LIDDELL, D. 1936 Report on the excavations at Hembury fort: 4th and 5th seasons, 1934 and 1935. Proc.Devon Arch.Expl.Soc. 2. 135-75.

LIDDLE, P. 1981 Archaeology in Leicestershire and Rutland 1980. Trans.Leics.Arch.Hist.Soc. 55. 83-97.

" 1982 Archaeology in Leicestershire and Rutland 1981. Trans.Leics.Arch.Hist.Soc. 56. 97-120.

" 1982 Leicestershire archaeology: the present state of knowledge. V.1 to the end of the Roman period. Leics.Mus.Art Galls. & Records Services Arch.Rep. 4.

" 1983a Archaeology in Leicestershire and Rutland 1982. Trans.Leics.Arch.Hist.Soc. 57. 78-93.

" 1983b Archaeology in Leocestershire and Rutland 1983. Trans.Leics.Arch.Hist.Soc. 58. 75-90.

" 1986 Archaeology in Leicestershire and Rutland 1985. Trans.Leics.Arch.Hist.Soc. 60. 78-95.

LITTLE, R. 1964 The Atwood Iron Age and Romano- British site, Sanderstead, 1960. Surrey Arch.Coll. 61. 29-38.

LOWE, E.E. 1926 The igneous rocks of the Mountsorrel District.

McWHIRR, A. (Ed) 1973 Archaeology in Leicestershire and Rutland 1970-2. Trans.Leics.Arch.Hist.Soc. 47. 62-76.

" 1977 Archaeology in Leicestershire and Rutland 1976. Trans.Leics.Arch.Hist.Soc. 51. 56-63.

" 1978 Archaeology in Leicestershire and Rutland 1977. Trans.Leics.Arch.Hist.Soc. 52. 82-102.

" 1979 Archaeology in Leicestershire and Rutland 1978. Trans.Leics.Arch.Hist.Soc. 53. 75-92.

MACKIE, E.W. 1971a English migrants and Scottish brochs Glasgow Arch.J. 2. 39-71.

" 1971b Some new quernstones from brochs and duns. Proc.Soc.Antiq.Scotland. 104. 137-46

MAKEPEACE, G.A. 1983 A Romano-British settlement at Staden near Buxton. Derbys.Arch.J. 103. 75-86.

MANNING, W.H. 1974 Excavations on late Iron Age, Roman and Saxon sites at Ufton Nervet, Berkshire in 1961-63. Berks.Arch.J. 67. 1-62.

MARJORAM, J. 1973 Archaeological notes 1972. Lincs.Hist. & Arch. 8. 35-50.

" 1974 Archaeological notes 1973. Lincs. & Hist.Arch. 9. 17-33.

MARSH, J. 1983 A rotary quern topstone from Barbon Beck near Casterton. Trans.Cumb. & West.Antiq. Arch.Soc. 83. 174-5.

MARTIN, E., PLOUVIEZ, J. & ROSS, H.(Eds) 1984a Archaeological finds 1980. Proc.Suffolk Inst.Arch. 35. 73-6.

" 1984b Archaeological finds 1981. Proc.Suffolk Inst.Arch. 35. 155-8.

" 1984c Archaeological finds 1983. Proc.Suffolk Inst.Arch. 35. 321-6.

MARTIN, R.A. & OSBORN, G. 1976 An outline of the geology of Northamptonshire. Northants.Nat.Hist.Soc. & Field Club publication.

MASSON-PHILLIPS, E. 1966 Excavation of a Romano-British site at Lower Well Farm, Stoke Gabriel, Devon. Proc.Devon Arch.Expl.Soc. 23. 3-34.

MAY, J. 1970 Dragonby: an interim report on excavations on an Iron Age and Romano- British site near Scunthorpe, Lincolnshire 1964-9. Antiq.J. 50. 221-45.

" 1976a Prehistoric Lincolnshire. Lincoln.

" 1976b The growth of settlements in the later Iron Age in Lincolnshire. in (Cunliffe, B. & Rowley, T., Eds), Oppida: the beginnings of urbanisation in Barbarian Europe. B.A.R. Suppl.Ser. 11. 163-80.

" 1984 The major settlements of the later Iron Age in Lincolnshire. in (Field, N. & White, A., Eds), A prospect of Lincolnshire. 18-22.

MAY, J. (Ed) 1963 East Midlands Arch.Bulletin no.6

" 1964 East Midlands Arch.Bulletin no.7

" 1965 East Midlands Arch.Bulletin no.8

" 1966 East Midlands Arch.Bulletin no.9

MAYHEW, R.W. 1966 A sedimentological investigation of the Marsdenian Grits and associated measures in North-East Derbyshire. Ph.D. Thesis. Univ. of Sheffield.

MEREDITH, R. 1981 Millstone making at Yarncliffe in the reign of Edward IV. Derbys.Arch.J. 101. 102-6.

METCALFE, P.J. 1985 Millstone Grit querns from Derbyshire. Unpublished Undergraduate Dissertation Univ. of Southampton.

MIDDLEMISS, F.A. 1975 Studies in the sedimentation of the Lower Greensand of the Weald, 1875-1975: a review and commentary. Proc.Geol.Ass. 86. 457-73.

" 1978 The cherts in the Hythe Beds (Lower Cretaceous) of South-East England. Proc.Geol.Ass. 89. 283-98.

MILLETT, M. & GRAHAM, D. 1986 Excavations on the Romano-British small town at Neatham, Hampshire 1969-70. Hants.Field Club & Arch.Soc. Monograph 3.

MILTON, B.H. 1987 Excavations at Barringtons Farm, Orsett Cock, Thurrock, Essex, 1983. Essex Arch. & Hist. 18. 16-33.

MITCHELL, G.H., STEPHENS, J., BROMEHEAD, C. & MOORE, L.R. 1947 The geology of the country around Barnsley. Mems.Geol.Surv.U.K.

MOORE, L.R. 1941 The prescence of the Namurian in the Bristol District. Geol.Mag. 73. 279-92.

MORRIS, P.G. 1966 The stratigraphy and palaeontology of upper Dinantian and Namurian rocks in the area East and South-East of Leek, North Staffordshire. Ph.D. Thesis. Univ.of London.

" 1969 Dinantian and Namurian stratigraphy East and South-East of Leek, North Staffordshire. Proc.Geol.Ass. 80. 145-75.

MORRIS, S & BUCKLEY, D.G. 1978 Excavations at Danbury Camp, Essex 1974 and 1977. Essex Arch. & Hist. 10. 1-28

MORITZ, L.A. 1958 Grain Mills and flour in classical antiquity. Clarendon Press, Oxford.

MORITZ, L.A. & JONES, C.R. 1950 Experiments with grinding wheat in a Romano-British quern. Milling (1950). 594-6.

MOSELEY, F. 1953 The Namurian of the Lancaster Fells. Q.J.Geol.Soc.Lond. 109. 423-54.

MOWAT, R.J. 1975 The Hollesley Bay Romano-British rural settlement. East Anglian. Arch. 1. 17-23.

MYNARD, D. 1970 An Iron Age enclosure at Ravenstone, Buckinghamshire. Records of Bucks. 18. 393-413.

" 1987 Roman Milton Keynes: excavations and fieldwork 1971-82. Bucks.Arch.Soc. Monograph Series 1.

NARYAN, J. 1964 Sedimentology of the Lower Greensand of the Weald and Bas Boulonnais, France. Ph.D. Thesis. Univ. of Reading.

NEAL, D.S. 1980 Bronze Age, Iron Age and Roman settlement sites at Little Sombourne and Ashley, Hampshire. Proc.Hants.Field Club & Arch.Soc. 36. 91-143.

" 1987 Excavations at Magiovinium, Buckinghamshire, 1978-80. Records of Bucks. 29. 1-124.

NELSON, M.C. 1987 Contemporary specialization and marketing of manos and metates in the Maya highlands. in (Hayden, B., Ed) Lithic studies among the contemporary highland Maya. 148-59.

" 1987 Site context and structure: metate quarries and workshops in the Maya highlands. in (Hayden, B., Ed) Lithic studies among the contemporary highland Maya. 120-47.

O'BRIEN, C. 1979 Iron Age and Romano-British settlement in the Trent basin. in (Burnham, B. & Johnson, H., Eds) Invasion and response: the case of Roman Britain. B.A.R. Brit.Ser. 73. 299-313.

OLIVER, M. & 1978 Excavation of an Iron Age and Romano-British settlement at Rucstalls Hill Basingstoke, Hampshire 1972-5. Proc.Hants. Field Club & Arch.Soc. 35. 41-92.

OSBORNE-WHITE, H.J. 1923 The Geology of the country South and West of Shaftesbury. Mems.Gol.Surv.U.K.

OSWALD, A. 1967 Excavations at Barford, Warwickshire Trans.& Proc.Birm.Arch.Soc. 83. 1-64.

" 1972 Excavation at Beckford. Trans. Worcs.Arch.Soc. 3rd.Ser. 3. 7-54.

OWLES, E. 1972a Archaeology in Suffolk 1970. Proc. Suffolk Inst.Arch. 32. 92-107.

" 1972b Archaeology in Suffolk 1971. Proc. Suffolk Inst.Arch. 32. 205-14.

" 1972c Archaeology in Suffolk 1972. Proc. Suffolk Inst.Arch. 32. 282-291.

" 1976a Archaeology in Suffolk 1973. Proc. Suffolk Inst.Arch. 33. 94-102.

" 1976b Archaeology in Suffolk 1974. Proc. Suffolk Inst.Arch. 33. 212-224.

" 1976c Archaeology in Suffolk 1975. Proc. Suffolk Inst.Arch. 33. 322-8.

OWLES, E. & SMEDLEY, N. 1964a Archaeology in Suffolk 1962. Proc. Suffolk Inst.Arch. 29. 166-74.

" 1964b Archaeology in Suffolk 1963. Proc. Suffolk Inst.Arch. 629. 348-54.

" 1967a Archaeology in Suffolk 1964. Proc. Suffolk Inst.Arch. 30. 116-23.

" 1967b Archaeology in Suffolk 1965. Proc. Suffolk Inst.Arch. 30. 187-97.

" 1967c Archaeology in Suffolk 1966. Proc. Suffolk Inst.Arch. 30. 275-83.

PADGHAM, R.C. 1970 A study mainly petrological and petrochemical in the Folkestone Beds of the Weald. Ph.D. Thesis. Univ. of London.

PARKHOUSE, J. 1976 The Dorestad quernstones. Berichten van di Rijksdienst voor het Oudheidkundig Bedermonderzoek. 26. 181-8.

" 1977 Anglo-Saxon commercial connections with the Continent: with specific reference to the distribution and typology of Rhenish basalt lava quernstones and their use as an indicator of trade. M.A. Thesis. Univ. of Manchester.

PARRINGTOM, M. 1978 The excavation of an Iron Age settlement, Bronze Age ring ditches and Roman features at Ashville Trading Estate, Abingdon (Oxfordshire) 1974-76. Oxon.Arch.Unit Rep.1. C.B.A.Res.Rep.28.

PEACOCK, D.P.S. 1980 The Roman millstone trade: a petrological sketch. World Arch. 12. 43-53.

" 1986 The production of Roman millstones near Orvieto, Umbria, Italy. Antiq.J. 66. 45-51.

" 1987 Iron Age and Roman quern production at Lodsworth, West Sussex. Antiq.J. 67. 61-85.

PENNY, L. & RAWSON, P. 1969 Field meeting in East Yorkshire and North Lincolnshire. Proc.Geol.Ass. 80. 193-216.

PHILLIPS, J.T. 1950 A survey of the distribution of querns of Hunsbury or allied types. Appendix 3 in (Kenyon, K.) Excavations at Breedon-on-the-Hill Trans.Leics.Arch.Hist.Soc. 26.75-82.

PHILP, B. 1959 Reculver: excavations on the Roman fort in 1957. Arch.Cant. 73. 96-115.

" 1968 Excavations at Faversham 1965: the Royal Abbey, Roman villa and Belgic farmstead. First Rep.of the Kent Arch.Res. Groups Council.

" 1973 Excavations in West Kent 1960-1970. Second Rep.of the Kent Arch.Res.Groups Council.

PICK, M.C. 1964 The stratigraphy and sedimentary features of the Old Red Sandstone Portishead coastal section, north-east Somerset. Proc.Geol.Ass. 75. 199-221.

PINDER, A. 1986 Excavation at Willington 1984: II Iron Age and Roman periods. Beds.Arch.J. 17. 22-40.

PITT-RIVERS, A. 1884 Report on the excavations at Pen Pits near Penselwood, Somerset.

POTTER, T.W. 1979 Romans in North-West England: excavations at the Roman forts of Ravenglass, Watercrook and Bowness on Solway. Cumb.&.West.Antiq.Arch. Soc.Res. Ser.V.1.

POTTER, T.W. & POTTER, C.F. 1982 A Romano-British village at Grandford, March, Cambridgeshire. Brit.Mus. Occasional Paper 35.

POTTER, T.W. & TROW, S.D. 1988 Puckeridge-Braughing: the Ermine Street excavations, 1971-1972. The late Iron Age and Roman settlement. Herts.Arch. 10 .

PRICE, D., WRIGHT,W., JONES, R.C., TONKS, L.H. & WHITEHEAD, T.H. 1963 The geology of the country around Preston. Mems.Geol.Surv.UK.

PRICE, E.G. 1983 Frocester Court Roman villa: third report 1980; the Well. Trans.Bristol Gloc.Arch.Soc. 101. 49-76.

PRICE, F.G.H. 1875 On the Lower Greensand and Gault of Folkestone. Proc.Geol.Ass. 4. 135-50.

PRYOR, F.M.M. Prehistoric man in the Nene valley. Nene Valley Research Comm. Publications.

PRYOR, F.M.M. & CRANSTONE, D. 1978 An interim report on excavations at Fengate, Peterborough, 1975-77. Northants. Arch. 13. 9-27.

PRYOR, F.M.M. et al 1985 The Fenland Project, number 1: the Lower Welland Valley, volume 2. East Anglian Arch. 27.

PUTNAM, W. 1970 Recent discoveries on Portland. Proc.Dorset.Nat.Hist.Arch.Soc. 92. 141-7.

RADLEY, J. 1964 Peak millstones and Hallamshire grindstones. Trans.Necomen.Soc. 36. 165-73.

" 1964 A Millstone makers smithy on Gardoms Edge, Baslow. Derbys.Arch.J. 84. 123-7.

RAHTZ, P. 1969 Upton, Gloucestershire 1964-68. Second Report. Trans.Bristol Gloc.Arch.Soc. 88. 74-126.

" 1981 Medieval milling. in (Crossley, D.W., Ed), Medieval industry. C.B.A. Res.Rep. 40. 1-15.

RAHTZ, S. & ROWLEY, T. 1984 Middleton Stoney: excavation and survey in a North Oxfordshire parish 1970-1982. Univ. of Oxford Dept.of External Studies.

RAWES, B. 1980 The Romano-British site at Wycomb, Andoversford: excavations 1969-1970. Trans. Bristol Gloc.Arch.Soc. 98. 11-56.

" 1981 The Romano-British site at Brockworth, Gloucestershire. Britannia. 12. 45-77.

" 1984 The Romano-British site on the Portway near Gloucester. Trans.Bristol Gloc.Arch.Soc. 102. 23-72.

" 1986 The Romano-British settlement at Haymes, Cleeve Hill, near Cheltenham. Trans.Bristol Gloc.Arch.Soc. 104. 61-94.

REDKNAP, M. & MILLETT, M. 1980 Excavations on a Romano-British farmstead at Elstead, West Sussex. Sussex Arch.Coll. 118 197-229.

REID, C. 1903 The geology of the country near Chichester. Mems.Geol.Surv.U.K.

RICHARDSON, J. 1947 Chert formation in the Bargate Beds of the Churt neighbourhood, Surrey. Proc.Geol.Ass. 58. 161-77.

RICHARDSON, K. 1951 The exacavation of Iron Age villages on Boscombe Down West. Wilts.Arch.Mag. 54. 123-68.

ROBINSON, M. 1984 Landscape and environment of central southern Britain in the Iron Age. in (Cunliffe,B. & Miles, D., Eds) Aspects of the Iron Age in Central Southern Britain Univ.Oxford Comm.Arch. Monograph no.2 1-11.

ROBSON, D.A. (Ed) 1980 The geology of north-east England. in CUNLIFFE, B. & ROWLEY, T. (Eds)

RODWELL, W. 1978 Buildings and settlements in South-East Britain in the late Iron Age. in (Cunliffe, B. & Rowley, T., Eds) Lowland Iron Age communities in Europe. B.A.R. Int.Ser.(Supplem.) 48. 25-42.

ROGERSON, A. 1977 Excavations at Scole 1973. East Anglian Arch. 5. 97-224.

ROWLEY, T. & BROWN, L. 1981 Excavations at Beech House Hotel, Dorchester on Thames 1972. Oxoniensa. 46. 1-55.

R.C.H.M. 1975 An inventory of the historical monuments in the County of Northampton: V.1 Archaeological sites in North-East Northamptonshire. H.M.S.O.

" 1979 An inventory of the historical monuments in the County of Northampton: V.II Archaeological sites in central Northamptonshire. H.M.S.O.

" 1981 _An inventory of the historical monuments in the County of Northampton. V.III Archaeological sites in North-West Northamptonshire._ H.M.S.O.

" 1982 _An inventory of the historical monuments in the County of Northampton. V.IV Archaeological sites in South-West Northamptonshire._ H.M.S.O.

" 1985 _An inventory of the historical monuments in the County of Northampton. V.V Archaeological sites and churches in Northampton._

RUDGE, E.A. 1965a The maker of querns. _Essex Countryside._ 13. 26-8.

" 1965b Interim report on the distribution of the puddingstone quern. _Trans.Essex Arch.Soc._ 3rd. Ser. 1 247-9.

RYAN, J. 1972 Rotary querns. _Old Kilkenny Review._ 24. 68

RYCRAFT, K.G. 1976 The Millstone Grit Series of the southern Pennines. _Proc.Westmor.Geol.Soc._ 1. 4-5.

SALWAY, P. 1967 Excavations at Hockwold-cum-Wilton, Norfolk. _Proc.Cambs.Antiq.Soc._ 60. 39-80.

SANKALIA, H. 1959 Rotary querns from India. _Antiquity._ 33. 128-30.

SAVAGE, R.J.G. 1977 _Geological excursions in the Bristol district._ University of Bristol.

SAVILLE, A. 1976 Archaeological investigations at Beedles Quarry, East Goscote Leicestershire. _Trans. Leics.Arch.Hist.Soc._ 51. 29-39.

SCHADLA-HALL, R.T. 1984 The excavation of an Iron Age enclosure near Middle Barn Farm, ChilboLton Hampshire. in (Catherall et al, Eds) _The Southern Feeder: the archaeology of a gas pipeline._ 97-116.

SCOTT ROBERTSON, W.A. 1876 Medieval Folkestone. _Arch.Cant._ 10. civ-cxxvii.

SHERLOCK, R. 1960 _London and the Thames valley._ 3rd. Ed. British Regional Geology. H.M.S.O.

SILVESTER, R.J. 1980 The prehistoric open settlement at Dainton, South Devon. _Proc.Devon Arch.Soc._ 38. 17-48.

SIMCO, A. 1973 The Iron Age in the Bedford region. _Beds.Arch.J._ 8. 5-22.

SIMPSON, W.G. 1966 Romano-British settlement on the Welland

Gravels. in (Thomas, C., Ed) Rural settlement in Roman Britain. C.B.A. Res.Rep. 7. 15-25.

SMART, J.G., BISSON, G. & SMEDLEY, N. & 1966 The geology of the country around Canterbury and Folkestone. Mems.Geol. Surv.U.K.

1964 Archaeology in Suffolk 1961. Proc. Suffolk Inst.Arch. 29. 91-102.

SMITH, C. 1977 The valleys of the Tame and Middle Trent - their populations and ecology during the late first millenium BC. in (Collis, J., Ed), The Iron Age in Britain- a review. 51-61. Sheffield.

" 1978 The landscape and natural history of Iron Age settlement on the Trent gravels. in (Cunliffe, B. & Rowley, T., Eds) Lowland Iron Age communities in Europe. B.A.R. Int.Ser. (Supplementary). 48. 91-102.

" 1979 Fisherwick: the reconstruction of an Iron Age landscape. B.A.R. Brit.Ser. 61.

SMITH, D.B. & FRANCIS, E.A. 1967 The geology of the country between Durham and West Hartlepool. Mems.Geol.Surv.U.K.

SMITH, E.G., RHYS, G.H. & EDEN, R.A. 1967 The geology of the country around Chesterfield, Matlock and Mansfield. Mems.Geol.Surv.U.K.

SMITH, K. 1977 The excavation of Winklebury Camp, Basingstoke, Hants. Proc.Prehist.Soc. 43. 31-129.

SOWAN, P.W. 1975 Firestone and hearthstone mines in the Upper Greensand of east Surrey. Proc.Geol.Ass. 86. 571-91.

SPAIN, R.J. 1984 Romano-British watermills. Arch.Cant. 100. 101-28.

STARTIN, D. 1982 Excavations at South Grove Cottage, Dorchester. Proc.Dorset Nat.Hist.Arch.Soc. 103. 21-42.

STEAD, I.M. 1976 Excavations at Winterton Roman villa and other Roman sites in Lincolnshire, 1958-1967. Dept.of Envt.Arch.Repts. no.9. H.M.S.O.

" 1980 Rudston Roman villa.

STEAD, I.M. & RIGBY, V. 1986 Baldock: the excavation of a Roman and pre-Roman settlement; 1968-72. Britannia Monograph Ser. 7.

STEPHENS, J.V., MITCHELL, G.H. & EDWARDS, W. 1953 The geology of the country between Bradford and Skipton. Mems.Geol.Surv.U.K.

STEVENSON, I. & GAUNT, G.D. 1971 The geology of the country around Chapel-en-le-Frith. Mems.Geol.Surv.U.K.

STORCK, J. & TEAGUE, W.D. 1952 A history of milling: flour for mans bread. Univ.of Minnesota Press.

SUMMERFIELD, M.A. & GOUDIE, A.S. 1980 The sarsens of Southern England. in Jones, D.K.C., Ed) The Shapeing of Southern England. Inst.Brit.Geog.Special.Pub. 11. Academic Press

SUTHERLAND, D.S. 1982 Igneous rocks of the British Isles.

SWEETING, G.S. 1946 An outline of the geology of Ashover Derbyshire. Proc.Geol.Ass. 57. 117-36.

SWINNERTON, H.H. & KENT, P.E. 1976 The geology of Lincolnshire from the Humber to the Wash. 2nd.Ed. Lincs. Nat. Union.

SYLVESTER-BRADLEY, P.C. & FORD, T.D. (Eds) 1968 The geology of the East Midlands. Leic.Univ.Press.

TAYLOR, A. 1977 Early Cambridgeshire. Oleander Press.

TAYLOR, B.J., LAND, D.H., MILLS, D.A.C., SMITH, D.B. & WARREN, P.T. 1971 Northern England. 4th.Ed. British Regional Geology. H.M.S.O.

TEST VALLEY ARCHAEOLOGICAL COMMITTEE 1984 The Romano-British settlement at little Sombourne. in (Catherall et al, Eds), The Southern Feeder: the archaeology of a gas pipeline. 126-41.

TESTER, P.J. 1963 A prehistoric saddle quern from Bexley. Arch.Cant. 78. 183-4.

" 1969 Excavations at Fordcroft, Orpington. Arch.Cant. 84. 39-77.

TESTER, P. & CAIGER, J. 1954 Excavations on the site of a Romano-British settlement in Joydens Wood, near Bexley. Arch.Cant. 68. 167-83.

THOMPSON, A. & HOLLAND, E. 1976 Excavation of an Iron Age site at Dellfield, Berkhamstead. Herts.Arch. 4. 137-52.

THOMPSON, F. 1979 Three Surrey hillforts: excavations at Anstiebury, Holmbury and Hascombe 1972-77. Antiq.J. 59. 245-318.

THOMPSON, N. 1971 Archaeological research in the Pewsey vale Wilts.Arch.Nat.Hist.Mag. 66. 58-75.

THURRELL, R.G. 1957 The geology of the country between Willingham and Spilsby in Lincolnshire. Ph.D. Thesis. Univ.of London.

THURRELL, R.G., WOSSAM, B.C. & EDMONDS, E.A. 1968 The geology of the country around Haslemere. Mems.Geol.Surv.U.K.

TILSON, P. 1973 A Belgic and Romano-British site at

Bromham. Beds.Arch.J. 8. 23-66.
TODD, M. 1973 The Coritani. Duckworth.
TREWIN, N.H. 1969 The stratigraphy and sedimentology of the Upper Pendleian and Lower Arnsbergian of the North Staffordshire basin area. Ph.D. Thesis. Univ.of Keele.
TREWIN, N.H. & HOLDSWORTH, B.K. 1973 Sedimentation in the lower Namurian rocks of the North Staffordshire Basin. Proc.Yorks.Geol.Soc. 39. 371-408.
TROTTER, F.M. & HOLLINGWORTH, S.E. 1932 The geology of the Brampton district Mems.Geol.Surv.U.K.
TUCKER, D.G. 1971 Millstone making at Penallt, Monmouthshire. Ind.Arch. 8. 229-39.
" 1977 Millstones, quarries and millstone makers. Post-Med.Arch. 11. 1-21.
" 1982 Millstones north and south of the Scottish border. Ind.Arch.Rev. 6. 186-93.
" 1985 Millstone making in the Peak District of Derbyshire: the quarries and the technology. Ind.Arch.Rev. 8. 42-58.
UNIVERSITY OF NOTTINGHAM 1948 Guide to the geology of the East Midlands.
USSHER, W. 1890 The geology of parts of Lincolnshire and south Yorkshire. Mems.Geol.Surv.U.K.
USSHER, W., JUKES-BROWNE, A.T. & STRAHAN, A. 1888 The geology of the country around Lincoln. Mems.Geol.Surv.U.K.
VERSEY, H.C. & CARTER, C. 1936 The petrography of the carstone and associated beds in Yorkshire and Lincolnshire. Proc.Yorks.Geol.Soc. 20. 349-65
WACHER, J.S. 1964 Excavations at Breedon-on-the-Hill Leicestershire 1957. Antiq.J. 44. 122-42.
" 1977 Excavations at Breedon-on-the-Hill. Trans.leics.Hist.Arch.Soc. 52. 1-36.
WAINWRIGHT, G. J. 1970 An Iron Age promontory fort at Budbury, Bradford-on-Avon, Wiltshire. Wilts.Arch. Nat.Hist.Mag. 5. 108-66.
" 1979 Gussage All Saints: an Iron Age settlement in Dorset. Dept.Envt.Arch.Rep. 10
WAKE, T. 1942 Early corn milling in Norfolk. Norfolk Arch. 28. 111-6.
WALDHAUSER, J. 1981 Kelstke rotacni mlyni v Czechach

(Keltische Drehmuhlen in Bohmen). Pamatky Archeologicke. 72. 153-221.

WALLIS, F.S. 1927 The Old Red Sandstone of the Bristol District. Q.J.Geol.Soc.Lond. 83. 760-89.

WEBSTER, G. & SMITH, L. 1982 The excavation of a Romano-British rural establishment at Barnsley Park, Gloucestershire, 1961-1979: part II cAD 360-400+. Trans.Bristol Gloc.Arch.Soc. 100. 65-190.

WEDD, C.B., SMITH, B. & WILLS, L.J. 1927 The geology of the country around Wrexham: part I Lower Palaeozoic and Lower Carboniferous rocks. Mems.Geol.Surv.U.K.

WEDLAKE, W.L. 1958 Excavations at Camerton. Somerset.

WELBOURN, D.A. 1985 Craft specialisation and complex societies: a critique. in (Champion, T. & Megaw, J.V.S., Eds) Settlement and society: aspects of West European prehistory in the first millenium BC. 123-31.

WELCH, F. & TROTTER, F. 1961 The geology of the country around Monmouth and Chepstow. Mems.Geol.Surv.U.K.

WELFARE, A.T. 1983 The milling stones. in (Miket, R.) South Shields Roman Fort: excavation of the defences 1977-1981.

1985 The Milling Stones in (Bidwell et al) The Roman fort of Vindolanda at Chesterholm, Northumberland. H.B.M.C. Arch.Rep.1. 154-164.

WHEELER, H. 1979 Excavation at Willington, Derbyshire 1970-1972. Derbys.Arch.J. 49. 58-220.

WHEELER, H. (Ed) 1978 East Midlands Arch.Bulletin no.12

WHEELER, R. 1943 Maiden Castle, Dorset. Rep. of the Res.Comm. of the Soc.of Antiq. London. 12.

WHITBREAD, I. 1979 A comparison between selected querns from Leicester Museum and the Millstone Grit outcrop around Melbourne, Derbyshire. Unpublished Undergraduate Dissertation. Univ. of Bristol.

WHITE, A.J. 1976 Archaeology in lincolnshire and South Humberside 1975. Lincs.Hist. & Arch. 11. 55-64.

WHITE, D.A. 1964a Excavations at the War Ditches, Cherry Hinton 1961-62. Proc Cambs.Antiq.Soc. 56-57. 9-29.

" 1964b Excavations at the War Ditches, Cherry Hinton 1949-51. Proc.Cambs.Antiq.Soc. 56-57. 30-41.

WHITEHEAD, T.H., DIXON, E., POCOCK, R., ROBERTSON, T. & CANTRILL, T.C. 1927 The country between Stafford and Market Drayton. Mems.Geol.Surv.U.K.

WHITWELL, J.B. 1967 Archaeological notes. Lincs.Hist. & Arch. 2. 31-54.

" 1970 Roman Lincolnshire. Lincoln.

" 1982 The Coritani: some aspects of the Iron Age tribe and the Roman civitas. B.A.R. Brit.Ser. 99.

WHITWELL, J.B. & WILSON, C. 1968 Archaeological notes Lincs.Hist. & Arch. 3. 19-40.

WICKENDEN, N. 1986 Prehistoric settlement and the Romano-British small town at Heybridge, Essex. Essex Arch. & Hist. 17. 7-68.

WILD, J.P. 1974 Roman settlement in the Lower Nene valley. Arch.J. 131. 140-70.

WILLIAMS, A. 1950 Excavations at Allards Quarry, Marnhull, Dorset. Proc.Dorset Nat.Hist.Arch.Soc. 72. 20-75.

WILLIAMS, J.H. (Ed) 1974 Two Iron Age sites in Northampton. Northampton Devt.Corp.Arch.Monograph 1.

WILSON, C. 1970 Archaeological Notes 1969. Lincs. Hist. & Arch. 5. 3-20.

" 1971 Archaeological notes 1970. Lincs. Hist. & Arch. 6. 3-18.

" 1972 Archaeological notes 1971. Lincs. Hist. & Arch. 7. 3-20.

WILSON, V. 1948 East Yorkshire and Lincolnshire. British Regional Geology. H.M.S.O.

WINBOLT, S.E. 1925 Roman Folkestone.

WINDELL, D. 1984 Upper Nene 400 BC-400 AD: the Upper Nene valley in the Iron Age and Roman periods. Arch.Unit, Northants. City Council.

WOOD, P. 1959 The early Iron Age camp called Grimsbury Castle near Hermitage, Berks. Berks.Arch.J. 57. 74-82.

WOODFIELD, C. 1977 A Roman military site at Magiovinium? Records of Bucks. 20. 384-99

WOODS, P.J. 1969 Excavations at Hardingstone, Northants 1967-85 Rep.To Northants. County Council.

WOODWARD, H.B. 1898 Boulders of Spilsby Sandstone. Geol.Mag. 35. 334.

WORRALL, G.A. 1954 The Lower Greensand in East Kent. Proc.Geol.Ass. 65. 185-202.

WORSSAM, B.C. 1963 The geology of the country around Maidstone. Mems.Geol.Surv.U.K.

WRIGHT, M.D. 1964 Cementation and compaction of the Millstone Grit of the central Pennines, England. J.Sed.Pet. 34. 756-60.

WRIGHT, M.E. 1986 Beehive querns in the Sheffield Region: a preliminary investigation. M.A. Thesis. Univ. of Sheffield.

1988 Beehive quern manufacture in the south-east Pennines. Scottish Arch.Rev. 5. 59-65.

Addenda

LEWIS, E. & WALKER, R. 1976 A Middle Bronze Age settlement at Westbury, West Meon, Hampshire. Proc.Hants. Field Club & Arch.Soc. 33. 33-44.

WISDOM, L. 1981 A petrological, typological and distribution study of quernstones quarried from the Quartz Conglomerate of the Forest of Dean. Unpublished Undergraduate Dissertation. Univ. of Bristol.