Sourcing the clay: Iron Age pottery production around Poole Harbour and the Isle of Purbeck, Dorset, UK

Volume 1 of 2

Grace Perpetua Jones

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Abstract

One of the most ubiquitous types of Romano-British coarseware pottery, Black-burnished ware 1 (BB1), was produced around the shores of Poole Harbour, in South East Dorset. Previous researchers have shown that this industry was already well-established by the 1st century BC, while reports documenting excavations at earlier Iron Age sites in Dorset indicate that its roots can be traced back to around 700 BC. However, little is known about the production and circulation of wares during these formative phases of the industry, a topic that is addressed by the research presented here with a specific focus on the clays selected by potters working between 700 BC and 100 BC.

A typology of Iron Age Poole Harbour wares has been compiled, drawing together the range of forms found on sites across Dorset. A programme of fieldwork revealed that the landscape of Poole Harbour and the Isle of Purbeck offered a range of clays and sands to the potters. Petrological analysis of 255 sherds of pottery illustrated that the Poole Harbour ware fabrics are characterised by the presence of elongated argillaceous inclusions and a low incidence of silt-sized quartz, with variability in the range of larger quartz grains. Thin sections of 105 clay samples revealed the silt content of the clays is greater than that of the pottery, suggesting potters levigated the raw clay rather than simply utilising a naturally sandy clay. Examination of the elongated argillaceous inclusions in the pottery, using petrology and a scanning electron microscope with energy dispersive X-ray spectroscopy, indicated they are a component of the clay rather than shale fragments added as temper. Compositional analysis of 100 samples of pottery and clay, using inductively coupled plasma spectrometry, demonstrated the potters selected the iron-rich, red-firing clays, rather than the malleable white-firing clays. It also revealed that during the earlier Iron Age the potters utilised the Wealden Clay deposits from the southern side of the Purbeck Ridge, but exploited the Poole Formation clays to the north during the later Iron Age. The wider cultural context of this change is considered and it is suggested that shifting settlement patterns may have influenced the location of the expanding production sites and their ties to communication networks.

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Author's declaration

I confirm that the work presented here is my own.

Grace Perpetua Jones

Chapter 1

Introduction

> *"It has been said, rightly, "they are but shards", yet I know no reason why one should be ashamed to bring them forward. Shards though they may be, they have done an important part in helping to prove the Roman occupation of Wareham"* (Bennett 1899, 153).

At some point during the Earliest Iron Age (800-600 BC), potters working around Poole Harbour and the Isle of Purbeck, in South East Dorset, began to use a distinctive recipe of sand and clay to create their vessels (Figure 1.1). For reasons not yet understood, this fabric and the resultant vessels became very popular, and have been recovered from many Early and Middle Iron Age sites across Dorset. By the middle of the 1st century BC the industry was highly developed and its products saturated the regional markets. During the 1st century AD, these potters took advantage of the commercial opportunities afforded by the Roman conquest and began supplying the incoming army, locally at first, but by the early 2nd century AD their products, now known as Black-burnished ware category 1 (BB1), achieved widespread distribution, as far north as the Antonine Wall and southwards onto the Continent. The potters also created vessels for the domestic markets and became one of the most important producers of coarse wares during the Romano-British period.

Previous researchers (Peacock 1967, 1973; Williams 1975) successfully used heavy mineral analysis to ascertain that the sand in this fabric originated from the Tertiary deposits of the Poole Harbour area of Dorset. Advances in the range of techniques and instrumentation now available for provenancing studies have created an opportunity to try to examine the choices potters made in terms of how they selected and processed their raw materials. This thesis will focus on pottery production around Poole Harbour and the Isle of Purbeck during the Early and Middle Iron Age periods. It will examine sources of raw materials, their selection and processing, and the range of vessels produced. This will provide a comprehensive overview of the origins of an industry that achieved outstanding commercial success during the ensuing Late Iron Age and Romano-British periods.

1.1 The Iron Age and Romano-British pottery of Dorset

The Iron Age pottery of Dorset is characterised by three of Cunliffe's (2005) *style-zones* – the Dorset variant of the All Cannings Cross-Meon Hill group (Early Iron Age), the Maiden Castle-Marnhull style (Middle Iron Age) and the Durotrigian group (Late Iron Age). These *style-zones* represent regional variations in the ceramic repertoires across Britain during the Iron Age, with each portraying a fairly distinct style current at a point in time and space, within a defined area. Cunliffe stressed these are rather broad definitions, with some vessel forms, particularly utilitarian types such as storage jars, likely to have a longer currency than some finer wares (Cunliffe 2005, 87). He hoped that examination of these style-zones might facilitate a model to examine the social, economic and political networks behind the vessels, and proposed that they represent the contacts and shared values between communities (Cunliffe 2005, 88). Furthermore, Cunliffe suggested that the creation of distinctive vessels may have allowed potters to embed and portray an identity and 'distinguish self from others living in neighbouring regions' (*ibid.*).

The Early Iron Age vessels from Dorset are characterised by bowls with flared rims, and bipartite bowls with fairly vertical sides, many of which have red-finished surfaces (Cunliffe 2005, 99; Figure 1.2). They have been most commonly encountered on sites on the Isle of Purbeck, such as Rope Lake Hole and Eldon's Seat, Kimmeridge. The Middle Iron Age pottery is typified by the assemblages from the type-sites of the Maiden Castle and Allard's Quarry *style-zone*, and has been found on sites across the modern county of Dorset (Figure 1.3). Cunliffe described the range of forms as encompassing bead-rimmed jars and bowls of ovoid profile, jars with countersunk lug-handles, and bowls with flattened rims. Decorative motifs include grooved wavy lines, scrolls, arcs and dimples (Cunliffe 2005, 107). He recognised that 'the entire assemblage could easily have developed out of preceding ceramic forms' and that the countersunk lugs were a local development rather than having a continental origin (*ibid.*). Jars with flattened, beaded rims also first appear during this period. During the Late Iron Age a new technology was introduced – the potter's wheel, and a new range of forms was produced, including copies of imported Armorican and Gallo-Belgic vessels. Many of the types produced during the Middle Iron Age period continued to be made, such as the bead-rimmed jars and bowls, and flat-rimmed jars, with newer forms added including necked jars. Cunliffe labelled the pottery of this period *the Durotrigian group* (Cunliffe 2005, 107 & 117; Figure 1.4), referring to the name of communities living in the Dorset area during the 1st century AD, the Durotriges, a name identified from three Roman historical sources (Papworth 2001, 22-28). The territory of the Durotriges has been defined using coin distribution maps (for example Figure 1.5) and the characteristic pottery found in this area. A distribution map of pottery from the preceding period indicates a similar area of shared identity (Figure 1.6).

The Roman conquest appears to have had little influence on the range of forms that were produced. Instead Williams (1975, 15-16) sees the bead-rimmed jars, necked jars and countersunk-handled jars as precursors of the early Black-burnished ware forms. The industry was well-placed to supply ceramic vessels to the incoming army. The potters produced a very wide range of forms, but perhaps the most commonly made were the everted rim jars, flat-rimmed or flanged bowls and dishes, and plain-rimmed dishes, often decorated with burnished lattice or arcs (Figure 1.7). The forms were utilitarian, designed for the preparation, cooking and storage of food - 'it seems that practically every household had its black-burnished 'service' in the kitchen' (Peacock 1982, 86). Williams (1975, 41) has, however, suggested the vessels were probably not used for serving food, with the exception of low status homes or the lower ranks of the army. From the late 1st century AD, Black-burnished ware began to be transported over greater distances in small quantities, but on a much larger scale from the early 2nd century AD. A change in the sourcing for the Roman army in the north, and the movements of the II *Augusta* legion who were already familiar with the Dorset pottery, have been linked to the widespread distribution of Black-burnished ware from Dorset from the 2nd century AD onwards (Williams 1975, 315).

1.2 Aim and objectives of the research

The aim of this project is to understand the origins and development of the pottery industry that evolved into one of the largest producers of coarseware vessels during the Romano-British period. The archaeological evidence for the Late Iron Age and Romano-British phases of this industry indicates that production was situated around the Poole Harbour and Wareham area of South-East Dorset. This research will focus on the Early and Middle Iron Age periods, *c.* 800-100 BC, although conservatism in the industry, and the continuity of forms through the Middle and Late Iron Age periods, necessitate that the Late Iron Age products will also be considered, but are not paramount to the aim.

This project will examine the following research questions:

- What constitutes a Poole Harbour ware?
- When did potters start to utilise the tertiary clays and sands of the Poole Harbour/Wareham area?
- What raw materials were available to the potters during the Iron Age, and is it possible to identify the clay sources that were exploited?
- To what extent did the Iron Age potters modify the raw clay for pottery production?
- What was the range of vessel forms being produced, and were specific clay/sand recipes being utilised for certain forms?
- What was the social and economic context in which these industries developed?

In order to achieve the aim and examine the research questions, the following objectives were set:

1. Review the evidence for pottery production around the Harbour during the prehistoric and Romano-British periods.
2. Characterise the local geology and identify known sources exploited for brick and pottery production from the medieval period onwards, as indicators of the main clay sources.
3. Collect clay samples from the Poole Harbour area and characterise their mineralogical and chemical composition.
4. Review reports of Iron Age pottery assemblages from Dorset and the surrounding area to identify those that contain possible Poole Harbour wares of Early and Middle Iron Age date.
5. Compile a corpus of early types and their distribution.
6. Characterise the mineral and chemical composition of samples from vessels identified as originating in the Poole Harbour area during the Early to Middle Iron Age.
7. Consider the mineralogical and chemical composition of the clays and vessels, and attempt to identify selection of specific clay sources.
8. Interpret the results of the data collection to examine the less tangible aspects of the social and economic framework in which the potters operated.

1.3 Chronological scope of the project

The chronological divisions of the Iron Age used in this thesis follow those used by Cunliffe and Brown, with the period 800-600 BC classified as the ‘earliest Iron Age’ phase, the period *c.* 600-400 BC classified as the ‘Early Iron Age’ and the period *c.* 400-100 BC classified as the ‘Middle Iron Age’. The Late Iron Age period is here defined as 100 BC to AD 43, although the ceramic traditions of this area of Dorset remained largely unchanged by the advent of the Roman conquest. The Late Iron Age pottery of Dorset is often referred to as ‘Durotrigian’, but in this thesis, all of the Iron Age pottery thought to have been produced in the area around Poole Harbour will be referred to as ‘Poole Harbour wares’ (after Brown 1997), to avoid chronological bias, particularly in forms that straddle the Middle and Late Iron Age periods.

1.4 Structure of the thesis

This thesis is divided into ten chapters, each covering a specific aspect of the project.

Chapter 1 briefly introduces the project, focussing on the aim, research questions and objectives of the research. Chapter 2 provides an overview of the geology and geography of the study area, a summary of previous work carried out on the Iron Age and Romano-British pottery of this area, and the rationale behind the techniques chosen to address the objectives. Chapter 3 presents the known evidence for the production of pottery during the Late Iron Age and Romano-British periods around Poole Harbour and Wareham. A summary of the ceramic assemblages from which samples were taken is given in Chapter 4. Details of the fieldwork carried out in the course of this project will be presented in Chapter 5, including discussion of the field observations of the clay samples taken. Chapter 6 presents the petrological analysis of the pottery samples. Chapter 7 details the petrological analysis of the clay samples, and provides comparison of the pottery and clay samples. Chapter 8 presents the compositional analysis of the pottery and clay samples. Chapter 9 provides a typology of the forms of pottery produced in the Poole Harbour sandy fabrics, with figures compiled from the published literature to illustrate examples of each form type. The final chapter, 10, will return to the original research questions posed in this chapter, and attempt to answer them using the background research, fieldwork and petrological and compositional analysis presented in Chapters 2 to 8. Suggestions for further work in this area are also presented.

In order to aid the flow of the document, most of the figures are presented in the first part of Volume 2. Exceptions to this are the figures produced for Chapter 8, the compositional analysis - as most are the graphical representations of the data, and Chapter 9, the typology, where the figures illustrate the types discussed. The remainder of Volume 2 presents supplementary data relevant to each chapter, as a series of appendices.

Chapter 2

Background: geology, previous work and considerations of ceramic provenancing

This chapter provides an overview of the geology and topography of the area around Poole Harbour; a summary of the previous investigations into Black-burnished ware and its Iron Age predecessors, and a discussion of the considerations underpinning ceramic provenancing studies.

2.1 The geology and topography of the Poole Harbour region

The study area, arbitrarily defined by a 10km radius from the centre of Poole Harbour, is diverse in its geology, topography and land use (Figure 2.1). Geological processes over thousands of years resulted in Poole Harbour taking its current estuarine form from around 4000 BC, but continuing to evolve (May and A'Court 2010, 19). This large, natural harbour, approximately 3500 hectares in area, has a shoreline of 160km. It contains a number of islands, of which the largest are Brownsea, Furzey, Green, Round and Long Island. The rivers Frome and Piddle drain into the Harbour from the west, and the Corfe River from the south. To the north of the Harbour is the urban area of Poole, a sharp contrast to the open heathlands of the Isle of Purbeck on the southern shores of the Harbour. These heathlands are separated from the south of Purbeck by the chalk ridge of the Purbeck Hills. The Wealden Beds to the south of the ridge lie beneath a wooded valley, dotted with stone-built villages and farms. The Jurassic Purbeck and Portland stone formations, and their associated quarries, are found in the coastal (mainly upland) areas of south-eastern Purbeck, whilst the Kimmeridge Clay surfaces in south-western Purbeck. Here the cliffs contain bands of a black, often bituminous, shale (Arkell 1947).

2.1.1 Sea-level change

The sea-level in Poole Harbour was lower during the Iron Age than the present day. Edwards (2001) established sea-level index points for Poole Harbour using foraminiferal and radiocarbon data from multiple cores taken from Arne Peninsula and Newton Bay. He identified four phases of relative sea level change in the past 5000 years. A period of rising sea level occurred between 2750 BC and 450 BC, although Edwards notes evidence from the Solent of a possible period where this slowed or even fell, from 1550-650 BC (Middle Bronze Age to Early Iron Age). During the second phase, from 450 BC to AD 750, the palaeomean tide level (PMTL) 'remained relatively constant at around 1m below modern MTL, perhaps even falling slightly' (Edwards 2001, 229), or -1.0m OD (Edwards 2001, 230). From AD 750-1050/1150 there was a rise in sea level, with no further changes until *c.* 1550.

A lower sea-level during the late Romano-British period was suggested by Keith Jarvis in his 1993 report of an inter-tidal site on the eastern side of Brownsea Island, visible at the lowest level of the spring tides (NGR SZ 0318 8817). A layer of sandy material, 12m long, 5m wide and 0.3m thick, was found in 1973, 'adjacent and parallel to the old tide line', and thought to represent rubbish dumping on an old ground surface, or in a depression cut into it (Jarvis 1993, 89). It contained 'copious Romano-British pot-sherds', animal bone and charcoal. The base of the sandy layer was calculated to be -1.01m (Newlyn Ordnance Datum). During the years 1974-1978 the layer eroded, revealing a ditch aligned approximately north to south and containing pottery of 3rd to early 4th century AD date. A high proportion of large jars and bowls were thought to be indicative of a specialist industrial function (Lyne 1993a, 91). Jarvis calculated a sea-level rise of 2.67m on the basis of a highest astronomical tide (HAT) of 1.66m, and taking into account a theory (after Waddelove and Waddelove 1990) that a settlement would need to be 0.4m above the HAT, and therefore 2.06m OD on the basis of a HAT of 1.66m. 'As the site level was -1.01m this would imply a relative sea level rise of at least 3.07m' (Jarvis 1993, 90). If the layer was not used for occupation but simply for industrial activity or rubbish disposal, a rise in sea level of 2.67m may be suggested (from -1.0m OD to 1.66m) since the late Romano-British period.

The findings by Jarvis (1993) indicate a relative sea level during the Romano-British period that was considerably lower than that suggested by Edwards (2001). However, Edwards notes that 'the low vertical precision of archaeological evidence warns against their quantitative application to studies of RSL change' (Edwards 2001, 232). This may be compounded by the data used for the calculations, for example, the levels used by Jarvis were 1.66m OD for the HAT, a level recently defined as 1.2m OD (2.6m chart datum [CD]) (Simpson *et al.* 2004, 45). A rise of 1m since the later Iron Age/Romano-British period would be more in-keeping with the general picture across the UK (Shennan and Horton 2002) and the archaeological evidence from Hengistbury Head. At this nearby Iron Age coastal site, to the east of Poole Harbour, an area of gravel hard-standing in the Rushy Piece inlet had been partially covered by a sandy estuarine deposit, 'suggesting a mean sea-level somewhere about – 0.5m OD in the Late Iron Age' (Cunliffe 1987, 8).

2.1.2 Geology

The geological strata of the area around Poole Harbour and the Isle of Purbeck is summarised in Table 2.1 and discussed below.

Table 2.1. Summary of the geological strata of the study area (adapted from Barton et al. 2011)

Period	**Epoch**	**Formation/Lithostratigraphy**
Quaternary	Holocene	Blown sand, sand and shingles, alluvium and peat
Palaeogene	Eocene Paleocene	Barton Group Bracklesham Group: Poole Formation London Clay Reading Formation
Cretaceous		Chalk Group Wealden Formation
Jurassic to Cretaceous		Purbeck Group
Jurassic		Purbeck Group Portland Group Kimmeridge Clay Formation

Jurassic Period

Jurassic deposits outcrop along the southern coast of the county. At the end of the Jurassic Period, the sea bed was raised or simply filled with sediment, 'and a vast swamp, sometimes land, sometimes brackish lake, sometimes freshwater lake, covered the South of England' (Arkell 1947, 11). This resulted in the Purbeck Formation (or Purbeck Beds), the base of which is Jurassic but most is Lower Cretaceous (West 2013). The Lower Purbeck Beds comprise a series of 'pale grey clays and shales' whilst the upper layers are composed of shelly limestones (often characterised by ostracods), shales and marls (Arkell 1947, 137). The most abundant fossils of the Purbeck Beds are the ostracods, described by Arkell (1947, 130) as 'minute bivalve Crustaceans, which swarmed in shallow water, whether fresh, brackish or marine'. The Purbeck Marble is formed from a mass of freshwater gastropod shells, particularly those of *Viviparus inflatus* and *Viviparus cariniferus* (Arkell 1947, 130).

Cretaceous Period

The end of the Purbeck epoch was signalled by earth movements and the resultant formation of 'an extensive shallow basin of fresh water over the South of England, from west Dorset to Kent and the Boulonnais [chalk download of northern France] and northwards at least to the present edge of the Chalk downs' (Arkell 1947, 148). Rivers flowed into this basin, bringing detritus that spread over the basin floor 'as false-bedded sands, marls and clays, with bands of coarse grits' (Arkell 1947, 148). In Purbeck, rocks such as tourmaline slate and quartzite indicate derivation from the south-west peninsula of Devon and Cornwall. 'The heavy minerals were largely derived from the Dartmoor granite, now freshly laid bare of its sedimentary covering' (Arkell 1947, 149).

The clays and sands of the Wealden Beds followed, from which few freshwater and land fossils have been recovered, suggesting 'the delta of a large river or rivers with shifting lakes' (Arkell 1947, 11). Arkell (1947, 150) describes the Wealden Beds as comprising two contrasting lithological types: 'the Variegated Marls and Sandstones below and the much thinner Wealden Shales above'. The strata are varied and include clays, marls and mudstones in reds, purples, greens and greys. There are also bands of sandstone, coarse quartz and conglomerate, the latter often cemented by iron. It is these Wealden Variegated Marls that have been used for over 200 years by the Swanage Brick and Tile Co, now operating as Ibstock Brick Limited, and which were exploited to provide bricks to the Banks Estate (Arkell 1947, 350).

The end of this period was heralded by compressive earth movements and the faulting and folding of the Jurassic and Wealden rocks, the Upper Cretaceous. For approximately 30 million years the region became the bottom of a sea, and sediments, mainly chalk, were laid down.

Palaeogene Period

The Cretaceous Period came to an end 60 million years ago as 'north-west Europe was gently and irregularly upheaved to form land areas interspersed with shallow basins, in which a tropical life flourished' (Arkell 1947, 12). During the Eocene epoch (the second epoch of the Palaeogene Period), southern Britain was occupied by shallow sea basins: the London Basin, covering the valley and estuary of the River Thames; and the Hampshire Basin (Figure 2.2), an area described as 'bounded by a triangle with corners at Dorchester, Salisbury and Worthing' (Curry 1965, 151). Smaller Palaeogene deposits also occur in Devon, including the Petrockstow and Bovey Basins.

The Hampshire Basin was filled with 'great quantities of granitic debris derived from the erosion of the granite intrusions of the West Country and Brittany, now cleared of their sedimentary covering and undergoing denudation. The white sands and kaolin pipe-clays of the Dorset heaths are derived from this source' (Arkell 1947, 12). This was also confirmed by analysis of the heavy mineral content of deposits from the Palaeogene formations by Blondeau and Pomerol (1968, 449-450) who found that zircon is much more abundant than tourmaline in the lower Bracklesham sand deposits (part of the Palaeogene series of the Hampshire Basin, discussed below), but in the higher levels the reverse was noted, with tourmaline found in excess of zircon. This led them to suggest that 'the sands with suites predominantly of ubiquitous minerals' (defined as zircon, tourmaline and rutile) 'may have been derived from the igneous rocks of Devon and Cornwall; in particular from the Dartmoor granite (Blondeau and Pomerol 1968, 451, after Boswell, 1923 and Groves, 1931). Most of the known, or suspected, sites of Late Iron Age and Romano-British pottery production around Poole Harbour are located on the Palaeogene strata of the Hampshire Basin.

Reading Formation and London Clay

The lowest deposit of the Palaeogene strata comprises the sands and red and white clays of the Reading Formation, recorded at depth in boreholes around Wytch Farm (Bristow *et al.* 1991, 29). The deposits are probably lacustrine in origin, with the exception of the base which may have been deposited in salt water (as indicated by the presence of glauconite) (Arkell 1947, 215). In the north west of the district, the overlying London Clay sits directly on the Chalk (*ibid.*). The London Clay outcrops in a band around the succeeding Bracklesham Group deposits, from Wimborne to Corfe Mullen and Lytchett Minster, and then westwards to Bere Regis and Briantspuddle. On the western side of the Bracklesham deposits there is a north-south outcrop between Wool and Lulworth. On the southern side there is a very narrow band running from Creech Grange eastwards, along the Purbeck Ridge. The London Clay is described as a 'dark brownish or bluish grey marine clay' that once extended over south-east England, 'south-east of a line approximately from Norwich to Dorchester' (Curry 1965, 159). It also extended into the Channel, France, the Low Countries, and north-west Germany. The clay contains silt-sized or very fine quartz, particularly in the west. The lowest levels were laid down in a shallow sea (marine), with no estuarine or freshwater species recognised amongst the fossil record. The named members of the London Clay within this area comprise the West Park Farm Member (worked at the Knoll Manor Clay Pit for floor tiles), Warmwell Farm Sand and Ltychett Matravers Sand.

Bracklesham Group

The Bracklesham Group comprises the strata from the top of the London Clay and base of the Barton Group, named as the Poole Formation, and the overlying

Branksome Sand Formation (Bristow *et al.* 1991, 33; Curry *et al.* 1978). Previous researchers have applied various labels to define the Palaeogene sequence of the region, with the area between Hengistbury Head and Studland initially referred to as the 'Plastic Clay Formation' by Lyell in 1827 (Bristow *et al* 1991, 4). As part of the 6-inch mapping of the district at the end of the nineteenth century, the Palaeogene sequence was divided by Reid into the 'Reading Beds, London Clay, Bagshot Beds, Bracklesham Beds, Barton Clay, Barton Sands and Headon Beds' (*ibid.*). Exploratory drilling associated with the development of the Wytch Farm Oilfield allowed a better understanding of the sequence, and when the Bournemouth district was remapped in 1983 at the 1: 10,000 scale, the stratigraphic sequence was re-defined (Bristow *et al* 1991, 5). The Bracklesham Group equates to the Bagshot Beds and lower 'Bracklesham Beds of the old One-Inch Geological Sheet 329 (Bournemouth)' (Bristow *et al* 1991, 33). In the Bournemouth and Poole area, the Bracklesham Group strata 'comprise dominantly fluviatile sediments, with only minor marine or estuarine deposits' (*ibid.*).

The clay units of the Poole Formation that have been heavily exploited for brick, tile and pottery production have been named (Bristow *et al.* 1991, 33). These clays, and their associated sands, are (in ascending stratigraphic order): the Creekmoor Clay, Oakdale Clay, Broadstone Clay, and Parkstone Clay. Minor named clays that have also been exploited for brick-working comprise the Haymoor Bottom Clay around the Canford Heath area, and an isolated outcrop of the Creechbarrow Beds, the sands and loamy clays found around the slopes of Creech Barrow (centred on NGR SY 92130 82450), at the foot of the Purbeck Hills. The deposition of this series of sands and clays 'represents a series of marine transgressions during which lagoonal clays, and locally beach-barrier sands, were deposited, interrupting a mainly fluviatile sedimentary environment' (*ibid.*). Bands of shale were noted by Arkell (1947, 225) in the Poole Formation strata in a railway cutting between Claywell and Bushey, located at the southern edge of Rempstone Heath. The section showed grey shales and clays, whilst black shaly bands were noted in the section of a clay pit south of Norden Farm.

The Creekmoor Clay is described as 'off-white to pale grey, red stained and mottled, with subordinate dark grey, carbonaceous clay' at outcrop, whilst in boreholes it is variable, with ‘dark brown carbonaceous clay, laminated pale grey and brown silty clay, structureless clay with listric surfaces, and clayey, fine-grained, laminated sand’ all recorded (Bristow *et al.* 1991, 35). The Oakdale Clay in the Oakdale area is described as ‘stiff, fissured, grey silty clay’, whilst elsewhere it is ‘commonly carbonaceous and laminated, and is red stained locally’ (Bristow *et al.* 1991, 35). The clay is divided into upper and lower levels by thick bands of sand, up to 30m; the lower clay is known as ‘Arne Clay’, a ‘pale grey structureless clay interbedded with brown lignitic layers’, overlain by the ‘green bed’ of silty clays, sands and lignite, but also, locally, flint and glauconite. The upper level of Oakdale Clay is also known as the ‘Trashers’ or ‘Newton clays’, and described as ‘grey, brown or black, carbonaceous, patchily red-stained, locally laminated clays’ (Bristow *et al.* 1991, 35). The Broadstone Clay is the most widespread of the Poole Formation clays. It ‘varies from pale grey silty clay, through homogeneous, medium grey silty clay, to laminated, lignitic, silty and fine-grained sandy clay’ (Bristow *et al.* 1991, 37). The Parkstone Clay is described as ‘a brown silty, slightly carbonaceous clay’ of sandy to silty texture (West 2016). It is generally dark in colour, ‘because of a content of lignite (plant material) and pyrite’, although beds of ball-clay within this clay are a much paler grey to white colour (West 2016).

The grain size and sorting of the Poole Formation sand deposits are highly variable, and both fining- and coarsening-upwards sequences have been recorded (Bristow *et al.* 1991, 35). Bristow *et al.* (1991, 38, after Plint 1983) have suggested the upward fining sequences represent a fluviatile or lacustrine origin, whilst the coarsening-upward sands result from a marine transgression. Likewise, the variability of the clay deposits also represents deposition in a range of environments. They may have formed in ‘tidally influenced back-barrier lagoons’, and the palaeosols they contain, some red-stained, indicate ‘a fall in water level accompanying retreat of the lagoonal brackish waters, and sufficient drying out to allow a measure of oxidisation in the sediment’ (Bristow *et al.* 1991, 39). With the exception of the green bed of the Oakdale Clay, the clays do not represent full marine conditions, but instead suggest minor marine incursions (as evidenced by the Creekmoor, Broadstone and Parkstone clays), with ‘belts of beach-barrier sands associated with back-barrier lagoons’, migrating ‘backwards and forwards across a broad tract between the central Isle of Wight and the western Wareham Basin’ (Bristow *et al.* 1991, 40).

During the Middle Tertiary, 25 million years ago, earth movements and pressures built the mountain ranges of southern Europe (the Alps, Pyrennes and Carpathians) but also produced 'a series of parallel folds running east to west across the country' (e.g. the Vale of Wardour, Vale of Pewsey), the most acute of which was the Purbeck Anticline (Arkell 1947, 12). The rising land, created by the 'sediments of earlier sea beds', was eroded by rain and 'carried down again in streams to the sea' (Arkell 1947, 12-13).

<u>Ball clay</u>

The clays of the Poole Formation are hosts of the ball clay, with the Poole Harbour and Isle of Purbeck area one of few places in the world, and one of only three in Britain, where these clays occur. Ball clays are very fine, kaolinitic, sedimentary clays, prized by the ceramics industry as a result of their plasticity, tensile strength, white colour and refractory properties. They are used for a wide range of household items as well as in the fertilizer and polymer industries (Dorset County Council 1973, 8; Arkell 1947, 221).

The ball clays were formed from the decomposition of the granites from Dartmoor, and perhaps Cornwall, transported by river and sorted on the way to the Poole Harbour/Purbeck area, with the quartz of the granites forming the sand layers of the Poole Formation and the finer particles, dominated by a 'compound of hydrated alumina and silica, called "clay substance",….separated to form beds of pure clay' (Arkell 1947, 220). These clays differ to the kaolin clays of the Cornish granite areas in that they have been transported and sorted rather than being residual clays. They are so rare because the conditions required for their deposition, including the 'climate, mineralogy, transport, sorting, salinity', only rarely occurred in the past (Dorset County Council 1973). They 'contain a rich tropical flora, including large fan palms and ferns' (Arkell 1947, 218).

The ball-clays are so named as they were dug using a spade known as a 'tubal' in 10-inch (25cm) cubes, each 30-35lbs (13-16kg), known as 'balls' as their edges quickly rounded (Arkell 1947, 220 and Bristow *et al.* 2002, 19). In the 20th century, the most common type of mines were the vertical shafts, frequently up to 35m deep, with galleries dug outwards from the shafts, 1.5m high and worked by two men by gas or candle light (Arkell 1947, 220). They would be shored with timber and the clay taken along the galleries by hand or rail cart. Once work in the galleries was complete, the timber would be removed and the galleries would collapse, causing subsidence at the surface. The last underground mine closed in 1999 and the clay is now only worked in opencast mines by IMERYS Minerals Ltd at Trigon, Doreys, Povington, Furzeyground, and Arne (Bristow *et al.* 2002, 26).

The highest grade ball clays have 50-55% silica, >35% kaolinite, >30% alumina and <2.5% iron and titanium. The ball clays of the Oakdale Clay have an average kaolinite content of 36.1%, relatively high silica (average 59.9%), and 3.1% iron and titanium oxides (Bristow *et al.* 2002, 21). The geochemical data for the ball clay deposits of the Parkstone Clay are variable, with an average kaolinite content of 31.9%, silica of 64.9% and combined iron and titanium of 2.9% (Bristow *et al.* 2002, 26). The Broadstone Clay has 45.1% kaolinite, 61% silica and 3.4% iron and titanium oxides. The Creekmoor Clay has the highest kaolinite (average 52.6%) and lowest silica content (53.7%) of the host clays and is the most consistent in terms of being a good quality ball clay (Bristow *et al.* 2002, Table 3, 26). Limited geochemical analysis of the main elements from 149 samples, taken from 23 boreholes and trial pits in the Wareham area by the British Geological Society, indicated 'the clays show lateral heterogeneity, with little continuity in geochemical stratigraphy in host clays from borehole to borehole' (Bristow *et al.* 2002, 34). The Dorset clays are blended, with 26 different clays extracted for 24 blends, each containing three to seven clays.

Quaternary deposits

Tidal flat deposits occur around the present shoreline of Poole Harbour, with pockets of River Terrace Deposits 1-13 occurring to the south, west and north of the Harbour. Alluvial deposits are to be found along the river channels. South of the gently curved ridge of the Purbeck Hills, superficial deposits comprise occasional patches of River Terrace Deposits 1 and 2, and a band of alluvium running almost parallel to the spine of the ridge, from Swanage to Corfe and Steeple.

Economic geology

The area around Poole Harbour and the Isle of Purbeck has provided a rich resource for sand, gravel, clay, building stone, lime and hydrocarbons. The London Clay and all of the Poole Formation clays were extensively exploited for brick, tile and pipe production in the 19th and 20th centuries. The clays represent two main clay types: a sandy, carbonaceous and laminated brown clay, and a more homogeneous, grey and often red-stained clay that is less sandy. The brown, sandy clays were predominantly exploited for brickmaking, and the grey clays for pottery manufacture (Bristow *et al.* 1991, 98). The Parkstone Clay was mostly used for pottery, whilst the Broadstone Clay was used for brickmaking. The ball clays were first exploited on a large scale in the 16th century to make tobacco pipes, and from the 18th century for fine pottery. Their use later extended into a wide range of industries and today ball clay remains an important mineral resource, with 200,000 tonnes removed in 2000 (Bristow *et al.* 2002, 18).

2.2 Archaeological investigation of pottery production in south-east Dorset

Antiquarians and archaeologists have been aware of the presence of a pottery industry in the Poole Harbour area during the Romano-British period from at least the late 19th century. Edward Cunnington, writing in 1894, states ‘That the Romans made use of the clay at their pottery at Norden I am well aware; also their use of the Kimmeridge clay needs scarcely mentioning’ (Cunnington 1894, 71). In 1899 George Bennett suggested that there must have been a pottery production site near the cemetery in Wareham due to the quantities of pottery recovered,

> “…that a Roman pottery existed in the locality of the cemetery, and that the refuse was scattered broadcast. Yes! recent excavations have proved that both sand and clay were obtainable within the ramparts” (Bennett 1899, 154).

The labels of Black-burnished ware and Durotrigian pottery were not applied until the second half of the 20th century, however, earlier researchers were clearly familiar with these wares and their descriptions often identify it as such. Bennett (1899, 154) describes a vessel presented at a meeting of the Dorset Field Club in 1898,

> “an earthen vessel with perforated corners for hanging, discovered at a depth of six feet in the cemetery, and which Mr. Bellows considers are portions of a

> Roman cooking vessel. Mr. B. A. Hogg asserts that these perforated fragments are undoubtedly Roman, yet a peculiar kind of sand was used in the manufacture, and it is a make of pottery new to him. Fragments of a similar make were found in the same locality, and with them bones and ashes" (Bennett 1899, 154).

Another example is provided by Heywood Sumner, describing surface finds of pottery from Buzbury Rings as 'the early British type, hand-made, imperfectly baked, and made of clay mixed with siliceous granules' (Sumner 1913, 40). H. P. Smith's description of the pottery from Hamworthy includes mention of 'a large admixture of fine quartz grit' in the fabric, which he suggests was added to counteract the 'plastic nature of the Poole "ball" clays', making the fabric more porous and therefore easily fumed, and also improve thermal shock resistance in the firing and subsequent use of the vessel (Smith 1931, 104).

The term 'Black-burnished ware' was first used by J. P. Gillam in his discussion of the Roman pottery from the fort of Mumrills, on the Antonine Wall. In a previous summary of coarseware vessels from northern Britain, Gillam had described the fabric as 'fumed ware' (Gillam 1957, 14), but later suggested 'black burnished ware' was a more accurate description (Gillam 1963, 126). 'It was made from a slightly gritty clay which probably had refractory qualities' (*ibid.*). He also suggested the thin walls of the vessels would have aided these thermal properties. The other characteristics of the ware described by Gillam were that the vessels were handmade (due to the suggested difficulty in throwing a gritty fabric on the wheel), fired in a reducing atmosphere, and used for a range of cooking pots, bowls and dishes (Gillam 1963, 126). He divided the ware into two categories, based on fabric. He associated category 1 with vessels found on other sites in Scotland and throughout England and Wales. He suggested the 'industry has roots going back several generations in the south-west of England, and under Hadrian it greatly increased its production, not necessarily in the same region, and expanded its trade, mainly in the military market'. He stated 'it is clear that category 1 black-burnished wares were made at a single industrial centre, as yet unlocated' (Gillam 1963, 126). Compositional analysis of 40 sherds from Mumrills measured the sodium, magnesium, manganese, titanium, calcium and iron content of the samples, and led the analyst to suggest a Hertfordshire/Middlesex origin for category 1 (Richards 1963, 129).

A Dorset origin for at least part of the Black-burnished ware category 1 was proposed by Dorset archaeologist Ray Farrar who might not have had any scientific evidence for his claims, but did have an in-depth knowledge of the archaeology of the area. He suggested the discovery of possible late Roman pottery production at Corfe Mullen, and the kiln that had been found at Ower (Field 1952), supported his view that 'the category 1 fabric was established amongst the Durotriges in Iron Age 'C'', that the changing forms seen in Dorset mirrored those from the northern forts and in Wales, and

> 'the tradition survived in our region, unchallenged, indeed unaccompanied by rivals, to almost as late a date as we can place anything by archaeological means in Roman Dorset, and certainly beyond the supposed extinction of the category 1 industry in 367-8' (Farrar 1969, 176).

2.3 Mineral and chemical analysis

Black-burnished ware (BB1) pottery of the Romano-British period, and its Late Iron Age predecessor (commonly known as Durotrigian pottery), have been subject to mineralogical and compositional analysis by a small number of previous researchers. The most well-known is the heavy mineral analysis that was carried out by David Peacock and David Williams, of the University of Southampton - analysis that tied down the origin of this type of pottery to the Wareham/Poole Harbour area of South-East Dorset. The first compositional analysis was carried out by Jennifer Grant as part of a Masters Degree in the early 1980s. She attempted to ascertain if a number of Late Iron Age quartz-tempered cordoned vessels from Hengistbury Head were French imports or local imitations. This was expanded by Belinda Coulston during the late 1980s, in her doctoral research into the use of compositional analysis in archaeology, using the Late Iron Age Durotrigian pottery from Maiden Castle as a case study. A few years later, Lisa Brown submitted samples of Iron Age pottery from three Dorset sites for inductively coupled plasma spectrometry analysis. Compositional analysis of BB1 from two Dorset production sites was also carried out by Jeremy Evans in the late 1980s. A summary of these studies is presented below.

2.3.1 Heavy mineral analysis

The work by David Peacock and David Williams in the 1960s and 1970s is perhaps the most influential in the study of the Late Iron Age and Romano-British pottery industry of the Poole Harbour region. In 1967 David Peacock published a paper advocating the use of heavy mineral analysis in the identification of the source regions of archaeological ceramics. This technique involves the crushing of a sherd and floating the sample on a liquid 'with a specific gravity of 2.9', the point of division between the heavy and light minerals present in the sands (Peacock 1967, 97). The heavier minerals sink and can be collected, identified and counted using a petrological microscope. The results can then be used to compare to known geological profiles and suggest areas of production. Peacock used Black-burnished ware pottery as an example of the use of this technique. He assessed the two categories of the ware identified by Gillam (1963): category 1 containing medium to coarse-grained sand, and category 2 containing a finer grade of sand.

The results of the heavy mineral analysis confirmed the division of the two categories, and indicated the sand in the category 1 fabric contained a high proportion of tourmaline, in excess of zircon. Peacock noted the similarity of the mineral suite of the pottery to the Upper Greensand of Devon (after Boswell 1923, in Peacock 1967, 99), concluding that the comparison was not sufficiently close to imply this was the actual source, but indicated that the sand derived, either directly or indirectly, from the granites of Devon and Cornwall. Peacock suggested that the eastern end of the south-western peninsula would be archaeologically more feasible than the western end, and this would link with Gillam's suggestion of derivation from an Iron Age industry in the south-west (Peacock 1967, 99). Later discussions with Ray Farrar concerning the possible BB1 production site at Corfe Mullen also suggested the Tertiary sands of the Wareham-Poole Harbour area as a possible source. Peacock analysed the sands of this area and found them to have a very similar mineral composition to the Black-burnished ware. Samples from Late Iron Age 'Durotrigian' vessels of the area were then analysed, revealing an identical composition to the Roman Black-burnished ware (Peacock 1973, 64). The similarities in the Iron Age and Roman pottery, and the sands, led Peacock to state 'I have no doubt that all are identical' (Peacock 1973, 64). The Wareham/Poole

Harbour area was therefore suggested as the location of production and confirmed that the Romano-British vessels were a continuation of an Iron Age pottery tradition of the area. The category 2 pottery was very different and a source in the eastern half of England was suggested (Peacock 1967, 100).

The work by David Peacock provided a basis for the doctoral research of David Williams, who examined the origins and developments of the two categories of Black-burnished ware. He suggested that a potter might be willing to travel to obtain a good clay, but this was not likely for the sand, and the source of the sand was therefore indicative of the production area (Williams 1975, 49). Heavy mineral analysis by Williams provided irrefutable evidence that the Romano-British BB1 pottery, present on sites across the country including the northern military sites, was produced in Dorset. The pottery contained a very distinctive suite of heavy minerals: ‘a very high content of tourmaline (mean 50.4%), exceeding that of zircon (mean 39.43%), and a virtual absence of garnet (mean .09%)’ (Williams 1975, 78). Williams analysed samples of sand from the known production sites, including Fitzworth, Shipstal Point and Ower, and wasters from Redcliff and Stoborough (Figure 3.1, Table 3.1). The heavy mineral assemblages of the sands and wasters matched the Durotrigian and Black Burnished ware pottery, again seeming ‘to point to the Wareham-Poole Harbour area of Dorset as being the source for the sand temper used in the pottery’ (Williams 1975, 78-82). However the technique was not sensitive enough to identify any variations within the results, or differentiate between production centres (Williams 1975, 82).

Williams analysed ‘seven characteristically Durotrigian vessels from both pre- and post-Conquest contexts’ (Williams 1975, 10). He found that six of these vessels had a similar composition to 160 Roman BB1 vessels, leading him to conclude that ‘this clearly shows continuity of production in the same area from the late Iron Age until almost the end of the Roman period’ (Williams 1975, 15). The seventh Durotrigian vessel analysed, an upright-rimmed jar from Allard’s Quarry, Marnhull (Williams 1951, fig. 17, no. 140; Brailsford 1958, type 5), had a completely different mineral suite, suggesting a different source to the other six vessels. Williams had also analysed a wheel-turned version of Brailsford’s type 5 upright-rimmed jar with a wavy line on the neck and lattice decoration on the body from the Claudian kiln at

Corfe Mullen (Calkin 1935, Class E), again revealing ‘a completely different suite of minerals’, to the 160 BB1 vessels, which he suggested may reflect the geological setting of the site, on valley gravels close to the Reading Beds (Williams 1975, 13). Interestingly, the mineral suite was similar to the upright-necked jar from Allard’s Quarry, leading Williams to suggest ‘some form of Durotrigian production’ in the Corfe Mullen area, or imitations of the forms by the Corfe Mullen potter(s), and warn that ‘not every Durotrigian upright-rimmed jar was made in the Wareham-Poole Harbour area’ (Williams 1975, 14-15). Furthermore, he stated that these Late Iron Age forms ‘can be traced back to the previous traditions current in the area’ (Williams 1975, 9). The expansion of this industry in the post-Conquest period was suggested by Williams as a response to the needs of the incoming army, and the presence of an existing large scale pottery industry ‘would have provided an additional source to supplement the army’s own products’ (Williams 1975, 12).

Heavy mineral analysis has been used not only to identify the area of production for BB1, but has also indicated that samples of Early Iron Age ‘haematite ware’ from Rope Lake Hole, Kimmeridge, contained a high tourmaline content, suggesting this too may have been made in the Poole Harbour/Wareham area (Williams and Tolfield 1987, 158). This complemented analysis carried out on red-finished sherds from Eldon’s Seat which again revealed a tourmaline-rich fabric for the sampled vessels from this site (by Partridge 1974 but not published; in Williams and Tolfield 1987, 158).

David Williams has also carried out petrological analysis of many sherds of Iron Age and Romano-British pottery and briquetage from the Wareham/Poole Harbour area, and of kiln and clay samples. Analysis of thin sections of one of the kiln structures at Cleavel Point, Ower, of the clay within a clay box, and a number of clay samples from the surrounding area, indicated that none contained the quantities of shale/mudstone seen in the pottery, although a little was present. Instead, the samples contained a high quartz content, especially from the kiln, ‘possibly a deliberate addition for refractory purposes’ (Williams 1987a, 95). Petrological comparison of the pottery and briquetage indicated a greater amount of shale and mudstone in the briquetage (*ibid.*). A heavy mineral separation of pottery and briquetage samples indicated a high tourmaline content, typical of the pottery of the

Wareham/Poole Harbour area. Williams thin-sectioned three of the Redcliff Roman pottery wasters, and three raw clay samples from the site. None of the clay samples contained the shale visible in the pottery samples, leading Williams (2002, 92) to conclude that these clays were not used for potting, although the use of the clays for other purposes on site, such as the kilns, was not ruled out (Williams 2002, 92).

2.3.2 Petrology and Neutron Activation Analysis

Jennifer Grant

Petrological and compositional analysis of quartz-tempered pottery from Hengistbury Head was carried out by Jennifer Grant, as part of a Masters degree at the University of Bradford in 1982. The aim of her research was to establish if any of the cordoned ware vessels recovered from Hengistbury Head had been made locally. Previous petrological analysis of this class of vessel had been carried out by Freestone and Rigby (1981), who identified six fabric types. Four contained igneous or metamorphic rock fragments, suggestive of an origin in northern France, but one contained undiagnostic inclusions of quartz sand, and one of shell and grog. It was the origin of these unsourced sandy wares that she hoped to establish, and identity if the vessels were made by potters who manufactured the Durotrigian range of forms.

Grant selected nine samples of the wheel-thrown, highly burnished, sandy cordoned ware bowls and jars, all from the Bushe-Fox excavation, and two from other sites, at Rotherley and Moordown. She also analysed five samples of vessels displaying a distinctive form of decoration comprising a horizontal matt band outlined by parallel grooves and with vertical internal lines (as seen on form BC 3.52, Brown 1987) and fourteen of the standard range of Poole Harbour wares. The latter included nine classified as ‘Durotrigian’, including a straight-sided bowl, necked bowls and a jar with countersunk handles, and five classed as ‘coarse wares’, comprising two flat-rimmed jars (one with petal motif and one with eyebrow motif), a necked jar with eyebrow motif, a bead rimmed jar with groove and dot decoration, and a base with possible nail impressions. Clay samples were taken from the headland at Hengistbury, and further east along the coast at Highcliffe and Barton, to assess if any of the pottery might have been made locally to the site.

Grant carried out grain-size analysis of 30 thin sections by point-counting. This indicated separation between the cordoned wares and the other pottery samples analysed, with the exception of one cordoned ware sample which clustered with the coarser pottery, and a Durotrigian vessel that was found to be an outlier as a result of its larger mean grain size. Shale was noted in the coarse pottery but not in the cordoned wares. The samples were submitted for Neutron Activation Analysis (of fourteen elements initially, but then reduced to eight), the resultant data scaled to scandium and analysed using a discriminant analysis and re-estimation analysis. She found the cordoned vessels separated from the other vessels. Within her decorated, coarse and Durotrigian wares there was considerable overlap, leading Grant to suggest they ‘represent a single clay source or several closely related sources’, but not one matched by her clay samples (Grant 1982, 37). The elemental data, like the grain size analysis, indicated that one of the cordoned wares grouped more closely with the Poole Harbour wares. However, there was compositional similarity between the cordoned wares and the other pottery, leading Grant to conclude that the cordoned vessels were not imported from the Armorican area of north-west France but instead were made in the same region as the Durotrigian vessels, although one from Moordown appeared to represent a different source. In a draft paper by Grant, Freestone, Hughes, Rigby and Leese (Grant *et al.*, unpublished), it was suggested that the cordoned vessels may have been made at the same centre as the more typical Durotrigian wares, but with specific clays or clay blends, and that different preparation methods may have been used.

Belinda Coulston

Doctoral research by Belinda Coulston, completed in 1989, considered the Late Iron Age ‘Durotrigian’ pottery from Maiden Castle, as well as earlier material from this site (‘pre-Durotrigian’), and attempted to characterise the chemical and mineral composition of the pottery, ascertain if variations in fabric were related to typology or different workshops, and made a tentative attempt to locate the clay sources. She carried out petrological analysis of 200 thin sections of the pottery, commercially prepared by the British Museum, and compositional analysis using Neutron

Activation Analysis (NAA). A summary of her research is presented below, with further details included as Appendix A.

Comparison of 116 photomicrographs of Durotrigian pottery resulted in the identification of six fabric groups, identified by eye on the basis of the size and density of the quartz. She found that the amount of quartz was fairly consistent in all fabrics, at 20-30%, suggesting the potters were adding a constant volume of sand in the recipes; the difference between the fabrics was the actual grain size, thought to be the result of the use of different sources. This may indicate the products of a number of workshops, or that different grades of sand were used for different vessel types. Comparison of the petrological results with the typology found no correlation, suggesting that potters did not use certain grades of sand for specific types of vessels, but instead 'a number of different workshops were probably in operation, each producing a range of pottery types' (Coulston 1989, 461). Furthermore, the consistency in the amount of added sand was also suggested to indicate that most of the workshops exploited the same clay source: 'Assuming that the potters were aiming for a consistent physical property (such as plasticity or thermal shock resistance), and the fact that different clays have different properties, the consistency in the volume of added sand suggests that potters were dealing with the same clay' (Coulston 1989, 521).

Elemental analysis, using NAA, initially suggested 15 groups in the resultant data, but the multivariate analysis indicated that the sand acted as a diluent for most of the elements. Coulston found that 'pottery groups are being differentiated, at least partially, on the basis of arbitrary differences in sand content, and the significance of differences in clay composition consequently underweighted' (Coulston 1989, 379). This effect was counteracted using Dilution Assessment procedures, after Mommsen *et al* (1988). The Dilution Assessments were used to reduce the 15 initial groups to five, Groups A-E (Coulston 1989, 390). Groups A and B were thought to be part of a single group, with the differences between them appearing to result from variation in the quantity of sand temper; Group D may be associated (Coulston 1989, 447-465). Groups C and E represent a different clay source to Groups A, B and D.

Coulston attempted to identify if there was any correlation between these compositional groups and the forms of the vessels, but found that each group had been used for a variety of Late Iron Age forms (Appendix A, Table A1). Coulston looked for variation in the chemical composition within different form types, but the data suggests a number of workshops were in operation during the Late Iron Age, each producing a range of forms.

Four groups were identified amongst the 'pre-Durotrigian' (PD) pottery. Three of the groups (PD Groups 2, 3, and 4) were thought to represent a single source. Pre-Durotrigian Group 1 was rather spread, but petrologically distinct (Coulston 1989, 429). Pre-Durotrigian Group 4 included six samples initially classified as pre-Durotrigian and three as Durotrigian; the latter comprised a body sherd decorated with the petal motif (illustrated in Wheeler 1943, fig. 69, 141), a bead-rimmed bowl or jar and a bead-rimmed 'war cemetery' bowl (after Wheeler 1943). The presence of earlier and later forms in this group (PD4) was interpreted as the continued exploitation of a clay source during the earlier and later Iron Age. Four clay samples were taken from the area around Maiden Castle and compared with the pre-Durotrigian pottery, with the pottery of PD Groups 2-4 'matched' by one sample of Loess clay, taken from a location approximately 3km to the north-west of Maiden Castle. Coulston (1989, 513) concluded that most of the pre-Durotrigian pottery, represented by PD Groups 2, 3 and 4, was made locally to Maiden Castle, using the Loess clay.

Coulston compared two of the pre-Durotrigian groups of pottery (PD Groups 1 and 3, representing the different clay types identified) with the two distinct clay types in the Durotrigian pottery (compositional Groups A and C). The elemental profiles of Groups A and C were very different to PD1, but the profiles of Group C and PD3 were fairly similar, leading Coulston (1989, 485) to conclude 'it is conceivable that these two groups may be related, which suggests that Group C [and consequently related Group E] may have originated from closer to Maiden Castle than previously expected'. Petrographically, groups C and E did not contain any shale or tourmaline, suggesting they are not typical Durotrigian wares. Coulston therefore proposed 'that a small proportion of the Durotrigian pottery was being produced at Maiden Castle, using some of the local clay', by a local potter imitating the Poole Harbour Late Iron

Age vessels (Coulston 1989, 486). The forms of the Group C and E samples included a barrel-shaped jar; a high-shouldered jar; four bead-rimmed jars; three bead-rimmed bowls; two round-profiled jars with short, upright rims; a saucepan pot; a beaker and a lid.

Coulston also re-analysed Jenny Grant's data from Hengistbury Head, adjusting it for inter-laboratory comparison. Seven of the nine samples of cordoned ware grouped with Coulston's Group C, as well as one of the five 'decorated' samples and one of nine 'Durotrigian' samples (Coulston 1989, 487-90). She suggested that 'perhaps an adventurous local potter was trying his hand at imitations – producing replicas of both the local Durotrigian ware and the Armorican cordoned ware' (Coulston 1989, 522). Significantly, her research suggests that the cordoned ware vessels were made in the area around Maiden Castle rather than Wareham/Poole Harbour. In addition, not all of the 'Durotrigian' forms from Maiden Castle were made in the Wareham/Poole Harbour area, although the forms and fabrics appear superficially similar.

Clay samples were collected from five locations, to try to identify the origin of the bulk of the Durotrigian assemblage, represented by compositional Group A (Table 2.2). Sand samples were also collected at three of these locations (Shipstal Point, Kimmeridge, Swanage Bay) to evaluate the effect of sand on the chemical composition of the clay, however, Coulston first levigated the clay and therefore altered the original quartz content of the clay. Her analysis suggested that the elemental composition of the clay was affected in samples with greater than a 25% added sand component (Coulston 1989, 196). Of the three locations sampled, Shipstal Point was thought to represent the most likely source for the sand temper (Coulston 1989, 190).

Table 2.2. Summary of clay and sand samples taken by Belinda Coulston (after Coulston 1989)

Location	Clay Type	Age of deposit
Shipstal Point, Arne	Bracklesham Group	Eocene
Rempstone	Bagshot Beds	Eocene
Corfe	Bagshot Beds	Eocene
Kimmeridge	Kimmeridge Clay	Jurassic
Swanage Bay	Wealden Beds	Cretaceous

Coulston indicated that ‘one important petrographic trait identified in the pottery was the presence of shale’ (Coulston 1989, 491), and suggested two possible interpretations of these inclusions. One was that they are not shale, but a result of clay processing techniques - ‘a gradual drying process may allow the clay particles on the surface to become aligned and form a crust. This crust, on crushing, may give the appearance of shale’ (Coulston 1989, 172). Alternatively, they represent shale fragments that are a component of the clay, as the size of the inclusions was not matched by the size of the quartz. In the case of the latter, ‘in order to identify a clay as being a possible source, both a compositional ‘match’ and the presence of shale inclusions was required’ (Coulston 1989, 491).

Shale fragments were identifed in the thin-sections of the Wealden clays of Swanage Bay and the Tertiary clay from Rempstone, but not in the Tertiary clay from Shipstal Point, Corfe Castle or the Kimmeridge clay from Kimmeridge Bay. The latter was surprising to Coulston as shale was visible in the original sample (taken from a small, weathered deposit on top of the shale in the cliff), leading her to suggest that the shale may have been removed during levigation, or there was a mix up at the laboratory. The element profiles of the clay samples from Swanage, Rempstone and Kimmeridge were all fairly similar to the Durotrigian pottery, however those from Shipstal Point and Corfe Castle were not. The Wealden clay gave the best compositional ‘match’ to the Group A pottery, the Rempstone clay was fairly close, but the results from Kimmeridge were inconclusive due to small sample size.

Lisa Brown

In 1992 Lisa Brown submitted 21 samples of Early to Late Iron Age Poole Harbour ware pottery to Oxford University for petrological and compositional (inductively coupled plasma spectrometry) analysis. They came from Rope Lake Hole, Gussage All Saints and Tollard Royal. All were similar in terms of the inclusions identified in thin-section, with differences in the carbonate content, but only minor variations in the relative abundancies of the other inclusions. The argillaceous inclusions were identified as clay pellets and laminated mudstones. All but one (an Early Iron Age jar from Gussage All Saints) had only a minor silt component. During compositional analysis, a flat-rimmed jar from Gussage All Saints with a high mudstone content, appeared to be an outlier with higher levels of Al_2O_3, Fe_2O_3, MgO and K_2O, consistent with 'a clay-rich composition' (Doherty and Hatcher 1993). Five of the Early Iron Age sherds also appeared slightly separated from the other sherds, with these others seemingly made from related materials.

Other researchers

Neutron Activation Analysis of 12 sherds of BB1 from Ower, and 12 from Redcliff, was undertaken by Jeremy Evans, University of Bradford, but failed to find any meaningful groups in the data (Evans 1987). Very little chemical analysis of the clays of the Poole Harbour region has been conducted, with only limited data available from the British Geological Survey or Imerys - the latter only analyse the ball clays and neither conduct detailed trace element analysis.

2.4 Ceramic provenancing

Fundamental to this study of pottery production around Poole Harbour during the Early to Middle Iron Age is a consideration of the provenance of the raw materials that potters selected for use. A review of the literature was carried out to explore and understand the factors that underpin any such undertaking and to examine examples of other studies involving the provenancing of ceramics. Provenance is defined by Pollard and Heron (2008, 100) as 'the geographical origin of the raw materials used'. Pollard *et al.* (2007) have stated that determination of provenance depends on a number of requirements. These are that the object in question contains a chemical fingerprint 'that is unique to a particular source'; this source should be 'sufficiently geographically unique to be archaeologically meaningful'; the analytical techniques employed need to be capable of distinguishing between sources; and that post-depositional alteration 'should be negligible, or at least predictable' (Pollard *et al.* 2007, 15). It is necessary that the chemical fingerprints of the raw material are 'carried through to the final object' (Wilson and Pollard 2001, 507) and that they can be measured with enough precision in the pottery 'to enable discrimination between competing potential sources' (*ibid.*, 508). These assumptions are at the basis of the 'Provenience Postulate', termed as such by Weigand *et al.* (1977, 24), the tracing of an artefact's source, or at least grouping artefacts of unknown source, but on the assumption that 'there exist differences in chemical composition between natural sources that exceed, in some recognizable way, the differences observed within a given source' (*ibid.*). Tite (2001, 445), Wilson and Pollard (2001, 508) and Hein *et al.* (2004, 246) also stress the necessity of the inter-source variation being greater than the intra-source variation.

The raw materials in a pottery vessel are not directly comparable to the final artefact in the same way that a stone object would be. The clay goes through a number of anthropogenic stages, indeed alterations, to become a vessel. In the first instance the raw clay is processed to some degree by the potter. At a minimum, any obvious large inclusions such as roots and stones will be removed, but it might be dried and crushed, or levigated; inclusions may be added to it in the form of temper (in this case quartz sand), designed to improve the workability of the clay and its ability to dry and fire without cracking, as well as improving its thermal and mechanical strength; different clays might even be mixed. A vessel can then be formed and fired. It may be used for a number of different purposes, some of which will leave traces on the vessel or within its walls. At some point it will be disposed of and become buried, and may then be affected by the post-depositional environment. Other complications include the possibility that a single potter or workshop might use different clays or preparation methods for vessels with different intended uses.

The anthropogenic processes the clay goes through from clay bed to vessel has led many authors to suggest that a control material is used to act as a bridge between the raw clay and the final vessel, such as a kiln waster or vessel of known provenance (Pollard and Heron 2008, 100). On the whole this seems to be preferred to the direct comparison of pottery to a clay source. Although there are no kiln sites/wasters for the Early to Middle Iron Age Poole Harbour wares, there are for the Romano-British Black-burnished ware, but Orton and Hughes warn ‘it is very important to compare sherds of similar chronological period, because of the very probable use by potters of different clay sources (and preparation techniques) at different periods’ (Orton and Hughes 2013, 169).

Wilson and Pollard (2001, 508) state the success of the provenance hypothesis is surprising given the underlying assumptions, and had they all been met, the study may not have been conducted. Furthermore, they state that the provenancing of ceramics ‘generally remain an outstanding success story, in spite of the inherent complications of the production cycle’ (Wilson and Pollard 2001, 514).

2.4.1 Choice of instrumentation

A wide range of techniques are employed by researchers involved in provenance studies of ceramic material. Pollard and Heron advocate the use of a technique capable of measuring the trace and ultra-trace elements as ‘they are extremely unlikely to represent deliberate additions to the fabric, and therefore give a true reflection of the geochemical ‘fingerprint’ of the clay sources’ (Pollard and Heron 2008, 101). Wilson and Pollard (2001, 508) have argued that the trace elements ‘are less susceptible to anthropogenic control than the major and minor elements’ and Tite (1999, 200) also states that they are less mobile in the burial environment than some of the major elements that may be leached from the pottery, including sodium, potassium, magnesium and calcium. Most researchers recommend analysis of as many elements as possible to provide ‘the secure statistical basis for defining differences between sources’ (Orton and Hughes 2013, 168). Mommsen argued that if 20-25 elements are measured with high enough ‘elemental precision’, the resultant ‘elemental pattern’ has a high probability of being unique (Mommsen 2001, 658). A number of elements are routinely excluded from analysis, including those that may be affected by the post-depositional environment, principally barium, calcium, potassium, sodium and phosphorus. Mommsen (2001, 658; 2004, 268-9) argues that firing temperature has negligible effect on element concentrations in the 30 elements commonly analysed by Neutron Activation Analysis (NAA), with the exception of bromine. This leaves ‘slightly more than forty elements which ideally we should attempt to quantify', with twenty to thirty elements commonly analysed (Orton and Hughes 2013, 170).

The dominant inclusion in the Poole Harbour wares is quartz, a highly ubiquitous mineral, therefore petrology alone is not sufficient to provenance these vessels, although the technique is useful in the definition of fabrics and can provide evidence of raw clay processing. David Peacock and David Williams successfully used heavy mineral analysis to define the broad source area of this type of pottery, but not to identify the actual clay sources or to distinguish between production sites. Neutron activation analysis has provided interesting results for the analysis of Late Iron Age pottery from this area, recovered from Maiden Castle, however this technique has become less popular in recent years due to the difficulties in accessing nuclear facilities and the increasing availability of inductively coupled plasma spectrometry. The latter technique (specifically inductively coupled plasma-atomic emission spectrometry, ICP-AES) was used to examine vessels of Bronze Age date from Bestwall Quarry, Wareham (Walsh 2009).

Inductively coupled plasma spectrometry is a bulk analysis technique, homogenising the complete sample, and therefore clay and sand. As it is the clay that is the subject of this particular research, techniques that would analyse only this aspect of the pottery, such as scanning electron microscopy with energy-dispersive X-ray spectrometry (SEM-EDS), were also considered, as this could focus on a specific point within the sherd, but the technique is more limited in its ability to determine the trace elements. It was therefore decided to use ICP-OES to examine the question of clay source.

2.4.2 Dilution effect

Pottery combines a naturally occurring material in its raw state, the clay, and an intervention on the part of the potter to transform it to a material suitable for their purpose, often including the addition of temper. Compositional analysis of pottery must therefore take account of the cultural processes that will have affected the composition of the raw material. One such consideration is the effect of the quartz sand that has been added to the clay as temper. Its addition to clay can create a 'dilution effect' which in trace element analysis would 'reduce the quantities of all of the other elements measured' (Wilson and Pollard 2001, 512) and thereby create additional compositional groups (Tite 1999, 200). Furthermore, Bishop and Neff (1989, 69) suggest that 'the size distributions of the added non-plastics also contribute to compositional complexity' as the concentrations of elements within sediments 'vary depending on grain size'. Olin and Sayre (1971, 200) argue that if a pure material, such as quartz, has reduced the concentrations of the elements in a sample by the same fraction, then 'division by this fraction *f* would correct the measured concentrations to what they would have been had the dilution not occurred'. The use of other types of temper might also enrich the elemental concentrations (Bishop and Neff 1989, 69). Additionally, Leese *et al.* (1989, 244) have argued that when quartz sand is added to a clay, the elemental concentrations will be diluted by the same amount and therefore the elemental ratios are unaffected. They also note the naturally occurring sand in the clay may also have a diluting effect.

2.4.3 Data analysis

A number of techniques may be used to interpret the data generated by the ICP analysis, with Principal Component Analysis (PCA) perhaps the most widely used in the provenancing of archaeological ceramics (Wilson and Pollard 2001, 509; Orton and Hughes 2013, 176). This is a data reduction technique, described by Baxter and Freestone (2006, 512) as an 'exploratory, pattern-seeking tool for identifying structure in archaeological data sets'. It considers each sample as a point in a multidimensional space that is 'defined by the measured variables'; samples that are chemically similar will group together in this space and form groups, suggesting the same source (Pollard and Wilson 2001, 509). Pollard and Wilson (2001, 510) state that provenance studies can only refute a match between source and object and that any matches remain possibilities rather than confirmed sources.

There has been considerable debate on data treatments prior to statistical analysis, with some researchers using the data with its original values (parts per million, for example), and others taking logarithms of the data. Some normalise their data to

100%, whereby the elements selected for analysis are transformed to sum 100%; others use the data as a sub-set of the variables. Orton and Hughes suggest taking logarithms (usually base 10) of the concentrations of all the elements before submitting the data to PCA – 'to avoid the principal components being dominated by elements whose concentrations are just numerically larger' (Orton and Hughes 2013, 177). This is echoed by a number of other authors, including Bishop and Neff (1989, 63), Baxter (2001, 685) and Baxter and Freestone (2006, 512). Furthermore, log transformation may 'convert a variable with a skew distribution to one having a more nearly symmetrical distribution' (Baxter 2001, 685). Principal Component Analysis may be supported by additional analysis, particularly cluster analysis.

Baxter and Freestone (2006, 512) have discussed the use of log-ratio analysis (LRA), first advocated by Aitchison (1986) and developed by Buxeda i Garrigós (1999). In the case of fully compositional data, i.e. the sum of the variables is 100%, LRA scales the variable values for a case 'either by dividing by the geometric mean of values for the case, or by the value for a selected variable, and then taking logarithms' (Baxter 2008, 974). In the case of sub-compositional data, where the variables are a sub-set of the fully compositional data, the 'values are rescaled to be fully compositional before doing this' (*ibid.*). Baxter and Freestone have identified that results obtained using LRA may be 'overly influenced by minor oxides, present at low absolute levels and not 'structure carrying', that dominate the LRA to no good effect because of their high relative variance' (Baxter and Freestone 2006, 513). They also state that 'LRA can miss important features of a data set, precisely because of the focus of ratios and relative variation at the expense of absolute differences' (*ibid.* 516). Baxter and Freestone used a number of real and simulated examples to assess the use of LRA and found that although proponents of the technique stress 'the importance of relative as opposed to absolute variation in the components of a composition', the 'absolute differences can reflect the use of different recipes or source material' (Baxter and Freestone 2006, 523). Furthermore, Baxter (2008, 974) states that 'by happy chance it turns out that analyses of sub-compositional data of trace elements based on logarithmic transformation are mathematically more or less the same as a log-ratio analysis'.

2.5 Conclusion

Heavy mineral analysis of Romano-British Black-burnished ware pottery by David Peacock and David Williams established that this ubiquitous coarseware was manufactured in Dorset, using the sands that outcrop around the southern shores of Poole Harbour. They were also able to prove that this industry was born out of an already successful tradition during the Late Iron Age, and David Williams has furthermore provided tantalising evidence of still much earlier production, extending back into the Early Iron Age. The conclusions of the analysis by Peacock and Williams were based on the presence of a high tenor of tourmaline in the mineral assemblages of the pottery, indicative of a source ultimately related to the granites of the south-west. Studies of the geology of the Poole Harbour area reveal that the tertiary deposits of the Hampshire Basin initially derived from rivers flowing from the south-west. Pottery production sites have been found around Poole Harbour, supporting the theory that the Wareham/Poole Harbour area of south-east Dorset was the origin of this pottery. The evidence for this production will be presented in Chapter 3.

Compositional analysis of a small number of clay and sand samples, and of Late Iron Age pottery from Maiden Castle, by Belinda Coulston, suggested a possible source for the clay in the Wealden Beds deposits of Swanage Bay, and a source for the sand along the southern shores of Poole Harbour, at Shipstal Point. Williams (1975, 49) too had suggested the possibility that a potter may be prepared to travel further afield for clay. The geological literature indicates that it was not only the tertiary deposits of the Hampshire Basin that derived from the south-west, but also the Cretaceous deposits that are to be found to the south of the Purbeck Ridge (*c.* 7m from the known production sites) and it is therefore prudent to include Wealden clays, found to the south of the ridge, as well as the Poole Formation clays of the Hampshire Basin, in any consideration of clay source.

Coulston also found that not all vessels that might be classified as a Poole Harbour wares in terms of form and fabric were actually made around the Harbour. She identified that another source, located in the immediate vicinity of Maiden Castle, was utilised by potters creating vessels in typical Late Iron Age Poole Harbour forms, and also copies of Armorican cordoned jars and bowls. Petrological analysis carried out by Coulston indicated no evidence of fabric and form correlation in the Poole Harbour wares, with variations in quartz grain size thought to relate to varying sand deposits exploited by different workshops, each exploiting the same clay source and making the full range of Late Iron Age forms. Her research indicates there is potential to provenance the Late Iron Age Poole Harbour wares – she suggested it could be expanded to investigate other sites and to undertake a more thorough programme of clay sampling.

Chapter 3

Pottery and brick production around Poole Harbour and Wareham

The Tertiary clays and sands around Poole Harbour and the Isle of Purbeck have been exploited for ceramic production for at least 4000 years, from the Beaker period to the present day. This chapter will examine the evidence for pottery production in this area of Dorset, from the Bronze Age through to the medieval period, and present a summary of the exploitation of the clays of this area during the 17th to 21st centuries. Supplementary information on this later production is included in Appendix B.

3.1 Prehistoric and Romano-British pottery production

The earliest evidence for pottery production in Dorset was discovered at Bestwall Quarry, Wareham, but this was of Beaker and grog and flint-tempered wares. To date, no evidence for the production of the Early to Middle Iron Age Poole Harbour sandy wares has been identified, and the earliest traces of the production of the these wares comes from sites of Late Iron Age date.

3.1.1 Bronze Age pottery production at Bestwall Quarry, Wareham

The site at Bestwall Quarry, close to Poole Harbour just east of Wareham, has produced evidence of Bronze Age pottery production. A deposit of wasters was found in the upper fills of Beaker pit G128, amongst normally fired pottery. Evidence for over-firing included distorted sherds, and grey and lightweight material. Two vessels also demonstrated fire-clouding, typical of re-firing (Woodward 2009, 255). Two radiocarbon dates from this pit provide a date of 2340-2200 cal BC (95% confidence) for the use of this pit (Bayliss *et al.* 2009, 133). A second Beaker pit, H429, appeared to contain remains from a firing, including charcoal and partly fired clay, but no pottery wasters (Woodward 2009, 255).

The remains of a clamp firing of Middle Bronze Age date were evidenced by an ‘intensely burnt’ circular area, associated with charcoal and quernstone fragments;

the latter may have been used in the processing of raw materials by the potters. A large, biconical vessel from this area was burnt, whilst a small biconical vessel was distorted; both were in a grog and flint-tempered fabric (Woodward 2009, 253). A second possible firing area of this date was suggested by the presence of a deposit of raw clay, flint and charcoal. A possible pit-clamp was also identified (H198), with fired clay and charcoal deposits found in the base of the pit, whilst a pottery waster and fired clay cylinders, possibly oven/kiln furniture, were found at the top and edges of the pit. Another Middle Bronze Age pit, J712, contained 'a deposit of perforated clay cylinders and charcoal', but no wasters or evidence of *in-situ* firing (Woodward 2009, 253).

A deposit of black ash, partially fired clay and pottery wasters were found in Late Bronze Age pit G313, interpreted as the 'redeposited debris from a firing area' (Woodward 2009, 255). A Late Bronze Age waster also appeared to have been deliberately deposited in a pit (P1491).

3.1.2 Early to Middle Iron Age pottery production

There is currently no known evidence of pottery production during the Early to Middle Iron Age periods from the area around Poole Harbour. This may be a result of a number of factors, including the faint traces left by clamp/bonfire firings in the archaeological record, although such evidence has been recognised at Bestwall Quarry, and undated ashy deposits have been noted at some of the sites discussed below. The southern shores of Poole Harbour have suffered little development, and consequently, a fairly limited amount of archaeological investigation has been carried out in this area; it may therefore be that production was carried out in areas not yet investigated, including below the current low water mark.

Table 3.1a Black Burnished ware production sites, or suspected sites of production

Fig ref.	Parish/District Site	Location (NGR)	Monument No.	NMR No.	Description	References
Arne, Purbeck (Figure 3.1)						
1	Shipstal Point	SY 9820 8815	456624		Debris that may have resulted from salt extraction or pottery production and a fired clay floor, of probable 1st/2nd century AD date.	Smith, 1935, 16-17; RCHM (1970, 593), no. 54; Swan 1984, 261
2	N. of Bank Gate Cottages	SY 9574 8723	456637	SY 98 NE 10	Oxidised sherds and briquetage. Pottery of early and late Roman date, briquetage includes containers and one support fragment. Revealed by ploughing.	Farrar (1963, 140); RCHM (1970, 593), no. 52; Swan 1984, 260
3	Nutcrack Lane and Stickland's Gardens, Stoborough	SY 92618 86341	456686	SY 98 NW 14	Clay-lined vat/basin, possibly a pit kiln; remains of clamp firings; dumps of pottery wasters.	Summarised in Lyne (2003); RCHM (1970, 592), no. 50; Swan 1984, 259
4	Worgret, west of The Purbeck School	SY 9125 8690	456691	SY 98 NW 17	LIA to LRB settlement and pottery production. Pit clamp of late 1st/early 2nd century AD and kilns of 2nd century and later date. Also other features associated with pottery production.	Richardson (1915); Farrar 1953; Hearne and Smith 1991; RCHM (1970, 592), no. 49; Swan 1984, 259
5	Redcliff Farm, Ridge	SY 93219 86618	456724	SY 98 NW 36	RB pottery production, C1st to 4th AD.	Various phases of work, all summarised in Lyne 2003; Swan 1984, 260
6	Big Wood, near Shipstal	SY 9760 8843			1st/2nd century AD oxidised pottery and ashy soils found in rabbit burrows.	Farrar 1955; RCHM (1970, 593), no. 53; Swan 1984, 261
Corfe Castle, Purbeck (Figure 3.1)						
7	Fitzworth Point	SY 99244 86741	456628	SY 98 NE 5	Occupation evidence and two possible working areas with oxidised pottery of 1st-4th century AD date, unfired clay, briquetage containers and props.	Calkin 1949; Farrar (1950); RCHM (1970, 597), no. 226; Swan 1984, 262-3
8	Cleavel Point, Ower	SZ 0005 8603	456632	SZ 08 NW 135	LIA and RB (3rd to 4th century) settlement, pottery production and salt extraction; evidence for small scale working of mudstone, limestone, shale and ironworking.	Farrar 1952; Farrar 1963; RCHM Dorset 2 (1970, 597-8), 227; Woodward 1978; Swan 1984, 261-2

Table 3.1b Black Burnished ware production sites, or suspected sites of production

9	Old Landing Stage, Green Island	SZ 0070 8679			Listed by Swan as a site of possible pottery production, but little evidence for this. There are some oxidised sherds in Poole Museum, some fired clay from the 2003 Time Team excavation may have come from oven/kiln/hearths/furnaces; also areas of burnt deposits.	RCHM (1970, 597), no. 224; Wessex Archaeology (2003); Swan 1984, 262
10	West of Corfe River	SY 966 853			Remains of a possible pit clamp, LIA.	Cox and Hearne (1991)
11	East of Corfe River	SY 969 854	1135771	SY 98 NE 24	Possible remains of pit clamps; deposits of waste from probable pottery manufacture in a ditch and a scoop.	Cox and Hearne 1991
12	Norden	SY 9564 8271	456816	SY 98 SE 24	RB settlement, inhumations, three ovens/kilns, possibly from pottery manufacture. Other materials worked include shale, mudstone, chalk and Purbeck marble.	Farrar 1952; RCHM (1970, 598), no. 230; Sunter 1987; Cox and Hearne 1991; Swan 1984, 263
13	Sandyhill Copse	SY 9695 8157			Large, fragile pieces of LIA/ERB pottery and spreads of burnt and unburnt clay revealed during fieldwalking, thought to 'possibly indicate a site of specialised character such as a kiln' (Farrar 1963, 114).	Farrar 1963; RCHM (1970, 599), no. 233
Corfe Mullen, East Dorset (Fig. 3.2)						
14	East End Ballast Pit (Site B)	SY 99211 98287	457141	SY 99 NE 8	1st century AD pottery kiln producing flagons, mortaria, bead-rimmed bowls and jars, and an upright-necked jar, but not using the Poole Harbour Tertiary clays.	Calkin 1935; Swan 1984, 264; RCHM (1970) 600, no. 24
15	East End Ballast Pit (Site A)	Near to East End Ballast Pit Site A (?SY 992 983)			Group of 6 oxidised Late Roman vessels in a pit with burnt soil and fired clay.	Farrar 1969; Swan 1984, 263; RCHM (1970) 600, no. 24

Table 3.1c Black Burnished ware production sites, or suspected sites of production

East Holme, Purbeck (Fig. 3.1)						
16	East Holme	SY 896 859	455224	SY 88 NE 28	Clay bowl-shaped structure overlying pit, containing ash and pottery, of 2nd to 4th century date. Fired clay included fragments wrapped around vessels during firing.	Beavis 1972; Jones forthcoming
Milton Abbas, North Dorset (Fig. 3.2)						
17	Bagber Farm	SY 800 992	455842	SY 89 NW 4	Possible site of pottery production, but probably not of BB1.	Mansel-Pleydell 1896; Farrar 1973; Swan 1984, 264
Poole (Fig. 3.1)						
18	Lake, Hamworthy	SY 980 907	457377	SY 99 SE 3	RB lamp and pottery found in clay pit.	Smith 1931, 126-7; RCHM 1970, 603
19	Hamworthy	SZ 0025 9045	458241	SZ 09 SW 19	Pottery production and salt extraction during LIA and 3rd century AD.	Smith 1931; RCHM 1970, 603, no. 402; Lyne 1994
Steeple, Purbeck (Fig. 3.1)						
20	Creech Grange	SY 911 822	456986		Finds include 'much black and red' pottery, of 2nd to 3rd century AD date, three stone pillars 'thought to be supports for a drying floor' and perforated clay plate fragments ; none survive and production unconfirmed.	
Stinsford, West Dorset (Fig. 3.2)						
21	Bockhampton Cross	SY 72150 91691			Possible pottery kiln containing mid to late 4th century AD wasters.	Wessex Archaeology 2008
Studland, Purbeck (Fig. 3.1)						
22	Godlingston Heath (VGS)	SZ 0147 8212	457657	SZ 08 SW 38	Briquetage (props and containers) and RB pottery, some oxidised sherds (2nd to 3rd century AD); deposits of clay and sand with evidence of burning. A large, curved piece of fired clay, possibly from an oven/kiln.	Farrar 1963, 141-142; RCHM 1970, 609, no. 45; Swan 1984, 264
Wareham Town, Purbeck (Fig. 3.1)						
23	Bestwall Quarry	SY 94163 88045	1122593	SY 98 NW 82	EBA - RB settlement. Possible LIA pottery production. Large-scale pottery production during 3rd to early 5th centuries AD: 32 kilns, two driers, nine possible structures and clay-filled pits, within ditched enclosures.	Ladle 2012

3.1.3 Late Iron Age and Romano-British pottery production

A total of 23 locations around Poole Harbour have produced certain or possible evidence of pottery production during the Late Iron Age and Romano-British periods (Table 3.1a-c, Figures 3.1-3.2). Many of these result from field observations with limited or no sub-surface investigation, but pottery production is suspected on the basis of the presence of oxidised sherds of Black-burnished ware (BB1) ware, presumed to be firing failures, sometimes in association with ashy soils, fired clay fragments or burnt areas of ground. This is the case for sites such as Shipstal Point (Table 3.1, site 1), Bank Gate Cottages (site 2), Big Wood (site 6), Fitzworth Point (site 7), Old Landing Stage, Green Island (site 9), Sandyhills Copse (site 13), Creech Grange (site 20) and Godlingston Heath (site 22). Separating the evidence for the production of pottery and the extraction of salt is often problematic, with both producing quite similar oxidised, sandy ceramic remains and kiln material. There is undisputed evidence for pottery production at Bestwall Quarry (site 23), Worgret (site 4), Redcliff Farm (site 5) and Ower (site 8).

Late Iron Age to early Romano-British production

The earliest possible evidence for production of the sandy wares variously known as Poole Harbour ware, Durotrigian ware, and Black-burnished ware comes from East of Corfe River, West of Corfe River (Cox and Hearne 1991), and Bestwall Quarry (Ladle 2012, 306), in the form of the suspected remains of surface or pit clamps dating to the Late Iron Age period (1^{st} century BC to 1^{st} century AD). This method of firing continued into the post-conquest period, with examples from Worgret, Redcliff Farm, Stickland’s Gardens, and possibly Ower. The evidence from these sites is discussed in the following sections.

East of Corfe River (Figure 3.1, site 11)

The Late Iron Age phase of activity at the East of Corfe River site comprised a series of enclosures and other features associated with settlement and industrial activity. Salt extraction was carried out on a fairly intensive scale, and there was circumstantial evidence for pottery production. One of the enclosure ditches contained a black, ashy deposit incorporating 57kg of pottery (mostly large, oxidised jar fragments) and 10kg of fired clay (including oven/kiln furniture and hearth lining) and fuel ash slag, interpreted as the remains of a bonfire clamp (Cox and Hearne 1991, 38).

A steep-sided, sub-rectangular pit, 0.67m wide and 2.0m long, was interpreted as a kiln or furnace (Figure 3.3; Cox and Hearne 1991, 38, feature 2914). The sides had been lined and re-lined on four occasions, with different coloured clays. An archaeomagnetic determination of 250-150 cal BC (68% confidence) was obtained for the linings (Cox and Hearne 1991, 38). The excavators suggested that it may have been 'composed of a sunken trench flue with the firing probably taking place within a clamp located on the top of the trench' and is therefore 'an intermediate stage of development between a clamp and a simple updraft kiln' (Cox and Hearne 1991, 39). Two meters to the south was an ovoid-shaped pit, feature 2927 (Figure 3.3), again steep-sided, 1.15m long, 0.09m wide and 0.45m deep. It had been partially filled by a deposit of ball clay, a layer of dark silt and another clay deposit, although the colour of this clay is unknown (Cox and Hearne 1991, 38).

A scoop, cut into the corner of an enclosure ditch, was thought to represent 'the base of a hearth or small oven', but was badly truncated (Cox and Hearne 1991, 38, feature 2912). Patches of an orange fired clay lined the base of the scoop. The practice of siting firing structures in or near out-of-use ditches in this area has been noted elsewhere (e.g. at Ower [Woodward 1987a, 64], Worgret [Hearne and Smith 1992, 62] and Bestwall Quarry [Ladle 2012, 73]).

<u>West of Corfe River (Figure 3.1, site 10)</u>

At West of Corfe River, an irregularly shaped, clay-lined feature (3040), up to 2.6 x 2.2 x 0.5m in size, had been infilled with a layer of burnt and fired clay and a large deposit of pottery. Three stakeholes were visible in the lower layer of clay and a deeper, circular cut, 1.4 x 0.5m, was present at one end of the feature. Cox and Hearne (1991, 69) suggested it may be the remains of a clamp for firing pottery.

Bestwall Quarry (Figure 3.1, site 23)

Indirect evidence of possible pottery production during the Late Iron Age period has also been recorded at Bestwall Quarry. The fills of pit Z1810 included large amounts of ash, charcoal and pottery sherds. Ditch Z23 contained a large amount of pottery, 'including some spalled pieces, together with raw and fired clay', some possible oven debris, 'and a pebble burnisher' (Ladle 2012, 101). Ditch Z1705 also contained large quantities of pottery, fired clay, heathstone and a complete upper quern stone, although it is not known if the pottery included any firing failures.

Worgret, Wareham (Figure 3.1, site 4)

Construction of an army camp at Worgret, just west of Wareham, during World War I, uncovered a large quantity of Roman pottery, and it was suggested as the location of a 'Roman pottery works' (Richardson 1915, xl-xli). However, it was not until the construction of the Wareham by-pass during 1985-6 that the site was excavated. The earliest evidence of pottery production was a possible pit clamp, described as 'an oval, scoop-like, pit' (feature 140), cut into the upper fills of a Late Iron Age (earlier 1st century BC) enclosure ditch (Hearne and Smith 1992, 61). It measured 7.1 x 2.9m and 0.6m deep. A clay lining with occasional limestone and sandstone blocks survived on one side. Thirteen stakeholes were recorded in this clay lining, possibly the remains of a structure within the pit. Its fills were comprised of ashy sands with a large collection of pottery, including distorted and spalled examples, of Durotrigian and post-Conquest forms, dating to the late 1st to early 2nd century AD (Hearne and Smith 1992, 62).

There was no evidence for pottery production during the pre-conquest occupation of the site, although given the use of the site for pottery production from the early Romano-British period onwards, and the expanded distribution (and therefore production) of Poole Harbour wares from the 1st century BC, 'it is highly likely that pottery production, at some level, was undertaken on the site during the first century BC' (Hearne 1992c, 98). Although undated, spreads of reddish clay on the site may have resulted from a surface/bonfire firing (Hearne and Smith 1992, 71).

Redcliff Farm, Arne (Figure 3.1, site 5)

Redcliff Farm, Arne, was first identified as a site of pottery production by P. A. Brown in 1953. He excavated a number of test-pits, with later excavations carried out by Ray Farrar. Farrar suggested three phases of pottery production at the site, the first relating to evidence of a surface clamp firing of mid 1st to early 2nd century AD date, comprising 'a large oval patch of blackened sandy loam 7.00 by 5.00m' (Lyne 2003, 49). The second phase, dating to the 2nd century AD, again represented a surface clamp firing but to higher temperatures than the preceding phase (on the basis of soil observations from the base, Allen 2003, 90). It comprised an approximately circular area of burning, 4.5m in diameter. A possible firing structure was also noted within a ditch but was beyond the area of excavation. The third phase is discussed below.

Stoborough (Figure 3.1, site 3)

Four sites excavated by P. A. Brown and H. Burr in the early 1950s were located around Stoborough. Test-pits north of Nutcrack Lane revealed a clay-lined vat, 0.9m internal diameter and 0.6m deep, with a drainage hole in the base and a narrow tongue or platform of puddled chalk on the western side. A series of stakeholes were found around the rim of the feature, possibly to hold a windbreak or other structural component (Lyne 2003, 57). The vat contained fragments of heathstone, ash and pottery of 1st to 2nd century AD date. It had been cut through a series of ashy dumps, up to 1.5m thick, containing a large quantity of Late Iron Age pottery. Some 'showed shrinkage cracks in firing and were possibly from kiln 'wasters'' (Farrar 1953, 96). The vat was interpreted as a possible potter's clay-puddling hole by Farrar (1953, 96) but re-examined by Malcolm Lyne who noted it was similar to an example from Worgret and therefore suggested it may have been a pit kiln, of 2nd century AD date (Lyne 2003, 57).

At Stickland's Gardens, Stoborough, a layer of red 'ash', containing Durotrigian pottery and some 2nd century material, was identified by Brown and Burr during 1952 and 1953. Layers of ash and pottery were also recorded from another site located to the south-east of the village. Although little of the pottery survived, it did include ‘bloated and discoloured wasters’ (Lyne 2003, 57).

Cleavel Point, Ower (Figure 3.1, site 8)

There was no direct evidence for pottery production at Ower during the late 1st century AD occupation, however the burnt deposits from this phase may have derived from open firings that left little trace in the archaeological record.

Corfe Mullen (Figure 3.2, site 14)

A pottery kiln at Corfe Mullen was discovered by workmen in a gravel quarry during 1932, and excavated by J. Bernard Calkin a few months later. The fill of the stokehole contained pottery wasters, often under-fired, and lumps of prepared clay including ‘some 15 to 20 lumps of white clay, and a few lumps of mixed red and grey clay’, as well as ‘two piles of brown loamy clay’ (Calkin 1935, 44). The remains of approximately 200 vessels indicated the potters were making a more specialised range of vessels than the Poole Harbour potters, mainly Romanised forms such as flagons and mortaria, and may therefore have come into existence to supplement the needs of the army for vessels not made by the Poole Harbour potters (Williams 1975, 13). They also manufactured wheel-finished bead-rimmed jars and bowls, and wheel-turned versions of Brailsford’s (1958) type 5 upright-rimmed jar. Analysis of one of the necked jars by David Williams found it to contain a completely different heavy mineral suite to the typical, tourmaline-rich, Poole Harbour wares, and therefore it is likely that the potters at Corfe Mullen exploited the Reading Formation deposits of London Clay. The kilns were in operation during the middle of the 1st century AD, post-conquest, but not for long, perhaps because they were not able to compete with the larger Poole Harbour industry.

Pottery production during the 2nd to 5th centuries AD: firing structures

Evidence, or suspected evidence, for the production of Romano-British Black-burnished wares from the 2nd century onwards has been identified at ten sites and is presented below. The first part of this section discusses the evidence for the actual firing of pottery, and the second section looks at evidence for other aspects of the production process, including the possible quarrying, processing and storage of clay; drying of vessels; working areas and structures.

<u>Worgret (Figure 3.1, site 4)</u>

Three firing structures of mid 2nd to early 3rd century AD date were identified at Worgret. Kiln 46 was, like the earlier pit-clamp from this site, located in a ditch. It comprised a 'clay-walled, sub-circular chamber and a stone and clay flue' (Figure 3.4; Hearne and Smith 1992, 62). The chamber measured 0.48m diameter, with sides surviving to a height of 0.4m. Its internal surface and walls were a yellowish-red colour. The flue (0.95m long and 0.33m wide internally) was formed from two parallel rows of stone blocks set in clay, terminating in the stoke pit. The entire structure was 1.85m long. Large quantities of 'broken, oxidised BB1 sherds' within the chamber were thought to represent the last load of the kiln before the chamber collapsed (Hearne and Smith 1992, 62-4). There was no evidence of an inbuilt floor or a raised floor in the kiln.

A second possible kiln, or drying oven (feature 36), sited in a ditch, comprised a 'sub-circular, clay-walled chamber, 1.60m long', surviving to a height of 0.5m, and of 'substantial thickness', up to 0.3m (Figure 3.5). The walls sloped from a diameter of 0.7m at the uppermost surviving area to 0.36m at the base. It too was a yellowish-red colour internally, and appeared to have been re-lined. There was no evidence for a raised floor. A layer of ashy sand was found at the base of the chamber, overlain by clay fragments from the collapse of the structure. One end appeared to run into a ditch, and this was possibly used as a rake-out area, although ashy deposits were not recovered from the ditch. The kiln/oven contained a single vessel leading excavators to suggest it may have been used as a drying oven rather than a kiln (Hearne and Smith 1992, 66). A spread of burnt clay (1.75 x 0.8m) in part appeared to form a semi-circular area and lead to stone blocks set in clay, possibly the remains of another firing structure (feature 174).

Two kilns of 3rd to 4th century date were also identified at Worgret, located within two metres of each other, and adjacent to feature 174 (Figure 3.6). Kiln 160 was 2.15 x 0.9m, having a sub-rectangular chamber with a rounded end. It had vertical clay walls, occasionally incorporating stone blocks, with a height of up to 0.34m surviving. At the western end the walls were 0.1-0.15mm thick, becoming thicker at the eastern end of the structure. The chamber appeared to be elongated but there was no obvious flue. The stoke pit was well-defined and had been off-set from the chamber. There was no evidence for a clay floor or raised floor within the chamber (Hearne and Smith 1992, 68). Oxidised, over-fired late Romano-British BB1 and kiln stackers had been dumped in the chamber, but did not represent a final kiln load. Kiln 161 was a more complex structure, a total of 2.4m in length, and 1.45m wide. Unlike the other firing structures and kilns on the site, its chamber had a solid stone floor. Relining of the clay walls resulted in a final thickness of 0.4m, reducing the internal dimensions of the final chamber to 1.15 x 0.75m. There was no clear evidence for a flue, although there were 'short lengths of straightened clay walling, incorporating a few stone blocks', at the western end of the chamber. An ash-filled scoop represented the stoke pit. The chamber contained a similar, but smaller, deposit of over-fired pottery, again thought to represent material dumped after the kilns had gone out of use, rather than a failed final load (Hearne and Smith 1992, 69).

A further seven kilns were recorded during a watching brief, including 'a well preserved clay and stone kiln', with 'outer stone wall and inner clay lining' and a 'short but well-defined stone flue'. The pottery contained in its fill was of 4th century date (Hearne and Smith 1992, 71).

<u>Redcliff Farm, Arne (Figure 3.1, site 5)</u>

The third phase of pottery production at Redcliff Farm (phases 1 and 2 are discussed above) was dated to the early 3rd century, and included evidence for a firing structure constructed in the natural hillslope, in the south-west end of a gully (Lyne 2003, 52).

Although not recognised as such at the time of excavation, information was reconstructed from photographs, suggesting an oval reddened area, 2 x 1.5m, upon which were 'several complete and nearly complete vessels – presumably discarded from the last pot load' (Lyne 2003, 52). This area extended into a gully, becoming brighter in colour, possibly indicating a flue area. Away from the structure, the gully contained 'large numbers of complete and semi-complete wasters' (Lyne 2003, 52). Another area of the site contained large quantities of 4th century AD pottery, including complete vessels, the base of a possible kiln and evidence of a living or working area, probably the latter.

Bestwall Quarry (Figure 3.1, site 23)

The site at Bestwall Quarry has provided wide-ranging evidence for extensive pottery production from the early 3rd century through to the 5th century. A total of 32 kilns were excavated, as well as two drying ovens, pits containing raw clay, two buildings with clay floors and six sunken-featured buildings (Ladle 2012, 40). All were set within ditched enclosures.

The Bestwall kilns each comprised a firing chamber and stoke pit, generally linked by a flue. The firing chambers were all constructed from the white-firing ball-clay. Twenty five of the kilns survived to the extent that their form could be assigned to one of six types (Table 3.2; Figures 3.7-3.9). All had been dug into hollows in the Roman ground surface and were constructed with thick or thin walls of clay, many incorporating slabs of limestone and heathstone. The thick-walled structures tended to have flues comprised of 'large slabs of stone with two verticals at the side and a horizontal slab over the top' (Ladle 2012, 40). Their stoke pits were usually sub-oval in shape, and larger than the thinner-walled structures. The flues of the thinner-walled kilns, where present, were usually of clay.

Table 3.2. Summary of Black-burnished ware kiln types identified at Bestwall Quarry (after Ladle 2012, 41-42, table 4)

Type	Oven shape	Oven int. diam. (m)	Oven wall thickness (m)	Flue length (m)	Stoke pit size	Use of stone?	No. present	Date range
1	Circular	0.6-0.77	0.12-0.2	0.6-0.7	2.0-2.6 x 1.8-2.4	No	3	200-380
2	Pear-shaped	1.0 x 1.7	0.2	0.15	3.2 x 2.9	No	1	260-290
3	Circular	0.5-1.0	0.12-0.24	0.2-0.5	0.6-3.0 x 0.5-2.8	Yes	6	200-420
4	Oval and pear-shaped	0.6 x 0.8-1.2 x 0.8	0.1-0.28	0.5-0.6	2.0-2.7 x 1.3-2.1	Yes	4	300-420
5	Circular and pear-shaped	0.6 x 0.5-0.8 x 0.5	0.03-0.09	0.1-0.15	0.95-1.6 x 0.6-1.3	No	7	200-420
6	Circular and pear-shaped	0.44-0.8 x 0.6	0.03-0.07	0.26-0.4	0.9-2.2 x 0.44-0.8	Yes	4	250-420

Seven of the kilns were said to have been constructed 'over silted-up ditches' whilst a further eight were 'sited next to ditches' where the upcast could be employed for shelter and the ditch as a convenient disposal point (Ladle 2012, 73 and fig. 101).

Cleavel Point, Ower (Figure 3.1, site 8)

Cleavel Point, Ower, was first investigated in 1951 by N. H. Field and students from Poole Grammar School, at the suggestion of H. P. Smith who had found Romano-British pottery along the shoreline in 1940. They discovered part of a fired clay domed structure (1.4m diameter, 0.25m thick and 0.45m maximum height) with heat-reddened floor (0.5m thick), entered by two opposing flues, each 0.45m long and 0.25-0.3m high, of square section (Farrar 1952, 91). Quantities of briquetage and pottery were recovered from the site. It included pottery of early Romano-British date, thought to be waste from pottery manufacture (Farrar 1952, 91-92), although the structure was presumably later in date. A spread of salt boiling debris was revealed during a further investigation of the site in 1958 (Farrar 1963, 115) and by the author in 2013 (Figure 3.10 shows the extent of two spreads of material, as marked by Xs, the 2013 material by a star, and the kilns discovered in 1951 and 1978).

Excavation of the site in 1978 revealed a range of evidence for pottery production during the 3rd to 4th centuries AD. Two stone-built kilns or ovens were discovered at the northern edge of the site and preserved *in situ*. One (feature 578) had a bowl of horizontal heathstone blocks, at least three courses high and a single stone thick. It was approximately 1m diameter 'with a slightly cranked flue composed of pitched limestone blocks' (Woodward 1987a, 57). The remains of the second structure (589) comprised three courses of a limestone wall associated with pitched limestone blocks. Both were located within an artificial depression, contemporary with the possible kilns. A third kiln (feature 540; Figure 3.11) was associated with an out-of-use ditch that appeared to have been used as a rake-out area; the kiln may have been 'located in the area of the bank' (Woodward 1987a, 64). The bowl of the kiln had been constructed from heathstone blocks, with occasional limestone pieces, bedded horizontally with clay - three courses survived. It was ovate in plan, 'with a cranked flue constructed of large pieces of pitched heathstone which ran westwards into the open ditch (555)' (Woodward 1987a, 65). Ball clay found within its fill suggests this may have been used in the construction of the chamber. The pottery in the fill comprised 'large broken unabraded vessels', not obviously wasters and thereby leaving the function of this structure in question (Woodward 1987a, 65).

Norden (Figure 3.1, site 12)

A group of three ovens or kilns were excavated at Norden, all constructed of limestone set in clay (Figure 3.12). The kilns were not thought to be contemporary, and one had been 'partially demolished to form the stoke-pit' of another (Sunter 1987, 16). Kiln 1.11 was pear-shaped in plan, 1.13 x 0.7m in size, with a clay floor. Kiln 1.12 was 1.4 x 0.5m, with a floor of limestone slabs, but with no visible distinction between the flue and the oven (Figure 3.13). Kiln 1.13 was asymmetrical in plan, 1.25 x 0.7m, with a clay floor (Figure 3.14). Sunter identified all as variations of an up-draught, key-shaped kiln. The kilns contained Black-burnished ware of late 3rd century date, mostly with wiped external surfaces, and included some unusual variants but no obvious wasters (Sunter 1987). A small bar of pottery of trapezoidal section, in the same fabric as the vessels, was found in one of the kilns and may represent kiln furniture. The excavators questioned the interpretation of these features, in particular the small size of the kilns, however this is not unusual in this area. They concluded that 'pottery was manufactured on or near the site' (Sunter 1987, 18).

Hamworthy (Figure 3.1, site 19)

The site at Hamworthy was investigated by H. P. Smith, and students from South Road Boys School, during the years 1926-1928, during an extension to the site of the Carter Brothers Floor Tile Works. Workmen digging the foundations for a new kiln found 11 square-sectioned trenches, one filled by a mottled red and white clay, interpreted by Smith as having been puddled, and others contained quantities of briquetage. These features were later interpreted by Malcolm Lyne as being used for brine boiling, with parallels for this technology drawn from Armorican salt production sites of the Iron Age period, and he suggested the ideas for this may have been brought to the area by immigrant producers (Lyne 1993b, 23). He also suggested that the arrangement of three of the trenches, radially from a central pit or sump, may have formed a substructure for a pottery clamp, ‘the trenches acting as flues’ (Lyne 1993b, 25).

Smith discovered the chamber of a possible kiln, with an external diameter of 0.7m and internal diameter of 0.45m, 0.4m deep (Smith 1931, 101). Lyne has argued that Smith’s interpretation of this feature as a small kiln or oven may have been correct, despite concerns relating to its size, the absence of wasters and the presence of large quantities of briquetage incorporated into the walls (RCHM 1970, 604). Lyne (1993b, 25) notes that its size was comparable to pottery kiln 46 at Worgret and suggested that the briquetage was simply reused as a constructional material. Dating of the features at Hamworthy is problematic as the surviving archive is dominated by imported wares indicating a selective retention of the finds (Lyne 1993b, 4). However, the earliest material was of mid 1st century BC date, and the latest was of 3rd century AD date.

Smith and his students carried out further investigations at the site in 1949, excavating ‘the bases of the combustion chambers of two collapsed Romano-British pottery kilns’ (Farrar 1950, 66). They recovered briquetage from salt extraction, but there was no clear evidence of pottery manufacture. In 1974 excavations were carried out by G. Dowdell for Poole Museums on a site 60m away from Smith’s 1926-1928 works, in advance of development. The pottery recovered from the site was mostly unstratified, comprising a Late Iron Age/early Roman component and a

3rd century AD group, with an apparent break between phases. The vast majority of sherds were 'oxidised honey-brown or orange' (Lyne 1994, 105). Of note was a trend towards larger jars (*c.* 260mm) in the later period (Lyne 1994, 105). Evidence of salt production was provided by the presence of briquetage, bars and props. Lyne interpreted the finds from this phase of excavation as relating to pottery production during both phases of activity, with the larger pottery jars from the later phases used as evaporation jars in the salt production processes (Lyne 1994, 108). The evidence for pottery production from the 1926-1928 and 1949 excavations has been called into doubt (RCHM 1970, Swan 1984), however, the high levels of oxidised BB1 from the 1974 excavations are highly suggestive of pottery production on the northern shores of the Harbour, alongside salt extraction.

Other archaeological investigations at Hamworthy, including the Pilkington Tiles site (Jarvis 1980, 139), the James Brothers site at 19 Blandford Road (Tatler 2007, 129), and Shapwick Road (Coles and Pine 2009), have all produced evidence of salt production, ranging in date from the Late Iron Age period through to the 3rd century AD.

<u>East Holme (Figure 3.1, site 16)</u>

A site of possible production at East Holme was uncovered by builders in 1971, and a salvage excavation by John Beavis uncovered a shallow pit containing ash and broken pottery. A clay bowl-shaped structure overlay the pit and had evidence of burning on the interior (Beavis 1972, 161). Examination of the pottery by the present researcher has indicated the presence of fragments of fired clay that were used to support vessels during firing, and substantiates the interpretation of this site as one of late Romano-British pottery production.

<u>Corfe Mullen (Figure 3.2, site 15)</u>

A group of late 3rd to 4th century BB1 wasters, or seconds, were discovered in the vicinity of the Claudian kiln excavated by Calkin in 1929, but not published until Farrar's paper of 1969 on the findings. The exact location of the site is unknown, and was not included in Calkin's round-up of other sites 'within twenty yards of the kiln'

(Calkin 1935, 50). The five jars and one flanged bowl were laid in two rows of three in a pit. Calkin had noted they were red and distorted, although they remained almost whole, and were found with burnt earth and fired clay (Farrar 1969, 174). Of the four that were retained, Farrar notes they are not clearly wasters, but did display some fine cracking, possibly a result of their firing (Farrar 1969, 174). These vessels were not included by Williams in his programme of heavy mineral analysis, although the results of his analysis of one vessel from the Claudian kiln, with a very low tourmaline content, had indicated the potters utilised the local geology and he therefore suggested it 'highly probable' that the later vessels 'will contain similar local sand temper to the Claudian vessel….and as such have an identical suite of heavy minerals' (Williams 1975, 195). The archaeological evidence from the late Roman group of vessels is certainly suggestive of a second phase of pottery production in the area, but whether the potters used the Poole Harbour tertiary clays, or the local clays as their predecessors did, is currently unknown.

Bockhampton Cross, Stinsford (Figure 3.2, site 21)

Evidence of BB1 production outside the nucleus area of the industry was uncovered by Wessex Archaeology in 2007, during the evaluation of a proposed gas pipeline between Mappowder, Dorset and the Isle of Portland. Part of a possible kiln was revealed, located immediately to the south of the Roman road from Dorchester to Badbury Rings, and to the north of Bockhampton Cross. The structure had been cut into the gravel, the chamber was described as vertical-sided but the full shape in plan was not ascertained. It was excavated to a depth of 0.9m below the base of the trench, but the bottom of the feature was not reached. Its walls had been constructed from 'flint nodules and large fragments of re-used structural sandy mortar set into a mid grey clay-silt matrix, and lined with a thin skim of grey clay-silt' (Wessex Archaeology 2008, 23). The chamber contained 'four complete or near-complete (but clearly misfired) WA type 18 jars (cf. Seager Smith 1993) which were stacked against the chamber edge' (Wessex Archaeology 2008, 23). Also present were the fired clay fragments used to protect the vessels during firing, as seen at other BB1 productions sites (Worgret, Bestwall Quarry, East Holme), although in this instance they were made from a 'chalk-tempered clay-silt', presumably the local clay deposits. Other features in the evaluation trench included two courses of a flint-built wall and ‘a setting of thin upright and horizontally-laid tabular limestone slabs’ (Wessex Archaeology 2008, 23). The latter may have been a feature used in the preparation or storage of clay for potting, but no further details of the feature are known.

The pottery dates from the last quarter of the 4th century AD and would have been contemporary with production at Bestwall Quarry, at a time when the industry had contracted in size in terms of its British market, shrinking back to just supplying its neighbouring areas, around the modern counties of Dorset, Devon, Somerset, Wiltshire and part of Gloucestershire, with some supply into Hampshire, the Isle of Wight, West Sussex, Wales and northern France (Lyne 2012, 242). The BB1 potters were diversifying in their fabrics for the first time in around 800 years, producing a more shale/mudstone-rich, oxidised fabric, known as South-East Dorset Orange Wiped Ware (SEDOWW), alongside Black-burnished ware. Discussion of the pottery markets and economic environment during the later 4th to 5th century AD is beyond the scope of this thesis, but the possible kiln here is of considerable interest as it is located over 22km to the west of the contemporary production at Bestwall and the heartland of the BB1 industry. No further work was carried out at the site, but any future developments may shed light on this possible extension to, or offshoot of, the industry.

<u>Bagber Farm, Milton Abbas (Figure 3.2, site 17)</u>

A possible pottery kiln has been recorded at Bagber Farm, Milton Abbas. It was said to contain ‘fragmentary ware’, mostly jugs, and objects associated with pottery manufacture (Mansel-Pleydell 1886, 128). Unfortunately only one vessel remains from this site and heavy mineral analysis indicated a tourmaline rich suite suggesting it originated from the Wareham/Poole Harbour area and was not produced at the site, which is located on chalk downland (Williams 1975, 284). In view of the lack of information from the site, interpretation as a centre for the production of BB1 is now impossible.

Other features associated with pottery production during the 2nd to 5th centuries AD

As well as the actual firing structures, a number of sites have revealed evidence for the processing of clay and vessel preparation, and this is discussed below.

Dryers

Two dryers were identified at Bestwall Quarry, characterised ‘by narrow, elongated ovens constructed of heathstone and limestone and short, shallow rectangular stoke pits’ (Figure 3.15; Ladle 2012, 42, fig. 50). Feature Z622, of middle Roman date, had an oven of 1.3 x 0.4m internally, and stoke pit of 0.8m diameter. The other (Z887) was of late Roman date, with internal oven dimensions of 1.2 x 0.3m and a stoke pit of 1.7 x 0.75m (Ladle 2012, 58). Similar dryers were also found within a late Roman building (707) at Ower (Figure 3.15; Woodward 1987a, fig, 37-38). Two phases were identified - the later was composed of heathstone blocks, with three horizontally-laid courses for the bowl, and pitched stones for the upper course. It was 1.0 x 0.6m x 0.4m, with a flue of block and pitched limestone slabs, 0.3m wide. Most were dry-bedded, but with some clay (Woodward 1987a, 61). The dryer contained a dark grey sandy loam and charcoal at its base, overlain by briquetage and burnt clay, possibly from the walling. Above this were deposits of oxidised BB1 vessels, part of a quernstone, iron nails and iron bindings, thought to derive from a wooden superstructure (Woodward 1987a, 61).

Two ovens, thought to have been used to dry vessels prior to firing, were identified at Redcliff Farm, dating to the 3rd century phase of the site. They were circular in plan, approximately 0.5m in diameter, constructed of Purbeck burr stone with vertically set slabs capped by covering stones, set in hollows and with an opening for fuel on one side (Lyne 2003, 52).

Pits that may have been used for clay processing

A total of 48 pits at Bestwall Quarry contained deposits of raw clay, varying in colour from white to grey, yellow, red and brown, with some pits containing multiple colours (Ladle 2012, 59). The datable examples ranged from the Late Iron

Age through to the Late Romano-British period. These features may have been used to store clay supplies, or some may have been utilised in the levigation of clay. One of the 3rd century features (pit Z2713) contained deposits of raw clay, charcoal, ash, pottery and also a 'sterile yellow sand' (Ladle 2012, 61). Thin slabs of shale and limestone found within some of these clay-filled pits may have been used as baffles in a levigation process, causing coarser particles 'to settle and be trapped' (Rye 1981, 37). Three 4th century features (Z1184, Z1233 and Z1851) were thought to be clay puddling pits, two possibly associated with a kiln (Z227) (Lyne 2012, 244).

At Worgret, a rectangular pit with vertical sides and a flat base (feature 63; Figure 3.16), measuring 1.65 x 1.25m, and 0.44m deep, may have been used as a settling tank or to mix clay. It had been 'lined with a thick layer of yellow/grey hardened (unburnt) clay', causing the sides to slope (Hearne and Smith 1992, 71). Thin limestone slabs had been placed on the top of the clay lining at the base of the pit. A possible cover was indicated by the presence of a posthole at each corner of the feature, cut through the clay-lining. Post-packing material included limestone blocks, a quern fragment and a flat-rimmed bowl, of 2nd century AD date. The lower fill of the pit was said to be similar to the lining, 'a 'dirty' yellow clay', but with flint inclusions; the upper fill was a 'grey brown sandy silt with frequent stone inclusions' (Hearne and Smith 1992, 71). This feature was broadly contemporary with kiln 46, kiln/oven 36 and firing structure 174; but by the 3rd century it was out of use and filled with rubbish (Hearne and Smith 1992, 71). An undated scoop at Worgret (feature 80), 0.7m in diameter, had been lined with a band of grey clay, 0.4m thick, around its upper area, and filled with 'an unstructured deposit of raw clay' (Hearne and Smith 1992, 71). The colour of the clay was not noted in the report, but this feature may also have been used in the preparation of clay.

Storage boxes

'A 'box' of pitched limestone slabs', 1.0 x 1.1m and lined with limestone tiles across the base, was cut into the floor of building 707 at Ower (feature 148, Woodward 1987a, 61). A second box (152) was discovered cut into the centre of a yard surface. This was rectangular in plan, $0.35m^2$ internally, made from squared limestone blocks and with limestone tiles in the base, overlain by a layer of clay.

Petrological analysis revealed that this clay was not the potting clay (Williams 1978, 94-95). Woodward paralleled box 148 with a stone-lined clay-mixing tank at Stibbington, Nene Valley and therefore suggested the Ower box may have been utilised as a clay store (Woodward 1987a, 67).

A rectangular feature at Bestwall (Z1030), measuring 1.0 x 0.5 x 0.1m, was interpreted as a possible 'wood-lined clay-storage box', abutting a 'possible puddling floor of laid stones', and near to mid-4th century kiln Z947 (Lyne 2012, 244).

Clay quarrying

A possible clay quarry was found at Worgret (feature 55), located just 2m to the north of possible tank 63 and probably contemporary with it (2nd century AD). It was sub-circular in plan, 9 x 5.6m, and its profile indicated a number of steps and sloping sides. It was excavated to a layer of ball-clay, at a depth of 1.25m, at which point the water table was reached. It had been cut through layers of sand, gravel and clay, and its fills comprised clayey gravels and silty sands; the final fills were thought to have accumulated after the abandonment of the site (Hearne and Smith 1992, 71).

Smith's 1931 article notes that a Roman lamp and pottery sherds were found at the Doulton's Clay Works on the Lake Shore at Hamworthy, suggesting possible clay extraction during the Romano-British period (Smith 1931, 127).

Structures

Nine possible Romano-British structures, believed to have been associated with pottery production, were identified at Bestwall. Clay flooring and stone rubble were all that remained of possible 3rd century Structures 1 and 2. Post-built Structure 3 was square in plan, 3 x 3m, but may have been open on one side (Ladle 2012, 63). Three postholes adjoining this structure may represent another room. Within this room was a pit (Z2604) 'filled with prepared, sandy potters' clay' (Lyne 2012, 247). Lyne has suggested the larger room of Structure 3 may have been used as a drying room or to store fired pots (Lyne 2012, 247). Two large pits (3.8 x 2.4m and 2.8 x

2.2m) were located near to this building, both with steep sides and a flat base, one of which contained a large jar, although its lowest fills (>0.99m) were not excavated due to the watertable being reached. Possible Structures 4 and 5 were thought to have a domestic origin. Four probable sunken-floored buildings (Structures 6, 7, 8 and 9) were dated to the second half of the 4^{th} century AD. The fills of all four features contained large quantities of pottery, predominantly Black-burnished ware but also regional finewares. A hearth near the centre of Structure 9 contained oxidised pottery sherds and 'an accidentally fired clay bung from the top of a drying flagon', suggesting the building may have been used to dry vessels, and possibly for the 'decoration and finishing-off of leather-hard ones' (Lyne 2012, 247, fig. 161.13). This interpretation is strengthened by the discovery of burnishers and forming tools from in and around this structure.

A group of late Romano-British buildings at Ower, arranged around a yard, were interpreted as 'a BB1 pottery-making settlement' (Figure 3.17; Woodward 1987a, 57). Building 707 contained an internal division and a dryer (825), replaced on one occasion (as 708) after a period of rebuilding. Layers of briquetage and oxidised BB1 were excavated within and outside of the building.

Working areas

Five circular/oval depressions at Hamworthy, 'filled with very black earth', were thought to represent hut-sites (Smith 1931, 102). Evidence for iron working was identified nearby and it has since been suggested that these hut sites are more likely to represent working areas (RCHM 1970, 603).

A flint gravel spread, found near to the late Romano-British kilns at Worgret, may represent the remains of a metalled surface/working area (Hearne and Smith 1992, 72).

3.2 Interpreting the archaeological evidence

Details of various aspects of the pottery industry of the Poole Harbour region may be ascertained from the archaeological evidence and a number of experimental and ethnographic observations. Although this information predominantly relates to the Late Iron Age and Romano-British phases of the industry, many of these issues are also of relevance to the earlier stages.

3.2.1 Location

Most of the known or suspected sites of pottery production are situated along the southern shores of Poole Harbour, or near the banks of the rivers that empty into the Harbour, thereby affording easy access to inland markets via the riverine trade and onwards on the road network from Dorchester, or by sea. The sea level in the Harbour would have been approximately 1m lower during the Iron Age than current levels (Edwards 2001), at a time when Green Island and Furzey Island were probably one land block, and the production sites may have been slightly further inland, however the potters at these sites would still have had easy access to the transport routes afforded by the Harbour. It may be that some evidence for Iron Age and Romano-British pottery production exists below the current low water mark. The underlying geology of most of the production sites is the Broadstone Clay, although some, such as two of those on the Arne peninsula (Shipstal Point and Big Wood) and the inland site of Godlingston Heath, are actually situated on the Parkstone Sand, but within 250m of the Broadstone Clay. The site at Worgret is located on the Broadstone Sand, but again within 250m of the Broadstone Clay. The geology of some parts of the southern shores of the Harbour and the islands has not been mapped in detail, including the sites at Shipstal Point, Fitzworth Point and Green Island, but this area is dominated by the Broadstone Clay deposits. The bedrock geology of two possible production sites is the Creekmoor Clay (East Holme and Norden), another is on the Oakdale Clay (Hamworthy), a possible site is on the Parkstone Clay (Creech Grange, Steeple) and one suggested site is on the Wealden deposits (Sandyhill Copse, Corfe Castle). The outlying site at Bockhampton Cross is on a completely different bedrock, the Portsdown Chalk Formation.

3.2.2 Fabric

Heavy mineral analysis by David Peacock (1973) and David Williams (1975, 1977) indicated that the sand used by the Late Iron Age (Durotrigian) and Romano-British (BB1) industries originated from the Wareham/Poole Harbour area of Dorset and suggested that potters utilised the same Tertiary clay and sand sources throughout the Iron Age and Romano-British periods. In the hand specimen, the pottery of these periods is similar, and the fabric is said to have the appearance of 'cod's roe' in section (Williams 1977, 189). The sand is widely believed to have been added as temper rather than naturally occurring in the clay. Many previous researchers have been aware of the refractory properties of the sand-tempered clay and its use to prevent thermal shock during firing and subsequent use (Smith 1931; Gillam 1963; Farrar 1973; Williams 1975). This may explain the market dominance of this ware from the 1st century BC across the region, and its importance on a national scale from the early 2nd century AD. Other reasons may relate to the contents of the vessels, perhaps salt or salt-preserved foods from the other industries around the Harbour, or to social and economic factors.

3.2.3 Vessel formation

From the Iron Age to the end of the Romano-British period, the bulk of the pottery made around Poole Harbour was crafted by hand. However, a number of researchers have suggested that a handmade pot may have been placed on a slow wheel or turntable at the leather hard stage for any trimming or decorative treatment, or for the rim or flange formation (Farrar 1973, 72; Hearne 1992c, 100). Gillam and Williams both suggested the fabric would have been too coarse for wheel-turning, but note that the sand is rarely visible through the burnish (Gillam 1963, 126; Williams 1975, 22). By contrast, some of the copies of Armorican vessels, such as the cordoned jars, produced during the Late Iron Age, must have been made using a fast wheel, but these were made in finer fabrics.

3.2.4 Firing technology

Vessel firing during the Late Iron Age and early Romano-British period was carried out using surface (bonfire) and pit clamps. Swan notes that there was little technological difference between the surface and pit clamps, other than the latter afforded greater heat retention and protection from sudden draughts (Swan 1984, 54). Researchers had initially thought this firing tradition remained unchanged throughout the Romano-British period as there had been no change in the techniques of vessel formation. Vivian Swan's extensive survey of Romano-British pottery kilns includes comment on the Dorset industries: 'firing methods also seem likely to have remained unchanged, and the use of surface clamps was thus probably normal for this industry during the Romano-British period as well as during the Iron Age' (Swan 1984, 54).

Experimental firings carried out at Southampton University found that bonfire/surface clamp firing is an extremely effective method. 'There is no reasonable limit to the number of vessels that can be fired at once, and it is possible to use cheap grade fuel' (Peacock 1973, 64). They also looked at the visibility of this process in the archaeological record, by excavating the bonfire sites after the firings, and finding the underlying topsoil had been little altered, and after a period of weathering, all that remained were a few pieces of charcoal (Williams 1975, 285).

It was the Worgret excavations of 1985 and 1986 that gave archaeologists the first hint of a gradual change in technology over time, with a pit clamp of late 1st/early 2nd century AD date, but clay and stone built structures of 2nd to 4th century AD, although the later structures (encompassed by Swan's class of 'single-chambered single-flued kilns…lacking a proper raised or false oven-floor') represent a direct evolution of this technology (Swan 1984, 113-114). The evidence from Bestwall Quarry indicates the increasing use of stone to line flues and ovens during the 4th century AD (Lyne 2012, 252). A tendency towards small kilns resulted in difficulties in excavators identifying some structures as such, particularly given the number of vessels that were being produced.

The pit clamps and kilns were often situated within or next to partially infilled ditches, particularly in the 1st to 2nd centuries AD, presumably to offer some protection from sudden gusts of wind that can be detrimental to the firing. The kilns at Worgret appear to have been constructed from the iron-rich clay deposits, however all of the Bestwall kilns, and possibly the kilns at Ower, were made from white-firing clays, indicating the potters of the Romano-British period had developed a very good empirical understanding of the properties of the different clays, including the refractory qualities of the ball clay. Some structures had clay or stone bases but others did not. There was no evidence for any form of permanent floor between the oven and combustion chamber in any of the kilns. This may have been compensated for by leaving waster cooking pots lying on their sides at the base, 'with the gaps between the rows or recumbent pots acting as channels for drawing the fire' (Lyne 2012, 254). This has also been suggested for the pots at the base of a possible BB1 kiln at Bockhampton Cross.

Evidence from a number of sites indicates that the potters used fired clay stackers or setters to separate the vessels during firing. These are recovered as fired clay fragments, but were formed of clay in the same recipe as the pots (with the exception of the fragments from the outlying Bockhampton Cross), applied in a plastic state when the vessel was leather-hard and then chipped away after firing. Fragments from the necks of vessels are particularly obvious (Figure 3.18). Hearne argued that this practice allowed the circulation of hot gases, and also stabilised the load as the fuel burnt away in the floorless structures. She suggested that these stackers would have 'physically bound' the lower levels of the load together, but also notes that one of the examples on a cooking pot rim from Worgret had a flattened surface above the interior of the rim mouth, possibly indicating 'that the pots were stacked directly above one another' (Hearne 1992b, 90 and 1992c, 99). Furthermore, she suggests that these 'stackers' would have probably been placed at just two or three points around the rim, and not around the complete circumference (Hearne 1992b, 90). Lyne has also suggested the clay strips from Bestwall may have been used around vessels in the lowest tier to create cylindrical shapes and 'prevent them shattering on direct exposure to the fire in the kiln mouth' (Lyne 2012, 252). In addition, evidence of 'custom-built, pot-stands or saggers' was identified amongst the Bestwall kiln material (Lyne 2012, 252).

The ceramic load may have supported an earth-covered turf dome, and a central top vent would have allowed the escape of gases (Figure 3.19; Lyne 2012, 255). Experiments by Bill Crumbleholme indicated the kiln may have been fired for around 12 hours, the kiln becoming sealed 'when the flames became incandescent orange', and then allowed to cool for several days (Lyne 2012, 256).

3.2.5 Firing temperature

Belinda Coulston attempted to ascertain the original firing temperature of the Late Iron Age Poole Harbour wares from Maiden Castle. She used thermogravimetric analysis to measure changes in weight of a powdered pottery sample when heated under controlled conditions. The experiments indicated an original firing temperature of 700°C (Coulston 1989, 178-182).

3.2.6 Wasters

The Black-burnished ware from the production sites is often oxidised to an orange or red colour. The colours of the vessels from Worgret ranged 'from light grey/white to pink, bright orange, dark red/brown and dense black' (Hearne and Smith 1992, 84). The range of vessel distortion from this site was also noted, including spalling from 'an over-rapid rise in temperature' in the early stages of firing; fire-cracking from fast firing during the main stage of firing; and bloating, warping and vitrification in the case of extreme over-firing (Hearne 1992a, 84). Up to 88% of the kiln assemblages from Bestwall were described as discoloured (Lyne 2012). No wasters of Early or Middle Iron Age date have yet been identified.

3.2.7 Fuel

The charcoal from Redcliff indicated that mixed fuels of wood and peat/turves were used for the kilns. These included 'heather, gorse (and/or broom), birch, oak and blackthorn, as well as alder and willow', predominantly as small roundwood but with some larger billets of oak (Gale 2003, 86). Gale found no evidence of woodland management, suggesting gathering from wild sources. The use of roundwood rather than heartwood may represent a strain on resources, or they may have been selected to produce a greater heat (Ian Freestone pers. comm., in Gale 2003, 86). Gorse and heather also create a short burst of intense heat, whilst peat and turves may have been selected for a longer-lasting fire (Gale 2003, 86).

Most of the sampled charcoal at Bestwall Quarry represented narrow roundwood and twiggy material, predominantly from oak and gorse/broom, but also heather, hawthorn, blackthorn, willow/poplar and elder (Gale 2012, 277). The exception was the chamber of one of the kilns (Z822) that appeared to have been fired using only gorse/broom. At this site, Gale has suggested that the roundwood would probably have been obtained from a managed woodland and the oak may have been obtained from the area of the present woodland, to the north of the site (Gale 2012, 288). Chaff from the processing of emmer and spelt was used a fuel in some of the kilns, particularly during the 3rd century but declining in the 4th (Carruthers 2012).

Fourteen pits at East of Corfe River, of Late Iron Age date, contained oak charcoal, obtained from trees of less than 25 years old and its size was suggestive 'that coppicing or pollarding was practised to generate a steady fuel supply' (Gale 1991, 203). This is further evidence of a woodland source around the southern shores of the Harbour, although the overall picture is one of the widespread exploitation of the ericaceous vegetation, supplemented with woodland stems.

A similar, mixed, range of fuels has also been suggested for the production site at Worgret, with the use of some oak, gathering of other woods from local sources, ericaceous plants and turfs, occasionally supplemented by shale debris (Hearne 1992, 98).

3.2.8 The colour conundrum

The question of how the black colour of the vessels, particularly during the Late Iron Age and Romano-British periods, was achieved is one that was first contemplated by Smith (1931) and it still debated today. Smith suggested it was the result of a fuming process described in the *Catalogue of Antiquities in the Museum of the Wiltshire Archaeological and Natural History Society at Devizes* whereby 'before the firing is completed the vessels are smothered in dense, black smoke, the resulting black or blackish colour being due to the chemical action of the smoke and gases in combination with the iron contained in the clay, not as was formerly believed by the direct penetration of the soot, or carbon particles' (Smith 1931, 104). He also suggests that the fuel covering would have created a reducing atmosphere and the red peroxide of the iron would have been reduced to 'black magnetic oxide through the action of the carbon monoxide' (Smith 1931, 104).

Farrar considered this question on more than one occasion, and in his 1973 paper on the techniques used by the Black-burnished ware industry he recounts an ethnographic example, first presented by Henry Hodges, of a modern Turkish industry in the village of Sorkun where the women make 250,000 casseroles per annum, by hand. Each firing was of 500-600°C, with 2000-3000 pots, but up to 7000, laid in rows on the ground, downwind. A black colour is achieved by covering the vessels with 'dead pinewood and field rubbish' to ensure an ash coverage, 'grassy rubbish' is also placed inside the vessels (Farrar 1973, 93). He notes that the naturally refractory clay results in only two or three wasters. In a comment on the black colour of the Dorset Black-burnished ware vessels, Farrar (1976) argued against chemical reduction of the iron in the clay, instead suggesting a separate soot-soaking stage at a 'relatively low temperature' (Farrar 1976, 50). In this way, only vessels that had successfully survived the first firing would be 'blackened' (*ibid.*).

Shepard (1963, 106) states that black pottery is usually the result of smudging: 'black surface and paste show complete smudging or surface smudge of highly carbonaceous paste unoxidised in firing'. She describes the process of smudging as 'a means of blackening pottery by causing carbon and tarry products of combustion to be deposited on it' (Shepard 1963, 88). Shepard's ethnographic study of the Pueblo potters of the Rio Grande, New Mexico revealed that they carried out their firings in two parts, the first, to the highest temperature, was carried out in an oxidising atmosphere, but then the fuel was covered by 'a very fine, loose manure'. The Pueblo potters protect the vessels with scraps of sheet metal, but these are removed after a few minutes of the fuel being smothered. This process lasts around 15 minutes, during which the potters must ensure the flames do not burst through the covering. The result is that the 'sooty black smoke from the smoldering dung settles on the pottery, turning it a permanent black since the carbon penetrates the pores' (Shepard 1963, 88). Shepard also addresses the question of the white-firing clays, which she notes 'are free from iron oxide' and 'are the same color whether fired in oxidising or reducing atmosphere, provided there is no deposition of carbon' (Shepard 1963, 221).

Orton and Hughes (2013, 152) also examine this question, noting that the final colour of the vessel is a result of the iron and carbon contained within the clay, the temperature reached during the firing, how long that temperature is held for and the amount of oxygen present in the firing atmosphere. In an oxidising atmosphere the carbon can burn and is released as carbon dioxide. In a reducing atmosphere, or in a short firing, the carbon does not completely burn out and is evidenced by a grey/black core (Orton and Hughes 2013, 152). A black surface and margins may result from carbon being 'deposited on the surface of the pot during firing in a process known as 'smudging'' (Orton and Hughes 2013, 152). The iron compounds in the clay will be converted to ferric iron (Fe_2O_3) during firing, creating a red colour, but this change happens once the carbon has burnt off, so an iron-rich clay will still be grey if fired in an oxygen poor atmosphere (Orton and Hughes 2013, 152).

A number of researchers have re-fired small numbers of Poole Harbour ware sherds to establish the oxidised colour of the clay. Sherds from Green Island became a yellowish red colour (5YR 5/6-6/6) at 600°C and red (2.5YR 5/8) at 800°C. Cleal (1992, 101) re-fired ten sherds from the Worgret assemblage, with all except one firing to an orange colour (5YR 6/6; 7.5YR 7/6; 5YR 6/8; 7.5 YR 6/6), indicating the use of an iron-rich clay. The exception was a flanged bowl that re-fired to 'a pale cream-coloured core, and buff surfaces' indicating an iron-poor clay (Cleal 1992, 102). Cleal argued that the iron-rich clays could produce black vessels by reduction or smudging/soot soaking, but a black vessel made from an iron-poor clay could only have been achieved by 'carbon deposition by smudging and/or the incomplete burning out of carbonaceous material present in the clay' (Cleal 1992, 102).

Hearne (1992, 100) noted the oxidised clay colours on the inside of the kiln structures and the fired clay 'stackers', and suggested that the firing did actually take place in an oxidising atmosphere - the black colour of the pots was more likely to be a result of 'blackening by smudging or carbon deposition on the site rather than by firing vessels in a true reducing atmosphere' (Hearne 1992c, 100). Hearne suggests that the simple nature of the kilns does not appear to have been designed with deliberate reduction in mind, but may 'have been intended to facilitate smudging, in which, towards the end of the firing, a carbon-rich atmosphere is obtained by covering the vessels with organic material so that carbon can be absorbed into the fabric of the pots' (Hearne 1992c, 100). Rye (1981, 100) states that 'blackening by carbon staining is usually achieved by sealing the kiln after cooling, after filling the firebox with fuel'.

The experimental firing carried out at Southampton University 'showed that bonfires were an extremely efficient method of producing intensely black pottery' (Peacock 1973, 64). The students created a bonfire with 'a core of dried leaved, grass or hay, surrounded by a thick layer of wood and general rubbish' (Williams 1975, 285). Williams suggested the colour of the vessels was a result of 'the close packing of fuel over the pots', whereby 'all the free oxygen is used up during the burning process', thus 'creating a reducing atmosphere which normally results in pottery of black to grey colour', (Williams 1975, 285), without the need for 'deliberate soot-soaking' (Williams 1975, 15).

Lyne suggested that the quantities of wheat chaff recovered from the Redcliff excavations may have made 'a good smudging agent if packed around the pots in the centre of the structure; then covered with stacked oak billets and branches together with smaller quantities of alder, birch, blackthorn and willow before being sealed in with stacked turves. The carbonisation of large quantities of chaff around the pots in an oxygen-starved atmosphere would be the equivalent of covering them in soot and making the burning out of carbon within the pot fabric virtually impossible under such circumstances' (Lyne 2003, 96).

3.2.9 Potters' equipment

A number of artefacts amongst the finds recovered from Redcliff, Stoborough, Worgret and Bestwall Quarry have been identified as relating to pottery production. Rounded pebbles of flint and chert may have been used for area burnishing whilst line burnishers were made from pot sherds, heathstone, flint, sandstone, mudstone, quartzite, limestone or sarsen (Lyne 2003, 80; Lyne 2012, 247). Worked stone pieces also appear to have been suitable for removing the excess of clay from the interior of a cooking pot (Lyne 2012, 247). An iron awl from Bestwall Quarry, found within a kiln dated to the first half of the 3rd century AD, may have been a potter's tool (Corney 2012, fig. 118.3). A square, stone pivot from the site may have been utilised as a simple tournette (Lyne 2012, fig. 161.12). Other potters' tools from Worgret comprised two mortars and a pestle in Purbeck limestone, and fragments from four quernstones - three in Greensand and one in a local, Tertiary sandstone (Mills and Hearne 1992, 95).

3.3 Medieval pottery production

A similar fabric to the one that characterises the Iron Age and Romano-British pottery was also used during the medieval period. This is known as Fabric C at Wareham (Hinton and Hodges 1978) and Q401 from the Wytch Oilfield sites; it is a coarse, sandy fabric, described as 'the major medieval ware used in Wareham, and has a currency from the 11th to the 14th century', when it was used for a range of cooking pots, bowls, dishes and jugs (Lancley and Mepham 1991, 137-140; Hinton and Hodges 1978, 60). Heavy mineral analysis of three sherds from Wareham revealed a high tenor of tourmaline, although not as much as in the Romano-British Black-burnished ware, but indicating they were produced in broadly the same area (Williams 1978, 61). No certain production sites for this fabric have yet been found, however a recent archaeological evaluation by Bournemouth Archaeology has revealed traces of a pottery kiln of this period, seemingly producing buff-coloured wares rather than the sandy successor to the Iron Age and Romano-British fabric in question (Jonathan Monteith, Bournemouth Archaeology, pers. comm.).

3.4 Clay Exploitation in the 17th to 21st Centuries

The clay industry around Poole Harbour reached prominence again when the introduction of tobacco to England during the 16th century led to a demand for ball clay on a national and international level. This resource provided the perfect material from which to make the pipes used to smoke tobacco. The earliest historical record relating to clay exploitation in this period is a lease dated 1619, for the purpose of extracting clay for tobacco pipe manufacture (Cooksey 1980, 1). Both raw clay and the finished pipes were exported, with records in the National Archives of a shipment of pipes from Poole to Cowes in 1666. A draft bill of 1669 indicates merchant Thomas Cornell was hiring boats to supply pipe clay to Kings Lynn, Hull, Newcastle, Boston, Great Yarmouth, Colchester, Maldon, Rochester, Rye, Dover, Sandwich, Deal, Margate, Lyme Regis and Plymouth (Cooksey 1980, 9). During the 18th century the export of clay and pipes extended to Penryn and Helston (Cornwall) and Liverpool. Pipes were transported as far afield as Newfoundland, with records for this from 1798 and a mention of export to South Carolina in a port book of 1769 (Cooksey 1980, 14).

The introduction of tea to England during the second half of the 17th century also led to an increase in exploitation of the ball clay for production of vessels suitable for consumption of the new beverage. British potters' desire to find a medium suitable to rival the Chinese porcelains led to the first imports of ball clay to the Staffordshire potteries in 1720 (Purbeck Mineral and Mining Group 2011) and eventually to the attention of Josiah Wedgewood who used the clay to create his famous 'Queen's Ware'. The Hyde family were clay merchants at Arne, and had a contract with Josiah Wedgewood, dated 1771 (now held at the Dorset Records Office), to supply him with a white-firing clay 'from the Rollington Common pits at the rate of 1400 tons per annum' (Cooksey 1980, 9). The ball clay was also shipped to other centres, such as Doulton at London, Hull and Glasgow.

3.5 Production of pottery and architectural ceramics during the 19th to 21st centuries

The clays around the Harbour and Isle of Purbeck were extensively utilised for architectural ceramics during the 19th and 20th centuries. Prior to the 19th century, brickworks would spring up for specific building projects and were often quite short-lived. The raw materials for brickmaking were rarely transported, with brickyards located on or adjacent to the clay source being exploited. Young (1972, 221) notes that a small brickworks would employ two men and one kiln. The clay would be dug during the winter months and stacked and weathered. During the summer, 700-800 bricks would be formed by each man in a day and fired on a monthly basis. Bricks were often formed by hand, as they are today by the Swanage factory of the Ibstock brick manufactures, however brick-making machines are known from Brownsea and may also have been used by the South Western Pottery (Young 1972, 221). The bricks would be left to dry naturally, in drying sheds, and then fired. The building boom in Poole and Bournemouth from the middle of the 19th century led to large scale production of bricks and other architectural ceramics, with salt-glazed, stoneware pipes produced at a number of factories including Brownsea, The South Western Pottery, Bourne Valley and Kinson. They were used locally and sold across Britain (Young 1972, 222). It is estimated that a third of pottery in England in 1830 was made from clay from Poole (Lands 1980, 47). The tiles that covered the walls of many of the country's shops, hospitals and factories in the 19th and 20th centuries, as well as the London Underground, were all made in Poole.

3.5.1 Exploitation of the different clay members of the Poole Formation

A wide range of clays were utilised by the 19th and 20th century brick-makers, each with 'different physical and chemical characteristics, which together with conditions of firing and additives introduced to the clay produce different colours and textures' (Webb 2010, 18). The Wealden Clay was used in brick and tile production near Corfe Common (Lynch Brickworks) and Ulwell (Swanage [Ibstock] Brickworks/Godlingston Tileries). The London Clay, located around the north and west of the study area, and a band along the Purbeck Ridge, was used by a brickworks at Lytchett Matravers and Morten, but was otherwise not widely exploited in the Poole/Purbeck region. It is said to produce 'yellowish bricks known as 'malms'' (Webb 2010, 19).

Within the Poole Formation, all clay members were utilised by the brick and pottery makers. To the north-east of Poole a band of Parkstone Clay, up to 600m wide, runs NNE-SSW through the Alderney, Mannings Heath and Foxholes area, between Oakdale and Newtown. It was favoured by brick producers in the late 19th century, including the Alderney Brickworks, Newton Vale/New Town Brickworks, Fox Holes Brick Works, Dupe's Brick Works and Kinson Brick Works. The Kinson Pottery was located in the southern part of this area. There appears to have been little use of the nearby deposits of Broadstone Clay and Oakdale Clay to the west of the Parkstone Clay, in this particular area. The Parkstone Clay was also exploited by the South Western Pottery at Parkstone, the Branksea/Brownsea Pottery on Brownsea Island and by brickmakers on the Isle of Purbeck, around Furzebrook and the Breach Plantation.

The Broadstone Clay was mostly exploited on the southern side of Poole Harbour, by the Newton Clay Works at Newton Heath and the Ridge Clay Works at Arne. There were also clay pits at Wytch Heath (Thrasher's Pit), Godlingston Heath, Furzebrook, Norden and the Blue Pool site. On the northern side of the Harbour it was used by the Beacon Hill Pottery and Brickworks, the Longfleet Brickworks (located to the north of Oakdale), Gravel Hill Brick Works (west of Bearwood), Elliott's Brickworks at Bear Cross and Jubilee Brickworks at Lytchett Matravers. The location of a brickworks at Corfe Mullen is mapped as Poole Formation, but was adjacent to deposits of Broadstone Clay. The Beacon Hill Clay Pits were adjacent to deposits of Parkstone Clay and Oakdale Clay. Elliott's Brickworks exploited a seam of clay within the Branksome Sand, the Kinson Steam Brickworks were also located in this area, just north of the present Wallisdown Industrial Estate, as well as brickworks at West Howe and the Blake Hill Pottery, the latter operating for a brief period at the beginning of the 20th century. The Creekmoor Clay was targeted by the Creekmoor Brick and Tile Works and the Norden Clay Works. The Broadstone Pottery was also located at the northern tip of a deposit of Creekmoor Clay, near Darby's Corner. The Oakdale Clay around the northern shores of the Harbour at Hamworthy was used by the Hamworthy Junction Brick Works and Pottery. The

White Works Pottery was situated in this area, but may have used other clay sources. The Oakdale Clay was also exploited around Sandford by the Victoria Works/Sandford Pottery, producing buff-coloured bricks, tiles and chimney pots (Webb 2010, 20). The Lytchett Brick Works at Upton was situated on the Oakdale Clay but may also have used adjacent sources of Creekmoor Clay, and produced red bricks. A very isolated deposit of Creech Brick Clay was used by the Creech Brick Works. A clay pit exploiting the Oakdale Clay was on the site of the Beacon Hill Camping and Caravan Park. The White Works Pottery and Architectural Pottery at Hamworthy also utilised the clay within the Oakdale Clay deposits. A summary of the major brick and pottery producers that operated around Poole and its harbour during the 19th and 20th centuries is provided in Appendix B.

The exploitation of ball clay continued throughout the 19th and 20th centuries, and is still a very important industry today. Local historian, Rodney Legg, remembers

> "there were pits and shafts across what seemed to be the entire heath on the north side of the Purbeck Hills, served by their own rail-trucks below ground and an over-ground mineral line with its own little steam engines, operated by Pike Bros from Furzebrook. We went down the cable-operated adit-mine that raised grey ball clay from below Creech Barrow for the Staffordshire Potteries" (Legg 2008).

Ball clay is still extracted from the Isle of Purbeck, with 125,000-150,000 tonnes exported per year, and the trade employing approximately 200 people (Purbeck Mineral and Mining Group 2011).

3.6 Conclusion

The clay deposits that surround the shores and hinterland of Poole Harbour are an important economic resource today and have been exploited by potters for four millennia. The earliest evidence for the actual production of pottery using the characteristic sandy fabric that achieved fame as Dorset Black-burnished ware is of Late Iron Age date. Sites of probable and definite production during the Late Iron Age and Romano-British periods are predominantly located around the shores of Poole Harbour, or slightly further inland but at the banks of the rivers that drain into the Harbour. The underlying geology of these sites is clay, or sand within 250m of the clay. Most are very close to the mapped interface of the clay and sand deposits.

Analysis of charcoal samples from the production sites suggests the gathering of roundwood from local woodlands, and the use of the ericaceous plants and turfs that were widely available to fire the vessels. The workshops would therefore appear to have been sited to take advantage of the availability of clay, temper, water, fuel and transport links.

There is no evidence yet found for the firing of vessels during the Early to Middle Iron Age periods in this area, despite the fact that fabric and form analysis indicates production during this time. The earliest evidence for vessel firing comes from the remains of possible surface and pit clamp firings, of Late Iron Age date. These firing methods continued to be used throughout the 1st century AD and into the 2nd century, but have left little trace in the archaeological record. From the 2nd century AD a change of technology is evident, with firing structures constructed from clay and stone, with a firing chamber (generally small in size) and stoke pit, usually linked by a flue, where discernible. For many, but not all, of these structures, the potters had deliberately selected white-firing clays for their construction. The firing temperature was probably in the region of 700°C. The smothering of vessels in organic material during firing would have caused the deposition of carbon on their surfaces and resulted in their black colour, however it is not certain if this was the result of a smudging material being packed around the vessels for the full duration of the firing, or as a second stage once the maximum firing temperature had been achieved. Ethnographic and experimental examples indicate that either would have been successful.

The evolution in firing technology is not echoed in the formation of the vessels, which were handmade during all phases, however a turntable or slow wheel may have been used to finish vessels. The exception is the formation of the Late Iron Age cordoned jars and bowls which would have been produced using a fast wheel. Other aspects of the production process have also been identified at a number of sites, including structures to facilitate the drying of vessels prior to firing, clay-lined ‘tanks’ and ‘boxes’ that may have been used to levigate or store clay, buildings used in the manufacture and drying of vessels, and possible areas of clay quarrying.

A change in the industry occurred during the late Romano-British period, with the introduction of a new fabric and new forms. Most of this production appears to be focussed around the shores of the Harbour, however one possible production site was located well outside the heartland of the industry. The sands and iron-rich clays of the area were utilised again during the 11th to 14th centuries, however no production sites of these wares have yet been identified. It was not until the 17th century that the white-firing ball clays were utilised on any scale, when the introduction of tobacco and tea both created a demand for the clays and they were mined and transported, as raw materials and finished products, on an international scale. The coarser, iron-rich clays also came into favour during the 19th and 20th centuries, and were used to make the bricks for many of the buildings of Poole and Bournemouth. There is evidence that brick makers and potters of this period selected specific clays for their wares, and it seems likely that this was the case in the later prehistoric and Romano-British periods.

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Chapter 4

The ceramic assemblages sampled for analysis

The style of the vessels being produced and used during the Early to Middle Iron Age in Dorset has been broadly characterised (Chapter 1), and it is hoped that this research will shed light on aspects of the ceramic technology employed to create them. Mineralogical and compositional analysis of samples from key assemblages has been carried out in order to address this aim. Analysis of material from the type sites of Maiden Castle and Allard's Quarry, Marnhull, was deemed pivotal to a greater understanding of this type of pottery, and a total of 60 samples of pottery were taken from their assemblages (Table 4.1; Figures 4.1-4.2). Other key assemblages targeted for analysis were those that contained a relatively large Early to Middle Iron Age component of vessels that were thought to originate from the Poole Harbour industries. These included vessels from sites around the heartland of the Late Iron Age/Roman production zone, such as the sites excavated as part of the Wytch Farm Oilfield investigations and Green Island. Samples of vessels found at sites to the south of the Purbeck Ridge came from Football Field at Worth Matravers and two sites near to Kimmeridge: Eldon's Seat and Rope Lake Hole. From further afield, but of great significance to Iron Age pottery studies in the region, were the assemblages of Gussage All Saints and Hengistbury Head, although only part of the latter was made available for study. Other assemblages sampled included those from Barton Field, Tarrant Hinton; Bradford Down, Pamphill; Oakley Down, Wimborne St. Giles; Sigwells (part of the South Cadbury Environs project) and Southdown Ridge, Weymouth. This range of sites allows consideration of temporal and chronological variation across the industry. Romano-British pottery from three Black-burnished ware production sites (Bestwall Quarry, Redcliff Farm and East Holme) was sampled to allow comparison with vessels of undisputed origin.

Other assemblages were excluded on the basis of previous levels of analysis, date range, and the time constraints of a single doctoral research project. For example, the Iron Age hillfort at Hod Hill has produced Middle to Late Iron Age pottery in typical Poole Harbour ware forms, but the assemblage has not been subject to fabric analysis (Richmond 1968). Sites without an Early to Middle Iron Age component, such as

Tollard Royal, Pilsdon Pen, Buzbury Rings, Milborne St. Andrew, Poundbury and Halstock were also not included, although they have produced large assemblages of Late Iron Age Poole Harbour wares.

A summary of the sampled assemblages is presented in this chapter. The sample numbering is site specific, starting with number 1 for each site. Details of the samples are presented in the tables for each section.

Table 4.1. Summary of samples taken for petrological and compositional analysis

Figure no.	**Site no.**	**Site**	**National Grid Reference**	**No. of samples**
Harbour area and hinterland				
4.1		Wytch Farm Oilfield sites:		
	1	West Creech	SY 90022 82476	13
	2	West of Corfe River	SY 966 853	3
	3	East of Corfe River	SY 969 854	4
	4	Ower Peninsula	SZ 000 860	3
	5	Furzey Island	SZ 011 870	1
4.1	6	Green Island	SZ 00589 86654	20
4.1	7	Redcliff Farm, Ridge	SY 93219 86618	5
4.1	8	Bestwall Quarry, Wareham	SY 94163 88045	8
4.1	9	East Holme	SY 896 859	1
South of the Purbeck Ridge				
4.1	10	Eldon's Seat, Encombe	SY 939 775	10
4.1	11	Rope Lake Hole, Kimmeridge	SY 932 777	31
4.1	12	Football Field, Worth Matravers	SY 975 778	8
West Dorset				
4.1	13	Maiden Castle, Dorchester	SY 668 884	31
4.1	14	Southdown Ridge, Weymouth	SY 673 832	17
East Dorset				
4.1	15	Hengistbury Head, Bournemouth	SZ 172 907	5
North Dorset				
4.2	16	Gussage All Saints	ST 998 101	35
4.2	17	Barton Field, Tarrant Hinton	ST 9259 1194	5
4.2	18	Bradford Down, Pamphill	ST 9780 0423	3
4.2	19	Oakley Down, Wimborne St. Giles	SU 0160 1775	8
North-east Dorset and Somerset				
4.2	20	Allard's Quarry, Marnhull	ST 79543 19893	29
4.2	21	Sigwells, South Cadbury	ST 648 237	12
	Total			**255**

4.1 Sites located around Poole Harbour and its hinterland

4.1.1 Wytch Farm Oilfield (Figure 4.1, Sites 1-5)

An expansion to the Wytch Farm Oilfield in 1987 led to archaeological survey and excavation at a number of sites between Furzey Island and the northern shores of the Harbour, and the Purbeck Ridge (Cox and Hearne 1991). The works revealed occupation and activity in this area from the 2nd century BC, with the establishment of an agricultural settlement at Furzey Island (previously investigated by Underwood 1989) and also at West Creech, at the foot of the Purbeck Ridge (Cox and Hearne 1991). An industrial site on the west bank of the River Corfe (West of Corfe River) may also have been established at this time, with the main focus of activity during the Late Iron Age period. Evidence for salt extraction, shale working and possible pottery production were identified. It is likely that this site was linked to another on the other bank of the river, at East of Corfe River, from which evidence for the large-scale extraction and processing of salt, and the working of shale, was identified. Pottery production and metalworking were suspected but no evidence for these activities was found (Cox and Hearne 1991). Investigations were also carried out at the previously excavated Late Iron Age and Roman site at Ower Peninsula.

The vast majority of pottery recovered from the Wytch Farm sites was in the local Poole Harbour fabrics (8337 sherds, 17,697 g), with very small quantities of flint-tempered wares (two sherds, 13 g) and a vesicular fabric (17 sherds, 82 g) from West Creech and Furzey Island. Lancley and Morris (1991, 122) argued for a chronological progression from coarser to finer fabrics in the Poole Harbour wares, as had previously been suggested for Rope Lake Hole, Kimmeridge (Davies 1987). The coarsest fabric amongst the Wytch Farm vessels, Q3, was identified at West Creech, Furzey Island, West of Corfe River and Ower Peninsula, and was associated with the earliest forms. By far the most commonly occurring fabric was the fine to medium-grained Q1, accounting for over 80% of the Poole Harbour wares. Medium to coarse-grained fabric Q2 represented 13.6% of the assemblage by count. Minor variations comprised a medium to coarse-grained, micaceous fabric (Q4) and a medium-grained fabric with clay pellets and voids (Q5).

Early Iron Age pottery (here dated as 8th to 4th centuries BC) included a jar with internal hooked/flanged rim, a red-finished shouldered bowl and fingertip impressed body sherds, all from West Creech (Lancley and Morris 1991). Although none were recovered from features that would allow interpretation of actual occupation at the site during this period, the vessels are indicative of activity in the area at this time. This was also the case for the Middle Iron Age pottery, as no features containing purely Middle Iron Age pottery were excavated, but the pottery was interpreted as representing activity during this period (Lancley and Morris 1991, 136). The range of forms assigned to a Middle to Late Iron Age date (*c.* 5th to 1st centuries BC) included slack-profiled jars, ovoid or barrel-shaped jars, proto bead-rimmed vessels, large barrel-shaped jars with pulled and flattened rims, large jars with twisted/cabled rims, large, slack-sided jars with slightly expanded rims, a shouldered vessel, a jar with slightly pulled rim and a jar with slightly out-turned rim. Three other jar forms were also noted as first occurring during this phase, but were more commonly seen during the later ceramic phase: bead-rimmed jars, straight-necked jars with beaded rims and an everted rimmed vessel. These forms were recorded only from West Creech and West of Corfe River.

The Late Iron Age phase at these sites was assigned on the basis of the forms typically known as 'Durotrigian'. They included bead-rimmed bowls and jars, flat-rimmed jars, necked and everted rim jars, hemispherical bowls, a tankard and lids. Most span the 1st century BC to 1st century AD, with some produced into the post-conquest period. Decoration included the 'eyebrow' motif (Figure 4.4, sample 24), pinched 'petal' motif (Figure 4.3, sample 16), an applied knob, cordons and burnished lines and lattice in the latest phase. Evidence was also found that the Poole Harbour potters were copying imported forms during the late 1st century BC to 1st century AD, including a cordoned long-necked jar or flagon, a lid-seated bowl and platters. During the post-conquest period, flagons and beakers were produced, as well as a range of other forms.

Previous excavations on Furzey Island produced a pottery assemblage of 564 sherds (4,300 g) of Poole Harbour wares, with three sherds of Dressel 1 amphora and three from north-western France (Underwood 1989, 61; Williams 1989, 61). Regional imports were represented by a saucepan pot in a flint-gritted and vesicular fabric

(Underwood 1989, fig. 9, 1) and a coarse flint-tempered ware bowl (*ibid.* fig. 9, 2), both indicating settlement towards the end of the Middle Iron Age. A range of Middle to Late Iron Age forms were illustrated, although all were reported to be of 1st century BC to 1st century AD date. The forms included flat-rimmed jars and bowls (one with moulded impressions), bead-rimmed jars and bowls, shouldered bowls and a hemispherical bowl with squared rim. A countersunk handle was also recovered. Re-visiting of the assemblage by the current researcher has revealed that the beaded rims were quite crudely formed, often created by an irregular incised line at the top of the wall, and would be more in-keeping with a slightly earlier, 2nd century BC date.

<u>The samples</u>

Twenty four vessels were sampled from the Wytch Farm Oilfield sites (Table 4.2; Figure 4.3 and 4.4). Early Iron Age forms included a vessel with internally bevelled rim and a shouldered bowl. Middle to Late Iron Age forms comprised bowls with expanded rims and a range of jars, whilst the Late Iron Age vessels included flat-rimmed jars, necked jars and bowls, some with eyebrow motifs.

Table 4.2. Pottery vessels sampled from the Wytch Farm Oilfield sites

Sample	Details from excavation report (Lancley and Morris 1991)					
	Site	**Fig.**	**Fabric**	**Form**	**Description**	**Ceramic phase**
1	West Creech	58.1	Q1	113	Jar/vessel with internal hooked/flanged rim	EIA
2	West Creech	58.2	Q3	110	Slack-profiled jar	MIA-LIA
3	West of Corfe River	58.3	Q1	112	Ovoid jar with plain rim	MIA-LIA
4	West Creech	58.4	Q2	122	Proto-bead rimmed vessel with convex profile	MIA-LIA
5	West Creech	58.5	Q2	123	Barrel-shaped jar with flattened and pulled rim	MIA-LIA
6	West Creech	58.6	Q3	124	Jar with grooved rim, twisted effect	MIA-LIA
7	West Creech	58.7	Q3	125	Large, slack-shouldered jar, expanded rim	MIA-LIA
8	West Creech	58.8	Q2	127	Shouldered vessel	MIA-LIA
9	West Creech	58.9	Q1	128	Vessel with upright, slightly pulled rim	MIA-LIA
10	West of Corfe River	58.10	Q3	133	Jar upright, slightly out-turned rim	MIA-LIA
11	Furzey Island	58.12	Q1	103	Bead rimmed jar with countersunk handles	MIA-LIA
12	West Creech	58.13	Q1	108	Necked jar with slightly beaded rim	LIA
13	West of Corfe River	58.14	Q3	134	Vessel with everted rim	M/LIA
14	East of Corfe River	58.15	Q1	101	Flat-rimmed jar	LIA
15	East of Corfe River	58.16	Q2	101	Flat-rimmed jar	LIA
16	Ower Peninsula	58.17	Q2	101	Flat-rimmed jar with petal motif	LIA
17	West Creech	58.18	Q1	106	Jar with short neck and out-turned rim, with eyebrow motifs	LIA
18	East of Corfe River	59.27	Q2	135	Large ovoid jar with flat, incurving rim	LIA
19	West Creech	59.33	Q3	126	Shouldered bowl with out-turned, slightly rolled rim	EIA
20	West Creech	59.34	Q2	116	Bowl with expanded rim	MIA-LIA
21	West Creech	59.35	Q2	116	Bowl with expanded rim	MIA-LIA
22	Ower Peninsula	59.36	Q1	102	Straight-sided bowl with beaded rim, footring base	LIA
23	Ower Peninsula	59.40	Q1	105	Bowl with expanded, grooved rim	LIA
24	East of Corfe River	61.87	Q2	Dec. 876	Flat-rimmed jar with dimple and eyebrow decoration	LIA

4.1.2 Green Island (Figure 4.1, Site 6)

Excavation by J. Bernard Calkin in 1953, test-pitting by Eileen Wilkes in 2001-2003, and an evaluation for the Time Team programme in 2003 (Wessex Archaeology 2003b), all produced Late Iron Age pottery assemblages dominated by the local sandy wares, with small quantities of imported wares. Analysis of material recovered during the course of an excavation by Alan Bromby in 1969 and a watching brief by Bournemouth Archaeology in 2010 has been carried out as part of this research and revealed evidence for Middle Iron Age activity on the island.

A high proportion of rim, base and decorated body sherds (82% of the number of sherds) amongst the Bromby archive indicates that the surviving 277 sherds (4371 g) result from selective retention policies. Quantitative analysis of the fabrics proportions is therefore biased, however, the surviving assemblage comprises 94.6% Poole Harbour sandy wares, 4.3% imported wares and 1.1% other coarsewares (Appendix C, Table C1). The Poole Harbour wares range from fine to very coarse-grained, but are dominated by medium-grained fabrics (70% by count / 77% by weight). The assemblage is predominantly of 1st century BC to 1st century AD date, with two flat-rimmed bowls of 2nd century AD date. The forms present are given in Appendix C, Table C2.

The pottery assemblage from the 2010 watching brief (291 sherds, 3082 g) is almost all in Poole Harbour fabrics (99%) with very small quantities of other coarsewares (Appendix C, Table C1; Jones 2013). This phase of work did not reveal any of the imported fabrics found during previous investigations on the island. The sandy wares include a range of fine to very coarse fabrics, but are dominated by medium-grained wares (76% by count, 79% by weight). The forms include bead-rimmed jars and bowls, with a range of proto beads to well-defined beads, beads created by a linear groove, and one which was slightly out-turned (Appendix C, Table C2). Other vessels include flat-rimmed jars, necked jars, everted rim jars, a hemispherical bowl and a lid. Two countersunk handles from jars were also recovered. Approximately one third of the assemblage has evidence of smoothing or burnishing of the vessel surfaces. The pottery is predominantly plain, with only one decorated vessel - a bead-rimmed bowl/jar with a semi-circular indent. Sooting and the presence of burnt residues on some sherds indicate vessels used for cooking, including a flat-rimmed jar and a hemispherical bowl. Although conservatism in the forms of the Late Iron Age Poole Harbour wares makes dating problematic, the 2010 assemblage included vessels with less carefully finished surfaces or without the well-defined form attributes that might be expected from the later side of the industry, and therefore does appear to contain a significant Middle Iron Age component (Lisa Brown pers. comm).

<u>The samples</u>

Twenty one samples were selected from the 1969 and 2010 assemblages (Table 4.3; Figure 4.5). These included a range of jar and bowl forms of Middle to Late Iron Age date, as well as two body sherds from the fabric reference collection.

Table 4.3. Pottery vessels sampled from Green Island

Sample no.	Information from analysis by author			
	Form	**Fabric**	**PRN**	**Description**
	Jars			
1	R6	Q1	85	Flat-rimmed jar
2	R6	Q7	88	Flat-rimmed jar
3	R6	Q6	106	Flat-rimmed jar
4	R4	Q1	108	Bead-rimmed jar
5	R4	Q1	111	Bead-rimmed jar
6	R7	Q1	121	Upright-necked jar with proto-bead rim and slight internal bevel
7	R7	Q7	139	Upright-necked jar with proto-bead rim and slight internal bevel
8	R9	Q1	107	Jar with rounded profile and short, out-turned rim
9	R9	Q5	112	Jar with rounded profile and short, out-turned rim
10	R3	Q7	89	Everted rimmed jar with rounded body
11	R8	Q8	148	Small jar with upright neck and bead-rim, defined by two horizontal grooves
	Bowls and other vessels			
12	R1	Q1	81	Round-bodied vessel with proto-bead rim
13	R2	Q1	86	Round-bodied vessel, probable bowl, with beaded rim, defined by a horizontal groove
14	R2	Q1	87	Round-bodied vessel, probable bowl, with beaded rim, defined by a horizontal groove
15	R2	Q4	117	Round-bodied vessel, probable bowl, with beaded rim defined by a horizontal groove
16	R11	Q5	1 (1969)	Bowl with slightly expanded grooved rim. BC 3.42
17	R5	Q1	142	Hemispherical bowl with flat-topped, squared rim
18	R10	Q1	110	Lid with developed bead rim
	Body sherds			
19	P	Q1	10	Body sherd
20		Q3		Body sherd from fabric reference collection
21		Q9		Body sherd from fabric reference collection

4.1.3 Redcliff Farm (Figure 4.1, Site 7)

The site of Roman pottery production at Redcliff Farm, Ridge, has been discussed in the previous chapter (Chapter 3.1.3). The pottery from the site ranges in date from the mid- 1st century AD through to the late Romano-British period. Five samples were taken from vessels that appeared to be wasters from pottery production at the site (Table 3.4; Figure 4.6). The earliest form sampled was a highly abraded lid-seated bowl (sample 1; Lyne 2002, fig. 8, 40, phase 1, assemblage 4) that was over-fired, with grey to orange surfaces and some spalling (Figure 4.7). Lyne paralleled the vessel to Ower type 16 (after Woodward 1987a, 89), a Gallo-Belgic copy dated to the 1st century AD. The other four vessels sampled came from the phase 3 assemblage 6. This was the largest assemblage from the site and thought to represent the dumped remains from a firing structure, of mid to late 2nd century AD date. The samples comprise two flat-rimmed bowls, one oxidised with evidence of fire-clouding (sample 3) and one spalled example (sample 4); a bead-rimmed dish, mostly oxidised with some fire-clouding (sample 5) and a mostly oxidised cooking pot (sample 2, Figure 4.8).

Table 4.4. Pottery vessels sampled from Redcliff, Ridge

Sample no.	**Information from pottery report (Lyne 2002)**		
	Fig. No.	**Fabric**	**Description**
1	8.40	Not listed	Lid-seated bowl
2	10.57	C3	Cooking pot
3	11.62	C3	Flat-rimmed bowl
4	11.67	C3	Flat-rimmed bowl
5	11.71	C3	Bead-rimmed dish

4.1.4 Bestwall Quarry, Wareham (Figure 4.1, Site 8)

A large pottery assemblage was recovered from the Late Iron Age and Roman pottery production site at Bestwall Quarry (discussed in Chapter 3; Ladle 2012). It comprised 6312 sherds (114,376 g) of Iron Age pottery and 105,383 sherds (1,109,147 g) of Roman pottery, mostly the Late Iron Age Poole Harbour and Romano-British Black-burnished wares (89% by count and 93% by weight). The pottery spans the 2nd century BC through to the early 5th century AD. The Middle Iron Age pottery came from two pits, with a total of 162 sherds represented, and included a Middle to Late Iron Age flat-rimmed jar with a band of fingertip decoration just under the rim, and a bead-rimmed, ovoid jar with an oval impression, possibly part of a petal motif (Lyne 2012, fig. 139, 1-2). This appears to indicate small scale activity on the site during this period, followed by much larger scale occupation during the Late Iron Age. A lack of Armorican imports was taken to indicate an earliest date of 50 BC for this later phase (Lyne 2012, 198). The Late Iron Age assemblage includes bead-rimmed bowls and jars, flat-rimmed jars and necked jars, some with countersunk lug handles. A wide range of Roman Black-burnished ware forms were also present. The latest material comprised the BB1 variant fabric known as South-East Dorset Orange Wiped Ware (SEDOWW), a paste containing occasional inclusions of shale, but with ‘moderate to large quantities’ sometimes present in the bases of these vessels (Gerrard 2010, 296).

The samples

Eight samples were taken from the assemblage (Table 4.5; Figure 4.9). These included two Late Iron Age vessels - a flat-rimmed jar with oval indents and a short-necked jar with eyebrow motif (samples 1 and 2). Four samples were also taken from Roman vessels recovered from the kiln structures as examples of pottery known to have been manufactured on site. These included two plain-rimmed dishes (samples 3 and 4) and two cooking pots (samples 5 and 6). Two samples were taken from a single globular jar in the SEDOWW fabric (Lyne 2012, fig. 155.1, from a midden associated with a structure) to examine the shale inclusions, with one sample from the rim of the vessel (sample 7) and one from the base (sample 8).

Table 4.5. Pottery vessels sampled from Bestwall Quarry

Sample no.	Lyne (2012) fig. no.	Phase	Form
1	141.1	LIA	Flat-rimmed jar with two oval indents
2	Fig. 141.6	LIA	Short-necked jar with beaded rim, with two eyebrow motifs
3	Not illustrated (kiln Z184)	MRB	Plain-rimmed dish
4	147, 8/2 (kiln Z184)	MRB	Plain-rimmed dish
5	151.6 (kiln Z227)	LRB	Cooking pot
6	Fig. 144 1/7 (kiln Z274)	LRB	Cooking pot
7	Fig. 155.1, rim	LRB	Globular jar with pie-crust rim
8	Fig. 155.1, base	LRB	Globular jar with pie-crust rim

4.1.5 East Holme (Figure 4.1, Site 9)

The East Holme assemblage derives from the salvage excavation carried out at a site of possible Roman Black-burnished ware pottery production, discussed in Chapter 3 (Beavis 1972). Analysis by the current researcher indicated it comprises 992 sherds (14204 g) of BB1 and is dominated by two forms (Jones and Hewitt forthcoming). The most commonly occurring is the plain-rimmed dish (Seager Smith and Davies 1993, type 20), of which 91 examples were recorded. Flat-rimmed bowls were also fairly frequently encountered (type 22, 31 examples). Six cooking pots (jar forms 1/2, 2 and 3) and two drop-flanged bowls (type 25) were also present. The plain-rimmed dishes have a long currency, from the late 1st century AD through to the end of the Roman period, however the flat-rimmed bowls are more tightly dated to the 2nd century AD. Unusually though, some examples are wiped on the exterior, a trait more commonly seen on vessels of late Roman date.

A single sample from a plain-rimmed dish was selected for analysis, as an example of a Black-burnished ware vessel from a probable production site (Table 4.6).

Table 4.6. Pottery vessel sampled from East Holme

Sample no.	**Description**
1	Plain-rimmed dish (RB)

4.2 Sites to the south of the Purbeck Ridge

4.2.1 Eldon's Seat, Encombe (Figure 4.1, Site 10)

The site at Eldon's Seat lies on deposits of Kimmeridge Clay, on the south coast of the Isle of Purbeck. An area of 2600 ft^2 was excavated by Barry Cunliffe between 1963 and 1966, but he notes it was clearly part of a much larger site (Cunliffe 1968, 193). Three phases of activity were identified, of Late Bronze Age to Late Iron Age date.

The Period I pottery included bucket-shaped vessels, sometimes decorated with cordons and fingertip impressions below the rim/on the cordons, and carinated jars and bowls, suggesting a date towards the end of the Late Bronze Age/beginning of the Early Iron Age for this phase (Cunliffe 1968, 63). The Period II pottery (*c.* 5th to 3rd centuries BC) was dominated by carinated and round-shouldered bowls, usually with red-finished surfaces, with 123 examples recorded. Small quantities (11 vessels) of hemispherical bowls with flat-topped, expanded rims, were also present. A range of jar forms was recorded, but were less numerous (31 vessels). The pottery of this period is epitomised by Cunliffe's 'Dorset variant of the All Cannings Cross-Meon Hill group' *style zone.*

The fabrics of the Period I and Period II pottery were grouped into three classes. Two were calcareous: class I is a shell-tempered ware, usually coarse in texture, whilst class II is described as ‘grit-tempered’, ‘the grits being small fragments of a highly fossiliferous shelly limestone’ (Cunliffe 1968, 206). Class III relates to sandy wares, divided into a coarse ware (class IIIA) and a finer ware, often red-finished (class IIIB). Thin-sectioning (by H. W. M. Hodges) of an example of the Class I/II fabric and of a Class IIIB, indicated they were made from a similar clay, but with quartz sand added to one and deliberately crushed Purbeck limestone inclusions to the other. A local origin was proposed for both. The single example of a different fabric was also thin-sectioned, revealing a granitic sand from the south-west or possibly north-western France (Cunliffe 1968, 208). The Period I assemblage was dominated by calcareous gritted fabrics, with only 5.5% sandy wares. A complete shift in the fabrics was evident in the Period II assemblage, with a fall in the calcareous fabrics to 13.3% and a corresponding rise in the sandy wares to 86.7%.

Some Late Iron Age and Roman pottery was also recovered from the site, but in much smaller quantities than the earlier material. It included bead-rimmed bowls and jars, flat-rimmed jars, necked jars and lids (Cunliffe 1968, fig. 19, 198-213).

<u>The samples</u>

Eleven samples of pottery were taken, but thin sections made of ten (Table 4.7; Figure 4.10). The analysed samples were from Period II features and layers, all but two (samples 2 and 9) were red-finished. The forms comprised four carinated bowls, a hemispherical bowl with flat-topped rim, a large, open-mouthed bowl, two jars with everted rims, and a slack-sided jar with an irregularly-formed, flattened rim top. It was not possible to establish if all of the vessels sampled were illustrated – those with question marks in Table 4.7 represent samples taken from vessels that are thought to be those illustrated, but this could not be confirmed.

Table 4.7. Pottery vessels sampled from Eldon's Seat

Sample	Cunliffe (1968) fig. no.	Excavator's phase	Description
1	? 18. 196	Period IIc	Hemispherical bowl with flat-topped rim, slightly expanded on the interior, red-finished
2	15.96	Period IIa	Large, open-mouthed bowl
3	?16.116	Period IIc	Very long-necked carinated bowl, red-finished
4	?17.165	Period IIc	Thick-walled jar with everted rim, red-finished
5	16.124	Period IIc	Long-necked carinated bowl, red-finished
6	?17.166	Period IIc	Large jar with upright rim (not taken to analysis)
7	16.119	Period IIc	Long-necked carinated bowl, red-finished
8	15.104	Period IIa	Everted rim jar with red-finished surface
9	N/A	Unknown	Slack-sided jar with irregular rim
10	16.129	Period IIc	Long-necked carinated bowl, red-finished
11	N/A	Unknown	Red-finished body sherd

4.2.2 Rope Lake Hole (Figure 4.1, Site 11)

The site at Rope Lake Hole was located 1km to the west of Eldon's Seat. Evidence for settlement and industrial activity from the earliest Iron Age through to the late Romano-British period was identified during excavations in the late 1970s (Woodward 1987b). Three ceramic phases were identified. The Period 1 assemblage was thought to be slightly earlier in date than Eldon's Seat II, marginally post-dating the Kimmeridge II material, and therefore of 8th to 6th century date (Davies 1987, 155). The Period 2 assemblage was broadly comparable to Eldon's Seat II, and therefore assigned a date range of 5th to 3rd centuries BC (*ibid.*). Period 3 relates to Late Iron Age activity on the site.

A total of 5063 sherds (90.5 kg) of pottery was recovered from the stratified deposits. Ten fabrics were identified, including calcareous-gritted, flint-tempered and sandy wares. The flint-tempered wares were only a minor component of the Period 1 assemblage (<4%). The shell and limestone fabrics were most commonly encountered during this phase, accounting for 30% of the Early Iron Age assemblage (by count), falling to 10% of the Period 2 and 3 assemblages. The sandy wares were dominant in all phases, with five different fabrics identified. Fabric 4 was poorly sorted but often red-finished, accounting for 26% of the number of sherds in Period 1, 3% in Period 2 and 18% in Period 3. Fabric 5 was very coarsely gritted, representing 28% of the Period 1 sherds, 43% of Period 2 and 14% of Period 3. Heavy mineral analysis of sherds in Fabrics 4 and 5 indicated a tourmaline rich mineral suite and therefore a Poole Harbour origin for the wares. Fabric 6 was a fine to medium-grained ware, accounting for up to 12% in each period. Fabric 7 was identified as a typical Poole Harbour ware, with Fabric 10 a coarser version of this fabric. Fabric 7 accounted for just 2% of the Period 1 assemblage, and 4% of Period 2, but rising to 33% for Period 3. Fabric 10 accounts for 6% of Period 2 and 13% of Period 3. Together, the wares identified as originating from Poole Harbour account for nearly 70% of the Period 1 assemblage, and 90% of Periods 2 and 3.

The Early Iron Age (Period 1) forms were predominantly carinated bowls, often red-finished (54 vessels, 45 in Poole Harbour wares), and shouldered jars (ten vessels, three in Poole Harbour wares). A slack-shouldered jar and a bowl with flattened rim were also recorded in these sandy wares. Decoration was rare but included incised lines and dots. An increased range of forms was identified amongst the Period 2 assemblage, but was still dominated by carinated bowls (100 vessels, 91 in Poole Harbour wares), with 12 other bowls (11 in Poole Harbour wares), eight shouldered/carinated jars (all in Poole Harbour fabrics), 11 slack-shouldered jars (eight in Poole Harbour wares) and three storage jars (two in Poole Harbour wares). The number of decorated sherds decreased in this period, but red-finishing of the vessels surfaces was as common in Period 2 as the previous period, and vessels were often burnished. During Period 3 there was a considerable increase in the repertoire of the forms, and the number of vessels recovered (72 identified by form in Period 1, 134 in Period 2 and 276 in Period 3). Jar forms became dominant and the carinated bowls gave way to vessels with more rounded profiles. The common Poole Harbour forms, such as bead-rimmed jars, everted rim jars and flat-rimmed jars, were all recorded.

The samples

The 31 samples (Table 4.8; Figures 4.11 and 4.12) were taken only from pottery dated to Period 1 (*c.* 8th to 6th centuries BC) and Period 2 (*c.* 5th to 3rd centuries BC). Sixteen came from carinated bowls (forms 1- 5, samples 2-15, 24 and 25), 14 of which were red-finished. All but one of these types were found in Period 1 and Period 2 contexts, with form 1 only occurring in Period 1. Three open bowl forms were also sampled (forms 6-8, samples 16-21), all but one were red-finished. Form 6 occurs in Periods 1 and 2, but forms 7 and 8 solely in Period 2 deposits. Eight samples were taken from jars (forms 21-25, samples 22-23, 26-31). Of these, forms 21 and 25 occur in Periods 1 and 2, but forms 23 and 24 were found solely in Period 2.

Table 4.8. Pottery vessels sampled from Rope Lake Hole

Sample no.	**Details from excavator's report (Davies 1987); rf=red-finished surface**				
	Fig. No.	***Fabric***	***Form***	***Description***	***Period***
1	79.4	UK (RF)	6	Open bowl with internally flanged, flat-topped rim	1
2	79.5	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	1
3	79.6	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	1
4	79.7	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	1
5	79.9	2 (RF)	2	Steeply angled carinated bipartite bowl	1
6	79.10	5 (RF)	2	Steeply angled carinated bipartite bowl	1
7	79.15	7 (RF)	1	Steeply angled, probably carinated, bowl with cordon below inclining rim	1
8	79.18	4	3	Steeply angled carinated bowl with short, upright neck	1
9	79.20	4	3	Steeply angled carinated bowl with short, upright rim	1
10	80.23	7 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	2
11	80.24	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	2
12	80.25	6 (RF)	5	Furrowed, carinated bowl	2
13	80.26	7 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	2
14	80.27	5 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	2
15	80.30	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	2
16	80.32	5 (RF)	7	Open bowl with plain rim	2
17	80.33	9 (RF)	6	Open bowl with internally flanged,	2

				flat-topped rim	
18	80.34	4 (RF)	6	Open bowl with plain rim	2
19	80.35	5 (RF)	6	Open bowl with internally flanged, flat-topped rim	2
20	80.36	5 (RF)	6	Open bowl with internally flanged, flat-topped rim	2
21	80.37	5	8	Open bowl with dropped internal flange	2
22	80.39	5	23	Carinated jar, high angled shoulder, plain inclining rim	2
23	80.40	5	25	Large, shouldered jar with short, upright neck and beaded rim	2
24	80.41	1 (?RF)	3	Steeply angled carinated bowl with short, upright rim	2
25	80.42	7 (?RF)	3	Steeply angled carinated bowl with short, upright rim	2
26	80.43	4	25	Large, shouldered jar with short, upright neck and beaded rim	2
27	80.44	4	22	Slack profile, bag-shaped jar with slightly everted rim	2
28	80.46	5	21	Slack profile jar, slightly inclining rim	2
29	80.47	4	22	Slack profile, bag-shaped jar with slightly everted rim	2
30	80.48	10	24	Large, necked storage jar, knife-trimmed rim	2
31	80.49	5	24	Large, necked storage jar, knife-trimmed rim	2

4.2.3 Quarry Field / Football Field, Worth Matravers (Figure 4.1, Site 12)

The archaeological site near Compact Farm, Worth Matravers, was first noted by Ray Farrar in the Dorset Proceedings (Farrar 1955 and 1965) and excavated by the University of Southampton during the early 1990s. These excavations, in a field then known as Quarry Field, revealed an Early Iron Age and Late Iron Age settlement, but no evidence for Middle Iron Age activity. Occupation continued throughout much of the Romano-British period, with a possible hiatus in the 2nd to 3rd centuries (Hinton and Peacock 1992, 1993, 1994; Graham *et al.* 2002; Seager Smith 2002). An evaluation was carried out by Wessex Archaeology in 2003 (Wessex Archaeology 2003a) and then excavation by the East Dorset Antiquarian Society, ahead of a housing development (Ladle and Morgan 2012). These works were carried out in the same field as the investigations by the University of Southampton, but now known as Football Field. Excavation revealed a stone feature of possible early prehistoric date, a midden layer of Late Bronze Age/Early Iron Age date (*c.* 800-600 BC), overlying a cobbled floor, and associated features (a hearth and pits). A single pit of

Middle Iron Age date and a Late Iron Age structure and stone-lined pit were also identified. Roman remains included a rectangular structure and associated infant burials.

The University of Southampton excavations produced 27,713 sherds of pottery, ranging in date from the Early Iron Age to the end of the Romano-British period, but dominated by material of Late Iron Age/early Romano-British date. The bulk of the pottery was recovered from ‘midden-type deposits’ (Seager Smith 2002, 45). The assemblage is dominated by the sandy Poole Harbour wares, but smaller quantities of calcareous fabrics were also recorded, accounting for 8% of the Early Iron Age pottery, falling to 1% of the Late Iron Age/early Romano-British material when it was probably residual (*ibid*, 48). A chronological progression was suggested from very coarse-grained sandy wares during the Early Iron Age to finer wares during the later phases. Four pre-Roman Poole Harbour ware fabrics were identified: Q1 – a very coarse-grained ware of Early Iron Age date; Q2 – a medium to coarse-grained fabric of Early to Late Iron Age date; Q3 – a fine sandy fabric of Early to Late Iron Age date; and Q4 – a fine sandy fabric, of possible French origin or a copy of such a ware (Seager Smith 2002, 48). Interestingly, thin-sectioning of the shelly material suggested a Wareham/Poole Harbour origin, although the basis of this was not included in the report, and one of the shelly wares (S3) was said to include ‘argillaceous material’ (Seager Smith 2002, 48).

The site at Football Field is currently being prepared for publication, but Lilian Ladle kindly allowed access to sample the pottery assemblage and provided draft text for contextual information (Table 4.9; Figure 4.13). Samples were taken from five vessels of probable Early Iron Age date. Three samples came from a single feature (stone-lined pit 1126), all sandy wares of probable Earliest Iron Age date and probably bowl forms, but too fragmentary to confidently identify their type (samples 2, 3, 6). Other vessels of this date included a furrowed bowl from deposit 1169 (sample 7) and a red-finished body sherd from pit 1513 (sample 5). Two sandy body sherds from Middle Iron Age pit 1182, one of which was red-finished, were also sampled (samples 1 and 8). The final sample came from a bead-rimmed jar with eyebrow motif in Late Iron Age pit 2316, a feature that produced 49kg of pottery (sample 4).

Table 4.9. Pottery vessels sampled from Football Field, Worth Matravers

Sample	Feature	Excavators temp. drawing no.	Excavator's phase	Description
1	Pit 1182		MIA	Red-finished body sherd
2	Pit 1126	682	LBA/EIA	Flat-topped, upright rim, possible bowl
3	Pit 1126	683	LBA/EIA	Upright rim, probably from tripartite bowl or jar
4	Pit 2316	fig. 1.8	LIA	Jar with undercut bead rim and lunette/eyebrow decoration
5	Pit 1513		LBA/EIA	Red-finished body sherd
6	Pit 1126	694	LBA/EIA	Upright rim from thin-walled vessel, probably a bowl
7	Deposit 1169	751	LBA/EIA	Furrowed bowl
8	Pit 1182		MIA	Body sherd

4.3 Sites in west Dorset

4.3.1 Maiden Castle (Figure 4.1, Site 13)

The excavations of Mortimer Wheeler during 1934-37 and Niall Sharples in 1985-86 produced assemblages of Neolithic, Beaker, Iron Age and Roman pottery. Full quantification of all the Iron Age pottery recovered from the site is not possible due to selective retention by Wheeler. Analysis of the assemblage recovered during Sharples's excavation provides a clear indication of the growing popularity of the Poole Harbour wares at Maiden Castle during the Middle and Late Iron Age, to the almost complete exclusion of other wares by the 1st century AD. In total, the Poole Harbour sandy wares account for 71% of the ceramic assemblage, rising from 24% during the earlier Middle Iron Age (Sharples 1991, phase 6D) to 93% by the 1st century AD (*ibid.* phase 7; Appendix C, Table C3). Brown identified four sub-groups within the Poole Harbour fabrics, A0-A3, with A0 being the coarsest. Neutron activation analysis indicated that the finest fabric, A3, was chemically distinct from the other types, although compositionally similar, but without inclusions of shale. The sandy wares from non-Poole Harbour sources were the next most frequently encountered overall, with their decrease commensurate with the increase of the Poole Harbour derived sandy wares. Other fabrics include calcareous wares representing exploitation of the Jurassic clays, located 7–12km from the site (shelly wares, oolitic and limestone-gritted fabrics), with minor quantities of grog-tempered and flint-tempered wares.

The vessel forms were recorded under the system used for the Danebury and Hengistbury Head pottery. The earliest forms were undecorated, slack-shouldered, devolved situlate jars (Brown 1991, forms JB1-JB4 and JC1-JC2) and tripartite bowls (BA2 and BB1), predominantly made from the local clays. Furrowed or scratch-decorated varieties were not encountered. Brown (1991, 198) suggested a date of *c* 5th to 3rd centuries BC for this phase of occupation of Maiden Castle. Classic Middle Iron Age forms included saucepan pots (PB1) and associated jars (JB2, JB4, JC1, JC3 and JD3) and bowls (BA2, BC1 and BC2), in a range of fabrics. A third of the saucepan pots (PB1) were in fabrics thought to originate from the Poole Harbour industries (Brown 1991, 188). Prototypes of this form were assigned codes PA1-PA3, but of the 57 examples recorded, only six were in Poole Harbour fabrics. The evidence suggests that the Poole Harbour potters were copying saucepan pots from the 3rd century BC onwards, but with this style of vessel also being drawn from other sources, including the centres supplying Danebury (Brown 1991, 198). The Late Iron Age assemblage included a range of jar and bowl forms that are typical of the Poole Harbour industry, such as the bead-rimmed jars and bowls, necked jars, flat-rimmed jars, but also copies of imported vessels including the cordoned bowl forms (BD1, BD2; but not the rilled bowl BD3) and tazza (BD7). Notable amongst Wheeler's Iron Age C pottery are the straight-sided, bead-rimmed bowls from the 'war cemetery' (Wheeler 1943, fig. 72, 171-181).

Samples

As the Wheeler assemblage contained some of the earliest material, it was decided to take samples from this collection, with eight from his period 'A' pottery, twelve from period 'B', five generally assigned to periods A-C, five to periods B to C and one to period ‘C’ (Table 4.10; Figures 4.14 and 4.15). The earlier forms comprised carinated bowls and shouldered jars, whilst the later material included more typical Poole Harbour forms such as the bead-rimmed jars and bowls, flat-rimmed jars and bowls, often displaying the characteristic motifs of the industry such as the ‘eyebrow’ or ‘petal’ motifs, dimples and wavy lines.

Table 4.10. Pottery vessels sampled from Maiden Castle (Wheeler's assemblage)

Sample no.	From Wheeler 1943		Form
	fig. no.	phase	
1	56.7	A	Carinated bowl with out-turned rim, red-finished, burnished exterior
2	56.10	A	Carinated bowl, red-finished
3	56.14	A	Carinated bowl, upright rim, red-finished
4	56.15	A	Shouldered bowl, red-finished, burnished on both surfaces, has a boss at the shoulder, pushed out from interior
5	57.34	A	Jar with upright, slightly flared rim
6	58.45	A	Slack-sided jar with short upright/slightly flared and beaded rim
7	59.56	A	Weakly carinated bowl with slightly out-turned rim, red-finished
8	59.63	A	Bead-rimmed jar
9	66.89	B	Round-bodied jar with beaded rim, burnished surfaces
10	66.90	B	Bead-rimmed jar with irregular folding of rim on interior, possible petal motif
11	66.96	B	Jar with low waist, out-turned rim, red-finished exterior, well burnished on exterior and upper interior of rim
12	66.97	B	Bead-rimmed jar/bowl, tooled wavy line on exterior, burnished surfaces
13	66.108	B	Bead-rimmed bowl with panel of grooved decoration on shoulder
14	66.109	B	Bead-rimmed bowl with eyebrow motif on shoulder
15	66.112	B	Bead-rimmed (created with a groove) bowl, incised wave around shoulder
16	66.115	B	Bead-rimmed bowl with wavy line decoration, ?made with twig. Fingertip impression, pinched rim.
17	67.125	A-C	Flat-rimmed vessel with two tooled concentric arcs
18	67.128	A-C	Very coarse flat-rimmed jar
19	67.131	A-C	Flat-rimmed jar with eyebrow motif
20	67.132	A-C	Flat-rimmed jar
21	67.134	A-C	Flat-rimmed jar with countersunk lug handle
22	68.134A	B	Bead-rimmed jar, red-finished, burnished exterior and upper interior
23	68.134B	B	Vessel with irregular bead and slightly convex walls. Red-finished, burnished exterior
24	68.135	B	Bead-rimmed jar with burnished line chevron decoration
25	68.137	B	Flat-rimmed jar with oval impressions
26	69.139	B-C	Flat-rimmed jar with petal motif
27	69.142	B-C	Flat-rimmed jar with impressed double eyebrow motif repeated at least three times around the vessel
28	69.144	B-C	Bowl with grooved rim top and two incised wavy lines on exterior, appears to be red-finished, burnished on both surfaces
29	69.145	B-C	Flat-rimmed bowl, externally expanded, rim top decorated with two lines parallel with the rim edge and impressed dots between
30	69.146	B-C	Deep, hemispherical bowl with flat-topped rim, externally expanded, groove around interior of rim. Burnished interior and lower exterior
31	74.227	C	Tankard

4.3.2 Southdown Ridge, Weymouth (Figure 4.1, Site 14)

The site at Southdown Ridge was excavated during 2008-2009 ahead of construction of the Weymouth Relief Road, revealing part of a cross-ridge dyke, an Iron Age settlement and burial ground (Brown 2014). The settlement and cross-dyke were probably established during the earliest Iron Age (*c.* 800-600 BC), continuing in use throughout the Early Iron Age (*c.* 600-400 BC). Little activity was identified from the Middle Iron Age period, but the site was remodelled during the Late Iron Age, and partially used as a burial ground during the 1st century AD, possibly post-conquest. Seventeen inhumation burials were made within the previous settlement area and in or next to field boundaries. All had been placed in a crouched position, with some accompanied by pottery vessels, joints of meat and shale armlets (Brown 2014, 182). This burial tradition is typical for south Dorset during the Late Iron Age, and lasted well beyond the conquest, with 2nd century AD examples from Alington Avenue (Brown 2014, 182, after Davies *et al* 2002, 196). Three Roman coffined burials were also excavated, possibly contemporary with the graves of two infants.

The excavations produced 17,167 sherds (136 kg) of pottery, ranging in date from the earliest Iron Age (*c.* 800-600 BC) through to the 1st century AD. Over 80% of the assemblage was recovered from layers and spreads from across the site that were essentially unstratified, with only 17% coming from cut features (Cooper and Brown 2014, 197). The earliest Iron Age pottery (*c.* 800-600 BC) was mostly in shelly or oolitic fabrics and accounted for less than 3% of the assemblage. The forms included furrowed bowls and shouldered jars. Decorative motifs comprised incised lines and impressed circles/dots, sometimes with white inlay; some of the bowls were red-finished. The Early Iron Age material (*c.* 600-400 BC) was again predominantly in locally produced calcareous fabrics, but also included small quantities of Poole Harbour wares. The forms of this period comprised fineware bowls and coarseware vessels, sometimes red-finished or decorated with fingertip/nail impressions, or horizontal or diagonal lines, chevrons or other impressions, particularly around the shoulder or rim.

Little Middle Iron Age pottery was discernible in the assemblage, but the small component of this date indicated a shift from calcareous wares to sandy wares during this period. Poole Harbour wares were present in the form of S-shaped jars, jars with irregular pedestal bases and dishes with flattened rims. One vessel in an oolitic ware, with perforated lugs, appeared to be copying a Poole Harbour form (Cooper and Brown 2014, 201). Poole Harbour forms that span the Middle to Late Iron Age included proto-beaded rimmed vessels; decorative motifs include bosses, waves and dimples.

The Late Iron Age material was predominantly sand-tempered, largely from the Poole Harbour region, but some vessels were thought to have been made in the Exeter area. The Poole Harbour wares included bipartite jars and bowls, particularly high-shouldered vessels; bead-rimmed, necked vessels; flat-rimmed jars; bowls with grooved rims; dishes and lids (Cooper and Brown 2014, 202). Vessels were usually well-finished, burnished or smoothed, with lattice or wavy line decoration, occasional dimples and bosses.

Ceramic vessels accompanied at least three of the Late Iron Age burials, however, truncation and later ploughing of a number of the other graves may have removed/destroyed grave goods. An adult male had been buried with two Poole Harbour ware bead-rimmed bowls (typically known as ‘war cemetery bowls’ after Wheeler 1943; Brailsford’s type 1), one placed near to his head and one by his knees (Brown 2014, burial 7565, fig. 6.10, 73 [below, sample 10] and 74). The bones of a young lamb were also found in the grave. Three complete vessels had been placed by the head of a mature woman, comprising two ribbed, bead-rimmed bowls (Brown 2014, grave 7624, fig. 5.30, ON 112-113; fig. 6.10, nos. 70-71; below sample 9) and a bowl with flaring rim and horizontal tooled lines, also known as a tazza (Brown 2014, fig. 30, ON 111; fig. 6.10, no. 72; below, sample 11). Cattle and sheep remains were also recovered from the grave. A younger woman placed in grave 7053 was accompanied by a necked jar with wavy line on the neck (Brown 2014, fig. 5.32; Cooper and Brown 2014, fig. 6.9, no. 69; below, sample 16). A Devonian, rather than Poole Harbour, origin was suggested for these vessels (Cooper and Brown 2014, 214).

The samples

Fifteen samples were taken from the Southdown Ridge assemblage (Table 4.11; Figures 4.16 and 4.17). Most were of Middle to Late Iron Age, with the exception of one Early Iron Age jar. Samples 9, 10, 11 and 16 were from four funerary vessels.

Table 4.11. Pottery vessels sampled from Southdown Ridge

Sample no.	**Details from Cooper and Brown (2014)**			
	Fabric	**Fig. no.**	**Phase**	**Description**
1	QU1	6.3, 12	LIA	Necked jar, burnished
2	QU1	6.3, 15	LIA	Bead-rimmed jar or bowl, burnished
3		Not published	EIA	Jar with upright, slightly flared rim
4	QU1	6.4, 20	LIA	High-shouldered jar with moulded bead rim, burnished
5	QU1	6.5, 30	LIA	Grooved rim bowl / lid
6	QU1	6.2, 6	M-LIA	Flat-rimmed bowl with petal / pinched flower motif
7	QU1	6.7, 66	M-LIA	Flat-rimmed jar with countersunk handles
8	QU1	6.5, 33	M-LIA	Large, flat-rimmed jar
9	QU1 (Devon?)	6.10, 70	LIA	Ribbed bowl
10	QU1	6.10, 73	LIA	Straight-sided, bead-rimmed bowl
11	QU1	6.10, 72	LIA	Cordoned, pedestal bowl - ‘tazza’
12	QU1	6.7, 67	M-LIA	Bead-rimmed bowl
13	QU1	N/A	LIA	Necked jar with bead rim, rounded shoulder and tooled, wavy line decoration
14	QU1	6.6, 52	M-LIA	Cup with elongated flaring rim
15	QU1	6.3, 16	LIA	Pedestal base, burnished
16	QU1	6.9, 69	LIA	Necked jar, decorated with burnished wavy line on neck
17	QU1	N/A	M-LIA	Large, flat-rimmed jar

4.4 Sites in east Dorset

4.4.1 Hengistbury Head (Figure 4.1, Site 15)

The headland at Hengistbury Head, Bournemouth, has been subject to a number of archaeological investigations. The first was carried out in 1911, under the direction of J. P. Bushe-Fox. He assigned the pottery to 12 different classes (A-L), illustrating and describing each one. Cunliffe and Brown (1987, 205) note the contribution to British archaeology made by Bushe-Fox's 1915 publication of such a wide and hitherto unknown range of Iron Age pottery. Excavations were subsequently carried out by St George Gray (1919-1924) and David Peacock (1970-1971). A much larger programme of excavation commenced in 1979, led by Barry Cunliffe as part of a research programme into social and economic change in southern Britain during the Iron Age (Cunliffe 1987, 18). The pottery was analysed by Lisa Brown who incorporated material from the earlier excavations, although selective retention by Bushe-Fox and St George Gray was clearly evident, and the assemblages from their excavations had been split between a number of museums and the then landowner, the Meyrick family at Hinton Admiral.

The later prehistoric and Roman pottery assemblage from Hengistbury Head comprises 17,968 sherds (Cunliffe and Brown 1987, 206). The ceramic sequence was derived from stratified deposits across the site, and ranges in date from the 8th century BC to the 4th century AD. The assemblage was classified using a modified version of the system devised for Danebury (Cunliffe 1984, 231-331). Quantification of the assemblage in terms of fabric and form was retained in the archive but is not available in the published report.

A wide range of fabrics was identified, including wares from north-west France, south-western Britain, flint-tempered fabrics from the Wessex chalklands, micaceous clays from Wiltshire, and a number of unsourced fabrics, presumed local, including sandy wares, shelly wares, grog-tempered fabrics, a coarse fabric with inclusions of flint, chalk, shell and haematite, and one with inclusions of chaff or shell. Four fabric types were thought to originate from the Wareham/Poole Harbour region (Brown

1987, H19, A4, A2, E). The most frequently occurring was A4, sub-divided on the basis of coarseness into A4a (coarse-grained quartz) and A4b (finer quartz grains), dating from the Middle Iron Age through to the end of the Late Iron Age period. The sand of the Poole Harbour wares was fairly consistent in size, leading Cunliffe and Brown to suggest that one particular workshop was supplying Hengistbury with its pottery (Cunliffe and Brown 1987, 321).

Use of the A4 fabric during the Early Iron Age was represented by fabric H19, and defined as equivalent to A4a, although sometimes with coarser grains, but distinguished on the basis of the rough finish of the vessels (Brown 1987, 265). Fabric A2 was used to make copies of the imported cordoned jar and bowl forms (Brown 1987, forms BD1, BD2 and JE1). Fabric E was a hard, sandy fabric used for vessels with decoration comprising 'horizontal zones of slightly roughened, matt texture defined by grooves and usually incorporating short vertical burnished stripes over the roughened band' (Brown 1987, 264, forms BC3.52, BC3.5, JD4.6).

The Early Iron Age pottery was characterised by coarseware jars and finer bowls, predominantly in oxidised fabrics, whilst the Middle Iron Age material tended to be reduced with less distinction between the coarseness of the different vessel classes. However, the quantity of material recovered from both phases was relatively small. The Late Iron Age was marked by a change in the supply of vessels to the site, with wine from Italy arriving in Dressel 1a containers, Armorican pottery of a 'higher technical competence' than the local wares, and the south-western decorated wares from the West Country. A number of these forms were subsequently copied by the Dorset potters in Poole Harbour/Wareham fabrics. The Late Iron Age Poole Harbour/Durotrigian wares comprise a wide range of forms and have been used as the basis for the typology presented in this thesis (Chapter 9). Cunliffe and Brown (1987, 207) note the difficulties in separating the Late Iron Age and Roman pottery due to continuity in local production during these periods, however, the presence/absence of imported wares allowed them to sub-divide the Late Iron Age period into LIA 1 (contact period) and LIA 2 (Durotrigian period), at approximately 50-40 BC.

The samples

The assemblage from Cunliffe's excavation was deposited with the Russell-Cotes Museum, however, it is stored in a poor state and was not available for study, although the author had the opportunity to view some of the pottery whilst selecting pieces for display at the new Visitor Centre on the site. Samples were instead taken from an assemblage currently housed at the University of Southampton (Table 4.12). These comprised three flat-rimmed jars, and two necked jars.

Table 4.12. Pottery vessels sampled from Hengistbury Head

Sample no.	**Brown (1987) fabric**	**Brown (1987) form**
1	A4a	JC4.1: Flat-rimmed jar
2	A4a	JC4.1: Flat-rimmed jar
3	-	Flat-rimmed jar
4	A4a	JD4.4: necked jar with out-turned and beaded rim, eyebrow decoration
5	A4a	JD4.0/CS O.C.S.L: handle from jar with countersunk lug

4.5 Sites in north Dorset

4.5.1 Gussage All Saints (Figure 4.2, Site 16)

The enclosed settlement at Gussage All Saints was in use from the Early Iron Age through to the Late Iron Age, possibly abandoned at the time of the conquest. Excavation of the site by Geoffrey Wainwright in 1972 produced a large assemblage of Iron Age pottery - 76,602 sherds. Three stratigraphic phases were recognised and radiocarbon dates obtained for each. The pottery was assessed (quantification by count but not weight), with Wainwright stressing that this work was a preliminary stage and that the pottery 'will deserve further study as a topic in its own right' (Wainwright 1979, 49). The data was recorded onto record card and also transferred to computer. The cards and a print-out of the electronic data were deposited with the archive. Cross-referencing of the print out and the record cards by the current researcher revealed that not all of the data is present on the archived sheets. The data recorded in the archive cannot therefore be used to quantify the assemblage in terms of the fabric distributions across features and phases as the record is incomplete. However, the published report does provide a reasonably comprehensive summary of the assemblage, a feat in itself given its size. The publication includes illustration of 303 vessels, although 1034 vessels were actually drawn, and many of these are retained in the archive.

Fabrics

Each sherd in the assemblage was assigned to one of 26 fabric types based on visual characteristics, and a sample from each group submitted for petrological and heavy mineral analysis. This resulted in the 26 fabric types being divided into seven groups, corresponding to the source of the ware (Gale 1979, 49). Group One represents sandy wares from the Wareham/Poole Harbour area, and accounted for 69.6% of all pottery from the site. The proportion of Poole Harbour wares increased over time, with the Group One fabrics representing just 2% of the identifiable forms (including lugs) during the Early Iron Age, rising to 6% of the Early to Middle Iron Age forms, 24% of the Middle Iron Age forms, 66% of the Middle to Late Iron Age forms and achieving market dominance during the Late Iron Age, accounting for 96% of the identified vessels.

The Group Two fabrics were much finer sandy wares, with grains of probable altered glauconite, and of a different origin to the Group One vessels, possibly in the immediate vicinity of the site. Of the 29 red-finished vessels from the site, 27 were in Group Two fabrics, however, two of four vessels in the oolitic Group Five fabric were also red-finished, a fabric thought to originate from the Jurassic Ridge, 27km to the north-west of the site, and therefore suggestive of the import of some red-finished vessels to the site during this period.

Sandy wares Groups One and Two together accounted for 93% of the entire assemblage (Gale 1979, 53). The minor fabrics include a third sandy ware (Group Three), similar in appearance to the Group One and Two fabrics but not from Poole Harbour; fossiliferous shell-tempered wares from the Jurassic Ridge (Group Four); flint-tempered wares, possibly imports from Early Iron Age industries in Hampshire (Group Six); and grog-tempered wares (Group 7), thought to be local in origin

(Wainwright 1979, 53). The assemblage also included small quantities of imported Roman finewares and amphorae.

Forms

The most commonly occurring Early Iron Age (Phase 1) vessel forms were coarse and fine shouldered jars and bowls (types 1-4), but only 2% derived from the Poole Harbour area (Appendix C, Table C4). Most of the vessels of this phase had been made from the local Group 2 sandy fabrics. A number of forms were encountered in Phase 1 contexts but were more commonplace in the Middle Iron Age Phase 2 deposits. These included saucepan pots (Wainwright 1979, type 5), angular bowls (type 11) and shallow bowls (type 21), and were again predominantly in the local sandy wares with very few derived from Poole Harbour sources (Appendix C, Table C5). Eight forms were most commonly encountered in the Phase 2 deposits (Appendix C, Table C6). Types in Poole Harbour fabrics include large jars with everted rims (type 7), proto-bead rim bowls and jars (type 20), necked bowls (type 30) and flat-rimmed barrel jars (type 23). The latter (type 23) were identified as 'ancestral' to the flat-rimmed jars of Late Iron Age Phase 3 (type 40). Globular jars (type 48) span Phases 2 and 3, whilst cordoned bowls (type 28) were first seen in Phase 2, but were more commonplace in Phase 3, with 91% in Group One fabrics (Appendix C, Table C7).

The Late Iron Age (Phase 3) forms that were found almost exclusively (>90%) in Poole Harbour fabrics included bead-rimmed bowls and jars (types 35-37), upright-rimmed jars (type 38), flat-rimmed jars (type 40), fine, necked bowls (type 41), shallow dishes (type 43), necked bowls with rolled rims (type 44), grooved rim bowls (type 45), tankards (type 49), vessels with multiple bead rims (type 58), platters (type 56), burnished jars (type 57), flagons (type 53) and lids (type 54) (Appendix C, Table C8). Those of mixed origin include the Hengistbury Class B bowls (type 39, 53% in Group One, 47% in Group Two), shouldered bowls (type 42, 67% in Group One, 33% in Group Two) and large storage jars (type 47, 67% in Group One, 6% in Group Two, 17% in Group Four and 11% in Group Seven). A single narrow-necked jar, described as a corrugated jar (type 46, Group One fabric) was unphased but presumably of Late Iron Age date. Four moulded rims from globular bowls (type 29) were also found, but all in Group 2 fabrics.

<u>The samples</u>

A total of 36 samples were taken from the assemblage, some clearly Poole Harbour fabrics, but others in a sandy fabric that appeared similar to the finer versions of these wares (Table 4.13; Figures 4.18 and 4.19). Thin-sectioning was carried out to confirm if these finer fabrics, particularly those used for saucepan pots, might have originated from the Poole Harbour industry (Gussage Group 1 fabrics) or were more locally produced (Gussage Group 2 fabrics). One sample was taken from a barrel-shaped jar, recovered from the lowest fill of Phase 1 pit 379 (sample 34, P667), dated to 730-420 cal BC. Twenty five samples came from the upper secondary fills of the Phase 2 enclosure ditch. Nine samples (numbers 16-24) were selected from segment 1M, layer 4, as this was said to have 'produced a great deal of Phase 2 pottery' and was associated with a radiocarbon date of 410-170 BC. A further four came from the overlying fill, layer 3 (samples 6-9) and three from the adjacent slot, 1N, layer, 3 (samples 10, 25, 26). Joining sherds from one vessel were found across adjacent sections and layers - P137 in 1N(3) and P188 in 1M(4) (samples 10 and 22). Two jars found in the lower fills of enclosure entrance ditch 603 were sampled (P157 and P158, samples 12 and 13). A classic Poole Harbour vessel, a flat-rimmed jar with eyebrow motif, was sampled from the terminal of the main enclosure, section 1L, layer 4 (sample 11, P142). Six other samples were taken from slots through the enclosure ditch (samples 2-5, 14 and 15). Four came from pits 53, 55 and 57, located near the southern boundary of the enclosure (samples 28-31) and one from pit 351, located towards the centre of the enclosed area (sample 33).

Four samples were also selected from Phase 3 deposits, as all were characteristic Poole Harbour wares and would offer a basis for fabric comparison for this site. A flat-rimmed jar with petal motif came from the terminal of the smaller enclosure ditch, 310 (sample 1). A second vessel of this type and decoration came from possible Phase 3 pit 20, located within the main enclosure, at its south-western edge (sample 27). A flat-rimmed jar with eyebrow motif came from pit 781 (sample 36), one of few pits located outside of the enclosed area, but in proximity to ditch 310.

Another typical Poole Harbour ware was a tankard, from pit 330 (sample 32), and an everted rim jar from pit 380 (sample 35), both located in the central area of the enclosure.

Table 4.13. Pottery vessels sampled from Gussage All Saints

Sample	**Details from excavator's report (Wainwright 1979)**				
	Vessel	**Fig.**	**Description**	**Phase**	**Feature**
1	P102	N/A	Flat-rimmed jar with petal motif	3	Ring ditch 310Y, layer 6
2	P111	N/A	Saucepan pot with groove around rim	2	Enclosure ditch, 1C (4)
3	P117	N/A	Saucepan pot with groove around rim	2	Enclosure ditch, 1G (4)
4	P118	N/A	Saucepan pot	2	Enclosure ditch, 1G (4)
5	P120	N/A	Saucepan pot	2	Enclosure ditch, 1G (5)
6	P132	N/A	Saucepan pot	2	Enclosure ditch, 1M (3)
7	P133	58	Saucepan pot	2	Enclosure ditch, 1M (3)
8	P134	58	Slack-sided jar	2	Enclosure ditch, 1M (3)
9	P135	58	Saucepan pot	2	Enclosure ditch, 1M (3)
10	P137	N/A	Vessel with beaded rim and fingertip decoration, possibly carinated	2	Enclosure ditch, 1N (3)
11	P142	N/A	Flat-rimmed jar with eyebrow motif	2	Enclosure ditch, 1L (4)
12	P157	60	Ovoid jar with possible handle	2	Enclosure entrance, 603 (6)
13	P158	60	Bead-rimmed jar	2	Enclosure entrance, 603, layer (8)
14	P171	N/A	Straight-walled vessel/saucepan pot	2	Enclosure ditch, 1R (4)
15	P172	N/A	Saucepan pot	2	Enclosure ditch, 1R (4)
16	P178	58	Bead-rimmed jar	2	Enclosure ditch, 1M (4)
17	P179	58	Ovoid, beaded jar	2	Enclosure ditch, 1M (4)
18	P180	58	Saucepan pot	2	Enclosure ditch, 1M (4)
19	P182	58	Saucepan pot	2	Enclosure ditch, 1M (4)
20	P184	58	Barrel-shaped jar	2	Enclosure ditch, 1M (4)
21	P187	58	Jar with flat-topped, squared rim, internally expanded	2	Enclosure ditch, 1M (4)
22	P188	58	Joins P137 (above)	2	Enclosure ditch, 1M (4)
23	P193	N/A	Necked, cordoned jar	2	Enclosure ditch, 1M (4)
24	P197	59	Pedestal base	2	Enclosure ditch, 1M (4)
25	P200	59	Bowl with channel-topped rim	2	Enclosure ditch, 1M/N (3)
26	P201	59	Bowl with channel-topped rim	2	Enclosure ditch, 1M/N (3)
27	P209	N/A	Flat-rimmed jar with petal motif	?3	Pit 20, layer 5
28	P270	60	Proto bead-rimmed bowl/jar	2	Feature 53 (6)
29	P282	60	Round-bodied jar	2	Feature 55 (7)
30	P289	60	Bead-rimmed jar/bowl	2	Feature 57 (8)
31	P290	60	Hemispherical bowl	2	Feature 57 (8)
32	P636	53	Tankard	3	Pit 330, layer 8
33	P640	62	Hemispherical bowl	2	Feature 351 (3)
34	P667	57	Barrel-shaped jar	1	Pit 379 (8)
35	P676	64	Everted rim jar	?3	Pit 380, layer 6
36	P998	67	Flat-rimmed jar with eyebrow motif	3	Pit 781, layers 5-6

4.5.2 Barton Field, Tarrant Hinton (Figure 4.2, Site 17)

The multi-period site at Barton Field, Tarrant Hinton, located to the north-east of Blandford, was excavated from 1968 to 1984, by the Wimborne Archaeological Group . The Iron Age settlement dates from the 6th century BC to the 1st century AD, and is one of several on Cranborne Chase. Unfortunately parts of the archive were lost before post-excavation analysis of the data, with the Iron Age material (1288 sherds, 43,261 g) said to be 'very incomplete' (Graham 2006, 19) and also subject to selective retention (Brown 2006, 64). A typical range of Iron Age fabrics was present, including sandy wares (64% of the assemblage was identified as Poole Harbour wares and 11% as glauconitic), calcareous fabrics (15% oolitic with <1% shelly wares) and flint-gritted wares (9% of the assemblage). Five fabrics were identified amongst the Poole Harbour wares, A1a to A1e, with A1a the finest. The forms were recorded using the typology devised for Danebury, with a total of 239 Poole Harbour vessels attributed to a vessel form; a further 14 lids and 47 bases also recorded (Appendix C, Table C9).

The earliest occupation on the site was represented by a furrowed, carinated bowl in a fine, sandy fabric with occasional flint fragments, dated to the 7th century BC but residual in its context (Brown 2006, fig. 25, 84). Material of 5th to 3rd centuries BC date included small quantities of Poole Harbour wares from five of the seven pits assigned to this phase, including a barrel-shaped jar with lugged handles (Brown 2006, JB4.2, not illustrated). Supply from Poole Harbour increased during the Middle Iron Age period, with Poole Harbour ware fabrics found in all eight pits assigned to this period. Forms included a barrel-shaped jar (JC2.2, Brown 2006, fig. 23, 31), four high-shouldered jars (JC2.3 with tooled arc decoration, *ibid.* fig. 23, 30; JC2.0, fig. 23, 36; JC2.3; JC3.1 with moulded dimple); a flat-rimmed jar (JC4.2, not illustrated); two saucepan pots (PB1.1 and PB1.1) and a round-bodied bowl (BC3.3 with eyebrow motif). A number of rims were also recovered from features broadly dated Middle to Late Iron Age, including two flat-rimmed jars (JC4.2), an S-profiled jar (JD3.0), two tripartite jars with countersunk handles (JD4.41), two saucepan pots (PB1.1) and a round-bodied bowl (BC3.3). It seems that, by the Late Iron Age period, the Poole Harbour industry was supplying almost all of the vessels to this site. The usual range of Late Iron Age forms were present, including bead-rimmed bowls and jars, necked bowls and jars, flat-rimmed jars and lids. Rarer types included a cordoned jar and tazza, and copies of Armorican cordoned bowls (Brown 2006, 22, 28).

Samples

Five samples were taken for analysis, all identified as Poole Harbour wares (Table 4.14; Figure 4.20). They comprised three jars of Middle Iron Age date, and two flat-rimmed jars of Late Iron Age date.

Table 4.14. Pottery vessels sampled from Barton Field, Tarrant Hinton

Sample no.	Brown (2006) Fig. No.	Feature	Phase	Fabric	Form	Description
1	23.30	Pit 7	MIA	A1d	JC2.3	Round-bodied jar, beaded rim, tooled arc decoration
2	23.31	Pit 9	MIA	A1c	JC2.2	Barrel-shaped jar
3	23.36	Pit 12	MIA	A1c	JC2.0	Round-bodied jar with short, upright rim
4	24.45	Pit 20	LIA	A1b	JC4.1	Flat-rimmed jar with petal motif
5	24.48	Pit 20	LIA	A1b	JC4.1	Flat-rimmed jar

4.5.3 Bradford Down, Pamphill (Figure 4.2, Site 18)

Excavations at Bradford Down, Pamphill, were carried out between 1968 and 1972, with evidence for Early to Middle Iron Age activity found within an area enclosed by a Late Iron Age ditch (Field 1983).

The pottery report indicates that a relatively small proportion of the Iron Age and Roman assemblages was analysed: ‘of an estimated 2,500 sherds recovered, 293 were selected as worthy of further study and these were reduced to the 120 illustrations described’ (Field 1983, 83). The illustrated material derived from stratified material and general layers. It includes 12 vessels of Early to Middle Iron Age date; their forms are described as devolved situlate jars, saucepan pots, pans with flat rims and a bowl with a pinched rim. Unfortunately the fabric descriptions are too vague to assign to inclusion type: ‘dark grey paste’, ‘red-brown ware with large white grit', 'brown-black paste with heavy grit', and so forth (Field 1983, 83). The Late Iron Age material included bead-rimmed bowls and jars; necked, cordoned bowls; flat-rimmed jars (with dimple and petal motifs); necked jars; jars with countersunk handles and grooved rim bowls.

The samples

Of the 11 illustrated vessels of Middle Iron Age date, three were found to be sandy wares and were sampled for analysis (Table 4.15; Figure 4.21).

Table 4.15. Pottery vessels sampled from Bradford Down, Pamphill

Sample no.	Field (1983) Fig. No.	Feature	Phase	Fabric	Description
1	12.1	Pit A19	MIA	'Fine, sandy paste'	Barrel-shaped jar with short, upright rim (JB4)
2	12.2	Pit A19	MIA	'Dark grey paste'	Round-bodied jar with plain rim (JC2)
3	12.3	Pit A19	MIA	'Sandy grey paste'	Barrel-shaped jar with short, upright rim (JB4)

4.5.4 Oakley Down, Wimborne St. Giles, Dorset (Figure 4.2, Site 19)

An Iron Age and Romano-British settlement at Oakley Down, on Cranborne Chase, was identified from cropmarks in the summer of 1949, and excavated over the next five years by F. H. G. Montagu-Puckle. There was a phase of open settlement during the Early Iron Age, prior to the construction of an enclosure during the Middle Iron Age. The settlement may then have been continuous through to the Early Romano-British period, although most of the material culture recovered from the site relates to Late Iron Age to Early Roman activity (Corney 1996, 77).

The proportion of diagnostic sherds within the pottery assemblage indicates selective retention of material, and a high level of abrasion was suggestive of re-deposition (Brown 1996, 72). Of the 987 sherds (16.508kg) retained, 37% of the count and 40% of the weight were identified as quartz sand-tempered ware originating from the Wareham-Poole Harbour area. Other Iron Age fabrics were predominantly non-Poole Harbour sandy wares (some glauconitic), but also shelly wares, oolitic wares and flint-tempered wares.

The Early Iron Age pottery included tripartite jars with upstanding rims (Brown 1996, form 1) and tripartite bowls, often red-finished (*ibid.* form 12). Of the 20 examples of form 1, one was in a Poole Harbour ware, nine were in a sandy fabric with other inclusions, four were in a glauconitic sandy ware, three were in a shelly ware and three were in a sand, flint and chalk-gritted fabric. Of the bowls, two were in a Poole Harbour fabric and two were in a mixed sandy ware. A red-finished body sherd from a tripartite bowl was also identified as a Poole Harbour product.

Middle Iron Age forms included bipartite jars and saucepan pots. The bipartite jars (form 2) were mostly in Poole Harbour fabrics (five vessels), with single examples in other sandy fabrics (two vessels). Of the proto-saucepan pots (form 22), none of the eight examples were in Poole Harbour wares, although four of the six more developed versions (form 23) were in these fabrics. Forms that were predominantly in Poole Harbour ware fabrics included bead-rimmed jars (form 3), flat-rimmed jars (form 4) and a flat-rimmed dish (form 20), of Middle to Late Iron Age date. A wide range of fabrics was therefore still in use during this period, including oolitic wares from the Jurassic Ridge. Brown notes the manufacture of saucepan pots by the Poole Harbour potters, and suggests the potters selected 'fine grades of sand temper' for these vessels (Brown 1996, 74). She also indicated that all four grades of sand temper recognised at Maiden Castle were also identifiable in the assemblage from Oakley Down, with the two coarsest fabrics used solely for the flat-rimmed jars. The assemblage included oxidised versions of this form, which Brown had recognised in other assemblages including Tollard Royal, Gussage All Saints and Hengistbury Head, suggesting this was deliberate (Brown 1996, 75).

During the Late Iron Age to Early Romano-British period, Poole Harbour wares dominated the assemblage, the most popular forms being the upright-necked jars (form 6) and bead-rimmed bowls (forms 13 and 14). Some of the flat-rimmed jars will also relate to this phase. Grog-tempering was first used during this phase, however no imported finewares were seen, other than a little samian during the early Roman period.

The samples

Eight of the 20 illustrated vessels were identified as Poole Harbour wares (Brown 1996) and samples were taken from each (Table 4.16; Figure 4.22). The earliest forms are a tripartite bowl and bipartite, ovoid jars. A Middle Iron Age saucepan pot and four Late Iron Age jars were also included.

Table 4.16. Pottery vessels sampled from Oakley Down, Wimborne St. Giles

Sample no.	Illustration (Brown 1996)	Form type	Description	Phase
1	9, 3	2	Ovoid, bipartite jar with beaded, rolled or thickened rim	EIA-MIA
2	9, 4	2	Ovoid, bipartite jar with beaded, rolled or thickened rim	EIA-MIA
3	9, 5	23	Saucepan pot with straight sides and plain rim	MIA-LIA
4	9, 6	4	Ovoid jar with flattened beaded rim	LIA
5	9, 7	5	Tripartite jar with elongated or everted rim	LIA
6	9, 8	6	Wide mouthed, necked jar	LIA-RB
7	9, 9	6	Wide mouthed, necked jar	LIA-RB
8	9, 19	12	Small tripartite bowls	EIA

4.6 Sites in north-east Dorset and Somerset

4.6.1 Allard's Quarry, Marnhull (Figure 4.2, Site 20)

The Iron Age and Romano-British site at Marnhull was discovered by quarry workers in the late 19th century and investigated by C. E. Bean and Audrey Williams. The scale of the quarrying and the onset of World War II meant that much information was lost from the site but the available data was compiled by Williams and published in 1951. There was no quantification of the pottery in the published report, nor was any fabric analysis undertaken, with descriptions along the lines of 'smooth buff-grey ware' or 'grey-black ware' (Williams 1951, 48). It is therefore not possible to ascertain the proportion of Poole Harbour wares from the site. Williams presented the pottery assemblage by period (adhering to the A/B/C Iron Age classification), making some general comments about the range of wares and illustrating 144 Iron Age vessels.

The Iron Age ‘A’ material included the same range of devolved situate jars (occasionally with handles) and red-finished bowls as Maiden Castle. Williams noted that the surfaces of the jars were usually rough, oxidised and the shoulders tended to be more rounded than angular. The bowls were in finer fabrics and often red-finished. They included furrowed bowls, two of which were illustrated (Williams 1951, fig. 9. 39 and 49). Other tripartite, carinated, hemispherical and straight-sided bowls were also present. Williams identified changes in the Iron Age ‘B’ material with better finished surfaces and the evolution of some of the earlier forms. The range of vessel forms included high-shouldered jars with beaded or plain rims, flat-rimmed jars, jars with countersunk handles, convex-sided/barrel-shaped jars, saucepan pots and bowls with beaded or grooved rims. Like Wheeler, she suggested that the flat-rimmed jar form had its ancestry in the Iron Age A forms (Williams 1951, 50). The Iron Age ‘C’ vessels were described as wheel-turned and included forms thought to have been ‘introduced direct from Belgic sources’, including Wheeler’s ‘war cemetery’ bowl, described as ‘popular throughout Dorset’ (Williams 1951, 50). Other forms included necked jars, bead-rimmed jars and dishes, and flat-rimmed jars – some decorated with the eyebrow or petal motif.

<u>The surviving archive</u>

It was hoped to obtain samples from the published illustrated vessels, but only 48 of the 144 illustrated vessels were located, many of which were not Poole Harbour wares. Selective retention policies appear to have been applied to the finds from the site, with the surviving archive biased towards rim sherds and other featured pieces such as red-finished sherds, decorated sherds, handles and some base forms. The fact that only a third of the illustrated material could be located indicates that part of the retained archive is now missing. Any quantification of fabric is therefore no longer possible, however most of the vessels in the surviving archive are in calcareous fabrics, particularly those containing oolitic limestone (75% of the number of vessels), with smaller quantities of sandy wares from a range of sources, including

Poole Harbour (up to 17%; other sandy wares comprise 4%), and some flint-tempered wares (4%).

The samples

Samples were taken from a range of Early to Late Iron Age vessels in the bulk archive (Table 4.17; Figure 4.23). The Early Iron Age vessels selected for petrological analysis were all fine, sandy wares with red-finished surfaces. They were mostly carinated bowls - eight were furrowed and two plain, and a tripartite jar. The later material sampled was mostly forms associated with the Poole Harbour industries. These included a flat-rimmed jar with eyebrow motif; eight jars with rounded shoulders and bead-rims, one slightly flattened (three with eyebrows); four jars with countersunk handles; a bead-rimmed bowl; a bowl with grooved rim and a bead-rimmed bowl with more than 13 small holes drilled through its base, post-firing. Other vessels included a saucepan pot that had the appearance of a Poole Harbour ware fabric in the hand specimen, and a fine, carinated bowl with beaded rim that was thought to be a possible glauconitic vessel, but sampled for confirmation. The archive includes pottery from pits with numerical and alpha codes, however only numeric codes are used in the publication report. Where a published vessel was located, it was possible to match the features denoted by letter codes to the published feature numbers.

Table 4.17. Pottery vessels sampled from Allard's Quarry, Marnhull

Sample No.	**Red-finished**	**Marnhull phase**	**Form and figure number, if applicable (from Williams 1951)**	**Feature**
1	Yes	A	Furrowed and carinated bowl (body sherd)	Pit 71
2	Yes	A	Plain, carinated bowl (body sherd)	Pit 71
3	No	C	Bead rim jar	Pit 119
4	No	C	Bead rim jar	Pit 124
5	Yes	A	Furrowed vessel (body sherd)	Pit 124
6	No	B	Bead rim jar with eyebrow motif	U/S
7	No	B	Fine carinated bowl, bead rim, burnished	Pit B (1932, Bean)
8	No	C	Bead-rimmed bowl	Pit B (1932, Bean)
9	No	B	Bowl with channelled rim (fig. 15, 113)	H3 / H4 hearth
10	No	B	Ovoid jar with bead rim and eyebrow motif	H3 / H4 hearth
11	No	B	Countersunk handled jar (fig. 15, 108)	119
12	Yes	A	Furrowed and carinated bowl	U/S
13	No	A/B	Countersunk handled jar	Pit AAC (pit 47)
14	No	A/B	Round-shouldered jar, bead rim	Pit AAC (pit 47)
15	Yes	A	?Tripartite jar with upright rim (fig. 7, 21)	Pit AAD (pit 45)
16	Yes	A	Furrowed and carinated bowl (fig. 9, 49)	By pit 2-H1
17	No	B	Saucepan pot	Pit UU
18	Yes	B	Plain rim	Pit UU
19	No	B	Countersunk handled jar	Pit UU
20	No	B	Countersunk handled jar	Pit near SS and TT
21	No	C	Round-shouldered jar, bead rim	Small pit, east side near burial
22	No	C	Bead rim bowl, perforated base (strainer)	
23	Yes	A	Furrowed and carinated bowl (body sherd)	U/S
24	No	B	Flat-rimmed jar with dimple and eyebrow	U/S
25	Yes	A	Furrowed and carinated bowl	Pit SP (pit with cow)
26	Yes	A	Plain carinated bowl	Pit SP (pit with cow)
27	Yes	A	Furrowed bowl? (body sherd)	U/S
28	Yes	A	Furrowed bowl? (body sherd)	U/S
29	No	B/C	High shouldered vessel, flattened beaded rim	August 1944, Pit CP
30	No	B/C	Bead rim jar with eyebrow	August 1944, Pit CP

4.6.2 Sigwells, South Cabury Environs (Figure 4.2, Site 21)

The South Cadbury Environs Project was set up to examine the landscape around Cadbury Castle using a varied programme of investigation including fieldwalking, geophysical survey, test-pitting and excavation. The director of this programme, Richard Tabor, submitted 60 pottery samples of Neolithic to Late Iron Age date from six sites to the current researcher for petrological analysis, and the sandy wares have been included here. These 14 samples come from the site of Sigwells, located *c.* 2km to the south-east of the hillfort (Table 4.18; Figure 4.24).

Analysis of the pottery from the hillfort itself has revealed that calcareous fabrics were dominant during the Early to Middle Iron Age phases, with the Poole Harbour products not imported until the 1st century AD. Williams and Woodward (2000, 261) note that 'at Cadbury Castle, and in Somerset as a whole, the industry does not appear to have had any impact until the time of the Roman conquest'. It is in this context that the samples from Sigwells are particularly significant, with seven from vessels recovered from feature F003, associated with a radiocarbon date of 177-1 BC, whilst four came from feature F011, dated to 166 BC – AD 59. If positively identified as Poole Harbour wares, this would suggest the industry was reaching the area at least 100 years earlier than previously thought. The forms included wide-mouthed, necked cordoned bowls; bead-rimmed bowls and jars; flat-rimmed jars; a tripartite jar; S-profiled jar; a south-west decorated bowl and a tankard.

Table 4.18. Pottery vessels sampled from Sigwells, South Cadbury

Sample	Feature	Fabric	Form	Description
1	F011	Ufa	JD4.12	Tripartite jar with everted rim
2	F011	Ufa	BC3.3	Bead-rimmed bowl
3	F011	Y	BD1	Wide-mouthed, necked, cordoned bowl
4	F003	Ufa	JC3.1	High shouldered jar with beaded rim
5	F003	Ufa	BC3.3	Bead-rimmed bowl
6	F003	Ufa	JD3	Globular, S-profiled jar
7	F003	UN	BD6	SW decorated-style bowls
8	F003	Ufa	JC4.2	Flat-rimmed jar
9	F003	Y	BD2	Wide-mouthed, necked, cordoned bowl
10	Cxt 086	Ushale	Tankard	Tankard
11	F011	Ufa/Ug	BD2	Wide-mouthed, necked, cordoned bowl
12	F003	D	BD1	Wide-mouthed, necked, cordoned bowl
13	F003	Ushale	JC4.1	Flat-rimmed jar
14	F003	Ufa	JC4.2	Flat-rimmed jar

4.7 Conclusion

Twenty-one key assemblages of Iron Age pottery from Dorset were selected for study, to provide an opportunity to examine the growth of the Poole Harbour industry, the range of forms being produced, and their distribution. Sampling of a selection of the vessels from each will allow investigation of the choices potters made in terms of their clay sources and processing techniques.

Unfortunately, selective retention by excavators at a number of sites, and/or subsequent loss of material, means that full quantification by fabric is not possible for many of these assemblages. Other difficulties arise in that prior to the work of Peacock and Williams in the late 1960s and 1970s, the Poole Harbour fabrics had not been classified and were therefore not recognised as such on sites excavated prior to the 1970s (for example at Allard’s Quarry and Eldon’s Seat). Nonetheless, a number of conclusions may be drawn concerning the growth of the Poole Harbour industry from the published reports.

The overall picture of ceramic production and use during the Early Iron Age in much of Dorset is one of locally sourced ceramics in a range of fabrics, predominantly fine sandy wares, often glauconitic, with smaller quantities of shell-tempered, limestone-gritted or oolitic wares. A different emphasis on fabrics was identified at Southdown Ridge, Weymouth, with calcareous fabrics dominating the Early Iron Age assemblage and the shift to sandy wares occurring during the Middle Iron Age. Oolitic fabrics may also have dominated the earlier phases at Allard's Quarry. The Early Iron Age forms were predominantly shouldered jars and finer, carinated bowls, often red-finished.

The earliest evidence for the use of the tourmaline-rich fabric thought to originate from the Wareham/Poole Harbour area of Dorset comes from Rope Lake Hole, on the southern coast of the Isle of Purbeck. Even during the earliest phase of occupation at this site, *c.* 8th to 6th centuries BC, sandy wares dominated the assemblage, with shelly wares and limestone-gritted fabrics accounting for 30% of the pottery from this period, and flint-gritted fabrics for less than 4%. These sandy fabrics were identified as Poole Harbour wares (Davies 1987).

Poole Harbour wares have also been recorded on other Early Iron Age sites, with small quantities at Gussage All Saints (Period 1, *c.* 8th to 5th centuries BC), Bradford Down, Pamphill (Early Iron Age phase) and at least one jar from the Early Iron Age site at Hog Cliff Hill, Maiden Newton (Williams 1987b). This suggests that some vessels were being traded over considerable distances during the Early Iron Age, with Gussage located 22km to the north of Poole Harbour, Bradford Down 12km to the north and Hog Cliff Hill 40km to the west of the Harbour. Riverine transport may have made long distance westward journeys feasible, with Hog Cliff Hill situated just 1.3km to the north-east of the present course of the River Frome. Alternatively, the single vessel from this site may simply reflect a vessel that travelled as someone's personal possession, but the overall picture is one of some form of limited trade or exchange during the Early Iron Age period, prior to the 5th century BC. From the 5th to 3rd centuries BC, distribution of these wares appears to have increased and Poole Harbour wares have been recorded from sites such as Maiden Castle, Barton Field, Eldon's Seat, Oakley Down, Southdown Ridge and West Creech (Wytch Farm), but again in small quantities.

Around the 3rd century BC there is a change in the ceramic record, with sandy wares becoming dominant in all of the assemblages examined, and the Poole Harbour wares gaining in momentum, accounting for approximately one quarter of the Middle Iron Age assemblages from Dorset. A wider range of forms was being used on these sites, including the saucepan pot, a characteristic form of the Wessex heartland and of Cunliffe's (2010) 'saucepan pot continuum' *style-zone*. By the 3rd century BC the Poole Harbour potters had started to make copies of these vessels, but selected a finer grade of sand for them (Brown 1996, 74). Saucepan pots in sandy wares and flint-tempered fabrics from other industries were also being utilised in the Poole Harbour region, and have been found at Furzey Island. Some of the forms synonymous with the later 'Durotrigian' pottery first make their appearance during the Middle Iron Age, most noticeably the flat-rimmed jar but also earlier bead-rimmed forms and flat-rimmed bowls and dishes.

By the Late Iron Age, the range of forms in use had increased further, but the range of sources had decreased as the Poole Harbour potters saturated almost all of the Dorset markets with their products. These included bead-rimmed jars and bowls, flat-rimmed jars, necked jars, grooved rim bowls, lids, and copies of imported vessels such as cordoned bowls and jars, tazze, platters and beakers. However, this was not the case for all sites, with a notable exception at the Late Iron Age enclosed settlement at Bearwood, Poole, located just 10km from the Harbour (SZ 0509 9642). Excavation in 1972 produced a largely unstratified pottery assemblage, dated *c* 150-50 BC, with most of the pottery in a fabric 'with small quantities of quartz' (Field 1985, 142). The forms from Bearwood included saucepan pots, bead-rimmed bowl and jar forms and necked jars (Field 1985, fig. 11). One vessel with countersunk lug-handles and a flat-rimmed jar were also present (*ibid.*). These are all characteristic forms of the Poole Harbour industry, yet the excavator stated that the fabrics 'are distinctly different from BB1' (Field 1985, 142). This may represent a potter from the main industries to the south setting up a new venture to the north of the Harbour, or the imitation of Poole Harbour wares by other potters using different resources.

Pottery from the Poole Harbour industry was also traded further afield from the 1st century BC, possibly a little earlier. The earliest evidence for a trade westwards into Devon is a group of pottery vessels deposited in a Late Iron Age ditch at Gatcombe

Ash, Seaton, including at least one thought to have come from Poole Harbour, but most were vessels in local Upper Greensand derived fabrics in forms that resemble the contemporary Dorset vessels, such as the bead-rimmed jars and necked jars. Radiocarbon dates from charred residues on the vessels indicate a date of 176-40 cal BC and 196-42 cal BC and therefore possibly a 2nd century BC date for the import of Poole Harbour wares to this area, and a prior familiarity with the forms if they were being copied by the local potters, albeit without any decoration (Quinnell and Reed 2012). A very small quantity of Poole Harbour wares was also recovered from Blackhorse, on the eastern outskirts of Exeter - a site along the route of the A30, including an ovoid jar with bead rim, dating from the later 1st century BC (Laidlaw and Mepham 1999).

To the north, it was thought that Poole Harbour wares did not reach sites such as South Cadbury until the 1st century AD, but pottery recovered during the recent excavations by Richard Tabor suggests the earlier import of vessels, during the 1st century BC. The industry also seems to have supplied pottery to the inhabitants of Ham Hill during the 2nd to 1st centuries BC (Brudenell 2012, 57). Poole Harbour wares first appear on sites in the environs of Danebury, in Hampshire, some 60km to the north-east of Poole Harbour, from the middle of the 1st century BC. Brown (2000, 124) notes the fabric (D17) accounts for 10% of the Late Iron Age pottery from Houghton Down, 25% from Woolbury, and 30-40% of the Suddern Farm and Nettlebank Copse assemblages, all part of the Danebury Environs Project.

The overall picture is of an industry with its origins in the Earliest Iron Age, creating a range of vessels for an increasing market. The reasons why the Poole Harbour potters were able to achieve market dominance by the Late Iron Age is uncertain, but may have resulted from the technical properties of their vessels, for efficient heating and cooking, or for their contents – possibly salt, or may relate to the development and maintenance of social networks (Morris 1997, 38). Whatever the reason, the shift from locally produced vessels to regionally-traded wares is one that is repeated across central-southern Britain. During the Early Iron Age in this region, the overall pattern is one of local production, with certain finewares, such as scratch-cordoned bowls, probably produced in a restricted area but distributed up to 40km away (Cunliffe 1984, fig. 6.22). There was a shift during the Middle Iron Age with the increased production of vessels at specific centres and their use at sites much further afield. Standardisation of production is evident, again suggesting 'some form of more specialised production and exchange of products developing during the later part of the Iron Age' and probably evolving from the Early Iron Age (Morris 1996, 45). By the end of the 1st century BC this shift to regionally produced ceramics had replaced local production across much of the south-west, Somerset and Dorset (*ibid*, 49). The resource base utilised by the potters who successfully supplied these sites will be explored in Chapter 5.

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Chapter 5

Fieldwork

A programme of field sampling was devised to 'assess the degree of natural variation and the potential choice available to potters in the past' (Whitbread 2001, 452). Defining the study area was problematic as no sites of Early or Middle Iron Age pottery production have been identified (Chapter 3). It was therefore necessary to hypothesise that the focus of production sites dating to the Late Iron Age and Romano-British periods was broadly comparable in the preceding periods, as the recipe of clay and sand used by potters in all periods was similar, suggesting related sources and therefore production areas. This later focus was on the southern and western shores of the Harbour, and along the rivers Frome and Corfe (Figure 5.1). Exploitation of clay sources in the 19th and 20th centuries by brick makers and potters was also examined to help identify clays with properties suitable for ceramic manufacture that could potentially have been exploited in earlier periods.

Most known sites of Late Iron Age and Romano-British pottery production are located on the Poole Formation deposits of the Bracklesham Group (Figure 5.2). One site of possible pottery production, at Sandyhill Copse, Corfe Castle, lies on the Wealden deposits, whilst a possible site at East Holme is located towards the western edge of the Poole Formation deposits, with the geologically older deposits of the London Clay located 3km to the west of this site. The Wealden Clays lie on the southern side of the Purbeck Ridge but this topographical feature would have presented a considerable barrier in terms of the movement of clay, with gaps in the ridge at Corfe Castle and Ulwell being the only easy access to these clays. Riverine and coastal waters may also have been used for the transportation of raw materials.

The main focus of the Late Iron Age and Romano-British pottery production is an area approximately 10km from east to west and 8km from north to south, with Ridge (located to the south-east of Wareham) at its centre, itself a site of production. Dean Arnold's 1985 ethnographic study of the distances potters are willing to travel to obtain clay, indicated that 33 percent of the 111 potters studied obtained their clay within a 1km radius and 84 percent would travel up to 7km (Arnold 1985, 38). All mapped clays within a radius of 7km of Ridge have therefore been sampled. Samples of the Wealden clays from the south of the Purbeck Ridge were also been taken, to allow the opportunity to follow on from work by Belinda Coulston in the late 1980s, suggesting a similarity between the Wealden clays and the Late Iron Age Poole Harbour wares from Maiden Castle (Chapter 2).

5.1 Methodology

Historic Ordnance Survey maps of the late 19th and early 20th centuries were explored to ascertain the location of mapped clay pits and brick and pottery works (Chapter 3). A detailed list was compiled of these sites, and each assigned a 'Historic Workings' reference number (hereafter HW; Appendix D, Table D1). The National Grid References of each site were transposed to the geological mapping to ascertain the clay types that were exploited. The research revealed that all of the Poole Formation clays were used for brick and pottery production during the 19th and 20th centuries, as well as the Wealden and London Clays. The locations of the known sites of Late Iron Age, Romano-British and medieval pottery production, together with those of brick and pottery production of the 19th and 20th centuries, were used to create a schedule of fieldwork, with the aim of collecting clay samples from as many of the known areas of previous exploitation as possible (Figure 5.3).

Poole Harbour would have looked quite different during the Iron Age as a result of the lower sea-level (Chapter 2), but due to practical constraints, no attempt was made to obtain clay samples from now submerged landscapes. Fieldwork was instead concentrated on those areas where the clay is mapped as outcropping. It was hoped to take samples from all of the named clay members of the Bracklesham Group (in ascending stratigraphic order: Creekmoor Clay, Oakdale Clay, Haymoor Bottom Clay, Broadstone Clay and Parkstone Clay), however the Haymoor Bottom Clay was very localised, occurring only in a small area to the east of Canford Heath that has been extensively worked and is now mapped as Made Ground. Where possible, samples from each clay member were taken at different locations to examine variability within a particular mapped clay type. In addition, Brownsea Island was selected for multiple sampling to assess variability within a restricted geographical location. It was hoped to assess if variability between the named clay members is greater than that exhibited by samples within a particular clay type, one of the key aspects of provenance studies.

Transposing the target list for sampling to the field proved problematic. Areas of more recent exploitation for brick and pottery production tend to now be heavily altered or built over. Access to a number of sites initially listed for sampling was refused or proved impractical. Nonetheless, all clay members of the Poole Formation have been sampled and these are wide ranging in terms of their locations, but it was only possible to obtain samples of Creekmoor Clay from one area (Table 5.1). An overview of the spatial relationship between the sites of Late Iron Age/Romano-British pottery production (or suspected production), historic brick and pottery works, and the samples taken as part of this research, is visually presented in Figure 5.4.

Most of the sampling was carried out using a 1m gouge auger for hard soils, although occasionally a sample was taken by digging through a surface deposit with a trowel. The numbering sequence for the samples was site specific, with each starting at number 1. Each of the clay samples was formed into three or four briquettes, depending on the amount collected in the field. A small amount from each sample was made into a coil and tied in a knot to assess the plasticity of the clay and its suitability for vessel formation. A small bowl was also often formed for the same purpose. Consideration was given to the possible methods of forming the briquettes. Most potters will remove any pebbles or visible organic remains, such as roots. A potter may process the clay further by drying and crushing the clay to remove any unwanted inclusions. Other processing methods include levigating the clay - this involves mixing the clay with water to form a slip, allowing it to settle and the coarse particles to sink and any organic material to float, then transferring the upper, finer fraction to another container and extracting the finer clay (Rye 1981, 17). Alternatively the clay may be mixed with water and sieved. It is not known how the potters who worked around Poole Harbour during the Iron Age and Roman periods processed their clay. The clay samples collected as part of this project have had few inclusions that needed to be removed in order to successfully form a briquette or small bowl, however drying and crushing or mixing with water may have facilitated an easier method of combining the raw clay with sand if the latter was added as temper.

Levigating the clay may have removed a fraction of the clay, but given that it is not known what, if anything, was removed by the Iron Age potters, it was decided to use the sample in its entirety, other than taking out any obvious pebbles or roots that could be removed by hand. Clay sampling and briquette making of the Kimmeridge clay by Belinda Coulston had also highlighted possible complications if samples are levigated, as the shale fragments evident in her sample in the field were not apparent in the thin section of the briquette made from the levigated sample, suggesting the shale had been removed by the process (Coulston 1989, 500). A small amount of water was added to make the clay workable, the quantity dependant on the sample. Analytical reagent grade water was used to ensure that any chemical analysis conducted would not be affected by the impurities present in tap water. A small number of briquettes were made from clay samples with sand added to them, in approximately the same quantities seen in the pottery, to allow consideration of the effect of adding sand on the elemental composition of the clay.

Each briquette was approximately 100mm in length, 20mm wide and 10mm thick, although this occasionally varied depending on the amount of sample present and the plasticity of the clay. A 50mm line was incised on each after forming, as well as a unique number. The briquettes were dried at air temperature (usually 20°C) for two weeks, and then fired in a Carbolite muffle furnace, in oxidising conditions. The temperature in this furnace steadily increases to the required level, maintains the temperature for the allotted time (five hours) and then slowly cools. The total time for the furnace to heat, fire and cool is approximately 24 hours. A briquette from each sample was fired to one of three temperatures, 600°C, 800°C or 1000°C, with some also fired at 700°C. The colour of the clay was recorded when first formed into the briquette, when dried and then when fired. The 50mm line was also measured after firing, with the shrinkage rates presented in Appendix D, Tables D2-D29.

5.2 Results

A summary of the fieldwork at each site is presented below, according to the sequence of Poole Formation clays, in ascending stratigraphic order, followed by the Wealden Clays. The sample locations were recorded using a hand-held Global Positioning System (GPS). Details are given of the clays recovered, their formation into briquettes and their firing colours.

Table 5.1. Number of sites sampled, and samples analysed, for each clay type

Clay type	**No. of sites sampled**	**No. of samples analysed**
Creekmoor Clay	1	3
Oakdale Clay	4	8
Broadstone Clay	11	32
Parkstone Clay	4	38
Poole Formation	3	10
Wealden Clay	3	11
Barton Clay	1	3
Total	**27**	**105**

5.2.1 Creekmoor Clay

Upton Country Park

Fieldwork was carried out at the north-eastern edge of Holes Bay, at Upton Country Park. Initial attempts to auger at the edge of the mud flats were unsuccessful, reaching an oily, grey mud with abundant organic debris. Sample 1 represents the clay towards the back of this area, at an elevation of 10m OD (Table 5.2). Another auger hole was attempted one metre higher up the bank at the back of this area, but only soil was reached, to a depth of 1m.

Samples 2 and 3 were taken on higher ground, at the level of the footpath, 12-13m OD. The samples were just 1m apart, but both produced good clay, from 0.1m. Augering was abandoned at 0.7m due to the difficulty in removing the auger from the ground.

Table 5.2. Location of samples taken from Upton Country Park

Sample No.	NGR	Comments
1	SY 99636 92850	Elevation: 15m. Augered to 0.85m.
2	SY 99631 92858	Elevation : 13m. Augered to 0.7m.
3	SY 99636 92854	Elevation: 12m. Augered to 0.7m.

<u>Briquettes (Appendix D, Table D2)</u>

Sample 1 was a very dark greyish brown colour with frequent organic material. It was fairly easy to work, and could be coiled. The clay from samples 2 and 3 was a light grey with yellow/orange mottles. The clay was reasonably easy to work, however sample 3 was difficult to coil without breaking. When mixed with water, sample 1 was a very dark grey colour, drying to a greyish brown; samples 2 and 3 were a little paler, greyish brown when wedged, drying to a light brownish grey. All fired to a reddish yellow at 600-800°C, but samples 2 and 3 turned to a pink colour at 1000°C. The shrinkage of samples 2-3 was 6-10% but sample 1 was far greater, at 16-18%.

5.2.2 Oakdale Clay

Sandford

Three clay samples were taken from Sandford, in an area of disused clay pits to the north-west of the village; two of the Broadstone Clay (samples 5 and 6) and one of the Oakdale Clay (sample 4; Table 5.3). Sample 4 was taken at the mapped junction of the Oakdale Clay and Broadstone Sand, from a cleared section of slope just below the road (western side of B3075). The deposit was a very sandy clay, with mixed grey, red and yellow colours. The sample that was collected was clayey in texture from the surface of the slope, but sandier below.

Table 5.3. Location of samples taken from Sandford

Sample No.	NGR	Comments
4	SY 92538 89601	Trowelled from slope surface.

Briquettes (Appendix D, Table D3)

This sample was a yellowish brown mottled clay, containing frequent organic inclusions. It was sandy in texture and very easy to work. It felt like a dough and a coil could be tied in a knot. When first formed it was a light yellowish brown colour, it dried to a pale brown and fired to a light reddish brown at 600°C and 800°C, turning paler and more pink at 1000°C. The shrinkage rate was 6% at all temperatures.

East Holme

Two samples were taken from the spoil heap of a mechanically excavated area that forms part of the research of Emily Norton, Bournemouth University (forthcoming), into the prospection of clandestine mass graves in temperate environments (Table 5.4).

Table 5.4. Location of samples taken from East Holme

Sample No.	NGR	Comments
1 and 2	SY 90831 85061	Hand-collected from a mechanically excavated trench.

Briquettes(Appendix D, Table D4)

In their dry state, both samples were a greyish white colour with red streaks, and had a fine, silty texture. They were very hard and were broken down and mixed with water. This produced a sticky clay, perhaps due to the addition of too much water. The clay was easily formed into a thumb pot. The wedged clay was a brownish yellow in colour, drying to a buff colour and firing to a pink at 600-800°C, and a pinkish white or buff at 1000°C. The shrinkage rate of the briquettes was 6-10%.

Longfleet Lodge

Two samples of clay were taken from a single location, by a member of the Poole Harbour Heritage Project, Alan Hawkins, at Longfleet Lodge, located to the south of Canford Heath and east of the Nuffield Industrial Estate (Table 5.5).

Table 5.5. Location of samples taken from Longfleet Lodge

Sample No.	NGR	Comments
1 and 2	SZ 02081 93954	Hand collected sample from surface deposit.

<u>Briquettes (Appendix D, Table D5)</u>

These samples were of a reddish grey, soft clay that was easily formed into a thumb pot, the sides held up well, and a coil of this clay could be tied into a knot. The clay dried to a light grey colour, and fired to a pink at 600°C and 800°C or a buff colour at 1000°C. One of the briquettes fired at this higher temperature exploded in the furnace. The shrinkage rate was 8% at all temperatures.

Upton, Poole Road

An area of Oakdale Clay located at Upton, north-east of Poole, has a long association with the brick-making industry. The Lytchett Brick Works, later to become the Upton Brickworks, were in operation for over 100 years, closing in 1968. The kilns were situated at the interface of the clay and the sand, as shown on the geological mapping, and were therefore ideally placed to exploit both of these raw materials. The clay seam exploited by this industry is now almost exclusively under housing, but fortunately it was possible to auger in the back garden of 14 Poole Road, Upton (Table 5.6). The subsoil was 0.3-0.35m deep, and the underlying clay was a mottled grey and yellowish brown colour, becoming more grey with depth, and sandy in texture.

Table 5.6. Location of samples taken from Poole Road, Upton

Sample No.	NGR	Comments
1	SY 98279 93115	Elevation: 14m. Maximum depth reached: 0.85m.
2	SY 98278 93114	Elevation : 21m. Augered to 0.57m.
3	SY 98277 93111	Elevation: 22m. Augered to 0.57m.

Briquettes (Appendix D, Table D6)

This light yellowish brown clay was sandy in texture and dried to an olive yellow or light to pale brown. It fired to a reddish yellow to red colour, most shrank in firing by 4% but two briquettes shrank by 6%.

5.2.3 Broadstone Clay

The Broadstone Clay underlies much of the superficial deposits on the Isle of Purbeck, north of the Purbeck Ridge. To the west it forms the lower slopes of Trigon Hill, and there are a few patches around Sandford. On the northern side of the Harbour, there is a NNE-SSW band running parallel to the below-mentioned band of Parkstone Clay (section 5.2.4), between Canford Heath and Oakdale Cemetery, but most is located north of a line between Beacon Hill and Canford Heath, around Broadstone, Bearwood and to the west and south of Merley. Fieldwork was concentrated around the southern shores of the Harbour and the Isle of Purbeck, in the areas known to have been utilised by potters working during the Late Iron Age and Romano-British periods.

South of Bramble Bush Bay

The geological mapping indicates an area of Broadstone Clay between the north-west side of the Ferry Road at Studland and the foreshore. It extends from the southern side of Bramble Bush Bay (at Jerry's Point) south-westwards for approximately 550m before meeting the Branksome Sand 1km east of Redhorn Quay. This area is part of Studland Heath and the ground cover is heather, with trees and gorse along the shore line.

An attempt was made to auger through the heathland at the back of the beach, 15m back from the 'cliff' edge/junction with the beach sand (sample 1; Table 5.7). The upper 0.6m comprised soil, clay was then reached, but the hole was abandoned at 0.75m. The sample was dominated by organic material and soil, and was not retained. Sample 2 was taken from the back of the beach, below the heathland, in an area where clay was visible from the surface. The upper 0.45m comprised sand and plant material, the next 0.15m comprised a silty clay, with a purer clay present from a depth of 0.6m. It was extremely compact and difficult to auger through. Samples 3-5 were also taken in this area. Sample 3 was 1.5m from the water's edge (30 minutes before a low tide of 1.6m). The upper 0.45m was a deposit of sand and plant material, with clay reached at 0.45m. Sample 4 was taken 3m from sample 3, just under the water. Clay was again reached, but the deposit was sandier. Another sample (5) was taken to target the clay reached in sample 3. Sample 6 was taken from the back of the beach, behind the location of samples 3 and 5. Clay was present from the ground surface but a maximum depth of 0.5m was reached due to the compactness of the deposit. A small sample of a red-coloured, iron-rich deposit was collected by hand, approximately 150m to the south of samples 1-6, towards the centre of the bay.

Clay was much more evident on the surface in the southern part of the bay, and was pale grey to white in colour. Augering revealed it was very compact and difficult to penetrate. Sample 8 was taken close to the water's edge, and sample 9 was collected by hand from the surface, in the same location. As the coast curves to the north, a sample (10) was taken through an area where clay was outcropping on the surface. The sample was found to be much sandier, presumably as it was in an area approaching the Parkstone Sand. A depth of 0.5m was reached before the auger hole was abandoned due to the clay being too compact.

Table 5.7. Locations of samples taken south of Bramble Bush Bay

Sample No.	NGR	Comments
1	SZ 02839 85970	On heathland, predominantly soil and organics, not retained.
2	SZ 02821 85970	At junction of heathland edge and beach, clay visible on surface, clay at 0.6m.
3	SZ 02817 85967	Taken 1.5m from water's edge (30 minutes before a low tide of 1.6m).
4	SZ 02817 85966	Taken 3 m from sample 3, just under the water.
5	SZ 02816 85968	Same area as sample 3.
6	SZ 02824 85948	At back of beach, behind samples 3-5. Clay from surface, augered to 0.5m.
7	SZ 02807 85804	Sample of red, iron rich deposit, taken by hand.
8	SZ 02717 85707	Clay from surface.
9	SZ 02717 85707	Hand collected sample of clay from surface, at location of sample 8.
10	SZ 03527 85570	White/yellow clay, sandy texture.

Briquettes (Appendix D, Table D7)

Samples 2-6 were difficult to wedge initially, but once wedged, the clay was pliable and it was easy to form them into long coils. Small thumb pots were made from sample 5, the sides of which held their shape without sagging. Sample 7 was a grey clay with lumps of iron or ochre which were difficult to break down. The sample was very sticky and difficult to form into a briquette. Samples 8 and 9 were very easy to work and form into briquettes. Sample 10 was noticeably sandier than the other clays but still formed a coil and a thumb pot, and the sides held up well. The clays were similar in colour, varying from a light grey to a buff colour (identified as pale brown on a Munsell Chart) or white. They fired to a pink, pinkish white, white or buff colour, indicating that all are iron-poor clays. The clay sample with lumps of possible ochre (sample 7) was a pale red when mixed and fired. The shrinkage rates were 4-12%, but most were 4-6%.

Ower Bay

Ower Bay was a site of pottery production during the Romano-British period. The location of this production was close to Cleavel Point (at SZ 0004 8618) but this area is not currently accessible. Fieldwork was therefore carried out approximately 190m to the west, on the beach at the end of the track across the peninsula (Figures 5.5 and 5.6; Table 5.8).

A white clay with yellow streaks was evident at the back of the beach. Unfortunately augering was not very successful as the water table was hit at a depth of 0.3m. A small amount of clay was obtained at SY 99864 86205 (sample 1). Clay was also collected from the 0.5m high section at the back of the beach (sample 2). A third sample was taken representing clay from two adjacent auger holes, where a maximum depth of 0.2m was reached (Figure 5.7). Walking a little further round the shoreline, a surface scatter of oxidised ceramic material was encountered at SY 99890 86193, elevation 4m. This comprised yellowish red (5YR 5/6-4/6) body sherds, a slightly footed base sherd, a plain base sherd and two rims. One was a lid with groove around the lower exterior, the other was from a possible short, stumpy dish. A few of the sherds exhibited fire-clouding, or had traces of a white coating, possibly salt. The surfaces of some were smooth. Most appear to be fragments of briquetage, but the lid had well-finished surfaces and is probably pottery. The material is most likely to derive from activity during the Iron Age or Romano-British periods.

<u>Briquettes (Appendix D, Table D8)</u>

The clays recovered from this area were very easy to work, coiled well and had the consistency of putty. Sample 1 was grey in colour, sample 2 was a light grey with yellowish brown mottles, mixed to a pale brown, sample 3 was a greyish brown colour. All dried to a buff or white colour and fired to a buff (very pale brown, pale orange yellow and pale yellowish pink), pink, pinkish white or white. They had a low shrinkage rate, of 2-6%.

Newton Bay

Two auger holes were attemped at Newton Bay, 400m to the south of Ower Bay (Table 5.8). In both the subsoil was 0.75-0.9m deep, at which point the water table was reached.

Table 5.8. Location of samples at Ower Bay and Newton Bay

Sample No.	NGR	Comments
1	SY 99864 86205	Elevation 3 m. Water table at 0.3 m.
2	SY 99851 86194	Elevation 2 m. Surface collection from section at back of beach.
3	SY 99848 862000	Elevation 2 m. Depth of 0.2 m reached.
N/A	SY 99890 86193	Surface finds of oxidised sherds.
N/A	SY 99958 85841	Newton Bay, soil to 0.75 m then water table. No clay recovered.

Arne Peninsula

Permission was granted by the RSPB to access their land on the Arne Peninsula (Figure 5.5). It was intended to auger in a low area mapped as clay (at NGR SY 96666 88832) but this was found to be a very large pond/lake. An alternative location was selected just off the track, in an area with a change of vegetation from heathland to birch trees, ferns and rhododendrons (Table 5.9). Two samples were taken 0.5m apart. They revealed a grey clay with some iron staining, augered to a depth of 0.6m.

Table 5.9. Location of samples taken from Arne Peninsula

Sample No.	NGR	Comments
1	SY 97006 88634	Elevation: 22m. Augered to a depth of 0.6m.
2	SY 96624 88816	Located 50m from sample 1.

<u>Briquettes (Appendix D, Table D9)</u>

The clay samples were a light brownish colour prior to working, with some orange-coloured streaks noted in sample 2. They were easy to wedge, forming a putty-like consistency, and could be shaped into a small bowl, however the coils snapped on bending. They dried to a white colour and fired to a buff, pinkish white or white colour, depending on the temperature. They had a low shrinkage rate, at 2-4%.

Arne, South of Bank Gate Cottages

A small triangular patch of land was augered between Arne Road and the road that runs south-east past Slepe Farm (Figure 5.5; Table 5.10). Two samples were taken: the first was quite sandy at the top but then went down onto solid clay; the upper 0.3m of the second was sand (sample 2A) and the lower 0.25m was clay (sample 2B).

Table 5.10. Location of samples taken from Arne, South of Bank Gate Cottages

Sample No.	NGR	Comments
1	SY 95573 86568	Elevation: 4m. Augered to a depth of 0.8m.
2	SY 95567 86575	Elevation: 4m. Augered to a depth of 0.55m.

<u>Briquettes (Appendix D, Table D10)</u>

Soil and sand were present in the upper part of the auger hole for sample 1, but discarded, and briquettes made from the clay below. It was a light grey colour, with brownish yellow mottles, and mixed to a light yellowish brown. The clay was easily formed into a coil and had the consistency of putty. The upper 0.3m of the adjacent sample (2) was a coarse sand (sample 2A), dark greyish brown in colour. A briquette was made from this, but it was not possible to form a coil. The lower 0.25m was a compact, fine clay in a light grey colour with yellow mottles (sample 2B). This was of putty-like consistency, was easy to work and coiled well. Part of the sandy deposit was mixed with the purer clay to experiment with adding sand to clay. The ratio was approximately 20% of sample 2A (sand) to 80% of sample 2B (clay), forming briquettes 245-247, however the resulting clay did not coil well. These light grey, mottled clay samples dried to a light grey or buff colour, and fired to a buff or pink. They shrank at a rate of 2-6%.

Arne Beach

Two samples of clay were taken using a trowel on the north-western coast of Arne, below Russel Quay, at the northern tip of the Arne Peninsula (Figure 5.5; Table 5.11).

Table 5.11. Location of samples taken from Arne Beach

Sample No.	NGR	Comments
1 and 2	SY 97122 89397	Collected from surface with a trowel

<u>Briquettes (Appendix D, Table D11)</u>

The clay was a light grey colour and was easily worked into a thumb pot and a coil could be knotted. Part of each sample (140g) was mixed with sand (20g) and crushed, dried shale (3g), the latter being an unstratified archaeological find from Green Island. The resultant briquettes dried to a white or buff colour and fired to a pink or pinkish white.

Godlingston Heath

Godlingston Heath was the location of pottery production during the Romano-British period (Chapter 3) and was also exploited for clay in the late 19th century, with at least nine locations of brick workings (HW points 100-108) recorded on the historic maps (Appendix D, Table D1). The geology of Godlingston Heath is dominated by Broadstone Clay and Parkstone Sand, overlaid in parts by Head deposits (Figure 5.8). There are also two localised pockets of Parkstone Clay, enclosing patches of Branksome Sand. These are located on the higher ground, between 75m and 85m OD. The site of the Roman pottery kiln, and most of the later clay pits, are at the interface of the Broadstone Clay and the Parkstone Sand. During fieldwork, access to the heath was gained from a path leading northwards from the B3351 at SZ 01770 81882.

The first auger hole was attempted 95m north-east of the road/path junction, in a low area with water running through (Table 5.12). The geological mapping shows this point to be Broadstone Clay but it is at the western end of a swath of Head deposits. Clay was reached at a depth of 0.8m (sample 1). The second sample was taken 23m NNW of sample 1, on slightly higher ground at 107m OD, on land covered by heathland plants (Figure 5.9). The clay was reached at a depth of 0.6m, and a maximum depth of 0.8m was obtained with the auger. The clay appeared to be iron-rich. Sample 3 was taken from 7m to the East-North-East of sample 2, again through the heathland flora. The path from the Fishing Barrow was followed in a westerly direction for a distance of 250m before turning northwards for 30m into an area of trees and a low stream. The stream appeared to run in an approximately NE-SW direction, flanked by banks on either side. These banks were comprised of clay and samples were taken from each (sample 4 from the south-east bank and sample 5 from the north-west side). However, no clay was recovered from the stream bed and it is not known if these raised areas/banks are natural or artificial, perhaps representing dumping from any levelling of the golf course.

Table 5.12. Location of samples from Godlingston Heath

Sample No.	NGR	Comments
1	SZ 01802 81931	Elevation 103m. Clay reached at 0.8m.
2	SZ 01796 81952	Elevation 107m. Clay reached at 0.6m.
3	SZ 01803 81957	Elevation 107m.
4	SZ 01526 82099	Good clay on slope.
5	SZ 01514 82108	Approximately 12m to W of sample 4.

Briquettes (Appendix D, Table D12)

Once dry, the clay samples varied from a light brownish grey, to an olive yellow or pale brown. Samples 1-4 fired to a reddish yellow or light red, with sample 4 becoming lighter at 1000°C (a very pale brown). Sample 5 was rather different, firing to a pink at 600°C and 800°C, and even paler (a very pale brown) at 1000°C. The shrinkage rate was 5-12%, but most were at the lower end of this (6%).

Romano-British pottery kiln

An attempt was made to locate the Romano-British pottery kiln (Swan 1984, fiche 1.264). The published NGR for this site appears to be on private land, probably associated with the building at SZ 014455 821274 (the site is located 55m to the north-east of this probable farm building), however it was accessible from the path. The site is on overgrown land, with moderate tree cover and has been used for dumping refuse (Figure 5.10). A concentration of heathstone (a local sandstone) was visible in the area of the possible kiln (at SZ 01485 82170), however no ceramic material was identified. Several attempts to auger were made in the immediate vicinity but no deposits of clay or clean sand were reached, only soil and heathstone.

Redcliff Farm, Ridge

The site of the Romano-British pottery kiln at Redcliff is recorded as SY 93219 86618, an area located at the junction of the Broadstone Clay and Parkstone Sand (Figure 5.5; Swan 1984, fiche 1.260; Lyne 2002). Much of this area is on private land and was not accessible, however two samples were taken from the edge of the road close to Redcliffe Farm (Table 5.13). A maximum of 0.4m depth was reached with the auger. It was also hoped to take samples from the caravan park, but the owner refused permission to auger or carry out any form of survey.

Table 5.13. Location of samples taken from Redcliffe Farm, Ridge

Sample No.	NGR	Comments
1 and 2	SY 93222 86621	Elevation 11m, two augered samples, to a depth of 0.4m

<u>Briquettes (Appendix D, Table D13)</u>

Both samples were brown in colour when first wedged, drying to a light brownish grey and firing to a pink at 600-800°C and pinkish white or buff at 1000°C. Both appeared to be micaceous and were easy to work and form into thumb pots; they could be coiled and were easy to cut and inscribe. Drying and firing caused a shrinkage of 6%.

Foxground Plantation

This area of pine and birch planting land was investigated, at the bend of Breaches Lane. Clay was noted adjacent to a narrow drainage gully (Figure 5.11) and two samples (numbers 1 and 2) were taken, augered to a depth of 0.6-0.7m (Table 5.14). Sample 2 appeared to be particularly iron rich. On the other side of the track was a stream with sand deposits on the banks. Two surface sand samples were taken (samples 3 and 4). One section of this stream was walled and the remains of a stone structure once integrated into the stream were also noted, probably part of an eighteenth century water meadow system.

Table 5.14. Location of samples taken at Foxground Plantation

Sample No.	NGR	Comments
1	SY 99451 82695	Elevation 53m. Waypoint 1. Depth reached: 0.7m.
2	SY 99461 82705	Elevation 52m. Waypoint 2. Depth reached 0.6m.
3	SY 99439 82722	Elevation 54m. Waypoint 3. Surface sand sample.
4	SY 99452 82743	Elevation 53m. Waypoint 4. Surface sand sample.

<u>Briquettes (Appendix D, Table D14)</u>

Both samples were yellowish brown in colour, and sticky and sandy/gritty in texture. They would not coil, although could hold a shape. They dried to a pale brown or olive yellow and fired to a yellowish red to light red or red. One of the sample 1 briquettes, and two of sample 2, exploded. Petrological analysis revealed an unidentified golden coloured inclusion that was not seen in the other clay samples. Where measurable, the shrinkage rates were greater than other clay briquettes, at 12-14%.

Rempstone Heath

A sample of clay was hand-collected from a stream running alongside the track to Ower Farm, on the north-eastern edge of Rempstone Heath (Table 5.15).

Table 5.15. Location of samples taken from Rempstone Heath

Sample No.	NGR	Comments
1	SY 99512 85093	Elevation 3m, auger hole failed, sample collected by trowel

<u>Briquettes (Appendix D, Table D15)</u>

The clay was a yellowish brown colour with orange mottles, slightly fibrous in texture. It was soft and easy to work, and coils formed from the clay could be bent without breaking. It fired to a reddish yellow at 600-800°C but to a pinkish white at 1000°C. It shrank at a rate of 8-10%.

Sandford

Several attempts were made to auger adjacent to disused clay pits (at SY 92430 89446, SY 92410 89548, SY 92450 89605 and SY 92493 89444), but only sand was encountered in each, from the surface to a depth of 1m. Sample 5 was taken near to a clay loam pit (Figure 5.12) where clay was noted on the surface (Table 5.16). Sample 6 was hand dug with a trowel from an exposed section adjacent to the loam pit.

Table 5.16. Location of samples taken from Sandford

Sample No.	NGR	Comments
5	SY 92704 90006	Augered to 0.4m
6	SY 92702 89998	Hand excavated from section

<u>Briquettes (Appendix D, Table D16)</u>

Samples 5 and 6 were similar, both grey in colour, although sample 6 was slightly darker. The clay was soft and easily worked - both samples could be readily formed into coils and briquettes, and were easy to cut. They both dried to a white colour and fired to a pinkish white or buff colour, and shrank at a rate of 6-8%.

Wytch Heath

Three samples were taken in a pine plantation on the western side of a track running from the B3351 northwards towards Wytch Heath Oil Gathering Station (Figure 5.5 and 5.13; Table 5.17). Sample 1 was taken through an area of standing water in a furrow. The upper 0.6m was clay and bagged as sample 1A, whilst the lower 0.2m was very sandy and bagged as sample 1B. The clay from sample 2 was also found to be quite sandy.

Table 5.17. Location of samples taken at Wytch Heath

Sample No.	NGR	Comments
1	SY 97350 84225	Eevation 26m. Augered to a depth of 0.8m, upper 0.6m clay, lower 0.2m sand.
2	SY 97332 84267	Elevation 23m. Augered to a depth of 0.6m.
3	SY 97351 84238	Elevation 23m. Augered to a depth of 0.6m.

<u>Briquettes (Appendix D, Table D17)</u>

The brown clay from sample 1A was easy to form into a thumb pot, the sides of which did not flop. A coil of this sample could be tied in a knot. The lower, sandier deposit from this auger hole (sample 1B) was a yellowish brown colour, was less cohesive and it was not possible to bend a coil. Sample 2 was also sandy, brown in colour, and coils of this clay would tend to break when bent. Sample 3 was a mottled grey and orange colour, was of a workable texture that was easily formed into a thumb pot and a coil could again be tied in a knot. When wedged the colour evened to a yellowish brown. All dried to a light yellowish brown or pale brown, and fired to a reddish yellow or light red. They shrank at 2-8%.

5.2.4 Parkstone Clay

On the northern side of Poole Harbour, the Parkstone Clay outcrops in a north to south band to the east of Alderney, southwards to the marina at Parkstone Bay and then south-eastwards to Poole Head; and also in pockets around Hill View and Bourne Valley. To the west of the Harbour there is an outcrop around Trigon Hill, towards the Purbeck Ridge at Creech Heath, and within the Harbour at Brownsea Island. Samples were taken from four locations: Brownsea Island, Creech Heath, Bourne Valley and Tower Park.

Brownsea Island

Twenty two samples were taken around the shores of Brownsea Island in the areas mapped as exposed clay (Figures 5.14 and 5.15; Table 5.18). Samples 1-10 were located across a 125m stretch along the south-western coast of the island, just south of Pottery Pier (central point SZ 01025 87929; Figure 5.16). Samples 11-22 were taken across a length of 340m, from the area of ponds and marsh on the northern side of the island, in the location of the disused clay mines (Figure 5.17). Cliff sections expose the stratigraphy of the island around its southern coastline. A section behind the location of sample 4 (SZ 01020 87949) stood to a height of 1.7m (Figure 5.18). The upper 0.35m comprised topsoil, mixed with 19th century pipe fragments. Below was a sandy subsoil, 0.2m thick and then a fairly uniform brownish grey clay, 1.15m thick. Sample 4 was taken from the base of the section.

Table 5.18. Location of samples taken around Brownsea Island

Sample No.	NGR	Comments
1	SZ 01003 87980	Sample 1A: upper 0.7m; sample IB: lower 0.3m.
2	SZ 01011 87969	Quite wet but in area of chine run off. Clay from 0-0.9m.
3	SZ 01016 87956	Max. depth reached = 0.5m.
4	SZ 01020 87949	Max. depth reached = 0.8m.
5	SZ 01020 87949	Grab sample from section. 1m from top of footpath.
6	SZ 01027 87928	At back of shoreline to 1m depth.
7	SZ 01035 87906	Clay from surface to 1m depth.
8	SZ 01039 87896	Clay from surface to 1m depth.
9	SZ 01054 87869	Blue/grey clay at surface, becoming sandier with depth
10	SZ 01054 87869	Surface collection of blue/grey clay seen at top of auger for sample 9.
11	SZ 01885 88563	Mix of clay and soil near shaft in the low area.
12	SZ 01885 88563	Sample through clay spoils, probably from shaft. Surface to 1m.
13	SZ 01883 88565	Adjacent to sample 12, sample through clay spoils, probably from shaft. From surface to 0.6m.
14	SZ 01844 88560	At shaft, on water's edge, from surface to 1m.
15	SZ 01844 88560	At shaft, on water's edge, from surface to 1m.
16	SZ 01767 88554	At water's edge, near spit (used to go out to a pier), 0.7m depth.
17	SZ 01773 88556	Near sample 16 but closer to spit, near water's edge. Not kept: organic and soil.
18	SZ 01769 88556	Surface sample adjacent to sample 16.
19	SZ 02001 88505	Further north, area of surface clay in lagoon, only a small amount of clay at 0.7m, between areas of sand and organics.
20	SZ 02028 88465	Next to mine shaft at back, some clay reached at 0.6m but then into sand.
21	SZ 02102 88481	Good clay at 0.6m, north of mine.
22	SZ 02096 88489	Adjacent to sample 21, clay reached at 0.6m.
23	SZ 02097 88482	Between samples 21 and 22.

<u>Briquettes (Appendix D, Table D18)</u>

Samples 1-9, from the south-west of the island, and sample 11, from the northern coast, were a dark grey, very dark grey or dark greyish brown colour when first exposed, dried to a grey or greyish brown and fired to a pink colour, or occasionally a pinkish white or white. Sample 10 was a light grey and fired to a pinkish white or buff colour. Samples 21-23 (northern coast) were also a dark grey when first sampled, drying to a grey and firing to white. Samples 12 and 13 were very similar in colour, appearing as a light yellowish brown in the field and drying to a buff/pale brown colour. They fired to a light red or reddish yellow 600°C or 800°C, turning pink at 1000°C. Sample 14 was a pinkish grey initially, drying to a light grey and firing to a pink or pinkish white at 1000°C. Sample 15 was a light reddish brown but dried to a pinkish white and fired pink. Samples 16 and 18 were a light brown in the field, drying to a buff/pale brown and firing pink at 600°C and 800°C, turning to a buff colour at 1000°C. Samples 19 and 20 were a light brown colour in the field, sample 19 drying to a light brownish grey and firing pink, sample 20 to a greyish white and firing to a pinkish white.

Most of the grey clay samples from the southern side of the island were smooth, pliable, and were easy to form into coils, and even to knot the coils. Sample 2 was a little sandier in texture than the others, and sample 9 comprised a mix of smooth clay and a dark sandier deposit. The samples from the northern coast tended to contain organic material (in samples 11-20). Sample 11 appeared contaminated and had a sandy texture. Samples 12, 13, 14, 16, 18 and 19 also contained some sand/grit. Samples 14, 15, 18, 19, 22 and 23 formed coils. All of the sample 15 briquettes exploded on firing. The shrinkage rates were 2-10%, but most were at 4-8%.

Creech Heath

Four samples of Parkstone Clay were taken from Creech Heath (Table 5.19).

Table 5.19. Sample locations, Creech Heath

Sample No.	NGR	Comments
1	SY 9290 84030	Mottled grey clay with orange streaks, augered to 0.8m depth.
2	SY 92807 84016	Mottled grey clay, augered to 0.5m depth.
3	SY 92694 84020	Gritty, soft grey clay.
4	SY 92560 84040	Reddish brown clay, sandy texture, augered to 0.8m depth.

Briquettes (Appendix D, Table D19)

When first excavated, samples 1-3 were grey in colour, with orange and red streaks noted in sample 1, and yellow mottles in sample 2. Sample 4 was reddish brown in colour. Samples 1 and 2 were smooth in texture, sample 3 was more gritty and sample 4 was sandy with numerous stones that were picked out of the sample, leaving a putty-like clay. All clay samples easily formed coils. When fired to 600°C and 800°C the clays became a light red or reddish yellow colour, although sample 2 became more pink at 800°C. When fired to 1000°C, samples 1 and 4 remained a reddish yellow, but samples 2 and 3 became pink in colour. They shrank at a rate of 4-10% most at 6%.

Alderney, Newtown and Foxholes

A band of Parkstone Clay, up to 600m wide, runs NNE-SSW through the Alderney, Newtown and Foxholes area. It was favoured by brick producers in the late 19th century, with the brickworks and the associated clay pits of six producers visible on the historic maps of the area (Figure 5.19). These include the Newton Vale Brickworks (historic working [HW] points 10-12), New Town Brickworks (HW 13-15), Fox Holes Brick Works (HW 16-18) and Kinson Brickworks (HW 19). The Kinson Pottery was located in the southern part of this area (HW 23), just to the south of the present Ringwood Road. The legacy of this industry has left its mark in this area, the original location of the works is now the *Kinson Pottery Industrial Estate*, the Public House on the opposite side of the road is named *The Pottery*, and the adjacent block of flats is *Pottery View*. Clearly an area of industrial focus at the end of the 19th century, this has continued into the present day and this zone is now heavily developed with industrial estates, housing, roads and other services. All the original clay pits and brickworks are now built over or the land has been heavily altered during modern industrial use. The British Geological Survey maps show this entire area as a mixture of infilled ground and made ground. Nonetheless, the locations of all the clay pits and previous brick and pottery works in this area were plotted onto geological and Ordnance Survey maps (historic workings [HW] points 10-26) and an attempt was made to visit and sample as many of these areas as possible.

Newton Vale Brickworks

The brickworks (HW point 10) and associated clay pits (HW points 11 and 12) exploited the Parkstone Clay, however point 10 is located on the Branksome Sand. All are now located under industrial units and roads, on made ground. There were no opportunities to attempt an auger hole.

Newton Vale Tile Works

These works (HW point 26) were located at the edge of the Parkstone Clay band, on the Branksome Sand (but overlain by River Terrace Deposits), although it is not certain which clay pit they exploited, possibly also HW points 10, 11, 12 or 15. The location of the works is now under industrial units and associated hard standing. There was no opportunity for augering in the vicinity.

New Town Brick Works

The brickworks (HW points 13-14) and clay pit (HW point 15) were located on the Parkstone Clay, now infilled or made ground. Point 13 is now under a road. Point 14 is now covered by industrial buildings and associated hard standing, including the buildings of Breeze Volkswagen, Tower Supplies and Yarrow Road. Immediately adjacent to Tower Supplies is an area of land currently available for rent, and point 15 would have been located within the area. The area has been levelled and covered with aggregate. Augering with a 1m auger through this land did not reveal original deposits. At the southern end of this plot there is a steep embankment, which rises to the Old Wareham Road. Attempts were made to auger at a number of spots across this embankment, and clay deposits were reached at depth of 0.75m, on a ridge of approximately 10m from the current base of slope. Further cores taken higher up the embankment revealed areas of dumped refuse, probably thrown from the above road, pockets of sand and disturbed ground. It was not possible to ascertain if the clay was in situ or had been deposited during levelling of the ground below or construction of the road above. The embankment was covered in trees, brambles and dumped waste, making surveying difficult. However, two clay samples were taken, 1m apart (Table 5.20).

Table 5.20. Sample locations, Newtown, Alderney and Foxholes

Sample No.	NGR	Comments
1	SZ 03324 93490	Augered to 0.75m depth.
2	SZ 03328 93489	Augered to 0.75m depth.

Briquettes (Appendix D, Table D20).

The clay samples were a dark grey to very dark grey colour, quite soft and easily worked, able to form into coils. They fired to a pink or buff colour and shrank at a rate of 4-8%.

<u>Fox Holes Brick Works</u>

The brickworks (HW points 16 and 17) and clay pit (HW point 18) are located under housing and roads, and much of the land is now classified as infilled ground, formally Parkstone Clay. There were no opportunities for auger sampling.

<u>Kinson Brickworks</u>

The site of the brickworks (HW point 19) is located under housing, in an area of infilled ground, formally the Parkstone Clay.

<u>Other brickworks</u>

HW point 20 is a clay pit and HW points 21 and 22 are un-named brickworks. Point 20 was located on the Branksome Sand, now on infilled ground, in an area of industrial units (Figure 5.20). Point 21 is located on the Branksome Sand and point 22 on the Parkstone Clay, both under housing. There were no opportunities for augering in the vicinity of points 20-22.

<u>Kinson Pottery</u>

The pottery was located at HW point 23, its clay pit at HW point 24. Both were on the Parkstone Clay, now classified as infilled ground. They are covered by industrial units. An area of steep embankment exists at the back of the units, to the south. Most is fenced off and inaccessible, however it was possible to climb through to one area to auger. The slope was overgrown with brambles, holly and other bushes and trees, and there was a significant amount of refuse. No clay was encountered, only orange sand. Observation of an excavation at the junction of the Ringwood Road and the entrance to the industrial estate by British Gas during this fieldwork had also revealed only orange sand.

Dupe’s Brick Works

A little further south, Dupe’s Brick Works (HW 115) and another brick works (HW 114) were noted on the 1880s historic mapping, but had gone out of use by the 1900s. They now lie under a housing estate.

Bourne Bottom Local Nature Reserve and Alder Hills Nature Reserve

An outcrop of Parkstone Clay was visible on the geological mapping approximately 3km to the east of the above-mentioned band, around the Alder Hills Nature Reserve. Here, two bands of Parkstone Clay run north-west to south-east, 300m apart, each between 60m and 600m wide, overlaid by Head deposits. Part of this area comprises worked and made ground. Evidence of clay exploitation has been mapped in five areas at this location (Figure 5.21; HW points 2-6). A kiln was once located at HW point 2 and brickworks at HW points 3, 4 and 5. In the Alder Hills area the clay was used to produce drainage pipes for the growing conurbation; the largest pit was infilled in the 1950s to form the Sharp Road Industrial Estate (HW point 6). A clay pit abandoned in 1948 became flooded and is now a large pond in the Alder Hills Nature Reserve. Due to the intensity of housing in these areas, fieldwork was only attempted around HW points 4-5 and 6.

HW points 4-5

The area around points 4 and 5 is a band of clay lying either side of a small stream and a pond, in an area known as Bourne Bottom. To the north and south of the stream is housing, edged by South Park Road on the northern side and Bloxworth Road on the southern side. It widens on the other side of the Alder Road. A pond is located at the southern end of the band, on the western side of Alder Road. A brickworks (point 5) was located in this area and the lake is presumably the old clay pit for the works. Samples 1-5 were taken from this area (Table 5.21).

Approximately 300m to the west of this area, two further samples were taken through the stream bed and on the northern bank (samples 7 and 8). Another sample (sample 6) was taken at the edge of the stream, a further 800m to the west, in the Bourne Valley Nature Reserve.

Briquettes (Appendix D, Table D21)

Sample 1 was silty in texture. Samples 2 and 3 were a fine, sandy texture and contained frequent organic inclusions and occasional gravels. Both were difficult to inscribe when formed into briquettes due to the inclusions, and seemed unlikely to be of any use to a potter. Samples 4 and 5 were also sandy but contained fewer organic inclusions. Inscribing the briquettes was again difficult and the samples did not appear to represent a good potting clay. All were of a similar colour, black to dark olive brown, when first worked, drying to a light olive brown, greyish brown or light yellowish brown. Sample 1 fired to a pink colour, samples 2-5 to a yellowish red or reddish yellow.

Sample 6 was sandy in texture but sample 7 contained a greater amount of sand than clay; the latter would have been of no use for potting and was almost too rough to inscribe. Sample 8 represented a small pocket of soft, white clay, of which sufficient was recovered for only two briquettes. Sample 6 was a light olive brown colour when first worked, drying to an olive yellow and firing red. Sample 7 was a dark greyish brown, firing to a brown, whilst sample 8 appeared grey when first worked, possibly discoloured as the darker soil matrix from which it came became worked in, firing to a pinkish white.

<u>HW point 6</u>

An old clay pit, abandoned in 1948, now forms a lake in the Alder Hills Nature Reserve. Attempts were made to auger around the edges of the lake, but only sand was reached. Augering of the bank opposite the steps that lead down to the lake reached clay at 0.75m (sample 9). A lump of clay that had been upcast from a fox hole through the top of the slope by the steps, was also retained (sample 10).

Briquettes (Appendix D, Table D21)

Sample 9 contained frequent gravels, up to 6mm in size, making it difficult to wedge. Sample 10 contained larger inclusions but also plant material and sand. Neither sample could be formed into a coil without breaking. Sample 9 was a light yellowish brown, drying to a pale brown and firing to a light reddish brown at 600°C and 800°C but becoming more pink in colour at 1000°C. Sample 10 was a pale brown when first formed, drying to a pale yellow and firing pink at the lower temperatures and white at 1000°C.

Table 5.21. Sample locations, Bourne Valley and Alder Hills Nature Reserves

Sample No.	NGR	Comments
1	SZ 06087 93709	In riverbed to NW of pond, clay reached at 0.5m.
2	SZ 06113 93630	Auger hole through path on southern side of lake. Clay reached at 0.75m.
3	SZ 06164 93619	Auger hole through deposits at edge of pond. Some clay towards bottom of auger hole but mixed with sand.
4	SZ 06161 93607	Some clay reached at 0.8 m, but this was mixed with sand.
5	SZ 06159 93598	Auger hole at base of hillslope.
6	SZ 05028 93946	Augering alongside stream, Bourne Valley nature reserve.
7	SZ 05898 93830	Auger hole into stream bed.
8	SZ 05876 93850	Auger through area 3 m from northern bank of stream, lumps of white clay at surface. Clay at 0.7m but ground appeared disturbed.
9	SZ 06277 93064	Auger hole through bank at edge of lake, clay reached at 0.75m.
10	SZ 06292 93080	Surface collection of clay upcast from foxhole.

5.2.5 Poole Formation

With the exception of Brownsea Island (see section 5.2.4), the islands within Poole Harbour are mapped as undifferentiated Poole Formation, classified as a sedimentary bedrock of sand, silt and clay formed during the Palaeogene period. Samples were taken from Round Island, Furzey Island and Green Island (Figure 5.5).

Furzey Island

The western side of Furzey Island was visited in June 2013, during torrential rain. The cliff here was approximately 4m in height, various layers were visible in the cliff but most were sand (Figure 5.22). A few lenses of clay were noted, and two samples were taken from the bottom of the cliff (Table 5.22). These were not in situ and may have fallen from the upper levels. The clay appeared to be very fine, and was very compacted, dry and powdery. A sand sample was also taken from the cliffs.

Table 5.22. Location of samples taken at Furzey Island

Sample No.	NGR	Comments
1 and 2	SZ 00831 87054	Elevation 3m. Trowelled samples from bottom of cliff-face.

<u>Briquettes (Appendix D, Table D22)</u>

Sample 1 was a grey clay with yellowish brown mottles. It was difficult to work initially, but when wedged it softened and it was possible to knot a coil of the clay. Sample 2 was brown in colour and was quite sticky in texture, possibly from the addition of too much water. A bowl formed from sample 2 cracked, and a coil broke when bent. Sample l fired to a pink and sample 2 to white or buff. The briquettes shrank little on drying and firing, 4-8%.

Green Island

As at Furzey, samples were collected from the base of the cliff on the western side of the island, in similarly appalling weather conditions (Figure 5.23). Clay deposits were visible in the section but only as minor lenses of approximately 100mm in thickness. Three clay samples were taken from these lenses at various points (Table 5.23), but it was not possible to establish if there were related. The clay is a light grey, compacted and laminated but powdery. It is fairly uniform in colour with only a little iron staining.

Table 5.23. Location of samples taken from Green Island

Sample No.	NGR	Comments
1	SZ 00451 86567	Elevation: 12m. Taken from cliff section.
2	SZ 00441 86608	Elevation : 10m. Taken from cliff section.
3	SZ 00434 86626	Elevation: 11m. Taken from cliff section.

<u>Briquettes (Appendix D, Table D23)</u>

Sample 2 was quite sandy and possibly represents a deposit at the interface of clay and sand layers. Nonetheless, it was easily formed into a pot and coils that could be bent. Sample 3 had a very silty texture; sample 1 was less sandy than samples 2 or 3. These were also good clays that could be made into bowls and coils. The samples were all grey in colour when first collected and formed into briquettes. They dried to a white colour and then fired to a pinkish white or white at 600-800°C, and a white or buff at 1000°C. They shrank at a rate of 2-6%.

Round Island

The caretakers of Round Island advised that a landslide the previous autumn (2012) had exposed clay deposits on the eastern side of the pier (Figure 5.24). Clay samples were taken from the cliff face in this area, and from the associated cliff fall (Table 5.24). The clay was of variable colours, from a light grey with evidence of iron streaking, to a mid-brown colour (Figure 5.25).

Table 5.24. Location of samples taken from Round Island

Sample No.	NGR	Comments
1	SY 98713 87524	Elevation 6m. Sample from cliff section.
2 and 3	SY 98712 87520	Elevation 6m. Sample from cliff fall.
4	SY 98713 87515	Elevation 3m. Sample from cliff fall.
5	SY 98710 87520	Elevation 4m. Sample from cliff fall.

Briquettes (Appendix D, Table D24)

The colour variability in the clay has been noted above, however most was a light grey to light brown colour with some yellow/orange mottling in all except sample 3. The samples were extremely easy to work, were of a putty-like consistency - a soft, smooth clay that could be formed into bowls and coils. The briquettes all dried to a buff or white colour and fired to a buff, pink, pinkish white or white.

5.2.6 Wealden Clay

Samples of the Wealden Clay were taken from three locations, however the exact location of one, near to Ulwell, Swanage, cannot be published due to commercial sensitivities and is listed here as 'South-East Purbeck'.

Belle View Farm

A single sample of clay was hand collected by Lillian Ladle at Belle View Farm (Table 5.25).

Table 5.25. Location of samples taken at Belle Vue Farm

Sample No.	NGR	Comments
1	SZ 104 702	Hand collected

Briquettes (Appendix D, Table D25)

This was a yellowish brown clay that was easily worked into a thumb pot. The clay held its shape well and the walls of the pot did not sag. It fired to a red colour but at 1000°C it warped and cracked, splitting in the furnace. It had a relatively high shrinkage rate, 10-12% in the briquettes fired to 600-800°C but 16% in the sample fired to 1000°C.

Lower Lynch House

Permission to explore an area around an old clay pit located in the grounds of Lower Lynch House was kindly granted by the land owner, Nick Burt. The clay pit is now filled with water and the surrounding area is quite overgrown (Figure 5.26). Mr Burt pointed out a pipe in the base of a small stream which he thought related to works on the site, but did not know the history of this. He was in possession of a drawing of a large brick kiln but again did not know where the kiln had been situated (Figure 5.27). The illustration of the kiln held by Mr Burt shows Corfe Castle in the distance, with high ground behind, suggesting it was sketched from somewhere to the north-east of the castle (Jane Randall, pers. comm.), and perhaps associated with an old clay pit shown on the 1890s historic mapping (available through Edina Digimap) on New Mills Heath (NGR SY 95650 83754).

In the garden of Lower Lynch House a large stack of narrow ceramic pipes was noted adjacent to the stream. Other pipe fragments were frequently encountered within the grounds, as well as the remains of a brick-built structure, including a corner fragment, vitrified on one side (Figure 5.28). These all suggest the production of ceramic building material on this land. The historical maps show the Lynch Brick Works here (Figure 5.29), and the clay pit still visible was just part of, or at the edge of, a larger clay pit marked on the maps of the 1880s and 1900s, but by the 1920s the brick works had gone out of use. Records of baptism from 1840 to 1879 in the parish of Corfe Castle show three children (James, Eva and John) of a brickmaker at Lynch, John Hill, and his wife Hannah, in 1861, 1865 and 1866 (Kent 2016) and indicate the brickworks was in use from at least the 1860s.

Four clay samples were taken, using the auger (Table 5.26). Sample 1 was taken from the area just outside the back gate of the property, adjoining Corfe Common (Figure 5.30). This was a low area surrounded by a bank. The clay was a mottled yellow brown and grey, but predominantly the former. Sample 2 was taken from an area of leaf litter between the streams (Figure 5.31). The clay was a mottled yellow brown and very dark grey, the grey clay becoming more prominent towards the bottom. Charcoal was noted in the sample at the base. Sample 3 was taken from the edge of the clay pit. The clay was very orange in colour, and less mottled than the other samples. Sample 4 was taken from a low area at the base of a slope. It was a mottled yellow brown and light grey colour, the grey dominating the lower area, and this sample was bagged into the upper, yellow brown clay (sample 4A) and lower, grey clay (sample 4B).

Table 5.26. Location of samples taken from Lower Lynch House

Sample No.	NGR	Comments
1	SY 96204 80563	Elevation 29m. Clay reached at 0.2m, augered to 0.75m.
2	SY 96235 80495	Elevation 31m. Clay reached at 0.45m, augered to 1m.
3	SY 96230 80503	Elevation 31m. At edge of clay pit.
4	SY 96258 80489	Elevation 33m. Upper clay:sample 4A; lower clay: sample 4B.

<u>Briquettes (Appendix D6, Table D26)</u>

Sample 1 was a dark, yellowish brown clay with greyish mottles, but when wedged was more of an even dark yellowish brown. It was quite difficult to form a thumb pot from the raw clay, as the sides could not easily hold their weight and it was therefore only possible to make quite a wide, shallow bowl. A little soil and organic content was present in sample 2, giving it a more gritty texture and darker colour - a dark brown with yellowish brown mottles. It was possible to form a thumb pot from the sample, and tie a coil in a knot, however it was difficult to form into briquettes. Sample 3 was a mottled dark yellowish brown colour prior to wedging. It was easy to shape into a thumb pot that held its shape without sagging or cracking, and it coiled well. The upper part of sample 4 (A) was a mottled yellowish brown to grey clay that contained occasional brick fragments. The lower part of sample 4 (B) contained frequent gritty lumps of hard clay that could not be broken down by hand. It was possible to form it into a thumb pot but was difficult to coil. All samples fired to a reddish yellow, yellowish red or red, and shrank at a rate of 8-12%.

South-east Purbeck

Six samples were taken from different clay layers visible in a mechanically excavated section.

Briquettes (Appendix D, Table D27)

It was very difficult to form sample 1 into a workable clay. It contained frequent very small, hard lumps and was very sticky. It was a blue/purple colour but had an orange sand adhering to it, mixing to form a yellowish brown colour. Sample 2 was a mottled grey and yellowish brown clay, mixing to an olive brown. It was again very hard to work, the yellowish brown parts being hard lumps of sand, but it could be formed into a bowl and a coil that bent without breaking. Sample 3 was a grey and red mottled clay, also plagued by small lumps, marring what was otherwise a clay with putty-like consistency. Sample 4 was a dark, greyish brown, containing small rock fragments rather than sand, was almost impossible to work but was formed into a bowl; a coil broke on bending. Sample 5 could not be broken down. Sample 6 was a dark grey colour, was difficult to work and contained lumps of sand and rock. A combination of these samples was mixed with sand, producing a dark, yellowish brown clay that was very hard to work and sticky. It was difficult to form into a thumb pot, thick walls were necessary. When formed, the briquettes varied slightly in colour, when dry a light yellowish brown, brownish yellow, brown, light olive grey and light olive brown were recorded. Upon firing all became various shades of red, including light brown, light reddish brown, light yellowish brown, reddish yellow, yellowish red and red. The mixed sand and clay briquettes fired to a red. The briquettes shrank at a rate of 4-12% during drying and firing, most in the 8-12% range.

5.2.7 Kimmeridge Clay

One sample of clay was collected using a trowel on the headland at Kimmeridge Bay (Table 5.27). It dried to a yellowish brown and fired to a red colour, but unfortunately exploded during firing (Appendix D, Table D28).

Table 5.27. Location of sample taken at Kimmeridge Bay

Sample No.	NGR	Comments
1	SY 90718 79199	Trowelled from surface deposit.

5.2.8 Barton Clay

Three clay samples were taken at Hengistbury Head (Table 5.28). Although not part of the Poole Formation clays, the Barton Clay is part of the Bracklesham Group. Sample 1 was from an area mapped as Quaternary deposits, samples 2 and 3 were taken from the cliff face at the end of the beach road.

Table 5.28. Location of samples taken at Hengistbury Head

Sample No.	NGR	Comments
1	SZ 16547 91333	Adjacent to a pond.
2 and 3	SZ 18039 90551	Adjacent samples, trowelled from cliff-face.

Briquettes (Appendix D, Table D29)

Sample 1 was difficult to use, warped when drying and went mouldy. It was full of iron and blistered and exploded on firing. Sample 2 was quite difficult to work and contained lumps of ironstone. Sample 3 was a little easier to work, possibly as a result of the addition of less water as both samples were taken in fairly close proximity of one another. A knotted coil could be formed from both. Samples 2 and 3 were a dark to very dark grey when first wedged, drying to a grey or greyish brown and firing to a reddish yellow.

5.3 Summaries of the sampled clay types

5.3.1 Creekmoor Clay

Three clay samples were taken from one location, Upton Country Park, on the shores of Holes Bay. The raw clay was a very dark greyish brown to a greyish brown, firing to a reddish yellow, although one turned pink at 1000°C. They were reasonably easy to work but difficult to coil without breakage, however their shrinkage rates were quite high, 6-18%.

5.3.2 Oakdale Clay

The samples of Oakdale Clay included the both pink and red firing clays. The Upton, Poole Road samples were a yellowish brown to brown colour in the field, firing to a reddish yellow or red. The single example from Sandford was a yellowish brown mottled clay that fired to a light red at 600-800°C but became more pink at 1000°C. It was sandy in texture but very easy to work, providing coils that could be knotted. The East Holme samples were a light grey clay with red streaks that fired pink. The Longfleet Lodge samples were a grey clay that fired to a pink colour at 600°C and 800°C, and to a buff colour at 1000°C. The clay was soft and pliable, and it was possible to knot coils from the samples. On drying and firing the samples shrank at a rate of 4-10%.

5.3.3 Broadstone Clay

The Broadstone Clay varied in colour at the different survey sites. The eight samples taken from south of Bramble Bush Bay, on the east side of Poole Harbour, were a light grey or white colour in the field, with yellow mottling. They fired pink or pinkish white at 600-800°C and to white or a buff colour at 1000°C. The clay was easy to work and form into thumb pots and coils that could be bent. Three samples were taken from Ower Bay, 3km to the west of the south of Bramble Bush Bay site. Here, a white clay with yellow streaks was visible on the beach, and augering also produced a clay that was grey in colour with yellowish brown mottles. It was very malleable and coiled well. Samples were also taken from the Arne Peninsula, 3.7km north-west of the Ower Bay site on the west side of Poole Harbour. These samples were of a grey clay with some iron staining, they dried to a white colour and fired to a pinkish white, buff or white. Clay samples were also taken 2.5km to the south-west of Arne, near Bank Gate Cottages. They were a light grey colour with yellow mottles, firing to a buff or pink colour. A further two samples were taken from the north-west coastline of Arne, again a pale grey clay that fired pink or pinkish white. A similar, grey clay was found 4.5km to the north-east, at Sandford, in an area of dis-used clay pits. It was soft and malleable and fired to a pinkish white or buff colour. A slight change was noted in the Broadstone Clay at Redcliffe Farm, Ridge, located 3.5km south of Sandford and 2.3km west of Bank Gate Cottages. Here, the clay was brown in colour with iron patches, but dried to a light brownish grey and again fired pink. It was again very easy to work and to coil. These were all iron-poor clays.

There was a change in the clay recovered from samples taken on the plantations at Wytch Heath, Rempstone Heath, Foxground Plantation, and at Godlingston Heath. The single sample from Rempstone Heath was a yellowish brown clay with orange mottles, that fired to a reddish yellow. The clay was soft and it was possible to bend coils of this sample without breakage. A little further inland, the clay from Wytch Heath was variable in texture. The upper part of sample 1 was a brown clay that was malleable and coils of this clay could be tied into knots, but coils of the sandier clay of sample 2 would break. The mottled grey and orange clay of sample 3 was easy to work and form into thumb pots and coils. All fired to a reddish yellow or light red. Clay deposits from closer to the Purbeck Ridge included two from the Foxground Plantation and five from Godlingston Heath. The Foxground samples were a yellowish brown colour that fired to yellowish red, light red or red. It was not a particularly workable clay and would not coil. Shrinkage of the Broadstone Clay samples was relatively low. The pink/buff/white firing clays from South of Bramble Bush Bay, Sandford, the Arne sites, Ower and Redcliffe Farm, mostly shrank by 4-6% on drying and firing, with four samples shrinking 8%, and one each at 2% and 10%. The red firing clays included samples that shrank at 4% (two from Wytch Heath), 6% (three from Godlingston Heath), at 8% (two at Wytch Heath, one from Godlingston Heath and one Rempstone Heath) and 10% (one from Godlingston

Heath). The two samples from the Foxground Plantation shrank at 12% and 14% but both exploded on firing.

5.3.4 Parkstone Clay

Multiple clay samples were taken from Brownsea Island to assess variability within a restricted geographical location. Variability was noted in the colour of the samples. Thirteen of the 22 samples were a dark grey, very dark grey or greyish brown colour when first removed from the ground, one was a light grey, four were a light brown, two a light yellowish brown, one was a pinkish grey and one a light reddish brown. The vast majority (15 samples) fired to a pink colour, occasionally becoming a pinkish white or buff colour at 1000°C. A light brown clay sample from the northern shore and a light grey sample from the south-western shore fired to a pinkish white or buff. Three of the samples from the northern shore that were a dark grey when first excavated, fired white, however a very dark grey clay from the south-western shoreline fired to a light reddish brown. Two samples from the south-western shore that were a light yellowish brown in the field, fired to a reddish yellow. Overall, the Brownsea clays were iron poor, but there were occasional examples of more iron-rich clays.

The two samples of clay taken from the Newtown area of Poole were similar to many of the Brownsea samples, and were a dark grey to very dark grey clay that fired pink, or one to a buff colour at 1000°C. The Parkstone Clay that outctrops approximately 1km to the north-east of Newtown, at the Bourne Valley and Alder Hills Nature Reserves, showed a greater amount of variability. One black clay sample and one pale brown/buff sample fired pink (the latter becoming white at 1000°C) however the others indicated greater variability in the red/yellow ranges. Four dark greyish brown or very dark greyish brown samples fired to yellowish red or reddish yellow and one to a strong brown; a dark olive brown clay fired to a yellowish red; a light olive brown fired red; a grey clay fired to a pinkish white; a light yellowish brown to a pink or light reddish brown and a pale brown/buff clay to a pink at 600°C and 800°C, white at 1000°C. Three of the four samples from Creech Heath, towards the western side of the Isle of Purbeck, were grey clays but mottled with red or orange streaks, or had yellow mottles, whilst one was a reddish brown and all evened out to a pale brown or brown when wedged. They fired to a reddish yellow or light red, with one sample turning pink at 800°C and 1000°C and one at 1000°C.

The texture of the samples was variable depending on the sand content but most of the Brownsea, Creech Heath and Newtown samples provided a soft, workable clay that could be formed into thumb pots and coils that would bend without breaking or even when tied into knots. The exceptions were the samples from Bourne Valley and Alder Hills that were difficult to use or coil. The shrinkage of the briquettes was also variable, with very little from the Newtown and Creech Heath samples (1-2%). Five of the Brownsea samples shrank by 4%, eleven shrank by 6% and five shrank by 8%, only one was greater, at 10%. The Bourne Valley and Alder Hills samples were the most variable, with shrinkage rates of 2-20%.

5.3.5 Poole Formation

The samples of clay recovered from Green Island, Furzey Island and Round Island were similar in terms of their texture and colour. The Furzey Island samples comprised a grey clay with iron-staining that fired pink and a brown clay that fired white. The Green Island samples were grey in the field and fired to a white, pinkish white or buff colour. The colour variation in the clay deposits was particularly noticeable from Round Island, ranging from a light grey with iron streaking, to a mid-brown colour. The fired colours represent the same as that of Furzey and Green Island: pink, pinkish white and buff. There was a low rate of shrinkage, with seven of the ten samples displaying only 4% shrinkage, and three with 6% shrinkage.

5.3.6 Wealden Clays

The Wealden Clays from the three locations were consistently a yellowish brown, greyish brown or brown colour in the field, although at Lower Lynch Farm it was noted that the uppermost clay was a brownish yellow, but the clay became more grey in colour with depth. The samples fired to a light brown, reddish yellow, yellowish red or red. Half of the samples had 6-8% shrinkage whilst the other half had 10-12% shrinkage. The clays varied in their workability: the sample from Belle View Farm was easily worked into a thumb pot, as were samples 2 and 3 from Lower Lynch Farm, but not samples 1 and 4 from the same site.

5.3.7 Kimmeridge Clay

The single sample of Kimmeridge Clay was a yellowish brown clay that fired red, but exploded in the furnace.

5.3.8 Barton Clay

The Barton Clay samples from Hengistbury Head were a dark grey colour and fired to a reddish yellow with 2-6% shrinkage.

5.4 Conclusion

Most clay types include areas of iron-poor and iron-rich clays, their textures varying from silty to very coarse sandy clays. All types produced clays that were easy to work, to form into thumb pots and create coils that could be bent or even tied into knots. All also contained clays that seemed less suited to pottery production, but these were less frequently encountered. The iron-poor clays were mostly located on the islands and around the southern shores of the Harbour, whilst the more iron-rich clays were found further inland on the Isle of Purbeck, both north and south of the Purbeck Ridge, on the northern shore of the Harbour and into Poole. Most of the clays that appeared to be white or light or dark grey in the field, fired to a white, pink or buff colour, indicative of an iron-poor clay. The brown, yellowish brown or greyish brown clays tended to fire to various shades of red, indicating iron-rich clays. There were occasional examples when this did not hold true, for example the grey clays with red/orange streaks or yellow mottles from Creech Heath, firing to shades of red. On balance though, the results of the fieldwork suggest that a potter would be able to identify an iron-rich or iron-poor clay on sight and that potters working on Purbeck, around the Harbour or in the area to the north, would have been spoilt for choice in terms of the range of clays suitable for potting, from the very fine, white-firing clays to the more gritty, red-firing clays. Furthermore, the different clays available could have been targeted for specific purposes, as they are today.

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Chapter 6

Petrological analysis of pottery samples

A total of 255 sherds of pottery was thin-sectioned, from 21 sites across Dorset and into Somerset (Chapter 4, Table 4.1). Almost all were of Iron Age date, with the exception of 12 from sites of Romano-British Black-burnished ware pottery production at Bestwall Quarry, Redcliff and East Holme. The samples were selected on the basis of previous identification as a Poole Harbour ware fabric, or suspected origin in the region. The thin-sections of the pottery (and clay, Chapter 7) were subject to qualitative analysis using a petrological microscope. Each section was described with the aid of density, angularity, sorting and grain-size charts (in PCRG 2010; Appendix E), and an estimation made of the frequency of the different grain sizes of quartz (very fine, fine and so forth). Each slide was then assigned to a site-specific petrological group. This was carried out without knowledge of the forms to avoid any bias in the groupings. An attempt was made to place the samples in cross-site petrological groups but the variability in the quartz content rendered this meaningless. Broad trends are instead drawn out in the concluding section (6.7). Summaries of the results of the petrological analysis are presented below, grouped according to the location of the archaeological sites from which the assemblages derived.

6.1 Harbour sites and hinterland

Fifty-nine thin-sections were made of pottery recovered from sites in the immediate area of the known Late Iron Age and Romano-British pottery industry. This included three of the actual production sites: Bestwall Quarry, Wareham (Ladle 2012); Redcliff, Ridge (Lyne 2002) and East Holme (Jones forthcoming). Earlier material of Early and Middle Iron Age date was drawn from the sites excavated as part of the Wytch Farm Oilfield project (Lancley and Morris 1991), and Middle to Late Iron Age pottery from the 1969 and 2010 excavations on Green Island.

6.1.1 Green Island, Poole Harbour

Twenty-one vessels from the excavations at Green Island (1969 and 2010) were thin-sectioned, representing a range of Middle to Late Iron Age forms. These assemblages were analysed by the author during the course of this research and the macroscopic fabric types (Q1, Q2 and so forth) are those assigned during analysis, and presented in the grey literature report (Jones 2013). The slides were grouped according to their microscopic traits, creating seven petrological groups (Table 6.1). This revealed the most homogenous assemblage of all those analysed, with most vessels dominated by medium-grained quartz (Figure 6.1), although coarser (Figure 6.2) and finer fabrics were also noted (Appendix E, Table E1). Almost all samples contained just 1-3% coarse silt to clay-sized quartz in their matrices; the exception was a single sherd (sample 12) - a round-bodied jar with proto bead rim, with a slightly greater amount (7%). All but three contained elongated argillaceous inclusions that possessed the same highly birefringent properties as the surrounding clay matrix (Figure 6.3). Of the three that did not, two (samples 12 and 19) appeared macroscopically similar to those that did (fabric Q1). Rare to sparse equant argillaceous inclusions (clay pellets) were also noted in all, but were particularly frequent (20%) in an upright-necked jar (sample 11, petrological group 5).

The finest fabric was recorded in a body sherd from the fabric reference collection (analyst's fabric Q3, Jones 2013; petrological group 1). It contained moderate quantities of both fine and medium-grained quartz, with occasional larger grains. Fourteen samples were dominated by medium-sized grains but split into three petrological fabric groups on the basis of the quantity of elongated argillaceous inclusions. None were recorded in two samples (petrological group 2), although one slide was quite dark and any such inclusions may have been obscured. Petrological group 3 was created for medium-grained sandy fabrics with rare to sparse elongated argillaceous inclusions, and petrological group 4 for those with a much greater amount. Five samples were coarse-grained, four with elongated argillaceous inclusions (petrological group 7) and one without (petrological group 6). Evidence of paste preparation was visible in one slide (sample 19; Figure 6.4), with a large swathe of clay that was dominated by coarse silt to clay-sized grains of quartz, with only occasional very fine ones.

Table 6.1. Petrological grouping of pottery samples from Green Island

Key – PRN: pottery record number; GI: Green Island; PG: petrological group

Sample no.	***Information from grey literature report (Jones 2013)***			
	PRN	**Fabric**	**Form**	**Description**
GI PG 1. Fine to medium-grained quartz with elongated argillaceous inclusions				
20		Q3		Body sherd from fabric reference collection
GI PG 2. Medium-grained quartz without elongated argillaceous inclusions				
12	81	Q1	R1	Round-bodied vessel with proto-bead rim
21		Q9		Body sherd from fabric reference collection
GI PG 3: Medium-grained quartz with elongated argillaceous inclusions				
	PRN	Fabric	Form	Description
5	111	Q1	R4	Bead-rimmed jar
1	85	Q1	R6	Flat-rimmed jar
13	86	Q1	R2	Round-bodied vessel, probable bowl, with beaded rim, defined by a horizontal groove
14	87	Q1	R2	Round-bodied vessel, probable bowl, with beaded rim, defined by a horizontal groove
8	107	Q1	R9	Jar with rounded profile and short, out-turned rim
4	108	Q1	R4	Bead-rimmed jar
18	110	Q1	R10	Lid with developed bead rim
9	112	Q5	R9	Jar with rounded profile and short, out-turned rim
6	121	Q1	R7	Upright-necked jar with proto-bead rim and slight internal bevel
17	142	Q1	R5	Hemispherical bowl with flat-topped, squared rim
GI PG 4: Medium-grained quartz with moderate to common elongated argillaceous inclusions				
16	1 (1969)	Q5	R11	Bowl with slightly expanded grooved rim
142	117	Q4	R2	Round-bodied vessel, probable bowl, with beaded rim defined by a horizontal groove
GI PG 5: Medium to coarse-grained quartz with common equant argillaceous inclusions and rare elongated argillaceous inclusions				
11	148	Q8	R8	Small jar with upright neck and bead-rim, defined by two horizontal grooves
GI PG 6: Medium to coarse-grained quartz, without elongated argillaceous inclusions				
19	10	Q1	P	Body sherd
GI PG 7: Coarse quartz with elongated argillaceous inclusions				
2	88	Q7	R6	Flat-rimmed jar
10	89	Q7	R3	Everted rimmed jar with rounded body
3	106	Q6	R6	Flat-rimmed jar
7	139	Q7	R7	Upright-necked jar with proto-bead rim and slight internal bevel

6.1.2 Wytch Farm Oilfield sites

Pottery samples from five sites excavated as part of the Wytch Farm Oilfield project were thin-sectioned, representing 24 vessels of Early, Middle and Late Iron Age date (Lancley and Morris 1991, fig. 58. 1-10, 12-18; fig. 59. 27, 33-36, 40; fig. 61. 87). They are summarised here as a single assemblage. There were no obvious correlations between fabric, form, decoration or phase. Seven petrological groups were defined, six related to quartz grain size, the seventh was a miscellaneous group created for a slide that failed to consolidate (Table 6.2). The distribution of quartz in each sample tended to be more evenly distributed across the range of very fine to very coarse-sized grains than the Green Island samples, making grouping problematic (Figure 6.5; Appendix E, Table E2). Four groups were created on the basis of being characterised by one or two size classes (groups 1-4), whilst groups 5 and 6 contained fairly even quantities of very fine to very coarse grains. Almost all had only 1-2% coarse silt-sized grains in their matrices, with slightly higher quantities in sample 22 (5%), sample 16 (7%) and sample 18 (10%). All of the vessels sampled contained grains of very fine, fine, medium and coarse size, and 14 of the 24 also contained very coarse-sized quartz, but no granules. Whilst some were predominantly medium-grained (Figure 6.6) or tended towards the coarser grains (Figure 6.7), these were not tight groups. What is perhaps more characteristic is that all but one contained the elongated argillaceous inclusions, ranging in quantity from 1% to 10%. None were noted in the slide of a round-bodied jar with out-turned rim, decorated with a band of eyebrow impressions (sample 17), however this is a motif typical of the Poole Harbour pots.

Other inclusions seen in some of the slides included rare quartzite, ferruginous sandstone, sandstone, siltstone, flint/chert (at 3% in sample 8), iron oxides, limestone and shell. Up to 7% opaques were also seen. Eight samples contained tourmaline, and rock fragments incorporating lathes of tourmaline were noted in two (Figure 6.8).

Evidence of paste preparation was noted in five samples. Two patches of a different clay were visible in the slide of sample 10, one containing a mix of coarse silt/very-fine quartz, with one fine-sized grain and some translucent iron, the other patch contained mostly silt-sized quartz with one very fine (angular) and one medium-sized (rounded) grain (Figure 6.9). The inclusions in samples 2 and 6 did not appear to be naturally distributed as they were not regularly spaced, with some areas completely devoid of inclusions. Areas of denser silt-sized quartz and very fine or fine quartz in sample 13 appeared to represent clay mixing. A streak of a possible different clay was also visible in sample 17.

Table 6.2. Petrological grouping of pottery samples from the Wytch Farm Oilfield sites

Key – WFO: Wytch Farm Oilfield; PG: petrological group

Sample no.	***Information from published report (Lancley and Morris 1991)***					
	Site	**Illustration**	**WF Fabric**	**WF form**	**Description**	**Ceramic phase/date**
WFO PG 1: Fine to medium-grained quartz with elongated argillaceous inclusions						
22	Ower Peninsula	59.36	Q1	102	Straight-sided bowl with beaded rim, footring base	LIA
18	East of Corfe River	59.27	Q2	135	Large ovoid jar with flat, incurving rim	LIA
24	East of Corfe River	61.87	Q2	Dec. 876	Flat-rimmed jar with dimple and eyebrow decoration	LIA
WFO PG 2: medium-grained quartz, with elongated argillaceous inclusions						
11	Furzey Island	58.12	Q1	103	Bead rimmed jar with countersunk handles	M-LIA
14	East of Corfe River	58.15	Q1	101	Flat-rimmed jar	LIA
16	Ower Peninsula	58.17	Q2	101	Flat-rimmed jar with petal motif	LIA
WFO PG 3: medium to very coarse-grained quartz, with elongated argillaceous inclusions						
1	West Creech	58.1	Q1	113	Jar/vessel with internal hooked/flanged rim	EIA
3	West of Corfe River	58.3	Q1	112	Ovoid jar with plain rim	MIA-LIA
4	West Creech	58.4	Q2	122	Proto-bead rimmed vessel, convex profile	MIA-LIA
5	West Creech	58.5	Q2	123	Barrel-shaped jar with flattened and pulled rim	MIA-LIA
8	West Creech	58.8	Q2	127	Shouldered vessel	MIA-LIA
10	West of Corfe River	58.10	Q3	133	Jar upright, slightly out-turned rim	MIA-LIA

15	East of Corfe River	58.16	Q2	101	Flat-rimmed jar	LIA
WFO PG 4: very coarse quartz, with elongated argillaceous inclusions						
2	West Creech	58.2	Q3	110	Slack-profiled jar	MIA-LIA
6	West Creech	58.6	Q3	124	Jar with grooved rim, twisted effect	MIA-LIA
7	West Creech	58.7	Q3	125	Large, slack-shouldered jar, expanded rim	MIA-LIA
13	West of Corfe River	58.14	Q3	134	Vessel with everted rim	M/LIA
19	West Creech	59.33	Q3	126	Shouldered bowl with out-turned, slightly rolled rim	EIA
WFO PG 5: very fine to very coarse grained quartz, with elongated argillaceous inclusions						
12	West Creech	58.13	Q1	108	Necked jar with slightly beaded rim	LIA
20	West Creech	59.34	Q2	116	Bowl with expanded rim	MIA-LIA
21	West Creech	59.35	Q2	116	Bowl with expanded rim	MIA-LIA
23	Ower Peninsula	59.40	Q1	105	Bowl with expanded, grooved rim	LIA
WFO PG 6: very fine to very coarse grained quartz, without elongated argillaceous inclusions						
17	West Creech	58.18	Q1	106	Jar with short neck and out-turned rim, with eyebrow motifs	LIA
WFO PG group 7: miscellaneous (failed slide)						
9	West Creech	58.9	Q1	128	Vessel with upright, slightly pulled rim	MIA-LIA

6.1.3 Redcliff, Ridge

Five samples from the vessels found within the Romano-British pottery kiln structures at Redcliff were thin-sectioned. These fell into three petrological groups on the basis of the presence of argillaceous inclusions in the fabrics, although all were similar in terms of their quartz content, dominated by fine or fine to medium-sized grains, with occasional rare to sparse coarse-sized grains (Table 6.3: Appendix E, Table E3). The silt component in the matrices was 2-3%. No elongated argillaceous inclusions were noted in a grooved-rim bowl (sample 1) or flat-rimmed bowl (sample 3), but were present in another flat-rimmed bowl (sample 4; Figure 6.10) and bead-rimmed dish (sample 5). A cooking pot (sample 2) was unusual in containing common argillaceous inclusions that were equant in shape, with only one possible elongated example. Possible evidence of paste preparation was noted in sample 5 with one area of clay that had very little quartz in comparison to the surrounding matrix, suggesting the quartz was added by the potter and mixed in.

Table 6.3. Petrological grouping of pottery samples from Redcliff, Ridge

Key – RR: Redcliff, Ridge; PG: petrological group

Sample no.	**Lyne (2002) Fig. No.**	**Lyne (2002) fabric**	**Description**
RR PG 1: fine-grained quartz with elongated argillaceous inclusions			
4	11.67	C3	Flat-rimmed bowl
5	11.71	C3	Bead-rimmed dish
RR PG 2: Fine to medium-grained without argillaceous inclusions			
1	8.40	Not listed	Lid-seated bowl
3	11.62	C3	Flat-rimmed bowl
RR PG 3: Fine to medium-grained quartz with common equant argillaceous inclusions			
2	10.57	C3	Cooking pot

6.1.4 Bestwall Quarry, Wareham

The Bestwall Quarry samples of Romano-British date were included as examples of vessels known to have been made at Wareham, with two Late Iron Age jars included to compare a slightly earlier form, both of which displayed the typical decorative motifs of the period. Samples from the rim and base of a globular jar with pie-crust rim, of mid to late 4th century AD date, in the south-east Dorset orange wiped ware fabric (SEDOWW) were taken to examine a Black-burnished ware variant fabric, characterised by a high quantity of shale. All slides were dominated by medium-grained quartz; sparse amounts of elongated argillaceous inclusions were seen in three of the slides (petrological group 1), but moderate to common quantities in four, including the two from the SEDOWW vessel (petrological group 2; Table 6.4; Appendix E, Table E4). All but one also contained rare to sparse argillaceous inclusions that were more equant in shape, probably representing clay pellets. The coarse silt-sized quartz component was just 1-3%.

Table 6.4. Petrological grouping of pottery samples from Bestwall Quarry

Key – BQ: Bestwall Quarry; PG: petrological group

Sample no.	***Information from published report (Lyne 2012)***		
	Fig. No.	**Phase**	**Form**
BQ PG 1: Medium-grained quartz with sparse elongated argillaceous inclusions			
1	141.1	LIA	Flat-rimmed jar with two oval indents
4	147, 8/2	MRB	Plain-rimmed dish
5	151.6	LRB	Cooking pot
BQ PG 2: medium-grained quartz with moderate to common elongated argillaceous inclusions			
2	Fig. 141.6	LIA	Short-necked jar with beaded rim, with two eyebrow motifs
6	Fig. 144 1/7	LRB	Cooking pot
3	Not illustrated (kiln 184)	MRB	Plain-rimmed dish
7	Fig. 155.1, rim	LRB	Globular jar with pie-crust rim
8	Fig. 155.1, base	LRB	Globular jar with pie-crust rim

6.1.5 East Holme

This sample (PRN 42) came from a Romano-British dish (Seager Smith and Davies 1993, type 20). It was a fine to medium-grained sandy fabric with sparse elongated argillaceous inclusions, some of which contained some silt-sized quartz and were laminated (Table 6.5; Appendix E, Table E5).

Table 6.5. Petrological grouping of pottery samples from East Holme

Key – PRN: pottery record number; EH: East Holme; PG: petrological group

Sample no.	PRN	Phase	Form
EH PG 1: Fine to medium-grained quartz with elongated argillaceous inclusions			
1	42	RB	Plain-rimmed dish

6.2 South of the Purbeck Ridge

A total of 49 samples were taken from three sites on the southern side of the Purbeck Ridge, at Football Field, Worth Matravers; Rope Lake Hole, Kimmeridge and Eldon's Seat, Encombe. The geology of the site at Worth Matravers is Early Cretaceous limestone, whilst Kimmeridge and Encombe lie on the Jurassic Kimmeridge Clay. The samples came from vessels of Late Bronze Age/Early Iron Age to Middle Iron Age date, with one Late Iron Age example from Football Field, Worth Matravers.

6.2.1 Eldon's Seat, Encombe

Ten samples of Late Bronze Age/Early Iron Age pottery from the Eldon's Seat assemblage were thin-sectioned and assigned to four petrological groups (Table 6.6). They were predominantly coarse-grained with up to 5% silt-sized quartz in the matrix, and only 1-3% very fine and fine-grained quartz (Appendix E, Table E6). A medium to coarse-grained fabric contained rare to sparse limestone and sparse to moderate elongated argillaceous inclusions, typical of the Poole Harbour vessels (petrological group 4). It had been used for a slack-profiled jar with irregularly overlapped rim, and two red-finished vessels: an everted rim jar and long-necked, carinated bowl. Six vessels contained elongated argillaceous inclusions that appeared to result from poor wedging of the clay, and up to 7% limestone. Their forms included a hemispherical bowl with flat-topped rim, a thick-walled jar with flared rim, three long-necked carinated bowls and a large bowl/bucket-shaped vessel; five were red-finished. A red-finished body sherd in a very coarse sandy fabric did not contain elongated argillaceous inclusions.

The origins of these vessels are uncertain, although it is likely that the three with elongated argillaceous inclusions came from the Poole Harbour industry. The vessels with poorly wedged clay are unlike any seen from other sites analysed as part of this research, and may have been made relatively locally to the site. Williams (1987, 158) notes that a red-finished vessel from Eldon's Seat had been analysed, revealing a tourmaline-rich fabric, however the report relating to this analysis is unpublished and unavailable. It does, however, indicate vessels from the Poole Harbour industry were reaching Eldon's Seat during the Early Iron Age.

Table 6.6. Petrological grouping of pottery samples from Eldon's Seat

Key – ES: Eldon's Seat; PG: petrological group

Sample no.	***Information from published report (Cunliffe 1968)***		
	Fig. no.	**Phase**	**Description**
ES PG 1: very coarse quartz , no elongated argillaceous inclusions			
11	N/A	Unknown	Body sherd
ES PG 2: medium to coarse-grained quartz, sparse limestone, no elongated argillaceous inclusions			
1	?18.196	Period IIc	Hemispherical bowl with flat-topped rim, slightly expanded on the interior, red-finished
4	?17.165	Period IIc	Thick-walled jar with everted rim, red-finished
5	16.124	Period IIc	Long-necked carinated bowl, red-finished
ES PG 3: medium to coarse quartz with 15-20% argillaceous inclusions (from poor wedging) and sparse limestone			
2	15.96	Period IIa	Large, open-mouthed bowl
3	16.116	Uknown	Very long-necked carinated bowl
7	16.119	Period IIc	Long-necked carinated bowl, red-finished
ES PG 4: medium to coarse-grained quartz, with elongated argillaceous inclusions and sparse limestone			
8	15.104	Period IIa	Everted rim jar with red-finished surface
9	N/A	Unknown	Slack-sided jar with irregular rim
10	16.129	Period IIc	Long-necked carinated bowl, red-finished

6.2.2 Rope Lake Hole, Kimmeridge

Samples were taken from 31 of the illustrated sandy ware vessels of Rope Lake Hole's Period 1 (8^{th} to 6^{th} centuries BC) and Period 2 (5^{th} to 3^{rd} centuries BC), represented by the analyst's fabrics 4, 5, 6, 7 and 10 (Davies 1987). Fabrics 4 and 5 were the most commonly occurring, and a heavy mineral separation by David Williams indicated a Wareham/Poole Harbour origin (Williams 1987). Fabric 7 was described as a typical Poole Harbour/BB1 fabric and Fabric 10 as a coarser version of Fabric 7. This would suggest a Poole Harbour origin for most of the samples. Sample 17 was published as calcareous fabric 9 but in the hand specimen looked like a Poole Harbour coarse sandy ware and was therefore included in this analysis. One sample (no. 5) was also taken from a calcareous fabric 2 vessel as it contained a noticeable quartz component.

The fabrics of the vessels from Rope Lake Hole shared some similarities with those from the Harbour and hinterland sites but also exhibited differences in terms of their limestone content (Table 6.7; Appendix E, Table E7). Two carinated bowls from Period 1 contexts contained medium-grained quartz and the elongated argillaceous inclusions, but also frequent shelly limestone inclusions (petrological group 6). Three very coarse sandy fabrics with moderate to very common shelly limestone but without elongated argillaceous inclusions were also analysed, used for a furrowed, carinated bowl, a bowl with plain rim and a large, upright-necked jar (all Period 2; petrological group 8). The clay matrices of the vessels with frequent shell and limestone inclusions were not calcareous. Five carinated bowls (Periods 1 and 2), three bowls with internally-flanged, flat-topped rims (Period 2), a carinated jar (Period 2) and two necked, storage jars (Period 2) in medium to very coarse-grained fabrics with elongated argillaceous inclusions had sparse to moderate quantities of limestone (petrological groups 5 and 7; Figure 6.11). There were also sandy wares with elongated argillaceous inclusions but without limestone (petrological groups 1, 2, 3, 9 and 10), including six carinated bowls (Periods 1 and 2), a large, upright-necked jar (Period 2), two slack-sided jars (Period 2), two bowls with flat-topped, expanded rims (Period 2) and a bowl with dropped internal flange (Period 2). Six of these vessels had red-finished external surfaces, and three had moderate to common amounts of silt-sized quartz in their matrices (petrological groups 1 and 2; Figure 6.12). Three samples of medium to coarse-grained sandy ware vessels did not contain limestone or elongated argillaceous inclusions (petrological groups 4 and 11). They represented two red-finished carinated bowls and a slack-profiled jar.

Two thirds of the 31 vessels sampled were classified by Davies (1987) as fabrics 4 or 5. Heavy mineral analysis of red-finished sherds in these fabrics indicated a Wareham/Poole Harbour for the samples submitted to David Williams, unfortunately it has not been possible to ascertain details relating to the form of the samples. It would also be unwise to extrapolate this result to all of the fabric 4 and 5 vessels as the excavator’s fabric groupings were not particularly tight. The vessels with frequent shelly limestone but without elongated argillaceous inclusions are likely to represent pottery manufacture that was carried out fairly near to the site, using local resources. Those vessels with sandy fabrics and elongated argillaceous inclusions probably came from the Poole Harbour industry, although three had much siltier matrices than the harbour and hinterland sites. The 13 vessels with elongated argillaceous inclusions and sparse to common limestone may represent a different workshop or production centre that was operational during the Early to Middle Iron Age - a workshop that added quartz sand as temper to its clay, but operated on the southern side of the Purbeck Ridge, and used the local clays. There was also a much higher incidence of tourmaline in the slides of the Rope Lake Hole pottery than sites from the northern side of the Ridge, present in 24 of the 31 slides, and in 20 of the 25 with elongated argillaceous inclusions (Figure 6.13). A rock fragment covered in lathes of tourmaline was also seen in eight of the slides (Figure 6.14). Tourmaline was particularly noticeable in samples 9, 14, 17 and 21. This would also suggest exploitation of the clays from the south of the Purbeck Ridge, with tourmaline noted in 10 the 12 Wealden clay samples from the south of the Ridge (Chapter 7).

Table 6.7. Petrological grouping of pottery samples from Rope Lake Hole

Key – RLH: Rope Lake Hole; PG: petrological group; RF: red-finished

Sample no.	***Information from published report (Davies 1987)***				
	Fig. No.	**Fabric**	**Form**	**Description**	**Period**
RLH PG 1: Common silt-sized quartz, sparse very fine to coarse grains, rare elongated argillaceous inclusions					
18	80.34	4 (RF)	6	Open bowl with plain rim	2
RLH PG 2: Moderate silt-sized to very fine quartz, sparse fine to coarse grains, rare elongated argillaceous inclusions					
11	80.24	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	2
25	80.42	7 (?RF)	3	Steeply angled carinated bowl with short, upright rim	2
RLH PG 3: Medium-grained quartz, with elongated argillaceous inclusions					
6	79.10	5 (RF)	2	Steeply angled carinated bipartite bowl	1
RLH PG 4: Medium-grained quartz, without elongated argillaceous inclusions					
3	79.6	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	1
10	80.23	7 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	2
RLH PG 5: Medium-grained quartz with sparse limestone, and elongated argillaceous inclusions					
1	79.4	UK (RF)	6	Open bowl with internally flanged, flat-topped rim	1
7	79.15	7 (RF)	1	Steeply angled, probably carinated, bowl with cordon below inclining rim	1
RLH PG 6: Medium-grained quartz, common limestone with elongated argillaceous inclusions					
5	79.9	2 (RF)	2	Steeply angled carinated bipartite bowl	1
9	79.20	4	3	Steeply angled carinated bowl with short, upright rim	1
RLH PG 7: Coarse to very coarse quartz with sparse to moderate limestone and rare to sparse elongated argillaceous inclusions					
2	79.5	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	1
4	79.7	4 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	1
14	80.27	5 (RF)	4	Carinated bowl with 'low slung' carination and flaring rim	2
17	80.33	9 (RF)	6	Open bowl with internally flanged, flat-topped rim	2
19	80.35	5 (RF)	6	Open bowl with internally flanged, flat-topped rim	2
22	80.39	5	23	Carinated jar, high angled shoulder, plain inclining rim	2

24	80.41	1 (?RF)	3	Steeply angled carinated bowl with short, upright rim	2
30	80.48	10	24	Large, necked storage jar, knife-trimmed rim	2
31	80.49	5	24	Large, necked storage jar, knife-trimmed rim	2
RLH PG 8: Coarse to very coarse quartz with moderate to very common shelly limestone, without elongated argillaceous inclusions					
12	80.25	6 (RF)	5	Furrowed, carinated bowl	2
16	80.32	5 (RF)	7	Open bowl with plain rim	2
23	80.40	5	25	Large, shouldered jar with short, upright neck and beaded rim	2
RLH PG 9: Coarse to very coarse quartz with 5-15% elongated argillaceous inclusions, 7-10% equant argillaceous inclusions and 7-15% opaques					
8	79.18	4	3	Steeply angled carinated bowl with short, upright neck	1
26	80.43	4	25	Large, shouldered jar with short, upright neck and beaded rim	2
27	80.44	4	22	Slack profile, bag-shaped jar with slightly everted rim	2
29	80.47	4	22	Slack profile, bag-shaped jar with slightly everted rim	2
RLH PG 10: Coarse to very coarse-grained quartz, with elongated argillaceous inclusions					
13	80.26	7 (RF)	4	Carinated bowl with ‘low slung’ carination and flaring rim	2
15	80.30	4 (RF)	4	Carinated bowl with ‘low slung’ carination and flaring rim	2
20	80.36	5 (RF)	6	Open bowl with internally flanged, flat-topped rim	2
21	80.37	5	8	Open bowl with dropped internal flange	2
RLH PG 11: Very coarse quartz with sparse limestone, without elongated argillaceous inclusions					
28	80.46	5	21	Slack profile jar, slightly inclining rim	2

6.2.3 Football Field, Worth Matravers

Eight samples were thin-sectioned, five of Late Bronze Age/Early Iron Age date, two of Middle Iron Age date and one of Late Iron Age date (Table 6.8). Amongst the earlier material was a furrowed bowl in a coarse, sandy fabric, containing elongated argillaceous inclusions, suggestive of an origin in the Poole Harbour area (sample 7). The other vessels of this period were probably bowl forms, but all were fragmentary, made in medium to coarse-grained sandy fabrics that may have been made more locally (samples 2, 3, 5 and 6). A red-finished body sherd from a Middle Iron Age pit contained predominantly very fine to fine-grained quartz, in a matrix characterised by common silt-sized grains (sample 1; Appendix E, Table E8). Whilst it did contain occasional equant and elongated argillaceous inclusions, they were slightly different in appearance to the inclusions that characterises the Poole Harbour vessels. Another body sherd from this feature was in a coarse-grained fabric with elongated argillaceous inclusions, indicative of a Poole Harbour origin (sample 8). The Late Iron Age vessel was a bead-rimmed jar with eyebrow motif, in a medium-grained fabric with elongated argillaceous inclusions, again from the Poole Harbour industry (sample 4).

Table 6.8. Petrological grouping of pottery samples from Football Field, Worth Matravers

Key – WM: Football Field, Worth Matravers; PG: petrological group

Sample no.		***Information from Lilian Ladle (pers. comm.)***		
	Feature	**Drawing no.**	**Excavator's phase**	**Description**
WM PG 1. Fine quartz with a background of frequent coarse silt to clay-sized quartz and opaques, with elongated argillaceous inclusions				
1	Pit 1182		MIA	Red-finished body sherd
WM PG 2. Medium-grained quartz, without elongated argillaceous inclusions				
2	Pit 1126	682	LBA/EIA	Flat-topped, upright rim, possible bowl
3	Pit 1126	683	LBA/EIA	Upright rim, probably from tripartite bowl or jar
WM PG 3. Medium-grained quartz, with elongated argillaceous inclusions				
4	Pit 2316	1.8	LIA	Jar with undercut bead rim and eyebrow decoration
WM PG 4. Coarse-grained, without elongated argillaceous inclusions				
5	Pit 1513		LBA/EIA	Red-finished body sherd
6	Pit 1126	694	LBA/EIA	Upright rim from thin-walled vessel, probably a bowl
WM PG 5. Coarse-grained, with elongated argillaceous inclusions				
7	Deposit 1169	751	EIA	Furrowed bowl
8	Pit1182		MIA	Body sherd

6.3 West Dorset

6.3.1 Maiden Castle, Dorchester

Thirty-one vessels of pottery were thin-sectioned from Maiden Castle, including eight from Wheeler's 'period A', dated by him to the 3rd and 2nd centuries BC but with forms more typical of the 5th to 3rd centuries BC. Three were in a very fine to fine-grained fabric with a moderate amount of silt-sized grains in the matrix, but no elongated argillaceous inclusions (petrological group 2; Table 6.9; Appendix E, Table E9). The forms included a carinated bowl (sample 3), a jar with flared rim (sample 5) and a slack-sided jar with upright, slightly flared rim (sample 6). Four were in medium to coarse-grained fabrics with elongated argillaceous inclusions (petrological groups 6 and 7): three red-finished carinated bowls (samples 1, 2 and 4) and a bead-rimmed jar (sample 8); sparse to moderate amounts of limestone were seen in one of the carinated bowls (sample 2) and the bead-rimmed jar. Previous heavy mineral analysis by David Williams (1991, M9:F6-7) had indicated a Poole Harbour origin for a weakly carinated, red-finished bowl in a medium to coarse-grained fabric without elongated argillaceous inclusions (sample 7) and the bead-rimmed jar (sample 8). This indicated the movement of vessels during the 5th to 3rd centuries BC from the Wareham/Poole Harbour industries to a location 25km to the west.

A range of fabrics was noted amongst the Middle to Late Iron Age material, from Wheeler's periods B-C. This is exemplified by the flat-rimmed jars, of which eight examples were sectioned, including one with countersunk lug handles, one decorated with the petal motif, one with oval impressions, one with double concentric arcs and two with impressed eyebrows. Five were in medium, medium to coarse or very coarse grained fabrics with elongated argillaceous inclusions, all but one also contained sparse limestone (samples 18, 19, 21, 25 and 27). Two were in medium to coarse-grained fabrics without elongated argillaceous inclusions: one with sparse limestone (sample 20) and one without (sample 26). One of the vessels, with the concentric arc decoration and perhaps an early version of the flat rim, was in a completely different fabric, predominantly very fine grained, in a very silty matrix, without elongated argillaceous inclusions (sample 17).

The round-bodied bead-rimmed jar/bowl was another commonly occurring form, also synonymous with the Poole Harbour industry although widely made in other centres. Thin-sectioned examples included two in the very fine/silty fabric without elongated argillaceous inclusions, but decorated with wavy lines and eyebrow motifs used by the Poole Harbour potters (samples 14 and 15). Another four bead-rimmed jars had been made from medium or medium to coarse-grained fabrics with elongated argillaceous inclusions, three of which also contained sparse limestone; one was red-finished, one was decorated with grooved lines and one with a possible petal motif (samples 8, 10, 13 and 22). Bead-rimmed jars in medium to coarse-grained fabrics without elongated argillaceous inclusions included two decorated with burnished lines (samples 12 and 24) and one plain example (sample 9). A bead-rimmed bowl decorated with dimples and wavy lines is closely related to the Poole Harbour vessels in form and decoration, but was a glauconitic fabric (sample 16).

Three hemispherical bowls were thin-sectioned: one with a grooved rim top, and two with flat-topped, externally expanded rims - one decorated on the rim top. The grooved rim bowl was in a medium-grained fabric with elongated argillaceous inclusions (sample 28); the bowl with flat-topped, decorated rim was in a glauconitic fabric (sample 29), the other flat-topped bowl was in a medium to coarse-grained fabric without elongated argillaceous inclusions (sample 30). At least one of the bowls probably came from the Poole Harbour area and one from the Gault, a seam of which is located 3km to the south-east of the site. Other forms analysed included a tankard in a fine to medium-grained fabric with elongated argillaceous inclusions (sample 31) and a low-waisted jar in a medium to coarse-grained fabric with elongated argillaceous inclusions (sample 11). The tankard is a form synonymous with the Poole Harbour industry. Analysis by Coulston suggested it may have been made in a specialised workshop (Coulston 1989, 473).

Evidence of clay mixing was noted in two slides. Mixing of three different pastes was noted in the slide of sample 24 - the different swathes were visible without recourse to the microscope. One paste was predominantly medium-grained with sparse coarse silt to clay-sized quartz; the second was a much cleaner paste than the first, again with sparse silt-sized and very fine grains, but only 1% of larger grains.

The third paste contained common silt-sized quartz and sparse very fine quartz, but nothing larger. In the thin-section of sample 6 two lenses of different clay were seen on the slide, running parallel to each other but at approximately 45° to the edge of the vessel. Another patch was located at the top edge of the slide. These clay lenses are of an iron-rich clay which is virtually quartz free, although contained occasional opaques. A few grains of quartz appeared to be overlying both clays and suggest the quartz from the sandy clay of the main body of the vessel was beginning to become mixed in.

Samples of the Iron Age pottery from the Maiden Castle assemblages have been subject to analytical work by David Williams (1991, fiche M9: F5-6) and Belinda Coulston (1989). Heavy mineral analysis by Williams indicated a Wareham/Poole Harbour origin for the vessels represented by samples 7, 8, 11 and 12. These were medium to coarse-grained fabrics, two with elongated argillaceous inclusions and two without; one also contained sparse limestone. Those with comprised a bead-rimmed jar (sample 8) and a red-finished, low-waisted jar (sample 11). A red-finished, weakly carinated bowl (sample 7) and a bead-rimmed jar decorated with wavy lines (sample 12), but without obvious elongated argillaceous inclusions in their fabrics, were also assigned a Wareham/Poole Harbour origin. Integration of the analysis undertaken by Williams and this petrological analysis indicates that although the presence of elongated argillaceous inclusions is synonymous with a Poole Harbour origin, the lack of such inclusions cannot be taken to preclude such an origin. Compositional analysis by Coulston grouped vessels represented by samples 13, 18, 20, 22, 27 and 28 as compositional group A, and sample 19 in related compositional group B, suggesting a shared, Poole Harbour, origin for these vessels.

Three of the Maiden Castle samples contained a common amount of silt in their matrices, with moderate very fine quartz and sparse quantities of larger grains, but all three are forms or display decorative motifs that are at home in the Poole Harbour repertoire, even though such silty matrices were not encountered in the samples from the Harbour and hinterland sites. They were bowls with beaded or flattened rims with eyebrow motifs or wavy lines (samples 14, 15 and 17). It is not known if these vessels represent one-offs of an industry experimenting with their pastes, or imitations of the products from a well-known industry. Other variation from the

Harbour and hinterland sites was a higher proportion of calcareous inclusions (limestone, shell, calcite; 3-10%) in the fabrics of four vessels that also contained elongated argillaceous inclusions; two were previously assigned to a Poole Harbour source by Williams (samples 2 and 8) and two were typical forms of the industry (samples 10 and 25). Sparse limestone was also seen in two vessels without elongated argillaceous inclusions: a flat-rimmed jar (sample 20) and a bowl with flat-topped rim (sample 30), both were also forms made by the industry. Petrological analysis of two vessels, a bead-rimmed bowl decorated with dimples and wavy lines (sample 16) and a flat-rimmed bowl with decorated rim top (sample 29), indicated they had been made from a glauconitic sandy ware. The motifs on the bead-rimmed bowl are similar to those used by the Poole Harbour potters and serve as a reminder that decorative techniques may be shared by different groups of potters operating in different industries.

Table 6.9. Petrological grouping of pottery samples from Maiden Castle

Key – MC: Maiden Castle; PG: petrological group

Sample no.	***Information from published report (Wheeler 1943)***		
	Fig. no	**Phase**	**Description**
MC PG 1: Common silt-sized quartz, moderate very fine quartz, larger grains also present. No elongated argillaceous inclusions			
14	66.109	B	Bead-rimmed bowl with eyebrow motif on shoulder
15	66.112	B	Bead-rimmed (created with a groove) bowl, incised wave around shoulder
17	67.125	A-C	Flat-rimmed vessel with two tooled concentric arcs
MC PG 2: Very fine to fine sandy ware with a moderate amount of silt-sized grains, no elongated argillaceous inclusions			
3	56.14	A	Carinated bowl with upright rim, red-finished
5	57.34	A	Jar with upright, slightly flared rim
6	58.45	A	Slack-sided jar with short upright/slightly flared and beaded rim
MC PG 3: Fine to medium-grained quartz, with elongated argillaceous inclusions and irregularly distributed opaques			
31	74.227	C	Tankard
MC PG 4: Medium-grained quartz with elongated argillaceous inclusions			
13	66.108	B	Bead-rimmed bowl with panel of grooved decoration on shoulder
21	67.134	A-C	Flat-rimmed jar with countersunk lug handle
22	68.134A	B	Bead-rimmed jar, red-finished, burnished exterior and upper interior
23	68.134B	B	Vessel with irregular bead and slightly convex walls. Red-finished, burnished exterior
27	69.142	B-C	Flat-rimmed jar with impressed double eyebrow motif repeated at least three times around the vessel
28	69.144	B-C	Bowl with grooved rim top and two incised wavy lines on exterior, appears to be red-finished, burnished on both surfaces
MC PG 5: Medium-grained, without elongated argillaceous inclusions			
24	68.135	B	Bead-rimmed jar with burnished line chevron decoration
MC PG 6: Medium to coarse-grained quartz with elongated argillaceous inclusions			
1	56.7	A	Carinated bowl with out-turned rim, red-finished, burnished exterior
4	56.15	A	Carinated bowl with out-turned rim, red-finished, burnished exterior and interior, dimple pushed out from interior
11	66.96	B	Jar with low waist, out-turned rim, red-finished exterior, well burnished on exterior and upper interior of rim
19	67.131	A-C	Flat-rimmed jar with impressed eyebrow motif

MC PG 7: Medium to coarse-grained quartz with elongated argillaceous inclusions and at least 3% limestone			
2	56.10	A	Carinated bowl, red-finished
8	59.63	A	Bead-rimmed jar
10	66.90	B	Bead-rimmed jar with irregular folding of rim on interior, possible petal motif
25	68.137	B	Flat-rimmed jar with oval impressions
MC PG 8: Medium to coarse-grained, without elongated argillaceous inclusions			
7	59.56	A	Weakly carinated bowl with slightly out-turned rim, red-finished
9	66.89	B	Round-bodied jar with beaded rim, burnished surfaces
12	66.97	B	Bead-rimmed jar/bowl with tooled wavy line decoration, burnished interior and exterior
26	69.139	B-C	Flat-rimmed jar with petal motif
MC PG 9: Medium to coarse-grained quartz with at least 3% limestone, no elongated argillaceous inclusions			
20	67.132	A-C	Flat-rimmed jar
30	69.146	B-C	Deep, hemispherical bowl with flat-topped rim, externally expanded, groove around interior of rim. Burnished interior and lower exterior
MC PG 10: Very coarse quartz, with elongated argillaceous inclusions and sparse limestone			
18	67.128	A-C	Flat-rimmed jar
MC PG 11: glauconitic sandy wares			
16	66.115	B	Bead-rimmed bowl with wavy line decoration, ?made with twig. Fingertip impression, pinched rim.
29	69.145	B-C	Flat-rimmed bowl, externally expanded, rim top decorated with two lines parallel with the rim edge and impressed dots between

6.3.2 Southdown Ridge, Weymouth

One sample of Early Iron Age pottery, and 16 of Middle to Late Iron Age date, were thin-sectioned from the Southdown Ridge assemblage (Table 6.10). Amongst the vessels were forms synonymous with the Poole Harbour industry, but only seven contained the elongated argillaceous inclusions that might be expected to be present in the fabrics (Appendix E, Table E10). These inclusions were most numerous in two medium to coarse-grained flat-rimmed jars (samples 8 and 17), one of which also contained sparse limestone. Fewer were noted in a bead-rimmed bowl (sample 12) and a necked, bead-rimmed jar (sample 13). In the fine to medium-grained fabrics, a cordoned, pedestal bowl –*tazza* (sample 11), a flat-rimmed bowl with petal/pinched flower motif (sample 6) and a high-shouldered jar with moulded bead rim (sample 4) contained elongated argillaceous inclusions; a moderate amount of silt-sized quartz was also present in the matrix of the latter two vessels, with a little less in the *tazza*. A third flat-rimmed jar, with countersunk lug handles, was in a medium to coarse-grained fabric without elongated argillaceous inclusions (sample 7). Other fairly typical forms were also in fabrics without elongated argillaceous inclusions: a straight-sided, bead-rimmed bowl (sample 10) and a grooved rim bowl/lid (sample 5); whilst a cup with elongated, flared rim (sample 14) is a more unusual form and may have been made elsewhere.

A necked jar with wavy line on its neck (sample 16) is also amongst those classified by Brailsford (1958) as Durotrigian (his type 5), but petrological analysis again revealed a lack of elongated argillaceous inclusions and an extremely silty matrix, containing 30% silt-sized quartz, suggesting this was not a product of the Poole Harbour industry. Williams (1977) had previously used heavy mineral analysis to show that the early Romano-British pottery kilns at Corfe Mullen were producing wheel-turned versions of this style of vessel using completely different raw materials to the Poole Harbour potters, and suggested a source in the local Reading Beds (Williams 1977, 13). Furthermore, he found that a necked jar with wavy line on the neck from Allard’s Quarry (Williams 1951, fig. 17, 140) shared a similar heavy mineral suite. This supports the suggestion that the necked jar from Southdown Ridge is also not a product of the Poole Harbour potters.

A very fine-grained ribbed bowl (sample 9) is another form included by Brailsford in his typology of Durotrigan vessels (his type 1a) but has more recently been suggested to be a product of the pottery industries operating around the Exeter area (Brown 1997, 41). The thin-section revealed a fabric without elongated argillaceous inclusions, but with 20% silt-sized quartz in its matrix, again higher than most vessels presumed to be Poole Harbour products, supporting Brown’s suggestion of production away from Poole Harbour. The footring base from a vessel (sample 15) was sampled and found to have a moderate amount of limestone and opaques, with a slightly higher amount of flint/chert (3%) than is typical of the Poole Harbour wares. Thin-sectioning of an Early Iron Age fine-grained jar with slightly flared, upright rim (sample 3) revealed the presence of 7% flint and no elongated argillaceous inclusions, this vessel was probably produced fairly locally to the site. Two vessels (a necked jar: sample 1, and a bead-rimmed jar/bowl: sample 2) were petrologically similar, with medium to coarse-grained quartz and sparse shelly limestone; their source is unknown.

Petrological analysis suggests that of the four vessels that accompanied burials, two were not products of the Poole Harbour industries (the necked jar, sample 16, and the ribbed bowl, sample 9); the *tazza* (sample 11) probably is a Poole Harbour product, and a straight-sided bead-rimmed bowl (sample 10) may be a Poole Harbour vessel, but its source is less clear. The grave goods were therefore drawn from at least two sources, but combined in a single burial in grave 7624.

Table 6.10. Petrological grouping of pottery samples from Southdown Ridge

Key – SR: Southdown Ridge; PG: petrological group

Sample no.	***Information from published report (Cooper and Brown 2014)***			
	Fabric	**Fig. no.**	**Phase**	**Description**
SR PG 1: Very-fine grained quartz with common silt-sized quartz, no elongated argillaceous inclusions				
9	QU1 (Devon?)	6.10, 70	1st century BC/AD	Ribbed bowl
SR PG 2: Fine to medium-grained with very common silt-sized quartz, no elongated argillaceous inclusions				
16	QU1	6.9, 69	LIA	Necked jar, decorated with wavy line on neck
SR PG 3: Fine to medium-grained quartz fabrics with moderate coarse silt to clay-sized quartz and occasional elongated argillaceous inclusions				
4	QU1	6.4, 20	LIA	High-shouldered jar with moulded bead rim, burnished
6	QU1	6.2, 6	M-LIA	Flat-rimmed bowl with petal / pinched flower motif
SR PG 4: Fine-grained quartz with sparse flint, no elongated argillaceous inclusions				
3		Not published	EIA	Jar with upright, slightly flared rim
SR PG 5: Fine to medium-grained quartz with elongated argillaceous inclusions				
11	QU1	6.10, 72	1st century BC/AD	Cordoned, pedestal bowl, ‘tazza’
SR PG 6: Medium-grained quartz, no elongated argillaceous inclusions				
10	QU1	6.10, 73	1st century BC/AD	Straight-sided, bead-rimmed bowl

SR PG 7: medium-grained quartz with a moderate amount of elongated argillaceous inclusions				
8	QU1	6.5, 33	M-LIA	Large, flat-rimmed jar
SR PG 8: Medium to coarse-grained quartz with 5% limestone and 7% elongated argillaceous inclusions				
12	QU1	6.7, 67	M-LIA	Bead-rimmed bowl
13	QU1	Not illustrated	LIA	Necked jar with bead rim, rounded shoulder and tooled, wavy line decoration
SR PG 9: Medium to coarse-grained quartz, with elongated argillaceous inclusions				
17	QU1	Not illustrated	M-LIA	Large, flat-rimmed jar
SR PG 10: Medium to coarse-grained quartz, without elongated argillaceous inclusions				
5	QU1	6.5, 30		Grooved rim bowl / lid
7	QU1	6.7, 66	M-LIA	Flat-rimmed jar with countersunk handles
14	QU1	6.6, 52	M-LIA	Cup with elongated flaring rim
SR PG 11: a medium to coarse-grained fabric with sparse limestone but no elongated argillaceous inclusions				
1	QU1	6.3, 12	LIA	Necked jar, burnished
2	QU1	6.3, 15	LIA	Bead-rimmed jar or bowl, burnished
SR PG 12: Medium to coarse-grained quartz with sparse limestone and flint but no elongated argillaceous inclusions				
15	QU1	6.3, 16	LIA	Pedestal base, burnished

6.4 East Dorset

6.4.1 Hengistbury Head, Bournemouth

Five vessels were sampled from the Hengistbury Head pottery assemblage, all very typical Poole Harbour forms but divided into three petrological groups (Table 6.11). One vessel was singled out as it had quite a silty matrix (10% silt-sized quartz) with fairly even amounts of fine, medium and coarse-sized quartz, and rare very coarse quartz, but no elongated argillaceous inclusions (petrological group 1; Appendix E, Table E11). It had been used for a roughly made flat-rimmed jar that appeared to be a Poole Harbour product in the hand specimen. Two other flat-rimmed jars were in a fine to medium-grained sandy fabric with sparse silt-sized quartz in the matrix, and sparse elongated argillaceous inclusions (petrological group 2). A necked jar with eyebrow motif, and countersunk lug handle, were slightly coarser, with moderate medium-sized grains, sparse coarse-sized grains, and elongated argillaceous inclusions (petrological group 3; Figure 6.15). All were probably Poole Harbour products, however the siltier vessel without obvious elongated argillaceous inclusions may have come from a different workshop to the others, or simply reflect variation in paste preparation.

Table 6.11. Petrological grouping of pottery samples from Hengistbury Head

Key – HH: Hengistbury Head; PG: petrological group

Sample no.	**Brown (1987) fabric**	**Brown (1987) form**
Group 1. Fine to coarse-grained quartz with a background of smaller grains, no elongated argillaceous inclusions		
3		Flat-rimmed jar
Group 2. Fine to medium-grained quartz with elongated argillaceous inclusions		
1	A4a	JC4.1, Flat-rimmed jar
2	A4a	JC4.1, Flat-rimmed jar
Group 3. Medium-grained quartz with elongated argillaceous inclusions		
4	A4a	JD4.4, necked jar with out-turned and beaded rim, eyebrow decoration
5	A4a	JD4.0/C.S.L, handle from jar with countersunk lug

6.5 North Dorset

Of the 52 samples taken from the pottery assemblages of Bradford Down, Barton Field, Gussage All Saints and Oakley Down, 23 were found to be glauconitic sandy wares. Bradford Down is located on the Reading Clay, some 20km from the band of Gault from which the glauconitic vessels may have derived, however they may have been transported relatively easily down the River Stour. The other three sites were situated on the Chalk and located 7-15km from the Gault. Like the assemblages from the Harbour and hinterland sites, the non-glauconitic sandy wares from these sites have only rare quantities of limestone present, if at all. They contained even fewer inclusions of tourmaline, with examples noted in just four vessels.

6.5.1 Gussage All Saints

A total of 36 thin sections were made of pottery from phases 1-3 at Gussage All Saints, however 15 were found to be glauconite, despite looking very similar to the non-glauconitic sandy wares in the hand specimen (Table 6.12). The sectioned glauconitic sandy wares included a range of forms, comprising saucepan pots, a slack-walled jar, hemispherical bowls, a barrel-shaped jar, a proto bead-rimmed bowl/jar, a bead-rimmed jar/bowl, a possible ovoid jar and a pedestal base. Sample 20, a barrel-shaped jar, had a very micaceous fabric with common well rounded black inclusions, similar in appearance to glauconite, but their identity is uncertain. Six petrological groups were defined among the non-glauconitic sandy wares. One vessel (sample 23, a necked cordoned jar) was not included in the analysis as the consolidation had failed, however it appeared to be dominated by fine-grained quartz.

Twenty-one samples were taken from phase 2 contexts, representing five petrological groups. Two saucepan pots (samples 9 and 19) were in a very fine to fine-grained sandy ware with a background of common silt-sized quartz, without elongated argillaceous inclusions (petrological group 1, Figure 6.16; Appendix E, Table E12). A further seven vessels also had quite silty matrices (10-20%) with sparse to moderate very fine, fine and medium-grained sand and occasional coarser grains, but again without the elongated argillaceous inclusions (petrological group 2). These vessels included two saucepan pots with grooved rim (samples 2 and 3); an ovoid jar with possible handle (sample 12); an ovoid jar with beaded rim (sample 17); a jar with flat-topped, squared rim, internally expanded (sample 21) and two bowls with grooved rims (samples 25-26). The source(s) of these very fine and fine to medium-grained sandy wares is uncertain, but the lack of elongated argillaceous inclusions, and the higher frequency of silt-sized quartz, particularly in two of the saucepan pots, suggests they were not derived from the Poole Harbour industry. The two grooved rimmed bowls represent a form commonly made by the Poole Harbour potters, but not exclusively.

Two medium to coarse-grained sandy ware bead-rimmed jars had 7-10% silt in their matrices but also contained elongated argillaceous inclusions (samples 13 and 16, petrological group 3). Two other medium to coarse sandy ware vessels had less silt in their matrices but again contained the elongated argillaceous inclusions (petrological group 5). These were a vessel with beaded rim and fingertip decoration (samples 10/22) and a flat-rimmed jar with eyebrow motif (sample 11). The former is not a form typically associated with the Poole Harbour industry, but the latter is. The fingertip decorated vessel also contained a rock fragment covered in lathes of tourmaline (Figure 6.17). These vessels are all assumed to be Poole Harbour products.

Five vessels were selected for analysis from Late Iron Age (phase 3) contexts, on the basis that they were all typical Poole Harbour ware forms. Three were medium-grained vessels with moderate quantities of elongated argillaceous inclusions and opaques (petrological group 4). They included two flat-rimmed jars (sample 27 with petal motif and sample 36 with eyebrow motif, Figure 6.18) and an everted rim jar (sample 35). Another flat-rimmed jar with petal motif (sample 1) was recorded as part of petrological group 5, characterised by medium to coarse-grained quartz and the presence of elongated argillaceous inclusions. A tankard was the only vessel in petrological group 6 and was singled out as it contained fine to medium-grained quartz with sparse (3%) fossiliferous limestone and elongated argillaceous inclusions. The presence of the elongated argillaceous inclusions in diagnostic forms again suggests that such inclusions are characteristic of the Poole Harbour industry.

Table 6.12. Petrological grouping of pottery samples from Gussage All Saints

Key – GAS: Gussage All Saints; PG: petrological group

Sample no.	***Information from published report (Wainwright 1979)***				
	Vessel	**Fig. no.**	**Form**	**Phase**	**Feature**
GAS PG 1: very fine to fine-grained quartz sand with a background of common coarse silt to clay-sized quartz, no elongated argillaceous inclusions					
9	P135	58	Saucepan pot	2	Enclosure ditch, 1M (3)
19	P182	58	Saucepan pot	2	Enclosure ditch, 1M (4)
GAS PG 2: fine to medium-grained quartz sand with a background of moderate coarse silt to clay-sized quartz, no elongated argillaceous inclusions					
2	P111	N/A	Saucepan pot with groove around rim	2	Enclosure ditch, 1C (4)
3	P117	N/A	Saucepan pot with groove around rim	2	Enclosure ditch, 1G (4)
12	P157	60	Ovoid jar with possible handle	2	Enclosure entrance, 603 (6)
17	P179	58	Ovoid, beaded jar	2	Enclosure ditch, 1M (4)
21	P187	58	Jar with flat-topped, squared rim, internally expanded	2	Enclosure ditch, 1M (4)
25	P200	59	Bowl with channel-topped rim	2	Enclosure ditch, 1M/N (3)
26	P201	59	Bowl with channel-topped rim	2	Enclosure ditch, 1M/N (3)
GAS PG 3: medium to coarse-grained quartz sand with a background of sparse to moderate (7-10%) coarse silt to clay-sized quartz, with elongated argillaceous inclusions					
13	P158	60	Bead-rimmed jar	2	Enclosure entrance, 603, layer (8)
16	P178	58	Bead-rimmed jar	2	Enclosure ditch, 1M (4)
GAS PG 4: medium-grained quartz sand with moderate elongated argillaceous inclusions					
27	P209	N/A	Flat-rimmed jar with petal motif	?3	Pit 20, layer 5
35	P676	64	Everted rim jar	?3	Pit 380, layer 6
36	P998	67	Flat-rimmed jar with eyebrow motif	3	Pit 781, layers 5-6
GAS PG 5: medium to coarse-grained quartz sand with elongated argillaceous inclusions					
1	P102	N/A	Flat-rimmed jar with petal motif	3	Ring ditch 310Y, layer 6
10	P137	N/A	Vessel with beaded rim and	2	Enclosure

			fingertip decoration, possibly carinated		ditch, 1N (3)
11	P142	N/A	Flat-rimmed jar with eyebrow motif	2	Enclosure ditch, 1L (4)
22	P188	58	Joins P137 (above)	2	Enclosure ditch, 1M (4)
GAS PG 6: medium-grained quartz with elongated argillaceous inclusions and sparse shelly limestone					
32	P636	53	Tankard	3	Pit 330, layer 8
GAS PG 7: Glauconitic wares					
4	P118	N/A	Saucepan pot	2	Enclosure ditch, 1G (4)
5	P120	N/A	Saucepan pot	2	Enclosure ditch, 1G (5)
6	P132	N/A	Saucepan pot	2	Enclosure ditch, 1M (3)
7	P133	58	Saucepan pot	2	Enclosure ditch, 1M (3)
8	P134	58	Slack-sided jar	2	Enclosure ditch, 1M (3)
14	P171	N/A	Straight-walled vessel/saucepan pot	2	Enclosure ditch, 1R (4)
15	P172	N/A	Saucepan pot	2	Enclosure ditch, 1R (4)
18	P180	58	Saucepan pot	2	Enclosure ditch, 1M (4)
24	P197	59	Pedestal base	2	Enclosure ditch, 1M (4)
28	P270	60	Proto bead-rimmed bowl/jar	2	Feature 53 (6)
29	P282	60	?Ovoid jar	2	Feature 55 (7)
30	P289	60	Bead-rimmed jar/bowl	2	Feature 57 (8)
31	P290	60	Hemispherical bowl	2	Feature 57 (8)
33	P640	62	Hemispherical bowl	2	Feature 351 (3)
34	P667	57	Barrel-shaped jar	1	Pit 379 (8)
GAS PG 8: Possible glauconitic fabric					
20	P184		Barrel-shaped jar	2	Enclosure ditch, 1M (4)
Failed consolidation					
23	P193		Necked, cordoned jar	2	Enclosure ditch, 1M (4)

6.5.2 Barton Field, Tarrant Hinton

Five vessels from Barton Field, Tarrant Hinton were thin-sectioned, a site located 7km to the west of Gussage All Saints (Table 6.13). A bead-rimmed jar of Middle Iron Age date (sample 1), and two flat-rimmed jars of Late Iron Age date (samples 4 and 5; Figure 6.19), were assigned a Poole Harbour origin on the basis of their form, decoration (tooled arcs and a wavy line on the bead-rimmed bowl and a petal motif on one of the flat-rimmed jars) and fabric (medium or coarse-grained quartz with 7-20% elongated argillaceous inclusions). Two other Middle Iron Age vessels, a barrel-shaped jar (sample 2) and round-bodied jar with short, upright and beaded rim (sample 3) were of a fabric with very fine to coarse-grained quartz, in a moderately silty matrix, but without elongated argillaceous inclusions (Appendix E, Table E13). These may have come from the same source or been made more locally.

Table 6.13. Petrological grouping of pottery samples from Barton Field

Key – BF: Barton Field; PG: petrological group

Sample no.	***Information from published report (Brown 2006)***					
	Fig. no.	**Feature**	**Phase**	**Fabric**	**Form**	**Description**
Medium-grained quartz with a background of moderate silt-sized quartz, no elongated argillaceous inclusions						
2	23.31	Pit 9	MIA	A1c	JC2.2	Barrel-shaped jar
Coarse-grained quartz with a background of moderate silt-sized quartz, sparse (5%) flint but no elongated argillaceous inclusions						
3	23.36	Pit 12	MIA	A1c	JC2.0	Round-bodied jar with short, upright rim
Medium-grained quartz with elongated argillaceous inclusions						
4	24.45	Pit 20	LIA	A1b	JC4.1	Flat-rimmed jar with petal motif
Medium-grained quartz with a common amount of elongated argillaceous inclusions						
5	24.48	Pit 20	LIA	A1b	JC4.1	Flat-rimmed jar
Very coarse-grained quartz, with elongated argillaceous inclusions						
1	23.30	Pit 7	MIA	A1d	JC2.3	Round-bodied, bead-rimmed jar, tooled arc decoration

6.5.3 Bradford Down, Pamphill

Three samples were taken from sandy ware vessels associated with the Early to Middle Iron Age phases of the site at Bradford Down, located 10km to the south of Gussage (Table 6.14). Only one appears to have derived from the Poole Harbour industry: an ovoid jar in a fine-grained fabric with elongated argillaceous inclusions (sample 2, Figure 6.20; Appendix E, Table E14). A medium-grained sandy ware with a very silty matrix was used for a vessel described as a 'devolved situlate jar' (Field 1983, fig. 12.3) and was probably not from the Poole Harbour area (sample 3, Figure 6.21). Evidence of paste preparation was visible in the section as the quartz was irregularly distributed, with some areas of the section having no sand at all. A glauconitic version of this form (sample 1, Figure 6.22) was also from producers elsewhere.

Table 6.14. Petrological grouping of pottery samples from Bradford Down

Key – BD: Bradford Down; PG: petrological group

Sample no.	***Information from published report (Field 1983)***			
	Fig. No.	**Feature**	**Phase**	**Description**
BD PG 1: Glauconitic wares				
1	12.1	Pit A19	MIA	Barrel-shaped jar with short, upright rim (JB4)
BD PG 2: Fine-grained quartz with elongated argillaceous inclusions				
2	12.2	Pit A19	MIA	Round-bodied jar with plain rim (JC2)
BD PG 3: Medium-grained quartz in a matrix of common silt-sized quartz, without elongated argillaceous inclusions				
3	12.3	Pit A19	MIA	Barrel-shaped jar with short, upright rim (JB4)

6.5.4 Oakley Down, Wimborne St. Giles

A range of fabric types was identified amongst the Oakley Down assemblage, a site located 7km to the north of Gussage. Eight vessels in a fabric thought to originate in the Wareham-Poole Harbour area (Brown 1996) were illustrated in the publication, and samples were taken from each for petrological analysis (Table 6.15). At least three (samples 1-3) were found to be glauconitic fabrics (Figure 6.23). These were two bipartite jars of Early to Middle Iron Age date, and a saucepan pot, of Middle to

Late Iron Age date. A small tripartite bowl, of Early Iron Age date (sample 8) also appeared to be glauconitic.

Only one vessel could be positively identified as a Poole Harbour ware, a flat-rimmed jar (sample 4) in a medium-grained sandy fabric with elongated argillaceous inclusions (Appendix E, Table E15). In the hand specimen, a wide-mouthed, necked jar of Late Iron Age date (sample 6) appeared similar to sample 4 but thin-sectioning revealed a greater amount of sand than is usual for the Poole Harbour products, and none of the elongated argillaceous inclusions. A tripartite jar of Late Iron Age date (sample 5) and a wide-mouthed, necked jar, also of Late Iron Age date (sample 7) were in medium to coarse-grained fabrics without elongated argillaceous inclusions. Sample 7 contained a relatively high amount of flint/chert (5%) and opaques (15%). Of the eight illustrated vessels thought to come from Poole Harbour, only one can be positively assigned to this source (sample 4). Sample 5 may come from this area, but it seems unlikely that samples 6 and 7 did. Samples 1-3 and 8 did not come from the Poole Harbour area.

Table 6.15. Petrological grouping of pottery samples from Oakley Down

Key – OD: Oakley Down; PG: petrological group

Sample no.	**Information from published report (Brown 1996)**		
	Fig. no.	**Form**	**Phase**
OD PG 1: Medium-grained quartz, with elongated argillaceous inclusions			
4	9.6	4: ovoid jar with flattened beaded rim	LIA
OD PG 2: Medium to coarse-grained, no elongated argillaceous inclusions			
5	9.7	5: tripartite jar with elongated or everted rim	LIA
6	9.8	6: wide-mouthed, necked jar	LIA-RB
OD PG 3: Medium to coarse-grained with sparse flint, no elongated argillaceous inclusions			
7	9.9	6: wide-mouthed, necked jar	LIA-RB
OD PG 4: Glauconitic wares			
1	9.3	2: ovoid, bipartite jar with beaded, rolled or thickened rim	EIA-MIA
2	9.4	2: ovoid, bipartite jar with beaded, rolled or thickened rim	EIA-MIA
3	9.5	23: saucepan pot	MIA-LIA
8	9.19	12: small tripartite bowl	EIA

6.6 North-east Dorset and Somerset

6.6.1 Allard's Quarry, Marnhull

A total of 28 vessels from the Allard's Quarry assemblage was sampled for petrological analysis, of Early Iron Age to Late Iron Age/early Romano-British date. The samples were grouped according to those that contain more than 2% limestone, the presence/absence of elongated argillaceous inclusions, and quartz grain size (Table 6.16). In terms of the quartz, the samples were divided into coarse/medium/fine and so forth, on the basis of the most dominant grain size, but all contained a range of sizes, each with silt-sized quartz, very fine, fine and medium grains, and all but sample 29 have coarse quartz (Appendix E, Table E16). Only samples 6 and 20 contained very coarse quartz, both of 2%, and none contained granules. Where a sample has a peak that straddled two categories, both sizes are referred to in the description.

Typologically, the Early Iron Age vessels (defined by Williams 1951, as Iron Age A) form a clear group. Almost all were red-finished, and the forms comprise carinated bowls, including furrowed examples, and a single jar. Of the ten vessels sampled from this phase, two (samples 23 and 25; petrological group 12) were glauconitic and therefore probably originated from the band of the Gault Formation, located approximately 7km to the east of the site. This fabric was very fine, dominated by quartz grains in the coarse silt to very fine size ranges. The non-glauconitic Early Iron Age sandy wares were also very fine to fine-grained, with six (samples 1, 2, 5, 15, 16 & 26; petrological groups 2 & 3) demonstrating a matrix of moderate to common coarse silt to clay-sized quartz, and two (samples 27 & 28, petrological group 1) containing only sparse amounts in this size range. Three of the vessels with a silty matrix also contained sparse to moderate limestone (samples 15, 16 & 26; petrological group 3). None of the vessels of this phase contained argillaceous inclusions. Their origin is uncertain, and they may have been made locally to the site or further afield, but there are four different sandy pastes represented amongst the samples.

The Middle to Late Iron Age vessels have been summarised according to the excavator's phases (Iron Age B and C), but typologically are difficult to distinguish, with many of the forms first coming into use during the Middle Iron Age but continuing unchanged throughout the period and into the Late Iron Age. Petrologically, there is a move away from the silty matrices to those with only rare to sparse amounts of coarse-silt to clay-sized quartz. The exception was a Late Iron Age bead-rimmed jar that did have a silty matrix and a very fine to fine-grained fabric, but was distinguished from the earlier fabrics on the presence of a sparse amount of elongated argillaceous inclusions that are typical of the Poole Harbour wares (sample 21; group 5). Two other bead-rimmed jars also shared a petrological grouping with the Early Iron Age material (petrological group 1), a very fine to fine-grained fabric, but without silty matrix or argillaceous inclusions (samples 4 & 29); their origin is uncertain.

For the other Middle to Late Iron Age vessels from Allard's Quarry, the silt-sized quartz component was not higher than 5%. A number of petrological groups appeared to represent vessels made around Poole Harbour. The finest was group 4, a very fine to fine-grained fabric that contained the highest proportion of elongated argillaceous inclusions. It had been used to make a bead-rimmed bowl and a flat-rimmed jar (samples 8 & 19), both typical Poole Harbour forms. Petrological group 6 contained predominantly fine to medium-grained quartz and sparse elongated argillaceous inclusions. It too had been used to make classic Poole Harbour forms including a bowl with channelled rim (sample 9), a countersunk handled jar (sample 13), a bead-rimmed jar with eyebrow motif (sample 10) and another bead-rimmed jar (sample 3). Evidence of paste preparation was visible in the thin-section of sample 9 (Figure 6.24). Inclusions of limestone would be expected for vessels made locally at this site, sitting as it does on Jurassic deposits, and sparse to moderate amounts of limestone were noted in a medium-grained sandy fabric with sparse elongated argillaceous inclusions (group 8). It had been utilised for a jar with countersunk handles (sample 11), a bead-rimmed jar with eyebrow motif (sample 30) and a Romano-British bead-rimmed bowl with post-firing perforations through its base. All are forms typically associated with the Poole Harbour industry. Two coarse-grained fabrics were also recorded, one with elongated argillaceous inclusions (group 10) and one without (group 11). The group 10 vessels included two obvious

Poole Harbour vessels, a bead-rimmed jar with eyebrow motif (sample 6) and a flat-rimmed jar with dimple surrounded by an eyebrow, and a slight channel on the rim top (sample 24). The group 11 vessel was also a Poole Harbour form, a countersunk handled jar (sample 20).

Petrological group 7 represents a single vessel (sample 14), a high shouldered jar with pulled/beaded rim, rather crudely finished on the interior of the rim. The fabric contained fine to medium-grained quartz, with a moderate amount of limestone and none of the elongated argillaceous inclusions. In the hand specimen it did not appear to be a typical Poole Harbour fabric and was probably produced fairly locally. The single vessel of group 9, a saucepan pot (sample 17), was characterised by medium-grained quartz but did not contain any of the elongated argillaceous inclusions and had the highest amount of opaques from the Allard's Quarry samples (15%) and a sparse amount of flint/chert (3%). This vessel may have been part of a wider distribution network in the region. A fine, weakly carinated bowl with beaded rim (sample 7) was assigned to Iron Age B phase by Williams, and found with flat-rimmed jar sample 8. It appeared in the hand specimen to contain glauconite and this was confirmed by petrological analysis.

In conclusion, it has not been possible to ascertain the source of the non-glauconitic Early Iron Age sandy wares from Allard's Quarry using petrology alone, and they may have been made locally or brought in from elsewhere. Most of the Middle to Late Iron Age vessels were Poole Harbour products and have been defined as such on the basis of low quantities of silt in their matrices and the presence of elongated argillaceous inclusions in their fabrics. Although none of these inclusions were seen in a slide of one of the countersunk handled jars, it seems likely this vessel did also come from this industry. The origin of two fine-grained, bead-rimmed jars was uncertain, but their form would again suggest a Poole Harbour origin. The presence of sparse to moderate limestone in some of these vessels is a trait seen in other vessels from sites to the south of the Purbeck Ridge, but not in the Harbour area and its hinterland. A saucepan pot, a high-shouldered jar and a weakly-carinated bowl were not Poole Harbour products.

Table 6.16. Petrological grouping of pottery samples from Allard's Quarry

Key – AQ: Allard's Quarry; PG: petrological group

Sample	Phase	Description
AQ PG 1: Very fine to fine-grained quartz, without elongated argillaceous inclusions		
27	A	?Furrowed bowl, red-finished (body sherd)
28	A	?Furrowed bowl, red-finished (body sherd)
29	B/C	High-shouldered jar with flattened beaded rim
4	C	Bead-rimmed jar
AQ PG 2: Very fine to fine-grained quartz, with a background of moderate to common coarse silt to clay-sized quartz, without elongated argillaceous inclusions		
1	A	Body sherd, furrowed and carinated, red-finished
2	A	Body sherd, carinated, red-finished
5	A	Body sherd, furrowed, red-finished
AQ PG 3: Very fine to fine-grained quartz, with a background of moderate to common coarse silt to clay-sized quartz, without elongated argillaceous inclusions but with sparse to moderate limestone		
15	A	?tripartite jar with upright rim, red-finished
16	A	Furrowed and carinated bowl, red-finished
26	A	Plain, carinated bowl, red-finished
AQ PG 4: Very fine to fine-grained quartz with 7-15% elongated argillaceous inclusions		
8	C	Bead-rimmed bowl
19	B	Countersunk-handled jar
AQ PG 5: Very fine to fine-grained quartz, with a background of moderate coarse silt to clay-sized quartz, with elongated argillaceous inclusions		
21	C	Round-bodied jar with tightly beaded rim, well burnished exterior
AQ PG 6: Fine to medium-grained quartz, with elongated argillaceous inclusions		
3	C	Bead-rimmed jar
9	B	Bowl with channelled rim (Williams 1951, fig. 15.113)
10	B	Ovoid jar with bead rim and eyebrow motif
13	A/B	Countersunk handle
AQ PG 7: Fine to medium-grained quartz, moderate limestone, no elongated argillaceous inclusions		
14	A/B	Jar with high/rounded shoulder and pulled/beaded rim, irregular fold on interior of rim
AQ PG 8: Medium-grained quartz, with elongated argillaceous inclusions and 3-15% limestone		
11	B	Countersunk handled jar (Williams 1951, fig. 15.108)
30	B/C	Bead-rimmed jar with eyebrow
22	C	Bead-rimmed bowl with post-firing perforations through base to make a strainer
AQ PG 9: Medium-grained quartz, with 3% flint/chert but without elongated argillaceous inclusions		
17	B	Saucepan pot with horizontal incised line 20mm below rim

AQ PG 10: Coarse-grained quartz, with elongated argillaceous inclusions		
6	B	Bead-rimmed jar with eyebrow motif
24	B	Flat-rimmed jar with dimple surrounded by eyebrow
AQ PG 11: coarse-grained quartz, without elongated argillaceous inclusions		
20	B	Countersunk handle
AQ PG12: glauconitic wares		
7	B	Fine carinated bowl, bead rim
23	A	Furrowed and carinated bowl, red-finished
25	A	Furrowed and carinated bowl, red-finished

6.6.2 Sigwells (South Cadbury Environs)

Thirteen samples of Late Iron Age pottery from the South Cadbury Environs site of Sigwells were thin-sectioned, all in sandy fabrics (Table 6.17). Six of the samples are sandy wares containing rare to sparse quantities of elongated, argillaceous inclusions, suggesting an origin in the Poole Harbour region (Appendix E, Table E17). These samples ranged in texture and included a very fine to fine-grained fabric (petrological group 1) utilised for a tankard (sample 10); a fine to medium-grained sandy ware (petrological group 2) used to make a globular, S-profiled jar (sample 6) and a flat-rimmed jar (sample 13); and a medium-grained ware (petrological group 3) used for a tripartite jar with everted rim (sample), a high-shouldered jar with beaded rim (sample 4) and flat-rimmed jar (sample 8). All have an optically active clay matrix with a little mica.

The other samples include one (sample 7) with an elongated argillaceous inclusion that may simply be a clay pellet, sparse shelly limestone (3%) and rare flint/chert and opaques (petrological group 4). It had been used in the manufacture of a shouldered bowl, a vessel form typical of the South-Western ‘Glastonbury’ decorated style, but the fabric does not fit with Peacock’s petrological groups of these wares (Peacock 1969, 48) and remains unsourced.

Three wide-mouthed, necked, cordoned bowls (samples 3, 9 and 12) were all in a fine-grained sandy fabric that bore a close resemblance to the finer-grained Poole Harbour wares in the hand specimen, but none contained the diagnostic elongated argillaceous inclusions (petrological group 5). Absence of such inclusions does not preclude a south-east Dorset source for these vessels, however other methods of analysis would be required to identify their source. A fourth necked, cordoned bowl (sample 11) contained a greater proportion of silt-sized quartz in the matrix and did not have the appearance of the Poole Harbour wares in the hand specimen (petrological group 6). A bead-rimmed bowl in a fine to medium-grained sandy ware (sample 2) also remains unsourced due to the ubiquity of its inclusions (petrological group 7). A second bead-rimmed bowl (sample 5) had been made from a fabric containing a moderate amount of fossiliferous limestone; the bioclasts included ostracods (mostly fragmented), as well as a quartz component (petrological group 8). This may have been made locally to the site.

Table 6.17. Petrological grouping of pottery samples from Sigwells

Key – S: Sigwells; PG: petrological group

Sample no.	***Information from excavator (Richard Tabor)***				
	Sample	**Feature**	**Fabric**	**Form**	**Description**
S PG 1: Fine-grained quartz with elongated argillaceous inclusions					
10	P55	Cxt 086	Ushale	Tankard	Tankard
S PG 2: Fine to medium-grained quartz with elongated, argillaceous inclusions					
6	P50	F003	Ufa	JD3	Globular, S-profiled jar
13	P59	F003	Ushale	JC4.1	Flat-rimmed jar
S PG 3: Medium-grained quartz with elongated, argillaceous inclusions					
1	P45	F011	Ufa	JD4.12	Tripartite jar with everted rim
4	P48	F003	Ufa	JC3.1	High shouldered jar with beaded rim
8	P53	F003	Ufa	JC4.2	Flat-rimmed jar with petal motif
S PG 4: Fine to coarse-grained quartz with elongated, argillaceous inclusions and sparse fossiliferous limestone					
7	P52	F003	UN	BD6	SW decorated-style bowls
S PG 5: Fine-grained quartz, without elongated argillaceous inclusions					
3	P47	F011	Y	BD1	Wide-mouthed, necked, cordoned bowl
9	P54	F003	Y	BD2	Wide-mouthed, necked, cordoned bowl
12	P57	F003	D	BD1	Wide-mouthed, necked, cordoned bowl
S PG 6: Fine to medium-grained quartz with a background of silt-sized quartz					
11	P56	F011	Ufa/Ug	BD2	Wide-mouthed, necked, cordoned bowl
S PG 7: fine to medium quartz, no elongated argillaceous inclusions					
2	P46	F011	Ufa	BC3.3	Bead-rimmed bowl
S PG 8: fine to medium quartz, with moderate fossiliferous limestone					
5	P49	F003	Ufa	BC3.3	Bead-rimmed bowl

6.7 Conclusion

The purpose of the petrological analysis carried out as part of this research was threefold: to attempt to characterise the fabrics of vessels thought to have been made in the Wareham/Poole Harbour area of Dorset, to examine variability in the pastes used for different vessel forms, and to compare the thin-sections of the pottery to those of the clays of this area in an attempt to suggest possible areas of clay procurement. The difficulty in assigning sandy wares to a source using petrology alone is widely acknowledged, both by researchers documenting this industry (Peacock 1967, 97; Williams 1975, 49) and in pottery studies more generally. Characterisation of the pottery from the sites around Poole Harbour, and the results of previous petrological, heavy mineral and compositional analysis by Peacock (1967), Williams (1975, 1986) and Coulston (1989) provided a baseline for the range of inclusions that might be expected to be seen in a slide of pottery made by the Poole Harbour potters. The 59 thin-sections from the Harbour sites shared many traits, despite coming from a wide range of vessel forms and dates, from the Early Iron Age to the later 4th century AD. The most diagnostic was the presence of elongated argillaceous inclusions, thought to be shale, providing one means by which to differentiate products of this industry from other wares.

Another trait that was quite consistent in the vessels from the Harbour area was the low quantity of silt-sized quartz ($\leq$3%) in their matrices, with only four containing greater quantities (5-7% in three vessels and 10% in one). Both monocrystalline and polycrystalline grains of larger quartz grains were also present, with some fine-grained vessels, some medium-grained and some coarser grained examples. Many of the Green Island vessels displayed a peak in the medium range but the Wytch Farm vessels tended to be more wide ranging in their quartz content. Minor components in the fabrics from these sites may include rare quartzite, ferruginous sandstone, sandstone, siltstone and flint/chert. One vessel contained a slightly higher quantity of flint/chert, at 3%. The opaque content was variable, but not greater than 10%. The amount of argillaceous inclusions that were equant in shape was also quite variable, up to 20% in frequency, representing clay pellets or remnants of the preparation techniques. Calcareous inclusions were rarely encountered, with 1% limestone in one vessel from Green Island, and a little shelly limestone in one from West Creech

(Wytch Farm Oilfield). Tourmaline seen in 16 of the 51 samples and fragments of a rock with lathes of tourmaline were present in two samples. Elongated argillaceous inclusions were present in all but six samples, including two from the kilns at Redcliff Farm, again a reminder that the absence of this inclusion cannot be taken to preclude a Poole Harbour origin.

Throughout the analysis of the slides there was a constant need to evaluate and re-evaluate the traits that suggest a vessel was made in the Wareham/Poole Harbour area. The presence of the above mentioned elongated argillaceous inclusions was found to be related to vessels synonymous with this industry and therefore appeared to be an indicator of origin. Fortunately, these inclusions may also be seen in the hand specimen. A number of the more commonly occurring Poole Harbour forms, such as the flat-rimmed jars and bead-rimmed jars, often with diagnostic motifs such as the eyebrows and petals, or incorporating countersunk lug handles, and their rarer forms (e.g. the tankard) have been previously used to define the Late Iron Age 'Durotrigian' identity (Brailsford 1958). The petrological profiles of these vessel forms were therefore used to test the validity of using the presence or absence of the elongated argillaceous inclusions as indicators of a Poole Harbour origin, and to ascertain if these inclusions are associated with certain types of vessels, or grades of paste, such as fine-grained vessels, or if there is any chronological variation. It was found that the elongated argillaceous inclusions are associated with most of the suspected Poole Harbour wares, but occasionally there were examples without these inclusions. This may be a result of the relatively small quantities present in the fabrics, or the small size of the samples that are taken for petrological analysis, perhaps just missing an inclusion.

This baseline was used to place all 255 samples into one of four categories: Poole Harbour wares (contain elongated argillaceous inclusions); probable Poole Harbour wares (classic form but no elongated argillaceous inclusions); non-Poole Harbour wares (glauconitic wares and other fabrics that were too different to the baseline to be assigned a Poole Harbour source) and wares of unknown origin (petrologically indistinct sandy wares that may, or may not, have derived from the Harbour area). Variation was visible in the Poole Harbour wares, and possible Poole Harbour wares, from the different areas of Dorset. Those from the sites to the south of the Purbeck

Ridge contained more calcareous inclusions, with between 5% and 25% limestone and shelly limestone visible in 12 of the 31 samples that were thought to originate from the Poole Harbour industry. The silt-sized quartz component was quite high in two samples (Rope Lake Hole, samples 18 and 25) and tourmaline was more frequently encountered in the slides of vessels from this area than any other area, seen in 24 of the possible 31 Poole Harbour vessels, some with multiple pieces recorded. Eight vessels also contained fragments of a rock incorporating lathes of tourmaline. The minor components present in the Harbour and hinterland sites are repeated in the sites to the south of the Ridge, although the quantity of opaques was a little higher in some of the samples from Rope Lake Hole (RLH samples 13, 15, 27, 29 and 30).

In West Dorset, of the 46 samples from Maiden Castle and Southdown Ridge, 35 represent vessels that probably originated from the Poole Harbour industry. Three from Maiden Castle had a particularly silty matrix, without any elongated argillaceous inclusions, but their forms suggest they may be variants or imitations of the ware. Two from Southdown Ridge contained moderate quantities of silt, but one was a flat-rimmed jar. The minor components included the same range as the samples from other areas, but some in slightly greater quantities, with up to 3% quartzite, sandstone, siltstone and flint/chert. Only six contained 5% or greater amounts of limestone or shell, but none above above 10%. Tourmaline was present in 11 samples and a rock with lathes of tourmaline in just one. Two of the vessels sampled from Maiden Castle were in glauconitic fabrics, one with quite similar decoration to the Poole Harbour vessels. In East Dorset the five samples from Hengistbury Head were all typical forms but no elongated argillaceous inclusions were seen in the slide of one of the flat-rimmed jars. This vessel also had the siltiest of the Hengistbury matrices (10%).

Forty-nine slides were made of vessels from Barton Field, Tarrant Hinton; Bradford Down; Oakley Down and Gussage All Saints, in north Dorset. All were thought by this researcher or others to be possible Poole Harbour products, yet 20 were found to be glauconitic wares, and therefore originating from the Gault or Lower Greensand. Only 16 vessels were assigned a Poole Harbour or probable Poole Harbour origin. The silt component was sparse for the most part, but up to 10% in three vessels. Up to 3% quartzite and flint/chert was recorded, but only rare sandstone and siltstone. Like the Harbour vessels, the limestone/shell content is low (1-2% for eight vessels and 3% in one vessel) and tourmaline was spotted in just four vessels and the rock type with tourmaline lathes in only one. The remaining vessels were undiagnostic in terms of their fabrics.

Forty-one vessels were sectioned from Allard's Quarry in north-east Dorset and Sigwells in Somerset, with three from Allard's Quarry found to be glauconitic and only 21 thought to come from the Poole Harbour industries. The silt component and quartzite, sandstone, siltstone and flint/chert quantities for these vessels was in keeping with trends noted in vessels from the harbour sites, with higher quantities of limestone (7% and 15%) present in two vessels, although both were typical Poole Harbour forms, and contained elongated argillaceous inclusions. Tourmaline was seen in five vessels but none contained the rock fragments with tourmaline lathes seen occasionally from the other sites, particularly those to the south of the Ridge.

Evidence of the paste preparative techniques of the Poole Harbour potters was glimpsed in several slides made as part of this research. A swath of a very silty clay was seen across the slide of a body sherd from Green Island, whilst the slide of sample 5 from Redcliff revealed one area with far few quartz grains than the surrounding matrix. Possible paste preparation was also noted in six slides of the pottery from the Wytch Farm Oilfield sites, with areas of denser silt-sized quartz (WFO samples 1, 10 and 13), irregularly distributed quartz or some with areas devoid of inclusions (WFO samples 2 and 6), and a streak of a possible different clay (WFO sample 17). The slides of two Poole Harbour vessels from Allards Quarry also revealed evidence of clay mixing (AQ samples 9 and 19). Evidence of clay mixing was revealed in two samples from Gussage All Saints (GAS samples 9 and 19), two from Maiden Castle (MC samples 6 and 24) and one from Southdown Ridge (SR sample 1), but none of these were identified as Poole Harbour products.

Chapter 7

Petrological analysis of the clay samples, and comparison of the pottery and clays

This chapter will explore the variability of the clay samples in thin section, and compare the petrological profiles of the pottery and the clay. This variability in the clays was seen in the colour and texture of the samples in the field and whilst making and firing the briquettes. It was evident in samples taken at a single site and between sites. It was therefore examined using qualitative petrological analysis in the same way as that carried out for the pottery samples (Chapter 6). The results of this analysis are summarised by clay type and site below, and the data is presented in Appendix F (Tables F1-F7). The microscopic details of the clay and pottery samples were then compared to try to identify evidence for clay selection and the processing of raw materials.

7.1 Petrological analysis of the clay samples

Thin sections were made of all clay samples fired at 800°C, and 14 samples were selected to assess any optical variation in samples fired at different temperatures (600°C, 800°C and 1000°C). These were: South of Bramble Bush Bay (samples 5, 8, 9 and 10), Brownsea Island (samples 4 and 8), Sandford (sample 4), Upton Poole Road (sample 1, 800°C and 1000°C), Godlingston Heath (samples 2 and 4 at all three temperatures, samples 3 and 5 at 600° and 800°C) and Alder Hills (samples 9 and 10). All clays were birefringent and slightly micaceous. Little difference was noted in the slides of the samples fired at the different temperatures, although nearly all lost their optical activity at 1000°C. A total of 134 thin-sections were made of the 105 clay samples, from 27 locations.

7.1.1 Poole Formation

Ten clay samples were taken from Round Island, Furzey Island and Green Island - all areas mapped as 'Poole Formation' by the British Geological Society, but not assigned to one of the members of this strata. Thin-sectioning of the clay samples confirmed the field observation that they were all either completely pure, silty or very fine in texture with only occasional larger grains (Appendix F, Table F1). Other inclusions comprised rare to sparse opaques in all, rare iron oxides in three samples, a piece of ferruginous sandstone in one from Round Island and a tourmaline fragment in a sample from Furzey Island, the coarsest of the samples.

Round Island

The Round Island clays were very pure, with only 1% silt-sized quartz noted in samples 2 and 3, and no larger grains. Sample 4 was similar, but had the odd larger grain up to medium-sized. Sample 5 had a slightly higher proportion of silt (7%) but again only very occasional larger grains, whilst sample 1 was much siltier, with 15% in this range, and few larger grains. All contained 1-3% opaques; a little iron was noted in sample 4.

Furzey Island

Sample 1 was quite a silty clay, with 15% silt and 15% very fine quartz, and 2-3% of fine, medium and coarse-sized grains. Sample 2 contained only 5% silt with occasional very fine, fine and medium-sized grains. Both contained rare opaques and iron oxides. A piece of tourmaline was noted in sample 1.

Green Island

The Green Island samples were very silty, with samples 1 and 2 having 20% silt and sample 3 with 40%. Samples 1 and 2 also contained rare to sparse very fine and fine grains, and rare medium grains. Sample 3 had a higher proportion of very fine-sized grains (15%), but also sparse fine and rare medium grains. The only other inclusions were rare to sparse opaques.

7.1.2 Broadstone Clay

The Broadstone Clays surround the southern shores of the Harbour and extend into other parts of the study area. They were wide ranging in terms of their quartz content (Appendix F, Table F2). The silt-sized component of these clays was estimated at 3-30% in frequency; very fine grains accounted for 2-20% of each slide; fine, medium and coarse grains for up to 15%, and very coarse grains for up to 2%. No granules were seen. Up to 10% opaques were noted in each sample. Rare to sparse iron oxides were present in 15 samples, rare limestone in four samples, rare quartzite in two samples, rare ferruginous sandstone in nine, rare siltstone in four and rare flint/chert in six. The two samples from Foxground Plantation contained a reddish-coloured inclusion that bore some similarity to the elongated argillaceous inclusions associated with the pottery (Figure 7.1). Equant argillaceous inclusions/clay pellets were noted in four samples (including the two from Foxground Plantation). Occasional tourmaline fragments were seen in 18 of the 36 samples and a metamorphic rock fragment covered in lathes of a probable tourmaline, was noted in one. Interestingly, rare flint and tourmaline were noted in the Arne Beach samples that had been tempered with sand and shale, but not in the base clay samples, suggesting these components may have come from the sand. Coulston (1989, 73) has also suggested the tourmaline may have derived from the sand rather than the clay component of the pottery. A comparison of the total quantity of fine-sized to very coarse quartz in the samples (including the two Arne samples with added sand) and the presence/absence of tourmaline also broadly supports this (Table 7.1). Of note is that multiple pieces of tourmaline were seen in three of the sandiest samples (with 21%, 32% and 62% quartz).

Table 7.1. Presence or absence of tourmaline in clay samples in relation to percentage of quartz present

Total % of fine to very coarse quartz	% of samples with tourmaline	No. of samples with tourmaline	No. of samples without tourmaline	Total no. of samples
0-10	28	7	18	25
11-20	100	5	0	5
21-30	100	3	0	3
31-40	100	2	0	2
62	100	1	0	1

Arne Peninsula

Six clay samples were taken from the Arne Peninsula. Two from the central area of the peninsula contained sparse silt-sized quartz and rare very fine quartz, with sparse opaques, rare iron oxides and a tourmaline fragment in sample 1. At the southern end of the peninsula (South of Bank Gate Cottages), sample 1 contained sparse silt, rare very fine and fine-sized quartz, sparse medium and coarse quartz and rare very coarse quartz, with sparse opaques, rare iron oxides and a piece of tourmaline. The upper part of adjacent sample 2 (2A) was noted as very sandy in the field, and contained moderate amounts of silt, very fine, fine, medium and coarse quartz, with rare very coarse quartz (Figure 7.2). The lower part of the sample (2B) was a compact clay with sparse silt and rare amounts of each of the other size grains, rare opaques and a tourmaline fragment (Figure 7.3). A mix of approximately 20% of the upper sample to 80% of the lower sample produced a clay with sparse amounts of all size classes from silt to coarse, with rare very coarse grains. Rare siltstone, flint/chert, limestone and micritic calcite were present in the sample 2 variants, and a rock fragment covered in lathes of tourmaline was noted in the mixed sample 2. Two samples from the northern coast (Arne Beach) contained common silt-sized quartz, sparse to moderate very fine quartz, rare fine quartz and sparse opaques.

Ower Bay

Three samples were taken from the shores of Ower Bay. Sample 1 contained sparse silt and very fine quartz, with rare fine, medium and coarse-sized grains. Sample 2 was siltier, with common silt and moderate very fine quartz, sparse fine quartz and rare larger grains. Sample 3 contained moderate silt with sparse amounts of the other grains (Figure 7.4). Also present were rare to sparse opaques in all, rare limestone and micritic calcite in sample 2, rare ferruginous sandstone in sample 3 and rare tourmaline in samples 1 and 3.

South of Bramble Bush Bay

The samples from this area were difficult to consolidate, with multiple attempts made to section samples 3, 5, 7, 9 and 10. Variation in the samples from this bay was noted in the field. Samples 2, 6 and 8 were similar to each other, containing sparse silt-sized and very fine quartz, rare fine quartz, and occasional rare medium and coarse quartz. Samples 3, 5, 9 and 10 were much siltier, with moderate to very common silt, moderate to common very fine quartz, rare to moderate fine quartz, rare to sparse medium quartz and rare larger grains. Other inclusions from the samples in this area comprised rare to sparse opaques, and occasional rare quartzite, ferruginous sandstone, iron oxides and tourmaline.

Redcliffe Farm

The two samples from Redcliffe Farm were similar, both with moderate to common silt-sized grains, and rare to moderate very fine quartz (Figure 7.5). Occasional larger quartz grains, sparse opaques, rare iron oxides and a fragment of tourmaline were also present. An argillaceous inclusion, equant in shape, was noted in sample 2.

Foxground Plantation

Two samples were taken from Foxground Plantation, both very similar with sparse amounts of silt-sized, very fine and fine quartz, rare to sparse medium quartz, and up to 1% coarse quartz. Both also contained a moderate amount of a golden red (in both cross-polarised light and plane polarised light), speckly mineral, 0.06-1.6mm, elongated and equant, rounded. It has not been possible to identify this mineral, but it is illustrated in Figure 7.1. Other inclusions comprised sparse opaques in both; rare iron oxides and a tourmaline fragment in sample 1.

Wytch Heath and Rempstone Heath

Three samples were taken from Wytch Heath and one from Rempstone Heath. Sample 1 from Wytch Heath was a clay in the upper 0.6m of the auger hole (1A), but the lower 0.2m was very sandy (1B). This was reflected in thin sections, with both upper and lower parts containing an even, moderate, amount of silt-sized quartz but only 1-3% of each of the larger classes in the upper sample (Figure 7.6) but greater amounts in the lower sample (Figure 7.7; 7% very fine, 10% fine, 15% medium, 3% coarse and 2% very coarse). Samples 2 and 3 were also sandy and similar to the lower part of sample 1, with only slightly less quartz in sample 3 than samples 1B and 2. All of the Wytch Heath samples contained rare to sparse opaques and rare flint/chert. Rare limestone was present in samples 2 and 3, rare iron in sample 3, and rare tourmaline in samples 1B, 2 and 3. The Rempstone Heath sample was silty, with a moderate amount of silt-sized quartz and sparse very fine quartz, rare fine quartz, opaques and iron oxides.

Godlingston Heath

Five samples were analysed from Godlingston Heath. Samples 1-4 were similar to each other, with moderate to common silt-sized quartz (Figure 7.8); rare to sparse very fine quartz in samples 1-3 and a moderate amount in sample 4. Up to 7% fine quartz was present in sample 4 but otherwise only occasional larger grains were noted. Sample 5 was a cleaner clay with only sparse silt-sized grains and rare larger sizes (Figure 7.9). Other inclusions in the Godlingston Heath samples comprised occasional rare quartzite, ferruginous sandstone, siltstone, iron oxides and tourmaline. Samples 3-5 had rare quantities of opaques, but this was higher in samples 1 (10%) and 2 (7%).

Sandford

The two samples from Sandford contained sparse to moderate silt, sparse very fine quartz and only 1% fine quartz. A sparse amount of opaques and rare to sparse iron oxides were noted in each, and rare ferruginous sandstone in sample 5.

7.1.3 Creekmoor Clay

Two samples of Creekmoor Clay were taken from a single location, Upton Country Park (Appendix F, Table F3). Sample 1 contained a slightly higher proportion of silt and very fine quartz than sample 2 (7%-2% for both classes), but both had fairly similar proportions of larger grains (2-3% fine quartz, 3-5% medium and 1% coarse quartz). Each contained sparse to moderate opaques, sparse iron oxides and rare flint/chert, in a highly birefringent, slightly micaceous matrix. A piece of tourmaline was noted in the slightly sandier sample 1.

7.1.4 Oakdale Clay

Samples of Oakdale Clay were taken from four locations (Appendix F, Table F4). Those from Upton Poole Road, Sandford and East Holme contained similar levels of quartz to some of the pottery samples. Much less sand was seen in the samples from Longfleet Lodge. Occasional pieces of tourmaline were noted in the sandier samples, and a rock fragment covered in tourmaline lathes was present in one. The groundmass of all samples was highly birefringent and slightly micaceous in samples fired up to 800°C, but the samples fired to 1000°C had lost this optical property.

Upton Poole Road

The clay samples from Poole Road, Upton contained sparse (7%) silt, sparse to moderate very fine quartz (5-10%) and sparse (5-7%) fine, medium and coarse-sized grains (Figure 7.10). One sample also had rare very coarse grains. The flint/chert content was slightly higher than the pottery samples, at 2-5%, with rare to sparse iron oxides and rare opaques and tourmaline. Other occasional inclusions comprised rare siltstone and equant argillaceous inclusions.

Sandford

One sample from Sandford was located on the Oakdale Clay. This contained sparse quantities of all size ranges recorded (silt, very fine, fine, medium, coarse, very coarse), but no granules. Other inclusions comprised sparse opaques and rare ferruginous sandstone, flint/chert, iron oxides and tourmaline.

East Holme

The two East Holme samples contained sparse silt-sized quartz, rare very fine grains, sparse fine and medium grains, and rare to sparse coarse grains. There was also rare ferruginous sandstone, flint/chert and opaques. A rock fragment covered with lathes of tourmaline was present in sample 1, and a fragment of plagioclase feldspar in sample 2.

Longfleet Lodge

There was little variation in the two samples from Longfleet Lodge, with sparse silt-sized quartz, and occasional very fine, fine and medium-sized larger grains. Sample 1 was unusual in containing abundant silt-sized opaques, whilst only a sparse quantity was seen in sample 2. Sparse iron oxides were also recorded in both.

7.1.5 Parkstone Clay

A total of 39 samples of Parkstone Clay were thin-sectioned, including 23 from Brownsea Island, an area chosen to examine variability within a single clay type in a restricted location (Appendix F, Table F5). The groundmass of all the samples was highly birefringent up to 800°C; of the samples fired to 1000°C and thin-sectioned, samples 4 and 8 from Brownsea Island were not birefringent at this temperature, however samples 9 and 10 from Alder Hills retained their birefringence, even at 1000°C. The proportion of silt-sized quartz in the samples varied from 2-40%, with 11 samples containing $\leq$7% silt, 16 containing 10-15% silt and 12 containing >20% silt-sized quartz. At the other end of the scale, nine samples contained very coarse quartz, and only two contained granules of quartz (Bourne Bottom Nature Reserve, samples 2 and 5). Other inclusions comprised 1-3% quartzite in five samples, rare ferruginous sandstone in 18 samples, rare sandstone in two samples, rare siltstone in seven samples, rare flint/chert in nine samples, rare equant argillaceous inclusions in five samples, rare to sparse iron oxides in 21 samples, and a little limestone was noted in one sample from Bourne Bottom. Each sample contained 2-15% opaques. Plagioclase feldspar was seen in two samples, and tourmaline in 27 samples, although none contained the rock fragments covered in lathes of tourmaline.

Brownsea Island

The Brownsea Island samples were difficult to make and the groundmass started to disappear in all but the 1000°C briquettes. Nonetheless, all have a micaceous groundmass, strongly optically active up to 800°C, with varying quantities of silt-sized quartz. The groundmass of all (except sample 11) is also scattered with rounded to linear opaques in this size range, perhaps one of the reasons the white firing clays from Brownsea were not commercially viable as ball clays. Variability is visible in the samples, and the clays range from the extremely fine sample 18, with silt-sized quartz scattered through the clay, but only very occasional larger (very fine or fine) quartz, and rare ferruginous sandstone. Opaques and iron oxides were present in sparse amounts. At the opposite end was sample 11, containing abundant medium-grained quartz, rare coarse quartz, moderate fine and sparse very fine quartz, and fewer opaques than most of the other samples. Sample 11 also contained sparse siltstone, rare iron oxides and tourmaline.

Other silty/very fine textured samples comprised samples 21, 22 and 23 from the northern side of the island, and sample 10 from the south-western side. They each contained a greater amount of silt-sized quartz than the above mentioned sample 18 (20-25%, compared to 10%) and also of very fine quartz (3%, compared to 1% in sample 18). Rare fine quartz was present in all, rare medium quartz was seen in all except sample 21, and only sample 22 had anything larger (1% coarse quartz). Silt-sized opaques were peppered through the matrix of each of the samples, with the highest quantity seen in sample 23. Other inclusions comprised occasional sparse iron oxides, and rare tourmaline and ferruginous sandstone. Sample 19 was a very fine clay, again with a micaceous background scattered with silt-sized opaques and quartz, however this sample also contained rare amounts of medium and coarse-grained quartz. Sample 20 was quite unusual in having very few silt-sized inclusions visible, the groundmass again being fine and micaceous, however it contained sparse amounts of medium and coarse-grained quartz, rare very fine and very coarse-grained quartz, as well as rare ferruginous sandstone, a large piece of quartzite, an argillaceous inclusion and two pieces of tourmaline (Figure 7.11).

Samples 1-6 were all broadly similar, with a moderate amount of silt-sized quartz, sparse to moderate very fine quartz, rare to sparse fine quartz, most had rare medium-grained quartz and only one had rare coarse quartz (sample 6). All had sparse to moderate opaques, most had rare ferruginous sandstone and tourmaline, there were a couple with rare iron oxides or quartzite, but none contained flint/chert. Sample 7 was similar but contained slightly less silt-sized and very fine quartz. In sample 2 swathes of clay that contained much less quartz (only the silt-sized component) were visible, and were in marked contrast to the surrounding clay (Figure 7.12). These could easily be mistaken for evidence of clay mixing if seen in the slide of a pottery vessel, but here showed variability in a single small area of one clay sample.

The other samples were coarser grained, but two had a particularly silty groundmass - 10% silt-sized and very fine quartz was noted in sample 8, and 20% silt-sized and 5% very fine quartz in sample 9. These two samples also each contained rare to sparse fine quartz, sparse medium quartz, rare coarse and very coarse quartz. Other inclusions comprised moderate opaques, rare to sparse quartzite, rare ferruginous sandstone, and occasional rare siltstone, equant argillaceous inclusions, iron oxides and tourmaline. Samples 12-16 were all similar, with sparse silt-sized quartz, rare to sparse very fine and fine grains, sparse medium quartz, rare coarse quartz and rare very coarse quartz in sample 14. The character and quantity of the opaques was similar throughout the group, with sparse to moderate amounts of rounded inclusions that resembled ink splodges - many being 0.1-0.8mm. Other inclusions comprised rare to sparse iron oxides, and occasional rare ferruginous sandstone and tourmaline. Sample 13 had a swath of a sandier clay within the sample, there are also a couple of lumps of a sandier clay in samples 14 and 16. In summary, the clay samples from Brownsea Island were heterogeneous in their composition, ranging from very fine to coarse-grained clays. The coarse silt to clay-sized component varied from 2-25% and the total very fine to very coarse-sized grains from 3% to 62%. Tourmaline was noted in 14 samples, but none contained any flint or chert.

Bourne Bottom Nature Reserve and Alder Hills Nature Reserve

Ten samples were taken across these nature reserves, with considerable variability noted in the quartz content. Five had a very high silt-sized quartz content in their groundmass (≥20%), but varied in their quantities of larger grains. The sandiest were samples 4 and 7, each containing moderate very fine, fine and medium quartz, with sparse coarse quartz and rare to sparse very coarse quartz. Other inclusions comprised sparse to moderate opaques, occasional rare ferruginous sandstone, siltstone, flint/chert, iron oxides and tourmaline. Samples 1 and 6 were less sandy with sparse very fine, fine and medium quartz, and rare to sparse coarse quartz. There was also rare to sparse opaques, rare tourmaline and occasional rare flint/chert, ferruginous sandstone, siltstone, iron oxides and plagioclase feldspar. A patch of a less sandy clay was noted within the sample 6 slide. Sample 10 contained only rare amounts of very fine to coarse grained quartz, with moderate opaques and rare flint/chert, iron oxides and tourmaline.

Samples 2, 3 and 5 were quite similar, with sparse to moderate silt-sized, very fine and fine quartz, sparse medium quartz and rare to spare coarse quartz; samples 3 and 5 also contained rare very coarse quartz; occasional granules were noted in samples 2 and 5 (Figure 7.13). Sparse to moderate opaques were present in each, but greatest in sample 3. Rare flint/chert was also present in all. Other occasional inclusions comprised rare to sparse iron oxides, rare quartzite, ferruginous sandstone, siltstone, equant argillaceous inclusions, plagioclase feldspar and tourmaline. Samples 8 and 9 contained variable quantities of silt-sized quartz (3% and 10% respectively) but both had sparse very fine and medium quartz, rare to sparse fine and coarse quartz, and rare very coarse-sized grains. Sparse opaques and iron oxides; rare flint/chert, equant argillaceous inclusions and tourmaline were present in each. Rare sandstone and limestone were seen in sample 9 and rare elongated argillaceous inclusions in sample 8. A lens of completely clean clay was also noted in sample 9.

Creech Heath

Four samples were taken from Creech Heath; all were quite different from each other. Sample 3 had the siltiest groundmass with abundant silt-sized quartz, it also contained sparse very fine, fine, medium and coarse grains, with sparse opaques and a piece of tourmaline. Sample 4 was also very sandy with common silt, moderate very fine and medium quartz, sparse fine and coarse quartz (Figure 7.14). Other inclusions comprised rare opaques, flint/chert, tourmaline and an argillaceous rock fragment. Samples 1 and 2 were similar, with sparse to moderate silt, sparse very fine and fine quartz, rare to sparse medium quartz and rare coarse quartz. Each contained sparse opaques and iron oxides, and rare tourmaline.

Alderney, Newtown and Foxholes

The two samples from this area were very similar, with moderate silt-sized and very fine quartz, sparse fine and medium quartz, and up to 2% coarse quartz. They also contained sparse to moderate opaques, rare ferruginous sandstone and tourmaline.

7.1.6 Wealden Clay

The Wealden Clays outcrop to the south of the Purbeck Ridge and samples were taken from three locations (Appendix F, Table F6). Each of the 12 samples contained moderate to common (10-20%) silt-sized quartz with variable quantities of larger grains, although only two contained very coarse quartz. Rare amounts of quartzite, ferruginous sandstone, sandstone, siltstone, limestone and iron oxides were occasionally present. Rare flint/chert was seen in eight samples, all but two contained tourmaline and one contained a rock fragment covered in lathes of tourmaline. All had a highly birefringent, and slightly micaceous, groundmass.

Belle Vue Farm

A single, hand-collected sample contained common silt, sparse very fine and fine quartz, and rare medium-sized grains. A moderate amount of opaques, rare flint/chert and ferruginous sandstone were also noted.

Lower Lynch Farm

Samples 1 to 3, and the upper part of sample 4, were all quite similar, containing common silt-sized quartz, sparse to moderate very fine quartz, sparse fine quartz and rare to sparse medium and coarse quartz, with occasional very coarse quartz in samples 3 and 3A (Figure 7.15). Each had sparse to moderate opaques and rare flint/chert. Rare ferruginous sandstone, sandstone and siltstone were occasionally noted, and rare tourmaline was present in samples 1-3. The lower part of sample 4 (4B) was much less sandy, with moderate silt-sized grains and rare very fine, medium and coarse grains. Other inclusions comprised sparse opaques, rare iron oxides, quartzite and tourmaline. There was also a lump of quartz-free clay, 2mm in size.

SE Purbeck

Five samples were taken from a mechanically excavated section at a site in the south-east of the Isle of Purbeck. These were very fine, sandy clays, with moderate to common silt and very fine-sized quartz, and moderate fine quartz. The quantity of larger grains was more variable in frequency, with none in sample 3, and only rare medium grains in sample 1. Sample 2 (Figure 7.16) contained moderate medium-sized grains and samples 4 and 6 had sparse medium-sized grains and rare coarse grains. The opaque component varied from 3% to 20% but were mostly silt-sized, and may be lignite. Other inclusions were noted in some of the samples: rare to sparse ferruginous sandstone, rare siltstone, rare flint/chert, limestone and iron oxides. All contained tourmaline. The samples appear to contain patches of different types of clay or clay pellets.

7.1.7 Barton Clay

Hengistbury Head

Two samples were taken of the Barton Clay, at Hengistbury Head (Appendix F, Table F7). Both contained common silt and very fine quartz, but no larger grains, in a highly birefringent, micaceous groundmass. The other inclusions were sparse opaques, rare ferruginous sandstone and tourmaline.

7.1.8 Sand

Petrological analysis was carried out of two sand samples, one from Rempstone Heath (sample 3) and one from Furzey Island (sample 3). The sample from Rempstone contained a quartzite and flint/chert component, however this was not present in the sand from Furzey Island. The minor components in the pottery, such as quartzite, sandstone, siltstone, chert and so forth, may therefore have derived from the sand added as temper, or from the raw clay, as these inclusions have been found in both deposits in the field.

7.2 Comparing Clay and Pottery Samples

Some of the sandy clay samples appeared to be texturally similar to the pottery, although previous researchers have indicated that the Romano-British Black-burnished ware, and earlier Poole Harbour wares, were deliberately tempered with sand (Williams 1977, Coulston 1989). As the fieldwork had revealed the presence of a range of naturally sandy clays in the area, the use of untempered clays was therefore considered to be a possibility. Consequently, the data from the qualitative visual characterisation of the clay samples and pottery was compared to search for similar samples.

Two differences between the clay samples and pottery samples in thin-section were immediately apparent: that silt-sized grains of quartz were more frequently encountered in the clay samples, and that the elongated argillaceous inclusions associated with the pottery were not present in the clays, although two samples (from Foxground Plantation and SE Purbeck) contained similar components. Of the 167 pottery samples thought to be Poole Harbour wares on the basis of the petrological analysis, 76% contained only 1-3% silt-sized quartz, yet this was matched by only 8% of the 109 clay samples (Figure 7.17 and 7.18).

The maximum silt-sized component in the Poole Harbour wares, or possible Poole Harbour wares, was 25%. The total percentage of larger quartz grains (very fine-sized to granules) was between 10% and 45% in total. Any untempered clay that was used for these vessels would therefore be expected to fall within these parameters. A total of 69 clay samples fulfilled these criteria. As only four pottery samples contained 20-25% silt-sized quartz, and were classified as ‘possible Poole Harbour wares’, clay samples with commonly occurring silt were then excluded from consideration, leaving 47 samples (Table 7.2). The data collected from the petrological analysis of these samples was then compared to that from analysis of the pottery samples, and the 15 samples underlined in Table 7.2 appeared to be most similar in terms of the proportions of the different sizes of quartz grains. Of these, three contained 2-3% silt-sized quartz, but most contained 5-7%.

Table 7.2. Clay samples containing up to 15% silt-sized quartz, and 10-45% larger grains. Those that appeared to be most similar to the pottery are underlined.

Clay member	Location	Sample numbers
Broadstone	South of Bramble Bush Bay	2, 9
Broadstone	Godlingston Heath	1, 4
Broadstone	Rempstone	1, 2
Broadstone	Wytch Heath	1A, 1B, 2, 3
Broadstone	Arne, South of Bank Gate Cottages	1, 2A/2B
Broadstone	Ower Bay	3
Broadstone	Redcliff Farm	2
Parkstone	Brownsea Island	1, 1B, 2, 3, 5, 6, 8, <u>12</u>, <u>13</u>, <u>14</u>, <u>15</u>,16, <u>20</u>
Parkstone	Bourne Bottom and Alder Hills	2, <u>3</u>, 5, 8, <u>9</u>
Parkstone	Alderney, Newtown, Foxholes	1, 2
Parkstone	Creech Heath	1, <u>2</u>
Oakdale	Upton, Poole Road	<u>1</u>, <u>2</u>, <u>3</u>
Oakdale	East Holme	<u>1</u>, <u>2</u>
Oakdale	Sandford	<u>4</u>
Creekmoor	Upton Country Park	<u>1</u>, 2
Wealden	SE Purbeck	2, 6
Poole Formation	Furzey Island	1

Quantitative textural analysis was carried out on eight of the clay samples that appeared to be the most similar to the pottery, as well as three other clay samples, two sand samples and 11 pottery samples. These included a clay sample taken from the published location for a Romano-British pottery kiln at Redcliffe Farm, Ridge, (RFR clay sample 2) and from a vessel found within one of these kilns (RR pottery sample 4; Lyne 2002, fig. 11.67). The analysis was conducted using a Petrog Point Counter at The Institute of Archaeology, UCL. A digital stepping stage attached to a high-powered microscope allows the user to analyse the composition of the thin section by classifying a pre-determined number of points on the section (300 were selected on each slide), recording each as an inclusion, the clay matrix or a void. The minimum and maximum size of each inclusion is measured, and the accompanying software provides descriptive statistics including the mean and modal grain size, the standard deviation, skewness and kurtosis (Appendix F, Tables F8-F10).

The data from the point counting has been displayed in bar graph form, using the grain size categories of the Wentworth scale, with very fine silt at the lower limit (0.004mm), and pebbles at the upper limit (64mm). The graphs of the clays revealed both unimodal and bimodal distributions, and illustrate the difficulty in using grain-size distribution to identify the addition of temper (Figures 7.19-7.27). What is striking from these graphs is the proportion of silt-sized quartz in the samples. This is far greater in the clay samples than the pottery (Figures 7.28-7.37), as visually demonstrated in the graphs, and numerically in Tables 7.3 and 7.4. It should be borne in mind that most of the clay samples selected for quantitative petrological analysis were those that appeared to contain the least silt-sized quartz during qualitative petrological analysis, and were thought to be the most similar to the pottery. Those samples not selected for quantitative analysis all contained much greater quantities of silt-sized quartz.

Table 7.3. Proportion of silt-sized inclusions in the clay samples analysed with the point-counter, and figure numbers of histograms

Clay type	Site	Sample	% of silt-sized inclusions	Figure no.
Broadstone	Arne Beach	2a	88.7	7.43
Broadstone	Arne Beach	2b	18	7.44
Broadstone	Redcliffe Farm	2	76.4	7.41
Broadstone	Godlingston Heath	5	48.4	7.19
Oakdale	Upton, Poole Road	2	5.7	7.21
Oakdale	Upton, Poole Road	3	8.8	7.22
Oakdale	Sandford	4	7.5	7.20
Oakdale	East Holme	2	12.5	7.23
Parkstone	Brownsea Island	14	6.8	7.24
Parkstone	Brownsea Island	20	16.3	7.25
Parkstone	Bourne Valley (Alder Hills)	9	27.5	7.26
Parkstone	Creech Heath	2	34.7	7.27

Table 7.4. Proportion of silt-sized inclusions in the pottery samples analysed with the point-counter, and figure numbers of histograms

RLH: Rope Lake Hole; WFO: Wytch Farm Oilfield; GI: Green Island; MC: Maiden Castle; RR: Redcliff, Ridge

Site	Sample	Form	% of silt-sized inclusions	Figure
Rope Lake Hole	RLH 19	Bowl	0	7.37
East of Corfe River	WFO 14	Flat-rimmed jar	1.5	7.33
East of Corfe River	WFO 15	Flat-rimmed jar	0	7.34
Ower Peninsula	WFO 16	Flat-rimmed jar	4.8	7.35
East of Corfe River	WFO 24	Flat-rimmed jar	1.9	7.36
Green Island	GI 1	Flat-rimmed jar	0	7.28
Green Island	GI 2	Flat-rimmed jar	2.4	7.29
Green Island	GI 3	Flat-rimmed jar	3.8	7.30
Maiden Castle	MC 18	Flat-rimmed jar	0	7.31
Maiden Castle	MC 20	Flat-rimmed jar	14.1	7.32
Redcliffe Farm	RR 4	Flat-rimmed bowl	8.8	7.39

Four of the pottery samples did not contain inclusions in the silt-sized ranges, whilst a further five contained between 1.5% and 4.8% (Table 7.4). Only two samples contained more than 5% silt-sized inclusions: a dish from Redcliff Farm (RR sample 4, 8.8%) and a flat-rimmed jar from Maiden Castle (MC sample 20, 14.1%). In contrast, none of the clays contained less than 5% silt-sized grains. Four clay samples contained 5-10% silt-sized grains (Upton Poole Road, sample 2: 5.7%; Brownsea Island, sample 14, 6.8%; Sandford, sample 4, 7.5% and Upton Poole Road, sample 3: 8.8%), slightly higher amounts were noted in a clay sample from East Holme (sample 2, 12.5%) and Brownsea Island (sample 20, 16.3%). The other clay samples contained 27.5-88.7% silt-sized grains. The clay sample taken from the area of the Romano-British pottery kiln at Redcliff, Ridge, is clearly in contrast to the pottery vessel recovered from a kiln at this site, with 76.4% silt-sized grains and 23.6% very fine grains in the clay sample, but 8.8% silt-sized inclusions, 73.7% fine-sized and 7% medium grains in the pottery vessel (Figure 7.38-41; Appendix F, Table F11). This information correlates with the qualitative petrological analysis of all of the clay and pottery samples, that overall, the clays contain a silt-sized component, and that the pottery does not, or only marginally so.

The effect of the deliberate addition of sand and shale to a clay sample was examined by point counting an example of a clay before and after the addition of such inclusions. The clay was a very fine to silty clay from Arne Beach (samples 1A and 2A) that was mixed with sand from the same beach, and a little crushed shale (samples 1B and 2B, Figure 7.42). This provided briquettes containing shale fragments that could then be used for mineralogical and compositional analysis. The untempered clay contained predominantly silt-sized grains, with some very fine-grained quartz (Figure 7.43). The proportions were altered by the addition of sand and shale (Figure 7.44), with a clear peak in the medium-sized range (39.8% of inclusions), relatively even quantities of very fine, fine and coarse-sized inclusions (12%, 14.5% and 14.5%) and a corresponding decrease in the silt-sized component to 18%. The addition of large quartz grains therefore dilutes the overall silt content of a naturally silty clay, but cannot remove it.

Quantitative analysis was also used to examine variability in grain size within the pottery and the sand. This variability was evident even within a single vessel class. The graphs in Figures 7.28-7.36 show the grain size distributions of a selection of flat-rimmed jars from Green Island, East of Corfe River, Ower Peninsula and Maiden Castle. Of the three examples from Green Island, sample 1 is dominated by medium-sized grains (Figure 7.28), sample 2 is much coarser (Figure 7.29), with a higher proportion of coarse-sized inclusions, whilst sample 3 is coarser still (Figure 7.30). Of the two examples from Maiden Castle, one (sample 18) has a broad spread of inclusion sizes, from very fine to granules, with a high proportion of medium to coarse-sized grains (Figure 7.31), whilst the other (sample 20) has a greater silt-sized component and a peak of coarse-sized grains (Figure 7.32). Of the two sand samples, the one from Furzey Island (Figure 7.45) has grains that are almost all in the medium to coarse-sized range, whilst the sand from Rempstone (Figure 7.46) is less well-sorted, ranging from very fine to granules, although with a peak of medium-sized grains.

7.3 Conclusion

Petrological analysis has been used to examine natural variation in the clay samples taken from the area around Poole Harbour and the Isle of Purbeck, and the cultural variation that results from a potter's interaction with these raw materials. The aim of this section of the analysis was to examine if potters were selecting specific clays for their vessels, and if they were using them in their raw state or altering them in any way. Of the eight clay samples that appeared to be the most similar to the pottery during qualitative petrological analysis, the quantitative analysis indicated that the closest matches were the samples of Oakdale clay from Upton, Poole Road and Sandford (sample 4) and a sample of Parkstone clay from Brownsea Island (sample 14). Nonetheless, such samples were in the minority, with the other 96% of the clay samples not matched by the pottery in terms of their grain-size distribution. The trend towards a higher silt-sized component in the clay than the pottery suggests that the potters working around the Poole Harbour/Wareham area during the Iron Age and Romano-British periods added quartz sand to a relatively pure base clay (such as the white-firing clays from Round Island), or levigated their clays prior to the addition of sand temper.

Rye (1981, 36-37) and others have detailed the stages a potter may go through in order to prepare their clay. Unless obtained from a waterlogged deposit, water must be added to the clay to allow it to be worked. The clay will first be dried, to allow the uniform intake of water. Any coarse inclusions or roots may be picked out at this stage. Water is then added to the dry clay (slaking) and then more water is added to hold it in suspension and it will be stirred. At this stage it might be sieved, although Rye notes that traditional potters are unlikely to have access to sieves to screen out particles of less than 1mm. It is more likely that the larger particles were left to sink (settle) and the Poole Harbour potters may have gone a stage further and levigated their clay. Rye (1981, 37) describes the process thus: 'clay slip flows slowly through a relatively long shallow trough before entering a vat or pit. Baffles or low walls (which may be less than 5cm high) placed along the bottom of the trough cause coarser or heavier particles to settle and be trapped, whereas the finer material remains in suspension.' Rye notes that this may be recognisable in a ceramic vessel from an archaeological site which has mineral particles of less than 50 microns (coarse silt), but may have coarser temper (Rye 1981, 37). Rice (1987, 118) states that levigation is usually associated with large-scale pottery industries. The process is also described by Norsker (1990) who states that raw clay is added to a 'washing pit' half filled with water. It is stirred and then left to allow the sand to settle at the bottom, the clay slurry then transferred to a settling pond, 'ideally located at a slightly lower level so that the clay slurry can run in by itself', or it is bucketed (Norsker 1990). If a particularly fine clay is sought, this process may be repeated several times. Finally, the clay is allowed to settle and the clear water taken out to be recycled for the next batch; the clay is then removed when it is stiff enough to handle.

Whilst it is not possible to characterise the geological diversity of all the area around Poole Harbour and the Isle of Purbeck during a single post-graduate research project, the overall trends indicate that the potters who worked in this area during the Iron Age to Romano-British periods did not use the naturally sandy clays in their raw state, despite the fact they occur fairly widely and basic tests such as the making of thumb pots and bending coils indicated they may have been suitable for ceramic manufacture. Furthermore, the black colour of the vessels after firing suggests they were made from an iron-rich clay and therefore not the pure, white-firing clays found around the shores of the Harbour and the islands. It therefore seems likely that the potters levigated the clays that they selected for use, and given the scale of production during the Late Iron Age and Romano-British periods, a consistent clay body was probably highly desirable. The elongated argillaceous inclusions that characterise much of the pottery were present in relatively low quantities and it has not been possible to identify them using petrological analysis, although their optical properties are very similar to the surrounding clay matrices, suggesting the two are related. These inclusions are believed to represent shale, but it is not clear if they are pieces deliberately added to the clay, fragments that became unintentionally incorporated in a shared location with shale workers, or components naturally present in the clay. The petrological analysis of the clay samples has also indicated that the original firing temperature of the pottery was less than 850°C as the pottery samples had high optical activity, a trait matched in the clay samples fired to 800°C but lost at 1000°C in most of the clay samples fired to this temperature.

Petrology has therefore provided an insight into the methods employed by the Dorset potters in their treatment of raw materials. The choices made in terms of the raw clays selected, and the identity of the elongated argillaceous inclusions, will be further interrogated using compositional analysis in Chapter 8.

Chapter 8

Compositional Analysis

The archaeological evidence (Chapter 3) suggests that the pottery industry located around the Wareham/Poole Harbour area of Dorset during the Late Iron Age and Romano-British periods operated across a number of different sites simultaneously, producing the same styles of vessels across these workshops. A number were operational for long periods of time, with technological changes noted at some sites. The scale of production during the Early to Middle Iron Age periods is completely unknown as no production sites have yet been identified. It is therefore not possible to ascertain if the potters worked at a single location, perhaps moving from one site to another over time, or operated from several bases simultaneously.

The petrological analysis has indicated that the potters in all periods processed their materials in a similar fashion, first levigating the raw clay and then adding a fairly consistent volume of quartz sand. What is less apparent is if they shared raw material sources or targeted specific clays. The fieldwork highlighted the vast resources available to the potters in terms of different clays and sand deposits. The white-firing ball clays were highly prized by pipe-clay makers from the 16th century onwards, and by potters from the 17th century. There is evidence that potters in the Romano-British period chose these white-firing clays for their kilns, but it is not known if they selected specific types of clays for their vessels. Compositional analysis, using Inductively Coupled Plasma Spectrometry (ICP-OES), has therefore been carried out to address this question.

8.1 Methodology

8.1.1 Sampling

Raw clays contain clay minerals, non-clay minerals (such as quartz), rock fragments and organic material (Pollard and Heron 2008, 112). The clay minerals are part of the silicates family that form most of the rocks of the Earth's surface (*ibid.*). These silicate minerals have a variety of chemical compositions but are 'virtually insoluble in anything other than hydrofluoric acid' (Pollard and Heron 2008, 104). The pottery and clay samples to be analysed using ICP-OES needed to be in a liquid state and therefore digestion by hydrofluoric acid was necessary. Bournemouth University did not have the necessary fume cupboard to work with this highly toxic and corrosive acid, so the digestions were carried out by Matt Cooper at the School of Ocean and Earth Science, National Oceanography Centre, Southampton. As a result of the cost of the digestions, it was only possible to analyse 100 samples, comprising 60 of pottery, 39 of clay, and one of crushed shale.

The samples (Tables 8.1-8.2) were chosen to represent variability in the forms, fabrics (Table 8.3) and site of recovery of the pottery, and the full range of clay types. A sample of crushed shale from an archaeological site on Green Island was also included as this is believed to be present in the pottery. The sample numbers for the compositional analysis are independent of the petrology sample numbers. The resultant data from the elemental analysis was analysed using multivariate statistics in the IBM SPSS software package. The aim of the compositional analysis was to try to identify a 'chemical fingerprint' in the pottery that might indicate the type of clay(s) selected, the presence of different workshops, and allow investigation of the differences between the clay types.

Table 8.1. Details of clay samples selected for compositional analysis

ICP sample no.	**Clay type**	**Site**	**Field sample no.**
1	Wealden Clay	Lower Lynch Farm	3
2	Wealden Clay	Lower Lynch Farm	4A
3	Wealden Clay	Lower Lynch Farm	4B
4	Broadstone Clay	Ower Bay	1
5	Broadstone Clay	Ower Bay	2
6	Broadstone Clay	Redcliffe Farm, Ridge	2
7	Oakdale Clay	East Holme	1
8	Parkstone Clay	Brownsea Island	3
9	Broadstone Clay	Wytch Heath	1A
10	Broadstone Clay	Wytch Heath	1B
11	Broadstone Clay	Wytch Heath	2
12	Broadstone Clay	Godlingston Heath	3

13	Oakdale Clay	Upton, Poole Road	1
14	Parkstone Clay	Bourne Bottom Nature Reserve	9
15	Parkstone Clay	Bourne Bottom Nature Reserve	5
16	Wealden Clay	SE Purbeck	6
17	Creekmoor Clay	Upton Country Park	1
18	Oakdale Clay	Longfleet Lodge	1
19	Oakdale Clay	Sandford	4
20	Parkstone Clay	Brownsea Island	2
21	Parkstone Clay	Brownsea Island	8
22	Parkstone Clay	Brownsea Island	14
23	Parkstone Clay	Brownsea Island	20
24	Parkstone Clay	Bourne Bottom Nature Reserve	3
25	Parkstone Clay	Alderney, Newtown and Foxholes	1
26	Parkstone Clay	Creech Heath	2
27	Broadstone Clay	South of Bramble Bush Bay	8
28	Broadstone Clay	Godlingston Heath	5
29	Broadstone Clay	Foxground Plantation	1
30	Broadstone Clay	Arne, South of Bank Gate Cottages	1
31	Poole Formation	Round Island	2
32	Poole Formation	Round Island	5
33	Poole Formation	Green Island	2
34	Poole Formation	Furzey Island	2
35	Shale	Green Island 2010 exc.	N/A
36	Broadstone Clay	Arne Beach	1a
37	Broadstone Clay	Arne Beach	1b
38	Broadstone Clay	Arne Beach	2a
39	Broadstone Clay	Arne Beach	2b
90	Kimmeridge Clay	Kimmeridge Bay	1
101	Shale	Green Island 2010 watching brief	N/A

Table 8.2. Details of pottery samples selected for compositional analysis

AQ: Allard's Quarry, Marnhull; BF: Barton Field, Tarrant Hinton; ES: Eldon's Seat, Encombe; GAS: Gussage All Saints; GI: Green Island; HH: Hengistbury Head; MC: Maiden Castle; RLH: Rope Lake Hole; SR: Southdown Ridge; WFO: Wytch Farm Oilfield; WM: Football Field, Worth Matravers

ICP no.	Site	Petrolog. no.	Vessel type	Petrolog. group
40	Allard's Quarry	AQ 28	?furrowed bowl, re-finished	1
41	Rope Lake Hole	RLH 10	Carinated bowl with flaring rim	14
42	Football Field, Worth Matravers	WM 3	Upright rim, probably from a tripartite bowl or jar	14
43	Maiden Castle	MC 20	Flat-rimmed jar	19
44	Maiden Castle	MC 30	Deep, hemispherical bowl with flat-topped rim, externally expanded	19
45	Gussage All Saints	GAS 9	Saucepan pot	2
46	Gussage All Saints	GAS 17	Ovoid, bead-rimmed jar	9
47	Allard's Quarry	AQ 16	Furrowed and carinated bowl, red-finished	3
48	Allard's Quarry	AQ 1	Furrowed and carinated bowl, red-finished	4
49	Gussage All Saints	GAS 26	Bowl with channelled rim	9
50	Gussage All Saints	GAS 3	Saucepan pot with groove around rim	9
51	Hengistbury Head	HH 3	Flat-rimmed jar	6
52	Barton Field	BF 2	Barrel-shaped jar	16
53	Rope Lake Hole	RLH 18	Open bowl with plain rim	7
54	Allard's Quarry	AQ 8	Bead-rimmed bowl	5
55	Hengistbury Head	HH 1	Flat-rimmed jar	8
56	Green Island	GI 16	Bowl with expanded, grooved rim	12
57	East of Corfe River	WFO 24	Flat-rimmed jar with dimple and eyebrow motif	8
58	Allard's Quarry	AQ 10	Ovoid jar with beaded rim and eyebrow motif	8
59	Allard's Quarry	AQ 11	Countersunk-handled jar	13
60	Rope Lake Hole	RLH 1	Bowl with internally flanged, flat-topped rim	13
61	Gussage All Saints	GAS 32	Tankard	13
62	Gussage All Saints	GAS 27	Flat-rimmed jar with petal motif	12
63	Gussage All Saints	GAS 36	Flat-rimmed jar with eyebrow motif	12
64	Allard's Quarry	AQ 6	Bead-rimmed jar with eyebrow	21
65	Allard's Quarry	AQ 9	Bowl with channelled rim	8
66	Allard's Quarry	AQ 17	Saucepan pot	15
67	Maiden Castle	MC 13	Bead-rimmed bowl with grooved line decoration	11
68	Maiden Castle	MC 27	Flat-rimmed jar with double eyebrow motifs	11
69	Furzey Island	WFO 11	Bead-rimmed jar with countersunk-lug handles	11

70	Ower Peninsula	WFO 16	Flat-rimmed jar with petal motif	11
71	Green Island	GI 1	Flat-rimmed jar	11
72	Green Island	GI 17	Hemispherical bowl with flat-topped, squared rim	11
73	Green Island	GI 6	Upright-necked jar with proto-bead rim and slight internal bevel	11
74	Gussage All Saints	GAS 10/22	Bead-rimmed vessel with fingertip decoration	17
75	Gussage All Saints	GAS 11	Flat-rimmed jar with eyebrow motif	17
76	West Creech	WFO 1	Jar/vessel with internal hooked, flanged rim	20
77	West of Corfe River	WFO 3	Ovoid jar with plain rim	20
78	East of Corfe River	WFO 15	Flat-rimmed jar	20
79	West Creech	WFO 4	Proto-bead rimmed vessel with convex profile	20
80	Green Island	GI 3	Flat-rimmed jar	21
81	Football Field, Worth Matravers	WM 7	Furrowed bowl	21
82	Maiden Castle	MC 2	Carinated bowl, red-finished	17
83	West Creech	WFO 6	Jar with grooved rim, twisted effect	22
84	West Creech	WFO 19	Shouldered bowl with out-turned, slightly rolled rim	22
85	Rope Lake Hole	RLH 8	Steeply angled carinated bowl with short, upright neck	24
86	Rope Lake Hole	RLH 26	Large, shouldered jar with short, upright neck and beaded rim	24
87	Rope Lake Hole	RLH 13	Carinated bowl with flaring rim	23
88	Rope Lake Hole	RLH 19	Bowl with internally flanged, flat-topped rim	25
89	Rope Lake Hole	RLH 21	Bowl with dropped internal flange	23
91	Rope Lake Hole	RLH 11	Carinated bowl with flaring rim	6
92	Southdown Ridge	SR 6	Flat-rimmed jar with petal motif	10
93	Eldons Seat	ES 2	Large, open-mouthed bowl	18
94	Maiden Castle	MC 3	Carinated bowl with upright rim	4
95	Rope Lake Hole	RLH 27	Slack-profiled jar with slightly everted rim	24
96	Eldons Seat	ES 4	Thick-walled jar with everted rim, red-finished	19
97	Eldons Seat	ES 3	Very long-necked carinated bowl	18
98	Eldons Seat	ES 7	Long-necked carinated bowl, red-finished	18
99	Eldons Seat	ES 1	Hemispherical bowl with flat-topped rim, slightly expanded on the interior, red-finished	19
100	Maiden Castle	MC 21	Flat-rimmed jar with vertical countersunk handles	11

Table 8.3. Descriptions of petrological groupings of the samples selected for compositional analysis

Petrological group	**Description**
1	Very fine to fine quartz, no elongated argillaceous inclusions
2	Very fine to fine quartz, common silt, no elongated argillaceous inclusions
3	Very fine to fine quartz, moderate silt, sparse to moderate limestone, no elongated argillaceous inclusions
4	Very fine to fine quartz, moderate silt, no elongated argillaceous inclusions
5	Very fine to fine quartz, sparse to moderate elongated argillaceous inclusions
6	Very fine to coarse quartz, moderate to common silt, rare elongated argillaceous inclusions
7	Very fine to coarse quartz, moderate silt, no elongated argillaceous inclusions
8	Fine to medium quartz, with elongated argillaceous inclusions
9	Fine to medium quartz, with moderate silt, no elongated argillaceous inclusions
10	Fine to medium quartz, moderate silt, rare elongated argillaceous inclusions
11	Medium quartz with elongated argillaceous inclusions
12	Medium quartz with moderate or common elongated argillaceous inclusions
13	Medium quartz with elongated argillaceous inclusions and sparse to moderate limestone
14	Medium quartz, no elongated argillaceous inclusions
15	Medium quartz with sparse flint/chert, no elongated argillaceous inclusions
16	Medium quartz with moderate silt, no elongated argillaceous inclusions
17	Medium to coarse quartz, with elongated argillceous inclusions
18	Medium to coarse quartz, with elongated argillceous inclusions and sparse limestone
19	Medium to coarse quartz, sparse limestone, poorly wedged matrix
20	Medium to coarse quartz, sparse limestone, no elongated argillaceous inclusions
21	Medium to very coarse quartz, with elongated argillaceous inclusions
22	Coarse quartz with elongated argillaceous inclusions
23	Very coarse quartz with elongated argillaceous inclusions
24	Coarse to very coarse with elongated argillaceous inclusions
25	Coarse to very coarse quartz with sparse to moderate elongated and equant argillaceous inclusions, and opaques
26	Coarse to very coarse quartz with sparse to moderate limestone and elongated argillaceous inclusions

8.1.2 Sample preparation

Pottery sherds may have been affected by the post-depositional environment, and an experimental study by Schwedt *et al.* (2004) found that the corroded surfaces of sherds may present a different compositional pattern to samples taken from the core of a sherd, particularly in the case of calcium, the alkali metals (Cs, Rb, K and Na) and some of the Rare Earth Elements (specifically Sm, Eu and La). As a result, the surfaces of the sherds were removed using a Dremel drill, and the sherds were then powdered in an agate mortar prior to digestion. They were dissolved in hydrofluoric acid by Dr. Matt Cooper, who has provided the following paragraph concerning the details of the digests.

For most samples 100mg of sample was weighed into Savillex Teflon vials and 10 drops of concentrated sub boiled nitric acid and 2ml of Romil SpA hydrofluoric acid added. The samples were heated on a hotplate at 130°C overnight; following cooling, the HF/HNO3 mixture was evaporated off and redissolved in approximately 6M sub boiled hydrochloric acid. The samples were refluxed overnight to ensure complete digestion and the 6M HCl dried off and the sample redissolved in more 6M sub boiled HCl. The samples were transferred to acid clean 30ml HDPE bottles and made up to 30ml with a mixture of sub boiled 6M HCl and Milli-Q water to give a final acid concentration of approximately 3M. For a number of samples this method did not produce clear solutions, these were the shale samples and also for those that showed signs of carbonate being present on addition of the nitric acid, an alternative digestion technique was then used. 100mg of sample was weighed into Savillex Teflon vials and 10 drops of concentrated sub boiled nitric acid, 0.5ml of trace element grade perchloric acid and 2ml of Romil SpA hydrofluoric acid added. The samples were heated on a hotplate at 130°C overnight; following cooling, the HF/HClO4/HNO3 mixture was evaporated off and redissolved in 0.75ml of perchloric acid and refluxed on the hotplate at 130°C overnight, this was then evaporated off and the samples redissolved in approximately 6M sub boiled hydrochloric acid. The digestion technique then followed that for the standard HF/HNO3 digestion to make up mother solutions.

8.1.3 ICP-OES

The digested samples were analysed using a Varian Vista-Pro CCD Simultaneous ICP-OES at Bournemouth University by Dr. Iain Green. The instrument was calibrated using diluted multi-element standards: Ree-Fluka TraceCERT rare earth mix for ICP and Merck-Certipur ICP Multi-Element Standard Solution IV. Analytical quality was ensured by the inclusion of processed blanks and Certified Reference Material (Nation Research Council Canada HISS-1 sandy sediment). Certified values were stated by the manufacture of the standards and the GeoReM database (http://georem.mpch-mainz.gwdg.de). Analysis was conducted on 16 rare earth elements (Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sc, Sm, Tb, Tm, Y and Yb) and 26 other elements (Ag, Al, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, In, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Se, Sr, Ti, W and Zn). The detection limit for each element was determined from three times the standard deviation of 10 replicates of a 0.5 parts per billion (PPB) solution of each element. The standard deviation was multiplied by 10 to give the minimum reporting level (MRL). Data from elements whose concentrations were below the MRL were not taken forward for further analysis. Where the MRL was exceeded, the concentration of each element in the digested sample was multiplied by the dilution factor to give the concentration in the actual sample. The precision and accuracy of the analysis was assessed from the data collected from the Certified Reference Material. Recoveries for most elements were within acceptable parameters (± 10% of certified values), although three had high relative standard deviations (Cu, Ni, W), and two had low recovery levels (Cr, Zn).

8.2 Statistical analysis of the data

8.2.1 The raw data

The measurements of 21 elements were selected for multivariate analysis. This was carried out by the author, using SPSS. The basic descriptive statistics for each element are presented in Table 8.4. The following elements were over-range in some samples: Al (samples 28 and 31), K (sample 31) and Mg (samples 85, 93 and 95). Boxplots were created for each element and the outliers noted (Table 8.5). Cronbach's Alpha measure of reliability was .047 for the 21 elements. Normality in the data was assessed using examination of histograms, the values of skewness and kurtosis (Table 8.4), and the Kolmogorov-Smirnov and Shapiro-Wilks tests (Table 8.6). Twelve elements (Ba, Ca, Cu, Li, Mn, Na, Pb, Sr, W, Zn, Tm and Nd) displayed a positively skewed distribution with values of >1; the greatest was in the concentrations of sodium (3.79). Fourteen elements displayed positive (Ba, Ca, Cu, Li, Mn, Na, Pb, Sr, W, Zn, Ce, La and Nd) kurtosis, one had negative (Mg) kurtosis, with values >1; Ba, Na and Pb had values between 13.8 and 17.081. The closest to zero, and therefore normal distribution, was aluminium (skewness: 0.27, kurtosis: 0.25). The Kolmogorov-Smirnov test classified 18 of the 21 elements as significant ($p < .05$), their values are therefore not normally distributed. The exceptions were Fe, Ni and Zn. In the Shapiro-Wilk test, 19 were significant ($p < .05$), only K and Ni were not significant.

Table 8.4. Descriptive statistics of the raw data of all 100 samples

Element	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewness		Kurtosis		Coefficient of Variation	
	Stat.	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Stat.	Std. Error	Stat.	Std. Error	CV	%CV
Al	99	59653.06	38559.61	98212.67	68874.46	1270.91	12645.43	159906863.58	0.27	0.24	0.25	0.48	0.18	18.36
Ba	101	1425.11	125.73	1550.84	369.48	19.28	193.79	37552.85	3.71	0.24	17.08	0.48	0.52	52.45
Ca	101	88238.10	54.65	88292.75	10408.54	1475.52	14828.84	219894447.69	2.56	0.24	8.45	0.48	1.42	142.47
Cr	101	98.52	59.40	157.92	98.35	1.95	19.63	385.53	0.62	0.24	0.48	0.48	0.20	19.96
Cu	101	61.14	6.55	67.69	22.91	0.99	9.92	98.41	2.10	0.24	6.62	0.48	0.43	43.30
Fe	101	63172.32	4373.42	67545.74	33014.58	1496.44	15039.00	226171654.10	-0.22	0.24	-0.80	0.48	0.46	45.55
K	100	22830.48	4945.79	27776.26	14747.21	431.15	4311.54	18589364.32	0.38	0.24	0.15	0.48	0.29	29.24
Li	101	61.67	13.85	75.53	36.24	1.27	12.78	163.31	1.07	0.24	1.44	0.48	0.35	35.26
Mg	98	6930.71	1058.66	7989.37	4112.12	171.66	1699.33	2887734.48	-0.11	0.24	-1.10	0.48	0.41	41.33
Mn	101	883.70	13.83	897.54	208.04	21.86	219.70	48266.98	1.36	0.24	1.04	0.48	1.06	105.60
Na	101	9311.73	318.86	9630.59	1601.91	150.05	1507.96	2273931.04	3.79	0.24	16.73	0.48	0.94	94.13
Ni	101	53.25	6.86	60.11	32.08	1.35	13.55	183.69	0.12	0.24	-0.93	0.48	0.42	42.24
Pb	101	73.41	11.77	85.18	22.82	1.11	11.15	124.39	3.37	0.24	13.80	0.48	0.49	48.87
Sr	101	353.15	9.41	362.57	95.21	5.18	52.10	2714.89	1.78	0.24	6.89	0.48	0.55	54.73
W	101	17.46	4.42	21.88	8.19	0.26	2.66	7.09	1.87	0.24	7.48	0.48	0.33	32.50
Zn	101	330.71	5.97	336.67	70.80	4.80	48.28	2331.20	1.76	0.24	7.74	0.48	0.68	68.19
Ce	101	152.23	21.48	173.70	71.08	2.76	27.69	766.64	0.94	0.24	1.12	0.48	0.39	38.95
La	101	73.08	6.82	79.90	31.26	1.29	12.98	168.35	1.00	0.24	1.59	0.48	0.42	41.51
Tm	101	21.46	5.24	26.70	10.81	0.44	4.41	19.43	1.13	0.24	0.73	0.48	0.41	40.76
Y	101	32.25	7.46	39.71	17.62	0.76	7.64	58.38	0.86	0.24	-0.12	0.48	0.43	43.37
Nd	101	72.39	6.50	78.89	27.86	1.18	11.89	141.41	1.14	0.24	2.41	0.48	0.43	42.68

Table 8.5. Presence of outliers in raw data and log_{10} data, as identified in boxplots

Element	Sample numbers of outliers in raw data	Sample numbers of outliers in log_{10} data
Ba	59, 60, 42, 81, 79	59, 60, 42, 81
Ca	96, 68, 61, 89	
Cu	35, 101, 47	
Na	31, 32, 33	
Pb	17, 24, 22, 35, 101	17, 24, 22
Sr	81	78, 57
W	1	
Zn	79	
Nd	40	

Table 8.6. Tests of normality for the raw data

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Al	.100	96	.020	.958	96	.004
Ba	.275	96	.000	.571	96	.000
Ca	.249	96	.000	.681	96	.000
Cr	.076	96	.200*	.969	96	.022
Cu	.177	96	.000	.818	96	.000
Fe	.087	96	.070	.968	96	.020
K	.074	96	.200*	.988	96	.510
Li	.122	96	.001	.921	96	.000
Mg	.107	96	.009	.946	96	.001
Mn	.194	96	.000	.819	96	.000
Na	.209	96	.000	.625	96	.000
Ni	.077	96	.196	.974	96	.052
Pb	.264	96	.000	.639	96	.000
Sr	.138	96	.000	.867	96	.000
W	.136	96	.000	.851	96	.000
Zn	.090	96	.053	.871	96	.000
Ce	.107	96	.009	.948	96	.001
La	.094	96	.034	.946	96	.001
Tm	.186	96	.000	.883	96	.000
Y	.152	96	.000	.917	96	.000
Nd	.095	96	.033	.933	96	.000

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

8.2.2 The data transformed to logarithms base 10

The data was then transformed to logarithms with a base of 10 to assess if this improved the suitability of the data for analysis using multivariate statistics (Table 8.7). The Cronbach's Alpha score increased to .764 indicating good consistency. The standard error was highest for Ca (0.09) and Mn (0.05), the lowest for Al and Cr (both 0.01). The Kolmogorov-Smirnov test indicated only Mn is not significant, whilst the Shapiro-Wilk test found Cr, Li, Na, Ce and Nd to not be significant. All other elements were significant and therefore different to normal. Boxplots of the $\log_{10}$ data indicated a reduction in the number of outliers (Table 8.5). Comparison of the probability-probability plots (Appendix G, Figure G1-G21) for all elements before and after transformation to $\log_{10}$ indicates that some are now closer to being normally distributed, particularly Cr, Li, Na, Ce, La and Nd. Almost all show some degree of improvement, with the exception of Fe, Mg, Ni, Sr and Zn where the data points are now further away from the line of expected distribution. The skewness and kurtosis of Cr is close to zero; Ce also has low values for these measures (-0.22 and 0.28 respectively). Transforming the data to base 10 logarithms has therefore improved the distribution of the data.

The coefficients of variation (CV) were extremely broad in the raw data. Michelaki *et al* (2013, 2) have suggested that this measurement might be used 'to establish the relative homogeneity of the element distributions' and that a broad distribution is indicative that the variation in the data is likely to identify chemical groups. However, the CVs expressed as a percentage indicated some values in the raw data were over 100% but the values in the $\log_{10}$ data are reduced in range (Table 8.8).

Table 8.7. Descriptive statistics for pottery, clay and shale data, transformed to logarithms base 10

Element	N	Range	Min.	Max.	Mean		Std. Deviation	Variance	Skewness		Kurtosis		Coefficient of Variation	
	Stat.	Statistic	Stat.	Stat.	Stat.	Std. Error	Statistic	Statistic	Stat.	Std. Error	Statistic	Std. Error	CV	% CV
Al	99	0.41	4.59	4.99	4.83	0.01	0.08	0.01	-0.41	0.24	0.91	0.48	0.02	1.69
Ba	101	1.09	2.10	3.19	2.53	0.02	0.16	0.02	1.45	0.24	4.60	0.48	0.06	6.20
Ca	101	3.21	1.74	4.95	3.44	0.09	0.88	0.77	-0.39	0.24	-1.11	0.48	0.26	25.51
Cr	101	0.42	1.77	2.20	1.98	0.01	0.09	0.01	0.04	0.24	0.01	0.48	0.04	4.32
Cu	101	1.01	0.82	1.83	1.33	0.02	0.17	0.03	0.13	0.24	1.41	0.48	0.13	12.64
Fe	101	1.19	3.64	4.83	4.45	0.03	0.27	0.07	-1.16	0.24	0.49	0.48	0.06	6.10
K	100	0.75	3.69	4.44	4.15	0.01	0.13	0.02	-0.62	0.24	0.97	0.48	0.03	3.25
Li	101	0.74	1.14	1.88	1.53	0.01	0.15	0.02	-0.08	0.24	0.41	0.48	0.10	9.75
Mg	98	0.88	3.02	3.90	3.57	0.02	0.21	0.05	-0.70	0.24	-0.64	0.48	0.06	5.99
Mn	101	1.81	1.14	2.95	2.04	0.05	0.53	0.28	-0.10	0.24	-1.19	0.48	0.26	25.94
Na	101	1.48	2.50	3.98	3.10	0.03	0.28	0.08	0.60	0.24	1.29	0.48	0.09	8.93
Ni	101	0.94	0.84	1.78	1.46	0.02	0.21	0.05	-0.73	0.24	-0.02	0.48	0.15	14.66
Pb	101	0.86	1.07	1.93	1.33	0.01	0.15	0.02	1.61	0.24	3.90	0.48	0.11	11.30
Sr	101	1.59	0.97	2.56	1.91	0.03	0.27	0.07	-1.13	0.24	2.36	0.48	0.14	14.08
W	101	0.69	0.65	1.34	0.89	0.01	0.13	0.02	0.25	0.24	0.72	0.48	0.15	14.52
Zn	101	1.75	0.78	2.53	1.74	0.03	0.34	0.12	-0.66	0.24	-0.18	0.48	0.20	19.86
Ce	101	0.91	1.33	2.24	1.82	0.02	0.17	0.03	-0.22	0.24	0.28	0.48	0.09	9.32
La	101	1.07	0.83	1.90	1.46	0.02	0.19	0.03	-0.51	0.24	1.17	0.48	0.13	12.79
Tm	101	0.71	0.72	1.43	1.00	0.02	0.16	0.03	0.51	0.24	-0.69	0.48	0.16	16.17
Y	101	0.73	0.87	1.60	1.21	0.02	0.18	0.03	0.18	0.24	-0.85	0.48	0.15	15.10
Nd	101	1.08	0.81	1.90	1.41	0.02	0.19	0.03	-0.32	0.24	0.55	0.48	0.13	13.28

Table 8.8. Percentage of coefficient of variance for each element, in the raw data and after transformation to log_{10}.

%CV	Raw data	Log_{10} data
0-10		Al, Ba, Cr, Fe, K, Li, Mg, Na, Ce
11-20	Al, Cr	Cu, Ni, Pb, Sr, W, Zn, La, Tm, Y, Nd
21-30	K	Ca, Mn
31-40	Li, Ni, Pb, W, Ce	
41-50	Cu, Fe, Mg, La, Tm, Y, Nd	
51-60	Ba, Sr	
61-70	Zn	
71-80		
81-90		
91-100	Na	
>100	Ca, Mn	

Two methods of statistical analysis were then applied to the log_{10} data, both in SPSS. Variability within the clay types, and between the clay types, was first assessed using a factor analysis of the groups. This method was also utilised to explore variation between the clay types and the pottery, when the latter is expressed as a group.

8.2.3 Discriminant function analysis

Discriminant function analysis of clay, pottery and shale (log10 data)

A discriminant function analysis of all the samples (log_{10} data) took through seven elements (Tm, Ni, Pb, Mn, Ba, Li and Cu), all others failed to comply with the Wilks' Lambda criteria (f >3.84; Appendix G, Table G1). The clay samples were assessed as a single group, labelled 'clay', the pottery samples as another group, labelled 'pottery' and the two digestions of shale sample 35 were labelled 'shale'. From the variables left in the analysis, SPSS found two discriminant functions, the first accounting for 89.6% of the variance and the second for 10.4% (Appendix G, Table G2), both were significant (Appendix G, Table G3). The analysis showed a clear separation between the pottery, clay and shale samples (Figure 8.1). It predicted group membership with 97% accuracy, grouping all pottery samples as pottery and both shale digestions as shale. From the clays, it predicted clay samples 16 (SE Purbeck, sample 6) and 31 (Round Island, sample 2) as pottery, and clay sample 24 (Bourne Valley, sample 3) as shale.

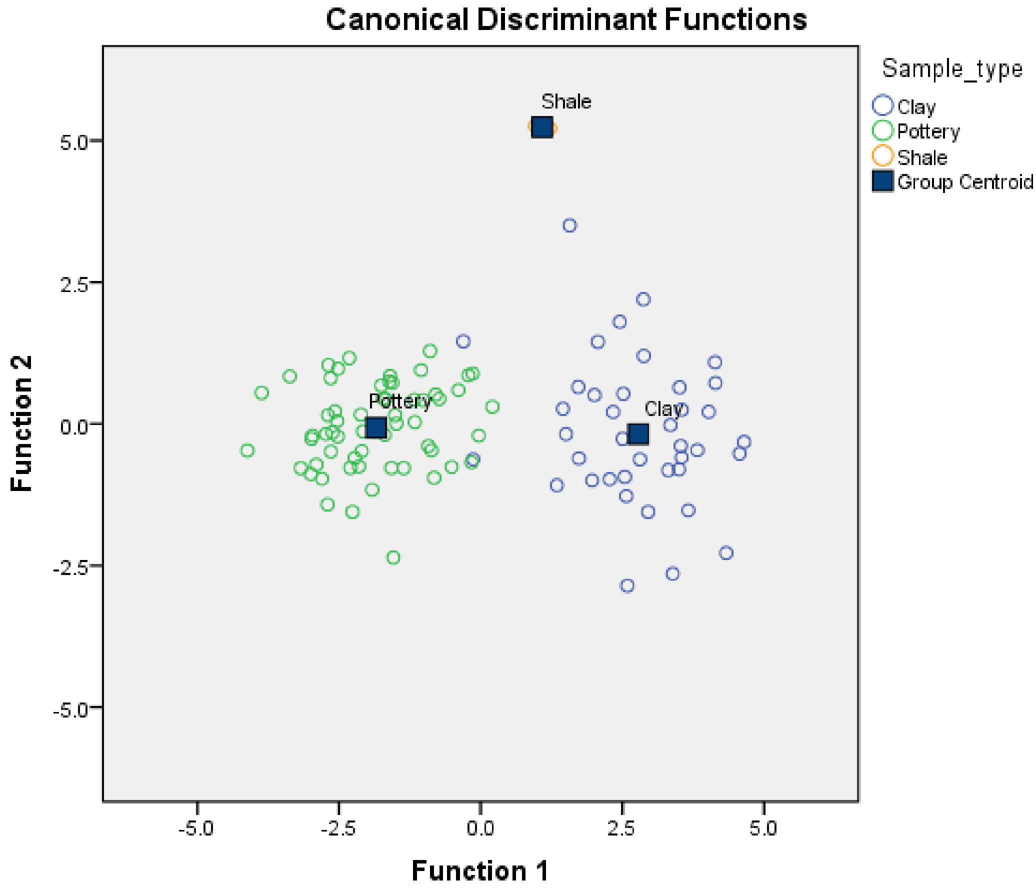

Figure 8.1. Discriminant function analysis of all clay, pottery and shale samples

Discriminant function analysis of clay samples (log_{10} data)

This procedure was also applied to the clay samples only, excluding tempered samples 37 and 39, to see how well they grouped according to their mapped clay types (Figure 8.2). SPSS used the variables manganese and tungsten for the discriminant analysis, all others failed to comply with the Wilks' Lambda criteria (f >3.84). From the variables left in the analysis, SPSS found two discriminant functions: the first accounting for 94.7% of the variance and the second for 5.3% (Appendix G, Table G4), the first was significant (Appendix G, Table G5). The analysis was only able to predict the groups of 43.2% of the clay types. The Oakdale clay, Broadstone Clay, Parkstone Clay and Poole Formation samples clustered together, with the Creekmoor Clay, Wealden Clay and Kimmeridge Clay separating (Figure 8.2). The Poole Formation clays are therefore very similar in terms of their chemical composition, with the possible exception of the Creekmoor Clay.

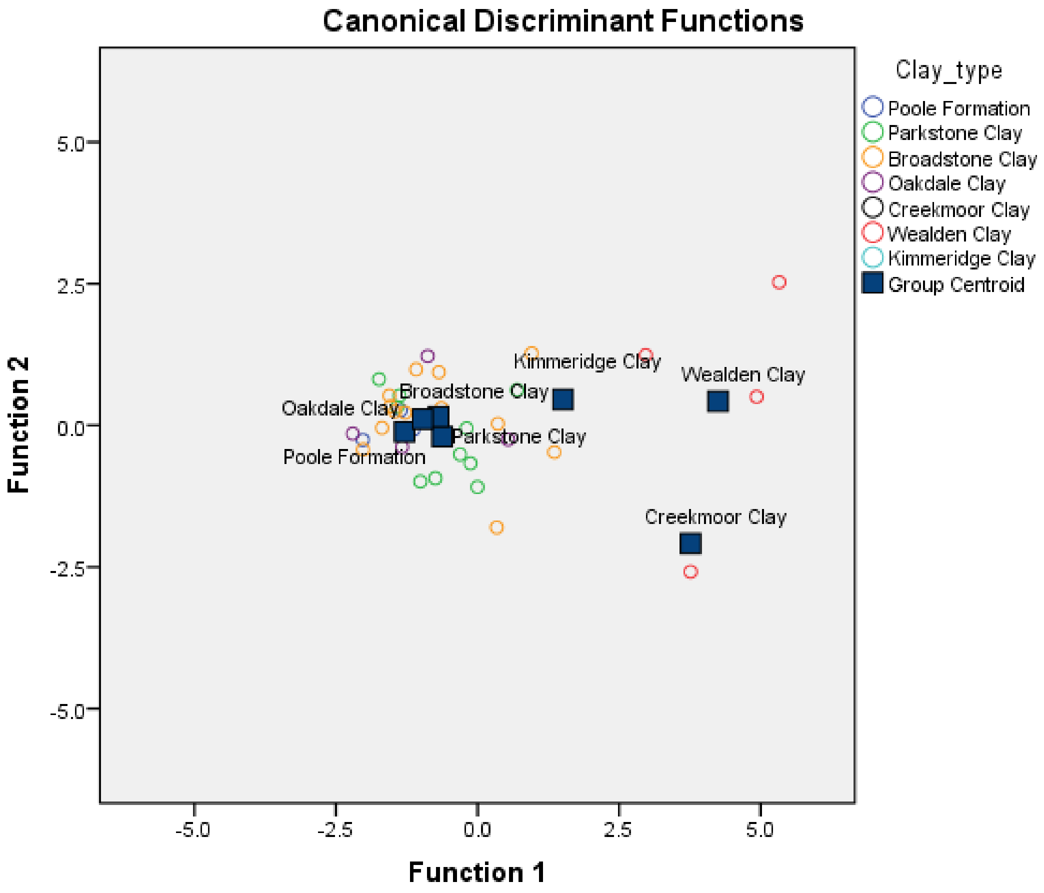

Figure 8.2. Discriminant function analysis of the clay samples, with the exception of tempered samples 37 and 39.

Discriminant function analysis of pottery and clay samples (log_{10} data)

The analysis was repeated and all samples of pottery and clay were included, the shale was excluded. SPSS carried five variables through (Tm, Ni, Pb, Mg and Na) and found five discriminant functions (Appendix G, Table G6), four of which were significant (Appendix G, Table G7). The analysis was able to correctly predict group membership for 81.3% of the samples. One clay sample (SE Purbeck, field sample 6) was predicted to be pottery, whilst three pottery samples (Green Island, PRN 121 and 142; Football Field, Worth Matravers, DWG 683) were predicted to be clays. It failed to predict three samples (ICP 85: Rope Lake Hole, sample 8; ICP 93: Eldon's Seat, sample 2; ICP 96: Eldon's Seat, sample 4). The pottery samples cluster together on the graph and appear closest to the Wealden Clay samples (Figure 8.3).

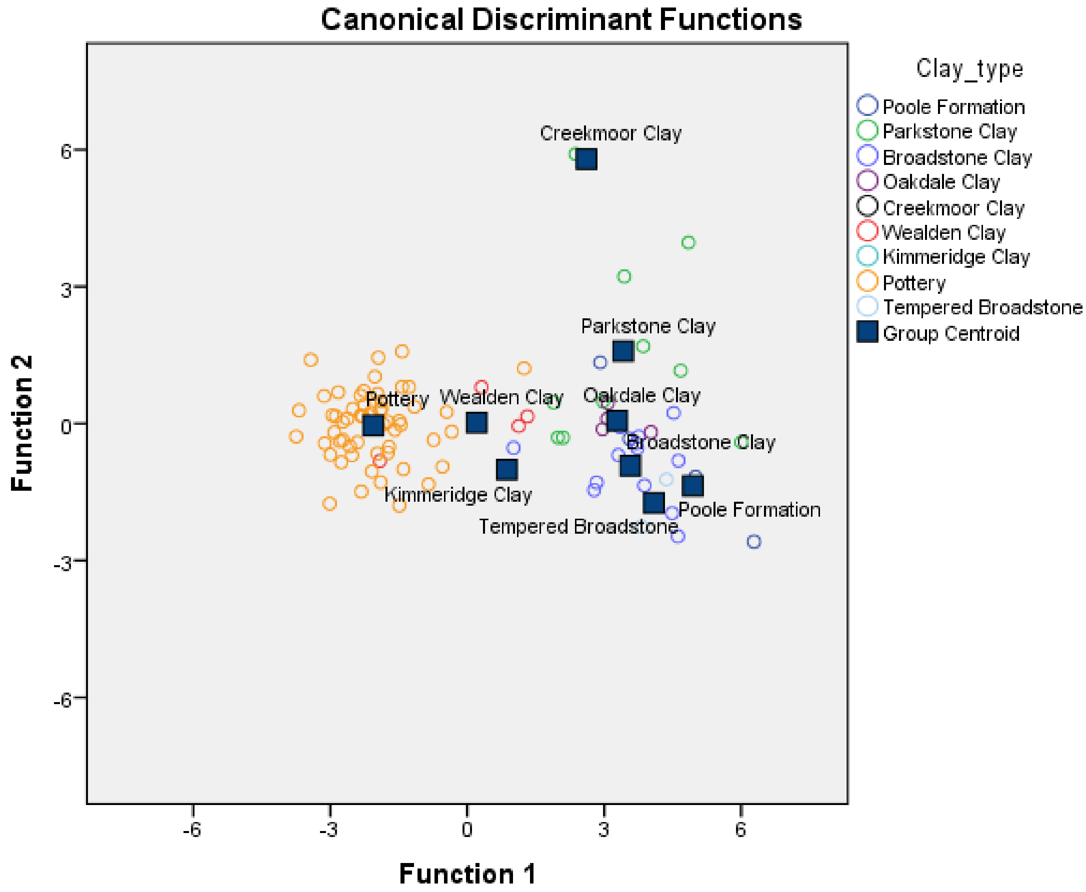

Figure 8.3. Discriminant function analysis of mapped clay types and pottery

8.2.4 Principal component analysis of all samples

The $\log_{10}$ data for the pottery, clay and shale samples were then submitted to SPSS to perform a Principal Components Analysis (PCA). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .794; the Barlett's Test of Sphericity gave a p value of <0.001, the data was therefore considered suitable to be analysed using this technique. The analysis found five principal components with Eigenvalues greater than 1 (Appendix G, Figure G22.). The first component accounted for 32.6% of the variation in the data, the second for 24%, the third for 11.4%, the fourth for 7.6% and the fifth for 5.3%, together accounting for 81% of the variance. The components are presented in Appendix G, Table G8. The strength of the correlations between the elements was examined in the correlation matrix. This data is summarised in Appendix G, Table G9. As might be expected for ceramics, there were strong correlations between the Rare Earth Elements (REEs - Ce, La, Nd and Tm)

(Michelaki *et al*. 2013, 1). The reproduced correlation matrix indicates values that are all very close to the correlation matrix based on the extracted components - the extracted components therefore account for most of the variance in the original correlation matrix and represent the original data. One anomalous value was noted in the residual matrix, of -6.4488, for Tm-Mg.

Principal components 1 and 2 were plotted on a scattergraph, revealing little overlap between the spreads of pottery and clay samples (Figure 8.4). The closest clay samples to the pottery are labelled on a reproduction of this plot in Figure 8.5. These include the four samples of the Wealden clays (ICP samples 1, 2 and 3: Lower Lynch Farm; ICP sample 16: SE Purbeck), the Kimmeridge Clay (ICP sample 90: Kimmeridge Bay), two of Parkstone Clay (ICP samples 15 and 24: Bourne Bottom) and one of Creekmoor Clay (ICP sample 17: Upton Country Park); all iron rich clay samples. The separation between the clays and the pottery may be a result of temper dilution. Michael Hughes, formerly the Principal Scientific Officer at the British Museum, has suggested plotting PC2 and PC3, and PC3 and PC4 to help account for the variance caused by tempering of the clay. This increased integration between the pottery and the clays (Figure 8.6-8.7). The clays that appeared the most similar to the pottery contained varying quantities of quartz sand, the very fine to very coarse components estimated at between 5% and 36% during petrological analysis.

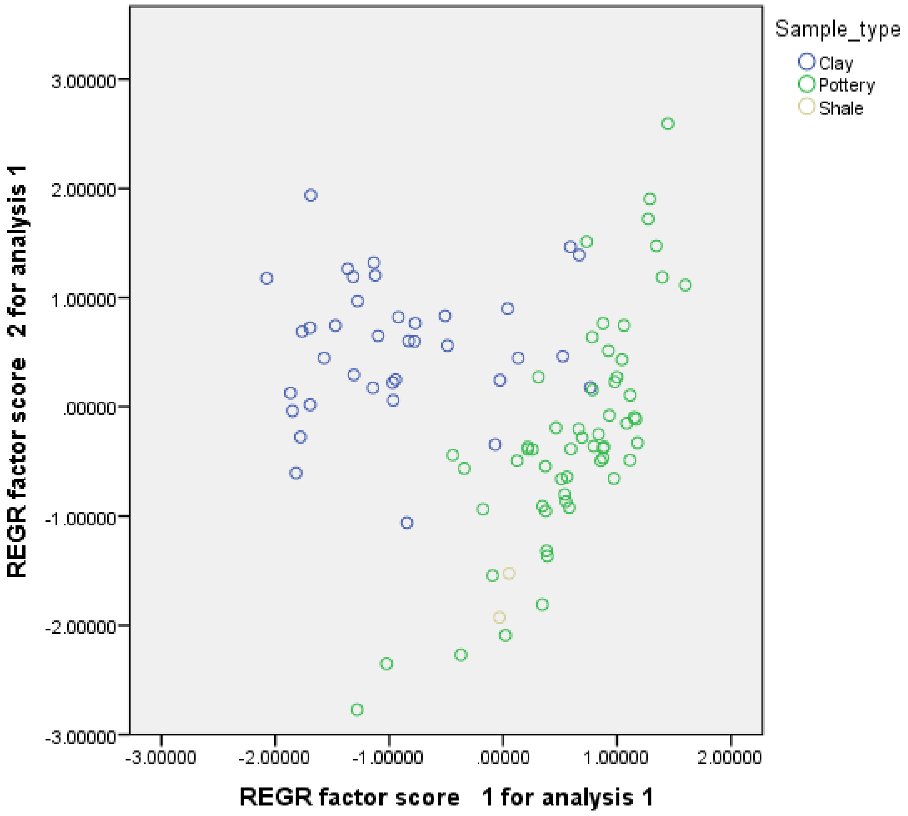

Figure 8.4. PC1 and PC2 of all pottery, clay and shale samples (log_{10} data)

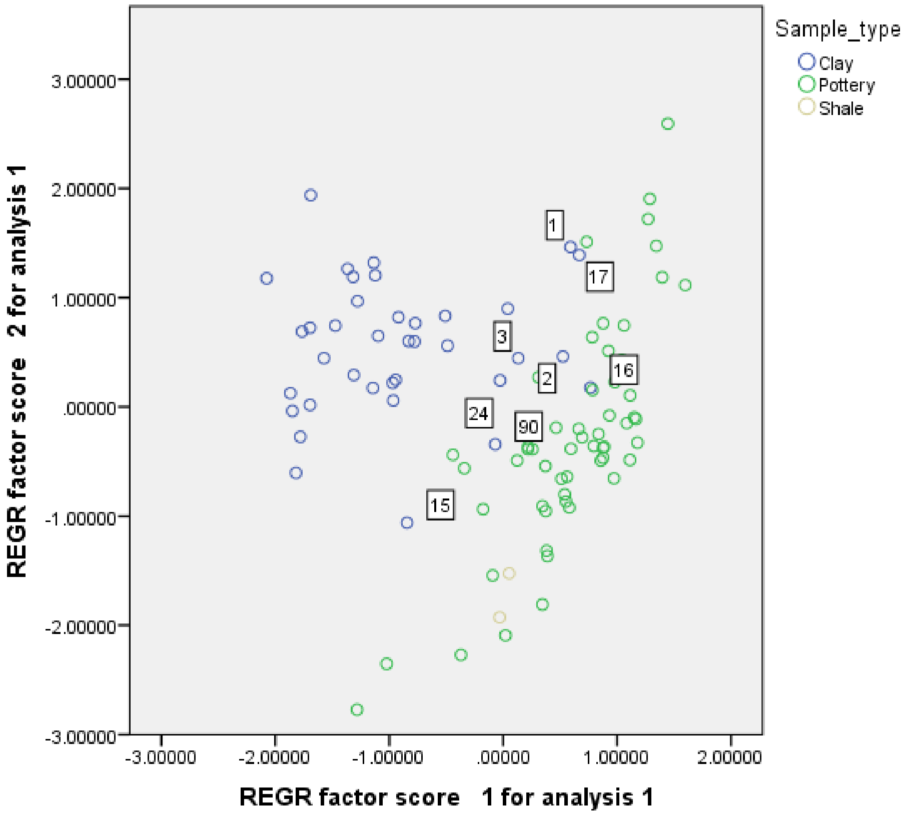

Figure 8.5. PC1 and PC2 of all pottery, clay and shale samples, with the overlapping clay samples labelled (log_{10} data)

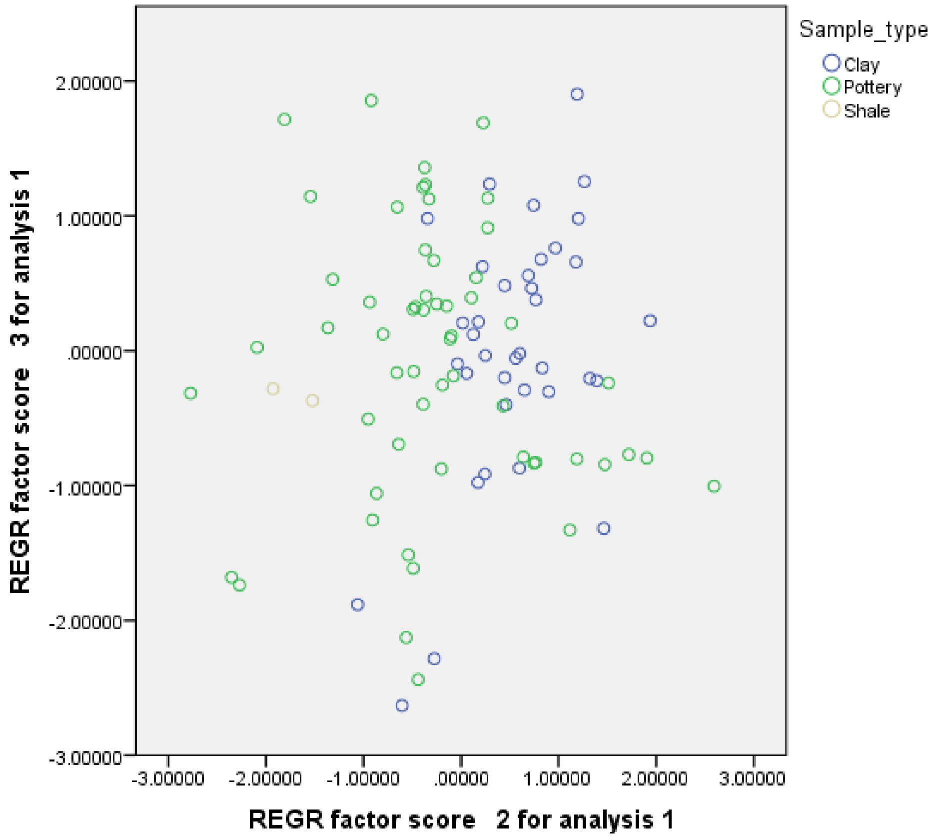

Figure 8.6. PC2 and PC3 of pottery, clay and shale samples (log_{10} data)

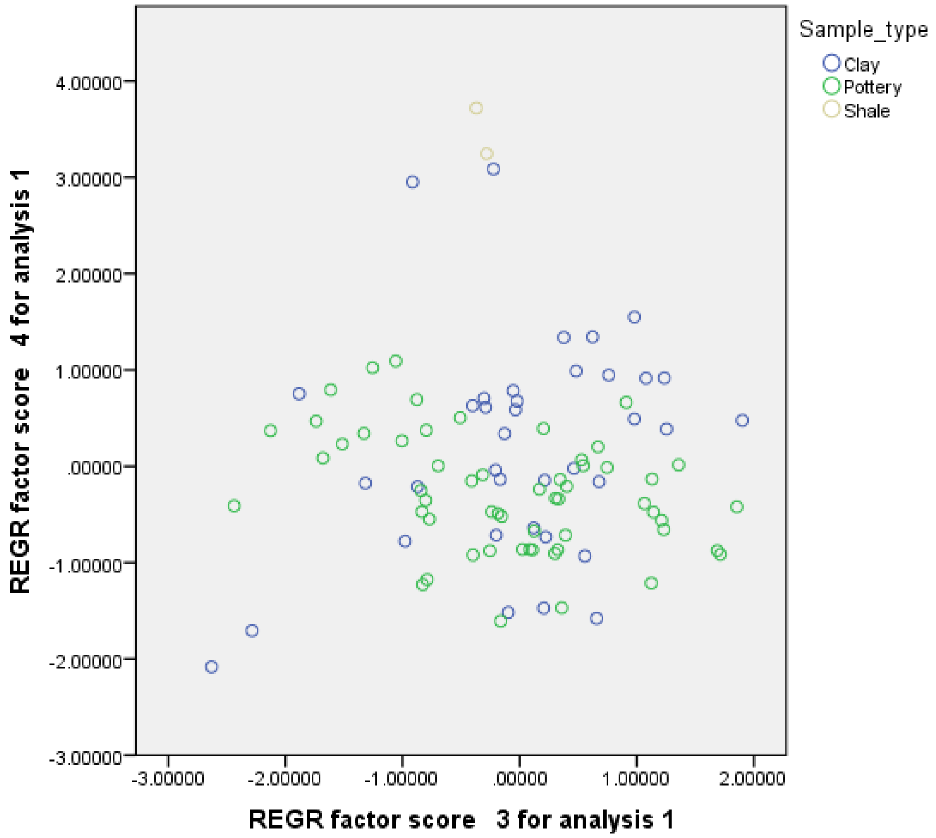

Figure 8.7. PC3 and PC4 of pottery, clay and shale samples (log_{10} data)

The elements strongly affecting principal components 1 and 2 were examined using a component plot of all elements analysed for the pottery log_{10} data. This was carried out using the rotated component plot in two dimensions. Varimax rotation was used to show how the components initially extracted differed from each other and which of the elements were associated with each factor (Steve Smith pers. comm.). This revealed that Mn, Ni and Zn were the strongest elements on PC2 and the REEs Ce, La, Nd and Y were the strongest on PC1 (Figure 8.8). Bivariate plots of these elements are shown in Appendix G, Figures G23-G35, with the closest clay samples to the pottery labelled. Those clay samples that appeared to be the most similar were the Wealden Clays from Lower Lynch Farm (ICP sample 1, on 9 plots; ICP sample 2, on 12 plots; ICP sample 3, on 8 plots) and SE Purbeck (ICP sample 16, on 9 plots); the Kimmeridge Clay (ICP sample 90, on 11 plots) and the Creekmoor Clay from Upton Country Park (ICP sample 17, on 12 plots). Also identified as similar on a number of plots were samples of Parkstone Clay from Bourne Bottom Nature Reserve (ICP sample 24, on seven plots; ICP sample 15, on four plots; ICP sample 14, on one plot) and Brownsea Island (ICP sample 8, on five plots; ICP sample 21, on four plots; ICP sample 20, on one plot; samples of Broadstone Clay from Foxground Plantation (ICP sample 29, on five plots) and Wytch Heath (ICP sample 9, on three plots) as well as one sample from Round Island (ICP sample 31, on four plots).

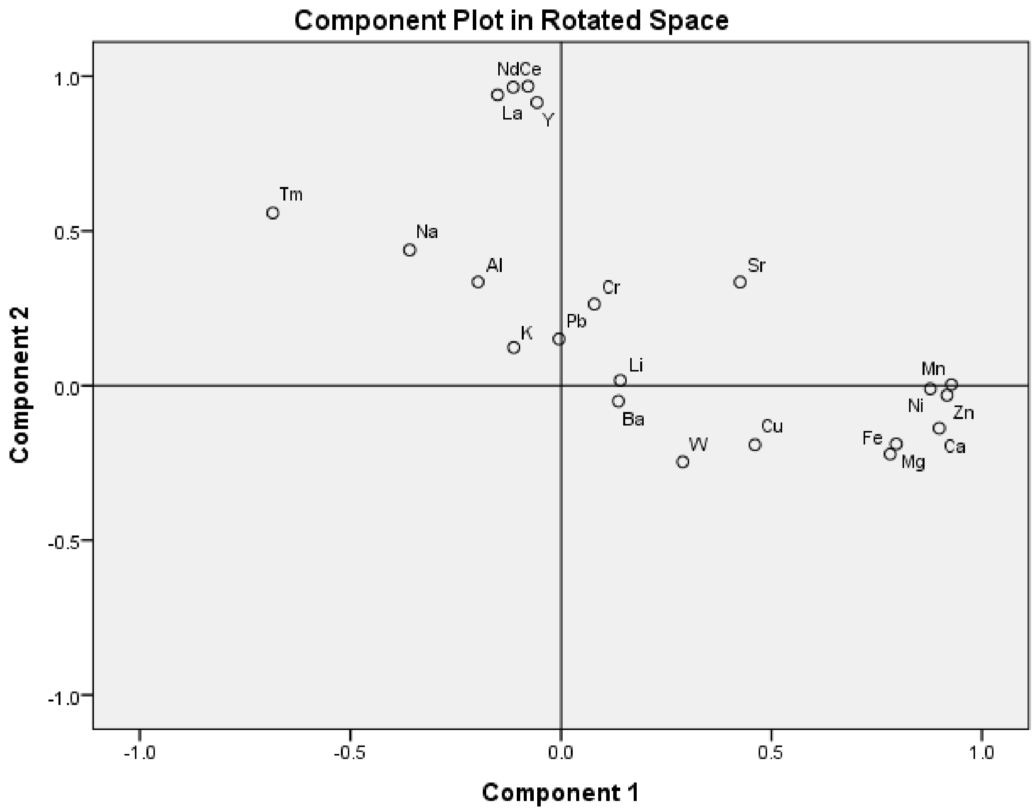

Figure 8.8. Rotated component plot of principal component analysis of all pottery, clay and shale samples (log_{10} data)

8.2.5 Principal components analysis of all pottery samples

The PCA was run on log_{10} data for the pottery samples alone; the descriptive statistics are presented in Table 8.9. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .688; the Barlett's Test of Sphericity gave a p value of <0.001, the data was therefore considered suitable to be analysed using this technique. The analysis found six principal components with Eigenvalues greater than 1. The first component accounted for 32.1% of the variation in the data, the second for 16.8%, the third for 12.4%, the fourth for 7.4%, fifth for 6.1% and the sixth for 5.7%, together accounting for 80.5% of the variance. The scree plot is shown in Appendix G, Figure G36. The components are presented in Appendix G, Table G10. The probability-probability plots of the pottery samples are compared to those of the clay in Appendix G, Figures G37-G57. The correlation matrix is summarised in Appendix G, Table G9. The rare earth elements were again highly correlated (Appendix G, Table G11), with Ce-La, Ce-Nd and La-Nd having values of >.9.

Scattergraphs were made of PC1 and PC2, with possible outliers highlighted (Figure 8.9). The plots were investigated by site (Figure 8.10), form (Figure 8.11) and decoration (Figure 8.12), but no patterns were evident. Plots were then also made using PC2 and PC3, and PC3 and PC4, but this did not help separate the groups, perhaps as all samples were tempered with quartz and therefore the dilution effect is not an issue as the graphs are comparing like with like.

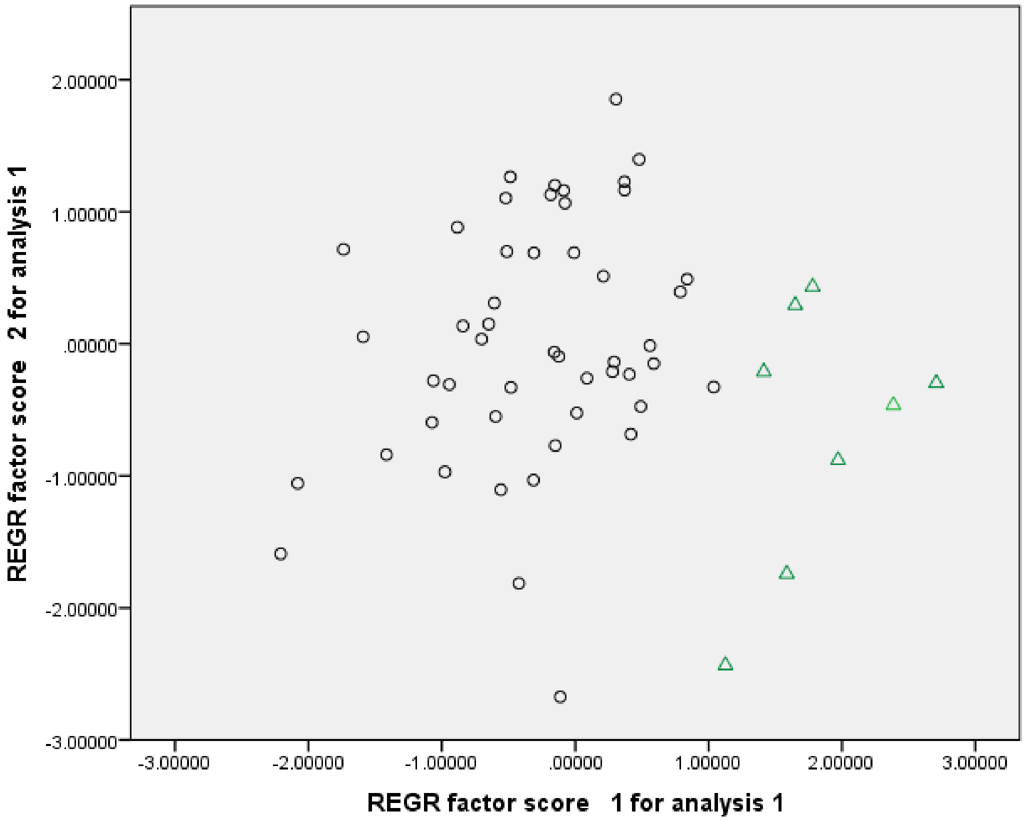

Figure 8.9. PCA1 and PCA2 plots for all pottery (log_{10} data). Possible outliers are highlighted as green triangles (ICP samples 40, 42, 45-50)

Table 8.9. Descriptive statistics for the pottery samples, using log_{10} data

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewness		Kurtosis		CV	% CV
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error		
Al	60.00	0.31	4.63	4.94	4.81	0.01	0.06	0.00	-0.63	0.31	1.79	0.61	0.01	1.18
Ba	60.00	0.89	2.30	3.19	2.56	0.02	0.18	0.03	1.73	0.31	3.43	0.61	0.07	6.89
Ca	60.00	2.67	2.27	4.95	3.97	0.07	0.58	0.34	-1.12	0.31	1.05	0.61	0.15	14.61
Cr	60.00	0.27	1.86	2.13	1.97	0.01	0.06	0.00	0.20	0.31	-0.39	0.61	0.03	3.12
Cu	60.00	0.72	1.01	1.72	1.35	0.02	0.12	0.01	-0.24	0.31	1.84	0.61	0.09	9.00
Fe	60.00	0.38	4.39	4.77	4.60	0.01	0.09	0.01	-0.27	0.31	-0.46	0.61	0.02	1.96
K	60.00	0.68	3.77	4.44	4.13	0.02	0.12	0.02	0.04	0.31	0.41	0.61	0.03	2.99
Li	60.00	0.63	1.14	1.77	1.52	0.02	0.12	0.01	-0.46	0.31	0.63	0.61	0.08	7.96
Mg	57.00	0.71	3.19	3.90	3.69	0.02	0.13	0.02	-1.71	0.32	3.83	0.62	0.04	3.54
Mn	60.00	1.80	1.16	2.95	2.35	0.05	0.36	0.13	-0.59	0.31	0.70	0.61	0.15	15.38
Na	60.00	0.83	2.50	3.33	2.98	0.03	0.21	0.04	-0.27	0.31	-0.68	0.61	0.07	6.94
Ni	60.00	0.49	1.28	1.78	1.57	0.02	0.13	0.02	-0.51	0.31	-0.33	0.61	0.08	8.01
Pb	60.00	0.45	1.08	1.53	1.28	0.01	0.08	0.01	0.55	0.31	1.35	0.61	0.06	6.37
Sr	60.00	1.59	0.97	2.56	1.94	0.04	0.32	0.10	-1.27	0.31	1.69	0.61	0.17	16.67
W	60.00	0.61	0.65	1.26	0.92	0.02	0.12	0.02	-0.78	0.31	0.89	0.61	0.13	13.34
Zn	60.00	1.16	1.36	2.53	1.92	0.03	0.20	0.04	-0.10	0.31	1.15	0.61	0.10	10.21
Ce	60.00	0.91	1.33	2.24	1.76	0.02	0.16	0.03	0.15	0.31	1.70	0.61	0.09	9.17
La	60.00	1.07	0.83	1.90	1.39	0.02	0.18	0.03	-0.30	0.31	2.74	0.61	0.13	12.88
Tm	60.00	0.31	0.72	1.03	0.90	0.01	0.08	0.01	-0.30	0.31	-0.74	0.61	0.09	8.61
Y	60.00	0.73	0.87	1.60	1.16	0.02	0.17	0.03	0.74	0.31	0.46	0.61	0.14	14.40
Nd	60.00	1.08	0.81	1.90	1.35	0.02	0.19	0.04	0.11	0.31	1.36	0.61	0.14	13.99

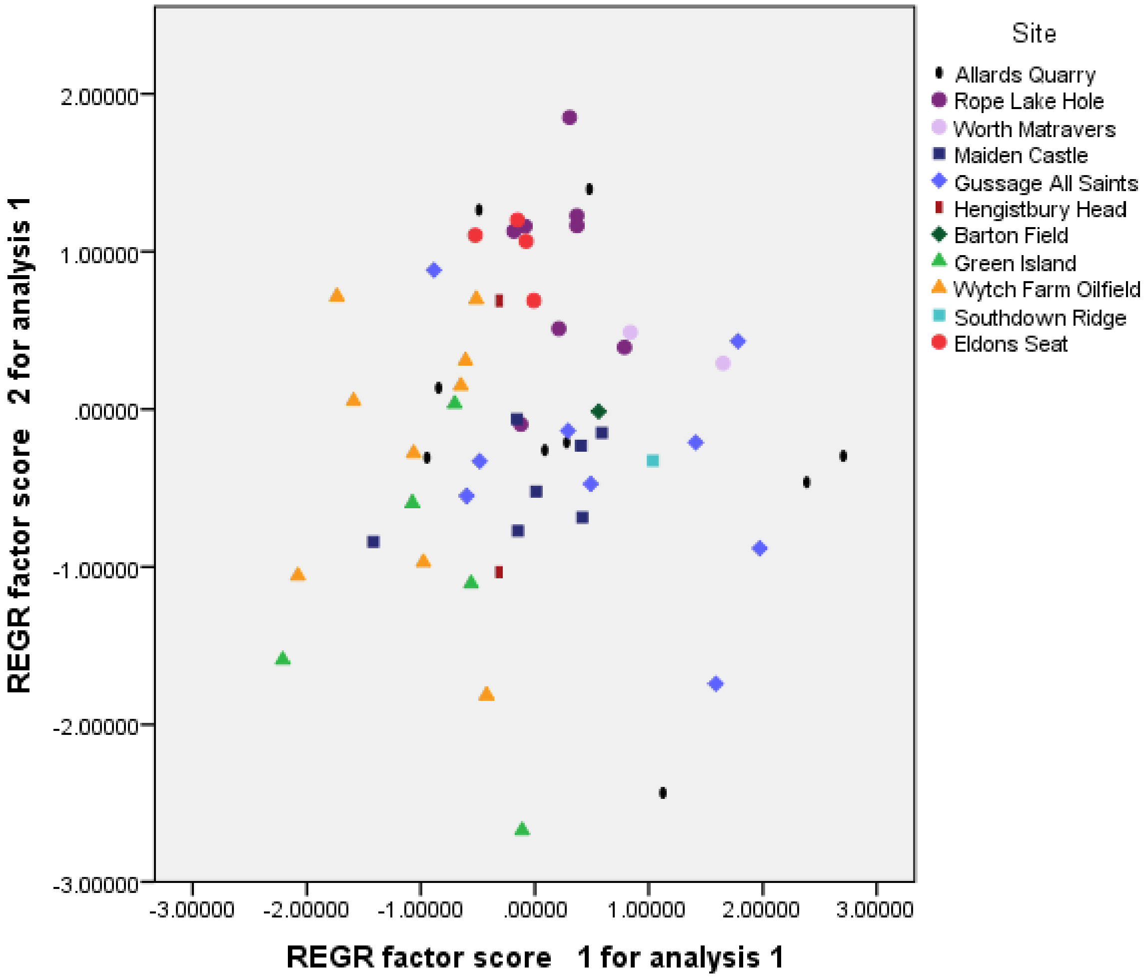

Figure 8.10. PC1 and PC2 of pottery (log_{10} data), indicating site of recovery

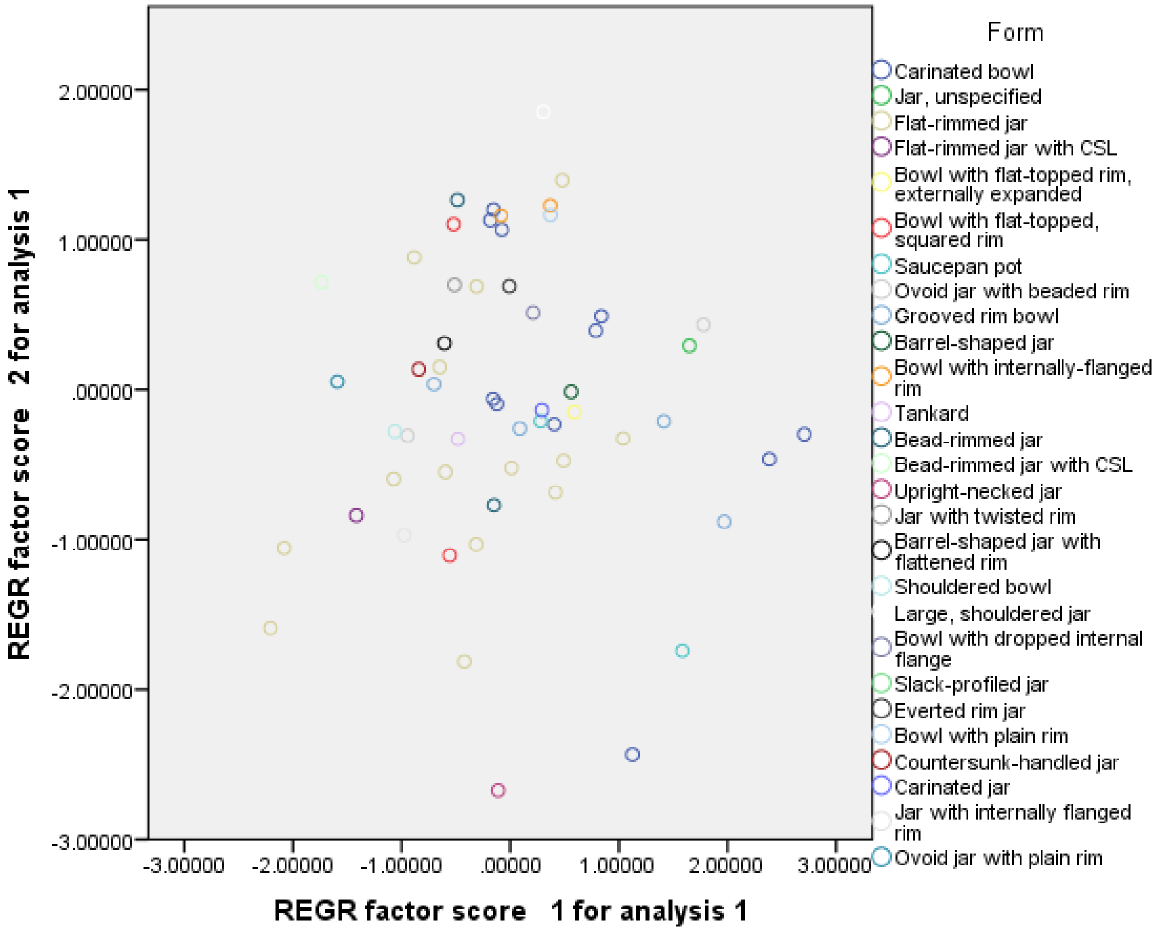

Figure 8.11. PC1 and PC2 plot for pottery samples (log_{10} data), indicating form type

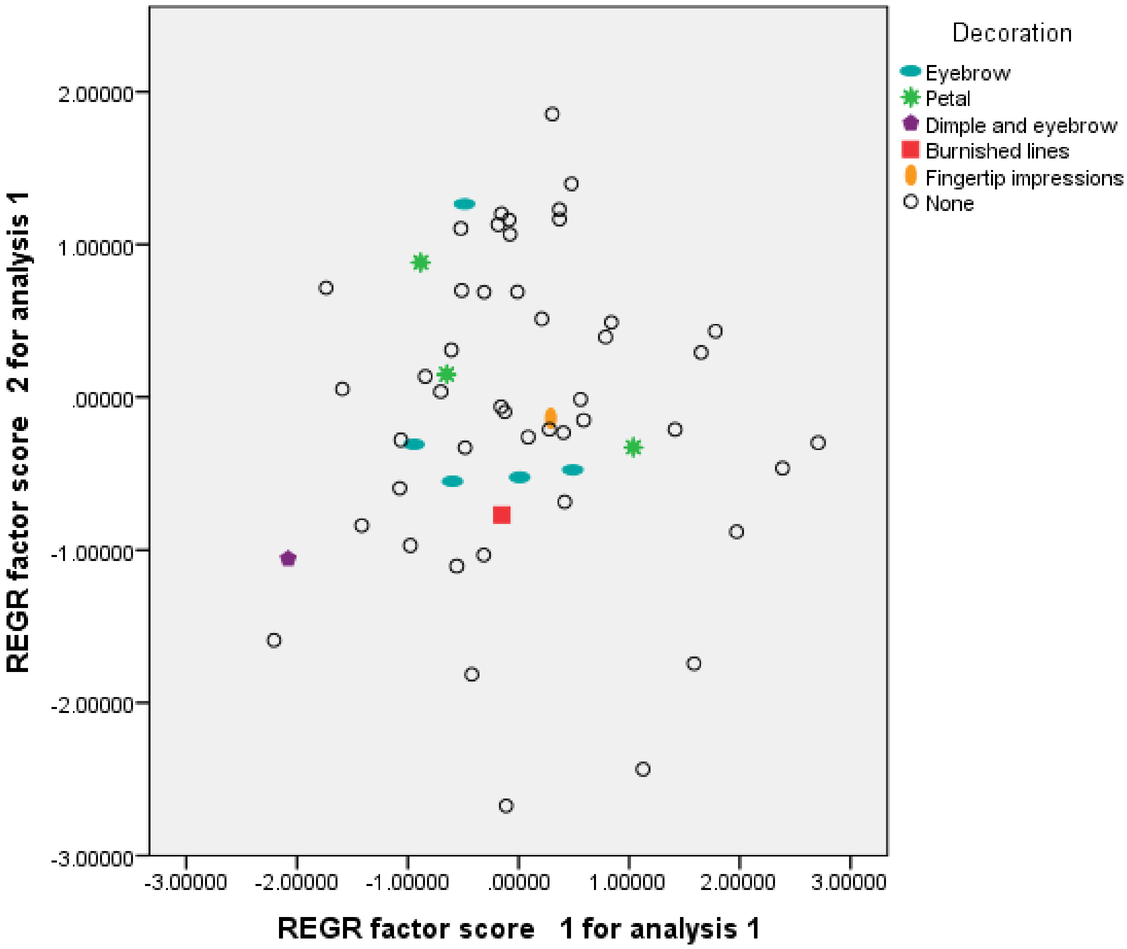

Figure 8.12. PC1 and PC2 plot for pottery samples (log_{10} data), indicating decoration

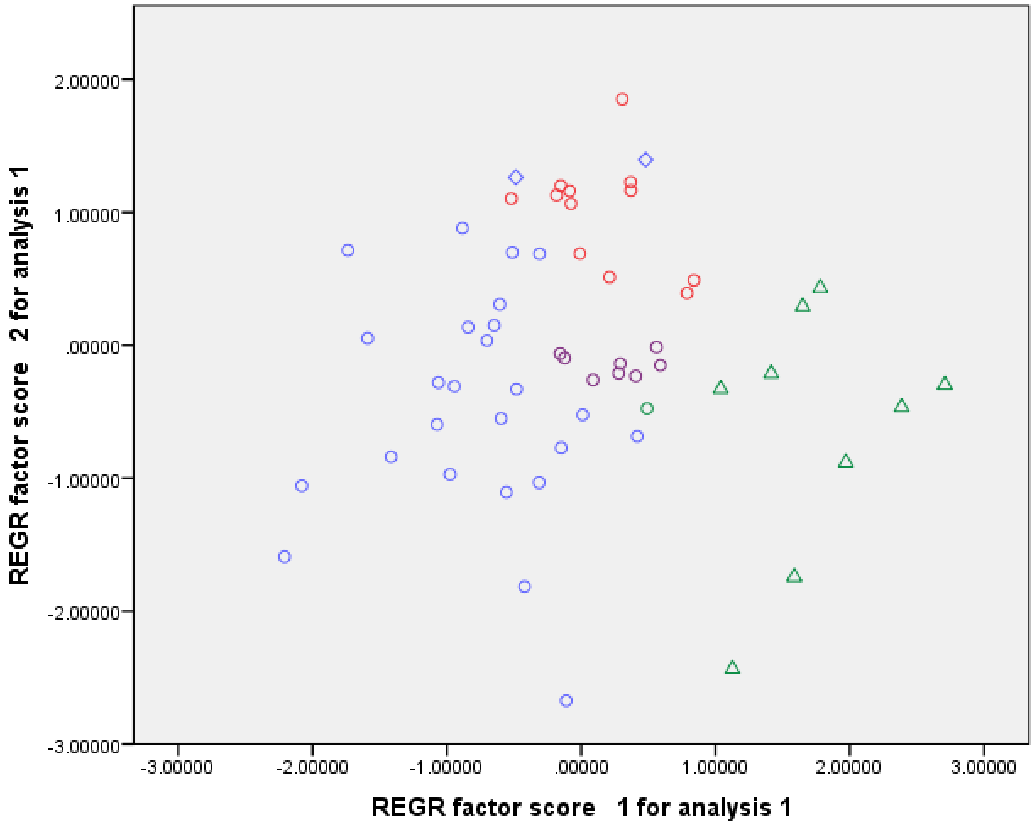

Figure 8.13. Plot of PC1 and PC2 for pottery samples (log_{10} data), indicating possible compositional groups and outliers.

The graph of PC1 and PC2 (Figures 8.9-8.13) is not easy to interpret but each point was identified to see if there were broad groupings that might be explained by aspects of the pottery. Each sample was assigned a chemical group number on the basis of the possible groupings on the plot. Those highlighted in blue on Figure 8.13 (Group 1) represent all samples from the Wytch Farm Oilfield sites (Furzey Island, Ower Peninsula, East of Corfe River, West of Corfe River, West Creech) and Green Island (Table 8.10), as well as some from Maiden Castle, Gussage All Saints, Allard's Quarry and Hengistbury Head.

Table 8.10. Group 1 of all pottery samples as suggested by the plot of PC1 and PC2 of the log_{10} data

ICP no.	Site	Petrol. sample no.	Vessel type	Petrol. group
43	Maiden Castle	MC 20	Flat-rimmed jar	20
51	Hengistbury Head	HH 3	Flat-rimmed jar	6
55	Hengistbury Head	HH 1	Flat-rimmed jar	8
56	Green Island	GI 16	Bowl with expanded, grooved rim	12
57	East of Corfe River	WFO 24	Flat-rimmed jar with dimple and eyebrow decoration	8
58	Allard's Quarry	AQ 10	Ovoid jar with beaded rim and eyebrow motif	8
59	Allard's Quarry	AQ 11	Countersunk-handled jar	13
61	Gussage All Saints	GAS 32	Tankard	13
62	Gussage All Saints	GAS 27	Flat-rimmed jar with petal motif	12
63	Gussage All Saints	GAS 36	Flat-rimmed jar with eyebrow motif	12
67	Maiden Castle	MC 13	Bead-rimmed vessel with grooved line decoration	11
68	Maiden Castle	MC 27	Flat-rimmed jar with double eyebrow motifs	11
69	Furzey Island	WFO 11	Bead-rimmed jar with countersunk-lug handles	11
70	Ower Peninsula	WFO 16	Flat-rimmed jar with petal motif	11
71	Green Island	GI 1	Flat-rimmed jar	11
72	Green Island	GI 17	Hemispherical bowl with flat-topped, squared rim	11
73	Green Island	GI 6	Upright-necked jar with proto-bead rim and slight internal bevel	11
75	Gussage All Saints	GAS 11	Flat-rimmed jar with eyebrow motif	17
76	West Creech	WFO 1	Jar/vessel with interal hooked, flanged rim	21
77	West of Corfe River	WFO 3	Ovoid jar with plain rim	21
78	East of Corfe River	WFO 15	Flat-rimmed jar	21
79	West Creech	WFO 4	Proto-bead rimmed vessel with convex profile	21
80	Green Island	GI 3	Flat-rimmed jar	22
83	West Creech	WFO 6	Jar with grooved rim, twisted effect	23
84	West Creech	WFO 19	Shouldered bowl with out-turned, slightly rolled rim	23
100	Maiden Castle	MC 21	Flat-rimmed jar with countersunk handle	11

Grouping of the other points was more difficult to interpret. A small group of four Early Iron Age bowls from Eldon’s Seat and Rope Lake Hole clustered together in the upper centre of the plot, and have been highlighted in red. The nearest points to this group represent other Early to Middle Iron Age vessels from these sites and are also highlighted in red; all have been classed as Group 2 (Figure 8.3; Table 8.11). This group also included two points in the upper area of this cloud, both vessels from Allard’s Quarry that had been previously classified as typical Poole Harbour vessels in terms of form and fabric (ICP samples 54 and 64), both are highlighted as blue diamonds.

Table 8.11. Group 2 of all pottery samples as suggested by the plot of PC1 and PC2 of the log_{10} data

ICP no.	Site	Petrol. sample no.	Vessel type	Petrol. group
41	Rope Lake Hole	RLH 10	Carinated bowl with flaring rim	14
53	Rope Lake Hole	RLH 18	Open bowl with plain rim	7
54	Allard's Quarry	AQ 8	Bead-rimmed bowl	5
60	Rope Lake Hole	RLH 1	Bowl with internally flanged, flat-topped rim	13
64	Allard's Quarry	AQ 6	Bead-rimmed jar with eyebrow	22
81	Football Field, Worth Matravers	WM 7	Furrowed bowl	22
86	Rope Lake Hole	RLH 26	Large, shouldered jar with short, upright neck and beaded rim	25
87	Rope Lake Hole	RLH 13	Carinated bowl with flaring rim	24
88	Rope Lake Hole	RLH 19	Bowl with internally flanged, flat-topped rim	26
89	Rope Lake Hole	RLH 21	Bowl with dropped internal flange	24
96	Eldons Seat	ES 4	Thick-walled jar with everted rim, red-finished	20
97	Eldons Seat	ES 3	Very long-necked carinated bowl	19
98	Eldons Seat	ES 7	Long-necked carinated bowl, red-finished	19
99	Eldons Seat	ES 1	Hemispherical bowl with flat-topped rim, slightly expanded on the interior, red-finished	20

Group 3 represents the miscellaneous samples highlighted purple in Figure 8.13 and detailed in Table 8.12. A group of samples on the right-hand side of the plot appeared separated from the bulk of the points (Group 4, Table 8.13). These were all samples that were unsourced during petrological analysis, without argillaceous inclusions, and not typical Poole Harbour forms; they are highlighted as green triangles (Figures 8.9 and 8.13). Group 5 is a single vessel from Southdown Ridge, a flat-rimmed jar with petal motif and therefore a Poole Harbour form with characteristic decorative motif, but of unusual fabric. Group 6 are the missing vessels from Figure 8.13 (ICP samples 85, 93 and 95; Table 8.14). The PCA was re-run excluding barium and calcium, as these elements may be affected by the post-depositional environment, but the resulting groups were the same.

Table 8.12. Group 3 of all pottery samples as suggested by the plot of PC1 and PC2 of the log_{10} data

ICP no.	Site	Petrol. sample no.	Vessel type	Petrol. group
44	Maiden Castle	MC 30	Deep, hemispherical bowl with flat-topped rim, externally expanded	20
65	Allard's Quarry	AQ 9	Bowl with channelled rim	8
66	Allard's Quarry	AQ 17	Saucepan pot	15
74	Gussage All Saints	GAS 10/22	Bead-rimmed vessel with fingertip decoration	17
82	Maiden Castle	MC 2	Carinated bowl, red-finished	18
91	Rope Lake Hole	RLH 11	Carinated bowl with flaring rim	6
94	Maiden Castle	MC 3	Carinated bowl with upright rim	4

Table 8.13. Group 4 of all pottery samples as suggested by the plot of PC1 and PC2 of the log_{10} data

ICP no.	Site	Petrol. sample no.	Vessel type	Petrol. group
40	Allard's Quarry	AQ 28	?bowl, re-finished	1
42	Football Field, Worth Matravers	WM 3	Upright rim, probably from a tripartite bowl or jar	14
45	Gussage All Saints	GAS 9	Saucepan pot	2
46	Gussage All Saints	GAS 17	Ovoid, bead-rimmed jar	9
47	Allard's Quarry	AQ 16	Furrowed and carinated bowl, red-finished	3
48	Allard's Quarry	AQ 1	Furrowed and carinated bowl, red-finished	4
49	Gussage All Saints	GAS 26	Bowl with channelled rim	9
50	Gussage All Saints	GAS 3	Saucepan pot with groove around rim	9
52	Barton Field	Bf 2	Barrel-shaped jar	16

Table 8.14. Groups 5 and 6 of all pottery samples as suggested by the plot of PC1 and PC2 of the log_{10} data

ICP no.	**Site**	**Petrology no.**	**Vessel type**	**Petrolog. group**	**Chemical group**
92	Southdown Ridge	SR 6	Flat-rimmed jar with petal motif	10	5
85	Rope Lake Hole	RLH 8	Steeply angled carinated bowl with short, upright neck	25	6
93	Eldons Seat	ES 2	Large, open-mouthed bowl	19	6
95	Rope Lake Hole	RLH 27	Slack-profiled jar with slightly everted rim	25	6

These groupings were then explored using a discriminant function analysis in SPSS (Figure 8.14). Five elements were taken through for the analysis, Cu, K, Na, W and Y (Appendix G, Table G12). From these variables, SPSS found four discriminant functions, the first accounting for 55.3% of the variance, the second for 34.1%, the third for 8.2% and the fourth for 2.4% of the variance (Appendix G, Table G13); the fourth variable is not significant ($p > .05$) (Appendix G, Table G14). The analysis classified 81.7% of the samples as belonging to the pre-defined chemical groups and re-classified eight samples (Table 8.15), these are labelled on a plot of PC1 and PC2 (by SPSS case number, Figure 8.15).

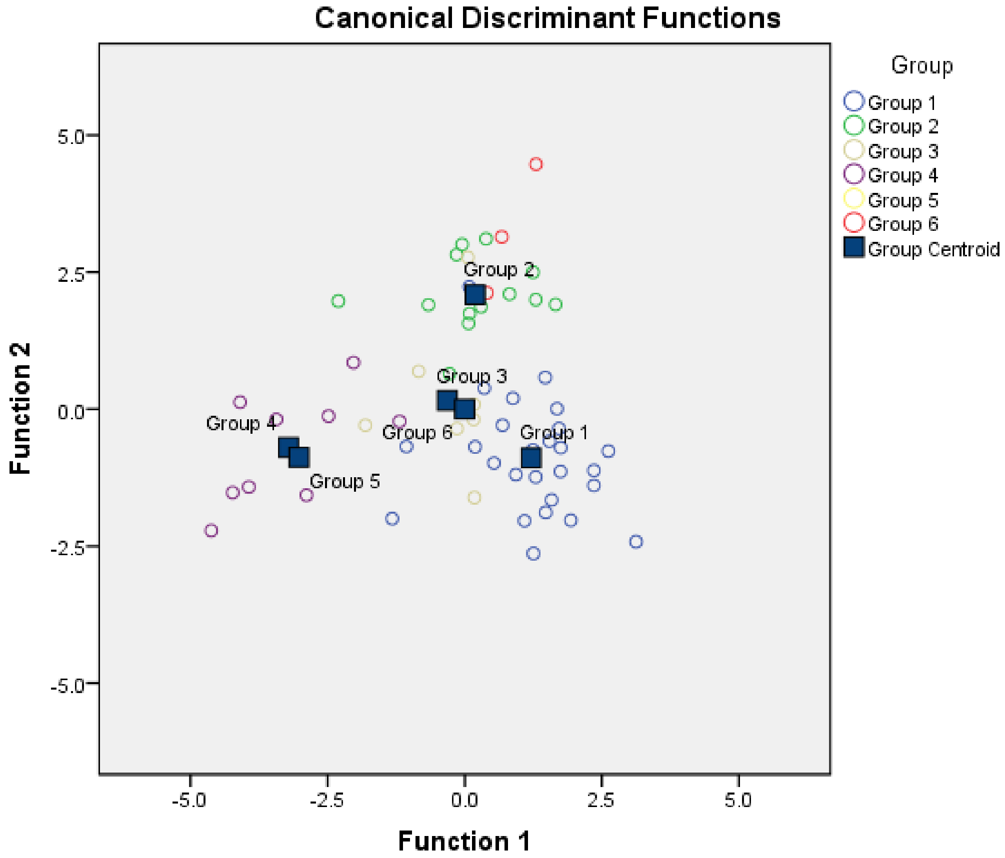

Figure 8.14. Discriminant function analysis of pottery samples, classified by chemical groups identified using a PCA

Table 8.15. Pottery samples re-classified by the discriminant function analysis (log_{10} data)

MC: Maiden Castle; BF: Barton Field; HH: Hengistbury Head; FI: Furzey Island; GAS: Gussage All Saints; GI: Green Island; WC: West Creech; RLH: Rope Lake Hole; ES: Eldon's Seat

SPSS case no.	ICP sample no.	Chemical group	Predicted group	Site	Form
4	43	1	4	MC	Flat-rimmed jar
13	52	4	3	BF	Barrel-shaped jar
16	55	1	2	HH	Flat-rimmed jar
30	69	1	3	FI	Countersunk-handled jar
36	75	1	4	GAS	Flat-rimmed jar with eyebrow
41	80	1	3	GI	Flat-rimmed jar
44	83	1	3	WC	Jar with twisted rim
46	85	6	2	RLH	Carinated bowl
51	91	3	2	RLH	Carinated bowl
53	93	6	2	ES	Bowl
55	95	6	2	RLH	Slack-profiled jar

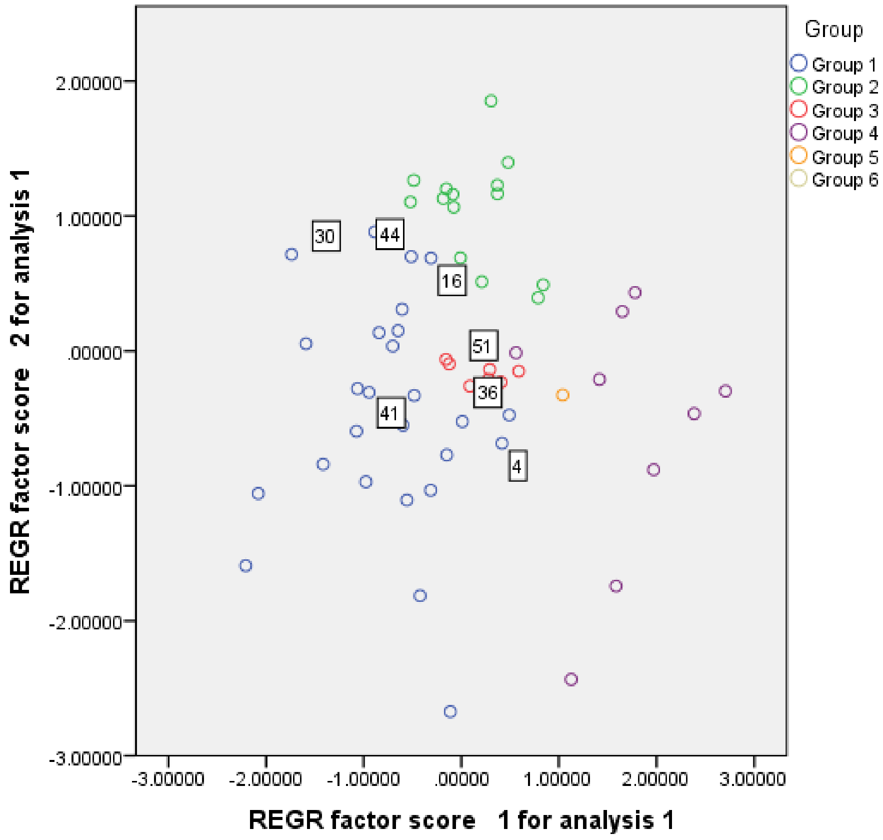

Figure 8.15. Plot of PC1 and PC2 of pottery samples, with samples re-classified by a discriminant function analysis highlighted (labelled by SPSS case number)

In an attempt to find sub-groups amongst the main cloud of points on the plots, a number of PCAs were run on samples from specific sites. For these analyses, magnesium was excluded due to missing values for three pottery samples. A PCA of pottery from the immediate harbour sites of the Wytch Farm Oilfield and Green Island, as well as Hengistbury Head, did not produce a KMO score and there were too few samples for any meaningful patterns to be deduced from the cloud of points. The analysis was run again, but this time included sites that were geographically separated: Maiden Castle and Southdown Ridge representing the West Dorset sites, and Gussage All Saints and Barton Field representing sites in North Dorset. Sites from south of the Purbeck Ridge were excluded. The KMO of this analysis was .649, with a significance of <.001. The analysis found six principal components together accounting for 74.9% of the variance. The first accounted for 34.9% of the variance, the second for 15.5%, the third for 12.7%, the fourth of 9.4%, the fifth for 1.3% and the sixth for 1.1%. The scree plot is presented in Appendix G, Figure G58 and the component matrix in Appendix G, Table G15. A plot of the samples indicated an overlap in the pottery from the different sites, however the samples from Maiden Castle are positively loaded onto PC2 (Figure 8.16). The two Hengistbury Head samples are adjacent to each other. A plot of the points with the different broad form groups highlighted indicate the typical Poole Harbour forms (here defined as flat-rimmed jars, jars with countersunk lugs and jars decorated with eyebrow or petal motifs and two other forms from Green Island: a bowl with flat-topped, square rim and an upright-necked jar) span the plot (Figure 8.17).

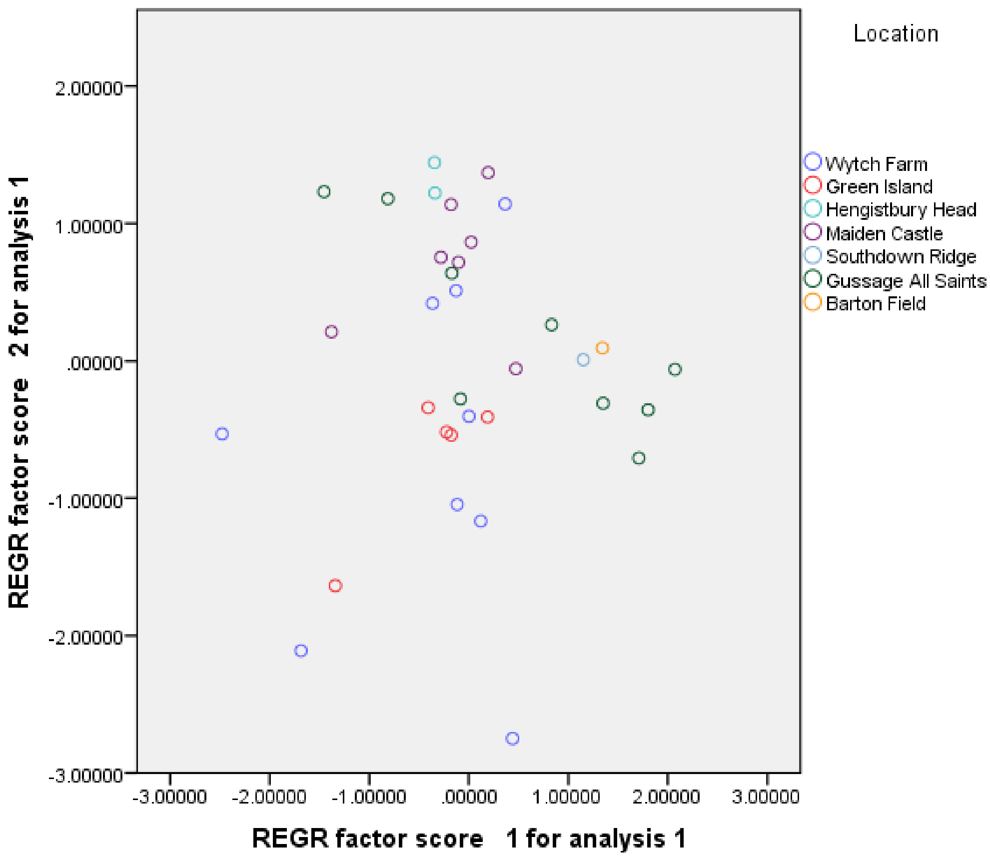

Figure 8.16. Plot of pottery samples from the Wytch Farm Oilfield sites, Green Island, Hengistbury Head, Maiden Castle, Southdown Ridge, Gussage All Saints and Barton Field, by site (excluding Mg)

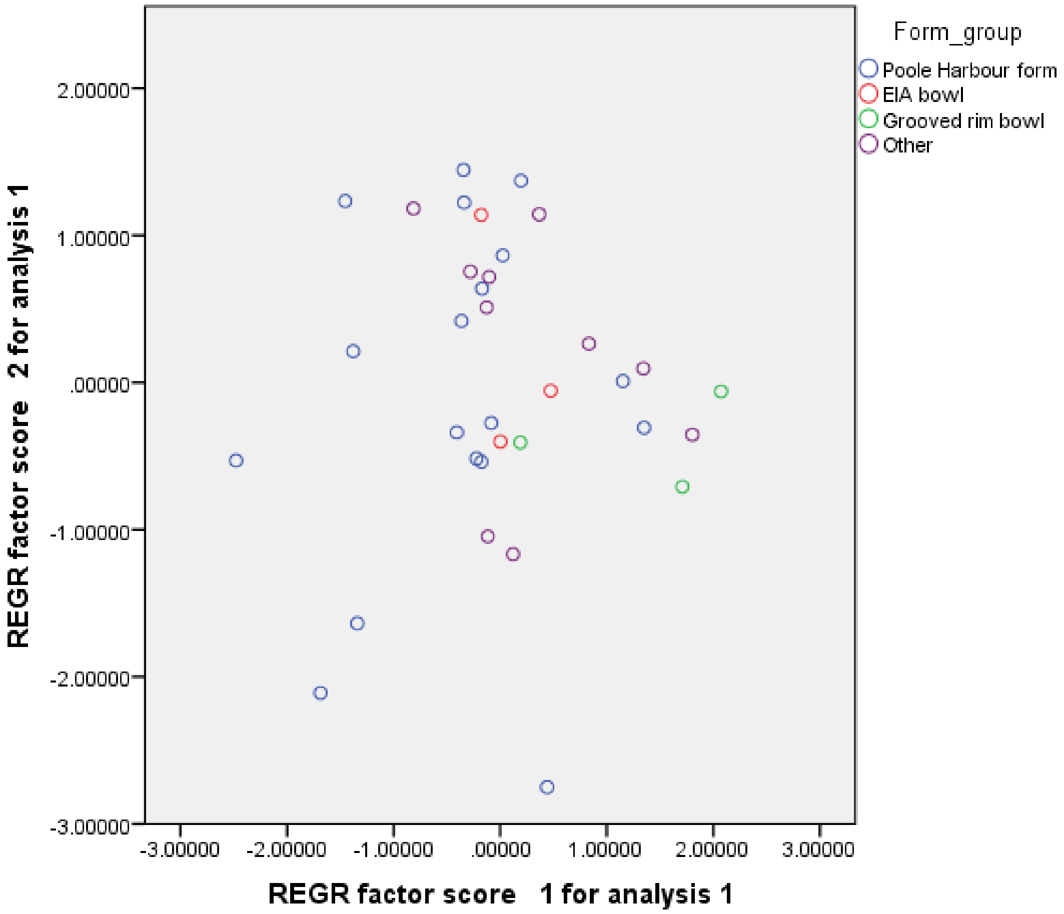

Figure 8.17. Plot of pottery samples from the Wytch Farm Oilfield sites, Green Island, Hengistbury Head, Maiden Castle, Southdown Ridge, Gussage All Saints and Barton Field, by broad form type (excluding Mg)

Bivariate plots were made of the elements that were identified as having the most variation (Al, K, Li; Ce, La, Nd and Y) on a component plot of the principal components, with varimax rotation (Figure 8.18; Appendix G, Figures G59-70: see Table 8.17 for concordance of ICP case numbers and sample numbers). Magnesium was excluded due to missing values for three samples. The outliers previously identified amongst the pottery samples did appear separated from the points in the bivariate plots (Table 8.16-8.17). These samples were associated with the highest levels of the rare earth elements. Samples 40, 46, 47 and 49 were identified as outliers in all of the bivariate plots, sample 42 in three of the plots, sample 45 in five plots, sample 48 in nine plots, sample 50 in eleven plots and sample 52 in three plots (and as a possible outlier in a further four). Samples 42 and 52 also appeared associated in the plots of Ce, La and Nd with Al, K and Li.

None of the samples identified as outliers contained the elongated argillaceous inclusions. ICP samples 45, 46, 49 and 50 all came from Gussage All Saints. Sample 45 was in a fabric containing very fine to fine-grained quartz with a background of common silt-sized quartz, the other samples were in a fine to medium-grained sandy fabric with a background of moderate silt-sized quartz. The samples from Allard's Quarry (ICP samples 40, 47, 48) were red-finished bowls in very fine to fine-grained sandy fabrics, some with a background of moderate to common silt, one also contained sparse to moderate limestone. The jar/bowl from Worth Matravers (ICP sample 42) was in a medium-grained sandy fabric whilst the jar from Barton Field (ICP sample 52) was in a medium-grained fabric with a background of moderate silt-sized quartz.

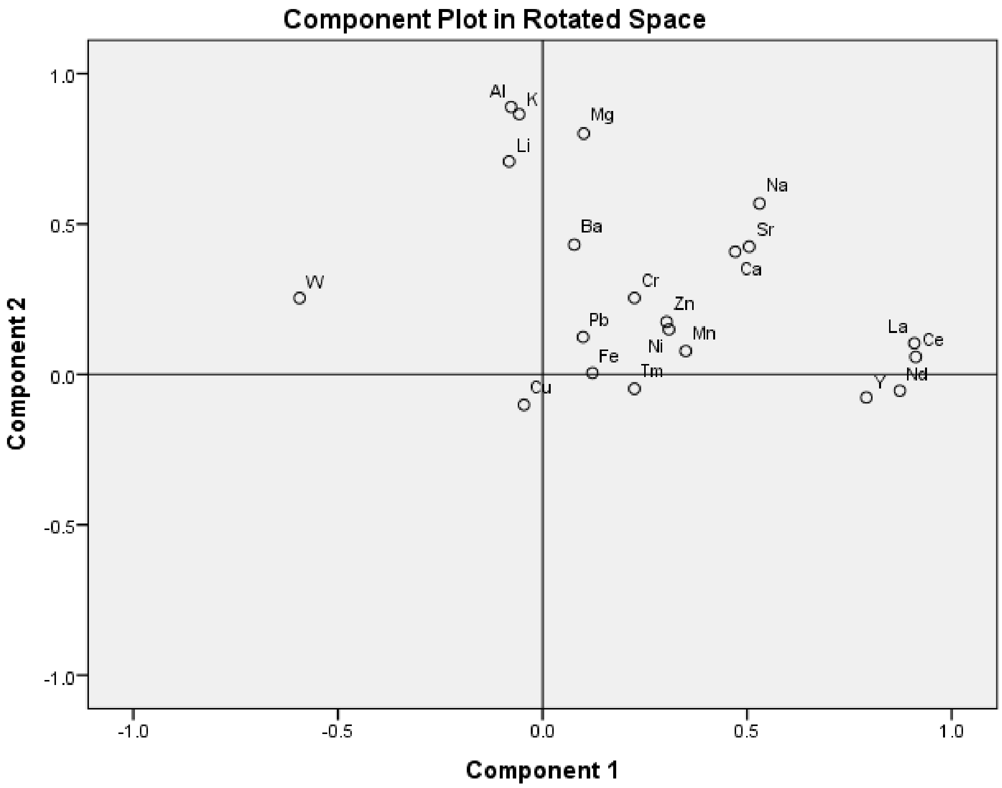

Figure 8.18. Rotated component plot of elements strongly affecting PC1 and PC2 of log_{10} pottery samples

Table 8.16. Outliers revealed in the bivariate elemental plots

Bivariate plot	Outliers (ICP sample numbers)
Al-Ce	40, 45, 46, 47, 48, 49 (42, 52)
Al-La	40, 45, 46, 47, 48, 49, 50 (42, 52)
Al-Nd	40, 45, 46, 47, 48, 49, 50 (52)
Al-Y	40, 45, 46, 47, 49, 50
K-Ce	40, 45, 46, 47, 48, 49, 50, 52
K-La	40, 46, 47, 48, 49, 50
K-Nd	40, 46, 47, 48, 49, 50 (52)
K-Y	40, 46, 47, 49, 50
Li-Ce	40, 42, 46, 47, 48, 49, 50, 52
Li-La	40, 42, 46, 47, 48, 49,50
Li-Nd	40, 42, 46, 47, 48, 49, 50, 52
Li-Y	40, 46, 47, 49, 50

Table 8.17. Details of outliers identified with bivariate plots

Case no.	ICP Sample no.	Site sample no.	Site	Form
1	40	AQ 28	Allard's Quarry	?furrowed bowl, red-finished
3	42	WM 3	Worth Matravers	Upright rim, probably from a tripartite bowl or jar
6	45	GAS 9	Gussage All Saints	Saucepan pot
7	46	GAS 17	Gussage All Saints	Ovoid, bead-rimmed jar
8	47	AQ 16	Allard's Quarry	Furrowed and carinated bowl, red-finished
9	48	AQ 1	Allard's Quarry	Furrowed and carinated bowl, red-finished
10	49	GAS 26	Gussage All Saints	Bowl with channelled rim
11	50	GAS 3	Gussage All Saints	Saucepan pot with groove under rim
13	52	BF 2	Barton Field	Barrel-shaped jar
55	95	MC 30	Rope Lake Hole	Slack-profiled jar with everted rim

PCA of pottery using raw data

A PCA was run of the raw data of the pottery samples (excluding Mg) to see if this would improve the group separation. The KMO score was .698, with a significance of <.001. Six principal components were identified, together accounting for 76.5% of the variance. The first accounted for 27.7%, the second for 15.5%, the third for 12.5%, the fourth for 7.8%, the fifth for 6.9% and the sixth for 6.1%. The scree plot is presented in Appendix G, Figure G71, the component matrix in Appendix G, Table G16 and the plot of PC1 and PC2 in Figure 8.19. The latter indicates a cloud of samples with eight outliers on the right-hand side of the plot. These are samples

40, 42 and 45-50 (SPSS cases 1, 3, 6-10). A ninth outlier was present at the uppermost part of the plot, sample 95 (case 55), a slack-profiled jar from Rope Lake Hole. The latter has previously not shown on a PCA of pottery and clay samples and may be a genuine outlier. Both the raw data and $\log_{10}$ data indicate that samples 40 and 45-50 are outliers. Samples 42, 52 and 95 are probably also outliers.

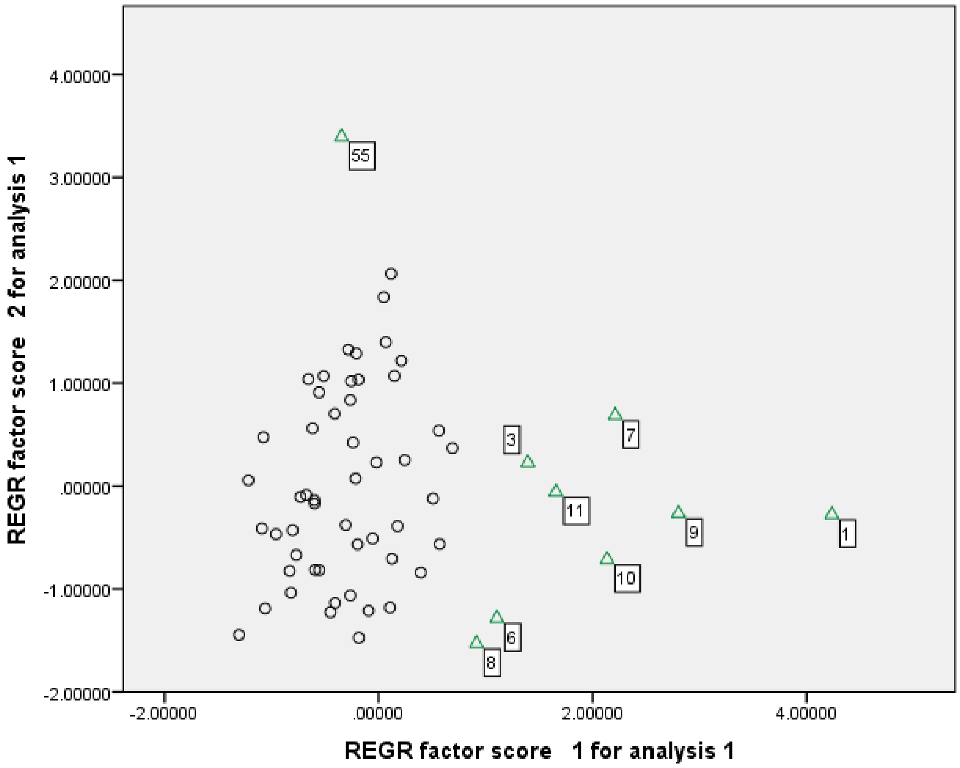

Figure 8.19. Plot of PC1 and PC2 of raw data of pottery samples (excluding Mg), outliers are labelled by SPSS case number (concordance of ICP case and sample numbers are presented in Table 8.17)

The PCA of the raw data of pottery samples was re-run excluding samples 40, 45-50, and Mg. This gave a KMO score of .691 and SPSS found six principal components, together accounting for 76.7% of the variance. The first accounted for 29%, the second for 14.4%, the third for 13.4%, the fourth for 7.6%, the fifth for 6.4% and the sixth for 5.9%. The scree plot is shown in Appendix G, Figure G72, the component matrix in Appendix G, Table G17 and the plot of PC1 and PC2 in Figure 8.20. This was first examined using vessel form, with each point assigned a coloured shape on the basis of form. The purple triangles are the flat-rimmed jars, synonymous with the Middle to Late Iron Age forms of this industry. The dark blue triangles are other jar forms displaying the motifs that are associated with the industry: eyebrows and petals. The light blue triangles are vessels with countersunk lug handles, again typical of the Poole Harbour wares. The black triangle is a single tankard, a Late Iron Age Poole Harbour form. The green dots represent other vessels from the heartland of the suspected production area: the Wytch Farm Oilfield sites and Green Island. The red dots are Early to Middle Iron Age carinated bowls; the orange dots are other Early to Middle Iron Age forms. The black dots are miscellaneous forms: a bead-rimmed vessel with grooved/burnished line decoration from Maiden's Castle (ICP sample 67), a hemispherical bowl from Maiden Castle (ICP sample 44), a bowl with grooved rim from Allard's Quarry (ICP sample 65), a saucepan pot from Allard's Quarry (ICP sample 66) and a barrel-shaped jar from Barton Field (ICP sample 52).

Comparison of pottery data sets (raw data vs. log_{10} data)

A PCA of the $\log_{10}$ of the pottery samples, excluding Mg and samples 40, 45-50, was extremely similar to the PCA of the raw data, with only very minor differences in the distances between some points (Figure 8.21). In both, a fingertip-decorated vessel from Gussage All Saints (ICP sample 74) is masked by another point, but groups with the typical Poole Harbour wares.

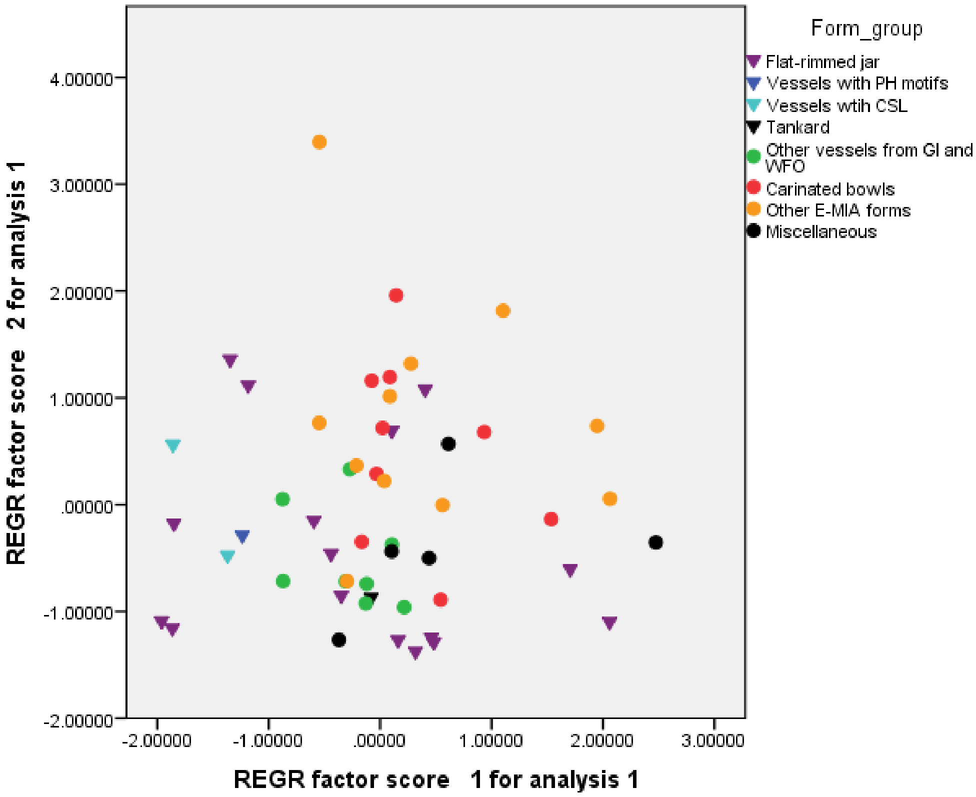

Figure 8.20. Plot of PC1 and PC2 for raw data for pottery samples, excluding Mg and samples 40, 45-50 (see text for further description of colour codes, p.269-270)

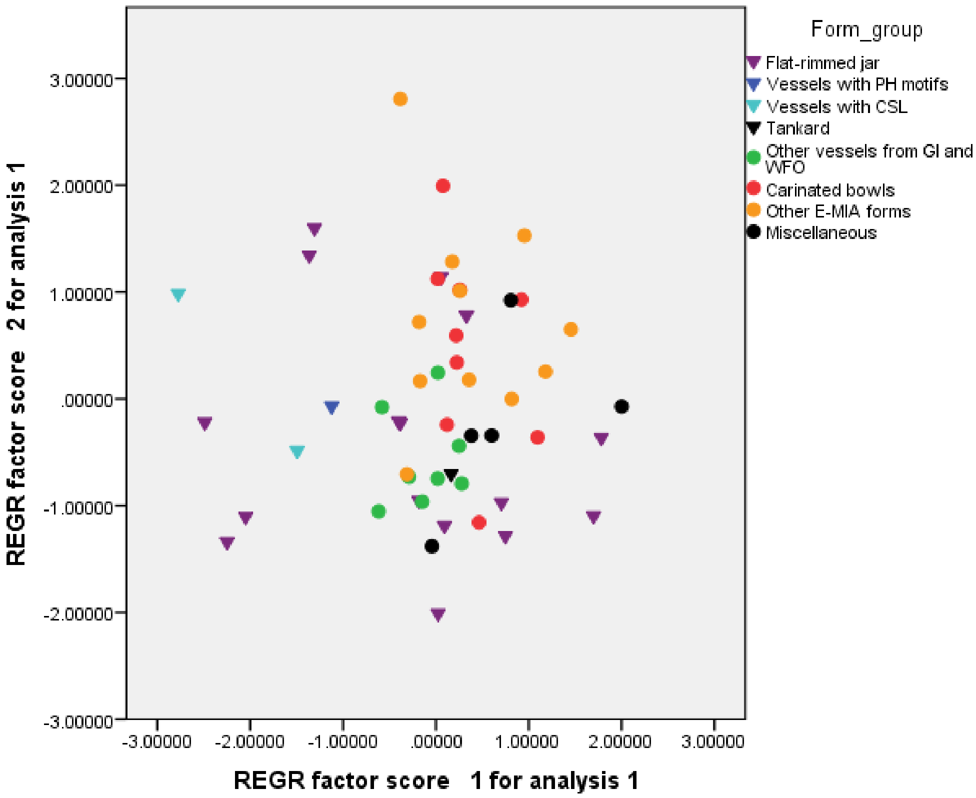

Figure 8.21. Plot of PC1 and PC2 for log_{10} data for pottery samples, excluding Mg and samples 40, 45-50 (see text for further description of colour codes, p.269-270)

It was then decided to remove sample 95, a slack-profiled jar from Rope Lake Hole. The fabric of this vessel contained the elongated argillaceous inclusions typically seen in the Poole Harbour wares, but scores considerably higher on PC2 than the other samples and its removal may allow any other groupings to become clearer. Sample 52 will also be removed as it is at the maximum extent of PC1 and was identified as a possible outlier in the previous PCAs. The graph does look different for the raw data (Figure 8.22) and $\log_{10}$ data (Figure 8.23). The raw data gave a KMO score of .668, <.001 significance and found six principal components, together accounting for 76% of the variance (PC1: 28.8%, PC2: 14.7%, PC3, 12%, PC4: 8%, PC5: 6.8% and PC6: 5.8%). The scree plot is presented in Appendix G, Figure G73 and the component matrix in Appendix G, Table G18. The $\log_{10}$ data gave a KMO score of .708, significance <.001. The analysis found six principal components, together accounting for 81% of the variance (PC1: 34%, PC2: 14.9%, PC3: 12.5%; PC4: 7.5%, PC5: 6.3% and PC6: 5.6%). The scree plot is presented in Appendix G, Figure G74 and the component matrix in Appendix G, Table G19.

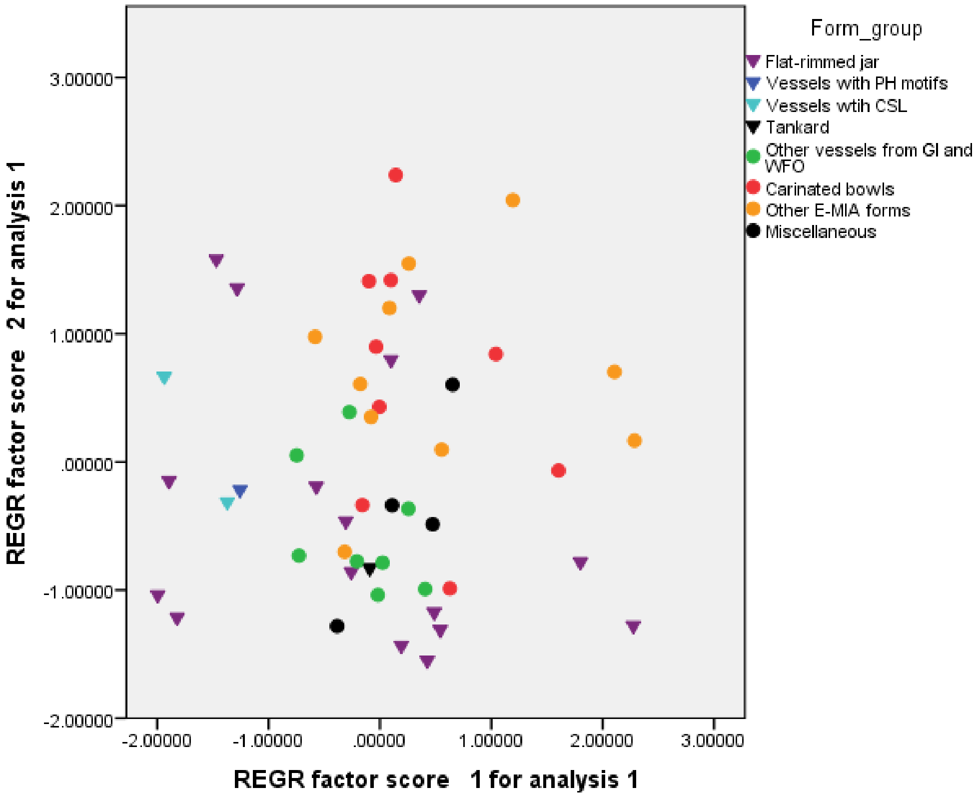

Figure 8.22. Graph of PC1 and PC2, raw data of pottery, excluding Mg and samples 40, 45-50, 52 and 95 (see text for further description of colour codes, p.269-270)

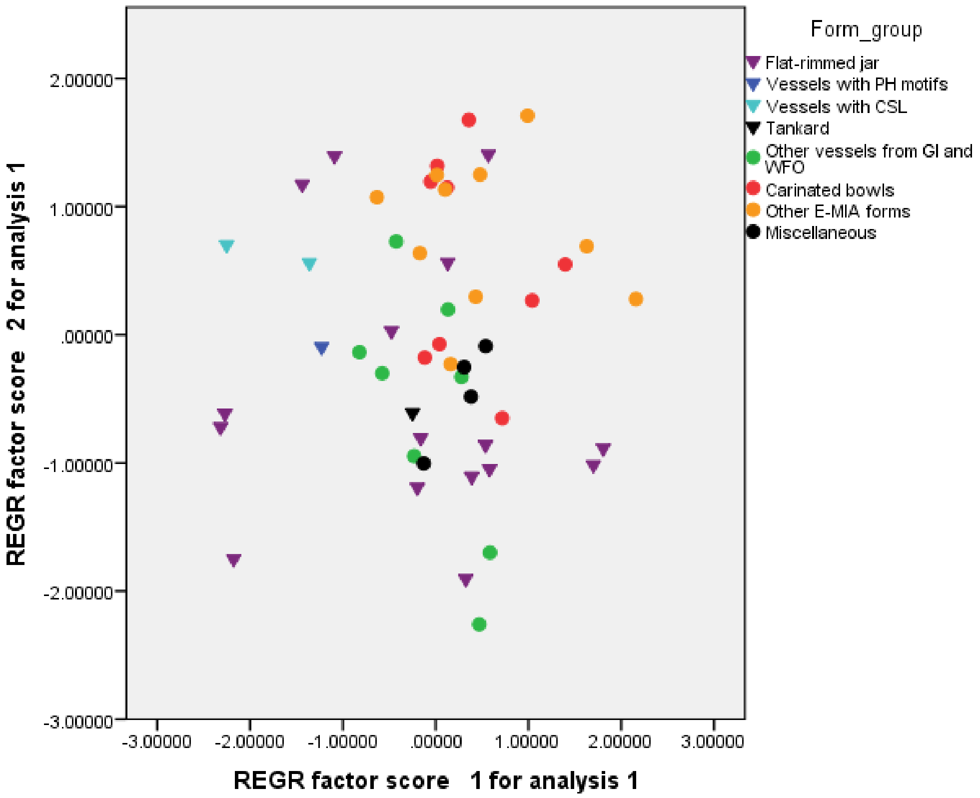

Figure 8.23. Graph of PC1 and PC2, log_{10} data of pottery, excluding Mg and samples 40, 45-50, 52 and 95 (see text for further description of colour codes, p.269-270)

The PCA plots of both the $\log_{10}$ data set and the raw data are difficult to interpret, yet a number of observations may be made. A visual inspection of the colour-coded plots revealed that the flat-rimmed jars, a form synonymous with the Poole Harbour industry, and indicated on the plot by the purple triangles, are found across the plot, predominantly below a value of 1.0 on the x-axis and .0 on the y-axis, but points are also present at greater values on both axes.

The points were then examined without reference to vessel form; five possible groups were identified on the plot of the raw data samples (Figure 8.24, Table 8.18). A tight cluster of 18 points was located around .0 for PC1 (x-axis) and <.0 for PC2 (y-axis) and labelled ‘Group 1’. It contained 18 vessels from Maiden Castle (x 6), Green Island (x 4), the Wytch Farm Oilfield sites (3), Gussage All Saints (x 3), Hengistbury Head (x 1) and Allard’s Quarry (x 1). The forms include typologically early forms, such as the two carinated bowls from Maiden Castle and vessel with fingertip decoration from Gussage All Saints, to Late Iron Age forms, including a tankard from Gussage All Saints - a diagnostic Poole Harbour form. Other typical forms of this industry include six flat-rimmed jars and vessels that were made by this industry but also by others, such as the grooved-rimmed bowls (x 2) and hemispherical bowls with flat-topped rims (x 2). This group includes the three vessels that were analysed by Belinda Coulston (ICP samples 67, 67 and 82), all classed in her ‘compositional group A’. Another two samples might be associated with this group, 70 and 84, both from the Wytch Farm sites: a flat-rimmed jar with petal motif and a shouldered bowl, but on Figure 8.23 are placed in Group 2.

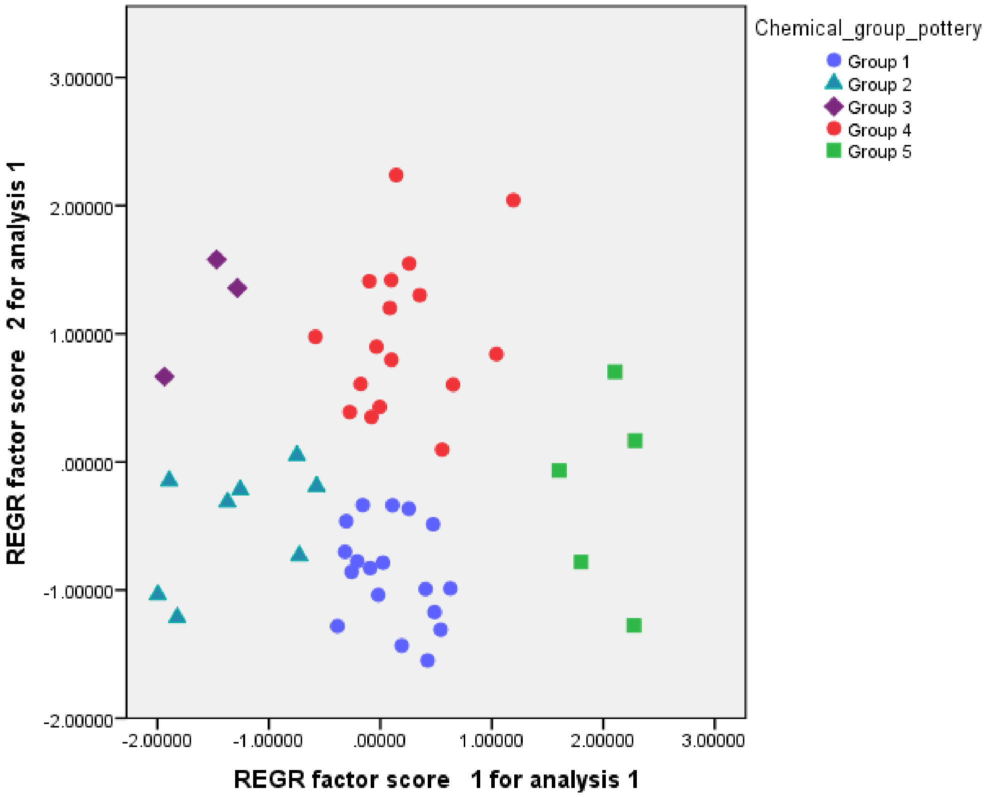

Figure 8.24. Possible groupings of the pottery as indicated by the plot of the raw data of samples (excluding Mg and samples 40, 45-50, 52 and 95)

A second probable group was identified adjacent to Group 1, loading negatively on both axes for PC1 and PC2 (Group 2). This group of eight samples also included vessels from Maiden Castle (x 1), Wytch Farm (x 4), Green Island (x 1) and Allard's Quarry (x 2). The forms comprised four flat-rimmed jars (one with a countersunk handle, one with petal motif and one with a dimple and eyebrow), a jar with countersunk lug handle but of unknown rim form, a bead-rimmed jar with eyebrow motif, an ovoid jar and a shouldered bowl. This group is strongly related to Group 1, in terms of its chemical and typological composition. The third group consists of just three samples, located negatively on the x-axis (PC1) but positively on the y-axis (PC2). It is typologically related to Groups 1 and 2, comprising a flat-rimmed jar with petal motif, a bead-rimmed jar with eyebrow motif and a bead-rimmed jar with countersunk handle. A range of petrological fabrics was present in compositional groups 1-3, most containing elongated argillaceous inclusions. Three vessels were characterised by fine to medium-grained quartz. Thirteen were dominated by medium-grained quartz, two of these also contained sparse limestone and three had above average quantities of the elongated argillaceous inclusions. A further five were dominated by medium to coarse-sized quartz grains, one of these with sparse limestone. One was coarse-grained and another was very coarse-grained. Four vessels did not contain the characteristic elongated argillaceous inclusions: one was a very fine to fine-grained fabric with a silty matrix (ICP sample 94), another contained fine to coarse quartz in a silty matrix (ICP sample 51) and two were medium to coarse-grained with sparse limestone (ICP samples 43 and 44).

A group of 17 samples was identified around the .0 point for PC1 but positively on PC2 (Group 4). It varied from the previously identified groups in that 13 of the 17 samples came from sites to the south of the Purbeck Ridge (eight from Rope Lake Hole and five from Eldon's Seat). The forms included six carinated bowls (five were red-finished); a hemispherical bowl with flat-topped rim (red-finished); a large, open-mouthed bowl; two bowls with internally flanged, flat-topped rim (both red-finished); a bowl with internal dropped flange; a large, shouldered jar and a thick-walled jar with everted rim (red-finished). This group also includes a jar with grooved, twisted rim from West Creech, a flat-rimmed jar from Hengistbury Head, and a bead-rimmed bowl and saucepan pot from Allard's Quarry. In terms of the petrological fabrics, the samples of this group were wide ranging. Thirteen contained elongated argillaceous inclusions, four did not. Those with these inclusions comprised one vessel with very fine to fine quartz, one with fine to medium quartz, one with medium quartz and sparse limestone, three with medium to coarse quartz and sparse limestone, three with coarse to very coarse quartz and two with very coarse quartz. One had very fine to coarse quartz in a silty matrix. Those without elongated argillaceous inclusions comprised two with medium-grained quartz (one with sparse flint/chert) and two with medium to coarse-grained quartz and sparse limestone, in a poorly wedged matrix; the latter were all from Eldon's Seat.

A fifth group, of five samples, was located around a value of 2 for PC1 but between <-1 and 1 on PC2. It contained a mix of forms, including two flat-rimmed jars (one with petal motif from Southdown Ridge, and one with eyebrow motif from Gussage All Saints), a bowl from Rope Lake Hole, and a carinated, furrowed bowl and a jar from Football Field, Worth Matravers. Again there was no consistency in petrological fabrics within this group, ranging from a very fine to coarse-grained sandy fabric in a silty matrix (ICP sample 53) to a coarse-grained fabric, but all contained elongated argillaceous inclusions, and none contained greater than 2% limestone.

Table 8.18. Details of samples in compositional groups for the raw data and log10 data

NB sample 57 was subsequently assigned to Group 3, and sample 70 to group 1 (See Table 8.20)

Raw data group	**Log_{10} group**	**Sample**	**Site**	**Form**
1	1	43	Maiden Castle	Flat-rimmed jar
1	1	44	Maiden Castle	Hemispherical bowl with flat-topped rim
1	1	51	Hengistbury Head	Flat-rimmed jar
1	1	56	Green Island	Bowl with grooved rim
1	1	61	Gussage All Saints	Tankard
1	1	63	Gussage All Saints	Flat-rimmed jar with eyebrow motif
1	1	65	Allard's Quarry	Bowl with channelled rim
1	1	67	Maiden Castle	Bead-rimmed vessel with grooved lines
1	1	68	Maiden Castle	Flat-rimmed jar with double eyebrow motif
1	7	72	Green Island	Hemispherical bowl with flat rim
1	7	73	Green Island	Upright-necked jar with proto-bead rim
1	1	74	Gussage All Saints	Bead-rimmed vessel with fingertip decoration
1	1	76	West Creech	Jar with internal hooked, flanged rim
1	7	78	East of Corfe River	Flat-rimmed jar
1	1	79	West Creech	Proto-bead rimmed vessel, convex profile
1	1	80	Green Island	Flat-rimmed jar
1	1	82	Maiden Castle	Carinated bowl, red finished
1	1	94	Maiden Castle	Carinated bowl
2	2	57	East of Corfe River	Flat-rimmed jar with dimple and eyebrow
2	1	58	Allard's Quarry	Bead-rimmed jar with eyebrow motif
2	3	59	Allard's Quarry	Countersunk-handled jar
2	1	70	Ower Peninsula	Flat-rimmed jar with petal motif
2	2	71	Green Island	Flat-rimmed jar
2	1	77	West of Corfe River	Ovoid jar with plain rim
2	1	84	West Creech	Shouldered bowl
2	2	100	Maiden Castle	Flat-rimmed jar with countersunk lug handle
3	3	62	Gussage All Saints	Flat-rimmed jar with petal motif
3	3	64	Allard's Quarry	Bead-rimmed jar with eyebrow motif
3	3	69	Furzey Island	Bead-rimmed jar with countersunk handle
4	5	41	Rope Lake Hole	Carinated bowl, red-finished
4	4	54	Allard's Quarry	Bead-rimmed bowl
4	1	55	Hengistbury Head	Flat-rimmed jar
4	4	60	Rope Lake Hole	Bowl with internally flanged, flat-topped rim, red-finished
4	1	66	Allard's Quarry	Saucepan pot
4	1	83	West Creech	Jar with grooved rim, twisted effect
4	4	85	Rope Lake Hole	Carinated bowl
4	4	86	Rope Lake Hole	Large, shouldered jar
4	4	87	Rope Lake Hole	Carinated bowl with flaring rim, red-finished

4	4	88	Rope Lake Hole	Bowl with internally flanged, flat-topped rim, red-finished
4	1	89	Rope Lake Hole	Bowl with internal dropped flange
4	1	91	Rope Lake Hole	Carinated bowl with flaring rim, red-finished
4	4	93	Eldon’s Seat	Large, open-mouthed bowl
4	1	96	Eldon’s Seat	Thick-walled jar with everted rim, red-finished
4	4	97	Eldon’s Seat	Long-necked, carinated bowl, red-finished
4	4	98	Eldon’s Seat	Long-necked, carinated bowl, red-finished
4	4	99	Eldon’s Seat	Hemispherical bowl with flat-topped rim, red-finished
5	5	42	Worth Matravers	Upright rim, probably from a tripartite bowl or jar
5	5	53	Rope Lake Hole	Open bowl with plain rim
5	6	75	Gussage All Saints	Flat-rimmed jar with eyebrow motif
5	5	81	Worth Matravers	Carinated, furrowed bowl
5	6	92	Southdown Ridge	Flat-rimmed jar with petal motif

Seven groups were identified in the $\log_{10}$ data (Figure 8.25). Three of the raw data Group 1 vessels were separated from the main cloud, and identified as Group 7. They comprised two vessels from Green Island (ICP samples 72 and 73) and one from East of Corfe River (ICP sample 78). Group 2 was reduced to three samples (ICP 57, 71 and 100, all flat-rimmed jars) as four clustered with Group 1 (ICP samples 58, 70, 77 and 84; one from Allard’s Quarry and the rest from the Wytch Farm Oilfield sites) and one with Group 3 (ICP sample 59, a countersunk handled jar from Allard’s Quarry). Six of the vessels identified as Group 4 in the raw data were placed in Group 1 when using the $\log_{10}$ data. This included two vessels that might be expected to have clustered with Group 1, such as a flat-rimmed jar from Hengistbury Head (ICP sample 55) and a jar with twisted rim from West Creech (ICP sample 83) but also a saucepan pot from Allard’s Quarry (ICP sample 66), two bowls from Rope Lake Hole (ICP samples 89 and 91) and a jar from Eldon’s Seat (ICP sample 96). Another bowl from Rope Lake Hole (ICP sample 41), classed as Group 4 with the raw data, was placed in Group 5 using the $\log_{10}$ data. Two samples (ICP 75 and 92, both flat-rimmed jars) split from Group 5 in the raw data classification and were identified as Group 6 using the $\log_{10}$ data, this split can also be supported by the raw data as both of these samples are located below the .0 value on the y-axis of Figure 8.24 and above 1.0 on the x-axis.

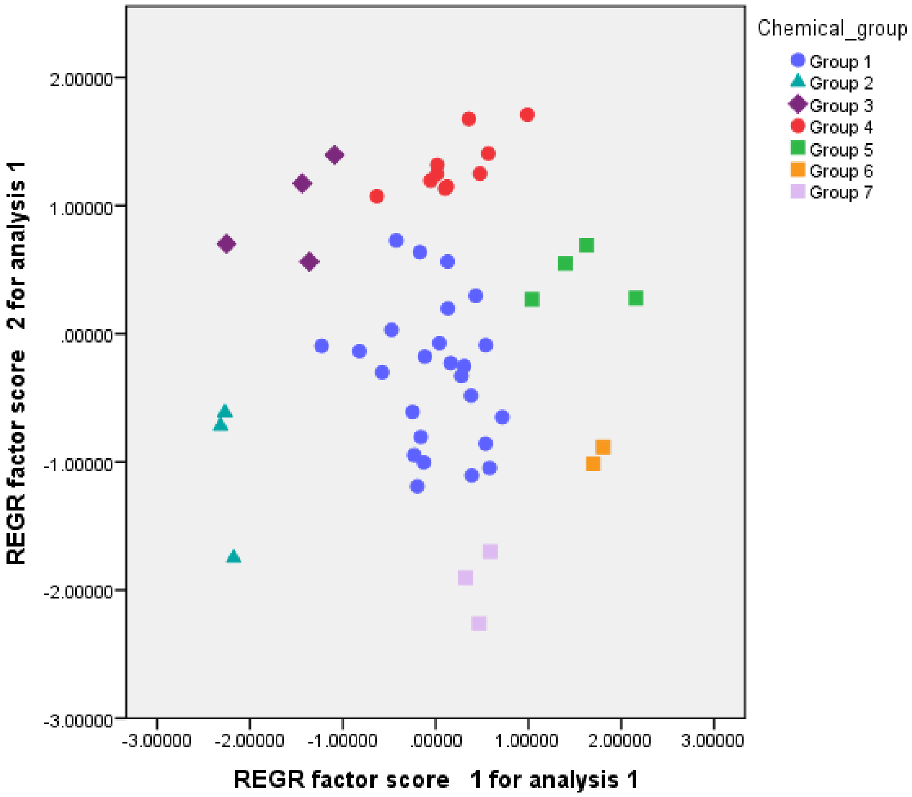

Figure 8.25 Possible groupings of the pottery as indicated by the plot of the log_{10} data of samples (excluding Mg and samples 40, 45-50, 52 and 95)

Discriminant function analysis of pottery groups identified by PCA

The groups detailed in Table 8.18 were evaluated using a discriminant function analysis. For the log_{10} data the analysis took through three elements (K, Y and Ce), all others failed to comply with the Wilks' Lambda criteria (f >3.84; Appendix G, Table G20). From the variables left in the analysis, SPSS found three discriminant functions, the first accounting for 60.6% of the variance, the second for 35.6% and the third for 3.8% (Appendix G, Table G21), all were significant (Appendix G, Table G22). The analysis predicted group membership (generated by investigation of the PC plots) with an accuracy of 72.5%. Those samples with a different predicted group to the original classification are shown in Table 8.19. The groups are plotted on Figure 8.26 and this indicates that the Group 7 samples are, as indicated in the raw data, part of Group 1.

Table 8.19. Discrepancies in the original and predicted group membership of the log_{10} pottery data, excluding samples 40, 45-50, 52 and 95

Sample	Original group	Predicted group
43	5	1
55	1	4
58	1	3
66	1	5
67	1	7
68	1	5
69	3	2
72	7	1
84	1	7
86	4	5
89	1	5
91	1	4
94	1	7
96	1	4

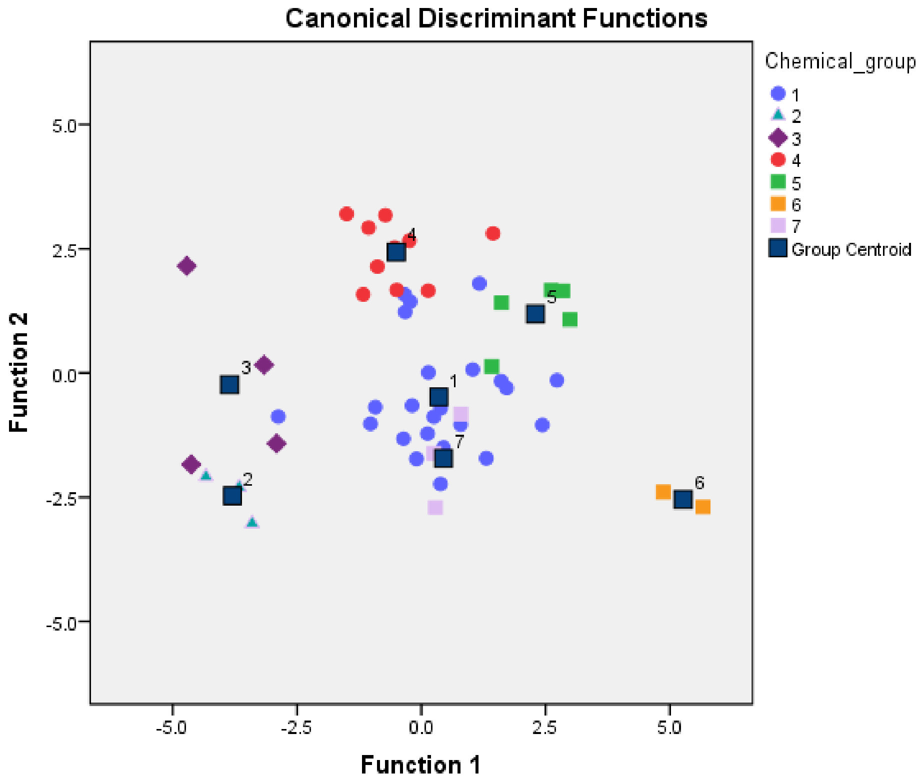

Figure 8.26 Discriminant function analysis of chemical groups of log_{10} pottery data, (excluding samples 40, 45-50, 52 and 95), identified using PCA

The process was repeated for the groups identified during the PCA of the raw data. The analysis took through five elements (Al, Na, Cu, Y and Ce), all others failed to comply with the Wilks' Lambda criteria (f >3.84; Appendix G, Table G23). From the variables left in the analysis, SPSS found four discriminant functions, the first accounting for 60.3% of the variance, the second for 35.6%, the third for 3.3% and the fourth for .7% (Appendix G, Table G24), three were significant (Appendix G, Table G25). The analysis predicted group membership (generated by investigation of the PC plots) with an accuracy of 96.1% (Figure 8.27). Those samples with a different predicted group to the original classification are shown in Table 8.20. As the groupings generated by the PCA plots of the raw data produced fewer discrepancies in the function analysis that the $\log_{10}$ data, it was decided to use the raw data groupings. Based on these results, it was also decided to assign ICP sample 57 to Group 3 and ICP sample 70 to Group 1.

Table 8.20 Discrepancies in the original and predicted group membership of the raw pottery data, excluding samples 40, 45-50, 52 and 95

Sample	Original group	Predicted group
57	2	3
70	2	1

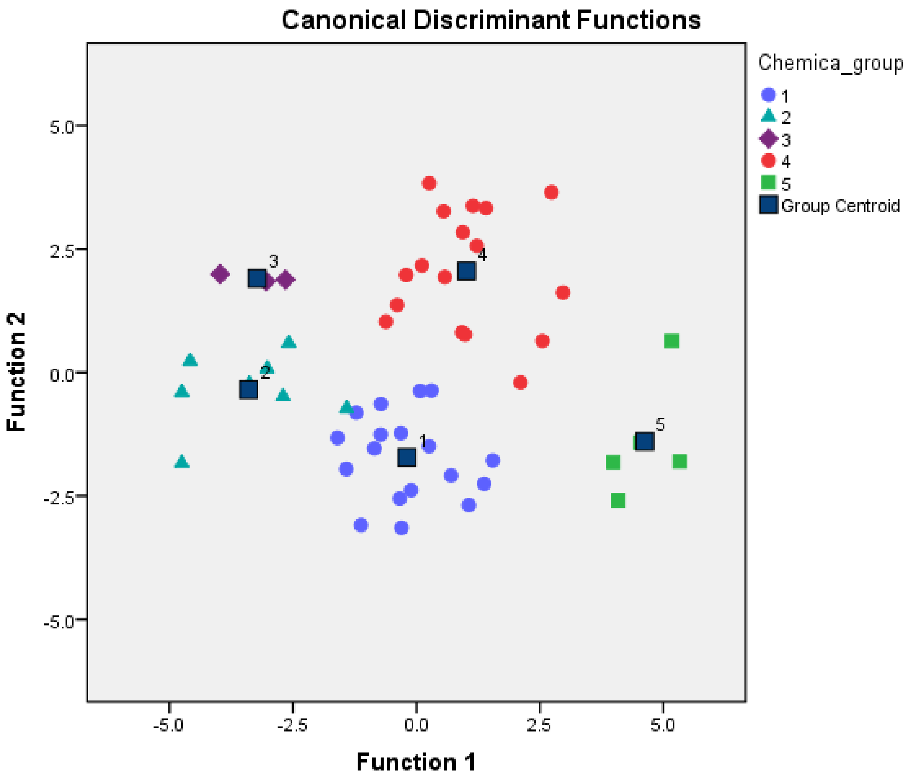

Figure 8.27. Discriminant function analysis of chemical groups of raw pottery data, (excluding samples 40, 45-50, 52 and 95), identified using PCA

8.2.6 Potential clay sources

The potential clay source of the pottery groups was then evaluated by running a PCA on each compositional group and all the clay samples. Given the higher score of the original and predicted group membership of the chemical groups in the discriminant function analysis for the pottery, it was decided to use the raw data in this analysis.

Compositional group 1

A PCA was run for the pottery samples in compositional group 1 and the clay samples, excluding Mg. The analysis yielded a KMO value of .714 and found five principal components (Appendix G, Figure G75), together accounting for 79.9% of the variance (component 1: 37.6%; component 2: 18.9%; component 3: 9.5%; component 4: 7%; component 5: 7%). The component matrix is presented in Appendix G, Table G26. In a plot of the components in rotated space, barium (Ba) and the rare earths (Ce, La, Nd, Tm, Y) showed the most separation (Figure 8.28).

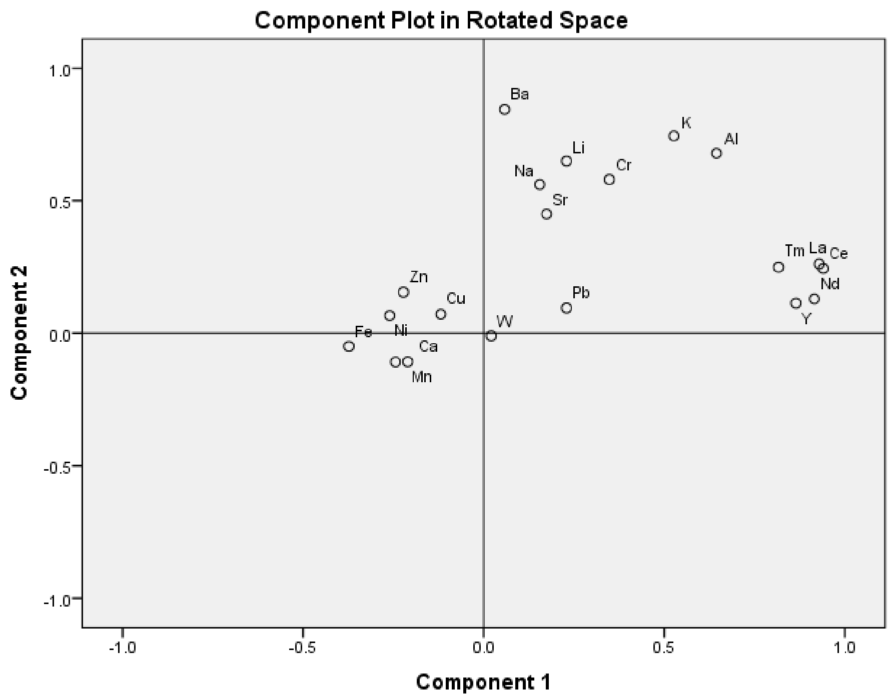

Figure 8.28. Rotated component plot of principal components for the clays and compositional group 1 of the pottery (raw data, excluding Mg)

The principal components were plotted on a graph to examine the clays that appeared to be the most similar to the pottery. The effect of tempering was investigated by comparing samples of clay from Arne Beach in their raw state (ICP samples 36 and 38; annotated on the plots as 'pre-tempered clay'), the same clay tempered with 15% quartz and 2% shale (ICP samples 37 and 39, annotated on the plots as 'tempered clay') and clay samples from two auger holes that varied in terms of their quartz content. Two clay samples taken from a single auger hole on Wytch Heath were found to be much sandier in the lower part of the auger hole (ICP sample 10, field sample 1B) than the purer clay towards the top (ICP sample 9, field sample 1A); whilst two samples from a single auger hole at Lower Lynch Farm were sandier in the upper part (ICP sample 2, field sample 4A) than the lower part (ICP sample 3, field sample 4B). In the plot of PC1 and PC2 the pottery clusters together and the clays are more spread (Figure 8.29).

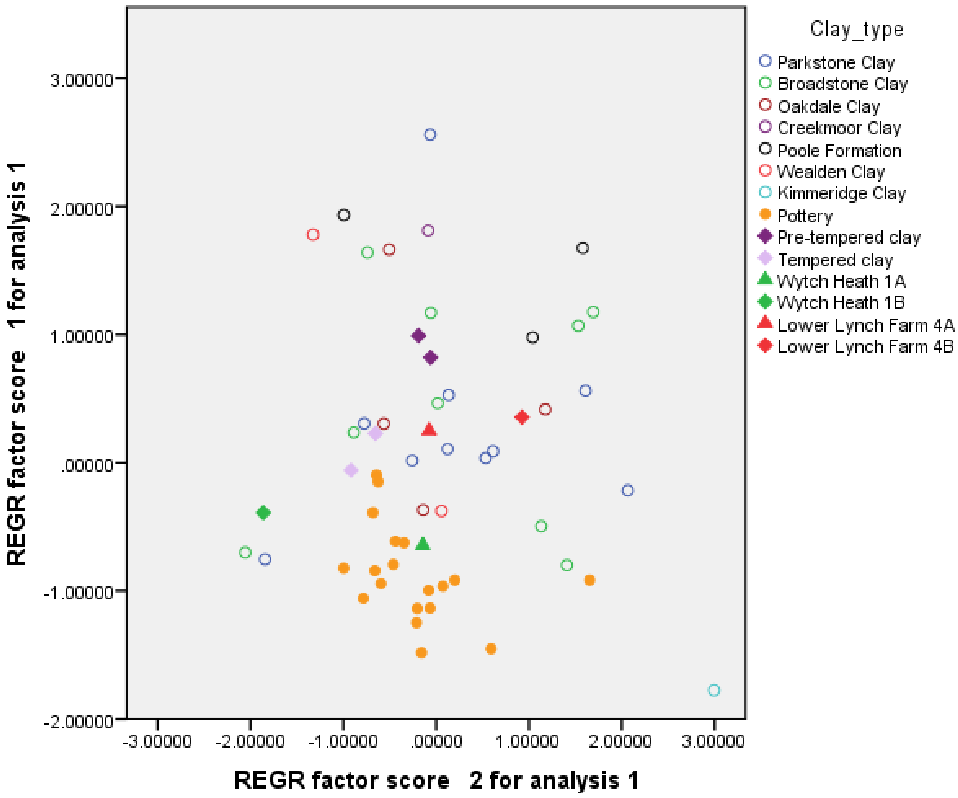

Figure 8.29. Plot PC1 and PC2 for the clays and compositional group 1 of the pottery (raw data, excluding Mg)

As noted previously, Michael Hughes, formerly the Principal Scientific Officer at the British Museum, has suggested plotting PC2 and PC3 to help account for the variance caused by the tempering of the clay. The pre-tempered clay and tempered clay samples from Arne Beach plot a little closer together in a graph of PC2 and PC3 (Figure 8.30) than PC1 and PC2, yet the Wytch Heath samples are still separated and the pottery becomes far more spread. Four pottery samples are more distant to the main groups, these are ICP sample 79, at the top of the graph, a barrel-shaped jar from West Creech; and a group of three to the right of the graph: ICP sample 43, a flat-rimmed jar from Maiden Castle, ICP sample 61, a tankard from Gussage All Saints, and ICP sample 68, a flat-rimmed jar with double eyebrow motif, from Maiden Castle. No conclusions may be drawn about the clay sources of this group from this plot, other than the sample of Kimmeridge Clay appears to be the most removed.

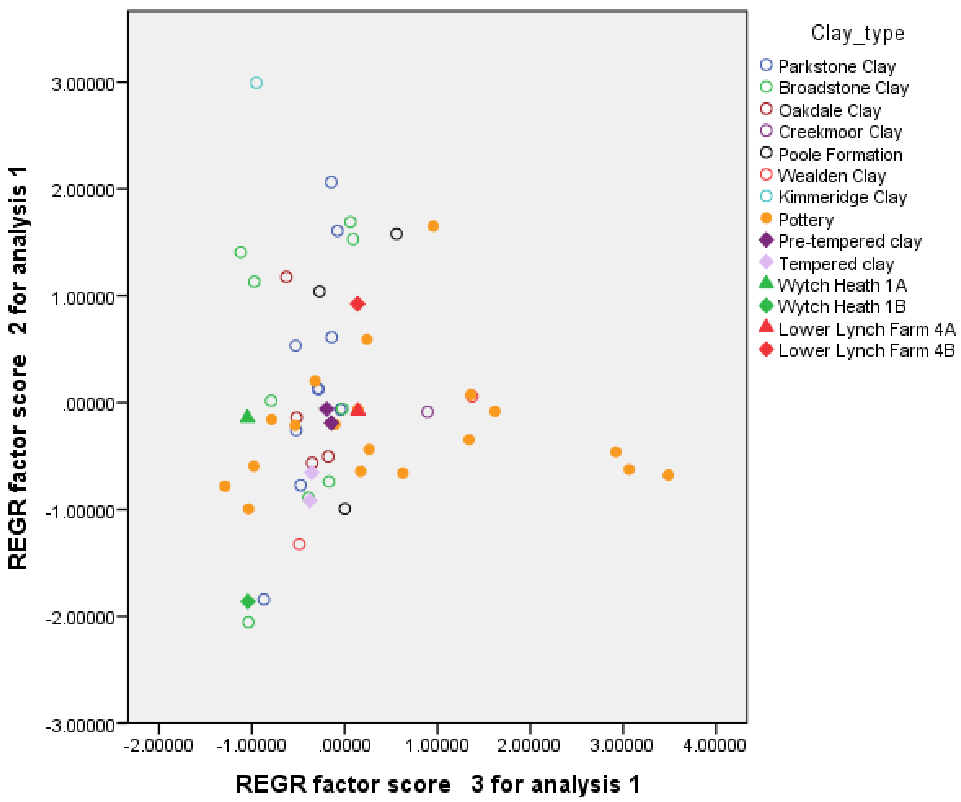

Figure 8.30 Plot PC2 and PC3 for the clays and compositional group 1 of the pottery (raw data, excluding Mg)

PC3 and PC4 were then plotted and this helped bring together the tempered and un-tempered clay together the best, and also two samples of Wealden Clay from a single auger hole (Lower Lynch House field samples 4A and 4B) and Broadstone Clay from Wytch Heath (samples 1A and 1B; Figure 8.31). Three pottery vessels are removed from the main cloud of points, these also separated in the plot of PC2 and PC3.

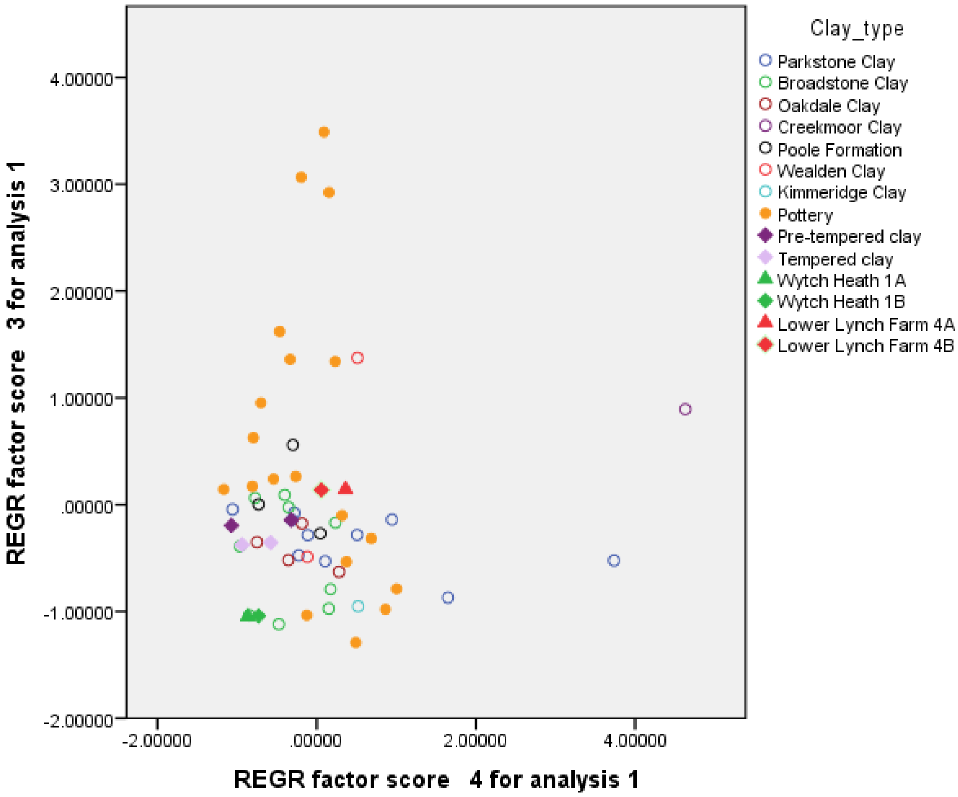

Figure 8.31 Plot PC3and PC4 for the clays and compositional group 1 of the pottery (raw data, excluding Mg)

Bivariate plots were made of Ba and each of the rare earth elements (Ce, La, Nd, Tm and Y; Appendix G, Figures G76-79). Sample 79, a barrel-shaped jar from West Creech, was found to be an outlier in each. The other pottery samples clustered together in these plots, with some overlap with the clays in the plot of Ba and Y. No conclusions may be drawn about the clay source for compositional group 1, other than the clay may have been drawn from any of the sources sampled during this research.

Compositional group 2

A PCA was run for the pottery samples in compositional group 2 and the clay samples, excluding Mg. The analysis yielded a KMO value of .679 and found five principal components (Appendix G, Figure G80), together accounting for 80% of the variance (component 1: 34.8%; component 2: 22.4%; component 3: 9.5%; component 4: 7.4%; component 5: 9%). The component matrix is presented in Appendix G, Table G27. In a plot of the components in rotated space, Ni, Mn and Nd, Y, Ce showed the most separation (Figure 8.32).

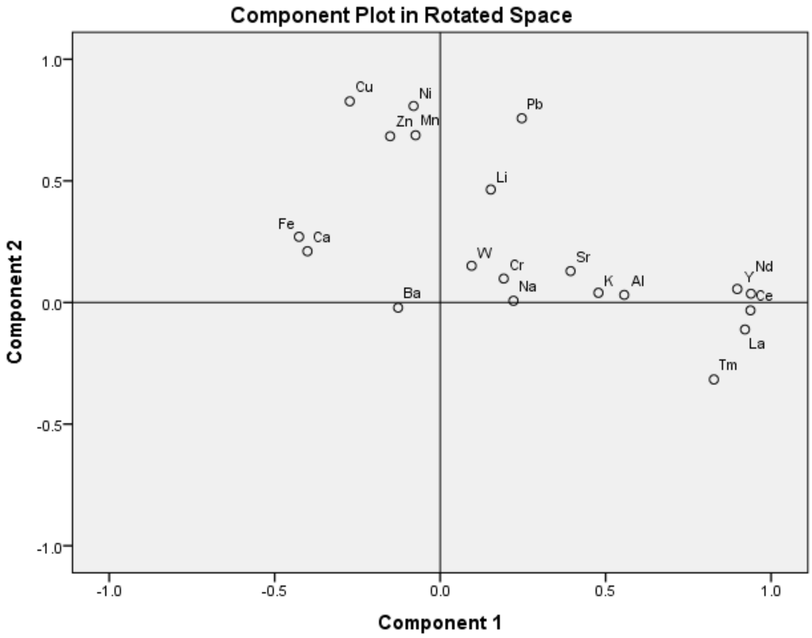

Figure 8.32. Rotated component plot of principal components for the clays and compositional group 2 of the pottery (raw data, excluding Mg)

Graphs were made of the various pairs of principal components (Figures 8.33-8.35). In the plot of PC1 and PC2, the six pottery samples cluster together, and are near to ICP clay sample 15 (Bourne Bottom, sample 5) and the clay sample from Kimmeridge Bay (Figure 8.33). The two samples from a single auger hole at Wytch Heath, divided according to their quartz content, are overlapping; two Wealden clay samples from a single auger hole at Lower Lynch Farm are fairly close to each other, whilst the tempered and untempered clay samples from Arne Beach are more separated and in this case it appears to be the shale rather than the quartz causing the separation. There is greater overlap between the pots and the clays in the plot of PC2 and PC3 (Figure 8.34), but the Wytch Heath sample 1 points have separated, thereby suggesting that this plot is affected by the dilution effect of the quartz. In the plot of PC3 and PC4 these two points are even further removed from each other, although the tempered and untempered clay samples remain fairly consistent in their relationship to one another (Figure 8.35). No conclusions may be drawn concerning the clay sources for group 2 vessels.

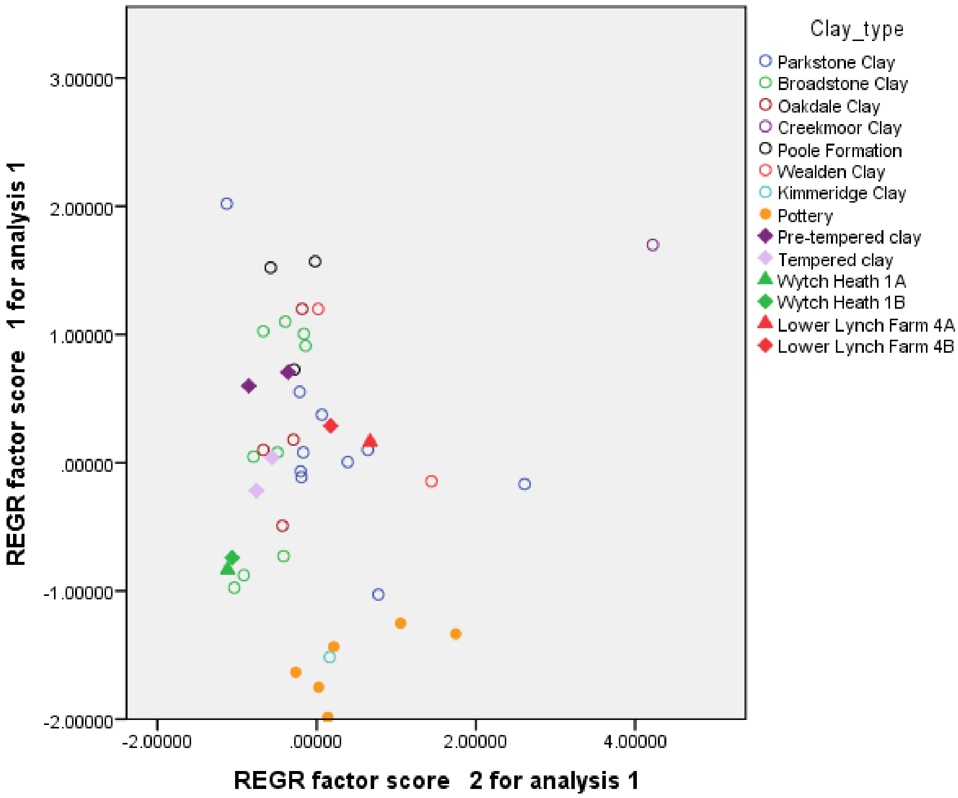

Figure 8.33. Plot PC1 and PC2 for the clays and compositional group 2 of the pottery (raw data, excluding Mg)

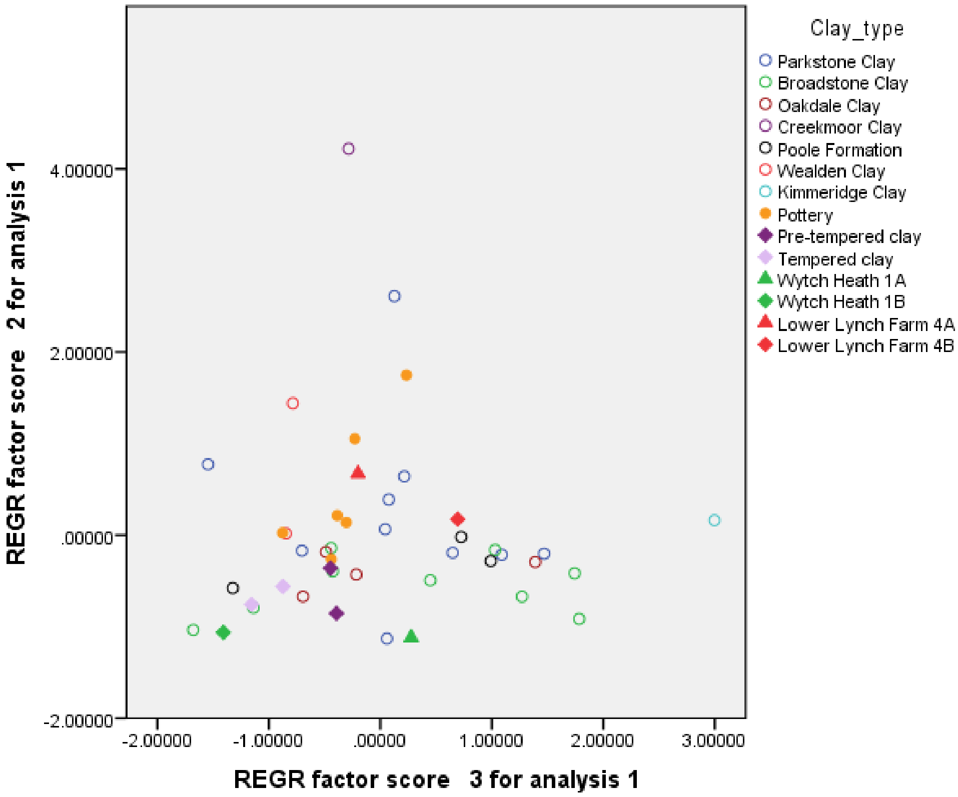

Figure 8.34. Plot PC2 and PC3 for the clays and compositional group 2 of the pottery (raw data, excluding Mg)

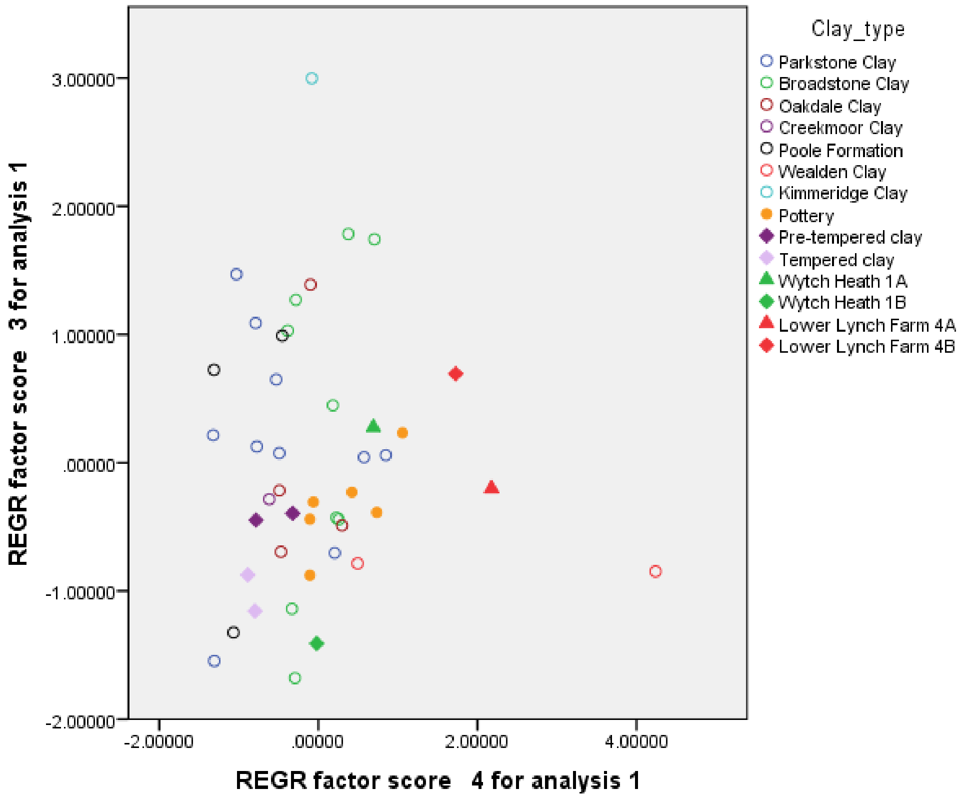

Figure 8.35. Plot PC3 and PC4 for the clays and compositional group 2 of the pottery (raw data, excluding Mg)

Compositional group 3

An attempt to run a PCA on the four pottery samples in compositional group 3 and the clays (excluding Mg) failed, so the other elements with missing values (Al, K) were also excluded. The PCA then generated a KMO value of .653 and found five principal components (Appendix G, Figure G81), together accounting for 81.3% of the variance (component 1: 31.2%; component 2: 25.5%; component 3: 10.3%; component 4: 8.7%; component 5: 7%). The component matrix is presented in Appendix G, Table G28.

A plot of PC1 and PC2 found the four pottery samples cluster together (Figure 8.36). The Wytch Heath and Lower Lynch Farm samples that came from single auger holes are plotted in close proximity on the graph, whilst there is some separation between the tempered and un-tempered clay samples from Arne Beach. On the plot of PC2 and PC3 (Figure 8.37) the pottery splits, with samples 57 and 69 (a flat-rimmed jar with dimple and eyebrow motif and a bead-rimmed jar with countersunk lug handles) on the left side and samples 62 and 64 (a flat-rimmed jar with petal motif and a bead-rimed jar with eyebrow motif) on the right. The tempered and untempered clays, and clays from the same auger holes, are fairly spread. The same patterns are revealed in the plot of PC3 and PC4 (Figure 8.38).

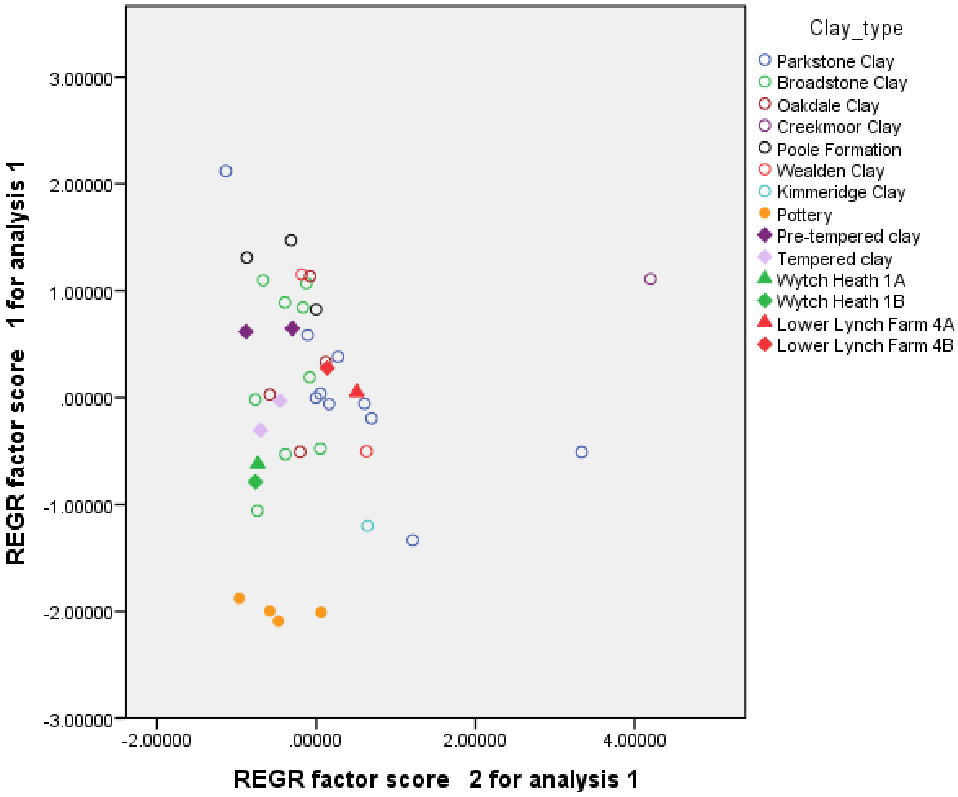

Figure 8.36. Plot PC1 and PC2 for the clays and compositional group 3 of the pottery (raw data, excluding Al, K, Mg)

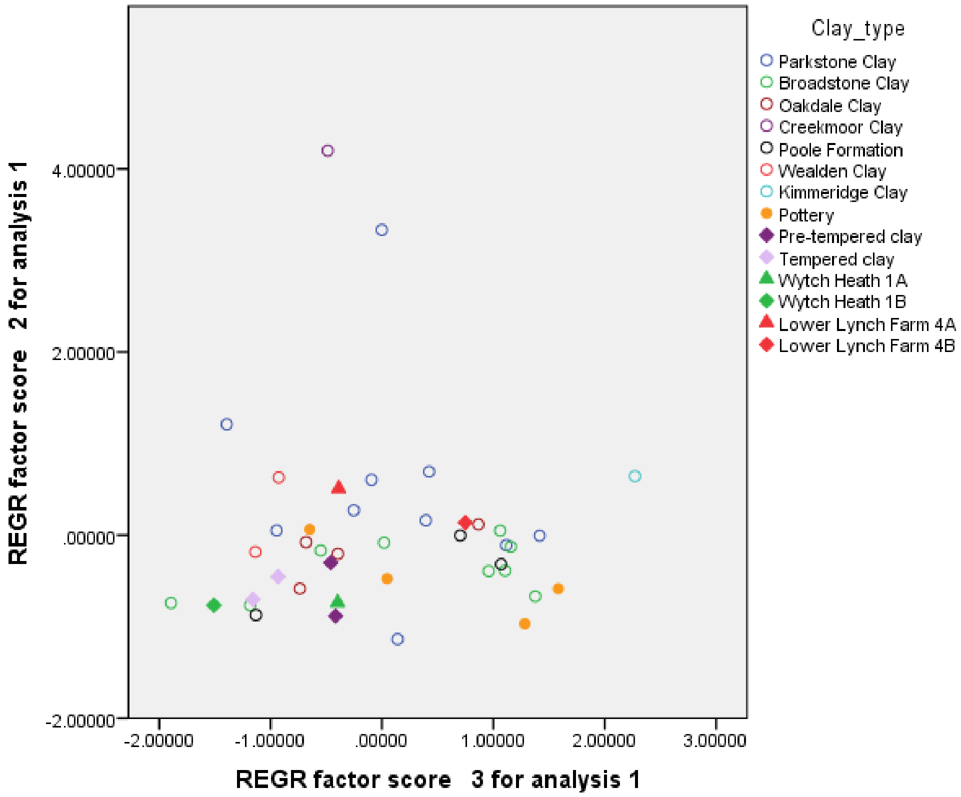

Figure 8.37. Plot PC2 and PC3 for the clays and compositional group 3 of the pottery (raw data, excluding Al, K, Mg)

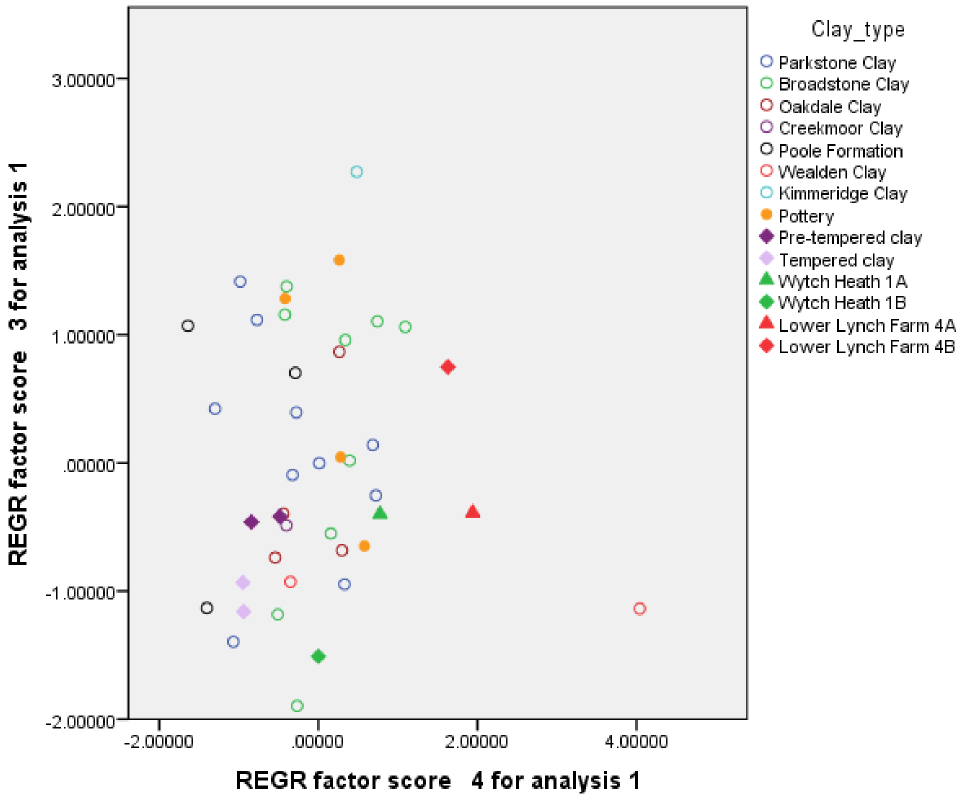

Figure 8.38. Plot PC3 and PC4 for the clays and compositional group 3 of the pottery (raw data, excluding Al, K, Mg)

Compositional group 4

A PCA was run on the 17 pottery samples in compositional group 4 and the clays (excluding Mg), generating a KMO value of .686. It found five principal components (Appendix G, Figure G82), together accounting for 79.1% of the variance (component 1: 34.6%; component 2: 21.6%; component 3: 9.2%; component 4: 7.5%; component 5: 6.3%). The component matrix is presented in Appendix G, Table G29. In a plot of PC1 and PC2, the pottery clusters together, and is associated with a single Wealden clay sample from SE Purbeck (Figure 8.39). The Wytch Farm and Lower Lynch House samples from the single auger hole show little affect in terms of quartz dilution, although there is some separation between the tempered and un-tempered clay samples from Arne Beach, probably related to the shale inclusions. A plot of PC2 and PC3 (Figure 8.40) has integrated some clay samples with the pottery, with seven samples plotted close to the main pottery spread: Upton Country Park (field sample 1), SE Purbeck (field sample 6), Lower Lynch House (field samples 4A and 4B), Creech Heath (field sample 2), Arne (South of Bank Gate Cottages, field sample 1) and Ower Bay (field sample 1). However, the two samples from Wytch Heath are now more separated, as are the two from Lower Lynch House. The tempered and un-tempered samples became a little closer together. In the plot of PC3 and PC4 the samples from Wytch Heath have become further separated suggesting that this plot is more affected by the dilution effect, although the spatial relationship between the tempered and un-tempered samples has changed little (Figure 8.41).

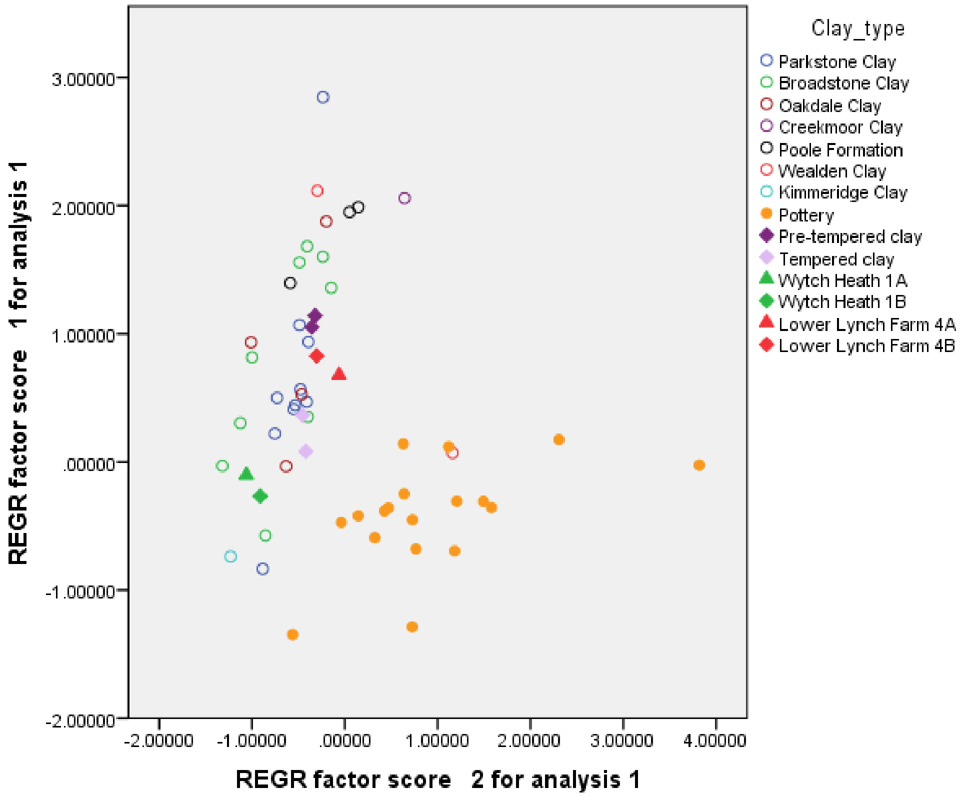

Figure 8.39. Plot PC1 and PC2 for the clays and compositional group 4 of the pottery (raw data, excluding Mg)

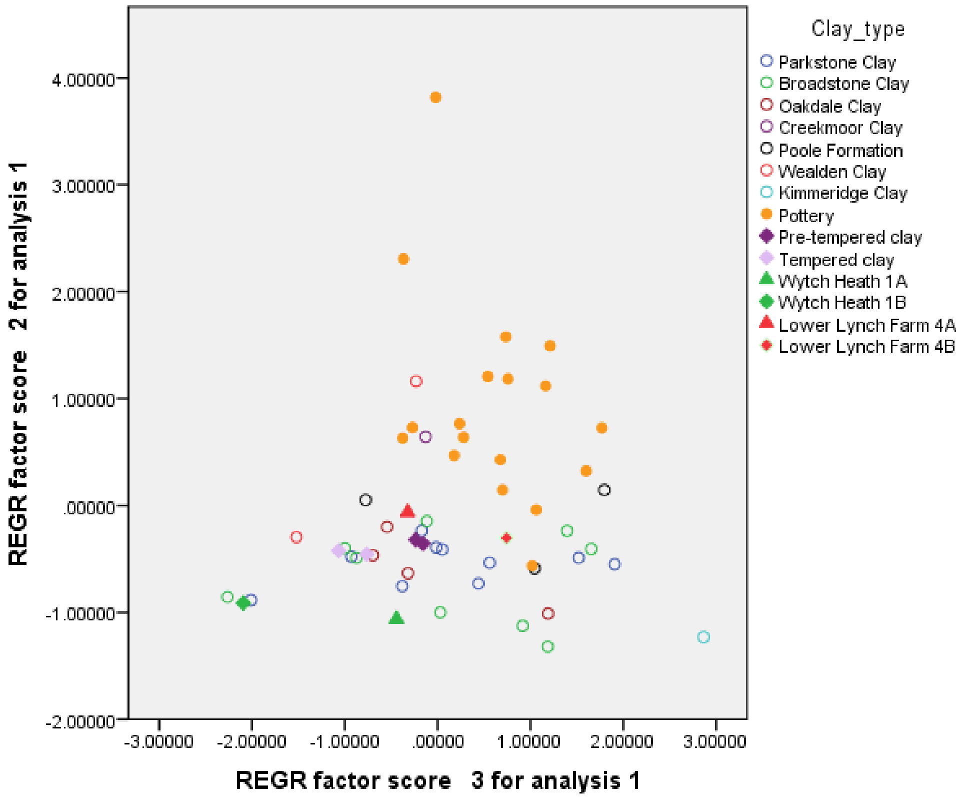

Figure 8.40. Plot PC2 and PC3 for the clays and compositional group 4 of the pottery (raw data, excluding Mg)

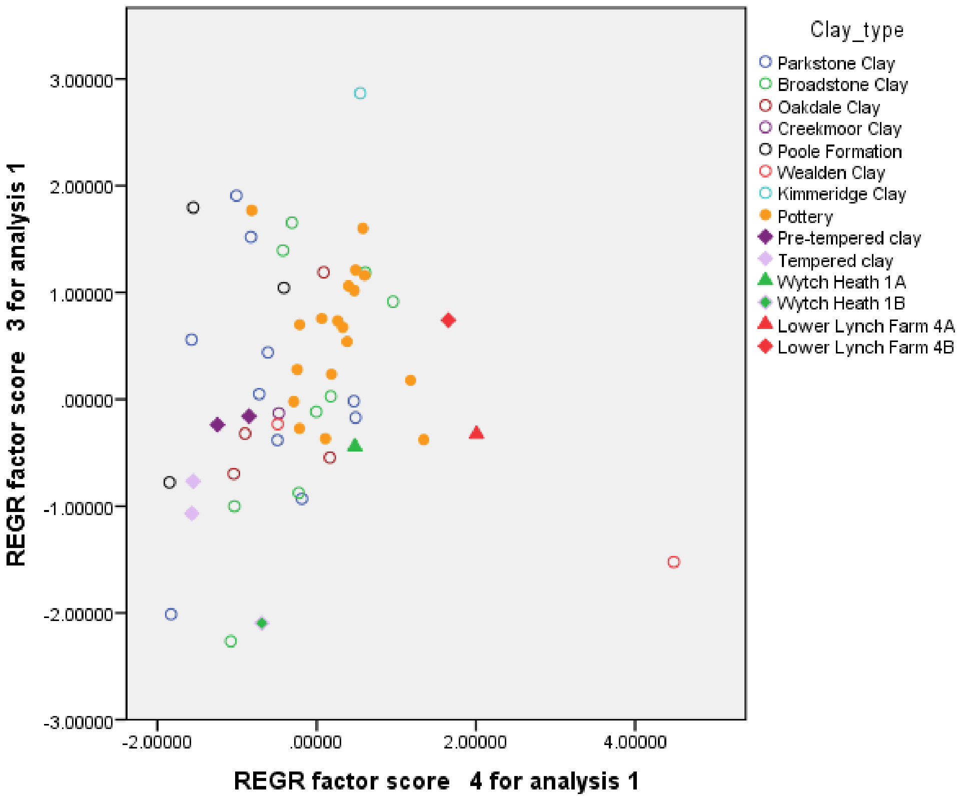

Figure 8.41. Plot PC3 and PC4 for the clays and compositional group 4 of the pottery (raw data, excluding Mg)

Compositional group 5

A PCA was run for the five pottery samples in compositional group 5, and the clays. Three elements were excluded from the analysis (Al, K and Mg) as the missing values for these elements were found to reduce the KMO value (.608 after exclusion). Five principal components were found (Appendix G, Figure G83), together accounting for 79% of the variance (component 1: 27.8%; component 2: 24.8%; component 3: 10.2%; component 4: 9.6%; component 5: 6.7%). The component matrix is presented in Appendix G, Table G30.

A plot of PC1 and PC2 found the samples from the single auger holes at Wytch Heath and Lower Lynch House were little affected by dilution (Figure 8.42). Three pottery samples plotted on the right hand side of the graph with the Wealden clays. These are sample 53 (a bowl from Rope Lake Hole), sample 75 (a flat-rimmed jar with eyebrow from Gussage All Saints) and sample 92 (a flat-rimmed jar with petal motif from Southdown Ridge). The other two samples (42 and 81) were located towards the centre of the graph and both came from Football Field, Worth Matravers. The centremost, sample 42, was within a cloud of clay samples from other clay members. In a plot of PC2 and PC3 (Figure 8.43) the tempered and untempered clays from Arne Beach came closer together, there was little change in the Wytch Heath and Lower Lynch House points. Again three pottery samples (ICP 53, 75, 92) were grouped with the Wealden clays, whilst the two from Football Field, Worth Matravers were closer to the other clays, particularly ICP sample 42. The plot of PC3 and PC4 (Figure 8.44) shows a different picture, with the Football Field pottery samples isolated, and a cluster containing most of the clay samples and the other three pottery samples in the lower left quadrant of the graph. The samples from the single auger holes at Wytch Heath and Lower Lynch House plot close to the other samples from each hole, and the tempered and un-tempered clays are also adjacent to each other. The outlying clay samples are ICP samples 17 (Upton Country Park, field sample 1), 24 and 15 (Bourne Valley, field sample 3 and 5) and 22 (Brownsea Island field sample 14).

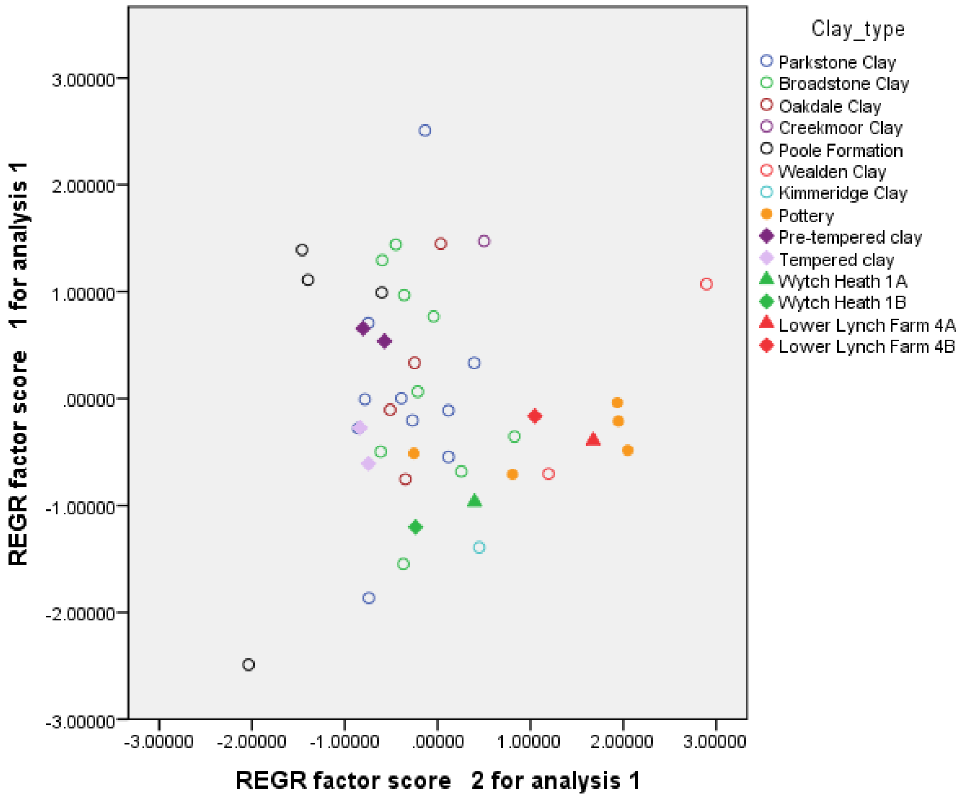

Figure 8.42. Plot PC1 and PC2 for the clays and compositional group 5 of the pottery (raw data, excluding Al, K, Mg)

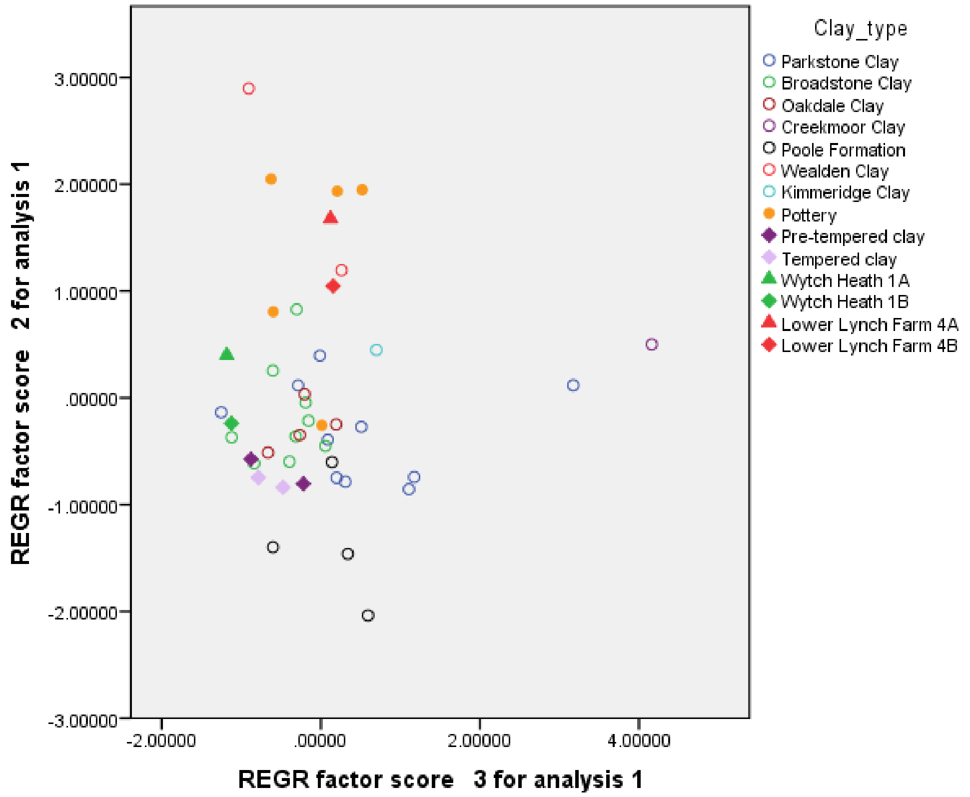

Figure 8.43. Plot PC2 and PC3 for the clays and compositional group 5 of the pottery (raw data, excluding Al, K, Mg)

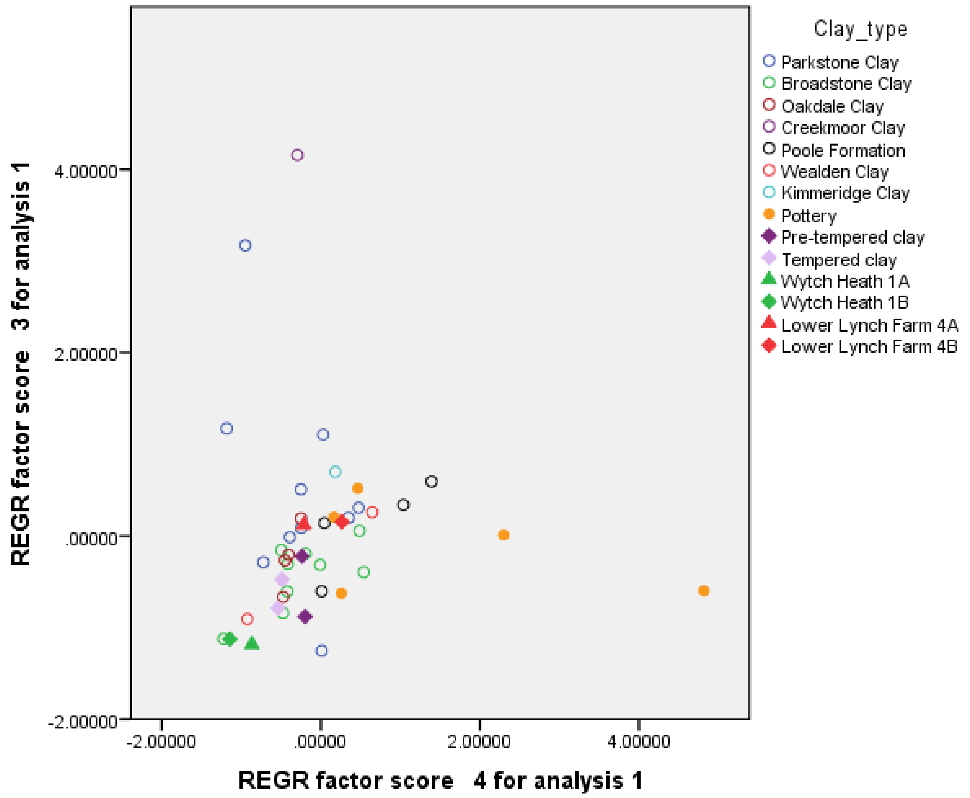

Figure 8.44. Plot PC3 and PC4 for the clays and compositional group 5 of the pottery (raw data, excluding Al, K, Mg)

The rotated (varimax) matrix was plotted in two dimensions to identify the elements that strongly influence the principal components for compositional group 5 (Figure 8.45). The elements showing the most variation were Zn, Ni, Mn and Y, Nd, Ce. Bivariate plots were made of these elements, the most similar clay samples are presented in Table 8.21 (Appendix G, Figures G84-G91).

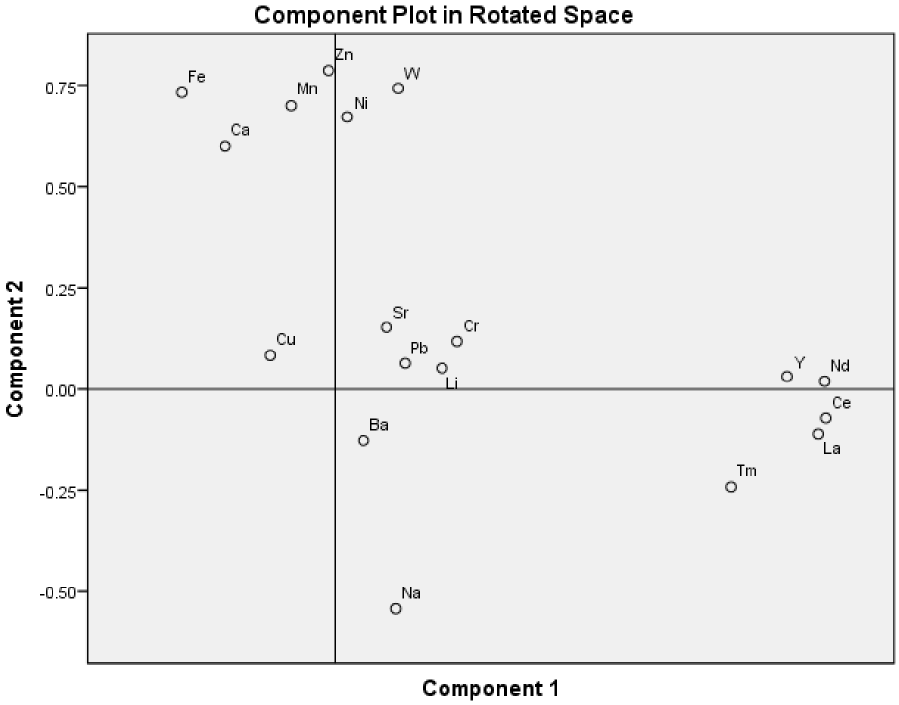

Figure 8.45 Rotated component plot of principal components for the clays and compositional group 5 of the pottery (raw data, excluding Al, K, Mg)

Table 8.21. Clays that appeared to be the most similar to pottery compositional group 5 in the bivariate plots

ICP sample no.	Clay type	Site	Field sample no.
1	Wealden	Lower Lynch House	3
2	Wealden	Lower Lynch House	4A
3	Wealden	Lower Lynch House	4B
16	Wealden	SE Purbeck	6
24	Parkstone	Bourne Bottom	3
20	Parkstone	Brownsea Island	2
8	Parkstone	Brownsea Island	3
21	Parkstone	Brownsea Island	8
9	Broadstone	Wytch Heath	1A
29	Broadstone	Foxground Plantation	1
90	Kimmeridge	Kimmeridge Bay	1

8.2.7 Hierarchical cluster analysis

As the principal components analysis had not produced clear correlations between the pottery groups and the clays, hierarchical cluster analysis (HCA) was carried out on the pottery groups identified from the PCA plots to investigate similarities between the clays and the pottery. For pottery group 1, the dendrogram initially splits into two, with the first branch containing only clay samples, and the second branch containing a mix of clay and pottery samples (Figure 8.46). The clays that showed similarity to the pottery are: SE Purbeck (field sample 6), Lower Lynch Farm (field samples 3, 4A and 4B), Foxground Plantation (field sample 1), Kimmeridge Bay, Bourne Bottom (field sample 3), Brownsea Island (field sample 14) and Upton Country Park (field sample 1). Groups 2 and 3 were examined together and produced a similar result to group 1, with a mix of clay and pottery samples on one initial branch, and only clays on the second branch (Figure 8.47). The clay samples clustering with the pottery were the same as those for group 1. In an HCA of the group 4 pottery and the clay, all of the pottery samples are again on one of the initial branches of the dendrogram, but this time associated with only a single clay sample, SE Purbeck field sample 6 (Figure 8.48). The HCA of the group 5 pottery and the clays again found all of the five pottery samples on one of the initial branches, but with nine clay samples (Figure 8.49). This branch of the dendrogram splits into two, this time with all of the pottery samples and one clay (SE Purbeck field sample 6) on one branch, and the following clays on the other branch: Foxground Plantation (field sample 1), Kimmeridge Bay, Bourne Valley (field sample 3), Brownsea Island (field sample 14), Lower Lynch Farm (field samples 3, 4A and 4B), and Upton Country Park (field sample 1).

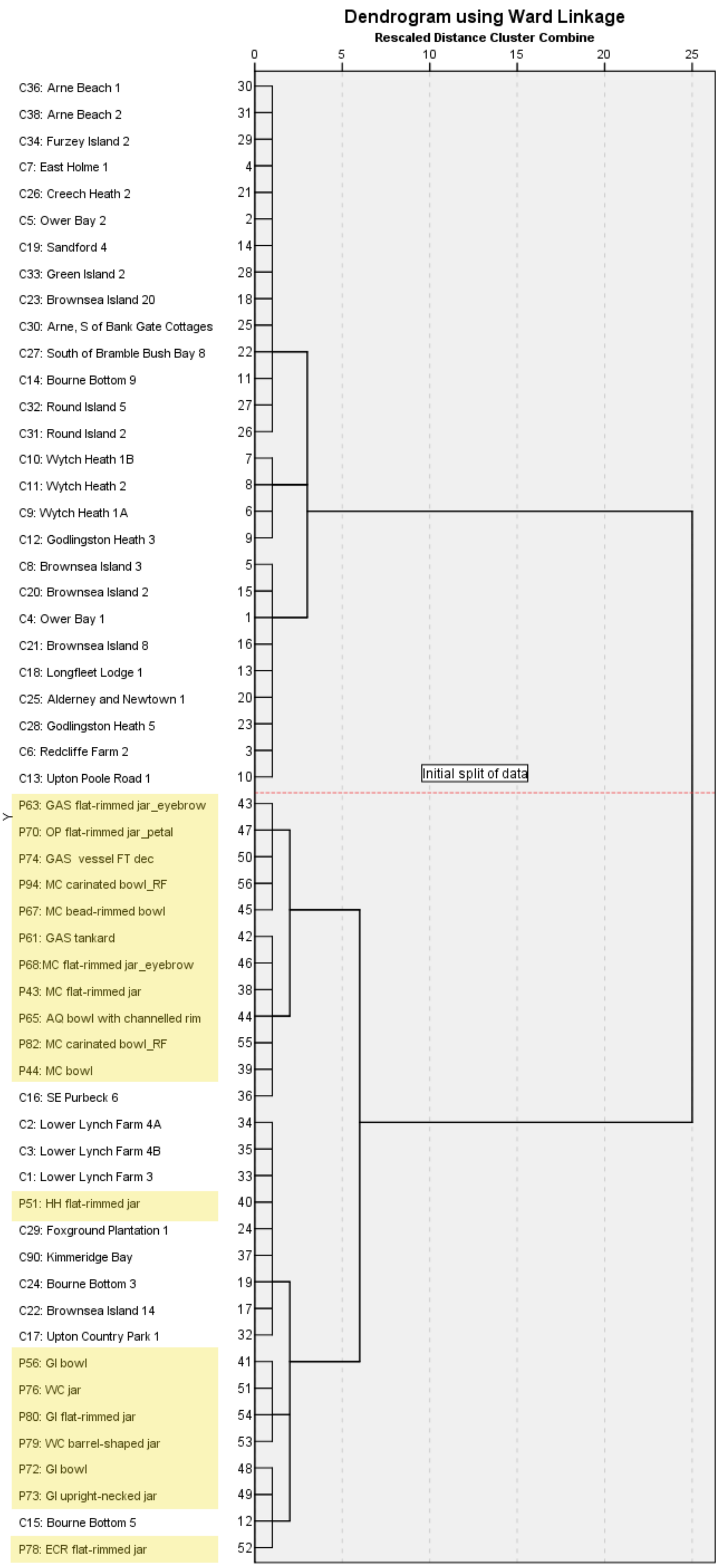

Figure 8.46. Dendrogram of HCA of pottery (P) group 1 and the clay (C) samples (log_{10} data, excluding Al, K and Mg). Pottery samples are highlighted.

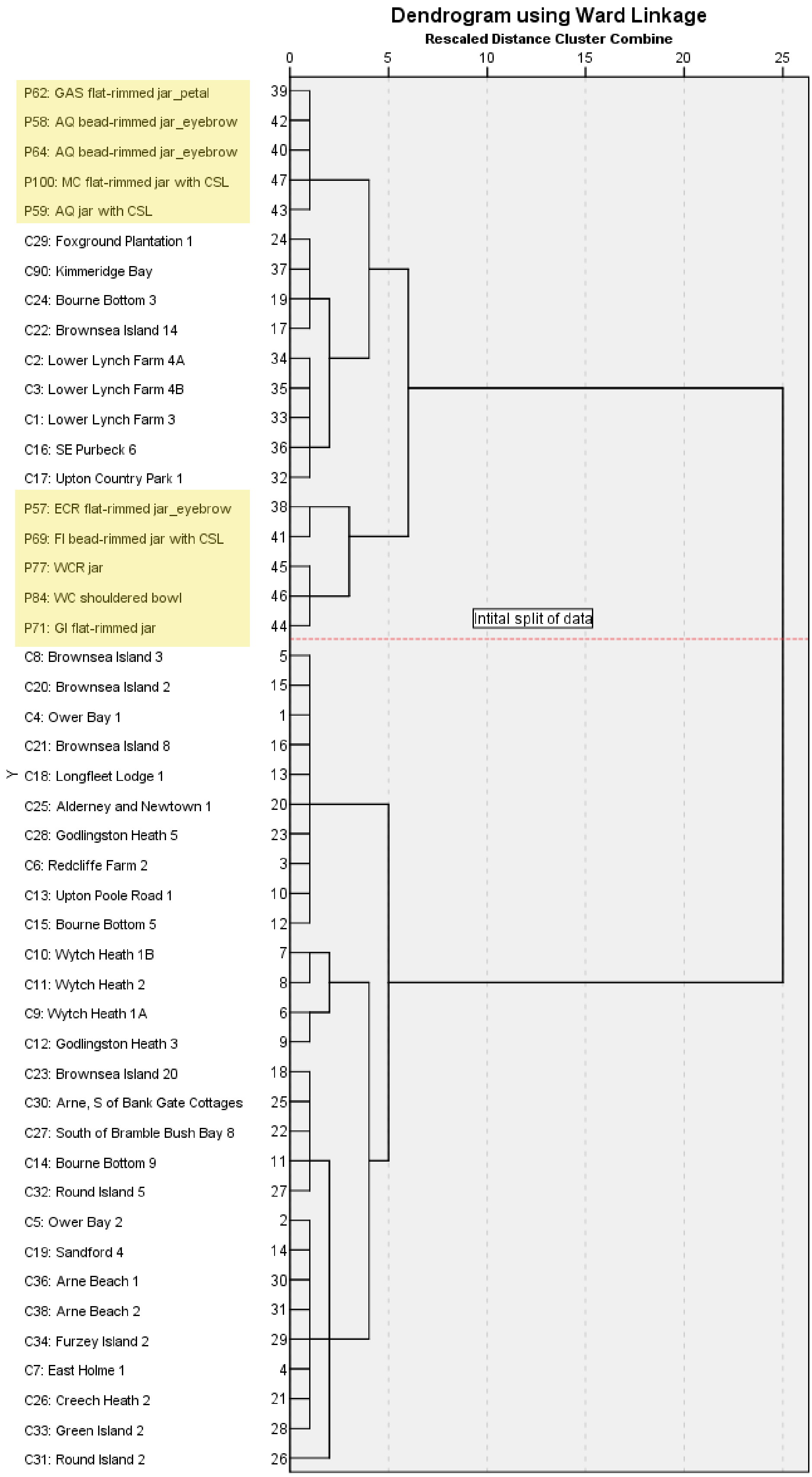

Figure 8.47. Dendrogram of HCA of pottery (P) groups 2 and 3 and the clay (C) samples (log$_{10}$ data, excluding Al, K and Mg). Pottery samples are highlighted.

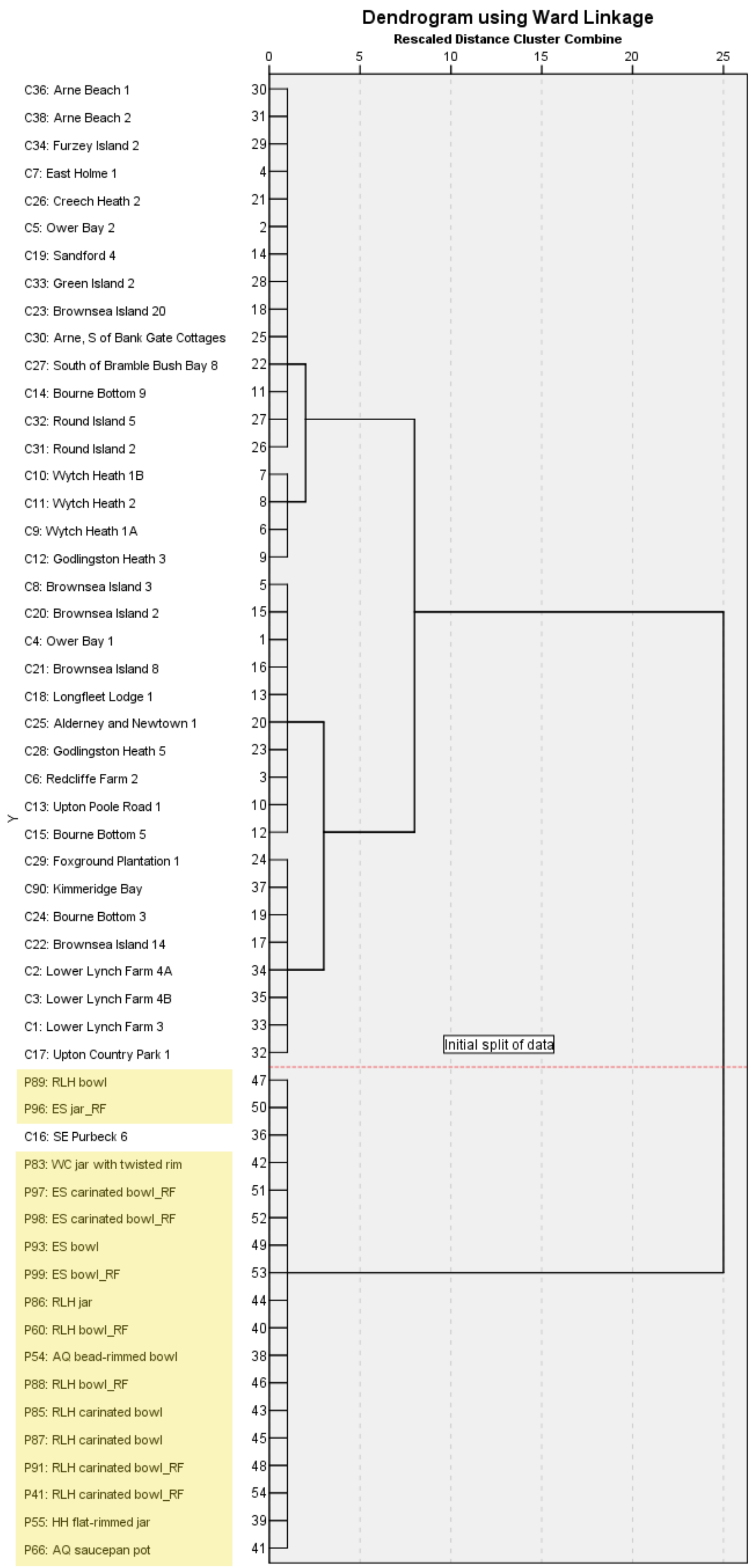

Figure 8.48. Dendrogram of HCA of pottery (P) group 4 and the clay (C) samples (log_{10} data, excluding Al, K and Mg). Pottery samples are highlighted.

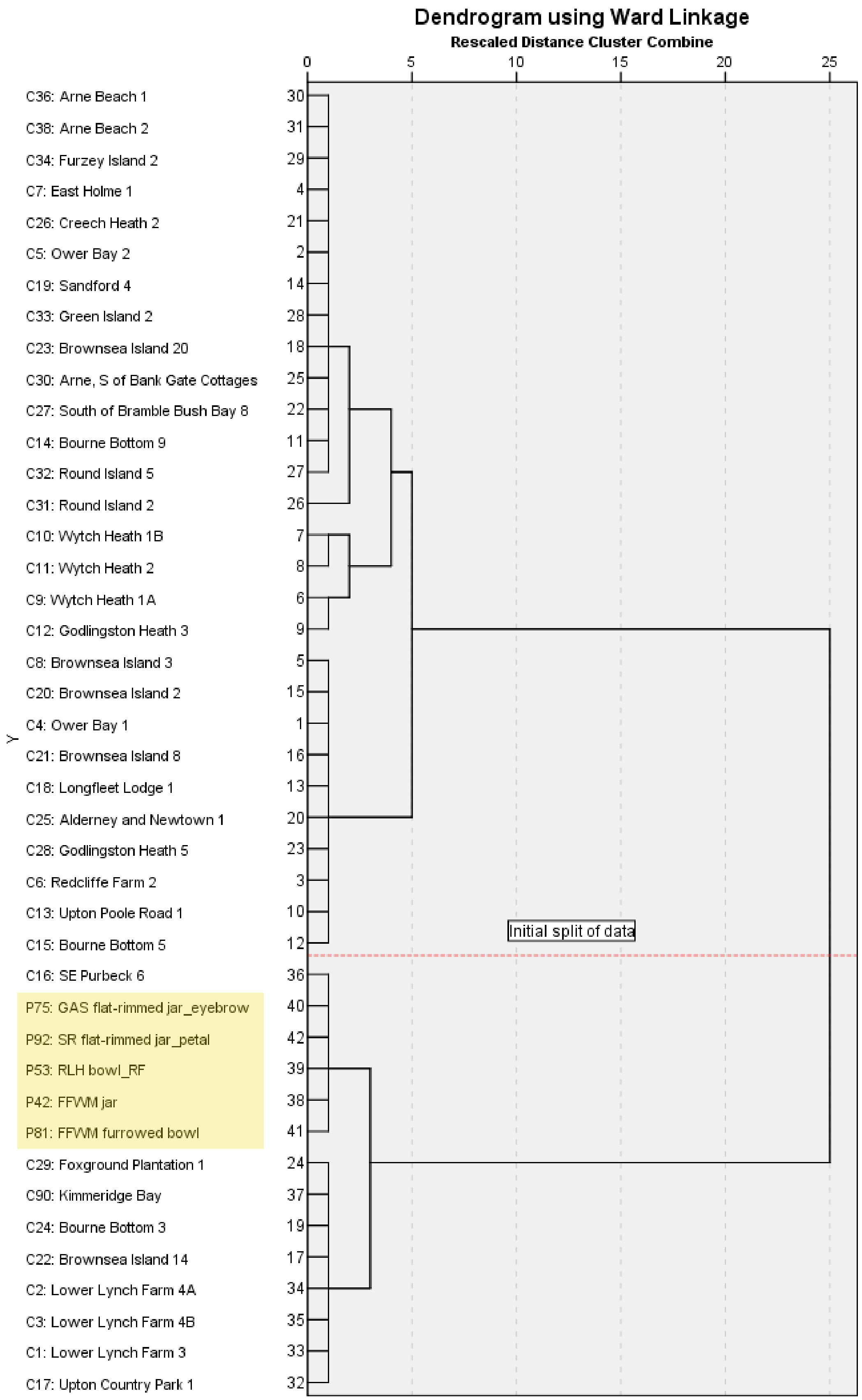

Figure 8.49. Dendrogram of HCA of pottery (P) group 5 and the clay (C) samples (log_{10} data, excluding Al, K and Mg). Pottery samples are highlighted.

8.3 Individual element analysis

The measurements for a number of the individual elements were also used to look for any trends that might help elucidate the possible clay sources for the pottery. The rare earth elements (REE) are widely acknowledged to be useful in ceramic provenancing as they are unlikely to be affected by anthropogenic processes or the post-depositional environment. Papachristodoulou *et al.* (2010, 2150) have suggested that some of the transitional metals, such as manganese (Mn), zinc (Zn) and chromium (Cr) 'may possibly provide a geochemical signature, as they are highly immobile and tend to concentrate in the clay fraction'. The proportion of iron in the samples was considered to be particularly diagnostic as this relates to the colour of the clay when fired in an oxidising atmosphere. The effects of temper dilution on each element was assessed using elemental measurements of the samples of clay from Arne Beach that were tempered with quartz grains and shale fragments, and the two parts of sample 1 from Wytch Heath.

8.3.1 Main elements

Iron

The Iron Age Poole Harbour wares, and Romano-British Black-burnished ware, are characteristically black, suggesting they were fired in an oxygen poor atmosphere. Re-firing of a number of sherds in an oxidising atmosphere by this and other researchers has revealed an orange or red colour, suggesting the use of an iron-rich clay source.

> "The amount, particle size, and distribution of iron oxide, together with characteristics of the clay, determine primarily whether a clay will be white, buff, or red when it is fired to a condition of full oxidisation" (Shepard 1963, 103).

The full range of iron identified in all samples was 4373-67545 mg kg^{-1}. The lowest amount of iron identified in the pottery was 24500 mg kg^{-1}, whilst the highest amount in a confirmed Poole Harbour ware vessel was 54288 mg kg^{-1}. The dilution of iron in the tempered clay samples from Arne Beach was 11-17%, the mean of these measurements suggests the original clay source for the pottery would have an iron content of at least 27930 mg kg^{-1}. Only ten clay samples contained this level of iron - these are listed in Table 8.22. Of note is the difference in the iron content of two samples from a single auger hole at Wytch Heath, with the purer clay at the top of the auger hole (1A) containing 51% more iron than the sandy clay below (1B), although the quartz content of the latter was much greater than that of the pottery (>40%). Interestingly, the 22 clay samples that contained the lowest concentrations of iron (4373-16520 mg kg^{-1}) were all clays that visually appeared to be iron poor from their pink/buff/white firing colours. One possible exception was a sample of Oakdale Clay from Sandford (field sample 4, ICP sample 19, iron content: 12333 mg kg^{-1}), that had fired to a light reddish brown colour at 600°C and 800°C, but at 1000°C had turned a pink/buff colour, suggesting a lower quantity of iron than some of the stronger red-firing clays. All clays with a concentration above 22800 mg kg^{-1} of iron visually appeared to be iron-rich when fired.

Table 8.22. Clay samples containing iron levels comparable to the pottery samples

Clay type	**Sample**	**Site**	**Sample**	**Fe (mg kg^{-1})**
Broadstone	10	Wytch Heath	1B	24931.73
Wealden	2	Lower Lynch Farm	4A	32471.6
Creekmoor	17	Upton Country Park	1	32889.74
Wealden	16	SE Purbeck	6	33619.48
Parkstone	24	Bourne Bottom	3	36696.13
Broadstone	9	Wytch Heath	1A	51117.39
Broadstone	12	Godlingston Heath	3	51666.1
Wealden	1	Lower Lynch Farm	3	55081.65
Kimmeridge	90	Kimmeridge Bay		59916.38
Broadstone	29	Foxground Plantation	1	67545.74

Chromium, manganese and zinc

The chromium content of the Poole Harbour pottery was 72.6 - 133.9 mg kg^{-1}. The tempered sample from Arne Beach and two parts of sample 1 from Wytch Heath suggest the chromium content may be reduced by 19.6-25.2% in the pottery. None of the clays contained greater than this, and only four clays contained less (Wytch Farm sample 1B and 2l; Ower Bay sample 2 and Bourne Valley sample 5), but by only 13%. The manganese content of the possible Poole Harbour wares was comparable to all of the clay samples. The range of zinc in most of the possible Poole Harbour wares was 23.1-170.8 mg kg^{-1}, with one outlier at 336.7 mg kg^{-1} (ICP sample 79). None of the clay samples contained greater amounts that the pottery, but 18 contained less (Table 8.23). The chromium and manganese content of the clays is therefore broadly comparable to the clays. The clay samples that contained less zinc than the pottery (Table 8.23) are unlikely sources for the pottery and were not identified as possible sources by the hierarchical cluster analysis.

Table 8.23. Clay samples containing less zinc that the pottery samples (<23 mg kg^{-1})

Clay type	Sample	Site	Sample
Poole Formation	33	Green Island	2
Poole Formation	31	Round Island	2
Poole Formation	32	Round Island	5
Poole Formation	34	Furzey Island	2
Broadstone	9	Wytch Heath	1A
Broadstone	10	Wytch Heath	1B
Broadstone	11	Wytch Heath	2
Broadstone	36	Arne Beach	1A/1B
Broadstone	16	Arne Beach	2A/2B
Broadstone	27	South of Bramble Bush Bay	8
Broadstone	5	Ower Bay	2
Broadstone	6	Redcliffe Farm	2
Broadstone	28	Godlingston Heath	5
Parkstone	26	Creech Heath	2
Parkstone	14	Bourne Valley	9
Parkstone	23	Brownsea Island	20
Parkstone	25	Newtown and Alderney	1
Oakdale	19	Sandford	4

8.3.2 Rare earth elements

In the case of the REEs, most of the samples identified as outliers during the PCA contained greater quantities of these elements (Ce, La, Nd, Tm and Y) than the known or suspected Poole Harbour wares. Samples 40, 46, 49, 50 and 52 all contained greater amounts of cerium (Ce), lanthanum (La), neodymium (Nd) and yttrium (Y), sample 48 had higher levels of Ce, La and Nd, and sample 47 contained greater amounts of La and Y. Samples 40, 46-50 and 52 are therefore probably genuine outliers, however the other samples identified as outliers by the PCA (samples 45 and 95) contained comparable amounts of REEs, but varied in the rest of their elemental make up to the bulk of the Poole Harbour wares.

Cerium

The cerium levels in the samples ranged from 21.5 to 173.7 mg kg^{-1}, with the possible Poole Harbour wares containing up to 81.8 mg kg^{-1}. The clay samples from Arne Beach saw a 26% reduction in the cerium levels after tempering whilst the sandier clay from Wytch Farm sample 1 saw only a 12.9% reduction. This suggests the parent clays of the vessels may have contained up to 103 mg kg^{-1} Ce. Clay samples containing comparable amounts of cerium to the pottery are presented in Table 8.24.

Lanthanum

The lanthanum (La) content of all samples ranged from 6.82-53.2 mg kg^{-1}, with the known Poole Harbour wares containing up to 34.9 mg kg^{-1}. The measurements of La before and after tempering of a clay sample from Arne Beach suggests that there might be a decrease in the percentage of La of 18-25% in the pottery samples; the decrease in the sandy part of sample 1 from Wytch Heath saw a 16% reduction in La. The mean of the decrease in the Arne Beach samples (21.75%) was added to each pottery sample to account for the dilution, suggesting the original La concentration in the raw clay used for the pottery might be up to 42.4 mg kg^{-1}. Twenty five clay samples were below this amount, and are therefore comparable to the pottery - these are detailed in Table 8.24.

Table 8.24. Clay samples containing comparable amounts of Ce and La to the pottery samples

ICP sample	Site	Field sample	La <44.5 mg kg^{-1}	Ce <103 mg kg^{-1}
1	Lower Lynch Farm	3	Y	Y
2	Lower Lynch Farm	4A	Y	Y
3	Lower Lynch Farm	4B	Y	Y
4	Ower Bay	1	Y	Y
5	Ower Bay	2	Y	Y
6	Redcliffe Farm, Ridge	2	Y	Y
8	Brownsea Island	3	Y	Y
9	Wytch Heath	1A	Y	Y
10	Wytch Heath	1B	Y	Y
11	Wytch Heath	2	Y	Y
12	Godlingston Heath	3	Y	Y
13	Upton, Poole Road	1	Y	Y
14	Bourne Bottom	9	N	Y
15	Bourne Bottom	5	Y	Y
16	SE Purbeck	6	Y	Y
18	Longfleet Lodge	1	N	Y
19	Sandford	4	Y	Y
20	Brownsea Island	2	Y	Y
21	Brownsea Island	8	Y	Y
22	Brownsea Island	14	Y	Y
24	Bourne Bottom	3	Y	Y
25	Tower Park	15i	Y	Y
29	Foxground Plantation	1	Y	Y
31	Round Island	2	Y	Y
36	Arne Beach	1a	Y	Y
38	Arne Beach	2a	Y	Y
90	Kimmeridge Bay		Y	Y

Neodymium

The range of neodymium present in the pottery and clay samples was 6.5-78.9 mg kg^{-1}, with the vessels identified as Poole Harbour wares containing up to 36.3mg kg^{-1}. Tempering of the clay samples from Arne Beach caused a 22.4-24.8% decrease in the levels of Nd, whilst the sandier part of sample 1 from Wytch Farm saw a 7% increase. The parent clays of the pottery vessels might therefore be expected to contain up to 44.9 mg kg^{-1} of Nd. Only six clay samples contained more than this, they are shown in Table 8.25.

Table 8.25. Clay samples containing greater than 44.9 mg kg^{-1} Nd

ICP sample	Site	Field sample
32	Round Island	5
34	Furzey Island	2
30	Arne, Triangular Patch	1
26	Creech Heath	2
17	Upton Country Park	1
7	East Holme	1

Thulium and yttrium

The range of the thulium content of the samples was small, 5.2-26.7 mg kg^{-1}, with all pottery below 10.8 mg kg^{-1}. The dilution effect in the tempered clay samples was much more variable than the other REEs, 11-33%, with a 25.9% reduction in the sandier sample 1B from Wytch Heath, suggesting a maximum of 14.4 mg kg^{-1} in the parent clay. All clay samples fall within this range. The range of the yttrium content of the samples was 7.5-39.7 mg kg^{-1}, with the possible Poole Harbour wares containing up to 26 mg kg^{-1}. Tempering of a clay sample from Arne Beach caused a drop in the levels of yttrium by 26-27%, and of 15.9% in sample 1 from Wytch Heath, the parent clay might be expected to contain up to 32.9 mg kg^{-1}. Only two clay samples contained greater levels, both at 33.5 mg kg^{-1}, and only fractionally greater than the pottery: Round Island, field sample 5 (33.5 mg kg^{-1}) and Upton Country Park, field sample 1. The yttrium content of all the clay samples is therefore comparable to that of the suspected Poole Harbour wares.

8.4 Scanning Electron Microscope

A second method of compositional analysis was employed to examine a key inclusion seen during the petrological analysis of the pottery. This elongated argillaceous inclusion proved to be a diagnostic feature of the Poole Harbour wares and has been provisionally identified as shale (Figure 8.51-8.56). These inclusions are always well rounded, are usually surrounded by shrinkage cracks, may display some internal banding and contain silt-sized quartz grains. Their optical properties are very similar to that of the clay matrix, indicating that they may simply be a component of the clay (Elaine Morris pers. comm) or may be poorly hydrated lumps of the raw material used for the clay (Patrick Quinn pers. comm). It was therefore decided to examine these inclusions under a scanning electron microscope with energy dispersive X-ray spectroscopy (SEM-EDX) to compare the inclusion to the surrounding clay matrix, and also to compare to the samples of clay from Arne Beach that had been tempered with quartz and crushed shale fragments from an archaeological site on Green Island (Figure 8.57-8.58). Seven samples of pottery were chosen for this analysis, all from vessels that contained relatively high concentrations of these inclusions, including an example of the late Roman South-East Dorset Orange Wiped Ware (SEDOWW), a fabric that characteristically contains a high proportion of the inclusion identified as shale (Figure 8.53-8.54). The analysis was carried out using a JEOL scanning electron microscope, model JSM 6010 Plus/LV with InTouchScope software.

Observations using the microscope indicated that the inclusions had a very smooth appearance and were texturally indistinguishable from the surrounding clay matrix, but were visible on account of the shrinkage voids surrounding them. A spectrum was measured for the inclusion and adjacent matrix at two points in the section, at x20 KV (WD10-13; SS58-55). The results are presented in Table 8.26 and indicate similarity between the inclusions and the surrounding clay matrix. Si, Al, Fe, K, Mg and Ti were measured in all samples, Ca in six samples and Sr in five.

Table 8.26a. Quantification of elements measured using the SEM-EDX (% atomic weight); GAS=Gussage All Saints

ID no	**Site**	**Petrol. Sample no.**	**Type**	**Si**	**Al**	**Fe**	**K**	**Mg**	**Ti**	**Ca**	**Sr**
1	Barton Field	BF 5	Shale	64.68	24.83	3.05	4.74	2.18	0.53		
2	Barton Field	BF 5	Clay	63.14	24.63	4.98	4.24	2.13	0.88		
3	Barton Field	BF 5	Clay	64.99	24.51	3.76	4.09	2.03	0.62		
4	Barton Field	BF 5	Shale	64.29	24.43	3.46	4.55	2.33	0.94		
5	Barton Field	BF 5	shale	63.39	26.52	3	4.26	2.27	0.56		
6	Barton Field	BF 5	Clay	62.41	22.35	10.07	2.9	1.57	0.71		
7	Barton Field	BF 5	Clay	63.39	25.35	4.02	3.88	2.37	0.99		
8	GAS	GAS 35	Shale	63.25	26.84	3.41	3.98	1.91	0.62		
9	GAS	GAS 35	Shale	62.3	26.87	3.81	4.31	1.94	0.77		
10	GAS	GAS 35	Shale	65.65	24.79	3.55	3.75	1.86	0.62		
11	GAS	GAS 35	Clay	63.97	25.39	3.95	3.92	2.19	0.59		
12	GAS	GAS 35	Clay	64.96	24.01	4.11	4.01	2.38	0.52		
13	Arne Beach	Tempered	Shale	67.6	27.56	0	2.07	2.77	0	0	
14	Arne Beach	Tempered	Shale	68.52	26.5	0	3.21	1.77	0	0	
15	Arne Beach	Tempered	Clay	78.34	18.45	0	2.17	0.65	0.39	0	
16	Arne Beach	Tempered	Clay	73.99	20.75	0.58	2.85	0.7	0.65	0.48	
17	Arne Beach	Tempered	Shale	68.56	25.97	0.62	2.41	2.43	0	0	
18	Arne Beach	Tempered	Shale	67.42	27.01	0.84	2.83	1.9	0	0	
19	Arne Beach	Tempered	Clay	75.78	20.43	0	3.02	0.77	0	0	
20	Arne Beach	Tempered	Shale	63.1	30.93	1.57	2.36	2.04	0	0	
21	Arne Beach	Tempered	Clay	74.5	21.89	0	2.85	0.76	0	0	
22	Arne Beach	Tempered	Shale	65.17	30.47	0	1.94	2.42	0	0	
23	Arne Beach	Tempered	Clay	75.03	21.32	0	2.26	1.39	0	0	

Table 8.26b. Quantification of elements measured using the SEM-EDX (% atomic weight)

ID no	Site	Sample	Type	Si	Al	Fe	K	Mg	Ti	Ca	Sr
24	Green Island	PRN 117	Shale	61.16	25.5	5.38	4.08	1.69	0.73	1	0.47
25	Green Island	PRN 117	Clay	61.87	21.82	4.53	3.1	1.05	0.83	0.69	0.7
26	Green Island	PRN 117	Shale	64.4	21.61	6.89	3.31	1.8	0.95	1.05	0
27	Green Island	PRN 117	Clay	67.28	21.82	4.53	3.1	1.05	0.83	0.69	0.7
28	Green Island	PRN 1	Shale	61.5	26.87	4.13	3.64	2.52	0.68	0.45	0
29	Green Island	PRN 1	Clay	60.19	27.2	4.96	3.57	2.59	0.84	0.66	0
30	Green Island	PRN 1	Shale	61.09	29.78	2.4	3.54	2.59	0.35	0.41	0
31	Green Island	PRN 1	Clay	63.1	26.42	3.46	3.83	2.17	0.5	0.52	0
32	Bestwall Quarry	SEDOWW	Shale	60.86	28.37	2.89	3.69	2.15	0.44	0.76	0.84
33	Bestwall Quarry	SEDOWW	Clay	65.26	24.87	3.55	3.02	1.73	0.66	0.91	0
34	Bestwall Quarry	SEDOWW	Shale	63.3	27.8	2.08	2.86	2.35	0.43	0.51	0.66
35	Bestwall Quarry	SEDOWW	Clay	61.83	28.11	2.74	3.06	2.21	0.35	0.82	0.87
36	Bestwall Quarry	Kiln 184	Shale	61.26	26.82	4.46	4.45	1.02	0.82	0.69	0.48
37	Bestwall Quarry	Kiln 184	Clay	62.78	26.02	4.49	4.14	1	0.93	0.64	0
38	Bestwall Quarry	Fig. 144.7	Shale	63.46	22.25	3.75	3.44	1.78	0.55	4.11	0.66
39	Bestwall Quarry	Fig. 144.7	Clay	63.53	23.09	3.17	3.77	2.28	0.6	2.93	0.63
40	Bestwall Quarry	Fig. 144.7	Shale	62.44	24.04	3.82	4.15	2.01	0.56	2.34	0.64
41	Bestwall Quarry	Fig. 144.7	Clay	66.24	20.06	4	3.74	1.81	0.62	3.53	0

The data was analysed using a PCA on SPSS. This produced a KMO of .616 and two principal components, together accounting for 81.8% of the variance: the first for 49.8% and the second for 32.1%. A plot of PC1 and PC2 (Figure 8.50) shows that the inclusions and surrounding clay matrices plot closely together. The shale added to the Arne Beach samples groups separately, as does the white-firing Arne Beach clay.

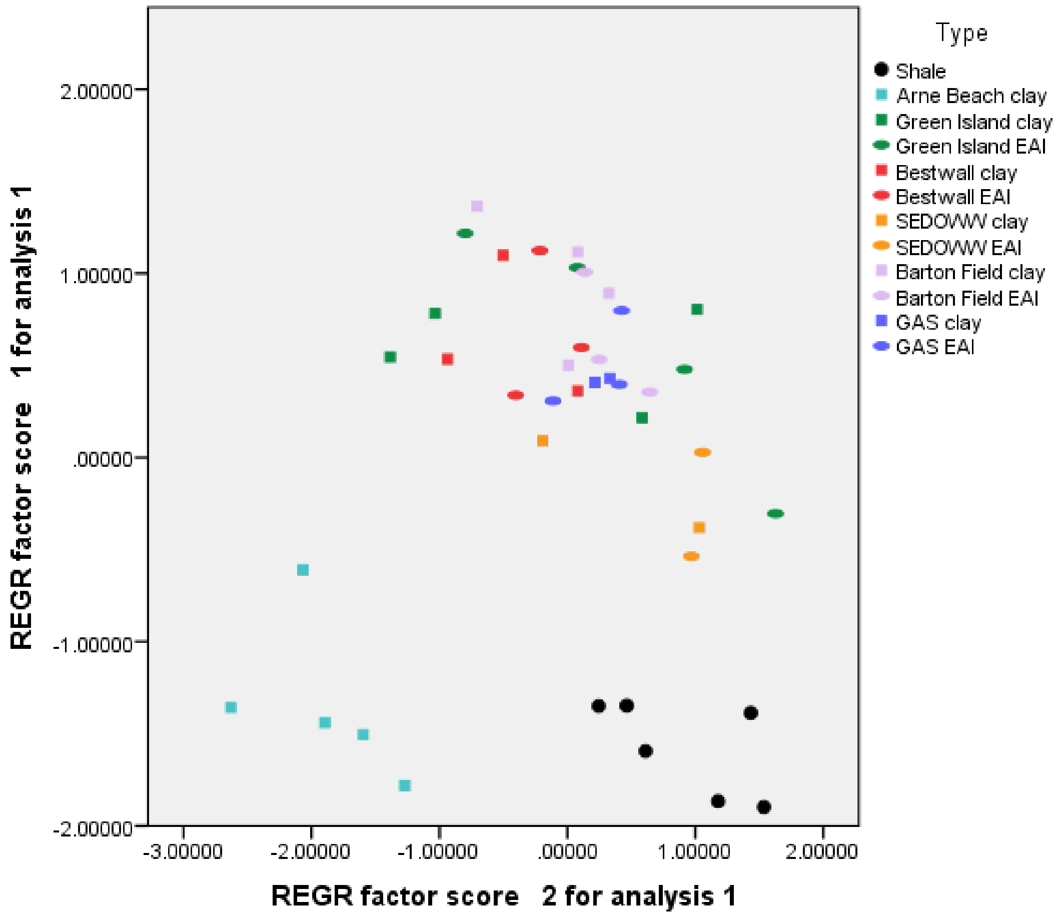

Figure 8.50 Plot of PC1 and PC2 for sample analysed using SEM-EDX

The results indicate the close similarity in the broad geochemical composition of the elongated argillaceous inclusions and the clay matrix in which they are found. This indicates the inclusions and the clay share the same source. There is a clear difference in the type of clay used for the pottery and the Arne Beach clay, although the compositional analysis has indicated that these white-firing clays were not used for pottery and this separation is therefore to be expected. The shale added to the

Arne Beach clay is also different to the pottery and therefore originates from a different source to all the other samples measured.

This leaves the question as to what these elongated argillaceous inclusions represent. They are never angular or sub-angular in shape, indicating they are not argillaceous rock fragments or grog (Whitbread 1986). Their shape and optical properties would support an interpretation of clay pellets, yet these inclusions are immediately apparent in the hand specimen as something distinct from the surrounding matrix and have the dried, laminated appearance of shale. However, the shale added to the Arne Beach clay samples did appear different in thin section, being more angular in shape, surrounded by greater shrinkage voids and having a more laminated structure than the inclusions in the pottery. These inclusions were immediately apparent in the pottery thin sections, but not in the clay samples collected. The only clays that contained similar inclusions were those from Foxground Plantation and SE Purbeck (sample 6), but none appeared to be a direct match.

Belinda Coulston briefly questioned if these inclusions are shale and suggested they may have resulted from clay processing, whereby 'a gradual drying process may allow clay particles, on the surface, to become aligned and form a crust. This crust, on crushing, may give the appearance of shale' (Coulston 1989, 172), but she did not pursue this line of enquiry. Levigation of large quantities of clay may indeed have created crusts on the surface of the drying clay, but if the inclusions relate to this, why are they not seen in vessels from other large scale industries that would also have levigated their clay (Rachael Seager Smith pers. comm.)? Clearly this is an area of further enquiry, but it may be concluded that the elongated argillaceous inclusions seen in the pottery are related to the clay matrix of the vessel and do not represent something from a different geological source that was added to the clay. Shales do weather to form clays, or can be crushed and wetted for this purpose; if the inclusions are shale then the clay would also have come from the same source. As discussed in Chapter 2, bands of shale were noted by Arkell (1947, 225) in the Poole Formation strata in a railway cutting between Claywell and Bushey, at the southern edge of Rempstone Heath, whilst black shaly bands were noted in the section of a clay pit south of Norden Farm. The Wealden Beds include mudstones/shales, and the Lower Purbeck Beds comprise layers of clay and shale (Arkell 1947, 137).

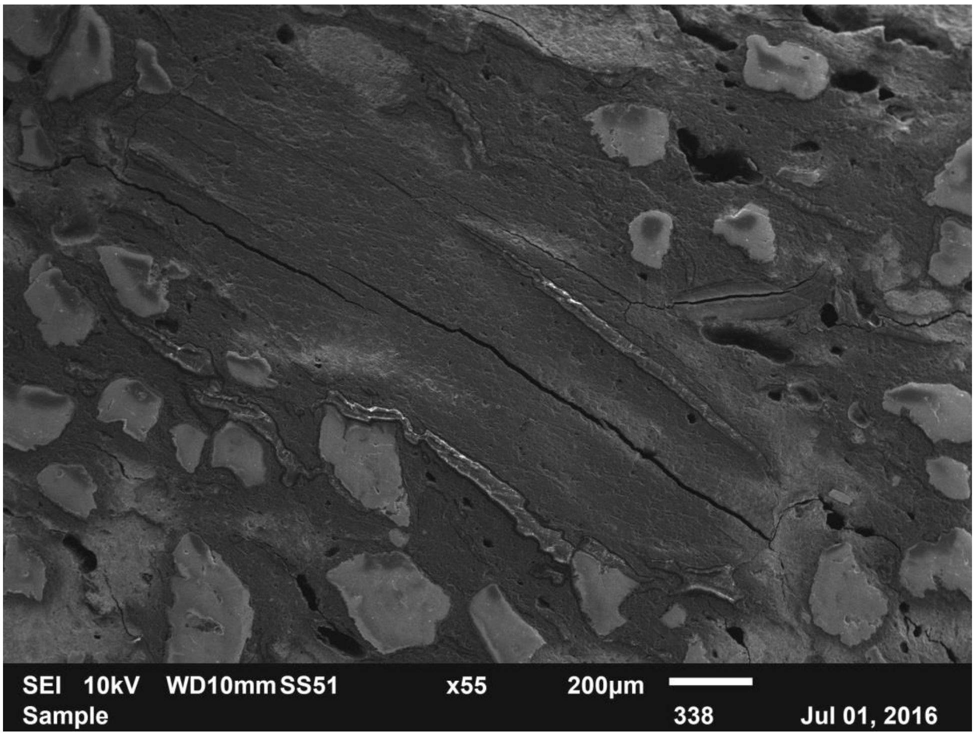

Figure 8.51. Example of an elongated argillaceous inclusion in a groove-rimmed bowl from Green Island, petrological sample GI 16 (x55 magnification).

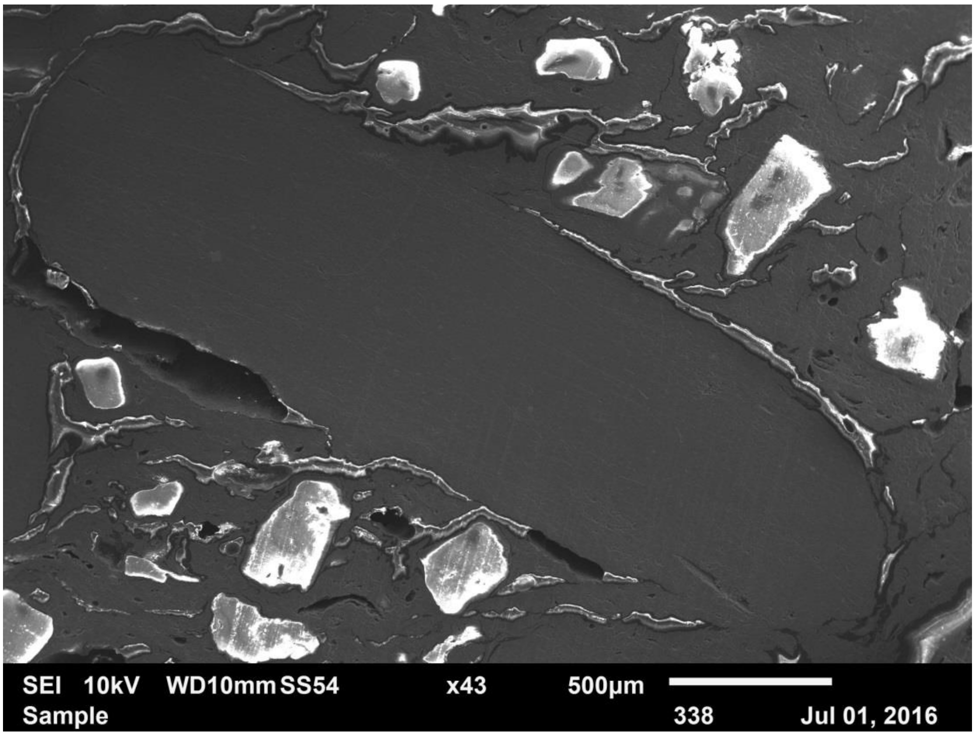

Figure 8.52. Example of an elongated argillaceous inclusion in a bead-rimmed vessel from Green Island, petrological sample GI 15 (x43 magnification)

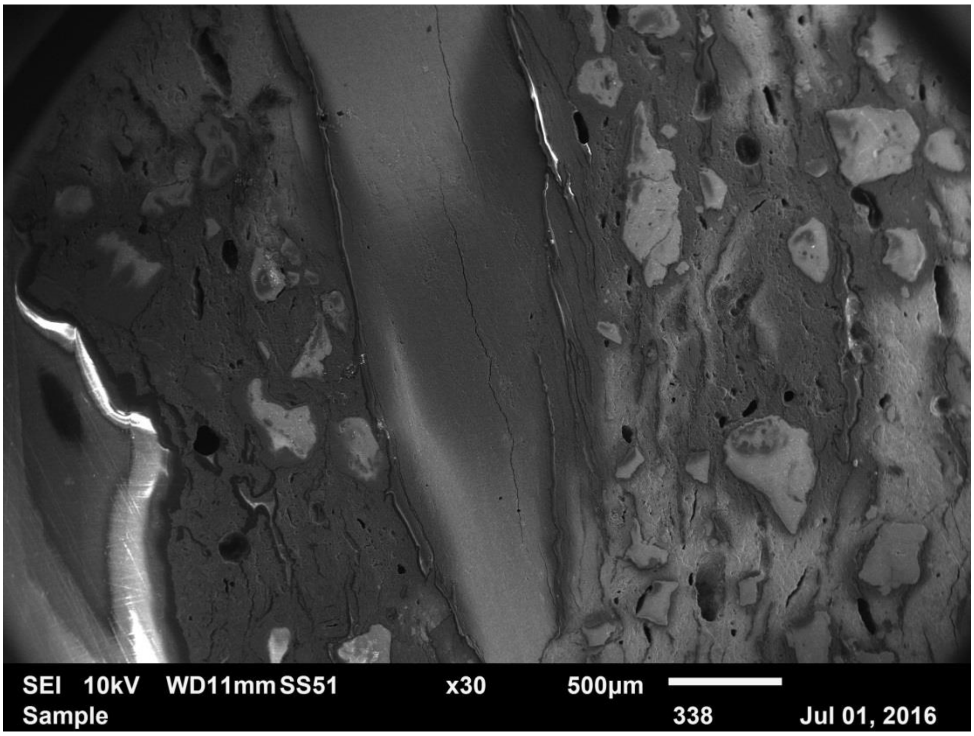

Figure 8.53. Example of an elongated argillaceous inclusion in sample of SEDOWW from Bestwall Quarry, petrological sample BQ 8 (x30 magnification)

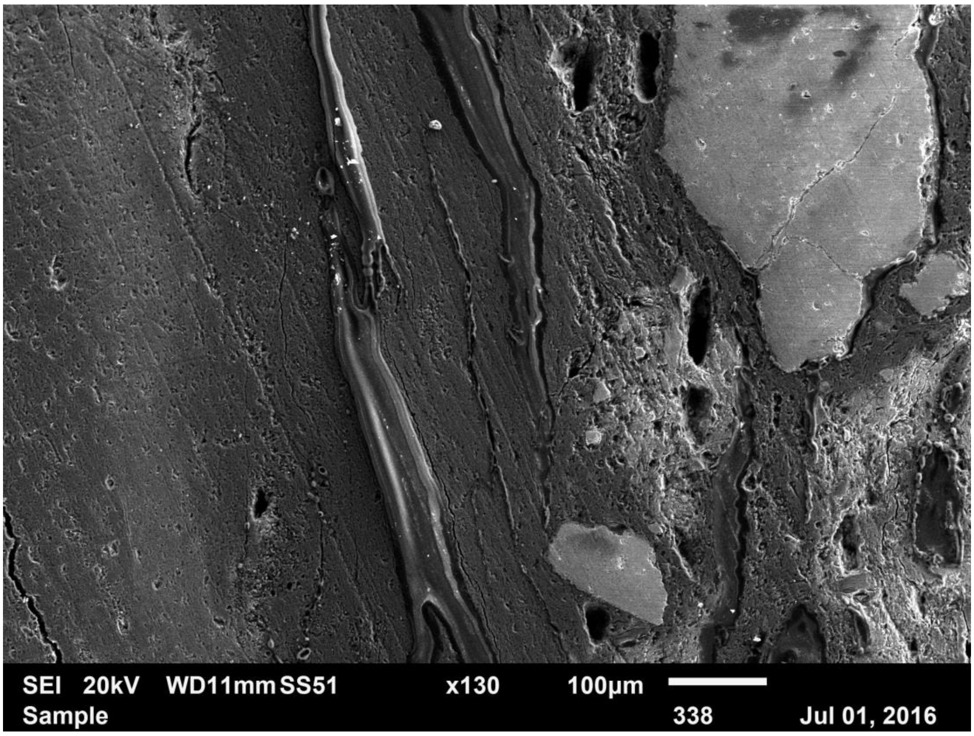

Figure 8.54. Example of an elongated argillaceous inclusion in a sample of SEDOWW from Bestwall Quarry, petrological sample BQ 8 (x130 magnification))

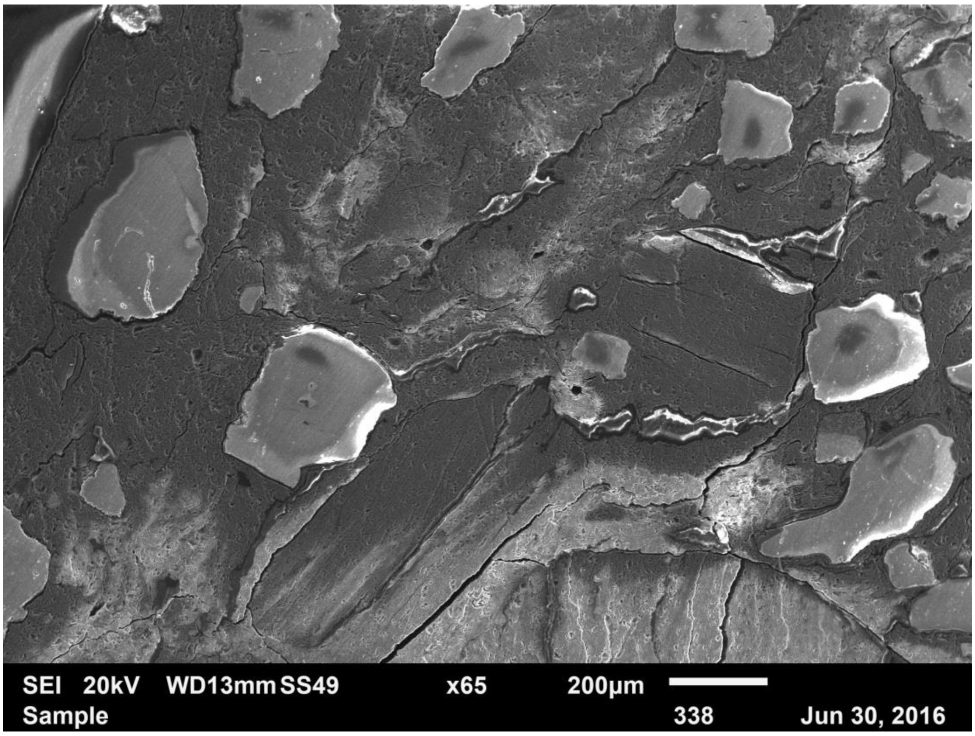

Figure 8.55. Example of elongated argillaceous inclusions in an everted rim jar from Gussage All Saints, petrological sample GAS 35 (x65 magnification)

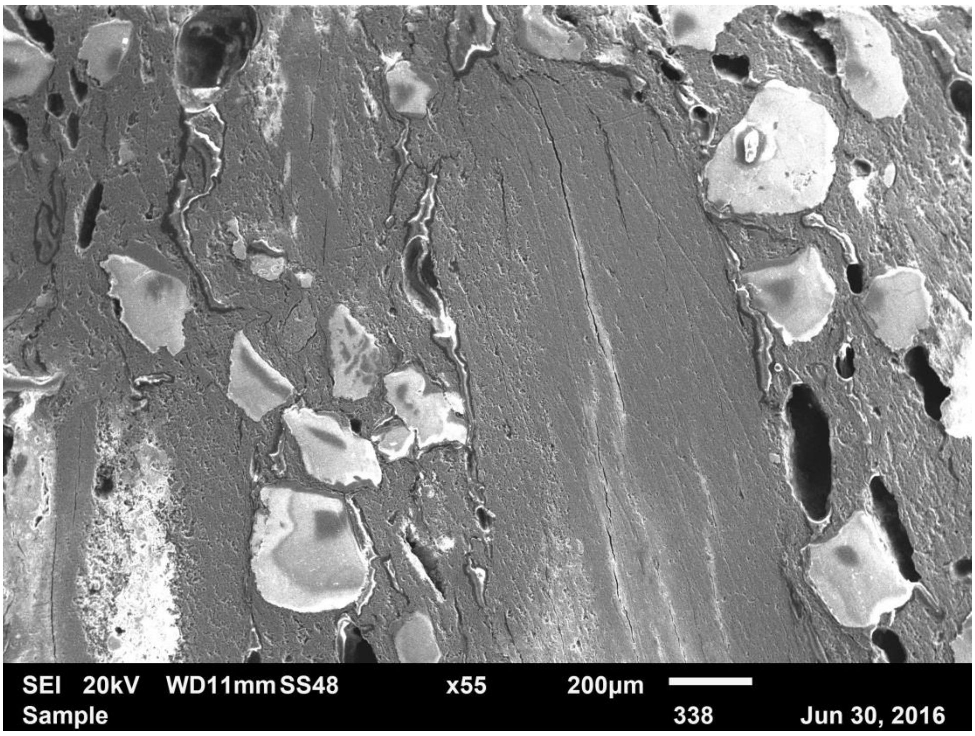

Figure 8.56. Example of elongated argillaceous inclusions in a flat-rimmed jar from Barton Field, Tarrant Hinton, petrological sample BF 5 (x55 magnification)

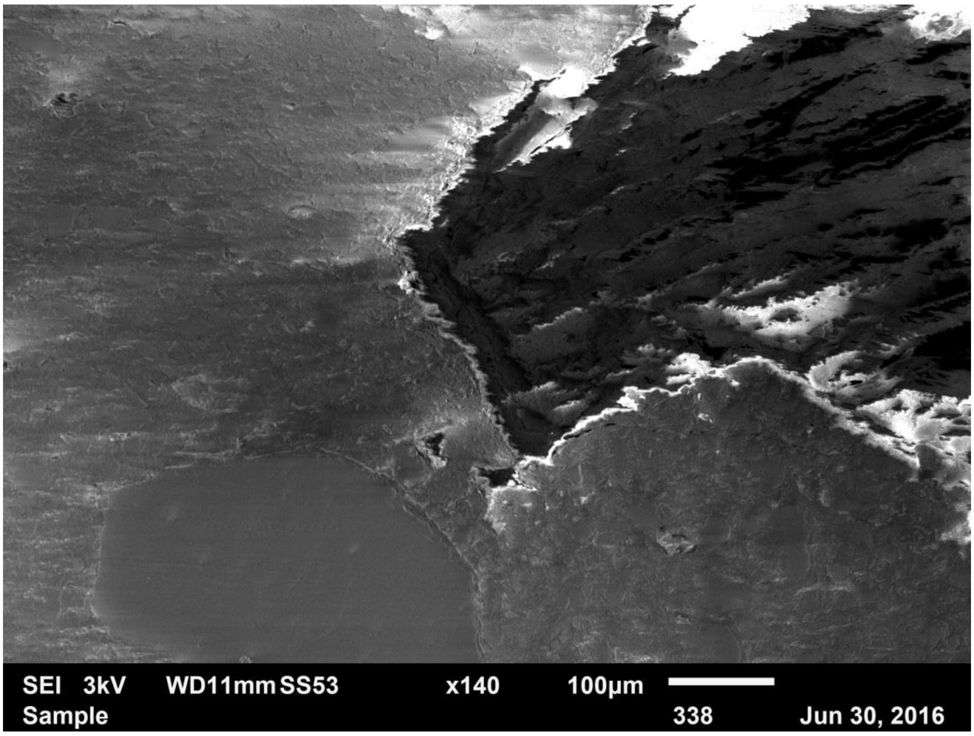

Figure 8.57. Example of shale added to clay from Arne Beach (x140 magnification)

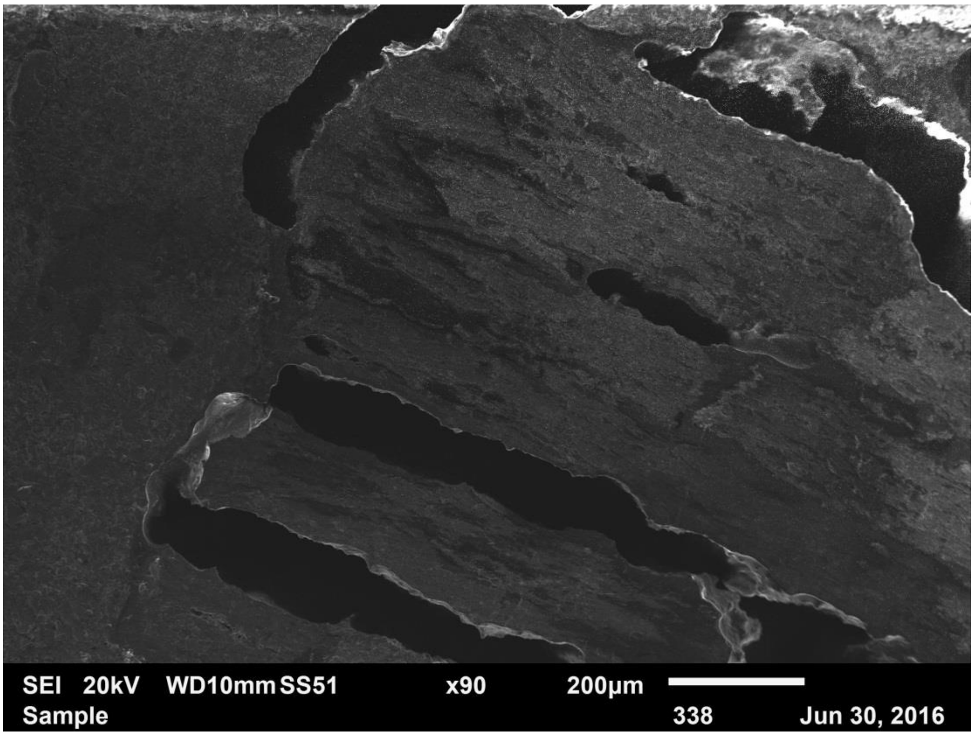

Figure 8.58. Example of shale added to clay from Arne Beach (x90 magnification)

8.5 Conclusions

A range of multivariate statistical techniques have been applied to the data generated by the ICP-OES analysis. The aim of the compositional analysis was to examine the variability in the clay types, to look for any groupings in the pottery and thereby potential evidence of workshops, and to compare the pottery and clay samples in order to identify the types of clays that may have been targeted by the potters. Investigation of the identity of a diagnostic elongated argillaceous inclusion seen in the pottery samples in thin-section was carried out using an SEM-EDX.

The principal component analysis and bivariate plots of the ICP data indicated that nine of the sampled vessels are outliers. These included three red-finished furrowed bowls from Allard’s Quarry; two saucepan pots, a grooved-rimmed bowl and bead-rimmed jar from Gussage All Saints and a barrel-shaped jar from Barton Field, Tarrant Hinton. A vessel from Football Field, Worth Matravers, may also be an outlier but was less clearly identified as such. All of these vessels were unsourced during petrological analysis, and none contained the characteristic elongated argillaceous inclusions. The compositional analysis indicate they are not Poole Harbour products. Once these vessels were removed from the analysis, five potential groups were identified in the pottery samples.

The first was quite a tight group comprising vessels from the sites located around the Harbour but also from the west (Maiden Castle), east (Hengistbury Head), north (Gussage All Saints) and north-east (Allard’s Quarry), but none from sites located to the south of the Purbeck Ridge. The forms comprised the ‘standard’ Middle to Late Iron Age Poole Harbour repertoire of flat-rimmed jars, bead-rimmed jars, a necked jar, grooved rimmed bowls, the tankard and hemispherical bowls with flat rims, but also much earlier forms including two carinated bowls, a vessel with a band of fingertip decoration, and a vessel with internally pulled flattened rim. Group 2 was similar: the samples originated from the same range of sites and comprised flat-rimmed and bead-rimmed jars, but also two with countersunk-handled lugs (again synonymous with the Poole Harbour industry), an ovoid jar with plain rim and a vessel of Early Iron Age date - a shouldered bowl. Physically removed from these on the plot were a small number of vessels that could easily be encompassed by Groups

1 and 2 as they were recovered from the same sites (Gussage All Saints, Allard's Quarry and Furzey Island) and were all Poole Harbour forms (two flat-rimmed jars with petal motif, a bead-rimmed jar with eyebrow motif and bead-rimmed jar with countersunk lug handle).

The range of forms identified in groups 1-3, and the location of the sites from which they were recovered, indicate that these groups represent part of the Poole Harbour industry and the groupings may therefore reflect different workshops within this industry, or a single workshop using more than one clay source. The repertoire of forms certainly indicates continuity in production from the Early Iron Age through to the 1st century AD, with a possible change in raw material source during the Late Iron Age represented by the three vessels of group 3. Two vessels from group 5 are typologically related to groups 1-3 (flat-rimmed jars) but were physically removed on the plot of the principal components. One, from Southdown Ridge, was a petrological anomaly for this type of form, containing a background of silt-sized quartz and without elongated argillaceous inclusions, however the other, from Gussage All Saints, was similar to the group 1-3 petrological fabrics.

Group 4 comprises most of the vessels from Rope Lake Hole and Eldon's Seat, all of Early to Middle Iron Age date. They included red-finished, carinated bowls; bowls with internally-flanged, flat-topped rims; a bowl with internal dropped flange; a wide-mouthed bowl; a red-finished hemispherical bowl with flat-topped rim; a shouldered jar and a red-finished jar. This group also included a flat-rimmed jar from Hengistbury Head, a jar with grooved, twisted rim from West Creech, and a bead-rimmed bowl and saucepan pot from Allard's Quarry. Group 4 may be interpreted as a different workshop to those of groups 1-3, using different raw materials and making a range of bowls and jars to supply to sites near the southern coast of the Isle of Purbeck during the Early to Middle Iron Age date. However, these potters also appear to have supplied some pottery to sites around the Harbour during this period, as indicated by a jar with grooved, twisted rim from West Creech. Furthermore, forms of Middle to Late Iron Age date that also grouped with this material included a flat-rimmed jar from Hengistbury Head and a bead-rimmed bowl and a saucepan pot from Allard's Quarry. This may be the result of continuity of this workshop during the later part of the Middle Iron Age and into the Late Iron Age, producing copies of regional wares such as the saucepan pot, and the standard Poole Harbour forms. It may also result from exploitation of this clay source by potters from another workshop. Either way, it is a group that is dominated by earlier forms from the southern sites, but with links to the workshops producing the standard range of later forms. Three vessels of group 5 may be associated with group 4. They comprised a bowl with plain rim from Rope Lake Hole and a jar and carinated, furrowed bowl from Football Field, Worth Matravers.

The analysis of the clay samples revealed that most of the Poole Formation clays (Parkstone Clay, Broadstone Clay, Oakdale Clay, undifferentiated Poole Formation) are compositionally very similar. The Kimmeridge Clay, Wealden Clay and Creekmoor Clay appear to be different to each other, and to the Poole Formation clays. When compared to the pottery groups, there was not enough separation in the principal component analyses to clearly identify possible clay sources for the pottery. The relationship between the pottery groups and the clays was therefore investigated using hierarchical cluster analysis. This found the following clays to be similar to the pottery of groups 1-3: SE Purbeck (field sample 6), Lower Lynch House (field samples 3, 4A and 4B), Foxground Plantation (field sample 1), Kimmeridge Bay, Bourne Bottom (field sample 3), Brownsea Island (field sample 14) and Upton Country Park (field sample 1). The group 4 pottery was similar only to a clay sample from SE Purbeck (field sample 6). The group 5 pottery was most similar to the SE Purbeck clay but was also related to the clays identified as similar for groups 1-3.

A comparison of the data from individual elements indicated the pottery samples were characterised by having iron levels above 24500 mg kg^{-1}. The combination of the observations made during fieldwork and the compositional analysis suggests that potters working around Poole Harbour would have been able to visually differentiate between iron-rich and iron-poor clays in the field and targeted the iron-rich clays for their pottery, rather than utilising the easy-to-work, pale-firing clays. Eleven clay samples contained a similar amount of iron to the pottery, and ten of these were also comparable in terms of their rare earth element content. These comprised three of the Wealden Clay samples (Lower Lynch House, field samples 3 and 4A; SE Purbeck, field sample 6); the Kimmeridge Clay sample; five Broadstone Clay samples (Wytch Heath, field samples 1A and 1B; Bourne Bottom, field sample 3; Godlingston Heath, field sample 3 and Foxground Plantation, field sample 1) and the Creekmoor Clay (Upton Country Park, field sample 1).

Investigation of the elongated argillaceous inclusions so commonly associated with the Poole Harbour wares was carried out using the SEM-EDX. This indicated they not only share the optical properties identified during petrological analysis, but were also very similar in terms of their chemical composition, and less similar to samples of shale. This suggests they are related to the clays and have a shared origin. Petrologically, the only clays to contain similar inclusions were those from SE Purbeck and Foxground Plantation.

In every stage of the compositional data analysis, the Wealden Clay samples have been shown to be the most similar to the pottery. In the case of the group 4 vessels, mostly comprised of vessels of Early to Middle Iron Age date from sites to the south of the Purbeck Ridge, they are more frequently associated with the Wealden Clays, particularly the sample from SE Purbeck, than the Poole Formation clays. Clay samples from north of the Purbeck Ridge that appeared to be the most similar to the pottery of groups 1-3 and part of group 5 included a sample of Broadstone Clay from Foxground Plantation (field sample 1), one of Parkstone Clay from Bourne Bottom Nature Reserve (field sample 3), the Kimmeridge Clay sample from Kimmeridge Bay, the Creekmoor Clay sample from Upton Country Park and the Wealden Clays from SE Purbeck (sample 6) and Lower Lynch Farm (samples 3, 4A and 4B).

Preliminary analysis into the clay sources used by the Poole Harbour potters by Belinda Coulston also found the Wealden Clay offered the best compositional match to her samples of Late Iron Age pottery from Maiden Castle, with a sample of the Broadstone Clay from Rempstone and one of Kimmeridge Clay from Kimmeridge also similar. The research reported here has also indicated that the Wealden Clays were probably exploited by the Poole Harbour potters in all periods, perhaps exclusively by the possible workshop indicated by pottery group 4 and as one source amongst others by the workshops suggested by groups 1, 2, 3 and 5. These other sources may have been located to the north and south of Poole Harbour. This suggests a chronological progression, with exploitation of the Wealden Clays during the Early to Middle Iron Age periods, but a greater range of sources exploited during the Late Iron Age, from areas closer to Poole Harbour. This will be further examined in Chapter 10.

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Chapter 9

Typology

The typology of the Romano-British Black-burnished ware pottery from Dorset is now relatively well established (Seager Smith and Davies 1993). A typology of the Late Iron Age vessels was published by J. W. Brailsford in the Dorset *Proceedings* in 1958 and this ceramic tradition is also encapsulated in Cunliffe's (2005) 'Durotrigian' types, but both authors portray a limited range of the forms of this period. The Middle Iron Age vessel types form the basis of Cunliffe's 'Maiden Castle-Marnhull style', but no summary exists of the range of Early Iron Age forms. This chapter will provide a summary of the way previous researchers have classified the pottery forms that are thought to have been produced around Poole Harbour and the Isle of Purbeck during the Iron Age, and then collate these forms and present them as a single typology.

9.1 Previous classifications of the Iron Age Poole Harbour wares

Brailsford's paper of 1958 attempted to define the cultural traditions of the inhabitants of Dorset during the latest stages of the Iron Age. He summarised the burial tradition, settlement pattern, pottery, coins and other metal objects, concluding that the Durotrigian culture was an indigenous development of traditions current in the preceding phases, with little external influence, and extended across the modern county of Dorset, into eastern Devon, south-east Somerset, south-west Wiltshire and parts of Hampshire, west of the River Avon (Brailsford 1958). He identified nine main pottery forms and three associated forms. The main forms are (Brailsford 1958, 118):

1. Bowls of Maiden Castle "War Cemetery" type, ribbed or plain
2. Pedestalled bead-rim bowls
3. Bowls with a channel round the rim
4. Bead-rim jars
5. Upright-rim jars
6. Countersunk-lug jars
7. 'Pear-shaped jars'

8. Tankards
9. Lids

The associated forms are tazze (type 10), Hengistbury 'Class B' bowls (type 11), and flat-rimmed jars (type 12). He suggested that three of these forms originated from earlier types: the bead-rimmed jars, jars with countersunk handles, and flat-rimmed jars, the latter he notes were sometimes red-finished (Brailsford 1958, 118). He described the fabric as uniform, gritty, quite hard and dark in colour. The exterior was recorded as having a fairly well-finished surface with a 'tooled' finish, and decoration 'consists of simple chevrons, lattice or wavy lines, incised, or burnished against a matt background' (Brailsford 1958, 118). In terms of manufacture, he felt that some of the better-finished vessels may have been wheel-made but that others may have been produced with the aid of a simple turntable. He recognised that there was no perceptible change in the forms from before or after the Conquest. His survey did not identify any imitations of 'Belgic' vessels, other than the occasional tazze, although he suggested the Durotrigian tankards might be copies of the bronze or wooden tankards from Belgic burials (Brailsford 1958, 118).

Brailsford's typology remained largely unchallenged for nearly 40 years, until research by Lisa Brown indicated that a number of Brailsford's forms may not actually be Dorset products and may have originated in other centres such as Exeter. Brown identified over 40 Poole Harbour forms, including imitations of 'Belgic' and Armorican vessels (Brown 1997, 41). She realised that forms such as the ubiquitous flat-based, bead-rimmed bowl (Brown 1987, 1991, form BC3.3) were not included by Brailsford and although he recognised the flat-rimmed jar as a Dorset product, he did not include it among his main forms. Lisa Brown has examined some of the largest Iron Age pottery assemblages from Dorset, notably Hengistbury Head and Maiden Castle, and applied the typology she devised for the pottery from the Iron Age hillfort at Danebury, Hampshire, to the Poole Harbour wares from other sites, creating new codes where necessary. This has been followed by some, but not all, other researchers reporting on Poole Harbour wares from other sites. Where this typology has not been applied, including sites excavated prior to the work of Brown, site specific form series have been created (for example Davies 1987; Lancley and Morris 1991).

9.2 Methodology

A review of the literature was carried out to identify all of the vessel types that are thought to originate from workshops operating around Poole Harbour during the Iron Age. Although the aim of this thesis is to examine the Early to Middle Iron Age phases of the Poole Harbour pottery industry, continuity in many of the forms current in the Middle Iron Age through to the Late Iron Age necessitates that the Late Iron Age forms are also included here. However, sites where only Late Iron Age and Roman pottery has been identified, such as Tollard Royal, Poundbury, Halstock and Buzbury Rings, were not included.

The sites from which this data has been drawn comprise those where Poole Harbour wares have been positively identified as such, on the basis of fabric analysis, in the published literature or by the current researcher. These include Hengistbury Head, Maiden Castle, Gussage All Saints, Rope Lake Hole, the sites investigated during the Wytch Farm Oilfield Project, Green Island, and Compact Farm in Worth Matravers. Assemblages where Poole Harbour wares have not been positively identified were not included, unless sampled during the course of this research and subsequently found to originate from Poole Harbour/Purbeck, such as selected vessels from Eldon's Seat, Encombe, and Football Field (Compact Farm) in Worth Matravers. Sites from which forms typical of the Poole Harbour repertoire have been recovered, but have not been subject to fabric analysis, such those from the Iron Age hillfort at Hod Hill (Richmond 1968), were not included in the compilation of this typology.

The typology put forward here uses the range of forms identified at Hengistbury Head as its base (after Brown 1987), expanding upon it by drawing in different forms from other sites. It is presented by period and then by broad form class (jars, bowls, etc.) within each period. In order to allow other forms to be added, a simple layered system has been devised (below), with a Roman numeral to denote the broad period, a two letter classification to denote the vessel class and a number to differentiate between forms (shown below). Thus I.JA.1, for example, is an Early Iron Age jar form. Each form is briefly described in the heading and illustrated using examples from the figures published in excavation reports. Scales are included in the figures presented below where examples were originally published at the same scale, at a third or quarter reduced. Where examples are drawn from vessels initially published at different scales, the rim diameters are instead shown in the captions, as is the case for single examples of a type. Note of the sites from which the vessels were recovered, and comment on the range of rim diameters of each form, are included in Appendix H. The publication of the Wytch Farm Oilfield sites includes the rim diameter range of each form, and the rim diameters for the vessels from the 1967 and 2010 excavations at Green Island were recorded by the author, but rim diameter data for the other sites in not available in the published reports or their microfiche. Instead the rim diameters of the published drawing were measured and the range included in the appendix, but this is clearly very incomplete data and only broad inferences may be suggested for the rim diameter range of each form.

Phase

I: Early Iron Age

II: Early to Middle Iron Age

III: Middle Iron Age

IV: Middle to Late Iron Age

V: Late Iron Age

Vessel Class

JA: jar

BO: bowl

SP: saucepan pot

DP: dish or platter

LI: Lids

OT: Other forms

9.3 Early Iron Age forms

9.3.1 Jars

I.JA.1 High, angular shouldered jar with flaring rim

This form has been identified at Rope Lake Hole with three examples in probable Poole Harbour sandy wares, but only calcareous vessels were illustrated.

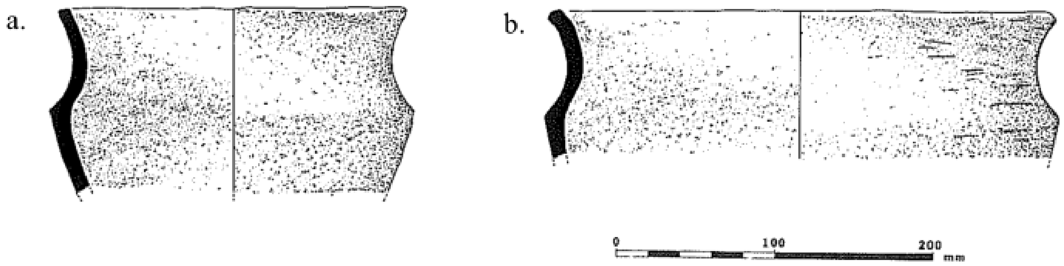

Figure 9.1 Examples of form I.JA.1 (from Davies 1987, form 20, fig. 79, a: 21 and b: 22)

I.JA.2 Jar/vessel with internal hooked/flanged rim

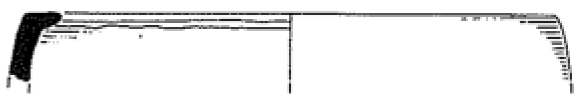

Figure 9.2. Example of form I.JA.2 (from Lancley and Morris 1991, type 113, fig. 58, 1; rim diameter 260mm)

I.JA.3 'High-shouldered jar with upright or slightly flared rim and fingertip or fingernail decoration on the rim top and/or shoulder' (Brown 1987, 208)

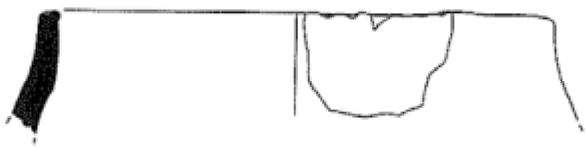

Figure 9.3. Example of form I.JA.3 (from Brown 1987, JB1.0, fig. 200, 1346, rim diameter: 200mm)

I.JA.4 'Shouldered jars with upstanding rims which are usually slightly flattened' (Brown 1987, 208). Similar to I.JA.3 but undecorated.

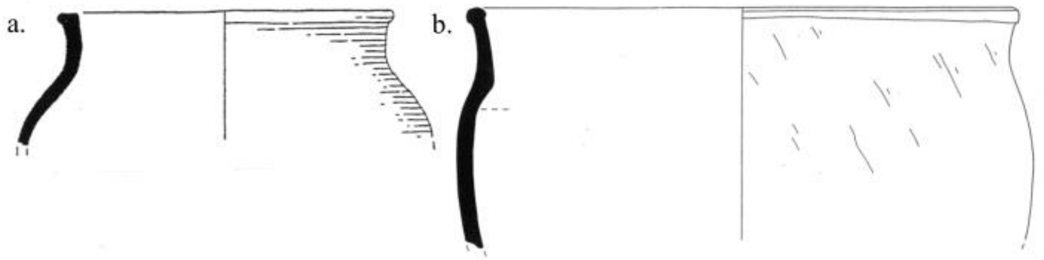

Figure 9.4. Example of form I.JA.4 (a: Seager Smith 2002, R4, fig. 1.29, no.6, rim diameter: 240mm; b: Brown 1987, JB2.2, ill. 200, 1302, rim diameter: 300mm)

I.JA.5 Large, round-shouldered jar with upright rim

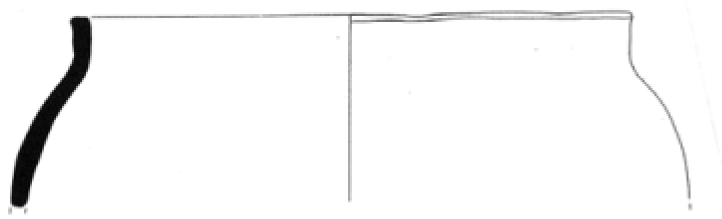

Figure 9.5. Example of form I.JA.5 (from Brown 1987, JB3.0, ill. 134, 1305, rim diameter: 240mm)

I.JA.6 'Large barrel-shaped jars with slack shoulders, in coarse fabrics with roughly finished surface' (Brown 1987, 208)

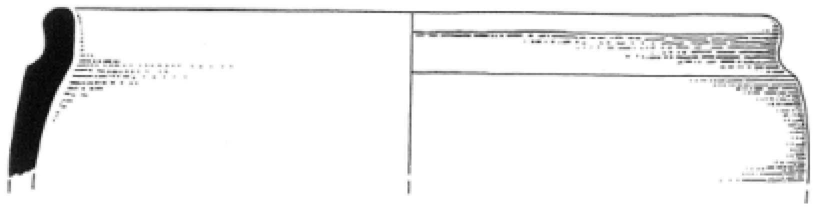

Figure 9.6. Example of form I.JA.6 (from Brown 1991, JB4.0, fig. 152, 8, rim diameter 240mm)

9.3.2 Bowls

I.BO.1 Carinated bowl, steeply angled, cordon below inclining rim

This single example from Rope Lake Hole was a large vessel with a red-finished exterior, incised-line and stabbed-dot decoration infilled with white paste. Body sherds with similar decoration have been found in Poole Harbour fabrics at Quarry Field, Compact Farm (Seager Smith 2002, fig. 1.31, 54).

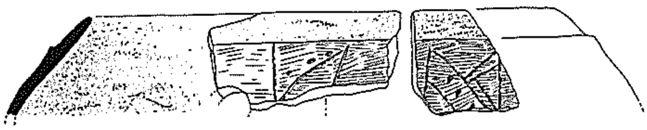

Figure 9.7. Example of form I.BO.1 (from Davies 1987, form 1, fig. 79, 15; rim diameter 260mm)

I.BO.2 Furrowed, carinated bowls, usually red-finished

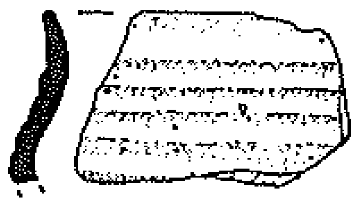

Figure 9.8. Example of form I.BO.2 (illustration supplied by Lilian Ladle from the forthcoming publication of Football Field, Worth Matravers)

9.4 Early to Middle Iron Age

9.4.1 Jars

II.JA.1 Slack-profiled jar, upright or slightly inclining rim, wall thickening towards the rim

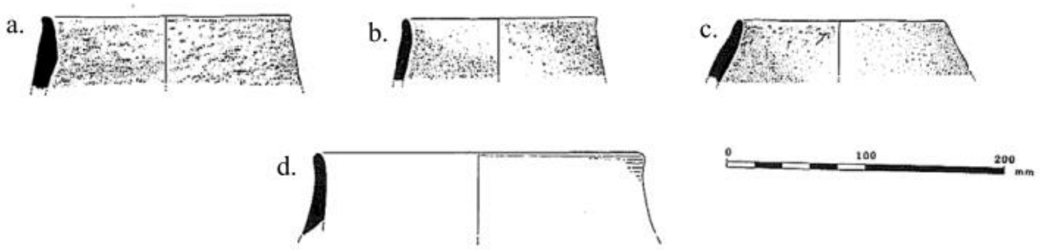

Figure 9.9. Examples of form II.JA.1 (Davies 1987, type 21, a: fig. 79, 16, b: fig. 80, 46 and type 23, c: fig. 81, 65; d: Lancley and Morris 1991, type 110, fig. 58, 2)

II.JA.2 Carinated jar with high, angled shoulder, plain inclining rim

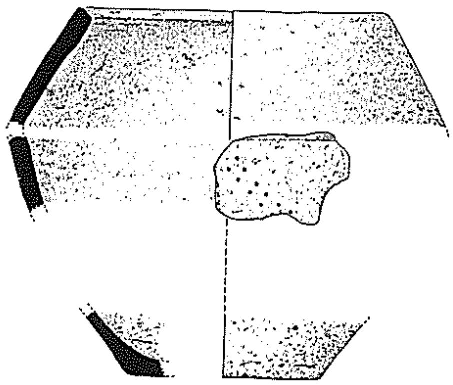

Figure 9.10. Example of form II.JA.2 (Davies 1987, type 23, fig. 80, 39; rim diameter 160mm)

II.JA.3 Large, barrel-shaped to ovoid jars with flattened rim top

Jar with high shoulder, a smooth, slightly rounded profile and in-turned, squared rim.

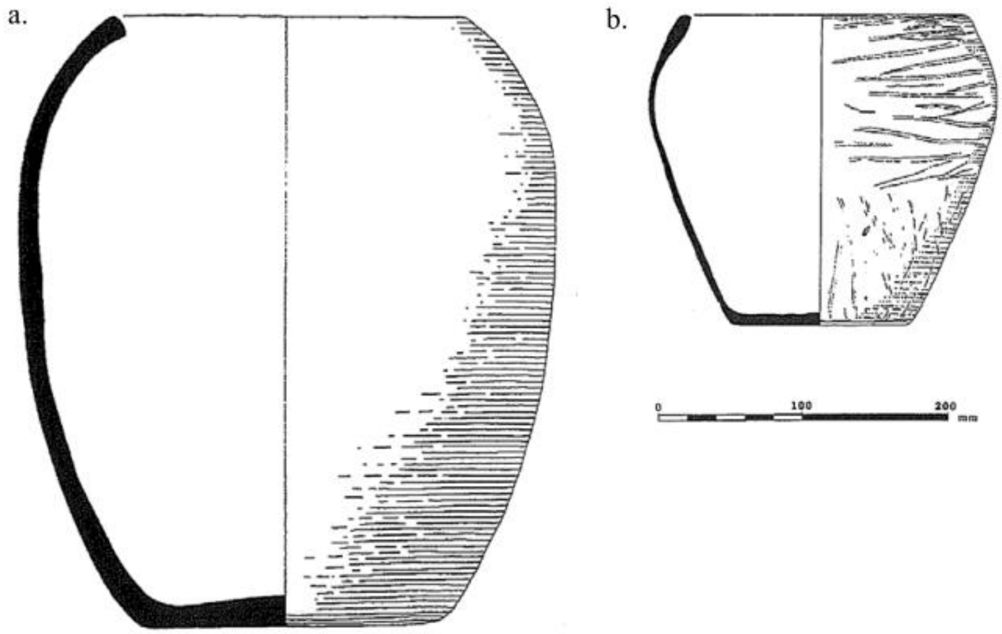

Figure 9.11. Example of form II.JA.3 (a: Seager Smith 2002, R2, fig. 1.29, 2; b: Brown 2006, JC1, fig. 25, 80)

9.4.2 Bowls

II.BO.1 Small open bowl or cup with plain, undifferentiated rim and rounded walls

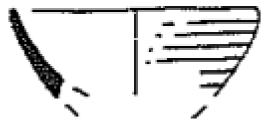

Figure 9.12. Example of form II.BO.1 (Seager Smith 2002, R25, fig. 1.30, 46; rim diameter 44mm)

II.BO.2 Carinated bowl with upright wall above the carination

Figure 9.13. Example of form II.BO.2 (Cunliffe 1968, fig. 16, 129 – no published scale)

II.BO.3 Shouldered bowl with concave neck and slightly everted rim

Figure 9.14. Example of form II.BO.3 (Lancley and Morris 1991, type 126, fig. 59, 33; rim diameter 120mm)

II.BO.4 Steeply angled, carinated bipartite bowl

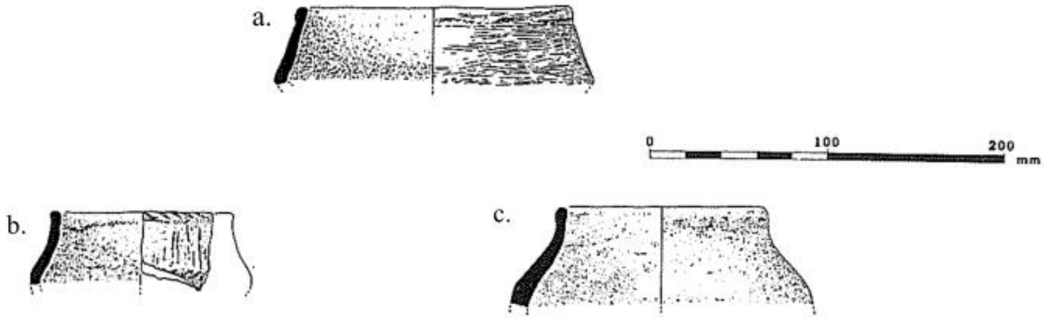

Figure 9.15. Examples of form II.BO.4 (Davies 1987, types 2 and 3, fig. 79, a: 10 and b: 18, c: fig. 80, 31)

II.BO. 5 Round-shouldered bowl

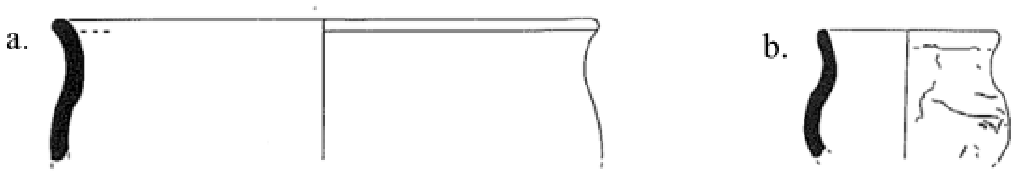

Figure 9.16. Examples of form II.BO.5 (Brown 1987, BA, a: fig. 156, 1510 [rim 240mm] and b: 231 [rim 80mm])

II.BO.6 Carinated bowls with 'low-slung' carination and flaring rim

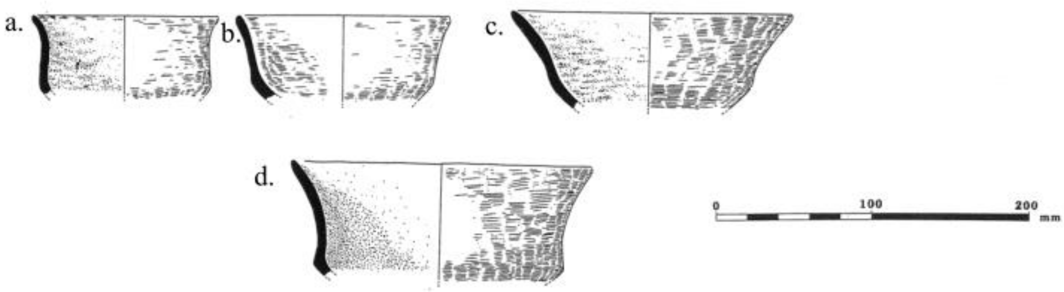

Figure 9.17. Examples of form II.BO.6 (from Davies 1987, type 4, fig, 80, a: 23, b: 24, c: 25, d: 26)

II.BO.7 Open bowl with internally flanged, flat-topped rim, often red-finished on both surfaces

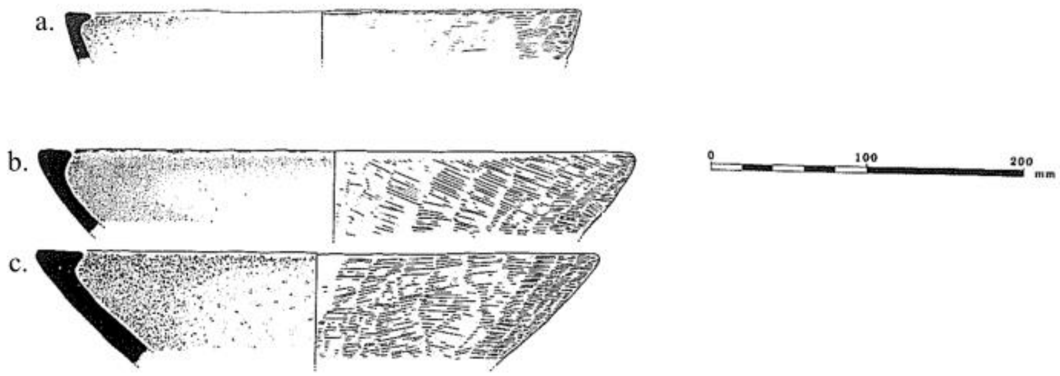

Figure 9.18. Examples of form II.BO.7 (from Davies 1987, type 6, a: fig. 79, 4 and fig. 80, b: 34, c: 35)

9.5 Middle Iron Age

9.5.1 Jars

III.JA.1 Slack-profiled, bag-shaped (low-waisted) jar with slightly everted rim

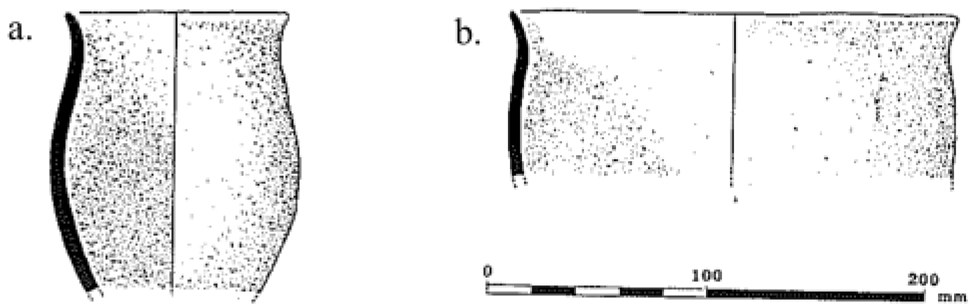

Figure 9.19. Examples of form III.JA.1 (from Davies 1987, form 22, fig. 80, a: 44 and b: 47)

III.JA.2 Large jar with grooved rim giving a twisted rim effect, may have handle/lug

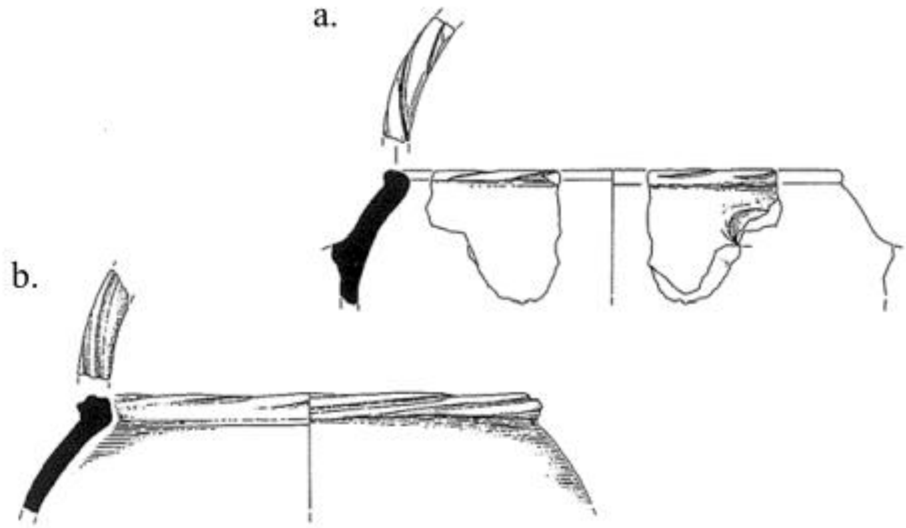

Figure 9.20. Examples of form III.JA.2 (a: Lancley and Morris, 1991, form 124, fig. 58, 6, rim: 290mm; b: Brown 1991, JC2.0 misc, fig. 153, 21, rim: 220mm)

III.JA.3 High-shouldered jar with beaded rim, two grooves outline edge of the rim top

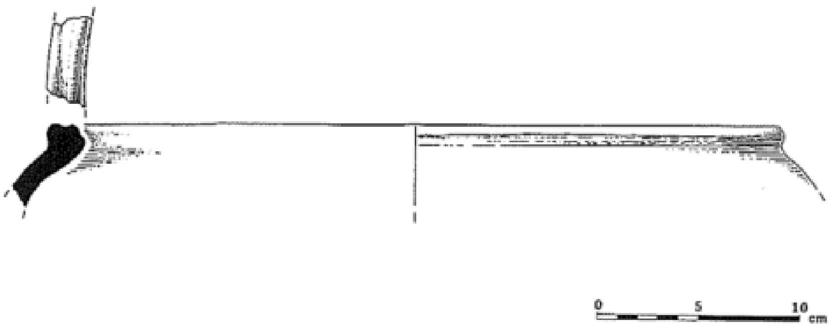

Figure 9.21. Example of form III.JA.3 (from Brown 1991, JC2.0 misc, fig. 153, 23; 360mm rim diameter)

III.JA.4 Large, globular jar with short neck and flattened rim

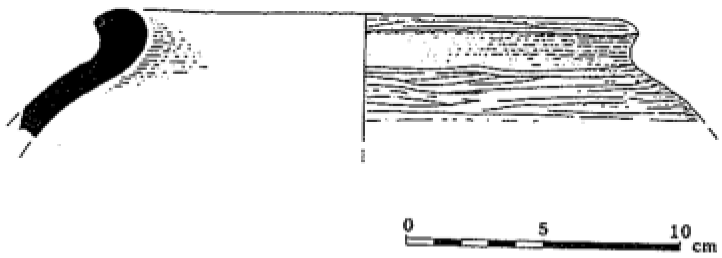

Figure 9.22. Example of form III.JA.4 (from Brown 1991, JC1.1, fig. 153, 3; rim: 200mm)

III.JA.5 Round-profiled jars, rims thickened and rolled out to form proto-bead

This category includes bead-rimmed jars formed by incising a groove at the base of a thickened rim, as is commonly seen at Green Island and Furzey Island, and those formed by thickening and rolling the rim top. It is a commonly occurring form; the vessels tend to be small to medium in size. The jars were often burnished, and sometimes decorated with horizontal and wavy lines of impressed dots (Brown 1987, ill. 135, 95), a wavy tooled line (Brown 2006, fig. 23, 30), incised horizontal lines (Green Island), indented bosses (Brown 1987, ill. 135, 665) or a band of fingertip impressions (Lyne 2012, fig. 139, 1). It may also have countersunk-lug handles.

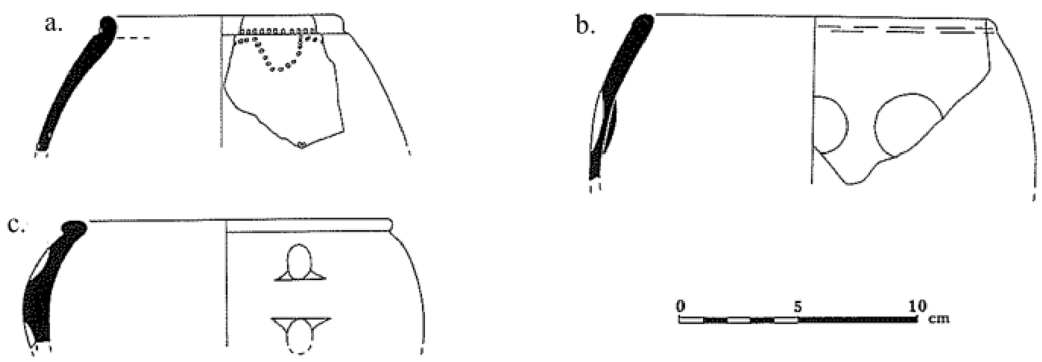

Figure 9.23. Examples of form III.JA.5 (from Brown 1987, JC2.0, ill. 135, a: 95, b: 665, c: 664)

III.JA.6 Round-bodied jar with everted rim

This form differs from V.JA.4 in having a more rounded, flowing profile.

III.JA.7 Shouldered jar with out-turned, beaded rim and fingertip decoration around shoulder

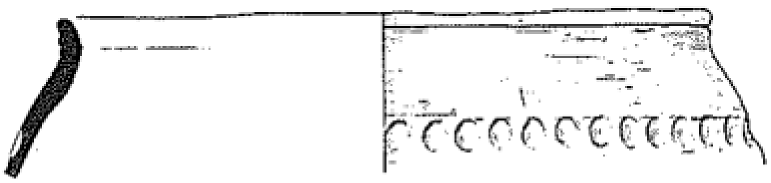

Figure 9.24. Example of form III.JA.7 (Wainwright 1979, fig. 58, 188, rim: 240mm)

9.6 Middle to Late Iron Age

9.6.1 Jars

IV.JA.1 Ovoid jar with plain rim

This form type encompasses a range of high-shouldered jars of ovoid profile.

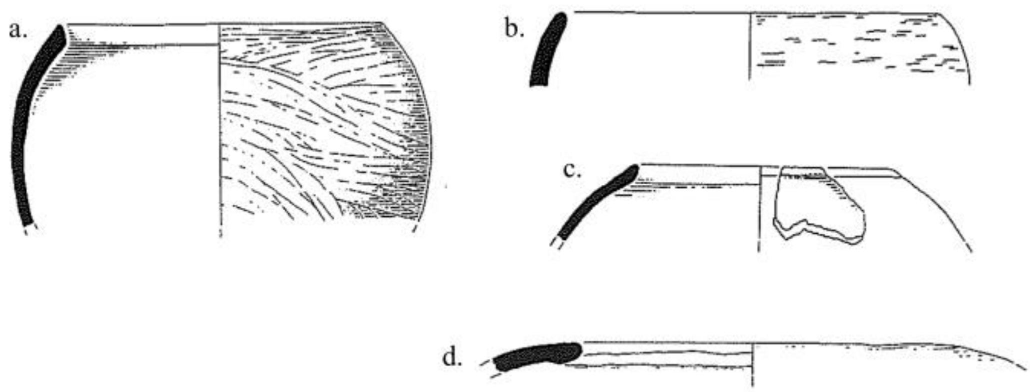

Figure 9.25. Examples of form IV.JA.1 (a: Brown 1991, JC3.1, fig. 159, 8, rim diameter: 140mm; b: Field 1983, fig. 12, 2, rim diameter: 220mm; c: Lancley and Morris 1991, type 112, fig. 58, 3, rim diameter: 160mm; d: *ibid.* type 135, fig. 59, 27, rim diameter: 210mm)

IV.JA.2 Barrel-shaped jar with slightly out-turned rim

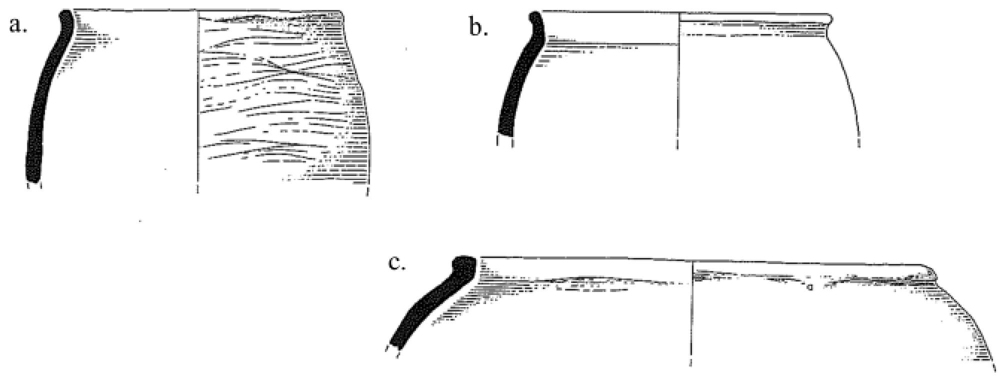

Figure 9.26. Examples of form IV.JA.2 (a: Brown 1991, JC2.1, fig. 157, 16; b: Lancley and Morris 1991, type 133, fig. 58, 10, 200mm rim diameter; c: Brown 1991, JC3.1, fig. 157, 10, rim diameter: 220mm)

IV.JA.3 High-shouldered, round bodied jar with short, upstanding rim, often has countersunk lug handles

These vessels are predominantly of Late Iron Age date but earlier examples, of late 2nd century BC date, have been recorded. Most had smoothed or burnished surfaces; some were decorated, with a horizontal line around the shoulder or moulded impressions such as the petal motif. Later forms of decoration included a band around the body with diagonal lines or burnished lattice.

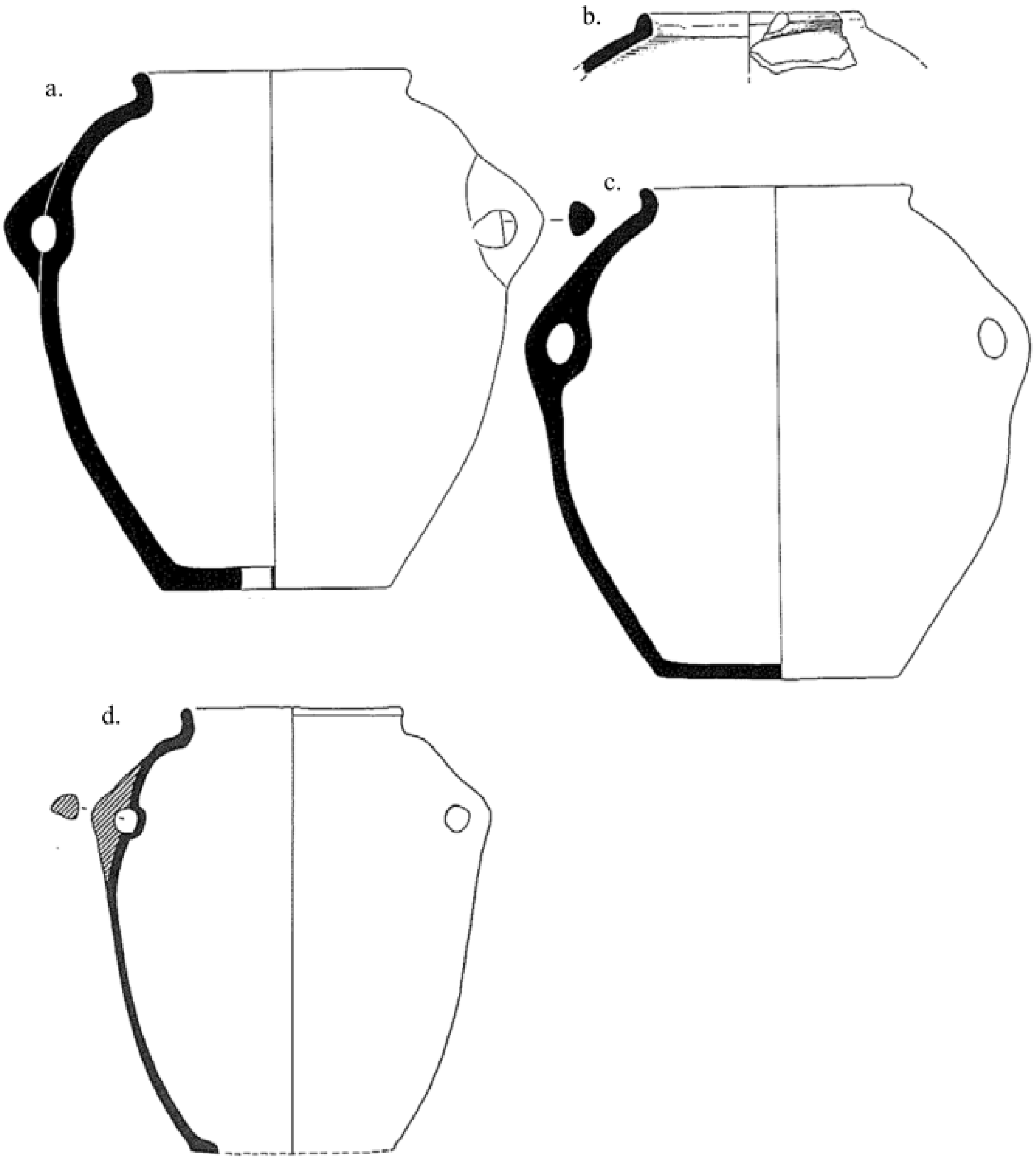

Figure 9.27. Examples of form IV.JA.3 (a: Brown 1987, JD4.41, ill. 148, 2124 [140mm rim]; b: Brown 1991, JC3.1, fig. 155, 9 [110mm rim diameter]; c: Brown 1987,JD4.41, ill. 148, 698 [135mm rim]; d: Wainwright 1979, type 55, fig. 53.436 [110mm rim])

IV.JA.4 Large, barrel-shaped jar, rim is internally bevelled and pulled on the exterior

Found at Wytch Farm Oilfield (Lancley and Morris 1991, type 123), Rope Lake Hole (Davies 1987, type 27), Hengistbury Head (Brown 1987, decorated with horizontal parallel rows of dots), Maiden Castle (Brown 1991) and Quarry Field (Seager Smith 2002, R23). The illustrated rim diameters of 80-260mm indicate it was made in a range of sizes.

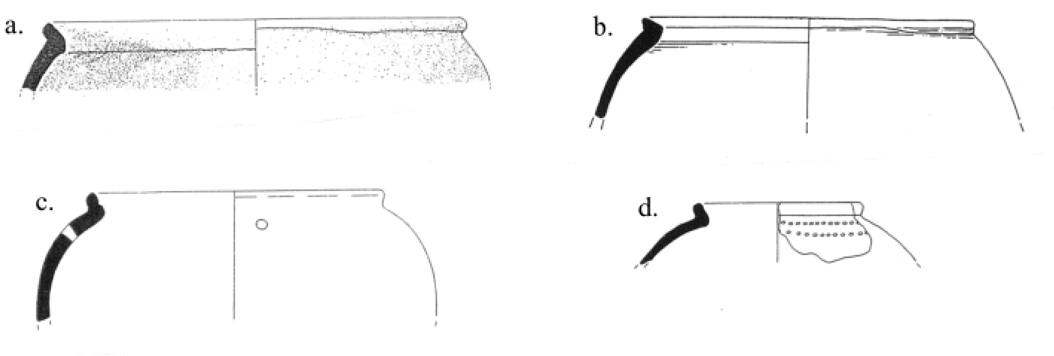

Figure 9.28. Examples of form IV.JA.4 (a: Davies 1987, type 27, fig. 82, 77 [270mm rim]; b: Lancley and Morris 1991, type 123, fig. 58, 5 [210mm rim]; c: Brown 1987, JC.3.1, ill. 211, 1308 [140mm rim]; d: *ibid.* JC2.0, ill. 135, 1711 [80mm rim])

IV.JA.5 Long-necked, slack-shouldered jar, may have a slightly expanded rim

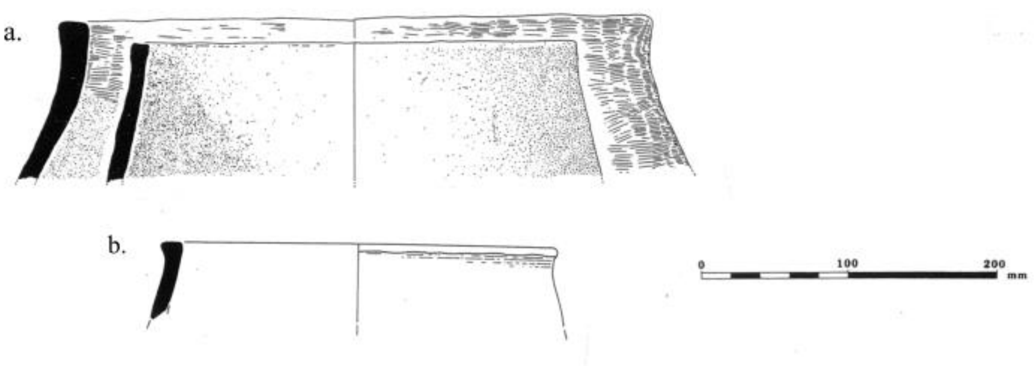

Figure 9.29. Examples of form IV.JA.5 (a: Davies 1987, type 24, fig. 80, 48-49 and Lancley and Morris 1991, type 125, fig. 58, 7)

IV.JA.6 High shouldered jar with vertical rim, may be decorated on neck or shoulder

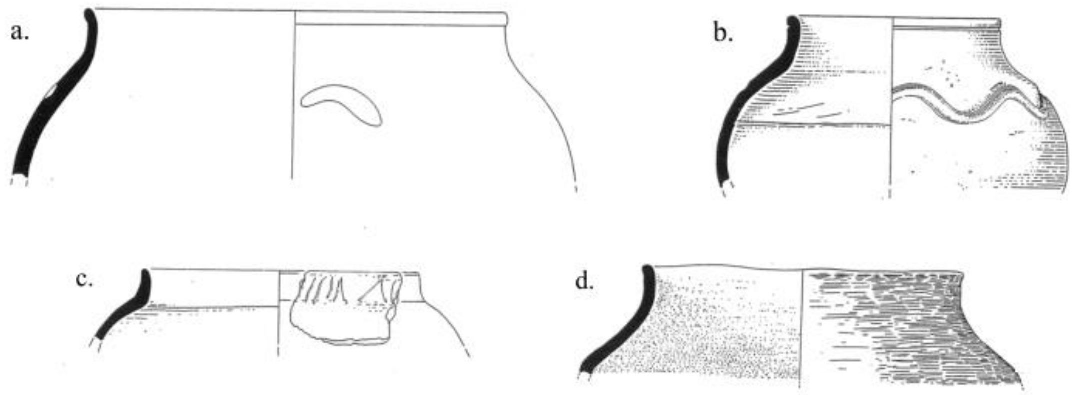

Figure 9.30. Examples of form IV.JA.6 (a: Brown 1987, JC2.0, ill. 135, 666 [rim 200mm]; b: Brown 1991, JD4.4, fig. 159. 11 [100mm rim], c: Lancley and Morris 1991, type 119, fig. 59, 23 [180mm rim] and d: Davies 1987, type 25, fig. 81, 67 [200mm rim])

IV.JA.7 Bead-rimmed jar with even, curved shoulders, plain bases (sometimes with pre-firing perforations), profile may be quite ovoid, may have countersunk lug handles

This jar form was one of the most extensively produced and distributed of the Poole Harbour types. The vessels were usually burnished or smoothed. Some were decorated, the range of motifs/schemes include the eyebrow motif, petal motif, overlapping diagonal lines, vertical wavy motifs on a panel below the shoulder, dots within grooved lines on a shoulder panel, vertical lines terminating in impressed circles, a horizontal line at the shoulder, a zig zag motif on a panel below the shoulder, three horizontal lines below the rim, lattice decoration, a dimple and wavy line, a shoulder band of double chevron and vertical lines on the body below, a band of pairs of horizontal elliptical impressions, groups of three circular dimples/fingertip impressions, and a scored wavy line.

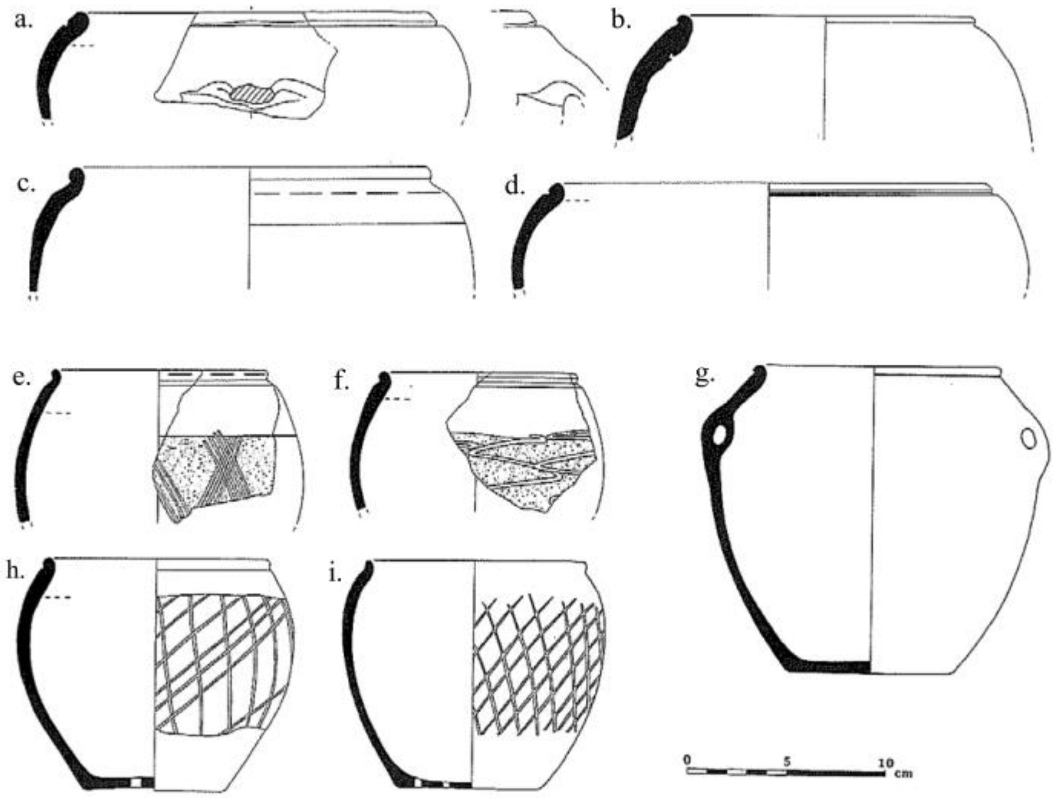

Figure 9.31. Examples of form IV.JA.7 (Brown 1987. JC3.1, ill. 137, a: no. 1985, b: no. 2038, c: no. 2042, d: no. 2035; e: *ibid.* ill. 138, no. 1285, f: no. 1288; g: *ibid.* ill. 137, 697; h: *ibid.* ill. 138, no. 2119, i: no. 700)

IV.JA.8 Flat-rimmed jar, may have countersunk lug handles

This was one of the most commonly occurring Poole Harbour ware forms from the Middle Iron Age through to the 1st century AD. This form was sub-divided by Lisa Brown into smaller vessels, usually undecorated (JC4.1) and larger vessels, often decorated (JC4.2).

There has been some debate as to the intended function of this vessel form. Brown noted that there was little evidence of this form being used to boil water, and suggested it may have functioned as a storage vessel (Brown 1991, 191). Analysis of the pottery recovered from the Wytch Farm Oilfield sites suggested an association between the flat-rimmed jars and bead-rimmed jars and the salt industry. Lancley and Morris (1991, 134) argued that the range of activities carried out on the site would have influenced the range of vessels produced. The production of salt was carried out on a large scale at East of Corfe River, but also at West of Corfe River and the Ower Peninsula site. This is reflected in the quantities of briquetage recovered from the sites, with 15 kg from East of Corfe River, in comparison to 3.8 kg from West of Corfe River, 4.4 kg from Ower Peninsula, just 12 g from Furzey Island and none from West Creech. The site at East of Corfe River certainly does have a very high proportion of flat-rimmed jars, accounting for 33% of all vessels identified by rim type from the site. This compares to 15% from West of Corfe River, 6% from Furzey Island, 7% from West Creech and just 3% from Ower. What part flat-rimmed jars may have played in the salt extraction process is unknown. Seawater would probably have been evaporated near the water's edge in troughs or pans; these might also have been used for drying the salt (Cleal 1991, 147).

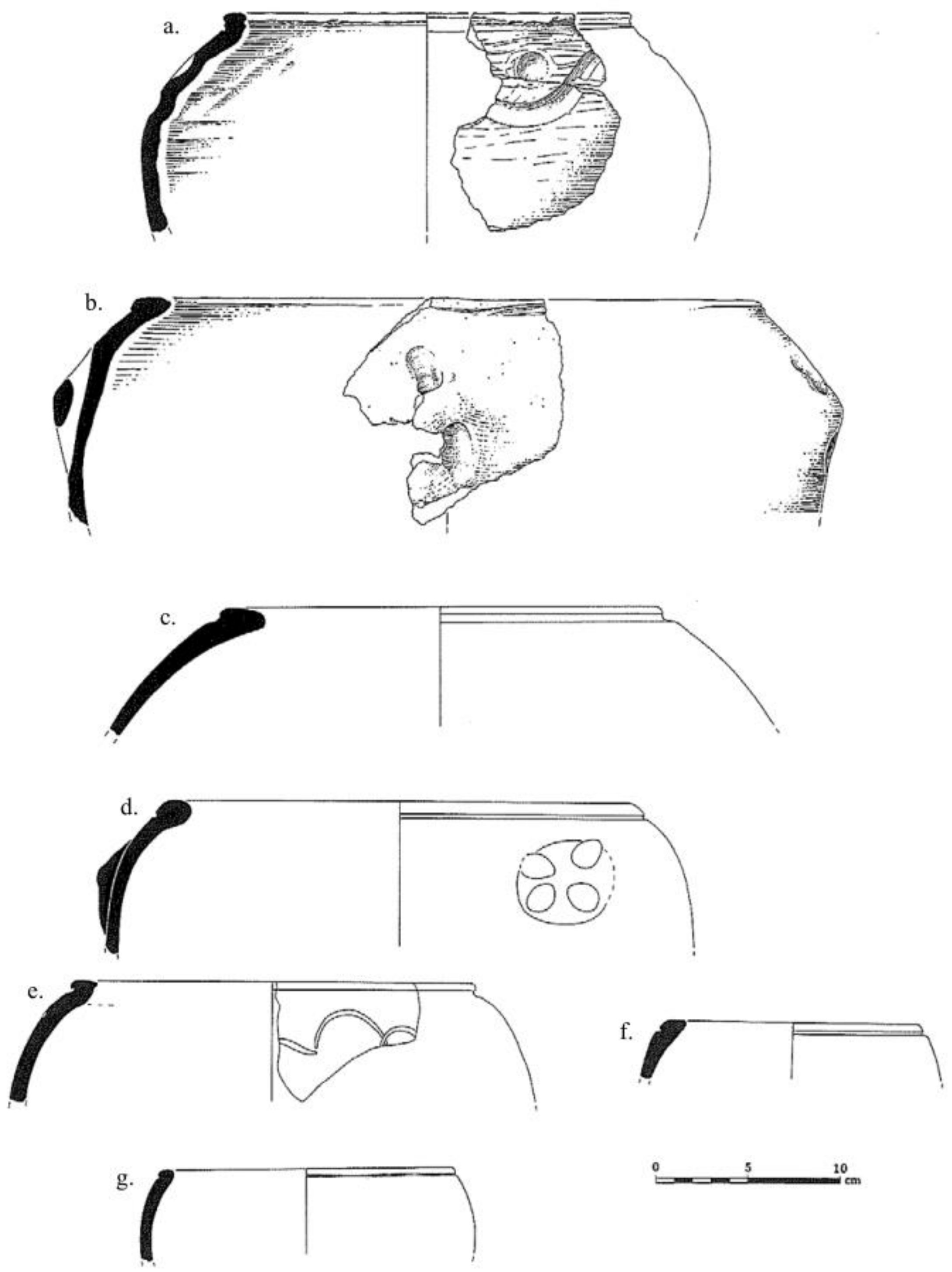

Figure 9.32. Examples of form IV.JA.8 (a: Brown 1991, fig. 158, 1 [JC4.1], b: fig. 159, 14 [JC4.2 CSL]; Brown 1987, ill. 141, nos. c: 1301 [JC4.2], d: 776 [JC.42], e: 855 [JC4.2], f: 1713 [JC4.1] and g: 2226 [JC4.1])

IV.JA.9 Barrel-shaped jar with short, upright rim

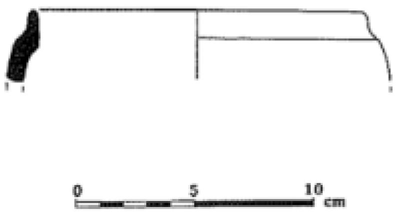

Figure 9.33. Example of form IV.JA.9 (from Brown 1987, JC3.1, ill. 205, 3064)

9.6.2 Bowls

IV.BO.1 Open bowl with dropped internal flange

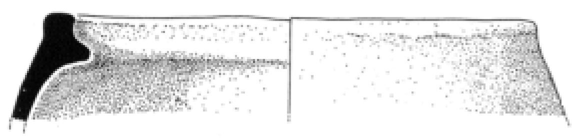

Figure 9.34. Example of form IV.BO.1 (from Davies 1987, type 8, fig. 79, 37, rim diameter: 270mm)

IV.BO.2 Open, round-bodied bowl with lid-seating

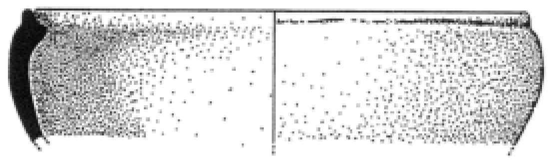

Figure 9.35. Example of form IV.BO.2 (from Davies 1987, type 14, fig. 81, 57, rim diameter: 200mm)

IV.BO.3 Round-bodied bowl with everted rim

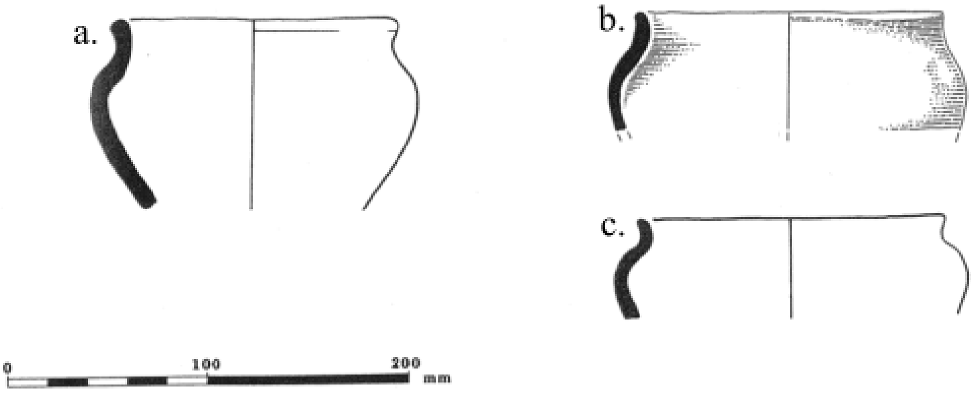

Figure 9.36. Examples of form IV.BO.3 (a: Wainwright 1979, type 21, fig. 47, 784, rim: 150mm; b: Brown 1991, BD4.2, fig. 161, 15, rim 115mm; c: Wainwright 1979, type 41, fig. 49, 817, rim 160mm)

IV.BO.4 Open, round-bodied shallow bowl with plain rim, may have been used as a lid

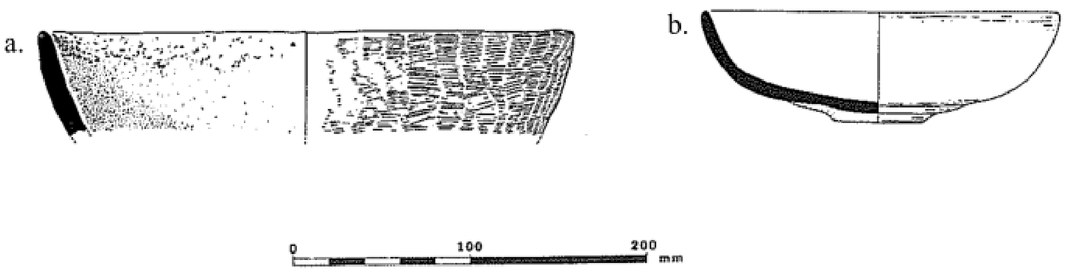

Figure 9.37. Examples of form IV.BO.4 (a: Davies 1987, type 7, fig. 80, 32; b: Lancley and Morris 1991, type 115, fig. 59, 43)

IV.BO.5 Plain, open bowl with flat-topped rim

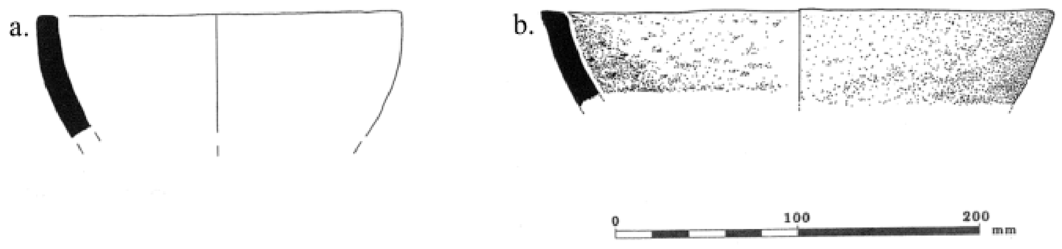

Figure 9.38. Examples of form IV.BO.5 (a: Green Island, author's drawing; b: Davies 1987, type 9, fig. 81, 52)

IV.BO.6 Round-sided bowl with squared rim, slight internal bevel

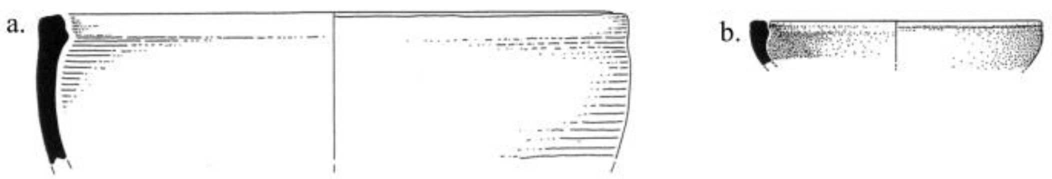

Figure 9.39. Examples of form IV.BO.6 (a: Brown 1991, BC3.42, fig. 155, no. 19, 240mm rim diameter; b: Davies 1987, type 13, fig. 81, 58, 160mm rim)

IV.BO.7 Simple hemispherical bowls with thickened out-curved rim top

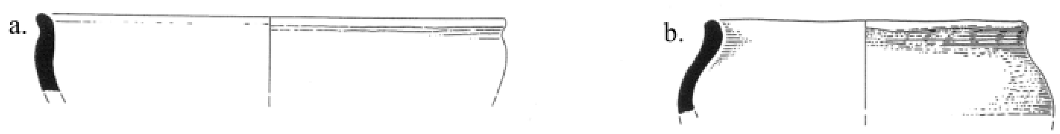

Figure 9.40. Examples of form IV.BO.7 (a: Lancley and Morris 1991, type 117, fig. 59, 41, rim: 270mm; b: Brown 1991, BC1.1, fig. 155, 7, rim: 140mm)

IV.BO.8 Shallow bowl with curved sides and expanded rim, often flattened

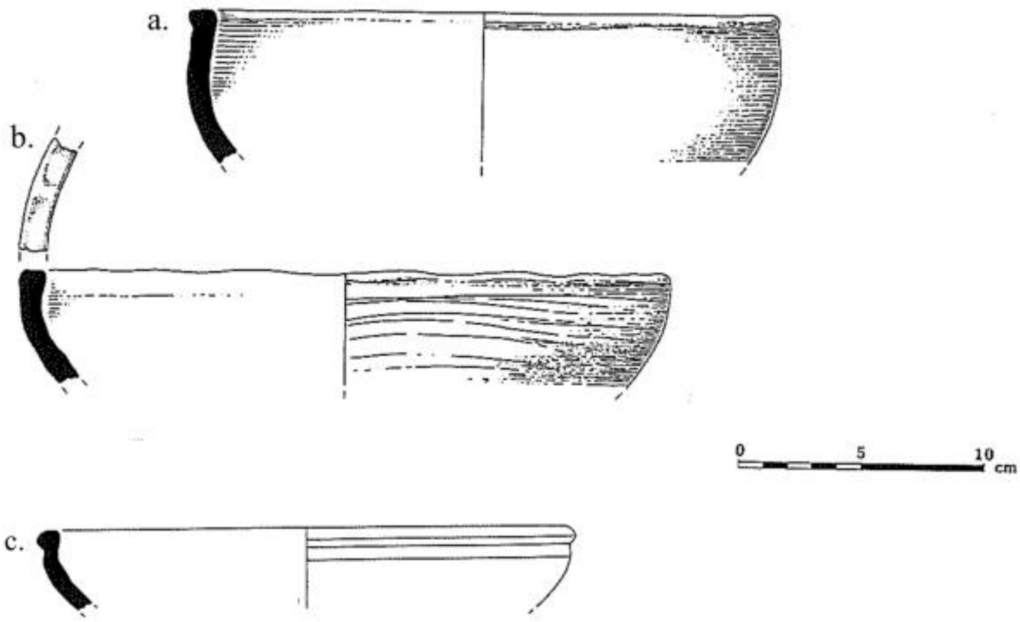

Figure 9.41. Examples of form IV.BO.8 (a: Brown 1991, BC3.41, fig. 161.1, b: fig. 152.3; c: Brown 1987, BC3.41, ill. 158, 428)

IV.BO.9 Bowl with curved sides and slightly expanded grooved rim

This was classified by Brailsford (1958) as type 3 and Brown (1987, 1991) as BC3.42. Some examples have been identified as lids, and the form may have served a dual purpose. It can be difficult to distinguish between bowls and lids with fragmentary examples. The earliest example noted as part of this research comes from an Early Iron Age context at Quarry Field (Seager Smith 2002, R5, fig. 129, 8), however most vessels of this type are of Middle to Late Iron Age date. Late Iron Age examples from Quarry Field were believed to derive from 'Gallo-Belgic prototypes' (Seager Smith 2002, R18, fig. 1.30, 36).

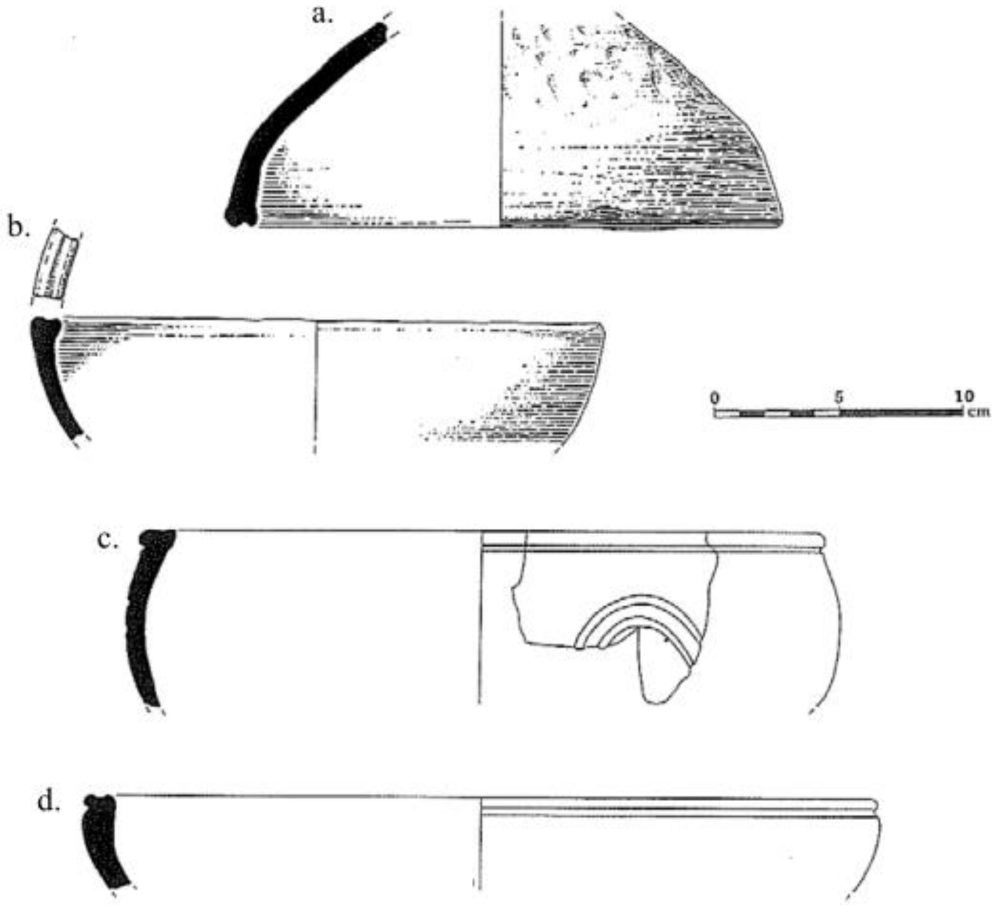

Figure 9.42. Examples of form IV.BO.9 (a: Brown 1991, fig. 163.1 [lid], b: fig. 161.8 [BC3.42]; c: Brown 1987, BC3.42, ill. 158, 911, c: ill. 158, 2005)

9.6.3 Saucepan pots

IV.SP.1 'Vessels with straight or slightly curved sides and rounded or beaded rim tops' (Brown 1987, 212)

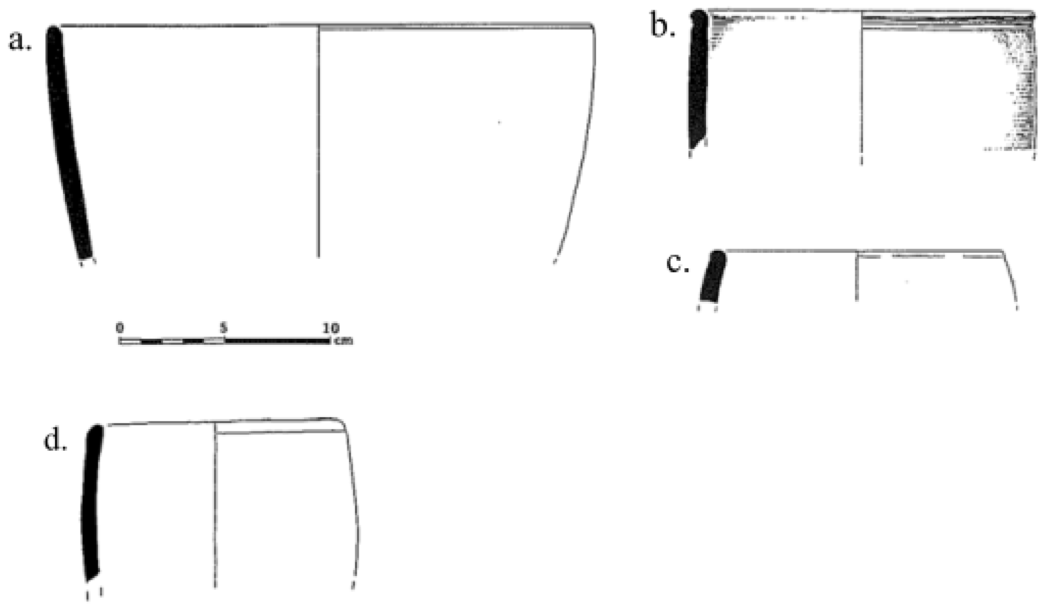

Figure 9.43. Examples of form IV.SP.1 (a: Brown 1987, PB1.1, ill. 209, 75; b: Brown 1991, PB1.1, fig. 160, 7; c: Brown 1987, PB1.1, ill. 204, 3055; d: Green Island, R20, author's illustration)

9.7 Late Iron Age

9.7.1 Jars

V.JA.1 Round-bodied jar with out-turned double bead rim

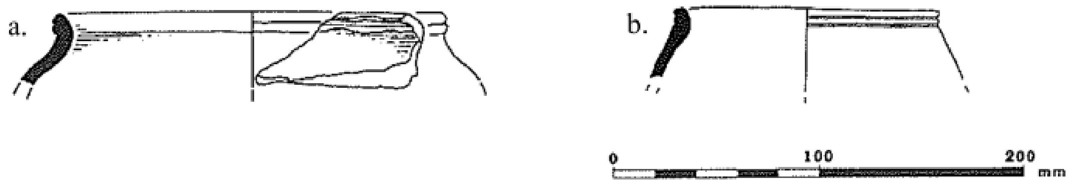

Figure 9.44. Examples of form V.JA.1 (a: Lancley and Morris 1991, type 106, fig. 58, 19; b: Green Island, author’s illustration)

V.JA.2 Very high-shouldered jar with a well-defined, thickened beaded rim

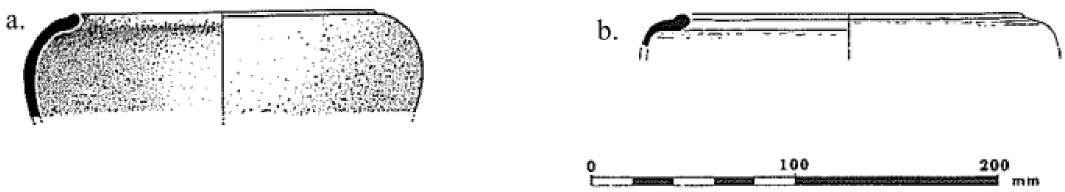

Figure 9.45. Examples of form V.JA.2 (a: Davies 1987, type 15, fig. 81, 56; b: Lancley and Morris 1991, type 136, fig. 59, 28)

V.JA.3 Globular jar with short, out-turned or pulled rim; may have countersunk lug handles

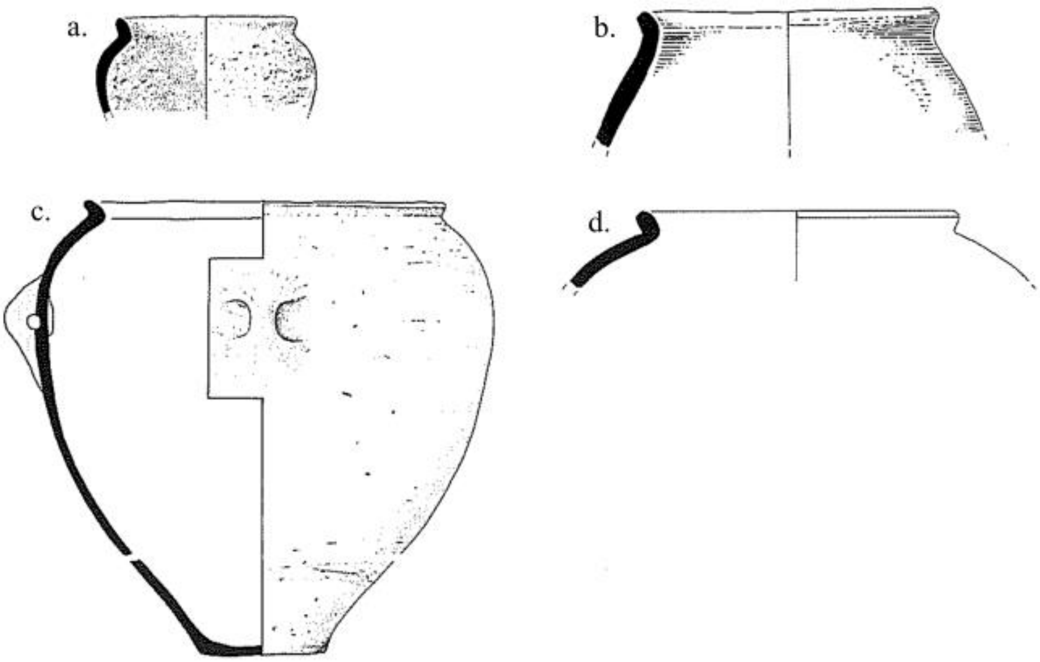

Figure 9.46. Examples of form V.JA.3 (a: Davies 1987, type 27, fig. 82, 76, rim diameter: 100mm; b: Brown 1991, JD4.4, fig. 157, 9, rim diameter: 140mm; c: Lyne 2012, JD4.41, fig. 141, 7, rim diameter: 210mm, height: 260mm; d: Brown 1987, JD4.4, fig. 139, 2046, rim diameter: 140mm)

V.JA.4 Tripartite jars with everted rims and rounded shoulders; plain and undecorated

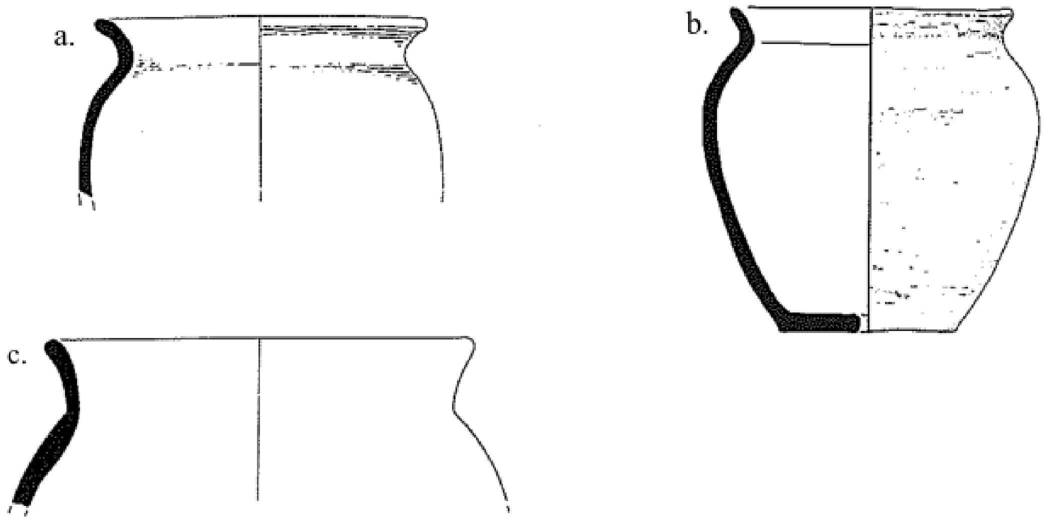

Figure 9.47. Examples of form V.JA.4 (a: Lancley and Morris 1991, type 114, fig. 59, 22; b: Lyne 2012, fig. 139, 11; c: Brown 1987, JD4.11, ill. 142, 1734)

V.JA.5 Tripartite jars with everted rims and rounded shoulders; decorated with tooled horizontal or diagonal lines, impressed circles or rouletting.

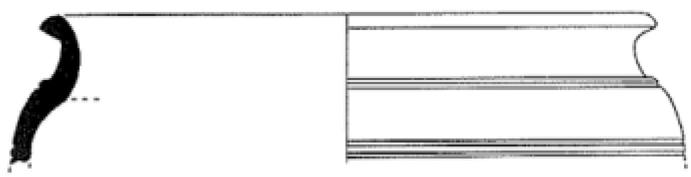

Figure 9.48. Example of form V.JA.5 (from Brown 1987, JD4.12, ill. 142, 633, rim diameter: 260mm)

V.JA.6 Jar with short, out-turned rim. The body of the vessel is burnished with the exception of a matt zone decorated with linear burnish or tooled lines and dots.

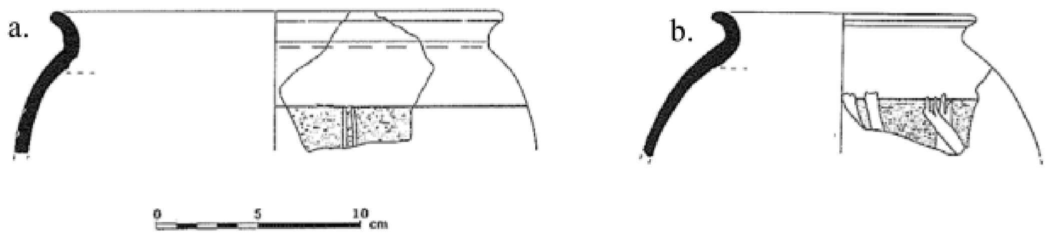

Figure 9.49. Examples of form V.JA.6 (Brown 1987, JD4.42, ill. 149, a: 1319 and b: 1207)

V.JA.7 Jars with rounded profile and short, out-turned rim, separated from the body of the pot by a short, squared indentation, almost a squat neck. May have countersunk lug handles.

The form is often decorated, schemes and motifs include a matt zone below the rim or around the belly of the vessel, decorated with diagonal lines in alternating directions or intersecting diagonal lines creating rough chevrons; horizontal and vertical lines; diagonal lines; tight zig zag lines below the rim; lattice decoration; a curved arc of lines with dots between the lines; wavy lines and the eyebrow motif (single or repeated in a band).

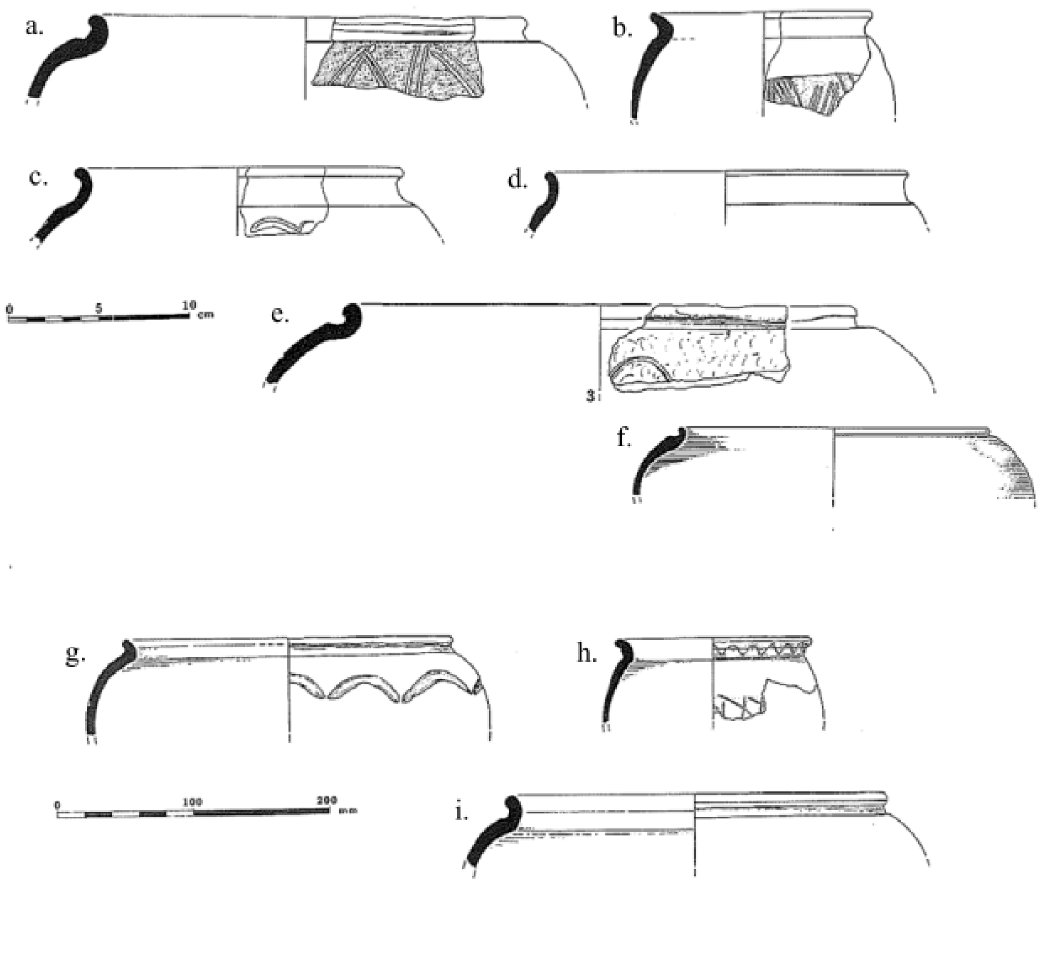

Figure 9.50. Examples of form V.JA.7 (Brown 1987, JD4.5, ill. 150, a: 544, b: 308, c: 1756; d: ill. 151, 1840; Brown 1991, JD4.5, fig. 164, e: 3 and f: 5; Lancley and Morris 1991, g: fig. 58, 18 [type 106], fig. 59, h: 31 [type 130] and i: 20 [type 107])

V.JA.8 Round-bodied jar with upright neck and out-turned rim, decorated with a matt zone defined by horizontal grooves and short vertical grooved lines between

This form has been identified at Hengistbury Head, in a specific fabric variation (Brown 1991, JD4.6, fabric E). The three illustrated examples from the site were all burnished and decorated with a schema that was also seen on bowl forms BC3.52 (V.BO.6) and BC3.6 (V.BO.6) at the site.

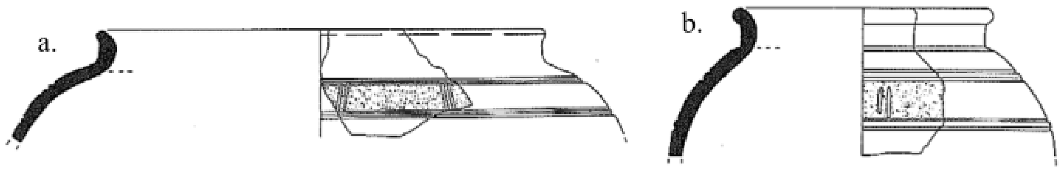

Figure 9.51. Examples of form V.JA.8 (from Brown 1987, JD4.6, fig. 151, a: 770 and b: 679)

V.JA.9 Ovoid jars with cordons placed at intervals down the entire length of the body, and pedestal bases, often with an omphalos' (Brown 1987, 209, JE1.0)

These are wheel-thrown French imports that were copied in Poole Harbour wares.

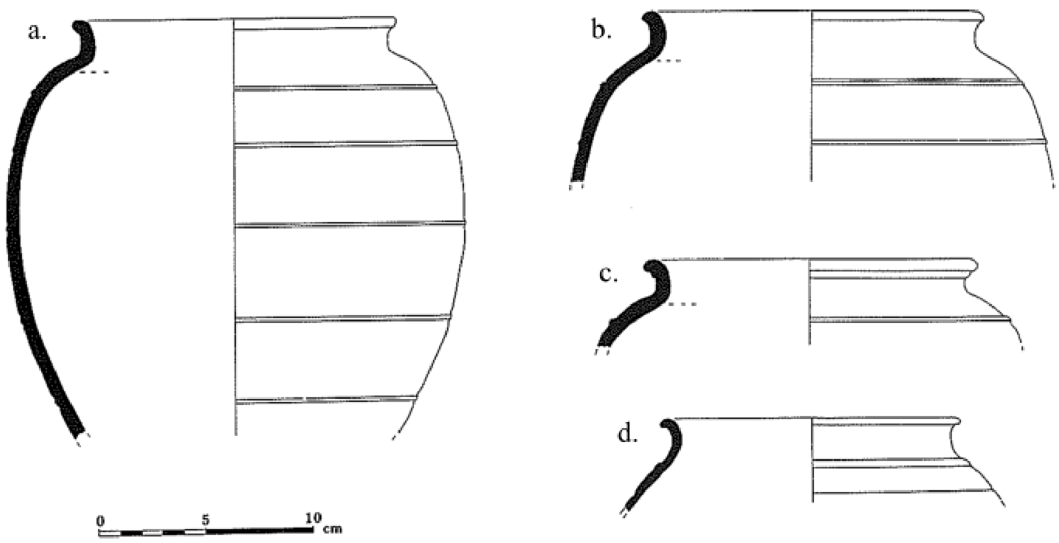

Figure 9.52. Examples of form V.JA.9 (Brown 1987, ill. 152, a: 591, b: 541, c: 624, d: 1829)

V.JA.10 'Jars with well-defined, out-turned rim and grooves or fine striations on shoulders' (Brown 1987, 210, JE3.1).

These are also French imports that were copied by the Poole Harbour potters.

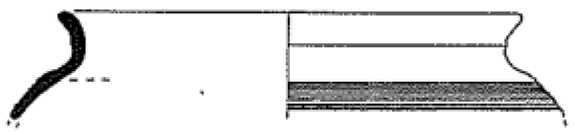

Figure 9.53. Example of form V.JA.10 (Brown 1987, ill. 154, 1292, rim diameter: 140mm)

V.JA.11 'High shouldered necked jars with upstanding or curved rims', characterised by a single cordon at the neck/shoulder junction (Brown 1987, 210). May have linear burnished decoration below the cordon.

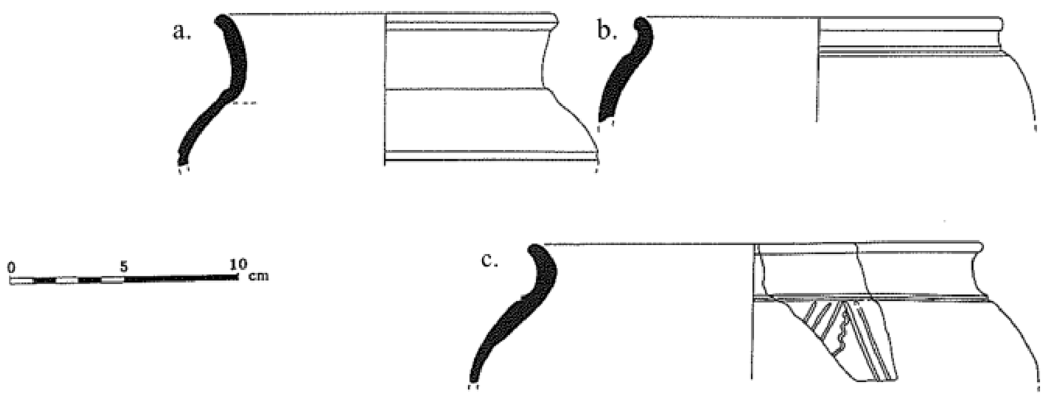

Figure 9.54. Examples of form V.JA.11 (Brown 1987, JE4.1, ill. 155, a: 1982, b: 2003, c: 1759)

V.JA.12 High shouldered, necked jars, with upright or everted rims, corresponding to Brailsford's Type 5. Neck may be decorated with a burnished zig zag/wavy line, body may have wavy lines or cross-hatched burnish on a matt zone. May have countersunk lug handles.

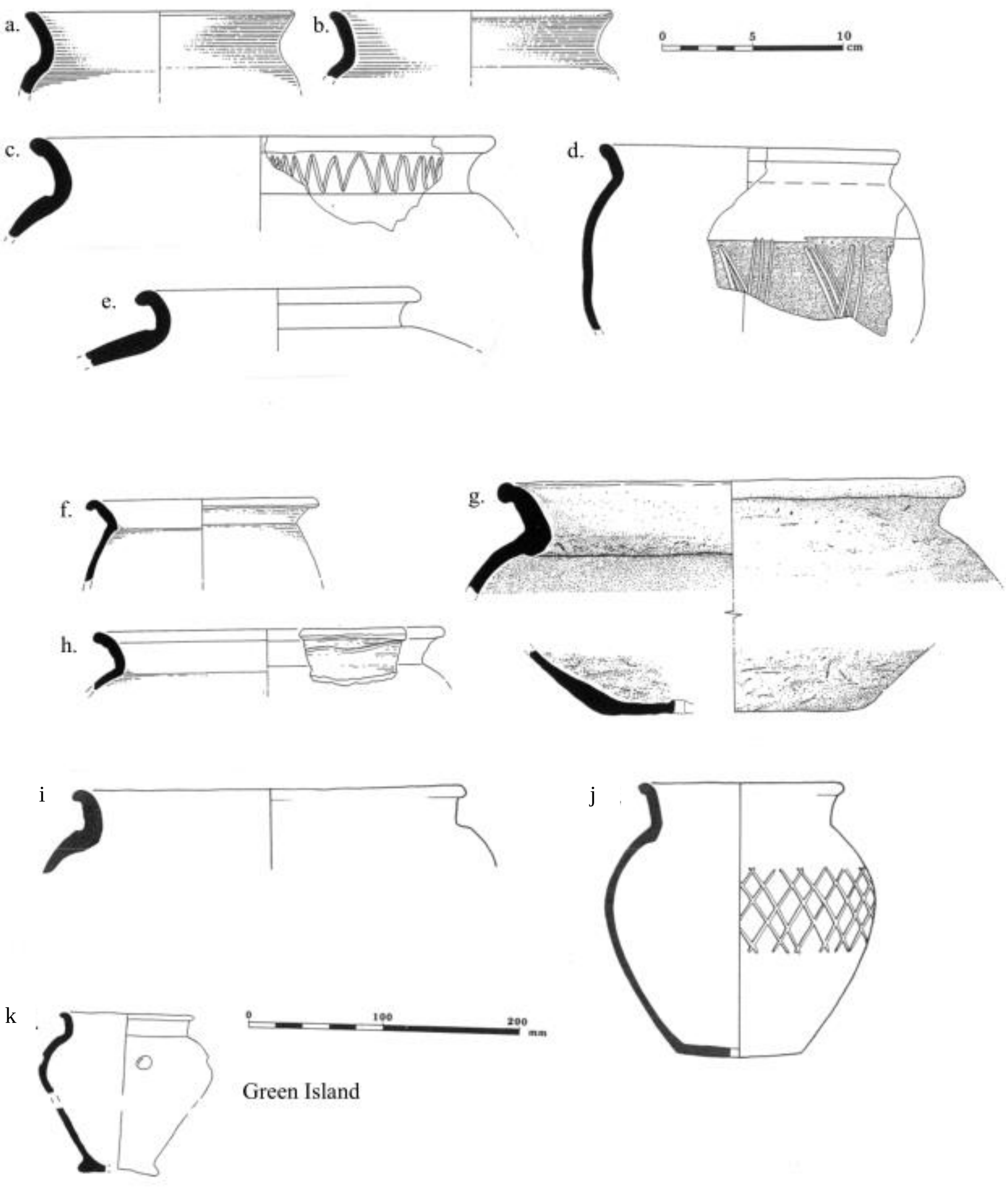

Figure 9.55. Examples of form V.JA.12 (Brown 1991, JE4.2, fig. 161, a: 19, b: 20; Brown 1987, JE4.2, ill. 155, c: 305, d: 1287 and e: 759; f: Lancley and Morris 1991, type 109, fig. 59, 29; g: Davies 1987, type 34, fig. 82, 82; h: Lancley and Morris 1991, type 109, fig. 59, 30; Wainwright 1979, type 47, i: fig. 52, 710, j: type 38, fig. 50, 626; k: Green Island, R22, author's own illustration)

V.JA.13 Low-waisted, round-bodied jar with out-turned, lid-seated rim

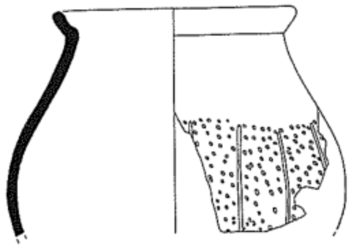

Figure 9.56. Example of form V.JA.13 (Brown 1987, JD4.42, ill.149, 1715, rim diameter 120mm)

V.JA.14 Jar with low carination, upright rim and groove at base of the neck

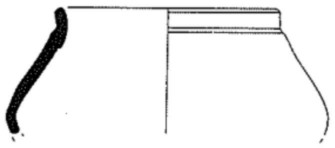

Figure 9.57. Example of form V.JA.14 (from Brown 1987, ill. 183, 1243, rim diameter 100mm)

V.JA.15 Barrel-shaped jar with sharp rim angle, grooved at base of rim

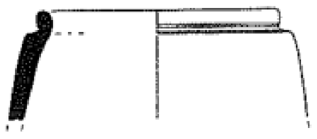

Figure 9.58. Example of form V.JA.15 (from Brown 1987, ill. 183, 2058, rim diameter 90mm)

V.JA.16 Small jar resembling a butt-beaker, with an elongated hollow rim

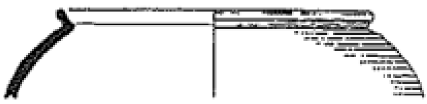

Figure 9.59. Example of form V.JA.16 (from Brown 2006, JD 4.43, fig. 25, 72, rim diameter 140mm)

9.7.2 Bowls

V.BO.1 ***'****Bowl with straight or slightly curved sides and foot-ring base' (Brown 1987, 210, BC3.11), also known as 'War Cemetery' bowls*

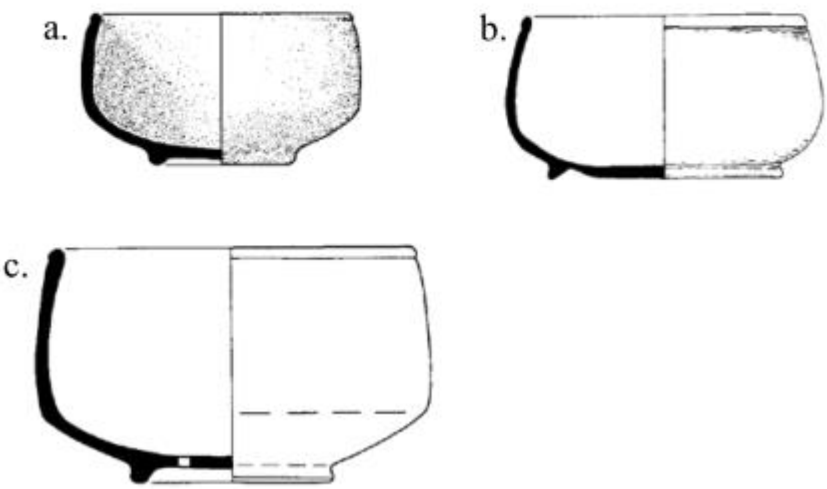

Figure 9.60. Examples of form V.BO.1 (a: Davies 1987, type 13, fig. 81, 59, rim diameter: 140mm; b: type 102, Lancley and Morris, fig. 59, 36, rim diameter: 150mm; c: Brown 1987, BC3.11, ill. 157, 701, rim diameter: 150mm)

.

V.BO.2 'Bead rim bowl with gently curving sides and foot-ring base' (Brown 1987, 210)

This form sometimes has vertical ribs (Brailsford type 1a), and Seager Smith has noted that the ribs may be 'surrounded by various arrangements of small impressed dots or occasional paired bosses (imitation rivets) located at the top of the ribs' (Seager Smith 2002, 51). The origin of the ribbed vessels in uncertain -Wheeler noted the type had previously been described as 'Dumnonian' but suggested 'Durotrigian' would be more fitting (Wheeler 1943, 233), but analysis by Lisa Brown (1997, 41) suggests that the ribbed variation is likely to have been made solely by the industries of the Exeter area.

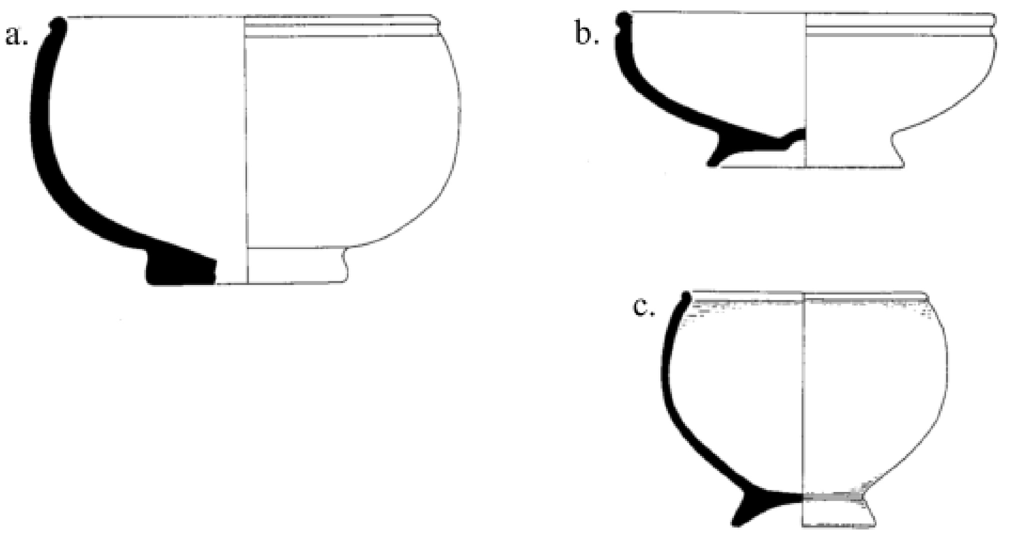

Figure 9.61. Examples of form V.BO.2 (Brown 1987, BC3.2, ill. 157, a: 760, rim: 160mm, b: 505, rim diameter: 150mm; c: Lancley and Morris 1991, type 102, fig. 59, 38, rim 130mm)

V.BO.3 'Bowls with rounded profile, plain flat bases and beaded or undifferentiated rim' (Brown 1987, 210, BC3.3)

This is a common form amongst Poole Harbour assemblages but was not recognised by Brailsford. The vessels were usually smoothed or burnished, and sometimes decorated. Motifs/schemes include a band of bosses around the shoulder, oval impressions, the eyebrow motif, a wavy line and diagonal, tooled lines.

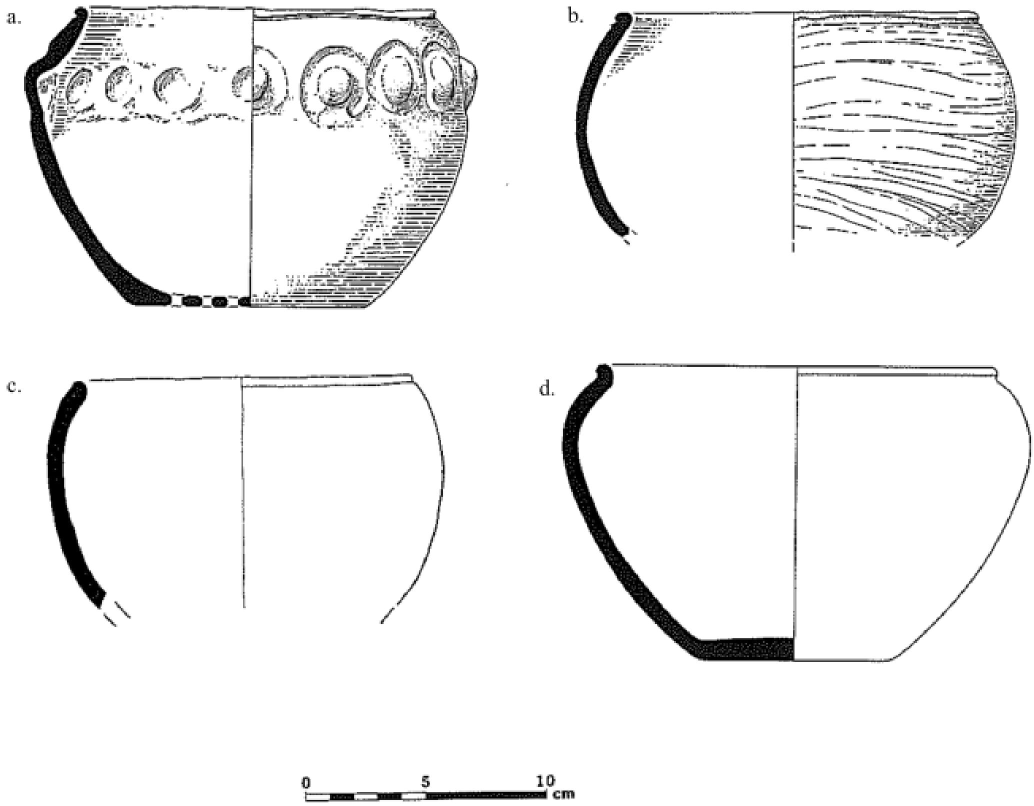

Figure 9.62. Examples of form V.BO.3 (a: Brown 1991, BC3.3, fig. 160, 6, b: fig. 158, 5; c: Green Island, R18,author's illustration; d: Brown 1987, ill. 157, 2130)

V.BO.4 'Shallow bowls with straight or convex sides and bead rim' (Brown 1987, 210, BC3.0)

This is a generic category for bead-rimmed bowls that cannot be assigned to a specific type due to their fragmentary state.

V.BO.5 Bowl with high, fairly sharp shoulder and short upstanding or beaded rim, usually shallow; undecorated

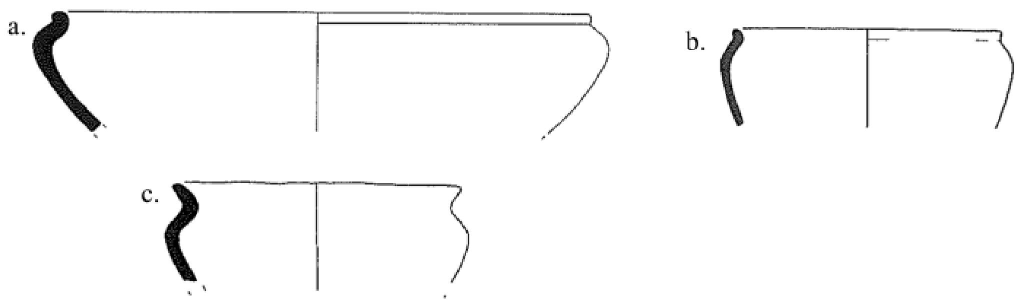

Figure 9.63. Examples of form V.BO.5 (a: Brown 1987, BC3.51, ill. 159, 1612, rim: 255mm; b: Wainwright 1979, type 42, fig. 49, 818, rim: 170mm; c: Green Island, R31, author's illustration, rim: 140mm)

V.BO.6 'Bead-rimmed, high shouldered bowl with zones of decoration defined by grooves. The decoration usually consists of a roughened strip with pairs of vertical lines' (Brown 1987, 211, BC3.52).

This vessel was made in a specific fabric type (Brown 1987, fabric E) and shares this fabric and a decorative scheme with bowl type V.BO.7 and jar type V.JA.8. Brown (1987, 211) has suggested the vessels may represent the products of a single potter or workshop.

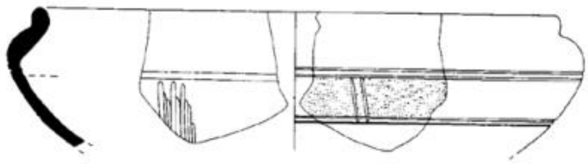

Figure 9.64. Example of form V.BO.6 (Brown 1987, ill. 159, 767, rim diameter: 260mm)

V.BO.7 'Bowls with elongated, slightly out-turned rim, some resembling a necked bowl. The shoulder is generally, but not always high' (Brown 1987, 211, BC3.6).

Brown notes that the fabric and decoration of this bowl form is identical to form V.BO.6.

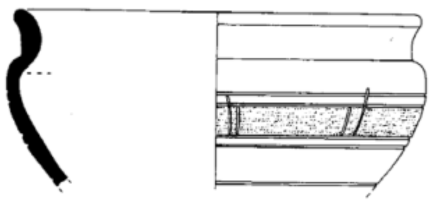

Figure 9.65. Example of form V.BO.7 (Brown 1987, ill. 160, 590, rim diameter: 180mm)

*V.BO.8 **'**Wide mouthed bowls with at least two cordons at or above shoulder level and pedestal or pedestal with omphalos base. These bowls are wheel-made and generally finished to a very high standard with black burnished surfaces' (Brown 1987, 211, BD1.0).*

This is a form that was initially made in north-western France but was also copied by the Poole Harbour potters.

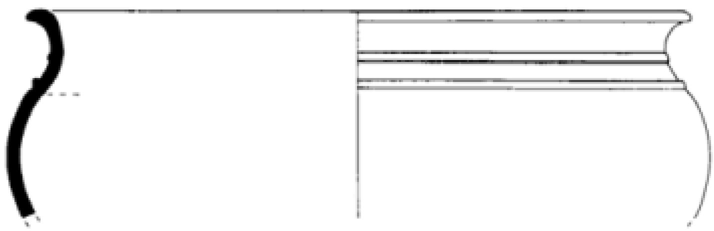

Figure 9.66. Example of form V.BO.8 (from Brown 1987, ill. 161, 1967, rim diameter: 280mm)

Brown suggested two variations of the form, a fine, thin-walled and highly burnished variant (***BD1.1, V.BO.8a)*** and a coarser, heavier variant with less highly finished surfaces, but may be decorated with grooves as well as cordons ***(BD1.2, V.BO.8b)***.

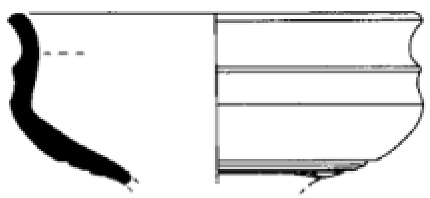

Figure 9.67. Example of form V.BO.8b (Brown 1987, BD1.2, ill. 163, 356, rim diameter 120mm)

V.BO.9 'Wide mouthed bowls with a single cordon at the junction of the neck and shoulder' (Brown 1987, 211, BD2.0)

This is an imported form that was copied by the Poole Harbour potters.

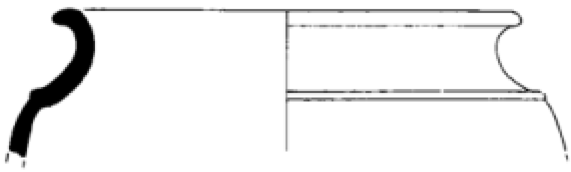

Figure 9.68. Example of form V.BO.9 (from Brown 1987, ill. 166, 1685, rim diameter: 160mm)

V.BO.10 Wide-mouthed bowls with a single cordon at the neck/shoulder junction, but none below

These were also found in French and Poole Harbour fabrics at Hengistbury (BD2.11), but it can be difficult to distinguish fragmentary examples from form V.BO.9.

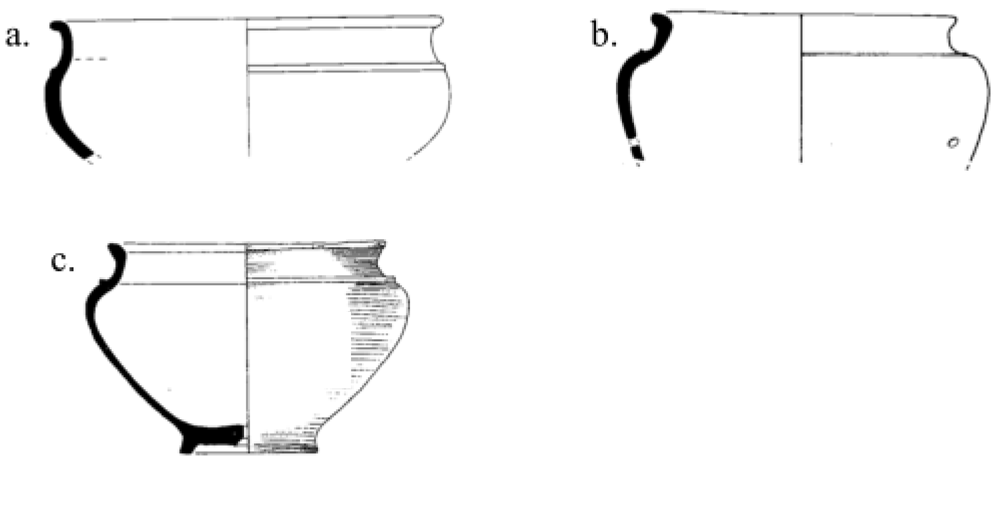

Figure 9.69. Examples of form V.BO.10 (a: Brown 1987, BD2.10, ill. 165, 1322, rim: 180mm; b: Wainwright 1979, type 28, fig. 48, 246, rim: 180mm; c: *ibid.* fig. 66, 724, rim: 160mm)

V.BO.11 Wide-mouthed bowls with single cordon at neck/shoulder junction, and additional cordon(s) below.

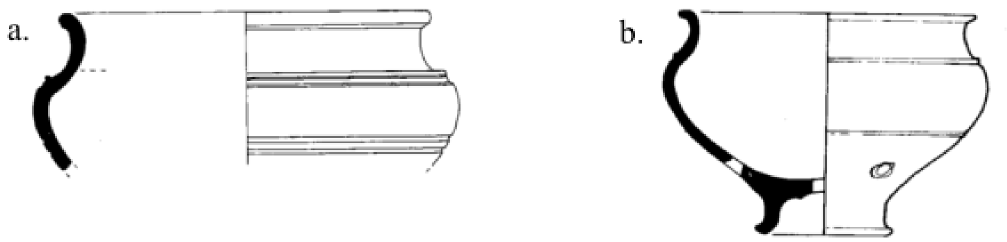

Figure 9.70. Examples of form V.BO.11 (a: Brown 1987, BD2.11, ill. 166, 509, rim diameter: 160mm; b: Wainwright 1979, type 39, fig. 51, 249, rim diameter: 170mm)

V.BO.12 Necked bowl with slightly everted rim

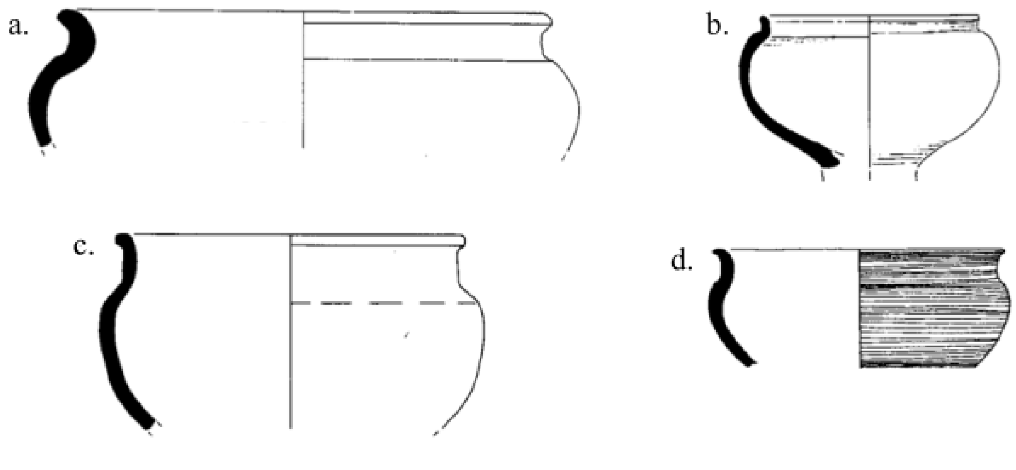

Figure 9.71. Examples of form V.BO.12 (a: Brown 1987, BD4.2, ill. 174, 1604, rim: 200mm; b: Lancley and Morris 1991, type 129, fig. 59, 45, rim: 120mm; c: Brown 1987, BD4.2, ill. 174, 1652, rim: 140mm; d: Wainwright 1979, fig. 60, 278, rim: 150mm)

V.BO.13 Necked bowl with elongated, out-turned rim and groove/shallow indentation on or below the shoulder

This form was found in French and Poole Harbour fabrics at Hengistbury.

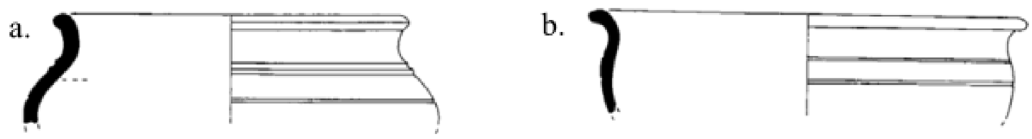

Figure 9.72. Examples of form V.BO.13 (Brown 1987, BD4.3, ill. 175, a: 594, rim: 160mm, b: 1651, rim: 200mm)

V.BO.14 'Bowls with a sharp shoulder angle' including bipartite and tripartite vessels (Brown 1987, 212, BD4.4)

This form type includes examples of French origin and some of Poole Harbour or other local sources.

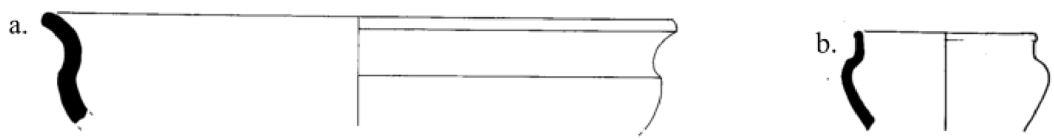

Figure 9.73. Examples of form V.BO.14 (a: Brown 1991, BD4.4, ill. 176, 1007, rim: 300mm; b: Wainwright 1979, type 42, fig. 49, 814, rim: 110mm)

V.BO.15 Bead-rimmed bowls with curved walls and cordon or groove around the waist

This form was made at a number of centres, including north-west France and Poole Harbour.

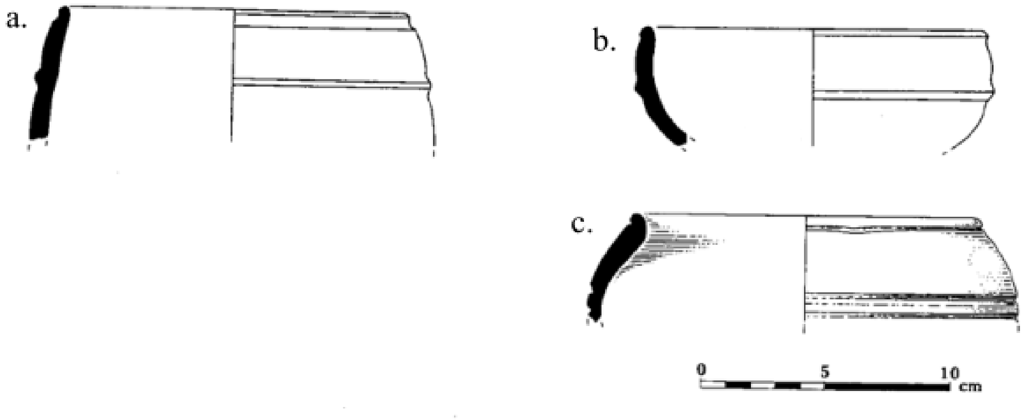

Figure 9.74. Examples of form V.BO.15 (from Brown 1987, BD5.1, ill. 177, a: 1977 and b: 1613; c: Brown 1991, BD5.0, fig. 163.17)

V.BO.16 Shallow, bead-rimmed bowls with a sharp shoulder angle

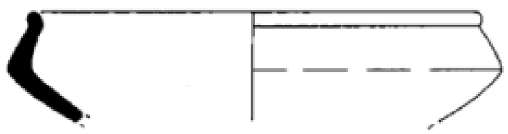

Figure 9.75. Example of form V.BO.16 (Brown 1987, BD5.3, ill. 177, 1620, rim diameter: 140mm)

V.BO.17 Bead-rimmed bowl with sharply angled shoulder, defined by a cordon or facet. Burnished linear decoration may be present on the lower half of the body

Brown (1987, 212, BD5.2) notes that these are 'almost invariably Wareham-Poole Harbour products'.

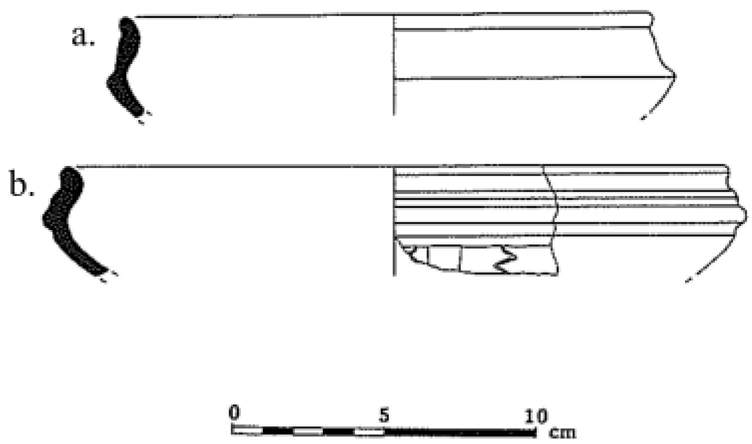

Figure 9.76. Examples of form V.BO.17 (from Brown 1987, ill. 177, a: 1618, b: 1614)

V.BO.18 Tazze

This form of carinated bowl, with restricted neck, forms part of the Gallo-Belgic repertoire, and was copied by the Poole Harbour potters (Brown 1987, BD7.0; Brailsford 1958, type 10). It is not a common form, and Cooper and Brown have suggested the form was restricted in terms of its production and distribution, 'and may have served a specific, perhaps ritual, function' (Cooper and Brown 2014, 202).

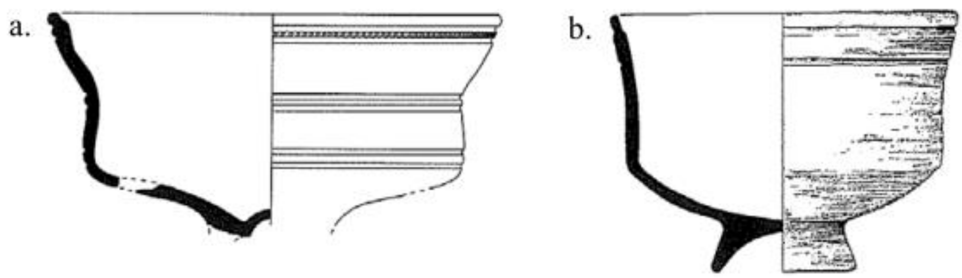

Figure 9.77. Examples of form V.BO.18 (a: Brown 1987, ill. 179, 1277, rim: 220mm; b: Cooper and Brown 2014, fig. 6.10, 72, rim: 160mm)

V.BO.19 Bowl with double bead rim

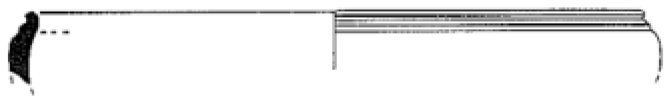

Figure 9.78. Example of form V.BO.19 (from Brown 1987, ill. 183, 2020, rim: 240mm)

V.BO.20 'High-shouldered bowl with simple rim, small external flange; slipped and burnished' (Seager Smith and Davies 1993, type 34, 235)

This form was classified by Brailsford as type 3.

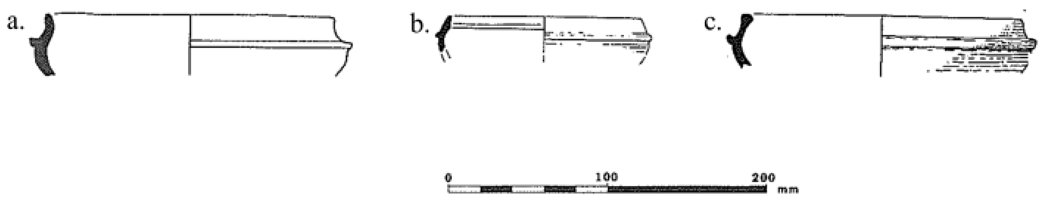

Figure 9.79. Examples of form V.BO.20 (a:Wainwright 1979, fig. 64, 686; b: Lancley and Morris 1991, type 132, fig. 59, 42; c: Brown 2006, BC3.7, fig. 25, 77)

V.BO.21 Straight-sided cup, upper wall flares out slightly, with rounded rim and footring base

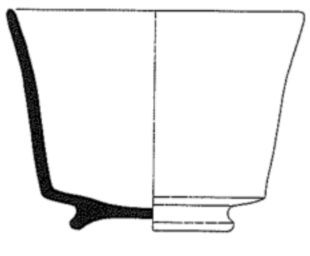

Figure 9.80. Example of form V.BO.21 (from Brown 1987, ill. 183, 2120, rim: 140mm)

9.7.3 Dishes and platters

V.DP.1 'Shallow, open vessels with straight or slightly curved walls, and chamfered base' (Brown 2006, 68)

Brown (*ibid.*) notes this type is related to Terra Nigra platters. Seager Smith suggests a cross-channel influence for this form (Seager Smith 2002, 55).

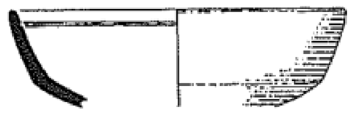

Figure 9.81. Example of form V.DP.1 (from Brown 2006, D1, fig. 25, 76, rim: 160mm)

V.DP.2 Shallow platter, highly burnished

Imitation of a Gallo-Belgic form, possibly copying CAM 1 or CAM 2A (Lancley and Morris 1991; Woodward 1987).

Figure 9.82. Example of form V.DP.2 (from Lancley and Morris 1991, type 155, fig. 60, 48)

9.7.4 Other forms

V.OT.1 Tankard

This is a straight-walled, handled vessel, classified by Brailsford as type 8 and Brown as BC3.12. Brown suggested that these vessels may be products of ‘a specialised section of the industry’, made in small numbers ‘for a specialised market’ (Brown 1991, 190). Analysis of one of the tankards from Maiden Castle as part of this project found that it was compositionally similar to other typical Poole Harbour wares found around the Harbour area, and petrological analysis revealed a fine to medium-grained fabric with elongated argillaceous inclusions, however it did contain larger opaques than might be expected for this fabric, and these were not evenly distributed.

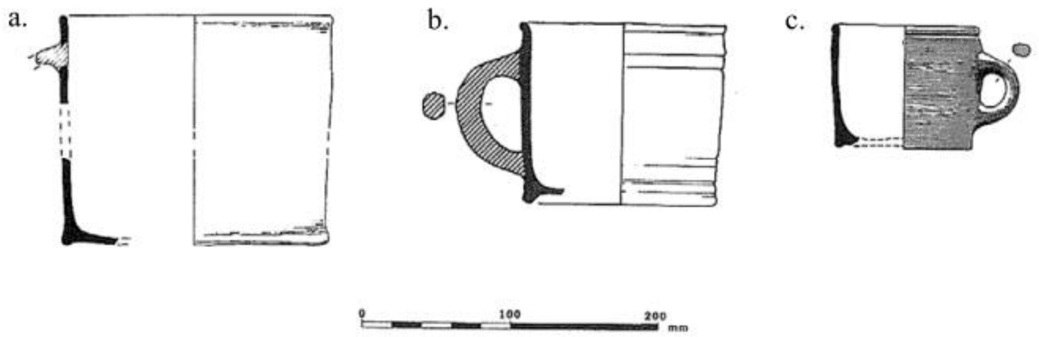

Figure 9.83. Example of form V.OT.1 (a: Lancley and Morris 1991, type 137, fig. 59, 32; b: Wainwright 1979, type 49, fig. 53, 560B; c: Wheeler 1943, fig. 74, 227)

V.OT.2 Narrow necked jar or flagon, may have cordoned or corrugated neck

This is a local copy of a Gallo-Belgic form.

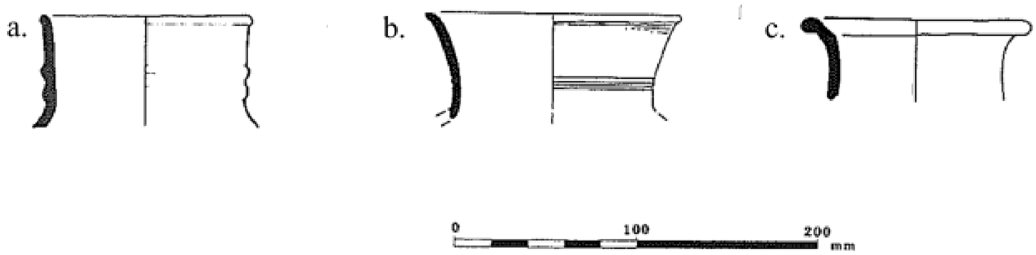

Figure 9.84. Example of form V.OT.2 (a: Wainwright 1979, type 46, fig. 52, 91; b: Lancley and Morris 1991, type 150, fig. 60, 46; c: Field 1983, fig. 13, 39)

V.OT.3 Butt beaker

This is a local copy of a Gallo-Belgic form.

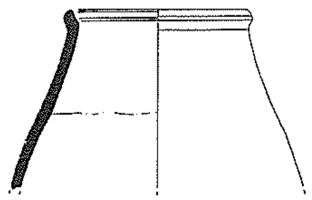

Figure 9.85. Example of form V.OT.3 (from Woodward, 1987, fig. 49, 170, rim diameter: 100mm)

V.OT.4 Strainer

Several examples of vessels with perforated bases have been recorded in Poole Harbour fabrics, but most appear to represent post-firing alterations to the vessels. This example from Gussage All Saints (Wainwright 1979, form 43) was not seen by the current researcher but it is assumed the holes represent pre-firing perforations.

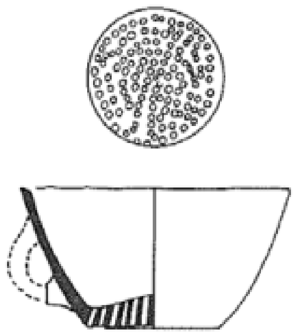

Figure 9.86. Example of form V.OT.3 (from Wainwright 1979, fig. 52, 211, rim diameter: 150mm)

9.7.5 Lids

A range of lids were made by the Poole Harbour potters, and some vessels appear to have been used interchangeably as bowls/dishes/lids.

V.LI.1 Lid with beaded rim

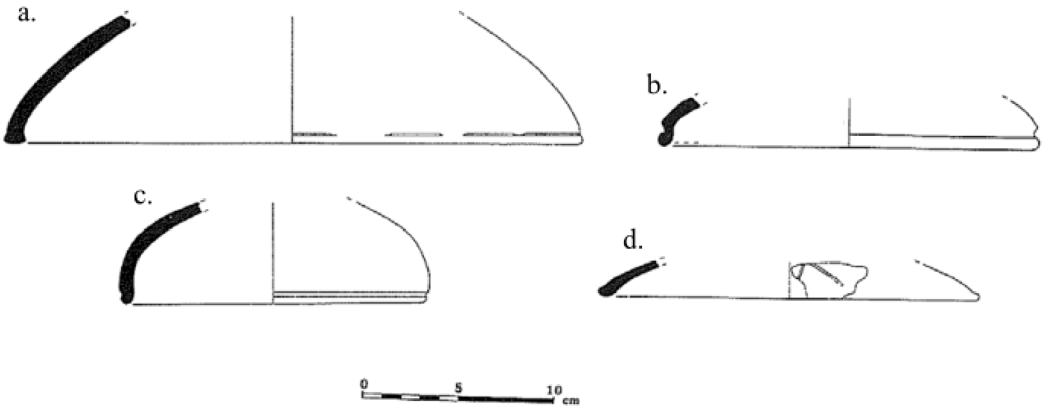

Figure 9.87: Examples of form V.LI.1 (from Brown 1987, ill. 182, a: 436, b: 2069, c: 1640, d: 98)

V.LI.2 Lid with channelled/grooved rim

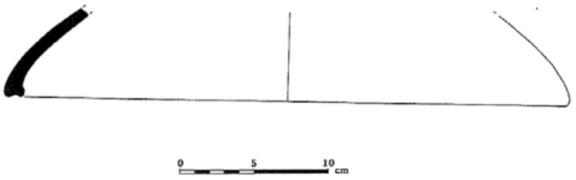

Figure 9.88: Example of form V.LI.2 (from Brown 1987, ill. 182, 379)

V.LI.3 Lid with plain or beaded rim, horizontal groove on body

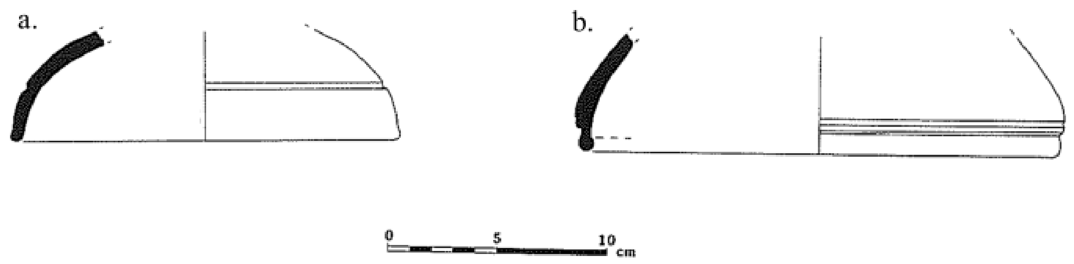

Figure 9.89: Examples of form V.LI.3 (from Brown 1987, ill. 182, a: 1826, b: 148)

V.LI.4 Lid with internal ledged rim

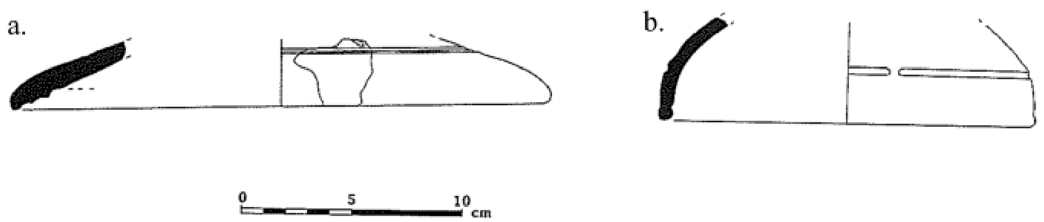

Figure 9.90: Examples of form V.LI.4 (from Brown 1987, ill. 182, a: 1823, b: 1825)

V.LI.5 Plain rim

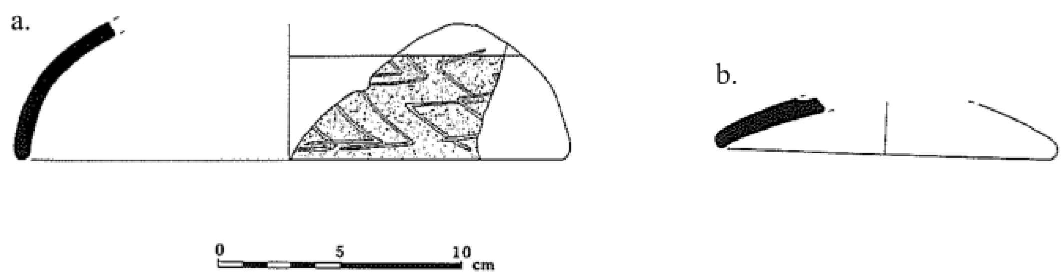

Figure 9.91: Examples of form V.LI.5 (from Brown 1987, a: ill. 211, 1314, b: ill. 210, 1340)

9.8 Decoration and surface treatment

Red-finishing was used to decorate the external surfaces of a number of the Early to Middle Iron vessels, and furrowing of the surface is synonymous with the furrowed bowl form. From the Middle to the Late Iron Age, the vessel surfaces were often smoothed or burnished, particularly on the bowls. At Hengistbury Head, Brown recorded two levels of surface treatment, with class D indicating an uneven burnishing and class E used to denote more evenly burnished vessels. The more uneven burnishing (class D) was recorded against 27% of the illustrated Poole Harbour vessels, on a range of forms including 63 jars, 25 bowls, three lids and a saucepan pot. More evenly burnished surfaces (class E) were recorded for 66% of the illustrated Poole Harbour vessels, with 120 bowls, 88 jars, 16 lids, a saucepan pot, a cup and a tazza displaying carefully burnished surfaces. A further 20 illustrated jars were classified as D/E.

The earliest form of decoration was the incised line and stabbed dot decoration, infilled with white paste, on an Early Iron Age bowl from Rope Lake Hole (Figure 9.91; Davies 1987, fig. 79, 15). Occasional use of fingertip/fingernail decoration is evident for the Early to Middle Iron Age periods: examples include a shouldered jar from Hengistbury Head (Brown 1987, fig. 200, 1346) and a bead-rimmed vessel from Gussage All Saints (Figure 9.94; Wainwright 1979, fig. 58, 188). The decorative motifs that are more typical of the industry, such as the eyebrows (Figure 9.98-99), petals (Figure 9.96-97), bosses and dimples (Figure 9.92), were first noted in the late 2nd century BC contexts of sites such as Maiden Castle, becoming more common during the 1st century BC phases at the site (Brown 1991, 189). Some vessels were decorated with shallow tooled horizontal, vertical, diagonal and wavy lines, and arcs (Figures 9.93-9.95). Motifs created with dots were also used, seen on a number of Middle Iron Age jars from Hengistbury Head (Brown 1987, ill. 135, 95 and 1711), and a Late Iron Age jar with vertical and horizontal swathes of dots (Brown 1987, ill. 208, 1215). Linear decoration was also created using burnished lines, and a similar range of motifs was employed: horizontal, vertical, diagonal and wavy lines, chevrons and zig zags, and burnished lattice in the latest examples. A jar and two bowl forms (V.JA.8, V.BO.6 and V.BO.7) shared a decorative scheme that comprised a roughened strip, defined by horizontal grooves and pairs of short vertical lines between. Other decorative motifs associated with a specific form include zig zag lines which sometimes adorned the necks of jar form JE4.2.

Some decorative techniques were used to create imitations of the imported wares, including the rilling on a jar from Hengistbury Head (Brown 1987, ill. 154, 1292). Applied or integral cordons or grooves (Brown 1987, method 4) were common on the Late Iron Age Poole Harbour vessels and noted on 62 of the illustrated vessels from this industry. Not surprisingly, they are present on the cordoned jars (V.JA.9), wide-mouthed bowls (V.BO.8-11), necked jars (V.JA.11), bipartite bowls (V.BO.15 and V.BO.17), tazze (V.BO.18), a bead-rimmed jar (IV.JA.7) and a range of lids.
Lattice decoration appeared to be a post-conquest trait.

There is no apparent correlation between these motifs and specific forms. For example, the classic eyebrow motif is most frequently seen on flat-rimmed jars, but also on bead-rimmed jars, bead-rimmed bowls and necked jars. Double concentric eyebrows were also occasionally used (cf Brown 1987, Ill. 158, 911). The source of inspiration for these motifs has been the subject of some discussion by previous researchers. Wheeler described the ‘eyebrow’ motif as ‘an abstracted unit of the Glastonbury decoration’ (Wheeler 1943, 214), a parallel also drawn on by Williams (1951, 44). Williams described the ‘petal’ motif as a ‘triform depressed ornament’, thought to derive ‘from the vertical eyelet handle common on these [flat-rimmed] jars’ (Williams 1951, 44), again following Wheeler (1943, 213). Brown has suggested a chronological development in the creation of the boss, with earlier examples applied to the vessel but later ones pushed out from the interior of the vessel, and sometimes emphasised by a circular depression (Brown 1991, 189-190, fig. 160, 9).

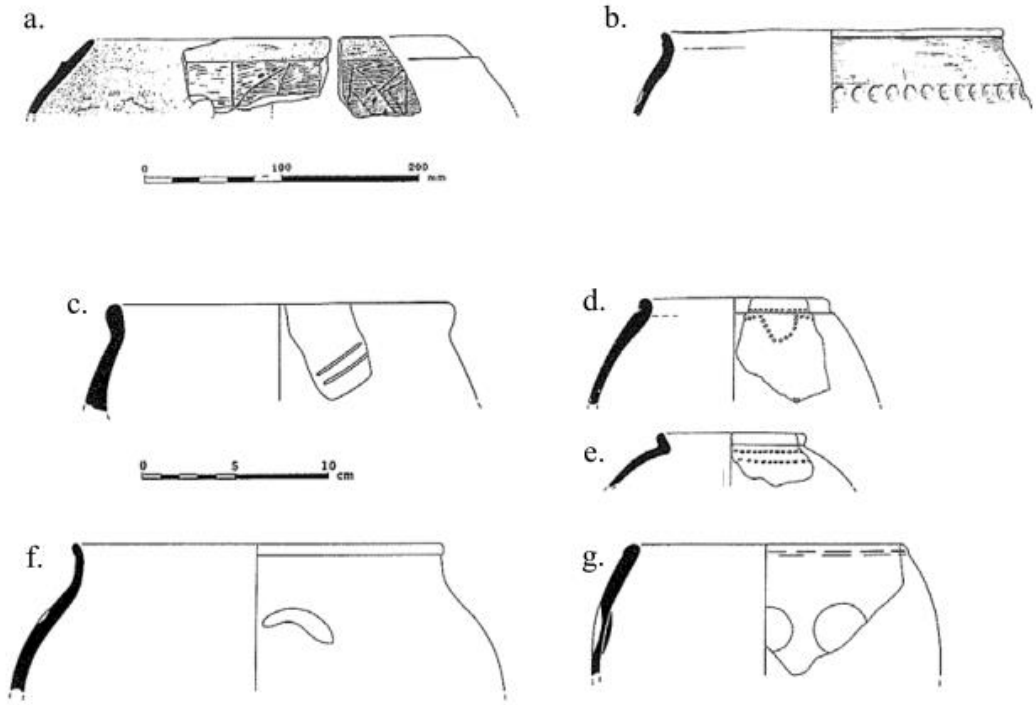

Figure 9.92. Examples of decorative motifs on Poole Harbour vessels of Early to Middle Iron Age date (a: Davies 1987, fig. 79, incised line and stabbed-dot decoration infilled with white paste; b: Wainwright 1979, fig. 58, fingertip impressions; c-g: Brown 1987, ill. 135, c – incised line, d and e – dots, f – eyebrow, f - bosses)

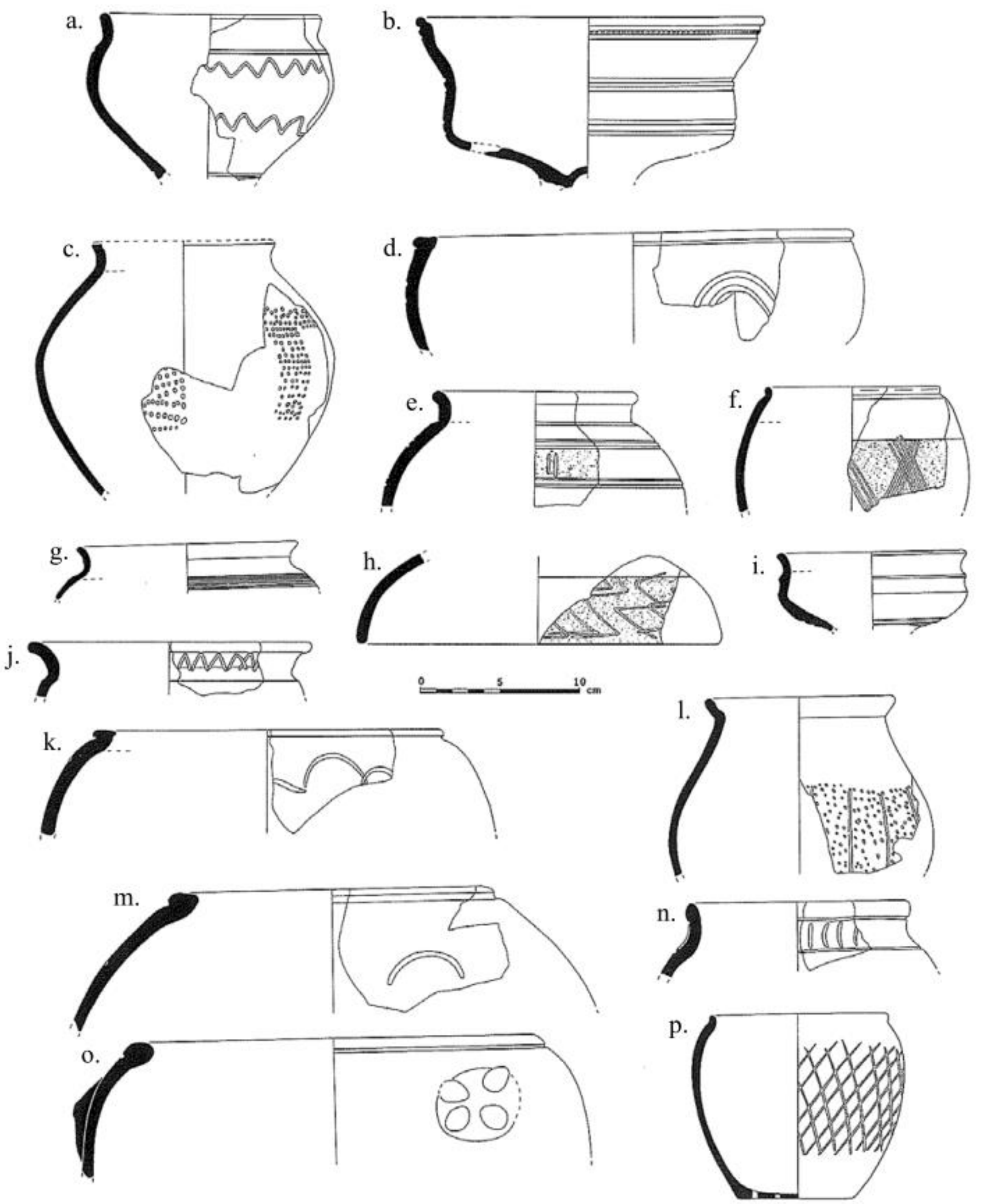

Figure 9.93. Examples of decorative motifs on Poole Harbour vessels of Late Iron Age date (source: Brown 1987, a: ill. 166, 1220; b: b: ill. 179, 1277; c: ill. 210, 1215; d: ill. 158, 911; e: ill. 151, 679; f: ill. 138, 1285; g: ill. 154, 1292; h: ill. 211, 1314; i: ill. 163, 356; j: ill. 155, 1754; k: ill. 141, 855; l: ill. 149, 1715; m: ill. 141, 1212; n: ill. 149, 762; o: ill. 141, 776; p: ill. 138, 700). These include tooled horizontal, vertical, diagonal, wavy lines or cordons (a, e, f, g, h, i, j, n); dots (c and l); the eyebrow motif (m); petal motif (o) and lattice (p).

Figure 9.94. Example of fingertip decoration on a sherd from Gussage All Saints (Wainwright 1979, vessel 137/188, in Dorset County Museum)

Figure 9.95. Example of wavy line decoration on a bowl from Maiden Castle (Wheeler 1943, fig. 69, 144, in Dorset County Museum)

Figure 9.96. Example of petal motif on a flat-rimmed jar from Sigwells

Figure 9.97. Example of petal motif on a flat-rimmed jar from Ower Peninsula (Lancley and Morris 1991 fig. 58, 17, in Dorset County Museum)

Figure 9.98. Example of the eyebrow motif on a flat-rimmed jar from Gussage All Saints (Wainwright 1979, vessel 142, in Dorset County Museum)

Figure 9.99. Example of the eyebrow motif on a bead-rimmed jar from Allard's Quarry (in Dorset County Museum)

9.9 Conclusion

The pottery industry that operated on the Isle of Purbeck and around the southern shores of Poole Harbour during the Iron Age produced a wide range of forms. During the Early to Middle Iron Age these included shouldered jars and carinated bowls, forms typical of the period and also produced at other, un-located centres in Dorset. During the Middle Iron Age the repertoire expanded, the potters again making types of jars and bowls seen elsewhere in central southern England, but also creating new forms, such as the flat-rimmed jars, and copying regionally imported vessels, including the saucepan pot. By the early 1st century BC the potters started to make copies of Armorican cordoned jars and bowls. These forms would have necessitated a change in manufacturing technique, from the hand forming of pots, with the occasional use of a turntable, to a much faster wheel. The potters also copied the 'Gallo-Belgic' forms such as the platter, butt beaker and tazze.

Surface treatments on the Early Iron Age forms included the red-finishing of bowl surfaces, and during the later periods most vessels were smoothed or burnished. Decorative motifs on the Middle to Late Iron Age forms included scrolls, wavy lines, horizontal, vertical and diagonal lines, zig zags, dots, bosses and the characteristic eyebrow and petal motifs. A lack of correlation between form and fabric was evident during analysis. It seems likely that each workshop simply used the most convenient sand source, rather than obtaining particularly fine sand temper for bowls and coarser sand for large jars. Most of the vessels were made in a range of sizes, although these would have been related to the intended use of the vessel, the flat-rimmed jars being noticeably large. Presumably some vessels were made as cooking pots or serving vessels, but others may have been simply containers for produce. The latter is a subject for further research, and the links with the salt industry seem inescapable here, with the vessels possibly used as containers for salt or cured meats. Evidence from the faunal assemblages of a number of coastal sites is also indicative of such specialised production (Maltby 2006).

Lisa Brown (1997, 41) has argued that rather than the ceramic industry of this area portraying a picture of 'cultural conformity' in Late Iron Age Dorset and 'an impression of cultural homogeneity in the Durotrigian region' (after Blackmore *et al.*

1979 and Hodder 1977), it provides evidence of an industry that readily absorbed external influences, swiftly mastering new forms that they came into contact with through the trade mechanisms evident in the area at the time, with imported goods from France and Italy coming in through Hengistbury Head, and to a lesser extent through Poole Harbour. Furthermore, Brown stresses that the arguments for the pottery industry being established to emphasise the ‘cultural coherence of the territory’ are based on the perceived notion of the production of a range of standardised forms (Brown 1997, 41). This standardisation would suggest the industry was ‘dependent on tribal control of the nature of resources, of the trade routes for distribution and, by extension, of the specialist craftsmen, in this case, potters’ (Brown 1991, 41). Brown has argued that this is simply not reflected in the Iron Age ceramic assemblages, given the external influences clearly absorbed by the potters, and the evidence for the supply of certain vessel types to restricted sites (cf forms V.JA.8, V.BO.6 and V.BO.7 to Hengistbury Head), perhaps produced to order or indicating the work of itinerant potters (Brown 1991, 42-44). These were skilled craftspeople, specialists in their trades, operating in an environment that was poorly suited to an agricultural economy and therefore where trade and exchange of products to supplement their existence was necessary. The evidence from the ceramics suggests the potters were successful business people, quick to exploit the market, producing vessels to order and imitations of rare, imported vessels. The advent of the Roman conquest in AD 43 appears to have led to further commercial opportunities, and Brown has suggested that ‘there is no evidence to suggest that the Wareham/Poole Harbour potters were coerced or compelled into producing their wares for the Roman army….Nor is there any evidence that the Romans took over the industry and ran it themselves’ (Brown 1997, 44).

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Chapter 10

Discussion

The aim of this research project is to understand the origins and development of a pottery industry that evolved into one of the largest producers of coarseware vessels during the Romano-British period. Previous research focussed mainly on the Late Iron Age and Romano-British phases of this industry, with little known of its Early to Middle Iron Age origins. This research was therefore devised to consider this gap by examining six key research questions; these have been addressed through the objectives set at the start of the project (Chapter 1). Much of this work focussed on exploring the choices that potters made in terms of selecting the raw materials they used. This chapter will return to the initial research questions and present answers to them using the results of the literature review, the fieldwork, and the detailed petrological and compositional analyses undertaken.

10.1 What constitutes a Poole Harbour ware?

In order to discuss this ceramic tradition it was necessary to consider how its products are defined. The fabrics of Romano-British products have been described in many reports by David Williams and can be summarised as follows:

> ‘The clay contains a very high amount of distinctive quartz sand temper, which in fracture, against a dark background, gives the impression of a ‘cod’s roe’ appearance…All without exception, including both early and late types, display a high content of large, closely packed quartz sand’ (Williams 1975, 288).

He noted that the colour of the clay in section is usually matched by the colour of the surfaces. In terms of the heavy mineral content of this sand, it is characterised by a relatively high content of tourmaline, which occurs in excess of zircon (Peacock 1973, Williams 1975). In the hand specimen and thin-section, occasional shale fragments are visible.

Analysis of thin-sections representing 59 vessels from Iron Age and Romano-British sites around Poole Harbour - including Green Island, Furzey Island, West of Corfe River, East of Corfe River, Ower Peninsula, West Creech, and the Romano-British

BB1 production sites at Bestwall Quarry, Redcliff Farm and East Holme, provided a baseline for the definition of Poole Harbour products (Chapter 6). They were characterised by a low quantity of silt in their matrices - the majority with up to 3%, but occasionally up to 10%. The vessels from Green Island and Bestwall Quarry contained predominantly medium-grained quartz, and those from Redcliff Farm were fine to medium-grained, but the samples from other sites were more wide-ranging in their quartz content, containing sparse amounts of very fine to coarse or very coarse quartz, with the coarsest vessels coming from West Creech. Elongated argillaceous inclusions were present in all but six vessels, including two from the BB1 production site at Redcliff Farm, Ridge. These are components of the raw clays, possibly worked lumps of the parent material, or hard shaly bands within the clays. Minor components include rare flint/chert, and may include rare quartzite, ferruginous sandstone, sandstone and siltstone. The opaques may be up to 10% in frequency, but are occasionally higher in samples from sites to the south of the Purbeck Ridge. Vessels with greater than 5% limestone or other calcareous inclusions came from sites to the south and west of the Ridge, but not to the north of the harbour.

10.2 When did potters start to utilise the tertiary clays and sands of the Poole Harbour/Wareham area?

A review of the work carried out by other researchers of this industry was undertaken to identify the chronological and spatial extent of its production and distribution (Chapters 2-4). This was supplemented by further petrological and compositional analysis during the course of this project (Chapters 6 and 8). Heavy mineral analysis by David Peacock and David Williams identified the source of the Late Iron Age ‘Durotrigian’ wares and Romano-British Black-burnished ware as the Wareham/Poole Harbour area of Dorset. This was based on the tourmaline-rich mineral suite of the vessels, indicating that the sands in the fabrics derived, directly or indirectly, from the granites of southwestern Britain. Granitic debris from the southwest and Brittany had filled the Hampshire Basin during the Eocene epoch of the Palaeogene era and the tourmaline-rich mineral suite of its deposits has been identified by Blondeau and Pomperol (1968). The Hampshire Basin covers a large area of central southern England (Figure 2.2) but the archaeological evidence for production of these wares is focussed on the Wareham/Poole Harbour area of southeast Dorset, and comparison with sand samples from the shores around Poole Harbour revealed a match for the pottery (Peacock 1973).

Archaeologists working in Dorset had long suspected that the Late Iron Age pottery had evolved from a pre-existing concern (Wheeler 1943, Williams 1951, Wainwright 1979, Field 1983 and Brown 1987, 1991), with Field (1983, 83) stating 'It is accepted that the Durotriges as a tribe did not suddenly appear on the scene along with pottery of that style'. Macroscopic fabric analysis, supported by limited heavy mineral analysis, revealed that these sandy wares dominated the earliest phase of activity at Rope Lake Hole, of 8th to 6th century BC date (Davies 1987; Williams and Tolfield 1987). Work by Partridge (1974 but not published, cited in Williams and Tolfield 1987) revealed a tourmaline-rich suite for red-finished vessels of Early Iron Age date from Eldon's Seat. Small quantities of Poole Harbour wares also reached Gussage All Saints; Bradford Down, Pamphill and Hog Cliff Hill, Maiden Newton during this period. Distribution of the wares, and therefore their production, increased during the 5th to 3rd centuries BC, with vessels identified from Maiden Castle, Dorchester; Southdown Ridge, Weymouth; Barton Field, Tarrant Hinton; Oakley Down, Wimborne, and on the southern coast of the Isle of Purbeck at Eldon's Seat and Rope Lake Hole. From this period there is the first evidence for the use of these wares in the area around Poole Harbour itself, at West Creech, situated at the foot of the Purbeck Ridge. By the 3rd century BC sandy fabrics dominate all of the ceramic assemblages from sites in Dorset, with the Poole Harbour fabrics gaining in momentum, copying the forms from other industries, such as the saucepan pot from Hampshire, as well as producing new forms including the flat-rimmed jar. By the end of the 1st century BC the products had saturated the Dorset markets and were reaching neighbouring areas.

The work of previous researchers is therefore indicative of production from the Earliest Iron Age, *c.* 8th to 6th centuries BC. Petrological and compositional analysis undertaken as part of this project has confirmed this, with Earliest and Early Iron Age forms (carinated bowls and bowls with internally flanged rims from Rope Lake Hole and a furrowed bowl from Football Field, Worth Matravers) sharing the same petrological characteristics as the Middle to Late Iron Age, and Romano-British, vessels.

10.3 What raw materials were available to the potters during the Iron Age, and is it possible to identify the clay sources that were exploited?

In order to explore the choices the potters made in terms of their raw materials selection, it was necessary to characterise the range of materials available to them. In some areas of Britain potters have access to a very restricted range of raw materials, with clays that require a great deal of processing to make vessels, such as on the Orkney Islands (Andrew Appleby, pers. Comm). In other areas, such as the Wareham/Poole Harbour area of Dorset, the landscape offered a wide selection of clays. The geological mapping indicates that this is an area of Palaeogene strata, with a series of sand and clay layers known as the Bracklesham Group, specifically the Poole Formation, outcropping around Poole Harbour (Chapter 2). The clay units of this formation have been extensively worked for brick and pottery production during the last two hundred years, and, with their associated sands, have been named. These clays are also hosts to deposits of ball clay, a rare raw material of considerable economic importance in more recent times. To the south of the Purbeck Ridge are the earlier Wealden Clays. These Cretaceous strata share a similar source to the Palaeogene strata, representing deposits derived from the Dartmoor granite (Arkell 1947, 149). The geological memoirs indicate considerable variability in the clays and sands of the Poole Formation and Wealden deposits. The fieldwork, mineralogical and compositional analysis carried out as part of this project confirmed there is great variability in the clays (Chapters 5, 7 and 8). Furthermore, this analysis revealed a lack of differentiation in the mapped Poole Formation clays, with the variability between the members of the Poole Formation not greater than that exhibited by samples within a particular clay type. However, as a group, the Poole Formation clays were found to be different to the Wealden Clays from the south of the Purbeck Ridge.

The vast clay fields of the Isle of Purbeck, the islands of Poole Harbour and its hinterland, and the lands to the north of the Harbour, were all able to offer clays that could be easily worked, shaped, dried and fired with little processing. Gosselain and Livingstone Smith's ethnographic study of potters in Sub-Saharan Africa indicates that, although a wide range of seemingly suitable clay sources might be available in the landscape, potters can have a restricted view as to which are suitable/acceptable sources (Gosselain and Livingstone Smith 2005, 39). They found that potters will assess the physical properties of a clay in the hand – colour, texture, plasticity and so forth, and they may reject a clay that can be fired very successfully, but simply does not conform to their own personal expectations of a suitable clay (Gosselain and Livingstone Smith 2005, 38). Furthermore, a new clay source must not only be deemed suitable, but it must also be easily accessible if pottery is not a full-time occupation. Thereby, in Sub-Saharan Africa most of the locations utilised for clay exploitation are near to areas used for farming and fishing, roads, water sources and so forth. The locations of clay sources 'are an integral part of the overall territory frequented by potters and non-potters' (Gosselain and Livingstone Smith 2005, 40). Therefore, although the geological landscape may offer a wide range of clay sources, their exploitation will be affected by a potter's discovery of a source, their perception of the suitability of the clay, the accessibility of the source, and the social and ritual framework of the potter and their wider community (Gosselain and Livingstone Smith 2005, 40).

The fieldwork revealed that the different named clays of the Poole Formation included the very pure, white-firing clays, as well as much sandier, red-firing clays (Chapter 5). The clays that fired to a white, buff or pink colour were assumed to be iron-poor, and this was largely confirmed by the chemical analysis of their iron content (Chapter 8). In the field, the iron-poor samples of Broadstone Clay tended to be a white or light grey colour, sometimes stained with yellow, orange or brown mottles, whilst the iron-poor samples of Parkstone Clay were mostly light to dark grey in colour. These were typically soft, malleable clays that were very easy to work. Other than the addition of water, they did not require any form of processing to form into briquettes. They could be coiled, and these coils bent without breaking, and they dried and fired with little shrinkage, suggesting they would make good potting clays. The red-firing clays from these deposits were usually brown, greyish brown or brownish yellow in the field, some were grey with red or orange mottles. Chemical analysis confirmed they contained greater levels of iron. They also had a much more variable sand content, with some of the sandiest examples being difficult to work, but most of the other samples again requiring little processing, being easy to form into coils and briquettes. The Wealden Clay samples, although far fewer in number than the Poole Formation samples, were consistently iron-rich clays, with slightly greater shrinkage rates than the Poole Formation clays. There did appear to be some spatial differentiation in the outcropping Poole Formation clays, with the purer, iron-poor clays tending to be located on the islands in the Harbour, and around its southern shores, and the iron-rich clays located further inland on the Isle of Purbeck, on the northern and southern sides of the Purbeck Ridge, and on the northern shores of the harbour and into the area around Poole town.

The potters therefore had a range of iron-rich and iron-poor clays available to them, but the compositional analysis presented in Chapter 8 indicates that potters from the Early Iron Age through to the Romano-British period selected iron-rich clays to make their vessels, rather than the more malleable white-firing clays. This is not immediately apparent from the fired vessels as the vast majority of Late Iron Age and Romano-British examples are black, although where oxidised, particularly on the production sites, a red or orange colour is revealed. The firing of the Early to Middle Iron Age vessels was more variable, producing red, brown and black surfaces. The preference for red-surfaced vessels during the Early Iron Age is evident from assemblages of this date. The field observations indicated that a potter would be able to identify iron-rich clays in the field, and a simple test firing would confirm or refute this. Only 10 of the 39 clay samples submitted for compositional analysis matched the pottery in terms of their iron content, comprising three from the Wealden Beds to the south of the Purbeck Ridge and seven from the Poole Formation clays, to the north and south of the harbour.

The use of different clay sources during the Iron Age was revealed by the petrological and compositional analysis of vessels recovered from Early to Middle Iron Age sites located to the south of the Purbeck Ridge (Chapters 6, 7 and 8). Inclusions of shell or limestone were often present in their fabrics, with 23 of the 31 suspected Poole Harbour wares from these sites containing up to 20% limestone. Although limestone was also present in vessels from sites to the west of Poole Harbour – Southdown Ridge and Maiden Castle, only six of the probable Poole Harbour products contained greater than 5% and none were above 10%. Very few calcareous inclusions were present in the vessels from sites located to the north of

Poole Harbour. The vessels from the sites to the south of the Purbeck Ridge all contained elongated argillaceous inclusions, 24 contained tourmaline and eight contained rock fragments that incorporate lathes of tourmaline. Their link to the vessels from sites to the north of the Ridge is their appearance in the hand specimen and the presence of elongated argillaceous inclusions in the fabrics. Heavy mineral analysis of a small number of vessels from Rope Lake Hole by Williams and Tolfield (1987) indicated a high quantity of tourmaline, suggestive of a Poole Harbour/Wareham origin. The petrological analysis undertaken as part of this project revealed that in thin-section, tourmaline is much more common in pottery and clay samples from sites to the south of the Ridge than those to the north. The presence of tourmaline in clay deposits from this area can be explained by the shared origin of the geological sediments, with those of the Hampshire Basin to the north of the Purbeck Ridge, and the Wealden deposits to the south, both derived from the granites of south-western Britain (Arkell 1947). It may therefore be suggested that the vessels from sites located to the south of the Purbeck Ridge represent the products of a separate, but related, workshop to those from the north of the Ridge.

Statistical analysis of the compositional data was undertaken to try to identify groups in the pottery – perhaps representing the products of different workshops, and to compare the pottery and clay samples (Chapter 8, sections 8.2.5-8.2.7). The results suggested five potential compositional groups amongst the pottery samples. The first, Group 1, contained 19 samples from a range of sites including the Wytch Farm Oilfield sites, Green Island, Maiden Castle, Gussage All Saints, Allard's Quarry and Hengistbury Head. The forms were wide-ranging in their date range, and included two Early Iron Age carinated, red-finished bowls from Maiden Castle, a vessel with internally flanged, flat rim from West Creech and a vessel with fingertip decoration from Gussage All Saints. Middle to Late Iron Age forms comprised seven flat-rimmed jars, bead-rimmed jars and bowls, a necked jar, bowls with grooved, and/or flat rims, and a Late Iron Age tankard from Gussage All Saints. A second group (Group 2) plotted adjacent to the first, and contained a similar range of forms from the same sites (with the exception of Gussage All Saints). A third group (Group 3), of just four samples, was again related in terms of the range of forms and sites of recovery. Thin-sectioning revealed that most of the fabrics of the three groups contained medium-grained or medium to coarse-grained quartz, but fine and coarse vessels were also present. Most (25 of 29 samples) contained elongated argillaceous inclusions; sparse limestone was occasionally recorded. Of the four that did not contain elongated argillaceous inclusions, two were anomalous in that they had a silty clay matrix. Compositional groups 1-3 appear to represent different, but related workshops, or possibly a single workshop utilising different resources, but all producing the same range of forms to supply to the same sites. In terms of chronology, Groups 1 and 2 represent potting from the Early Iron Age through to the Late Iron Age, and the three Group 3 samples are of Late Iron Age date.

The compositional profiles of pottery Groups 1-3 were compared to 39 clay samples, with hierarchical cluster analysis revealing the most similar clays to be the Wealden Clays from SE Purbeck (field sample 6) and Lower Lynch Farm (field samples 3, 4A and 4B); Kimmeridge Clay from Kimmeridge Bay (field sample 1); Broadstone Clay from Foxground Plantation (field sample 1); Parkstone Clay from Bourne Bottom Nature Reserve (field samples 3 and 5) and Brownsea Island (field sample 14) and Creekmoor Clay from Upton Country Park (field sample 1).

Seventeen pottery samples plotted as Group 4. Most derived from red-finished bowls or jars from the Early to Middle Iron Age assemblages of sites to the south of the Purbeck Ridge (13 came from Rope Lake Hole and Eldon’s Seat). The group also contained a flat-rimmed jar from Hengistbury Head, a bead-rimmed bowl and saucepan pot from Allard’s Quarry, and a jar with twisted rim from Creech Heath. The samples were again wide-ranging in terms of their petrological groupings, from vessels with very fine quartz to very coarsely gritted examples. Thirteen contained elongated argillaceous inclusions, 11 contained rare to sparse limestone and one contained sparse flint. The pottery of this group is related to the Groups 1 to 3 and Group 5 vessels by the similarities in the hand specimen and thin-section, suggesting its differentiation relates to the exploitation of a different clay source, and/or a specific workshop. The Group 4 vessels were similar only to a sample of Wealden Clay from SE Purbeck (field sample 6).

A loosely defined fifth group of five samples (Group 5) contained two flat-rimmed jars (from Southdown Ridge and Gussage All Saints), a bowl from Rope Lake Hole and a furrowed bowl and a jar from Football Field, Worth Matravers. The flat-rimmed jars were each marked with a motif that suggests a product of this industry: the petal motif and the eyebrow motif, and these are paralleled in the Groups 1-3 vessels. In terms of their petrology, all contained elongated argillaceous inclusions, suggesting these are related products, with variable quartz sizes. The Group 5 samples were most similar to the Wealden Clay from SE Purbeck but also related to the same clays as Groups 1 to 3.

The analysis suggests that some of the earliest Poole Harbour wares were made using the mudstone clays of the Wealden deposits, located on the southern side of the Purbeck Ridge. The physical traces of pottery production during the Late Iron Age and Romano-British periods indicate the workshops of these later periods were predominantly concentrated around the southern shores of the Harbour, presumably exploiting clay sources in the immediate vicinity. With no known production sites of the Early to Middle Iron Age, it had been assumed that the earlier production was carried out in broadly the same location, but compositional analysis of the vessels themselves has revealed the use of the Wealden Clays, found to the south of the Purbeck Ridge, during the Early to Middle Iron Age periods. This is perhaps not surprising as it is from this area that the evidence for settlement in the Early Iron Age comes, and not the shores around Poole Harbour. This research also indicates that new sources were utilised during the later Middle Iron Age and Late Iron Age, but with the Wealden clays still playing a role in production, and accessible to potters working around the shores of the Harbour via gaps in the Ridge at Corfe and Ulwell, and perhaps moved via the Corfe River. The new sources are more difficult to pinpoint due to the lack of differentiation in the Poole Formation clays, but a number of possibilities have been suggested (Chapter 8, section 8.2.7).

10.4 To what extent did the Iron Age potters modify the raw clay for pottery production?

Previous researchers have indicated they believe the quartz sand in the Late Iron Age and Romano-British Poole Harbour wares was deliberately added as temper (Williams 1975, Coulston 1989), yet the fieldwork carried out as part of this research had revealed the abundance of naturally sandy clays in the area (Chapter 5). Given the presence of such clays, the question arose as to why potters would not have simply made use of a naturally sandy clay rather than adding quartz sand to a less sandy clay. Field observations of these naturally sandy clays revealed they could be easily made into thumb pots and rolled into coils that could be bent, suggesting they may have been suitable for pottery manufacture. Forty-seven of the clay samples contained similar quantities of quartz to the probable Poole Harbour wares, with some of the most similar in terms of their petrology matched by those that were compositionally similar (Brownsea Island, field sample 14; Bourne Bottom Nature Reserve, field samples 3 and 5; Upton Country Park, field sample 1; SE Purbeck, field sample 6). However, comparison of the data from the petrological analysis of all of the pottery and clay samples indicated that 76% of the probable Poole Harbour wares contained only 1-3% silt-sized quartz, but this was matched by only 8% of the clay samples (Chapter 7, section 7.2). Quantitative petrological analysis of eight of the clay samples that were the most similar to the pottery in terms of their quartz content again revealed differences in the silt-sized component, with only three broadly comparable to the pottery (Upton Poole Road, field sample 2; Sandford, field sample 4 and Brownsea Island, field sample 14), but still containing greater quantities of silt. The petrological analysis therefore suggests that the potters working around Poole Harbour and the Isle of Purbeck did not use the naturally sandy clays in their raw state. The silt content of these clays is too high, indicating the potters added a fairly consistent volume of sand to a base clay that was relatively free of silt-sized quartz, or they levigated their clays prior to use. The only clays sampled without this silt component were the white-firing clays, but compositional analysis has shown they were not used. Of course the possibility that the potters utilised a clay source that has not been sampled cannot be discounted, but the overall picture is that the red-firing clays have a silty matrix and varying quantities of larger grains.

The process of levigating clay is discussed in Chapter 7 and will not be repeated here, but tends to be employed by large-scale industries aiming for a consistency in their products (Rice 1987, 118). Features resulting from such processes have not been recorded from the excavated production sites around the harbour, but may have been present and simply not identified as such. For example, a ditch at Redcliff, with ‘a flattened U-section’ and partially filled with a sandy silt (Lyne 2002, 51, ditch 7), may result from such a use. Probable evidence of paste preparation was noted in ten slides made of the vessels from Green Island, West of Corfe River, West Creech, Allard's Quarry and Redcliff Farm. This included swathes of a more silty clay in a fabric; areas devoid of any inclusions, and unevenly distributed inclusions, but it should be noted that such inconsistencies were occasionally seen in the thin sections of the clay samples (Chapter 7, section 7.1.5, Brownsea Island). The levigated clays had a fairly consistent volume of quartz added to them. Potters add non-plastic inclusions to their clay to improve its workability during forming, prevent cracks and spalling during drying and firing, and to improve its properties as a fired vessel. During forming the addition of inclusions, or temper, can reduce stickiness and improve rigidity. During drying the inclusions open up the body of the clay to facilitate the removal of water and also allow water to escape during firing. A vessel used for cooking must be able to cope with repeated heating and cooling, and the walls should have low permeability. Thermal shock in a vessel is created when the exterior walls that are in contact with the fire, heat more quickly than the internal walls. The reverse may also occur, if the interior is hotter than the exterior during cooling. These tensions cause fissures and cracks, but this may be relieved by creating voids in the fabric (as organic inclusions burn out), by adding mineral inclusions (ideally with a similar thermal expansion rate to the clay) or minimising sharp angles in the shape of the vessel (Rye 1981, 27). In the case of the Poole Harbour wares, the potters chose quartz sand as temper, a readily accessible and refractory material.

Ann Woods (1986) has argued that the choice of tempering material in prehistoric Britain was related to the choices offered by the immediate environment of the potters. Although other inclusions, such as grog, may have had a more similar expansion rate to the clay, the quartz-tempered pottery presumably functioned well, particularly as these vessels were so widely traded during the Romano-British period. Woods has argued that it was the coarseness of vessels that was important - 'the type of inclusion appears to be irrelevant and all that matters is that there is enough of it' (Woods 1986, 170). Williams (1975, 21-22) has also stated that the volume of sand in the fabric of the Romano-British Black-burnished ware vessels represents the deliberate addition of temper to counteract the effects of thermal shock in open firings and also relates to their intended uses as cooking vessels.

Another aspect to the question of clay processing was the origin of the elongated argillaceous inclusions visible in thin section and in the hand specimen. They have been identified as shale by most of the previous researchers of Late Iron Age Durotrigian and Romano-British Black-burnished ware fabrics, and are certainly one of the most characteristic traits of this type of pottery, from the Early Iron Age to the early 5th century AD, and from all sites of recovery. Yet it was not known if these inclusions represent shale that was deliberately crushed and added to the clay, something that naturally occurred in the clay, or was a result of processing techniques. The fact that shale was being worked on most of the known pottery production sites of the Late Iron Age and Romano-British periods on Purbeck and around Poole Harbour indicates that shale waste would have been readily available as a source of fuel and potentially temper. Shale may have been used to improve the mechanical and thermal properties of the vessel, the platy form of the inclusions being particularly suited to this purpose (Warfe 2015). However, of the 151 pottery samples that contained these inclusions, only 40 contained greater than 5%, and of these 40, 11 contained greater than 15%. It seems unlikely that potters aiming to improve a particular property of their clays would add such a small amount of an inclusion, particularly as a study of the effect of adding shale to clay bodies suggests shale would need to be added in sufficient quantities to alter these properties (Warfe 2015).

The optical properties of the argillaceous inclusions were very similar to the surrounding clay matrix, suggesting they are simply a component of the original clay, perhaps as clay pellets (Elaine Morris pers. comm.). Examination with a scanning electron microscope with energy dispersive x-ray spectroscopy, discussed in Chapter 8, section 8.4, revealed that the inclusions shared the same geochemical composition as the surrounding clay matrix and were different to Kimmeridge shale fragments found at Green Island. This confirms that waste from the shale industry was not added to the clay, and that these inclusions are a component of the original clay source. Ethnographic survey of potters in Sub-Saharan Africa has revealed that some ‘add a dried and grinded part of the same raw material’ to their clay as temper (Gosselain and Livingstone Smith 2005, 38). A similar practice in Dorset would account for the compositional similarity between the inclusions and the clay, and possibly for the shale-like appearance of the inclusions in the hand specimen. The only clay samples that contained similar inclusions were those from Foxground Plantation (Broadstone Clay) and SE Purbeck (Wealden Clays), but neither was an exact match. Reference to the geological literature indicates bands of shale in the Poole Formation strata in a railway cutting between Claywell and Bushey at the southern end of Rempstone Heath, and also in a clay pit south of Norden Farm, just to the north of the Purbeck Ridge (Arkell 1947, 225). Arkell also described the Wealden Beds as being partly composed of the 'Wealden Shales', or mudstones (Arkell 1947, 150). It may be that further sampling of the clay would eventually reveal examples of these inclusions in the clay but it may be concluded that they are a component of the geological strata from which the clay derived.

10.5 What was the range of vessel forms being produced, and were specific clay/sand recipes being utilised for certain forms?

A typology of the range of forms produced by the potters operating around Poole Harbour and the Isle of Purbeck during the Iron Age has been presented in Chapter 9, considerably expanding on Brailsford's 1958 typology of 12 forms. The earliest forms included carinated bowls, shouldered jars and slack-shouldered, barrel-shaped jars. During the Early to Middle Iron Age there was an increase in the range of forms produced, to include larger barrel-shaped jars, carinated jars, slack-profiled jars, and a range of bowls, predominantly shouldered or carinated types. During the Middle Iron Age there was a move to more rounded and globular jar forms and the first evidence for jars with cabled rims. A number of vessel types were produced throughout the Middle and Late Iron Age, including ovoid jars, high-shouldered jars, barrel-shaped jars, bead-rimmed jars, flat-rimmed jars, hemispherical bowls with plain or flattened rims, bowls with out-turned rims, bowls with internally-bevelled or lid-seated rims, and bowls with grooved rims. Some of the jars had countersunk lug handles. The potters also copied the saucepan pot form, typical of sites in the Wessex region. The Late Iron Age saw further developments in the range of forms produced, including copies of vessels imported from the Continent, such as the Armorican cordoned jars and bowls, and Gallo-Belgic platters, tazze, beakers and lids. Red-finishing of the vessels surfaces was widely carried out during the Early to Middle Iron Age period, with burnishing common during the later stages of the industry. A wide range of decorative motifs were employed, predominantly tooled lines and scrolls, bosses, and the characteristic eyebrow and petal motifs.

The petrological composition of different form types was examined to search for any correlations between form and fabric, but none was found. For example, the flat-rimmed jars were made using a range of sand grades. Other than three examples from Southdown Ridge and Hengistbury Head, they contained 1-5% silt-sized quartz. A range of the other size grades was noted in each, but vessels dominated by medium-grained quartz were identified from Gussage All Saints, Maiden Castle, Southdown Ridge and Sigwells, with coarser vessels from Maiden Castle and Allard's Quarry. All but four of the 30 examples sectioned contained elongated argillaceous inclusions, and up to 7% of calcareous inclusions were noted in 13 of the vessels. The flat-rimmed jars were also examined using quantitative petrology, confirming the variability in the size of the sand grains in a single class of vessel. There are no obvious petrological markers concerning the vessels with the trademark eyebrow and petal motifs, as they adhere to the general patterns of the pottery, typically with low silt, although there are two examples, from Southdown Ridge and Maiden Castle with 15-20% silt. Most are dominated by medium to coarse quartz. Three do not contain the elongated argillaceous inclusions, the greatest amount of limestone is 3%, and tourmaline was noted in just four.

This agrees with work carried out by Belinda Coulston (1989) on Late Iron Age Poole Harbour wares from Maiden Castle, who also found no link between form and fabric. The variability in the grain size was presumably a result of variability in the natural sand source, and petrological analysis of sand samples from Furzey Island revealed a deposit of medium to coarse-grained sand whilst one from Rempstone was less well-sorted, ranging from very fine-grained quartz to granules, but peaking in the medium range. It seems that it was the amount of sand added, rather than its size, that was important, to open up the clay enough for the successful firing of the vessel.

10.6 What was the social and economic context in which these industries developed?

The scientific analysis of the pottery has facilitated an insight into the way in which potters working around Poole Harbour and the Isle of Purbeck selected their clays and processed them, and provided an indication of changing practices over time (Chapters 7 and 8). Such analyses are invaluable in reconstructing past technologies, but also provide clues as to the cultural and economic context in which these vessels were created, exchanged or traded, and used. Peacock noted that 'all too often technology is considered an interesting sideline rather than a central issue in economic analysis' (Peacock 1982, 52). In recent years, researchers have been able to move beyond descriptions of fabrics to interpretations of behaviour and the social situation in which potters operated, often turning to the fields of anthropology to provide a framework in which to interpret the archaeological evidence. Whitbread (2001, 450) has stressed that it is the etic information, derived from observations and the analysis of the clays and pottery, that will lead to the discovery of emic information, the cultural context in which the potters operated. Tite (2001, 443) also notes there are two stages of material studies, the first concerned with reconstructing the processes of producing, distributing and using the objects, the second attempting to understand the behaviour of the people involved in these processes. He states that 'production, distribution and use are firmly embedded within the overall situational context that includes environmental and technological constraints, the economic and subsistence base, the social and political organization, and the religious and belief systems of the people under consideration' (Tite 2001, 445). Furthermore, Whitbread argues that ceramics are synthetic and therefore 'sensitive indicators of human decision-making and materials interaction', with each stage of the process of manufacture representing the 'cultural symbolism, traditions and individual preferences' of the potter (Whitbread 2001, 449).

The mechanisms of social organisation during the Iron Age are a subject of considerable debate (Champion 2016). Pottery production in central southern England during the Late Bronze Age and Early Iron Age was localised, with communities producing vessels for their own use, although occasionally vessels may have moved between communities, perhaps as gifts or as personal possessions.

Potters working in Dorset during the Early Iron Age changed from using crushed flint, grog and calcareous inclusions as temper in their vessels, to sand. Although the reasons for this are not understood, they represent technological style, and a choice between different options. Cunliffe and Brown note that the Earliest Iron Age pottery (*c* 7th to 6th centuries BC) in Dorset shares cultural affinities with sites in Wessex and part of the Upper Thames, with similarities in forms and decoration, but during the Early Iron Age (6th to 5th centuries BC) regional differences become obvious (Cunliffe and Brown 1987, 305). Cunliffe related the earlier shared cultural affinities resulting from contacts forged as a result of the bronze trade at the end of the Bronze Age, with the Dorset coast 'a contact zone between Armorica and Wessex' (Cunliffe 1987, 338). As this trade lessened, so too did the importance of this zone, although local distribution networks for salt, shale and iron continued. He argued that this resulted in the Middle Iron Age being 'a time of isolation and regional development in central southern Britain' (1987, 339) until the renewal of trading with the Continent towards the end of the period, so clearly evidenced at Hengistbury Head in the first half of the 1st century BC, with the import of pottery from northern France and wine from Italy. This view has been challenged by Webley (2015, 128) who has argued that continued cross-cultural contact during the 8th to 2nd centuries BC is suggested by the 'sharing of new technologies and artefact types', such as fired clay triangular objects, iron tools, bone weaving combs and the rotary quern. Webley also notes similarities in the forms of settlements on either side of the Channel, in midden deposits, the ritual deposition of metal objects and the treatment of the dead, and argues that contacts across the Channel and North Sea were maintained throughout the Iron Age, at different levels in society. The contacts allowed the exchange of technologies, ideas and objects – in both directions (Webley 2015, 137).

It was during the Earliest Iron Age period, *c.* 8th to 6th centuries BC, that potters working in south-east Dorset began to use quartz sand as an inclusion in the fabric of their vessels. The mineralogical and chemical analysis undertaken as part of this project suggests that production of the characteristic fabric that has been referred to as 'Poole Harbour ware' throughout this thesis, actually began on the southern side of the Purbeck Ridge, utilising the Wealden Clay deposits (Chapter 8). It seems that this resource may have continued to be exploited during the Middle and Late Iron Age, but new sources in the Poole Formation deposits came into use as the production sites moved closer to the water's edge around Poole Harbour. Throughout the Iron Age, potters levigated their clays and added a large amount of quartz sand to the clay, formed their vessels by hand, and fired them in a bonfire/clamp, but the clays that they used changed over time. So while one aspect of the ceramic technology of this industry remained constant, another was much more fluid. The analysis suggests that the technological knowledge was transferred between potters over centuries. Gosselain and Livingstone Smith's discussions with Sub-Saharan potters revealed their working methods are defined by tradition, thus asserting the 'individual and social ties' of the potter (Gosselain and Livingstone Smith 2005, 41). They found that on the whole, although not exclusively, potters tend to process their clays in the same way regardless of the intended function of the vessels (Gosselain and Livingstone Smith 2005, 41). They also stress that although a potter may relocate for social or economic reasons, and the move may necessitate a change in clay source, the potter is unlikely to change the methods they use to process the clay (Gosselain and Livingstone Smith 2005, 42).

This change in the resources used by potters on the Isle of Purbeck may have been triggered by social change. The longest sequence for prehistoric activity and settlement in this area of south-east Dorset has been identified at Bestwall Quarry, with evidence for flint-knapping during the Early Mesolithic period; a Neolithic timber structure, ditched enclosure and pits; field systems and structures of Middle Bronze Age date, with settlement continuing into the Late Bronze Age. Evidence for Beaker and Middle to Late Bronze Age pottery production was identified (Ladle and Woodward 2009). Settlement evidence for the Early to Middle Bronze Age periods has also been identified at East of Corfe River (Cox and Hearne 1991). There was then an apparent hiatus in the settlement of the area around the southern shores of Poole Harbour until the later Middle Iron Age, with evidence for settlement during the Early Iron Age coming from the landscape to the south of the Purbeck Ridge, at sites such as Football Field, Worth Matravers (Ladle forthcoming), Rope Lake Hole (Woodward 1987), Eldon's Seat (Cunliffe and Phillipson 1969), Kimmeridge, Langton Matravers, Gallows Gore, Sheepsleight, Encombe and Herstone (Calkin 1949). However, the environmental record reveals clues as to the utilisation of the area around the Harbour during the earlier part of the Iron Age. A pollen sequence from a peat deposit at Bestwall Quarry provided evidence of environmental change from the Late Neolithic through to the Saxon and period, supported by a series of 16 radiocarbon dates. The sequence indicated a cereals phase in pollen zone 4, sub-zone 2, with a peak in cereal pollen, dated 1010-845 to *c.* 400 cal BC, 'thus indicating a distinct phase of arable cultivation that lasted some 300-400 years', during the Late Bronze Age and Early Iron Age (Scaife 2009, 29). Evidence of Early Iron Age settlement that was presumably associated with this agricultural use of the site has not yet been identified. Analysis carried out as part of the Wytch Farm Oilfield project identified use of the littoral zone between the Harbour and the ridge during the Early to Middle Iron Age (below), but did not find associated settlement evidence, although two superimposed enclosures were identified during aerial monitoring at Slepe, located approximately 400m to the south of Bank Gate Cottages, Arne (NGR SY 956 864). They are comparable in terms of their shape and size to the Late Iron Age enclosures at Ower Peninsula and East of Corfe River, but it was suggested that one may represent an earlier, Middle Iron Age, enclosure (Cox and Hearne 1991, 81).

The area between the Harbour and the Purbeck Ridge had been covered by deciduous woodland during the later Mesolithic period, with areas cleared for agriculture from the Early Neolithic onwards. Although pockets of heathland are thought to have existed during the Neolithic, it was the large-scale woodland clearance carried out during the Bronze Age that caused depletion in the mineral nutrients of the soil, creating sandier, acidic soils, known as podzols. This resulted in changes in the vegetation, as fewer species could tolerate the acidic soil, and ericaceous vegetation, such as heather, bracken and gorse, became dominant in this area (Allen and Scaife 1991, 217). If the resultant heathland was not maintained, woodland species would again become dominant. Yet from the Bronze Age onwards the proportion of grasses remained high and the woodland did not regenerate, suggesting that the heathlands continued to be managed in some way during the Early and Middle Iron Age, prior to any evidence of settlement. This was probably due to grazing, the cutting of turves, or the controlled burning of the heath (Cox and Hearne 1991, 228). Different conditions prevailed at Bestwall Quarry, with woodland clearance not succeeded by the creation of podzols and heathland. This was thought to be a result of different soil conditions at the site, formed on the Pleistocene gravels (Scaife 2009, 31).

The use of the heathland of the littoral zone for grazing or the cutting of turves would have presented an opportunity to become familiar with the rich landscape of clays in this area. Gosselain and Livingstone Smith's examination of ethnographic data of potters working in Sub-Saharan Africa found that potters tend to be quite habitual in the types of environments that they would consider suitable when looking for new clay sources. They may use different visual clues, such as the slow drainage of rain on areas of soil overlying clay. Many clay sources are simply found in the course of the day-to-day activities of potters, their families and friends – such as building houses and working in the fields (Gosselain and Livingstone Smith 2005, 39). The exploitation of the landscape between Poole Harbour and the Purbeck Ridge may have been controlled by people living at the base of the northern side of the ridge, but evidence for such a settlement may be masked by colluvial deposits, or has not been discovered due to a lack of archaeological excavation in this area (Cox and Hearne 1991, 228).

Communities, perhaps groups of craftspeople and their families, appear to have moved back to the area north of the ridge during the Middle Iron Age, from approximately the 2nd century BC, or possibly earlier, and agricultural settlements were established at Furzey Island and also at West Creech, at the foot of the Purbeck Ridge (Cox and Hearne 1991). Middle Iron Age activity has also been identified at Green Island (Jones 2013), and unstratified pottery of Middle Iron Age date from Shipstal Point and Fitzworth Peninsula may also be indicative of Middle Iron Age settlement, or at least activity, during this period at these sites (Cox and Hearne 1991, 228-229). Cox and Hearne note that the lack of activity on the Ower Peninsula during this period is likely to be a result of the topography, with Furzey Island, Shipstal and Fitzworth situated on the 'littoral fringe of the harbour', but Ower still attached to Furzey Island and Green Island (*ibid.*). Further evidence of Middle Iron Age activity in the Harbour was provided by the discovery of an oak logboat off the coast of Brownsea Island in 1964, dated 295bc (±50) (Peers 1965; McGrail 1979). Two submerged stone-topped timber structures, investigated by the Poole Harbour Heritage project in 2000, also relate to activity during this period. One of these structures is 100m long and 8m wide, and extends from Cleavel Point towards Green Island. The other runs from Green Island and is 55m in length, with a gap of 70m between the two. Radiocarbon dating of their timbers indicated a date of construction in the mid 3rd century BC, and they have been interpreted as jetties used to load and unload boats (Le Pard 2010, 39). If this was indeed their use, this would suggest fairly large-scale trade into and out of Poole Harbour during the Middle Iron Age.

Cox and Hearne suggested that the move back to the sites around the shores of Poole Harbour during the Middle Iron Age period was driven by the opportunity to extract salt, and they envisaged small, permanent settlements of people carrying out salt extraction, pottery production and shale working (Cox and Hearne 1991, 229). Shale working and salt extraction were already carried out by those living on the sites to the south of the Purbeck Ridge, particularly near the coast at Kimmeridge, and the increase in salt production during the Middle Iron Age period is a phenomenon also seen at Rope Lake Hole (Woodward 1987, 145). It has been suggested that at the site of Hobarrow Bay, Kimmeridge, evaporation of the sea water was carried out on the beach, with the damp salt being carried to the cliff top for drying and packing (Cunliffe 2005, 511). A move away from the south coast of the Isle of Purbeck to the southern shores of Poole Harbour may have been prompted by more favourable working conditions offered by the sheltered bays and creeks of the area and the better distribution mechanisms afforded by the Harbour and the associated riverine systems. However, the changing landscape may account for a lack of evidence of Early to Middle Iron Age activity around the shores of Poole Harbour and its islands. The sea level would have been approximately 1m lower during this period (Chapter 2, Section 2.1.1) and the Harbour would have looked rather different to its current form. Settlements or activity areas around its shores may now be submerged and invisible to the terrestrial archaeologist.

The available evidence suggests a considerable increase in the level of industrial activity around the littoral fringe of the Harbour during the Late Iron Age. Shale working was carried out at Ower Peninsula, Green Island and at East and West of Corfe River. The evidence for pottery production is ambiguous but a probable clamp at East of Corfe River is certainly suggestive of this (Cox and Hearne 1991, 229). Salt production was carried out at a number of the Wytch Farm Oilfield sites, particularly East of Corfe River, and small-scale metalworking at Ower Peninsula (Cox and Hearne 1991, 230). Away from this littoral zone, activity along the foot of the ridge during this period is attested by surface finds at Godlingston, Rempstone and East Creech (Cox and Hearne 1991, 230). The evidence for the practice of agriculture indicates that the settlements around the shores of the Harbour were not seasonal but permanent.

The link between pottery production and salt extraction seems inescapable, and led Cox and Hearne (1991, 230) to suggest 'There can be little doubt that the extraction of salt for off-site consumption was closely linked with the manufacture of ceramic vessels as containers for their transport', although why this would be in pottery vessels rather than the more commonly encountered briquetage containers is less certain. The location of the sites on the littoral zone was presumably intended to take advantage of the natural resources – the clay, sand, fresh and saline water, source of fuel (including woodland species such as oak and alder, and the ericaceous vegetation) and the opportunity to move goods via river and sea. Agriculture was practiced at these settlements, with evidence for the cultivation of emmer/spelt wheat and barley, but documentary evidence from more recent years provides an insight into the difficulties of farming and living on the heath (Kerr 1993). It has been suggested this may have been supplemented by imported grain and that any cultivation was only possible because the industrial waste, principally ash, could be used to fertilise the soil (Cox and Hearne 1991, 45).

The archaeological record therefore indicates communities moved back to the shores around Poole Harbour during the Middle Iron Age, exploiting the natural resources of the area. It also provides clues as to the scale of pottery production during the Iron Age. David Peacock (1982) drew together ethnographic observations to suggest modes of pottery production that define the scale of production in terms of the level of investment in technology and resources, and examined the evidence from the Black-burnished ware industry using his model. During the Late Iron Age and early Romano-British periods, pottery produced around Poole Harbour was handmade, bonfire-fired and distributed at a relatively local level, including to army units in Dorset and Devon, and occasionally sent further afield, to forts at Usk and Richborough, but presumed to be sold through the local market at Dorchester (Peacock 1982, 86). These traits led Peacock (1982, 86) to state that this level of production has all 'the hallmarks of household industry and it is not excessive to postulate part-time domestic production possibly in the hands of women'. Furthermore, he notes that 'agriculturally impoverished' areas, where farming is challenging, are 'the sort of place where household industry normally develops' (Peacock 1982, 85-86), areas where communities cannot sustain themselves from farming alone (Peacock 1982, 23).

The explosion of BB1 from the early 2nd century AD indicated a change in the mode of production of this industry. The range of products increased and they were used up and down the country, by civilian and military consumers. Peacock has argued that the potters could not have organised this on their own, 'and we must now envisage the interest of the specialist dealer buying up lots and arranging for transport by road or ship' (Peacock 1982, 86). Furthermore, he adds that it is uncertain whether it was the pots that stimulated this trade, or an associated product such as salt. He has also suggested that it may have been contracts between the army and the Dorset potters that led to the widespread distribution of their wares (*ibid.*, 149). Production had changed to the level of workshop industry, with potting a full-time activity. This is supported by the archaeological evidence from pottery production sites around Poole Harbour, indicative of an industry with nucleated workshops, and pottery making the dominant activity. Archaeological evidence from Bestwall Quarry and Ower has provided evidence for the use of drying sheds, which would have allowed extension of the potting season, and investment in technology with the use of kilns to fire the pottery.

The mode of production for the industry prior to the 1st century BC is harder to define. It may be assumed that in its earliest stages it was at the simpler level of 'household production', carried out within a domestic setting, for immediate use (Peacock 1982, 9). However, the shared technical and stylist traits in pottery from a number of Early Iron Age sites (such as Rope Lake Hole, Eldon's Seat and Football Field) suggests a developing industry, moving towards craft specialisation. The expansion in the distribution of the wares from the 3rd century BC is suggestive that the mode of production for the later Middle Iron Age may have been at the level of household industry, carried out on a part-time basis with limited investment in technology. However, the distribution of the Poole Harbour products from the 1st century BC onwards is indicative of a large-scale industry where potting was probably carried out as a full-time activity.

The increasing levels of production during the Iron Age may be linked to the difficulties in sustaining communities on the heath from farming alone, and the economic opportunities offered by the raw materials of the area. However, understanding the mechanisms behind the movement of vessels in the prehistoric period is challenging. Sharples (2010, 92-93) differentiates between those objects exchanged as *gifts*, and thereby creating a social debt, and those exchanged as *commodities* for items of equal value. In the case of the former he follows Godelier (1999) in suggesting that the movement of the object is simply the consequence of the overriding aim - the establishment of social relationships. He contrasts this with commodity exchange, which does not create a social debt or the development of long-term relationships. Furthermore, Sharples views all material culture encountered in the archaeological record from the first millennium BC as resulting from gift exchange (Sharples 2010, 95). Morris (1997) has also examined why pottery is brought to a site, when the necessary resources for production are available locally, citing an example from Lains Farm, Hampshire, where local and non-local sandy wares were found in contemporary contexts. She suggests that the non-local vessels may have been technically superior, or the vessels were exchanged to maintain social relationships that underpinned Iron Age society in Wessex. These networks would support communities in cases of hardship (agricultural failure, warfare and so forth) and to provide marriage partners (Morris 1997, 38).

Sharples (2010, 115) notes the increase in the movement of ceramics during the eighth to sixth centuries BC, but stresses that this exchange ‘had a symbolic significance and does not indicate a trade in commodities’, and that they instead ‘indicate the development of contacts between local communities’. He has suggested that during the Middle Iron Age the communities living around the hillforts, such as Maiden Castle, defined their relationships with these centres ‘by regular participation in monument construction’. A change is visible towards the end of the period, with the renewal of the ramparts declining from the 2nd century BC. This may have led to a return to exchange mechanisms based on material culture being the way in which communities were structured and relationships created/renewed (Sharples 2010, 171). Sharples links this to the development of regional pottery production and other craft specialisations. Brown (1991, 44) has suggested that the Poole Harbour potters were ‘marginalised within society and relegated to a peripheral location but free to trade outside the region and free to produce vessels to order, both within and without tribal boundaries’. Sharples has also suggested that ‘specialist artisans’ may have been excluded from society, based in a peripheral location that ‘naturally facilitated exchange with other communities outside the region’ (Sharples 2010, 171). He states that on the one hand, interaction with these craftspeople helped develop the ‘hillfort communities and provided a mechanism for the integration of territories’, but on the other hand these artisans were removed from the ‘process of gift-giving between hillfort communities’, allowing a barter economy to develop (Sharples 2010, 172). The production and distribution of pottery and other goods became separated from the role material culture played in creating social links between the hillfort communities’ (Sharples 2010, 172). Thereby, the potters produced their wares in order to barter for other goods, without the social relationships implicit in gift exchange, but the movement of these vessels, and their contents, by the hillfort societies ‘was still undertaken on a gift exchange basis and probably occurred in heavily socialized ritual events’ (Sharples 2010, 172). Webley (2015, 129) has suggested that the evidence of imported goods at Hengistbury Head and Poole Harbour may indicate that these were places were communities gathered, consuming the wine and other goods evidenced in the archaeological record, at communal activities, perhaps feasts.

The nature of trade and exchange in southern Britain during the Iron Age is a complex one. Champion (2016) has summarised the debate concerning the traditional concept of hierarchical social organization during the earlier part of the Iron Age, and more recent attempts to discuss ‘other forms of society in which there may have been leaders rather than rulers’ (Champion 2016, 154). However, it seems highly likely that the move to more specialised craft production ‘would have been accompanied by more complex relationships for the distribution and acquisition of products, and control over these processes of production and distribution would have provided new opportunities for the accumulation of wealth and status’ (Champion 2016, 156).

10.7 Summary

This research has established that the pottery industry that evolved to become one of the largest producers of coarseware pottery during the Romano-British period, Black-burnished ware, began as a small-scale concern during the Earliest Iron Age, *c.* 8th to 6th centuries BC. The potters of this period selected the iron-rich Wealden Clay deposits to be found on the southern side of the Purbeck Ridge to make their vessels. They, and the generations of potters who followed them, levigated the raw clay and then added a consistent volume of quartz sand. Their products were used locally at first, but were soon exchanged with other communities in the Dorset area during the Early Iron Age, albeit on a small scale, presumably as part of a network of gift exchange.

The amount of vessels being exchanged gradually increased over time, and by the 3rd century BC their products accounted for a quarter of pottery in use at Maiden Castle, located 30km to the west of Poole Harbour. At this time, *c.* 3rd to 2nd centuries BC, communities appear to have moved back to the littoral zone between Poole Harbour and the Purbeck Ridge, presumably to take advantage of the natural resources of the area, principally salt and clay. This was an agriculturally impoverished area, but the increased pottery production and salt extraction allowed communities to supplement their basic farming by exchanging goods. During this period they appear to have continued to exploit the Wealden Clays but also new clay sources of the Poole Formation, although their processing techniques remained unchanged. By the later Iron Age they supplied ceramics to most of the communities of Dorset. Their success led to some potters attempting to imitate the wares, with evidence of this from a Late Iron Age assemblage from Bearwood, located just 11km to the north of the main nucleus of the industry (Jarvis 1985). The industry continued to evolve into the Romano-British period, as the potters quickly took up the opportunity to become suppliers to the incoming army, and become one of the longest lived and most prolific of the pottery industries of Roman Britain.

10.8 Achievements, limitations and further work

The aim of this research project was to examine the origins of a pottery industry that was located around the shores of Poole Harbour and the Isle of Purbeck during the Iron Age. The results have made a significant contribution to our understanding of ceramic technology during the Iron Age of Britain, and have implications for ceramic studies more widely. The scale of the fieldwork has revealed the variation that is present within selected geological strata and in restricted areas. This serves as a reminder that studies of the provenance of ceramics will need to consider the variability that may be encountered in the local geology. Application of a range of techniques has facilitated the understanding of not only clay sourcing but also technology. The role of petrology must be highlighted here, as it is only infrequently used for quartz-tempered pottery due to the ubiquity of its inclusions, yet this project has highlighted the information that the thin-sections were able to reveal. They provided evidence of levigation of the clays and the addition of temper; variations in the limestone content also hinted as the presence of different workshops or sources. Data collected from the ICP analysis has revealed the exploitation of different clay sources during the Iron Age, as communities moved from the southern areas of the Isle of Purbeck to the shores around Poole Harbour. The results also highlight that some of the ethnographic models that are used to understand archaeological phenomena, such as those by Arnold (1985) and Peacock (1982), whilst offering a frame of reference, may be too simplistic and not allow for a full understanding of the nuances of pottery production during the Iron Age.

The results have demonstrated that the earliest phases of the industry in question utilised the Wealden Clays that outcrop on the southern side of the Purbeck Ridge. As most of the clay sampling undertaken as part of this project was focussed on the areas of known Late Iron Age and Romano-British production, it may be fruitful to carry out a larger programme of sampling on the Wealden Clay deposits. This may reveal deposits with evidence for the elongated argillaceous inclusions. The link with salt production has long been suspected and was outside the scope of this project, but exploration of the similarities and differences in the pottery and briquetage fabrics, in terms of their mineral and chemical content, may provide links between the industries. A method to detect the water-insoluble chloride ion in pottery used for salt making was presented by Horiuchi *et al.* in 2011 and may provide another avenue by which the link between the industries is investigated, particularly in reference to the flat-rimmed jars. Further exploratory fieldwork projects could attempt to identify evidence for Iron Age settlement and industry in areas around the shores of Poole Harbour now submerged by water levels that have risen by approximately 1m since the Iron Age.

This successful study of the Iron Age Poole Harbour ceramics industry has clearly demonstrated that the multi-method approach applied here can meet the challenge presented by 'difficult' sandy wares and has provided significant new detail and depth of understanding of the social and economic position of the Poole Harbour pottery industry, the scale of industrial production, its organisation, and the techniques of manufacture employed by these prehistoric potters. Building on this achievement for Iron Age Poole Harbour wares there is potential for this multi method approach to be more widely adopted across the field of archaeological ceramic studies, to shed similar light on materials from other regions and time periods.

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