The Neolithic pottery of the Isle of Man and its relationship to that of surrounding areas:

a study in production, decoration, and use

(Volume 2)

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A1. Structuring the dataset

THE NEOLITHIC SITES AND CERAMICS FOUND THROUGHOUT THE IRISH SEA PROVINCE ARE ORGANISED INTO DEFINED MONUMENT AND CERAMIC TYPES AS AN AID TO ANALYSIS THROUGHOUT THIS STUDY

A1.1 Introduction

One fundamental result of early work in Neolithic studies has been the identification and classification of site and ceramic types. These types are based primarily on morphological form and allow previously disparate datasets to be grouped in a manner amenable to analysis.

These classifications have frequently altered since their initial construction as new finds have been made which are attributed to a type on the basis of a family resemblance to one or more of its existing members. The initial class definition then broadens as more varied materials are included within it, until it becomes too wide to allow meaningful analysis. At this point a revised classification is often proposed. Revised classifications also become necessary as the analytical objectives of the subject alter in order to pursue goals not satisfactorily addressed using existing schemes. This process is amply illustrated through a review of the development of 'Grimston-Lyles Hill ware' as defined by Smith (1974). This was originally termed Form 'G' by Stuart Piggott in 1931 (Piggott 1931) who used it to define a subset of material (ie, Neolithic A) within his broader definition of early Neolithic pottery. At the time the primary point Piggott was aiming to establish was the chronological distinction between early and late Neolithic ceramics. Subsequently the focus of attention turned to regional variations within this cover-all category, which resulted in such terms as Windmill Hill ware (Southern England) and Grimston ware (Northern England) which aimed to equate variations in ceramic form with prehistoric 'cultural' groupings. In part as a rebuff to this approach, a return to an over-arching ceramic classification was made by Smith (1974, 106) who renamed the early Neolithic ceramics as Grimston-Lyles Hill, thereby stressing the unity of ceramics from both Britain and Ireland. This classification did not however allow analysis of distinctions between regions, and in consequence there has been a return to increasingly regionalised terminologies, eg, Hembury wares, Windmill Hill wares, ?Eastern wares (Cleal 1993, 1995).

Within the study area there is ample evidence for regionalisation of terminology as both sides of the Irish Sea basin have pursued separate research. For example, the general type of tomb frequently known as a Court tomb in Ireland (De Valera 1960), is known as a Clyde tomb in Scotland (Kinnes 1985), and a Cotswold-Severn outlier in Wales (Smith and Lynch 1987). A more consistent terminology was therefore necessary in order to suit the needs of the present study area.

Before introducing the terms used in this study it is, however, necessary to consider in a little more detail what these terms actually represent. Within some of the early type names of ceramics, such as 'Drinking Vessel' and 'Food Vessel' there is the clear implication that the classification reflects that which was current during prehistory. Within ceramic studies, this approach is still prevalent today, for example, Cleal (1993) suggests that classifications should be based on those variables most likely to have had relevance in the past, eg, degree of aperture closure or, as Case (1961) suggests rim type. The extent to which a prehistoric classification is an attainable goal of archaeological analysis has been questioned by Melos (1989) who argues that even within the past it is unlikely that a single classificatory scheme was used. Perhaps more forcefully, Miller (1985) argues from ethnographic studies of pot use that an emic classification may not be the most appropriate for the examination of the structuring principles of a society and the way it utilises material culture. Miller suggests that the best classificatory system is one which focuses on those attributes which appear to be used to create diversity. This approach is closely related to that of Clarke (1968) who is perhaps the best known exponent of this viewpoint. In part this must be seen as a pragmatic approach in that the methodologies of archaeology are better atuned to studying variation than homogeneity.

From this viewpoint the most appropriate classification of Neolithic material culture would appear to be those 'types' developed from early intuitive assessments of the evidence since these serve to distinguish the dataset into units perceived to be diverse and yet internally unified. Whilst such an approach allows the structuring of much of the dataset, it does leave some sites between classifications, perhaps because they are too damaged to allow grouping, or because they are morphologically individual. For example, the Mull Hill Circle, Isle of Man (Herdman and Kermode 1894), is neither a Court tomb, Passage tomb, Portal dolmen, or any of the other available tomb types. An alternative category of 'Unclassified tomb' is necessary in order to loosely identify these more individual sites as distinctive. This classification does not have the same interpretive status as the other megalithic tomb groupings since it represents a 'catch-all' category. Other categories which fulfill the same role in this study are 'Enclosure', 'Unclassified burial', and arguably 'Occupation site'. Such an approach seems preferable to the over-interpretation of poor quality data, or the generalising of unique sites or ceramic assemblages within other categories.

Wherever possible, the author makes use of generally accepted names for ceramic and site types rather than producing a new and confusing array of terms. In some cases the initial definition has been altered in order to suit more readily the needs of the current work. It is also the case that some classes are developed in order to address particular questions which are only relevant to a portion of the thesis and are not used throughout. The list of site and ceramic classes is given below, along with a brief description.

A1.2 The choice of site types

The wide area covered by this study, and the considerable time period involved has necessitated the use of a large number of different site types. No attempt has been made to ensure that all site types are defined by the same criteria (eg, morphology, or function) and the types therefore range from the general to the specific. This approach allowed general themes within the study area to be examined, eg, Court tombs, as well as allowing specific areas of interest to be highlighted, eg, Earthfast jars.

The distribution of these site types which are used in the main body of this thesis are shown in Figures 4.2-4.23, and are discussed in chapter 4-5.

A1.2.1.1 Cist

Cists represent the primary mode of burial in much of the British Isles during the Early Bronze Age. Their strong association with Beaker pottery does, however, show that they owe their origins to the Neolithic period. In many cases cists have been found without a covering mound, although this is not normally the case. Typical examples include, Baroose, Isle of Man (Quine 1925); or Killeaba, Isle of Man (Cubbon 1978).

It must also be noted that cists were placed beneath round cairns earlier in the Neolithic period, although at this time the cists tended to be of megalithic proportions (see Section 1.2.1.8), and that round cairns without cists were also built during the Neolithic (see Section 1.2.1.16).

A1.2.1.2 Court tombs

A number of terms have been proposed for this monument according to the needs of the particular researcher, eg, Clyde tomb (Scott 1969), Clyde-Carlingford (eg, Childe 1935b) and horned tombs (eg, Corcoran 1960). Court tomb (eg, De Valera 1960) is retained here since it reflects the design of the monument most accurately. Within the study area Court tombs have been recognised in Ireland, Scotland and the Isle of Man. Typical examples include Ballyalton, Co Down (Evans and Davies 1934) and Audlesystown, Co Down (Collins 1954).

A1.2.1.3 Crematoria

Within the general class of non-megalithic long barrows synthesised by Kinnes (1992) a sub-set has often been recognised (eg, Kinnes 1992, 101). These have a cremation element within the ritual which results in the firing of a timber facade and / or chamber, often prior to a second phase of building in stone (eg, Ballymacaldrack, Co Antrim, Evans 1938b, and Lochill, Dumfries and Galloway, Masters 1973). Within the study area, this type of activity has been identified in Ireland, Scotland and the Isle of Man.

A1.2.1.4 Earthfast jar

This site type is currently peculiar to the Isle of Man where large and isolated jars (eg, Ballagawne, Colby and Colby Mooar) have often been found by farmers during ploughing. In the majority of cases no attempt has been made to locate further examples or to establish an archaeological context by enlarging the excavated area beyond the urn. Where such work has been undertaken (eg, Billown Quarry 2, Darvill *forthcoming*) no clear features have been revealed. For this reason, and since the jars are complete and therefore indicate deliberate deposition rather than stray loss, this is considered here to represent a particular site type.

A1.2.1.5 Enclosure

This category links those sites which are bounded by a clear enclosure bank or ditch, eg, Lyles Hill, Co Antrim (Simpson and Gibson 1986), and Beckton, Dumfries and Galloway (Cormack 1964b) which do not adequately relate to any other site type used in this thesis. For this reason the category acts as a catch-all which includes the 'Causewayed enclosure' at Donegore Hill, Co Antrim (Mallory 1990). This latter site is at present a unique form of monument within the study area, despite the wide occurance of causewayed enclosures in the southern England[1].

A1.2.1.6 Extraction site

This site type encompasses the major quarrying and mining operations which were carried out during the Neolithic, including flint mining at Ballygalley Hill, Co Antrim (Collins 1978), stone quarrying at Langdale Peak, Cumbria (Bradley and Edmonds 1993); Graig Llwyd, Clwyd (Warren 1919), and Ballapaddag, Isle of Man (Coope and Garrod 1988).

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[1] A causewayed enclosure has been suggested at Bryn Celli Ddu, Anglesey by Thomas (lecture 1995), although the evidence is ephemeral and ambiguous. A further site has been tentatively identified by Darvill (*pers comm.* 1995) at Billown Quarry 2, although in this case it appears that the causewayed ditch is present as a boundary rather than an enclosure.

A1.2.1.7 Henge

A sub-circular earthwork with a bank outside the ditch. This construction technique is widely recognised throughout the study area, occurring in Scotland, Ireland, Wales and England. Within the south of England a sub-set of henge enclosures have been defined Wainwright 1989) on account of their considerable size. Despite this size difference the basic morphology of the site is the same and so dates from these henge enclosures have been included within this analysis. Examples within the study area include Picts Knowe, Dumfries and Galloway (Thomas 1995) and Monknewtown, Co Meath (Sweetman 1976).

A1.2.1.8 Linkardstown cist

A round mound enclosing a megalithic chamber not designed to be accessed subsequent to construction. This particular construction technique appears to be closely linked to function since the cists are frequently found to contain individual inhumations with similar grave goods. Their distribution currently limits them to Ireland (see Brindley and Lanting 1990), with typical examples being Drimnagh, Co Dublin (Kilbride-Jones 1939) and Baunogenasraid, Co Carlow (Raferty 1973).

A1.2.1.9 Occupation site

This category represents a grey area since it is exceptionally difficult to isolate the actual habitation of a site from 'ritual practises' (see Gibson 1982). For this reason the term occupation is preferred over habitation since it acknowledges that these sites may not directly represent the living space of Neolithic communities. The definition as used here encompasses a number of sites which have in the past been considered as ritualistic in character, eg, Goodland (Case 1973). As Gibson notes there is little that can be done to resolve this problem without prior knowledge of whether archaeological features and material culture associations specifically distinguish ritual and occupation sites. Furthermore, Shanks and Tilley (1987) in a review of the approach adopted by Gibson note that there may have been no separation between ritualised behaviour and daily life making the distinction a spurious one.

A1.2.1.10 Passage tombs

A round mound enclosing a chamber accessed from the edge of the mound via a passage. This basic design structure is found in monuments covering a wide variety of sizes from mounds *c*6m across to the massive monument at Newgrange with a diameter of *c*76m (O'Kelly 1984). Within the study area the technique is found in monuments in Ireland, Scotland (i.e. the Bargrennan tombs), Wales, the Isle of Man and possibly England. Examples at the smaller end of the spectrum include: Bargrennan, Dumfries and Galloway (Piggott and Powell 1949) and Byrn Celli Ddu, Anglesey (Hemp 1931).

A1.2.1.11 Pit circles

Currently known within the study area there is a single unique pit circle at Newgrange, Co Meath (Sweetman 1985). This site type is presumably closely related to that of Timber circles, although at Newgrange there was no evidence that timbers had been placed in the pits.

A1.2.1.12 Pit cluster

This site type forms a rather unsatisfactory category of isolated pits which are not accompanied by sufficient other archaeological features to allow a placement into another site type. In many cases the fills of these pits have suggested that the contents were deliberately deposited, eg, Carzfield, Dumfries and Galloway (Maynard 1993) and Newton, Argyll (McCullagh 1990). The occurance of a number of pits, or other features, with apparently structured fills does, however, lead this category to blend in with that of Occupation sites (see Section 1.2.1.9).

A1.2.1.13 Portal dolmens

A single megalithic chamber frequently covered by a capstone of massive proportions. This monument type has been identified in Ireland and Wales. Within Wales the front of the chamber is formed by three stones forming an H shape (Darvill 1987, 64). A typical examples is Ballykeel, Co Armagh (Collins 1965).

A1.2.1.14 Rectangular timber buildings

Within the study area a number of rectangular timber buildings whose design relies heavily on the use of bedding trenches has been identified, eg, Ballygalley, Co Antrim (Simpson 1994). Those identified in Ireland have been recently summarised by Simpson (1994). Further examples have been found in England, Scotland and Wales.

A1.2.1.15 Round cairn

Round cairns have been traditionally viewed as of Bronze Age derivation and it is clear from the large number that have been excavated in all countries in the study area that this is generally the case. The excavation of such sites as Knockiveagh, Co Down (Collins 1957) and Lyles Hill, Co Antrim (Evans 1953) clearly indicate, however, that this form of monument was in use during the Neolithic. In the case of the two forementioned sites a large ceramic assemblage has also been derived from beneath the cairn suggesting that the site type may also be acommpanied by a common ritual usage.

A1.2.1.16 Stone circle

A free standing circle of megaliths, not interconnected at ground level. Within the study area these have been identified by Burl (1976) in Scotland, Ireland, Wales and England, eg, Machrie Moor, Arran (Haggerty 1991), and Newgrange. Co Meath (O'Kelly 1984). No certain examples are known on the Isle of Man.

A1.2.1.17 Stray find

Throughout the study area there are a large number of finds which cannot be adequately provenanced to a particular site. In many cases these include artefacts in museum stores, eg, ?Brougshane, and the Grainger collection (Herity 1982). In addition, those artefacts which were recovered from fieldwalking are also included within this section since the character of the site from which they derive is rarely definable without excavation (see Kilbride Hill, Arran; Beacon Hill 4 and Little Asby Scar 6, Cumbria).

The final type of context included within this category are sand dune sites which have not produced clear stratigraphy. As the methodological discussion by Trevor Cowie indicates, the possibility of verifying stratigraphy in dune sites with an active history is extremely poor and any artefactual associations are suspect (Cowie *in press*). The only dune site within the study area which was excluded from this category was Killelan Farm, Islay, since this had produced clear evidence of prehistoric structure (Burgess 1976a).

A1.2.1.18 Timber circle

A free standing circle of timber posts, not interconnected at ground level. Within the study area examples have been identified within Scotland and Ireland (see Gibson 1994)[2].

A1.2.1.19 Unclassified burial

Outside of megalithic burial there is little evidence for uniform classes of mortuary sits during the Neolithic. The current class is intended to reflect this and includes the single grave sites in Ireland which have been highlighted by Brindley and Lanting (1990) as forming a coherent burial practise, and the cave burials which are evidenced in N Wales (eg, Gops cave, Clwyd, and Ogof Pant Y Wennol, Gwynedd). For the purposes of this thesis the most important burial types within this category are the cemeteries of the Isle of Man. Although these are bound together by their use of cremation they employ a wide variety of burial techniques (eg, cremation platform, isolated urn, burning pit) to allow the production of a separate category of site type (see chapter 5). The practise of cremation itself is in evidence at all the megalithic tomb types used in this thesis.

A1.2.1.20 Unclassified Tomb

As stated in Section A1.1 this category is defined as a catch-all for those megalithic tomb sites which do not readily fit into the other site type categories used in this study, whether due to a unique form or serious disturbance. Such individual sites include Achnacreebeag, Argyllshire (see Henshall 1972; contra Ritchie 1970) and Trefignath, Anglesey (Smith and Lynch 1987) where the former may be an aberrant Passage tomb and the latter is a composite of various tomb types.

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2 Collingwood (1938) speculated that there might be timber circles at King Arthur's Round Table, but this has never been proved.

In addition to those sites which fail to fit a category there are those which are now too badly damaged to allow adequate classification, these include Ballaharra, Isle of Man (Cregeen 1978) and Carnduff, Co Antrim (Herity *et al* 1968).

A1.2.1.21 Wedge tombs

A tomb consisting of a main long chamber with a small ante-chamber at one end, which are generally enclosed within a mound which is higher and wider at the west end. This monument type is confined to Ireland (Shee Twohig 1990), with typical examples including: Ballyedmonduff, Co Dublin (O'Riordain and De Valera 1953).

A1.3 The choice of pottery types

Listed below are the dominant pottery types used throughout this thesis. It should be noted that the pot types described are frequently only the most diagnostic elements present within larger assemblages. For example, Carinated pottery from Machrie Moor was found in association with a range of vessels including globular types. Similarly, Shouldered pottery includes a wide variety of forms. This is explored in more detail in Chapter 11 with reference to Shouldered pottery.

The distribution of these ceramic types is considered in more detail in Chapter 4 (see Figures 4.2-4.23).

A1.3.1.1 Achnacree bowls

Abbreviation used in charts: **Ach**

This ceramic type was defined by Henshall (1972, 100-1) principally from material derived from Court tombs in Scotland. The form is characterised by a hooked rim and a shoulder which deviates only slightly from the general curve of the vessel. Lugs were also present in the case of the miniature Achnacree vessel from Glenvoidean, Isle of Bute (Marshall and Taylor 1977). Achnacree bowls have only previously been identified in Scotland, although this study suggests that vessels with comparable characteristics are present in Ireland (see Chapter 4).

A1.3.1.2 Beakers

Abbreviations used in charts: **Beak**

This ceramic type was the first Neolithic pottery type to be identified in the British Isles (Abercromby 1902), although its occasional association with metals has led to the widespread view that it is more appropriately placed in the Early Bronze Age. Nonetheless, since many Beaker yielding sites are devoid of metallurgy it seems likely that this ceramic type sits on the cusp of the transition between Neolithic and Bronze. For this reason it is included within this study. Beakers are generally well made vessels with a fine fabric (although a coarser 'domestic' variety is also known; Gibson 1982). Their form is normally flat based with a sinuous profile, whilst the range of decoration is wide and distinctive (Boast 1995). For the range of Beaker forms see the corpus published by Clarke (1970)

A1.3.1.3 Carinated bowls

Abbreviation used in charts: **Cari**

This pottery group was defined, in a general analysis covering the whole of the British Isles, by Andrew Herne (1988) as a subset of the traditionally recognised Grimston-Lyles Hill wares. This work drew on Alison Sheridan's thesis (1985) dealing with the Neolithic pottery of Ireland. The classification has subsequently been adopted in detail for Scotland by Cowie (1993). The only portion of the study area which does not contain this pottery type is the Isle of Man.

The form of the vessel type is closely related to that of Shouldered pottery described below, although it has a more sinuous profile and is never decorated with more than a fine burnish. One of the defining characteristics of the style is considered to be its chronological integrity at the start of the Neolithic. This hypothesis is tested in Appendix 2 where it was found to be correct. Typical examples of this ceramic form include vessels from Newton, Islay (McCullagh 1989); and Carzfield, Dumfries and Galloway (Maynard 1993).

A1.3.1.4 Drimnagh bowls

Abbreviation used in charts: **Dri**

The key morphological features of this pottery type are the often acute shoulder angle and the complex decoration. The bulk of sites which have produced this pottery are in Ireland, although it has been found at a number of southern Scottish sites. It has not been found in England. Typical examples include vessels from Baunogenasraid, Co Carlow (Raferty 1973); and Ballykeel, Co Armagh (Collins 1965).

A1.3.1.5 Grooved ware

Abbreviations used in charts: **Gro**

This ceramic type is characterised primarily by a flat base, and is the first type of pottery in use in the British Isles to commonly make use of this formal technique. The range of decoration on these vessels throughout Britain is generally quite wide but, within the study area it is apparently confined to incised techniques. Until recently this pottery style was only identified within Britain, although its presence has been previously suggested on the Isle of Man (Bruce *et al.* 1947, 156). Recent work has, however identified it in Ireland (see Sheridan 1985). Within Ireland there are several sites, eg, Ballyalton, Ballykeel and Ballymacdermot where flat based sherds are present but which have not been formally identified as a specific ceramic type. These sherds have been included within this thesis as ?Grooved ware to indicate the possibility that Grooved ware may be a more widespread phenomenon in Ireland than has hitherto been recognised. A lack of firsthand analysis of the sherd material in Ireland precludes the current author from commenting on this possibility and such potential sites, although highlighted, are not used in data analysis.

A1.3.1.6 Peterborough wares

Abbreviations used in charts: **Pet**

Peterborough pottery is generally round based, with heavy rims and a cavetto neck (eg, vessels from Old Grove, Cumbria, Shell Chemicals 1993), although within Scotland more open platter-like vessels have also been identified (see Burgess 1976b). This ceramic type is only recognised on the British side of the Irish Sea basin, although it seems likely that it is linked to the Irish Sandhills style of pottery.

A1.3.1.7 Ronaldsway

Abbreviation used in charts: **Ron**

This ceramic type was first identified on the Isle of Man in 1935 (Clark 1935), but was only correctly attributed to the Late Neolithic and named through the work of Bruce *et al* (1947). The most easily recognisable form of Ronaldsway ware is the large baggy jar that generally has a pronounced collar. Decoration on these vessels is limited to the collar, whilst the fabric is often very coarse. The full extent of this ceramic type is examined later in this work. Ronaldsway has never been identified outside the Isle of Man.

Within the Ronaldsway ceramic repertoire are a number of sherds with decoration highly reminiscent of Grooved ware pottery. The extent and influence of this Grooved ware component is explored within this thesis. When Manx assemblages containing both ceramic traditions are being discussed, the coverall term Manx Late Neolithic pottery is used.

A1.3.1.8 Sandhills ware

Abbreviation used in charts: **San**

Sandhills ware pottery has only been recognised within Ireland, where it occurs as round based bowls of a form ranging from open to closed. The ware is typically coarse, whilst the decoration shows a marked preference for incision and cord. It has been suggestsed (Case 1961) that Sandhills ware might be comparable with the British phenomena or Peterborough ware, although there are considerable differences in terms of form and decorative arrangement.

Carrowkeel ware is included within the general category of Sandhills ware in this study since the evidence increasingly points to similarities between the two types rather than differences, eg, overlap in contexts they are employed in, the range of decoration, and form.

A1.3.1.9 Shouldered wares

Abbreviation used in charts: **Sho**

It has been recognised, as stated in Section 1.3.1.3, that a class of Carinated pottery can be separated from the Grimston-Lyles Hill pottery class. Shouldered pottery represents the remainder of this traditionally recognised group. Within it is a broad range of forms from the closed form of the necked vessel to the more angular shouldered form. The fabric type is occasionally fine, although more typically lapses into a coarse ware. Other than the greater diversity of form the presence of decoration is the principle distinction between this pottery type and Carinated bowls. This is sometimes restrained to ripple burnish, but can involve elaborate incised work (eg, Ballaharra, Isle of Man B'ha 30 in Appendix 6).

A1.3.2 Bronze Age ceramic terms used in this thesis

At many sites within the study area there is apparently a phase of secondary use during which Early Bronze Age ceramics are deposited. This includes such Middle Neolithic sites as Passage tombs (eg, Loughcrew H, Co Meath) and occasionally Court tombs (eg, Giant's Graves, Arran), as well as at Late Neolithic sites. Since it could be argued that these ceramics are the manifestation of a tradition of continual use from the Middle Neolithic, they are recorded within this thesis. They are not however included within analyses since the full examination of these ceramic classes falls outside its scope. Pottery post-dating the Early Bronze Age is not recorded here.

A1.3.2.1 Collared urn and Food vessel

Abbreviation used in charts: **Coll** and **FV**

In all cases these terms have been adopted when they are used in the text by the contemporary report writer. Having established that the sherds assigned to this group were not of general Neolithic character no attempt is made in this thesis to examine and evaluate the ceramic types themselves.

A2. Chronology of the Neolithic in the Irish Sea area

THE PROBLEM OF DATING SITES AND ARTEFACTS WITHIN THE STUDY AREA IS ADDRESSED AND A PHASED METHODOLOGY ADOPTED WITH WHICH TO RESOLVE THIS PROBLEM. A CHRONOLOGY IS PRODUCED WHICH RELIES ON SECURE RADIOCARBON DATES, WITH STRATIGRAPHIC DATA BEING USED AS A CHECK ON ITS INTEGRITY.

A2.1 Discussion of previous dating schemes

In order to provide a framework for analysis and to ensure that only contemporaneous site and ceramic types are considered throughout this study a consistent chronological scheme was necessary. Unfortunately, no single coherent dating scheme was available which covered all parts of the Irish Sea province, and furthermore (with the notable exceptions of O'Kelly 1989 and Sheridan 1995), those regional chronologies which were available each treated the evidence in an individual and often inconsistent manner making a proper assessment of their validity difficult.

Before describing the methodology used in the production of the chronology employed in this study, these existing dating schemes are considered.

A2.1.1 Previous monument chronologies

Works relating to the Neolithic in the study area have generally divided the period into two parts, early and late, with the Beaker 'period' sometimes being included in the latter and sometimes being seen as the start of the Early Bronze Age (see Piggott 1954; Kinnes 1985; Darvill 1987, chap 3 and 4; Cooney and Grogan 1994, chap 4 and 5). In these works a general consensus has been reached regarding the position of monuments within these two chronological phases. It is normal to view Court tombs, non-megalithic long barrows, and simple Passage tombs as early, along with Carinated bowls and simple decorated pottery. To the later Neolithic are generally assigned developed Passage tombs, Wedge tombs, Henges, and Timber and Stone circles, accompanied by Grooved ware, Peterborough ware, and Beakers. The greatest area of debate regarding dating in recent years has centred around Linkardstown cists with Herity and Eogan (1977) classing them as late, whilst O'Kelly (1989, 131), and Cooney and Grogan (1994) placing them as early. A programme of radiocarbon dating has recently addressed this issue (Brindley and Lanting 1990), with the result that the latter view now predominates.

The approach detailed above of subdividing the Neolithic into early and late suffers from a considerable lack of chronological precision. This makes it difficult to study trends of change during the Neolithic period, but the present study addresses this problem.

A2.1.2 Previous ceramic chronologies

Although there has been general agreement as to the relative dates of monument types there has been considerable debate about the production of ceramic chronologies and indeed the nature of ceramic types. As a consequence of the latter problem, it is difficult to compare the results of the present study with previous works whose ceramic groupings were based on conflicting criteria and therefore contain varied material. The only ceramic type which seems to be consistently studied across the whole of the British Isles is Beaker pottery. Considerable work has been invested into dating and sub-dividing Beaker typologies (Abercromby 1912; Clarke 1970; Lanting and van der Waals 1972; Case 1977). Recent work by Kinnes *et al* (1991) has however, produced a large number of high quality radiocarbon dates, which provide a clear idea of the date of this pottery type although they provide no support for suggestions that the ware can be subdivided.

Given the regional nature of analyses of other Neolithic pottery types, it was decided to present the history of past studies by region.

A2.1.2.1 Previous chronologies for Irish Neolithic pottery

The earliest radiocarbon supported chronology for the study area was produced by Case (1961) dealing specifically with Irish Neolithic pottery. This used an elaborate sub-division of pottery styles, which aimed to reflect both chronology and regional distributions. The chronology employed all of the 15 radiocarbon dates available at that time with great reliance being placed on typological and stratigraphic considerations. Despite subsequent schemes superseding the results of this work (see below), this seminal publication still influences even very recent ceramic reports (see Sheridan 1995).

Herity's work (1982) avoided the complexity of approach adopted by Case (1961) and utilised very broad ceramic types. His early Neolithic ceramics correlate to Carinated and Shouldered pottery within the current study and were discussed in more detail in Herity (1987). His approach to late Neolithic pottery is interesting as he subdivided it into four types; globular, heavy rimmed, necked and exotic, on the basis of morphological criteria. This innovative approach has not however, met with widespread acceptance.

Case and Herity's work was re-examined by Sheridan (1985) who produced a 4 phase scheme of early, middle and late Neolithic, followed by Beaker pottery. The aim of Sheridan's work was to explore the evidence for trade and exchange in the Irish Neolithic. Her chronology was therefore produced from a need similar to that of the present study, ie, to know what types of pottery were in contemporary use and could therefore be compared. Different pot types were used by Sheridan and Herity, but the major difference in chronology was in the placing of Drimnagh / Decorated bipartite bowls. These were seen by Herity as late Neolithic, whilst Sheridan saw them as early / middle. In the light of Brindley and Lanting's (1990) recent dating programme it seems that the latter view is correct.

Perhaps the most important facet of Sheridan's work in the development of Neolithic pottery studies was her recognition of an early fine ware element within the generalised category of Western Neolithic pottery identified by Case (1990). This identification has been followed by other researchers (Herne 1988; Cowie 1993).

Nonetheless, the concept had only been tested using calibrated radiocarbon dates within Scotland (Cowie 1993), and it was decided to critically re-examine this view within the present study.

Alison Sheridan's thesis (1985) was the last major attempt to produce a ceramic chronology for Ireland. Despite its recent date it was not felt possible to incorporate its results directly into the present study for the following reasons:

1 Sheridan's work did not pay close attention to the relationship between the radiocarbon sample and the pottery supposedly dated.
2 It was considered that there were insufficient radiocarbon dates available from Ireland to justify Sheridan's chronological conclusions.
3 Sheridan's study employed stratigraphic and artefact associations as evidence on a par with radiocarbon dates. This approach was felt to be highly suspect.

The exact dating of Drimnagh bowls has also been the subject of study by Brindley and Lanting (1990). In this work the calibration of dates was undertaken, but their date range was selected using their preconceived impressions of how the pottery style should have developed:

> "Due to the shape of the calibration curve, there are several options for the time-span in calendar years. Given the limited typological development of the pottery and the actual radiocarbon dates for the stages of development a relatively short time-span in calendar years *seems most likely.*"
>
> Brindley and Lanting 1990, 4 (my italics)

The result of their study was to indicate a date range of 3525 - 3350cal BC. The end date range was constructed from all the possible intersections of the radiocarbon dates with the calibration curve, rather than the youngest possible end date.

The latest comment on the dating of Irish Neolithic pottery was produced by Sheridan 1995. This work in essence re-iterates her PhD programme, albeit with the dates presented in calibrated form.

A2.1.2.2 Previous chronologies for Scotland

Compared to research in Ireland, very little work has been done to produce a coherent chronology for the pottery of Scotland. Indeed, the earliest attempt to produce a concerted dating scheme using radiocarbon dates was in 1985 (Kinnes 1985). This used four main ceramic types with three being placed in an early, middle, late sequence (bowl, Unstan and Grooved ware), the fourth type was decorated pottery but this was seen as having an uncertain chronological position. Unstan ware is a ceramic type generally associated with the Orcadian Neolithic and does not occur within the study area.

In a study of more limited extent, Cowie (1993) focused particularly on the early Neolithic with a subdivision of Kinnes' bowl pottery into an early carinated form and subsequent coarse plain wares. This approach follows the opinion suggested by Sheridan (1985) and Herne (1988) that within the general spread of Grimston-Lyles Hill pottery was an earlier fine ware element. Cowie's findings lent support to the suggestion that this was indeed the case.

A2.1.2.3 Previous chronologies for Wales and NW England

Chronological schemes for pottery from northwest England and north Wales have not been previously assessed using radiocarbon dates, presumably due to the lack of available evidence both in terms of radiocarbon dates and ceramic assemblages. In general there has been a reliance upon the schemes for southern England which can be traced back to Piggott 1931 and 1954, ie, Neolithic A (Western Neolithic) followed by Neolithic B (Peterborough ware), Grooved ware and Beaker. This can be seen in the work of Lynch (1969) for N Wales, and Nicholson (1989) for NW England.

Recent work by Gibson (1995) has attempted to address the question of Peterborough chronology within Wales. From this preliminary study he notes that the existing selection of dates does not support the traditionally accepted subdivision of this pottery type into chronologically separate Ebbsfleet, Mortlake, and Fengate sub-styles.

A2.1.2.4 Previous chronologies for the Isle of Man

Prior to the present study there were only 9 radiocarbon dates available for the Manx Neolithic, two being clearly in error. Six of the seven acceptable dates refer to the later Neolithic, although only one date, from Ballavarry, could be said to be associated with pottery. The available data for the production of a chronology was therefore extremely poor.

There have been no systematic studies of Manx Neolithic pottery since 1935 (Clark 1935), and no attempts to produce a chronology independent of those developed for Britain and Ireland. Even in the 1930s the presence of a Grimston-Lyles Hill style ware was accepted and its date derived from evidence in Britain and Ireland (Piggott 1931). Similarly, the finding of Beaker pottery on the Island (Quine 1925) was also successfully recognised and fitted into the chronologies current throughout the British Isles (Clark 1935).

Late Neolithic pottery on the Island was not however, successfully recognised until 1947 (Bruce *et al* 1947), partly due to the unique style and forms of this pottery (*cf.* Clark 1935). The few radiocarbon dates available have however, served to confirm the broad chronological position of this ceramic type as suggested on the basis of its association with stone axes and flint tools (Bruce *et al* 1947).

As a part of this research project the Oxford Accelerator Unit granted 20 dates towards the more accurate chronological placement of Manx Late Neolithic pottery. The results of this work are incorporated in the present appendix.

A2.1.3 Conclusion

The discussion above has attempted to highlight the very broad manner in which monument chronologies for the British Neolithic are often construed. Such an approach makes the task of comparing the development of material culture practise through time extremely difficult. In the case of pottery chronologies it can be seen that there is considerable variation of approach throughout the study area, with differing reliance being placed on analogy, stratigraphy and radiocarbon dates. Only Ireland has a long history in the discussion of chronologies, and even here there has not been a rigorous approach to the use of radiocarbon dates. In the rest of the study area, chronologies have frequently relied upon comparison with evidence from elsewhere, noteably Southern England. The extent to which these comparisons are justified has gone untested.

This remainder of this appendix falls into two parts. First, a radiocarbon dated scheme is constructed for the major site and ceramic types considered in this work. Second, the resulting scheme is taken as the basis for a chronology which is developed in this thesis using the evidence from stratified associations. In this second phase the sparse evidence for the dating of stone axe production is also summarised. The chronology is then discussed, and its relationship to existing chronologies for parts of the study area is considered.

The rigorous approach adopted within this appendix results in the rejection of many existing radiocarbon dates as being insecure or residual, and in some cases accepts our inability to provide consistent evidence for all site and ceramic types. Such an acceptance of the limitations of the evidence is necessary if interpretations are to be developed from a secure foundation, and if weak points in the available datasets are to be recognised and remedied.

A2.2 Introduction to the chronology

The production of a secure chronology for the Irish Sea province was initially hampered by the limited number of available radiocarbon dates. This made it unlikely that there were sufficient secure dates within the study area to be confident that the full duration of the ceramic or site type was present within the sample. It therefore seemed preferable to produce a chronology which applied to the whole of the British Isles since this would increase the sample size sufficiently to make statistical work on the data set a possibility.

The negative side of collecting dates across the whole of the British Isles was to make it difficult to see regional trends within the study area. This was particularly problematic since the Isle of Man was itself very poorly dated making the study of the chronology of its archaeology only possible on the basis of analogy with elsewhere. This problem was overcome in large part through a grant from the Oxford Accelerator Unit towards the dating of Ronaldsway ceramics on the Isle of Man. Twenty dates were provided from this programme, the results of which are considered below and in Burrow and Darvill (forthcoming).

A2.2.1 Sources and method of data collection

A database of 1398 dates for the British Neolithic was assembled, principally from the following sources:

- Date-lists in *Radiocarbon* and *Archaeometry* until end 1993.
- Summary of dates funded by English Heritage, (Jordan *et al* 1994).
- Council for British Archaeology (British Archaeological Abstracts 1971).
- Synthetic sources such as Watts (1960), Smith *et al* (1971), Smith (1974).

The database assembled is not definitive and at an early stage it was decided to ignore all dates from obviously environmental sites, eg, the Somerset Levels[1].

Publication references to all dates within the time span 4,000bc[2] - 1,800bc were checked to ascertain whether Neolithic pottery was found on site, or whether the site type was one current in the study area during the Neolithic. Not all dates had been published as site reports and only 1188 samples were able to be checked to this level.

At this stage all relevant dates were separated off and the degree of association with the site or ceramic type was ascertained[3]. The results of this stage are given in tables referenced below.

The dates obtained were then calibrated to 2 standard deviations using OxCal v2.01, running the high precision calibration curve of Stuiver and Kra (1986). These preliminary data plots were examined and any dates which were clearly intrusive or residual were removed using criteria detailed below. Although the dates rejected at this stage do not appear on the final plots, they are included in Tables A2.2 to A2.19.

A2.2.2 The methodologies adopted

Two methodologies were developed in order to provide a reproducable criteria with which to assess the applicability of a given radiocarbon date when dating a particular site / ceramic type.

The first methodology, outlined in Section 2.3, aimed to establish the span of time during which particular site types were in use. The majority of contexts relevant to

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1 Since assembling this chapter the following radiocarbon dates have come to the attention of the author, Dunloy, Co Antrim (Conway *pers comm.* 1995), Newtown, Co Meath (Halpin 1994), Donegore Hill (Mallory *pers comm.* 1996), and a further date from Tankardstown (Sheridan 1995). There was insufficient time to incorporate these dates into the study.

2 The convention used in the recording of radiocarbon dates within this thesis is in accordance with Stuiver and Kra (1986), ie, uncalibrated dates are recorded as 'bc', whilst calibrated dates are noted as 'Cal BC'.

3 Some sites which had been radiocarbon dated but where the pottery was clearly not in association were filtered out at this stage. This did not include any dates from within the study area.

this analysis were not rapidly sealed and therefore have considerable potential for residuality and intrusion. A methodology which operated in terms of *terminus ante quem*, and *terminus post quem* was therefore adopted.

The second methodology, outlined in Section 2.4, attempts to deal with the dating of ceramic types by their association with radiocarbon dated material. In order for this to be achieved the degree of association needed to be assessed and the potential for residuality and intrusion limited. A statistical approach was then adopted towards the summation of calibrated dates in order to calculate the duration of each ceramic type.

Following the production of a chronology based strictly on radiocarbon evidence stratigraphic evidence was used to test and refine the scheme.

It was initially hoped to produce a radiocarbon backed scheme for the use of Neolithic stone axes, since these represent a commodity widely exchanged within the British Isles, often from known sources. As a result they provide a valuable source of data in the examination of exchange networks within the study area. However, it rapidly became apparent that there were an insufficient number of available radiocarbon dates directly associated with this type of material. In consequence it was decided to leave the dating of stone axe distribution networks until a framework of associations had been provided by the dating of site and ceramic types. See Section A2.7 for details.

A2.3 The dating of site types

As stated in Section A2.2.2, radiocarbon dates from sites often occur in the form of dated material within a layer which in turn forms part of a monument. This makes the potential for residuality and intrusion of datable material into a context a serious problem (eg, considerable discussion has been generated by the possible complications of bog oaks on dating a site, and of the mobility of charcoal) . It was therefore considered from the outset that, except in those rare instances given in

Table A2.1 (discussed below), all dates would be viewed in terms of their potential to give *terminus ante quem* (TAQ) and *terminus post quem* (TPQ) information. This made it impossible to adopt for site types the approach formulated for providing ceramic date ranges, since the degree to which the date related to the monument was often unclear. An alternative approach was therefore developed and is detailed below.

A2.3.1 The choice of site types

Sufficient radiocarbon dates were found to be present to date the following site types:

- Court tomb
- Crematorium
- Henge
- Linkardstown cist
- Passage tombs
- Rectangular timber building
- Stone circle
- Timber circle
- Wedge tomb

These represented all the major site types within the study area which were felt to constitute internally coherent classes, with the exception of Portal dolmens. Only 1 date was found for this type of monument (from Ballykeel, Co Armagh) despite the presence of over 160 tombs of this type throughout the British Isles (O'Kelly 1989, 92). In addition, the Ballykeel date has a large standard deviation rendering it of little diagnostic value. For this reason, no date range is proposed for Portal tombs within this thesis. This represents a considerable gap in our understanding of Neolithic chronology, which certainly needs to be addressed by a dating programme in the future.

It was also decided not to attempt the dating of sites such as Cists and Cist cairns since their life-span clearly extends into the Bronze Age and would therefore have entailed the collection of a significantly greater number of dates. Their association with Beakers does, however, indicate their currency at the end of the Neolithic. Site types such as Occupation and Unclassified burial / tomb were not included since they covered too wide a range of sites to provide useful chronological information. Sites falling into these categories are, however, considered in the body of this thesis if they can be dated independently using ceramic association or their own radiocarbon dates.

A2.3.2 The production of data ranges for site types

For each monument type, a provisional analysis of the radiocarbon database suggested that it would be possible to allocate dates at most sites to one of 4 categories.

1 Monument construction

2 Monument use

3 Monument blocking / destruction (if present)

4 Secondary use (eg, Bronze Age intrusive burials)

It is of course recognised that site information may lead to more than a single instance of each phase being identified at any one site, eg, in the case of multi-phase tombs such as Island, Co Cork (see Brindley and Lanting 1992).

Table A2.1 considers the interpretive value of dates from a variety of common Neolithic contexts in the light of the categories outlined above. The scheme accepts the potential residuality of all radiocarbon dated material but does not deal with the potential for intrusion into a context of later material. This is more problematic and the only feasible approach appeared to be the abandonment of all dates which clearly fall well outside the date range of particular site types.

The only site type which is not adequately examined within the above methodology is the henge. In this case, the only dates which can be clearly said to refer to the monument come from the henge ditch or bank, the former of which is open to a great degree of residuality. In addition, it is unclear at what point in the henge's history the ditch was allowed to fill in, ie, immediately after construction, during use or subsequent to use. It was therefore decided only to use dates which come from the primary fills, and then only to use them when there were 3 or more from each site which were statistically indistinguishable using the R_COMB function of OxCal v2.01.

Having removed all radiocarbon dates which were clearly residual or intrusive equal weight was given to all dates in the remainder of the analysis, although contextual information could remove further samples. As an example, in the case of the Court tomb Ballybriest (number 3 on Figure A2.2), the tomb could not have been constructed prior to the earliest portion of UB 534 which was found on the OLS, and similarly the tomb could not have been blocked prior to the deposition of UB 535 on the forecourt land surface. This provides a minimum span of use for the monument of *c*200 years. A more complex example can be found at Knowth 1 (number 7 on Figure A2.10). Here the mound could not have been thrown up prior to the oldest part of the youngest radiocarbon date. This means that UB 357 and UB 358 are slightly residual and the earliest that the mound could have been thrown up is given by the oldest portion of GRN 12357.

All dates were calibrated using OxCal v2.01 with the results for each site type being plotted as separate Figures (A2.2 to A2.18). The shaded portion of each figure gives the TAQ or TPQ for the relevant site phase at each site. For example, for Passage tombs, the majority of dates come from old land surface or mound material and the phase which can be dated is therefore the monument construction.

For Linkardstown cists all the dates come from the burial itself, providing a date which strictly speaking applies to the use of the monument.

A2.3.3 Discussion of site results

Full results for the analyses of dates from site types are provided in Figures A2.2-A2.18, and in the discussions below.

A2.3.3.1 Court tombs

As Table A2.2 and Figure A2.1 show 11 of the 14 Court tombs used in the analysis fall within the study area with the remaining 3 coming from western and southern Ireland. The majority of dates tend to give information regarding the construction and blocking of the monument (11 and 8 sites respectively). Only 3 sites provide information regarding the use of the tomb - an insufficient sample on which to make any real comment. The calibration of these dates show that if one ignores TAQ evidence there is no evidence for a Court tomb being constructed prior to 4037cal BC (ie, TPQ for Ballybriest), whilst there is no evidence for a blocking phase prior to 3953cal BC (also TPQ for Ballybriest). The latest start date for a blocking phase is at Monamore (3080cal BC), suggesting that the majority of sites had fallen out of use at around this time or earlier (see Figure A2.2). A suggested lifespan of this monument type is therefore proposed as 4037- 3080cal BC.

A2.3.3.2 Crematoria

9 sites were included in the calibration process of which only 2 fell within the study area (Dooey's Cairn and Lochill), the remainder clustering in Yorkshire with outliers in Perthshire and Hampshire (see Table A2.3 and Figure A2.3). Nonetheless the dates from Dooey's Cairn and Lochill do fall within the general spread of dates from the other 7 sites. This provides hope that this monument type was in use throughout the British Isles at the same time. The main phase for which information can be gathered from the available dates concerns the firing of these sites. The earliest possible date

for a firing is at Raisthorpe *c*4700cal BC (date extended beyond end of calibration graph), whilst the second and third earliest (Giant's Hill and Lochill) are at 4223cal BC and 4220cal BC respectively. The latest date after which a firing could have occured is at Dalladies, 3492cal BC (see Figure A2.4). Since the early portion of the Raisthorpe date falls outside the general cluster it is proposed that crematoria monuments were generally fired between 4223 - 3492cal BC.

A2.3.3.3 Henges

As stated in Section A2.3.2 this monument class was the most difficult to date due to the lack of secure contexts from which radiocarbon samples could be selected. As a consequence only 6 sites were included within the analysis, all of which clustered in Hampshire, Wiltshire and Dorset (see Table A2.4 and Figure A2.5). Some of these were large Henge enclosures which are not necessarily directly comparable with Henges outside of Wessex. This raises doubts as to the value of extrapolating the dates from these sites into the study area. Nonetheless, the absence of absolute dates elsewhere mean that there is no direct way of dating this monument type other than to assume that Henge monuments were a broadly contemporary cross-British Isles phenomena. The earliest date after which a Henge could have been built comes from Marden at 3605cal BC, but since the main cluster of dates after which a monument could have been built is around 2921cal BC (from Avebury) the Marden date is discarded. The latest date before which a Henge could have been built comes from Maumbury Rings at 2284cal BC (see Figure A2.6). A date range is therefore suggested for the construction of these monuments between 2921 - 2284cal BC.

A2.3.3.4 Linkardstown cists

7 monuments were included within this analysis, of which 4 were located within the study area (see Table A2.5 and Figure A2.7). The phase to which all but one of the available dates refer is the use of the monument. The earliest dates suggested for this phase come from Ballintruer More at 3775cal BC. The latest is 2699cal BC at Ashleypark, but this date does have a large error range which means the end date of

this monument type is likely to be older than this. As a result it was decided to adopt the end date of the next youngest site (Poulwark, at 2922cal BC) as the end date (see Figure A2.8). This gave a range of 3775cal BC - 2922cal BC.

A2.3.3.5 Passage tombs

10 monuments were included within this analysis, 9 of these were from within the study area (see Table A2.6 and Figure A2.9). All but one of the available dates refer to the construction phase of this monument type. The earliest date after which a Passage tomb was constructed comes from Slieve Gullion (4463cal BC), this is closely followed by Carrowmore 7 at 4330cal BC. The latest date after which a Passage tomb was constructed comes from Tara at 2869cal BC (see Figure A2.10).

On the evidence of radiocarbon date it appears that the Passage tomb tradition began after 4463cal BC, with all tomb building drawing to a close after 2869cal BC. This appears to entail an exceptionally early start for the tradition; a point which will be explored further when the evidence of stratigraphic association is brought into play in Section A2.6.

A2.3.3.6 Rectangular buildings

As Table A2.7 and Figure A2.11 show 6 sites were included within the analysis, only 1 of which was from within the study area. The remaining 5 were located in Co Limerick, Co Mayo, Perthshire, Co Tyrone and Cambridgeshire, providing a good geographical spread for this monument type. All of the available dates are fairly well clustered suggesting that this style of building was in use at broadly the same time throughout the British Isles. All of the dates are from contexts providing information regarding the construction of the monuments. The earliest date comes from Ballynagilly at after 4221cal BC, with the latest being Ballyglass at after 3488cal BC (see Figure A2.12). This therefore is the proposed date range for this monument type.

A2.3.3.7 Stone Circles

The analysis of this monument type suffered from the sparsity of secure radiocarbon dates. Only 2 sites provided dates, Avebury and Machrie Moor, the latter being from within the study area. The evidence from which to extrapolate a date range is therefore extremely weak (see Table A2.8 and Figure A2.13), however, the TPQ for the construction of Avebury suggests a start date for Stone Circle construction in the Late Neolithic (see Figure A2.14).

It is more generally recognised that the use of Stone circles was a long-lived phenomena. Indeed, Aubrey Burl (1976) notes that, from the evidence of radiocarbon dates and artefact associations, the construction technique probably had a life span of about 1500 years, extending from the Late Neolithic well into the Bronze Age. Burl (1976, 20) also notes:

> "it has to be admitted that any typology of stone circles is, at present, innately unreliable because there are so few dates on which to construct it. Artefactual material is sparse and unevenly distributed."

With this in mind, the separation of Bronze Age from Late Neolithic circles does not seem to be a viable proposition. It was therefore decided to exclude Stone circles from further study, rather than present a palimpsest view which would wrongly attribute a Late Neolithic date to many sites more accurately placed in the Bronze Age.

A2.3.3.8 Timber Circles

The Timber circles included within this analysis are distributed widely throughout the British Isles, with 3 of the 8 examples coming from the study area (see Table A2.9 and Figure A2.15). The dates all provide information regarding the construction of the sites. The earliest date after which a Timber circle was constructed comes from Arminghall at 3610cal BC. This date does however carry a very broad distribution range of 945 years, and therefore is of little diagnostic value. The next earliest date come from Machrie Moor at 3342cal BC. The latest date after which a Timber circle was constructed is 2669cal BC at the Newgrange structure (see Figure A2.16). This is the date range assumed for this type of monument.

A2.3.3.9 Wedge tombs

Of the 6 Wedge tombs within the analysis only one comes from the study area (see Table A2.10 and Figure A2.17). Nonetheless, since the monument class is confined to Ireland and the date range appears to be quite closely defined it seems fair to assume that the result of the analysis reflects the life history of Wedge tombs within the study area. With the exception of dates from Island, Co Cork, all the contexts dated provide information regarding the use of the monuments. The range of dates spread from after 2559cal BC (Lough Gur) to 1410cal BC (Toormore) (see Figure A2.18). This contrasts with the date range suggested by Brindley and Lanting (1992) which, although it was based on the same evidence, produced a result of 1900 - 1700cal BC. This is not consistent with the evidence.

A2.3.4 Summary

The dating of the major site types present within the study area represents a first step in the production of a chronology which will be subsequently refined using the evidence of artefact associations. Prior to this it is necessary to produce a radiocarbon chronology for the major ceramic types of the study area.

A2.4 The dating of pottery types

The dating of pottery presents problems which differ from those described in the production of a site based chronology. In this instance the primary concern is establishing the strength of association between a radiocarbon date and the pottery. A grading system was therefore developed. The system used is illustrated in Table A2.11 and draws on the work of Waterbolk (1971, 15-6) and the sample forms for the Oxford University Research Laboratory for Archaeology and the History of Art.

It was decided to accept only those dates which fitted into the first category (✓) since this represented the most secure class.

A2.4.1.1 The choice of pottery types

Of the ceramic types listed in Appendix 1 and used throughout this study there were sufficient radiocarbon determinations to date the following:

- Beaker
- Carinated pottery
- Drimnagh pottery
- Grooved ware
- Peterborough ware
- Ronaldsway ware

A2.4.2 Calculating the date range for a ceramic type

A considerable body of literature has grown up regarding the appropriate method for calculating the span of time in which ceramic types were in use or site phases in existence (see Buck *et al* 1991 and 1992, and Bell 1995). These rely on a statistical approach to the data which incorporates archaeological considerations, such as stratigraphic or historical information. Such an approach has been attempted at Danebury in order to examine the chronological validity of pottery phasing suggested on typological grounds (Bell 1995). It was decided to duplicate this exercise in the current project since it was considered that sufficient dates were available for such work.

The methodology adopted was to calibrate all the dates relating to a particular pottery type using OxCal v2.01. These were bracketed using the BOUND function which produced a range of probabilities relating to the potential start date, end date, and length of duration of the pottery type[4].

The earliest start date and the latest end date was then taken for each ceramic type in order to produce a single date range which had a 95.4% confidence of containing the correct lifespan of the pottery style.

A2.4.3 Discussion of ceramic date range results

Full results for the analyses of ceramic date ranges, a description of the quality of the evidence used in the analyses and the key results which were produced are provided in Table A2.12.

A2.4.3.1 Beaker pottery

Beaker pottery has been the subject of one of the most rigourous dating programmes for Neolithic pottery, in consequence there are 33 sites with 38 secure dates available for study (see Table A2.13, Figure A2.19). Unfortunately, the only dates which are available from sites within the study area are poorly associated with Beaker pottery and were therefore not included within this analysis, although they are listed as Table A2.14.

The geographical spread of the secure dates provides no reason to believe that the date range for the study area should be any different to that from the rest of the British Isles. The results produced a date range of 2511 - 1566cal BC at 2σ. This differs from the results produced by Kinnes *et al* (1991) from the same data; their calculations suggested a time range for Beaker pottery of *c*2600 - 1800cal BC. Kinnes *et al* did not, however, utilise the Bayesian methods employed within this study, although they did recognise (1991, 38) that such methods would become available in future.

[4] The suitability of this approach was confirmed by the program's author; Bronk Ramsey *pers comm.* 1995

A2.4.3.2 Carinated bowls

41 dates from 20 sites were included in the analysis, 7 of these sites fell within the study area, in Ireland and Scotland (see Figure A2.20 and Table A2.15). The analysis provided a date range of 4635cal BC - 3334cal BC at 2σ. Only 1 date could not be fitted adequately within the analysis; this was UB 305 from Ballynagilly with an agreement of 53.5%. The remaining dates had an agreement of 86.6%.

A2.4.3.3 Drimnagh pottery

6 sites with a total of 6 dates were included in the analysis; 3 of these sites were from within the study area. (see Figure A2.21 and Table A2.16). The date range produced spreads from 3749 - 3220cal BC at 2σ. This ceramic type has already been the subject of an attempt to produce a date range by Brindley and Lanting (1990).

A2.4.3.4 Grooved ware

24 dates from 13 sites were included in the analysis, 2 of these came from the study area in Scotland and Wales (see Figure A2.22 and Table A2.17). The analysis produced an overall agreement for these dates of 89.4% with only BM 704 (Hunstanton) being rejected with an agreement of 26.7%. The results provide a date range of 3003 - 2099cal BC at 2σ.

A2.4.3.5 Peterborough pottery

6 sites with a total of 12 dates were included in the analysis, none of these come from within the study area (see Figure A2.23 and Table A2.18). The results of this analysis are therefore treated as evidence for a cross-British Isles trend regardless of any regional variety. The date range produced in the analyis reflects the

considerable confusion that currently surrounds the dating of this pottery type. The results show a date span of 4081 - 1543cal BC at 2σ. Worryingly, this seems to indicate that Peterborough ware represents some of the earliest Decorated Neolithic pottery in the British Isles, a situation which seems very unlikely (see Piggott 1931, 73), and which will be tested against stratigraphic associations in Section 2.6. At this stage in the analysis, it must be concluded that either Peterborough pottery was current throughout nearly the full length of the Neolithic and Early Bronze Age, or the current sample of dates is insufficient to provide a meaningful date range.

A2.4.3.6 Ronaldsway pottery

21 dates were available for the dating of Ronaldsway ceramics. These were derived from 7 sites (see Table A2.19, and Figure 5.4). The close geographical limits of the ceramic type meant that all dates were from Manx sites. The date range for the pottery was 3120 - 2090cal BC at 2σ.

A2.5 The provisional radiocarbon-based chronology

The results of the radiocarbon dating analyses presented above indicate a fairly smooth continuum of site and ceramic types from *c*4600cal BC - *c*1500cal BC. Throughout this time, there are no marked boundaries at which one set of site and artefact types fall out of use and another set takes their place. This illustrates the fluidity of social development throughout the Neolithic which runs contra to the textbook impression of distinct early and late phases to the period (Megaw and Simpson 1984; Darvill 1987). The imposition of phasing is a necessary prelude to historical analysis, however, just as the initial grouping of the dataset into site types was necessary in order to structure the archaeological analysis.

The radiocarbon date ranges produced were therefore provisionally subdivided into four phases on the evidence provided by the start date for monument types. In

Section 2.6 the evidence of artefact association will then be used to test the validity of including each site and ceramic type within these provisional phases.

The proposed sub-division was as follows:

Early Neolithic (*c*4600 - *c*4000cal BC)

The earliest evidence of monument or ceramic activity within the study area are Passage tombs and Carinated pottery respectively. Also included within this phase are crematoriums and rectangular houses

Middle Neolithic (*c*4000 - *c*2500cal BC):

The majority of Early Neolithic monuments and ceramic types continue in use for at least the early part of this period. This period is characterised also by the appearance of new monument types: Court tombs, Linkardstown cists, Timber circles, Boyne Passage tombs, and the introduction of Drimnagh bowls.

Late Neolithic (*c*3000 - *c*2600cal BC):

Middle Neolithic monument types continue in use into this phase, but the building of Early Neolithic monument and artefact types has already been abandoned. Characteristic of this phase are henges and Grooved ware. Of particular relevance to the present study is the dating of Ronaldsway pottery to this period.

Latest Neolithic (c 2600cal BC -):

By this time all Middle Neolithic monument and artefact types have fallen out of use, although Late Neolithic types are still current until *c*2100cal BC. From c 2600cal BC Wedge tombs and Beaker pottery become current, whilst the only dated Stone circle in the study area, Machrie Moor, also dates to this phase. Although these monuments and ceramics are first found in the Neolithic they continue in use well past the traditional start date for the Bronze Age (*c*2300cal BC). As such it is only the commencment of the use of these monument and ceramic types which is relevant here, rather than their articulation with subsequent Bronze Age artefact types.

A2.6 Introduction to the use of artefact associations in dating programmes

This second part of the appendix deals with the verification and enhancement of the radiocarbon chronology through the use of artefact associations. Prior to the advent of radiocarbon dating this was one of the primary dating techniques and from it the broad chronological trends within the Neolithic were isolated (see Piggott 1954). It does, however, contain potential for tremendous inaccuracies if the security of the association of the artefact on the site, or indeed the association of two different artefacts in a context is not adequately checked. For example, it was assumed until recently that at Lough Gur, Co Limerick, both shouldered vessels and flat based pottery had been found in stratigraphic association. Re-examination has suggested that this association is spurious (see Sheridan 1995). Conversely, at Beacharra a phased chronology of Scottish pottery has been developed on the evidence of stratigraphy which re-examination suggests is not in fact present (see Scott 1964).

What is proposed below is therefore a rigorous consideration of the level of association which can be attributed to the data with a view to testing the radiocarbon dating scheme.

A2.6.1 Data check against the evidence of secure stratigraphy

The chronological scheme produced above can be tested and enhanced by analysing the range of ceramic and site type associations in a variety of ways. These are outlined below and are pursued in sequence with the evidence of each check being used cumulatively to improve the scheme at each stage.

1. The presence of ceramic types at particular site types is checked to confirm there are no associations anomalous to the proposed scheme. For example, if an Early

Neolithic rectangular timber building is found to contain Late Neolithic Grooved ware, or if Carinated pottery is found with Beaker pottery then there is a clear problem with the chronology.

2. The dated range of particular site types is also used below to provide a rough indication of the date range of associated ceramic types for which no radiocarbon dates were available. These include:
   - Achnacree
   - Shouldered pottery
   - Sandhills ware.

3. The range of ceramics associated with one another is used to further validate the dating scheme and to test the likelihood of overlaps in ceramic usage between types.

As with the choice of suitably secure radiocarbon dates a consistent and explicit selection criteria was necessary if the results were to have any validity. For this reason Tables A2.20 - A2.28 were produced. These indicate the association of particular ceramic types in specific contexts at site types[5]. The provisional allocation of Early, Middle, Late and Latest Neolithic site types were used in these tables[6], whilst all undated site types are included where appropriate. Footnotes show which sites are referred to in each instance. Wherever more than one ceramic type was found in the same context at a site then a brief discussion of the reliability of the association is given.

[5] The context types chosen are those introduced in the earlier part of this Appendix, see Figure A2.1

[6] An exception to this is the location of Passage tombs which the proceeding debate places in the Middle Neolithic.

A2.6.1.1 Implications for the proposed chronology of the association between ceramic and site types

The evidence of ceramics at Early Neolithic site types does not contradict the proposed chronology. There is a clear association of Carinated pottery at the timber buildings of Ballygalley and the Knowth Neolithic occupation scatter. There is however, no ceramic evidence associating Carinated pottery with Crematoria; such negative evidence does not however invalidate the dating scheme. No other Neolithic pottery occurs at these Early Neolithic site types, and although such negative data does not in itself constitute proof it does lend support to the evidence of radiocarbon dating that Carinated pottery was the only ceramic type in use during the Early Neolithic.

Turning to the later phases, there is no contradiction between the stratigraphic associations of Drimnagh pottery as a proposed Middle Neolithic ceramic type and the range of suggested Middle Neolithic sites. Nor is there any contradiction between the proposal of Grooved ware as a Late Neolithic ceramic type and the date range of suggested Late Neolithic sites.

The only area in which there is a significant contradiction between sites and ceramics is in the dating of Passage tombs. The suggestion in Section 2.3.3.5 that Passage tombs are Early Neolithic is based on the TPQ dates from Carrowmore 7 (LU 1441) and Slieve Gullion (UB 179), but there is no evidence for Early Neolithic pottery at Passage tombs. Indeed, the pottery associated with Passage tombs appears to be consistently of Middle Neolithic date (Achnacree, Peterborough ware and Sandhills ware are considered below). For these reasons it is proposed that the actual start date range of the Passage tomb is placed at the beginning of the Middle Neolithic, whilst its end date remains at *c*2869cal BC.

For the remaining site and ceramic types there is no significant contradiction between the evidence of radiocarbon dating and artefact association. No change is therefore suggested in the proposed chronology outlined in Section 2.5 which will be retained throughout this thesis.

A2.6.1.2 Implications of the proposed chronology for the dating of further ceramic types

The evidence of association between Shouldered pottery and Middle Neolithic site types supports the suggestion by Sheridan (1995) that there was a change in ceramic type from the classic Carinated form towards more varied Shouldered vessels. Similarly the evidence supports the placing of Achnacree, Sandhills pottery and the start of Peterborough wares into the Middle Neolithic.

A2.6.1.3 Implications for the dating scheme of the association between ceramic types

The evidence for the association of pottery types is not strong, with only 16 sites in the study area having more than one pottery type in secure association. These associations are shown in Table A2.29.

The pottery associations between Carinated pottery and Achnacree, Shouldered, Drimnagh and Sandhills ware support the indication from the radiocarbon dates that this Early Neolithic pottery type continued in use into the Middle Neolithic.

For the Middle Neolithic, the range of associations between Achnacree, Shouldered, Drimnagh, and Sandhills ware provide further confirmation for the dating of these ceramic types.

In the Late Neolithic the associations between Grooved ware and Ronaldsway ceramics are also consistent with the current model and will be explored throughout this thesis. One point of interest is the apparent association at Cairnholy 1 and Machrie Moor of Peterborough ware (Middle Neolithic) with Beakers (Latest

Neolithic). This would seem to suggest a late running for this former pottery type which, although surprising, is consistant with the evidence of the radiocarbon dates.

These patterns of association clearly indicate that more than one ceramic type was frequently in use by the same communities at the same time. This presents an interesting avenue to explore in order to understand the place of Neolithic pottery within society; one which has been generally overlooked.

A2.7 Stone axe dating

The final facet of Neolithic material culture to be dated within this appendix is the stone axe. This item has been left until now since an initial literature search indicated that there were very few secure radiocarbon dates available. In consequence, it was necessary to date stone axes from the evidence of artefact association, an enterprise not possible until the bulk of the chronological scheme for the thesis had been developed.

The dating of stone axe distributions is a far from straightforward matter. The first question to be asked is what is to be dated: the production of the axe, its currency in distribution, or the time of its deposition? This is no small matter given the durability of the material, and its potentially long life in daily use. In addition, there is ample evidence of stone axes being found in medieval and later contexts as if they had been deliberately collected (Sheridan *et al* 1992).

It is also clear that Mesolithic people had utilised stone axes, and there have been suggestions that the distribution patterns of their flint axes in Southern England might have mirrored the later stone axe distribution patterns of the Neolithic (Care 1979). Furthermore, there is some evidence to suggest that in many cases local stone was used in the production of stone axes (Sheridan *et al* 1992). In the context of this research it is only the dating of stone axes produced and distributed from known sources which is at issue.

This has been the focus for the only previous dating scheme for stone axes, by (Smith 1979). At that time Smith acknowledged that the available evidence for dating these artefacts was weak:

> "Much of that which has had to be called into play as 'evidence' is indirect, inferential, or of dubious reliability..... the degree of uncertainty involved in this process needs to be borne in mind."
>
> Smith (1979, 13).

The scheme she produced shows a series of axe sources in Cornwall (Groups IVa and XVII) beginning to produce axes in the early Neolithic, followed by a general increase in production in Wales, Ireland and the north of England about 500 years later[7].

Since Smith's work only one more radiocarbon date has been produced which refers specifically to the use-life of a stone axe. This comes from Shulishdar, Isle of Lewis and was taken from the wood of an intact axe haft, and calibrates to 3492 - 2914cal BC[8] (Hedges *et al* 1993). The axe in the haft has been macroscopically identified as Group IX from Northern Ireland and shows that this factory was producing in the Middle Neolithic.

Other dates have also come from axe production sites at Great Langdale (Group VI). These show that axe production occured between 3700 - 3100cal BC (Bradley and Edmonds 1993), once again in the Middle Neolithic. That this axe factory was producing material earlier than this is indicated by the recent find of a Group VI axe from a rectangular timber building at Ballygalley (Simpson 1994). This association suggests that production at Great Langdale may have begun very early in the 4th millenium BC, but this evidence for an early start to Group VI production appears to stand in isolation at present.

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7 Smith (1979) used uncalibrated dates. No attempt has been made here to convert her scheme into cal BC.

8 OxA 3537 4470+/-95bp.

A recent review of the evidence which tends to reinforce the Middle Neolithic date for widespread distribution of stone axes in this part of the country, has highlighted the association of stone axes with causewayed enclosures in southern England (Bradley and Edmonds 1993, 51; Edmonds 1995). A Group VI axe was also found within the facade trench of a crematorium at Street House dated to 4033 - 3388cal BC[9]

In addition, within the study area, there is a strong association between stone axes and Middle Neolithic tombs, with 9 Court tombs, 1 Passage tomb, and a Linkardstown cists having produced axes from building, chamber, or forecourt areas (Sheridan *et al* 1992). Unfortunately, only a probable Group IX axe from Altanagh[10] is identifiable to a recognised source. They may not therefore inform us as to the date of major stone axe distributions. Nonetheless, the evidence at present supports a Middle Neolithic date for the start of the distribution of axes from known factories.

The use of stone axes continued into the Late Neolithic as is amply illustrated by the associations listed by Wainwright and Longworth (1971, 261) for grouped stone axes (I, VI and VII) and Grooved ware. Excavations in Cranborne Chase have also produced a Group VII axe from a Grooved ware pit (Barrett *et al* 1991, 77), as well as a Group VIII axe from the henge of Wyke Down (Barrett *et al* 1991, 101). Within the study area, the most secure Late Neolithic association for axes of Groups VI and XXV is at Ronaldsway 'House', where three dates provide a range of 2568 - 2461cal BC[11]. It seems clear therefore that grouped stone axes were still being utilised in the Late Neolithic, although there is little evidence for whether they were actually being produced.

9 Dates used in calculation of date span were OxA 2013R, 2014R, and 2061N (4840+/-120bp, 4970+/-130bp, 5080+/-bp.

10 Macroscopically identified (Williams 1986).

11 Date range produced by combination of OxA 5328, 5329, and 5330 (3925+/-35bp, 3985+/-35bp, and 4010+/- 55bp)

Within this thesis, the active life-span of the distribution network of Grouped stone axes is taken to cover the Middle and Late Neolithic, as indicated in Figure A2.24.

A2.8 The finalised dating scheme

The finalised chronology is illustrated in Figure A2.24, this scheme divides the Neolithic into four phases.

Early Neolithic (*c*4600 - *c*4000cal BC)

It would appear from the evidence presented that the use of pottery throughout the study area pre-dated the appearance of systematically adopted site types by as much as 400 years. This picture of a staggered-start Neolithic is further reinforced when the evidence for the introduction of domestic plants is considered. A systematic review of the evidence by Williams (1989) suggests this may predate other elements of the Neolithic 'package', and runs contra to the traditional picture of the start of the Neolithic as a revolution in which all elements of the Neolithic life-style, appear together (Case 1969). It would seem instead that the introduction of Neolithic culture into the British Isles bears a closer resemblance to the adoption of Neolithic culture in Denmark, where the process of full adoption appears to have taken place in stages over many years (Hodder 1990). In considering the evidence for the start of the Neolithic on the Isle of Man further evidence will be presented which suggests that it may be possible to isolate a unique Manx approach to the adoption of the Neolithic cultural 'package'.

It has been suggested in the past (Piggott 1954; Case 1969) that the considerable changes in material culture practise associated with the start of the Neolithic are best explained in terms of a migration from the continent. In the light of the evidence presented for a staggered start to the Neolithic it now seems more likely that the Neolithic culture-package was adopted by indigenous groups as part of a protracted contact with continental farming communities.

Middle Neolithic (*c*4000 - *c*2500cal BC):

Throughout the Middle Neolithic it appears that the site and ceramic types developed prior to 4000cal BC continued in use. What is noticeable about this later phase is the profusion of site and ceramic types which appear. In terms of the material culture of the study area alone there are 5 different ceramic types, and 3 dateable tomb types[12]. It has been noted that throughout central Europe, in the initial phase of the Neolithic, material culture was fairly uniform. Subsequently, as settlements expanded and spare land became in short supply, ceramics and site types became more varied in an effort to display identity in the face of increased social stress (Hodder 1979). It is tempting to suggest that this process also applied in the British Isles during the Middle Neolithic, although it is worth noting that the start of the stone axe trade during this phase presents evidence of considerable contact between regions. In Chapter 4 the extent to which this profusion of site and ceramic types led to regional groupings will be explored.

Late Neolithic (*c*3000 - *c*2600cal BC):

By the Late Neolithic all the site and artefact types of the Early Neolithic had fallen out of use, as had some of the Middle Neolithic types such as Court tombs and Drimnagh bowls. The Late Neolithic does not however, seem to be characterised by a profusion of new forms. Grooved ware was the only new ceramic form to spread throughout the British Isles at this time, whilst Ronaldsway pottery was a highly localised type. Nonetheless, within Southern England, Henges and Grooved ware have been taken as evidence of a significant reorientation within Neolithic society at this time (Bradley 1984), with social power becoming increasingly focused in the hands of an elite (Burgess 1980). This pattern does not appear to hold true within the study area. Major henge complexes were constructed in parts of Britain such as King Arthur's Round Table, Cumbria; and in the Boyne valley, in Ireland. The

12 The association of Drimnagh pottery with the portal dolmen at Ballykeel also suggests that at least some portal dolmens also belong to this phase of the Neolithic.

building of such ostentatious monuments is a practise which also occured in the Middle Neolithic, with the Boyne Passage tombs, and possibly also the Anglesey monuments. The picture cannot therefore be described so rigidly as has been done in Southern England, and will be explored further when considering the regional distribution of monument types in Chapter 4.

Latest Neolithic (c 2600cal BC -):

The latest Neolithic stems from uncertain roots. By this time, the only major monument types known within the study area are Henges, whilst the only ceramic types used were Grooved ware and Ronaldsway pottery. The advent of Beaker pottery and the widespread adoption of single burial therefore seems to represent a stark contrast with the past. This has traditionally been interpreted as evidence for a migration of population (see Brodie 1994). With the general paucity of widespread artefactual symbols at this time, the continental trend towards the use of Beakers may have presented an opportunity for individuals to identify themselves outside of Late Neolithic power structures.

There is however some evidence for a perpetuation of more traditional interests in the development of Wedge tombs at this time. This burial monument seems to reflect strongly the form of Middle Neolithic Court tombs although these were now long disused. It is possible that these too represented an attempt to subvert the power structures of the Late Neolithic, albeit by a return to ancestral forms.

A2.9 Conclusion

The above analyses have made use of all the relevant and available radiocarbon dates for the British Isles in order to minimise the limitations imposed within the study area by the lack of local dates and the poor quality of many of the dates which are present. Considerable attention has been given to the relationship between the radiocarbon sample and the site in order to ensure that all samples used have good contextual integrity. The results can therefore be regarded with some confidence as broadly representing the major temporal changes which occured within the study area throughout the Neolithic. It should be recognised however, that in the choice of samples, no effort was made to select only dates from particular laboratories, and as a consequence it may be that laboratory errors are still present in the results. It should also be noted too, that there may be regional chronologies within the study area which deviate from the presented chronology which operates at the level of the British Isles. The sparsity of secure dates currently precludes the testing of this hypothesis.

The results themselves tend to support the views of previous researchers, although direct comparison is not possible since earlier works have used uncalibrated data and have tended towards greater sub-division of site and ceramic type than was felt prudent, given the low number of secure radiocarbon dates.

The framework developed in this appendix provides reasonable justification for the comparison of sites and ceramic types as contemporary facets of Neolithic material culture throughout the rest of this thesis. It is unfortunate that there was insufficient data on which to base a chronology of such site types as Stone circles and Portal dolmens. At present these sites are too poorly dated, a problem which certainly needs to be addressed by further dating programmes. This is not to suggest that individual sites which have their own dates, or are dated by good artefact associations will be excluded from the remainder of this study.

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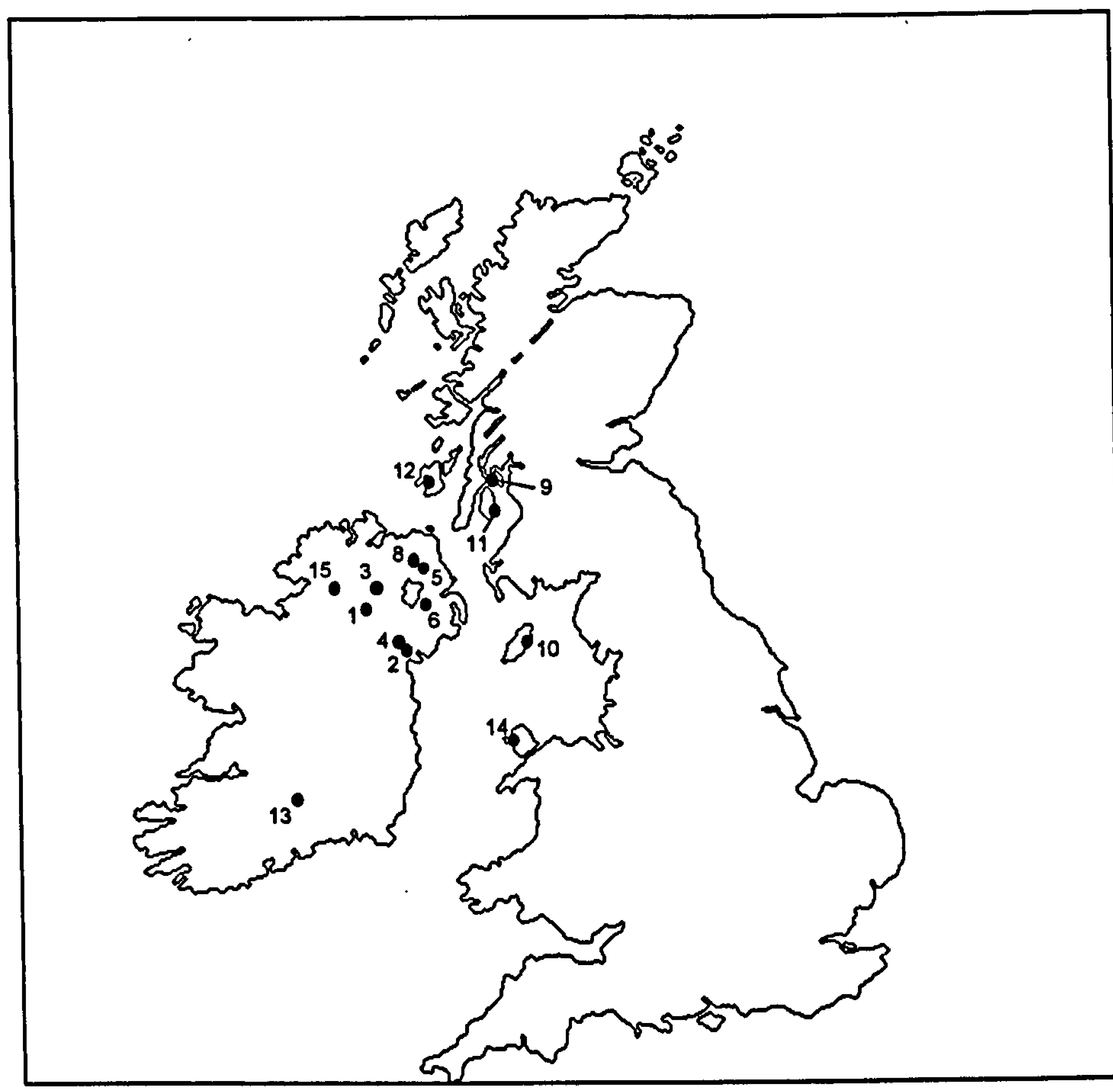

Figure A2.1: Geographical location of Court tombs (and allied structures) with associated radiocarbon dates. Dots indicate sites used in the analysis. Numbering refers to Table A2.2

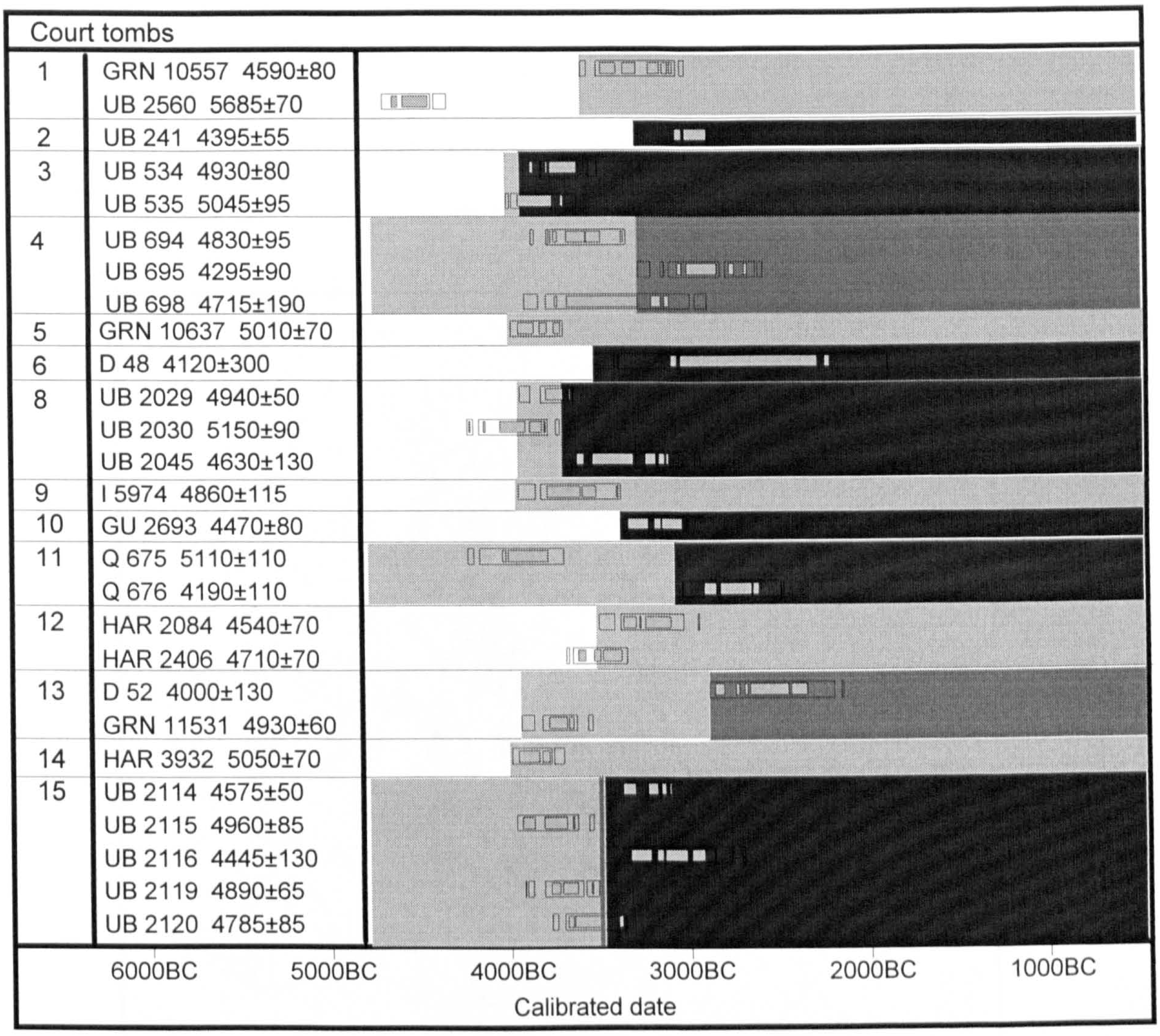

Figure A2.2: Calibrated dates for Court tombs. Lighter shading indicates phase during which monument was constructed (TAQ or TPQ). Mid-shading indicates phase during which monument was in use (TPQ). Dark shading indicates phase during which monument was blocked (TPQ). Numbers in left column refer to Table A2.2. Site locations can be found on Figure A2.1.

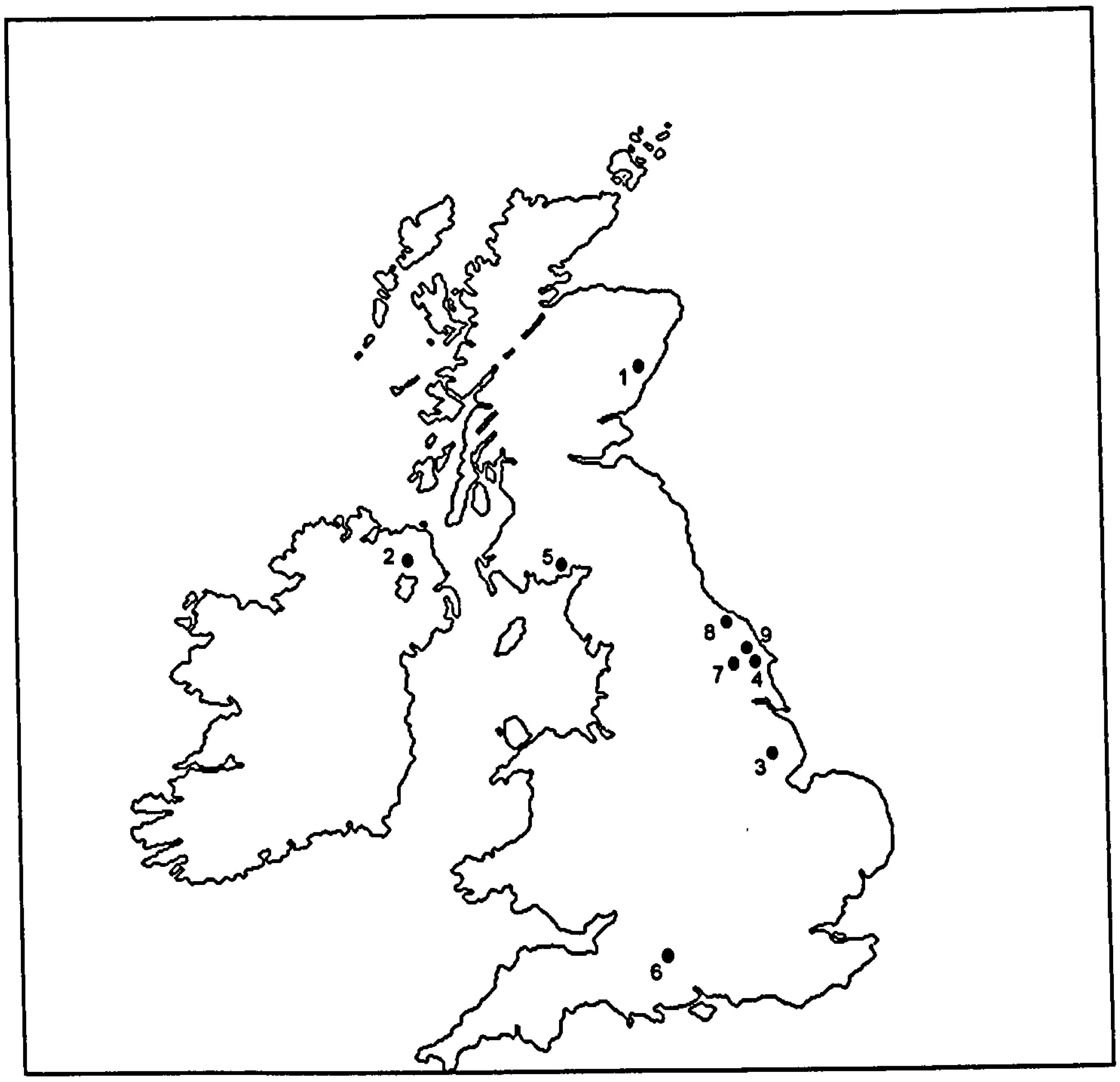

Figure A2.3: Geographical location of Crematoria (NMLB) with associated radiocarbon dates. Dots indicate sites used in the analysis. Numbering refers to Table A2.3.

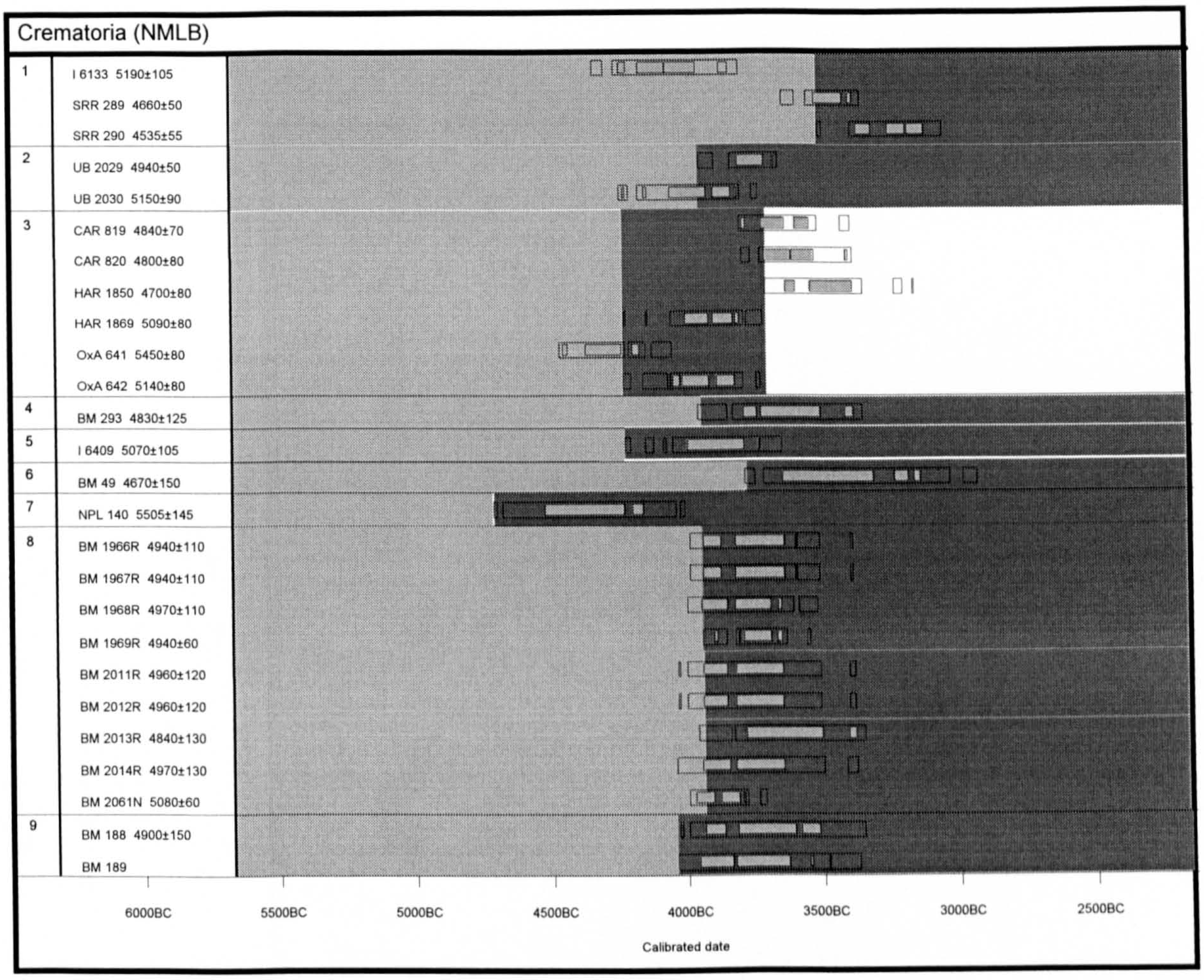

Figure A2.4: Calibrated dates for Crematoria (Non-megalithic Long Barrows). Lighter hading indicates phase during which construction may have taken place (TAQ). Darker shading indicates tomb in use during this phase (TPQ). Numbers in left column refer to Table A2.3. Site locations can be found on Figure A2.3.

Figure A2.5: Geographical location of Henges with associated radiocarbon dates. Dots indicate sites used in the analysis. Numbering refers to Table A2.4

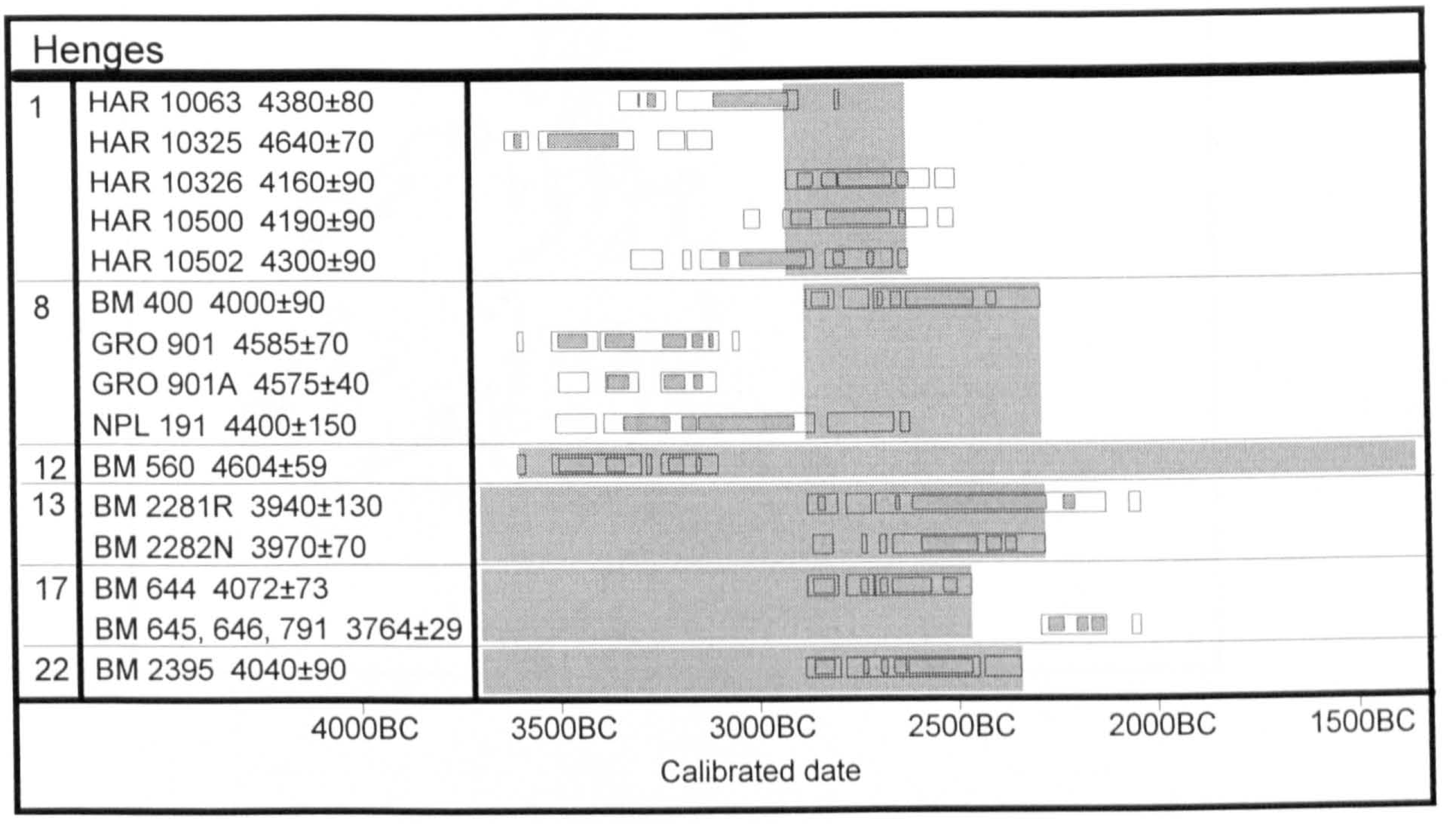

Figure A2.6: Calibrated dates for Henges. Lighter shading indicates phase during which monument was constructed (TAQ and TPQ). Numbers in left column refer toTable A2.4. Site locations can be found on Figure A2.5.

Figure A2.7: Geographical location of Linkardstown cists with associated radiocarbon dates. Dots indicate sites used in the analysis. Numbering refers to Table A2.5

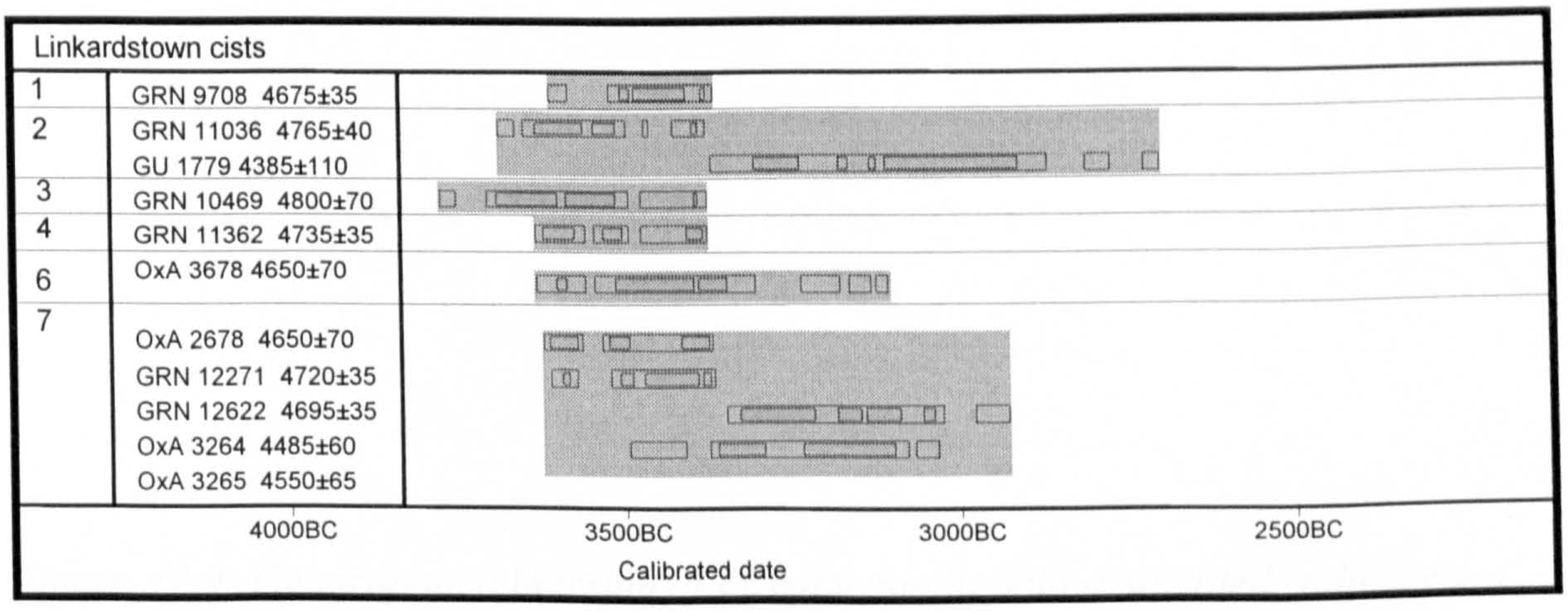

Figure A2.8: Calibrated dates for Linkardstown cists. Lighter shading indicates phase during which monument was in use (TPQ). Numbers in left column refer to Table A2.5. Site locations can be found on Figure A2.7

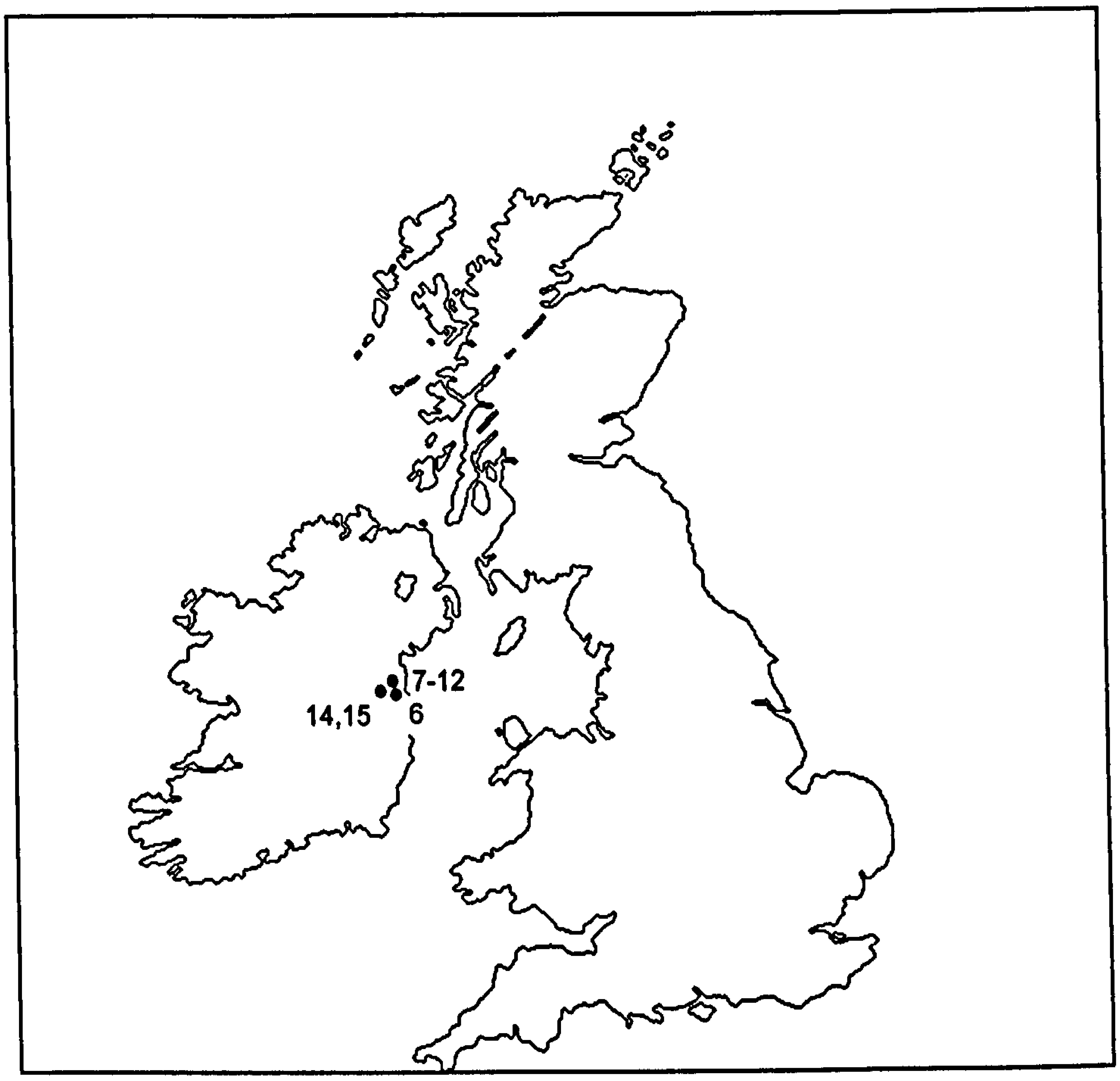

Figure A2.9: Geographical location of Passage tombs with associated radiocarbon dates. Dots indicate sites used in the analysis. Numbering refers to Table A2.6

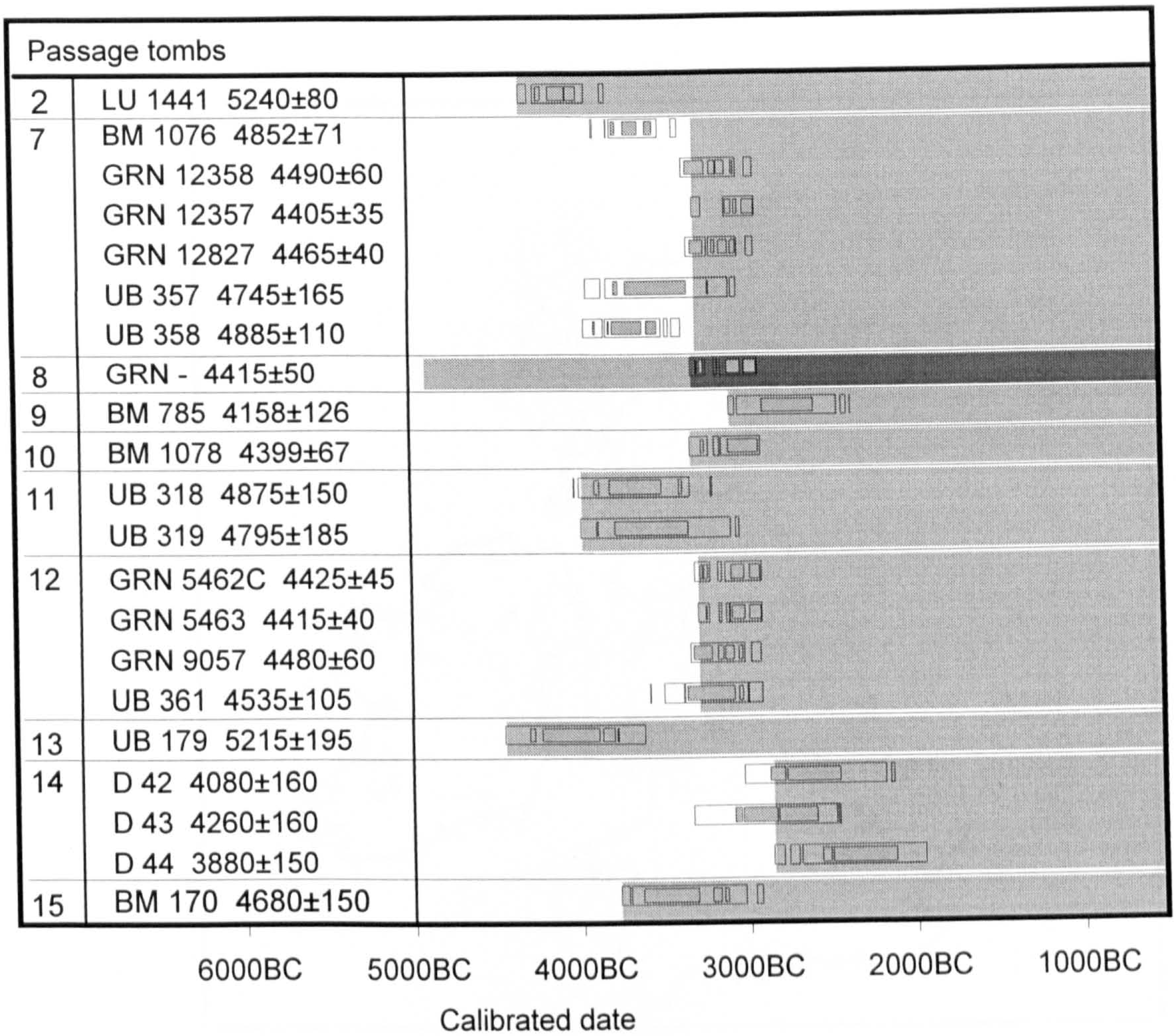

Figure A2.10: Calibrated dates for Passage tombs. Lighter shading indicates phase during which construction may have taken place (TAQ or TPQ). Darker shading indicates tomb in use during this phase (TPQ). Numbers in left column refer to Table A2.6. Site locations can be found on Figure A2.9

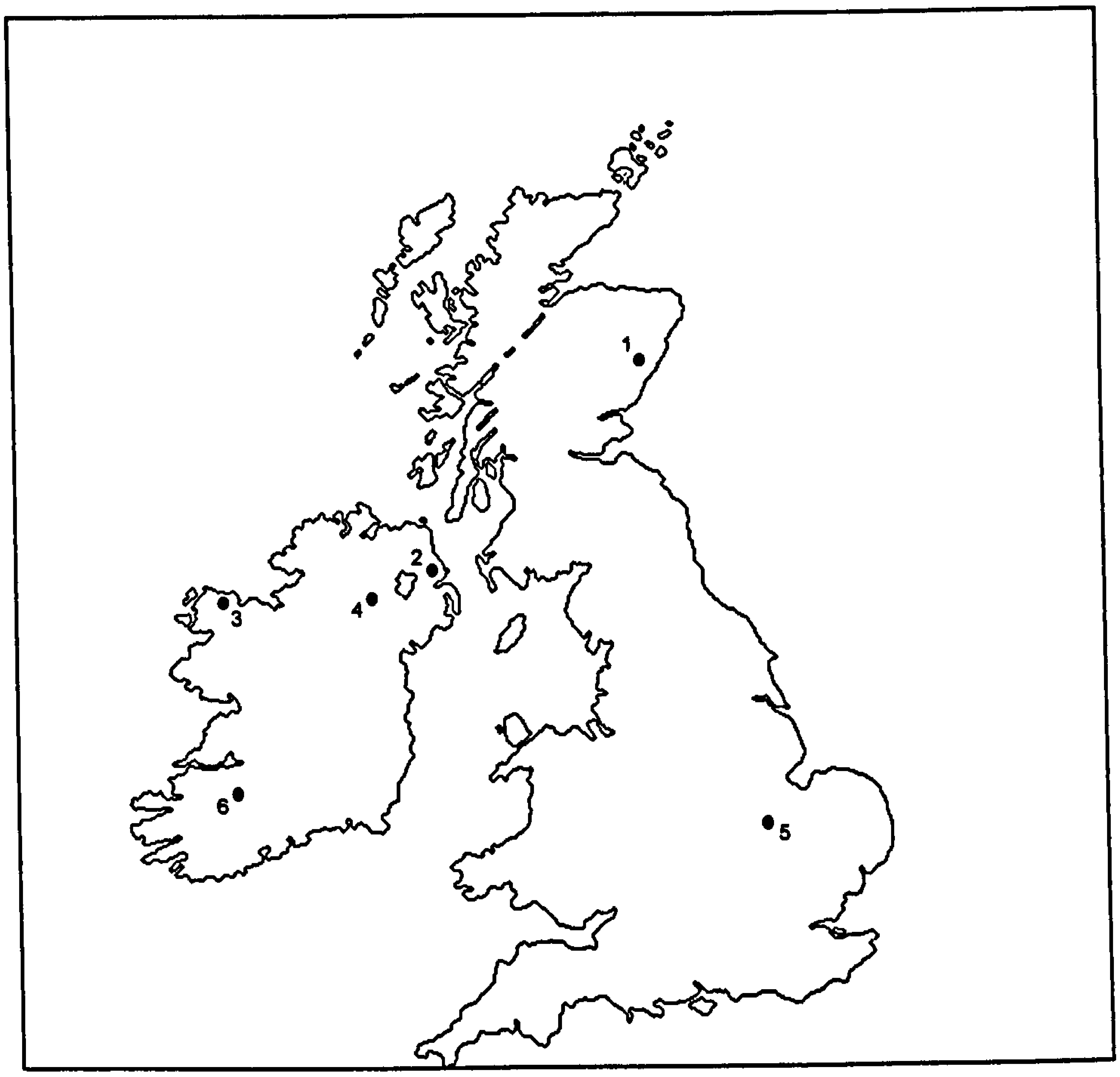

Figure A2.11: Geographical location of Rectangular buildings (with bedding trenches) with associated radiocarbon dates. Dots indicate sites used in the analysis. Numbering refers to Table A2.7

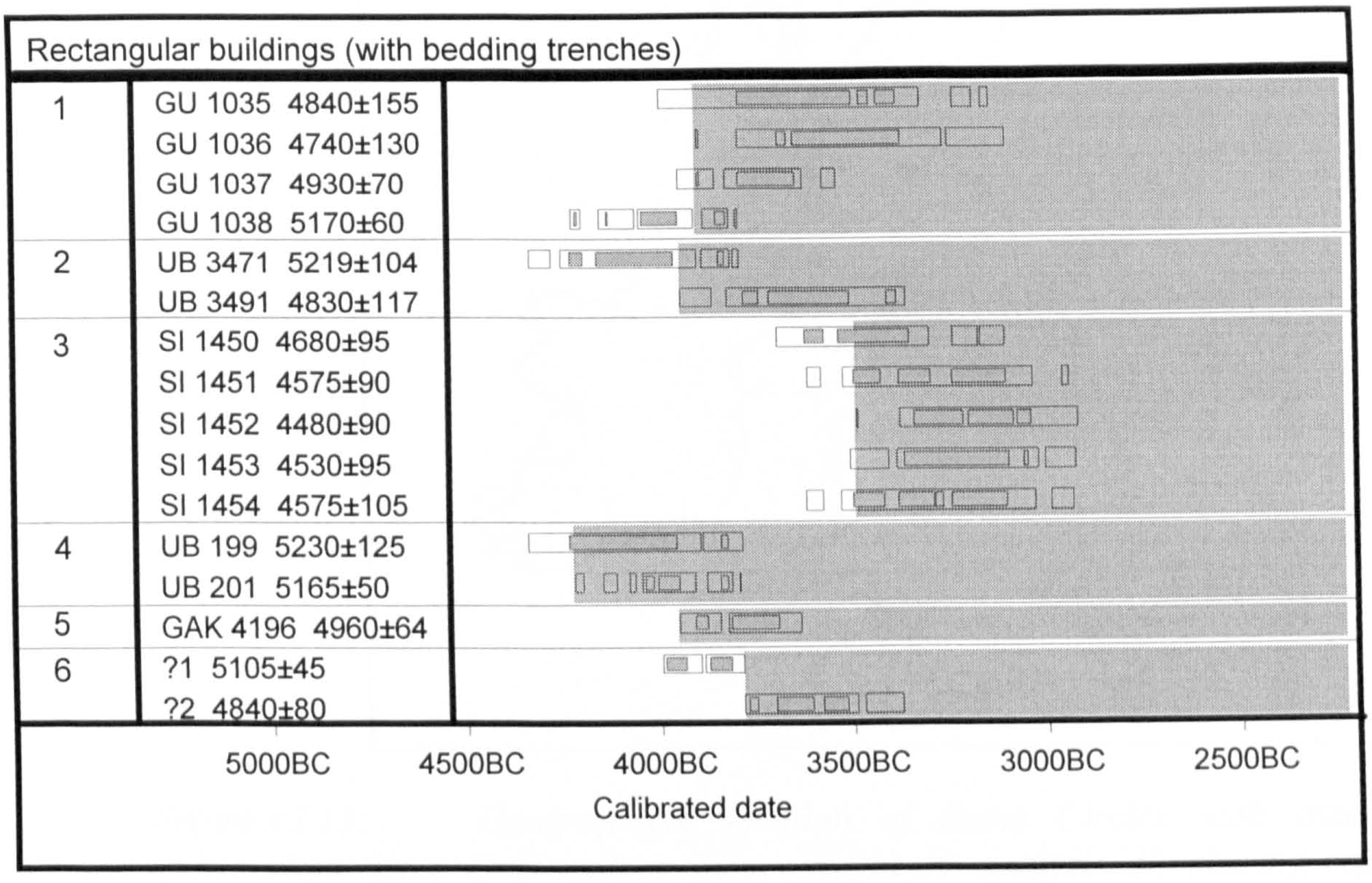

Figure A2.12: Calibrated dates for Rectangular buildings (with bedding trenches). Lighter shading indicates phase during which monument was constructed (TPQ). Numbers in left column refer to Table A2.7. Site locations can be found on Figure A2.11

Figure A2.13: *Geographical location of Stone Circles with associated radiocarbon dates. Dots indicate sites used in the analysis. Numbering refers to Table A2.8*

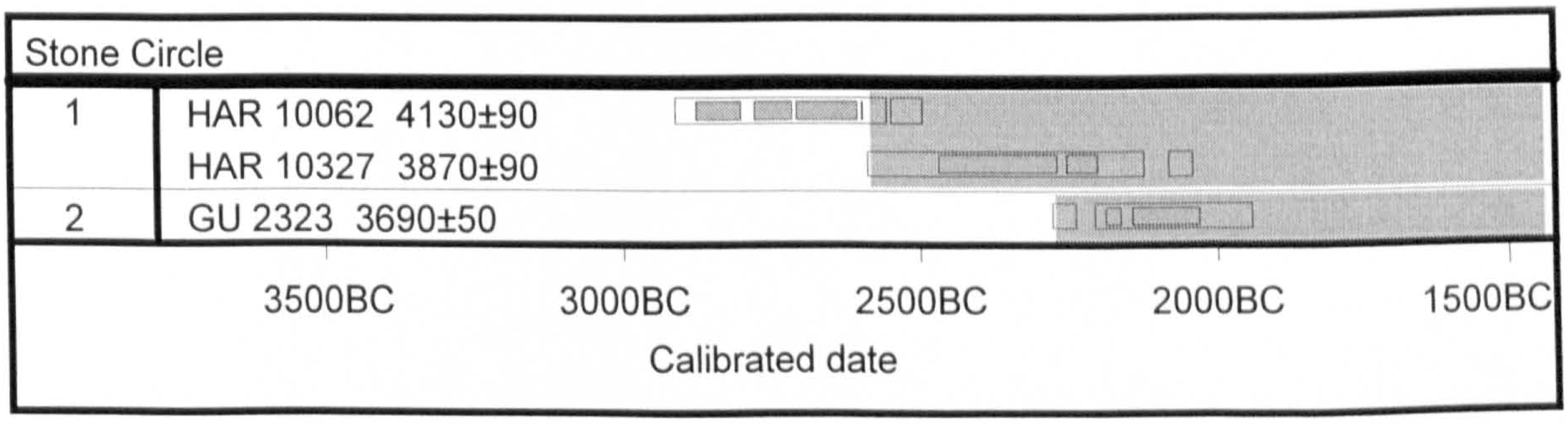

Figure A2.14: *Calibrated dates for Stone circles. Lighter shading indicates phase during which construction may have taken place (TPQ). Numbers in left column refer to Table A2.8. Site locations can be found on Figure A2.13*

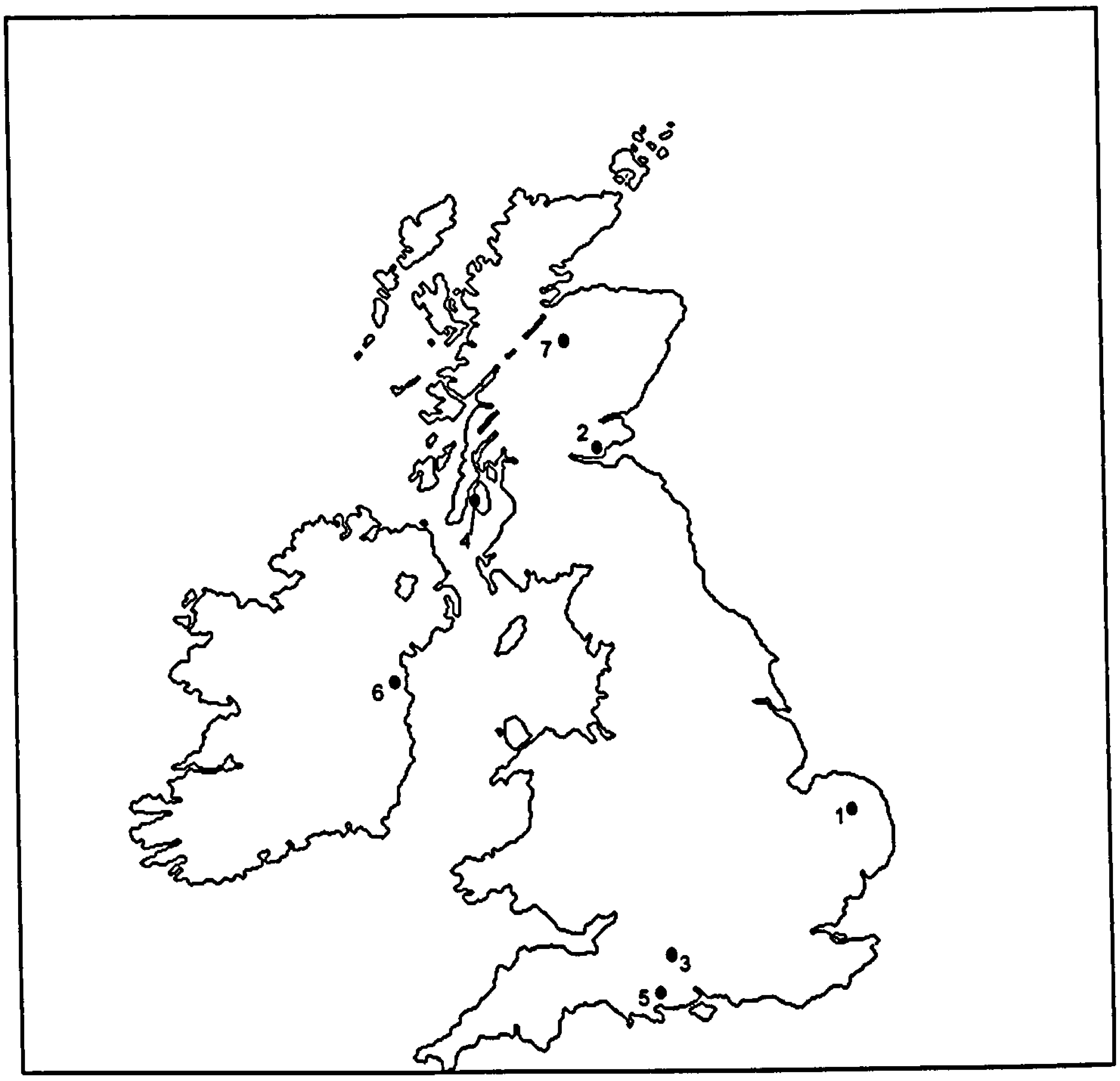

Figure A2.15: Geographical location of Timber Circles with associated radiocarbon dates. Large dots indicate sites used in the analysis. Numbering refers to Table A2.9

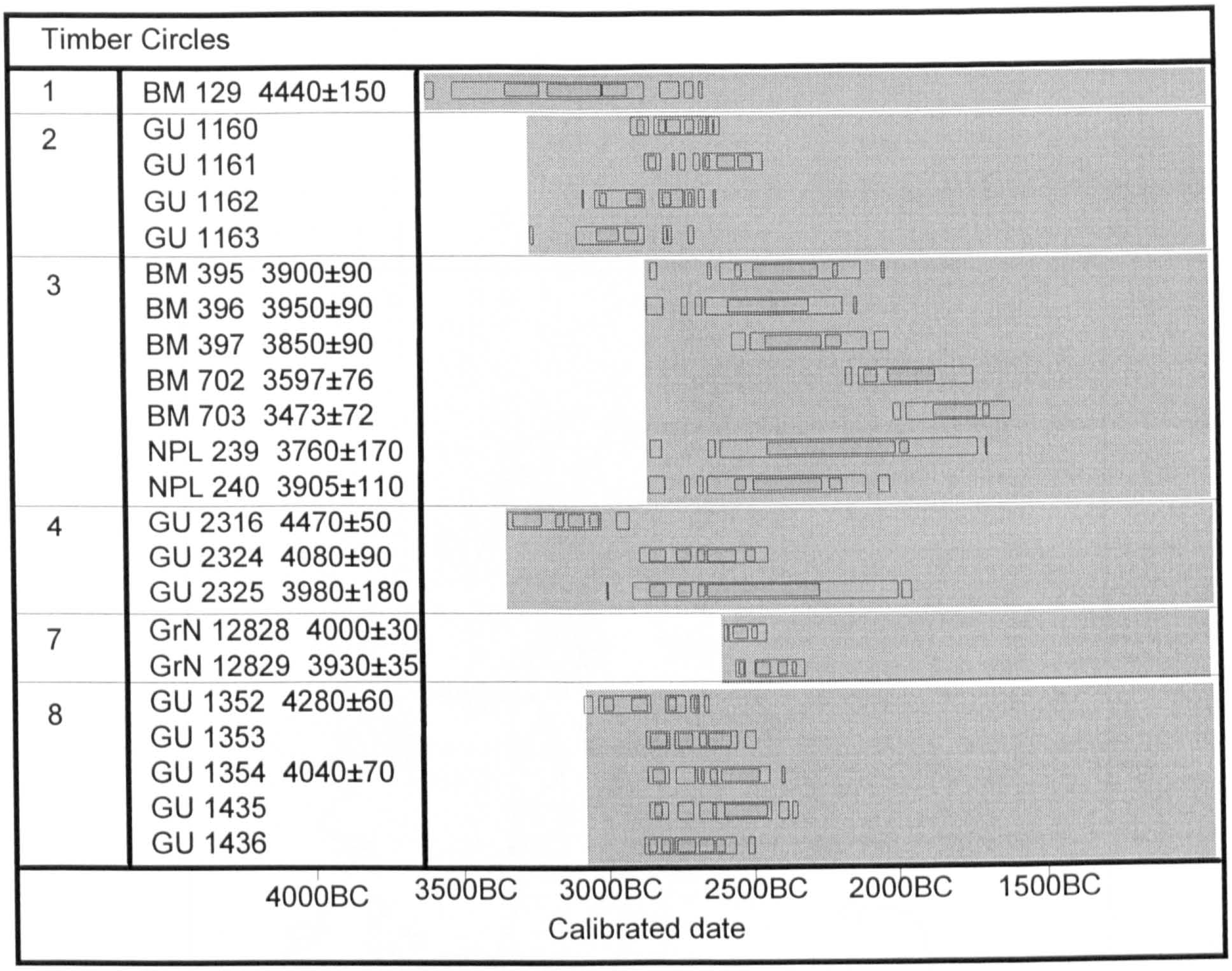

Figure A2.16: Calibrated dates for Timber circles. Lighter shading indicates phase during which construction may have taken place (TPQ). Numbers in left column refer to Table A2.9. Site locations can be found on Figure A2.15

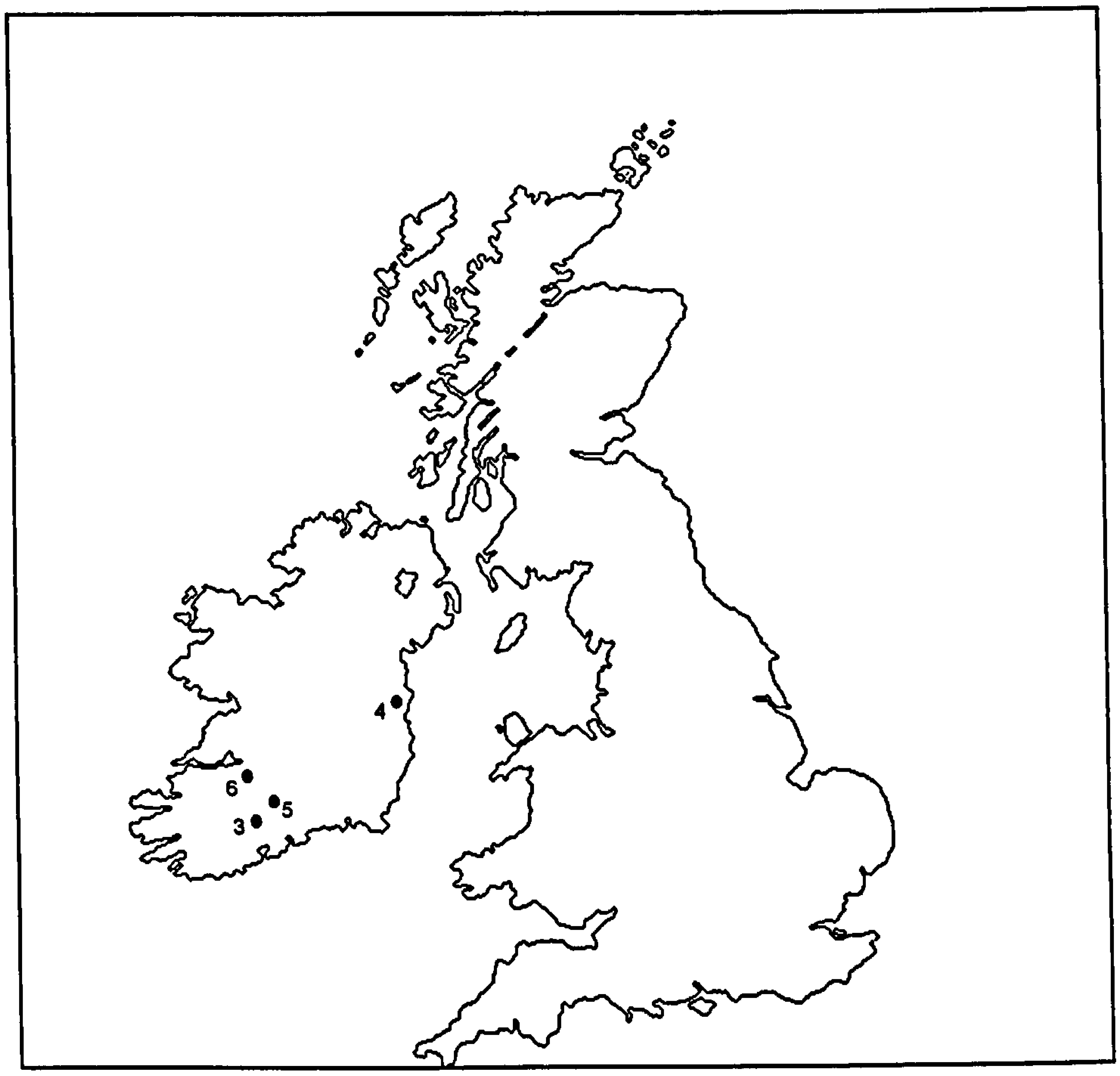

Figure A2.17: Geographical location of Wedge tombs with associated radiocarbon dates. Large dots indicate sites used in the analysis. Numbering refers to Table A2.10

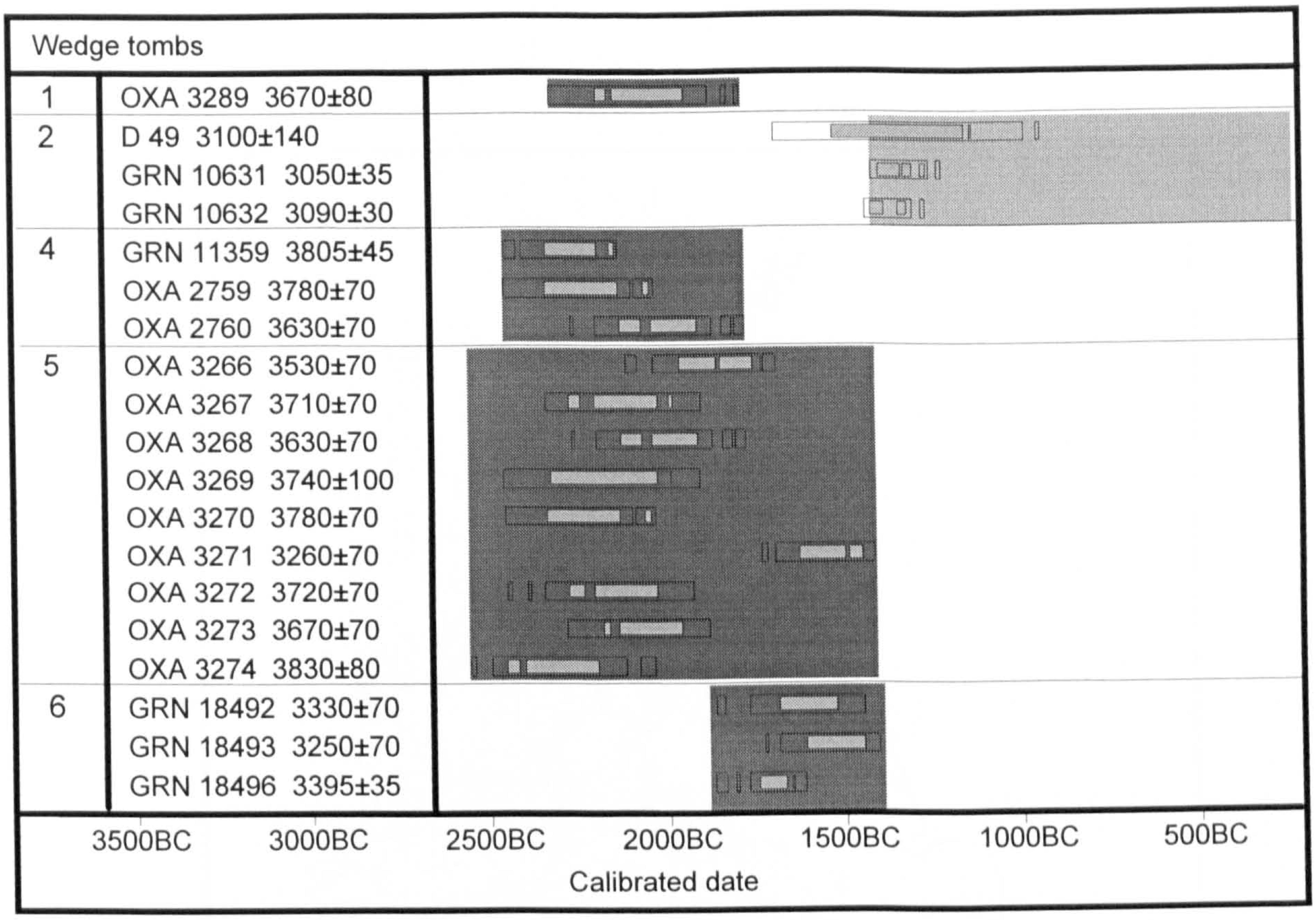

Figure A2.18: Calibrated dates for Wedge tombs. Lighter shading indicates phase during which monument was constructed (TPQ). Darker shading indicates phase during which monument was in use Numbers in left column refer to Table A2.10. Site locations can be found on Figure A2.17

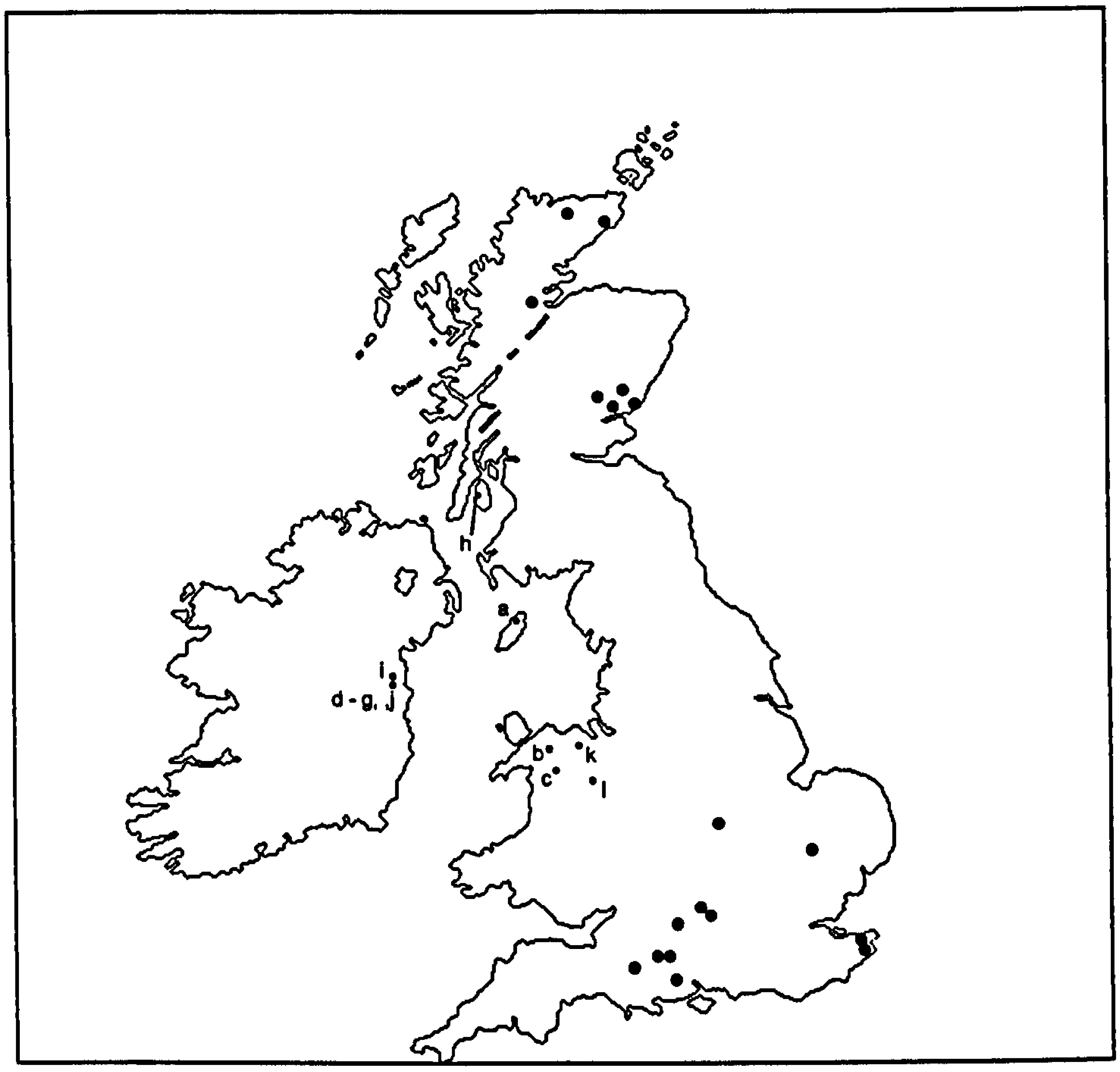

Figure A2.19: *Geographical locations of radiocarbon dated samples associated with Beaker pottery. A large dot indicates a site included in the analysis (data derived from Kinnes et al (1991). Those sites from within the study area which were considered but were excluded from analysis are marked with a small dot. Lettering relates to Table A2.14, unmarked dots are derived from Table A2.13*

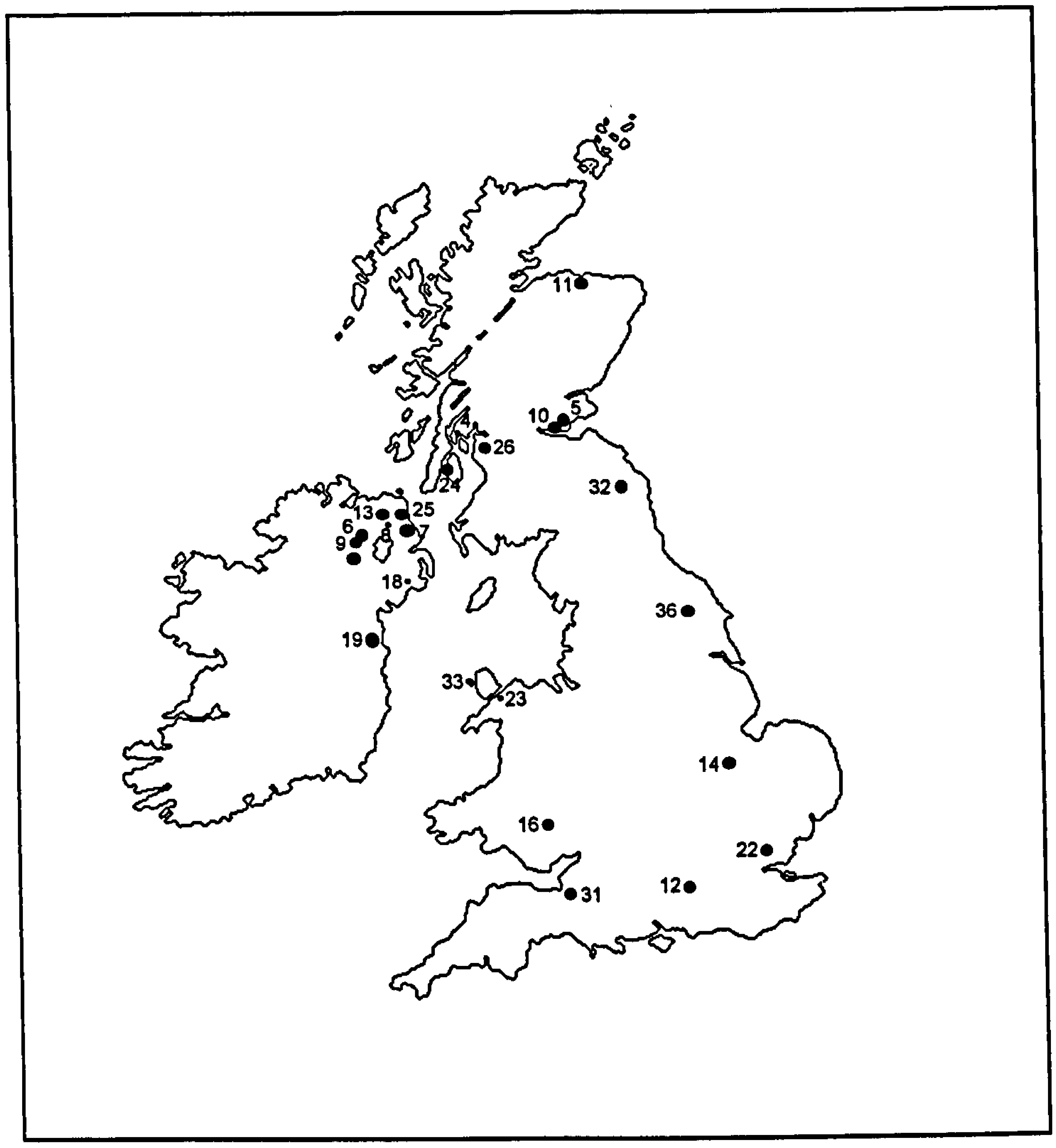

Figure A2.20: *Geographical locations of radiocarbon dated samples associated with Carinated bowls. A large dot indicates a site included in the analysis. Those sites from within the study area which were considered but were excluded from analysis are marked with a small dot. Numbering relates to Table A2.25.*

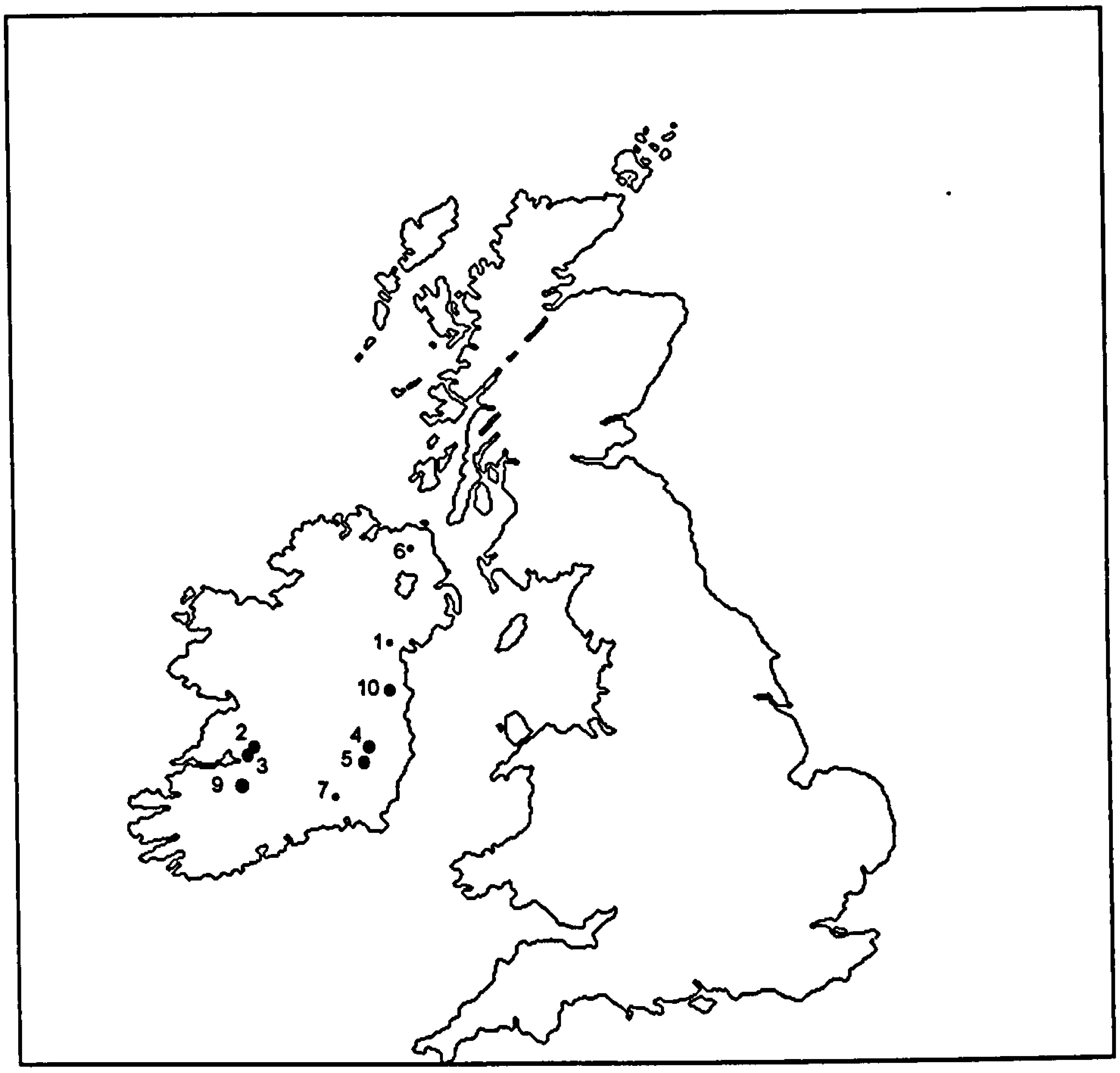

Figure A2.21: *Geographical locations of radiocarbon dated samples associated with Drimnagh bowls. A large dot indicates a site included in the analysis. Those sites from within the study area which were considered but were excluded from analysis are marked with a small dot. Numbering relates to Table A2.16*

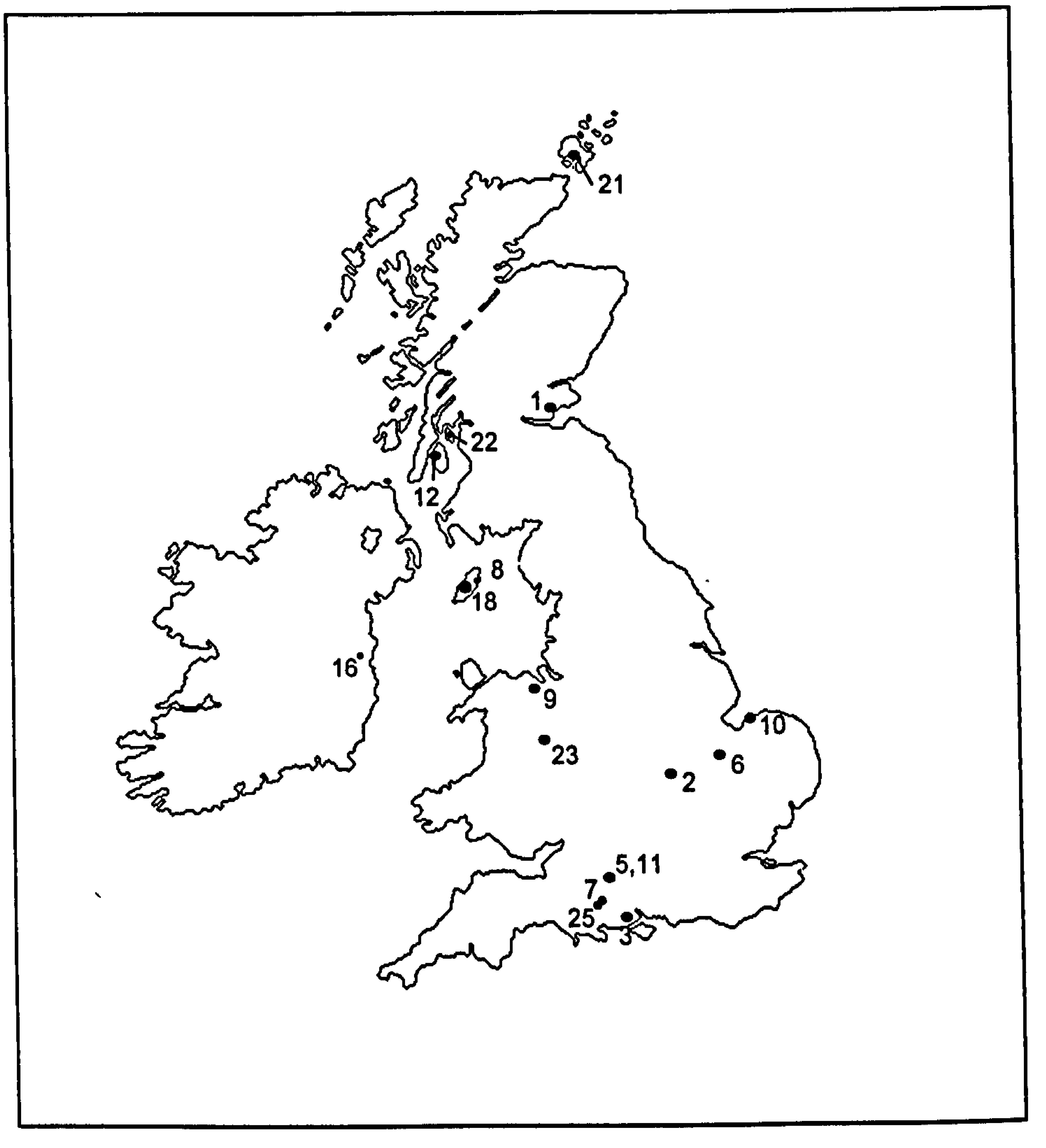

Figure A2.22: Geographical locations of radiocarbon dated samples associated with Grooved ware. A large dot indicates a site included in the analysis. Those sites from within the study area which were considered but were excluded from analysis are marked with a small dot. Numbering relates to Table A2.17

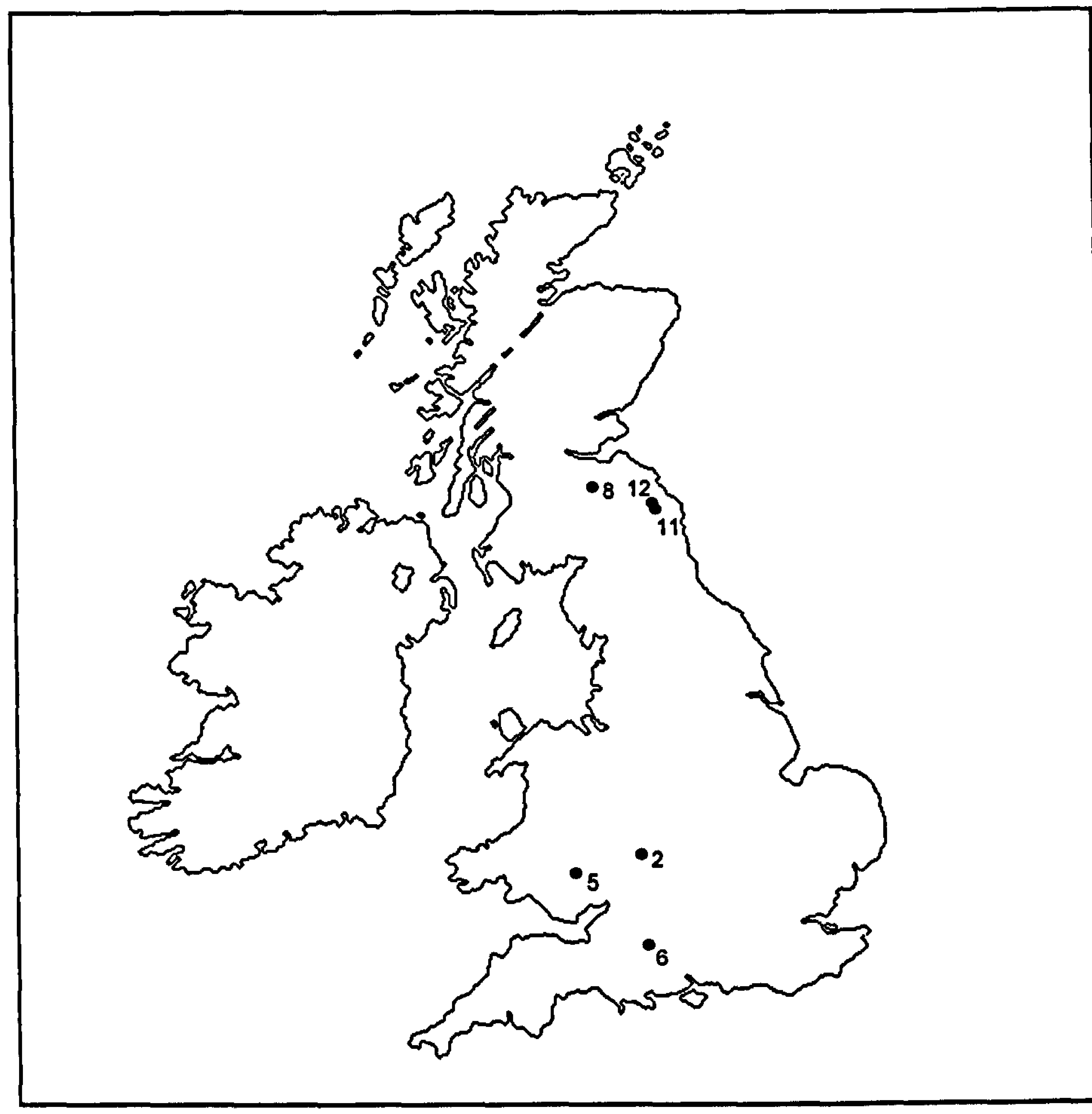

Figure A2.23: Geographical locations of radiocarbon dated samples associated with Peterborough pottery. A large dot indicates a site included in the analysis. There were no relevant sites from within the study area. Numbering relates to Table A2.18

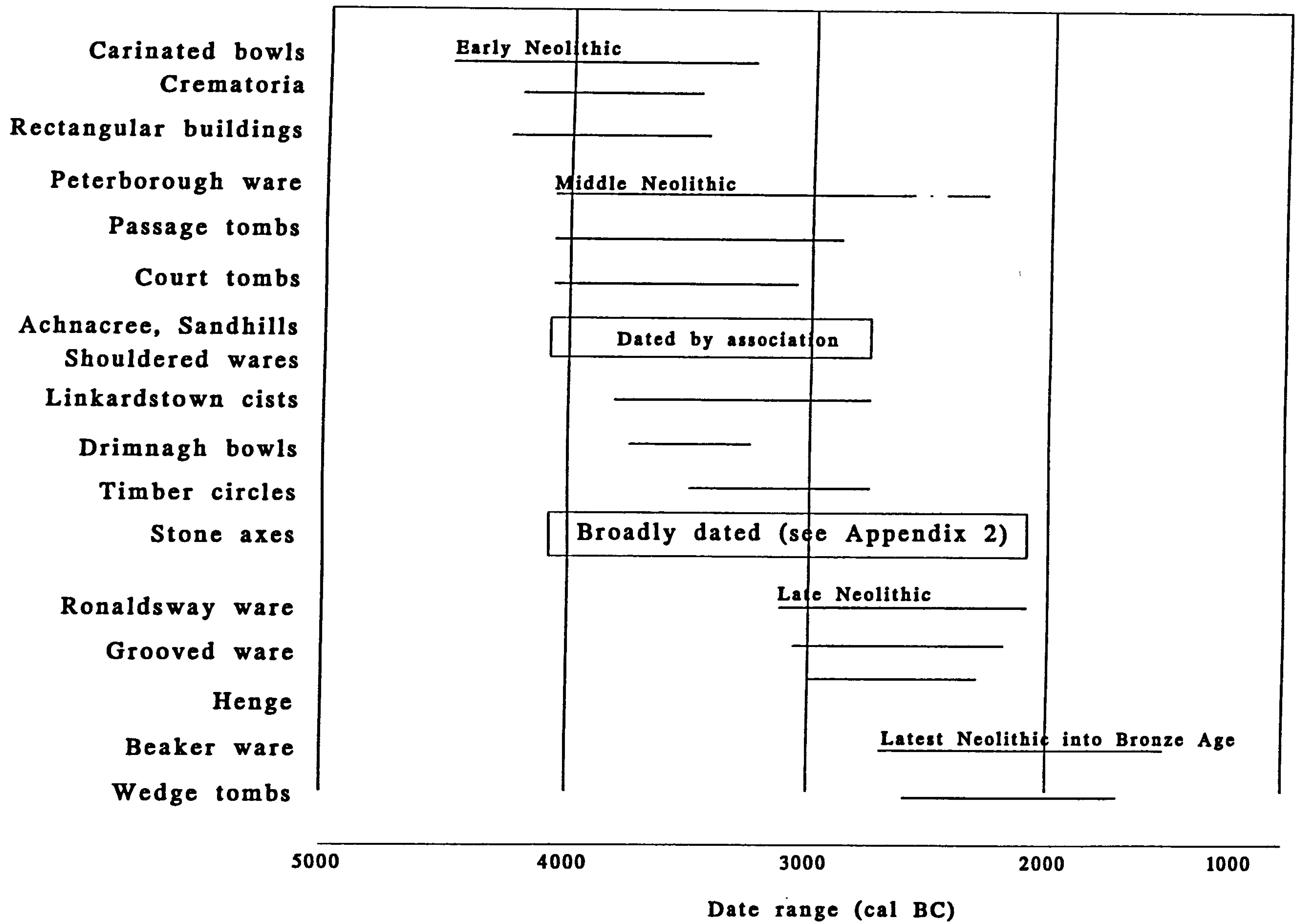

Figure A2.24: Chronology of the major site and artefact types used in this study

Dating implications of sampled contexts		
Context type	Dated material	Result
Old land surface	All	"monument constructed after this date"
Pre-monument feature	All	"monument constructed after this date"
Sealed stone socket / construction feature	All	"monument constructed after this date"
Cairn / mound	All (pieces)	"monument constructed after this date"
	All (hearths / other deposits)	"monument constructed before this date"
Base of ditch for mound material	Antler pick / bone shovel	"monument constructed during this date"
	All other	"monument constructed after this date"
"Ditch fills"	All	"-"
Primary ditch fill	All	"monument contructed before this date"[1]
Secondary ditch fill	All	"-"
Lower shaft fill	All	"monument constructed before this date"
Chamber deposit[2]	Human bone	"monument constructed before this date"
		"monument used during this date"
	Charcoal (pieces)	"monument used after this date"
	Charcoal (hearth / other deposits)	"monument constructed before this date"
		"monument used during this date"
		"monument used during this date"
Chamber firing	All	"monument fired after this date"
Facade firing	All	"monument constructed after this date"
		"monument fired after this date"
Forecourt feature	All	"monument blocked after this date"
Forecourt blocking	All (pieces)	"monument blocked after this date"
	All (hearths / other deposits)	"monument blocked during this date"
	Pieces	"monument used before this date"
Secondary feature	All	Ignored
For enclosure monuments		
Interior feature	All	"-"
Interior layer	All	"-"
External feature	All	"-"

Table A2.1: Summary of dating implications for radiocarbon samples from different locations on site.

[1] This is only taken to be the case if 3 or more statistically indistinguishable dates are found in the same context otherwise, since there is no check against the possibility of residuality and intrusion, all the dates are discarded.

[2] The stratigraphic sequence within tomb deposits has not been taken into account since it is unclear whether the infilling of tombs occurs during tomb use, blocking, or subsequent in-wash.

Court tombs				
	Site name	Lab. code	Phase type	Comments
1	Altanagh	GRN 10556	Secondary feature (ch)	Secondary feature
		GRN 10557	Pre-monument feature (ch)	
		GRN 11447	Chamber deposit (ch)	?Secondary feature
		GRN 11448	Secondary feature (ch)	Secondary feature
		GRN 11449	Secondary feature (ch)	Secondary feature
		GRN 11450	Secondary feature (ch)	Secondary feature
		GRN 12613	Unprovenanced (oats)	Intrusive
		UB 2560	Pre monument feature	
		UB 2561	Secondary feature	Secondary feature
		UB 2562	?Secondary feature	?Intrusive
		UB 2563	Secondary feature	Secondary feature
		UB 2564	Secondary feature (ch)	Intrusive
		UB 2565	Secondary feature (ch)	Intrusive
2	**Annaghmare**	UB 209	Chamber deposit (ch)	Intrusive
		UB 240	Chamber deposit (ch)	Intrusive
		UB 241	Forecourt feature (ch)	
3	**Ballybriest**	UB 534	OLS (ch)	
		UB 535	Forecourt feature (ch)	
4	**Ballymacdermot**	UB 207	Forecourt feature (ch)	Probably intrusive
		UB 693	Chamber deposit (ch)	Intrusive
		UB 694	Chamber deposit (ch)	
		UB 695	Chamber deposit (ch)	
		UB 697	Chamber deposit (ch)	Intrusive
		UB 698	Chamber deposit (ch)	
		UB 700	Mound (ch)	Intrusive
		UB 702	OLS (ch)	Strongly residual
		UB 703	Mound (ch)	Intrusive
		UB 705	Forecourt feature (ch)	Probably intrusive
5	**Ballymarlagh**	GRN 10637	OLS (ch)	
6	**Ballyutoag**	D 48	Forecourt feature (ch)	
7	Creggandevesky		Dates not located	
8	**Ballymacaldrack**	UB 2029	NM Chamber firing (ch)	Relates to NMLB
		UB 2030	NM Chamber firing (ch)	Relates to NMLB
		UB 2045	Blocking phase (ch)	
9	**Glenvoidean**	I 5974	OLS (ch)[1]	
10	**King Orry's Grave**	GU 2693	Forecourt feature (ch)	
11	**Monamore**	Q 675	Forecourt feature (ch)	Tomb built after
		Q 676	Forecourt feature (ch)	Tomb built after
12	**Port Charlotte**	HAR 2084	OLS (ch)[1]	
		HAR 2405	Forecourt feature (ch)	Intrusive
		HAR 2406	OLS (ch)	
13	Shanballyedmond	D 52	Chamber deposit (ch)	
		GRN 11531	OLS (ch)	

14	**Trefignath**	HAR 3932	OLS (ch)	
		HAR 3933	Forecourt feature (ch)	Intrusive
15	Tully	UB 2114	Forecourt feature (ch)	
		UB 2115	Forecourt feature (ch)	
		UB 2116	Chamber deposit (ch)	
		UB 2119	Chamber deposit (ch)	
		UB 2120	Chamber deposit (ch)	

Table A2.2: Radiocarbon dated Court tombs considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.1. Abbreviations within the phase type column refer to sample type (ch: charcoal). Any radiocarbon date with a note in the comments column was rejected during analysis.

1 Possibly a chamber deposit

Crematoria (Non-megalithic tombs with evidence for a burning phase)				
	Site name	Lab. code	Phase type	Comment
1	Dalladies	I 6113	Chamber firing (ch)	
		SRR 289	Chamber firing (ch)	
		SRR 290	Chamber firing (ch)	
2	**Dooey's Cairn**	UB 2029	Chamber firing (ch)	
		UB 2030	Chamber firing (ch)	
		UB 2045	Blocking phase (ch)	Secondary
3	Kilham	BM 293	Chamber firing (ch)	
4	**Lochill**	I 6409	Chamber firing (ch)	
5	Nutbane	BM 49	Chamber firing (ch)	
6	Raisthorpe	NPL 140	Facade firing (ch)	
7	Street House	BM 1966R	Chamber firing (ch)	
		BM 1967R	Chamber firing (ch)	
		BM 1968R	Chamber firing (ch)	
		BM 1969N	Chamber firing (ch)	
		BM 2011R	OLS (ch)	
		BM 2012R	OLS (ch)	
		BM 2013R	Facade firing (ch)	
		BM 2014R	Facade firing (ch)	
		BM 2060R	Pre-monument feature (ch)	Secondary
		BM 2061N	Facade firing (ch)	
8	Willerby Wold	BM 188	Chamber firing (ch)[1]	
		BM 189	Facade firing (ch)[1]	

Table A2.3: Radiocarbon dated Crematoria considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.3. Abbreviations within the phase type column refer to sample type (ch: charcoal). Any radiocarbon date with a note in the comments column was rejected during analysis.

1 These two dates are separated by a phase of rebuilding.

Henge				
	Site name	Lab. code	Phase type	Comments
1	Arminghall	BM 129	-	Date relates to timber circle
2	Avebury	HAR 10061	-	Date relates to stone circle
		HAR 10062	-	Date relates to stone circle
		HAR 10063	OLS (ch)	
		HAR 10064	Secondary ditch fill (ch)	
		HAR 10325	OLS (ab)	
		HAR 10326	Bank (an)	
		HAR 10327	-	Date relates to stone circle
		HAR 10500	OLS (ch)	
		HAR 10502	Primary ditch fill (an)	
		HAR 9696	-	Date relates to stone circle
3	Balfarg Henge	GU 1160	-	Date relates to timber circle
		GU 1161	-	Date relates to timber circle
		GU 1162	-	Date relates to timber circle
		GU 1163	-	Date relates to timber circle
4	Barford	Birm 7	-	Unrelated to henge
5	Condicote	HAR 3064	Secondary ditch fill (ch)	
		HAR 3067	Secondary ditch fill (ch)	
6	Coneybury henge	OxA 1408	Primary ditch fill (ab)	
		OxA 1409	Interior feature (ab)	
7	Dorchester henge	BM 2268	Ditch fill (an)	
8	Durrington Walls	BM 285	Primary ditch fill feature (ch)	
		BM 286	Primary ditch fill feature (ch)	
		BM 395	-	Date relates to timber circle
		BM 396	-	Date relates to timber circle
		BM 397	-	Date relates to timber circle
		BM 398	Base of ditch (ch)	Insuffficient dates in context
		BM 399	Base of ditch (ab)	Insufficient dates in context
		BM 400	Base of ditch (an)	
		BM 702	-	Date relates to timber circle
		BM 703	-	Date relates to timber circle
		GRO 901	OLS (ch)	
		GRO 901A	OLS (ch)	
		NPL 191	OLS (ch)	
		NPL 192	Interior feature (ch)	
		NPL 239		Date relates to timber circle
		NPL 240	-	Date relates to timber circle

9	Elton	HAR 3111	Primary ditch fill (ch)	Insufficient dates in context
10	Gorsey Bigbury	BM 1086	Ditch fill (ch)	Precise context undefined
		BM 1087	Ditch fill (ch)	
		BM 1088	Ditch fill (ch)	
		BM 1089	Ditch fill (ch)	
		BM 1090	Ditch fill (ab)	
		BM 1091	Ditch fill (ch)	
11	**Llandegai**	NPL 220		Context undefined
		NPL 221	Primary ditch fill (ch)	-
		NPL 224	External feature (ch)	-
		NPL 222	External feature (Ch)	-
		NPL 223	-	Date relates to timber building
12	Marden	BM 557	Primary ditch fill (ch)	
		BM 558	Primary ditch fill (b)	
		BM 559	Primary ditch fill (an)	
		BM 560	OLS (ch)	
13	Maumbury Rings	BM 2281R	Shaft fill (ch)	
		BM 2282N	Shaft fill (ch)	
14	Millfield North	BM 1149	Secondary ditch fill (ch)	-
		BM 1150	Primary ditch fill (ch)	-
		HAR 1199	Interior feature (ch)	-
15	Millfield South	HAR 3040	Interior feature (ch)	-
		HAR 3068	Interior feature (ch)	-
		HAR 3071	Interior feature (ch)	-
		HAR 3072	Interior feature	-
16	**Monknewtown**	UB 728		
		UB 729		
		UB 730		
		UB 731		
		UB 732		
		UB 733		
		UB 734		
17	Mount Pleasant	BM 644	OLS (ch)	
		BM 645	Primary ditch fill (an)	
		BM 646	Primary ditch fill (an)	
		BM 662	Interior feature (an)	-
		BM 663	-	Date relates to timber circle
		BM 664	Secondary ditch fill (ch)	-
		BM 665	Interior feature (ch)	-
		BM 666	-	Date relates to timber circle
		BM 667	-	Date relates to timber circle
		BM 668	-	Date relates to timber circle
		BM 669	-	Date relates to timber circle
		BM 788	Secondary ditch fill (ch)	-
		BM 789	Secondary ditch fill (ch)	-
		BM 790	Secondary ditch fill (ch)	-
		BM 791	Primary ditch fill (ch)	
		BM 792	Primary ditch fill (ch)	Rejected as non-consistent

		BM 793	Primary ditch fill (ch)	Rejected as non-consistent
		BM 794	Interior feature (an)	-
		CAR 5	Ditch fill (ch)	-
18	North Mains	GU 1350	-	Secondary feature
		GU 1351	-	Secondary feature
		GU 1352	-	Date relates to timber circle
		GU 1353	-	Date relates to timber circle
		GU 1354	-	Date relates to timber circle
		GU 1381	-	Secondary feature
		GU 1382	-	Secondary feature
		GU 1435	-	Date relates to timber circle
		GU 1436	-	Date relates to timber circle
		GU 1437	-	Secondary feature
		GU 1438	Interior feature	-
19	OS 124, Maxey	UB 456	Ditch fill (bulk ab)	Intrusive
20	Ring of Brodgar	SRR 503	Ditch fill (or)	-
21	Stones of Stenness	SRR 350	Base of ditch (ab)	-
		SRR 351	Interior feature (ch)	-
		SRR 352	Interior feature (ch)	Secondary
		SRR 592	Interior feature (ch)	Secondary
22	Wyke Down	BM 2394	Interior feature (ab)	-
		BM 2395	Primary shaft fill (an)	
		BM 2396	Secondary ditch fill (ch)	-
		BM 2397	Secondary ditch fill (ch)	-
23	Yeavering	HAR 3063	-	Unrelated to henge

Table A2.4: Radiocarbon dated Henges considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.5. Abbreviations within the phase type column refer to sample type (ab: animal bone; an: antler; b: bone; ch: charcoal; or: organic mud). Any radiocarbon date with a note in the comments column was rejected during analysis.

Linkardstown cist				
	Site name	Lab. code	Phase type	Comments
1	Ardcrony	GRN 9708	Chamber deposit (hb)	
2	Ashleypark	GRN 11036	Chamber deposit (hb)	
		GU 1779	?Chamber deposit (ab)	Intrusive (?)
3	**Ballintruer More**	GRN 10469	Chamber deposit (hb)	
4	**Baunogenasraid**	GRN 11362	Chamber deposit (hb)	
5	**Jerpoint West**	GRN 11897	Chamber deposit (hb)	Possibly contaminated
		OxA 2680	Chamber deposit (hb)	Possibly contaminated
6	**Knockmaree**	OxA 2678	Chamber deposit (hb)	
7	**Martinstown**	GRN 12271	Chamber deposit (hb)	
8	Poulawack	GRN 12621	Secondary deposit (hb)	Secondary
		GRN 12622	Chamber deposit (hb)	
		OxA 3259	Secondary deposit (hb)	Secondary
		OxA 3260	Secondary deposit (hb)	Secondary
		OxA 3261	Secondary deposit (hb)	Secondary
		OxA 3262	Secondary deposit (hb)	Secondary
		OxA 3263	Secondary deposit (hb)	Secondary
		OxA 3264	Chamber deposit (hb)	
		OxA 3265	Chamber deposit (hb)	
		OxA 3310	Secondary deposit (hb)	Secondary

Table A2.5: Radiocarbon dated Linkardstown cists considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.7. Abbreviations within the phase type column refer to sample type (ab: animal bone; ch: charcoal; hb: human bone). Any radiocarbon date with a note in the comments column was rejected during analysis.

Passage tombs				
	Site name	Lab. code	Phase type (dated material)	Comments
1	Carrowmore, site 4	LU 1111	Constructional feature (ch)	Rejected [1]
		LU 1840	Constructional feature (ch)	Rejected [1]
2	Carrowmore, site 7	LU 1441	Constructional feature (ch)	
3	Carrowmore, site 26	LU 1584	Secondary feature (ch)	Secondary
		LU 1585	Secondary feature (ch)	Secondary
		LU 1586	Secondary feature (ch)	Secondary
		LU 1624	Secondary feature (ch)	Secondary
		LU 1625	Secondary feature (ch)	Secondary
		LU 1627	Secondary feature (ch)	Secondary
		LU 1628	Secondary feature (ch)	Secondary
4	Carrowmore, site 27	LU 1630	Secondary feature (ch)	Secondary [1]
		LU 1631	Secondary feature (ch)	Secondary [1]
		LU 1698	Mound (ch)	Rejected [1]
		LU 1808	Constructional feature (ch)	Rejected [1]
		LU 1810	Constructional feature (ch)	Rejected [1]
5	Craigs	GRN 13876	Chamber feature (ch)	Secondary
6	**Fourknocks, site 2**	D 45	Pre-monument feature (ch)	Intrusive
7	**Knowth, site 1**	BM 786	Constructional feature (ch)	Intrusive
		BM 1076	Pre-monument feature (ch)	
		GRN 12358	Mound (ch)	
		GRN 12357?	OLS (ch)	
		GRN 12827	Mound (ch)	
		UB 357	Mound (ch)	
		UB 358	Mound (ch)	
8	**Knowth, site 9**	GRN -	Chamber deposit (ch)	
9	**Knowth, site 13**	BM 785	Mound (ch)	
10	**Knowth, site 16**	BM 1078	Mound	
11	**Knowth, site 17**	UB 318	OLS	
		UB 319	OLS	
12	**Newgrange**	GRN 5462C	Constructional feature (ch)	
		GRN 5463	Constructional feature (ch)	
		GRN 6342	Secondary feature (ch)	Secondary
		GRN 6343	Secondary feature (ch)	Secondary
		GRN 6344	Secondary feature (ch)	Secondary
		GRN 9057	Mound (ch)	
		UB 2392	Secondary feature (ch)	Secondary
		UB 2393	Secondary feature (ch)	Secondary
		UB 2394	Secondary feature (ch)	Secondary
		UB 360	Mound (ha)	Intrusive
		UB 361	Mound (ha)	
13	**Slieve Gullion**	UB 179	OLS (ch)	
		UB 180	Unclear (ch)	No available context

13	**Slieve Gullion**	UB 181	Unclear (ch)	No available context
14	**Tara**	D 42	Pre-monument feature	
		D 43	OLS	
		D 44	Mound	
15	**Townleyhall 2**	BM 170	OLS (ch)	

Table A2.6: Radiocarbon dated Passage tombs considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.9. Abbreviations within the phase type column refer to sample type (ch: charcoal; ha: humic acid). Any radiocarbon date with a note in the comments column was rejected during analysis.

[1] Generally rejected by most discussants (see Woodman 1994).

Rectangular buildings with bedding trenches				
	Site name	Laboratory code	Phase type	Comment
1	Balbridie	GU 1035	Construction feature (ch)	
		GU 1036	Construction feature (ch)	
		GU 1037	Construction feature (ch)	
		GU 1038	Construction feature (ch)	
2	**Ballygalley**	UB 3362?	-	Date relates to Pit cluster
		UB 3362?	-	Date relates to Pit cluster
		UB 3368	-	Date relates to Pit cluster
		UB 3374	-	Date relates to Pit cluster
		UB 3471	Construction feature (ch)	
		UB 3491	Construction feature (ch)	
3	Ballyglass	SI 1450	Construction feature (ch)	
		SI 1451	Construction feature (ch)	
		SI 1452	Construction feature (ch)	
		SI 1453	Construction feature (ch)	
		SI 1454	Construction feature (ch)	
4	Ballynagilly	UB 199	Construction feature (ch)	
		UB 201	Construction feature (ch)	
5	Fengate	GaK 4196	Construction feature (ch)	
		GaK 4197	Construction feature (ch)	Secondary
6	Tankardstown	?1	Construction feature (ch)	
		?2	Construction feature (ch)	

Table A2.7:Radiocarbon dated Rectangular timber buildings with bedding trenches considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.11. Abbreviations within the phase type column refer to sample type (ch: charcoal). Any radiocarbon date with a note in the comments column was rejected during analysis.

Stone circle[1]				
	Site name	Lab. code	Phase type	Comments
1	Avebury	HAR 10061	?Constructional feature	Secondary
		HAR 10062	Constructional feature	
		HAR 10327	Constructional feature	
		HAR 10063	-	Date relates to henge
		HAR 10064	-	Date relates to henge
		HAR 10325	-	Date relates to henge
		HAR 10326	-	Date relates to henge
		HAR 10500	-	Date relates to henge
		HAR 10502	-	Date relates to henge
		HAR 9696	?Constructional feature	Secondary
2	Balbirnie	GAK 3425	Interior feature	Secondary
		GAK 3426	Interior feature	Secondary
3	Beaghmore[2]	UB 11	OLS for cairn (ch)	Unclear relationship to circle
		UB 163	Ditch fill (ch)	Unclear relationship to circle
		UB 261D	Post monument (pt)	Secondary
4	Berrybrae			Details unlocated
5	**Machrie Moor**	GU 2315	-	Date relates to pit cluster
		GU 2316	-	Date relates to timber circle
		GU 2317	-	Date relates to ardmarks
		GU 2319	-	Date relates to ardmarks
		GU 2320	-	Date relates to pit cluster
		GU 2321	-	Date relates to pit cluster
		GU 2322	-	Date relates to ardmarks
		GU 2323	Pre-monument feature (ch)	
		GU 2324	-	Date relates to timber circle
		GU 2325	-	Date relates to timber circle
6	Penmaenmawr			Details not located
7	Ring of Brodgar	SRR 503	-	Date relates to henge
8	Scone Wood	GAK 787	Interior feature (ch)	Secondary
9	Stones of Stenness	SRR 350	-	Date relates to henge
		SRR 351	-	Date relates to henge
		SRR 352	-	Secondary
		SRR 592	-	Secondary

Table A2.8: Radiocarbon dated stone circles considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.13. Abbreviations within the phase type column refer to sample type (ch: charcoal; pt: peat). Any radiocarbon date with a note in the comments column was rejected during analysis.

[1] Dates are also listed by Aubrey Burl (1976) as coming from stone circles at Dromberg, Co Cork (D62 1350+/-120bp); Barbrook 2, Derbyshire (BM 179 3450+/-150bp); Sandy Road, Perthshire (GaK 787 3150 +/- 150bp). These dates are not included within this thesis section, although Burl's dating scheme is discussed in Section A2.3.3.7. Also excluded are dates from Stonehenge which is too atypical a monument to be compared with other sites.

[2] Although other dates are available from Beaghmore they relate to the environmental sequence.

Timber circles				
	Site name	Lab. code	Phase type	Comment
1	Arminghall	BM 129	Construction feature	
2	Balfarg Henge	GU 1160	Construction feature (ch)	
		GU 1161	Construction feature (ch)	
		GU 1162	Construction feature (ch)	
		GU 1163	Construction feature (ch)	
3	Durrington Walls	BM 285	-	Date relates to henge
		BM 286	-	Date relates to henge
		BM 395	Construction feature (an)	
		BM 396	Construction feature (ch)	
		BM 397	Construction feature (ab)	
		BM 398	-	Date relates to henge
		BM 399	-	Date relates to henge
		BM 400	-	Date relates to henge
		BM 702	Construction feature	
		BM 703	Construction feature	
		GRO 901	-	Date relates to henge
		GRO 901A	-	Date relates to henge
		NPL 191	-	Date relates to henge
		NPL 192	-	Unrelated feature
		NPL 239	Construction feature (an)	
		NPL 240	Construction feature (an)	
4	**Machrie Moor**	GU 2315	-	Date relates to pit cluster
		GU 2316	Construction feature (ch)	
		GU 2317	-	Date relates to ardmarks
		GU 2319	-	Date relates to ardmarks
		GU 2320	-	Date relates to pit cluster
		GU 2321	-	Date relates to pit cluster
		GU 2322	-	Date relates to ardmarks
		GU 2323	-	Pre-monument feature
		GU 2324	Construction feature (ch)	
		GU 2325	Construction feature (ch)	
5	Mount Pleasant	BM 644	-	Date relates to henge
		BM 645	-	Date relates to henge
		BM 646	-	Date relates to henge
		BM 662	-	Unrelated feature
		BM 663	-	Dates surrounding ditch
		BM 664	-	Date relates to henge
		BM 665	-	Unrelated feature
		BM 666	-	Dates surrounding ditch
		BM 667	-	Dates surrounding ditch
		BM 668	-	Dates surrounding ditch
		BM 669	-	Dates surrounding ditch
		BM 788	-	Date relates to henge
		BM 789	-	Date relates to henge
		BM 790	-	Date relates to henge
		BM 791	-	Date relates to henge
		BM 792	-	Date relates to henge
		BM 793	-	Date relates to henge
		BM 794	-	Unrelated feature
		CAR 5	-	Date relates to henge
6	**Newgrange,**	GrN 12828	Construction feature (ch)	

	structure	GrN 12829	Construction feature (ch)	
7	North Mains	GU 1350	-	Secondary feature
		GU 1351	-	Secondary feature
		GU 1352	Construction feature	
		GU 1353	Construction feature	
		GU 1354	Construction feature	
		GU 1381	-	Secondary feature
		GU 1382	-	Secondary feature
		GU 1435	Constructional feature	
		GU 1436	Constructional feature	
		GU 1437	-	Secondary feature
		GU 1438	Interior feature	

Table A2.9: Radiocarbon dated Timber circles considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.15. Abbreviations within the phase type column refer to sample type (ab: animal bone; an: antler; ch: charcoal). Any radiocarbon date with a note in the comments column was rejected during analysis.

Wedge tombs				
	Site name	Lab. code	Phase type	Comments
1	Altar	GRN 17498	Chamber deposit (sh	Secondary
		GRN 17499	Chamber deposit (ch)	Secondary
		GRN 17500	Chamber deposit (sh)	Secondary
		GRN 17501	Chamber deposit (ch)	Secondary
		GRN 17502	Chamber deposit (sh)	Secondary
		GRN 17503	Chamber deposit (ch)	Secondary
		GRN 17504	Chamber deposit (ch)	Secondary
		GRN 17505	Chamber deposit (ch)	Secondary
		GRN 17506	Chamber deposit (sh)	Secondary
		GRN 17507	Chamber deposit (ch)	Secondary
		GRN 17508	Chamber deposit (ch)	Secondary
		OxA 3289	Chamber deposit (hb)	
2	Island	GrN 10631	Pit cluster (ch)	Secondary
		D49	Pit cluster (ch)	Secondary
		GrN 10632	Pit cluster (ch)	Secondary
3	**Kilmashogue**	OxA 3230	Chamber deposit (ch)	Secondary
4	Labacalee	GRN 11359	Chamber deposit (hb)	
		OxA 2759	Chamber deposit (hb)	
		OxA 2760	Chamber deposit (hb)	
5	Lough Gur	OxA 3266	Chamber deposit (hb)	
		OxA 3267	Chamber deposit (hb)	
		OxA 3268	Chamber deposit (hb)	
		OxA 3269	Chamber deposit (hb)	
		OxA 3270	Chamber deposit (hb)	
		OxA 3271	Chamber deposit (hb)	
		OxA 3272	Chamber deposit (hb)	
		OxA 3273	Chamber deposit (hb)	
		OxA 3274	Chamber deposit (hb)	
6	Toormore	GRN 18492	Chamber deposit (ch)	
		GRN 18493	Chamber deposit (ch)	
		GRN 18494	Chamber deposit (ch)	Secondary
		GRN 18495	Chamber deposit (ch)	Secondary
		GRN 18496	Mound (ch)	

Table A2.10: Radiocarbon dated Wedge tombs considered during the course of study. Those in bold are sites within the study area. The number column relates to the location of the site on Figure A2.17. Abbreviations within the phase type column refer to sample type (ch: charcoal; hb: human bone; sh: shell). Any radiocarbon date with a note in the comments column was rejected during analysis.

Grading system for associating radiocarbon samples with ceramics	
Grading	Degree of association
✓	Dating sample found in a discrete feature with the pottery, eg, an OLS feature
×	Dating sample found in the same feature group as pottery, e.g., in a posthole from a timber building where other postholes had produced pottery. Dating sample and pottery found in a feature subject to subsequent disturbance, e.g., a deposit in a chambered tomb.
××	Dating sample and pottery from a layer, e.g., an old land surface. Dating sample and pottery from a non-discrete feature fill, e.g., a ditch fill. Dating sample and pottery found in a greatly disturbed feature, e.g., a chamber deposit subsequently rifled.
?	The degree of association is unclear due to, ambiguity in the site report, or possible errors in my data collection.

Table A2.11: Grading system for the selection of radiocarbon dates securely associated with ceramics.

Date range and durations for pottery types				
Pottery type	Start dates (cal BC)	Duration (years)	End dates (cal BC)	Notes
	Probability given in brackets			
Carinated bowls	4635 - 4382 (1.00)	857 - 1235 (1.00)	3582 - 3334 (1.00)	UB 305 - poor agreement 53.5%
Peterborough pottery	4081 - 4080 (0.00) 4068 - 4067 (0.00) 4038 - 4033 (0.00) 4023 - 4018 (0.00) 4003 - 3301 (0.99) 3289 - 3276 (0.00) 3261 - 3259 (0.00)	1167 - 1169 (0.00) 1188 - 1203 (0.00) 1209 - 2143 (0.98) 2149 - 2154 (0.00) 2159 - 2185 (0.01) 2192 - 2216 (0.00) 2222 - 2234 (0.00) 2244 - 2249 (0.00) 2275 - 2280 (0.00)	2257 - 1642 (1.00) 1605 - 1600 (0.00) 1594 - 1590 (0.00) 1545 - 1543 (0.00)	
Drimnagh bowls	3760 - 3390 (1.00)	10 - 490 (1.00)	3600 - 3210 (1.00)	
Grooved ware	3003 - 2738 (1.00)	376 - 853 (1.00)	2421 - 2109 (0.99) 2104 - 2099 (0.01)	BM 704 - poor agreement 26.7%
Ronaldsway ware	3120 - 2910 (1.00)	560 - 960 (1.00)	2400 - 2090 (1.00)	
Beaker pottery	2511 - 2288 (1.00)	556 - 886 (1.00)	1797 - 1795 (0.00) 1765 - 1566 (1.00)	

Table A2.12: Results of calibration exercise for pottery types using BOUND function of OxCal v2.01. Results are displayed as possible date ranges with the accompanying probability of the true date falling within that range being given in brackets.

Beaker pottery (from burial sites)					
	Site name	Lab. code	14C date	Sample type	Degree of association
1	Achavanich	BM 2590	3700+/-50	Human bone	✓
2	Boatbridge Quarry	GU 1117	3730+/-60	Human bone	✓
3	Boysack Mill	BM 2513	3460+/-50	Human bone	✓
4	Bractullo	BM 2515	3780+/-60	Human bone	✓
5	Chealamy	BM 2512	3630+/-50	Human bone	✓
6	Chilbolton	OxA 1072	3740+/-80	Human bone	✓
		OxA 1073	3780+/-80	Human bone	✓
7	Cookston Farm	BM 2523	3800+/-50	Human bone	✓
8	Cottington Hill	BM 2725	3630+/-60	Human bone	✓
9	Fetterangus	GU 2100	3650+/-50	Human bone	✓
10	Fodderty	BM 2514	3770+/-50	Human bone	✓
11	Handley Down	BM 2518	3760+/-50	Human bone	✓
12	Keobog	GU 1122	3730+/-60	Human bone	✓
		GU 1123	3700+/-100	Human bone	✓
13	Knockenny	N 1240	3390+/-90	Human bone	✓
14	Lambourne	BM 2643	3360+/-50	Human bone	✓
15	Little Pond Ground	HAR 340	3670+/-80	Human bone	✓
16	Mains of Ballnagowan	GU 1121	3519+/-90	Human bone	✓
17	Manston	BM 2642	3630+/-50	Human bone	✓
18	Middle Brighty Farm	BM 2524	3730+/-50	Human bone	✓
19	Mount Farm	HAR 4792	3710+/-110	Human bone	✓
20	Radley	BM 2520	3630+/-60	Human bone	✓
		BM 2700	3360+/-50	Human bone	✓
		OxA 1874	3930+/-80	Human bone	✓
		OxA 1875	3990+/-80	Human bone	✓
21	Risby	BM 2522	3660+/-50	Human bone	✓
22	Rotherley	BM 2519	3390+/-50	Human bone	✓
23	Ruchlaw Mains	GU 1356	3720+/-80	Human bone	✓
24	Shrewton 5a	BM 2517	3560+/-50	Human bone	✓
25	Shrewton 5k	BM 2525	3590+/-50	Human bone	✓
26	Shrewton 24	BM 2516	3750+/-50	Human bone	✓
27	Skateraw	SRR 453	4420+/-130	Human bone	✓
28	Smeeton Westerby	BM 2521	3440+/-50	Human bone	✓
29	Sorisdale	BM 1413	3890+/-45	Human bone	✓
30	Tavelty	GU 2169	3710+/-70	Human bone	✓
31	The Wig	BM 2644	3500+/-50	Human bone	✓
32	West Heslerton	HAR 6631	3510+/-80	Human bone	✓
33	Wetwang Slack	HAR 4426	3900+/-100	Human bone	✓

Table A2.13: Radiocarbon dates recorded by the Beaker dating programme (Kinnes et al *1991) as being from human bone on burial sites. The number column refers to the location of these sites on Figure A2.19, other dated beaker sites from within the study area also appear on this figure.*

Radiocarbon dated sites yielding beaker pottery from within the study area			
	Site name	Site type	Context type
a	**Ballachrink**	Occupation	Layer (ch)
b	**Brenig 51**	OLS	Layer (ch)
b	**Cefn Caer Euni 1**	Kerb cairn	Feature (ch)
d	**Knowth**	Passage tomb	Secondary feature (ch)
e	**Knowth 2**	Passage tomb	Secondary feature (ch)
f	**Knowth 18**	Passage tomb	Chamber deposit (ch)
g	**Knowth beaker concentration A**	Occupation	Layer (ch)
h	**Machrie Moor**	OLS	Ardmarks (ch)
i	**Monknewtown**	Occupation	Layer (ch)
j	**Newgrange**	Occupation	Feature (ch)
k	**Tandderwen**	Burial	Chamber deposit (ch)
l	**Ysgwennant**	Burial	Chamber deposit (ch)

Table A2.14: Sites with Beaker pottery from within the study area. None were used for further study due to the availability of the well contexted corpus compiled by the Beaker dating programme (see Table A2.13). The letter code relates to the location of each site on Figure A2.19.

Carinated bowls					
No	Sitename	Lab. code	14C date	Site type	Degree of association
1	Altanagh	GrN 10557	4590+/-80	Pit cluster	✓
		GrN 11447	3810+/-120	Chamber deposit	✓[1]
		UB 2560	5685+/-70	Pit cluster	✓
2	Ascott-under-Wychwood	BM 492	4735+/-70	OLS	××
3	Aston-on-Trent	BM 271	4700+/-150	OLS	××
4	**Auchategan**	I 4705	4250+/-110	Occupation	××
5	Balfarg Riding School	GU 1903	4765+/-55	Pit cluster	✓
		GU 2604	5170+/-90	Pit cluster	✓
		GU 2605	4950+/-70	Pit cluster	✓
6	**Ballybriest**	UB 534	4930+/-80	OLS	×
		UB 535	5045+/-95	Pit in forecourt	✓
7	**Ballygalley**	UB ?3362	5046+/-101	Pit cluster	✓
		UB ?3362	5469+/-69	Pit cluster	✓
		UB 3368	4821+/-67	Pit cluster	✓
		UB 3374	5002+/-92	Pit cluster	✓
		UB 3471	5219+/-104	Timber building	✓
		UB 3491	4830+/-117	Timber building	✓
8	**Ballymarlagh**		3050+/-50	OLS	××
9	Ballynagilly	UB 197	5625+/-50	Pit cluster	✓
		UB 199	5230+/-125	Timber building	✓
		UB 201	5165+/-50	Timber building	✓
		UB 301	4190+/-90	Pit cluster	✓[1]
		UB 305	5745+/-90	Pit cluster	✓[2]
		UB 306	4880+/-110	Pit cluster	✓
		UB 559	5500+/-85	Pit cluster	✓
		UB 625	4835+/-55	Pit cluster	✓
10	Barn's Farm	SRR 527	4711+/-50	Pit cluster	✓
		SRR 528	3796+/-80	Pit cluster	✓[1]
11	Boghead	SRR 683	4946+/-175	Pit cluster	✓
12	Cannon Hill	HAR 1198	5270+/-110	Pit cluster	✓
13	**Dooey's Cairn**	UB 2029	4940+/-50	Chamber deposit	✓
		UB 2030	5150+/-90	Chamber deposit	✓
14	Fengate	GaK 4196	4960+/-64	Timber building	✓
		GaK 4197	4395+/-50	Timber building	✓
15	Grendon	HAR 1495	2330+/-70	Mortuary enclosure	×?
		HAR 1497	2750+/-130	Mortuary enclosure	××
		HAR 1498	3000+/-80	Mortuary enclosure	×?
16	Gwernvale	CAR 113	5050+/-75	Pit cluster	✓
17	Hazleton	HAR 8350	4950+/-60	OLS	××
18	**Knockiveagh**	D 37	5010+/-170	OLS	××
19	**Knowth**	BM 1076	4850+/-71	Pit cluster	✓
20	Linlithgow Priory	GU 1875	5265+/-55	Pit cluster	✓?
21	Lismore Fields	OxA 2348	4920+/-80	Timber building	×?
		OxA 2434	4930+/-70	Timber building	×?

21	Lismore Fields	OxA 2436	4970+/-70	Timber building	×?
		OxA 2437	4840+/-70	Timber building	×?
22	Little Waltham	HAR 1087	5120+/-130	Pit cluster	✓
23	**Llandegai**	NPL 223	5240+/-150	Timber building	×?
24	**Machrie Moor**	GU 2320	5500+/-70	Pit cluster	✓
		GU 2321	4820+/-50	Pit cluster	✓
25	**Mad Man's Window**	UB 205	3000+/-110	Deposit	✓
26	**Newton**	GU 1952	4965+/-60	Pit cluster	✓
27	North Mains	GU 1546	4640+/-65	Pit cluster	✓
28	Shippea Hill	Q 585/6	4870+/-120	Occupation	××
		Q 527/8	4950+/-120	Occupation	××
29	South Street			OLS	××
30	Street House	BM 2013R	4840+/-130	Mortuary facade	×
		BM 2014R	4970+/-120	Mortuary facade	×
		BM 2061N	5080+/-60	Mortuary facade	×
31	Sweet Track			Trackway	✓
32	Thirlings	HAR 844	7200+/-150	Pit cluster	✓
		HAR 877	5230+/-150	Pit cluster	✓
33	**Trefignath**	HAR 3932	5050+/-70	OLS	××
34	Tulloch of Assery B	GU 1339	4840+/-65	OLS	××
35	Tully	UB 2119	4890+/-65	Chamber deposit	×
		UB 2120	4785+/-85	Chamber deposit	×
36	Whitegounds	HAR 5580	4950+/-90	Chamber deposit	✓

Table A2.15: Radiocarbon dates on sites containing Carinated Neolithic pottery, with the degree of contextual accuracy. Site names in bold are within the study area. See Figure A2.20 for the geographical distribution of sitse

[1] This date is rejected since it clearly falls outside the time range indicated for this pottery type by the remainder of secure available dates.

[2] Although this date is significantly earlier than the remainder of secure dates available for this pottery type, there is some overlap and therefore no reason to reject it outright.

Drimnagh bowls					
	Site name	Lab code	14C date	Site type	Degree of association
1	**Annaghmare**	UB 209	2475+/-75	Chamber deposit	×
2	Ardcrony	GrN 9708	4765+/-35	Chamber deposit	✓
3	Ashleypark	GrN 11036	4765+/-40	Chamber deposit	✓
4	**Ballintruer More**	GrN 10469	4800+/-70	Chamber deposit	✓
5	**Baunogenasraid**	GrN 11362	4735+/-35	Chamber deposit	✓
6	**Dooey's Cairn**	UB 2045	4630+/-130	Forecourt blocking	××
7	**Jerpoint West**	GrN 11897	4305+/-40	Chamber deposit	×[1]
		OxA 2680	4770+/-80	Chamber deposit	×[1]
8	Lisduggan North	OxA 2681	4585+/-80	Chamber deposit	✓
9	Lough Gur	OxA 3266	3530+/-70	Chamber deposit	××
		OxA 3267	3710+/-70	Chamber deposit	××
		OxA 3268	3630+/-70	Chamber deposit	××
		OxA 3269	3740+/-100	Chamber deposit	××
		OxA 3270	3780+/-70	Chamber deposit	××
		OxA 3271	3260+/-70	Chamber deposit	××
		OxA 3272	3720+/-70	Chamber deposit	××
		OxA 3273	3670+/-70	Chamber deposit	××
		OxA 3274	3830+/-80	Chamber deposit	××
10	**Martinstown**	GrN 12271	4720+/-35	Chamber deposit	✓

Table A2.16: Radiocarbon dates on sites containing Drimnagh bowls, with the degree of contextual association. Site names in bold are within the study area (see Figure A2.21).

1 GrN 11897 is rejected by Brindley and Lanting (1990, 3) since it does not correlate with that of OxA 2680 despite both coming from the same inhumation. However, no adequate explanation is given as to which of the two dates is accurate, so it appears parsimoneous to reject both.

Grooved ware					
	Site name	Lab. code	14C date	Site type	Degree of association
1	Balfarg Riding School	GU 1905	4285+/-55	Timber enclosure	✓
		GU 1906	4155+/-70	Timber enclosure	×
		GU 1907	4330+/-85	Timber enclosure	×
		GU 1904	4385+/-55	Ditch	××
		GU 1670	4425+/-50	Ditch	××
		GU 1902	4250+/-85	Pit cluster	✓
2	Briar Hill	HAR 2607	4010+/-90	Timber enclosure	✓
3	Christchurch X17	HAR 2907	4170+/-80	Pit cluster	✓
4	Coneybury henge	OxA 1408	4200+/-110	Henge ditch	××
5	Durrington Walls	BM 395	3900+/-90	Timber circle	✓
		BM 396	3950+/-90	Timber circle	✓
		BM 397	3850+/-90	Timber circle	✓
		BM 398	3927+/-90	Henge ditch	××
		BM 399	3965+/-90	Henge ditch	××
		BM 400	4000+/-90	Henge ditch	××
		BM 702	3597+/-76	Timber circle	×?
		BM 703	3473+/-72	Timber circle	×?
		NPL 192	4270+/-95	Midden	××
		NPL 240	3905+/-110	Timber circle	✓
6	Fengate	HAR 397	3980+/-100		✓
		HAR 399	3970+/-70		✓
		HAR 401	3960+/-90	Pit cluster	✓
		HAR 404	3880+/-80		✓
		HAR 409	3810+/-150		?
		HAR 771	3960+/-70	Pit cluster	✓
7	Firtree Field	BM 2406	4140+/-60	Pit cluster	✓
		BM 2407	3080+/-50	Pit cluster	✓
8	Glencrutchery	OxA 5427	3950+/-55	Occupation	?
		OxA 5334	3915+/-35	Occupation	?
		OxA 5335	3930+/-40	Occupation	?
9	**Hendre**	CAR 1279	3870+/-70	Pit cluster	✓
10	Hunstanton	BM 704	3686+/-63	Pit cluster	✓
		OxA 2311	4170+/-90	Pit cluster	✓
		OxA 2310	4005+/-90	Pit cluster	✓
11	King Barrow Ridge	OxA 1396	4700+/-150	Pit cluster	✓[1]
		OxA 1397	4500+/-120	Pit cluster	✓[1]
12	Machrie Moor	GU 2325	3980+/-180	Timber circle	✓
13	Marden	BM 557	3938+/-48	Henge ditch	××
		BM 558	3526+/-99	Henge ditch	××
		BM 559	3626+/-81	Henge ditch	××
14	Millfield North	BM 1650	3740+/-50	Henge ditch	××
		BM 1652	3770+/-50	Henge ditch	××
		BM 1653	3605+/-80	Henge ditch	××
15	Mount Pleasant	BM 668	3630+/-80	Timber circle ditch	××
		BM 791	3891+/-66	Henge ditch	××
		BM 972	4058+/-71	Henge ditch	××
15	Mount Pleasant	BM 793	4048+/-54	Henge ditch	××
16	**Newgrange,**	GrN 11800	4070+/-40	Pit circle	××

	pit circle	GrN 11801	4070+/-60	Pit circle	××
		GrN 11802	4030+/-35	Pit circle	××
		GU 1617	4050+/-65	Pit circle	××
		GU 1618	3980+/-75	Pit circle	××
		GU 1619	3885+/-70	Pit circle	××
		GU 1620	4000+/-65	Pit circle	××
		GU 1621	3890+/-75	Pit circle	××
		GU 1622	3907+/-70	Pit circle	××
		GU 1771	3935+/-70	Pit circle	××
		GU 1772	3900+/-60	Pit circle	××
		GU 1773	3975+/-60	Pit circle	××
		GU 1774	3965+/-65	Pit circle	××
		UB 2392	3985+/-55	Pit circle	××
		UB 2393	3985+/-45	Pit circle	××
		UB 2394	3875+/-90	Pit circle	××
17	Quanterness	PTA 1606	4130+/-60	Chamber deposit	×
		PTA 1626	4300+/-60	Chamber deposit	×
		Q 1294	4590+/-75	Chamber deposit	×
		Q 1363	4540+/-110	Chamber deposit	×
		Q 1451	4110+/-100	Chamber deposit	×
		Q 1479	4170+/-75	Chamber deposit	×
		Q 1480	3905+/-70	Chamber deposit	×
		SRR 754	4360+/-50	Chamber deposit	×
		SRR 755	3870+/-55	Chamber deposit	×
18	**Ronaldsway House**	GU 2694	3490+/-150	Occupation	?
		GU 2695	1310+/-130	Occupation	?
		OxA 5328	3925+/-35	Occupation	✓
		OxA 5329	3985+/-35	Occupation	✓
		OxA 5330	4010+/-55	Occupation	✓
19	Stacey Bushes	HAR 858	3780+/-150	Enclosure	××
20	Stonehenge	I 2328	4130+/-105	Enclosure	××
21	Stones of Stenness	SRR 351	4188+/-70	Stone Circle/Henge	✓
22	**Townhead**	GaK 1714	4070+/-100	Occupation	×?
23	Trelystan	CAR 272	4260+/-70	Timber building	✓
		CAR 273	4135+/-65	Timber building	✓
		CAR 274	3985+/-70	Timber building	××
24	Whitton Hill 1	BM 2206	3740+/-50	Ring ditch	××
		BM 2265	3680+/-80	Ring ditch	××
		BM 2266	3660+/-50	Ring ditch	××
25	Wyke Down	BM 2396	4140+/-80	Henge	×
		BM 2397	4150+/-50	Henge	✓

Table A2.17: Radiocarbon dates on sites containing Grooved ware, with the degree of contextual association (see Table A2.11). Site names in bold are within the study area (see Figure A2.22).

1 This date is rejected since it clearly falls outside the time range indicated for this pottery type by the remainder of secure available dates.

Peterborough wares					
	Site name	Lab code	14C date	Site type	Degree of association
1	Avebury	HAR 10502	4300+/-90	Henge ditch	××
2	Barford	Birm 7	4366+/-64	Pit cluster	✓
3	Dorset Cursus	OxA 624	4570+/-120	Cursus ditch	××
		OxA 625/6	4575+/-77	Cursus ditch	××
4	Giants' Hill 2	CAR 816	3830+/-60	Barrow ditch	××
		CAR 817	4370+/-70	Long barrow ditch	××
		CAR 818	4450+/-70	Barrow ditch	××
5	Gwernvale	CAR 114	4390+/-70	Pit at barrow	✓
		CAR 116	4590+/-75	Pit at barrow	✓
6	King Barrow Ridge	OxA 1397	4500+/-120	Pit cluster	✓
7	Maiden Castle	OxA 1141	4360+/-80	Causewayed ditch	××
		OxA 1142	4750+/-80	Causewayed ditch	××
		OxA 1341	4460+/-80	Barrow ditch	××
		OxA 1349	4660+/-80	Barrow ditch	××
8	Meldon Bridge	SRR 643	4676+/-180	Enclosure	✓
		SRR 644	4686+/-90	Enclosure	✓
		SRR 645	4082+/-80	Enclosure	✓
		SRR 646	4286+/-50	Enclosure	✓
		SRR 647	4240+/-55	Enclosure	✓
9	Millbarrow	OxA 3169	4620+/-90	Pit at barrow	××
10	North Marden	HAR 5542	3550+/-80	Barrow ditch	××
11	Thirlings	HAR 1451	4080+/-130	Pit cluster	✓
		HAR 844	7200+/-150	Pit cluster	✓[1]
12	Whitton Hill 1	BM 2266	3600+/-50	Henge	✓
13	Windmill Hill	BM 74	4530+/-150	Causewayed camp ditch	××

Table A2.18: Radiocarbon dates on sites containing Peterborough ware, with the degree of contextual association (see Table A2.11). Site names in bold are within the study area (see Figure A2.23)

[1] This date is rejected since it clearly falls outside the time range indicated for this pottery type by the remainder of secure available dates.

Ronaldsway pottery					
	Site name	Lab. code	14C date	Site type	Degree of association
1	**Ballacottier**	OxA 5886	3790+/-50	Occupation	✓
		OxA 5887	4415+/-55	Occupation	✓
		OxA 5888	3945+/-50	Occupation	✓
2	**Ballalheaney**	OxA 5892	4075+/-50	Occupation	✓
		OxA 5893	3980+/-55	Occupation	✓
		OxA 5894	3775+/-50	Occupation	✓
3	**Ballateare**	OxA 5884	3955+/-70	Occupation	✓
		OxA 5885	4240+/-55	Occupation	✓
4	**Ballavarry**	OxA 5331	4035+/-40	Occupation	✓
		OxA 5332	4185+/-55	Occupation	✓
		OxA 5333	3830+/-80	Occupation	✓
		GU 2696	4140+/-50	Occupation	✓
5	**Glencrutchery**	OxA 5427	3950+/-55	Stray find	✓
		OxA 5334	3915+/-35	Stray find	✓
		OxA 5335	3930+/-40	Stray find	✓
6	**Ronaldsway**	OxA 5328	3925+/-35	Occupation	✓
	'House'	OxA 5329	3985+/-35	Occupation	✓
		OxA 5330	4010+/-55	Occupation	✓
		GU 2694	3490+/-150	Occupation	×
		GU 2695	1310+/-130	Occupation	×
8	**West Kimmeragh**	OxA 5889	4260+/-50	Other burial	
		OxA 5890	4255+/-70	Other burial	
		OxA 5891	4280+/-50	Other burial	

Table A2.19: Radiocarbon dates for Ronaldsway pottery. These sites can be located on Figure 5.4.

Table illustrating the occurance of Carinated ceramics at site types throughout the study area											
	E Neolithic site types	Middle Neolithic site types			L Neo site types	Undated site types					
Site context	Timber building	Court tomb	Linkard stown cist	Boyne passage tomb	Stone circle	Round cairn	Enclosure	Occupation	Unclass tomb	Portal tomb	Extraction site
OLS		✓[1] ✓+Sho[2] ✓+Dri[3]		✓[4]		✓[5] ✓+Sho[6]		✓[7] ✓[8]	✓[9]	✓[10]	[11]
OLS feature	✓[12]			✓[13]	✓[14]		✓+Sho[15]	✓[16] ✓+Sho[17]			
Construction	✓[18]										
Mound			✓[19]						?✓[20]		
Primary ditch fill							✓+Sho[21]	✓[22]	✓[23]		
Secondary ditch fill											
Chamber		✓[24] ✓+Sho[25] ✓+Ach[26] ✓+Dri+San[27] ✓+Dri+San+Sho[28]									
Passage											
Forecourt feature		✓[29] ✓+Sho[30]							✓[31]		
Forecourt blocking		✓[32] ✓+Sho[33]									
Interior feature											
Secondary feature									?✓[34]		
Other finds		✓+San[35]						✓+Pet[36]			

Context stratigraphically related to, but not necessarily part of, the site type

Context irrelevant to site type

Table A2.20a: Assessment of the range of site and context types in which Carinated pottery has been found, and the extent to which it co-occurs with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Carinated pottery

[1] Ballymarlagh; Clontygora Large Cairn; Mourne Park.
[2] Ballyalton (*Nature of context makes association uncertain (Evans and Davies 1935)*).
[3] Ballyutoag (*Nature of context makes association uncertain (Herring 1937)*).
[4] Newgrange L.
[5] Ballintoy.
[6] Knockiveagh (*Nature of context makes association uncertain (Collins 1957)*).
[7] Donegore Hill; Feltrim Hill; Knowth Neolithic occupation; Langford Lodge, Mad Mans Window 1.
[8] Auchetagan.
[9] Trefignath.
[10] Ballykeel.
[11] Ballygalley Hill.
[12] Ballygalley.
[13] Newgrange L.
[14] Castle Mahon.
[15] Donegore Hill (*probably associated (Sheridan in press)*).
[16] Ballygalley; Carzfield; Dunmurry; High Crosby; Langford Lodge; Machrie Moor; Newton.
[17] Knowth Neolithic occupation *(Ceramics associated inside a rectangular house (Eogan 1984 Fig 76.804-11, Fig 77.812-26)*), Newtown (*identification by A Sheridan*).
[18] Knowth Neolithic occupation.
[19] Drimnagh.
[20] Trefignath.
[21] Donegore Hill (*probably associated (Sheridan in press)*).
[22] Langford Lodge.
[23] Trefignath.
[24] Goward.
[25] Ballymarlagh (*Context heavily disturbed (Davies 1949)*).
[26] Ballyedmond (*Ceramics came from same level in gallery (Evans 1938, fig 2)*).
[27] Ballyalton (*Cermics in chamber probably associated (Evans and Davies 1934)*).
[28] Clontygora Large Cairn (*Context disturbed leaving only the Decorated Shouldered and the Fancy Necked sherds associated (Davies and Paterson 1938)*).
[29] Ballymarlagh; Ballyutoag; Bronwdod; Cairnholy 1; Dyffryn Ardudwy.
[30] Ballintaggart (*Insufficient information to clarify association (unpub. notes Ulster Museum)*).
[31] Din Dryfol.
[32] Goward.
[33] Ballintaggart (*Insufficient information to clarify association (unpub. notes Ulster Museum)*).
[34] Din Dryfol.
[35] Dunloy (*Context disturbed (Conway pers comm. 1995)*).
[36] Ehenside Tarn (*Nature of context makes association uncertain (Darbishire 1874)*).

Table A2.20b: Site names refered to in Table 2.20a

Table illustrating the occurance of Achnacree vessels at site types throughout the study area

Site context	Early Neolithic site types	Middle Neolithic site types	Undated site types	
	Passage tomb	Court tomb	Occupation	Unclassified tomb
OLS				
OLS feature				
Construction				
Mound				
Primary ditch fill				
Secondary ditch fill				
Chamber	✓[1]	✓[2] ✓+Cari[3] ✓+Beak+Coll+FV[4] ✓+ San+Sho[5]		✓+Beak[6]
Passage				
Forecourt feature				
Forecourt blocking				
Interior feature				
Secondary feature				
Other finds			✓[7] ✓+Dri+Gro+?San[8]	

Context stratigraphically related to, but not necessarily part of, the site type

Context irrelevant to site type

Table A2.21a: Assessment of the range of site and context types in which Achnacree pottery has been found, and the extent to which it co-occurs with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Achnacree bowls

[1] Achnacree.
[2] Glenvoidean.
[3] Ballyedmond (*From same gallery and at same level, although in different chambers (Evans 1938, fig. 2)*.
[4] Giant's Graves (*From same chamber, although Bryce (1902, 44-52) notes this as probably disturbed (Henshall 1970, 357)*)..
[5] Audleystown (*Although pottery comes from 2 different galleries it is likely that these were in use contemporaneously as they are designed as a unit (Collins 1954)*).
[6] Nether Largie (*From same gallery, but the beaker comes from a disturbed context (Greenwell 1866, 342-5)*). Glecknabae (*From different galleries with no clear stratigraphic relationship (Bryce 1904, 37-52)*).
[7] Balloch Hill.
[8] Rothesay (*Insufficient contextual information (Scott 1964, 156)*).

Table A2.21b: Site names refered to in Table A2.21a

Table illustrating the occurance of Drimnagh vessels at site types throughout the study area							
	Middle Neolithic site types		Undated site types				
Site context	Court tomb	Linkardstown cist	Occupation	Unclassified tomb	Portal tomb	Unclassified burial	Stray find
OLS	F✓+Cari[1]		F✓+Beak+San+Sho[2]				
OLS feature			F✓[3]			F✓[4]	
Construction							
Mound					F✓[5]		
Primary ditch fill							
Secondary ditch fill							
Chamber	F✓[6] F✓+Cari+San[7] F✓+Cari +San+Sho[8] F✓+?San[9] F✓+San+Sho[10]	F✓[11] F✓ +San[12] F✓+Sho[13]		F✓+Pet/FV+?Sho[14]	F✓+?Gro[15]		
Passage							
Forecourt feature	F✓+San[16]						
Forecourt blocking							
Interior feature							
Secondary feature							
Other finds			F✓+Ach+?San+Gro[17]	F✓+Sho+San[18]			F✓ +San+Sho[19]

Context stratigraphically related to, but not necessarily part of, the site type

Context irrelevant to site type

Table A2.22a: Assessment of the range of site and context types in which Drimnagh pottery has been found, and the extent to which it co-occurs with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Drimnagh bowls

[1] Ballyutoag.
[2] Dalkey Island 2 (*Nature of context makes association unclear (Liversage 1968)*).
[3] Dun Ailinne; Rathgall.
[4] Martinstown.
[5] Ballynamona Lower.
[6] Bicker's Houses; Clachaig.
[7] Ballyalton (*Ceramic types apparently associated (Evans and Davies 1934)*).
[8] Clontygora large cairn (*Levels of chamber disturbance mean that only the Decorated shouldered and the Fancy necked sherds can be considered associated (Davies and Paterson 1938)*).
[9] Beacharra (*Ceramic types from the same gallery (Bryce 1902).*
[10] Ballymacaldrack (*Ceramic types clearly associated (Evans 1938b)*); Annaghmare (*Fancy necked and Sandhills sherds from same chamber, Shouldered sherds from beneath this chamber and probably associated (Waterman 1965)*).
[11] Ballintruer More; Baunogenasraid; Drimnagh; Norrismount.
[12] Linkardstown (*Ceramic types associated (Raferty 1944)*).
[13] Jerpoint West.
[14] Achnacreebeag (*Identification of sherds as Impressed wares is unclear (Henshall in Ritchie 1970, 117), also the shouldered sherd identification is based on fabric not form)*).
[15] Ballykeel (*No clear distinction between cairn and chamber contexts, nonetheless, ceramic types probably associated (Collins 1965)*).
[16] Ballymacaldrack (*Ceramic types associated (Evans 1938b)*).
[17] Rothesay (*Insufficient information to clarify association (Scott 1964, 156)*).
[18] Carnduff (*Insufficient information to clarify association (Herity et al 1968)*).
[19] Carrickfergus (*Inusufficient information to clarify association (Herity 1982, 373)*).

Table A2.22b: Site names refered to in Table A2.22a

Table illustrating the occurance of Peterborough vessels at site types throughout the study area																
	Early Neolithic site types			Middle Neolithic site types					Late Neolithic site types			Undated site types				
Site context	Passage tomb	Crematoria	Timber building	Court tomb	Linkards town cist	Pit circle	Timber circle	Boyne passage tomb	Henge	Wedge tomb	Stone circle	Occupation	Cairn	Unclass Tomb	Unclass burial	Stray find
OLS												✓[1]			✓+Beak[2]	
OLS feature												✓[3] ✓+Beak[4]				
Construction																
Mound																
Primary ditch fill																
Secondary ditch fill																
Chamber	✓[5]			✓+Beak[6]										✓[7] ✓+Gro[8] ?✓/FV+ ?Sho+ Dri[9]		
Passage																
Forecourt feature																
Forecourt blocking				✓+Sho[10]										✓[11]		
Interior feature																
Secondary feature																
Other finds												✓+Cari[12]	✓+Beak+ Coll[13]			?✓[14] ✓[15] ✓+Gro[16] ✓+Sho+ Gro+Beak[17]

(light shading) Context stratigraphically related to, but not necessarily part of, the site type

(black) Context irrelevant to site type

Table A2.23a: Assessment of the range of site and context types in which Peterborough pottery has been found, and the extent to which it co-occurs with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Peterborough ware

[1] Castell Bryn Gwyn.
[2] Ogof Pant y Wennol (*Nature of context makes association unclear*).
[3] Moel y Gaer; Old Grove.
[4] Machrie Moor (*From same archaeological feature (Haggerty 1991, 71)*)
[5] Barclodiad y Gawres.
[6] Cairnholy 1 (*From same chamber context (Piggott and Powell 1949, 117)*).
[7] Gop Cave.
[8] Trefignath (*From disturbed chamber deposits with no clear association (Smith and Lynch 1987)*).
[9] Achnacreebeag (*Identification of Impressed sherds is uncertain (see Henshall in Ritchie 1970, 41) although all ceramic types found in same chamber fill*).
[10] Cairnholy 1 (*Small sherds made identification uncertain (Piggott and Powell 1949, 120)*).
[11] Bryn yr Hen Bobl.
[12] Ehenside Tarn (*Nature of context makes association unclear (Darbishire 1874)*).
[13] Woodhouse End Barrow (*Nature of context makes association unclear (Rowley 1977*).
[14] Abbey Green.
[15] 65 Church St; Aglionby; Brougham; Gaythorn 7; Haberwain Rigg 6; Little Asby Scar 1; Lousy Brow; Old Kirkpatrick; Rayseat; Seal Howe 5, 9, 11.
[16] Little Asby Scar 6 (*Nature of context makes association uncertain (Cherry and Cherry 1991, 71)*).
[17] Luce Bay (*Nature of contexts make association uncertain (McInnes 1964; Cowie in press)*).

Table A2.23b: Site names refered to in table A2.23a

Table illustrating the occurance of Sandhills ware vessels at site types throughout the study area														
	E Neo site types			M Neolithic site types			L Neolithic site type	Undated site types						
Site context	Crematoria	Passage tomb	Timber building	Boyne Passage tomb	Court tomb	Linkardstown cist	Henge	Round cairn	Enclosure	Occupation	Unclassed tomb	Portal dolmen	Unclassed burial	Stray find
OLS	✓[1]			✓[2]						✓[3] ✓+Beak+Dri+Sho[4] ✓+Beak+FV[5]				
OLS feature				✓[6]			✓+?Gro[7]			✓[8] ✓+Sho[9]				
Construction														
Mound	✓[10]			✓[11]				✓+Sho+FV[12]			✓[13]			
Primary ditch fill										✓[14]				
Secondary ditch fill														
Chamber		✓[15] ✓+Beak +FV[16]		✓[17] ✓+FV[18]	✓[19] ✓+Ach+Sho[20] ✓+Beak[21] ✓+Cari+Dri+Sho[22] ✓+Cari+Dri[23] ?✓+Dri[24] ✓+Sho[25] ✓+Dri+Sho[26]	✓+Dri[27]					✓[28] ✓+Coll[29]	✓[30]	✓[31]	
Passage														
Forecourt feature					✓+Sho[32] ✓+Dri[33]									
Forecourt blocking					?✓+?Gro[34]									
Interior feature									✓[35]					
Secondary feature			✓[36]	✓[37]	✓[38]							✓[39]		
Other finds				✓[40] ✓+Beak[41]	✓[42]					✓[43] ?✓+Ach+Dri+Gro[44]	✓+Dri+Sho[45]	✓[46]		✓[47] ✓+Sho[48] ✓+Dri+Sho[49]

Context stratigraphically related to, but not necessarily part of, the site type

Context irrelevant to site type

Table A2.24a: Assessment of the range of site and context types in which Sandhills pottery has been found, and the extent to which it co-occurs with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Sandhills ware

[1] Fourknocks 2.
[2] Knowth 16.
[3] Island Machugh; Townleyhall; Windy Ridge; Knockans, Rathlin Island.
[4] Dalkey Island 2 (*Nature of context makes association uncertain (Liversage 1968)*).
[5] Dalkey Island 5 (*Nature of context makes association uncertain (Liversage 1968)*). Bay Farm 2 (*Nature of context makes association uncertain (Mallory 1994)*). Townleyhall 2 (*Nature of context type makes association uncertain (Eogan 1963)*).
[6] Knowth 9.
[7] Monknewtown (*Ceramic types not associated (Sweetman 1976)*).
[8] Newferry; Knockans, Rathlin Island.
[9] Goodland (*Insufficient information to clarify association (Case 1973)*).
[10] Fourknocks 2.
[11] Knowth 15, 16, 17; Newgrange L; Tara.
[12] Lyles Hill (*Ceramic types in context could be redeposited (Evans 1953)*).
[13] Millin Bay.
[14] Scotch St.
[15] Baltinglass Hill, Donegore Moat.
[16] Loughcrew H (*Insufficient information to clairfy association (Conwell 1877 quoted in Herity 1974, 236-8)*.
[17] Loughcrew S, U; Knowth 2.
[18] Tara (*No clear association between.ceramic types (O'Riordain 1955; De Paor 1957; O'Kelly 1960)*.
[19] Tamnyrankin.
[20] Audleystown (*Ceramics come from different but probably contemporary galleries (Collins 1954)*).
[21] Carrick East (*Gallery heavily disturbed (Mullin and Davies 1938)*).
[22] Clontygora large cairn (*Levels of disturbance mean that only the Decorated shouldered and the Drimnagh bowls are clearly associated (Davies and Paterson 1938)*).
[23] Ballyalton (*Ceramic types probably associated (Evans and Davies 1934)*).
[24] Beacharra (*Ceramic types clearly associated (Bryce 1902,*).
[25] Knockoneill (*Insufficient information to clarify association (unpub. notes Ulster Museum)*).
[26] Annaghmare (*Sandhills and Fancy necked sherds from same chamber, Shouldered sherds from beneath this chamber and probably associated (Waterman 1965)*); Ballymacaldrack (*Ceramic types clearly associated (Evans 1938b)*).
[27] Linkardstown (*Ceramics clearly associated (Raferty 1944)*).
[28] Fourknocks 2.
[29] Ballynahatty (*Ceramic types from a disturbed context (Hartwell 1991)*).
[30] Ticloy.
[31] Rath.
[32] Knockoneill.
[33] Ballymacaldrack (*Ceramic types probably associated (Evans 1938b)*).
[34] Ballyalton (*Sherds may have been redeposited (Evans and Davies 1934)*).
[35] Lyles Hill.
[36] Ballygalley.

Table A2.24b: Site names refered to in table A2.24a

Sites yielding Sandhills ware

[37] Knowth 3.
[38] Ballyalton.
[39] Ballykeel.
[40] Loughcrew R2, V, X1, X2.
[41] Newgrange Z (*Ceramic types from a disturbed context (O'Kelly* et al *'978,342)*).
[42] Cairnesegart; Dunloy (*Context disturbed (Conway pers comm. 1995)*).
[43] Ballygalley.
[44] Rothesay (*Insufficient information to clarify association (Scott 1964, 156)*).
[45] Carnduff (*Insufficient information to clarify association (Herity et al 1968)*).
[46] Greengraves.
[47] ?Broughshane; Ballynoe; Britonstown; Clea Lakes; Coney Island; Dundrum 6, 8; Grainger collection; Ireland; Knockans, Rathlin Island; Knowles collection; Lagore Big (aka Dunshauglin); Lambay Island; Mount Sandel (lower); Muldersleigh Hill; Murlough Bay; The White Cairn; Toome; Toome Bar; Ushet Lough.
[48] Phurt (*Association unclear due to nature of context*).
[49] Carrickfergus (*Insufficient information to clarify association (Herity 1982, 373)*).

Table A2.24c: Site names refered to in Table A2.24a

Table illustrating the occurance of Shouldered vessels at site types throughout the study area									
	Early Neolithic site types	Middle Neolithic site types		Undated site types					
Site context	Passage tomb	Court tomb	Linkardstown cist	Round cairn	Enclosure	Occupation	Unclassified tomb	Unclassified burial	Stray find
OLS		✓[1] ✓+Cari[2]		✓[3] ✓+Cari[4]		✓[5] ✓+Beak[6] ✓+Beak+Dri+San[7] ✓+Ron[8] ✓+San[9]			
OLS feature		✓[10]		✓[11]	✓+Cari[12]	✓[13] ✓+Ron[14] ✓+San[15]		✓[16]	
Constructin		✓[17]							
Mound		✓[18]		✓+Beak+FV +San[19]					
Primary ditch fill					✓[20] ✓+Cari[21]				
Secondary ditch fill									
Chamber		✓[22] ✓+Cari[23] ✓+Cari+Dri+San[24] ✓+Dri+San[25] ✓+Ach+San[26] ✓+San[27]	✓+Dri[28]				✓[29] ✓+Beak[30] ✓+Beak+FV[31] ✓+Gro[32]		
Passage									
Forecourt feature		✓[33] ✓+San[34]					✓[35]		
Interior feature									
Secondary feature									
Other finds		✓[36]				✓[37]	✓[38] ✓+Dri+San[39]	✓[40]	✓[41] ✓+Dri+San[42] ✓+Gro+Pet[43]

Context stratigraphically related to, but not necessarily part of, the site type

Context irrelevant to site type

Table A2.25a: Assessment of the range of site and context types in which Shouldered pottery has been found, and the extent to which it co-occurs with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Shouldered pottery

[1] Mid Gleniron 2

[2] Ballyalton (*Nature of context makes association uncertain (Evans and Davies 1934)*).

[3] Lyles Hill

[4] Knockiveagh (*Nature of context makes association uncertain (Evans and Davies 1934)*).

[5] Phurt.

[6] Gortcorbies; Knowth Beaker occupation A

[7] Dalkey Island 2

[8] South Barrule (*Nature of context makes association uncertain (Unpub. Manx Museum)*).

[9] Bay Farm (*Nature of context makes association uncertain (Mallory 1994)*). Townleyhall 2 (*Nature of context makes association uncertain (Eogan 1963)*).

[10] Ballybriest

[11] Lyles Hill

[12] Donegore Hill (*Probably associated (Sheridan 1995)*).

[13] Billown Quarry 1; Shane's Castle.

[14] Ballavarry

[15] Knowth Neolithic occupation (*Pit inside a rectangular house contained Carinated and Shouldered sherds (Eogan 1984, fig 76.804-11; fig 77.812-26)*). Goodland (*Insufficient information available to clarify association (Case 1973)).*

[16] Killaghy (*Clearly associated (Evans 1940)*).

[17] Ballymacaldrack

[18] Ballymacaldrack

[19] Lyles Hill (*Ceramic types could be redeposited (Evans 1953)*).

[20] Lyles Hill

[21] Donegore Hill (*Probably associated (Sheridan 1995)*).

[22] Cashtal yn Ard; Clontygora Small Cairn; King Orry's Grave

[23] Ballymarlagh (*Chamber heavily disturbed making association unclear (Davies 1949)*).

[24] Clontygora Large cairn (*Chamber disturbed such that only the Shouldered and Drimnagh bowls are clearly associated (Davies and Paterson 1938)*).

[25] Annaghmare; Ballymacaldrack

[26] Audleystown (*Ceramics from different, but probably contemporary, galleries (Collins 1954)*).

[27] Knockoneill.

[28] Jerpoint West.

[29] Din Dryfol; Mull Hill Circle.

[30] Dalineun.

[31] Ballaharra.

[32] Lligwy.

[33] Mid Gleniron 2; Monamore.

[34] Knockoneill.

[35] Pant y Saer.

[36] Tamnyrankin.

[37] Navan.

[38] Knockast; Lochill.

[39] Carnduff

[40] Kilgreany

[41] Berk; Castle Skreen; Grainger Collection; Knappers Farm; Phurt; Trough Head

[42] Carrickfergus (*Insufficient information to clarify association (Herity 1982, 373)*).

[43] Luce Bay (*Nature of context makes association uncertain (McInnes 1964; Cowie* in press)).

Table A2.25b: Site names refered to in Table A2.25a

Table illustrating the occurance of Grooved ware vessels at site types throughout the study area

Site context	Middle Neolithic site types			Late Neolithic site types		Undated site types				
	Court tomb	Pit circle	Timber circle	Henge	Wedge tomb	Occupation	Unclassified tomb	Portal tomb	Pit cluster	Stray find
OLS		✓[1]		?✓+Beak[2]						
OLS feature				?✓+San[3]		✓[4] ✓+Ron[5] ?✓+Ron[6] ✓+Sho+Beak[7]			✓[8]	
Construction			✓[9]							
Mound								?✓[10]		
Primary ditch fill										
Secondary ditch fill										
Chamber	✓[11]				✓[12]		✓+Pet[13] ✓+Sho[14]	?✓+Dri[15] ✓+Beak+FV[16]		
Passage										
Forecourt feature	?✓[17]									
Forecourt blocking	?✓+?San[18]									
Interior feature				✓[19] ?✓[20]						
Secondary feature										
Other finds						✓+Ach+Dri+?San[21]				✓[22] ?✓+Sho[23] ✓+Pet[24] ✓+Beak[25] ✓+Sho+ Pet+Beak[26]

Context stratigraphically related to, but not necessarily part of, the site type

Context irrelevant to site type

Table 2.26a: Assessment of the range of site and context types in which Grooved ware pottery has been found, and the extent to which it co-occurs with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Grooved ware

[1] Newgrange pit circle.
[2] Monknewton (*Nature of context makes association unclear (Sweetman 1976)*).
[3] Monknewton (*No clear association (Sweetman 1976)*).
[4] Beckton; Capel Eithin; Hendre; Mye Plantation.
[5] Glencrutchery (*Ceramic types probably from same archaeological feature - see Appendix 4)*; Ronaldsway House *(Ceramic types from same archaeological feature (Bruce et al 1947)*)..
[6] Ballacottier (*Nature of context makes association uncertain (Garrad 1978)*).
[7] Kirkburn (*Grooved ware and beaker clearly associated, identification of shouldered sherd is based on association with a single laminated sherd (Cormack 1964)*).
[8] Knappers Farm.
[9] Knowth structure; Machrie Moor.
[10] Ballykeel.
[11] Tormore 1.
[12] Moylisha.
[13] Trefignath (*Chamber deposit disturbed. No clear association (Smith and Lynch 1987)*).
[14] Lligwy (*From same chamber (Baynes 1909)*.
[15] Ballykeel (*Chamber had ill-defined limits, although association of sherds is likely (Collins 1965)*).
[16] Dyffryn Ardudwy (*Chamber highly disturbed (Powell 1973, 17)*).
[17] Ballymacdermot.
[18] Ballyalton (*Sherds may have been redeposited - excavation report unclear (Evans and Davies 1934)*).
[19] Moylisha.
[20] Mullaghmore A.
[21] Rothesay (*Insufficient information to clarify association (Scott 1964, 156)*).
[22] Beacon Hill 4, Dundrum 1, Gryfe Reservoir, Little Asby Scar 3, Raven Gill 3, Shewalton.
[23] Kilbride Hill (*Nature of context makes association unclear (Bowd pers comm. 1994)*).
[24] Little Asby Scar 6 (*Nature of context makes association unclear (Cherry and Cherry 1987, 75)*).
[25] Walney Island 6 (*Nature of context makes association unclear (Barnes 1956)*.
[26] Luce Bay (*Nature of context makes association unclear (McInnes 1964; Cowie in press)*).

Table 2.26b: Site names refered to in Table 2.26a

Table illustrating the occurance of Ronaldsway ceramics at site types throughout the study area						
	Late Neolithic site types	Undated site types				
Site context	Stone circle	Round cairn	Occupation	Stray vessel	Unclassified burial	Stray find
OLS	?✓[1]		✓[2] ✓+Sho[3]		✓[4]	
OLS feature			✓[5] ✓+Gro[6] ✓+?Gro[7] ✓+Sho[8]	✓[9]	✓[10] ?✓[11]	
Construction						
Mound		✓[12]				
Primary ditch fill						
Secondary ditch fill						
Chamber						
Passage						
Forecourt feature						
Forecourt blocking						
Interior feature						
Secondary feature						
Other finds			✓[13]	✓[14]	✓[15]	✓[16]

Context stratigraphically related to, but not necessarily part of, the site type

Context irrelevant to site type

Table A2.27a: Assessment of the range of site and context types in which Ronaldsway pottery has been found, and the extent to which it co-occurs with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Ronaldsway pottery

[1] Billown Circle (It is uncertain whether the pottery from this site came from the Stone Circle itself, and in the remainder of this study it is considered as an occupation site).
[2] Knockaloe Beg; South Barrule.
[3] South Barrule (*Nature of context makes association unclear (unpub. Manx Museum)*).
[4] West Kimmeragh.
[5] Ballalheaney; Park Farm.
[6] Glencrutchery (*Probably in the same archaeological feature - see Appendix 4)*; Ronaldsway House (*From same archaeological feature (Bruce et al 1947)*).
[7] Ballacottier (*Nature of context makes association uncertain (Garrad 1984b)*).
[8] Ballavarry
[9] Ballacross; Ballahot; Ballagawne; Ballagawne, Rushen; Ballaquayle; Cleigh Rouyr; Colby; Colby Mooar; Earybedn; Gob y Volley; Guilcagh; Knockaloe Beg; Orrisdale Brooghs; Ronaldsway airport; Round Ellan; Scholaby,
[10] Ballateare; Killeaba; Ramsey Brooghs; Scard.
[11] Ballaharra.
*[12] Cronk Coar; Skyhill.
[13] Ballacottier; Ballalheaney; Ballavarry; Knockaloe Beg; Park Farm,
[14] Crossag.
[15] West Kimmeragh.
[16] Ballateare (Dutch Barn); Greenlands; Leodest; Peel School; Ronaldsway village, Shellag

Table A2.27b: Site names refered to in Table A2.27a

Table illustrating the occurance of Beaker vessels at site types throughout the study area

Site context	E Neo site types	Middle Neolithic site types				Late Neolithic site types			Undated site types						
	Passage tomb	Court tomb	Pit circle	Timbe circle	Boyne passage tomb	Henge	Wedge tomb	Stone circle	Round cairn	Occupation	Portal dolmen	Unclass tomb	Cist	Unclass burial	Stray find
OLS						✓+?Gro[1]		✓[2]	✓[3] ✓+FV[4]	✓[5] ✓+Sho[6] ✓+Dri+San+Sho[7] ✓+San+FV[8]			✓[9]	✓[10] ✓+Pet[11]	
OLS feature									✓[12]	✓+FV[13] ✓+Gro+Sho[14] ✓+Pet[15]				✓[16]	
Construction								✓[17]							
Mound							✓[18]		✓[19] ✓+ San+Sho +FV[20]			[21]	✓[22]		
Primary ditch fill															
Secondary ditch fill															
Chamber	✓[23]	✓[24] ✓+Ach+Coll+FV[25] ✓+San[26] ✓+Sho[27]			✓[28] ✓+San+FV[29] ✓+Coll[30]		✓[31]		✓[32] ?✓+FV[33]		✓+Gro +FV[34]	✓[35] ✓+Ach[36] ✓+ Sho+FV[37] ✓+Sho[38] ✓+FV[39]	✓[40] ✓+F V[41]		
Passage	✓[42]											✓+Sho[43]			
Forecourt feature															
Forecourt blocking		?✓+?Sho[44]										✓[45]			
Interior feature									✓[46]						
Secondary feature				✓[47]	✓[48]							✓[49]			
Other finds		✓[50]	✓[51]		✓+Carr[52]				✓[53] ✓+Pet+Coll[54]	✓[55]				✓[56]	✓[57] ✓+Gro[58] ✓+ Gro+Pet+Sho[59]

Context stratigraphically related to, but not necessarily part of, the site type

Context irrelevant to site type

Table A2.28a: Assessment of the range of site and context types in which Beaker pottery has been found, and the extent to which it co-occur with other ceramic types. Numbers beside each find relates to the list of sites given overleaf. (The categories of Early, Middle and Lat Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

Sites yielding Beaker pottery

[1] Monknewtown
[2] Carneddau Hengwm, earth circle
[3] Muirkirk 1
[4] Muirkirk 3
[5] Ballachrink; Cefn Caer Euni 1; Cefn Caer Euni 2; Knowth Beaker occupation B; Knowth Beaker Occupation C; Knowth Beaker Occupation D
[6] Gortcorbies; Knowth Beaker occupation A
[7] Dalkey Island 2
[8] Dalkey Island 5
[9] Dalmellington
[10] Broomrigg
[11] Ogof Pant y Wennol
[12] Ysgwennant
[13] Kilellan Farm
[14] Kirkburn
[15] Machrie Moor
[16] Broomrigg; Llanelltyd
[17] Carnedday Hengwm, stone circle
[18] Ballyedmonduff
[19] Crosby Garrett; Mecklin Park
[20] Lyles Hill
[21] Achnacreebeag
[22] Bedd Branwen; Clynnog, Penarth; Muikirk
[23] Carriglong; Ty Newydd
[24] Cairnholy 1; Cairnholy 2; Dunan Beag; Kilchoan; Mid Gleniron 1; Mid Gleniron 2
[25] Giants' Graves
[26] Carrick East
[27] Cragabus
[28] Knowth 6
[29] Loughcrew H
[30] Loughcrew L
[31] Ballyedmonduff
[32] Ballymenach
[33] Mollance
[34] Dyffryn Ardudwy
[35] Dunan Mor
[36] Glecknabae; Nether Largie South
[37] Ballaharra
[38] Dalineun
[39] Largantea
[40] Ainstable; Auchencairn; Baroose; Bodtegir; Brymbo; Bwlch y Gwrhyd; Campbeltown; Castle Carrock; Clifton, Penrith; Clynnog, Penarth; Court Hill; Haylee, Largs; Haylie; High Banks Farm; Kilmory Knap; Llithfaen, Pistyll; Mainsriddle; Pentraeth; Plas Heaton; Poltalloch; Porth Dafarch Rhosbeiro; Tan yr Allt

Table A2.28b: Site names refered to in Table A2.28a

Sites yielding Beaker pottery

[41] Brougham, Moorhouse Farm
[42] Bargrennan
[43] Capel Garmon
[44] Cairnholy 1
[45] Achnacreebeag
[46] Muirkirk 2
[47] Newgrange, structure
[48] Knowth 9; Knowth 15; Knowth 18; Newgrange
[49] Lochill; Pant y Saer
[50] Knockoneill
[51] Newborough Warren
[52] Newgrange Z
[53] Sizergh Fell
[54] Woodhouse End Barrow
[55] Kirkburn
[56] Warton Crags
[57] Borland Castle Hill; Bushmills; Campbeltown; Castle Douglas; Clachsiant; Crosby Fell; Cumberland; Dundrum, site 9; Antrim; Garlands; Great Cumbrae; Hunsonby; Knoc-Riabhech; Lochpatrick Mill; Loudon Hill; Luce Sands; Merkland Knowe; Moel Hebog; Moyne Moor; Mynydd y Bryn; Newby Hills; Newton Reigny; Poltalloch Estate; Shewalton Moor; Stroangassel; Walney Island 6; Whitepark Bay
[58] Gryfe Reservoir, Shewalton; Walney Island 6
[59] Luce Sands

Table A2.28c: Site names refered to in Table 2.28a

Table comparing the association of pottery types against the tentative periods proposed in this study									
	Early Neolithic	Middle Neolithic					Late Neolithic		Latest Neolithic
Ceramic Type	**Carinated**	**Shouldered**	**Achnacre**	**Drimnagh**	**Sandhills ware**	**Peteroborough ware**	**Grooved ware**	**Ronaldsway**	**Beaker**
Carinated									
Shouldered	Knowth								
Achnacree	Ballyedmond	Audleystown							
Drimnagh	Ballyalton	Clontygora large cairn	Achnacree						
Sandhills ware	Ballyalton	Audleystown Tamnyrankin		Ballyalton Beacharra Ballymacaldrack Annaghmare Linkardstown					
Peterborough ware									
Grooved ware									
Ronaldsway ware							Ronaldsway 'House'		
Beaker						Machrie Moor Cairnholy I	Kirkburn		

Table A2.29: Illustration of the co-occurance of the major ceramic types used in this study, based only on secure stratigraphic associations. (The categories of Early, Middle and Late Neolithic relate to the provisional radiocarbon chronology produced in the first part of Appendix 2, and not the final chronology).

A3. Historical review of Manx Neolithic studies

THE MANX NEOLITHIC HAS RARELY BEEN INCLUDED WITHIN THE STUDY OF THE NEOLITHIC OF BRITAIN AND IRELAND. THIS IS DESPITE A RICH HERITAGE OF ARCHAEOLOGICAL RESEARCH ON THE ISLAND WHICH HAS RESULTED IN THE AVAILABILITY OF A LARGE NUMBER OF NEOLITHIC ASSEMBLAGES. OUTSIDE OF THE ISLAND THIS HISTORY OF RESEARCH IS NOT WELL KNOWN AND IT THEREFORE SEEMS WORTHWHILE TO RECORD IT IN SOME DETAIL IN THIS APPENDIX.

A3.1 A review of Manx Neolithic studies

The development of research into the Manx Neolithic from the 1850s to the present can be divided into 5 major phases. These phases, to a great extent, parallel the growth of archaeology as a discipline throughout the study area generally, and indeed further afield.

Many of the sites referred to within this appendix are as yet unpublished, whilst others are included in publications not widely available outside of the Isle of Man. Further details of all the Manx Neolithic sites included within this study can be found in Appendix 4.

A3.1.1 Antiquarian research

The first significant work to include discussion of the prehistoric monuments of the Isle of Man was published by H R Oswald in 1860 as the fifth volume of the Manx Society. Given its early date it is not surprising that he did not recognise the antiquity of many of the sites with which he deals. For example, although he correctly notes that barrows are either Scandinavian or earlier, he equates this earlier period with the Druids. Nonetheless, Oswald's work is important in that it provides an early and focused account of such Neolithic monuments as King Orry's Grave, the Cloven Stones, and Billown Circle. Oswald's work was followed by similar studies by

Barnwell (1866) and Lewis (1872) although these show a more developed understanding of the antiquity of these sites.

It was also in the 1860s that the first known excavation at a Neolithic site took place, with Lukis' work at the megalithic site of Ballakelly. Lukis' work indicates that the antiquarian interest in monumental sites which was prevalent throughout much of the British Isles in the 19th century was equally prevalent on the Isle of Man (*cf.* excavations by Colt-Hoare, Thurnam, Greenwell, Coffey).

Much of the work carried out at this time suffered from the lack of a coordinated approach, both in the approach to excavation, and in the interpretive framework with which it was to be understood. The latter point was initially addressed through the introduction of the Three Age System of classification which became widely used throughout Britain in the latter part of the 19th century (Lubbock 1865, quoted in Daniel 1967, 92-6).

A3.1.2 Early archaeological research into the Manx Neolithic

It was not, however, until towards the end of the century that archaeology developed from an amateur and uncoordinated discipline into an increasingly coherent practise of fieldwork and analysis (Malina and Vasicek 1990, 47), exemplified by the work of Pitt-Rivers (1887; 1888 etc). It is also noted by Malina and Vasicek (1990, 49, 53-4), that archaeology was also being increasingly recognised at this time as a valid subject of academic research through the establishment of university posts, eg, the Disney Chair of Archaeology at Cambridge. This pattern appears to hold good for the Isle of Man with the establishment of the Isle of Man Natural History and Antiquarian Society in 1879, and the Museum and Ancient Monuments Trustees in 1886. This latter body was entrusted with the aim of preserving the Island's material heritage (Harrison 1986, 9, 12).

It was through the *Proceedings of the Manx Natural History and Antiquarian Society* (initially titled *Yn Liaor Maninnagh*) that the bulk of early excavation on the Island reached publication. The most important of these late 19th century excavations are described below.

Perhaps the most methodologically significant of these excavations was at Ramsey Brooghs which was dug between 1888 and the early 1890s (Kermode 1894; Walkey 1894). This site is important in the context of the development of archaeological practise on the Island since it consisted primarily of an artefact scatter recognised due to coastal erosion, and was not a megalithic site such as had formed the major source of interest for antiquarians. Through excavation at least five cremation burials enclosed by rough cists and associated with both coarse and fine pottery were located[1].

Further Late Neolithic ceramic finds were made in the 1890s at Skyhill (Kermode 1894) and at Ballacross (Kermode 1930, 78, no.4), where whole jars were recovered, buried upright and with stone lids. These are the first recorded instances of the recovery of this characteristic type of Manx find. Most importantly, at Glencrutchery one of the most prolific ceramic yielding sites was located. This latter site has been much written about in studies of Manx prehistory (Clark 1935, Bruce *et al* 1947, and Moffatt 1978) and, as the second largest Late Neolithic assemblage on the Island, has formed the backbone of these studies. Unfortunately, it appears that the quality of the evidence regarding the nature of the site is far less clear and complete than has been previously suggested. As discussed in Appendix 4, the bulk of the finds appear to have been collected from a sand quarry and were contained within an area of *c*9.1 x *c*4.6m[2]. Within this area a number of discrete find spots were located, including one which probably contained the bulk of the assemblage. The nature of these find spots, beyond their existance as pits, is unclear.

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[1] The portion of the assemblage still surviving can be securely placed within the Ronaldsway family of wares.

[2] This interpretation of the evidence is *contra* Clark 1935 who believed that this quarry was itself the archaeological feature.

A further pivotal excavation on the Isle of Man was conducted at the Mull Hill Circle in 1893 (Kermode and Herdman 1894). This was the first excavation of a Manx megalithic site to be published together with its sizeable Middle Neolithic ceramic assemblage. The importance of the site was recognised by Piggott (1932) who analysed the pottery and published it again in the more available format of the *Antiquaries Journal.* Also in this period, Frederick Swinnerton dug at the Port St Mary cists which he interpreted as being Early Neolithic; however, no diagnostic finds were found during the excavation and the site has subsequently been destroyed (Swinnerton 1889). As a result this site has not been included as Neolithic within the present study.

In judging the quality of these Manx excavations it is important to recognise that they predate the major phase of megalithic research within the study area, That began in the 1900s with the work of Bryce in southern Scotland, and was continued in the 1930s with campaigns by Davies and Evans in northern Ireland, and Hemp in north Wales. At the time of these early Manx excavations there was not an established body of literature from which they could interpret their evidence, and it is noticeable that no inter-site comparisons were attempted.

By the turn of the century there had been at least 5, and possibly up to 8 finds of Neolithic pottery available to antiquarians (see Figure A3.1). Nevertheless, the absence of a defined approach to, or indeed widespread acceptance of the existance of, Neolithic pottery must have presented a serious obstacle to its recognition. It was not until 1902 that Abercromby published his classification of Beaker pottery, and only in the late 1920s and early 1930s that the existance of Neolithic pottery became widely recognised (see Callander 1929 and Piggott 1931).

From the 1890s to 1935 there were further sporadic stray finds, notably of Ronaldsway ceramics, many of which made their way to the Manx museum which had been established in 1922. This was probably the most significant single event in this period since it provided a centralised and stable repository for finds. Throughout the 1920s and 30s the ceramic collections at the new museum were supplemented with finds of a Beaker during the excavation of a cist at Baroose (Quine 1925), and a single earlier Neolithic vessel in a sandpit at Berk (Clark 1935). Further material was also retrieved through excavations of both earlier and Late Neolithic sites at Scard (Kermode 1902b), Ballafayle (Kermode 1927), Knocksharry (Cubbon 1932) and Cashtal yn Ard (Fleure and Neely 1936).

A3.1.3 The integration of Manx prehistory into a wider perspective

By the middle of this period it is clear that Manx prehistory was being examined from a broader perspective which encompassed the range of monuments known from the rest of the British Isles. This change reveals itself in the increased level of inter-regional comparison being attempted in Manx prehistoric studies from the 1920s onwards. This is shown by such works as P M C Kermode's presidential address to the Cambrian Archaeological Association (1929), and J G D Clark's synthesis of Manx prehistory in the first volume of the Proceedings of the Prehistoric Society (1935). In both there is a strong attempt to place the sequence of Manx prehistory within the context of the British Isles specifically, and Europe more generally. Of the two synthetic works Clark's has had the most lasting influence, not least because of the publication outlet he chose, and his appraisal of the Neolithic period is discussed in more detail below.

Clark dealt with his subject chronologically from the Mesolithic through to what he termed the Ultimate Bronze Age. The Neolithic he dealt with as a single period consisting predominately of megalithic monuments and the single stray pottery find from Berk. The ceramics on the Isle of Man were described as Neolithic A (following Piggott's scheme (1932)), although the absence of Neolithic B wares on the Island was not discussed. The monuments were placed within the existing typologies of the day, eg, long cairns and short horned cairns. This approach was uncontroversial and, although the megalithic finds would now be placed within the early portion of the Neolithic period, Clark's classification, in essence, remains the same to the present day.

With the benefit of hindsight the major error of Clark's work was his attribution of the Late Neolithic pottery on the Island to an 'Ultimate Bronze Age' date. In support of this view Clark cited as evidence the coarseness of the fabric, and the prevalence of larger jars. From this corpus, which was based primarily around the large Glencrutchery assemblage, Clark composed a three part classification based on the following rim forms:

- bevelled
- ogival
- thickened

He further sub-divided these groups with a consideration of decoration. This classification has been the basis for the majority of subsequent synthetic works on the Neolithic (eg, Bruce *et al* 1947 and Moffatt 1978), although its utility is questionable.

Within his article Clark made reference to 6 Late Neolithic ceramic yielding sites out of a total corpus available at the time of around 14 (see Figure A3.1). It is therefore apparent that Clark composed his classification without all of the available evidence to hand. Nonetheless, Clark's work on the Neolithic period provided a timely summary of many of the finds made during the development of Manx prehistoric archaeology. It is also extremely important in that his definition of an Ultimate Bronze Age identified a unique Manx phenomenon which was subsequently studied and refined from his initial classifications[3].

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[3] That Clark's ideas regarding the nature of these 'Ultimate Bronze Age' wares were not accepted by everyone on the Island is noted by Bruce *et al* (1947, 158) commenting on an unpublished paper of 1938 (now lost). In this he proposed that the jars were not cremation vessels, and that they belonged in the Neolithic period.

Subsequent to Clark's work further stray finds of Late Neolithic pottery were made during the 1930s and 40s, culminating in the major discoveries of the Ronaldsway 'House' in 1943 and Ballateare in 1946. The former site was a rescue excavation carried out in advance of airport construction. Within a rectangular feature was found evidence for a post structure, a hearth, and localised pit deposits. Of equal importance to the structural finds was the large assemblage of Late Neolithic pottery, flint and stone tools found within the feature fill. Complementing the excavation at Ronaldsway was the discovery of the site of Ballateare which was excavated by Gerhard Bersu[4]. The site was discovered by exploring a Viking mound which overlay the Neolithic level. The Neolithic site consisted of a cremation cemetery with accompanying jars, postholes and pits.

A3.1.4 The definition of the Manx later Neolithic

In the 1930s and 40s when these finds were being made there was a general move in archaeology away from the straightforward classification of objects and towards an interpretative structure based around the culture. Although the term was employed in a variety of different contexts it can be generally taken to rest on the assumption that different peoples used different styles of artefacts. As a result, if a collection of similar artefacts in a geographically discrete area were identified then an ethnic group was recognised (see Childe 1935a).

It was in this climate that Bersu (1947) and Bruce *et al* (1947) interpreted their discoveries and defined the 'Ronaldsway culture'. The lack of metalwork at any of the known sites, and the presence of stone axes and lozenge arrowheads at Ronaldsway itself, encouraged them to date the culture to the Late Neolithic. They also noted the affinities of some of the flat based vessels at Ronaldsway with the finds from Rinyo,

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[4] Gerhard Bersu, former Director of the Romisch-Germanische Kommission, was interned on the Isle of Man throughout the Second World War and conducted a large number of extremely significant excavations during this time (see Selkirk 1971).

Orkney, and felt able to compare the presence of cremations with Ronaldsway pottery with cremations at Irish Court tombs. Nonetheless, despite these comparisons they were clear that what they were dealing with was a unique archaeological culture.

The Ronaldsway culture was therefore dated to the Late Neolithic and defined on the basis of the following typical artefacts:

- Bones of domestic sheep / goat
- Probable cereal cultivation
- Stone axes (of a distinctive roughened and truncated form)
- Pottery with collared rims
- Flat based 'Grooved ware' style pots
- Flint work including, serrated saws, hump backed scrapers, lozenge shaped arrowheads and polished discoidal knives.
- Cremation burial.
- Inscribed slate plaques

This interpretative framework was continued by Stuart Piggott in his *Neolithic Cultures of the British Isles* (1954). In this he maintained the view that the Manx earlier Neolithic was part of the general trend of megalith building in the Irish Sea basin; however he recognised the anomalous nature of the Mull Hill Circle. Piggott classified the Ronaldsway material as one of his Neolithic cultures distinct from that of the surrounding area, but he did note further evidence for parallels additional to those suggested by Bruce *et* al (1947), including the following:

- the mushroom headed pin found at Ballateare was compared with similar examples found in the Boyne valley (see also Herity 1982).
- the design of the slate plaques were compared with designs found at Graig Lwyd (Warren 1921) and Skara Brae (see Childe and Paterson 1929).

- the pottery was compared with examples known in Scotland, (Piggott's early Beacharra, Piggott 1954).
- the cremation cemetery concept was paralleled with examples from Dorchester (Atkinson *et al* 1951).
- the pit shape at Ronaldsway was compared with such supposed house sites as Haldon, Devon (Clark 1938); Clegyr Boia, Pembrokeshire; and Lough Gur, Co Cork (O Riordain 1954).

Despite this greater breadth of reference in interpreting the Ronaldsway culture, Piggott's work did not add any new insights into the Late Neolithic of the Isle of Man. His general agreement with Bruce *et al* (1947) probably did much to solidify thought on the Manx Neolithic at this time.

A3.1.5 The Influence of 'New' approaches to the study of Manx prehistory

It was only in the 1960s with the development of the New Archaeology that the interpretation of archaeological sites and artefacts began to take a new path. This involved in part the abandonment of the artefact set = archaeological culture model and a recognition that the same community might use different toolkits in different circumstances (see Binford and Binford 1966), or indeed exchange goods (Smith 1974).

Within British Neolithic studies, there is little evidence today that the interpretative methodologies of the New Archaeology were explicitly employed[5]. During the 1970s there was a broadening of the subject area of Neolithic studies, with the major impact of radiocarbon dating occurring around this time (British Archaeological Abstracts 1971; Smith 1974), along with the rise of palaeo-ecological studies (eg, Evans 1975, Limbrey 1975).

[5] With the clear exceptions of David Clarke's study of Beaker pottery (1970), and Renfrew's study of the Neolithic monuments of southern England (1973).

In 1977 Peter Davey organised a conference focusing on Manx history and palaeo-environmental studies. As a part of this Peter Moffatt (1978) attempted to introduce the interpretative processes of the New Archaeology, along with the evidence provided by a few odd radiocarbon dates, to the Ronaldsway dataset[6]. By this time there was a very significant number of Late Neolithic ceramic yielding sites known on the Island. Of the 28 available, Moffatt made use of 14. However, Moffatt's work was intended only as a review of possible avenues for study rather than a total reassessment of the evidence. The strength of Moffatt's work is in addressing the diversity of cultural phenomena, eg, burial practise, which are represented within the Ronaldsway 'culture'. Moffatt also attempted to show the origins of the Ronaldsway culture within the earlier Neolithic material culture employed on the Isle of Man.

Also in 1978, Audrey Henshall published an interim article based on her review of megalithic monuments on the Isle of Man. This work represented the first significant step forward in the interpretation of the early Neolithic on the Isle of Man since Clark's work in 1935. Since this time there had been reviews of the evidence by Megaw (1942) and Daniel (1950), but neither had proposed any major alterations to our understanding of these monuments. With Audrey Henshall's article an alternative approach was employed through a consideration of the constructional sequence employed at these sites, although, in her interim article and, to the author's knowledge, in her final report, she did not deal with the artefactual evidence in any manner significantly different from that attempted previously[7].

A3.1.6 Neolithic studies on the Isle of Man: 1978 to the present

Subsequent to the *Man and Environment* conference (Davey 1978), the number of finds of Neolithic sites and ceramics made on the Isle of Man has increased dramatically to a great extent as a result of the work of three individuals. In the early

6 In 1978 there were five dates available, 3 from Killeaba and 2 from Ballaharra.

7 Henshall's work is currently unpublished and is held in draft manuscript form at the Manx Museum and also the Centre for Manx Studies.

1980s Alan Skillan began to fieldwalk in the north of the Island, whilst Robert Farrar began to walk in the south. Both men made significant finds which were capitalised on by the Manx Museum and Larch Garrad in particular. This has resulted in the recognition of a number of occupation sites on the northern plain and also in the uplands of the south of the Island[8]. Unfortunately, since 1978 there has been no major synthesis of these sites and their implications, with the emphasis of Manx prehistory having shifted to the Mesolithic period with the work of Peter Woodman (1978) and Sinead McCartan (1989 and 1994).

Despite this hiatus in Manx Neolithic studies, there has been a great deal of change from the 1970s in the study of this period throughout the rest of the Irish Sea area. This can be seen as coming from three main directions.

1. The rapid increase in the number of non-megalithic sites located as a result of developer archaeology (see Hamlin and Lynn 1988 for Ireland), and the changing emphasis of academic archaeology away from the heavily studied megalithic sites. This has allowed far more balanced interpretations of Neolithic life within localised parts of the study area.

2. There has been a rise in the number of synthetic works for Ireland and Wales by scholars based outside of the Wessex area (eg, Herity and Eogan 1977; O'Kelly 1989; Lynch 1991; and Cooney and Grogan 1994). This is of great importance in recognising the diversity of Neolithic life within the British Isles and its regional character.

3. The frame of academic reference has changed significantly since the New Archaeology of the 1960s and early 1970s. However, it is less easy to characterise the state of archaeological thought since this time due to the profusion of different viewpoints which have developed. For example, symbolic archaeology (Hodder

8 Much of this work is unpublished and is held by the Manx Sites and Monuments Record.

1982b), Neo-Marxist archaeology (Parker-Pearson 1982), critical archaeology (Leone 1984) post-processual archaeology (Bapty and Yates 1994), and interpretative archaeologies (Hodder *et al* 1995). These alternative approaches to the past have impacted on the study area in recent years through the work of such individuals as Thomas (lecture 1995) in Anglesey, Cooney and Grogan (1994) for Ireland, and Bradley *et al* (1993) for southern Scotland. In addition, Darvill (lecture 1995) has begun to adopt such approaches in his landscape study of the Billown Quarry area, Isle of Man.

The long term importance of the current reorientation of academic thought is something which will only be appreciated with the benefit of hindsight. The value of a broadening data base of sites and recognised site types, as well as comprehensive treatments of that data is clear, however.

A3.1.7 Summary

The discussion above has focused on the major formative moments in the development of Neolithic studies on the Isle of Man. This is necessarily a subjective process which draws on particular aspects of the subject's history to the exclusion of others, in order to illustrate these major trends. With this in mind the development of Manx Neolithic studies can be summarised as follows.

Throughout the formative years of archaeology the approach to research on the Isle of Man closely mirrored the approach adopted throughout the United Kingdom and Ireland. Perhaps the heyday of Manx Neolithic studies can be seen as the middle years of the 1940s when Ronaldsway 'House' and Ballateare were identified.

In terms of impact within Neolithic studies generally, the value of these sites cannot be underestimated. They presented an ideal opportunity for researchers of the day to illustrate the then current archaeological approach based on the 'culture'. In particular, the Manx Late Neolithic evidence was suited to this purpose since it provided evidence from both occupation and funerary contexts, in contrast to some other suggested cultures, eg, the Wessex culture (*cf.* Piggott 1938, 1954).

Much of the Manx data was consolidated in the conference volume *Man and Environment in the Isle of Man* (Davey 1978), however, since this time the focus of research on the Isle of Man has shifted towards data-recovery rather than interpretation. As a consequence the Isle of Man has featured only very slightly in recent interpretations of the Neolithic of Britain and Ireland (*cf.* Smith 1974; Sheridan 1985; Darvill 1987), despite the considerable advances being made in the interpretation of evidence from other specific parts of the study area.

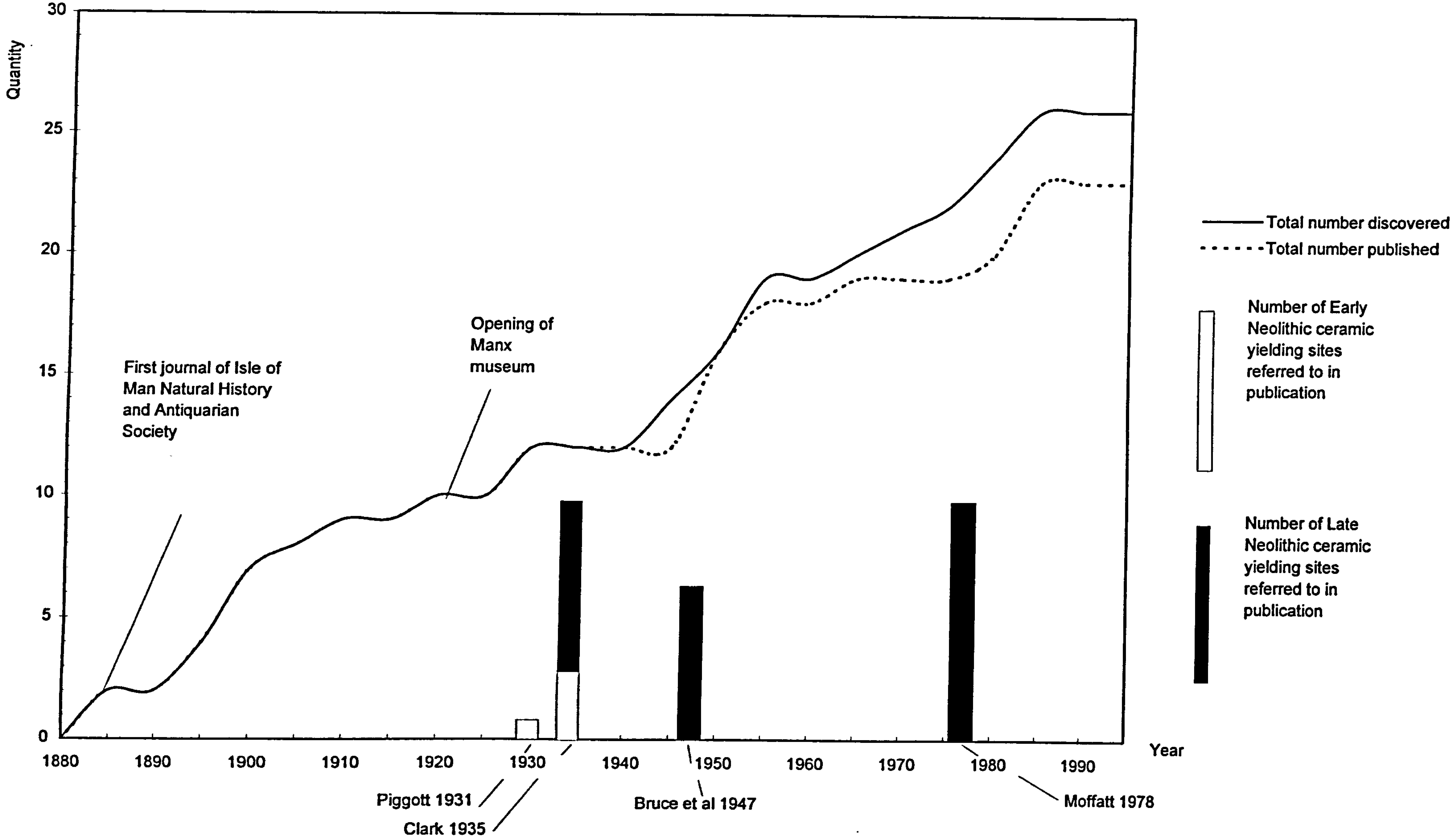


Figure A3.1: The rate at which finds of Neolithic pottery have been made on the Isle of Man, against publication

A4. Gazzeteer of Manx Neolithic sites

THIS APPENDIX CONSISTS OF A LIST OF ALL MANX NEOLITHIC SITES MENTIONED IN THE TEXT. IT IS INCLUDED SINCE MANY OF THE MANX SITES ARE OTHERWISE UNPUBLISHED AND ARE NOT THEREFORE WIDELY KNOWN.

A4.1 Introduction

Since this study focuses specifically on ceramics, the sites from which they are derived are treated in a summary form within this appendix. Extensive discussion regarding the nature of a site is reserved for those instance where clarification is necessary in order to avoid confusion in the discussion of the role of the ceramics themselves, eg, in the case of Glencrutchery or Ronaldsway 'House'. This appendix does not, however, attempt to give a definitive description of each site and the reader is refered to the main site publication if this is required.

Sites in this gazzeteer are arranged alphabetically, with no sub-divisions for the putative date of the site under discussion.

A4.2 Gazzeteer

Ballachrink NX393001

A lithic scatter was discovered during fieldwalking by Alan Skillan, and *c.*550 pieces were recovered. The site was excavated by S McCartan and A Johnson in 1988. The only feature located was a ditch cutting the edge of the excavation area. 84 sherds of Beaker pottery were recovered, along with more than 2000 flints. A stone axe, a whetstone, and a hammerstone were also recovered.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Latest Neolithic**
Publication:	McCartan and Johnson (1992)

Ballacottier NX435005

A scatter of flint and pottery was discovered during fieldwalking by Alan Skillan in 1979 and further finds were recovered from the site in 1981. Excavation by Larch Garrad located a hollow, but several test pits failed to locate features. A lithic assemblage including arrowheads and humpbacked scrapers were retrieved, as well as ceramics.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Garrad (1984b, 1984c)

Ballacross SC244710

A jar with a slate cover was found near the surface during quarrying. Other jars had been noted in the area previously.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Kermode (1930, 78, no4; and 80 no-)

Ballafayle SC478901

A small sub-rectangular cairn containing a central crematorium chamber. The site was excavated in the 1920s by P M C Kermode and two groups of bone were recovered from the chamber area. A few flints were also found in the mound, and samples of rock fused during the firing were recovered; no pottery was recovered.

Site type:	**CREMATORIA**
Publication:	Kermode (1927)

Ballagawne SC215695

A jar was found in 1936. A second jar at the Manx Museum is also recorded in museum records as coming from 'Ballagawne'. This may not have been associated with the first find.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Ballaharra SC265823

A megalithic structure was found during quarrying in 1971. This had already partly eroded over the quarry edge. It was excavated by S Cregeen. Recent reinterpretation of the site suggests that it had two chambers placed within a pit. One of these chambers was disturbed in the Bronze Age by considerable digging. Nearby were two cremation deposits dated to the later Neolithic.

Site type:	**OTHER TOMB** (megalith)
	OTHER BURIAL (cremations)
Date of Neolithic pottery from site:	**Middle Neolithic**
	Late Neolithic
Publication:	Cregeen (1978)

Ballahot SC277700

A slate covered jar was found in a disused quarry edge. Mouth upwards and empty. A carbon layer adhered to the inside. Trenches were dug in the area, but no further examples came to light.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Kewley (1906)

Ballakelly SC321719

A badly damaged megalithic chamber which was excavated by W C Lukis in 1865 but never published. A single sherd and some flint was recovered at this time but has subsequently been lost. One face of the kerb has a number of cup marks.

Site type:	**OTHER TOMB**
Publication:	Daniel (1950)

Ballalheaney SC426986

A lithic scatter was discovered in 1983 by fieldwalking. An excavation was carried out by Larch Garrad in 1984, and again in 1985. A number of hollows were located and ceramic and lithic assemblages were recovered, the latter containing hump backed scrapers. A few bone fragments were also found.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	*Pers comm.* Garrad (1994)

Ballaquayle SC375765

A slate covered jar was found mouth upwards during gardening. It contained rim fragments. The base of the cut for the jar was paved with slate fragments and covered in sand. The remains of another jar was found *c.*1.5m away. A large area of dark earth was found nearby.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Cubbon (1933)

Ballateare SC344970

A cremation cemetery was found sited beneath a Viking burial mound which was excavated by G Bersu. Several intercut hollows were found containing a few flints, cremated bone, and human teeth. Three hollows with dark burnt fills, termed *Ustrinae*, were also excavated. and found to contain sherds of both large and thin-walled vessels as well as flint, including a hump backed scraper, and cremated bone. Cremated bone fragments were also recovered from a nearby bedding trench. The major ceramic finds from the site were 7 large jars, a few of which contained further lithics, bone objects, cremated bone, and small vessels. Several cremation deposits in small scoops were also found.

Site type:	**OTHER BURIAL**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Bersu (1947)

Ballateare Dutch Barn SC345971

During building work for a new barn a number of pieces of pottery were found.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Ballavarry SC409981

The site was discovered as a surface scatter of lithic and pottery during fieldwalking by Alan Skillan in 1983. An excavation was carried out by Larch Garrad in the same year which located three inter-connecting pits. These contained a large pottery assemblage, a lithic assemblage containing hump backed scrapers, and an incised slate plaque.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Garrad (1984a, 1984c)

Baroose SC422806

A cist was discovered during ploughing and upon excavation was found to contain a single beaker, but no body.

Site type:	**CIST**
Date of Neolithic pottery from site:	**Latest Neolithic**
Publication:	Quine (1925)

Berk SC312897

A single vessel of Middle Neolithic type was found in 1929 in one of a group of three mounds. The precise context of the vessel is not clear.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Middle Neolithic**
Publication:	Kermode (1930)

Billown Circle

SC260696

An irregular circle of stones with an adjacent mound was excavated in 1929. This revealed a series of post holes amongst the stones, and a collection of burnt stones. From the edge of the mound some pottery was recovered. The relationship between the mound and the stones was not adequately established, and it is highly debatable whether the stones actually form a circle of Neolithic date.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Cubbon (1945)

Billown Quarry 1

SC268702

The site consisted of a pit cluster found whilst evaluating an area in advance of quarrying. The area was examined by Lancaster University Archaeological Unit in 1993 and a pottery and lithic assemblage was recovered.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Middle Neolithic**
Publication:	Lancaster University Archaeology Unit (1993)

Billown Quarry 2

SC268702

A lithic scatter was identified by Bob Farrer and Andrew Johnson. An excavation of a number of area in these same field were carried out in advance of quarrying by Bournemouth University in 1995. In one of these areas, two jars were located.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Darvill (1996)

Cashtal yn Ard SC462892

A Court tomb with five chambers, excavated by H Oswald in 1870s, and by Fleure and H Neely in 1930s. Beneath the middle of the cairn was found a burnt mound with a central built-up platform interpreted by Henshall (1978) as a crematorium. The entrance to the chambers suggests a portal, as found in the Cotswolds (Daniel 1950). All the chambers had been previously disturbed. In the first chamber was a cist containing pottery and inhumed bone. In the second chamber was paving layer but no finds, whilst the third chamber contained a few flints.

Site type:	**COURT TOMB**
Date of Neolithic pottery from site:	**Middle Neolithic**
Publication:	Fleure and Neely (1936)

Cleigh Rouyr SC290740

An upright jar was recovered during excavation in 1954. No stone cover, or covering mound was found.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Cloven Stones SC430814

A badly damaged megalithic site which has never been excavated. Henshall (1978) believed it to be a Passage tomb, although there is very little evidence to support this case. No pottery has been recovered from the site.

Site type:	**OTHER TOMB**
Publication:	Daniel (1950)

Colby

SC230700

A find of an isolated jar. No contextual information available.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Clark (1935)

Colby Mooar

SC225703

A jar found during ploughing in 1947. It was empty and had a dislodged stone cover.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Cronk Coar

SC335949

A levelled mound which produced fragments of two vessels in 1928-9. This may be the site noted by Oswald (1860, 50-1) as being opened in *c*1815 and which produced three inverted urns and cremated material. A Bronze Age cist was excavated in 1976-7 by the Manx Museum. Pottery of Late Neolithic date was also produced from the site.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Crossag

SC440930

A badly broken jar found in 1903. No further contextual details available.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Anon (1915, 79 and 92)

Earybedn

SC370929

Fragments of a jar found in a ruined cottage by Basil Megaw (1938-9).

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Glencrutchery

SC382776

This site was excavated over a thirty year period and produced one of the largest pottery assemblages found on the Isle of Man. Unfortunately, the level of documentation available is very poor. That which is available is summarised below.

1890s:	A burial ground with stone cists was found (Letter from Mr Kneen to P Kermode).
1890-8:	A sand quarry was opened between these dates, and all the pottery and flint was found in this (Letter Mr Kneen to W Cubbon 1935).
1892:	A jade axe was found. Not at the site area located subsequently (Letter from Mr Kneen to W Cubbon 1935).
1897:	A **further** burial ground was found *c*274m from the initial cists. Two dark areas were found during works' digging. One of these contained parts of a vessel, possibly with a slate cover.

A further site was located in the sandpit. This contained sherds (Gle 7 and Gle 14) overlain by flat stones. A flint was also found.

1900-1: Mr A Knox located further pottery and stone tools at the above site.

Site type: **STRAY FIND**

Date of Neolithic pottery from site: **Late Neolithic**

Publications: Kermode (1902a), Kermode (1902b)
Clark (1935)

Gob y Volley SC373942

Fragments of a jar were found during quarrying.

Site type: **EARTHFAST JAR**

Date of Neolithic pottery from site: **Late Neolithic**

Publication: Kermode (1930, 39, no8)

Greenlands SC450025

From a general area at Greenlands came a variety of ceramic and lithic finds made from the 1890s to the 1960s. The early finds may have been associated with the remains of a mound. The later finds appear to be independent of this.

Site type: **STRAY FIND**

Date of Neolithic pottery from site: **Late Neolithic**

Publication: Kermode (1930, 37, no-)

Guilcagh SC394986

A bowl was found during the widening of the Lhen trench in 1962. This appears to have been placed upside down.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Cubbon (1978b)

Kew SC274835

A parallel line of upright stones forming a narrow corridor and apparently set in an oval mound. No pottery has been found at the site.

Site type:	**PASSAGE TOMB**
Publication:	Daniel (1950)

Killeaba SC451937

A natural mound was excavated in the 1970s in advance of property development. A burning pit was found just south of the mound centre as well as four timber lined pits, one apparently associated with a cremation held in a skin bag. Two Ronaldsway jars were also recovered from the site. Stratigraphically this activity could be dated to the Neolithic; in addition a number of Bronze Age cists and cremations were found.

Site type:	**OTHER BURIAL**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Cubbon (1978a)

King Orry's Grave SC438843

A double ended megalithic tomb bisected by a road. Excavation of the forecourt and chambers at the northern end were carried out by Basil Megaw in the 1950s. These revealed a number of hearths containing worked flint in the forecourt, as well as some pottery from the chambers. The site was much disturbed.

Site type:	**COURT TOMB**
Date of Neolithic pottery from site:	**Middle Neolithic**
Publication:	Unpublished

Knockaloe Beg SC238830

A lithic scatter at this site was apparently discovered by C H Cowley during fieldwalking in the early part of this century. Following its rediscovery in the 1980s a number of test pits were sunk by Larch Garrad. Lithics and pottery were recovered, but no features were found.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Knocksharry SC274858

This natural mound was excavated by W Cubbon. It contained jars, cobbled platforms and *Ustrinae*, although the level of recording of these features was poor, and the ceramic assemblage has been badly restored leading to further ambiguity surrounding this site.

Site type:	**OTHER BURIAL**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Cubbon 1932

Leodest

SC402008

Pottery and lithics, including a hump backed scraper was found during routine digging by a farmer in 1986 in an area adjacent to a mound. An excavation was carried out by Larch Garrad which led to the suggestion that finds on the site were redeposited from the mound construction. A weathered stone axe was recovered, as well as further lithics, but no pottery.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Mull Hill Circle

SC189677

This extremely atypical megalith consists of a 6 tripartite chambers arranged in a circle, although no mound survives. Limited excavation by Audrey Henshall revealed a stone kerb around the site. The major excavation of the site took place in the 1890s when the chambers were emptied to reveal large quantities of pottery, as well as lithics and bone. Some of the chambers had, however, been disturbed before this date, and any central feature which may have been present was removed.

Site type:	**OTHER TOMB**
Date of Neolithic pottery from site:	**Middle Neolithic**
Publication:	Herdman and Kermode (1894)

Orrisdale Brooghs

SC323933

A jar was found, but no contextual information is available.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished Kermode daybook (1905, 17)

Park Farm SC342738

The site was discovered as a surface scatter by Bob Farrer. There is a Bronze Age site nearby. The lithic and pottery scatter was excavated in 1984, and again in 1987, when a number of pits and postholes were located. Pottery and lithics were recovered, although little contextual information is available. Further work in the area in 1989 located 44 more sherds.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Peel School SC250830

During the construction of a school in 1977 a collection of flints, pottery and a grain rubber were found.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Phurt NX468029

From 1983 a large quantity of pottery and flint began to erode from the cliff section at Phurt. This material came from a buried land surface with features cut into it. Some of these features contained finds, including in one instance a grain store. Information from Alan Skillan (*pers comm.* 1995) has suggested that there were two main sites at Phurt, a Middle Neolithic site, and a possibly later Neolithic or more likely Early Bronze Age site. The most significant single finds from the site were probably a saddle quern and the butt of a Group VI axe.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Middle Neolithic**
Publication:	Unpublished

Ramsey Brooghs SC447951

Three much damaged urns containing cremations and apparently covered by slabs were located by R Walkey and P Kermode in the late 1880s. Two other burial sites had been discovered previously. It is possible that an *Ustrina* was also found here by P Kermode, although the evidence is unclear, similarly parts of the site may date to the Bronze Age.

Site type:	**OTHER BURIAL.**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Kermode (1894); Walkey (1894)

Ronaldsway airport SC287686

Two jars were found during construction work at the airport in 1944.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Bruce *et al* (1947)

Ronaldsway 'House' SC290685

A sub-rectangular pit feature was located during airport extension works in 1943. It was excavated by J R Bruce, and B and E Megaw. Around the outside of this pit and through its base were a number of postholes. In the middle of the feature was a hearth, and to the east of this a deposit of ox bones and a small whole pot under stone slabs. The fill of the pit contained a great deal of pottery, flint, and stone; whilst at the base was an occupation deposit. The site was interpreted by the excavators as a house, but from the perspective of the artefacts this is not beyond reasonable dispute.

The report states that the base of the deposit was very dark, presumably as a result of the build-up of organic debris (a subject which is explored in Appendix 4, and Chapter 11). This would have presented an unpleasant setting for continual occupation, and it is noteable that interpretations suggesting that Neolithic man lived in pits with the remains of his meals (eg, Curwen 1934) have been generally abandoned elsewhere, although, the excavators state that the richest find scatter was within this lower layer, and the plan of the site would also suggest that it was from here that the majority of the 'fancy' stone assemblage, eg, carved plaques, axes, and polishing slabs, were found[1]. This assemblage presumably relates to the primary function of the pit and suggests a considerable degree of ostentation. Nonetheless, the excavators also note that there was no variation in the pottery and flint types from the upper and the lower layers (Bruce *et al* 1947, 142), and no hiatus in the distribution of finds from the base to near the top (Bruce *et al* 1947, 143). This suggests that finds continued to be deposited at the site long after the hearth and votive deposits at its base had been buried and were no longer accessible. Given the absence of midden material nearby it seems likely that these finds were deliberately deposited during the infilling of the pit, whilst their homogeneity suggests that this was a rapid affair. In the context of this thesis, it is primarily the ceramic assemblage which is of interest, and this cannot resonably be associated with the initial function of the pit feature. The site is therefore refered to within this thesis as Ronaldsway 'House'.

Site type:	**OCCUPATION**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Bruce *et al* (1947)

[1] Unfortunately, no contextual information survives additional to that presented in the original report. Although some find's bags containing ceramics are marked 'from the occupation layer' the author has disregarded this on the advice of Larch Garrad, of the Manx Museum, who believes that these bags may subsequently have become contaminated with material from other contexts.

Ronaldsway village SC291686

Stray finds of pottery from the later prehistoric and Viking village site excavated by C Neely in 1935.

Date of Neolithic pottery from site:	**Late Neolithic**
Site type:	**STRAY FIND**
Publication:	Unpublished

Round Ellan SC412993

Alan Skillan found a surface scatter in 1986, which Larch Garrad then excavated. Four areas were excavated, two of which contained the bases of jars containing burnt bone.

Publication:	Unpublished
Date of Neolithic pottery from site:	**Late Neolithic**
Site type:	**OTHER BURIAL**

Scholaby SC227707

A jar was found during ploughing. It was empty and covered by a slate lid.

Site type:	**EARTHFAST JAR**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

Scard SC228731

During pipe digging 4 jars spaced at c1.8m intervals were found. Burnt bone and charcoal were also found (it is unclear if this was inside a vessel). All jars were mouth up, and 1 had a slate cover. Five further jars were recovered by P M C Kermode in extending the original trench. Charcoal and burnt soil was found in each, but only the barest remains of bone. Three flints were also found. A total of 11 jars were located, of which the first 4 were lost. A possible 2 further jars were located.

Site type:	**OTHER BURIAL**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Kermode (1902b)

Shellag SC460999

Fragments of a vessel found during cliff erosion.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Kermode (1930, 35, no7)

South Barrule SC255749

A lithic scatter was located and walked by Bob Farrer and Larch Garrad in advance of forestry ploughing. A large quantity of flint, including hump backed scrapers, and polished edged knives was found, as well as a sizeable pottery assemblage.

Site type:	**STRAY FIND**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Unpublished

West Kimmeragh SC437004

A lithic and ceramic field scatter was located by A Skillan in 1984, the site was excavated by Larch Garrad in the same year. A cobbled surface was revealed, into which a number of cremation deposits had been placed. 12m east of this area a boulder cist was found in 1985. There is no clear relationship between the two sites. Finds from the cobbled surface included pottery, lithics, and burnt bone.

Site type:	**OTHER BURIAL**
Date of Neolithic pottery from site:	**Late Neolithic**
Publication:	Garrad (1987)

A5. Assessment of the quality of Manx Neolithic ceramic data

STUDIES OF NEOLITHIC ARCHAEOLOGY ARE OFTEN PRESENTED DIVORCED FROM THE PROCESS OF PRESERVATION, EXCAVATION, AND PUBLICATION WHICH INTERVENE BETWEEN SITE AND SYNTHESIS. THE PURPOSE OF THIS APPENDIX IS THEREFORE TO PRESENT THE LIMITATIONS WHICH QUALIFY THE INTERPETATION OF THE MANX NEOLITHIC DATA ON THE ISLE OF MAN.

A5.1 The quality of the Manx Neolithic dataset

In Chapter 5 the Neolithic archaeology of the Isle of Man has been described with reference to broad categories of classification rather than in a detailed manner from which to restructure the variety of life on the Island. This choice has been made largely because of the often variable quality of the Manx evidence.

That this should be the case is entirely to be expected since the dataset is composed of excavations which have taken place over the past hundred years, many of them before systematic excavation techniques had been developed, or a secure finds' repository established on the Island. Similar problems are of course prevalent in the study of material from all parts of the Irish Sea province. The more detailed nature of the research carried out on the Manx material meant that an assessment of these biasing factors was both more important, and more easily carried out.

A5.1.1 The quality of excavation at Neolithic ceramic yielding sites

As Appendix 3 has shown, the excavation of Neolithic sites on the Isle of Man has been in progress for just over one hundred years. In that time both the aims and methods of excavation have changed with the academic needs of the day (see Barker 1977 for a history of excavation techniques). As a result, data from many of the early excavations are ill-suited to the needs of modern archaeological research. For example, at Glencrutchery, the context of the finds was not recorded, despite the retrieval of a large ceramic assemblage; this presumably reflects the emphasis of research at this time. Similarly, at the Mull Hill Circle, Herdman and Kermode (1894) excavated the cists at the site, but it was only in further excavation by Audrey Henshall that the revetment wall which surrounds part of the site was discovered.

The difficulties resulting from the absence of a site archive have already been touched upon in Appendix 3. In the case of the earliest excavations on the Island, particularly by P M C Kermode and W Cubbon there exist diary notes as well as partial publications. Unpublished summaries are also found in the Manx SMR which refer to many other excavations, but with the exception of recent excavations at Billown Quarry 1 (Lancaster University Archaeology Unit 1993) and Billown Quarry 2 (Darvill 1996) no formal site archive exist. The difficulty this places on the interpretation of the evidence is clear

Having noted these points it is necessary to examine in more detail the evidence which is available. An initial question is: how representative is the dataset retrieved of the assemblage deposited? This has important implications for the usefullness of an assemblage for study at an intra-site level. This question can be explored using three separate criteria:

- the size of the excavated area (see Figure A5.1)
- the proportion of each feature excavated (see Table A5.1)
- the types of disturbance to which the site has been subjected prior to excavation (see Table A5.1)

In combination, Table A5.1 and Figure A5.1 show that there are several weaknesses in the Manx dataset. In the first instance, records are available for the excavation of 21 sites, all but two of which have revealed features. Nonetheless, in only 8 instances has it been possible to broadly judge the proportion of those features excavated. It can also be seen that the area excavated around a find spot also varies widely, with a mean of *c*101 sqaure metres being excavated. In 6 instances an area of less than 5m square was excavated, casting some doubt on the likelihood that all features within the immediate locality were located.

Regarding disturbance of sites prior to archaeological excavation it can be seen that the evidence is equally worrying. Of the 21 excavations, only 2 were of sites for which no previous disturbance is recorded. In the case of 13 sites there had been damage by ploughing which had removed parts of the assemblage out of context, and probably led to the further breakage of individual sherds. At 6 sites there was evidence for previous digging, most notably at megalithic tombs. In addition, one site had already partially eroded over a quarry edge prior to excavation.

In addition, in only 11 cases can ceramic finds be attributed to individual contexts on a site. In some cases this is the result of an absence of written records; in others it is not possible to match sherds from recorded locations with the assemblages currently in the Manx museum.

These are difficulties which seriously hamper the interpretation of sites with regards to form or function. They also cast doubt on the value of detailed analysis of the available assemblages with respect to proportions of sherd types in each assemblage etc. It is for these reasons that the analysis of individual sites throughout this thesis has only been carried out in broad terms and little work has been done on correlating the ceramic assemblage composition with other artefactual evidence on site.

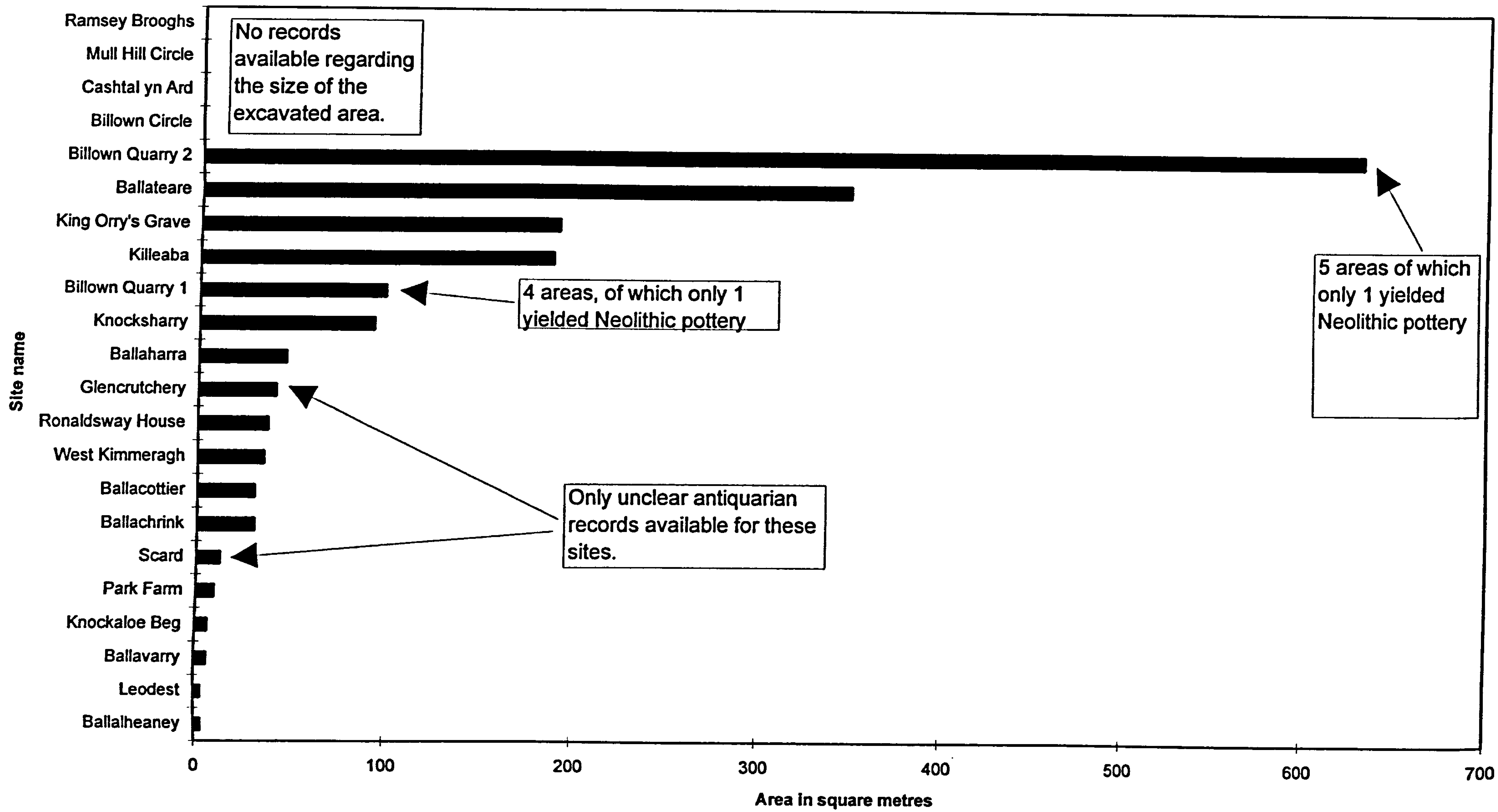


Figure A5.1: The size of area excavated during the study of Neolithic sites on the Isle of Man

Comparison of excavation data from Manx Neolithic sites						
	Finds disturbed by: ploughing (PL) digging (DIG) erosion (ER)	Features found	Estimated % of features excavated	Materials recovered	Materials identifiable to context	Materials re-analysed recemtly
Ballachrink	PL	Ditch	?	P F S C	✓	P F
Ballacottier	PL	Hollows	Figures not known	P F S B	✗	P F
Ballaharra	DIG ER	Chamber, pits	Figures not known	P F S B C	✓	P F
Ballalheaney	PL	Hollows	Figures not known	P F S B	✗	P F
Ballateare	PL	Hollows, pits, ditches, postholes	90	P F S B	✓	P
Ballavarry	PL	Pit	95	P F S C	✓	P F
Billown Circle	PL DIG	Postholes	?	P F S B C	✓	P F
Billown Quarry 1	PL	Pits	100	P F S C	✓	P F
Cashtal yn Ard	DIG	Chamber, forecourt, mound	Figures not known	P F S B C	✓	P
Glencrutchery	?	Pits	Figures not known	P F S B	✗	P F S
Killeaba	PL DIG	Chambers, pits	90	P F S B C	✓	-
King Orry's Grave	DIG	Chamber, forecourt	Figures not known	P F B C	✓	P
Knockaloe Beg	PL	None	-	P F	-	P
Knocksharry	✗	Pits, cobbling	?100	P F S B C	✗	-
Leodest	PL	None	-	P F S	-	P F
Mull Hill circle	DIG	Chamber, mound	Figures not known	P F S B C	✓	P
Park Farm	PL	Pits, postholes	95	P F S	✗	P F
Ramsey Brooghs	PL	Cist	Figures not known	P F B C	✗	P F
Ronaldsway House	✗	Pit	65	P F S B C	✓	P F
Scard	✗?	Pits	Figures not known	P F S B C	✗	P
West Kimmeragh	PL	Cobbling	<50	P F S	✗	P F

An OLS is not counted as a feature since the contemporaneity of finds on the surface cannot be assumed.
All figures are to the nearest metre, or to the nearest 5%.

Table A5.1: The level of recording, extent of excavation and priot disturbance at excavated Manx Neolithic sites

A6. An illustrated corpus of Manx Neolithic pottery

THIS APPENDIX PRESENTS ILLUSTRATIONS OF ALL DIAGNOSTIC NEOLITHIC SHERDS FROM THE ISLE OF MAN.

A6.1 Introduction

Appendix 5 has shown that a large number of Manx Neolithic site has only been published as site summaries, whilst details of others only exist in manuscript form. Few of the Manx ceramic assemblages have therefore been fully illustrated. Furthermore, synthetic studies such as Clark (1935), Bruce *et al* (1947), Piggott (1954), and Moffatt (1978) have a strong tendency to re-draw the same vessels rather than introduce other examples to the general public. It was therefore decided to reillustrate all diagnostic sherds of Manx Neolithic pottery.

A6.1.1 Criteria for inclusion

All whole vessels were included in the illustrated corpus, whilst sherds were included if they possessed one or more of the following characteristics:

- A rim
- A base
- A significant element of the vessel profile, eg, shoulder, or neck.
- Decoration

In the event this meant that *c*18% of the total number of 3614 sherds were illustrated, the remainder being plain body sherds.

A6.1.2 Drawing conventions

All illustrations were produced by the author from examination of the sherd material, except in the following instances. In the case of Ballachrink, the sherd material was too fragmentary to allow drawing, illustrations were therefore redrawn from those used in McCartan and Johnson (1992). In the case of sherds from Billown Quarry 1, vessel 1 was redrawn from an illustration by Lancaster University Archaeological Unit (1993, fig 17.pl), since the original sherds were again too fragmentary. One sherd appearing in the original report from Ballateare (Bersu 1947) and one from Ronaldsway 'House' (Bruce *et al* 1947) could not be relocated in the surviving assemblages. These were therefore redrawn from the existing illustrations. In the case of the sherd from Ronaldsway 'House' no scales was given on the original illustration and this has been noted by the relevant sherd within this corpus.

Vessels were drawn according to the quantity of sherd material present. This meant that reconstructed vessels based on partial evidence were only drawn on the basis of the sherds they contained. This had particular implications for the assemblage from Mull Hill which has been largely restored on fragmentary evidence. An exception was made in the case of vessel 2 from the site since no original sherds were visible in the restoration, but the vessel has been included in the corpus. Extrapolation from sherds to vessel form was effected in a number of instances where it was judged that the shape could be accurately reconstructed; however no effort was made to estimate vessel height or rim form if this evidence was not available.

Inclusions visible at the surface of the sherd have been shown as black dots, and carbonaceous residues appear as hatched marks (see vessel from Colby Mooar, Figure A6.30 ColM 1). Sherd thicknesses have been shown in profile, with any evidence for coil joining marked[1]. In the case of whole vessels, the wall thickness has not been marked below that level at which it was felt that it could be accurately measured.

[1] Draft illustrations were also produced of plain body sherds with coil joins, although these were not included in the final corpus.

A6.1.3 Organisation of corpus

The corpus is arranged alphabetically by site name with no attempt to sub-divide according to period. Each site has been allocated an abbreviated name (given in brackets) and each sherd at a site has been given a number. These are used in the text in order to avoid the continual repetition of a site's full name. Where the assemblage from a site includes both surface and contexted finds, the surface finds are presented first and are clearly labelled as such.

Within each site, the pottery has been arranged as follows:

- Whole vessels
- Decorated complex rim sherds, eg, collared, or everted.
- Decorated simple rim sherds
- Plain complex rim sherds
- Plain simple rim sherds
- Decorated body sherds
- Shoulders
- Bases.

The only site at which this structure was altered is Ballaharra. In this instance, Audrey Henshall had already studied the material and allocated it into putative vessels. It was not felt necessary to alter this approach within the present work.

Three scales are used throughout this corpus and these are clearly marked on each page.

Ballachrink (B'ch)

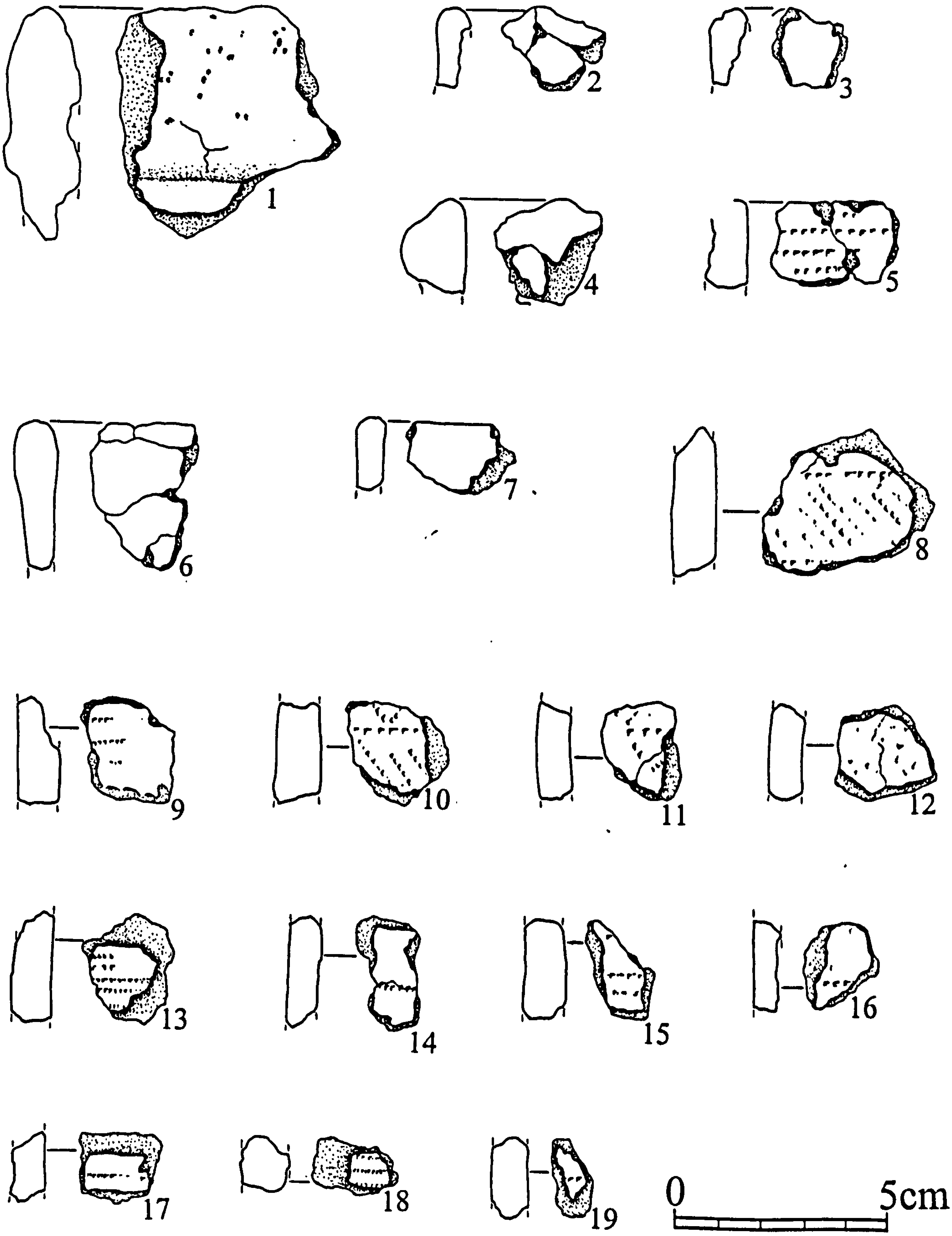
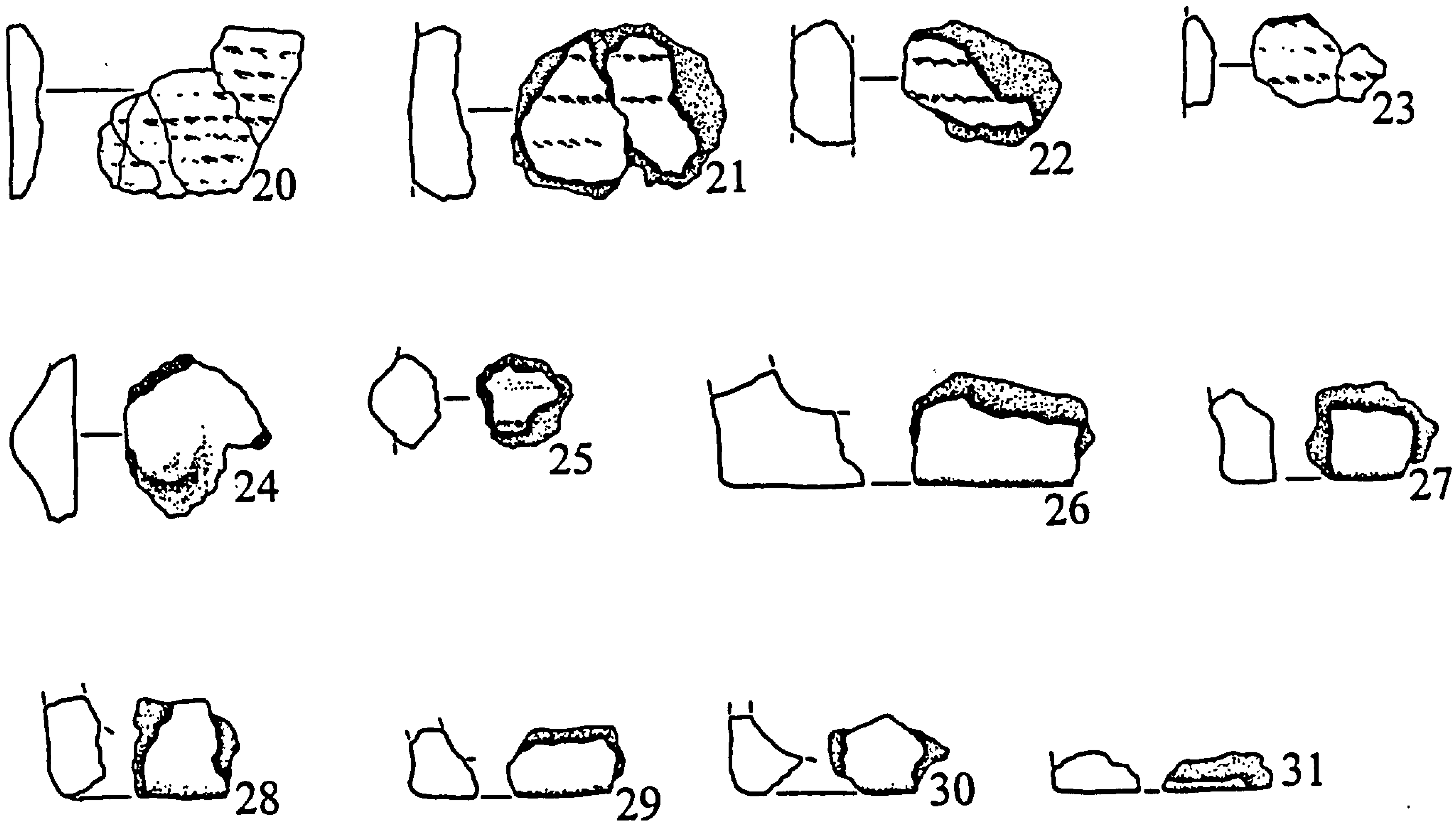


Figure A6.1: Ballachrink (B'Ch 1 - 19)

Ballachrink (B'ch).



Ballacottier fieldwalking (B'co)

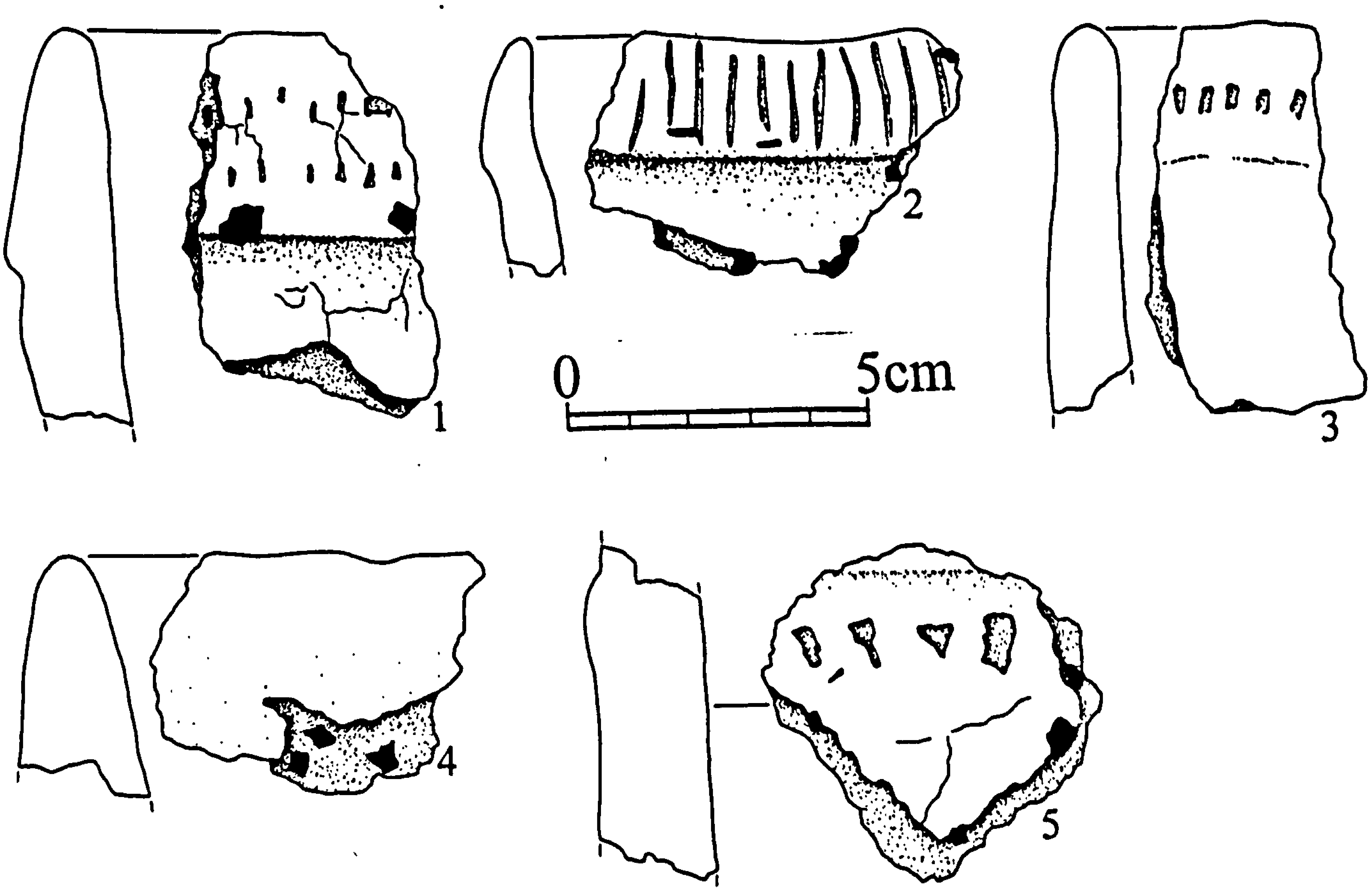
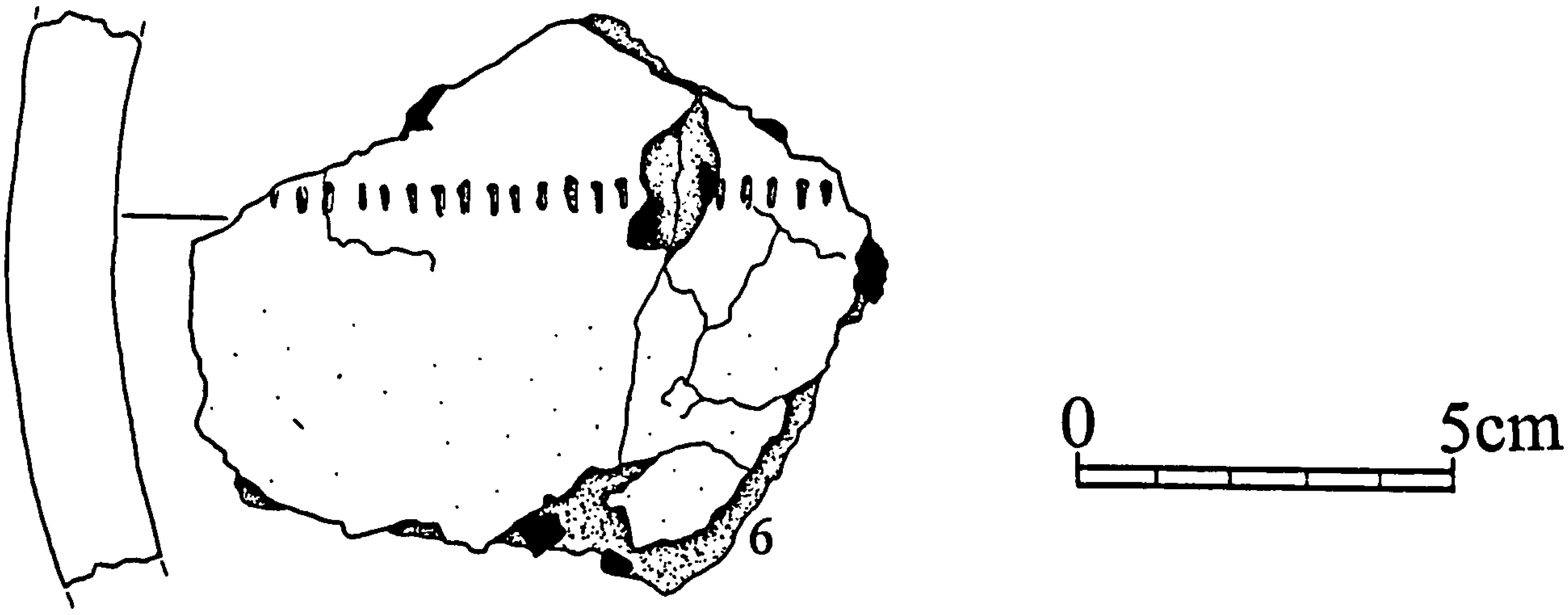


Figure A6.2: Ballachrink (B'Ch 20 - 31); Ballacottier (B'co 1 - 5)

Ballacottier fieldwalking (B'co)



Ballacottier excavation (B'co)

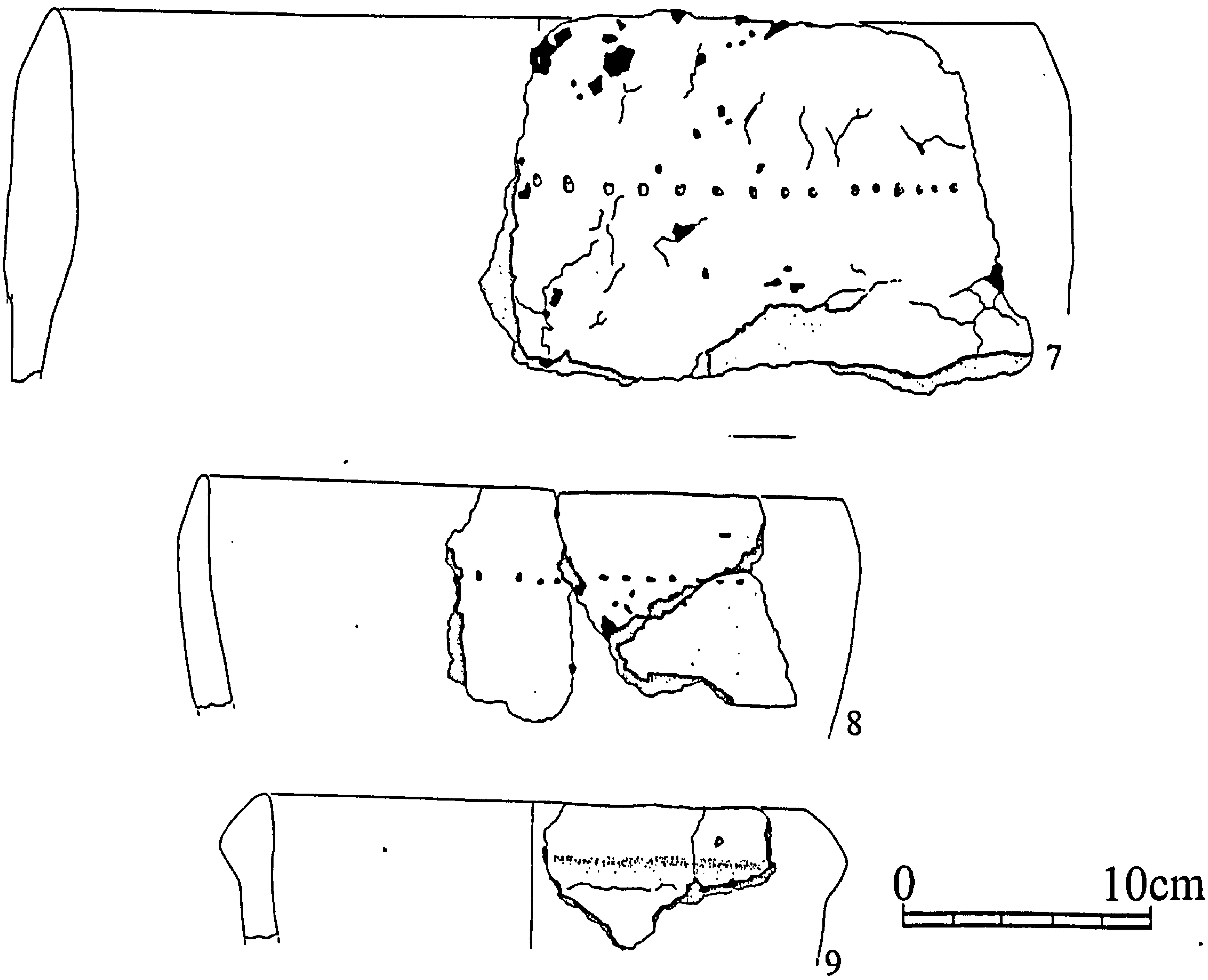


Figure A6.3: Ballacottier (B'co 6 - 9)

Ballacottier excavation (B'co)

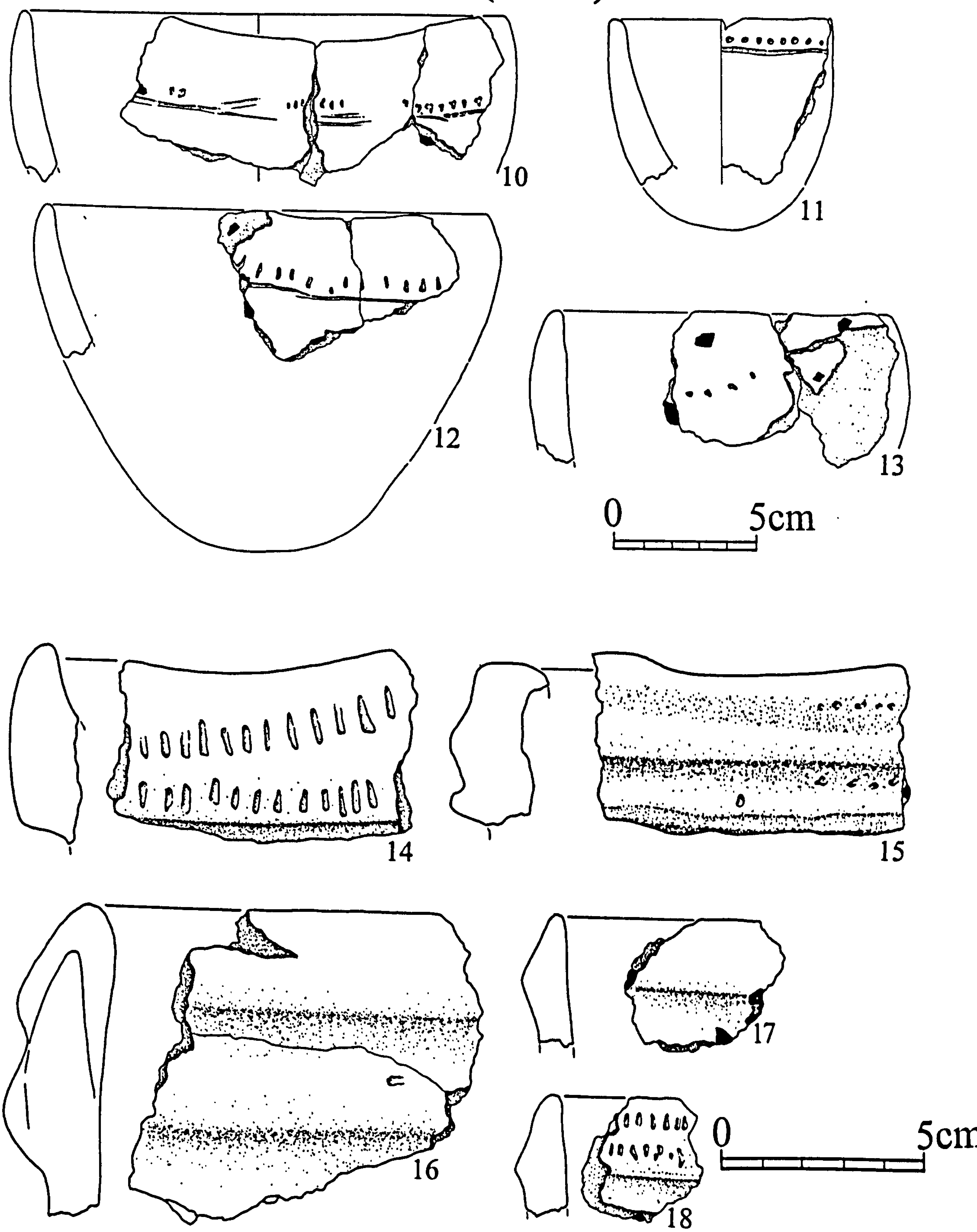


Figure A6.4: Ballacottier (B'co 10 - 18)

Ballacottier excavation (B'co)

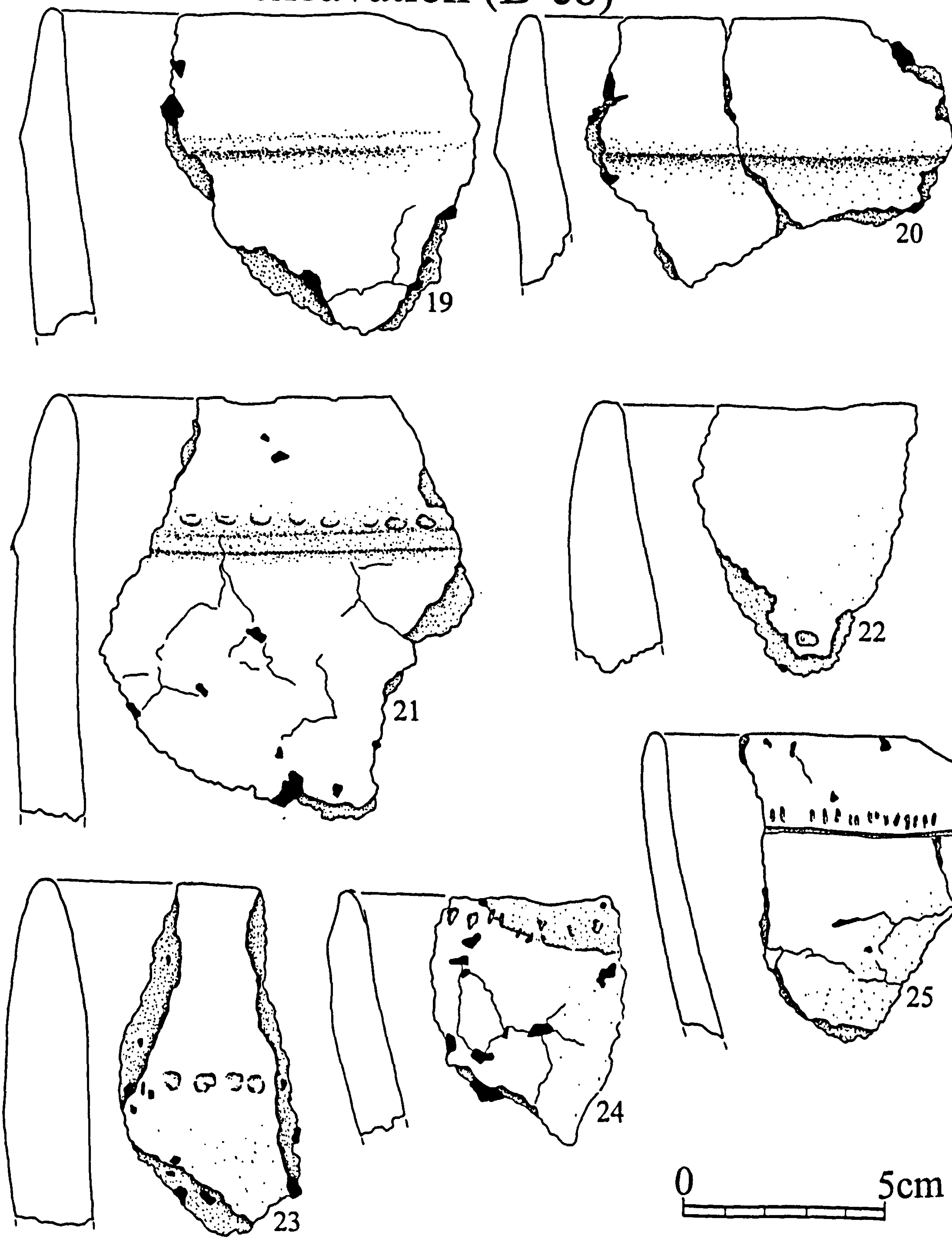


Figure A6.5: Ballacottier (B'co 19 - 25)

Ballacottier excavation (B'co)

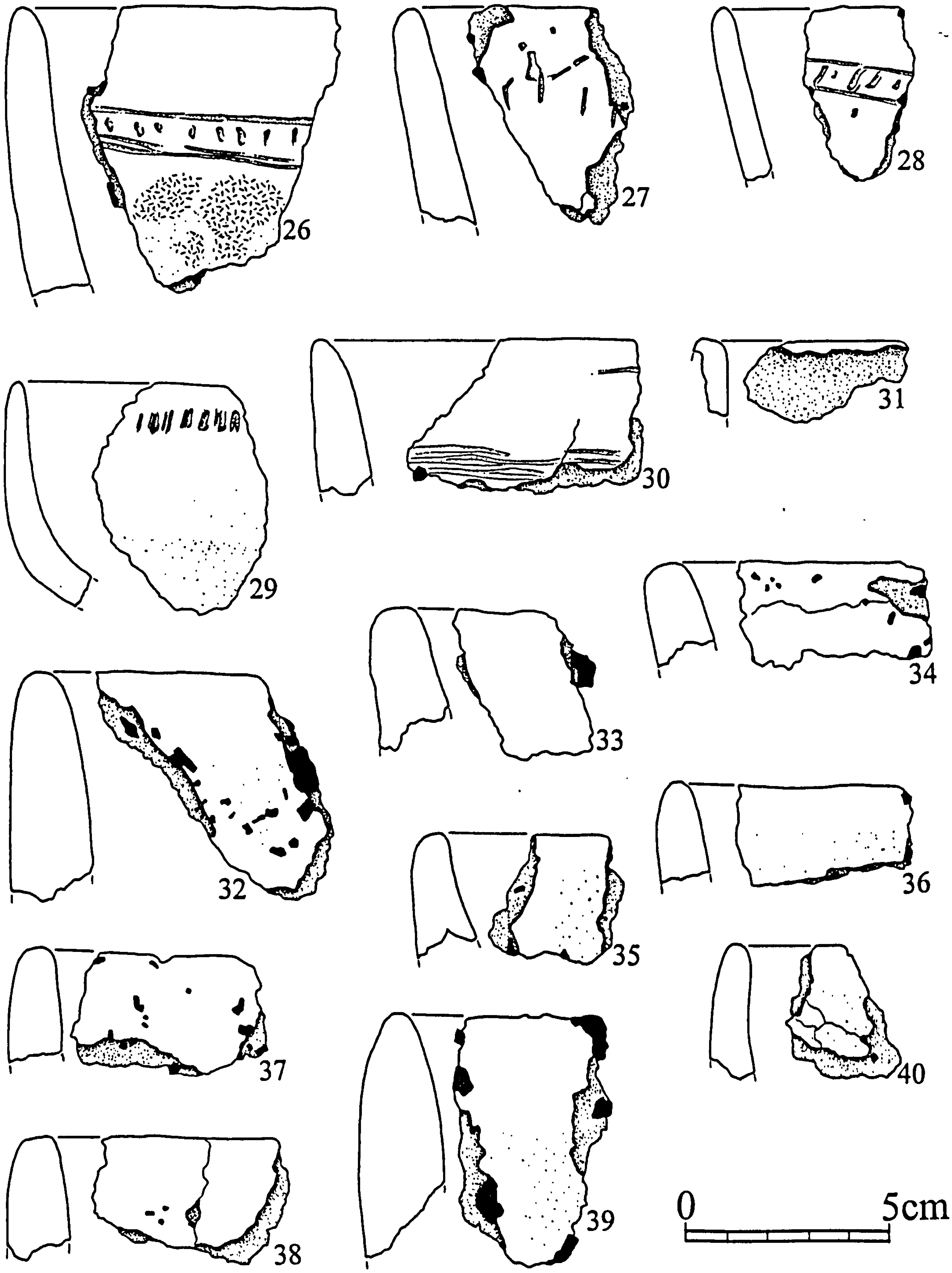


Figure A6.6: Ballacottier (B'co 26 - 40)

Ballacottier excavation (B'co)

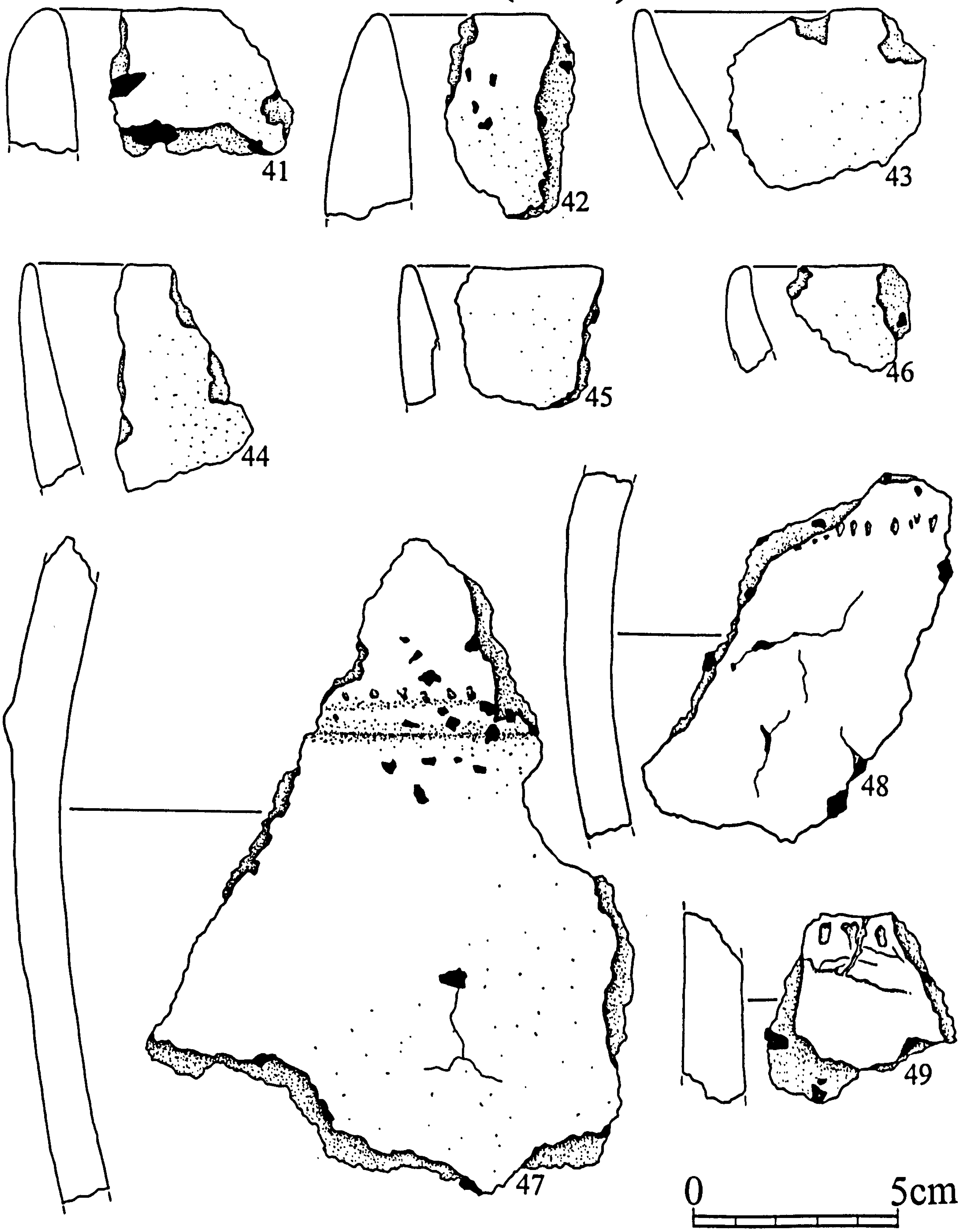
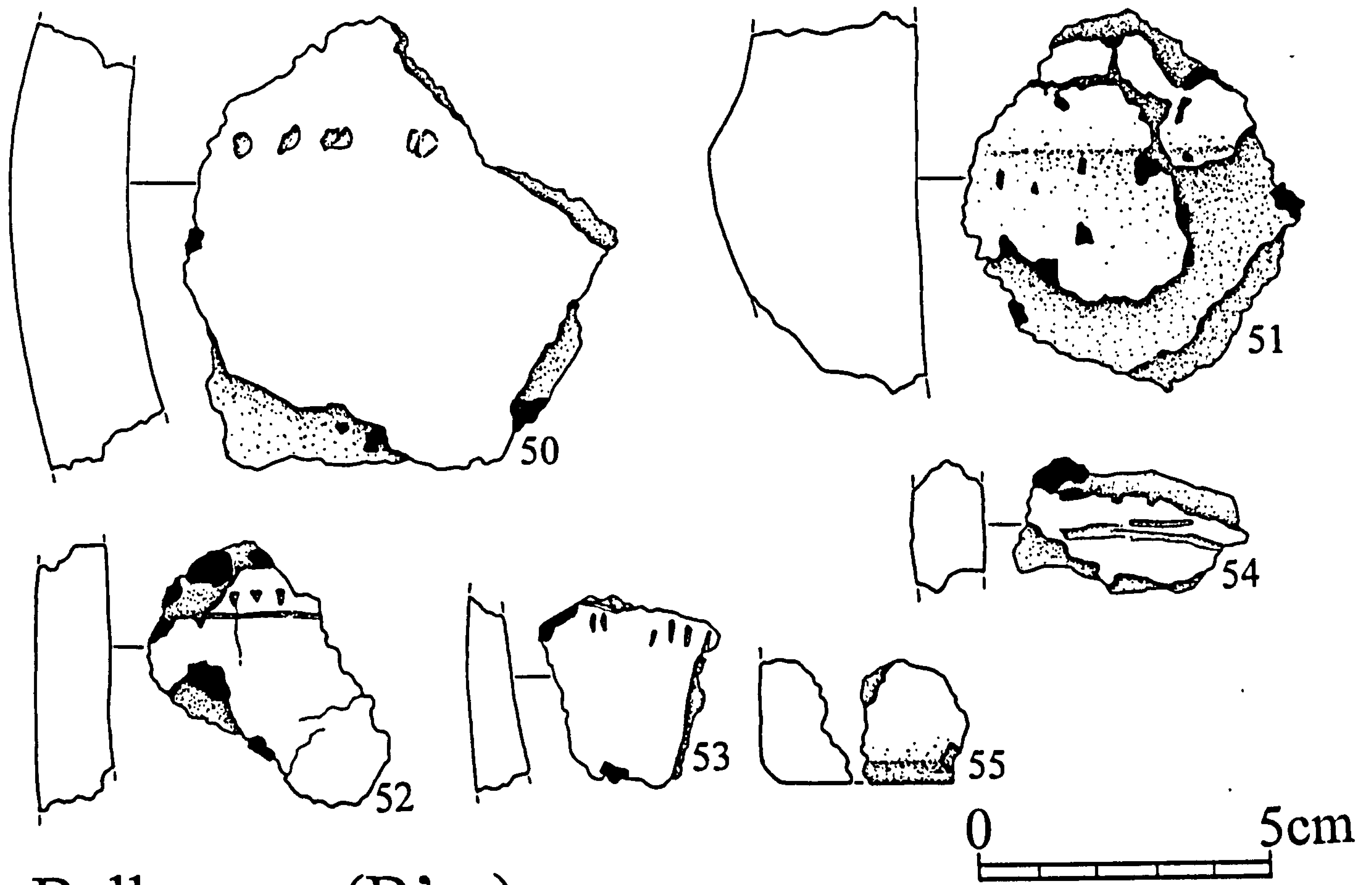


Figure A6.7: Ballacottier (B'co 41 - 49)

Ballacottier excavation (B'co)



Ballacross (B'cr)

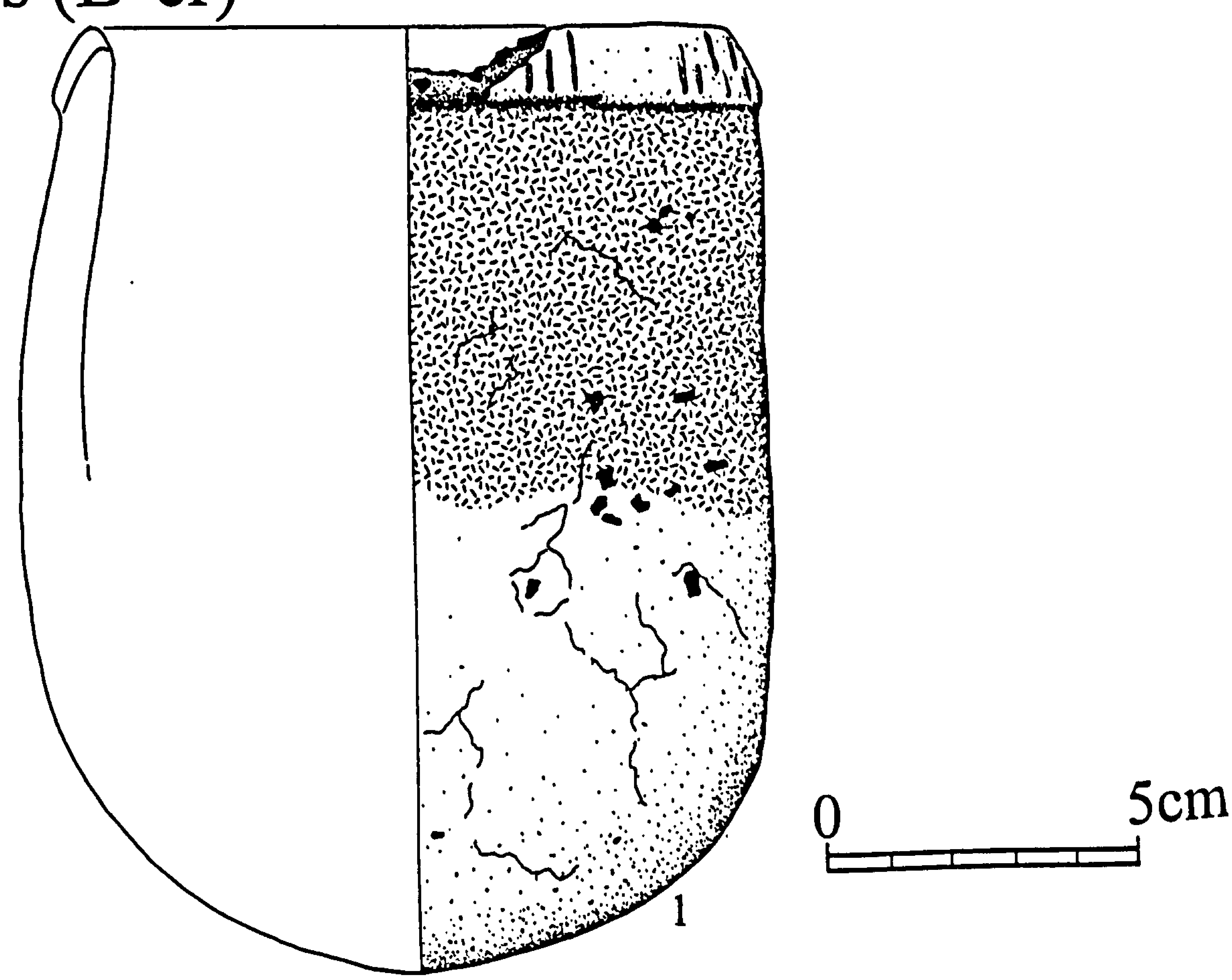


Figure A6.8: Ballacottier (B'co 50 - 55); Ballacross (B'cr 1)

Ballagawne (B'ga)

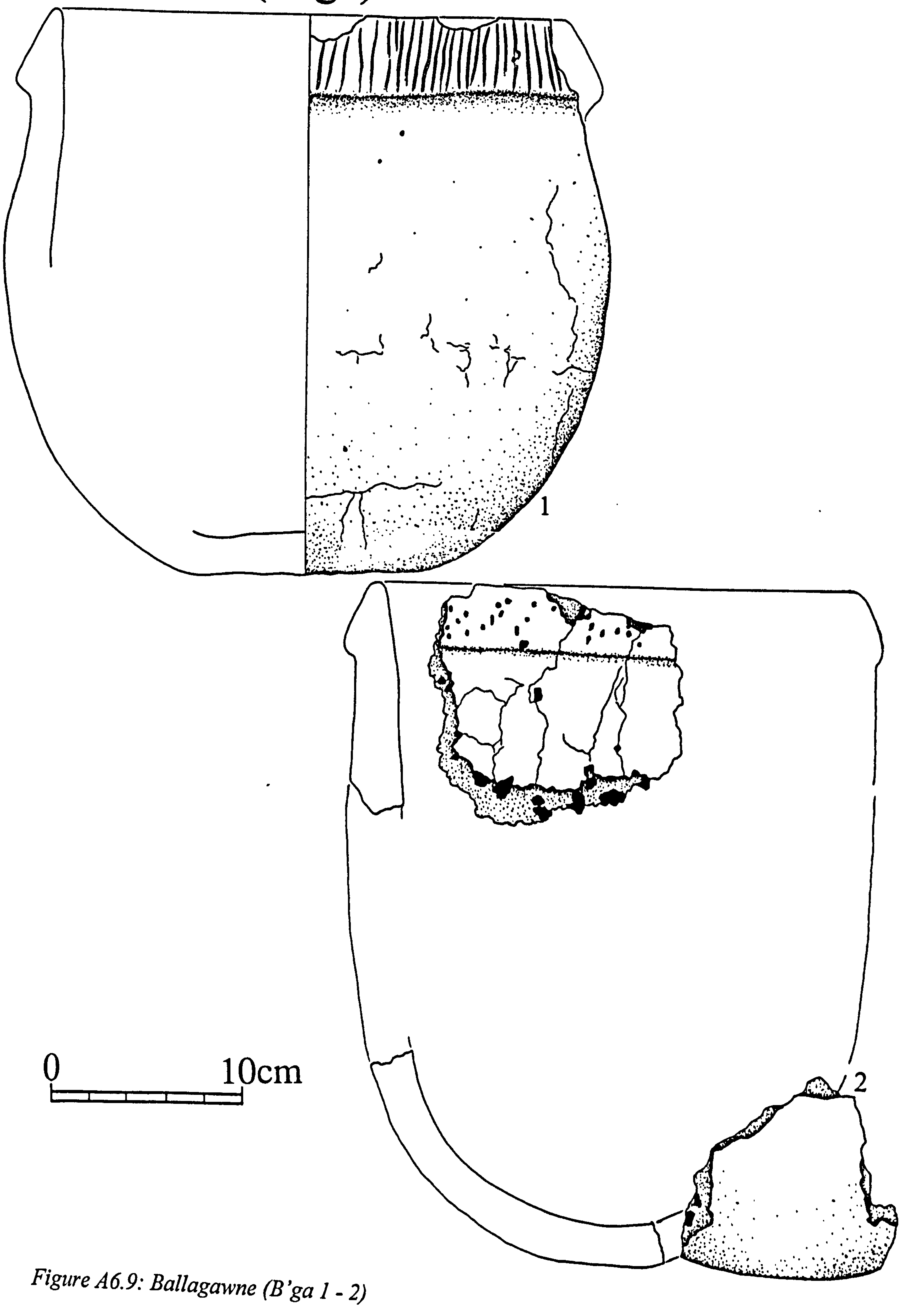


Figure A6.9: Ballagawne (B'ga 1 - 2)

Ballaharra (B'ha)

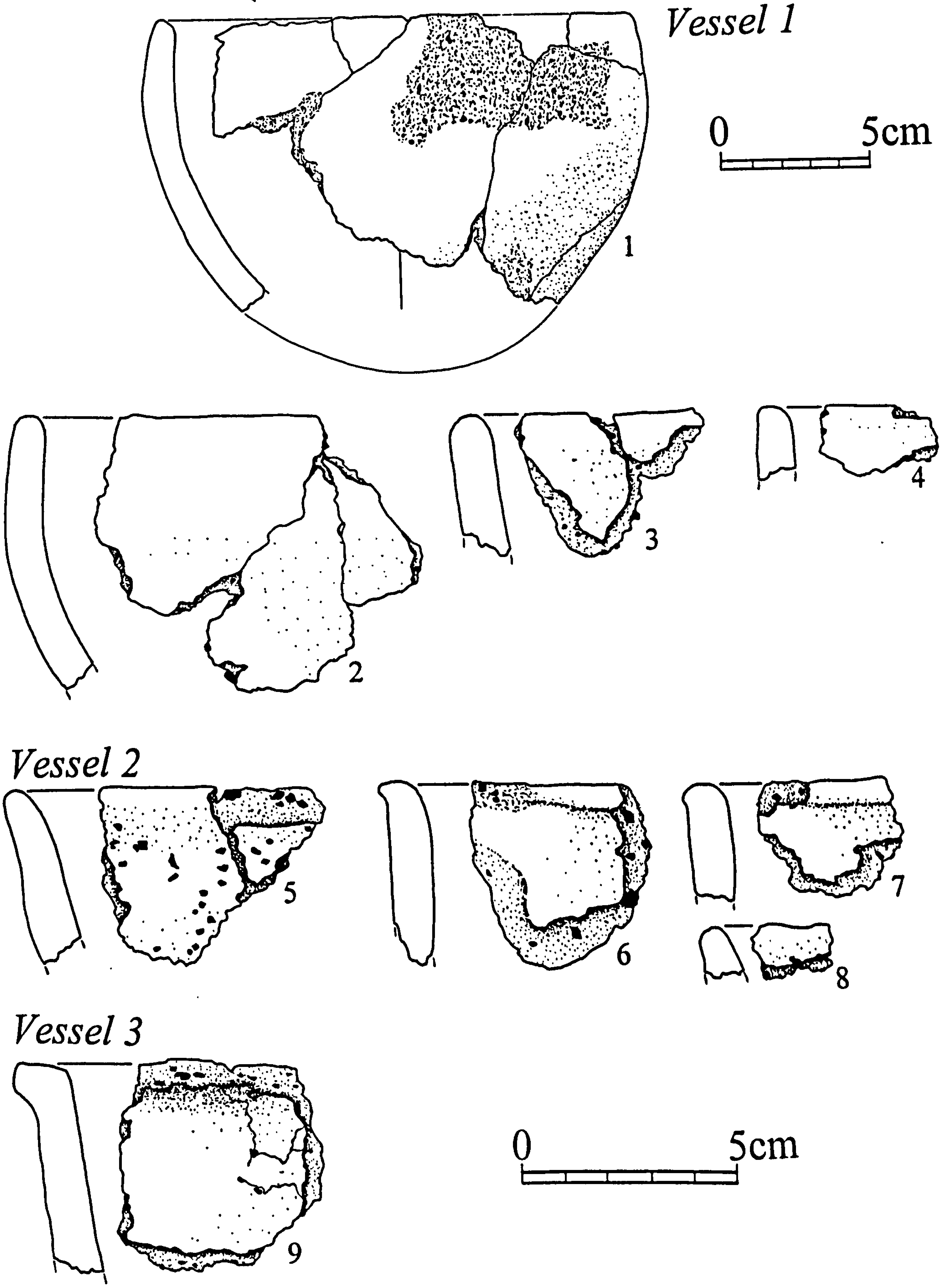
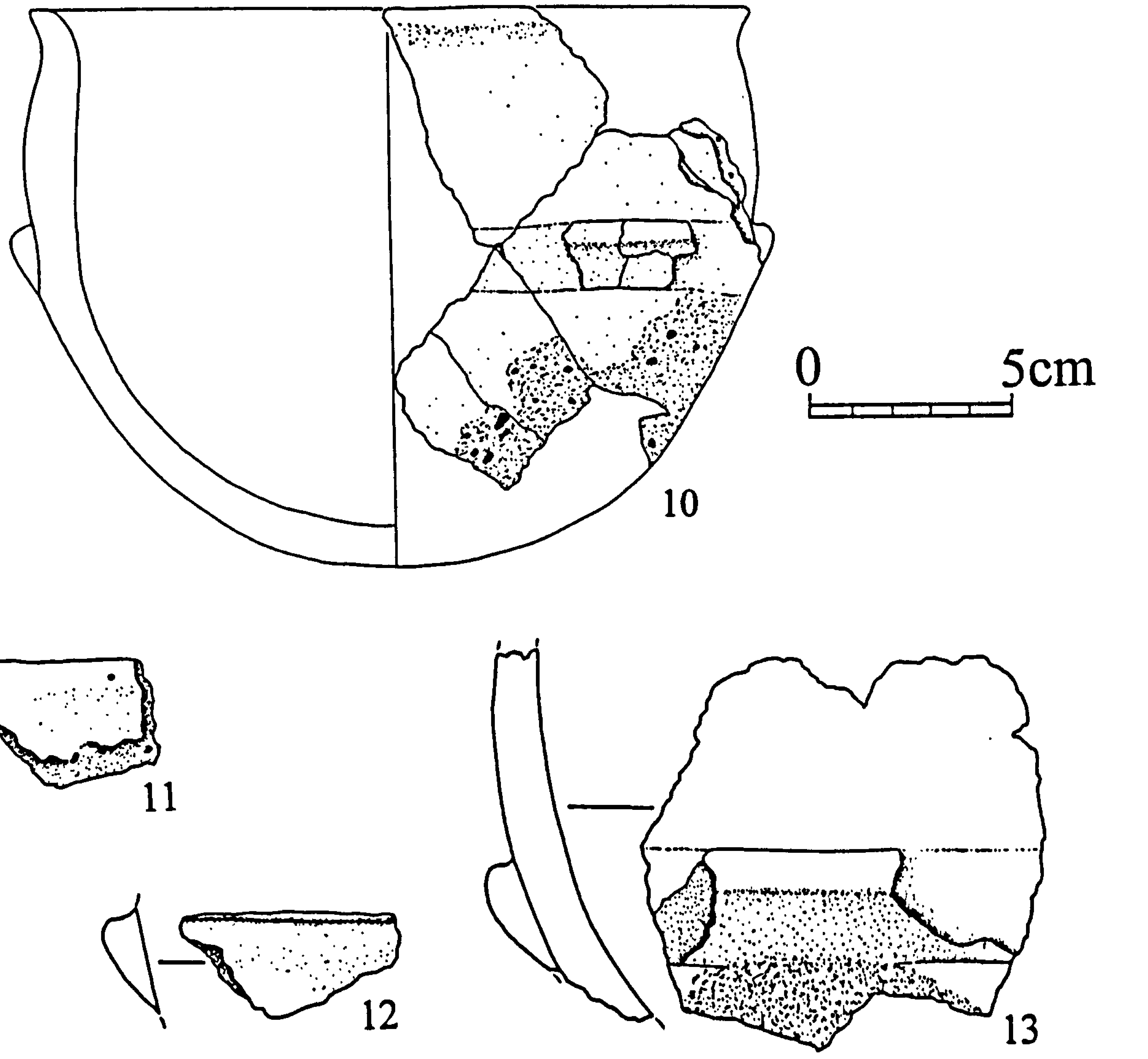


Figure A6.10: Ballaharra (B'ha 1 - 9)

Ballaharra (B'ha)

Vessel 4



Vessel (4 or 5)

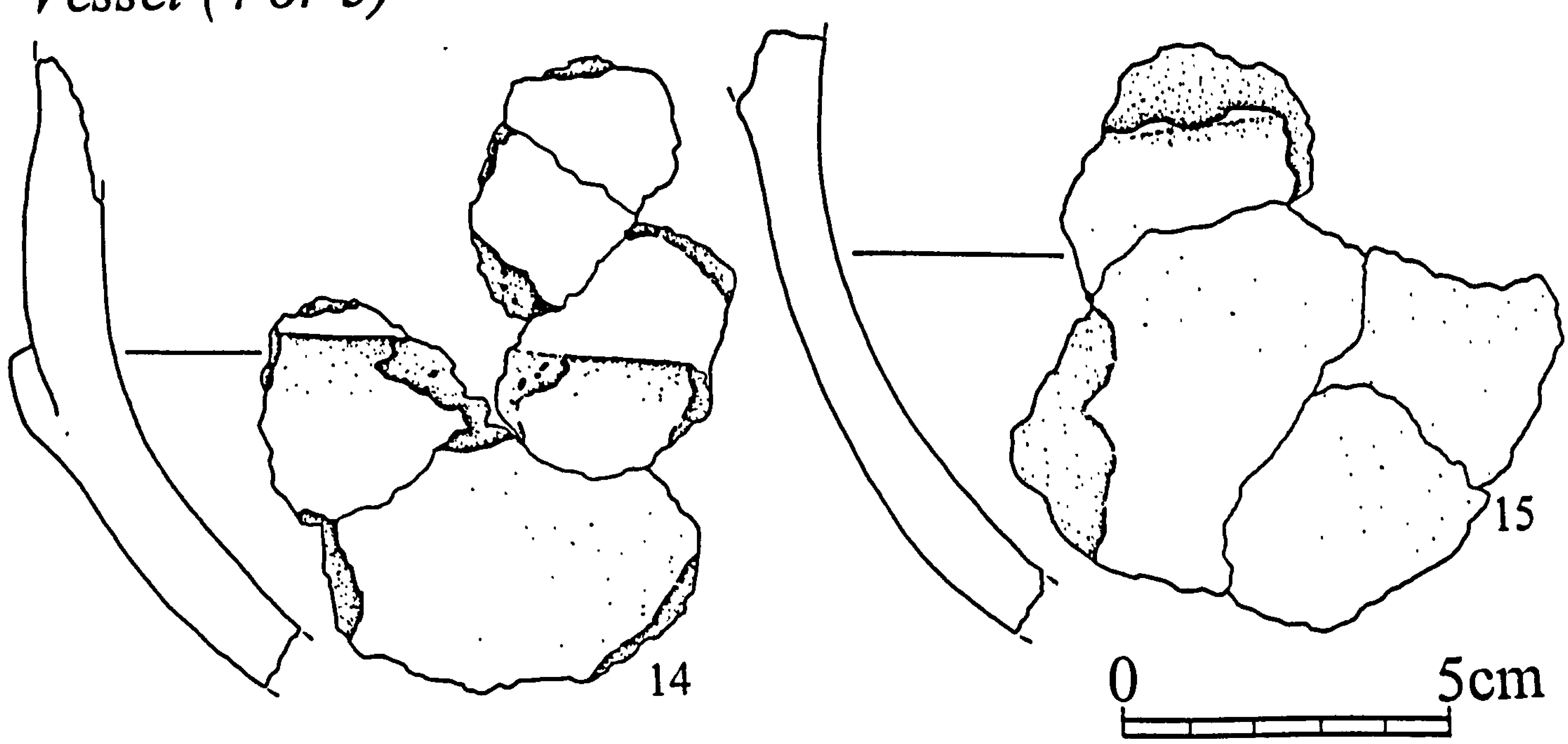


Figure A6.11: Ballaharra (B'ha 10 - 15)

Ballaharra (B'ha)

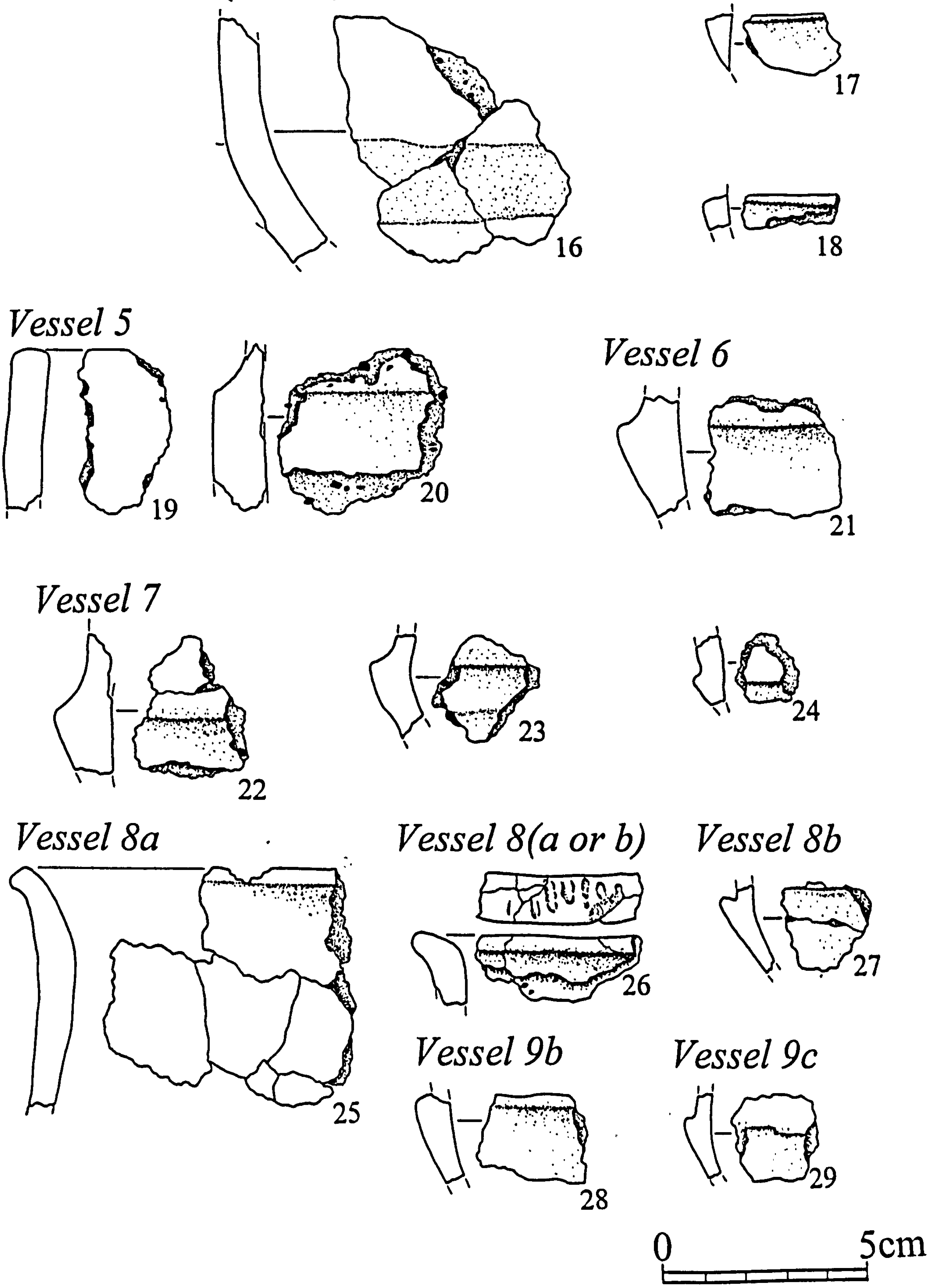


Figure A6.12: Ballaharra (B'ha 16 - 29)

Ballaharra (B'ha)

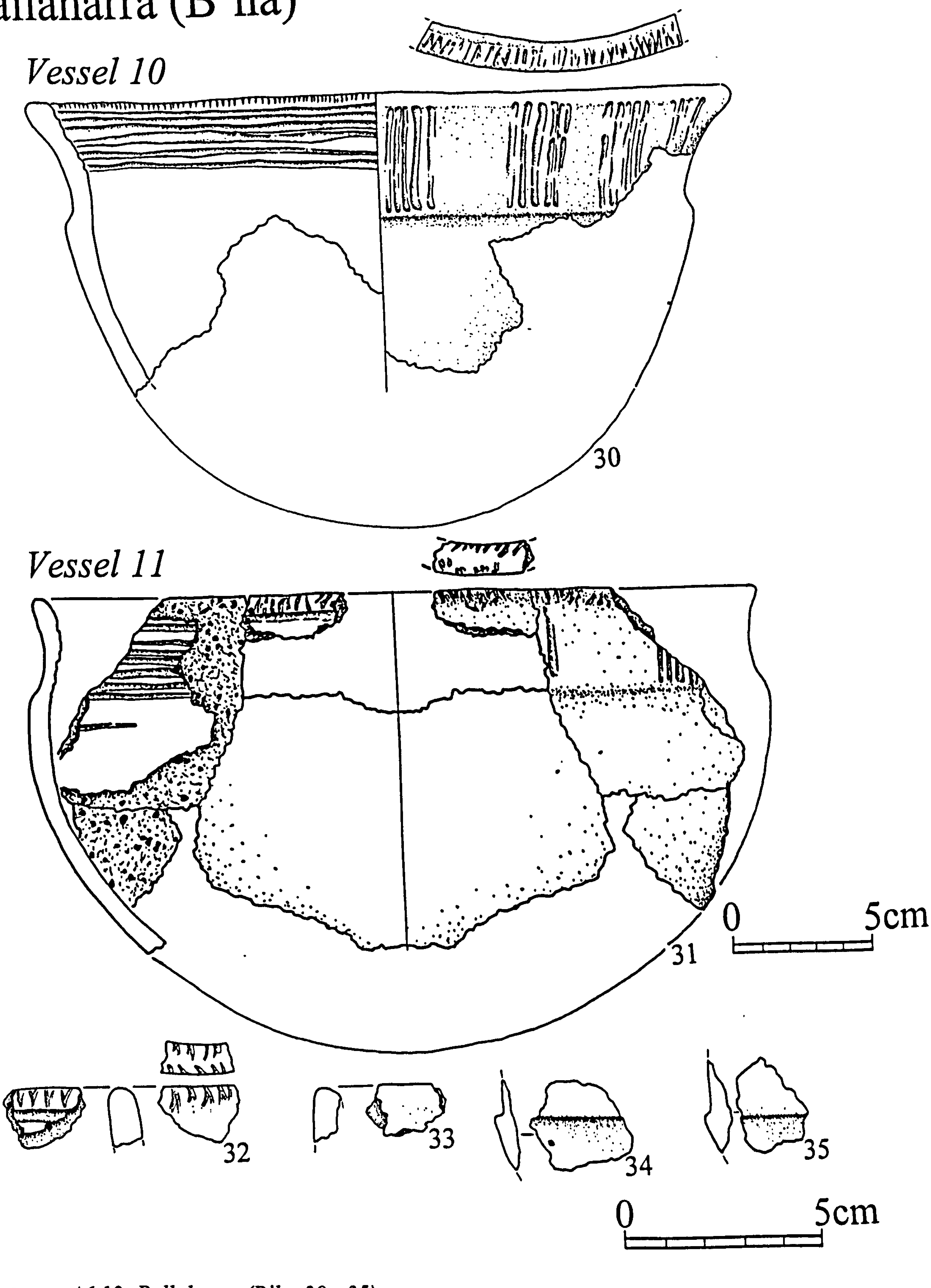


Figure A6.13: Ballaharra (B'ha 30 - 35)

Ballaharra (B'ha)

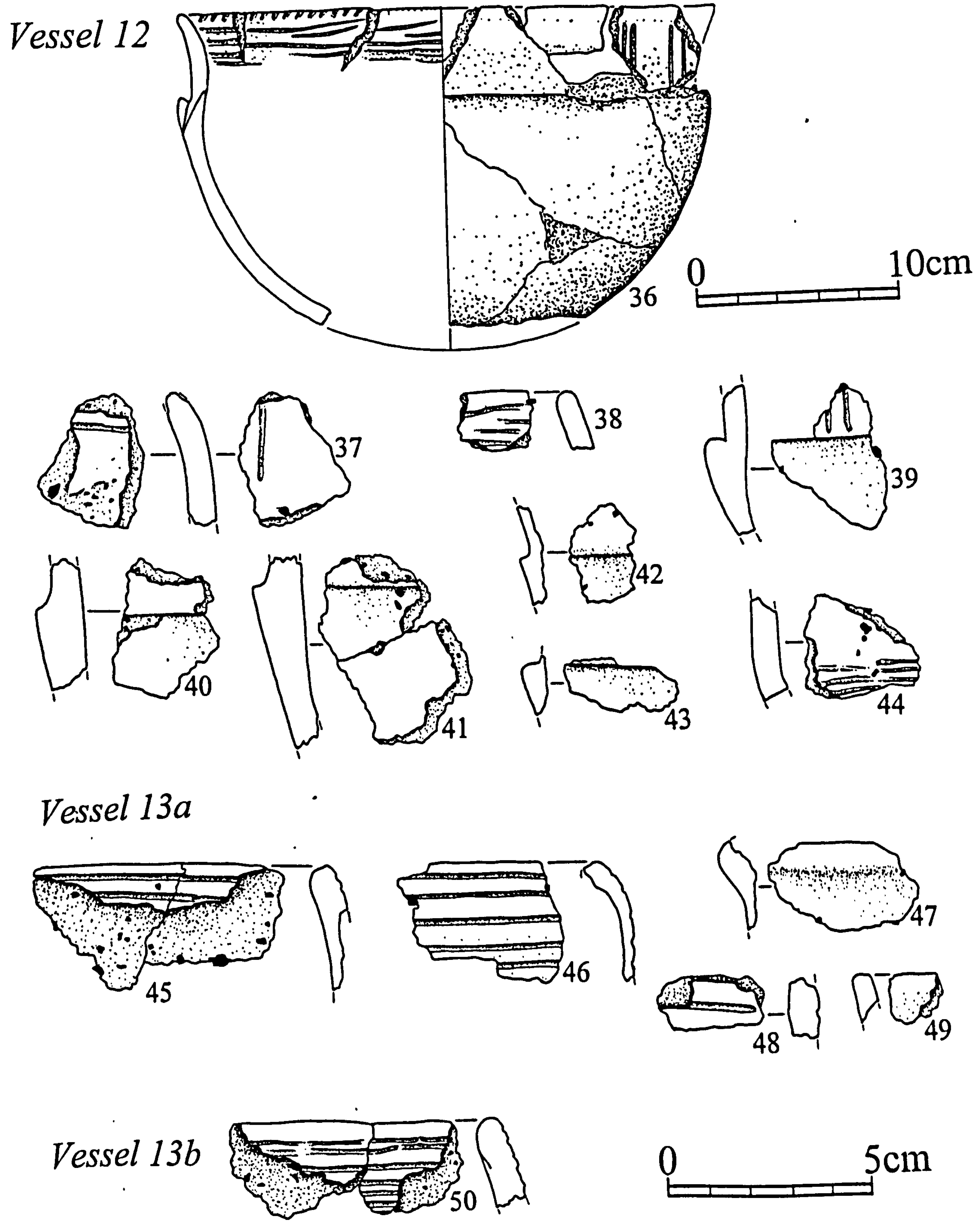


Figure A6.14: Ballaharra (B'ha 36 - 50)

Ballaharra (B'ha)

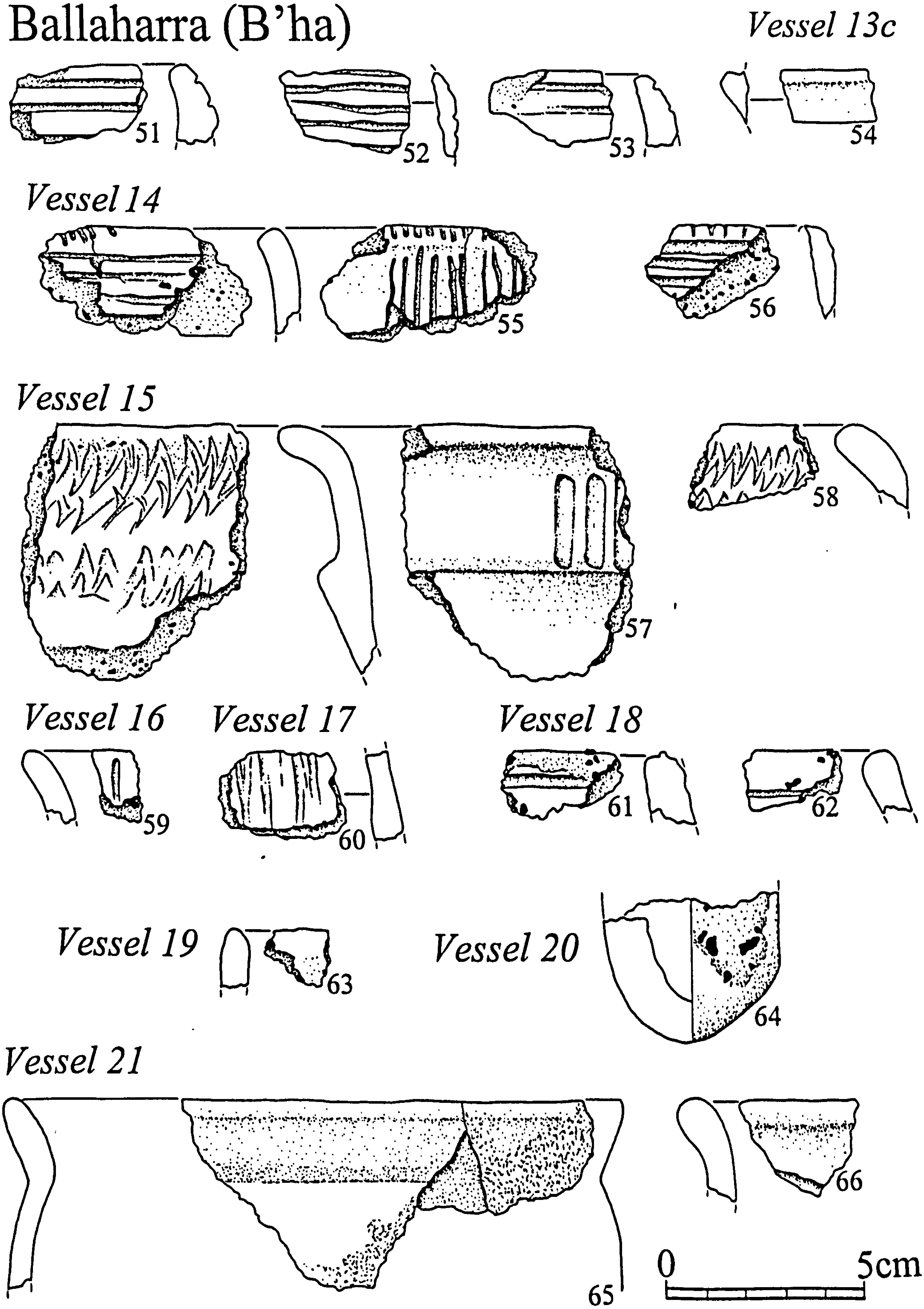
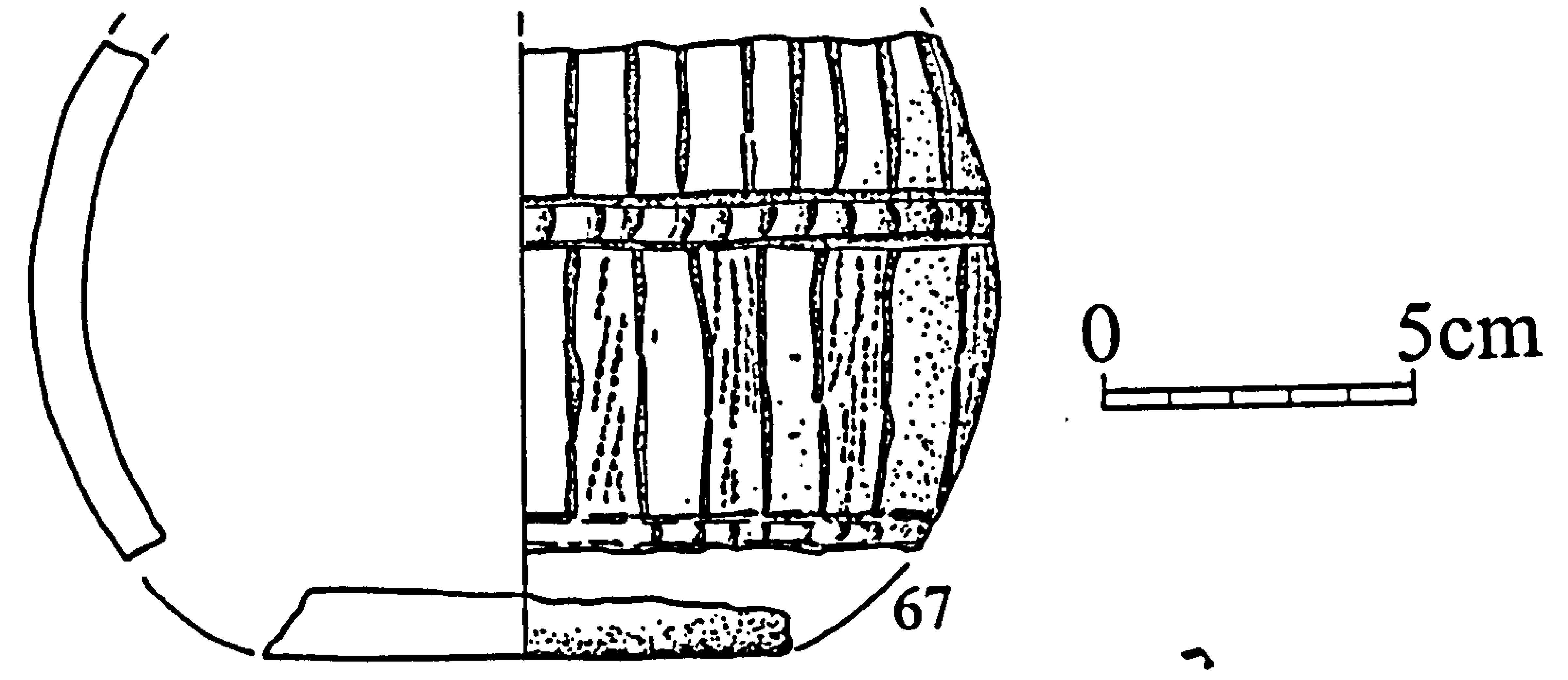


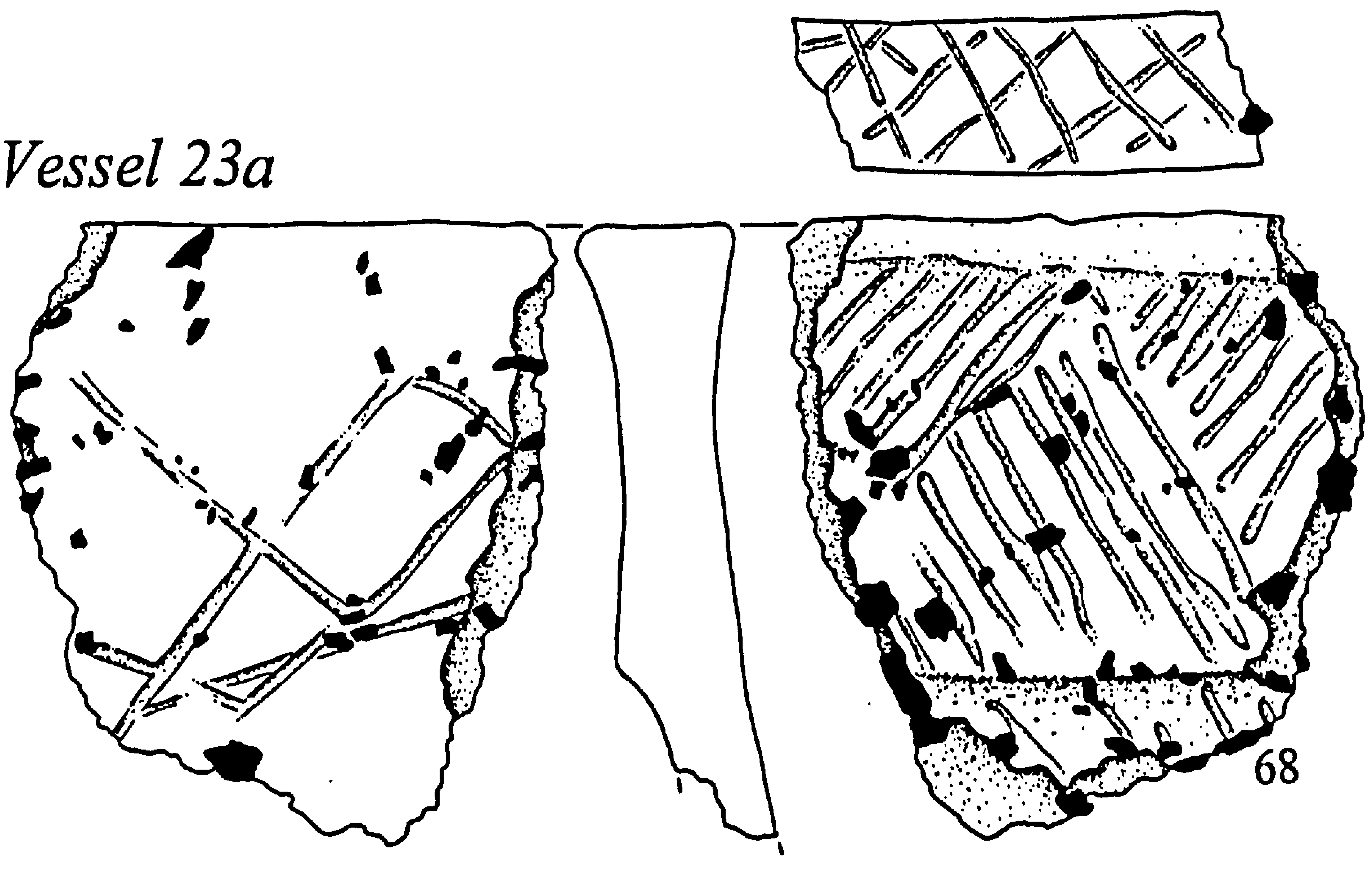
Figure A6.15: Ballaharra (B'ha 51 - 66)

Ballaharra (B'ha)

Vessel 22



Vessel 23a



Vessel 23b

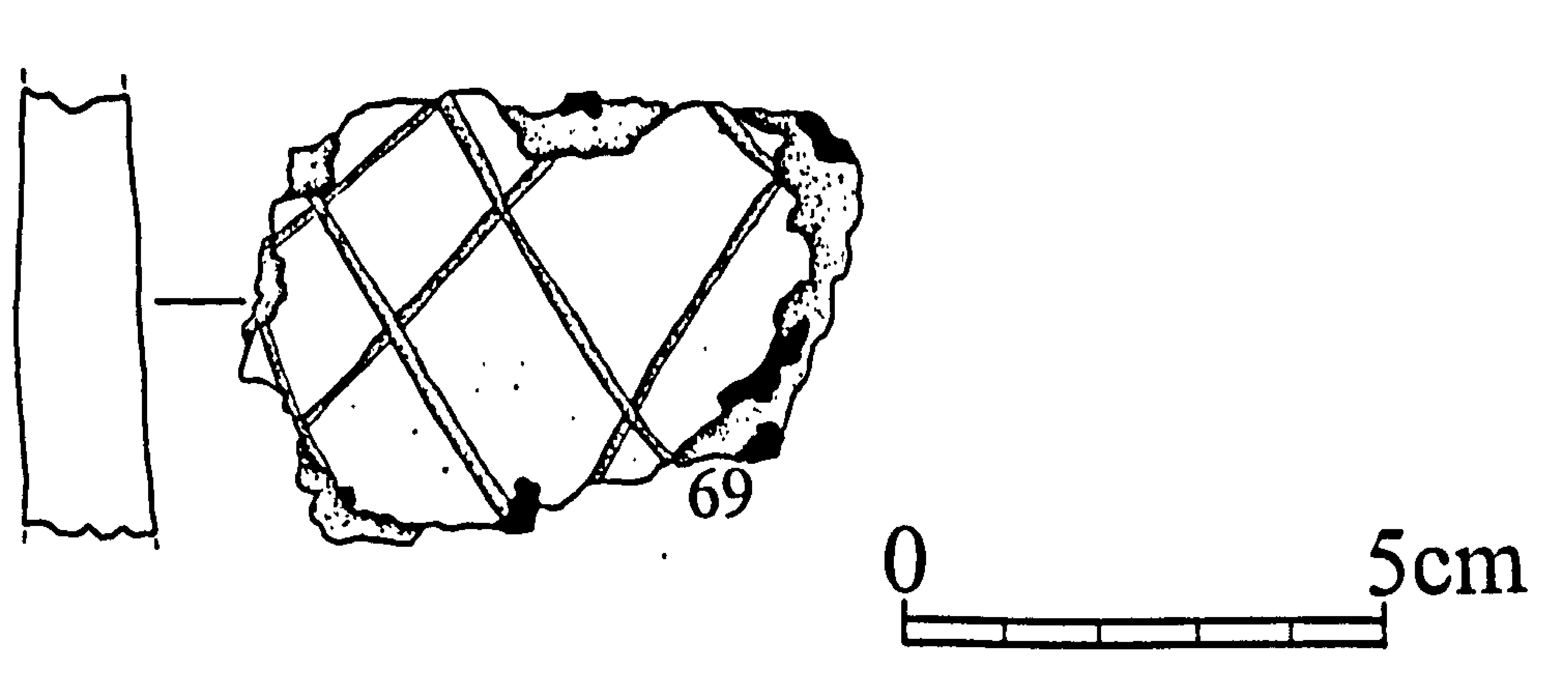
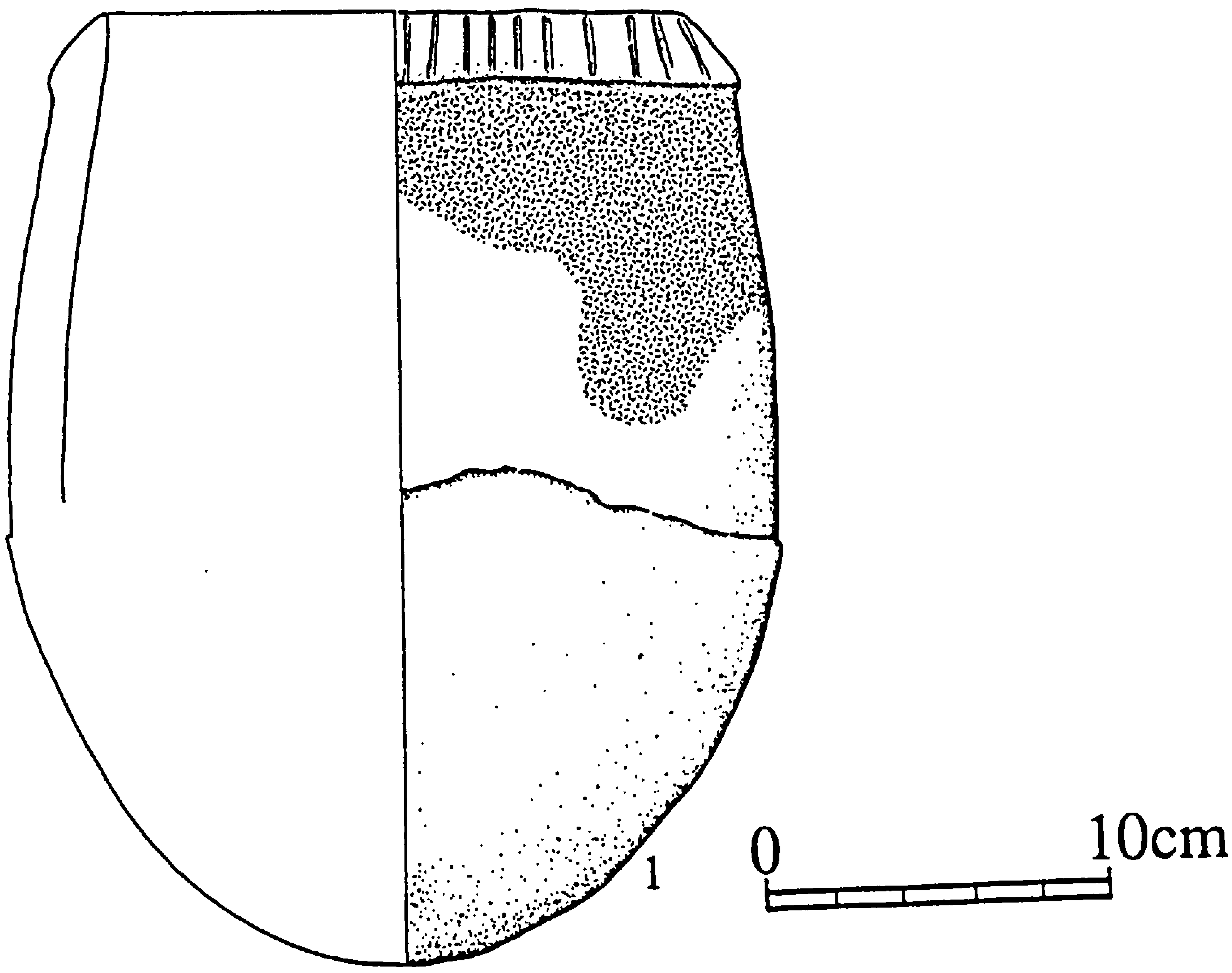
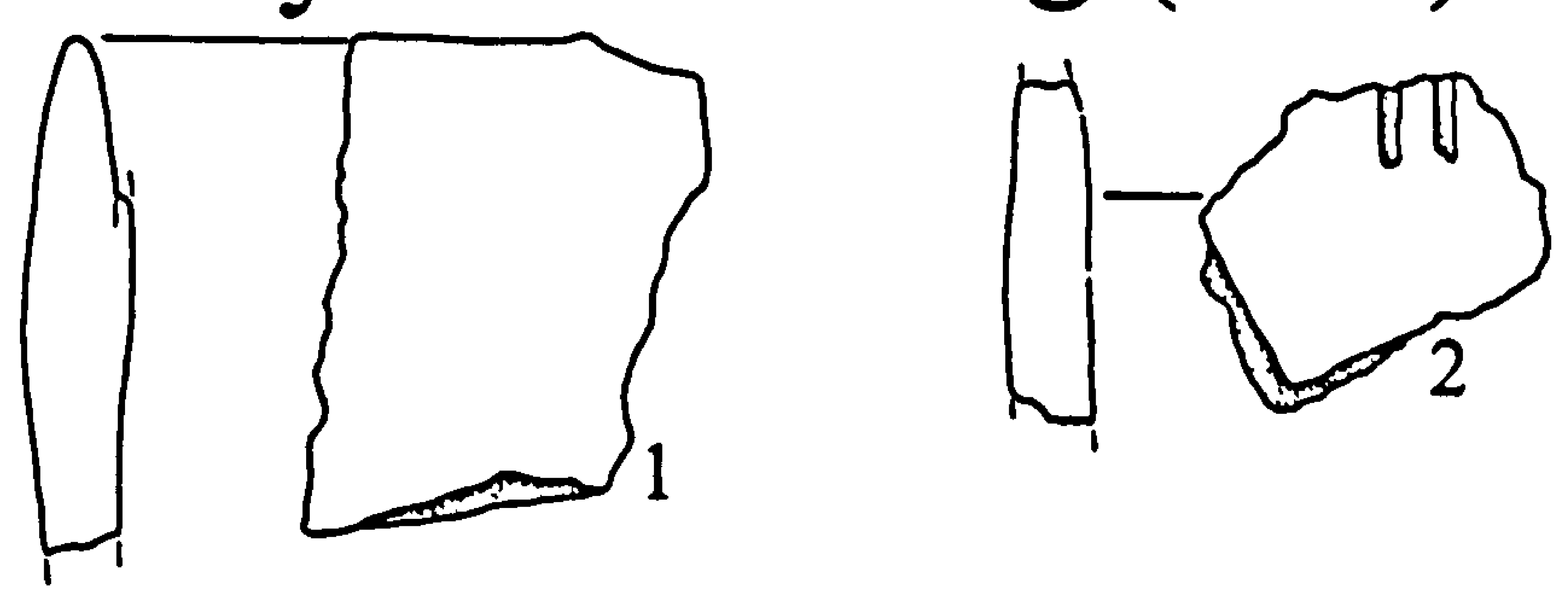


Figure A6.16: Ballaharra (B'ha 67 - 69)

Ballahot (B'ho)



Ballalheaney fieldwalking (B'lh)



Ballalheaney excavation (B'lh)

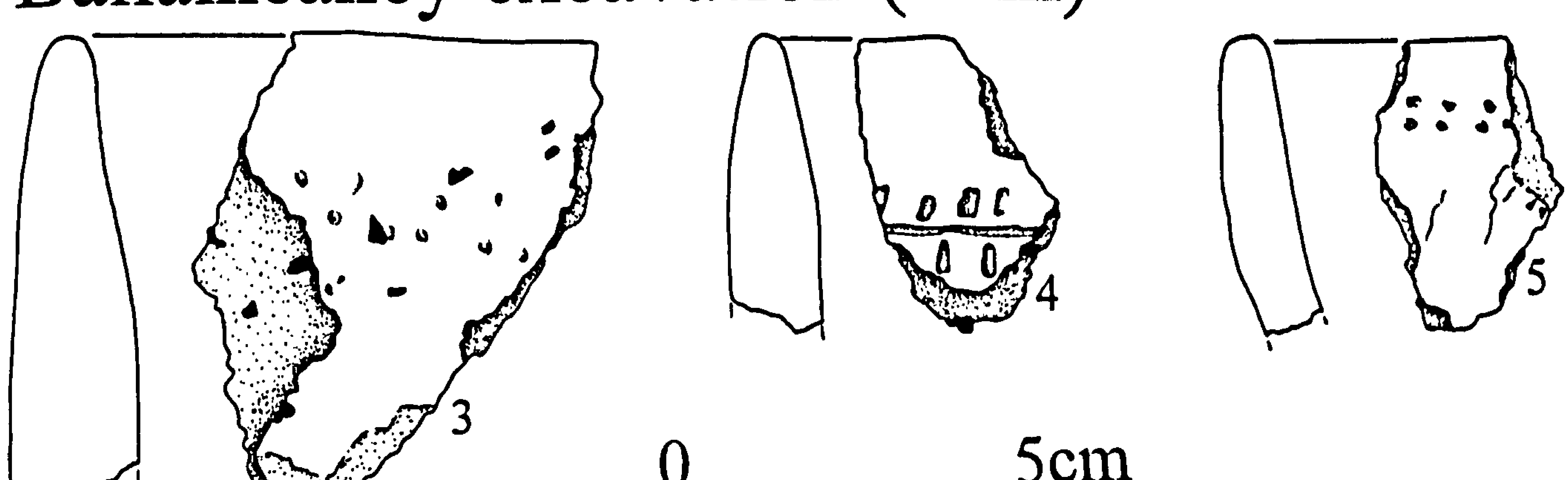
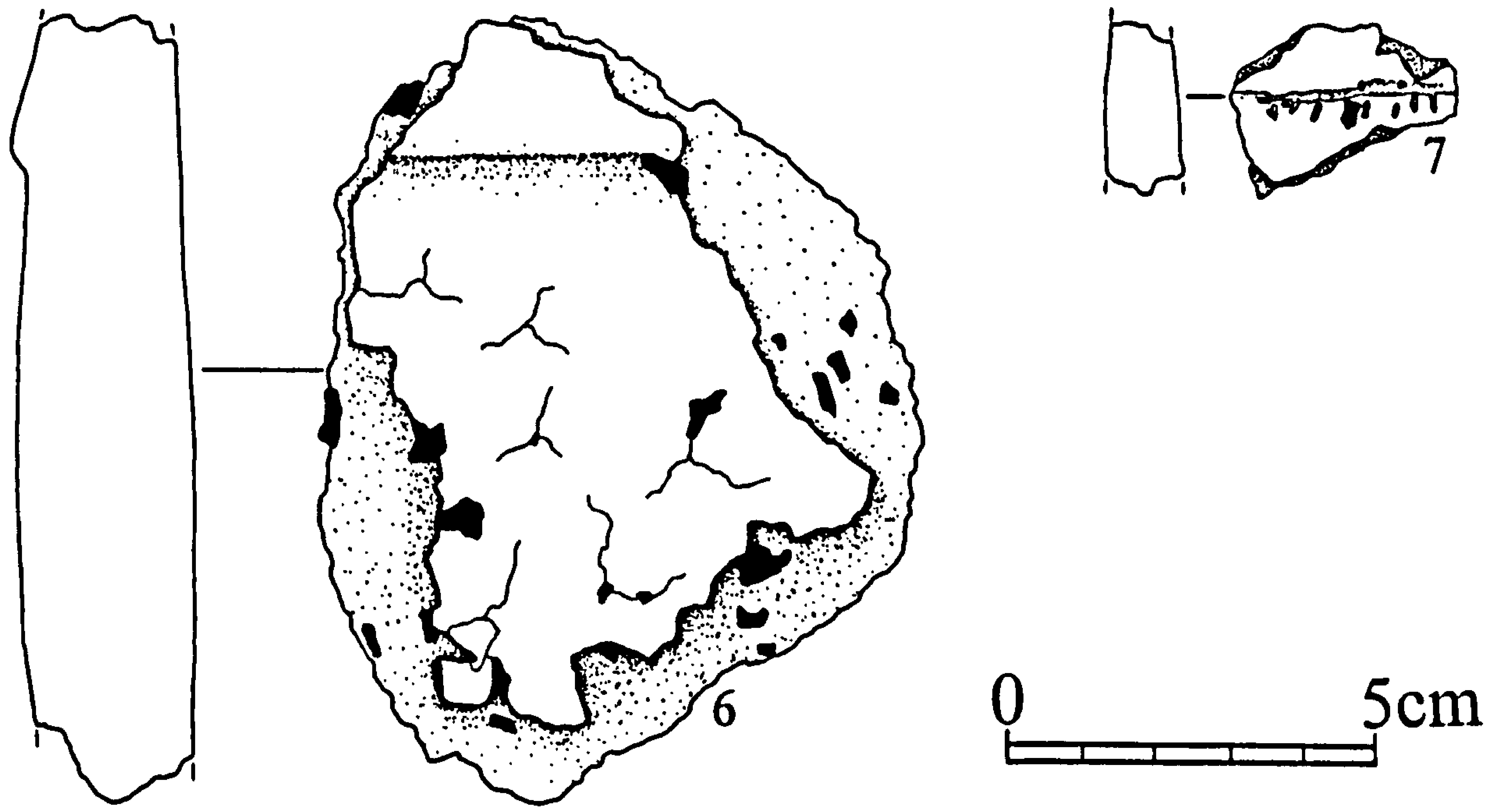


Figure A6.17: Ballahot (B'ho 1); Ballalheaney (B'lh 1 - 5)

Ballalheaney excavation (B'lh)



Ballaquaye (B'qu)

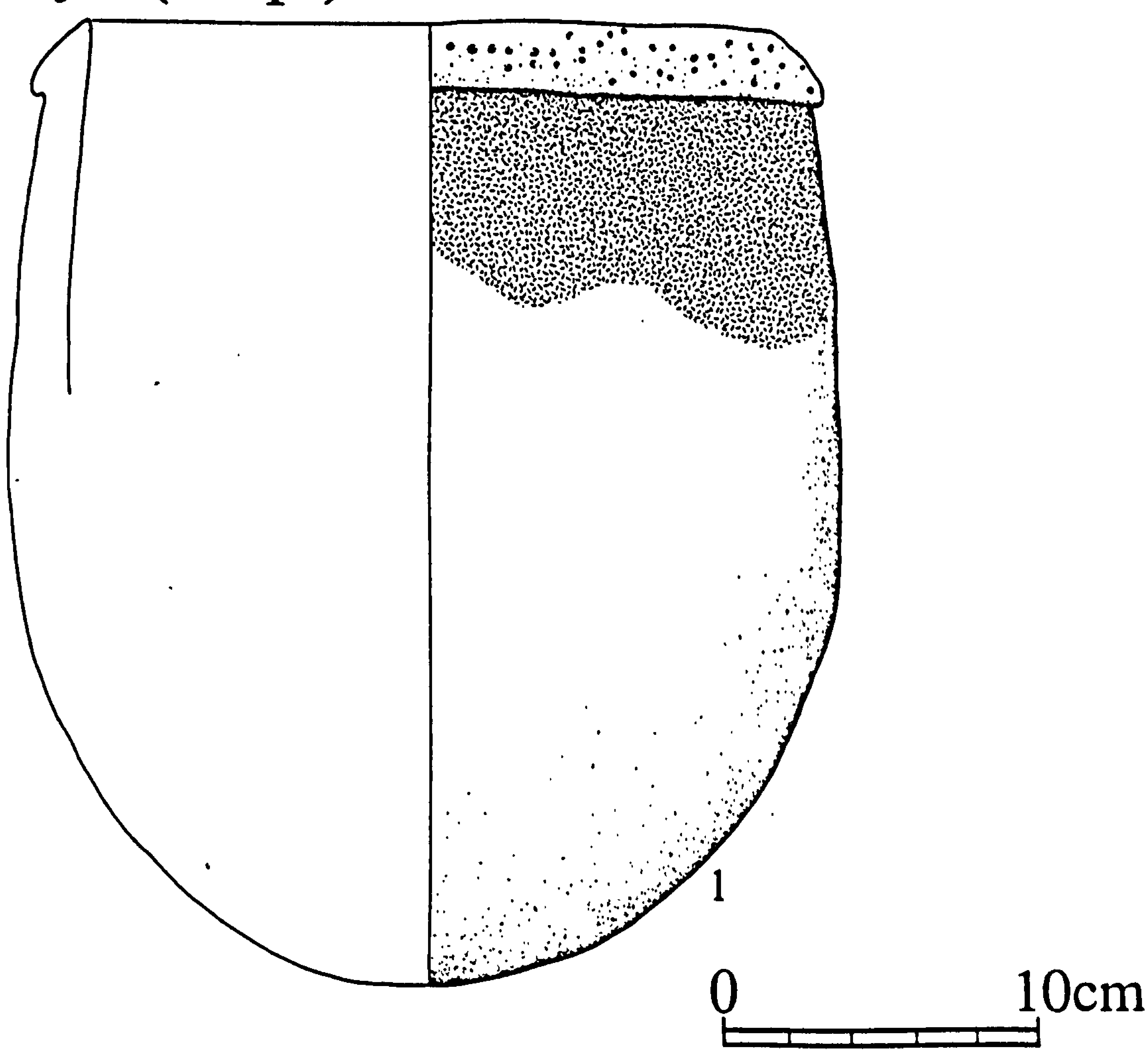


Figure A6.18: Ballalheaney (B'lh 6 -7); Ballaquayle (B'qu 1)

Ballateare (B'te1)

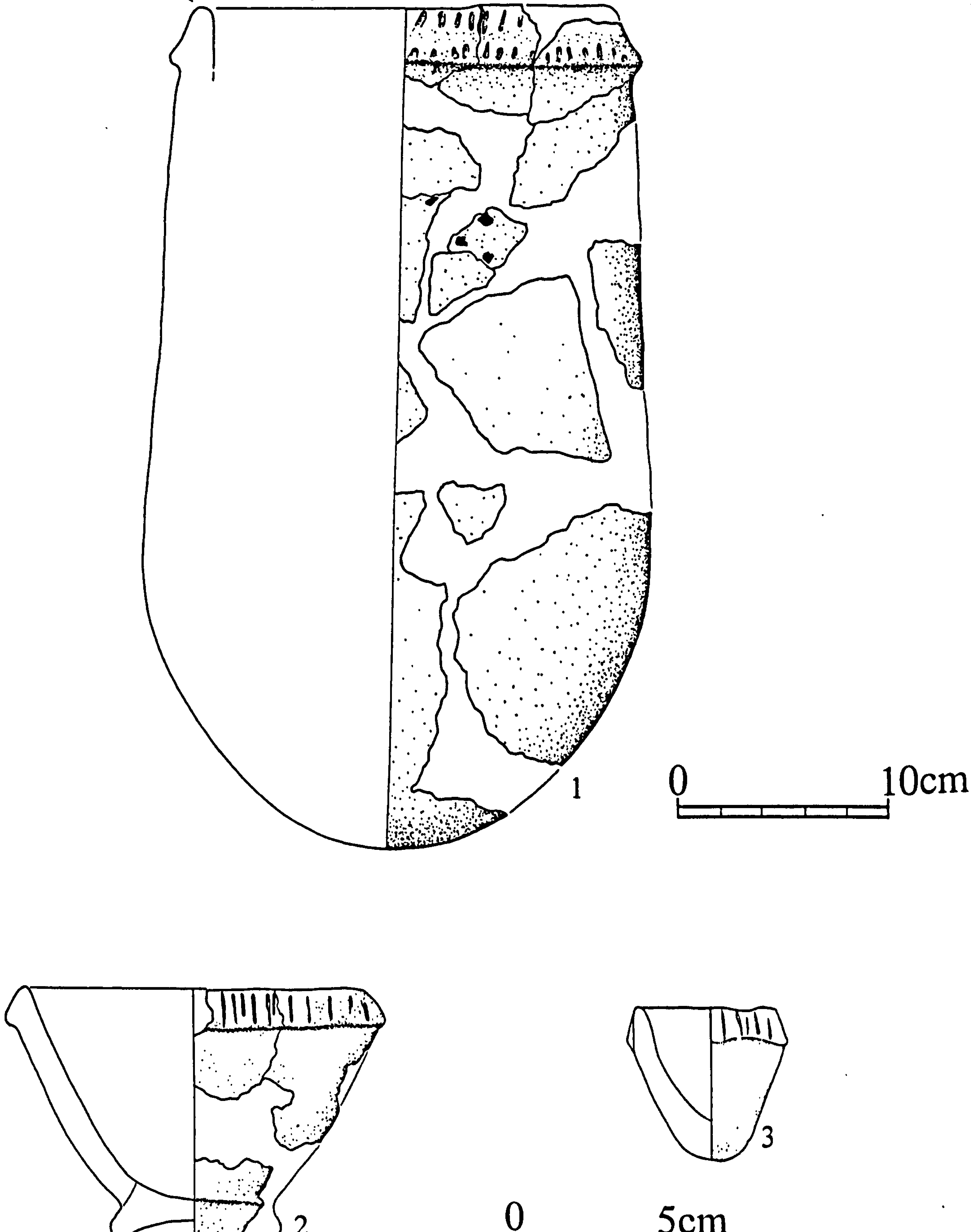


Figure A6.19: Ballateare (B'te1 1 - 3)

Ballateare (B'te1)

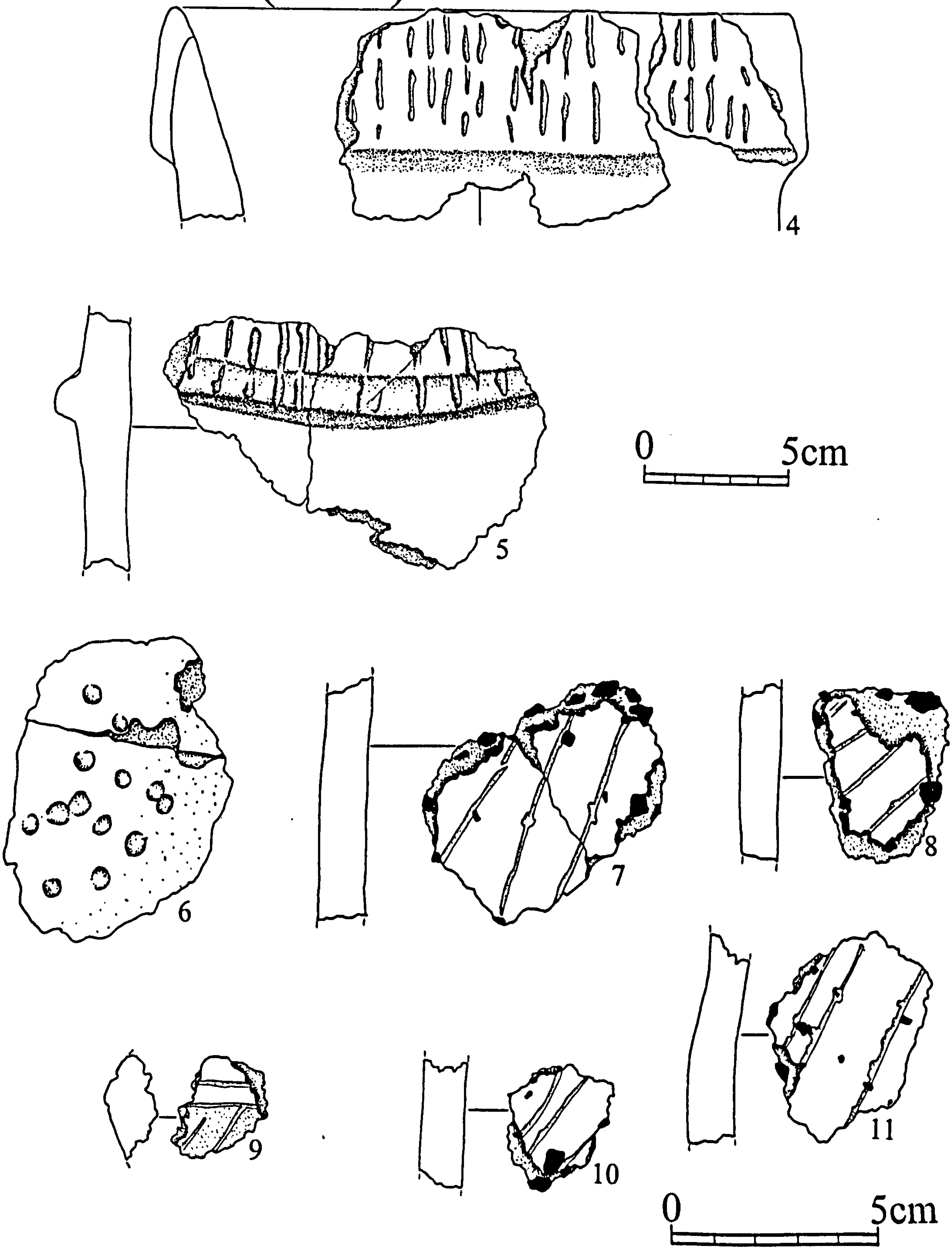
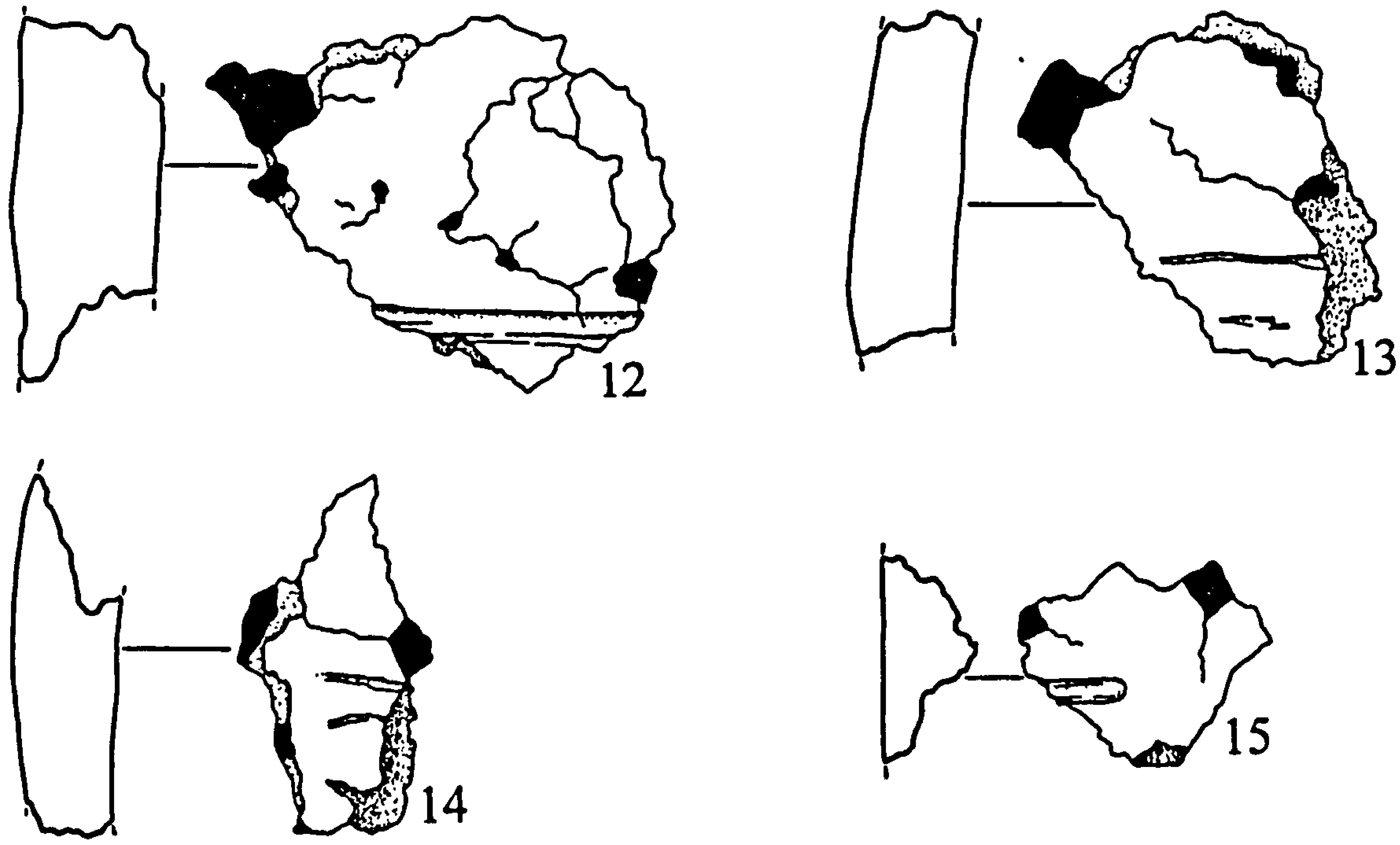


Figure A6.20: Ballateare (B'te1 4 - 11)

Ballateare (B'te1)



Ballateare, Dutch Barn (B'te2)

Ballavarry fieldwalking (B'va)

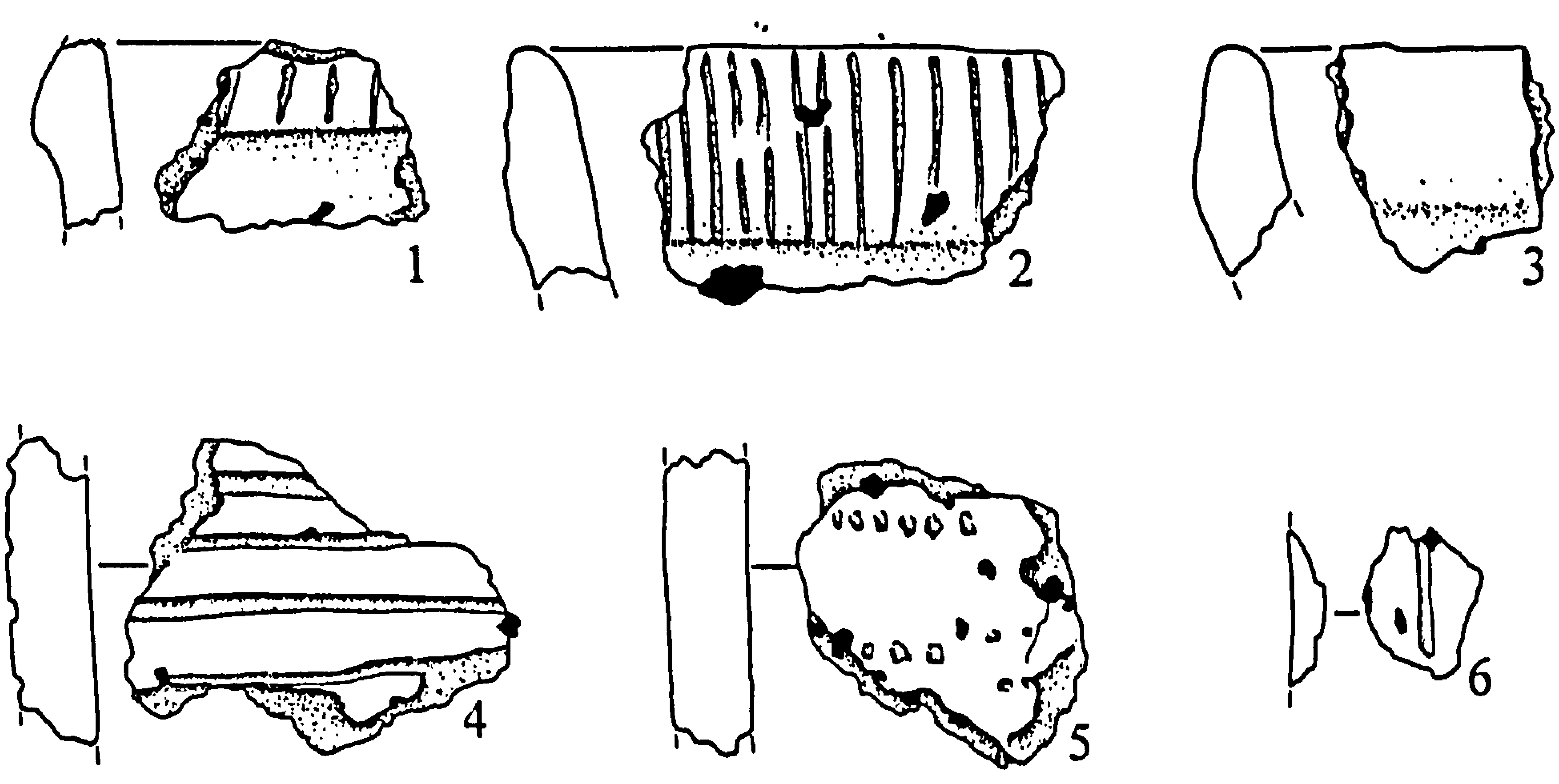


Figure A6.21: Ballateare (B'te1 12 - 15); Ballateare, Dutch Barn (B'te2 1); Ballavarry (B'va 1 - 6)

Ballavarry excavation (B'va)

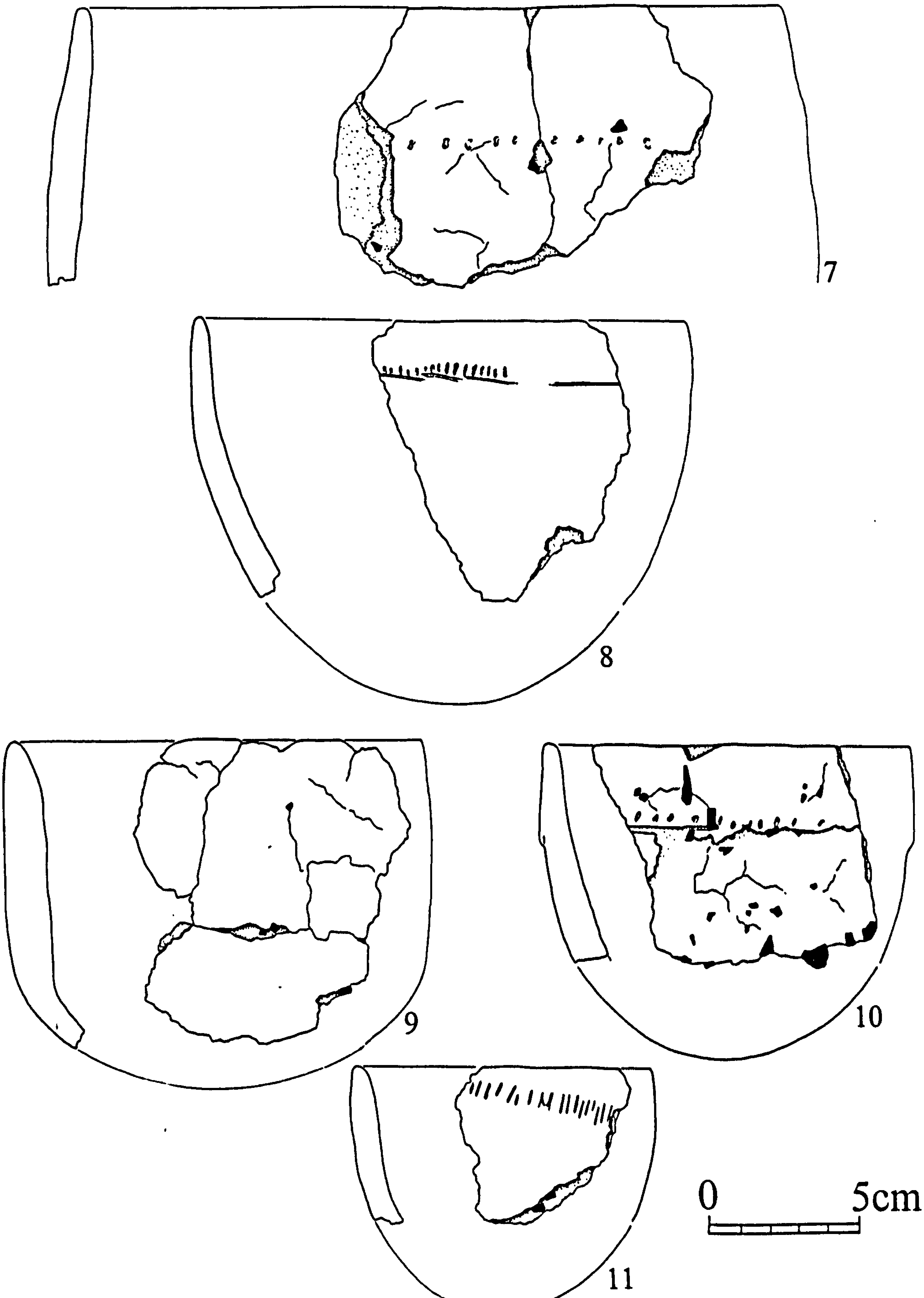


Figure A6.22: Ballavarry (B'va 7 - 11)

Ballavarry excavation (B'va)

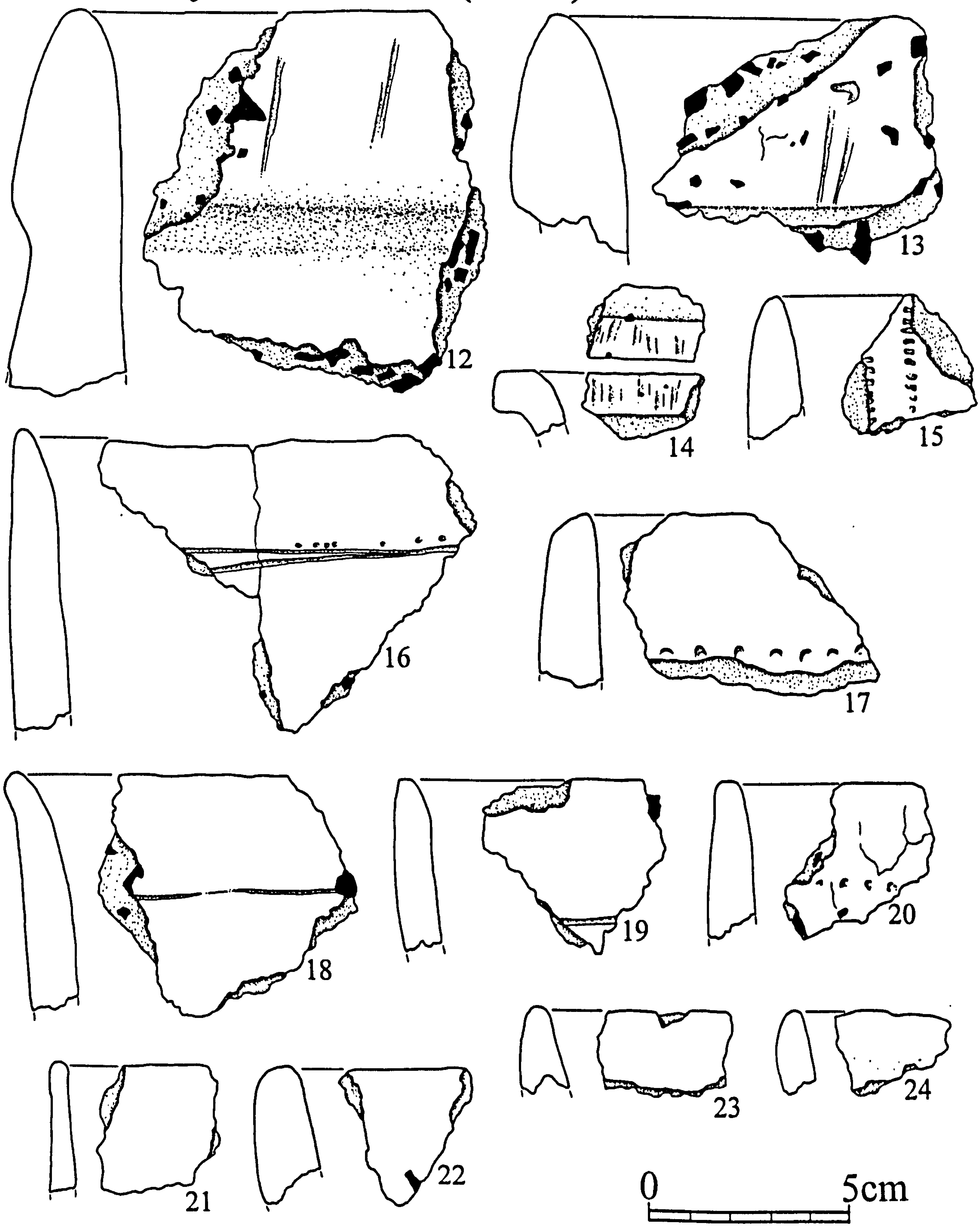
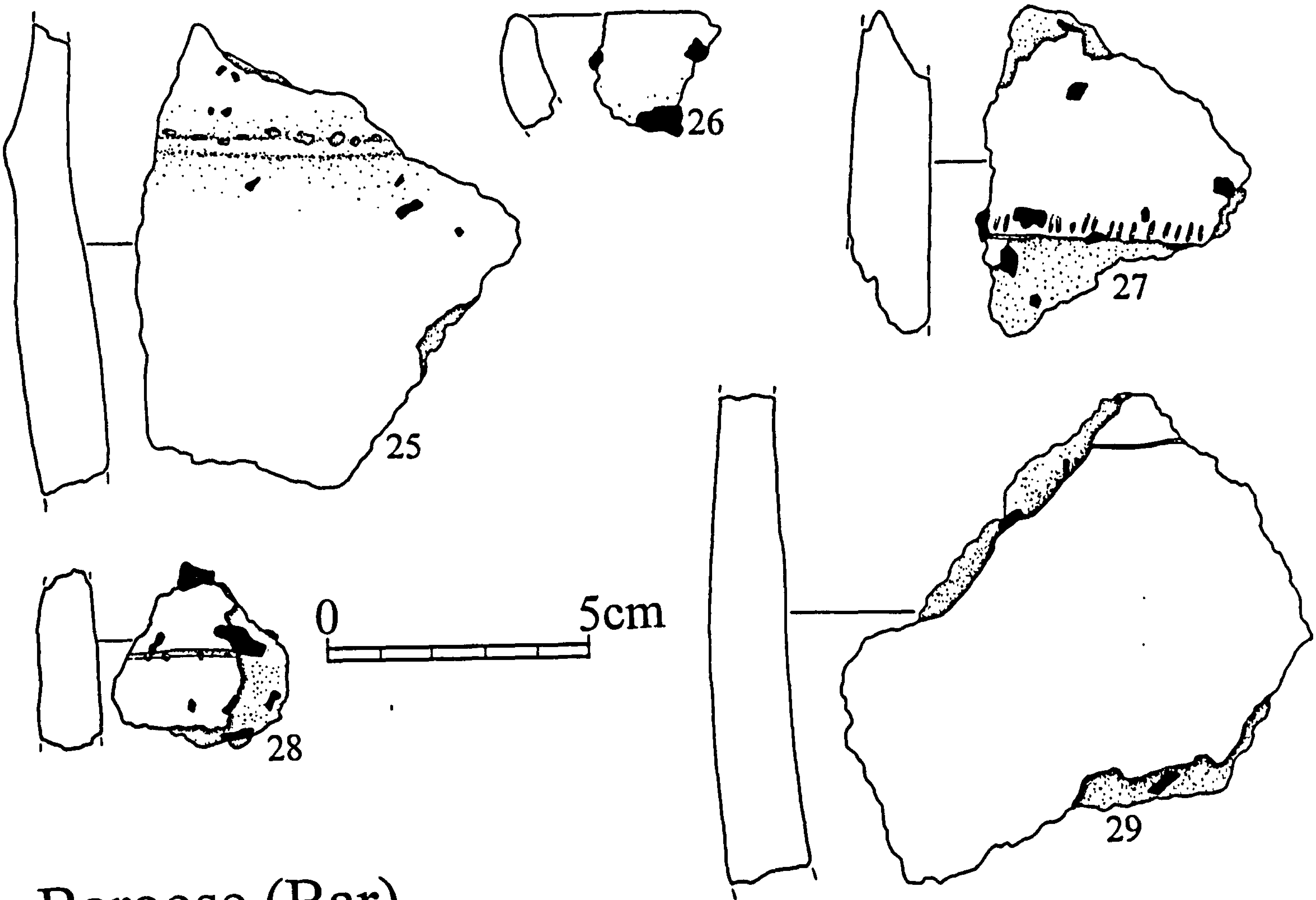


Figure A6.23: Ballavarry (B'va 12 - 24)

Ballavarry excavation (B'va)



Baroose (Bar)

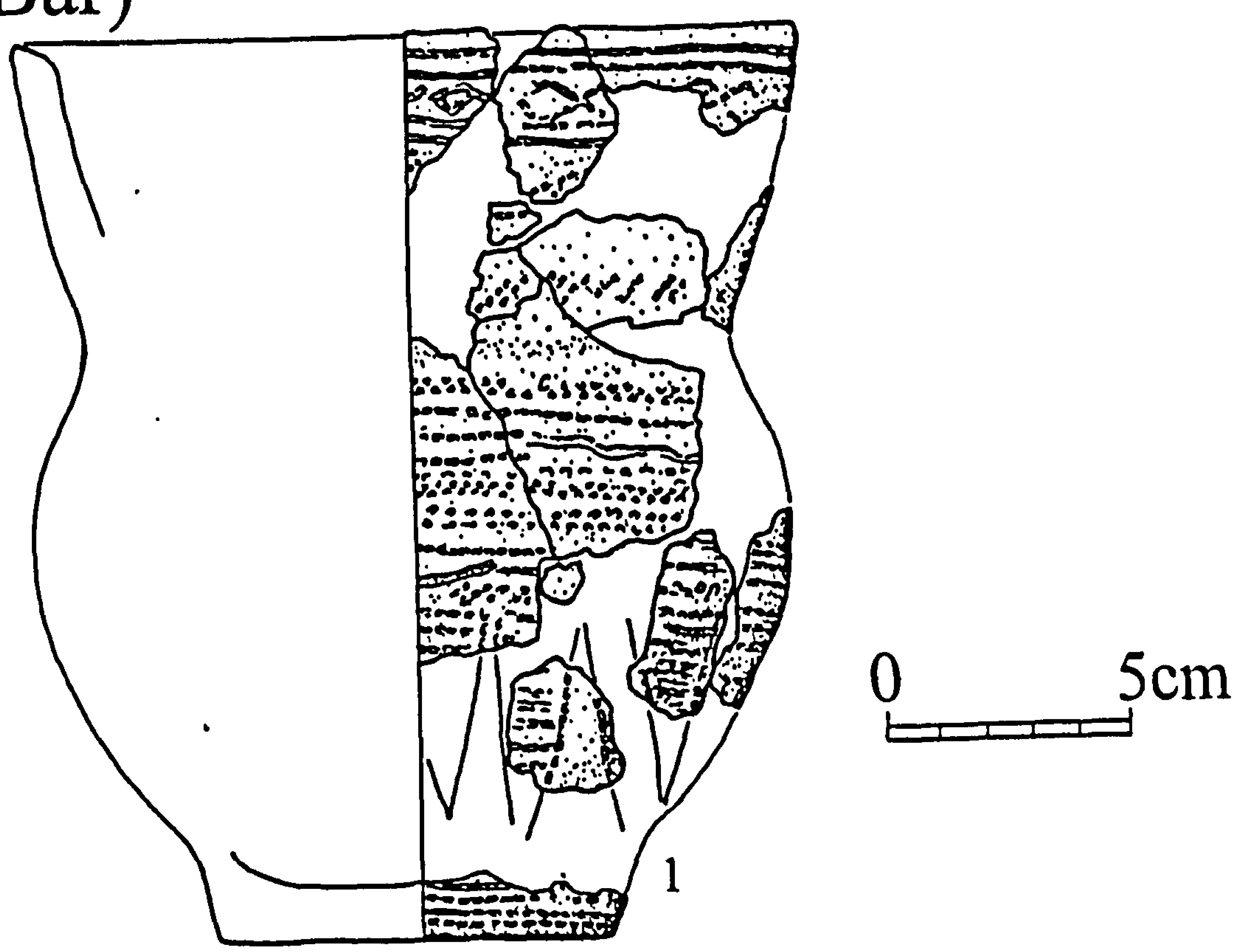
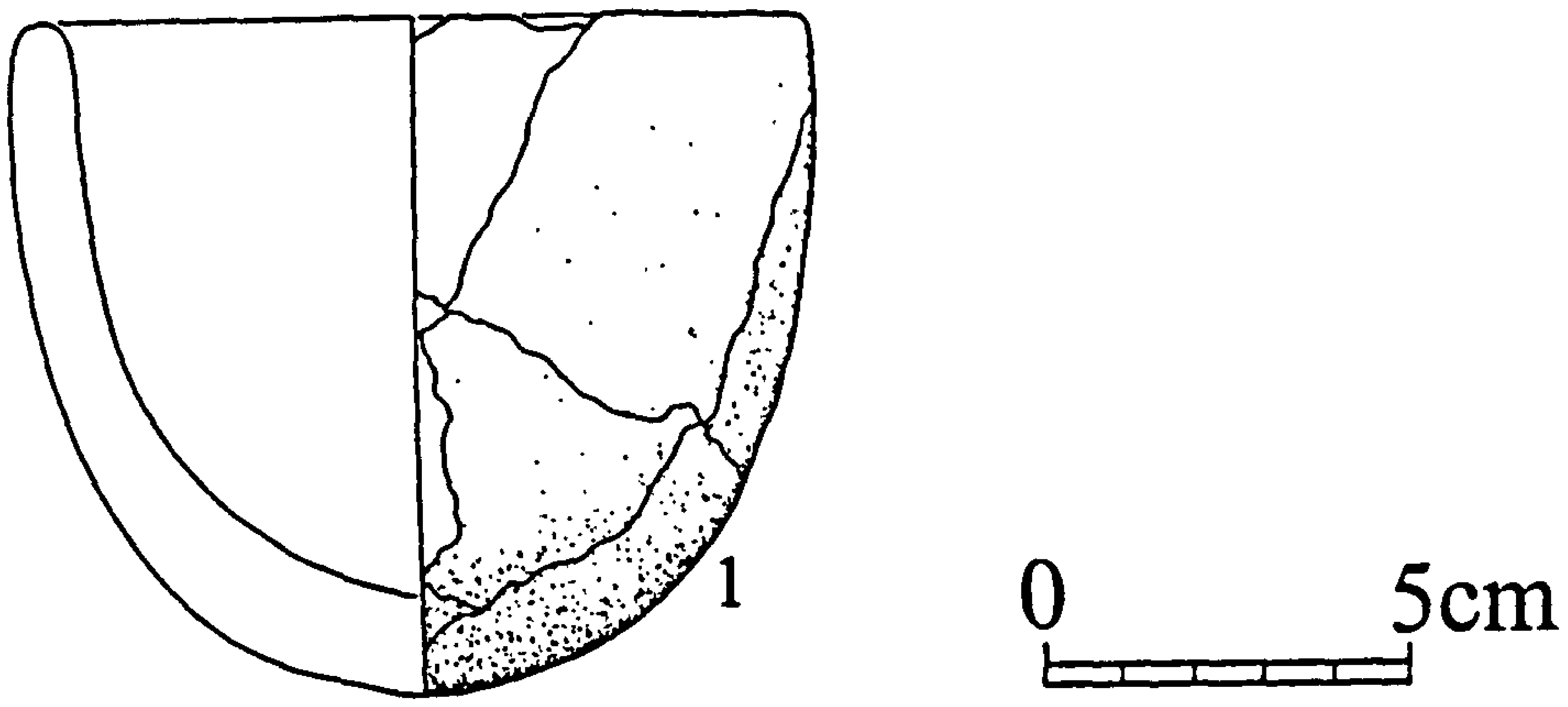


Figure A6.24: Ballavarry (B'va 25 - 29); Baroose (Bar 1)

Berk (Ber)



Billown Circle (Bil)

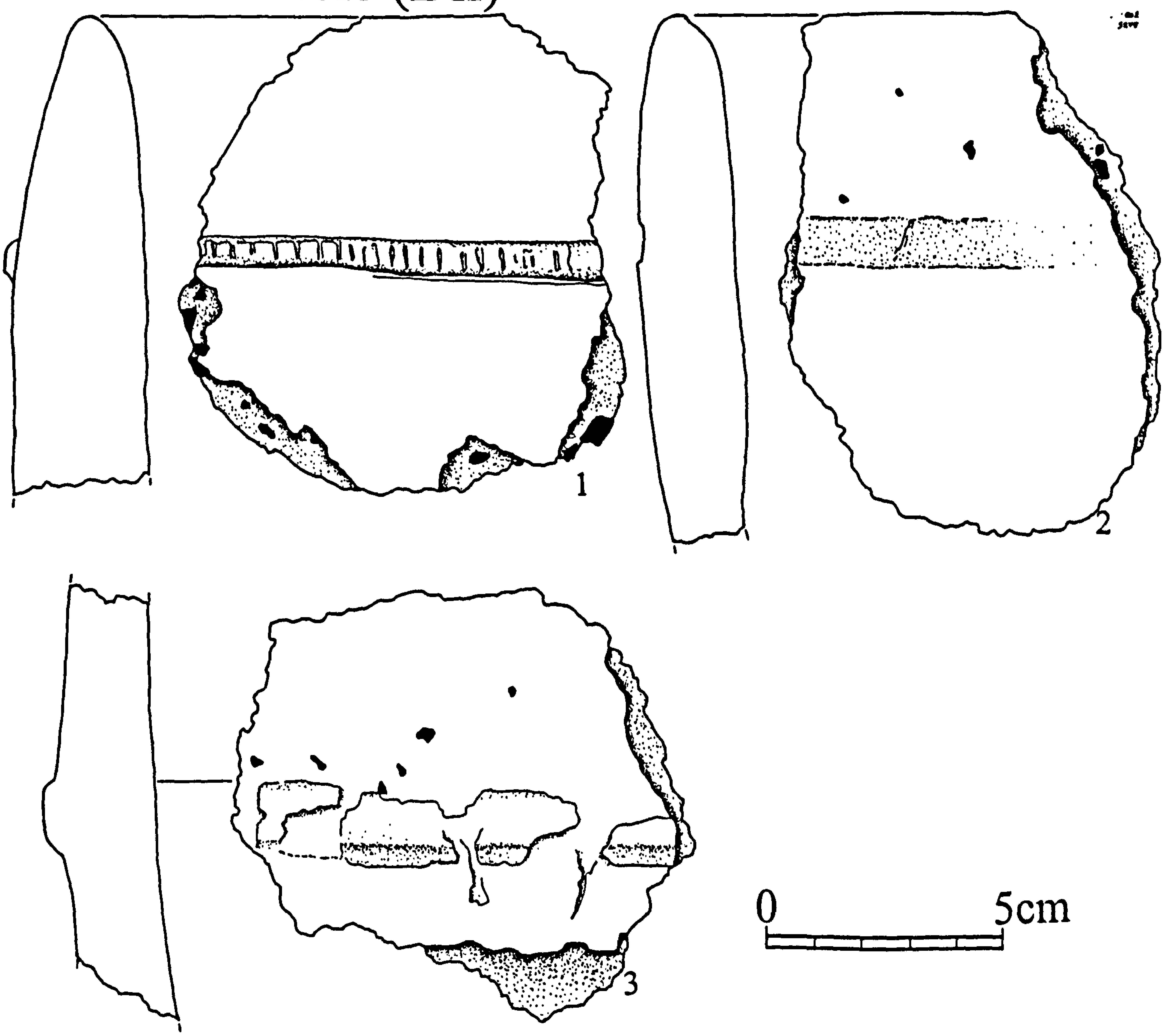


Figure A6.25: Berk (Ber 1); Billown Circle (Bil 1 - 3)

Billown Quarry 1 (BiQ1)

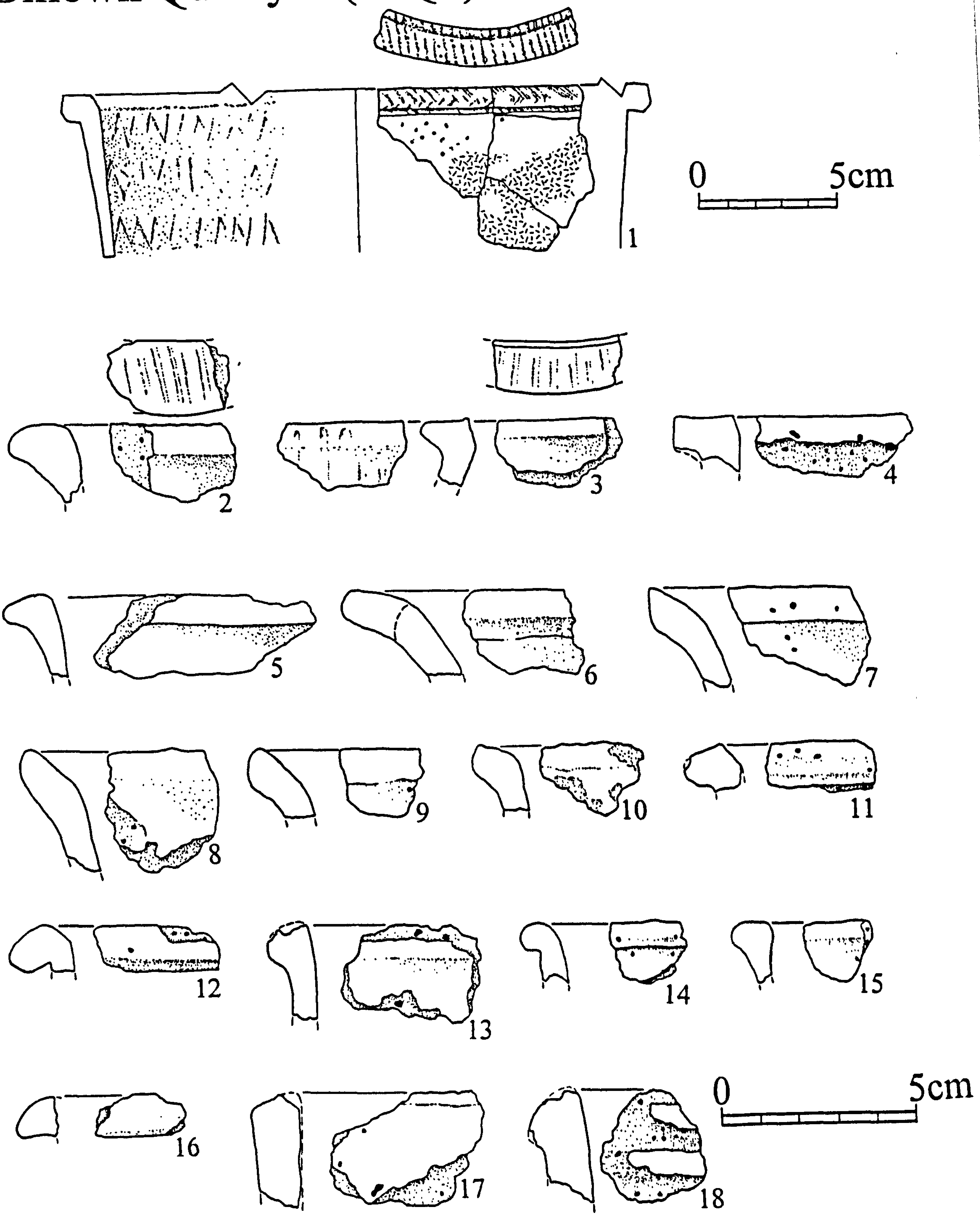
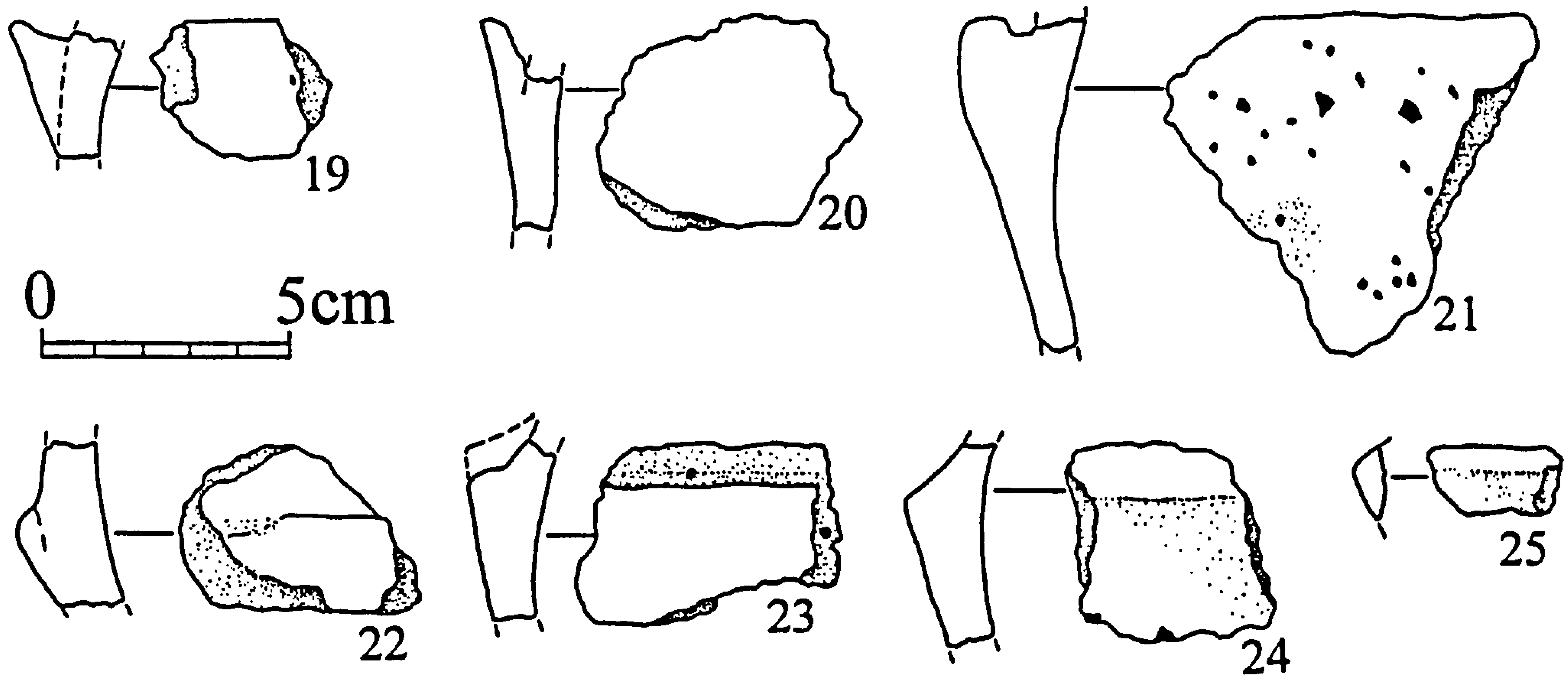


Figure A6.26: Billown Quarry 1 (BiQ1 1 - 18)

Billown Quarry 1 (BiQ1)



Billown Quarry 2 (BiQ2)

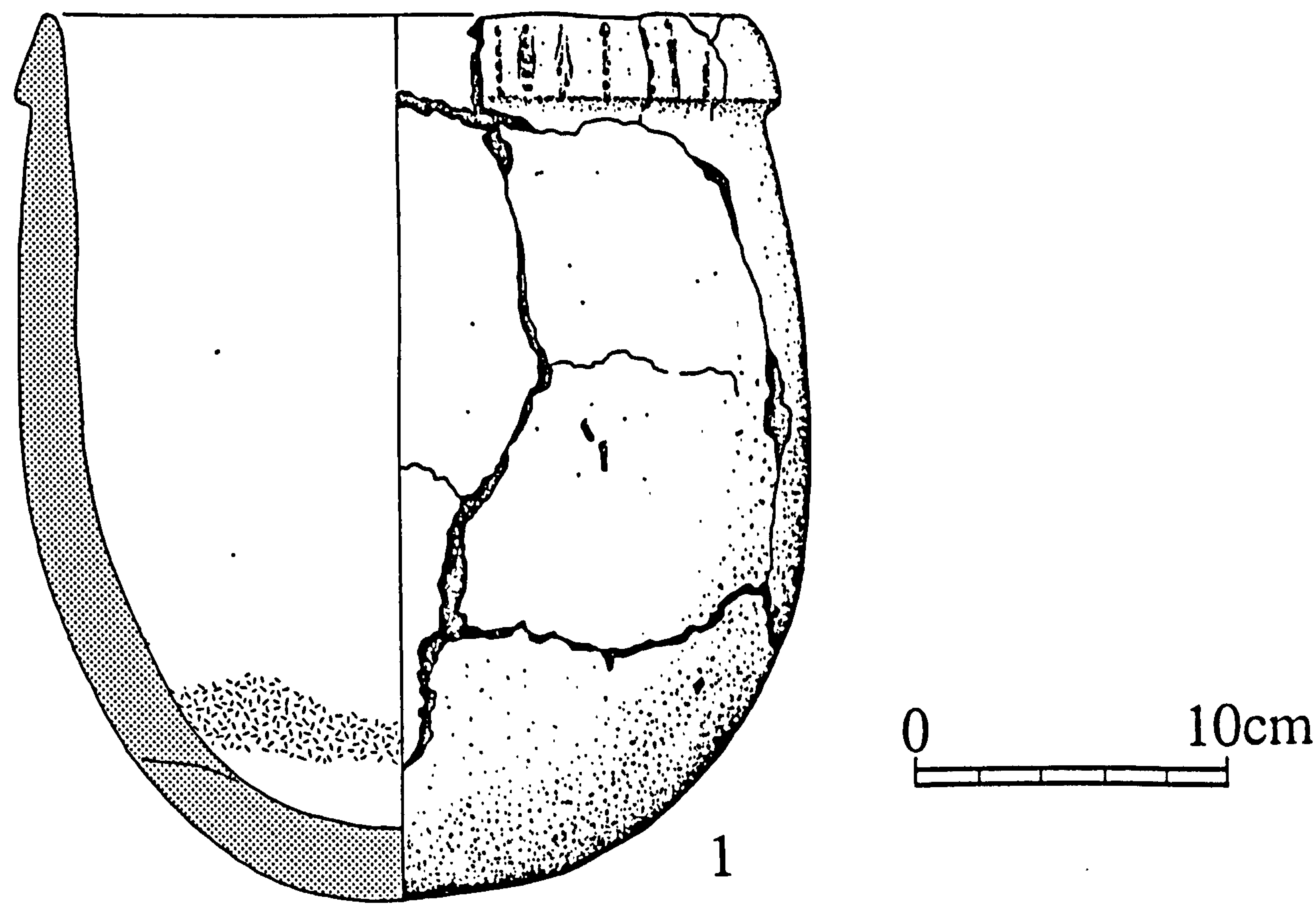
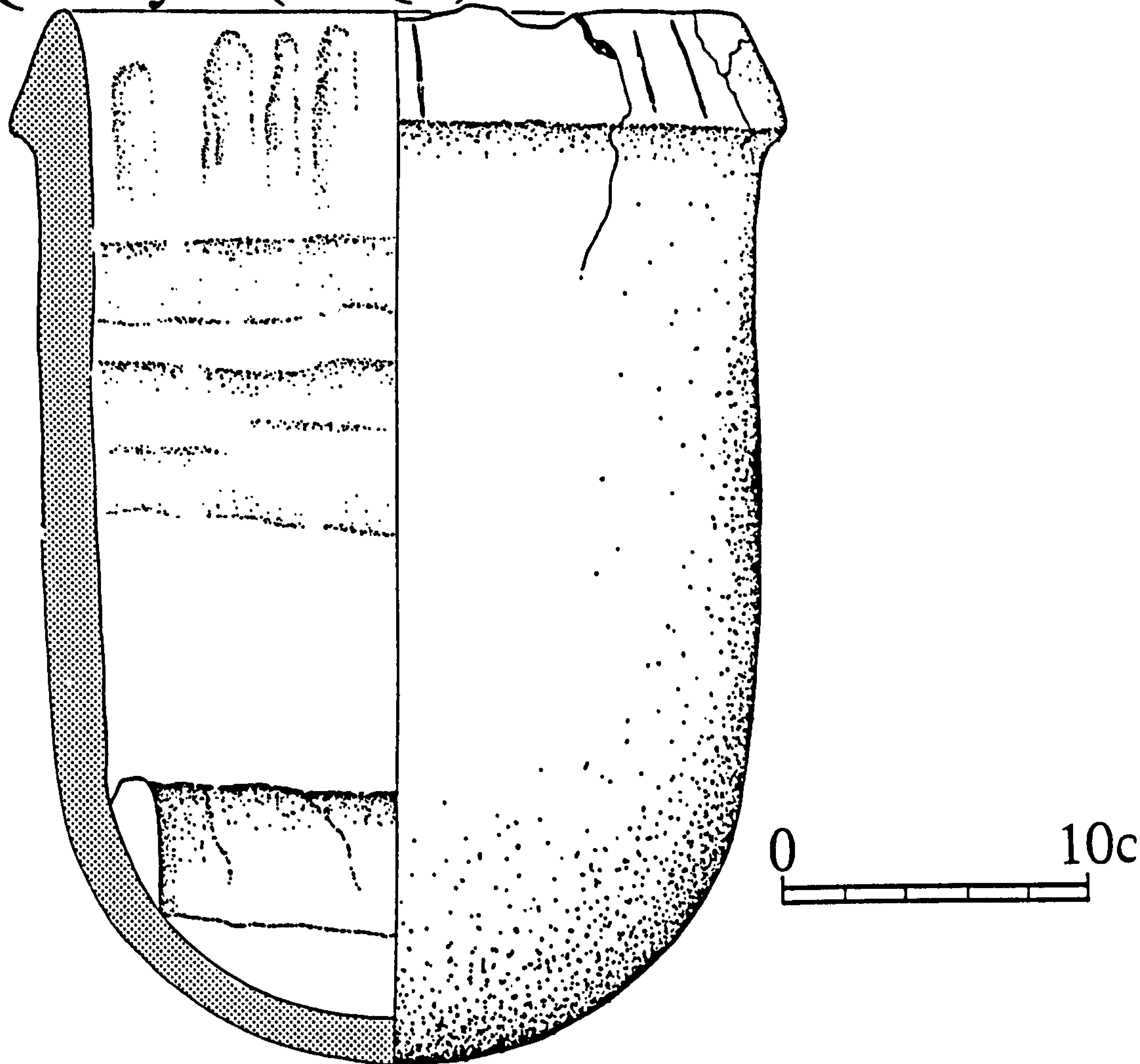


Figure A6.27: Billown Quarry 1 (BiQ1 19 - 25); Billown Quarry 2 (BiQ2 1)

Billown Quarry 2 (BiQ2)



Cashtal yn Ard (Cas)

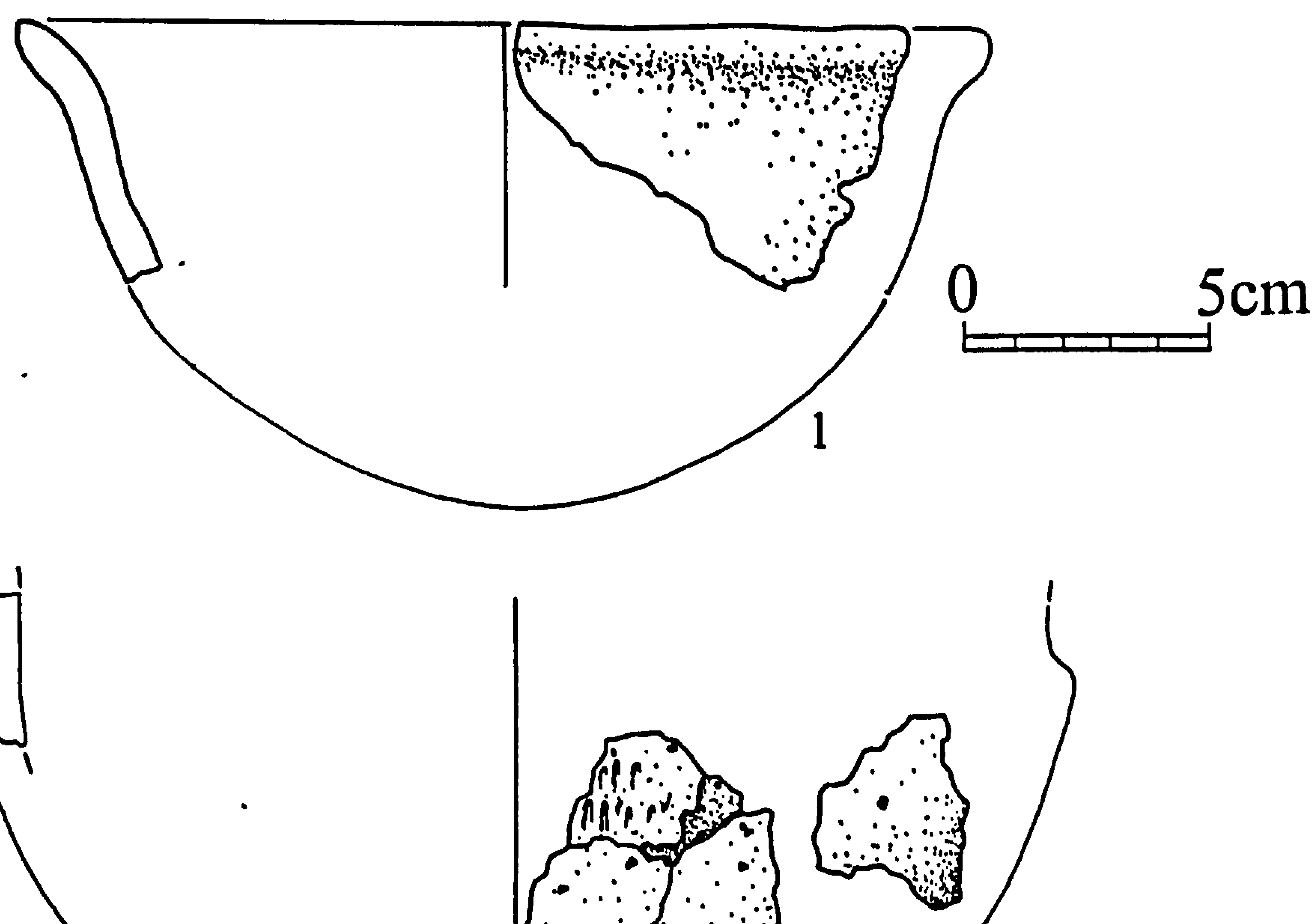
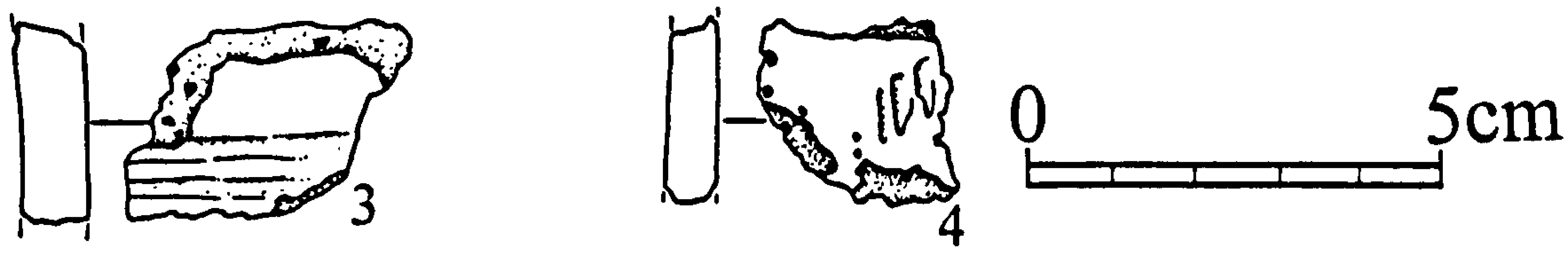
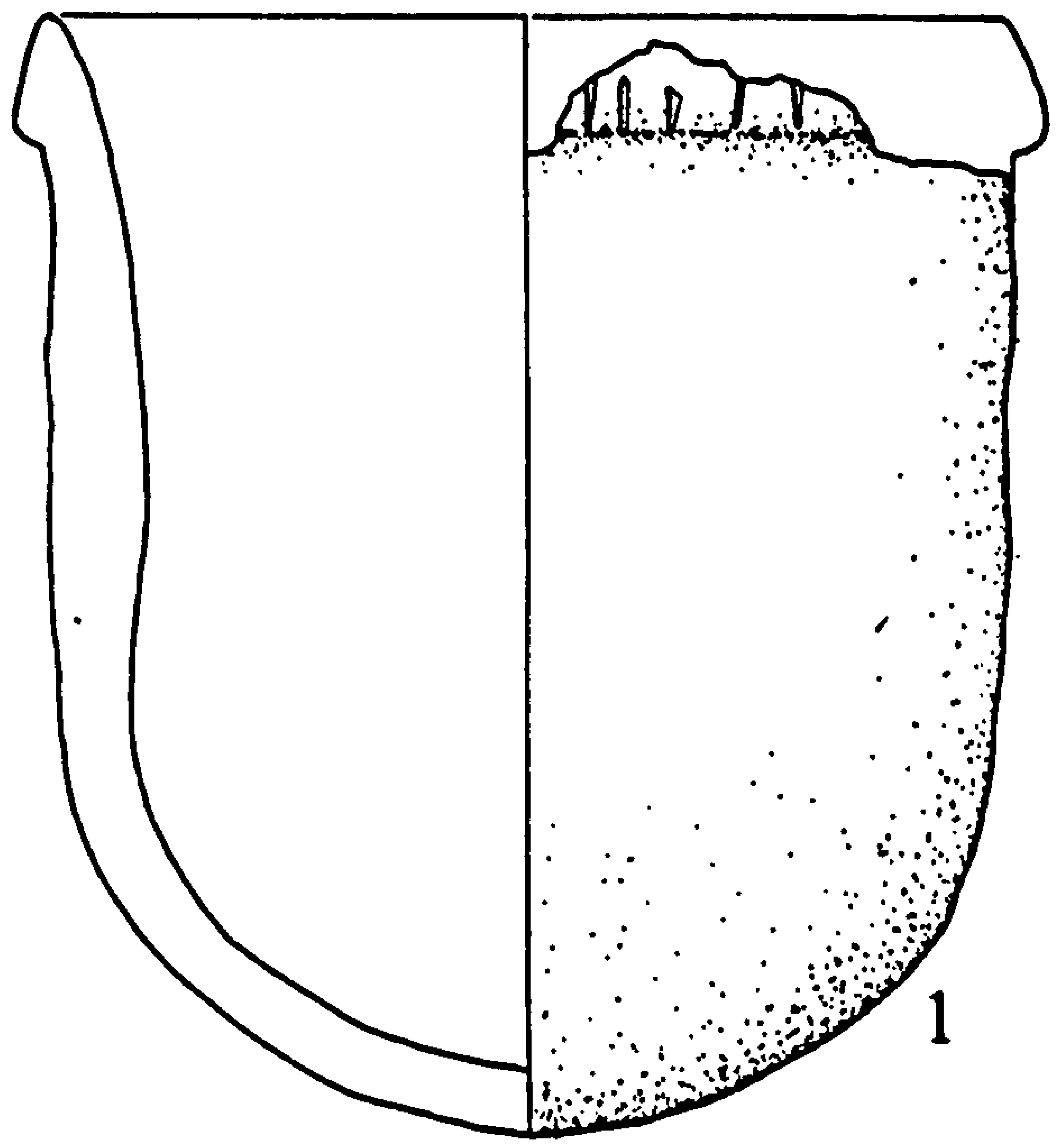


Figure A6.28: Billown Quarry 2 (BiQ2 2); Cashtal yn Ard (Cas 1 -2)

Cashtal yn Ard (Cas)



Cleigh Rouyr (Cle)



Colby (Col)

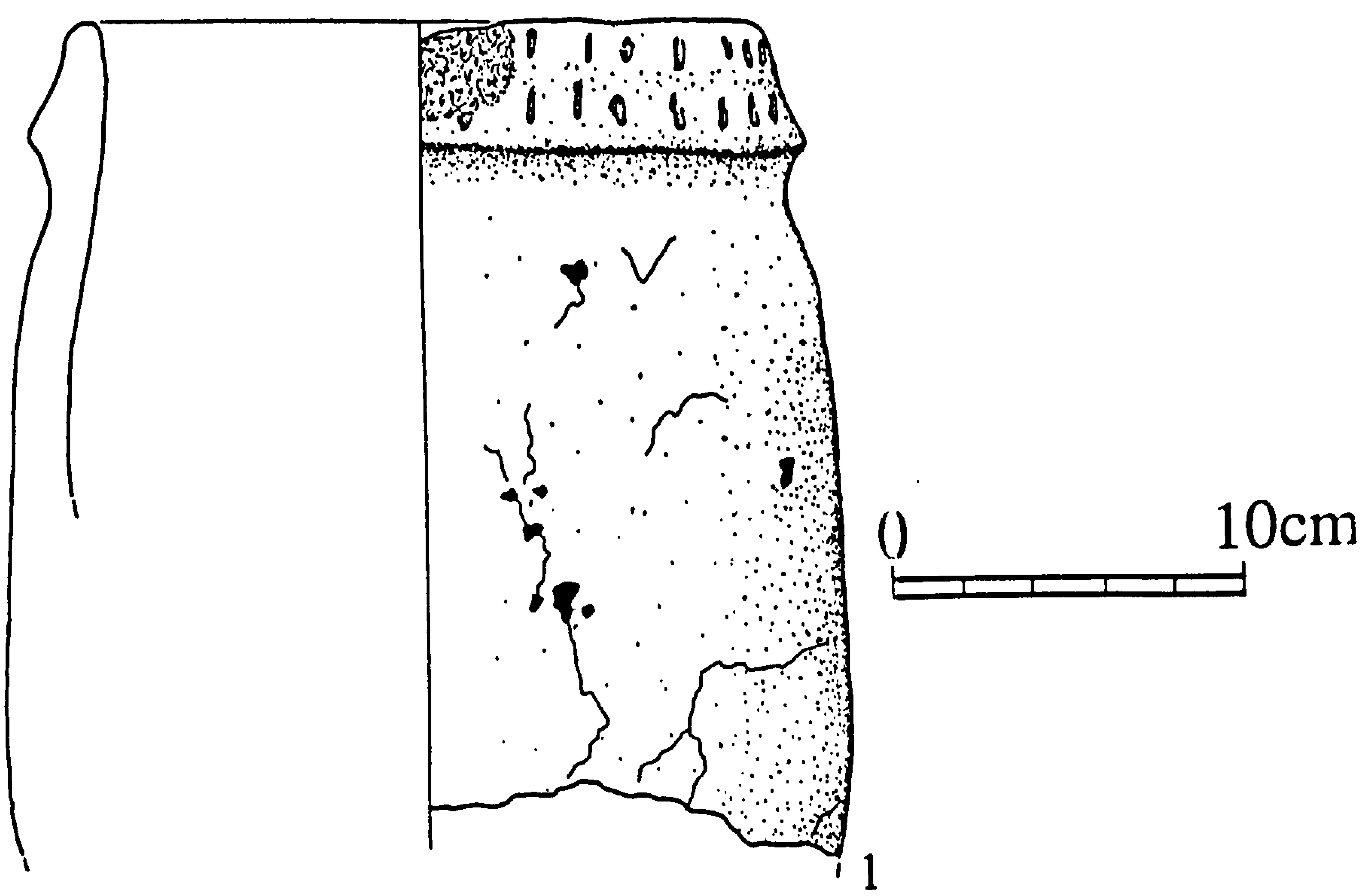


Figure A6.29: Cashtal yn Ard (Cas 3 - 4); Cleigh Rouyr (Cle 1); Colby (Col 1)

Colby Mooar (ColM)

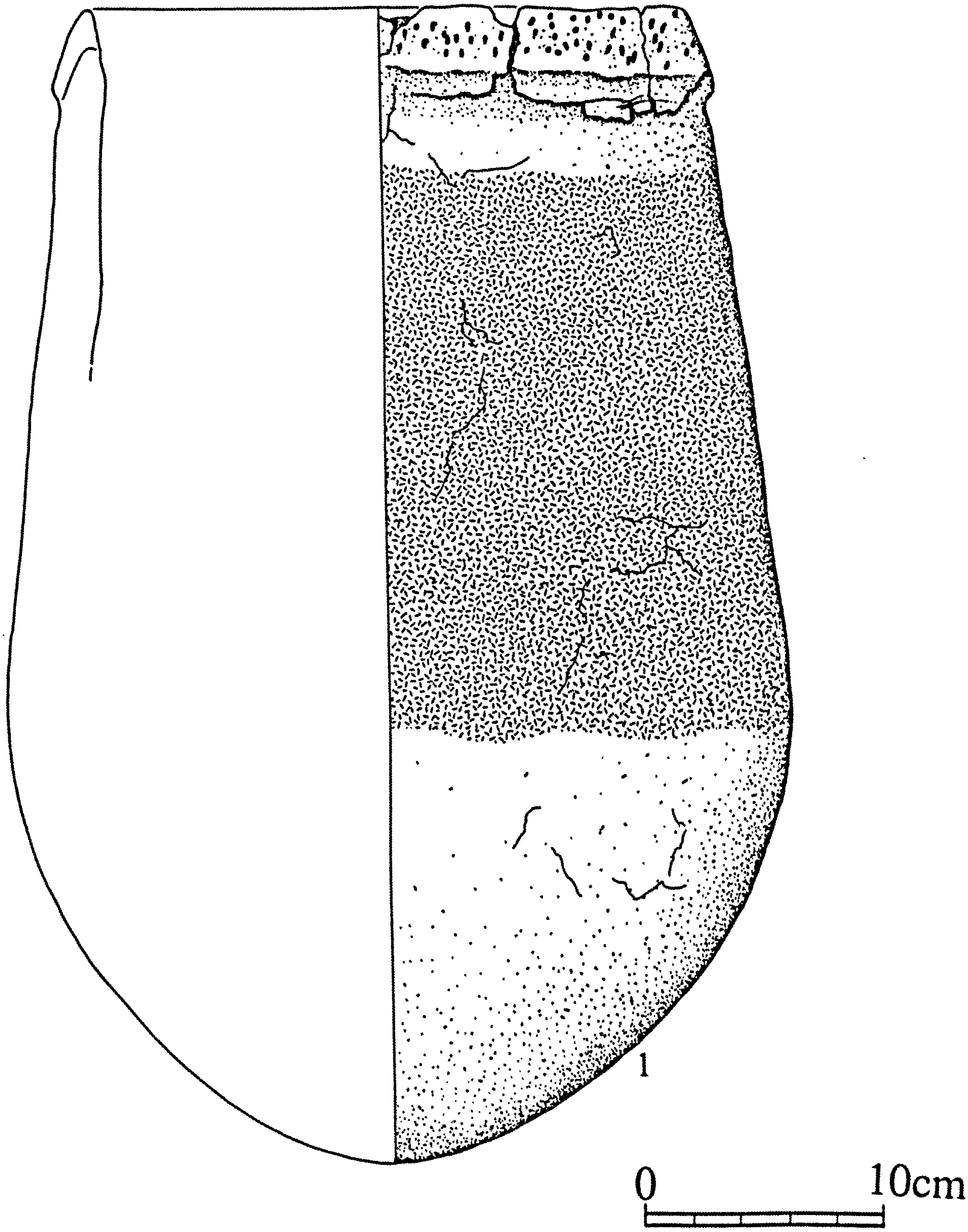
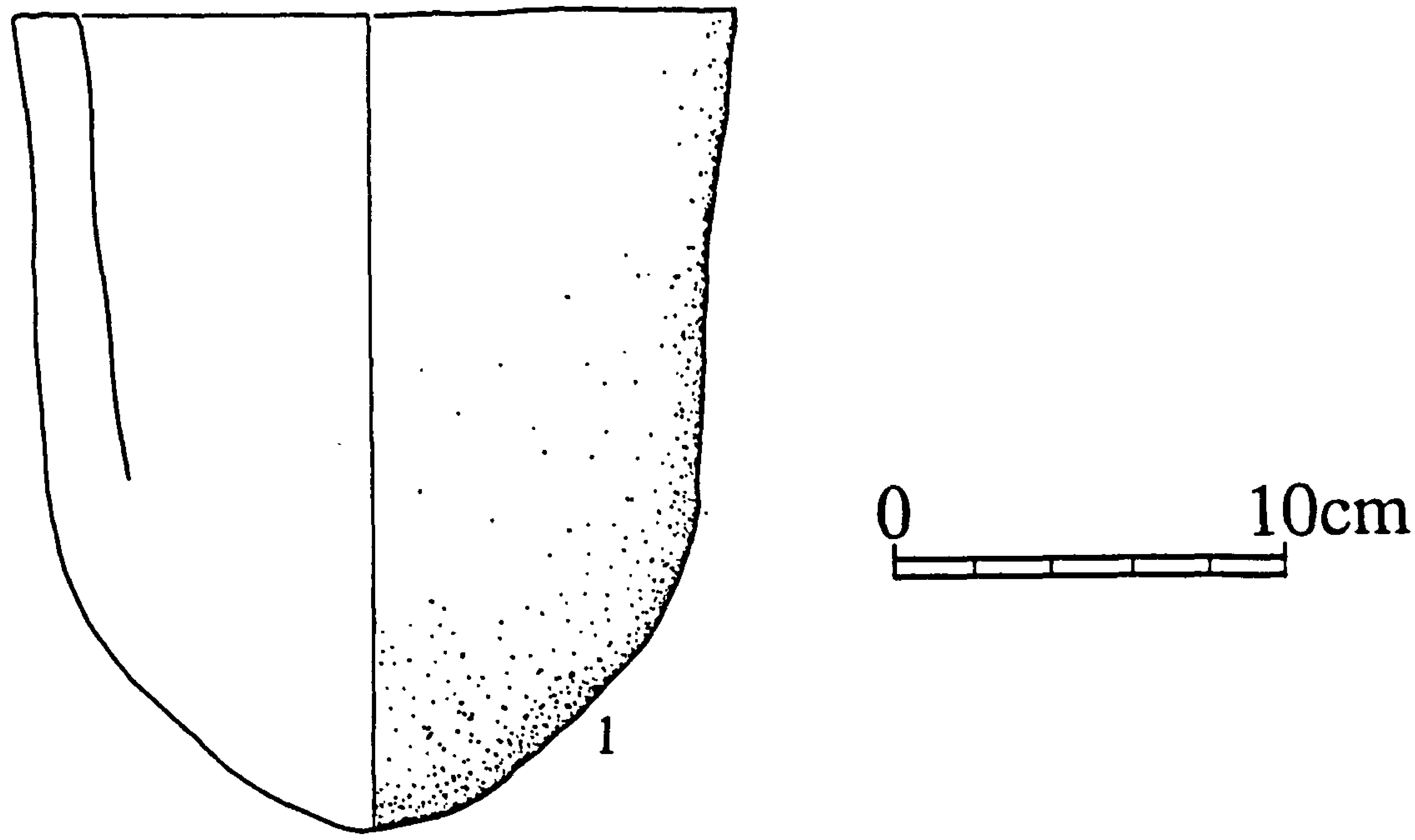
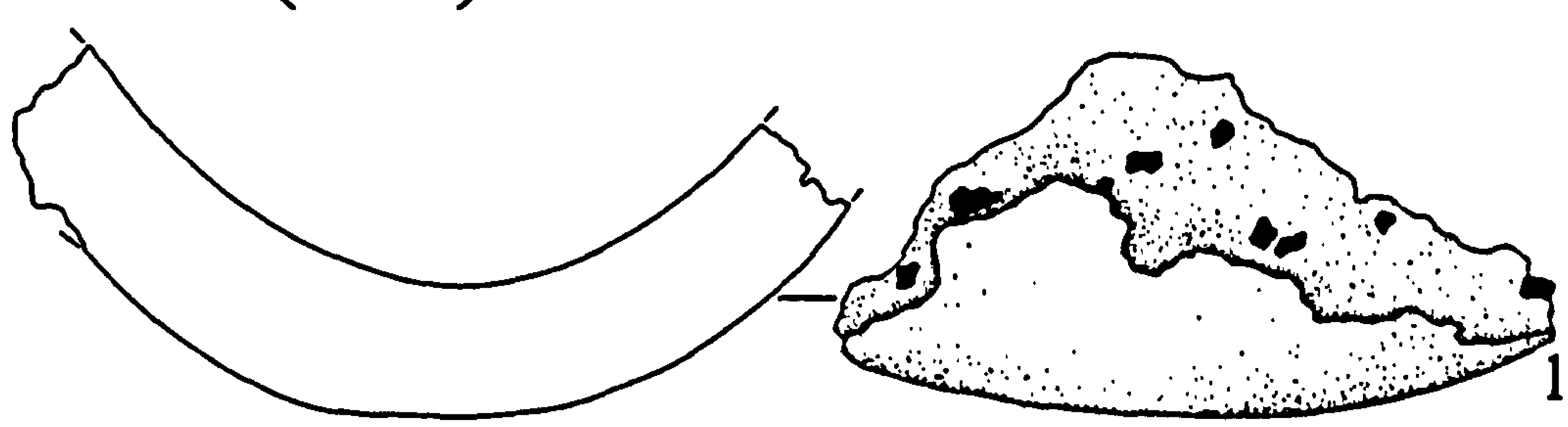


Figure A6.30: Colby Mooar (ColM 1)

Crossag (Cro)



Earybedn (Ear)



Glencrutchery (Gle)

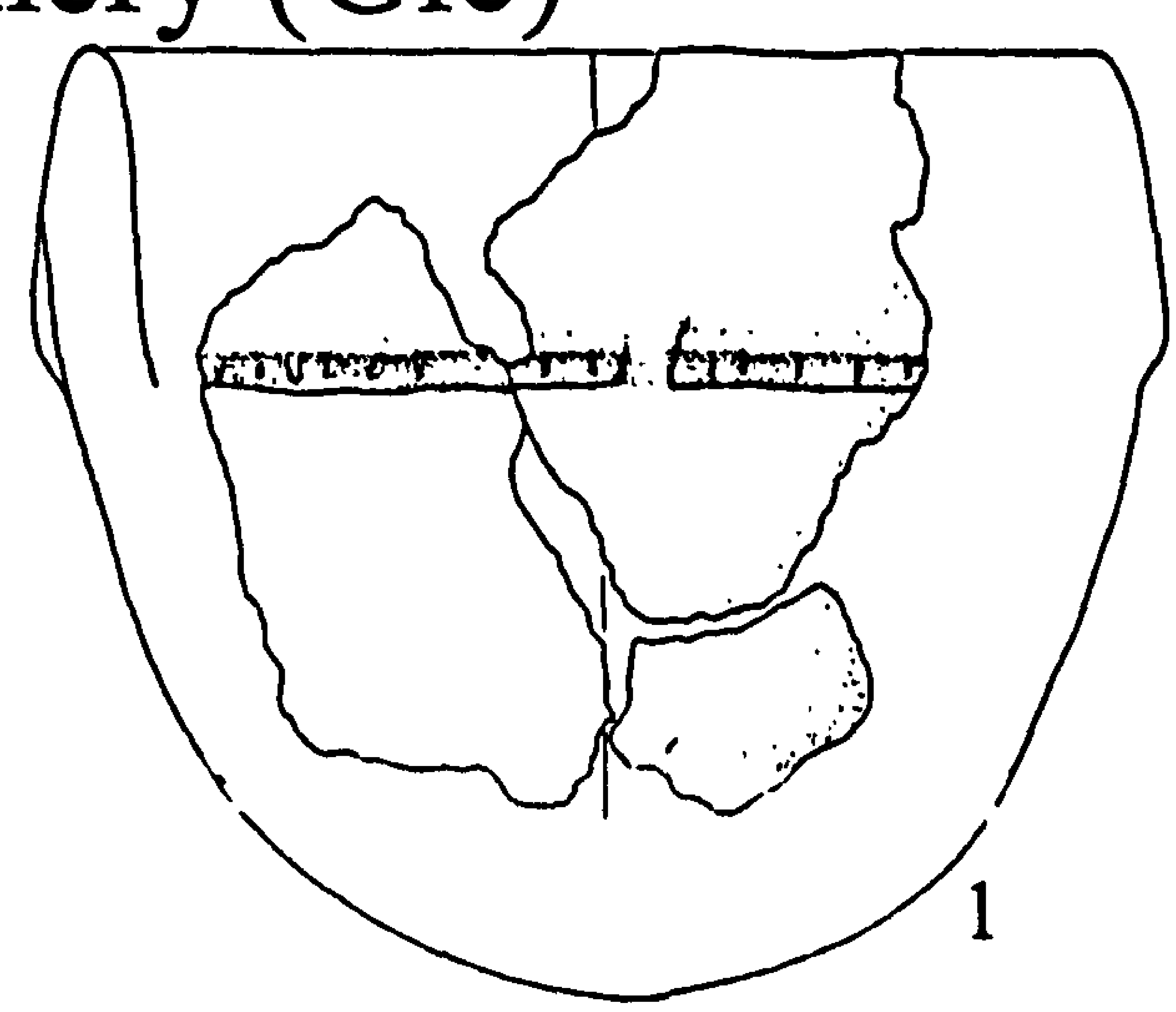


Figure A6.31: Crossag (Cro 1); Earybedn (Ear 1); Glencrutchery (Gle 1)

Glencrutchery (Gle)

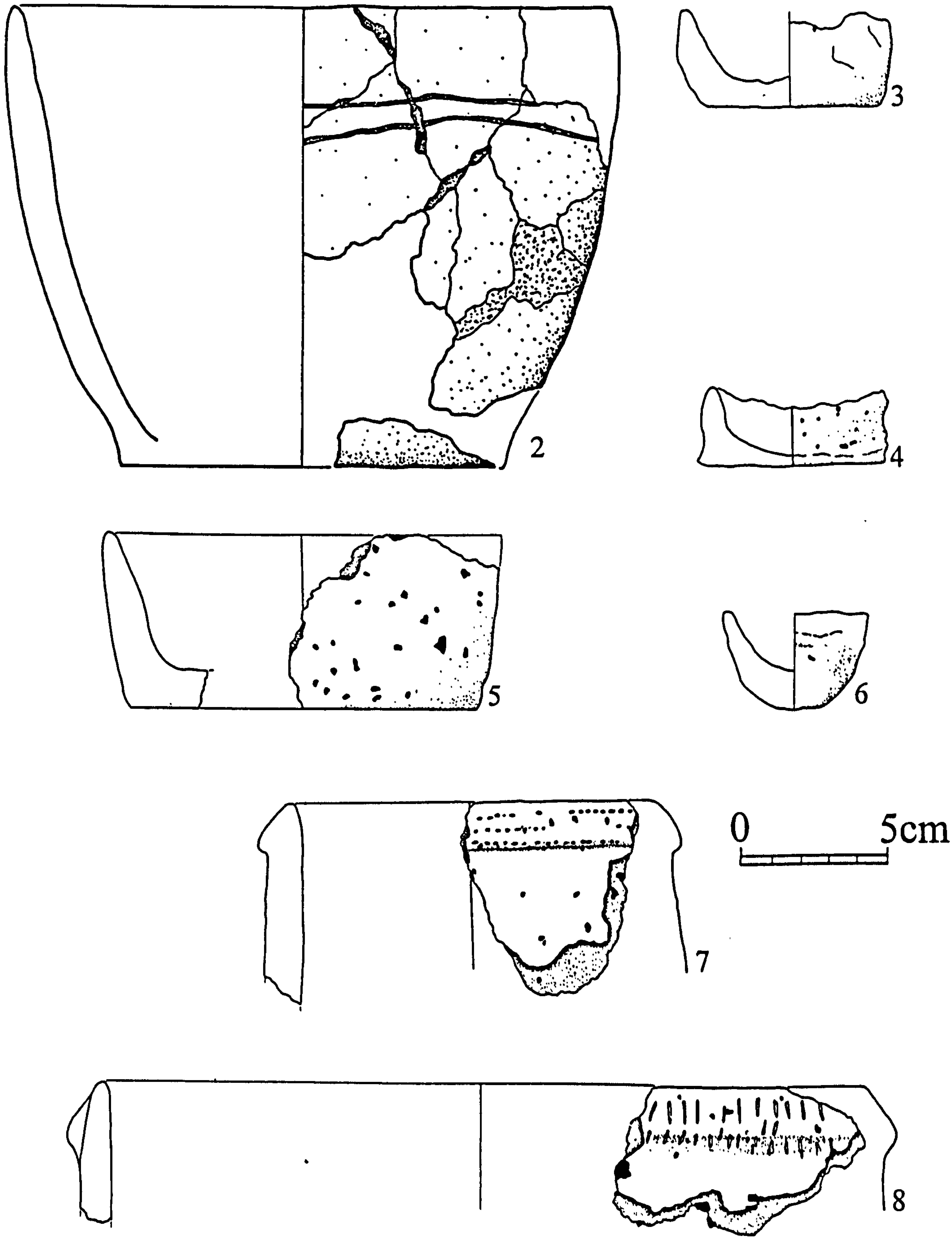


Figure A6.32: Glencrutchery (Gle 2 - 8)

Glencrutchery (Gle)

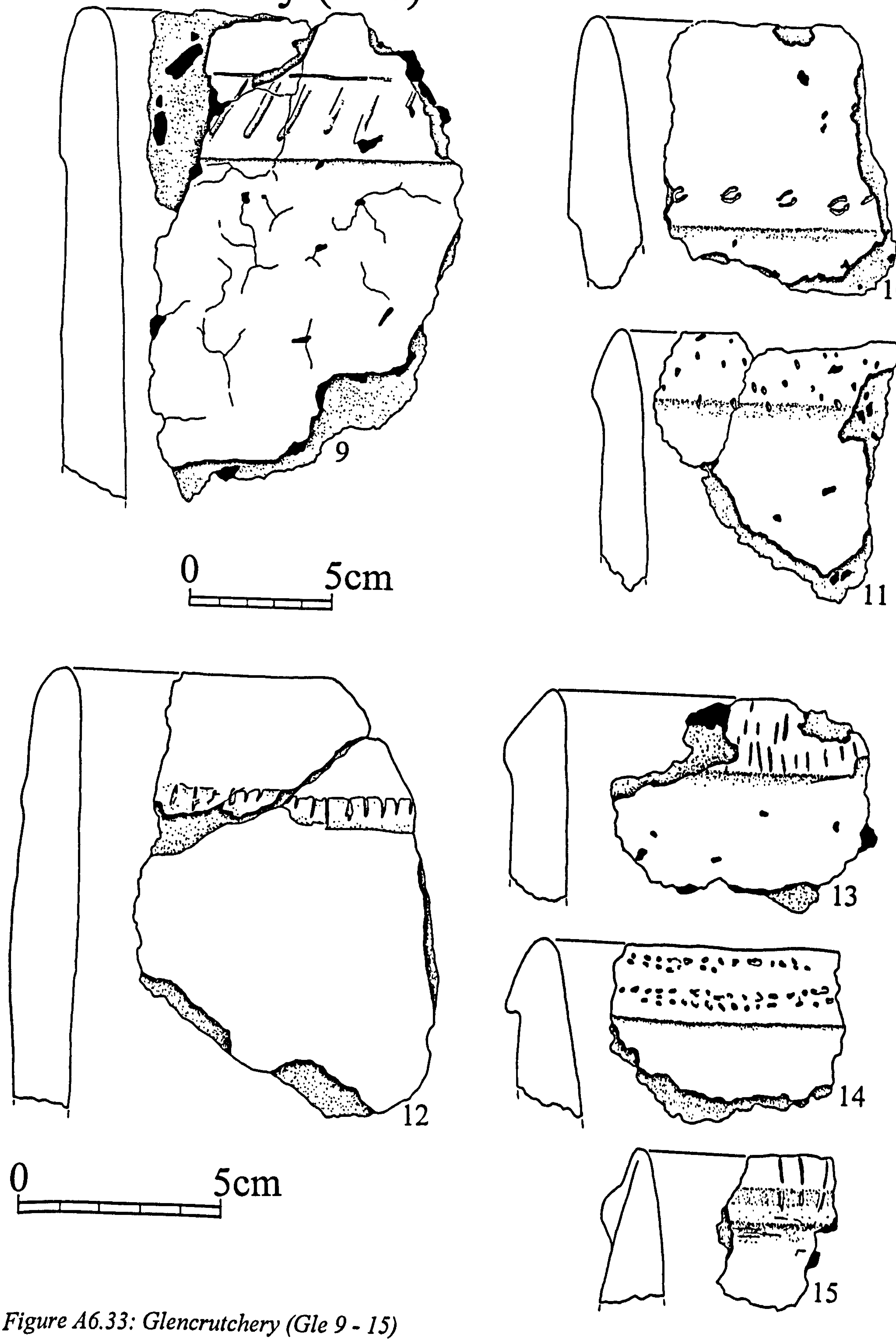


Figure A6.33: Glencrutchery (Gle 9 - 15)

Glencrutchery (Gle)

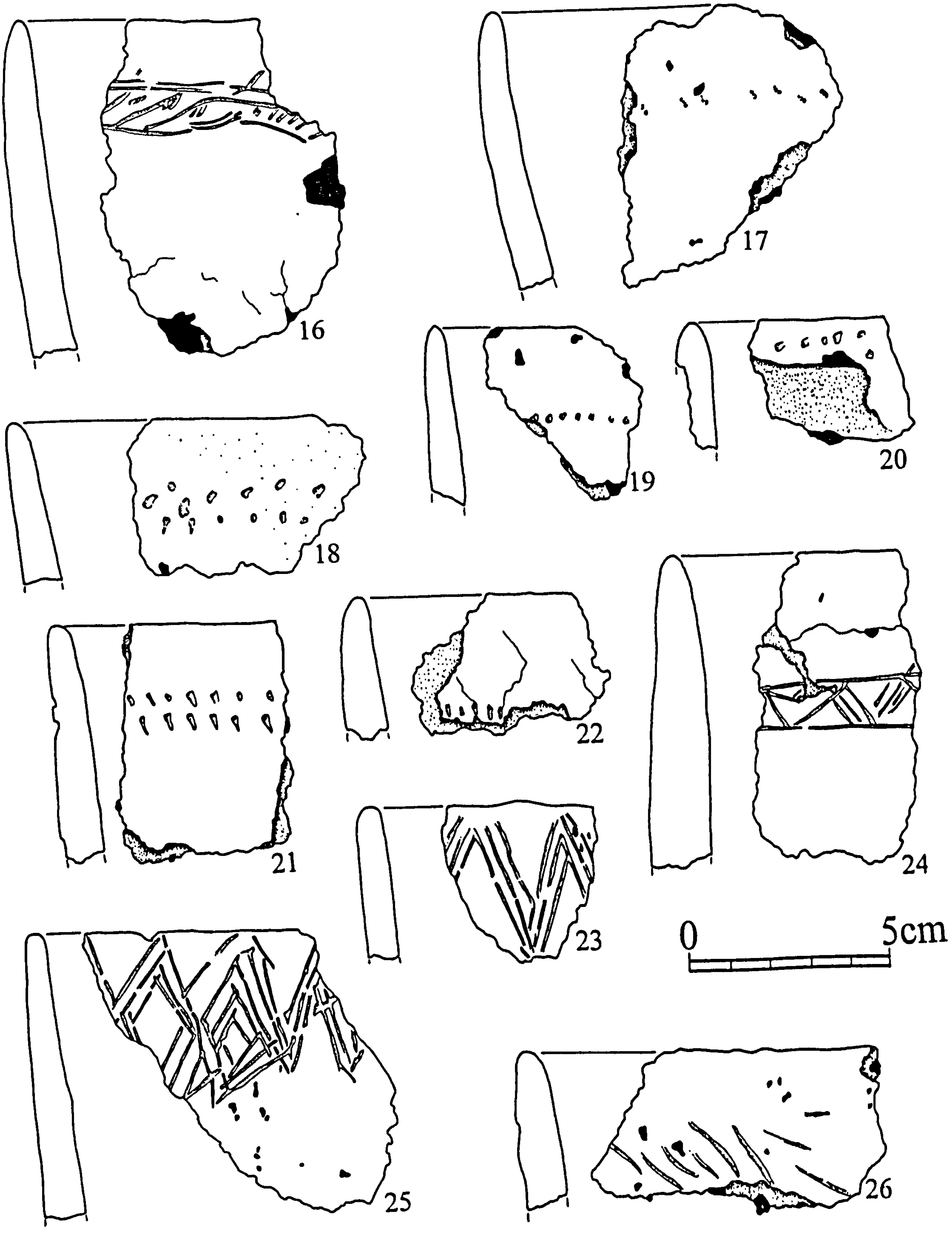


Figure A6.34: Glencrutchery (Gle 16 - 26)

Glencrutchery (Gle)

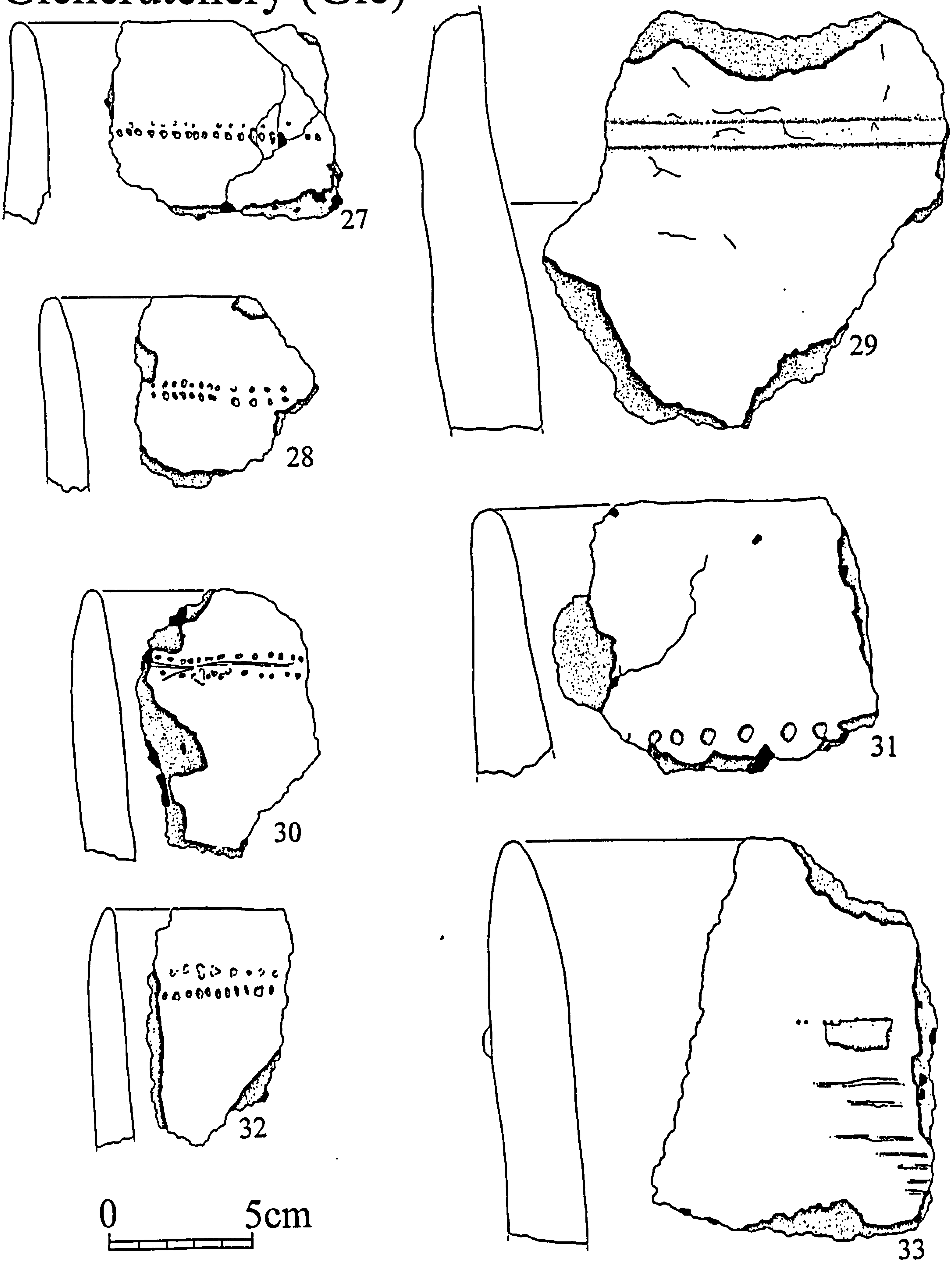


Figure A6.35: Glencrutchery (Gle 27 - 33)

Glencrutchery (Gle)

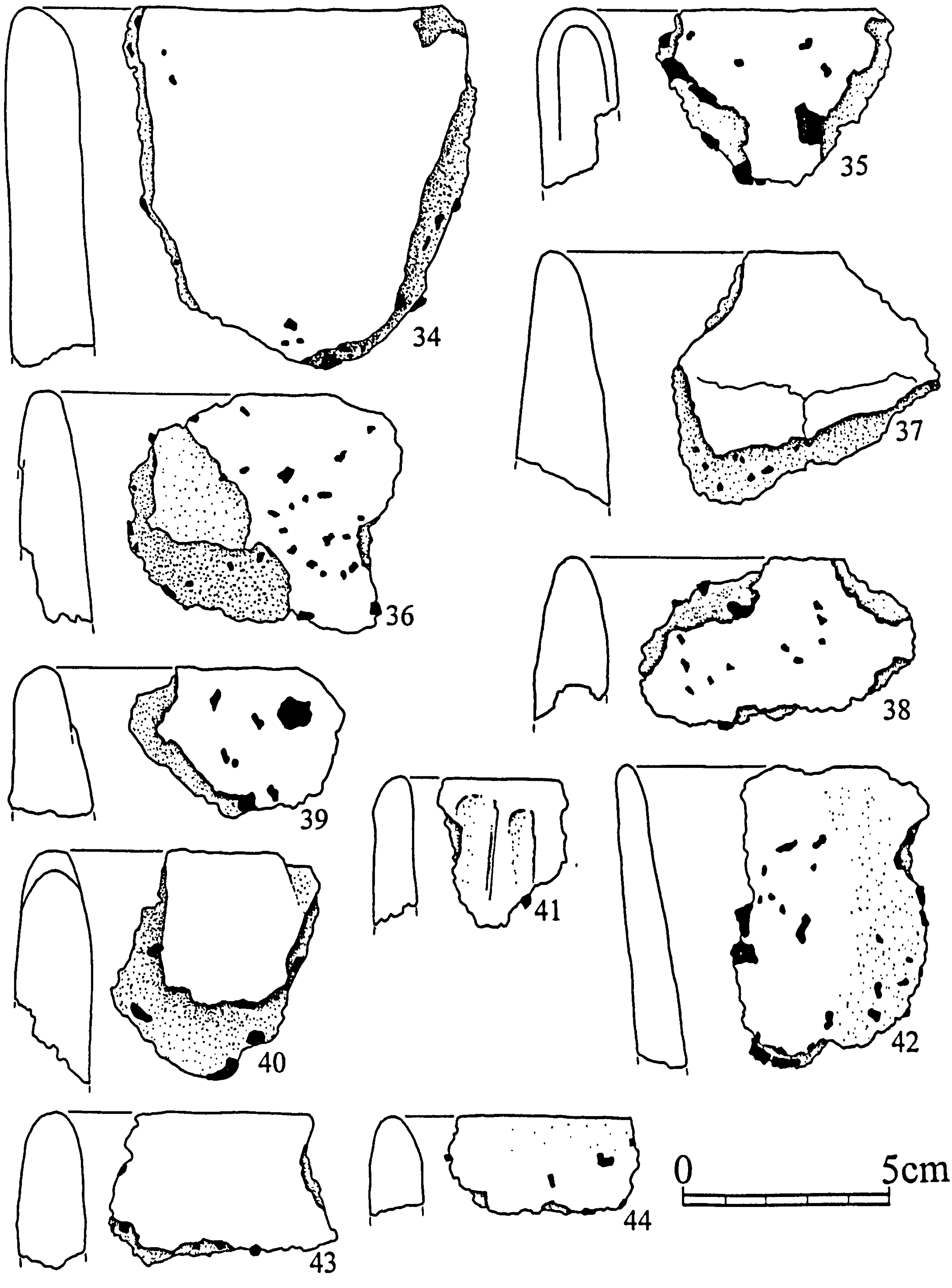


Figure A6.36: Glencrutchery (Gle 34 - 44)

Glencrutchery (Gle)

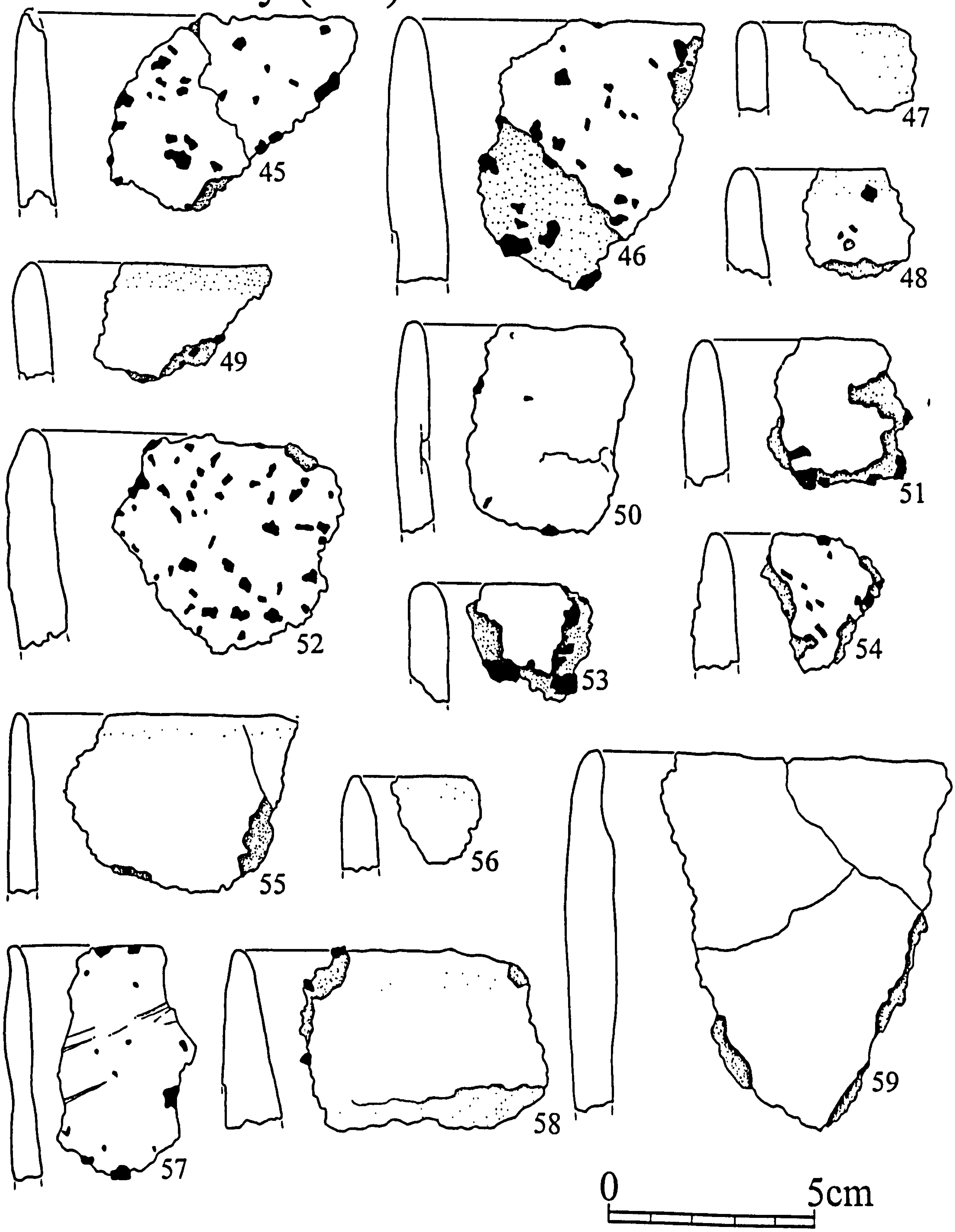


Figure A6.37: Glencrutchery (Gle 45 - 59)

Glencrutchery (Gle)

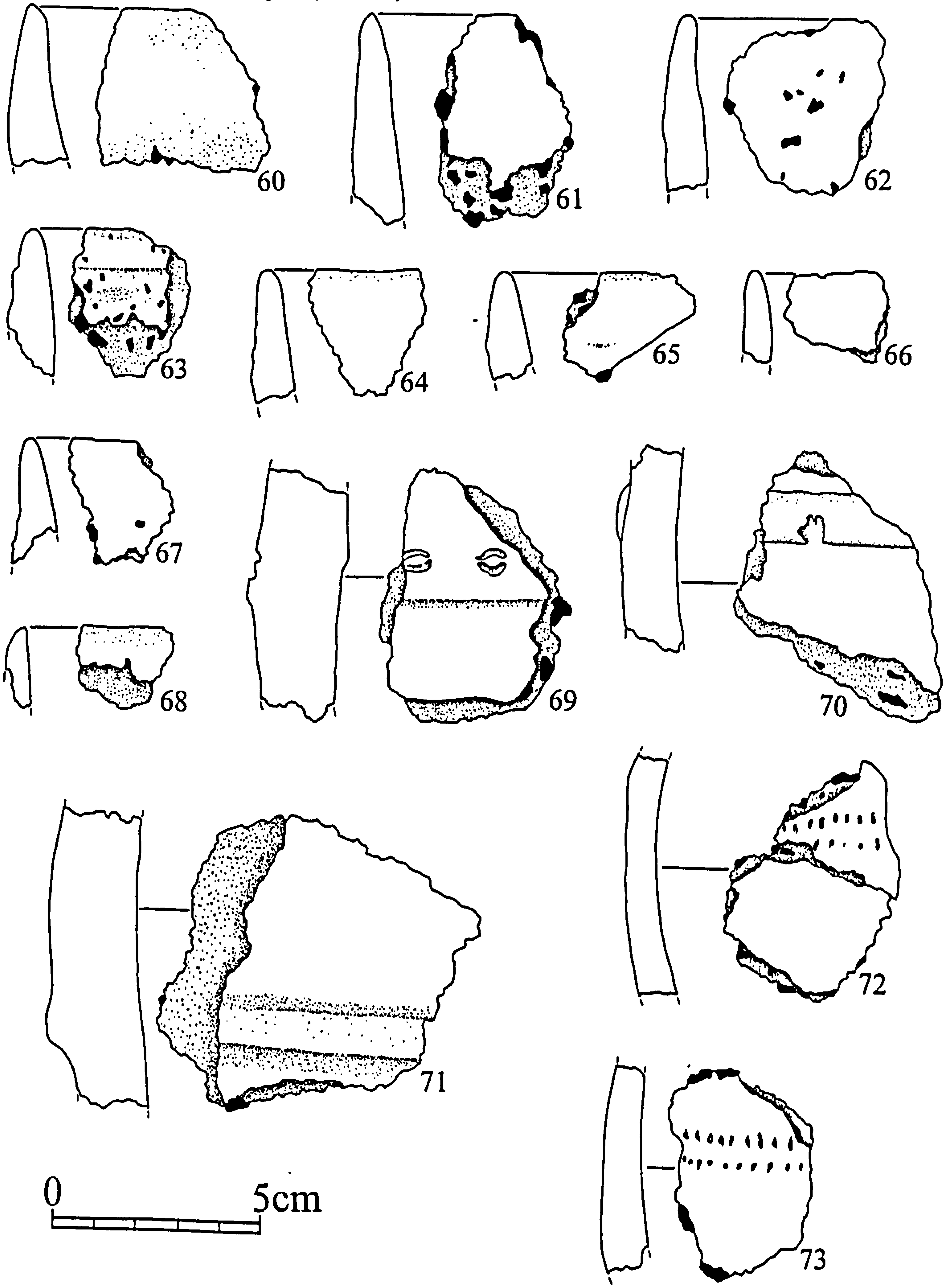


Figure A6.38: Glencrutchery (Gle 60 - 73)

Glencrutchery (Gle)

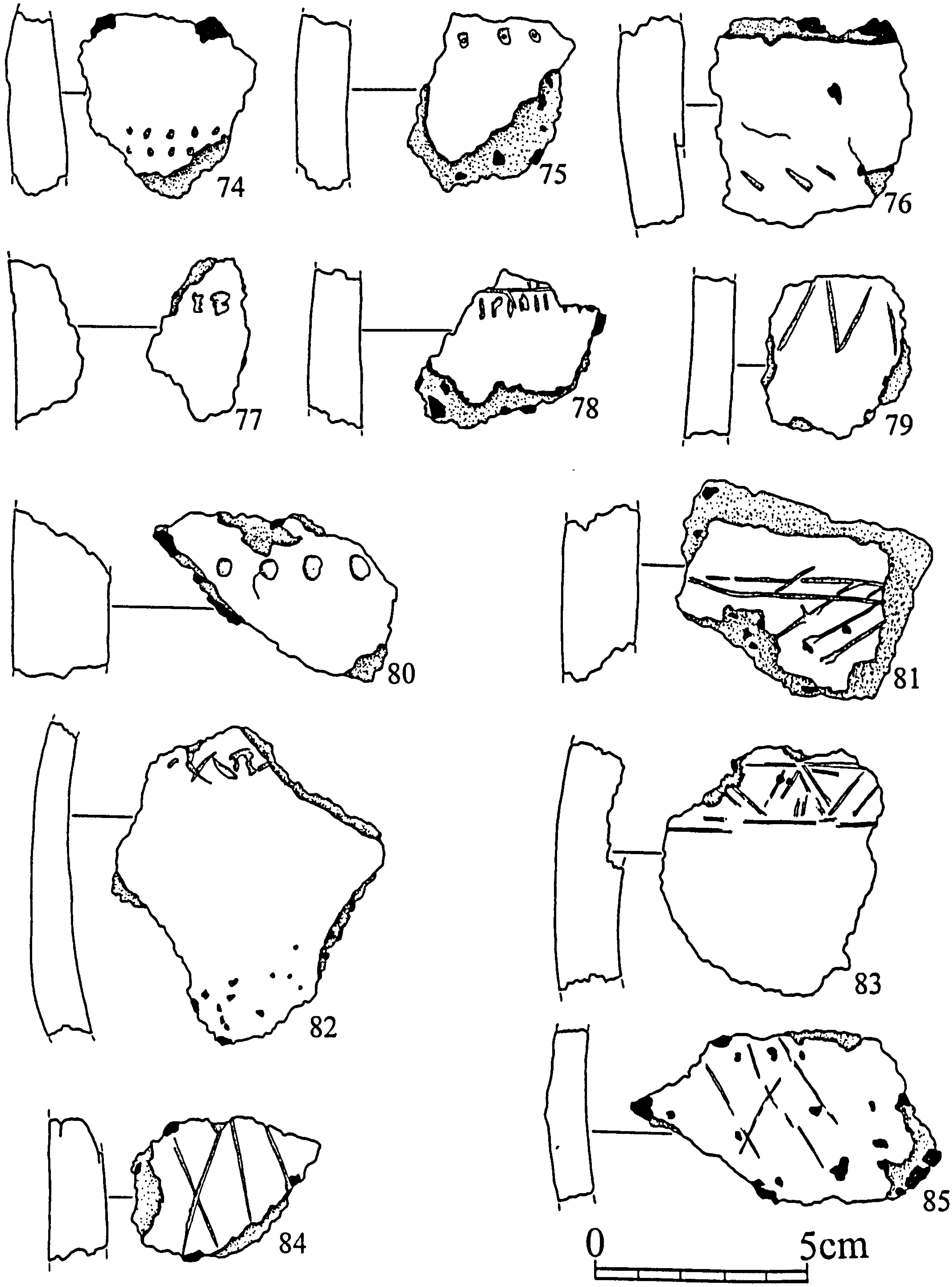


Figure A6.39: Glencrutchery (Gle 74 - 85)

Glencrutchery (Gle)

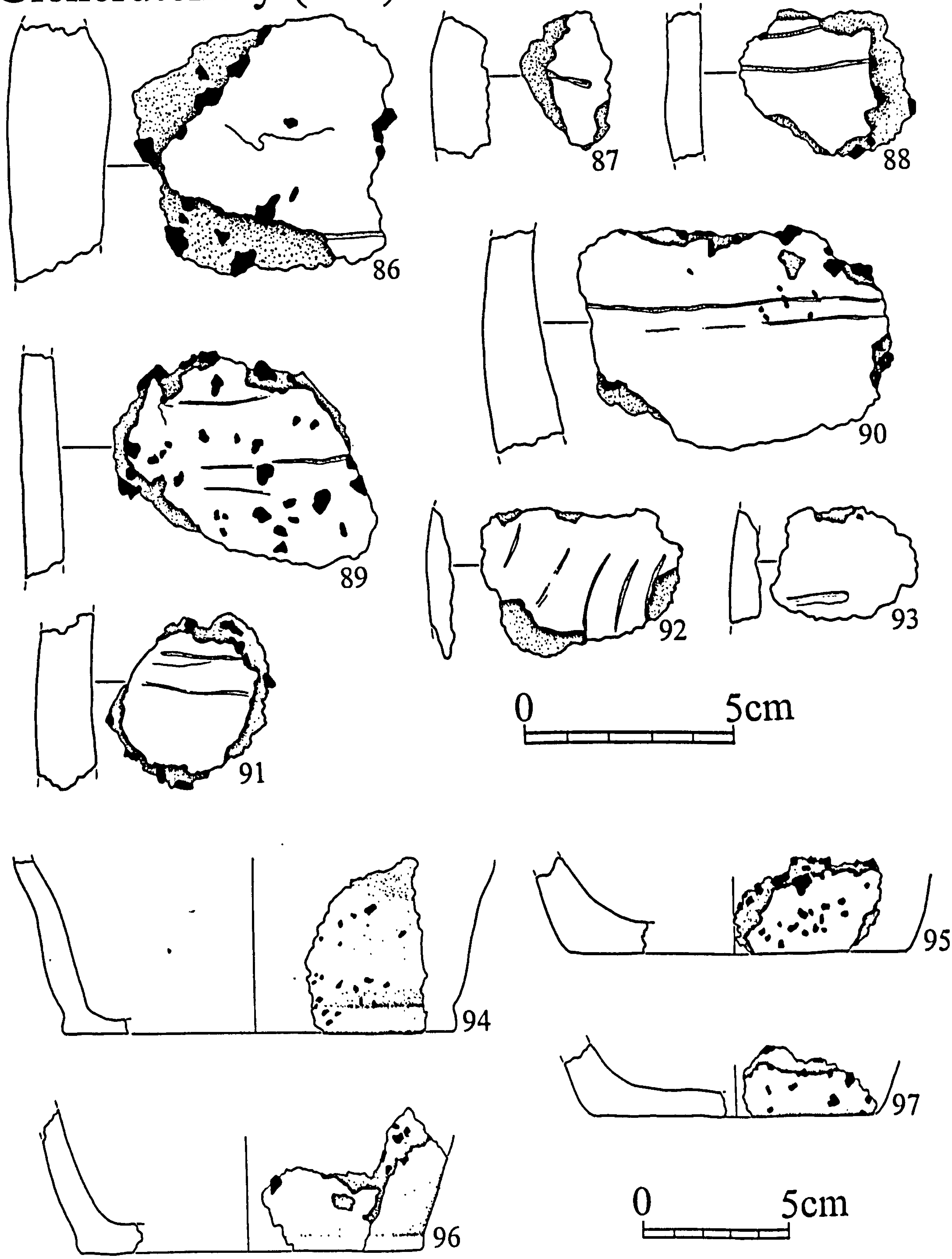


Figure A6.40: Glencrutchery (Gle 86 - 97)

Glencrutchery (Gle)

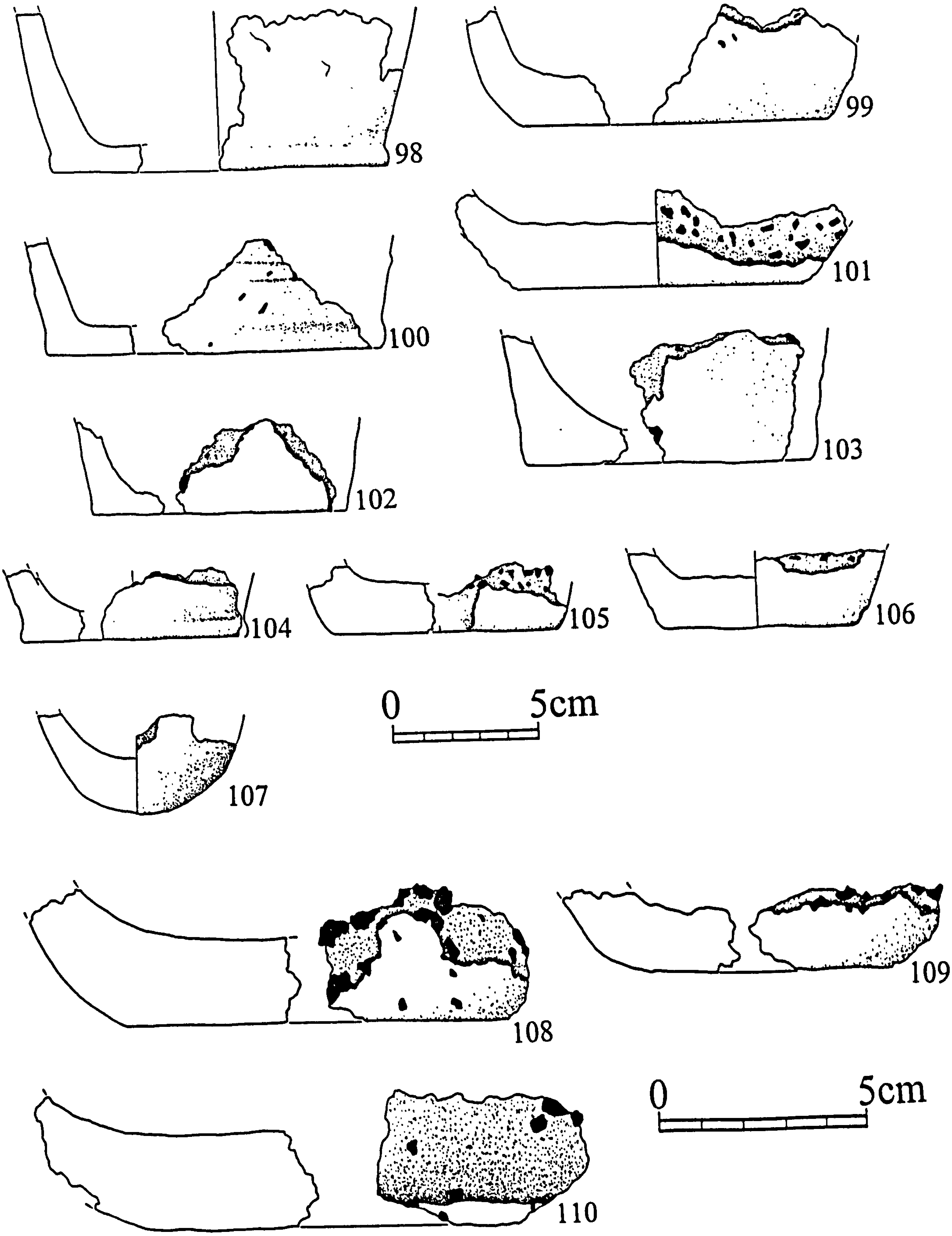


Figure A6.41: Glencrutchery (Gle 98 - 110)

Glencrutchery (Gle)

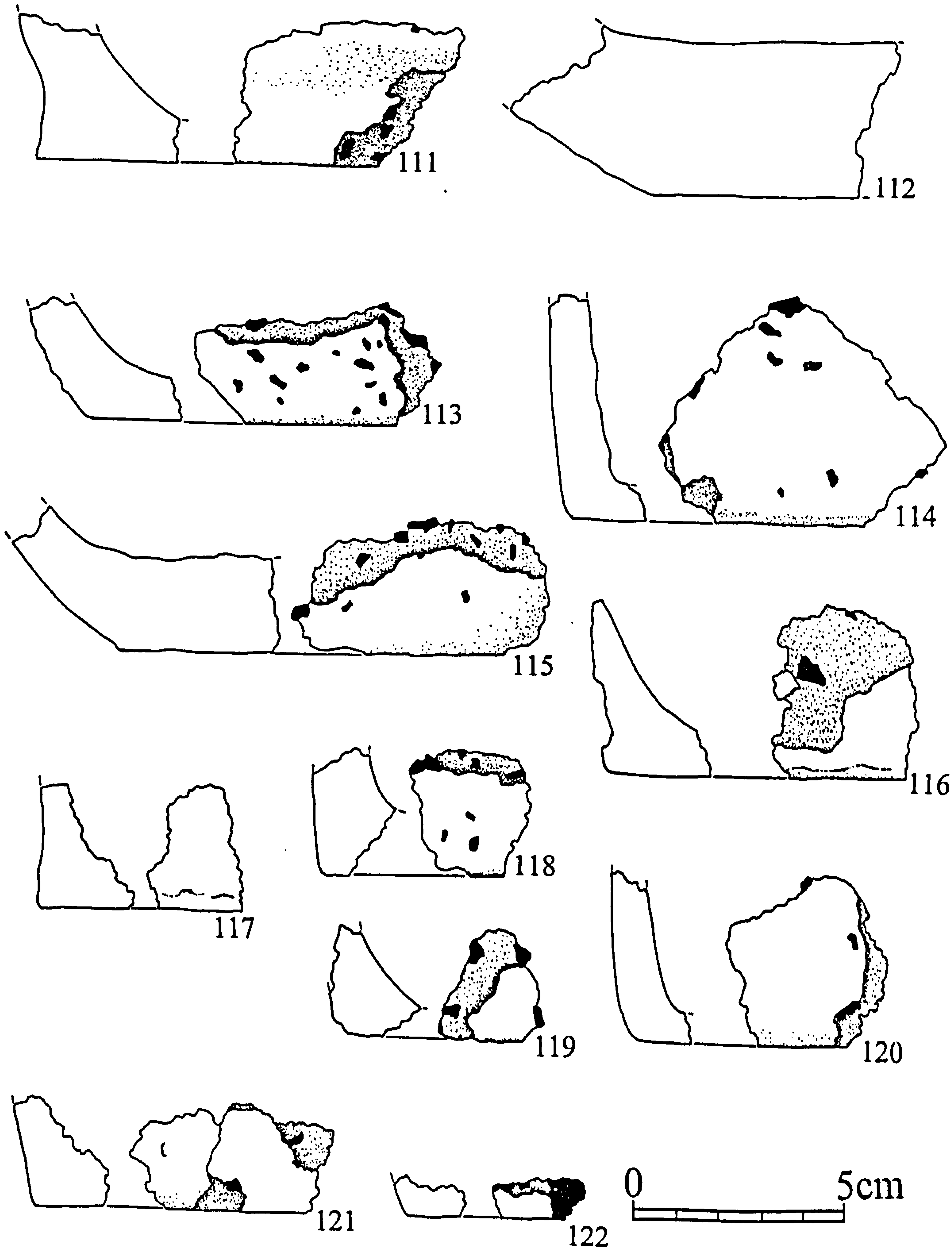
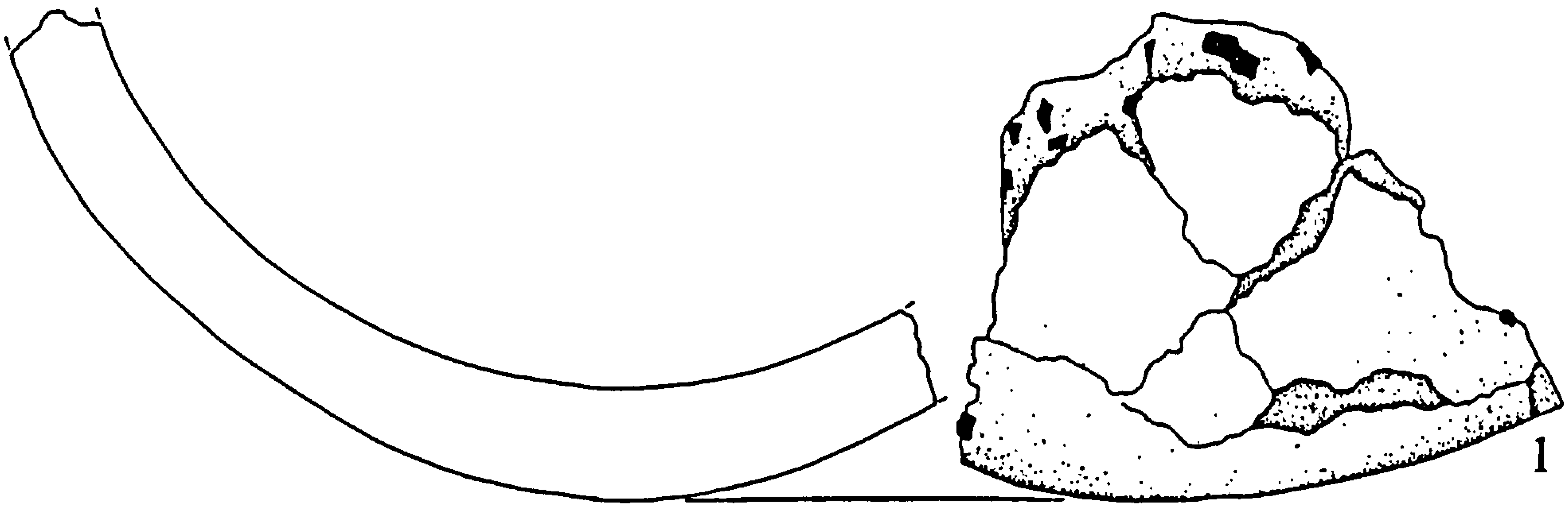


Figure A6.42: Glencrutchery (Gle 111 - 122)

Gob y Volley (Gob)



Greenlands (Gre)

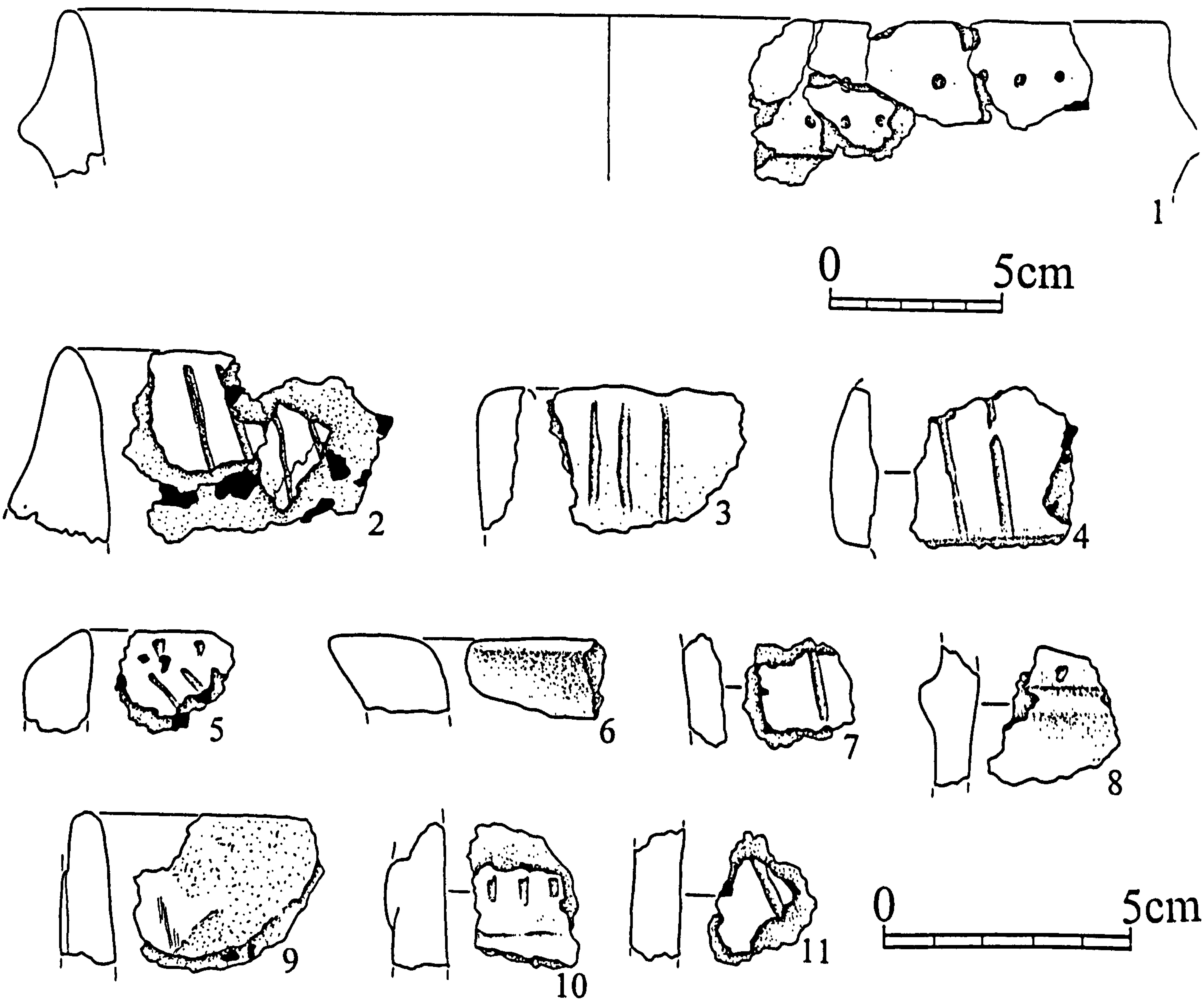
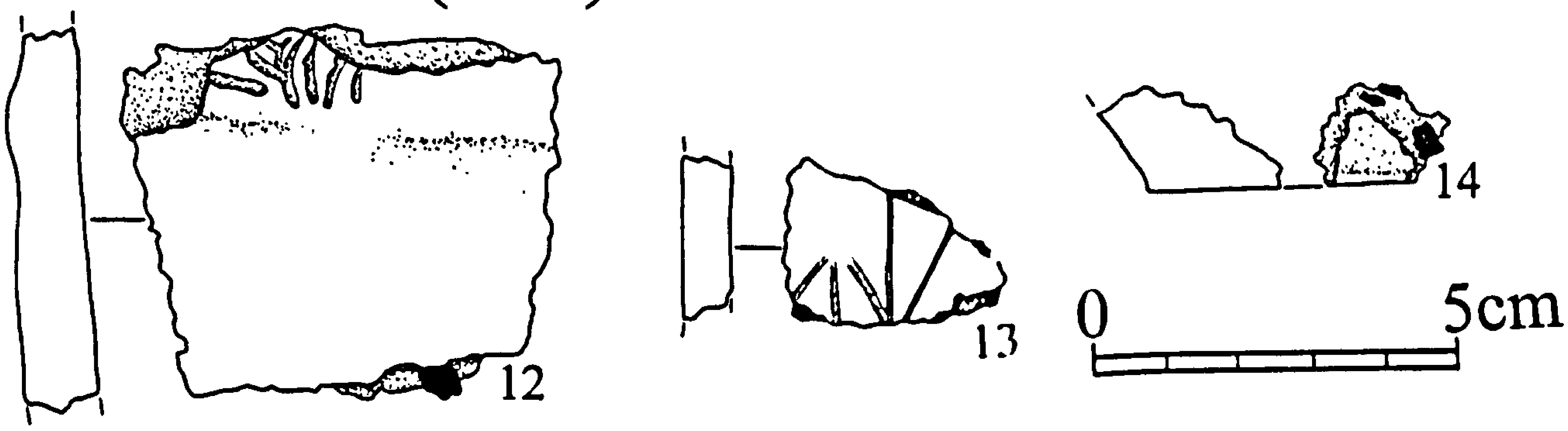
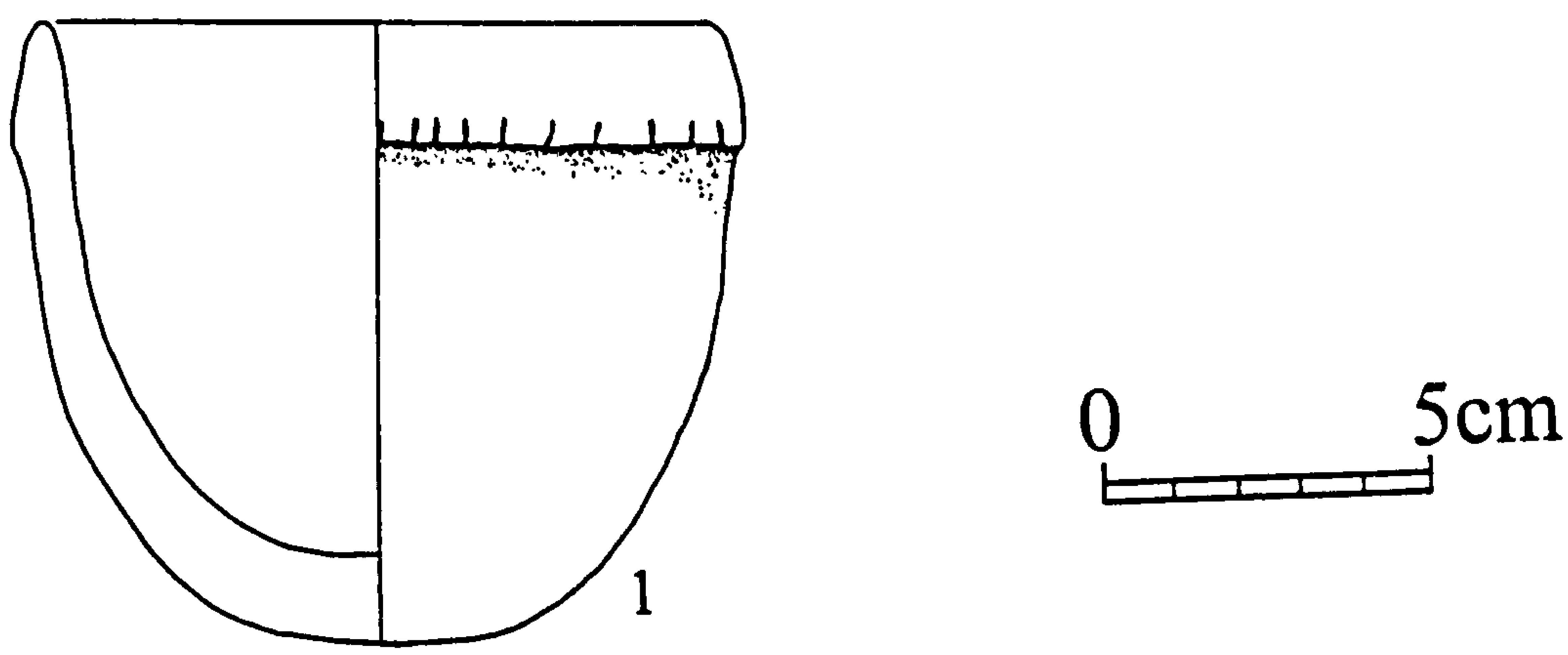


Figure A6.43: Gob y Volley (Gob 1); Greelands (Gre 1 - 11)

Greenlands (Gre)



Guilcagh (Gui)



Killeaba (Kil)

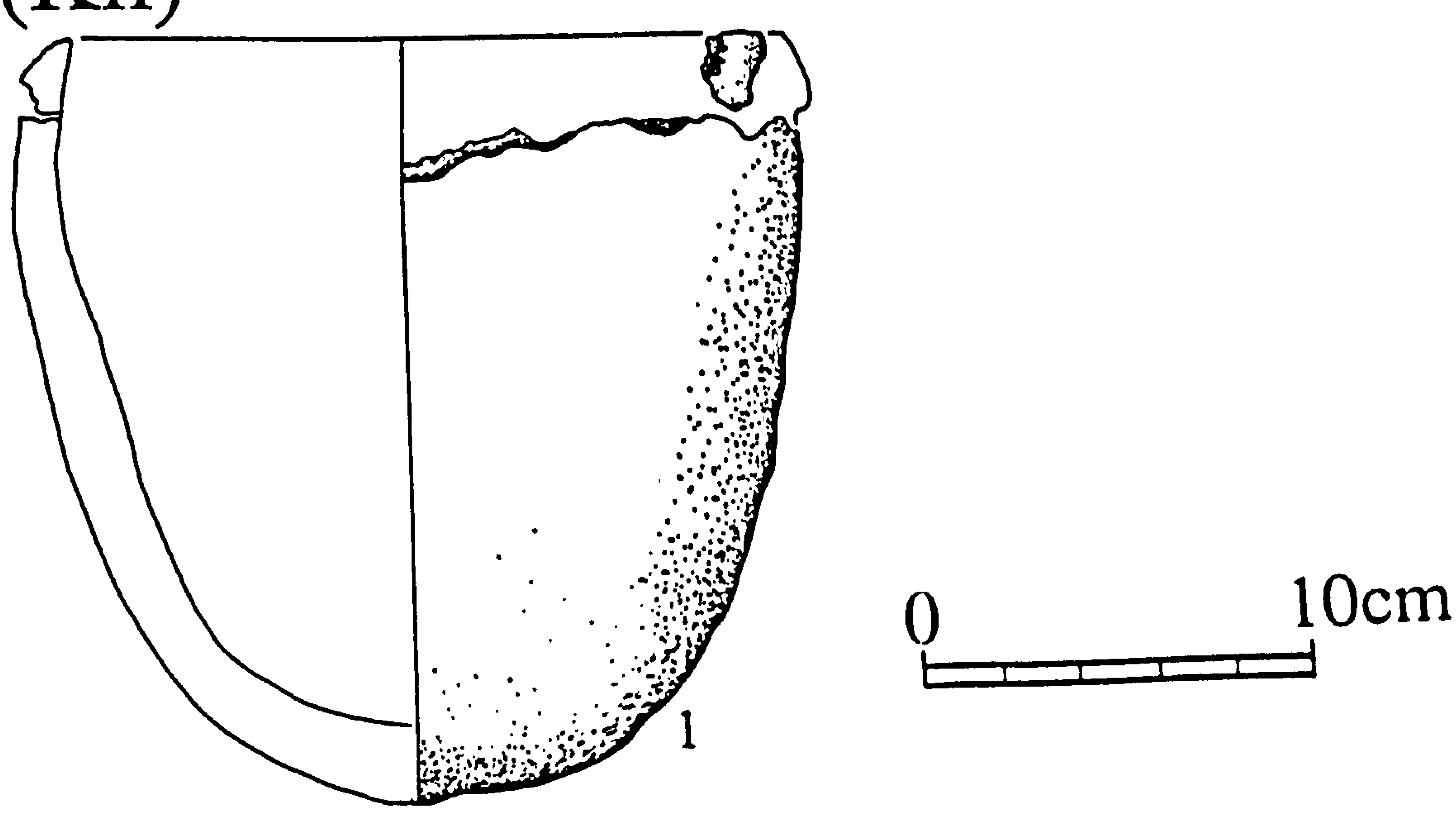
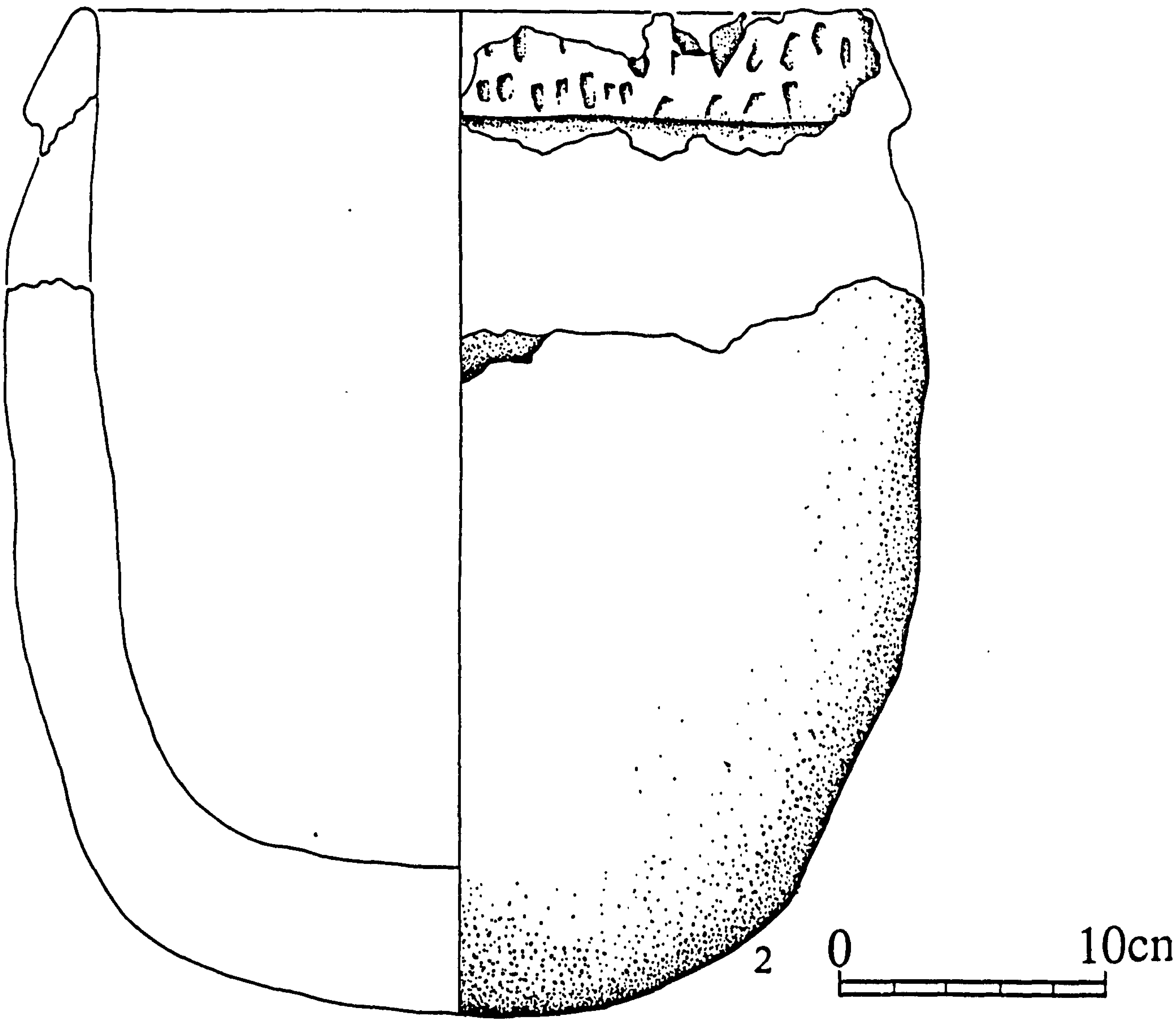


Figure A6.44: Greenlands (Gre 12 - 14); Guilcagh (Gui 1); Killeaba (Kil 1)

Killeaba (Kil)



King Orry's Grave (Kin)

Figure A6.45: Killeaba (Kil 2); King Orry's Grave (Kin 1 - 7)

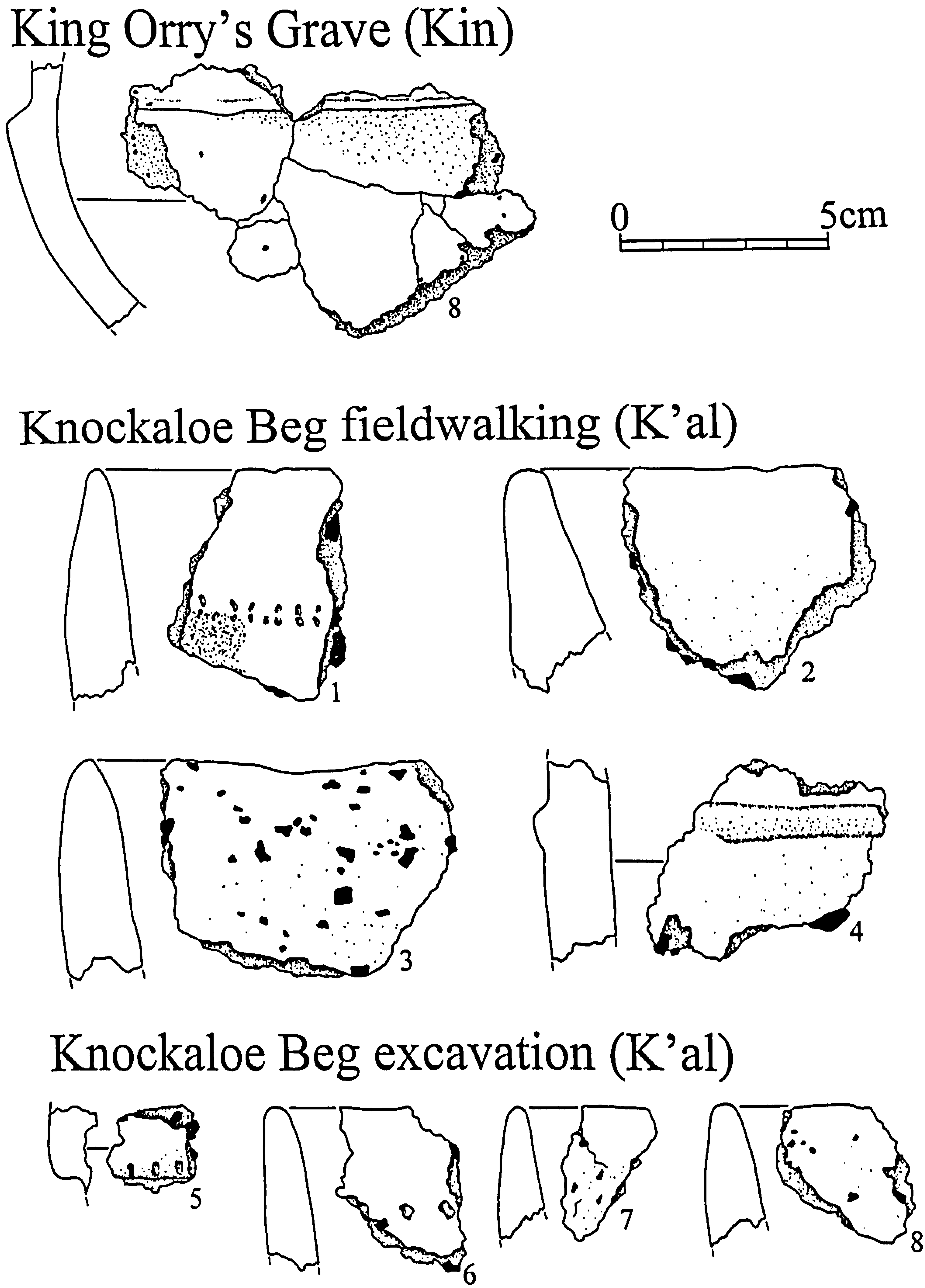


Figure A6.46: King Orry's Grave (Kin 8); Knockaloe Beg (K'al 1 - 8)

Knockaloe Beg excavation (K'al)

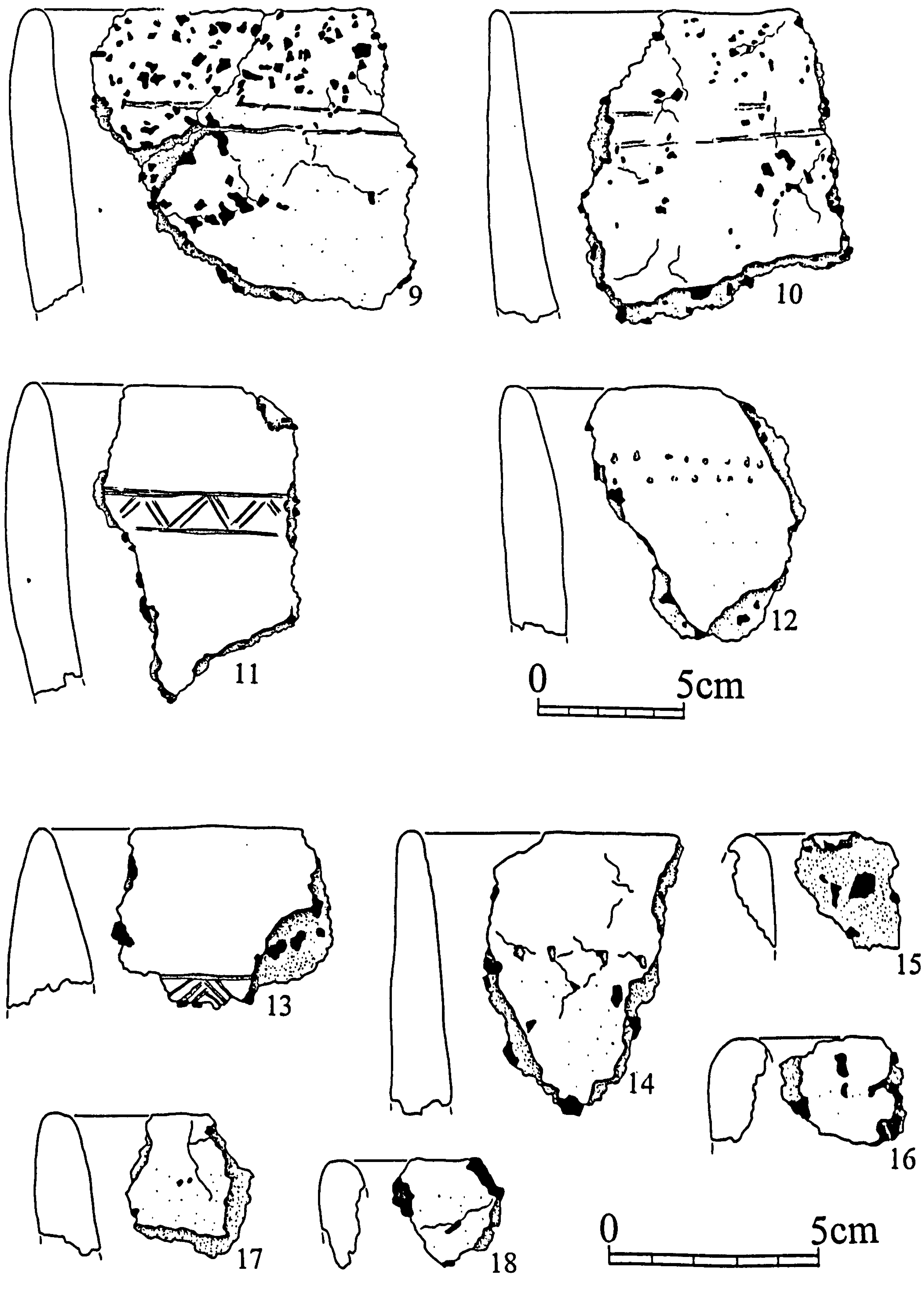


Figure A6.47: Knockaloe Beg (K'al 9 - 18)

Knocksharry (Kno)

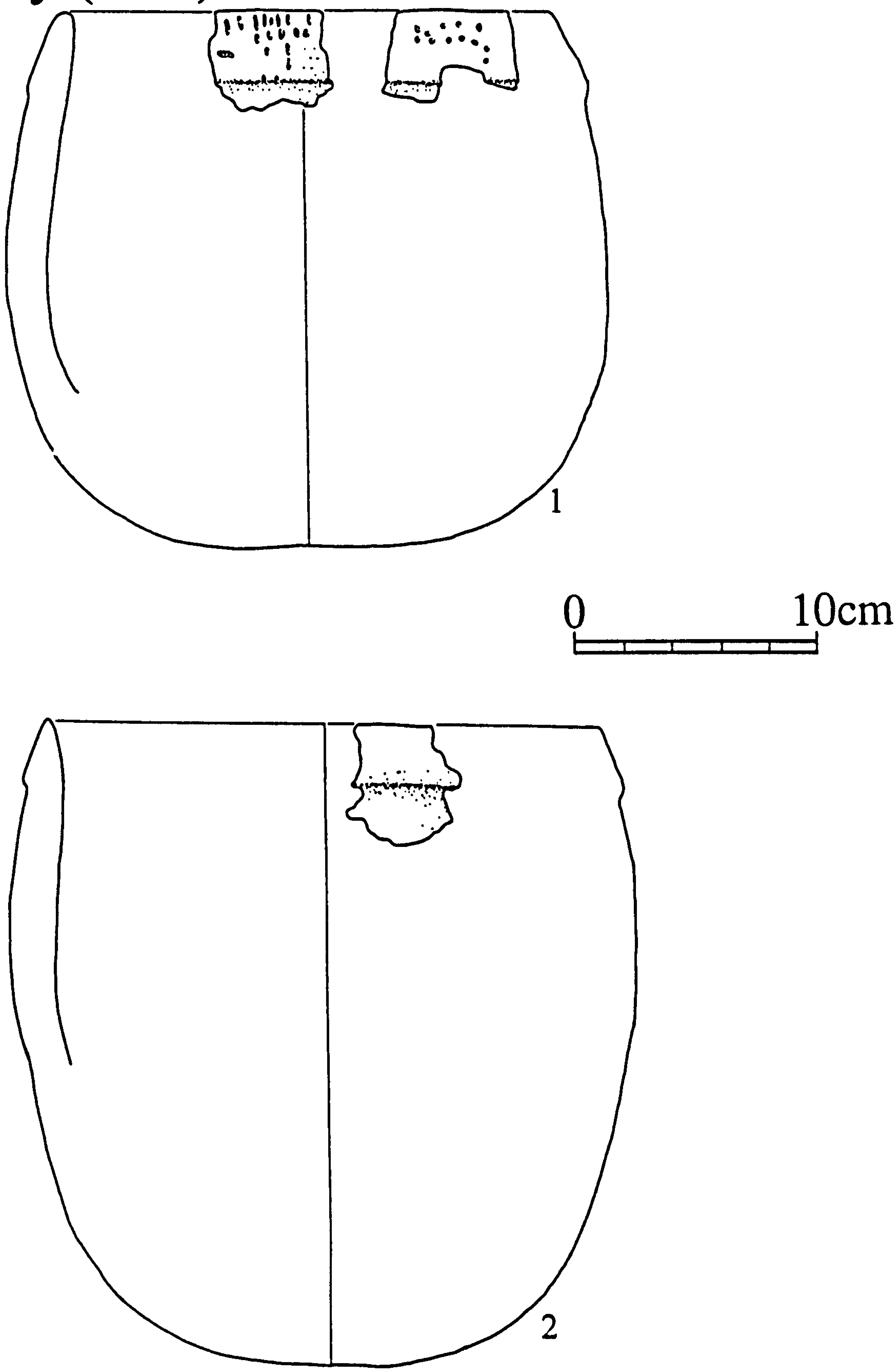


Figure A6.48: Knocksharry (K'no 1 - 2)

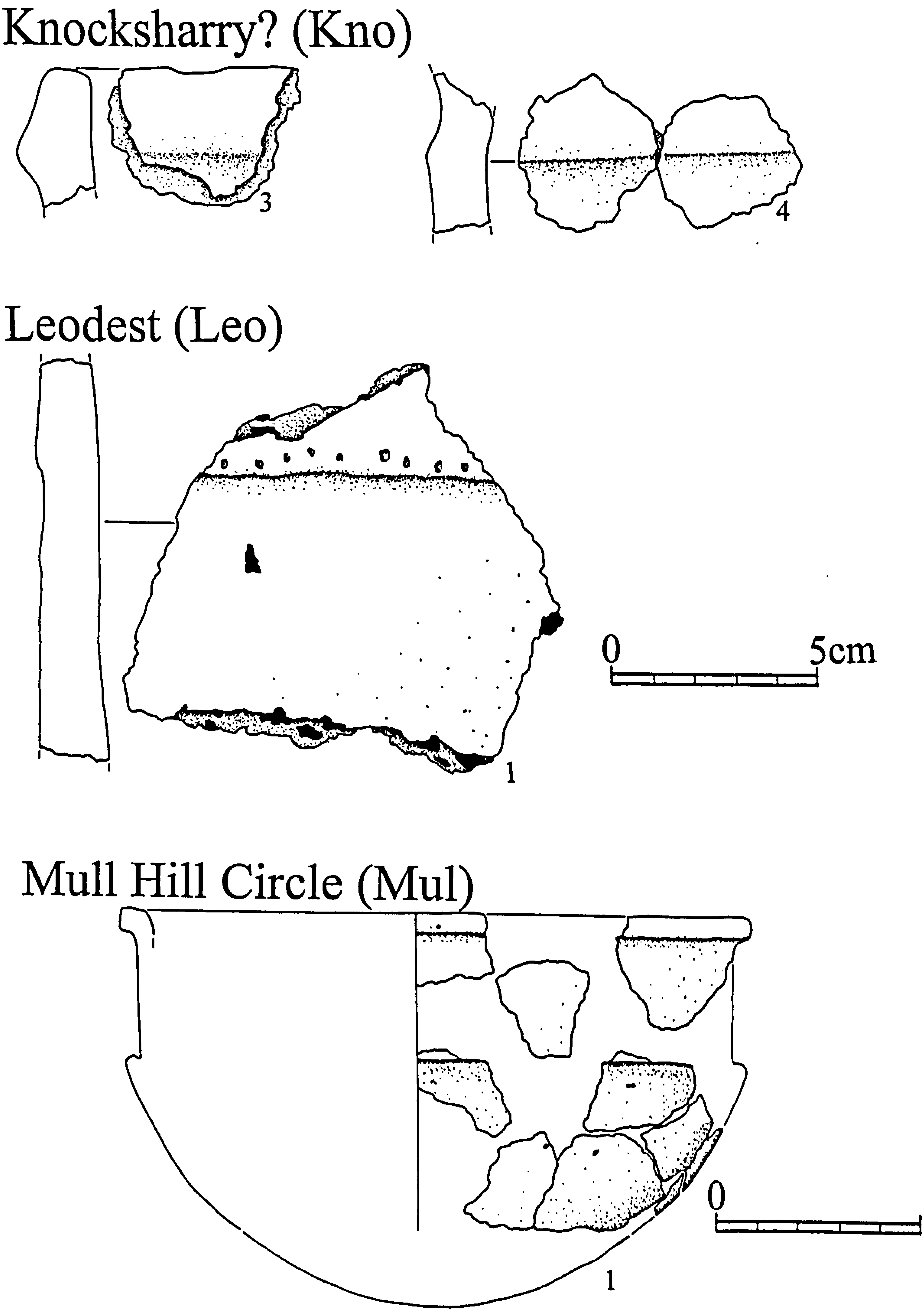


Figure A6.49: Knocksharry (K'no 3 - 4); Leodest (Leo 1); Mull Hill Circle (Mul 1)

Mull Hill Circle (Mul)

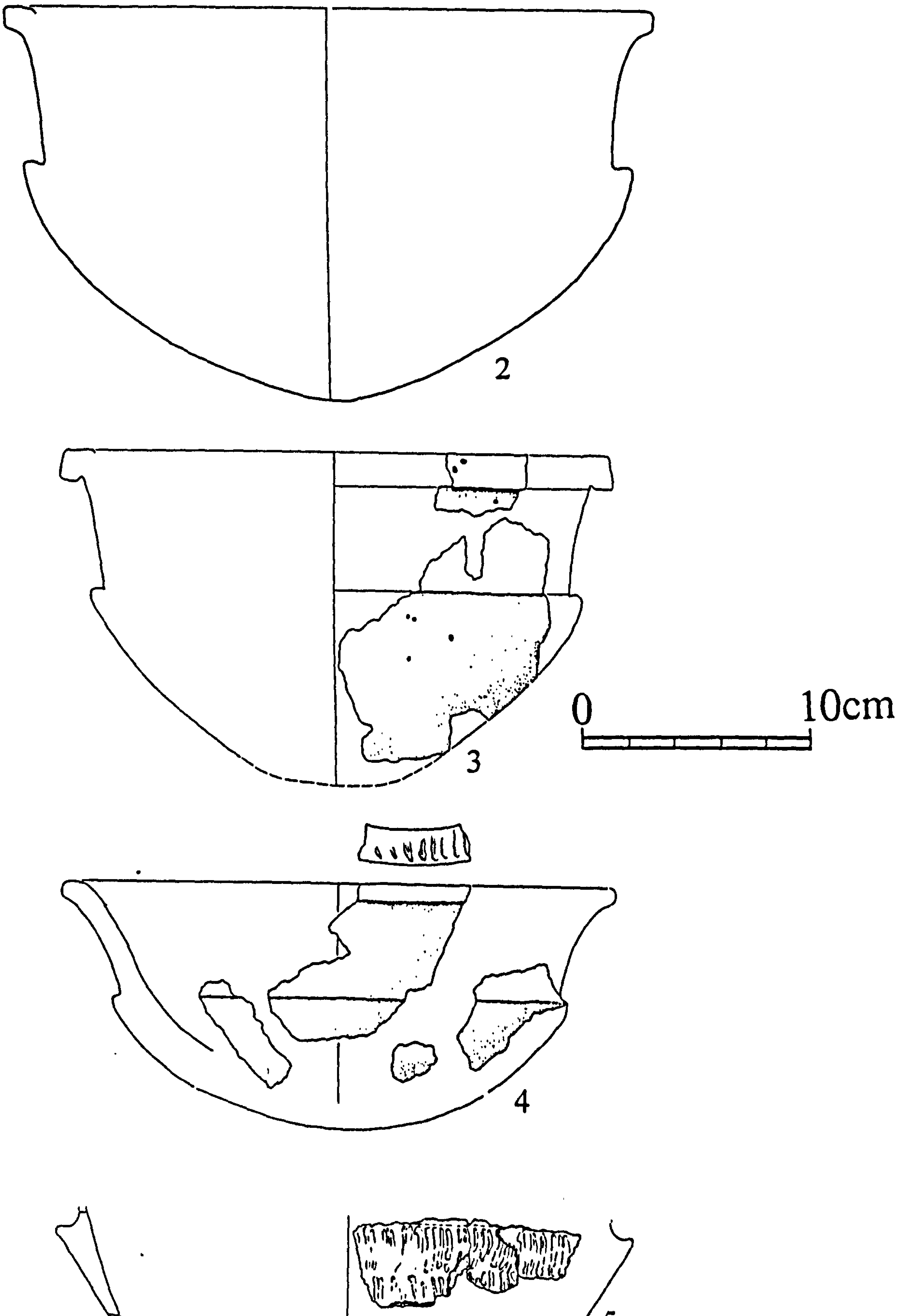


Figure A6.50: Mull Hill Circle (Mul 2 - 5)

Mull Hill Circle (Mul)

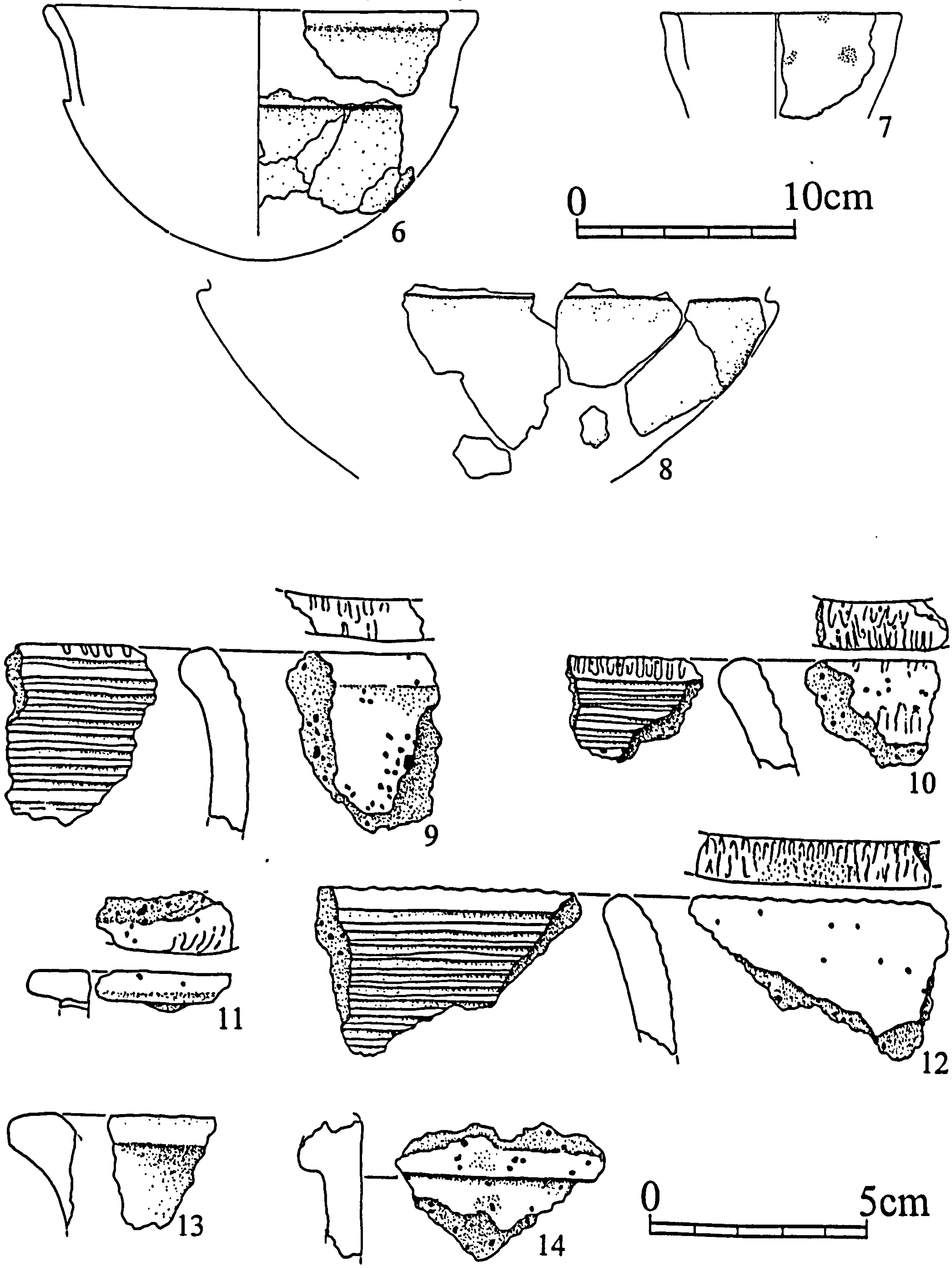


Figure A6.51: Mull Hill Circle (Mul 6 - 14)

Mull Hill Circle (Mul)

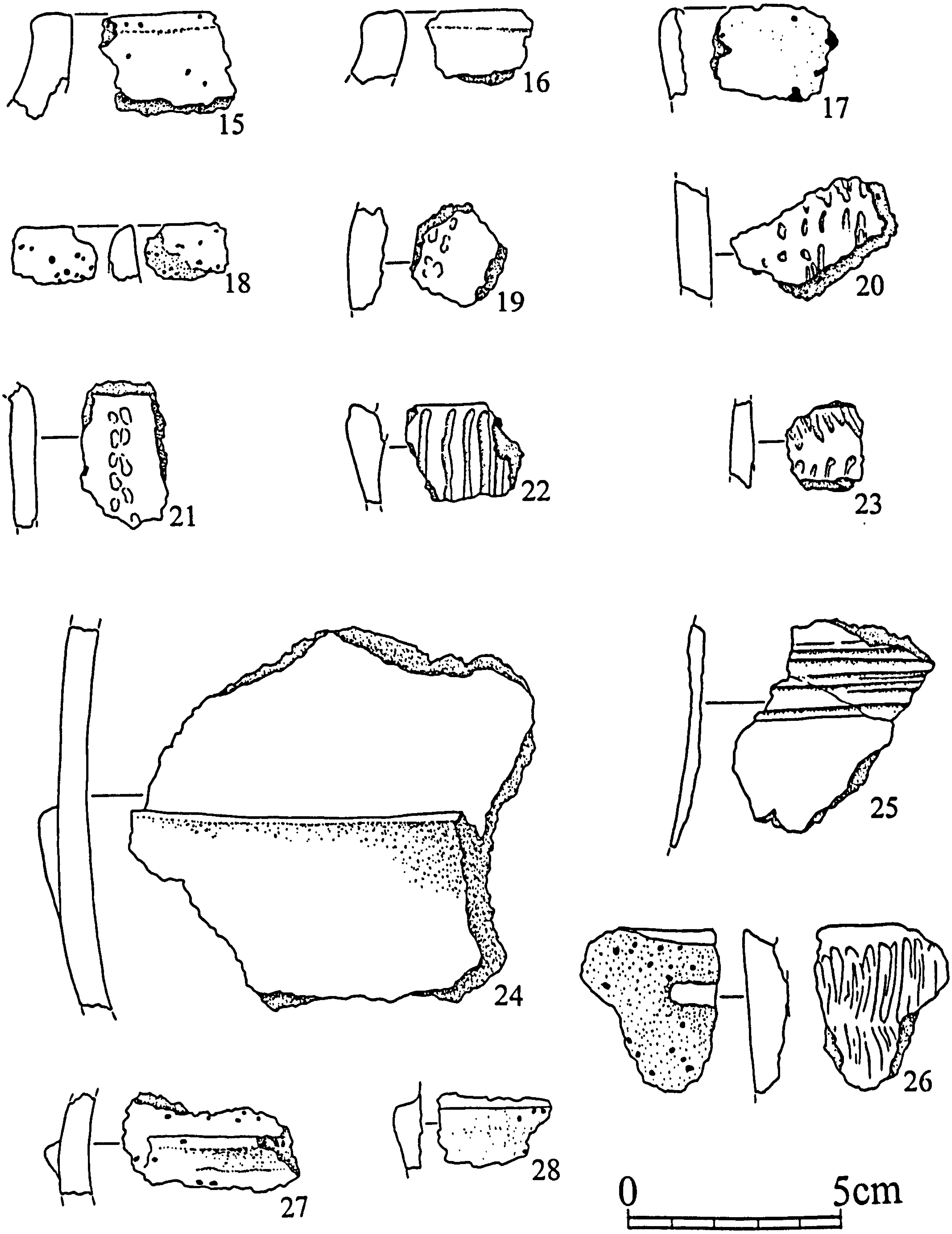
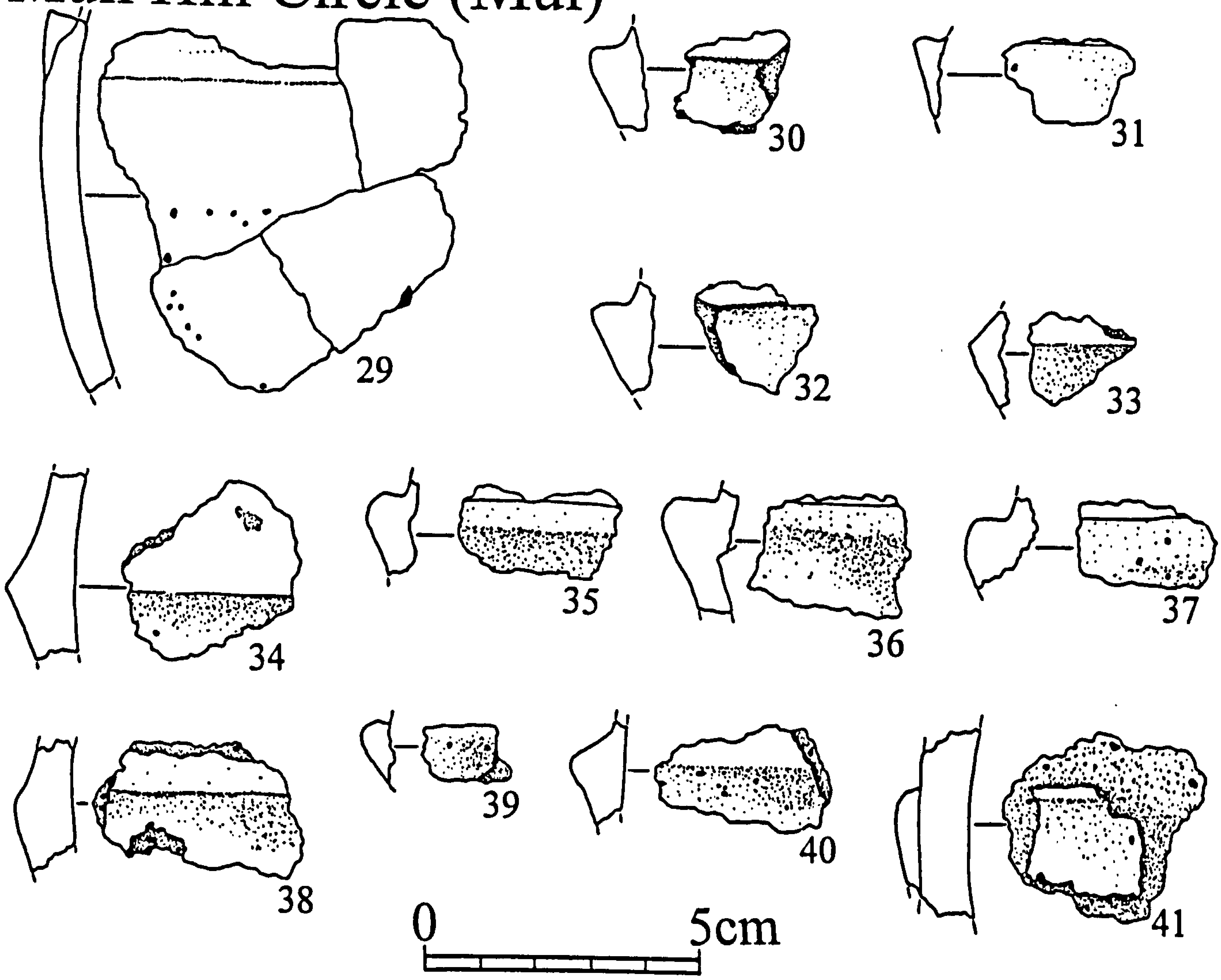


Figure A6.52: Mull Hill Circle (Mul 15 - 26)

Mull Hill Circle (Mul)



Orrisdale Brooghs (Orr)

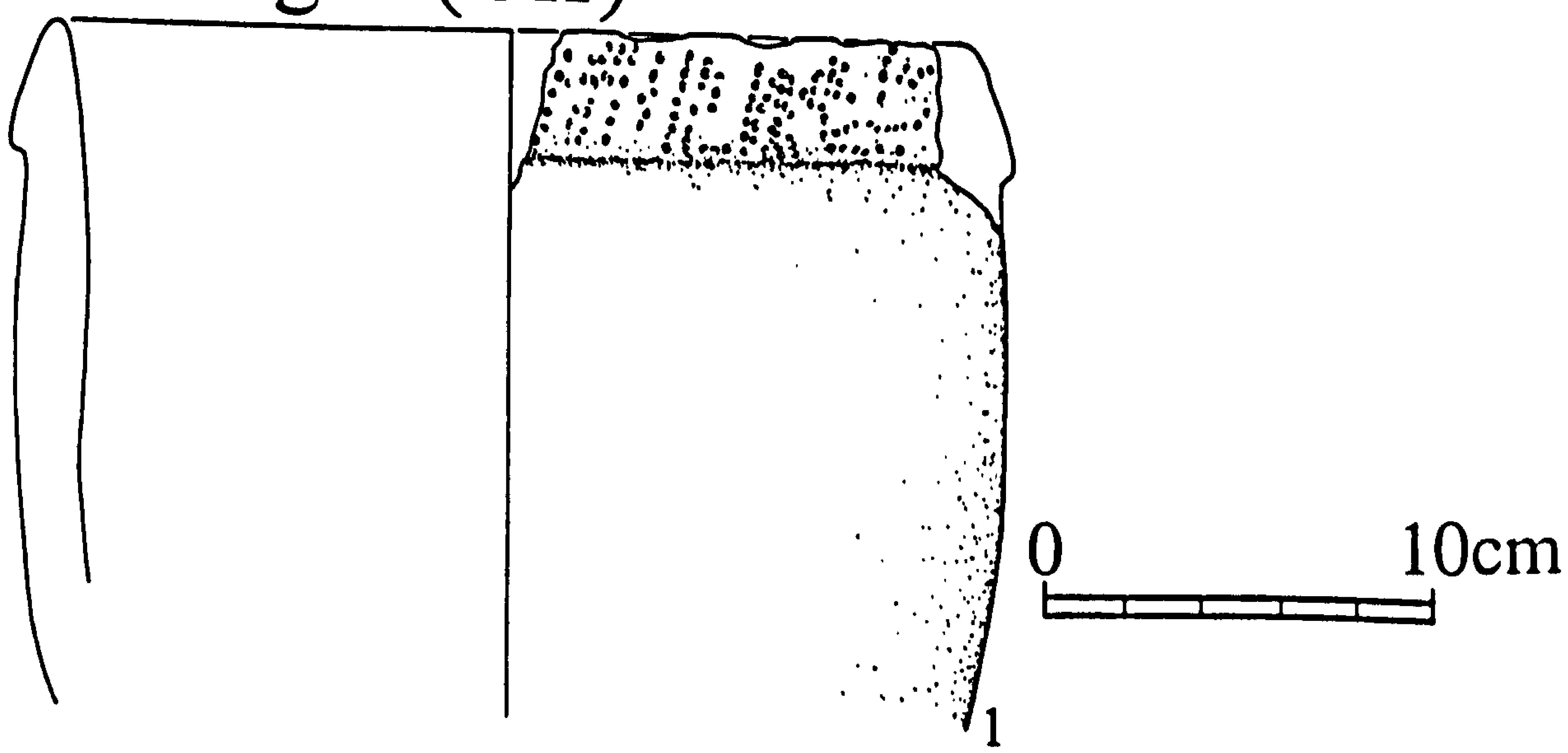
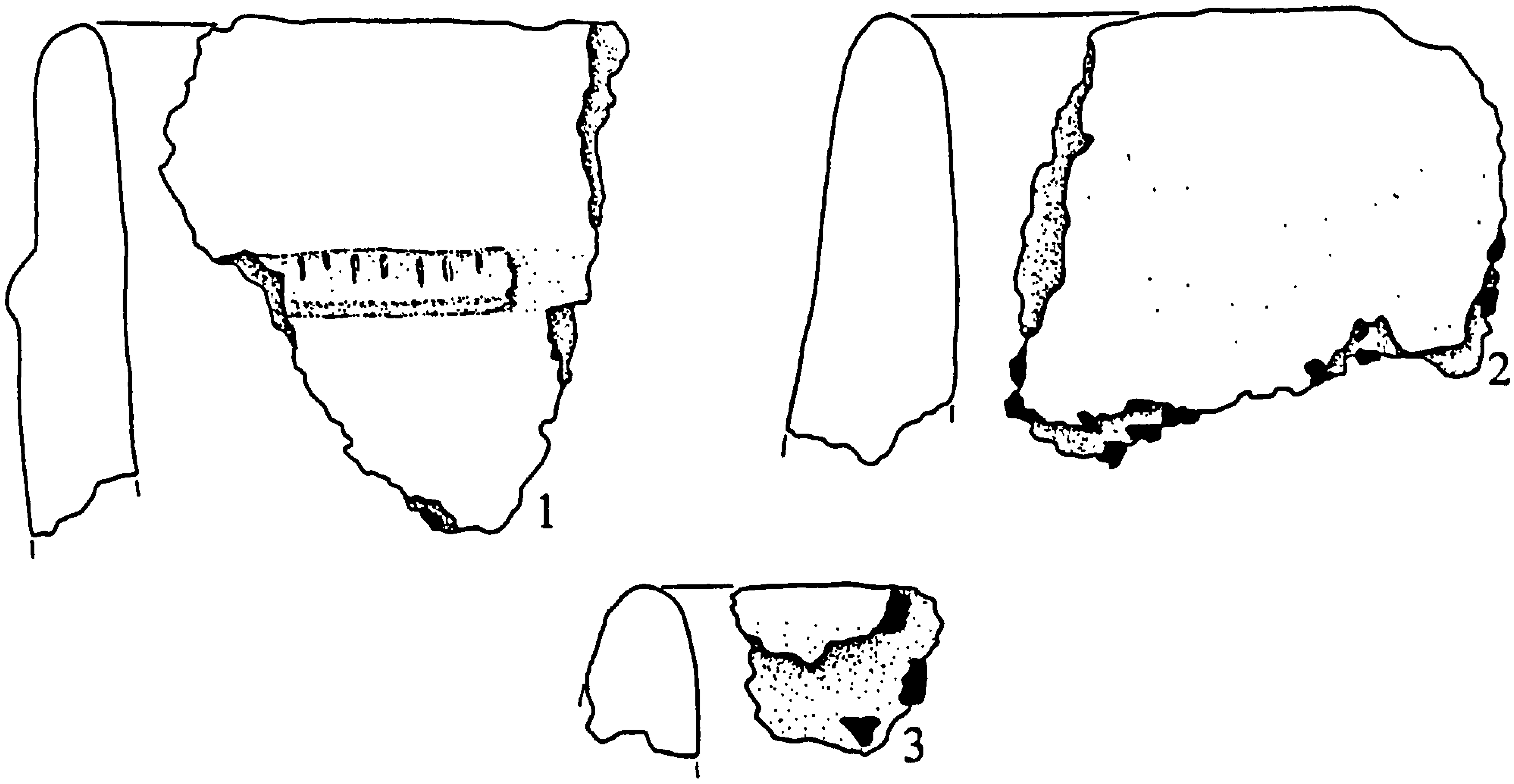
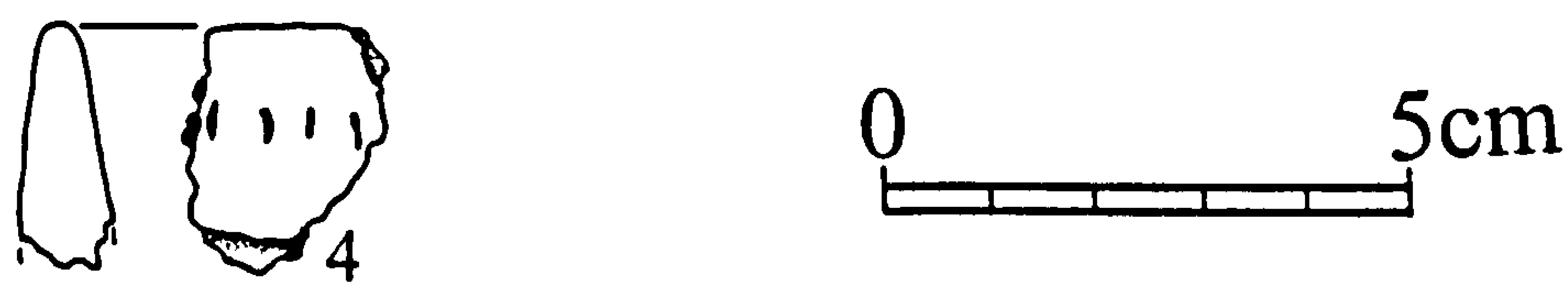


Figure A6.53: Mull Hill Circle (Mul 29 - 41); Orrisdale Brooghs (Orr 1)

Park Farm fieldwalking (Par)



Park Farm (Par)



Peel School (Pee)

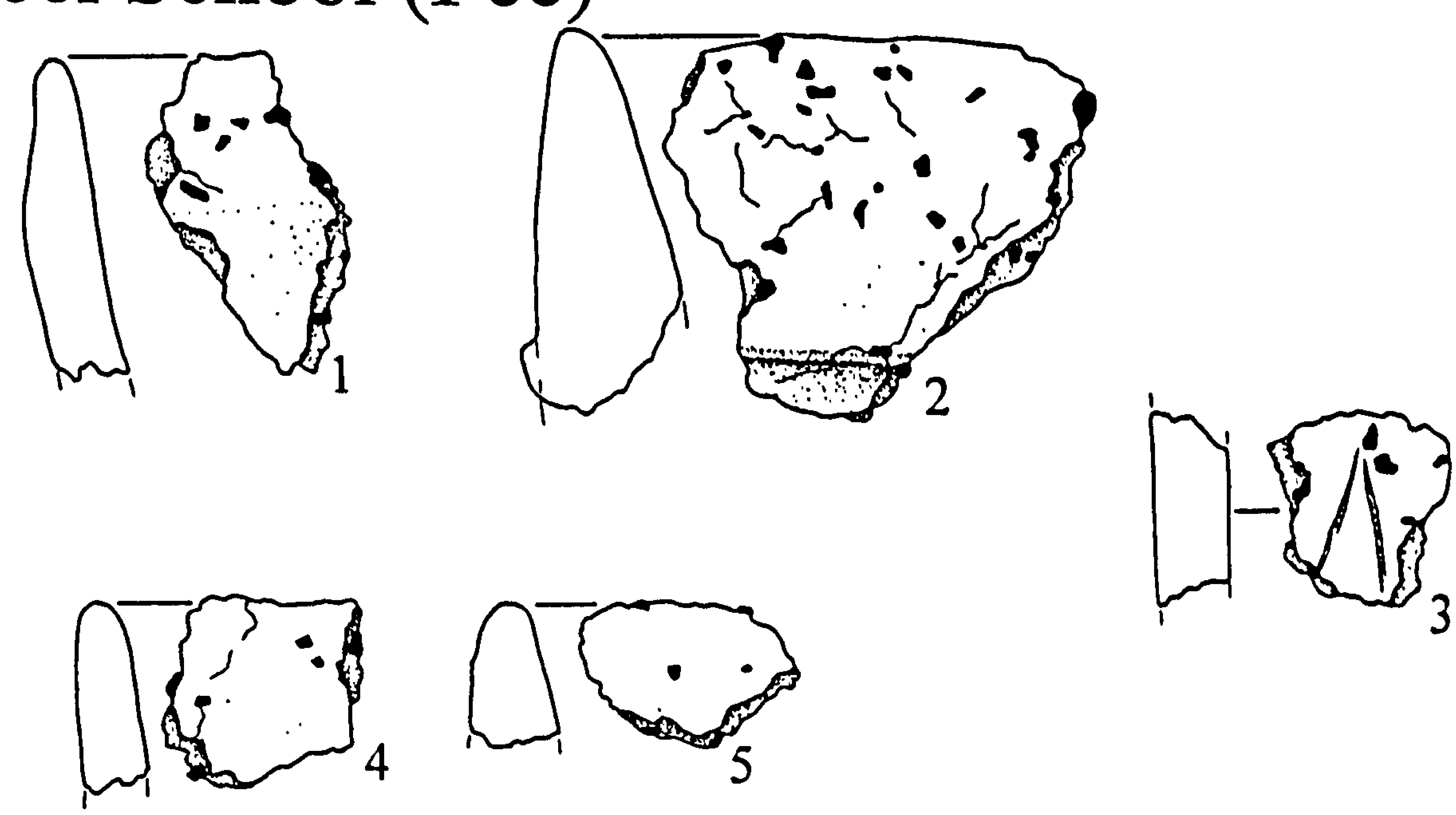


Figure A6.54: Park Farm (Par 1 - 4); Peel School (1 - 5)

Phurt (Phu)

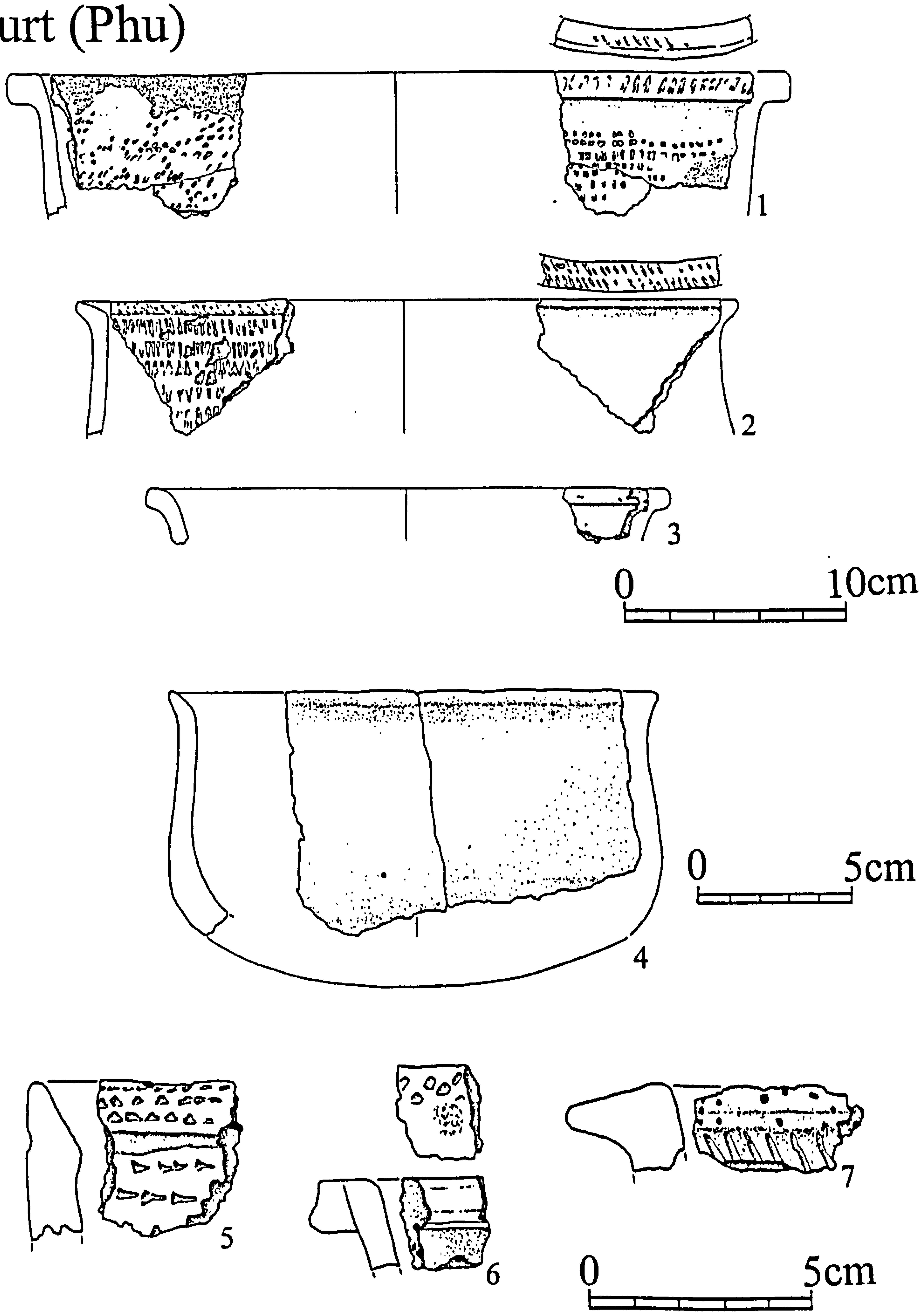


Figure A6.55:Phurt (Phu 1 - 7)

Phurt (Phu)

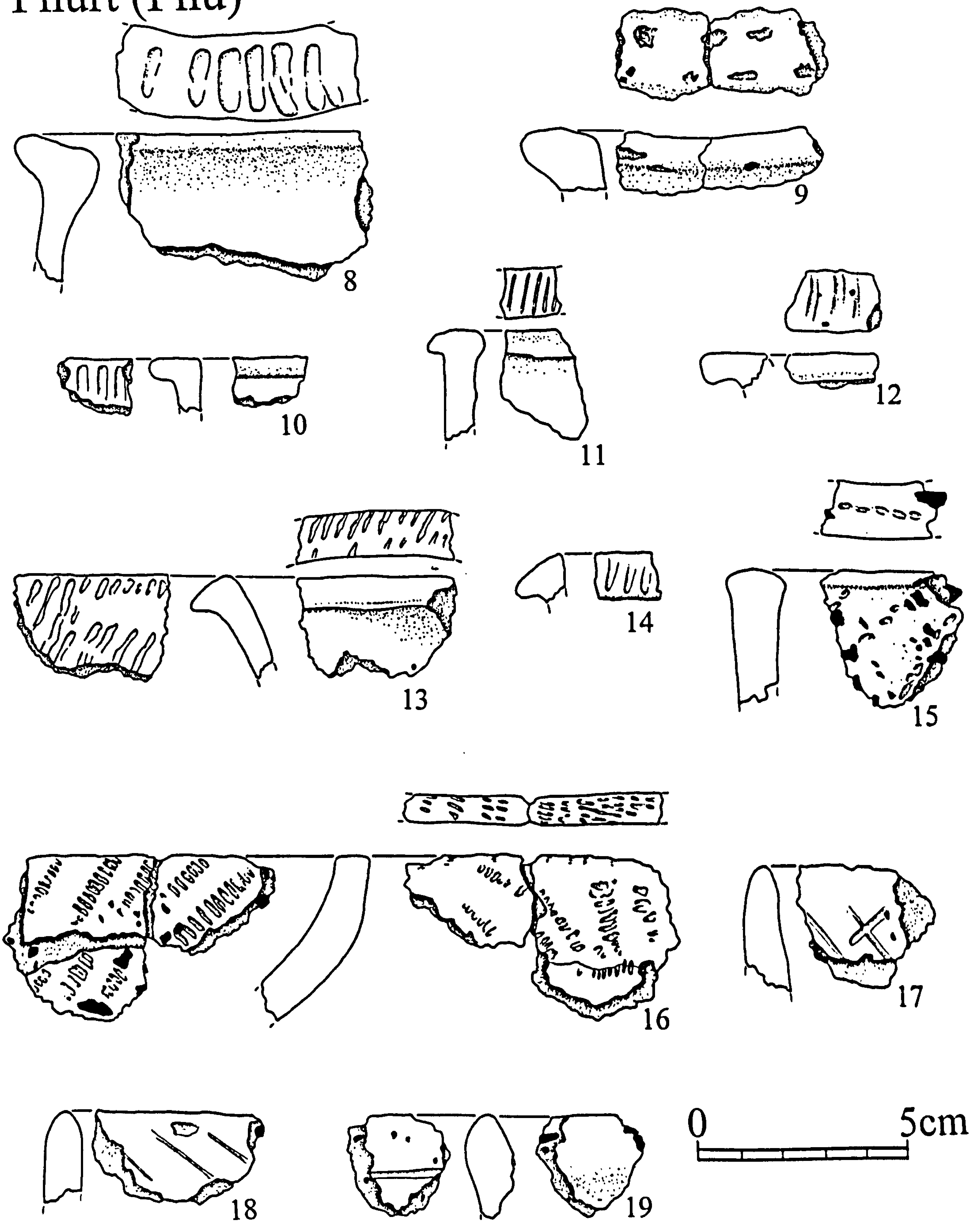


Figure A6.56: Phurt (8 - 19)

Phurt (Phu)

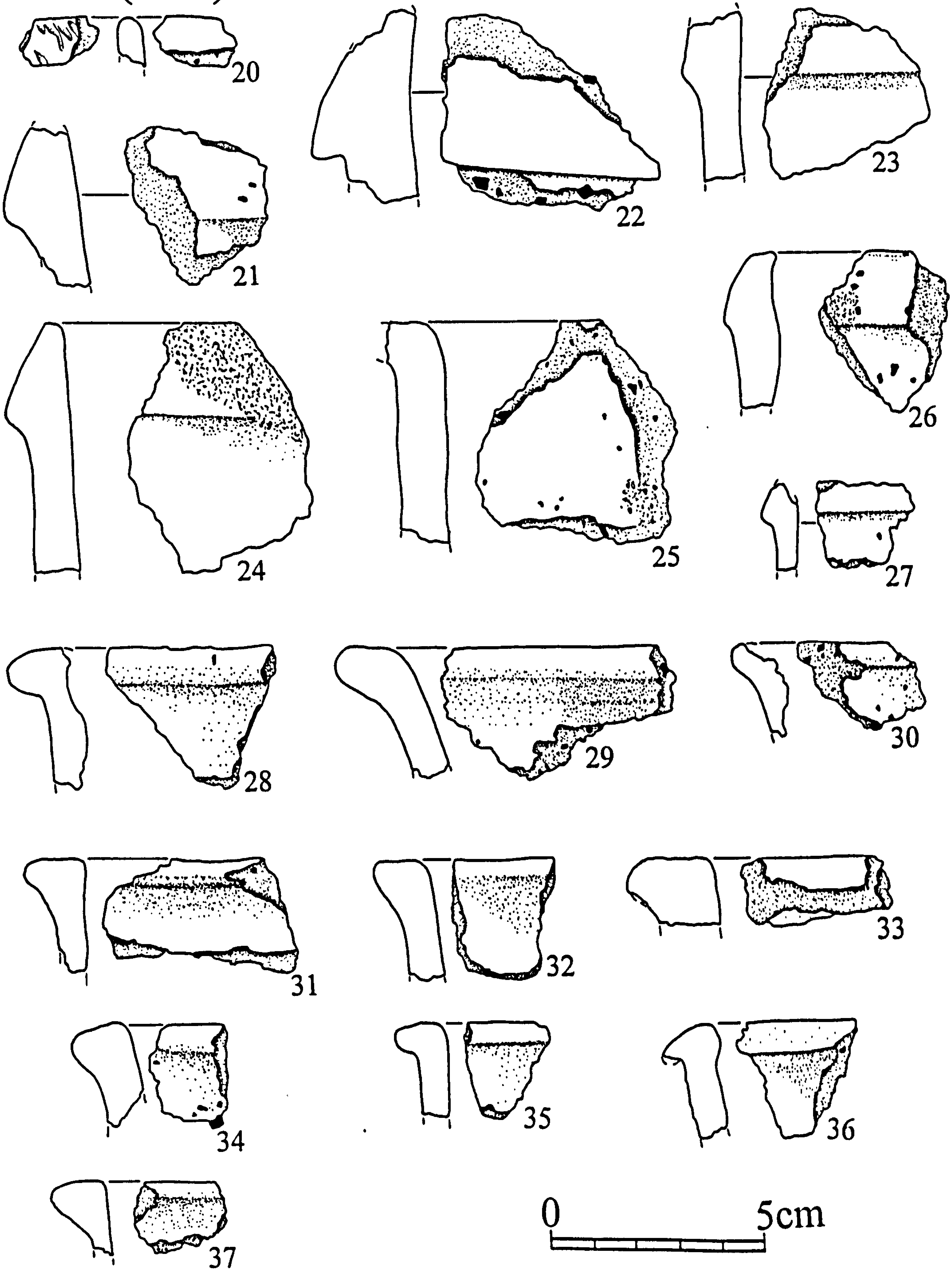


Figure A6.57: Phurt (20 - 37)

Phurt (Phu)

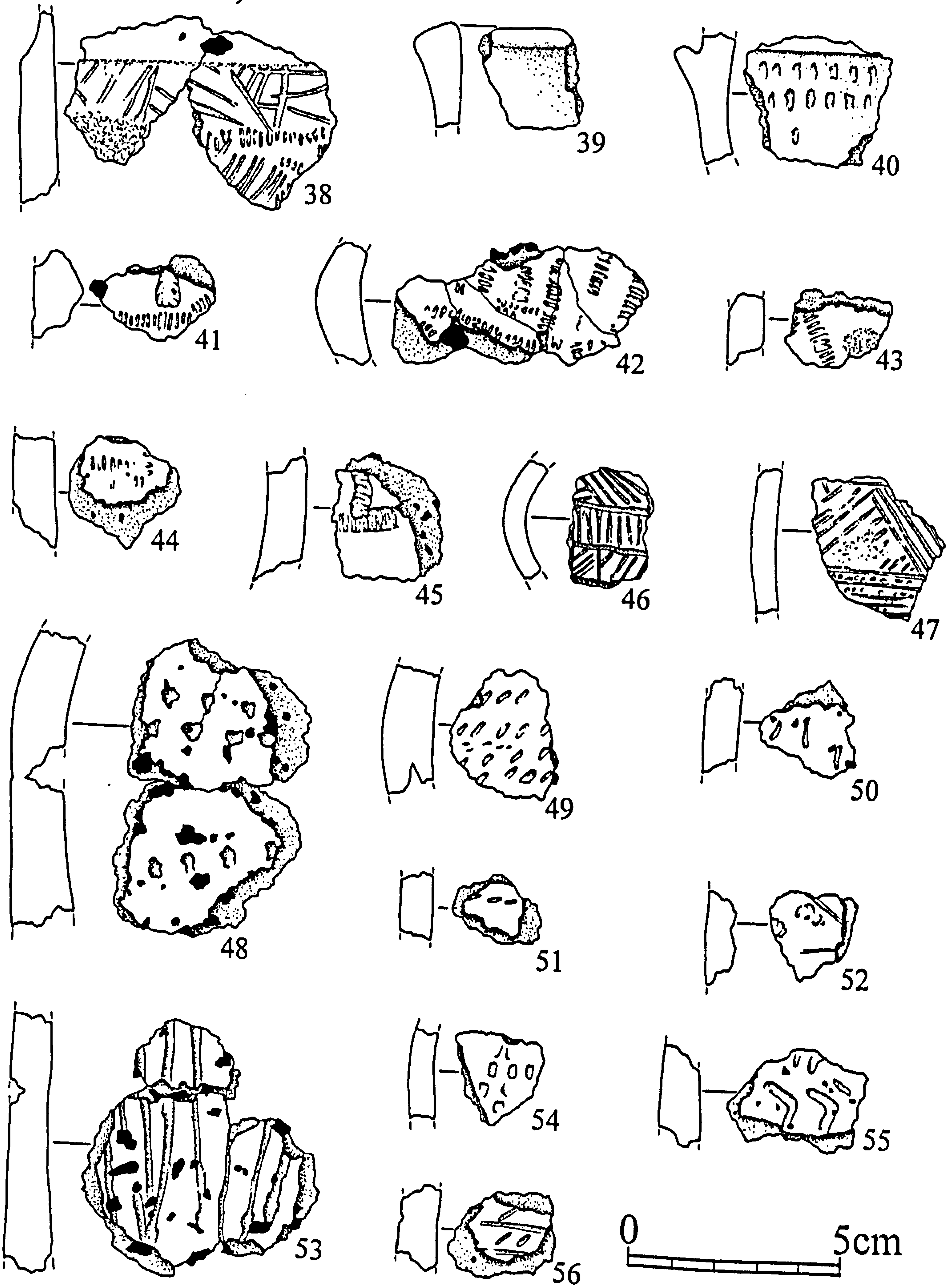


Figure A6.58: Phurt (38 - 56)

Phurt (Phu)

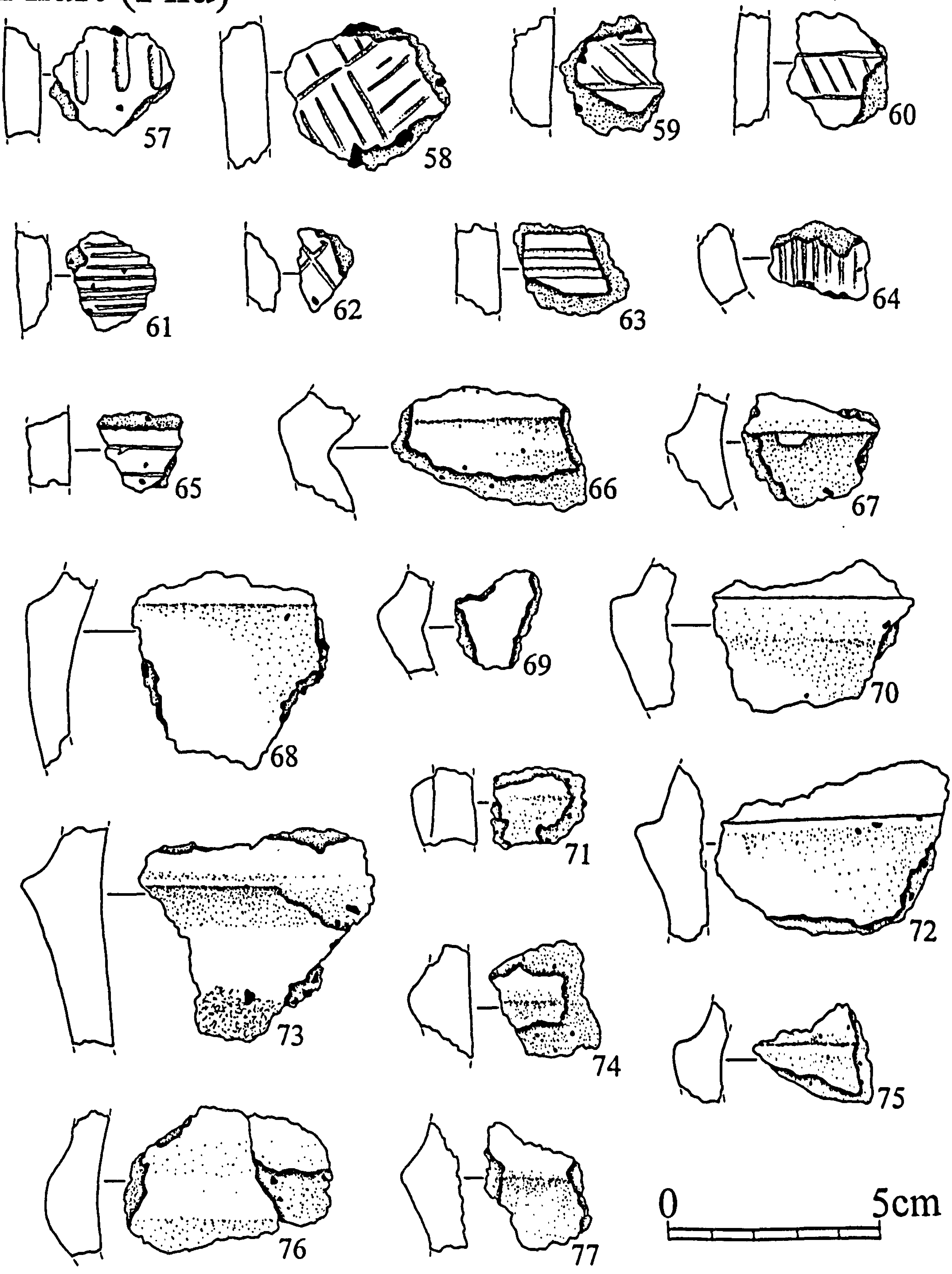


Figure A6.59: Phurt (57 - 77)

Phurt (Phu)

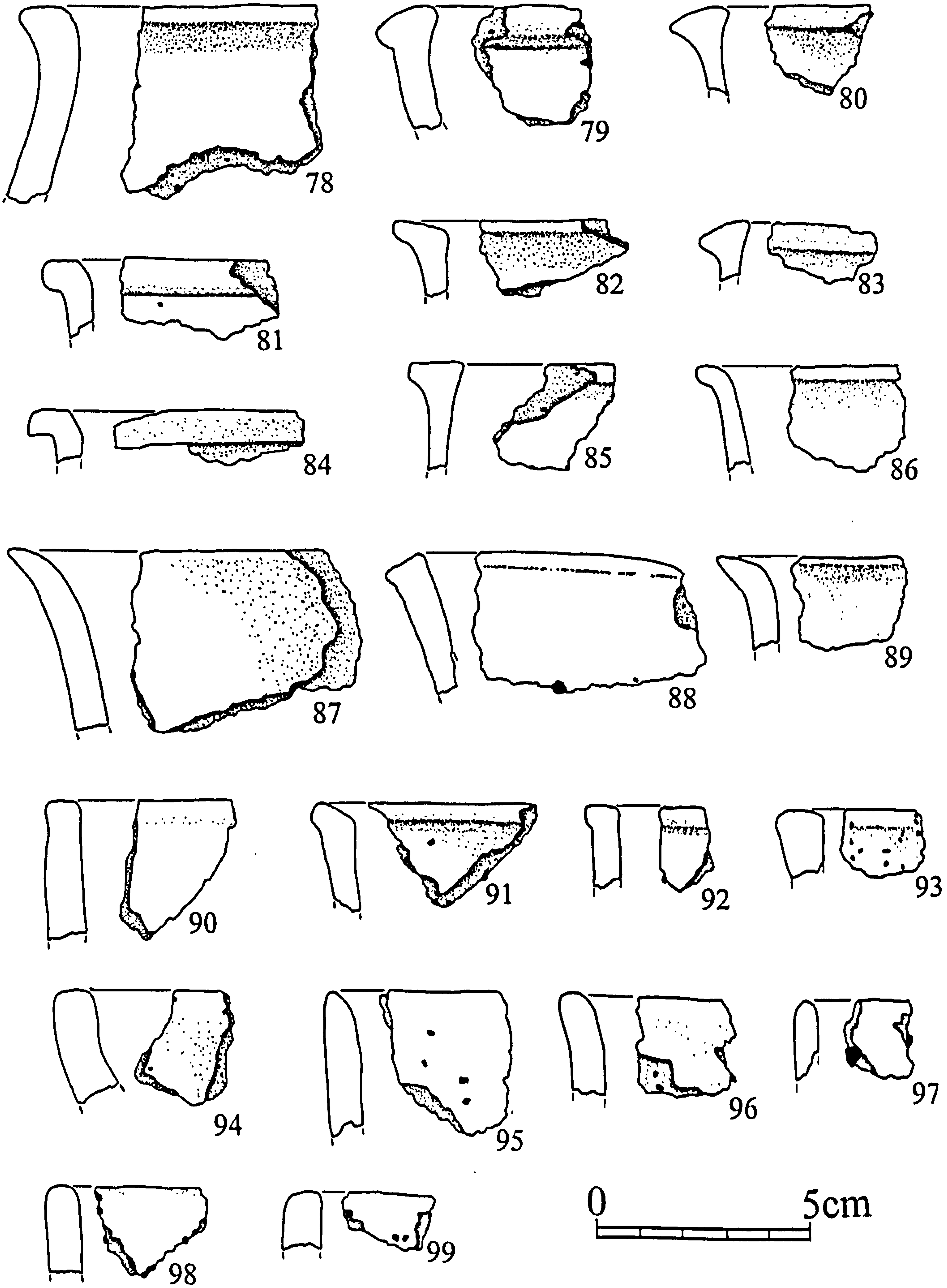
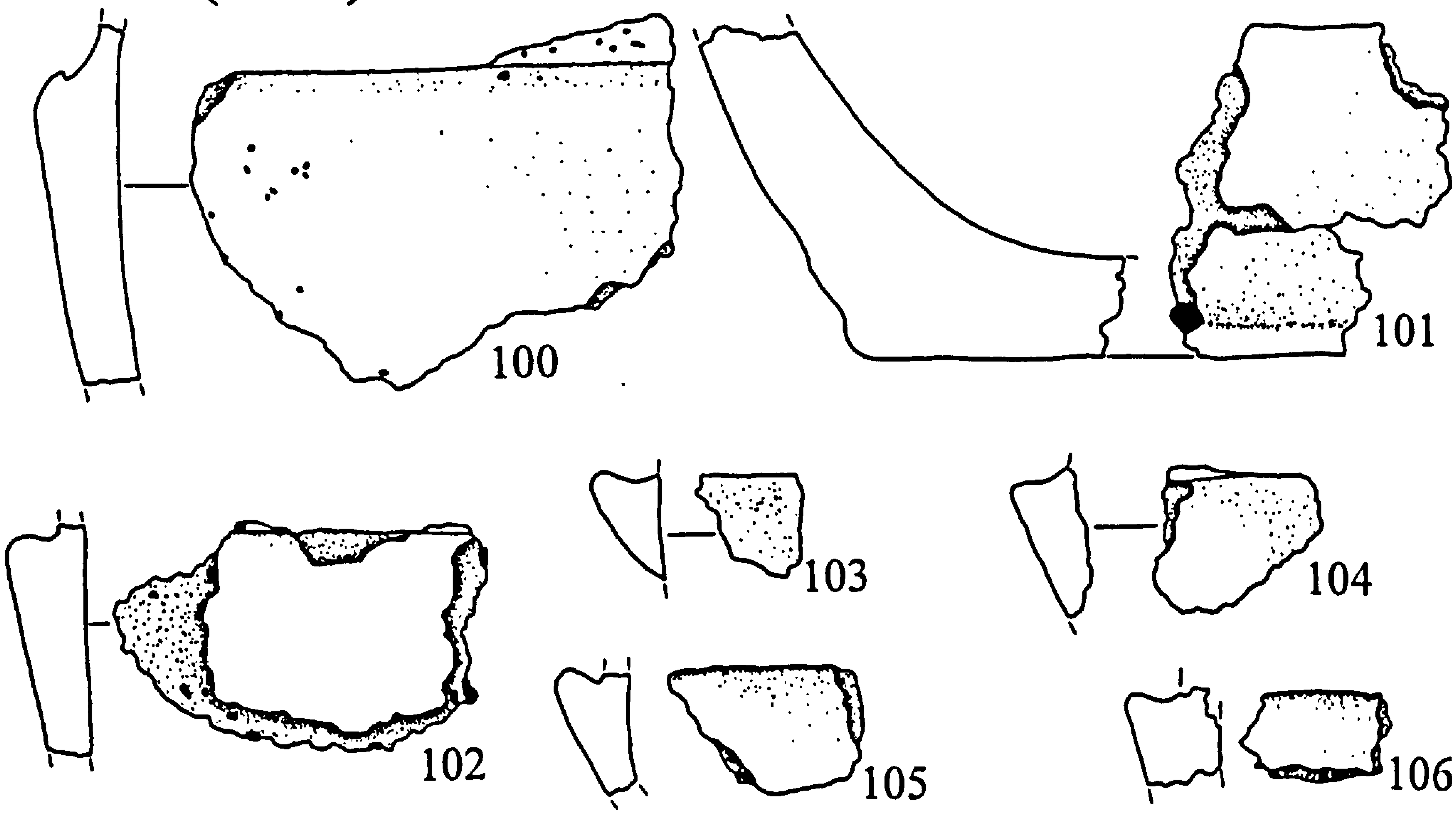


Figure A6.60: Phurt (78 - 99)

Phurt (Phu)



Ramsey Brooghs (Ram)

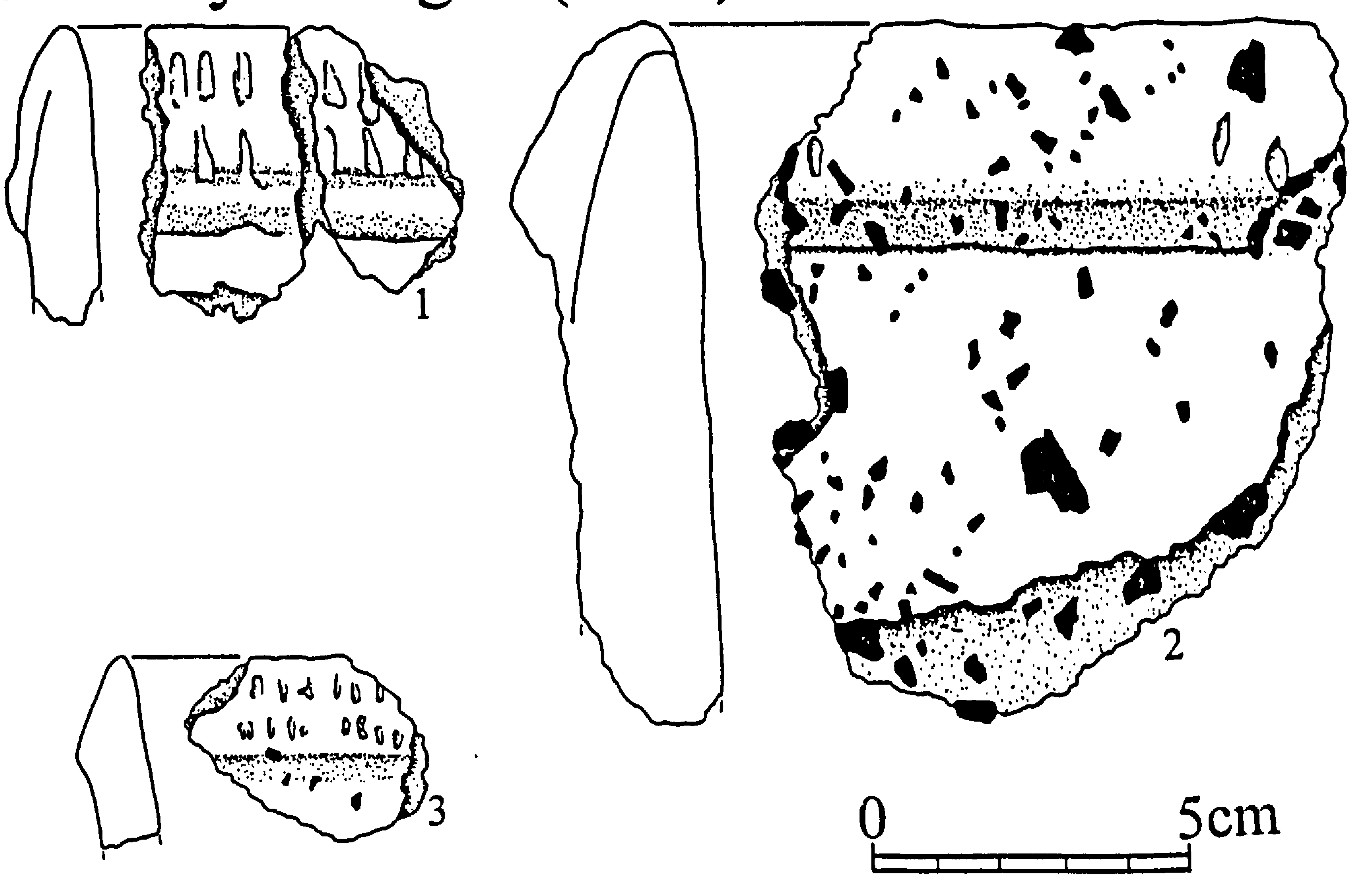


Figure A6.61: Phurt (100 - 106); Ramsey Brooghs (Ram 1 - 3)

Ronaldsway Airport (RonA)

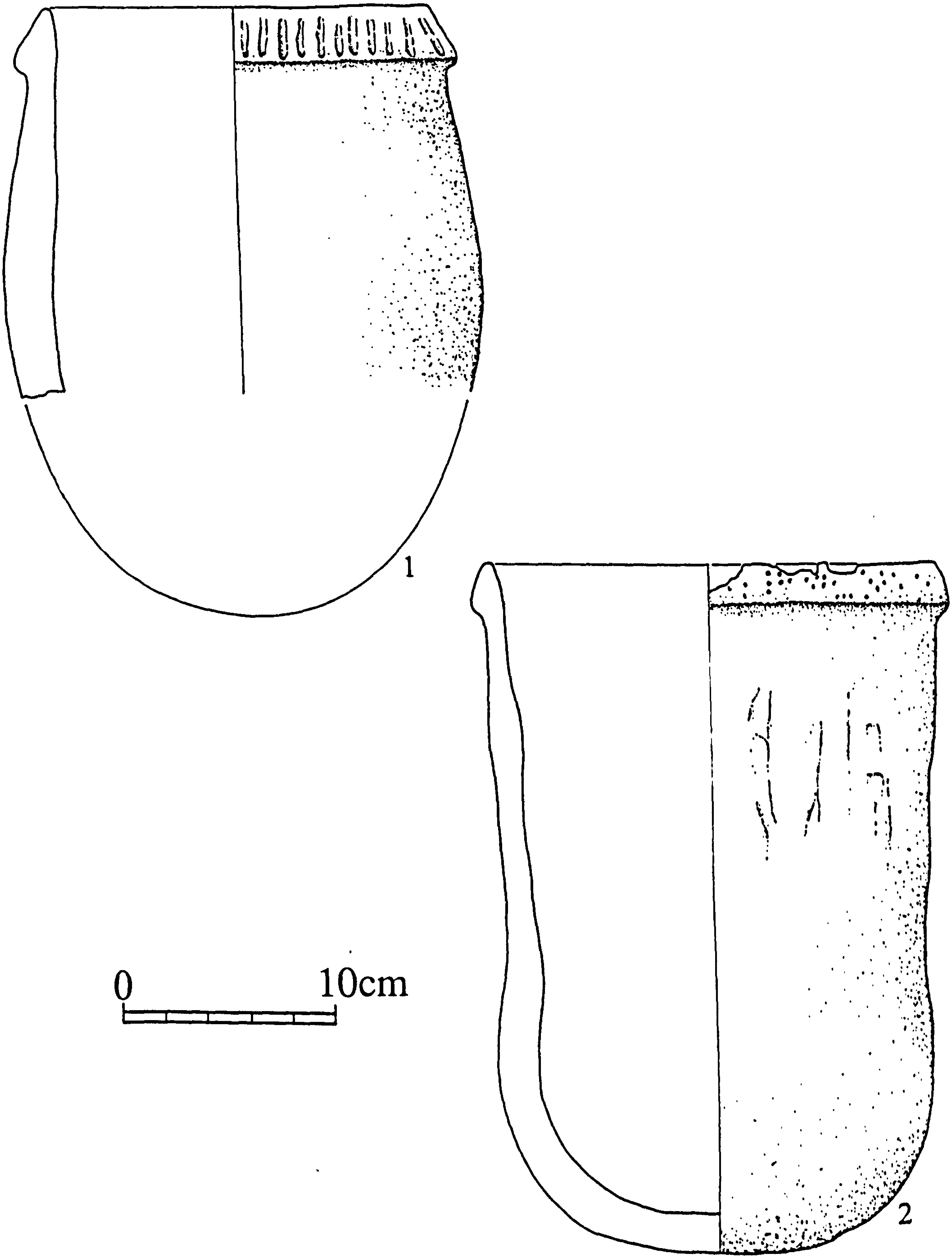
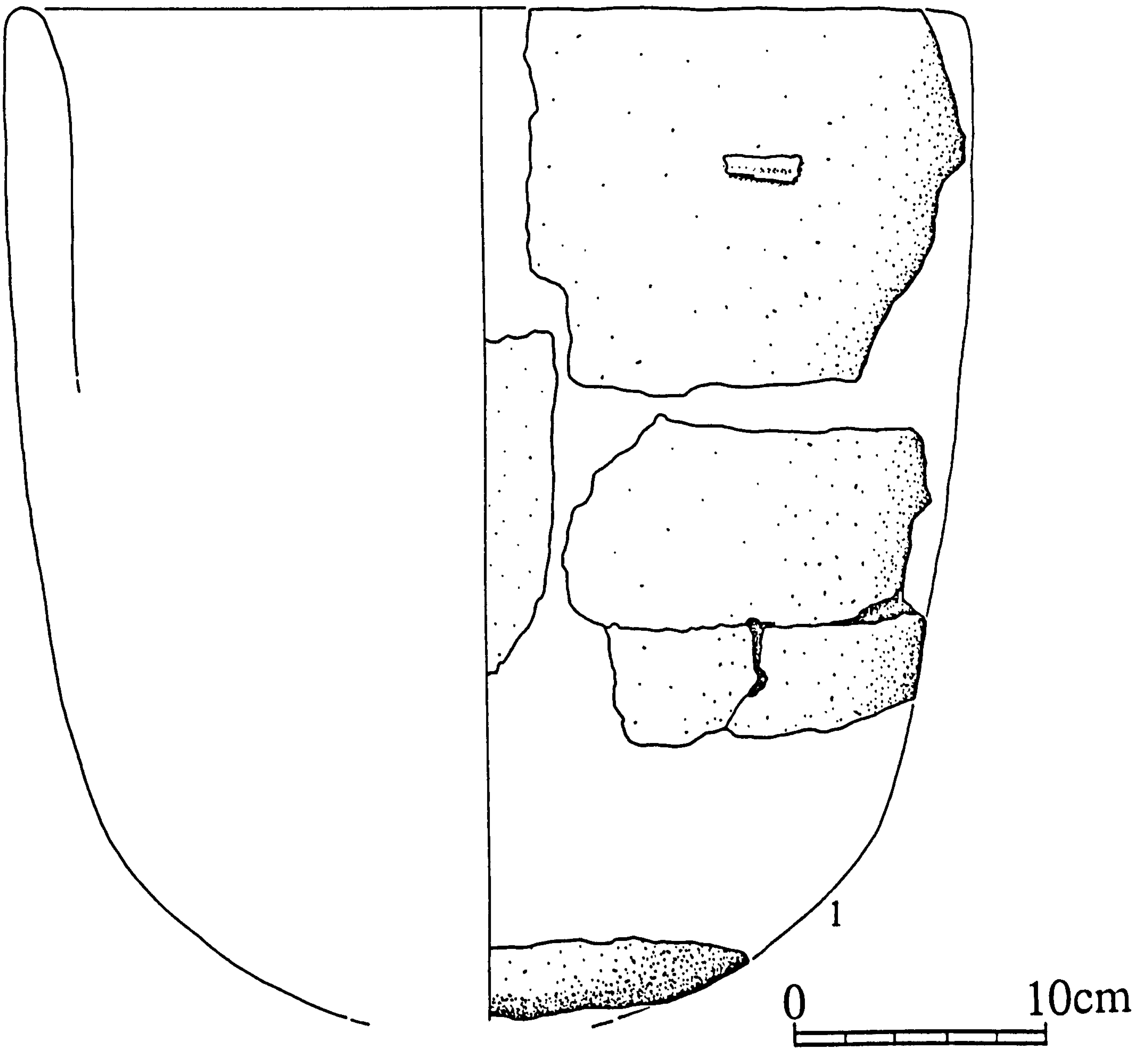


Figure A6.62: Ronaldsway Airport (RonA 1 - 2)

Ronaldsway House (RonH)



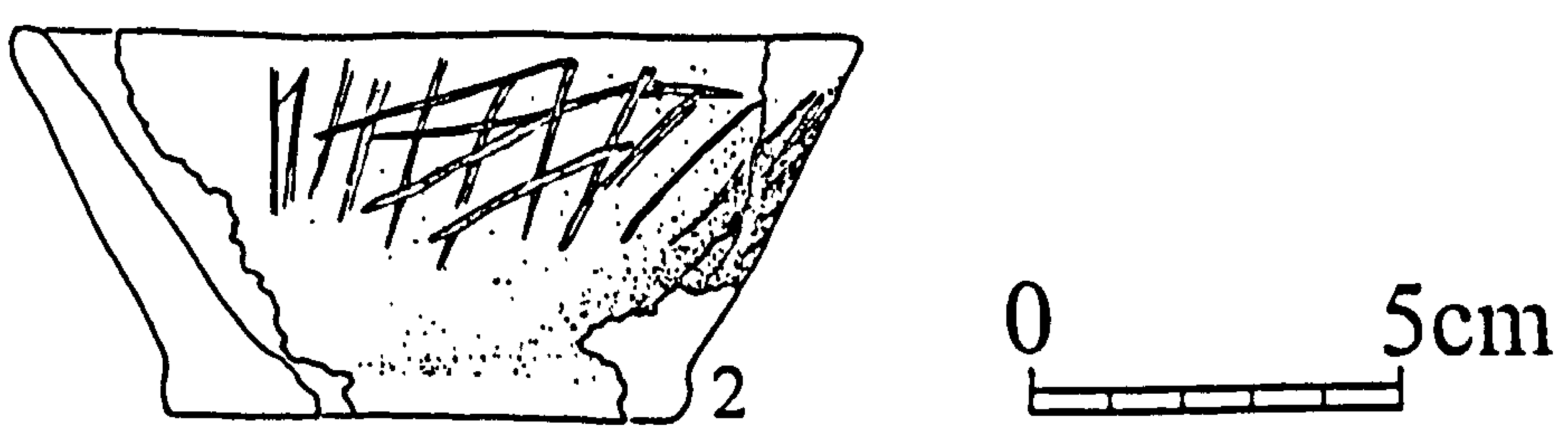


Figure A6.63: Ronaldsway 'House' (RonH 1 - 2)

Ronaldsway House (RonH)

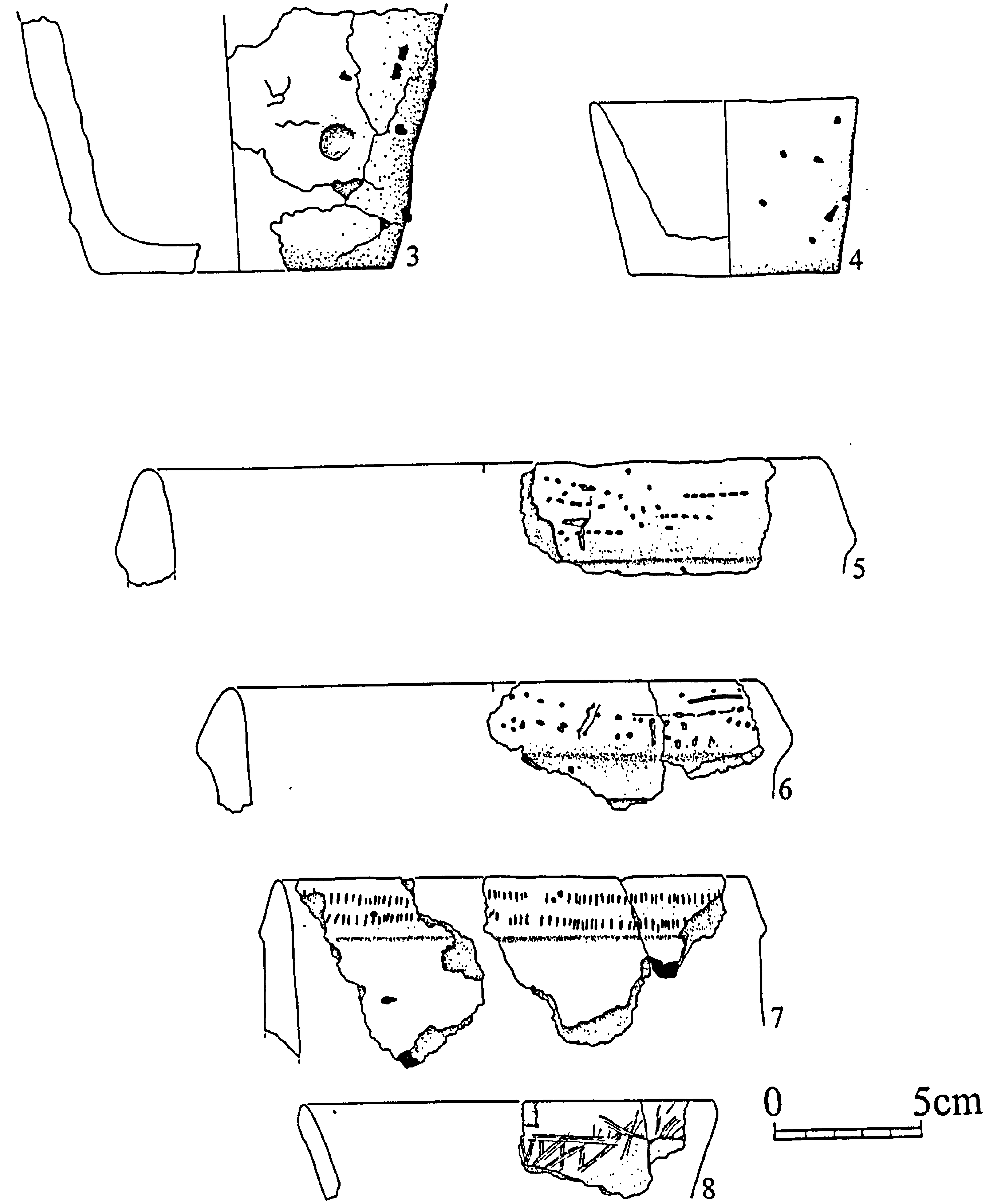


Figure A6.64: Ronaldsway 'House' (RonH 3 - 8)

Ronaldsway House (RonH)

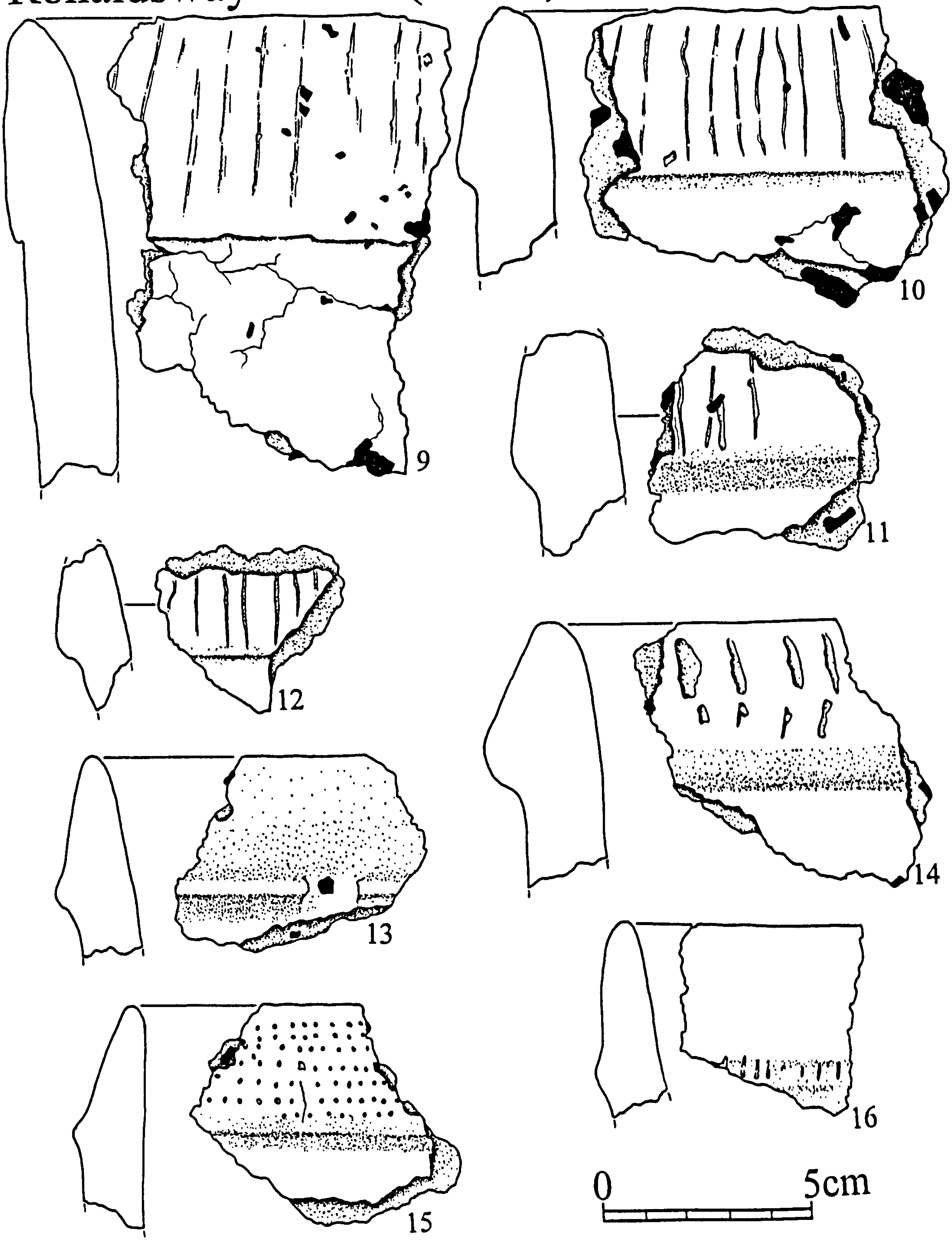


Figure A6.65: Ronaldsway 'House' (RonH 9 - 16)

Ronaldsway House (RonH)

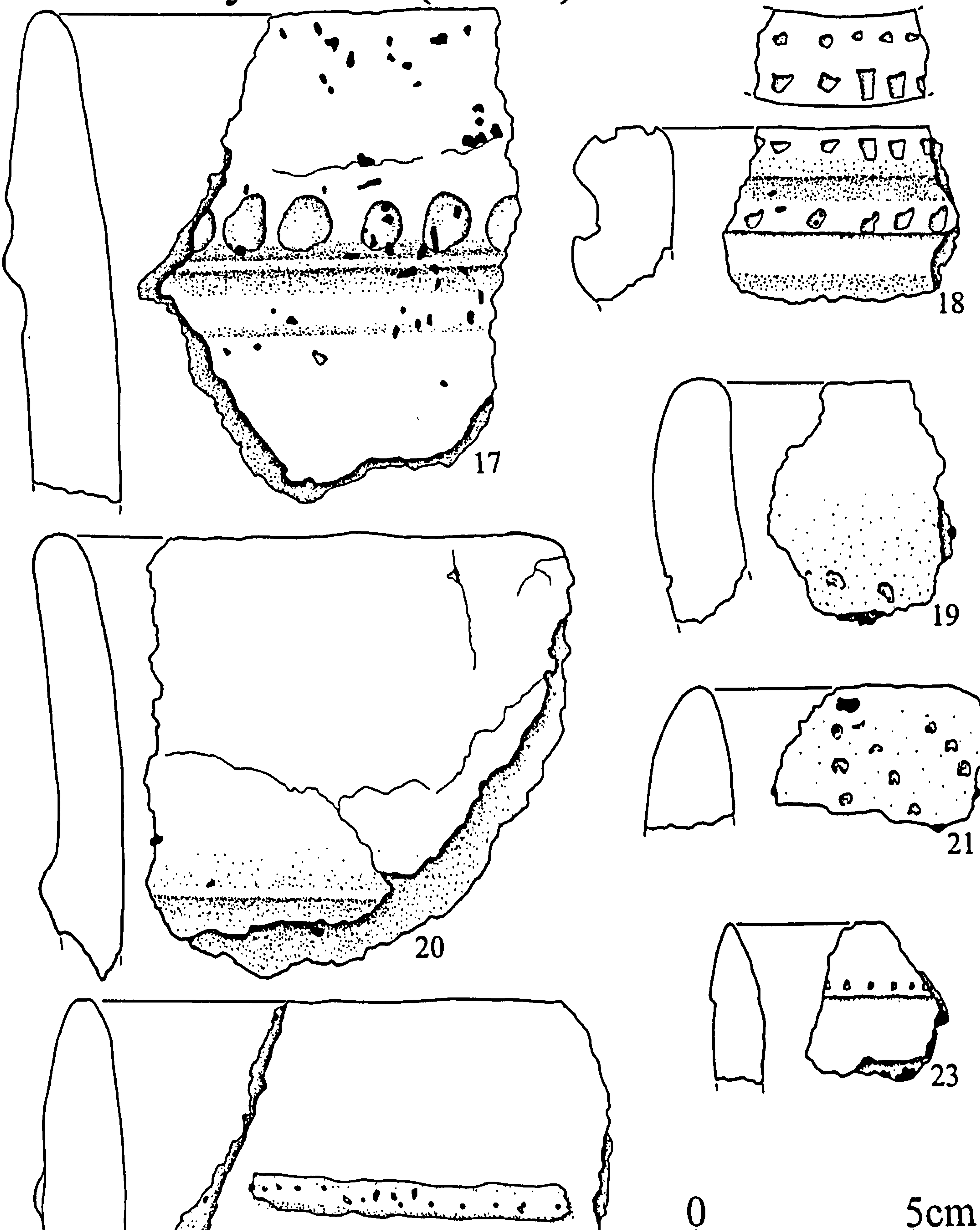


Figure A6.66: Ronaldsway 'House' (RonH 17 - 23)

Ronaldsway House (RonH)

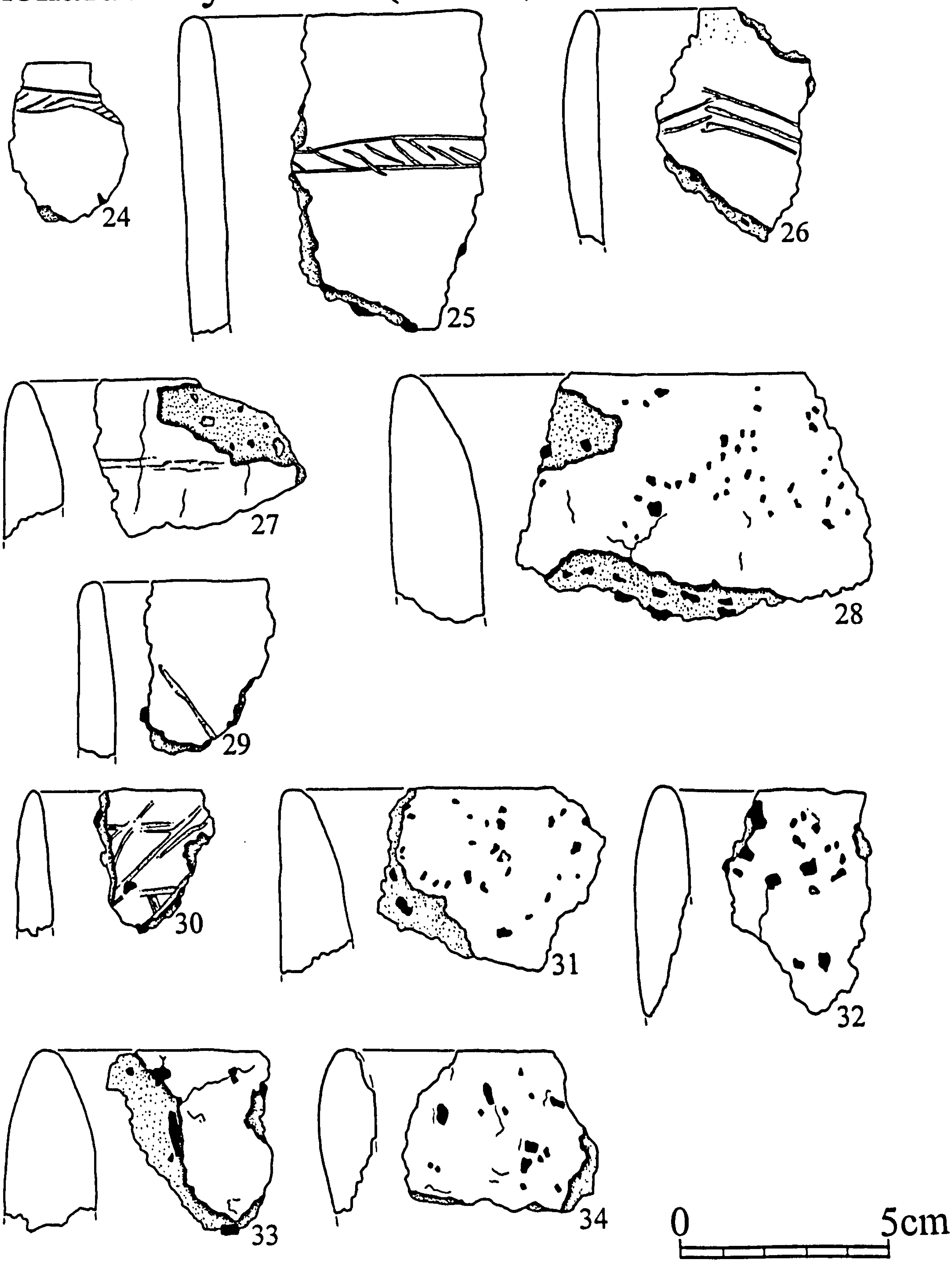


Figure A6.67: Ronaldsway 'House' (RonH 24 - 34)

Ronaldsway House (RonH)

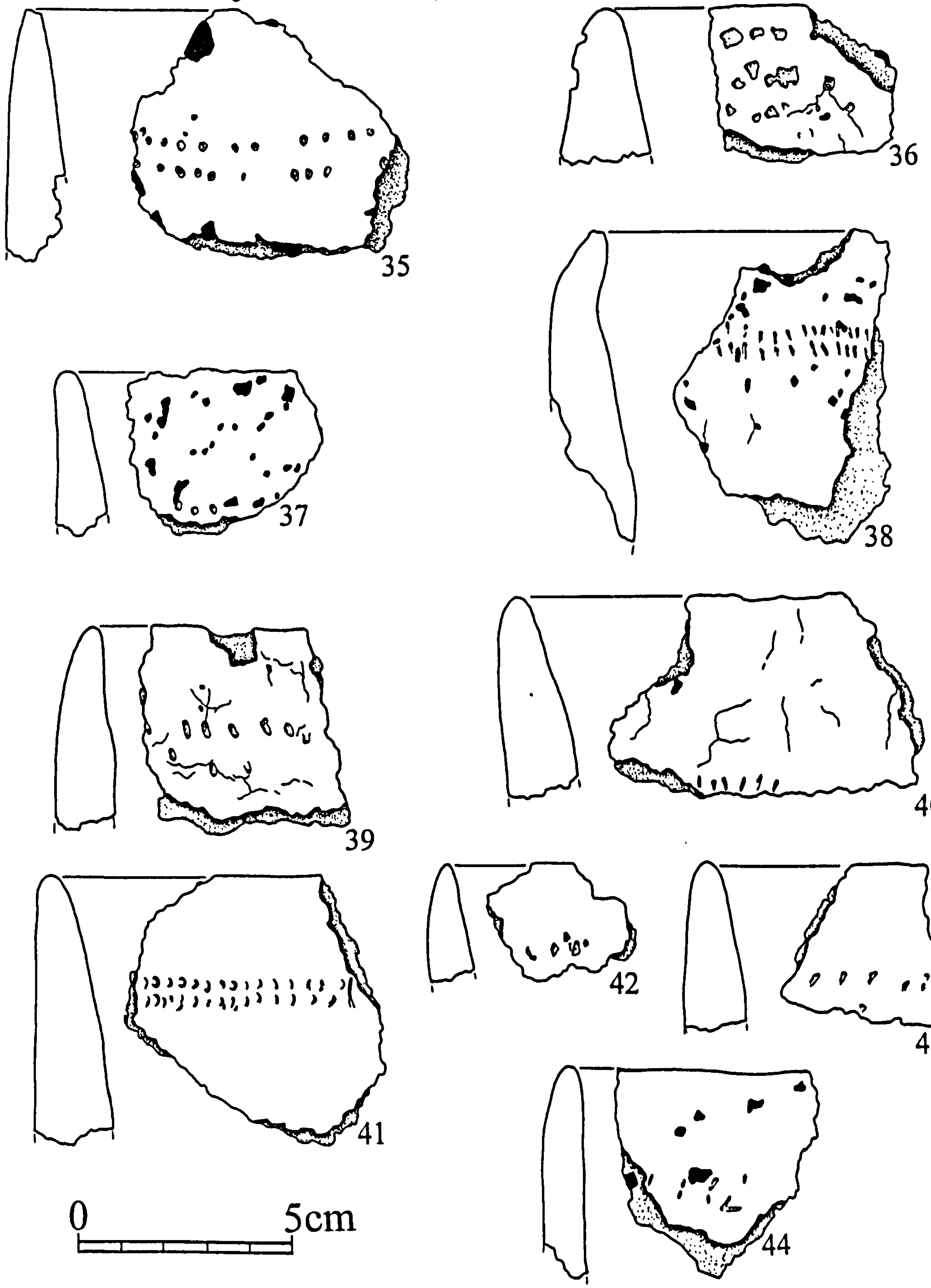


Figure A6.68: Ronaldsway 'House' (RonH 35 - 44)

Ronaldsway House (RonH)

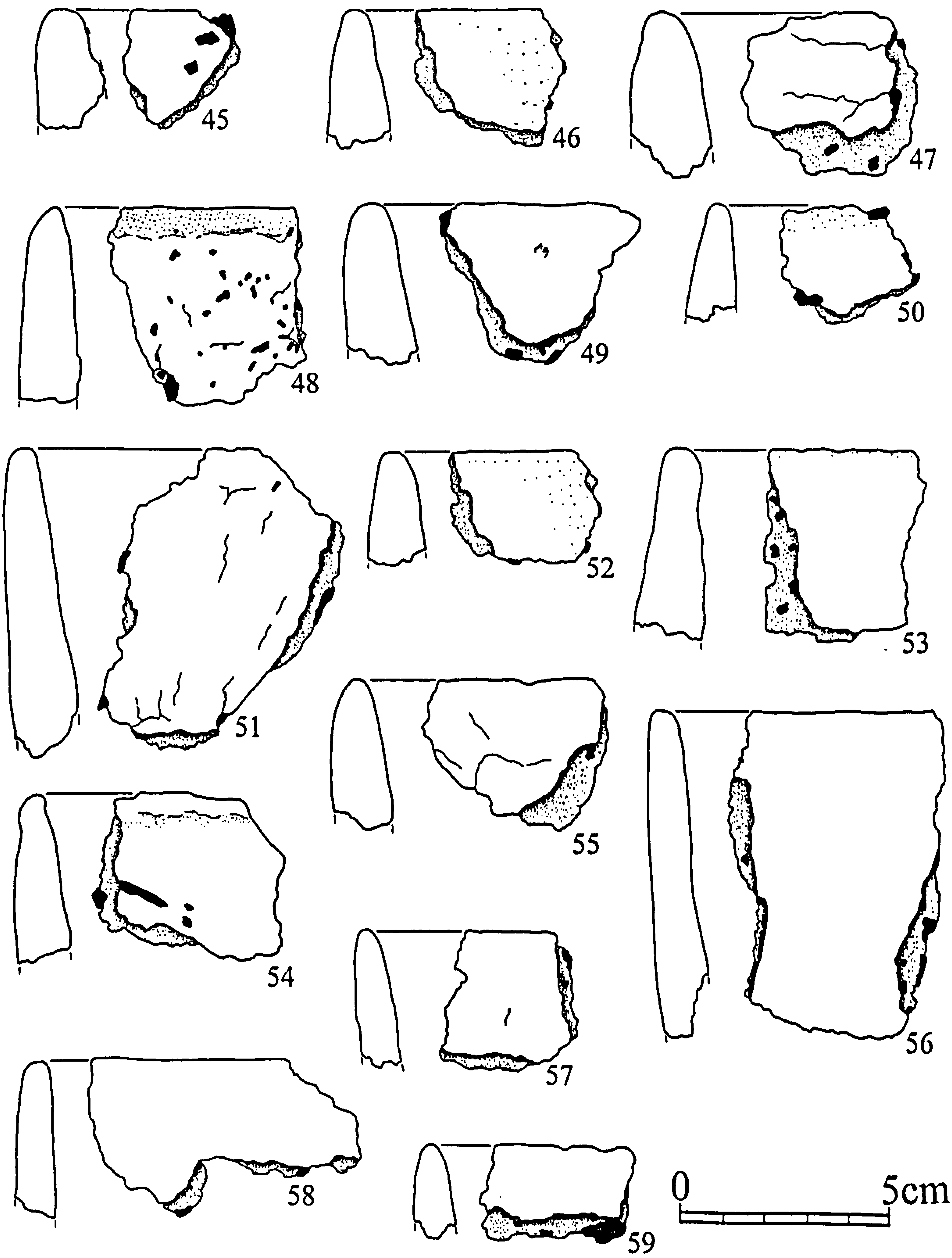


Figure A6.69: Ronaldsway 'House' (RonH 45 - 59)

Ronaldsway House (RonH)

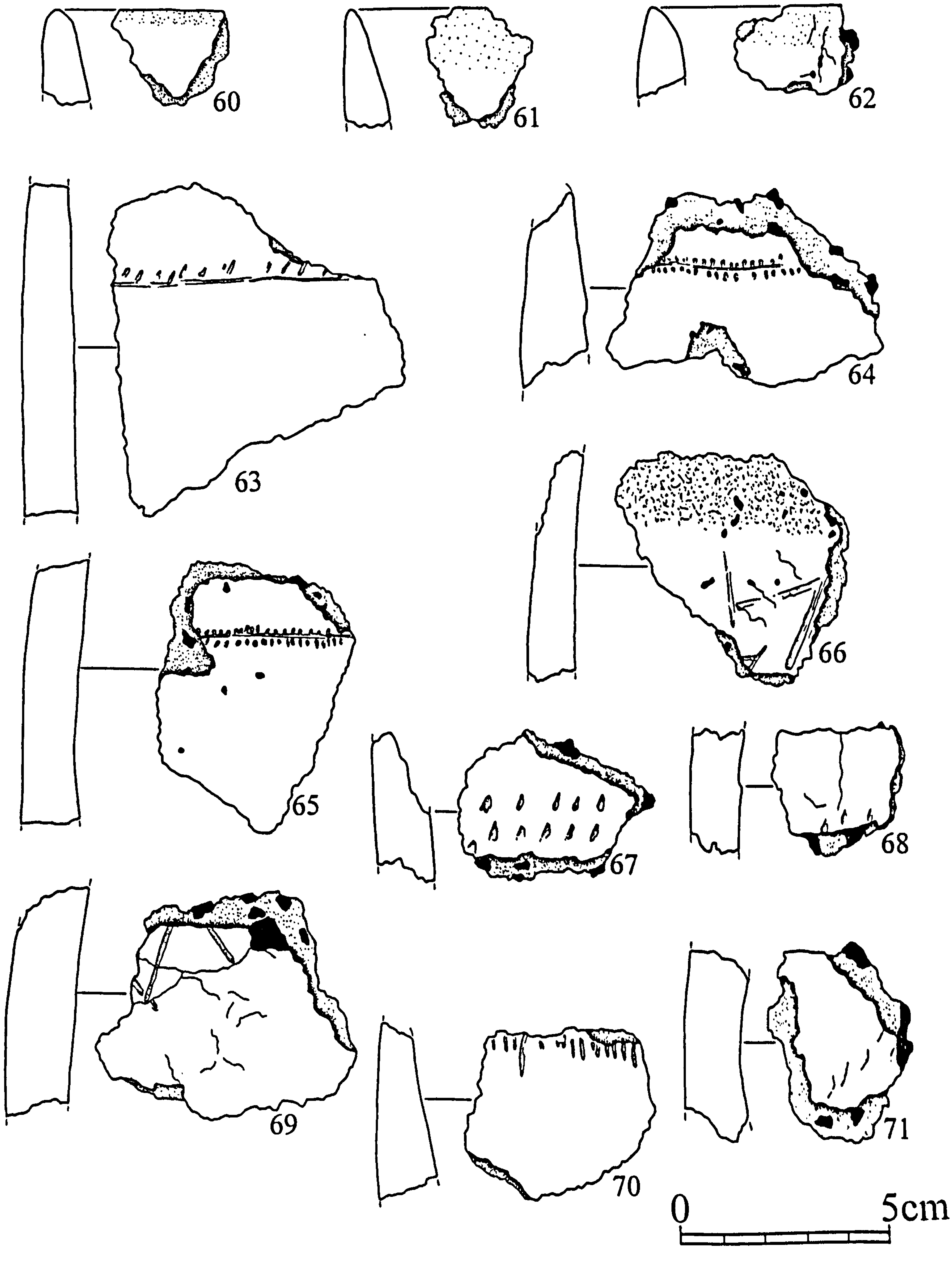


Figure A6.70: Ronaldsway 'House' (RonH 60 - 71)

Ronaldsway House (RonH)

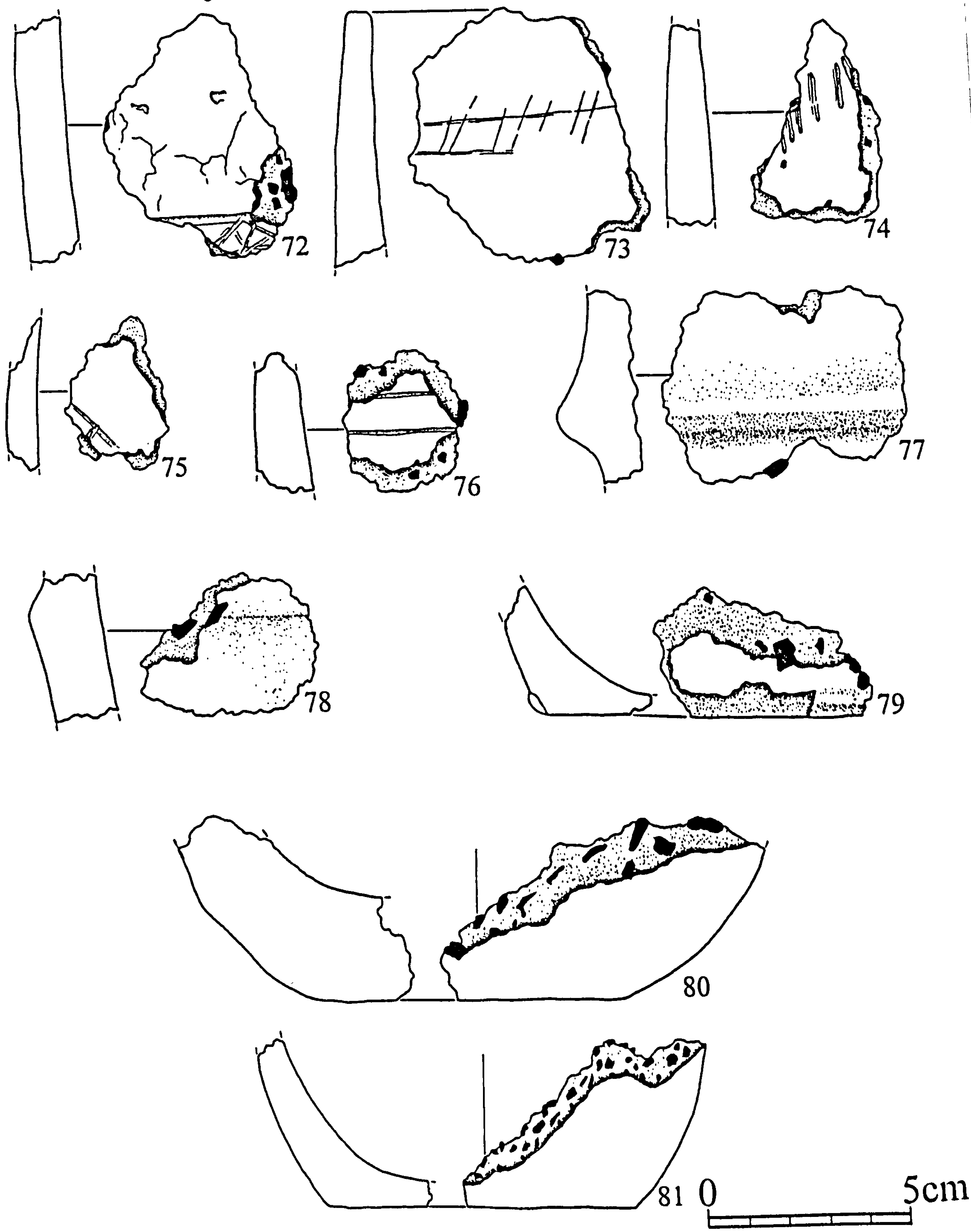
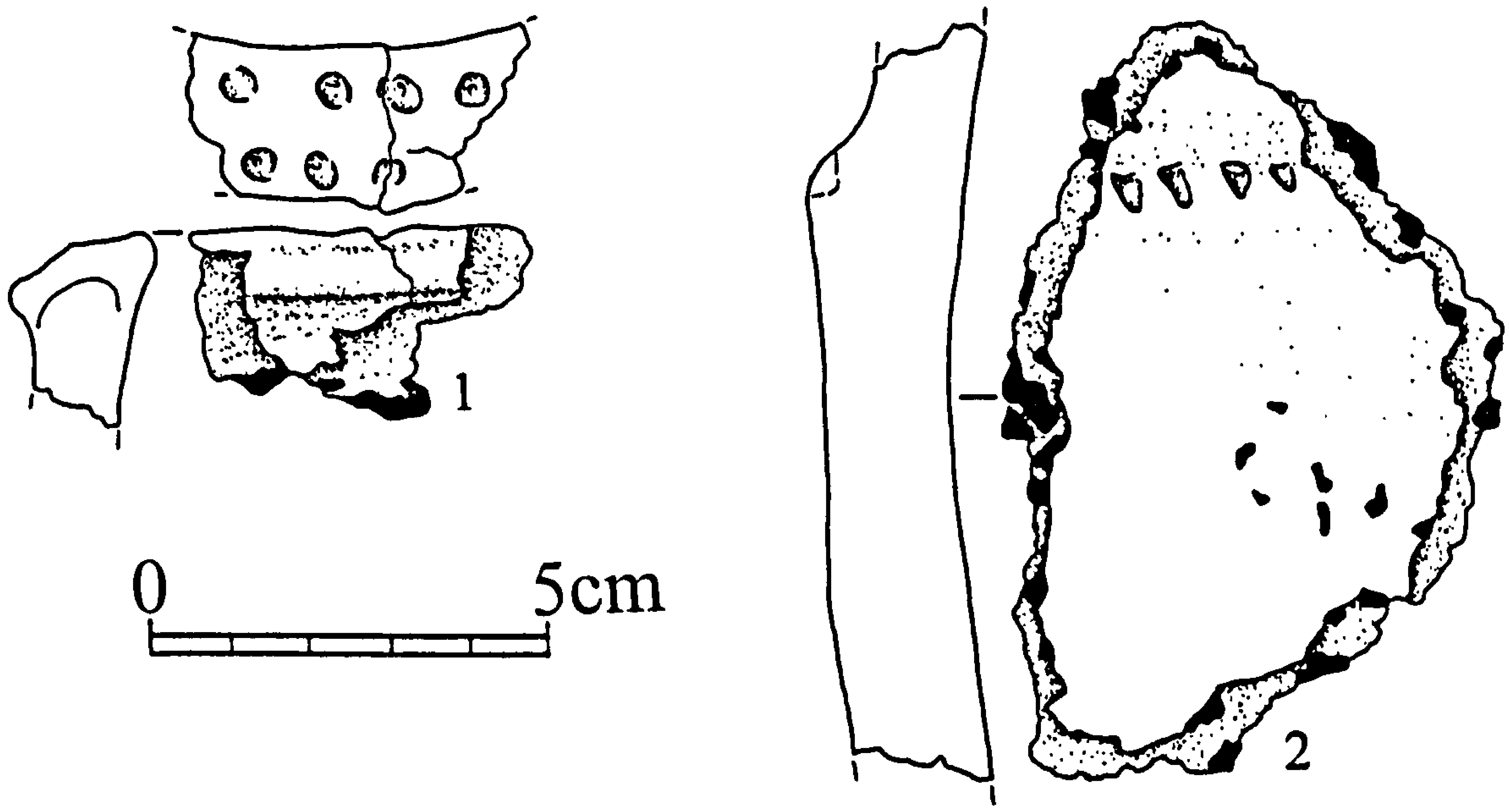
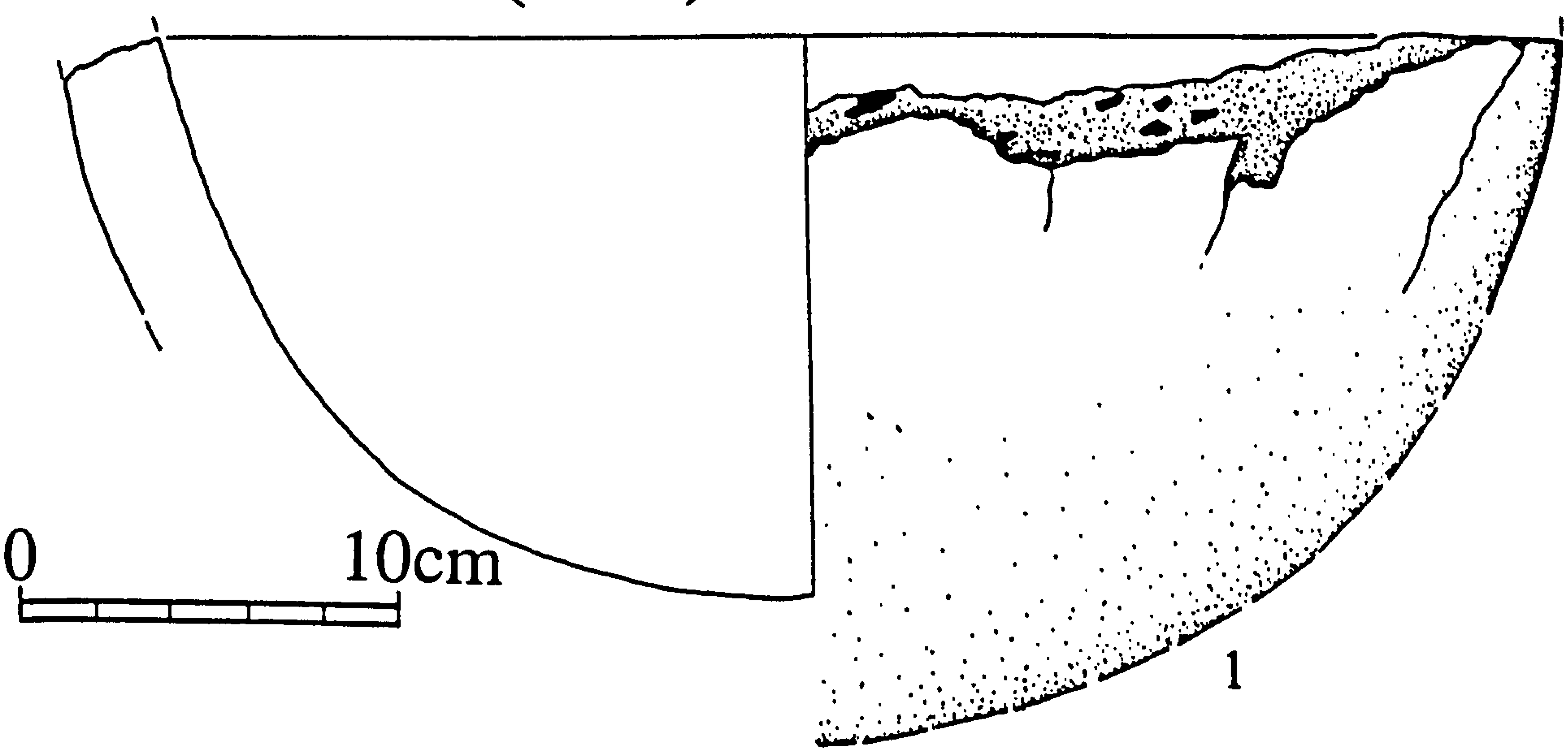


Figure A6.71: Ronaldsway 'House' (RonH 72 - 81)

Ronaldsway Village (RonV)



Round Ellan (Rou)



Scard (Sca)

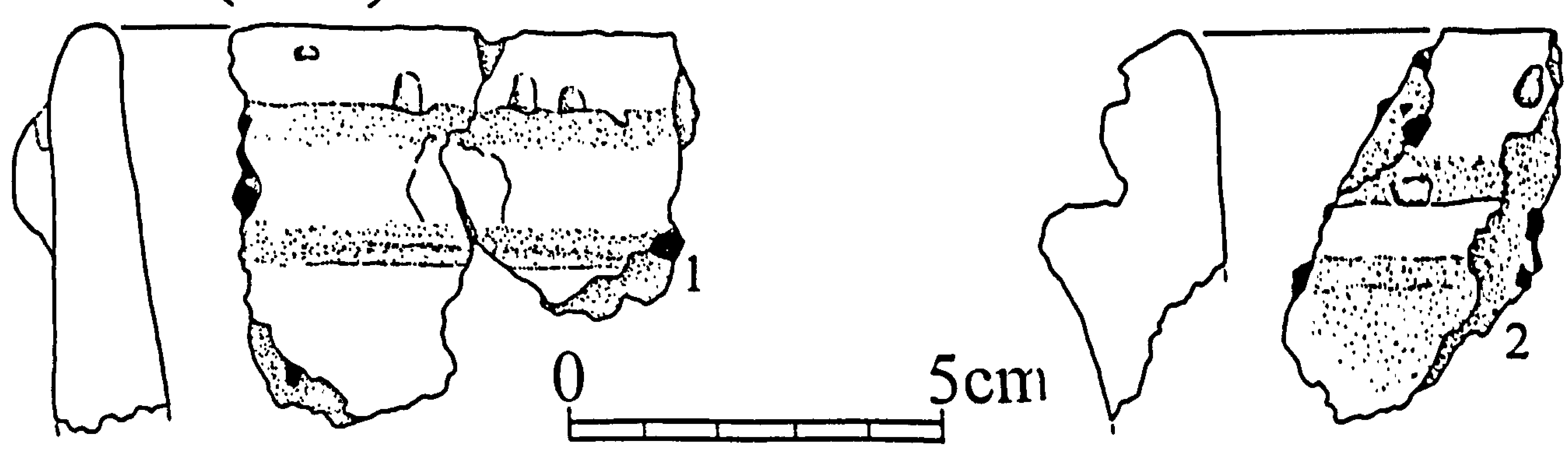
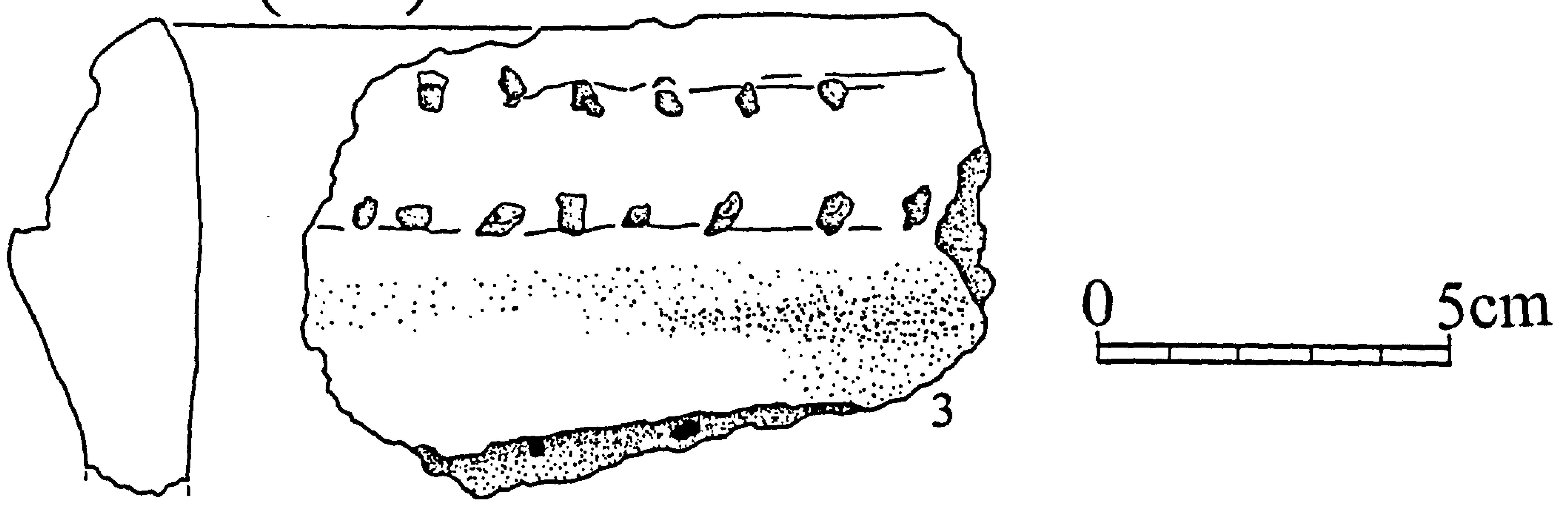


Figure A6.72: Ronaldsway Village (RonV 1 - 2); Round Ellan (Rou 1); Scard (Sca 1 - 2)

Scard (Sca)



Scard? (Sca)

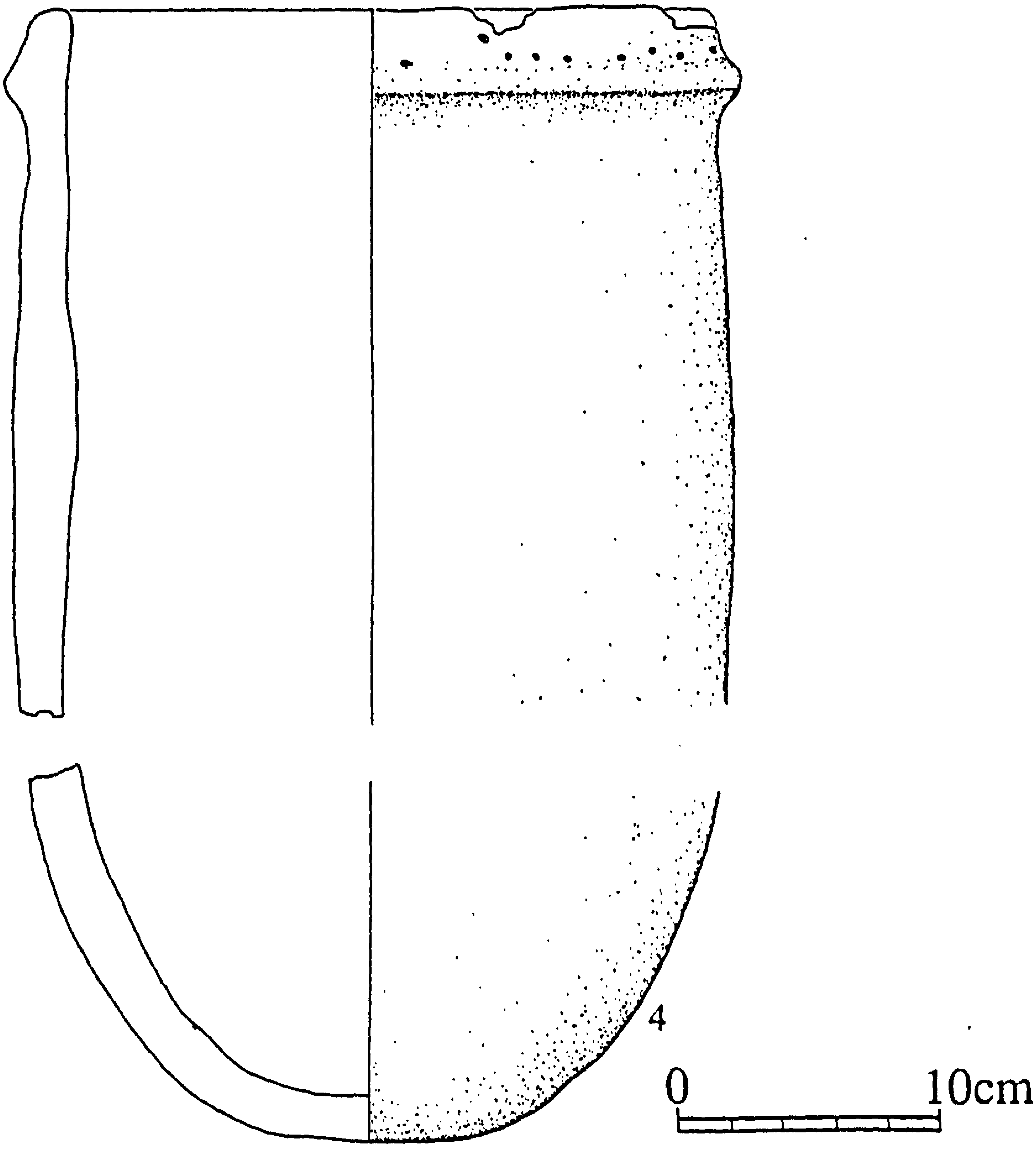
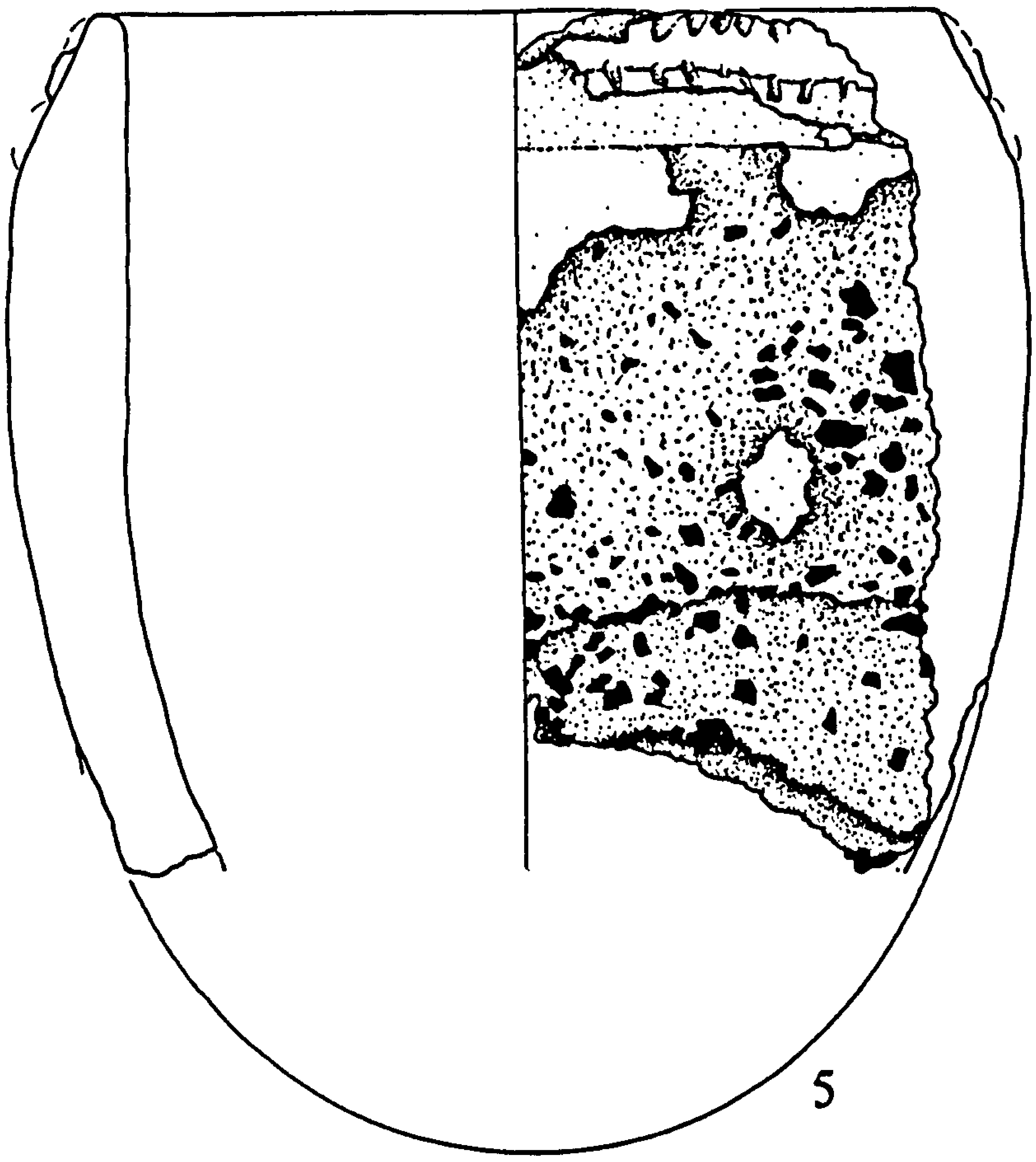


Figure A6.73: Scard (Sca 3 - 4)

Scard? (Sca)



Scholaby (Sch)

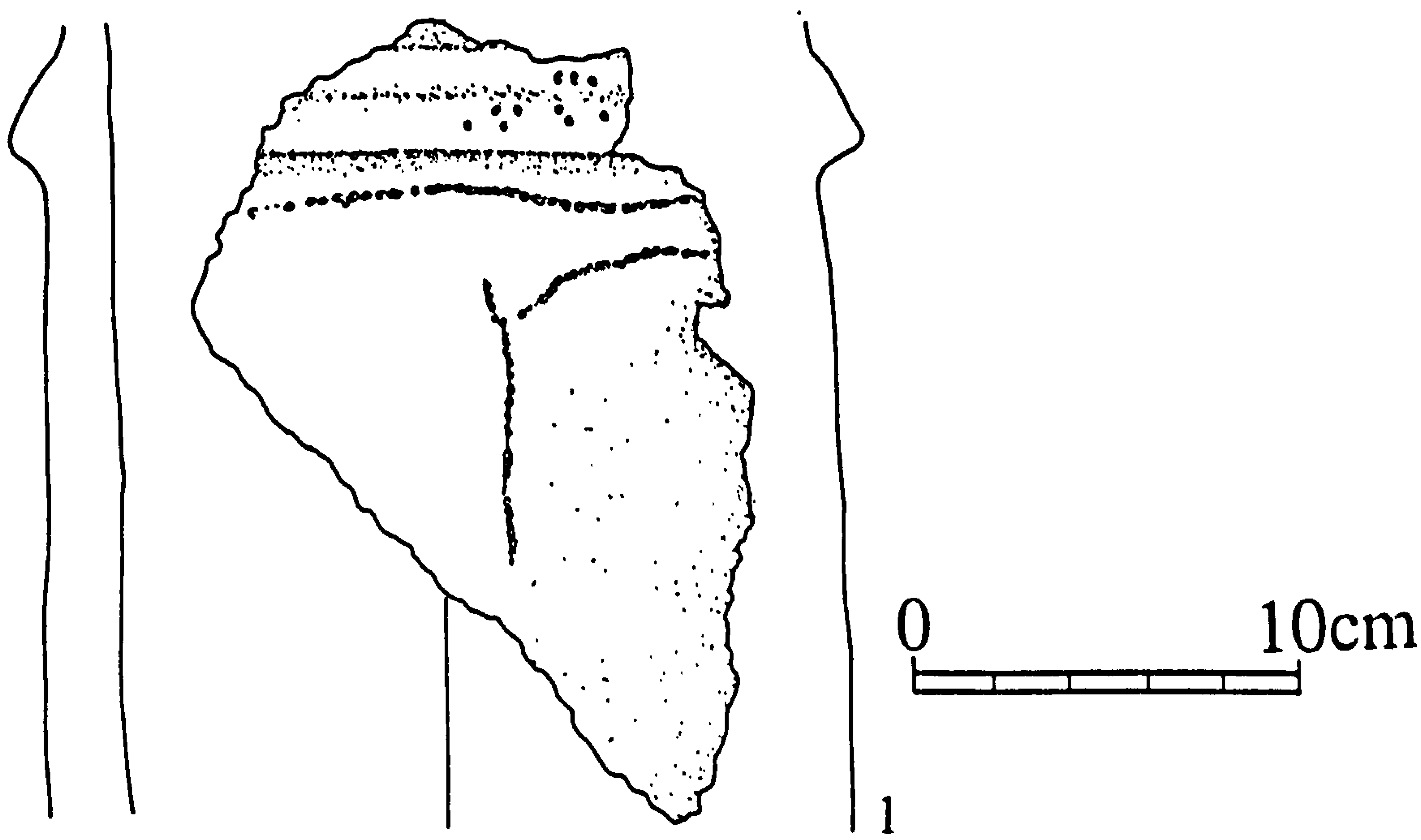
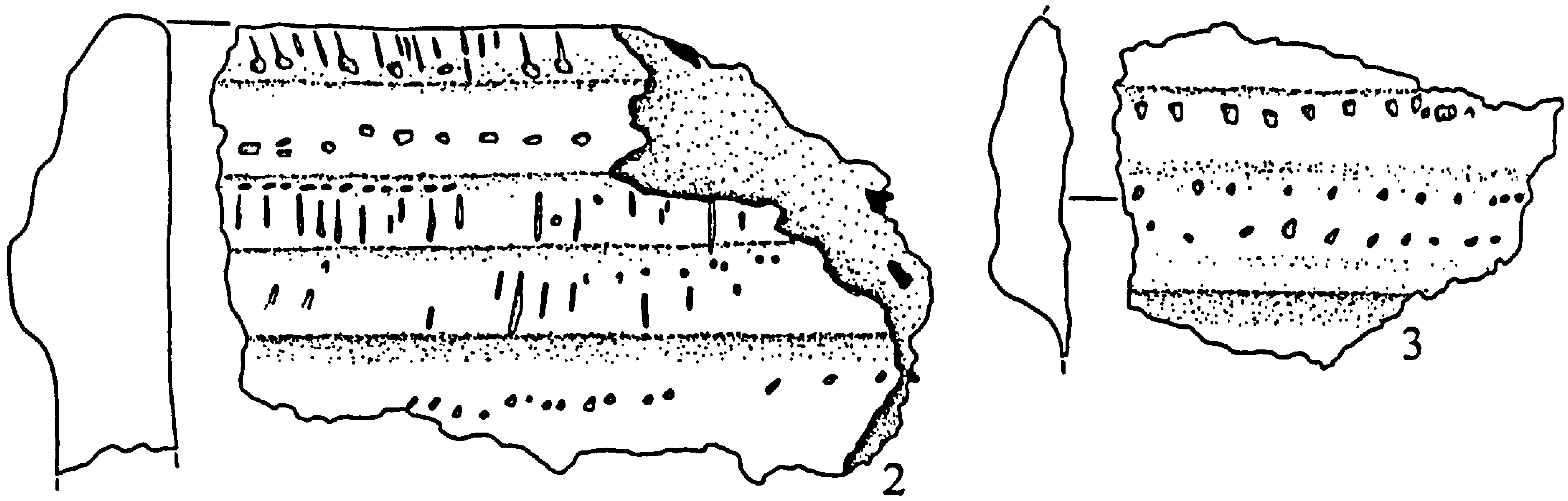


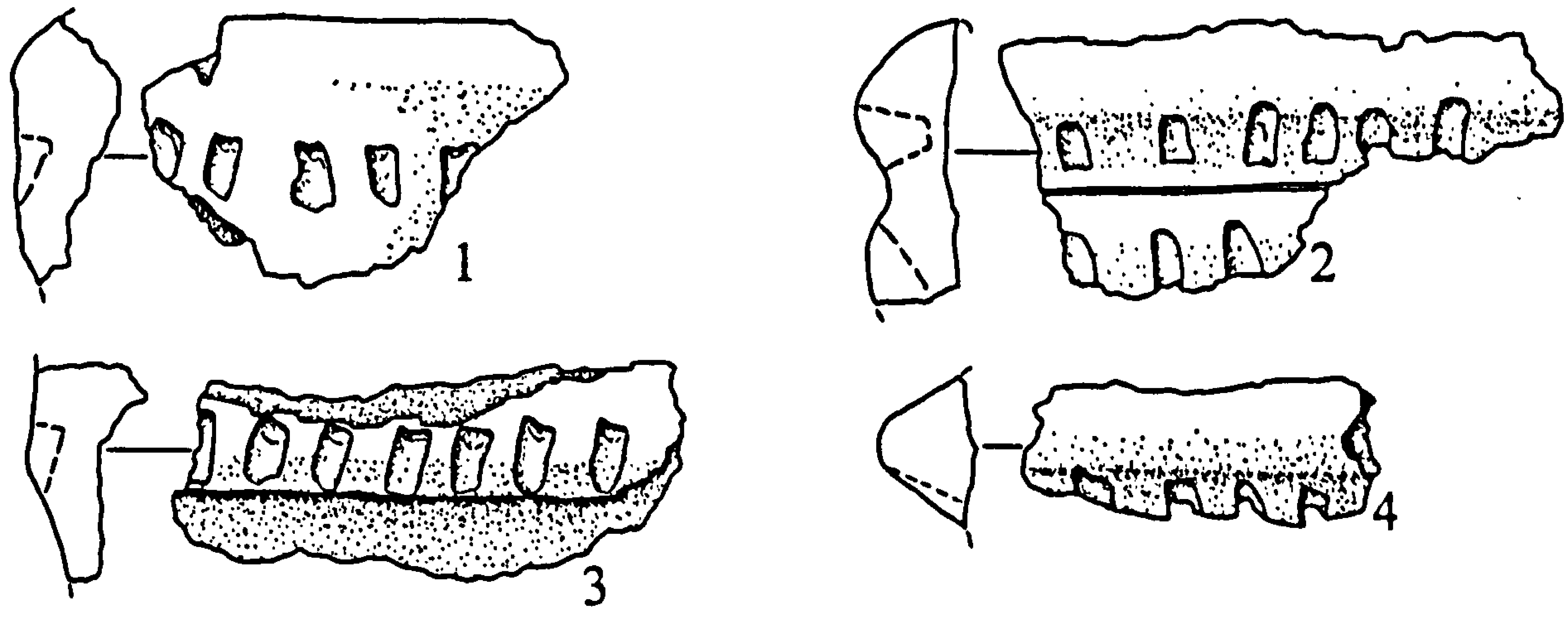
Figure A6.74: Scard (Sca 5); Scholaby (Sch 1)

Scholaby (Sch)



Shellag (She)

Skyhill (Sky)



South Barrule (Sou)

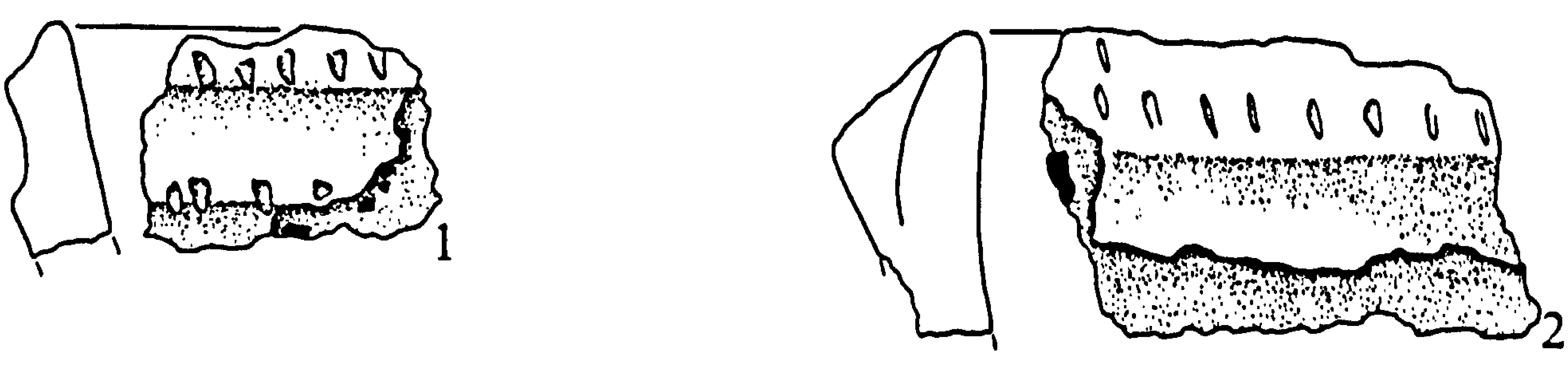


Figure A6.75: Scholaby (Sch 2 - 3); Shellag (She 1); Skyhill (Sky 1 - 4); South Barrule (Sou 1 - 2)

South Barrule (Sou)

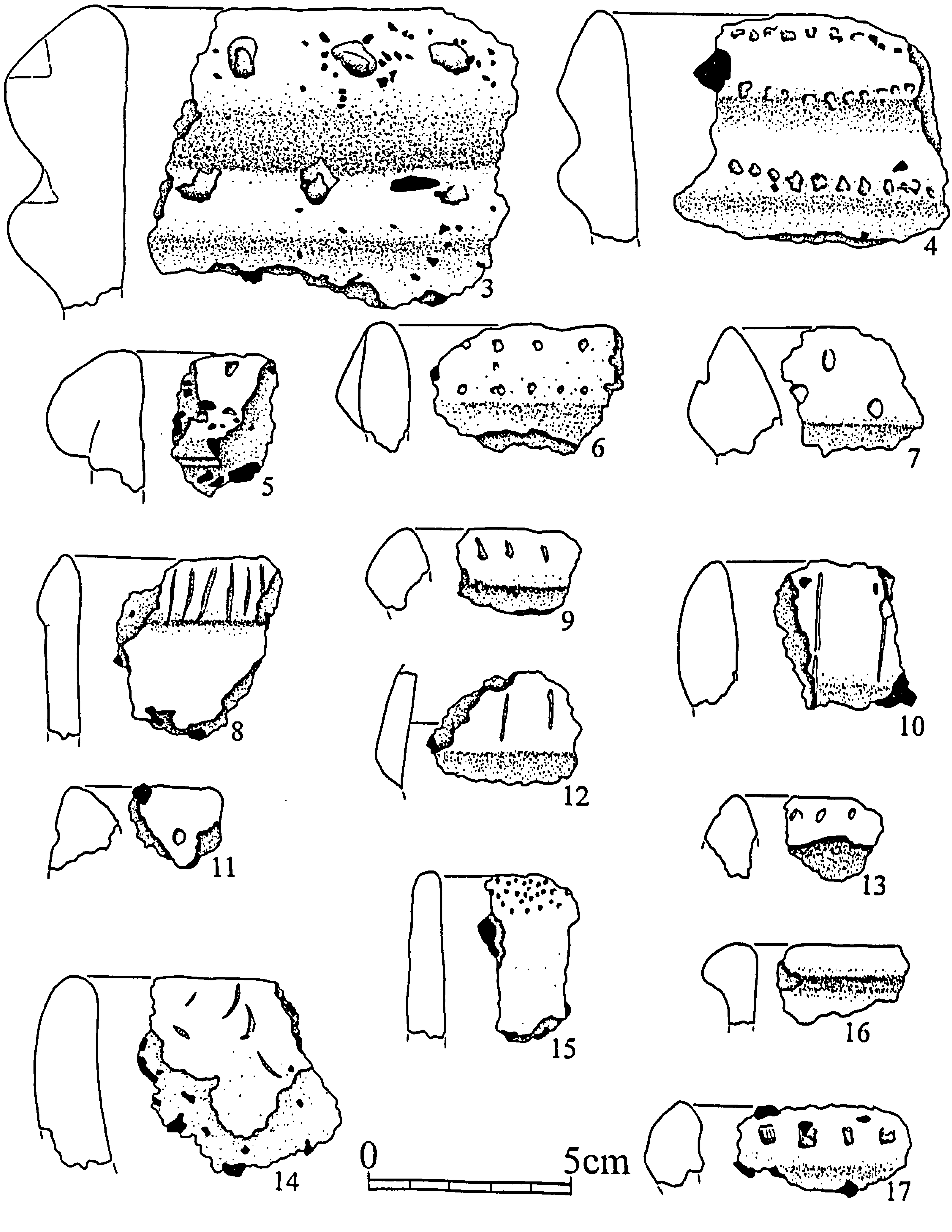
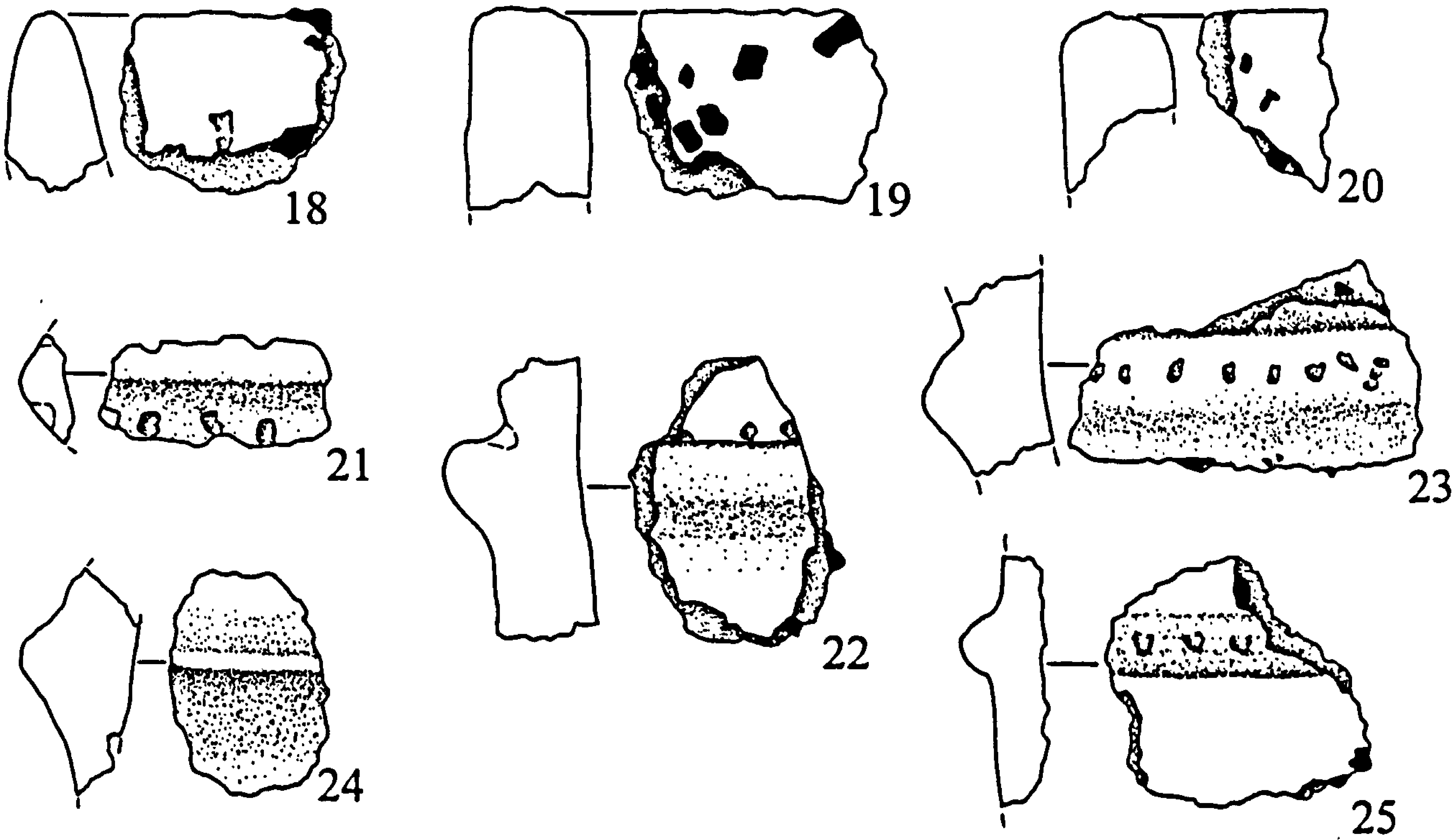


Figure A6.76: South Barrule (Sou 3 - 17)

South Barrule (Sou)



West Kimmeragh fieldwalking (Wes)

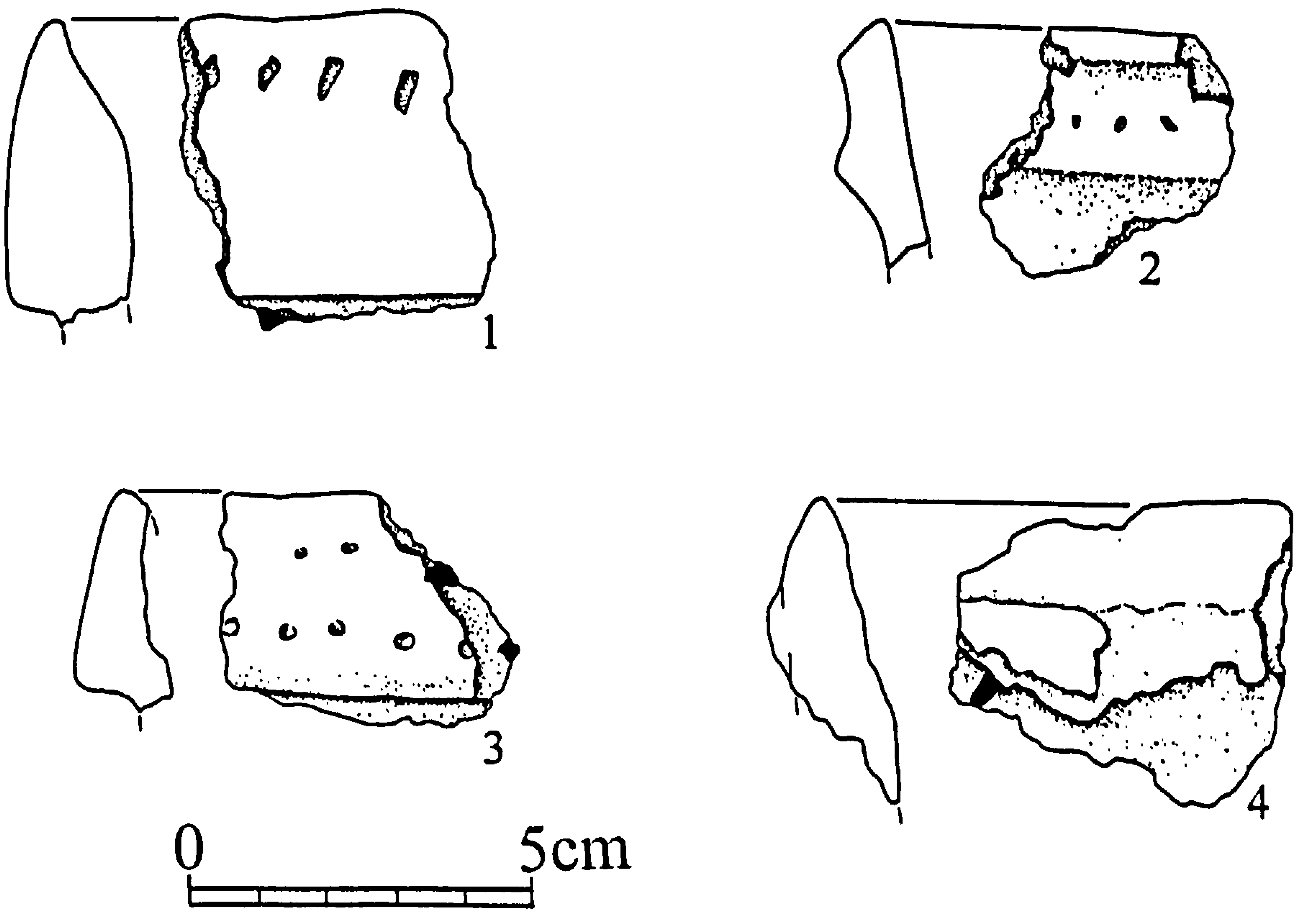


Figure A6.77: South Barrule (Sou 18 - 25); West Kimmeragh (Wes 1 - 4)

West Kimmeragh excavation (Wes)

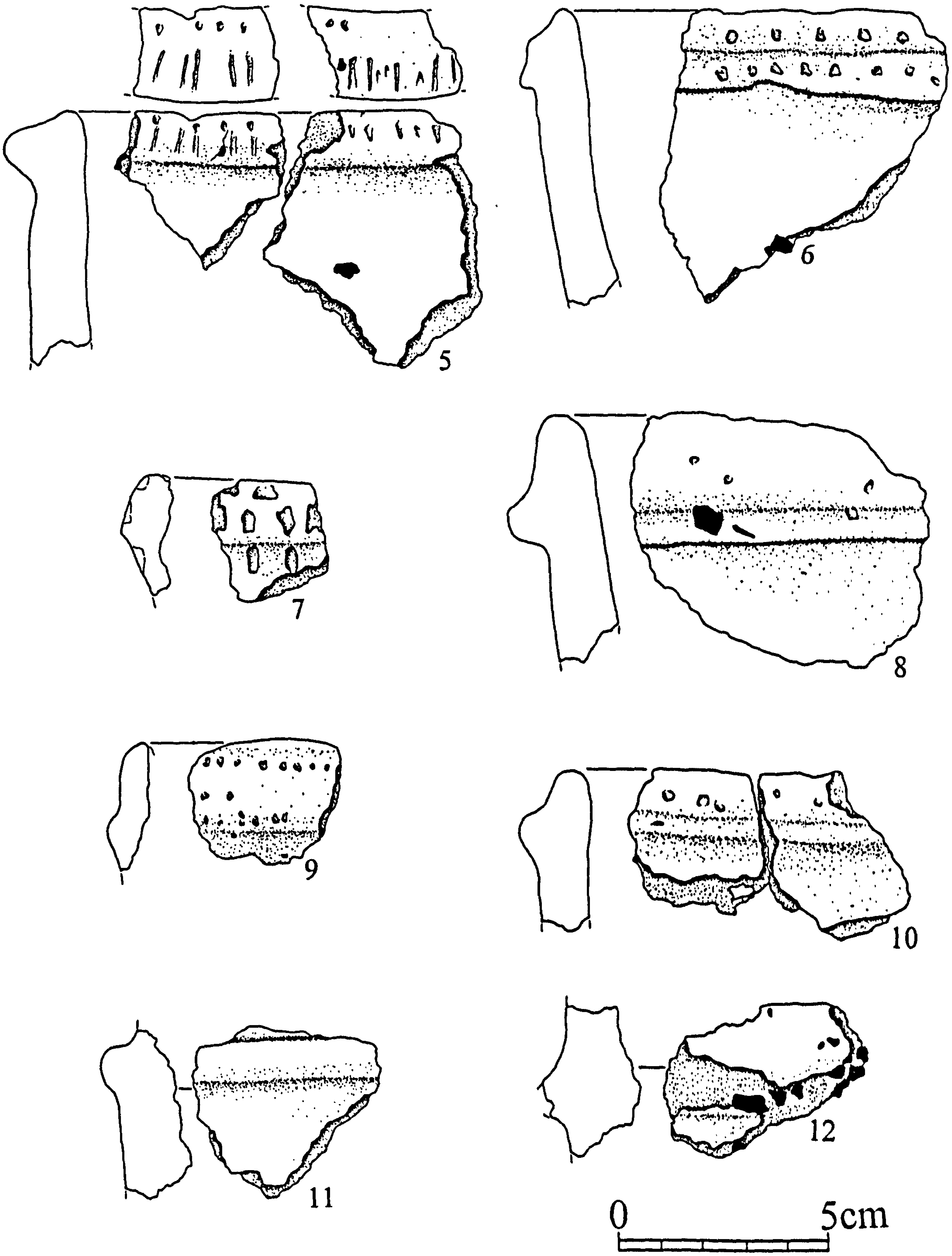


Figure A6.78: West Kimmeragh (Wes 5 - 12)

A7. Results of the reanalysis of the human and animal bone from the Ronaldsway 'House' by Mark Maltby, Bournemouth University

THIS APPENDIX PRESENTS THE TEXT OF A REANALYSIS OF THE BONE REMAINS FROM RONALDSWAY 'HOUSE' BY MARK MALTBY, BOURNEMOUTH UNIVERSITY

A7.1 Introduction

Animal bones from the Ronaldsway 'House'stored in the Manx National Heritage Museum in Douglas, Isle of Man were examined in April 1995 and are discussed in the site excavation report (Bruce *et al* 1947). The following list represents the bones that have been kept by the Museum. They have been sorted into groups in the past and appear to be bagged by species. The high proportion of identifiable bones in a poorly preserved sample probably indicates that small fragments were discarded at some stage. Proportions in the following lists indicate approximately amount of bone surviving.

Museum Accession no: 61 -1/2 a+b: (bird)

Distal ends of a radius and ulna from the wing of probably the same bird labelled as cormorant. Identifications not checked.

Museum Accession no: 65/1/1a: (cattle)

Cattle: horn core - right (small, flat from immature animal)

2 horn core fragments

humerus - right distal .25 - distal fused

radius - right shaft .50

radius - right proximal .25 - proximal fused

radius - right shaft .25 modern breaks

femur - proximal, medial .10 - proximal fused

femur - right shaft .50 modern breaks

tibia - right shaft .50

tibia - left shaft distal part of shaft .25

tibia - proximal .10 - proximal fused

astralagus - right (complete?)

calcaneus - left .75 modern break

centroquartal - left complete

metacarpal - distal .10 - distal fused

metacarpal - distal .10 - distal fused

metacarpal - right proximal lateral .10

metatarsal - right proximal medial .10

metatarsal - left proximal .25

metatarsal - 2x shaft .25

metatarsal - shaft lateral .25

1st phalanx - complete - proximal fused

2nd phalanx - complete - .75 modern break - proximal fused

Unid. large mammal thoracic vertebra - dorsal .25 (probably cattle)

Unid. large mammal longbone fragment.

Nearly all bones in this group are heavily eroded.

Museum Accession no: 65-1/1b: (Sheep/goat)

Sheep: humerus - left distal .25 - distal fused

radius - left proximal .50 - proximal fused - butchered

Sheep: ulna - left proximal .25

femur - left proximal .25 modern break - proximal fused

metacarpal - left distal .50 distal fused

metacarpal - right complete - distal fused

metatarsal - tight - proximal .25

S/G 4x lower molar (1 or 2) - worn

lower molar 3 - worn

lower molar 3 - unworn

upper molar (1 or 2) - worn
upper molar 3 - worn
radius - left distal part of shaft .10 - gnawed
tibia - right distal part of shaft .25
astralagus - left complete
metatarsal - right shaft .50
metatarsal - right shaft .25
1st phalanx - complete - proximal fused
thoracic vertebra - complete - fusing
3x lumbar vertebrae - complete

Most bones eroded. Sheep humerus, radius and ulna could belong to same animal. The posterior of the shaft of the radius has been chopped through obliquely. Several bones are measurable. S/G = sheep / goat but only sheep definitely identified.

Museum Accession no: 65-1/1c: (Pig)

Pig: 2x lower canines - male
scapula - right distal part of shaft .25 - eroded.

Museum Accession no: 65-1/1: (Cattle teeth)

Cattle: lower incisor - worn
upper premolar - worn
2x lower premolar 3 - worn
3x lower molar (1-2) - worn
lower molar (1-2) - unworn
5x lower molar 3 - worn (Grant stages g,h,i,j,k)
6x lower molar (1-2) - worn
2x upper molar 3 - worn

Museum Accession no: 65-1/3:

Human: femur

Museum Accession no: 65-1/-1: (Burnt animal bones)

Cattle: horn core - 8 fragments all probably from the same burnt core atlas - .25 -
eroded and burnt
scapula - right posterior part of shaft .10 - burnt

Unid. large mammal 2x vertebrae frags; 3x skull frags; 22 other frags.

Habitation layer: (bones not sent to Jackson)

Cattle: lower molar (1-2) - worn
ulna - shaft .10

Unid. sheep-sized mammal fragment (proximal femur).

A8. Methodology of analysis of the Manx Neolithic pottery assemblages

THIS APPENDIX DETAILS THE RECORDING SYSTEM USED DURING THE SORTING AND ANALYSIS OF NEOLITHIC ASSEMBLAGES FROM THE ISLE OF MAN.

A8.1 Introduction

Analysis of Manx Neolithic pottery began with the study of those assemblages which have been classed as Neolithic beyond reasonable doubt, eg, Ronaldsway 'House', Ballateare, and the Mull Hill Circle. These assemblages were chosen in order to gain an initial impression of the variety of material in use during the Neolithic. As a comparative measure, assemblages from other periods were also studied to assess the degree of overlap between the variety of Neolithic sherds and those of other periods. It was discovered that Neolithic assemblages could be distinguished with little difficulty.

Following this preliminary assessment the records of the Manx Museum and Manx SMR were reviewed and all instances where a potential Neolithic ceramic assemblage had been found were recorded. These assemblages were then analysed.

An assemblage was included within this thesis if it fulfilled one of the following criteria:

- If it was found in a context which was undoubtedly Neolithic, eg, megalithic tomb
- If it contained vessels of clearly Neolithic form
- If it had a rim or other formal feature of distinctively Neolithic type
- If it had decoration which was clearly Neolithic

Assemblages which had previously been classed as Neolithic were not included if they consisted solely of plain body sherds since fabric did not appear to be a sufficiently diagnostic criteria when compared to sherds of, for example, the Bronze Age, or medieval periods.

A unique identifier was marked on each sherd, following the museum accession number, eg, 65-1-1/354 = Museum accession number was 65-1-1, and unique sherd identifier was 354.

A sherd was defined as being any fragment large enough to accept such an identifier.

Features of the sherd were recorded on a database (FoxPro v2.6) using this unique identifier to allow double checking of points raised by subsequent analysis. A list of the features recorded for each vessel / sherd is given below, along with the discriminating criteria used (if relevant).

- **Unique identifier**

  Each site was allocated a unique number, followed by the number of the sherd from that site (see Table A8.1), eg, 1.354 = Ronaldsway 'House' (1.) sherd 354.
- **Museum accession number:**
- **Number of sherds covered by unique identifier:**

  Used if sherds could be joined
- **Sherd type:**

  Whole vessel, rim, shoulder, body, base
- **Decoration:**

  Incised, Cord, Comb, Stab, Impressed, Applied
- **Rim Diameter:**
- **Percentage of diameter present**
- **Base Diameter**
- **Percentage of diameter present**

- **Height of vessel**
- **Surface area of sherd**
- **Grit type:**

  Quartz, Granite, other igneous, sandstone, grog
- **Maximum grit size:**

  Of first three grit types present in sherd
- **Shape of grits:**
- **Clay characteristics:**

  Mica rich, sandy
- **Hardness:**

  Soft / Hard
- **Colour:**

  Degree of reduction on interior, core, and exterior surfaces (where visible)
- **Surface finish:**

  Rough, smooth, burnished
- **Manufactures marks:**

  Wiping to surface, coil joins, applied portions
- **Use:**

  Abrasion or accretions to surfaces
- **Description of decoration**
- **Cross reference to similar sherds**
- **Contextual details**
- **Other information**
- **Record of drawings made or samples taken.**

  Details of the methodology used in selecting sherds for drawing are given in Appendix 6.

Unique identifiers for Neolithic assemblages used in this study			
Site name	Site identifier	No of sherds/vessels	Museum accesion no.s
Ballachrink	30.	84	88-161
Ballacottier (excavation finds)	31.	312	81-46
Ballacottier (fieldwalking finds)	39.	4	80-69
Ballacross	10.	1	568
Ballagawne	47.	1	3756
Ballagawne	57.	1	
Ballaharra	12.	437	84-130 to 131; 84-133 to 134; 84-139; 84-141
Ballahot	38.	1	565
Ballalheaney (excavation finds)	35.	46	85-38
Ballalheaney (fieldwalking finds)	34.	21	83-319; 84-19; 85-119
Ballaquayle	37.	1	3214
Ballateare	3.	39	71-303
Ballateare (Dutch Barn)	51.	1	84-85
Ballavarry (excavation finds)	32.	188	83-295
Ballavarry (fieldwalking finds)	36.	1	83-299
Baroose	61.	1	21290
Berk	54.	1	
Billown Circle	4.	62	5278; 76-184
Billown Quarry 1	29.	53	93-195
Billown Quarry 2	66.		
Cashtal yn Ard	19.	15	3831
Cleigh Rouyr	21.	1	71-73; 83-210
Colby	48.	1	3517
Colby Mooar	11.	1	5768
Cronk Coar	42.	41	2785; 67-100; 77-49
Crossag	26.	1	3071
Earybedn	59.	1	4074
Glencrutchery	2.	450	21300; 72-1 to 3; 72-5 to 11; 72-14; 72-17 to 21
Gob y Volley	58.	1	
Greenlands	62.	109	61-66; 67-71; 67-101 to 2
Guilcagh	27.	1	62-190
Killeaba	46.	1	
King Orry's Grave	15.	71	67-24
Knockaloe Beg (excavation finds)	43.	128	92-170
Knockaloe Beg (fieldwalking finds)	44.	57	92-160; 92-195
Knocksharry (?)	64.	2	633; 84-211
Leodest	45.	28	86-200
Mull Hill Circle	13.	180	1620; 3054; 3056 to 9
Orrisdale Brooghs	28.	1	85-133
Park Farm	49.	40	87-49
Park Farm (fieldwalking finds)	63.	44	89-325
Peel School	50.	36	77-43
Phurt	14.		
Ramsey Brooghs	7.	92	5004; 67-87
Ronaldsway Airport	23.	2	83-212
Ronaldsway 'House'	1.	564	65-1
Ronaldsway village	65.	1	64-144
Scard (?)	9.	11	563
Scard	8.	7	5005
Scholaby	5.	1	83-209
Shellag	55.	1	67-86
Skyhill	20.	4	76-175
South Barrule	6.	118	85-275 to 6; 86-98
West Kimmeragh (excavation finds)	41.	6	84-231
West Kimmeragh (fieldwalking finds)	40.	51	84-243

Table A8.1: Unique identifiers and museum accession numbers allocated to assemblages included within this study

A9. Results of the thin section analysis of Manx Neolithic pottery

THIS APPENDIX PRESENTS A DESCRIPTIVE REPORT ON THE THIN SECTIONS ANALYSED BY KATHRYNE KNOWLES OF SOUTHAMPTON UNIVERSITY

A9.1 Report transcript

A9.1.1 Billown Quarry 1

A9.1.1.1 Sample: ?DAUB

CLAY MATRIX

Microcrystalline matrix with abundant muscovite mica, frequent monocrystalline quartz and common plagioclase feldspar.

MINERALS

QUARTZ - abundant, subangular to subrounded monocrystalline quartz grains, average size *c* 0.1 - 0.3mm in size and smaller. Occasional polycrystalline quartz is also present usually rounded and of a larger size *c* 0.3mm with slightly sutured boundaries suggesting a quartz from a metamorphic source.

PLAGIOCLASE FELDSPAR - angular, occasional plagioclase feldspar inclusions *c* 0.1 - 0.5mm in size.

ORTHOCLASE FELDSPAR - angular occasional orthoclase feldspar inclusions, *c*0.5 - 1.5mm in size.

MIC- abundant laths of muscovite mica detected in the clay matrix, with moderate laths of larger biotite mica, *c*0.1 - 0.3mm in length.

RED IRON ORE - common, subangular red iron ore *c*0.1mm in size.

ROCK FRAGMENTS

ARGILLACEOUS INCLUSION (clay pellets) - rare, rounded, large argillaceous inclusion, 1.1mm in size.

MICACEOUS SANDSTONE - Moderate to common, subrounded to rounded micaceous sandstone fragments (slightly metamorphosed) *c*0.2 - 1.0mm in size, with larger fragments ranging from 1.4 - 2.3mm in size. The rock comprises monocrystalline and polycrystalline quartz, small laths of muscovite mica, occasional larger laths of biotite mica, and an opaque mineral.

META-QUARTZITE - occasional, rounded meta-quartzite *c*0.3mm in size.

GRANITE - angular, occasional granite fragments, comprising microline and muscovite mica, *c*1.8mm in size.

A9.1.1.2 Sample no: 29.007

CLAY MATRIX

Fine grained cryptocrystalline matrix with occasional microcrystalline inclusions of quartz and mica.

MINERALS

QUARTZ - Moderate to common angular to subangular monocrystalline quartz grains, the smaller inclusions extending from *c*0.1 - 0.5mm and a larger ones, *c*1.0 - 1.5mm in size.

Occasional to moderate, angular polycrystalline quartz is also present, average size ranging from *c*1.0 - 1.8mm.

PLAGIOCLASE FELDSPAR - Common, angular plagioclase feldspar inclusions (heavily altered to sericite mica) *c*2.0mm in size, and occasional smaller grains *c*0.1-0.2mm.

ORTHOCLASE FELDSPAR - Common, subangular to subrounded orthoclase feldspar inclusions (heavily altered to sericite mica) extending from 0.6 - 2.1mm in size, and exhibiting perthitic and microperthitic twinning.

MICROCLINE - Occasional to common, subangular to angular microcline inclusions, average size *c*0.4mm ranging up to 0.8mm in size.

MUSCOVITE MICA - occasional muscovite mica laths extending from 0.1 - 0.8mm in size.

BIOTITE MICA - occasional biotite mica laths *c*0.7mm in size.

IRON ORE - rare to occasional iron ore inclusions *c*0.1mm and smaller in size.

ROCK FRAGMENTS

SANDSTONE - rare, subrounded sandstone fragments *c*0.2mm in size, comprising quartz, mica and an opaque mineral.

GRANITE - Moderate to frequent, angular granite inclusions, extending from 0.6 - 3.0mm in size. The rock is comprised of biotite and muscovite mica, polycrystalline quartz, partially altered orthoclase feldspar, partially altered plagioclase feldspar with simple and albite twins, and microcline.

A9.1.1.3 Sample no: 29.010

CLAY MATRIX

Microcrystalline matrix with abundant mica (both muscovite and biotite) and monocrystalline quartz.

MINERALS

QUARTZ - frequent, angular to rounded monocrystalline quartz, average size *c*0.1 - 0.3mm in size extending up to 0.9mm.

Occasional, rounded to subrounded polycrystalline quartz can also be detected, *c*0.2 - 0.4mm in size, many of the crystal boundaries are sutured suggesting quartz from a metamorphic source.

PLAGIOCLASE FELDSPAR - occasional to moderate, angular plagioclase feldspar inclusions, *c*0.3 in size with several inclusions extending up to 0.7mm, exhibiting both simple and multiple twinning.

ORTHOCLASE FELDSPAR - moderate to common, angular to subrounded orthoclase feldspar heavily altered to sericite mica, average size *c*0.2mm with larger inclusions, *c*1.0 - 1.3mm in size.

MICROCLINE - occasional, angular microcline, *c*0.9mm in size.

MUSCOVITE MICA - common to abundant laths of muscovite mica, extending from *c*0.2 - 0.7mm in size.

IRON ORE - occasional rounded iron ore inclusions, *c*0.1 mm in size, both red and black iron ore.

ROCK FRAGMENTS

META QUARTZITE - occasional, rounded meta-quartzite, *c*0.2 0.3mm in size.

MICACEOUS SANDSTONE - rare, rounded micaceous sandstone fragments, *c*0.4mm in size, comprising mica and monocrystalline quartz inclusions.

GRANITE - moderate to frequent, angular granite fragments, extending from 1.8 - 4.3mm in size and smaller. The granite comprises large laths of muscovite mica, orthoclase feldspar (altered to sericite mica), quartz and plagioclase feldspar.

A9.1.1.4 Sample no: 29.012

CLAY MATRIX

Fine grained matrix comprising microcrystalline quartz and feldspar

MINERALS

QUARTZ - moderate to common, large, subangular to angular inclusions of monocrystalline quartz extending up to 2.0mm in size (average size *c*0.1 - 0.8mm across).

Moderate large subangular to angular polycrystalline quartz (average size 0.6mm across) but extending from 1.0 - 2.8mm in size).

PLAGIOCLASE FELDSPAR - frequent large plagioclase feldspar phenocrysts, exhibiting simple and multiple twinning (average size *c*1.2mm across, extending up to 2.5mm in size, with smaller inclusions in the groundmass).

ORTHOCLASE FELDSPAR - sparse to common, subangular orthoclase feldspar inclusions *c*0.5 - 1.0mm in size, several exhibit evidence of simple twinning (Carlsbad twinning).

MICROCLINE - sparse, subangular inclusions of microcline *c*1.2mm in size.

MICA - occasional biotite mica laths *c*0.2mm in size and long thin muscovite mica laths 0.3-0.6mm in length.

IRON ORE - occasional black iron ore inclusions *c*0.1mm and smaller in size.

ROCK FRAGMENTS

SANDSTONE - sparse, subangular sandstone inclusions, *c*1.3mm in size (comprising subrounded monocrystalline quartz *c*0.1mm in size in a cryptocrystalline micaceous matrix.

SILTSTONE - rare, subrounded siltstone inclusion, *c*1.6mm in size.

IGNEOUS ROCK - common to frequent, large angular rock fragments, up to 4.0mm in size and smaller (*c*1.0mm). Comprising monocrystalline quartz, muscovite mica, orthoclase feldspar and plagioclase feldspar (frequently twinned and zoned).

A9.1.1.5 Sample no: 29.030

CLAY MATRIX

Matrix comprises microcrystalline quartz, feldspar, muscovite and biotite mica.

MINERALS

QUARTZ - abundant, subangular to subrounded monocrystalline quartz, average size *c*0.3mm

extending up to 1.2mm across.

Occasional, subangular polycrystalline quartz *c*0.2mm can also be detected.

PLAGIOCLASE FELDSPAR - moderate, angular to subangular plagioclase feldspar, *c*0.6 to 1.2mm in size.

ORTHOCLASE FELDSPAR - sparse to moderate, subrounded orthoclase feldspar inclusions, often heavily dusted with mica.

MICROCLINE - occasional, subangular to subrounded microcline inclusions, from *c*0.1 - 0.9mm in size

MUSCOVITE MICA- sparse to common, long thin laths of muscovite mica extending up to 2.5mm in size.

IRON ORE - occasional black iron ore inclusions, *c*0.1mm in size and smaller.

ROCK FRAGMENTS

SANDSTONE - occasional, subrounded to rounded, micaceous sandstone fragments. *c*1.0mm in size, comprising monocrystalline quartz, muscovite mica set in a cryptocrystalline clay matrix.

GRANITE - moderate to common, angular rock fragments *c*1.5 - 4.2mm in size. Comprising, monocrystalline quartz, muscovite mica, plagioclase feldspar, orthoclase feldspar and microcline, the latter three dusted with mica. A great deal of the larger aplastic mineral inclusions are derived from this rock.

A9.1.2 Ronaldsway 'House'

A9.1.2.1 Sample no: 1.087

CLAY MATRIX

Comprising microcrystalline fine grained quartz and mica.

MINERALS

QUARTZ - common to frequent, subangular to rounded monocrystalline quartz inclusions, 0.1 -0.3mm and smaller in size in the clay matrix (the larger grains are more rounded in shape).

Rare, subangular, polycrystalline quartz, *c*0.2 -0.3mm in size.

MICA - common to abundant tiny laths of muscovite mica, 0.1mm and smaller in the clay matrix. Occasional larger laths of biotite, *c*0.1mm in length.

FELDPSAR - occasional subangular plagioclase feldspar inclusions, detached from the olivine dolerite rock fragments.

RED AND BLACK IRON ORE - occasional to common, rounded grains of iron ore, *c*0.1mm in size.

ROCK FRAGMENTS

SHALE/SLATE - rare, subrounded rock fragment, *c*1.6mm in length.

PHYLLITE - rare, subrounded phyllite *c*0.3mm in size.

OLIVINE DOLERITE - frequent, holocrystalline medium to coarse grained olivine dolerite, with angular to subangular fragments extending from *c*1.0 - 6.0mm and smaller in size.

Comprising large plagioclase feldspar laths, olivine, occasional clinopyroxene (such as augite), accessory quartz and opaque material. Alteration products include illite (sericite) and limonitic material. Minerals from this rock fragment have broken off and can be seen separately in the clay.

A9.1.2.2 Sample no: 1.184

CLAY MATRIX

Microcrystalline quartz, and mica (the thin section is a little thick preventing close determination of the clay matrix).

MINERALS

QUARTZ - moderate, subangular, monocrystalline quartz *c*0.1mm and smaller in size, with occasional rounded monocrystalline quartz grains extending up to 0.4mm across.

Rare, subangular sheared metamorphic quartz grins, *c*0.2 - 0.3mm in size.

FELDSPAR - common, angular plagioclase feldspar inclusions *c*0.2mm in size (probably detached from the olivine dolerite and basalt fragments).

MICROCLINE - rare angular microcline feldspar inclusions, *c*0.3mm in size.

MICA - occasional long laths of biotite, *c*0.1mm in length.

IRON ORE - occasional, rounded iron ore, *c*0.1mm and smaller in size.

ROCK FRAGMENTS

CHERT - rare, subrounded chert fragments *c*0.3mm across.

SHALE/SLATE - rare, elongate slate/shale fragments up to 0.7mm in length.

META - QUARTZITE - rare subangular metamorphic quartzite extending from to 0.7 - 1.3mm in size.

OLIVINE DOLERITE - frequent, angular fragments of a medium grained, subophitic holocrystalline olivine dolerite extending up to 9.0mm in size, average size 2.0-3.0mm across. The rock comprises plagioclase feldspar, olivine, clinopyroxene (most commonly augite) and opaque minerals. Olivine has been altered to the brown alteration products of serpentine and limonite. Interstitial glass and cryptocrystalline clay minerals are also present.

OLIVINE BASALT - occasional, angular holocrystalline olivine basalt extending from 1.5mm up to 5.5mm in size. The rock comprises microphenocrysts of plagioclase feldspar (within the labradorite to bytownite range) , smaller grains of olivine and clinopyroxene (most commonly augite), interstitial glass and cryptocrystalline clay. Again olivine has been altered to serpentine and limonite producing a microcrystalline brown clay.

A9.1.2.3 Sample no: 1.281

CLAY MATRIX

Microcrystalline quartz, muscovite and biotite mica, and plagioclase feldspar inclusions.

MINERALS

QUARTZ - common to frequent, subangular to rounded monocrystalline quartz, average size *c*0.2mm, the larger grains are more rounded and extend from 0.6 - 1.3mm across

Occasional, subangular to subrounded polycrystalline quartz, *c*0.2mm across

FELDSPAR - sparse to rare, angular plagioclase feldspar and alkali feldspar (possibly orthoclase feldspar) inclusions ca.0.2mm and smaller in size (probably detached from the olivine dolerite).

MICA - frequent to abundant tiny laths of mica in the clay matrix (both muscovite and biotite).

There are also occasional larger biotite laths ca.0.1mm and smaller in size.

IRON ORE - occasional, red and black iron ore inclusions, *c*0.2mm and smaller in size.

ROCK FRAGMENTS

SANDSTONE - rare, fine grained, subrounded to subangular sandstone inclusions *c*0.1 -0.5mm in size, comprising well sorted microcrystalline quartz, feldspar and cryptocrystalline clay minerals

CHERT or SILTSTONE (difficult to determine without the use of a SEM) - rare, rounded to subangular fragments ca. 0.2 - 0.4mm in size.

SANDSTONE - rare, subrounded metamorphosed micaceous sandstone, *c*0.2mm across.

META-QUARTZITE - rare, rounded metamorphosed quartzite (with sutured boundaries) *c*0.3mm across.

OLIVINE DOLERITE - frequent, angular, subophitic holocrystalline olivine dolerite extending from *c*1.0 to 5.0mm in size. The rock comprises plagioclase feldspar, olivine, clinopyroxene

(commonly augite), opaque minerals and often small fragments of glass filling the interstices. The brown/red alteration products are most frequently serpentine, limonite and cryptocrystalline clay minerals.

A9.1.2.4 Sample no: 1.349

CLAY MATRIX

Fine grained microcrystalline matrix comprising abundant monocrystalline quartz, feldspar, muscovite and biotite mica inclusions.

MINERALS

QUARTZ - common, subangular to rounded monocrystalline and polycrystalline quartz grains, *c*0.2mm and smaller in size, with occasional rounded monocrystalline quartz inclusions extending up to 0.6mm in size.

MICA - abundant long thin laths of biotite and more commonly muscovite mica , *c*0.1mm and smaller in the clay matrix.

FELDSPAR - Occasional, angular plagioclase feldspar inclusions, *c*0.2mm in size, probably detached from the olivine dolerite.

Occasional alkali feldspar *c*0.2mm can also be detected, often heavily altered to mica.

RED IRON ORE - occasional rounded red/orange grains *c*0.1mm and smaller in the clay matrix.

ROCK FRAGMENTS

SANDSTONE - occasional, subrounded micaceous sandstone inclusions, *c*0.2mm across, comprising medium grained, well sorted quartz inclusions in a micaceous matrix.

Occasional, finer grained, well sorted, sandstone inclusions of a similar type can also be detected.

CHERT - occasional, subrounded chert 0.1-0.4mm and smaller can be seen, comprising cryptocrystalline quartz grains.

OLIVINE DOLERITE - frequent, angular fragments of a medium grained, subophitic holocrystalline olivine dolerite extending from *c*5.0 - 7.0mm and smaller in size. Comprising plagioclase feldspar, olivine, clinopyroxene (commonly augite) and opaque minerals, such as interstitial glass and magnetite. Alteration products include serpentine, limonite and cryptocrystalline clay minerals.

OLIVINE BASALT - frequent, angular holocrystalline olivine basalt extending from *c*3.5mm - 5.0mm and smaller in size. Comprising microphenocrysts of plagioclase feldspar, olivine, clinopyroxene (augite), interstitial glass and cryptocrystalline clay minerals. Olivine has frequently been altered to serpentine and limonite.

A9.1.2.5 Sample no: 1.449

CLAY MATRIX

Microcrystalline quartz, feldspar and muscovite and biotite mica.

MINERALS

QUARTZ - Common, subangular, monocrystalline quartz grains, average size *c*0.1 - 0.2mm and smaller in the groundmass, extending up to 0.6mm in size.

Rare, angular to subangular inclusions of polycrystalline quartz, *c*0.3 - 0.6mm in size.

Sparse subrounded sheared metamorphic quartz grains, 0.2-0.3mm in size.

FELDSPAR - sparse to common, angular plagioclase feldspar inclusions, ca.0.1mm across and smaller in size.

MICA - Large common long thin laths of biotite and muscovite mica, *c*0.2mm in length.

IRON ORE - occasional red iron ore inclusions, *c*0.1mm and smaller in size.

ROCK FRAGMENTS

CHERT - rare, rounded to subrounded chert inclusions 0.1 - 0.2mm in size.

SHALE/SLATE - rare, angular fragments of slate or shale, *c*0.2mm in length.

SANDSTONE - rare, subangular to subrounded, moderately well sorted arenaceous sedimentary rock, *c*3.0mm in size, comprising angular grains, 0.1mm and smaller in size of subrounded monocrystalline quartz, biotite and muscovite mica, plagioclase and alkali (probably orthoclase) feldspar, tiny slate/shale fragments, red iron ore and possibly chert, in a cryptocrystalline clay matrix.

OLIVINE DOLERITE - frequent, angular fragments of a subophitic, holocrystalline, basic intrusive igneous rock, up to ca. 8.0mm in size, average size of fragments, *c*1.5 - 2.0mm across.

Comprising plagioclase feldspar, olivine, clinopyroxene (commonly augite) and opaque minerals. The red/brown, yellow/brown alteration products are limonite and cryptocrystalline clay minerals which are indistinguishable without the use of a scanning electron microscope. The darker brown material represents interstitial glass which occurs in small amounts throughout the rock and the groundmass has largely been altered to clay minerals.

A9.1.2.6 Sample no: 2.057

CLAY MATRIX

Microcrystalline quartz, muscovite micand possibly feldspar inclusions.

<u>MINERALS</u>

QUARTZ - frequent, subangular to subrounded monocrystalline quartz, average size 0.1mm, extending to rounded grains 0.6mm in size.

Rare, subrounded to rounded polycrystalline quartz, ca. 0.4 - 0.6mm in size.

FELDSPAR - occasional to common, subangular alkali and plagioclase feldspar inclusions ca. 0.1-0.2mm in size. In addition, there is one large grain of heavily altered alkali feldspar (probably detached from an igneous rock) *c*2.2mm in size.

MICA - long laths of muscovite mica, *c*0.2mm in length.

IRON ORE - occasional red and black iron ore inclusions, *c*0.2mm and smaller in size.

ROCK FRAGMENTS

CHERT - rare to common, subrounded chert fragments, average size 0.2 - 0.4mm in size, with a rare long thin elongated fragment 1.7mm in length.

SANDSTONE - Moderate, rounded to subrounded, medium grained sandstone inclusions (occasionally heavily altered) *c*0.6 - 0.8mm in size comprising angular quartz and subrounded rock fragments (again heavily altered).

SANDSTONE - occasional, subrounded slightly metamorphosed, fine grained, well sorted micaceous sandstone, *c*0.7mm in size and smaller.

SLATE/PHYLLITE - Rare, subangular large phyllite fragments *c*1.8mm in size.

OLIVINE DOLERITE - Common to moderate, subangular to angular fragments of a subophitic, holocrystalline olivine dolerite, *c*1.2mm - 4.0mm in size, with smaller often separate grains detached from the parent material (*c*0.5mm across).

The rock comprises plagioclase feldspar, olivine and clinopyroxene (commonly augite) and opaque minerals. Alteration products include limonite and cryptocrystalline clay minerals. The darker brown material is interstitial glass and possibly magnetite.

OLIVINE BASALT - sparse, angular, large basaltic igneous rock fragments, *c*4.0mm across. Comprising microphenocrysts of plagioclase feldspar, olivine and clinopyroxene, interstitial glass and cryptocrystalline clay minerals. Alteration products are serpentine and limonite.

A9.1.2.7 Sample no: 2.080

CLAY MATRIX

Abundant, microcrystalline quartz, muscovite mica(possibly biotite) and feldspar.

MINERALS

QUARTZ - frequent to abundant, subangular quartz *c*0.1mm and smaller in the clay matrix, with occasional larger subrounded grains extending up to *c*0.4mm in size.

Rare, subrounded polycrystalline quartz, *c*0.1 - 0.4mm in size can be detected, in addition to occasional sheared metamorphosed quartz grains *c*0.4mm across with sutured boundaries.

MICA - rare, biotite and muscovite mica laths, *c*0.1 - 0.2 mm in length and smaller in the clay matrix.

FELDSPAR - occasional, subangular plagioclase feldspar *c*0.2mm across, and sparse, subangular alkali (orthoclase) feldspar inclusions, *c*0.6mm in size.

BLACK/RED IRON ORE - occasional, subrounded grains, *c*0.1mm in size.

ROCK FRAGMENTS

SHALE/SLATE - rare subrounded fragments, *c*0.6mm in size.

OLIVINE BASALT - common to frequent, angular, holocrystalline, olivine basalt fragments, extending from ca. 4.0 - 6.5mm in size. Comprising microphenocrysts of plagioclase feldspar, smaller grains of olivine and pyroxene, interstitial glass and cryptocrystalline clay minerals. Alteration products include serpentine and limonite.

OLIVINE DOLERITE - common, subangular holocrystalline olivine dolerite fragments, extending from *c*4.0 - 9.0mm in size. Comprising large plagioclase feldspar crystals, heavily altered to serpentine, limonite and clay minerals such as illite and sericite. Occasional olivine crystals are present (frequently altered) in addition to opaque minerals and accessory quartz.

IGNEOUS ROCK (possibly dolerite) - frequent, subangular recrystallised cataclastic igneous rock extending from *c*3.0 - 11.0mm in size. Comprises plagioclase feldspar (with alteration to sericite mic), clinopyroxene (augite), orthopyroxene and secondary quartz.

A9.1.2.8 Sample no: 2.082

CLAY MATRIX

Microcrystalline quartz, feldspar and mica.

MINERALS

QUARTZ - frequent, subangular monocrystalline quartz, ca 0.1mm and smaller in size, extending up to 0.4mm across.

Rare, subangular, to subrounded polycrystalline quartz, *c*0.4mm in size.

FELDSPAR - rare, subrounded alkali feldspar grains, *c*0.1mm in size.

IRON ORE - occasional rounded iron ore inclusions, *c*0.1mm and smaller in size.

ROCK FRAGMENTS

SANDSTONE - rare, subangular fragments *c*0.2mm in size, comprising relatively well sorted monocrystalline quartz grains

METAMORPHOSED SANDSTONE - rare, subangular micaceous sandstone inclusions, *c*1.0mm in size.

CHERT - rare, subangular, chert fragments, *c*0.5mm across.

SHALE/SLATE - occasional, elongated, slightly micaceous shale or slate fragments, extending from 1.5 - 2.2mm in length.

OLIVINE DOLERITE - moderate to frequent, angular holocrystalline, subophitic olivine dolerite fragments, *c*4.0 - 5.0mm and smaller in size. Comprising plagioclase feldspar, olivine, clinopyroxene (commonly augite) and interstitial glass. Some fragments have been altered very little, others have been altered to such an extent that serpentine, limonite and clay minerals have replaced the existing minerals so that it is difficult to determine the rock type, possibly an olivine dolerite.

OLIVINE BASALT - Moderate to frequent, angular holocrystalline basalt fragments, from 2.5 - 9.0 mm across and smaller in size. Comprising olivine (now largely replaced by serpentine, limonite and cryptocrystalline clay minerals), clinopyroxene (most commonly augite), microphenocrysts of plagioclase feldspar, rare quartz grains and some opaque minerals (probably glass and magnetite).

A9.1.2.9 Sample no: 2.101

CLAY MATRIX

Microcrystalline quartz, feldspar and muscovite and biotite mica, however the thin section is a little too thick to determine precisely.

MINERALS

QUARTZ - moderate, subrounded to subangular monocrystalline quartz inclusions, average size *c*0.2mm and smaller in the clay matrix, with occasional subangular grains extending up to 1.2mm in size.

Occasional subrounded polycrystalline quartz grains *c*0.1-0.2mm in size.

FELDSPAR - occasional plagioclase feldspar can be detected in addition to rare rounded alkali feldspar inclusions, *c*0.2mm in size (often slightly altered).

MICA - sparse, muscovite and biotite laths *c*0.2mm across and smaller in the clay matrix.

ROCK FRAGMENTS

CHERT - occasional grains of subrounded chert ca. 0.5mm and smaller in size.

SHALE OR SLATE - occasional elongated fragments *c*0.4mm in length.
SANDSTONE - rare, moderately well sorted arenaceous sedimentary rock.
A slightly metamorphosed subrounded micaceous sandstone *c*0.6mm in size, comprising angular quartz, muscovite mica and cryptocrystalline clay minerals.
OLIVINE DOLERITE - frequent to abundant, angular to subangular, subophitic, holocrystalline olivine dolerite inclusions extending from *c*3.0 - 4.0mm in size.
The rock comprises plagioclase feldspar, olivine, clinopyroxene (commonly augite), opaque minerals and interstitial glass. Alteration products include limonite and cryptocrystalline clay minerals.

A9.1.2.10 Sample no: 2.206

CLAY MATRIX
Cryptocrystalline clay matrix with microcrystalline quartz and muscovite mica.

MINERALS
QUARTZ - common, subangular to rounded monocrystalline quartz inclusions ranging from *c*0.2 - 1.0mm in size.
FELDSPAR - rare subangular plagioclase feldspar inclusions *c*0.5mm in size.
MICA - occasional to common laths of biotite mica, *c*0.1 - 0.5mm in length.
IRON ORE - occasional dark iron ore inclusions *c*0.1mm and smaller in size.

ROCK FRAGMENTS
SHALE/SLATE - rare, subangular fragments of shale/slate, *c*0.2mm in size.
CHERT - rare, angular chert inclusions, *c*1.7mm in size and smaller ca.0.2mm.
OLIVINE BASALT - common to abundant, angular olivine basalt, *c*2.0 - 6.0mm and smaller in size. Comprising microphenocrysts of plagioclase feldspar, occasional large laths of plagioclase, olivine (often heavily altered) , and clinopyroxene (commonly augite). Alteration products include serpentine, limonite, opaque minerals, interstitial glass and possible magnetite.
HEAVILY ALTERED DOLERITE ? - difficult to determine rock type due to the heavy alteration of the mafic minerals and plagioclase feldspar).
Frequent, subangular to angular fragments, average size *c*2.0mm extending up to 8.0mm across.
Comprising heavily altered plagioclase feldspar laths, accessory quartz with possible sutured boundaries and mafic minerals (possibly olivine and pyroxene), which have been altered to chlorite, serpentine and cryptocrystalline clay minerals. Opaque minerals can also be seen in addition to occasional laths of a mica which is either biotite or an alteration product.
It is not certain but it may be possible to suggest that this is a heavily altered olivine dolerite.

A9.1.2.11 Sample no: 3.001

CLAY MATRIX
Microcrystalline quartz, feldspar and muscovite and biotite mica, .

MINERALS

QUARTZ - frequent to abundant, subangular to subrounded monocrystalline quartz grains ca. 0.1mm and smaller in the clay matrix. Larger monocrystalline grains extend up to 0.4mm in size (the larger ones being rounded to subrounded).

In addition, occasional subrounded polycrystalline quartz grains 0.2 - 0.3mm in size can be detected in addition to rare subrounded, sheared metamorphic quartz grains 0.1-0.2mm in size.

FELDSPAR - occasional subrounded to subangular plagioclase and alkali feldspar inclusions, average size 0.3mm.

MICA - Frequent, muscovite and less frequent biotite mica, usually below 0.1mm in size can be seen in the clay matrix.

CLINOPYROXENE - Rare to common, subrounded augite inclusions *c*2.5mm and smaller in size.

RED IRON ORE - occasional rounded red iron ore, 0.1mm and smaller in the clay matrix.

ROCK FRAGMENTS

SANDSTONE - Common, arenaceous sedimentary rock, moderately well sorted.

There are two types :-

i) a medium grained sandstone containing subrounded quartz, and alkali feldspar *c*0.2mm in size in a cryptocrystalline clay matrix.

ii) a finer grained arenaceous sedimentary rock, the grains are subrounded and below 0.1mm in size) comprising angular quartz, subrounded chert and biotite/muscovite mica in a cryptocrystalline matrix.

CHERT - occasional rounded to subrounded microcrystalline quartz grains ca.0.2mm in size.

IGNEOUS ROCK - (difficult to determine, since it has been truncated and alteration products obscure a great deal of it).

Common, angular to subangular rock fragment, smaller grains *c*1.0mm extending up to 6.5mm in size. The rock comprises large interlocking zoned olivine crystals up to 5.2mm in size and plagioclase feldspar inclusions heavily altered to brown alteration products (possibly serpentine and limonite).

A9.1.2.12 Sample no: 3.006

CLAY MATRIX

Fine grained microcrystalline matrix of quartz, feldspar and mica (both biotite and muscovite although more frequently the latter)

MINERALS

QUARTZ - frequent, subrounded to subangular monocrystalline quartz grains, extending up to 0.3mm in size and smaller in the clay matrix.

Rare, subrounded polycrystalline quartz with sutured boundaries, *c*0.2mm in size, possibly quartz from a metamorphic source.

FELDSPAR - occasional subangular alkali feldspar (possibly orthoclase feldspar) inclusions, 0.1-0.2mm in size.

Rare angular plagioclase feldspar inclusions 0.2mm in size.

MICA - occasional large biotite laths *c*0.2mm in size.

ARGILLACEOUS INCLUSIONS - occasional, rounded dark red/brown argillaceous inclusions extending up to 0.8mm in size and smaller.
IRON ORE - occasional iron ore inclusions, *c*0.1mm and smaller in size.

ROCK FRAGMENTS
SANDSTONE - rare, angular, moderately well sorted arenaceous sedimentary rock, ca. 4.0mm in size (most of the minerals in the rock fragment are missing). The remaining are composed of angular to subangular quartz, subrounded chert and possible subrounded alkali feldspar.
ROCK FRAGMENT ? - (difficult to distinguish because it is heavily covered in a brown alteration product). Rare, subangular, badly sorted rock fragment comprising polycrystalline quartz, metamorphic quartzite and alkali feldspar, the feldspar has altered to a cryptocrystalline clay mineral.
CHERT - occasional angular fragments of chert *c*0.1mm in size and smaller.
DOLERITE (possibly olivine dolerite) - Occasional , angular, holocrystalline rock fragments *c*4.5mm across. Comprising abundant plagioclase feldspar and mafic minerals (olivine and pyroxene) which are heavily altered to possibly limonite or serpentine. Opaque inclusions are also present in addition to interstitial glass and cryptocrystalline clay minerals.

A9.1.2.13 Sample no: 3.009

CLAY MATRIX
Microcrystalline quartz, plagioclase feldspar, alkali feldspar and mica.

MINERALS
QUARTZ - abundant, rounded to subangular monocrystalline quartz grains, average size 0.1mm and smaller in the groundmass, larger grains extend from 0.2 to 1.3mm, (many of the larger grains are rounded).
Occasional subrounded polycrystalline quartz also occurs up to 0.3mm across (some of which have been slightly metamorphosed).
FELDSPAR - occasional angular plagioclase feldspar extending up to 0.6mm in size.
Occasional rounded to subrounded alkali feldspar (both microcline and orthoclase feldspar inclusions) extending up to *c*0.2mm in size.
MICA - common tiny muscovite mica laths usually below 0.1mm in size.

ROCK FRAGMENTS
QUARTZITE - occasional, subrounded to subangular quartzite inclusions *c*0.6 - 1.5mm in size and smaller.
CHERT - rare, rounded chert inclusions *c*0.3mm in size.
SANDSTONE - common to frequent, angular to subangular, poorly sorted arenaceous sedimentary rock fragments, extending from *c*2.0 - 8.0mm in size.
There are two types:-
i) A medium grained sandstone comprising angular to subrounded quartz grains 0.3-0.8mm in size. Common, subangular alkali feldspar (microcline and orthoclase) and rare plagioclase feldspar inclusions *c*0.3mm across with and without secondary alteration to sericite., Occasional to moderate long thin laths

of muscovite mica up to 0.5mm in size, and in one example, a single occurrence of biotite mica, *c*0.5mm in length. Occasional subrounded sheared metamorphic quartz grains can also be detected *c*0.4mm in size. All of which are set in a cryptocrystalline matrix containing a brown alteration product.

ii) A finer grained arenaceous version of above with the feldspar grains and cryptocrystalline matrix altered to a greater extent.

ARGILLACEOUS INCLUSIONS - occasional rounded brown argillaceous inclusions up to 0.8mm across

A9.1.2.14 Sample no: 32.123

CLAY MATRIX

Microcrystalline to cryptocrystalline clay matrix, comprising quartz, occasional plagioclase feldspar and muscovite mica.

MINERALS

QUARTZ - common, subangular quartz grains, *c*0.1mm and smaller in size in the clay matrix, extending up to *c*0.4mm across (several of the larger grains are rounded).

Occasional, subangular polycrystalline quartz, *c*0.3-0.5mm in size.

FELDSPAR - occasional, angular, plagioclase and alkali (possibly orthoclase) feldspar inclusions, *c*0.2mm across.

MICA - moderate laths of muscovite mica, and rare laths of biotite, *c*0.1mm in length.

RED/BLACK IRON ORE - rare to common, subrounded grains, *c*0.3 - 0.4mm across.

ROCK FRAGMENTS

SANDSTONE - occasional to common, subangular fragments of a poorly sorted, medium grained arenaceous sedimentary rock, average size *c*0.4 - 1.0mm extending up to 2.5 - 3.5mm across.

Comprising large subangular monocrystalline quartz grains, 0.8 - 1.5mm in size in a finer grained matrix of monocrystalline quartz and polycrystalline quartz with sutured boundaries (0.1-0.2mm across), muscovite mica, chert or a very fine grained arenaceous rock fragment, plagioclase feldspar and possibly alkali feldspar (heavily altered to clay minerals such as chlorite) set in a fine grained matrix of cryptocrystalline clay minerals.

METAMORPHOSED SANDSTONE - rare, angular metamorphosed sandstone with sutured boundaries, *c*0.8mm in length.

GROG/ARGILLACEOUS INCLUSIONS - common argillaceous inclusions (possibly grog) *c*0.4 - 0.8mm in size, however it is unlikely to have been deliberately added and has is more likely to have entered the clay fabric by accident.

OLIVINE DOLERITE - moderate to frequent, angular subophitic, holocrystalline olivine dolerite fragments , *c*2.8 - 5.5mm and smaller in size. Comprising laths of plagioclase feldspar, olivine, clinopyroxene (commonly augite), accessory muscovite mica, and small amounts of interstitial glass and cryptocrystalline clay minerals.

OLIVINE BASALT - moderate to frequent, angular olivine basalt inclusions, *c*1.8 - 6.0mm and smaller in size. Comprising microphenocrysts of plagioclase feldspar, olivine (often altered to serpentine and limonite) occasional clinopyroxene (augite) and interstitial glass and magnetite.

BASALT - (could be an olivine basalt but it is difficult to distinguish due to the heavy alteration of its minerals). The rock comprises microphenocrysts of plagioclase feldspar (with occasional large plagioclase feldspar grains) and large phenocrysts of what appears to be clinopyroxene (heavily altered). The material between the mineral grains comprises chlorite, illite (sericite) and opaque minerals such as magnetite and interstitial glass.

A9.1.2.15 Sample no: 32.125

CLAY MATRIX

Microcrystalline quartz, feldspar and biotite and muscovite mica.

MINERALS

QUARTZ - abundant, rounded to subangular monocrystalline quartz grains, average size 0.1-0.2mm and smaller in the clay matrix, with larger common, subrounded monocrystalline quartz grains extending up to 0.8mm across.

Rare, rounded polycrystalline quartz grains, average size *c*0.2 - 0.5mm in size.

Rare, subrounded, sheared metamorphic quartz grains, ca.0.2mm in size.

FELDSPAR - Occasional to common angular plagioclase and alkali feldspar inclusions (most commonly microcline), average size 0.1- 0.2mm, and smaller in the clay matrix. One plagioclase feldspar is 0.9mm in size. The feldspar is often heavily altered to fine grained sericite or chlorite (exact determination requires examination with a SEM).

MICA - Common, biotite and muscovite mica laths, average size 0.2mm in length with several larger biotite mica inclusions extending up to 0.6mm in size.

IRON ORE - occasional iron ore inclusions *c*0.1mm and smaller in size.

ROCK FRAGMENTS

CHERT - occasional, large subrounded chert inclusions *c*0.4 - 0.8mm in size and smaller. The matrix is microcrystalline and difficult to distinguish particularly since it has been heavily altered to sericite or chlorite.

OLIVINE DOLERITE - occasional subangular fragments of olivine dolerite *c*0.4-0.5mm in size. The rock comprises larger plagioclase feldspar laths (which have been heavily altered to a cryptocrystalline clay mineral), olivine, clinopyroxene (commonly augite), frequent opaque minerals and interstitial glass. Alteration products include limonite and serpentine.

OLIVINE BASALT - Common, subangular to subrounded , subophitic, holocrystalline olivine basalt fragments, ca.5.0mm in size , with common to frequent smaller fragments *c*0.8-1.2mm.

Comprising plagioclase feldspar (often as microphenocrysts), olivine, clinopyroxene (augite), opaque minerals, interstitial glass and cryptocrystalline clay minerals. Alteration products are the same as above.

A9.1.2.16 Sample no: 32.142

CLAY MATRIX

Microcrystalline quartz, plagioclase and alkali feldspar, biotite and muscovite mica.

MINERALS

QUARTZ - frequent, subangular to subrounded monocrystalline quartz ca. 0.2-0.4mm in size and smaller in the clay matrix.

Occasional rare subangular polycrystalline quartz, 0.1 - 0.5mm in size.

FELDSPAR - occasional to common, subangular alkali feldspar, ca0.2mm in size, heavily altered to a clay mineral.

Plagioclase feldspar can also be detected which has detached from the olivine dolerite.

MICA - sparse, long thin muscovite mica laths 0.2mm in length and occasional muscovite mica in the clay matrix.

ROCK FRAGMENTS

SANDSTONE - occasional rounded to subrounded fine grained sandstone fragments (occasionally altered) ca.0.2mm in size and smaller.

In addition, large sparse, subangular, medium grained, moderately well sorted sandstone inclusions extending up to 1.9mm across can be detected, comprising quartz, rock fragments (possibly chert) and alkali feldspar set in a heavily altered brown/orange cryptocrystalline clay matrix.

QUARTZITE - occasional, subangular metamorphic quartzite, *c*0.2mm in size.

OLIVINE DOLERITE - Common, subangular to subrounded, subophitic holocrystalline olivine dolerite fragments, 0.4 - 0.7mm in size, including smaller detached pieces. The rock comprises plagioclase feldspar, olivine, clinopyroxene (commonly augite), opaque minerals, and interstitial glass. Alteration products are limonite, serpentine and cryptocrystalline clay minerals.

BASALT - common, subangular holocrystalline basalt fragments *c*1.0 - 4.0mm and smaller in size. Comprising microphenocrysts of plagioclase feldspar, interstitial glass and opaque minerals but very little mafic minerals (such as olivine and pyroxene). Alteration is the same as above.

GROG/ARGILLACEOUS INCLUSIONS - occasional subangular rock fragments extending up to 3.5mm in size but usually smaller (average size *c*0.2mm).

Comprising moderate, subangular to rounded monocrystalline and polycrystalline quartz grains (*c*0.1-0.2mm across). Moderate plagioclase and alkali feldspar (Often altered to other minerals) *c*0.1mm and smaller in the groundmass. Occasional laths of biotite, and sparse possible sandstone inclusions (heavily altered) 0.1mm in size The inclusions are set in a cryptocrystalline matrix comprising brown alteration products.

A9.1.3 Ballachrink

A9.1.3.1 Sample: No 3 (N21E89 K1 L1)

CLAY MATRIX

Very fine grained microcrystalline matrix of quartz and muscovite mica.

MINERALS

QUARTZ - common, subangular to subrounded monocrystalline quartz grains, average size *c*0.2 - 0.4mm and smaller in size, extending up to 0.7mm.

Occasional subrounded polycrystalline quartz, *c*0.4 - 1.0mm in size with sutured boundaries.

MICA - moderate laths of muscovite and biotite mica *c*0.1 - 0.2mm in length.

PLAGIOCLASE FELDSPAR - occasional, angular plagioclase feldspar, *c*0.2 - 0.6mm in size.

OLIVINE - rare angular olivine inclusions, *c*0.2 - 0.9mm in size.

PYROXENE - rare, angular pyroxene inclusion, *c*0.2mm in size.

ROCK FRAGMENTS

SANDSTONE - ranging from badly sorted, to fine grained, relatively well sorted sandstone inclusions. Common, subrounded to subangular fragments from 0.6 - 3.0mm in size.

The sandstone comprises frequent monocrystalline quartz, occasional to common muscovite and biotite mica, occasional plagioclase feldspar, fine grained rounded argillaceous rock fragments opaque minerals, sparse alkali feldspar, and a single occurrence of augite.

META-QUARTZITE - occasional subangular meta-quartzite, *c*0.2 0.3mm in size.

BASALT - there is a possible, rare, subangular basalt inclusion, *c*1.3mm in size, however it has been heavily altered and only a SEM would positively identify this fragment.

IGNEOUS ROCK FRAGMENTS - it is difficult to determine these coarse to medium grained igneous rocks since the smaller crushed fragments in the fabric are not representative of the whole composition of the rock.

Overall there appears to be three different types of igneous rocks here, although it cannot be ruled out that they belong to the same rock type.

i) occasional, subangular igneous rock fragments (possibly granite) *c*0.8 - 1.8mm in size and smaller, comprising alkali feldspar heavily altered to sericite, olivine, quartz, clinopyroxene, plagioclase feldspar and limonite.

ii) occasional, angular igneous rock fragments, possibly dolerite, (although many of the components are missing) *c*0.9 - 1.2mm in size, comprising plagioclase feldspar laths, olivine, clinopyroxene and alteration products such as limonite.

iii) rare, angular igneous rock fragments, *c*0.9mm in size with a granophyric texture (possibly a microgranite), with intergrowths of heavily altered alkali feldspar and quartz, biotite micand hornblende.

A9.1.3.2 Sample: No 5 (N64E34 K8 L3)

CLAY MATRIX

Microcrystalline clay matrix of monocrystalline quartz and mica.

MINERALS

QUARTZ - occasional to moderate , subrounded monocrystalline quartz, *c*0.2mm and smaller in size.

PLAGIOCLASE FELDSPAR - occasional, angular plagioclase feldspar *c*0.3 - 0.5mm in size.
ORTHOCLASE FELDSPAR - common, subangular orthoclase feldspar, ranging *c*0.3 - 3.0mm in size.
MICROCLINE - occasional, subangular, large microcline inclusions, *c*1.4mm in size.
MICA - rare large angular biotite mica inclusions ranging from 0.7 - 2.2mm, average size 0.2mm.
Smaller angular muscovite mica *c*0.1 - 0.5mm in size.
IRON ORE - rare, microcrystalline iron ore inclusions, *c*0.1mm and smaller in size.

ROCK FRAGMENTS
META-QUARTZITE - occasional, subrounded meta-quartzite inclusions *c*0.5mm in size.
GRANITE - moderate to frequent, angular granite fragments, ranging from 1.0 - 3.8mm in size.
The rock comprises alkali feldspar (heavily altered to sericite mica), microcline, quartz, plagioclase feldspar, biotite and muscovite mica.

A9.1.3.3 Sample: No 7 (N74E90 L8 L1)

CLAY MATRIX
Very fine grained microcrystalline matrix of abundant monocrystalline quartz and muscovite mica.

MINERALS
QUARTZ - occasional to common, subrounded to subangular monocrystalline quartz, average size *c*0.1mm extending from 0.1 - 0.4mm in size. Occasional subrounded polycrystalline quartz is also present, *c*0.3mm in size. Many of the polycrystalline quartz grains have sutured boundaries suggesting quartz from a metamorphic source.
PLAGIOCLASE FELDSPAR - sparse, angular plagioclase feldspar inclusions, average size *c*0.2 - 0.3mm, with one large subangular intergrowth of both plagioclase and alkali feldspar, *c*1.2mm in size.
MICA - occasional laths of muscovite and biotite mica, *c*0.1mm in size.
PYROXENE - occasional, subangular to subrounded pyroxene inclusions (augite), *c*0.3mm in size. Most probably detached from the basalt.

ROCK FRAGMENTS
MICACEOUS SANDSTONE - occasional large subangular sandstone inclusions, *c*0.8 - 1.0mm in size. There are two types, a coarse grained sandstone and a finer grained version, both types comprising subangular monocrystalline quartz, muscovite mica and an opaque black mineral.
BASALT - occasional, angular to subangular basalt fragments extending from *c*0.6 - 2.9mm in size. The rock comprises small laths of plagioclase feldspar (with occasional larger laths), olivine and augite most commonly altered to serpentine and limonite, accessory quartz and an opaque mineral.

A9.1.3.4 Sample: No 8 (N80E44 K8 L1)

CLAY MATRIX

Cryptocrystalline clay matrix with occasional monocrystalline quartz and mica inclusions.

MINERALS

QUARTZ - common, rounded to subangular monocrystalline quartz inclusions, ranging from *c*0.1 - 0.4mm and smaller in size. Occasional subrounded polycrystalline quartz grains, *c*0.7mm in size.

PLAGIOCLASE FELDSPAR - occasional angular plagioclase feldspar inclusions, *c*0.3mm.

MICA - occasional laths of muscovite and biotite mica, *c*0.1mm in length.

CHERT - rare, subrounded chert inclusions, *c*0.5mm.

IRON ORE - occasional angular black iron ore inclusions, *c*0.1mm and smaller in size.

ROCK FRAGMENTS

SANDSTONE - common, subangular sandstone inclusions extending up to 1.3mm, comprising muscovite and biotite mica, monocrystalline and polycrystalline quartz, plagioclase feldspar and alkali feldspar (heavily altered), set in a cryptocrystalline clay matrix.

META-QUARTZITE - rare, angular meta-quartzite inclusions, *c*0.2mm in size.

IGNEOUS ROCK- rare, subangular, heavily altered alkali feldspar, plagioclase feldspar and possibly olivine *c*1.5mm in size. The heavy alteration of the minerals makes it impossible to closely identify the rock type.

CLAY PELLETS - moderate to common, subangular to subrounded clay pellets ranging from *c*0.2 - 2.8mm

A9.1.3.5 Sample: No 9 (N85E67 H15 L2)

CLAY MATRIX

Microcrystalline matrix of abundant quartz and muscovite mica.

MINERALS

QUARTZ - Moderate, angular to subrounded monocrystalline quartz grains, *c*0.3 - 0.6mm in size.

Occasional, rounded to subrounded polycrystalline quartz grains, 0.4 - 0.6mm in size. Many of these grains have sutured boundaries suggesting quartz from a metamorphic source.

PLAGIOCLASE FELDSPAR - occasional, subrounded plagioclase feldspar, *c*0.6mm in size.

ORTHOCLASE FELDSPAR - occasional, subrounded to subangular orthoclase feldspar, often heavily altered.

MICA - occasional to common, small laths of muscovite and biotite mica, *c*0.1 - 0.2mm in length.

IRON ORE - occasional, subrounded red iron ore, *c*0.1 - 0.2mm and smaller in size.

ROCK FRAGMENTS

SANDSTONE - Occasional, angular badly sorted sandstone fragments, comprising monocrystalline and polycrystalline quartz, muscovite and biotite mica and an opaque mineral.

MICROGRANITE (with granophyric texture)- common, subangular inclusions, *c*1.2 - 2.2mm in size. The rock comprises alkali feldspar with simple twins, and plagioclase feldspar (the latter more heavily altered than the former), quartz and an opaque mineral (possibly black iron ore). The rock has a granophyric texture caused by the intergrowth of quartz and alkali feldspar crystallising simultaneously within the melt.

GRANITE - common, angular granite inclusions, *c*0.4 - 1.2mm in size. The granite comprises alkali feldspar displaying simple twins which has been heavily altered to sericite mica, laths of biotite mica, quartz, and plagioclase feldspar.

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A10. Statistical output from discriminant analysis of Ronaldsway sherds using AAS analysis

THE FOLLOWING DATA CONTAINS THE HARD COPY OUPUT RESULTING FROM THE STATISTICAL ANALYSIS OF CHEMICAL FINGERPRINTS FROM RONALDSWAY SHERDS. EACH SET OF OUTPUTS IS PREFACED WITH A BRIEF INTRODUCTION. FULL DETAILS OF THE ANALYSES CAN BE FOUND IN CHAPTER 8.

A10.1 Kolmogorov-Smirnov test on data from AAS analyses

NPAR TESTS /K-S (NORMAL) CA MG CU K AL.

CA
Test Distribution - Normal Mean: 3065.83
Standard Deviation: 1699.38
Cases: 46
Most Extreme Differences

Absolute	Positive	Negative	K-S Z	2-tailed P
.10525	.10525	-.08184	.729	.662

MG
Test Distribution - Normal Mean: 3994.71
Standard Deviation: 1663.04
Cases: 46
Most Extreme Differences

Absolute	Positive	Negative	K-S Z	2-tailed P
.07391	.07391	-.05839	.512	.956

CU
Test Distribution - Normal Mean: 65.72041
Standard Deviation: 26.37176
Cases: 46
Most Extreme Differences

Absolute	Positive	Negative	K-S Z	2-tailed P
.11671	.11671	-.08410	.809	.530

K
Test Distribution - Normal Mean: 1967.79
Standard Deviation: 687.40
Cases: 46
Most Extreme Differences

Absolute	Positive	Negative	K-S Z	2-tailed P
.09302	.07864	-.09302	.644	.800

AL
Test Distribution - Normal Mean: 199.0633
Standard Deviation: 42.4953

Cases: 46
Most Extreme Differences

Absolute	Positive	Negative	K-S Z	2-tailed P
.07742	.07742	-.06364	.536	.936

A10.2 Data listing from analysis of data from elements Ca, Cu and Mg

DSCRIMINANT /GROUPS GROUPS (1,4) /VARIABLES CA MG CU /METHOD WILKS /STATISTICS

Since ANALYSIS= was omitted for the first analysis all variables on the VARIABLES= list will be entered at level 1.

-------- D I S C R I M I N A N T   A N A L Y S I S --------

On groups defined by GROUPS

46 (unweighted) cases were processed.
46 (unweighted) cases will be used in the analysis.

Number of Cases

GROUPS	Unweighted	Weighted	Label
1	19	19.0	
2	13	13.0	
3	6	6.0	
4	8	8.0	
Total	46	46.0	

On groups defined by GROUPS

Analysis number 1

Stepwise variable selection

Selection rule: Minimize Wilks' Lambda
Maximum number of steps.................. 6
Minimum Tolerance Level.................. .00100

Minimum F to enter....................... 1.0000
Maximum F to remove...................... 1.0000

Canonical Discriminant Functions

Maximum number of functions............. 3
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .25000

--------------- Variables not in the analysis after step 0 ---------------

Variable	Minimum Tolerance	Tolerance	F to enter	Wilks' Lambda
CA	1.0000000	1.0000000	6.1891	.69344
MG	1.0000000	1.0000000	1.1674	.92303
CU	1.0000000	1.0000000	9.2176	.60299

At step 1, CU was included in the analysis.

	Degrees of Freedom	Signif.	Between Groups	
Wilks' Lambda	.60299	1	3	42.0
Equivalent F	9.21757	3	42.0	.0001

--------------- Variables in the analysis after step 1 ---------------

Variable	Tolerance	F to remove	Wilks' Lambda
CU	1.0000000	9.2176	

--------------- Variables not in the analysis after step 1 ---------------

Variable	Minimum Tolerance	Tolerance	F to enter	Wilks' Lambda
CA	.8691337	.8691337	7.7833	.38419
MG	.9062435	.9062435	1.3868	.54744

At step 2, CA was included in the analysis.

	Degrees of Freedom	Signif.	Between Groups		
Wilks' Lambda	.38419	2	3		42.0
Equivalent F	8.38235	6		82.0	.0000

--------------- Variables in the analysis after step 2 ---------------

Variable	Tolerance	F to remove	Wilks' Lambda
CA	.8691337	7.7833	.60299
CU	.8691337	11.001	.69344

--------------- Variables not in the analysis after step 2 ---------------

Variable	Minimum Tolerance	Tolerance	F to enter	Wilks' Lambda
MG	.4070187	.3903517	1.9688	.33476

At step 3, MG was included in the analysis.

	Degrees of Freedom	Signif.	Between Groups	
Wilks' Lambda	.33476	3	3	42.0
Approximate F	6.15085	9	97.5	.0000

--------------- Variables in the analysis after step 3 ---------------

Variable	Tolerance	F to remove	Wilks' Lambda
CA	.3903517	8.4710	.54744
MG	.4070187	1.9688	.38419
CU	.8672341	10.128	.58904

F level or tolerance or VIN insufficient for further computation.

Summary Table

Step	Action Entered	Removed	Vars In	Wilks' Lambda	Sig.	Label
1	CU		1	.60299	.0001	
2	CA		2	.38419	.0000	
3	MG		3	.33476	.0000	

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr		After Fcn	Wilks' Lambda	Chisquare	DF	Sig
					:	0	.3348	45.415	9	.0000
1*	.9953	67.27	67.27	.7063	:	1	.6679	16.748	4	.0022
2*	.4559	30.82	98.09	.5596	:	2	.9725	1.159	1	.2817
3*	.0283	1.91	100.00	.1659	:					

* marks the 3 canonical discriminant functions remaining in the analysis.

Standardized Canonical Discriminant Function Coefficients

	FUNC 1	FUNC 2	FUNC 3
CA	-1.16855	.99222	-.46021
MG	.54673	-.61373	1.33466
CU	.87498	.60695	-.13828

Structure Matrix:
Pooled-within-groups correlations between discriminating variables and canonical discriminant functions (Variables ordered by size of correlation within function)

	FUNC 1	FUNC 2	FUNC 3
CU	.61966	.77797*	.10390
CA	-.43133	.73954*	.51676
MG	-.08452	.33561	.93820*

Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

Group	FUNC 1	FUNC 2	FUNC 3
1	-.91521	.43213	.03621
2	1.39267	.29046	.07217
3	-.29730	-1.49174	.17787
4	.13353	-.37949	-.33669

Classification Results -

Actual Group	No. of Cases	Predicted Group Membership 1	2	3	4
Group 1	19	14 73.7%	2 10.5%	0 0%	3 15.8%
Group 2	13	0 0%	9 69.2%	3 23.1%	1 7.7%
Group 3	6	1 16.7%	0 0%	5 83.3%	0 0%
Group 4	8	1 12.5%	1 12.5%	2 25.0%	4 50.0%

Percent of "grouped" cases correctly classified: 69.57%

Classification Processing Summary

46 Cases were processed.
0 Cases were excluded for missing or out-of-range group codes.
0 Cases had at least one missing discriminating variable.
46 Cases were used for printed output.

A10.3 Data listing from analysis of data from elements Ca, Cu, Mg and Al

DSCRIMINANT /GROUPS GROUPS (1,4) /VARIABLES CA MG CU AL/ METHOD WILKS / STATISTICS 13.

Since ANALYSIS= was omitted for the first analysis all variables on the VARIABLES= list will be entered at level 1.

-------- DISCRIMINANT ANALYSIS --------

On groups defined by GROUPS

46 (unweighted) cases were processed.
46 (unweighted) cases will be used in the analysis.

Number of Cases by Group

	Number of Cases		
GROUPS	Unweighted	Weighted	Label
1	19	19.0	
2	13	13.0	
3	6	6.0	
4	8	8.0	
Total	46	46.0	

-------- DISCRIMINANT ANALYSIS --------

On groups defined by GROUPS

Analysis number 1

Stepwise variable selection

Selection rule: Minimize Wilks' Lambda
Maximum number of steps.................. 8
Minimum Tolerance Level.................. .00100
Minimum F to enter........................ 1.0000
Maximum F to remove...................... 1.0000

Canonical Discriminant Functions

Maximum number of functions.............. 3
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .25000

---------------- Variables not in the analysis after step 0 ----------------

Variable	Tolerance	Minimum Tolerance	F to enter	Wilks' Lambda
CA	1.0000000	1.0000000	6.1891	.69344
MG	1.0000000	1.0000000	1.1674	.92303
CU	1.0000000	1.0000000	9.2176	.60299
AL	1.0000000	1.0000000	9.0379	.60769

At step 1, CU was included in the analysis.

		Degrees of Freedom			Signif.	Between Groups
Wilks' Lambda	.60299	1	3	42.0		
Equivalent F	9.21757		3	42.0	.0001	

---------------- Variables in the analysis after step 1 ----------------

Variable	Tolerance	F to remove	Wilks' Lambda
CU	1.0000000	9.2176	

---------------- Variables not in the analysis after step 1 ----------------

Variable	Tolerance	Minimum Tolerance	F to enter	Wilks' Lambda
CA	.8691337	.8691337	7.7833	.38419
MG	.9062435	.9062435	1.3868	.54744
AL	.9757515	.9757515	7.6317	.38693

At step 2, CA was included in the analysis.

		Degrees of Freedom			Signif.	Between Groups
Wilks' Lambda	.38419	2	3	42.0		
Equivalent F	8.38235		6	82.0	.0000	

--------------- Variables in the analysis after step 2 ---------------

Variable	Tolerance	F to remove	Wilks' Lambda
CA	.8691337	7.7833	.60299
CU	.8691337	11.001	.69344

--------------- Variables not in the analysis after step 2 ---------------

Variable	Tolerance	Minimum Tolerance	F to enter	Wilks' Lambda
MG	.4070187	.3903517	1.9688	.33476
AL	.9622159	.8570770	7.4472	.24651

At step 3, AL was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.24651	3	3	42.0	
Approximate F	8.42656		9	97.5	.0000

--------------- Variables in the analysis after step 3 ---------------

Variable	Tolerance	F to remove	Wilks' Lambda
CA	.8570770	7.5951	.38693
CU	.8596399	9.5323	.42274
AL	.9622159	7.4472	.38419

--------------- Variables not in the analysis after step 3 ---------------

Variable	Tolerance	Minimum Tolerance	F to enter	Wilks' Lambda
MG	.4063029	.3894394	1.7125	.21781

At step 4, MG was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.21781	4	3	42.0	
Approximate F	6.71744		12	103.5	.0000

--------------- Variables in the analysis after step 4 ---------------

Variable	Tolerance	F to remove	Wilks' Lambda
CA	.3894394	8.3068	.35699
MG	.4063029	1.7125	.24651
CU	.8581118	8.9474	.36773
AL	.9605235	6.9798	.33476

F level or tolerance or VIN insufficient for further computation.

Summary Table

Step	Action Entered	Action Removed	Vars In	Wilks' Lambda	Sig.	Label
1	CU		1	.60299	.0001	
2	CA		2	.38419	.0000	
3	AL		3	.24651	.0000	

Step	Action Entered	Action Removed	Vars In	Wilks' Lambda	Sig.	Label
4	MG		4	.21781	.0000	

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr		After Fcn	Wilks' Lambda	Chisquare	DF	Sig
					:	0	.2178	62.489	12	.0000
1*	1.0832	52.57	52.57	.7211	:	1	.4537	32.399	6	.0000
2*	.5977	29.01	81.58	.6116	:	2	.7249	13.189	2	.0014
3*	.3795	18.42	100.00	.5245	:					

* marks the 3 canonical discriminant functions remaining in the analysis.

Standardized Canonical Discriminant Function Coefficients

	FUNC 1	FUNC 2	FUNC 3
CA	-1.04689	.87737	.72167
MG	.48896	-.40197	-.60811
CU	.79409	-.06369	.72776
AL	.40447	.72637	-.54353

Structure Matrix:
Pooled-within-groups correlations between discriminating variables
and canonical discriminant functions
(Variables ordered by size of correlation within function)

	FUNC 1	FUNC 2	FUNC 3
AL	.43194	.79828*	-.40622
CA	-.31673	.66473*	.42745
MG	-.01030	.36705*	.08518
CU	.62807	.24373	.71799*

Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

Group	FUNC 1	FUNC 2	FUNC 3
1	-.77264	.64406	.14083
2	1.56058	.14715	.11200
3	-.24811	-.50964	-1.45714
4	-.51485	-1.38654	.57638

Classification Results -

Actual Group	No. of Cases	Predicted Group Membership 1	2	3	4
Group 1	19	16	1	0	2
		84.2%	5.3%	.0%	10.5%
Group 2	13	0	9	3	1
		.0%	69.2%	23.1%	7.7%
Group 3	6	1	0	5	0
		16.7%	.0%	83.3%	.0%
Group 4	8	1	1	0	6
		12.5%	12.5%	.0%	75.0%

Percent of "grouped" cases correctly classified: 78.26%

Classification Processing Summary

46 Cases were processed.

0 Cases were excluded for missing or out-of-range group codes.

0 Cases had at least one missing discriminating variable.

46 Cases were used for printed output.

A10.4 Data listing from analysis of data from elements Ca, Cu, Mg, Al, K

DSCRIMINANT /GROUPS GROUPS (1,4) /VARIABLES CA MG CU AL K
/ METHOD WILKS /STATISTICS 13.

-------- DISCRIMINANT ANALYSIS --------

On groups defined by GROUPS

46 (Unweighted) cases were processed.
46 (Unweighted) cases will be used in the analysis.

Number of cases by group

	Number of cases		
GROUPS	Unweighted	Weighted	Label
1	19	19.0	
2	13	13.0	
3	6	6.0	
4	8	8.0	
Total	46	46.0	

On groups defined by GROUPS

Analysis number 1

Stepwise variable selection
Selection rule: minimize Wilks' Lambda
Maximum number of steps.................. 10
Minimum tolerance level.................. .00100
Minimum F to enter....................... 1.00000
Maximum F to remove...................... .99990

Canonical Discriminant Functions

Maximum number of functions............. 3
Minimum cumulative percent of variance... 100.00
Maximum significance of Wilks' Lambda.... 1.0000

Prior probability for each group is .25000

---------------- Variables not in the Analysis after Step 0 ----------------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
AL	1.0000000	1.0000000	9.0378917	.6076945
CA	1.0000000	1.0000000	6.1890618	.6934448
CU	1.0000000	1.0000000	9.2175695	.6029916
K	1.0000000	1.0000000	5.0195517	.7360846
MG	1.0000000	1.0000000	1.1674218	.9230310

At step 1, CU was included in the analysis.

		Degrees of Freedom			Signif.	Between Groups
Wilks' Lambda	.60299	1	3	42.0		
Equivalent F	9.21757		3	42.0	.0001	

---------------- Variables in the Analysis after Step 1 ----------------

Variable	Tolerance	F to Remove	Wilks' Lambda
CU	1.0000000	9.2176	

---------------- Variables not in the Analysis after Step 1 ----------------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
AL	.9757515	.9757515	7.6317242	.3869253
CA	.8691337	.8691337	7.7833246	.3841906
K	.9993056	.9993056	4.9116273	.4435760
MG	.9062435	.9062435	1.3867607	.5474425

At step 2, CA was included in the analysis.

		Degrees of Freedom			Signif.	Between Groups
Wilks' Lambda	.38419	2	3	42.0		
Equivalent F	8.38235		6	82.0	.0000	

---------------- Variables in the Analysis after Step 2 ----------------

Variable	Tolerance	F to Remove	Wilks' Lambda
CA	.8691337	7.7833	.6029916
CU	.8691337	11.0010	.6934448

--------------- Variables not in the Analysis after Step 2 ---------------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
AL	.9622159	.8570770	7.4471766	.2465070
K	.9450267	.8219253	4.3824745	.2891509
MG	.4070187	.3903517	1.9687775	.3347605

At step 3, AL was included in the analysis.

		Degrees of Freedom			Signif.	Between Groups
Wilks' Lambda	.24651	3	3	42.0		
Approximate F	8.42656		9	97.5	.0000	

--------------- Variables in the Analysis after Step 3 ---------------

Variable	Tolerance	F to Remove	Wilks' Lambda
AL	.9622159	7.4472	.3841906
CA	.8570770	7.5951	.3869253
CU	.8596399	9.5323	.4227400

--------------- Variables not in the Analysis after Step 3 ---------------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
K	.7282640	.7282640	.7527603	.2330144
MG	.4063029	.3894394	1.7124964	.2178142

At step 4, MG was included in the analysis.

		Degrees of Freedom		Signif.	Between Groups
Wilks' Lambda	.21781	4	3	42.0	
Approximate F	6.71744		12	103.5	.0000

--------------- Variables in the Analysis after Step 4 ---------------

Variable	Tolerance	F to Remove	Wilks' Lambda
AL	.9605235	6.9798	.3347605
CA	.3894394	8.3068	.3569938
CU	.8581118	8.9474	.3677272
MG	.4063029	1.7125	.2465070

--------------- Variables not in the Analysis after Step 4 ---------------

Variable	Tolerance	Minimum Tolerance	F to Enter	Wilks' Lambda
K	.6893385	.3535022	.9778522	.2022043

F level or tolerance or VIN insufficient for further computation.

Summary Table

Step	Action Entered	Removed	Vars in	Wilks' Lambda	Sig.	Label
1	CU		1	.60299	.0001	
2	CA		2	.38419	.0000	
3	AL		3	.24651	.0000	
4	MG		4	.21781	.0000	

Canonical Discriminant Functions

Fcn	Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Fcn	Wilks' Lambda	Chi-square	df	Sig

				:	0 .217814	62.489	12	.0000
1*	1.0832	52.57	52.57	.7211 :	1 .453742	32.399	6	.0000
2*	.5977	29.01	81.58	.6116 :	2 .724923	13.189	2	.0014
3*	.3795	18.42	100.00	.5245 :				

* Marks the 3 canonical discriminant functions remaining in the analysis.

Standardized canonical discriminant function coefficients

	Func 1	Func 2	Func 3
AL	.40447	.72637	-.54353
CA	-1.04689	.87737	.72167
CU	.79409	-.06369	.72776
MG	.48896	-.40197	-.60811

Structure matrix:

Pooled within-groups correlations between discriminating variables
and canonical discriminant functions
(Variables ordered by size of correlation within function)

	Func 1	Func 2	Func 3
AL	.43194	.79828*	-.40622
CA	-.31673	.66473*	.42745
K	.00994	.52778*	-.11850
MG	-.01030	.36705*	.08518
CU	.62807	.24373	.71799*

* denotes largest absolute correlation between each variable and any discriminant function.

Canonical discriminant functions evaluated at group means (group centroids)

Group	Func 1	Func 2	Func 3
1	-.77264	.64406	.14083
2	1.56058	.14715	.11200

3	-.24811	-.50964	-1.45714
4	-.51485	-1.38654	.57638

Case Number	Mis Val	Sel	Actual Group	Highest Probability Group	P(D/G)	P(G/D)	2nd Highest Group	P(G/D)	Discrim Scores
1			1	1	.1201	.9506	4	.0455	-1.8761
									1.3575
									2.1670
2			1	1	.7584	.7952	4	.1669	-1.5783
									.3773
									.8170
3			1	1	.7033	.4419	4	.4059	-1.2504
									-.4415
									.1951
4			1	1	.8962	.6289	3	.2254	-1.1918
									.1938
									-.3310
5			1	1	.5623	.9210	2	.0441	-.5561
									2.0564
									-.0556
6			1 **	4	.8234	.5350	3	.3074	-.7562
									-1.2049
									-.3277
7			1	1	.9247	.6876	4	.2179	-1.1230
									.1605
									.4827
8			1	1	.1535	.9423	4	.0444	-3.0051
									.8874
									.6093
9			1	1	.0069	.9627	2	.0194	-.5387
									3.9392
									-.9683
10			1 **	4	.8267	.4501	1	.2728	-.1347
									-.5662
									.2984
11			1 **	2	.2839	.7333	3	.2382	1.8665
									.7168
									-1.7269
12			1	1	.8669	.8010	2	.1202	-.2478
									1.1748
									.5526
13			1	1	.5700	.3363	2	.3277	.2922
									-.0657

14	1	1	.6100	.4817	3	.2858	-1.5725	.7521 -.2838
15	1	1	.8216	.5680	2	.2046	-.0410	-.4265 .3751
16	1	1	.9922	.7871	3	.1003	-.6160	.6961 .8794
17	1	1	.7926	.4912	4	.2923	-.2001	.0099 .0135
18	1	1	.4269	.5776	3	.3990	-1.0876	.6981 1.1674
19	2	2	.9245	.7060	3	.1318	1.1104	-1.4105 .3726
20	2	2	.5896	.9918	1	.0045	2.7873	-.3581 .7765
21	2	2	.0946	.5273	1	.4456	.7416	.2418 1.5794
22	2	2	.0136	.9999	1	.0001	4.6638	2.0242 .6047
23	2	2	.4840	.4969	3	.3649	1.0229	1.0304 .6800
24	2 **	4	.5763	.5344	2	.3018	.8457	-1.2589 -1.4653
25	2 **	3	.6843	.5035	2	.2392	.4125	.2245 .4661
26	2	2	.0198	.7777	4	.2165	2.1981	-1.1369 -1.3026
27	2 **	3	.7076	.5132	2	.2755	.7230	2.8227 -.8351
28	2	2	.9621	.9173	4	.0337	1.7377	-.8723 -.0362

					.5852		
29	2 **	3	.6730	.6432	2 .2641	.8509
					.0569	
					-1.5640	
30	2	2	.9776	.8392	3 .0851	1.5392
					.0166	
					-.3150	
31	2	2	.8634	.9066	1 .0645	1.6544
					.9994	
					.0325	
32	1	1	.8082	.9416	4 .0204	-1.0632
					1.5003	
					.5329	
33	3	3	.7340	.4148	4 .4107	-.5349
					-1.0740	
					-.5198	
34	3	3	.6882	.9555	1 .0197	.1847
					-.3253	
					-2.5766	
35	3	3	.7289	.8841	2 .0621	.4245
					.0445	
					-2.1929	
36	3 **	1	.6721	.5044	3 .4247	-1.2222
					.3307	
					-.9745	
37	3	3	.9096	.6157	4 .2314	-.1717
					-1.0065	
					-.9192	
38	3	3	.9629	.8390	4 .0872	-.1690
					-1.0273	
					-1.5599	
39	4	4	.9174	.8287	3 .1167	-.5177
					-1.9081	
					.0918	
40	4 **	1	.2161	.8602	4 .1318	-1.6936
					.7789	
					2.0359	
41	4	4	.9812	.8824	1 .0705	-.8283
					-1.5420	
					.8105	
42	4	4	.7381	.6354	3 .2944	-.7976
					-1.7320	
					-.4547	
43	4	4	.9763	.8550	3 .0773	-.7346
					-1.7233	

				.3607	
44	4	4 .7024 .9593		3 .0204	-.1436
				-2.4894	
				.8195	
45	4 **	2 .6004 .8389		4 .1213	1.6193
				-.5593	
				1.2802	
46	4	4 .7135 .7344		3 .2126	-1.0226
				-1.9171	
				-.3328	

Classification results -

Actual Group	No. of Cases	Predicted Group Membership 1	2	3	4
Group 1	19	16	1	0	2
		84.2%	5.3%	.0%	10.5%
Group 2	13	0	9	3	1
		.0%	69.2%	23.1%	7.7%
Group 3	6	1	0	5	0
		16.7%	.0%	83.3%	.0%
Group 4	8	1	1	0	6
		12.5%	12.5%	.0%	75.0%

Percent of "grouped" cases correctly classified: 78.26%

Classification processing summary

46 (Unweighted) cases were processed.
0 cases were excluded for missing or out-of-range group codes.
0 cases had at least one missing discriminating variable.
46 (Unweighted) cases were used for printed output.

A10.5 Kolmogorov-Smirnov test on data derived from a Monte-Carlo roll

Test distribution - Normal Mean: 39.0668
Standard Deviation: 7.5626

Cases: 500

Most extreme differences

Absolute	Positive	Negative	K-S Z	2-Tailed P
.07606	.07606	-.05113	1.7008	.0061

Z score = 14.252 (standard deviations from the mean of a normal (random) distribution.

Corresponding with a <0.003% chance of the result of the discriminant analysis appearing randomly (ie, from a single population, or homogeneous dataset).

A11. Review of the methodologies available for the study of vessel function in prehistoric pottery

THIS APPENDIX PRESENTS A REVIEW OF THE POSSIBLE TECHNIQUES FOR THE EXAMINATION OF VESSEL FUNCTION, AS WELL AS A CONSIDERATION OF HOW WELL SUITED IS THE PREHISTORIC POTTERY OF THE IRISH SEA PROVINCE TO THE APPLICATION OF THESE TECHNIQUES.

A11.1 Introduction

The lack of attention traditionally given to vessel function has been noted in Chapter 2, where the major avenues explored during this thesis have been outlined. To recap, these were:

- Vessel sizes
- Vessel shapes
- Vessel surfaces
- Type of site and context of deposition

A further area which can be noted as being relevant to function is vessel fabric. Much has been made in the past of the relationship between vessel fabric and function, particularly with reference to thermal expansion (*cf.* Cleary 1983; Rye 1976). It is not pursued here since it seems uncertain that prehistoric potters were aware of the thermal properties of the materials they used (see Woods 1986), neither do we have a clear idea of the implications of those properties within the context of a prehistoric pot.

The various methodologies available for the study of the four areas presented above are considered in turn in the following sections, along with a rationale for the selection of the particular methodology used in this thesis. Each section ends with a quantification of the number of vessels available for analysis using the chosen methodology.

A11.2 Analysis of vessel size

The techniques employed in calculating vessel size can be divided into two main groups:

- those which deal with the size of the vessel either by the use of subjective categories, or as a factor of a key dimension, eg, rim or height
- those which deal with the volume of the vessel

A11.2.1 Approaches to vessel size

In its most basic form vessel size can be appraised by a visual inspection of the vessel which is then placed in a category such as large or small on the basis of an intuitive decision. This approach has been employed recently by MacSween (1995), although its value can be debated on the following counts:

- The attributing of vessels to loosely defined categories is unlikely to lead to a consistent approach to vessels whose size places them in the grey area between categories.
- When studying large assemblages over a protracted period of time the boundaries used by a researcher to distinguish between ill-defined categories of vessel size are likely to vary.
- Different researchers are likely to employ differing size criteria making inter-assemblage comparison difficult.

- When vessels of a number of different forms occur in an assemblage it will be difficult to deal consistently with all shapes, eg, is a tall but thin vessel the same size as a short but fat vessel?

Although some of these difficulties may be obviated if the assemblage is small and of fairly uniform type, an arbitrary decision as to vessel size is likely to cause difficulties in the majority of instances.

The recording of particular vessel dimensions as a measure of vessel size is a more systematic approach. The most common dimension to be chosen is rim diameter since this is easily reconstructed from sherd material (Barrett 1980), whilst height has been used in conjunction with rim diameter in the work of Smith (1965, 49), Howard (1981), Parker-Pearson (1990) and Woodward (1995). As with the previous approach this method can be criticised on a number of counts.

- The rim diameter of hand-made pots may vary significantly around the circumference (Rice 1987, 223; Cowie *in press*)
- Due to difficulties involved in calculating rim diameter from sherds, work by different researchers is likely to produce differing results (Rice 1987, 223).
- Calculations of vessel size based solely on rim diameter assume a close correlation between these two attributes. In the case of some Bronze Age wares this may be a fair assumption since a simple shape is common (see Parker-Pearson 1990). However, where the shape is globular (eg, Sandhills) or cylindrical (eg, Ronaldsway jars) rim diameter is unlikely to be a true indication of vessel size.

As can be seen the calculation of vessel size from rim diameters creates fewer complications than the use of an arbitrary class, but it is not entirely flawless. For the purposes of the present thesis the use of rim diameter as an indication of vessel size is not the most suitable method on account of the wide variety of vessel shapes incorporated within this study.

A11.2.2 Approaches to vessel volume

The calculation of vessel volume offers a more direct route to an appreciation of vessel size since it can be found regardless of vessel shape. The approach has not been widely used in the past, although it appears to have gained in popularity with Neolithic researchers in recent years (Thomas 1991; Case 1995).

A pragmatic criticism of using volume as a measure of vessel size is that it limits the dataset to those vessels which can be reconstructed to a reasonable degree and, where calculations are based on published illustrations, it also relies on the accurate depiction of vessels in their true state of completeness. For those vessels which can be reconstructed the calculation of volume does represent the most objective measure of vessel size.

There are a number of methods by which volume can be calculated, and these may be seen as having varying degrees of accuracy. The various approaches have been reviewed by Rice (1987), and Senior and Birnie III (1995). The present discussion draws heavily on these works.

- **Fluid volume method.** The vessel is filled with water which is then poured into a measuring jug to allow quantification (Senior and Bernie III 1995). This technique cannot be seen as suitable for the highly fragile and fragmentary assemblages with which prehistorians deal.

- **Dry volume method.** This is essentially the same as the fluid method with sand being added instead of water (Senior and Beirne III 1995). Although this approach might be seen as less damaging to prehistoric vessels, it still relies on whole vessels, with the additional problem that the dry grains must be allowed to settle.

- **Density methods.** The vessel is filled with a dry solid, eg, sand, and the pot is then weighed. The sand is then removed and the pot is weighed separately. The volume can then be calculated from the weight of sand (Senior and Bernie III 1995). This technique suffers from the same problems as the dry volume method described above.

- **Calculation based on a geometric solid.** The volume can be calculated by superimposing a geometric solid of the most suitable shape, eg, cylinder, cone or sphere, over the vessel illustration and using this as a broad indication of volume (Rice 1987, 219; Senior and Bernie III 1995). This technique is clearly of little value where the shape is non-geometric, and will probably result in a high degree of error which will not be standard between different vessels. Nonetheless, it has been employed in Neolithic studies by Case (1995) in his analysis of Beaker volumes. A development of the previous method is to calculate volume by subdividing each vessel into its geometric component parts, and calculating these separately (Rice 1987, 220). This technique is likely to be more accurate than that described previously, however, once again the error in each calculation is not likely to be standard between vessels.

- **Calculation of volumes from summed cylinders.** This technique requires the breaking down of a vessel illustration into a number of cylinders of varying diameters. These are then calculated separately and then summed (Rice 1987, 220). The degree of error in this technique is likely to be relative to the number of cylinders into which the illustration is subdivided, such that a few cylinders are less likely to reflect the shape than many. A further disadvantage cited by Rice (1987, 222) is the time it takes to calculate volumes using this method. This has been obviated in part by a computerised version of this technique developed by

Senior and Birnie III (1995) which allows the user to calculate volumes based on a digitised profile of the vessel. This approach also bevels the sides of the cylinders to produce a more accurate measure of the vessel volume.

From the discussion above it is clear that the only methods appropriate to the study of fragile prehistoric pottery are the geometric solid and the summed cylinders methods. For the present analysis it was decided to adopt the summed cylinder approach since this appeared to limit the degree of error to the greatest extent.

A11.2.3 Details of the methodology adopted

As a first step in the analysis it was necessary to collect a dataset consisting of all ceramic illustrations where a whole, or near complete, vessel was depicted. These illustrations were then separated into two groups:

1. Those which depicted the vessel schematically as if complete.
2. Those which depicted individual sherds or breakage lines within the illustration.

The former schematic group were treated with caution. The vessel was excluded from the analysis if a first hand examination of the sherds failed to confirm that the vessel was sufficiently complate to justify the illustration. As a result, of this first hand selection process, all the vessels from Goodland depicted as large globular jars were excluded since there was insufficient sherd material to warrant depiction as whole vessels (Case 1973). In addition, several vessels from Mull Hill (Piggott 1932) were excluded on similar grounds.

All those illustrations belonging to the second group were then examined to ensure that only vessels with a full, or nearly complete, profile were included in the analysis, whereas those profiles composed of non-joining sherds were excluded. All illustrations which successfully passed through this selection process were then reproduced to the same scale.

Senior and Birnie III (1995) note that volume can be calculated on the basis of either of two criteria:

1. Effective capacity: meaning the quantity which the vessel could hold when filled to its normal fill point (see Hally 1986).
2. Total capacity: meaning the total quantity which a vessel could hold if filled to the brim.

Effective capacity is a very difficult measure to apply in prehistory since it relies on a knowledge of the cultural role of the vessel: total capacity obviates this problem. Nonetheless, it was felt that neither of these approaches made any allowance for the quality of the original illustration. From personal experience in ceramic illustration. it was felt that the area where inaccuracy was likely to be most of a problem was in the drawing of inner wall profiles, since this can only be done with some difficulty. It was therefore decided to calculate volumes from the exterior wall, and not the interior. Although this does not result in a measure of vessel capacity, it does result in a measure of vessel volume: meaning the space occupied by the vessel.

Volume was calculated by overlaying 1cm cylinders over the illustrations and calculating the volume of each vessel using the formula

$$\sum = \left(\Pi r^2 h\right)_n$$

If incomplete, ie, <1cm, the final cylinder was excluded from the calculation of volume. All resulting calculations were converted into litres (l). It is accepted that there are a number of stages at which errors could enter into the calculation process, eg, initial illustration, re-scaling of drawing, or calculation. The calculations were therefore made three times for each vessel and an average result was employed.

A11.2.4 The size of the available dataset

Table A11.1 indicates the number of vessels of each type which were included in the analysis after passing through this selection criteria.

At first glance it can be seen that Peterborough and Grooved ware (other than Manx Grooved ware) are each only represented within the study area by a single reconstructable vessel. This is clearly not a representative sample and so these classes of vessel are excluded from the following analysis.

On the other hand, the remaining vessel types are represented by between 10 and 44 vessels each. Each of these classes were therefore analysed in this thesis without any undue reservation. In addition, it should be noted that at least one vessel type is included from each of the four phases used in this study. This has allowed some comment as to changing vessel size through time.

A11.2.5 Classifying vessel size

Having calculated vessel size a framework needs to be established with which to interpret these sizes. It was decided to class vessel volume using the maximum number of servings which one could reasonably expect to fit into the pot. The classification illustrated in Table A11.2 was therefore used.

These classes are only presented as a guideline and are not used dogmatically in this study. It should also be remembered that they relate to the total vessel volume, and are therefore an overestimation of capacity.

A11.3 Analysis of vessel shape

Vessel shape has been used as a classificatory tool since the beginning of prehistoric ceramic analysis in Great Britain. One vessel type in particular can be highlighted in this respect, the Beaker, or drinking cup as it was initially known (Colt Hoare 1812, 25). In addition, terms such as bowl and jar have also had a common currency in describing vessels. All of these terms rely heavily on a mental picture of what these shapes should look like. In order that these terms should be subject to a repeatable criteria the classification adopted in Mesoamerican archaeology is reproduced from Rice (1987, fig 7.4) as Table A11.3.

A similar approach has been adopted in British Neolithic studies. For example, Smith (1965, 49) adopted the shape classification used in Table A11.4.

Such a simple morphological scheme does not, however, cater for the more subtle variations in shape within each class. It will be noted that in Smith's scheme, the variability of shape within the bowl class has led to its subdivision into normal and carinated (Smith 1965).

This is just one of a number of methods which have been proposed to categorise the extra variation of shape within each broad classification. These have been summarised by Rice (1987, 212-222). For example, the details of a vessel's shape can be described with reference to its similarity to one of a number of geometric shapes, eg, sphere, ellipsoid, cylinder etc. More complex schemes build on the change in angle of an overall vessel form as a means of description. For example, a vessel with a maximum width at the rim is described as unrestricted, whilst a vessel whose form is more globular, with a maximum diameter below the rim is described as restricted. This scheme has been elaborated upon by Cleal (1993, fig 21.2) who subdivided earlier Neolithic vessels in Southern England into 15 forms based on the openness of the vessel and the form of the restriction. This was seen by Cleal as being an approach relevant to the functional role of a vessel since the openness of a vessel affects the ease with which its contents can be accessed.

Cleal's study dealt with five sites containing pottery of broadly the same form. This situation is very different from that pertaining to the current study which covers a large number of ceramic types which encompass a wide variety of shapes. As a result a less complex approach was adopted rather than suffer a proliferation of shape categories which overwhelmed the relatively small datasets.

A11.3.1 Details of the methodology adopted

The system which captured the greatest degree of variability within the present dataset is illustrated in Figure A11.1. Vessels are initially described as being of cup, bowl or jar form since this is likely to reflect in broad terms the ease of access to contents in the vessel's base. These classes are based on the ratios of height to rim diameter used by Smith (1965), see Table A11.4, with the exception of cups which are essentially treated as being vessels of pinchpot size. Bowls and jars are then further subdivided into open, neutral and closed forms since the openness of the vessel's aperture affects the ease with which contents can be sealed in or extracted. So for example, most Carinated vessels would be described as open bowls, whilst a large Ronaldsway vessel would be described as a neutral jar.

A11.3.2 The size of the available dataset

Using this methodology the dataset from the Irish Sea province can be subdivided as shown in Table A11.5.

The evidence clearly illustrates the clustering of ceramic types around the bowl form until the Late Neolithic. It should be noted that it is also in the Late Neolithic that the flat base, characteristic of Grooved ware and Beaker ceramics, is introduced. The possibility that these two ceramic attributes of flat bases and increased vessel diameter to height ratios, are connected cannot be ignored, although it would require considerable experimentation to establish the precise nature of this link.

A11.3.3 Surface characteristics

Throughout its useful life a vessel is likely to undergo a degree of abrasion, or concretion. The details of this use-wear will vary according to the function of the vessel. For example, if the vessel is used as a pestle, then the interior base will exhibit differential wear from the outside, or if it is placed over a fire, then sooting will build up on the exterior. The relevance of these two factors to the current study are discussed below.

A11.3.3.1 Surface wear

Evidence for surface wear is often extremely difficult to recognise from Neolithic sherds due to the problems of differentiating abrasion from use and abrasion from post-depositional factors. For example, abrasion can occur if the sherd is deposited in a mobile soil matrix, eg, sand, or colluvial deposits. As well as creating the impression of use wear, this can also lead to the eradication of existing use-wear evidence. An equally important factor in removing surface traces from sherds is cleaning during archaeological retrieval. Neolithic sherds are frequently extremely friable and without considerable care in drying they are easily damaged.

As a result of these complications, evidence from surface wear on sherds is rarely considered within this thesis. On the other hand, where a whole vessel is present, rather than sherds, the evidence for use-wear can be treated with more confidence since if significant post-depositional damage had occured it is likely that the vessel would have been broken.

A11.3.3.2 *Surface sooting*

The evidence derived from sooting[1] or surface residues is similarly difficult to interpret. Once again any such evidence could be derived from post-depositional process, such as burning of rubbish debris rather than use. One possible way of distinguishing between sooting during use and sooting after deposition is through analysis of the sherd section along old breaks. If sooting occured after the sherd had broken then it will overlap from the surfaces into the section. If sooting occured during the vessel's use it is more likely to be limited to the sherd surface.

Although detailed analysis of sherd sections has been carried out on the Manx material, a similar assessment of sherds from elsewhere in the study area was not possible. One way of obviating this problem is to limit the study to whole vessels, where any sooting present is likely to have resulted from use, since significant post-depositional change would probably have broken the vessel.

Several methodologies are available for the analysis of surface residues. At the most basic level the location of residue on a vessel can be used to infer the process by which it was deposited[2]. For example, a deposit occurring on the inside of the vessel is likely to be derived from the vessel's contents. In contrast, a deposit on the exterior is probably derived from sooting whilst the vessel was placed over a flame. These are not of course hard and fast rules, but they appear to be reasonable inferences.

More complex methodologies involve the study of the residues themselves using chemical means. The success of these techniques depends to a great extent on the nature and quality of the residues. If a residue consisted originally of a food substance which has become charred, then the resultant carbon deposit will be

1 By surface sooting is meant an actual carbon deposit adhering to the surface rather than fire clouding resulting from firing.

2 The use of whole vessels rather than sherds for the analysis makes it particularly easy to identify the location of sooting on a pot.

worthless for residue characterisation. However, it has been suggested that in the early stages of burning, a carbonised crust forms over residues sealing and protecting them from subsequent superficial burning (Needham and Evans 1987).

If sufficient residue remains, then the possibility of characterisation by chromatography is present (Evershed *et al* 1991). To date there has only been one published study relating to Neolithic ceramics in Britain. This assessed samples from the Runneymede Bridge assemblage (Needham and Evans 1987) and identified bees' wax, pork fat, and a fish-based food. However, only 22 sherds were examined, and each of those food-stuffs only occured on individual sherds. The authors also discuss the possibility of post-depositional contamination of sherds, although they discount this in the case of their own study.

Moving on to Bronze Age ceramics, work has been carried out by Richard Evershed on sherds from Ronaldsway Village (Woodcock 1993). 20 plain body sherds were tested. In this case, no residue was present and lipids were tested for within the sherd fabric. 3 samples were found to contain lipids indicative of both meat and vegetable fats[3].

It can be seen that although the chemical analysis of residues provides some detail as to the function of individual vessels the results at present tend to be of a very general nature. The scarcity of sherds with well-preserved residues also means that even at this most general level a characterisation of whole assemblages is likely to remain elusive.

Another approach which has been adopted is the analysis of pollen in sherd residues. Within British Neolithic studies this has been carried out most famously on a beaker found in a cist at Ashgrove, Fife (Dickson 1978). This contained lime and

[3] In Europe further chromatographic studies have been carried out on Neolithic assemblages in Denmark (Evans and Hill 1982), Iron Age assemblages from Germany (Rottlander 1986), and Roman assemblages from Austria (Rottlander and Hartke 1982).

meadowsweet pollen suggesting that honey formed a component within the contents. Perhaps the most impressive results using pollen analysis on sherd residues comes from the study of two Grooved ware vessels at Balfarg Riding School (Moffat 1993). Here a pollen suite of meadowsweet, flax, a member of the hemlock family, and the herbs fat hen and cabbage/mustard, were identified. In addition, macro-remains of oats, barley and droplets of beeswax were also present. Similarly, at Machrie Moor, Arran, sherds of Carinated bowls, Peterborough ware, Grooved ware and Beaker pottery were analysed and a pollen suite commensurate with honey was identified (Moffat in Haggerty 1991).

An attempt was made to analyse the chemical composition of residue found on sherds from Ballateare, Glencrutchery, and Ronaldsway 'House' on the Isle of Man, using Fourier Transform Infra-red Spectroscopy (FTIR). Results of preliminary work on sample sherds indicated that the residue was composed of elemental carbon (Geall *pers comm.* 1994), and work was therefore discontinued. Similar work was not attempted on assemblages elsewhere in the study area due to constraints of time within the current research project.

Instead, residues were used as evidence of use through a study of their locations on whole vessel surfaces only. Within the Isle of Man this could be undertaken by a first hand study of all material; in the rest of the study area although whole vessels were examined wherever possible, it was not possible to collect data from all known examples.

A11.3.4 Context of deposition

The context in which a vessel is finally deposited is unlikely to be that which it occupied during daily use. The discussion in Chapter 3 indicates that there is little chance of a pot surviving to the present day unless it was deliberately deposited (see Figure 3.2). The identification of such deliberately deposited remains is important since the act of burial does, in itself, indicate something of the final symbolic role of a vessel.

For example, the finding of a vessel in a tomb chamber implies deliberate burial and therefore tells us that the final use of the vessel was as a grave good or offering. In contrast, the finding of sherds on an old land surface is more likely to be the result of chance burial, meaning that the act of deposition occured when the vessel had been retired from active use.

Although these instances are easily interpreted other situations are more difficult to decipher. An objective criteria for the interpretation of the context of deposition was necessary if sites were to be considered uniformly throughout this thesis.

The variety of possible contexts were therefore classified using the same scheme as was applied in Appendix 2, Figure A2.1. These were then grouped according to whether they were indicative of chance or deliberate burial. The resultant groupings were as follows:

Contexts indicative of deliberate burial:

- Sealed features, ie:
    1. Features in old land surfaces (and ditch bases)
    2. Features produced during monument construction
    3. Features inside enclosures
    4. Features in tomb forecourts
    5. Forecourt blocking
    6. Features which are secondary to a monuments use)
- Tomb contexts, ie:
    7. Tomb chambers
    8. Tomb passages
- Forecourt blocking of tombs

Contexts indicative of chance burial:

- Open contexts, ie:
    1. Old land surfaces
    2. Ditch fills
- Contexts derived from elsewhere, ie:
    3. Material incorporated into a mound

This classification is intended to be used as a guide with the attribution of an assemblage to a particular class dependent upon the detailed context being studied,

Table A11.6 shows the number of instances where assemblages of each ceramic type have come from chance and deliberate contexts respectively, only positive identifications of each ceramic type having been included. There is some duplication in this list for sites where pottery of the same type was buried both by chance and deliberately. Stray finds were excluded from this analysis since the original context of these finds is no longer retrievable.

It will be noticed that all ceramic types occur more frequently in deliberate rather than in chance burial contexts. This means that the material which archaeologists are studying is strongly biased towards that which Neolithic people wished to be preserved. This may be very different from the total variability within the sum of the material culture in daily use.

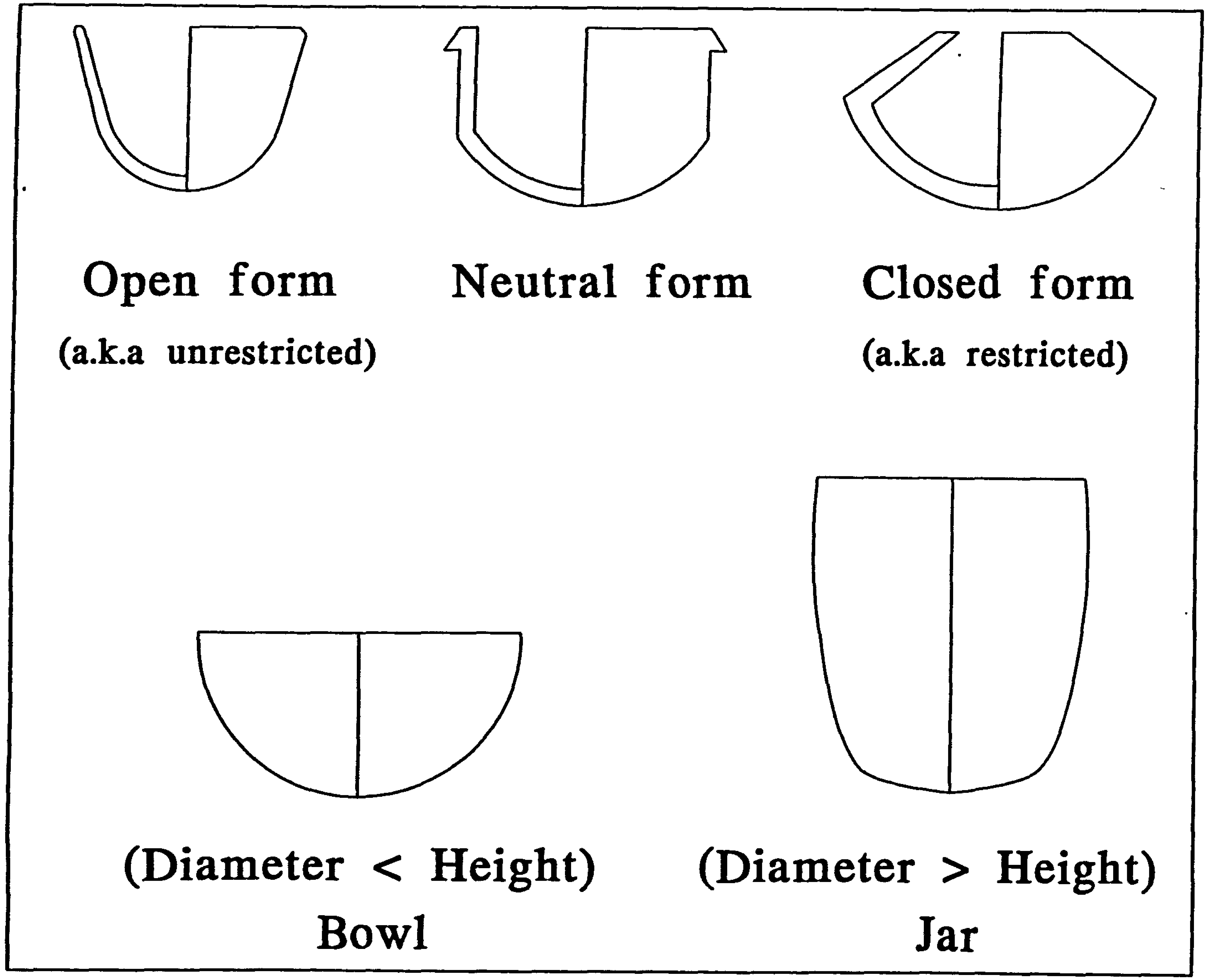

Figure A11.1: The classification of vessel shapes used in this study

Number of vessels available for volumetric analysis	
Vessel type	Number of reconstructable vessels
Early Neolithic	
Carinated bowls	14
Middle Neolithic	
Achnacree bowls	10
Drimnagh bowls	22
Peterborough wares	1
Sandhills vessels	24
Shouldered vessels	18
Late Neolithic	
Grooved ware outside of Isle of Man	1
Ronaldsway and Manx Grooved ware	30
Latest Neolithic	
Beaker	44
Totals	165

Table A11.1: Number of vessels of each type of which enough remains for volumetric analysis

Estimation of the size of group to which particular vessels of particular volumes are suited	
Vessel volume	Size vessel suited to
0 - 0.75 litres:	Miniature vessels
0.76 - 2.25 litres:	Individual sized
2.26 - 10 litres:	Group sized
10 > litres:	Communal

Table A11.2: The functional classification used in this study for vessels of specific sizes

Classification of shape in Mesoamerican archaeology (Rice ZZ1987, fig 7.4)	
Definition	Ratio of height : diameter
Plate	$x > 1 : 5$
Dish	$1 : 5 <= x < 1 : 3$
Bowl	$1 : 3 <= x < 1:1$
Jar	$1:1 <= x$

Table A11.3: Classification of shape used in MesoAmerican archaeology

Classification of shape in British Neolithic archaeology (Smith ZZ1965, 49)		
	Definition based on:	
Definition	Rim diameter	Ratio of height : diameter
Cup	<120mm	
Bowl		*c* 1:1
Carinated bowl		*c* 1:1
Pot		1+:1

Table A11.4: Classification of shape used by Smith (1965) in studying the Windmill Hill assemblage

Variety of shapes used by reconstructable Neolithic vessels							
	Cup	Bowl			Jar		
		Open	Neutral	Closed	Open	Neutral	Closed
Early Neolithic							
Carinated bowls		10		4			
Middle Neolithic							
Achnacree bowls		2	8				
Shouldered bowls		12	5	1			
Drimnagh bowls				22			
Peterborough wares							
Sandhill bowls		3	4	15			
Late Neolithic							
Grooved ware (outside of the Isle of Man)				1			
Ronaldsway (inc. Manx Grooved ware)	5	11			6	6	2
Beaker			1		2	35	2

Table A11.5: Number of vessels of each type of which enough remains for the shape to be analysed

Number of instances where an assemblage was buried by chance or deliberately		
	Chance burial	Deliberate Burial
Early Neolithic		
Carinated bowls	21	25
Middle Neolithic		
Achnacree	0	7
Sandhills	19	31
Drimnagh bowls	3	19
Peterborough wares	2	9
Shouldered bowls	22	36
Late Neolithic		
All Grooved ware	1	21
Ronaldsway ware (including Manx Grooved ware)	4[1]	29[2]
Latest Neolithic		
Beaker	26	61

Table A11.6: Number of sites at which chance and deliberately buried assemblages of each type have been found within the Irish Sea province

[1] It is possible that the sherds from Cronk Coar were derived from mound material, however since there is uncertainty about this the site has been excluded from this list.

[2] The retrieval of a whole jar from Skyhill strongly indicates that this vessel was deliberately buried and it has therefore been included in this total, however, since the details of its provenance are unclear it's context is listed elsewhere as 'mound material'.

A12. Phosphate analysis of Manx Neolithic pottery

THE AIM OF THIS APPENDIX IS TO SUMMARISE ANALYSES CARRIED OUT TO ASSESS THE PHOSPHATE CONTENT OF SHERDS FROM MANX LATE NEOLITHIC SITES. THE DATA OBTAINED IS THEN USED TO MAKE A PRELIMINARY ASSESSMENT OF THE NATURE OF THE CONTEXT INTO WHICH THE CERAMICS WERE DEPOSITED.

A12.1 Introduction

The role of phosphates as indicators of past human occupation has been recognised since the 1920s and has led to numerous analyses attempting either to elucidate the occupation patterns at known sites (Proudfoot 1976; Conway 1983), or to locate new sites (Sieveking *et al* 1973; Craddock *et al* 1985). The general principle exploited by these surveys is that occupation which results in the deposition of animal or human remains, or excreta will lead to enhanced levels of phosphates in the soil. The mechanism by which these enhanced levels are maintained in the face of soil leaching is, however, unclear, with suggestions being made that organic content in the soil, high soil pH, or the presence of carbon may all be relevant (Sieveking *et al* 1973; Proudfoot 1976; Walker 1992).

An alternative means by which phosphate can be maintained within an archaeological context is through adsorption or precipitation into low fired ceramics (Duma 1972; Freestone *et al* 1985). High levels of phosphate enhancement within ceramic fabric were first recognised by Duma (1972). Duma observed that the quantity of phosphate in vessels often increased from top to bottom, suggesting that what was being observed was the leaching of the phosphate-rich contents of a vessel through the fabric. This view is supported by Bollong *et al* (1993) who suggest that the enhanced phosphate levels in Bushmen pottery from South Africa was a result of the boiling of blood in the vessels after firing.

A contrasting view of the meaning of phosphate enchancement is held by Freestone *et al* (1985; 1994). Their work focused on electron microprobe analysis through sections of archaeological ceramic. This indicated that levels of Iron, Calcium and Phosphate were enhanced throughout the sherd fabric, but with noticeable peaks at the surfaces. That the peaks occured at both inner and outer faces of the sherds suggested that the phosphate levels were a consequence of post-depositional uptake and not from adsorption during use. This view was supported by the high levels of Iron and Calcium also found across the sherd sections. The conclusion reached by Freestone *et al* was that the high phosphate content was a consequence of post-depositional leaching. They also speculated that any phosphate derived from the use of the pot would probably be swamped by that derived post-depositionally.

Whichever view is correct it can be observed that if a ceramic contains a high level of phosphates it was deposited with a quantity of human / animal remains or excreta either attached or in association within the deposit.

In the context of the current research into Ronaldsway ceramics it was felt that this would be a useful area to explore since the generally acidic soils of the Isle of Man rarely support the preservation of bone, and there is very little other environmental evidence available from Manx Neolithic sites.

A12.2 Sample selection

In the light of the research detailed above it was decided to examine the phosphate content of sherds from four Ronaldsway sites[1].

- Ballateare
- Ballavarry
- Glencrutchery

[1] The specific samples selected were those used for the AAS analysis of sherd chemistry detailed in chapter 8. The rationale for sample selection is also presented in this section.

- Ronaldsway 'House'.

These sites represented an opportunity to compare the phosphate levels from sherds at two pit sites: Ballavarry and Ronaldsway 'House', with those of the cemetery site at Ballateare. The provenance of the sherds from Glencrutchery is less certain (see Appendix 4) and it was hoped that it would be possible to characterise the site more closely from the results obtained. Unfortunately, in no instance were soil samples available in order to test the background level of phosphates at a site. Records from all four sites do, however, indicate that sands and gravels were the consistent soil type. It has been noted that the open structure of such soils results in them having low phosphate contents (Sieveking *et al* 1973); in the absence of more detailed information it is therefore assumed that the background phosphate levels at all four sites are therefore comparable. Significant deviation between sites is therefore seen as indicative of differences in material culture practises.

A12.3 Sample preparation

Preliminary analysis was carried out using an energy dispersive x-ray analyser (EDAX) in order to assess at a qualitative level whether recognisable quantities of phosphates were present in the Manx sherds. Subsequent analysis was carried out using an ultra-violet visual spectrometer.

A12.4 Sample preparation for EDAX analysis

Samples were prepared by removing the sherd surfaces using a tungsten carbide burr, and the cleaned fragment was snapped into a mortar. The sample was then crushed and all visible temper was removed. The resulting powder was then mounted and coated with Au-Pd according to standard SEM preparation procedures.

Sherds from all four sites were analysed and the preliminary indication was that sherds from Ballavarry, Glencrutchery and Ronaldsway 'House', but not from Ballateare, had high phosphate levels.

A12.5 Ultra-violet Visual Spectrometer

It was decided to explore this phenomena further using an ultra-violet visual spectrometer (UV/vis). This technique allows the quantification of the levels of phosphate present in each sherd. Analysis using UV/vis entails the formation of a phosphomolybdate complex which is reduced to molybdonum blue. The intensity of the blue is measured and then used in conjunction with phosphate standards to calculate the concentration of phosphate present.

A12.5.1 Sample preparation for UV/vis

50mg samples were taken from 46 sherds using the method detailed in Chapter 8 (see Table A12.1 for breakdown). These were mixed with 5.0ml hydrochloric acid, 1.5ml nitric acid (70%) and 1.0ml perchloric acid (60%). Samples were heated to 100 degrees Celsius for 30 minutes. The liquid was then evaporated by raising the temperature to 200 degrees Celcius. Having cooled the sample, 10.0ml of hydrochloric acid was added to dissolve the residue, and the sample was made up to 100ml using distilled water.

A12.5.2 Analysis

An aliquot of sample was added to 5ml of Ammonium Molybdate solution and 5ml of Ascorbic acid. The resulting solution was then left to stand for 2 minutes and the level of absorbance was measured at 660nm in 1cm cells placed in a Philips PU 8730 UV/vis scanning spectrophotometer. The instrument was calibrated for phosphates using standard solutions of 10, 25, 50, and 75ppm.

The sample set was divided up by site and following initial testing it was decided to dilute sherds from Ronaldsway 'House' and Glencrutchery which had phosphate levels which exceeded that of the highest standards. Accordingly at these former two sites an aliquot of 1ml was used, whilst at Ballateare and Ballavarry 5ml were sampled.

Samples were arranged by site and selected at random from these predetermined groups.

A12.6 Results

The results of the analysis are presented in Table A12.1 as as parts per million of phosphate. Figure A12.1 presents a diagrammatic assessement of these results. An initial scan of the data shows that at each site there is considerable variation in the phosphate levels recorded. This may be explicable in terms of the micro-environment within which each sherd was situated, although there is insufficient contextual information from any of the sites examined to corroborate this view. It has also been noted by Conway (1983) that 'noise' levels during soil phosphate analysis may be as high as 15%. No comparable figures are available for 'noise' levels during ceramic phosphate analysis.

It is possible that the high values of 17162 from Ronaldsway 'House' and 10840ppm from Glencrutchery represent experimental errors although all efforts were made through repeated testing of standard solutions to ensure that such errors did not occur. The lowest range of sherd phosphate levels were obtained from Ballateare, where a range of 600 - 2360ppm was noted. The highest range was from Ronaldsway 'House' were values between 3550 and 17162ppm were recorded. The readings from Ballavarry and Glencrutchery fell between these extremes at 750 - 4600ppm and 1150 - 10840ppm respectively.

A12.7 Conclusions

Sherd phosphate levels at Ronaldsway 'House' are very high in comparison with those at other sites. This is perhaps not surprising given that the pit fill containing the pottery was noted to be dark and contained bones (Bruce *et al* 1947). The contextual information therefore suggests that the relatively high phosphate levels at the site can be interpreted as resulting from deposits of human / animal excreta or debris within the pit fill. This view contrasts with that of the excavators who regarded the fill at the site as being the result of the accumulation of occupation material.

In the case of Ballavarry the nature of the ceramic and coarse stone assemblages suggests that the site is comparable in function to Ronaldsway 'House' (see Chapter 11). It is surprising therefore that the phosphate levels at Ballavarry are very much lower than those seen at Ronaldsway 'House'. This may be accounted for by the details of soil structure between the two sites, however, in the absence of soil samples this remains something of an unknown. It may also be the case that midden materials were not deposited in the same quantities at the two sites, although the lack of preserved organic materials from either site prevents an independent assessment of this.

The ceramic assemblage at Ballateare consisted of complete, or near complete, Ronaldsway jars which had been deliberately buried (Bersu 1947). This is a situation which contrasts with that at the other three sites where the assemblage was deposited in a fragmentary condition. It is therefore of interest that the jars at Ballateare had significantly lower phosphate levels than at these other sites. The anomaly of the Ronaldsway jars, which are frequently found sealed but devoid of contents are discussed repeatedly in Chapter 11. In this chapter the possibility is entertained that the jars at cemetery sites were used as receptacles for offerings. If this was the case, then those offerings, as well as being for the most part bio-degradable do not appear to have led to the very high phosphate levels recorded from the midden material at Ronaldsway 'House', or the allied site of Ballavarry.

The phosphate levels from ceramics at the preceeding three sites of known archaeological character can be used to provide additional information about Glencrutchery, where no contextual information is available. In this instance, a large and fragmentary assemblage was excavated which has a high phosphate content (see Table A12.1 and Figure A12.1). In terms of the range of readings observed Glencrutchery has most in common with Ronaldsway 'House'. This would suggest that the ceramic assemblage was deposited with a quantity of human or animal remains or waste.

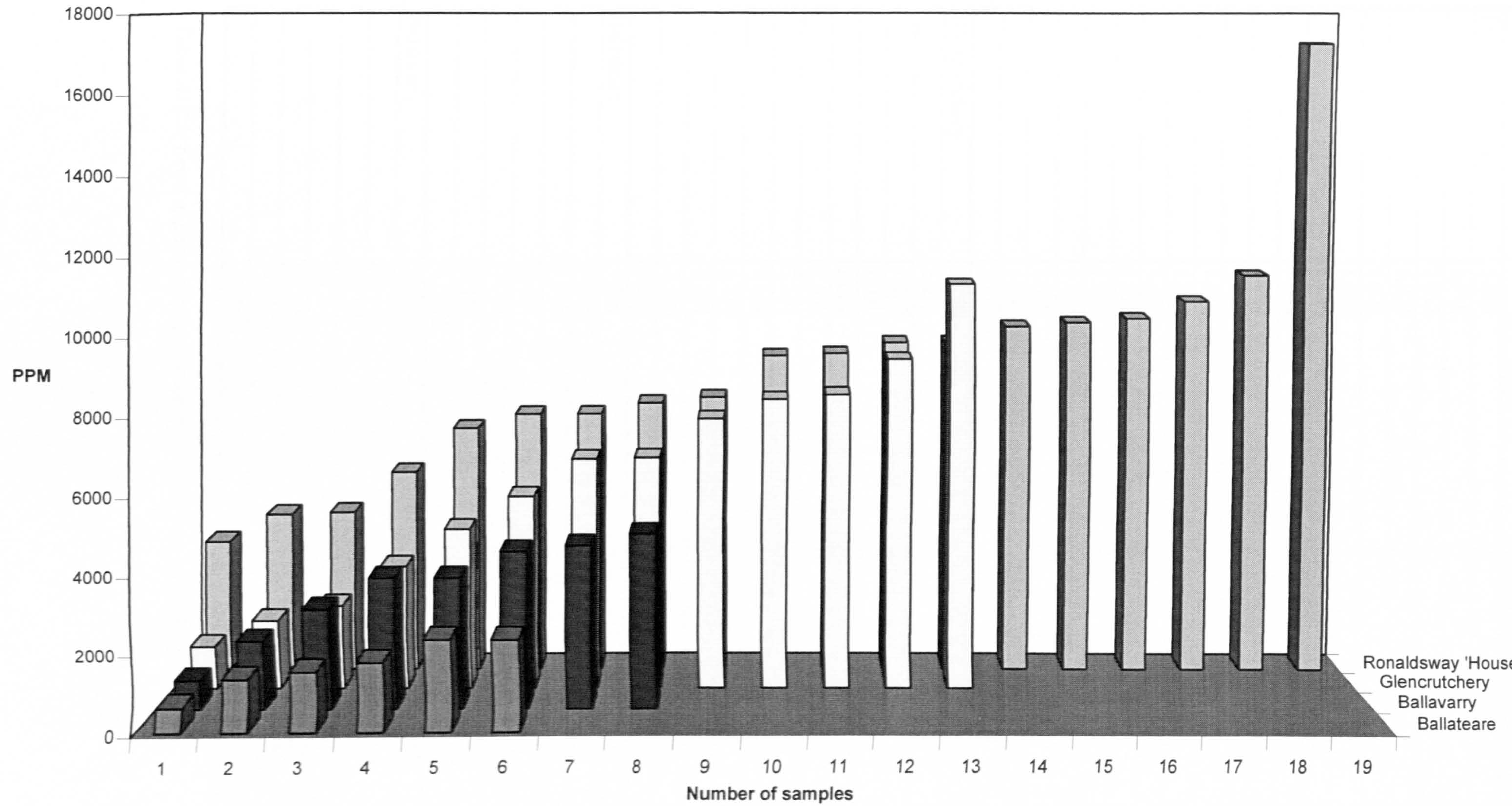

Figure A12.1: Diagrammatic assessment of the quantity of phosphate present in sherds from the Manx Late Neolithic sites sampled

Levels of phosphate in sherds from Late Neolithic sites		
	Sample number	Phosphate level (PPM)
Ronaldsway 'House	1.008	8700
	1.010	9000
	1.018	7050
	1.020	7350
	1.028	9648
	1.044	3550
	1.046	7050
	1.048	4300
	1.049	10122
	1.052	6662
	1.060	7498
	1.119	9430
	1.182	9540
	1.222	4350
	1.281	5450
	1.348	17162
	1.349	8644
	1.482	10840
	1.512	8988
Glencrutchery	2.020	5172
	2.053	6198
	2.257	7240
	2.080	7760
	2.082	10840
	2.092	1150
	2.101	8816
	2.184	1850
	2.189	2250
	2.201	3300
	2.206	7880
	2.224	4300
Ballateare	3.001	2360
	3.005	1760
	3.006	2360
	3.007	1320
	3.008	1520
	3.009	600
	32.122	2650
Ballavarry	32.123	1500
	32.125	4150
	32.137	3450
	32.142	3450
	32.145	4600
	32.163	1800
	32.166	4300

Table A12.1: Level of phosphates in sherds from Manx Late Neolithic sites

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