

Bronze Age Settlements and Land Use in the South Thy Sandhills

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Owing to an underlying interest in settlement patterns, problems of sampling and representativity receive a good deal of attention in Danish archaeology. There are two possible strategies. A defined area can be examined until its archaeological contents are clarified as far as this can be done, or a transect can be cut through it in hope of obtaining a representative sample of the archaeology of the area through which the transect passes. The studies being presented here fall into the category of transect survey. For several kilometres north of the western end of the Limfjord the North Sea coast is being rapidly eroded. As the coast advances inland, prehistoric settlements are exposed and washed away. By keeping the coast under archaeological surveillance a study can be carried out that is essentially similar to the transect survey of a motorway or pipeline investigation. The archaeology along a line cut through the countryside is thoroughly examined. The stretch of coast in question here runs for 12.5 km from the northern end of the sandbar that separates Fladesø lake (a cut off arm of the Limfjord) from the sea, almost to the village of Stenbjerg. Along this stretch the National Museum has been able with the help of some amateur archaeologists to record all the major prehistoric settlements and several minor ones in the 25-50 meters wide swathe through the landscape that has been washed away in 1966-1990.

Conditions for the preservation of archaeological and environmental material are particularly good, because the strata have been protected from disturbance by several meters of overlying sand and have

lain a large part of the time since their formation below ground water level, which has spared them from many of the forces of natural destruction. Also the rise of the surface and alternation between layers of blown sand and stable, plant-grown surfaces gives possibilities for stratigraphical deposition that would not normally be present, and this includes stratigraphy of natural phenomena and not just archaeology. The investigations carried out at the "Summerhouse" site give an idea of the potential of environmental sciences to yield information about human impact on the landscape in this area and show how important it is to have collaboration from the environmental sciences.

Unfortunately the investigation of aeolian sediments with their many superimposed buried land surfaces and encapsulated settlements has been considerably neglected. Dune areas have much in common with peat bogs, but peat bogs are a familiar subject and therefore more favoured for research in Denmark than anything new. It is therefore not easy to obtain resources, and we are grateful for what support has been forthcoming for the present research.

The purpose of the present paper is to present the Bronze Age settlements that have been investigated during this project together with some hypotheses about the character of Bronze Age land use in the dune belt and more generally. Previous publications relating to the project are: Liversage & Singh 1985; Hirsch and Liversage 1987; Liversage *et al.* 1987; Liversage & Robinson 1988; Robinson & Kempfner 1988; Liversage 1989; Rowley-Conwy 1990; Robinson 1992; Liversage 1995; Liversage & Robinson 1995.

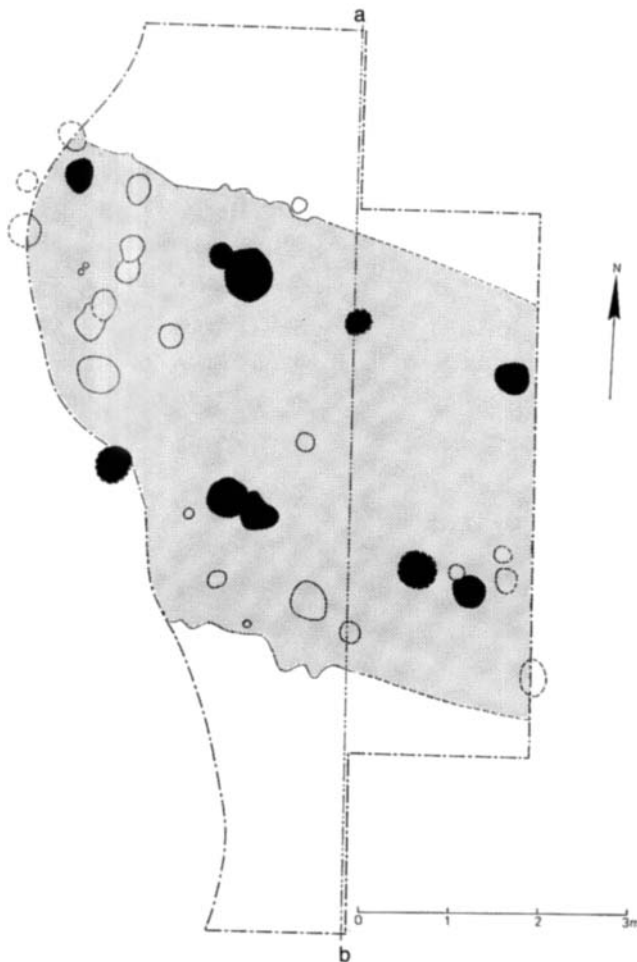


Fig. 1. Stenbjerg North, posthole plan.

THE SITES

Preliminary remarks

The sites are presented not in chronological order, nor in geographical or alphabetic order, but in the order in which they contribute to a discussion about land use in the last chapter. Each site is described concisely showing its special problems and contribution to archaeology in aeolian deposits. The pottery is described site by site and a dating scheme is put forward at the end, which lays no claim to being the newest in methodology, but it is hoped all the more will help the practical archaeologist to address practical dating problems.

Other finds are only described if especially interesting. Struck flint was found at all the sites, and is sealed above and below in a way that makes it absolutely sure that it was struck by the Bronze Age and early Iron Age inhabitants, but it is not dealt with in this paper. At most sites at least one small piece of natural amber was found, but there is no sign that amber was ever worked. Was this aimless gathering up, or was it wastage during collection for export?

Stenbjerg North

The site being called Stenbjerg North (Sb. 79, Nørhå parish) was discovered in 1980 by the Hirsch family, who in 1981 exposed and photographed several square meters of ard marks. The author visited the site together with D. Robinson in 1986, and later in the same year a rather rushed excavation was mounted together with the Hirsch family. Wind erosion had created a shelf at the time and it was possible to excavate the relatively large area of 34 m². Afterwards H. Holm discovered and examined a cooking pit with burnt stones close outside the house. This site showed that even when the substrate was blown sand settlements could remain in the same place for a substantial time and were directly accompanied by agriculture.

The occupation layer lay in the cliff about 6 m over the beach, with below it some older vegetation layers without archaeological finds. The excavation established that the ard marks lay at the lower interface of an old cultivated soil and were associated with a dwelling with sunken floor and postholes, which was dated by pottery to Period V¹ of the Bronze Age (Fig. 1). The width of the dwelling was about 4.6 m and the two parallel sides were orientated roughly WNW/ESE, which is the usual orientation of Bronze and Iron Age houses, and also of the field systems within which the houses stood. The length of the dwelling is unknown. The sunken floor lay about 25 cm below the base of the ploughsoil.

1 The normal Montelian period system is used. As this is based on metal, and as the current chronology deals with pottery exclusively, the reference to the various periods should be seen as an approximation only.

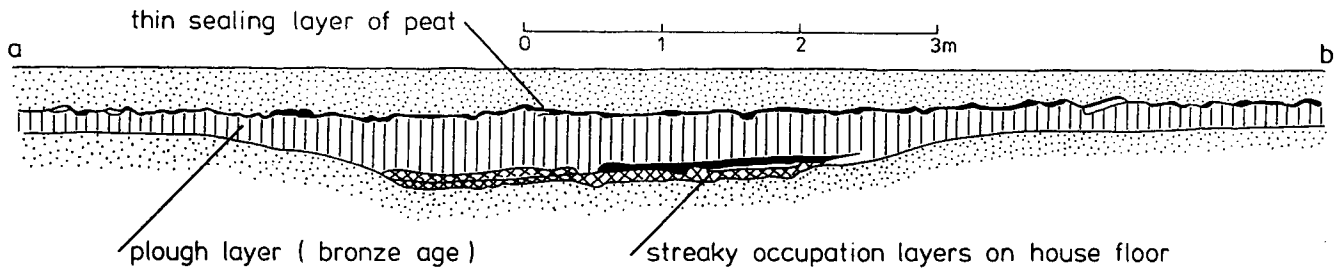


Fig. 2. Stenbjerg North, section across building.

A section across the feature at a-b on the plan is given as Fig. 2. The dirt on the floor was an approximately 12 cm thick deposit of brownish black, dirty, in places streaky sand, in which charcoal and a red mineral residue, no doubt left after burning peat, showed that fire had been regularly used. The sloping sides of the hollow are not the originally dug edges, but the final result of levelling and collapse after the building was demolished.

When the floor dirt was taken up numerous post-holes were found (Fig. 1). All were sectioned and were found to be filled with pale to dark grey sand without unambiguous marks of the posts themselves, showing that these were extracted at the demolition of the building. The holes came in all sizes up to 60 cm in diameter.

The various evidence may be interpreted as follows. Two rows of roof-bearing posts ran parallel with the edges of the sunken floor. The distance between the two rows (centre of post to centre of post) was 2.4 m. The distance between any hole and the next in the same row varied from 1.3 to 2.4 m, which is unusually irregular. Some of the posts had been replaced during the life of the building. The second post from the west in the northern row had been replaced by a smaller post, which cut its hole; the second post from the west in the southern row had placed beside it a post in a much shallower hole cutting the top of the original hole. At the eastern end of the southern row there were two equal posts about 60 cm apart. One of these can have replaced the other, or there may have been a supernumerary post. That the house not only had stood until it needed repairing, but also that it was repaired and continued for a further time, shows that it was in use in all events for some decades.

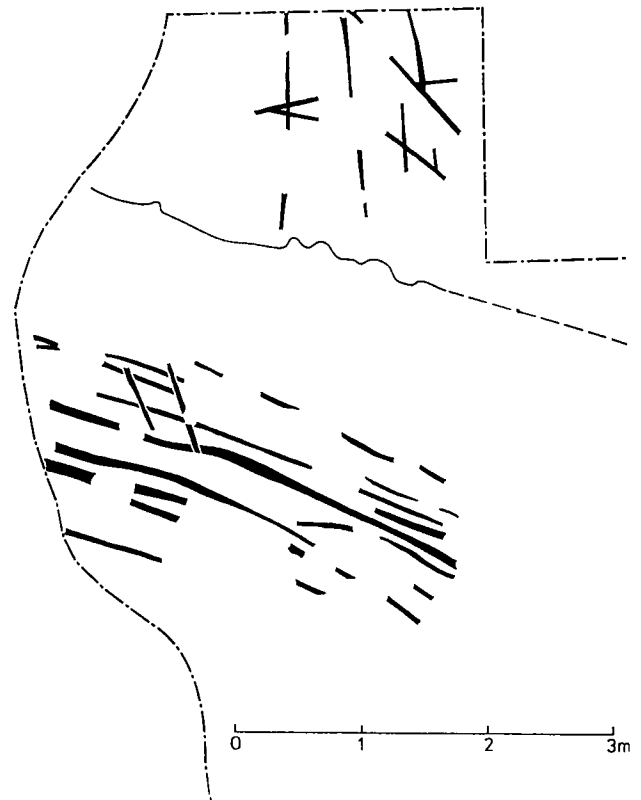


Fig. 3. Stenbjerg North, ard marks.

Though there was reasonable evidence of the roof construction, there were no signs of wall posts. Most Bronze Age houses had substantial rows of wall posts, but this one is unusual both for its sunken floor and its lack of wall posts. It is a simple dwelling that suggests that our inhabitants had a low social status!

It is not possible to explain all the other posts in the plan, but attention may be called to two pairs of deep posts in the westernmost part of the plan, each of which might be an original post and a replacement.

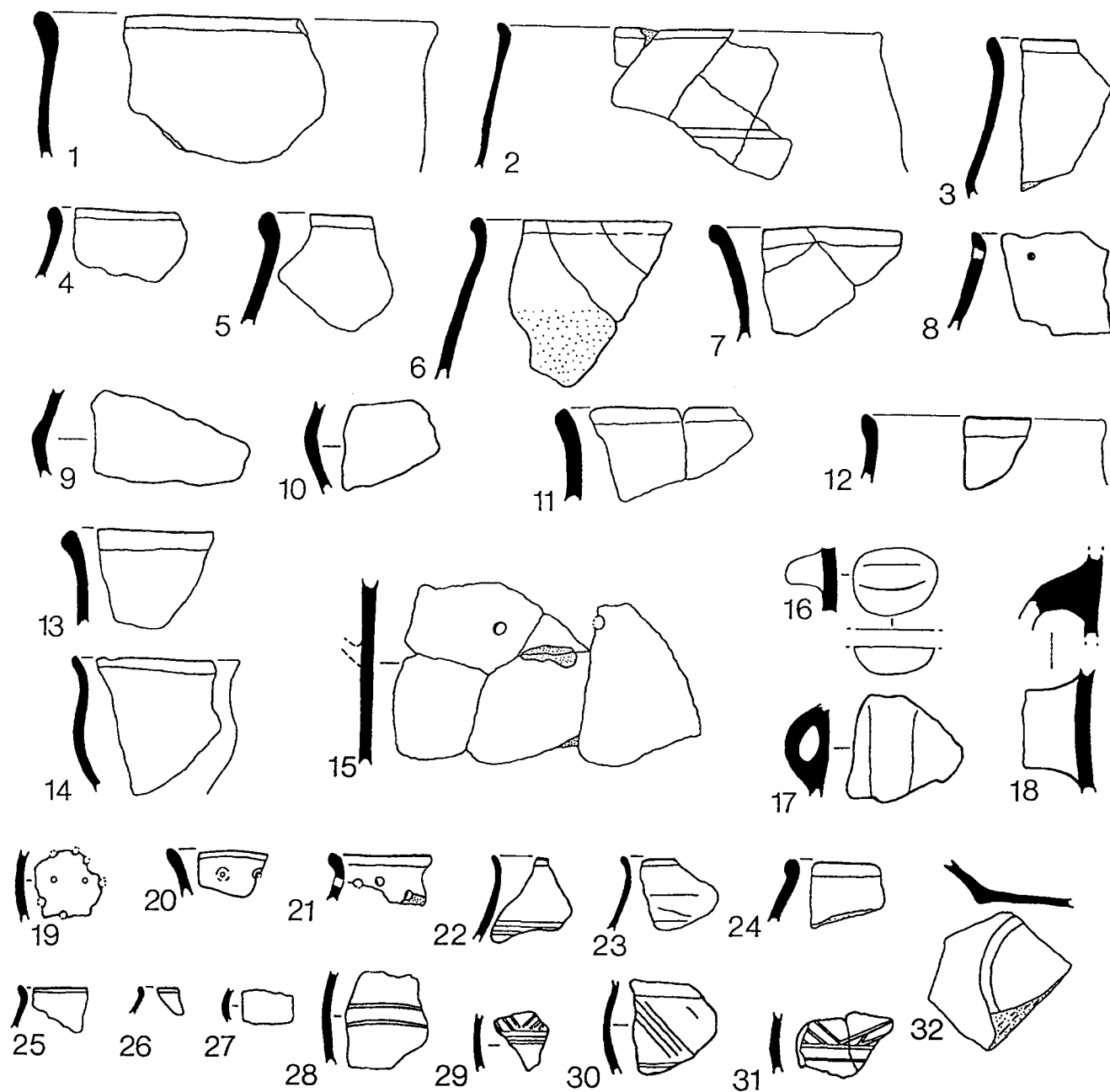


Fig. 4. Pottery from Stenbjerg North. Scale 1:3.

They could have been part of a transverse partition, but this is not certain. Attention should also be called to a number of small but deep stake holes. Such small holes could relate to internal furnishings. Their presence here may be due to the exceptionally good conditions of preservation in sealed layers in blown sand.

Not least interesting are the events, which took place after the dwelling was demolished. The area came under the plough, and the shallow pit that was all that remained of the house after demolition was not excepted. Ard marks were found south and north of the house (but here were only rarely visible because

the lower interface of the ploughsoil was much disturbed by animal burrows, which had obliterated nearly all the ard marks). They were also visible in the dirt on the house floor, where a great many furrows were visible running the long way of the hollow (Fig. 3) (owing to time pressure the marks were only planned over part of the floor). They were also occasionally visible at other levels in the house depression. The two furrows running NNW/SSE instead of WNW/ESE were plotted at a level about 10 cm above the others. The importance of this is that it shows that ploughing was not a once-only event after demolition of the building, but was repeated regularly as the hollow filled up. Cultivation continued until the hollow left by the old house was completely levelled up and the field surface over it quite flat, as can be seen in section a-b. This must indicate cultivation after the demolition of the building for a period that should at any rate be measured in decades.

The old cultivated soil (labelled "plough layer" in Fig. 2) was capped by a thin layer of peat in which lay many willow twigs which show there was a substantial period without deposition of further blown sand after the cessation of cultivation. It was certainly this prolonged pause that gave time for so much bioturbation. Some of the twigs were dated radiometrically (K-4909: 2420 ± 70 bp).

There was no success in determining the boundaries of the cultivated area. To the south a large blow-out had removed the evidence, while to the north the plough layer simply faded out, becoming progressively peaty and laminated, and soon no more furrows could be found.

Pottery: The pottery from Stenbjerg North comprised 1454 sherds with a combined weight of 5.9 kg. The clay was usually tempered with broken up quartz, derived from granite if we may judge from the occasional mica. Some however was tempered with rounded quartz grains, which must be sand. Tempering material seemed somewhat unevenly distributed through the clay, as though mixing had not been very thorough. Surfaces ranged in an even gradient from rather rough to quite smooth. A coarse sandy slurry had been applied in a few cases (Fig. 4: 6), but a smooth grey-black slip is commoner, being betrayed where it peels off showing the coarser pottery underneath. The

differences of thickness and aesthetic quality no doubt reflect different functions such as storage, cooking and eating. There is no sharp division of the ware into fine and coarse, but all intermediate stages are present.

Most sherds are small and none fit to give substantial portions of profiles, but there are nevertheless various clues to the types originally present.

The commonest was a jar with inward sloping neck and slightly articulated rim. Whether the neck was tall or short is normally unknown (Fig. 4: 2, 5, 6 and 8). A short neck is shown in Fig. 4: 3. Shoulder sherds are not common, but three examples are illustrated (Fig. 4: 3, 9 and 10), of which the second has a distinct bulging ledge while the shoulder of the others is more in the nature of a carination.

Bowls are indicated by outward sloping rims, but were less common (Fig. 4: 7, 11, 13 and 20, of which the last was a sieve). There seem not to be any of the form with high-rising handle joining rim and shoulder.

A very distinctive component of the pottery is the rare fine black ware (Fig. 4: 25-27). The sherds are only 2-3 mm thick with smooth, matt, blackish, slipped surfaces. The shapes seem much the same as those of pots of thicker ware, but the vessels were naturally smaller. Fig. 4: 25-26 are inward-sloping necks of unknown height with articulated rim, and Fig. 4: 27 is a slightly bulging shoulder.

Another kind of fine ware consists of decorated vessels, which so far as can be ascertained were necked bowls with walls not quite so thin as those of the fine black ware, and which often were not black but grey-brown or yellow-brown in colour. The decoration was executed with neatly incised straight lines and the motifs used were groups of horizontal lines and zones of multiple chevrons (Fig. 4: 22, 23-24, 28 and 29-31). This decoration can occur either on the shoulder, where the profile is convex, or on the neck, where it is concave. The lines range from very thin (Fig. 4: 22) up to 2 mm wide (Fig. 4: 28). The 20-30 sherds from this kind of fine ware provide most of the decorated pottery, but another rather unusual decoration is the pits flanking a now missing handle (Fig. 4: 15). This type of fine ware is found at other sites including Fragdrup (Draiby 1985), Voldtofte (Jensen 1967), and Bulbjerg (NM B9853), which places the Stenbjerg

North site in period V. There were thus two kinds of fine ware, the thin, plain blackish ware which is characteristic of the whole Late Bronze Age, and the decorated necked bowls, which are a specific form of ca. period V.

We may now turn to some specific details. Most rims were articulated by a slight outward bend. Some were completely unthickened (Fig. 4: 8, 11 and 14), but most were thickened. Though the amount of thickening is usually slight, the rims seen from the outside often appear to project like a lip (Fig. 4: especially 4-7 and 13). Another common trait of the rim was the smoothing of its inner side in a distinctive way which left a single internal facet, as is clear in Fig. 4: 2, 5, 8, and is rather pronounced in Fig. 4: 12. This is easier to see on the sherds than on the drawings. It is an important diagnostic trait of much of the Late Bronze Age.

A small number of sherds had handles or marks showing where they had broken off. They took the form of rather poorly formed small strap handles (e.g. Fig. 4: 17), placed so far as can be seen on the necks of jars. There is no positive evidence in our material of handles springing from the rim. Fig. 4: 18 is part of an unusually wide strap handle. Related to handles are the small tongue-shaped protrusions which we call lugs (Fig. 4: 16). The lugs would have been useful for lifting, the handles for suspending.

Another form is the clay sieves, of which there are about 30 sherds, all of very ordinary quality. They had holes in the sides (Fig. 4: 19-21). The natural explanation is as strainers for making some kind of milk fermentation product, but the variety of forms and hole spacing leaves questions unanswered.

Stenbjerg South

This site (Sb 80, Nørhå parish) might have been more interesting if the initial discovery could have been followed up before it was too late. It lay 700 m south of Stenbjerg North and was found and trial excavated by the Hirsch family in 1981 and inspected by the author in 1982 and 1984 without any clear result. Since then it has not been accessible, and it must now be washed away. Retrospectively its special interest is that hollows were observed, which perhaps were similar

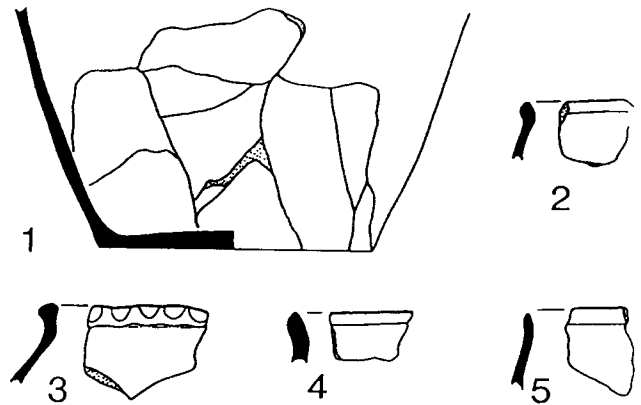


Fig. 5. Pottery from Stenbjerg South. Scale 1:3.

to the sunken house at Stenbjerg North, but this possibility did not come to mind before the excavation at Stenbjerg North. Also a posthole was seen. If the hollow(s) represented house(s) it might mean that a complete pot base discovered at a low level in a hollow (Fig. 5: 1) was a storage vessel in place in the floor. There was also a possible homogenised plough layer, but it was not possible to observe ard marks and it was not yet realised that ard marks could be obliterated by bioturbation.

The small amount of pottery recovered is basically of the same type as at Stenbjerg North (period V). Lipped rims were present, and some of the rims were smoothed inside in a way giving a sloping internal facet (Fig. 5: 2 and 4-5). This trait seems to be more pronounced at Stenbjerg South than Stenbjerg North.

The sherd with finger-marking on the rim (Fig. 5: 3) was found with a few other sherds 125 m further south again.

The pottery suggests that Stenbjerg North and Stenbjerg South were not far apart in time. However though both were from period V, they cannot be assumed necessarily to have been in use at the exact same time.

The "Summerhouse Site"

Stenbjerg North showed that dwelling and cultivation activity at these sites could have a substantial duration. This was also shown by the Iron Age "Summerhouse Site" (Sb 29, Lodbjerg parish). An internation-

al panel of experts (Liversage *et al.* 1987) has already published a report on this site, but the results deserve to be recapitulated both for their own sake and because of their importance for understanding prehistoric land use. By showing how much can be learned by the application of scientific methods to sites buried under blown sand, the report gives an idea how much information may have been lost at sites like Stenbjerg North, where these methods were not applied.

Briefly, an old naturally podzolized land surface separated from the underlying till by a thin layer of blown sand had been brought under cultivation and thereby turned into an old cultivated soil. The old cultivated soil survived as a layer of homogeneous grey-brown sand with ard marks at its lower interface. The layer was reburied under blown sand soon after abandonment, so the marks did not have time to be significantly disturbed by bioturbation. The equivalent surface outside the field had a peaty, often streaky character with a much higher organic content (quantified in the pedological report). The cultivated area may therefore be regarded as a field whose northern and southern limits were revealed in the cliff by the change from a natural peat covered podzol to an old cultivated soil. The cultivated bit extended for about 60 m along the coast. All that can be said about its extension inland is that early in the 1990's it had disappeared, but in the mid 90's it reappeared again, so there may have been a further field boundary parallel with the coast (Per Nørnbjerg, personal communication). The field and surrounding uncultivated surface were well sealed by further layers of blown sand. The cultivated soil contained pottery which dates it to the early Pre-Roman Iron Age.

Where cultivation ended along the southern edge of the field ran a bank of wind-blown sand about 0.25 m high and 6 m wide. Northwards the field ended in a wet depression, which could probably have been used for watering domestic animals. Through the middle of the field ran a second bank of blown sand also 0.25 m high but only 2 m wide, showing that for a time there had been at least two fields in the cultivated island in the heath. The identification during the archaeological excavation of the field banks as drifts of blown sand was confirmed by M.-A. Courty's pedological study, which established a rather higher content of the silt and clay fractions in them (probably

transported in the form of mull aggregates). Such low, broad, banks around "Celtic" fields in Denmark are common in sandy areas and are most probably blown dust caught in hedges. According to the pedological report the hedge theory also fits the high organic C content and the low C/N ratio of the material of the banks. Humus from an uncultivated surface outside the field has been C-14 dated (K4046: 2180 ± 85 bp).

It was clear that the field was a dwelling area. The old cultivated soil contained not only pottery, but also charcoal (both ordinary macroscopic pieces and finely-divided carbon dust observed only in the micromorphological mounts, where pieces of burnt daub and remnants of unburnt clay were also present).

The archaeological remains of at least one dwelling were found in the field. The traces took the form of a clay floor, which had been laid in a foundation hollow dug into the ploughsoil. The building must have stood for the normal life of a house, and had afterwards been ploughed over, as shown by the ard marks scraped into its upper surface. This also shows that the field was used for a substantial time, embracing both the life of the house and some further years of cultivation.

The amount of pottery present also showed that human activity must have been of a certain intensity.

The pedological study showed furthermore that the pH values were higher in the field than in the uncultivated soil outside. This is an indication of the decomposition of organic matter during cultivation and also a consequence of the admixture of ashes, as indicated by the micromorphology. Also the organic phosphate content was higher in the cultivated area than outside it, indicating that phosphate rich material had been added, probably in the form of food refuse, human and animal excrement, and ashes.

The research into the field also includes an important pollen analysis by Martin Munro from Queen's University, Belfast, who found that the original vegetation of the area had been heather moor, but that the impact of the settlement changed the local environment to one dominated by grasses and sedges together with a much more varied herbal flora of weeds of arable and pasture environments and a variety of other wild plants. The change in vegetation must have taken some time to effectuate and is further evidence of the duration of the settlement.

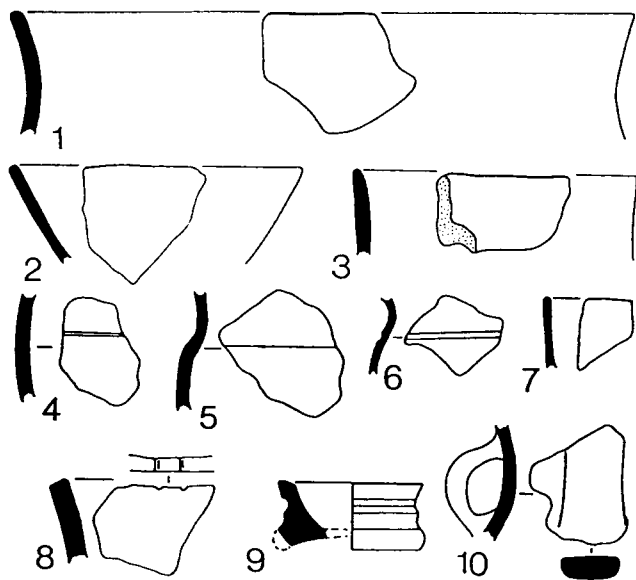


Fig. 6. Pottery from "Summerhouse Site", Iron Age. Scale 1:3.

Summing up, the situation at the "Summerhouse Site" is much the same as at Stenbjerg North, but the data are clearer. At both sites there had been a cultivated area, probably surrounded by hedges, in which one or more houses had stood for the lifetime of a house and had then been ploughed over, so that continuous habitation and cultivation lasting at least several decades has to be inferred at both sites.

Pottery: The 768 sherds recovered together weighing 6 kg were from a highly fragmented material, and no major parts of profiles or significant fits were present. The typical ware is abundantly tempered with fine sand, but some sherds contain ragged pieces of quartz and possibly organic temper as well. The pots were thinner walled and smoother than in the Bronze Age, and the standard of potting seems to have improved.

The forms must have been jars and a smaller number of bowls, but very little of the shapes is preserved. Typically the rims bend out a little like fig. 6: 1. Many jars must have been of middle size and of reasonably even grey ware, but large, coarse, thick walled vessels were also present, though no rims or parts of their profiles are available for illustrating. The

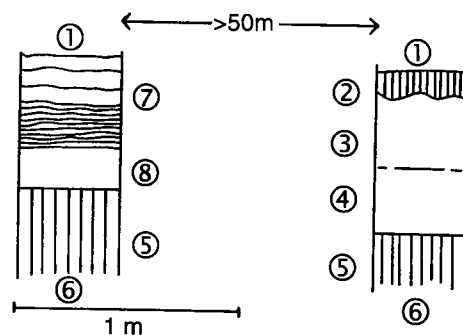


Fig. 7. Stratigraphy at Penbjerg South. 1: Blown sand with streaks of darker sand at base. 2: Homogeneous dark yellow-brown sand with small scattered stones and charcoal crumbs, and a few potsherds and flint flakes; ard marks at lower interface. 3: Streaky yellow-brown sand. 4: Firm sticky dark yellow-brown sand with a few small stones and crumbs of charcoal. 5: Dark sticky sand (old soil on underlying glacial deposit). 6: Yellow sticky sand (glacial). 7: Pale sand alternating with dark, strongly peaty sand, with most peat in its lower part. 8: brown silty sand with many small stones.

rims are never thickened - treatment is either simple rounding (Fig. 6: 7) or rounded-squared (Fig. 6: 1-2). Most of the rims are of jars with rather flat profile - a short slightly outward inclined neck curves gently around to a flat convex belly. The forms must have been like those published in large numbers by C.J. Becker (1961) from his period I. Handles are common, as also in Becker's material, and took the form of parallel-sided, flat-sectioned strap handles (fig. 6: 10) without the variety of handle types found in the Bronze Age.

The few bowls appear to have been shallow and open (Fig. 6: 2 and 8), and could more easily derive from forms like Fig. 17: 12-13 than from the earlier carinated bowls see below.

There are a few sherds of thinner, dark ware, which shows that the Late Bronze Age fine ware continued. Only one of them is worth illustrating (Fig. 6: 7). The ware is matt and unpolished, but is thin, even, and uniformly a dark grey-black in colour.

Decoration is rare, but a few sherds do have a single neatly incised horizontal line, which probably went right around the pot (Fig. 6: 4 and 6), and there are notches on the rim of Fig. 6: 8). Though not strictly

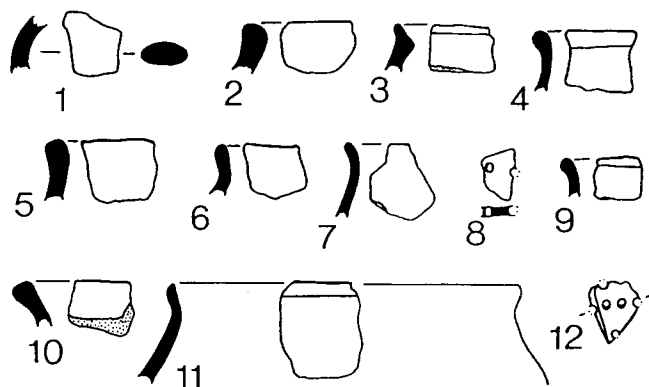


Fig. 8. Pottery from Penbjerg South. Scale 1:3.

decoration, some sherds show a sandy slurry, which is somewhat thinner and more regular than the slurry found in the Late Bronze Age.

Despite certain differences, this pottery is clearly a further development of Bronze Age pottery, especially the style found at Bodbjerg (see below), and reflects in handwork that the change from the Bronze to the Iron Age was evolutionary rather than revolutionary.

Penbjerg South

This site (Sb 30, Lodbjerg parish) confirmed that old ploughsoils were present in the blown sand area, but very little could be learned about it with the time and methods at our disposal. It is dated by scattered Late Bronze Age pottery, but in the first years a little pottery from the end of the Pre-Roman or beginning of the Roman Iron Age was also found (Fig. 8: 1, 2, 5, 10). This appears to have been limited to a small area and may be from a pit. A few calcined fragments of sheep bones kindly identified by Knud Rosenlund were found at the same time.

The stratigraphy of a test pit dug in 1978 is shown in Fig. 7 right. Ard marks at the layer 2/3 interface showed that layer 2 was an old cultivated soil. Layer 4 was very similar in character and may have been an earlier cultivated soil, but no ard marks were detected at its base, where there was no colour change, so they would have been invisible even if ploughing had taken place. The small amount of pottery from layer

4 may from its technology be Neolithic, and could be connected with the unpublished TRB settlement site of Penbjerg only about 150 m away. The small stones in the plough layers must have resulted from lateral transport from nearby till exposures. Layer 4 is thought to be blown sand mixed with the original weathering soil, layer 5, by bioturbation.

In 1982 a serious effort was made to trace the ploughsoil in both directions along the cliff and find how and where it ended. If the extent of cultivation were estimated from the pottery, it continued for 100-150 m, but the ploughsoil as such could not be followed nearly so far. The stratigraphy changed gradually. First the underlying paler yellow-brown sand (layer 3) wedged out, and then the homogeneous ploughsoil changed gradually without any sharp boundary to a streaky deposit, which still contained pottery and a little charcoal, but it seemed could never have been cultivated without destroying its streaky character.

A section through this recorded further north and four years later is given in Fig. 7 left. The upper layer (1) is the same in both profiles, but under it the north profile shows a streaky deposit (layer 7) of pale sand alternating with dark, strongly peaty sand. Clearly a deposit like this cannot have been ploughed, which would disturb the lamination. Below this came brown silty sand with many small stones (layer 8), which was the equivalent of layer 4 in the other section. The old soil on the glacial deposit, layer 5, is the same in both profiles.

In 1990 a new test pit was dug and samples taken for possible archaeobotanical study. It is felt that with more work in the field and laboratory it could still be possible to solve the riddle of this site. It must represent an inhabited cultivation area like Stenbjerg north or the "Summerhouse site", but we have not yet found a place where the house(s) stood and the archaeological material is rich.

Pottery: Only 188 sherds with a combined weight of 1.45 kg were recovered. Fig. 8: 2 and 5, are small rim sherds, which are noticeably thickened by the addition of clay on the inner lip. Fig. 8: 10 has a sharp angle inside the rim showing it had been broadly faceted in the late Pre-Roman manner. Fig. 8: 1 is a well made handle of oval section, which widens towards the ends. Facetted rims and handles of this type are

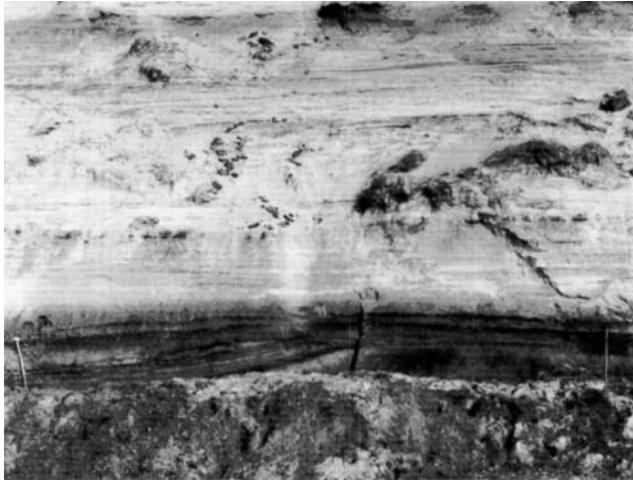


Fig. 9. "Middle" site Occurrence B during excavation, showing stratigraphy.

typical of the end of the Pre-Roman Iron Age, and the finds also include some dense blackish body sherds which are probably of the same age. Harald Holm found this material in 1973-76. Iron Age sherds have not otherwise been found at Penbjerg South.

The rest of the test pits and sections produced Late Bronze Age wares. Fig. 8: 4 and 9 are lipped, slightly thickened rims, while Fig. 8: 3, 11 have a very marked internal facet and 6 has a slighter facet. These are rim features found at Stenbjerg North, whose dating must also apply here, but not necessarily to the extent that the two sites were in use simultaneously.

The "Middle" site

This name was given to a complex of settlements situated midway between Bodbjerg and Penbjerg (Sb 33 of Lodbjerg parish). The site was found by Harald Holm in 1976, and in the same year the National Museum excavated sections through two find concentrations, one Late Neolithic (Occurrence A), and about 100 meters south of it another from the Younger Bronze Age (Occurrence B). As coastal erosion progressed inland of where Occurrence A had been, Occurrence C appeared and was excavated in 1982. The excavations at the "Middle" site showed that set-



Fig. 10. Ard marks at "Middle" site.

tlements in blown sand could be on a considerable scale when measured in postholes and broken pottery. There was also yet another plough layer, but many questions about it remained unanswered.

The stratigraphical situation at Occurrence B in 1976 is shown in Fig. 9. Inclining dark and lighter sand layers slope down to the left, and on the right have been cut off by erosion from above. This is where the actual settlement may have been located. The sloping layers contained a considerable amount of pottery, but were low and wet. A trial pit cut somewhere near by in 1978 also struck much pottery, and sherds continued to be found in the vicinity until 1980 and 1981, but not later, and the site is certainly now washed away. Charcoal from Occurrence B has been C-14 dated (K-3275: 3140 ± 80 bp).

A curious feature in the find layer was wads of unburnt clay with sand in it, the largest piece measuring 30 cm across. This may have been raw material for pottery, but the mixture seems somewhat different that seen in the sherds, and it may have had some other use.

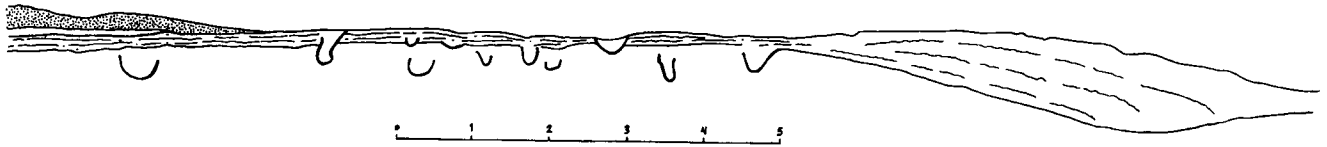


Fig. 11. Section through "Middle" Site Occurrence C

When Occurrence A was excavated in 1980 a fine example of a plough layer with ard marks at the base was discovered and photographed (fig. 10). Unfortunately it could not be related to the stratigraphy in the main part of the excavation because there was a large sand slip between. The sherds in the ploughsoil were Late Neolithic in technology, but so were those in the underlying blown sand, which implied that the sherds in the ploughsoil were ploughed up from below. Conditions are quite compatible with the plough layer having been part of Occurrence C, which was found later, but it has never been possible to obtain proof or find the plough layer again.

In 1982 it became plain that important new Bronze Age material was being washed out, and it was given the name Occurrence C. As the cliff was very high and steep it was impossible to excavate much horizontal surface, but a continuous section 19 m long was cleared. This was not the entire length of the find-bearing strata, and it is estimated from miscellaneous diggings that at that time Bronze Age pottery could be found continuously along around 30 m of the cliff.

The section could not be cut vertically in the normal way because this could have provoked a landslip, and therefore it was cleaned and recorded sloping. The effect of this was that only the bases of the outer postholes appeared in the "section", and only the upper parts of the inner postholes.

As well as postholes, the section (Fig. 11) showed a 15-20 cm deep occupation layer deepening southwards into a deep midden filling up a pre-existing natural hollow. In the northern 2-3 m of the drawn section there was a separate upper occupation layer separated from the main occupation layer by a lens of clean sand. This upper occupation layer is a stratigraphically distinct unit, but the small amount of pottery recovered from it is not typologically distinct from the rest of the material. The section is consider-

ably simplified compared with the field drawings. The upper occupation layer was a single black deposit, but the main occupation layer was streaky with many thin yellow, grey and blackish streaks, while the stratification of the deep midden was diffuse. Charcoal from the bottom of the midden has been C-14 dated (K4048: 2760 ± 75 bp).

The postholes were concentrated around the middle of the section. Their close spacing suggests that there was not one, but a number of successive structures but nothing can be said about building plans with the available information, and many details of the site are unclear. The amount of pottery found in this small excavation shows that the total amount at the site must have been large. From this and the postholes, which are so closely spaced that they must represent two or more building phases, it can be deduced that the settlement lasted a long time, but unlike Stenbjerg North and the "Summerhouse Site" it was not ploughed over after abandonment.

It is important to note that the settlement here was not only fairly prolonged, but was also extensive. Pottery was found not only at Occurrences B and C, but also in small quantity north of Occurrence C, including some by a hearth some scores of meters away, and also in low-lying strata south of Occurrence B. It seems likely that the area with direct settlement traces in the form of pottery was at least 200 m across. Animal bone was not preserved, but animal teeth sometimes survived in a decayed condition. As cattle, pig, and horse teeth were represented it may be concluded that the inhabitants practised a varied animal husbandry. The same is probably true of the other sites.

Pottery: The amount recovered from Occurrence B was fairly moderate (505 sherds weighing together 4.85 kg). Some were large, and substantial parts of pots, including one complete profile, could be reconstructed. The clay was for the most part abundantly gritted

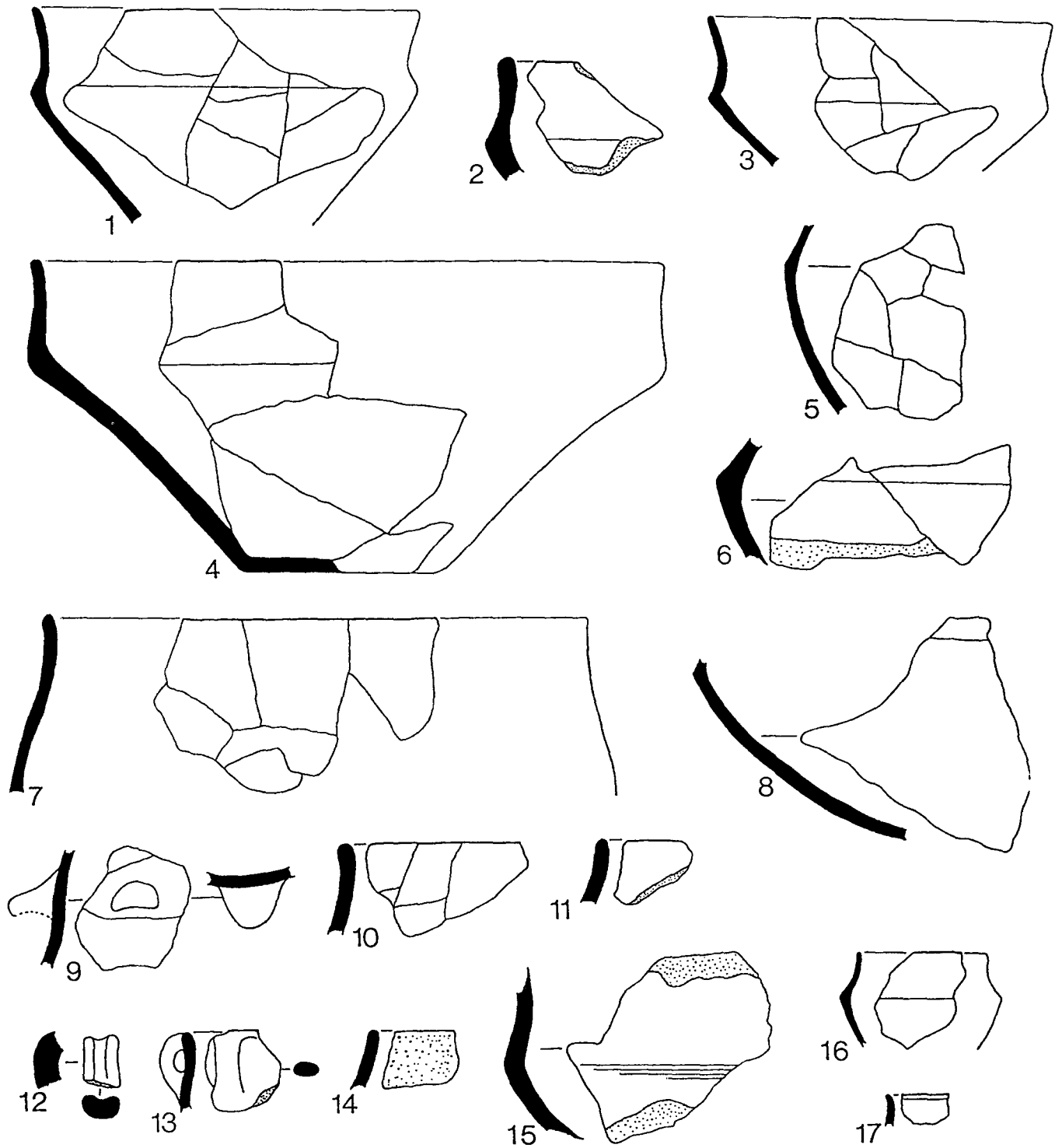


Fig. 12. Pottery from "Middle" site Occurrence B. Scale 1:3.

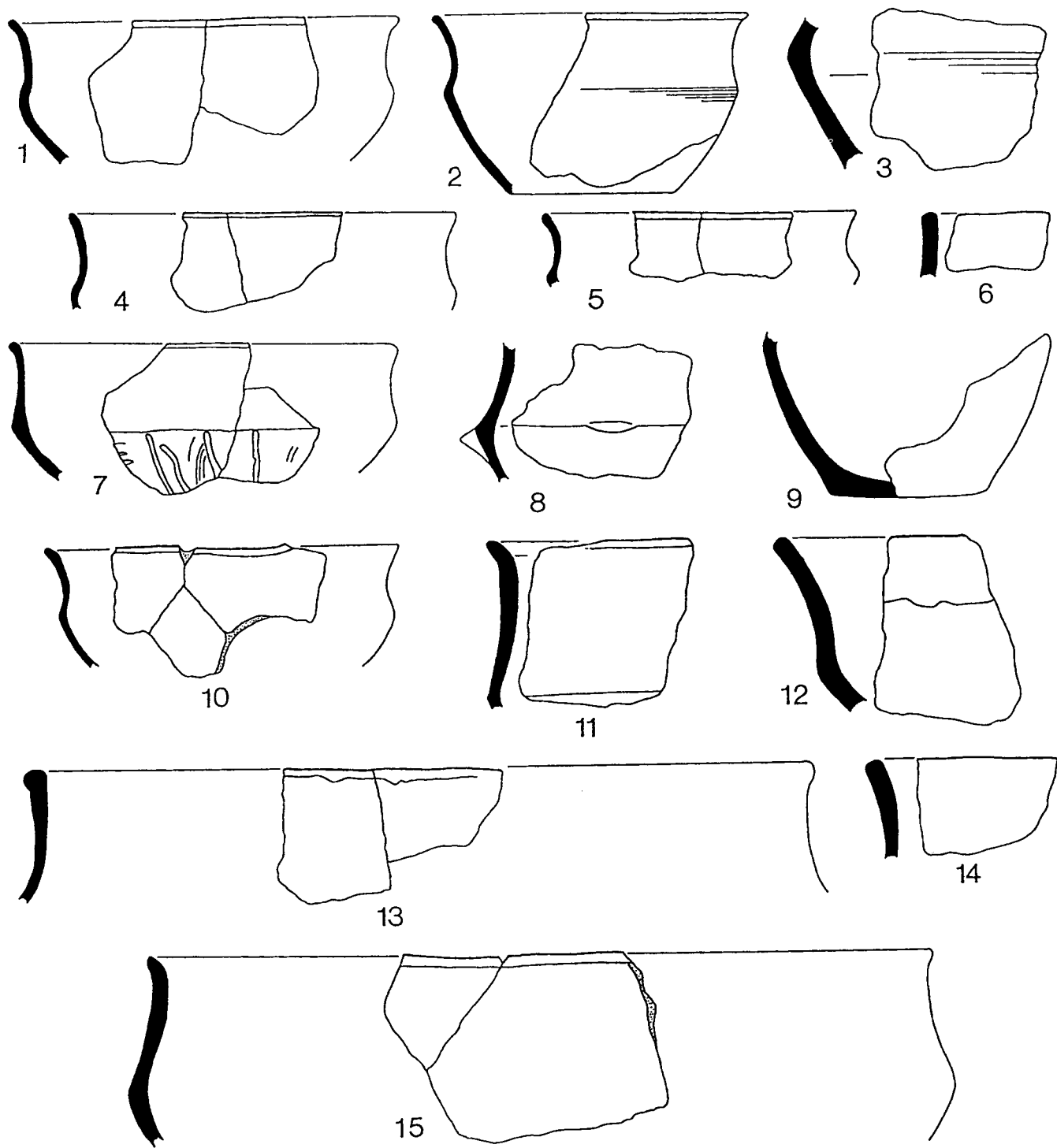


Fig. 13. Pottery from "Middle" site Occurrence C. Scale 1:3.

with rounded sand grains, but angular grains occurred also. Surfaces were fairly smooth. Firing tended to produce a fairly hard, dark brownish black ware.

Bowls and jars were almost the only forms present, with bowls considerably outnumbering jars. They were of the sharply carinated form (Fig. 12: 1, 3 and 6), or had slightly more rounded carination (Fig. 12: 2, 4 and 15), and some had markedly concave necks (Fig. 12: 1-3). Fig. 12: 4 shows a bowl with soft carination fitted continuously from rim to base.

The jars were fewer and less could be reconstructed of them. The rim sherds show an inward slope without the outcurving upper part characteristic of Bodbjerg. Fig. 12: 7 looks as though it flowed smoothly from neck to body. Fig. 12: 10-11 and 14 are further rim sherds from jars. The last is slurred externally right up to the rim.

Eight sherds were noteworthy for coming from small, thin-walled vessels of finer black ware, one of which could be reconstructed on paper as a miniature bowl (Fig. 12: 16), while the others could also have been bowls, but were slightly larger (e.g. Fig. 12: 17). Sherds of two handles (Fig. 12: 9) were found. The handles were rather thick, one with raised edges (Fig. 12: 12), the other joining the rim and shoulder of a little bowl (Fig. 12: 13). The lugs were tongue shaped (Fig. 12: 9).

Details of rim form are important. The commonest were simple rounded (Fig. 12: 3 and 11) or rounded-flattened (Fig. 12: 2 and 4). The latter is like one of the rim treatments common at Lyngby North. On the other hand the internal facet resulting from running a finger around the inside to evert the rim does not occur at all (cf. Fig. 4: 1, 3 and 6), and appears to be a later trait only.

From Occurrence C were recovered no less than 2239 sherds with a combined weight of 27.35 kg. There were many large sherds, but they did not fit as well as hoped.

The technology and typology were similar to those at Occurrence B, but there were a few differences. Bowls were commoner than jars. Nearly all were of a standard shape with concave neck and a distinct carination (Fig. 13). The ratio between width and height seems to have varied considerably. Fig. 13: 9 suggests a decidedly deep bowl, while the large vessel Fig. 13: 15 would have had much shallower proportions. Fig. 13:

12 seems unusually strongly splayed. The most typical form is represented by Fig. 13: 1-5, 7 and 10). Another variable is the sharpness of the carination, with Fig. 13: 2 and 8 at the sharp end of the range and the much more rounded Fig. 13: 1 and 15 at the blunt end. On the whole the carinations are less sharp than at Occurrence B, and the necks less concave.

Jar rims are recognisable from their inward slope, but important features of jar form are uncertain, as there are not enough fits. Fig. 14: 2-4 and 7 can perhaps be compared with a broad category of ovoid jars with slightly upbent top of profile. The form is best seen in Fig. 20: 2 from Lyngby North and Fig. 12: 7, but it is hard to distinguish sherds of such jars from those of jars with conical inward sloping neck with out-turned rim as represented by Fig. 14: 1 (cf. Baudou's form XXVIII C 1). A more marked out-turn of the rim is seen in Fig. 14: 5, 6 and 9 which leads on to a common type at Bodbjerg (see below).

A quite different jar profile is indicated by Fig. 14: 8. The form was barrel-shaped rather than necked. In this particular case there was an offset upper part, whose smooth surface contrasted with the heavily slurried body. Fig. 14: 11, shows some resemblance to it. Bucket-shaped profiles of this or any other kind were rare at this site.

An interesting feature of the assemblage was sherds of a small number of fine, dark, miniature vessels (Fig. 14: 12-14 and 18-21). Some sherds were as thin as 4 mm. Though smoother than the other wares, they were not polished or extremely fine, and the tempering and forms were essentially like those of the larger and coarser pottery, though finer. The small angled sherds Figs. 14: 12-13 must be from small carinated bowls. The rims Fig. 14: 18 and 20, as well as a few others, could also have come from such bowls. Miniature vessels of other shapes are already indicated by Fig. 14: 19 and 23, of which the latter was an unusual barrel shaped miniature and the former perhaps the same. The rims of the fine black ware were treated the same way as those of the material as a whole. We may therefore suppose that these small, thin-walled vessels were made locally or at any rate in the region. Their function is a little unclear as they seem too few and often too small to be a better class eating ware, and Fig. 14: 23 had been used for cooking as there are patches of burnt crust on its inner surface.

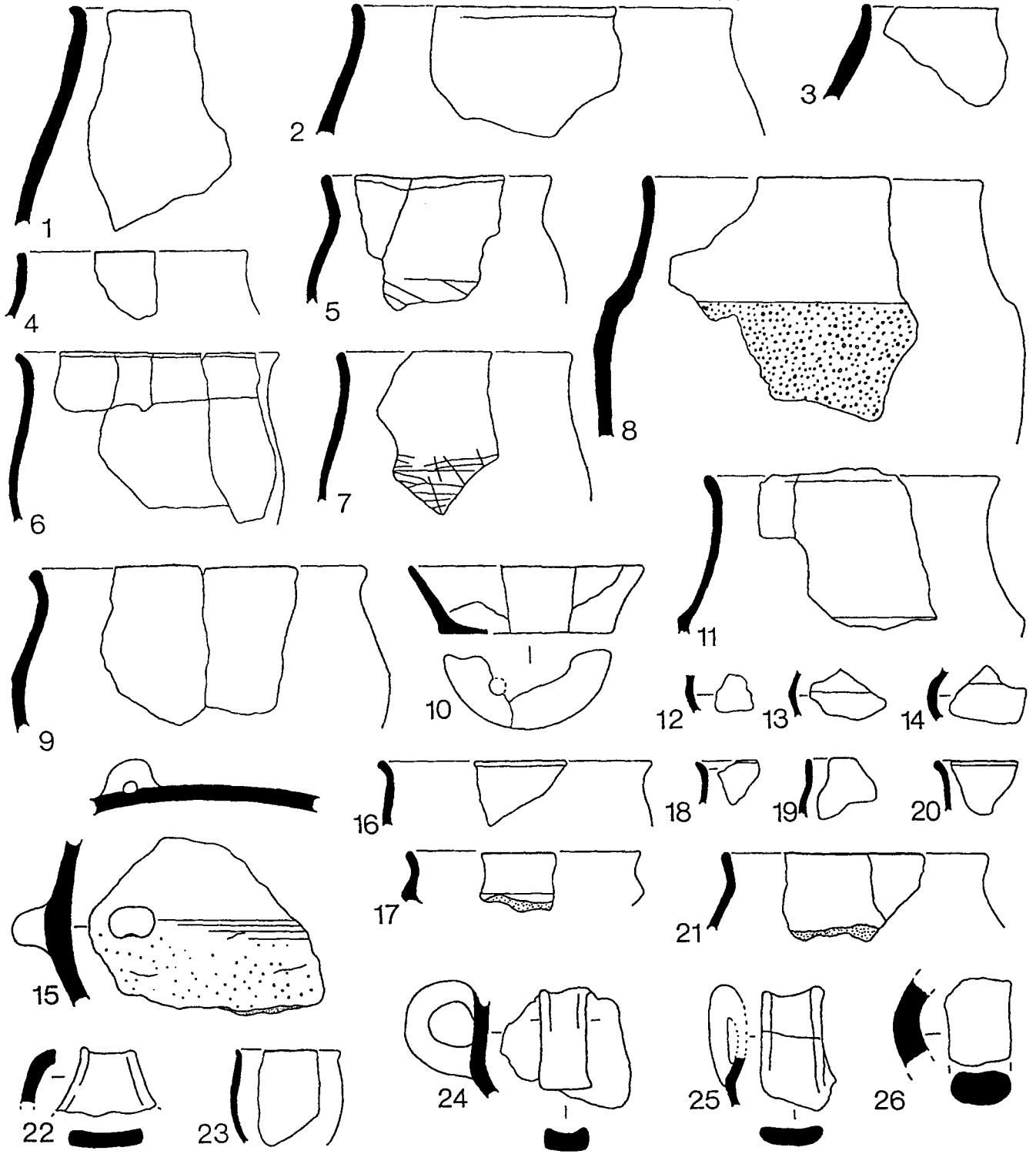


Fig. 14. Pottery from "Middle" site Occurrence C. Scale 1:3.

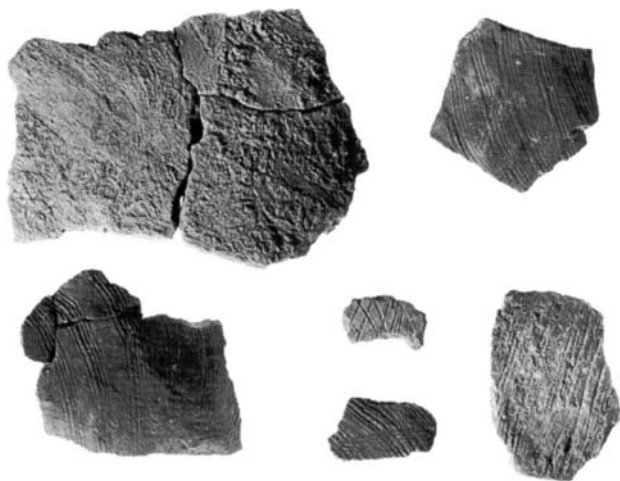


Fig. 15. Pottery decoration at "Middle" site Occurrence C.

A few bowls and jars of intermediate size and better than average technology also occur. Fig. 14: 10 was a sieve shaped as a small conical bowl with at least one hole through the bottom. Sieve sherds were not common at the "Middle" site.

A greater variety of rim shaping was present at "Middle" site C than at B. Squared off but still somewhat rounded rims, as at Occurrence B, are not uncommon (Fig. 13: 1 and 13; Fig. 14: 5, 7, 9 and 16), and there is a variant where more has been made out of the flat rim by making it really flat and more sharply set off from the sides of the pot (Fig. 13: 12 and 14). Simple rounded rims are also present (Fig. 13: 2 and 7; Fig. 14: 2 and 8). These tend to protrude slightly on the outer side without really being thickened. Attention may be called to the rims that have been shaped by running a finger around inside, thereby pressing them out a little and causing a facet (Fig. 13: 4, 10, 11 and 15; Fig. 14: 6). The facet can be rather distinct (Fig. 13: 4 and 15) or suppressed (Fig. 13: 11). It is a characteristic feature of pottery from much of the Late Bronze Age.

There are a small number of handles. Fig. 14: 25 shows a strap handle with raised edges and 'horned' top joining the rim and shoulder of a bowl. It is especially characteristic for having been pressed inwards when the clay was still wet. There is a parallel from Fragtrup (Draiby 1985, Pl. V, 1-2). The others are flat handles with raised edges (Fig. 14: 22, 24, of which 22

widens strongly towards the ends), and a thick handle (Fig. 14: 26). Lugs were not common. The only ones were Fig. 13: 8, a very small lug placed on a sharp carination, and Fig. 14: 15, a vertically perforate lug at the widest diameter of a pot with slurried lower part.

Decoration is very rough and not common, and has more the character of a surface-covering roughening than an embellishment underlain by even simple geometric ideas. We find surface-covering scoring with a narrow comb-like implement with multiple points (like Fig. 21), and rough parallel or cross-hatching applied with a single point (Fig. 14: 5 and 7; Fig. 15), or with a blunter implement (Fig. 13: 7).

The small typological difference between the pottery from Occurrences B and C was not recognised until the ceramics were studied in detail for publication. The technology is similar and both assemblages are dominated by a very characteristic form of carinated bowl, which unites the two sites in contrast with the others. However the carinations at Occurrence B show a tendency to be sharper and the necks to be more concave, while faceting of the inside of the rim was common at Occurrence C but absent at Occurrence B. Though some of the details can be a question of representativity, there are so many differences that the two middens can hardly be exactly contemporary. The radiometric datings however suggest a much larger age difference than is believable.

Bodsbjerg

At this site (Sb 32, Lodbjerg parish) settlement may well have lasted as long as at Stenbjerg North or the "Middle" site, if we may judge from the depth of the midden and the presence of postholes, but the evidence was not so clear. The extent of the surrounding area with scattered pottery supported that it had a surrounding territory as at those sites. Unfortunately Bodsbjerg cast no further light on agricultural practices.

The Younger Bronze Age midden at this locality was discovered in 1976 and excavated on various occasions until 1990 as the cliff retreated. It is not known how many meters of land were washed away, as all markers disappeared. The Bronze Age material came

from a midden built up of many greyer, browner, and paler lenses, containing a good deal of pottery that fitted relatively well. The thickness of the midden as exposed in 1978 was 40 cm, but in 1982 the thickness was about a meter. It showed in 1976 as a deposit thrown down a northward facing slope, but in 1982 as one thrown down a southward facing slope. In 1978 two postholes were observed. Charcoal from the bottom of the midden was C-14 dated (K-3535: 2590 ± 125).

It was naturally wished to follow the horizon out to the sides, especially in hope of finding traces of cultivation. However it was found that it could not be followed northwards at all because the surface had been deeply denuded by a recent blowout, but a few sherds found at the bottom of the blowout implied that traces of occupation had originally continued northwards. In 1982 an attempt was made to follow the horizon southwards, but the first 6 m were blocked by a sand-slip, and beyond that the occupation horizon was picked up again only in an inconclusive way.

A further attempt was made in 1990, but by that time funding was very short and the investigation had to be carried out in a great hurry and yielded little new information. The result is that we have a site with a good collection of pottery, some interesting archaeobotanical samples it has not been possible to have identified, some detailed stratigraphy of no value, but very little other information.

In 1967 an occurrence of pottery was investigated about 150 m away to the NE. Some of it was sand-blasted and lay on the bottom of old blowouts. It could not be dated more closely than to the Bronze Age, but could well be from the same period as the midden. On the other hand some sherds acquired in 1967 from a local informant could from their appearance have come from the midden itself, when this was earlier accessible in a blowout. In 1976 Harald Holm found some coarsely decorated sherds rather like those from the settlement about 50 m to the south. Thus there are various indications of settlement in the territory around the midden, and there is no reason why the territory should not have been as big as at the "Middle" site. In 1986 many carbonized seeds and grains were sieved out of the occupation layer by the Hirsch family and the author.

Pottery: This was more interesting. About 726 sherds were uncovered with a total weight of 16.5 kg. The sherds were on the whole large, and many fitted together giving substantial parts of relatively many profiles. The temper consisted of quartz sand with occasional mica suggesting the grit had been processed from granite. The temper and clay had not been very thoroughly mixed and little concentrations of grits could be observed in the biscuit. Firing however was hard, and the material seemed to lack nothing in utility.

The pottery was dominated by the larger "kitchen" wares, which had often been thrown into the midden in large connected pieces, but there were sherds of both small and middle-sized vessels of rather better, smooth, evenly dark ware, so the importance of the large, coarse wares should not be stressed unduly. A primary division can be made into jars and bowls, with the jars the more numerous. Most of them were plain with no sign of either slurry or decoration. Some have burnt organic material on the outside or inside, showing they were used for cooking. The most distinctive form element is the short everted neck (Fig. 16: 4, 5; Fig. 17: 2-5). A variant with short, upturned rather than out-turned rim is also present (Fig. 16: 6 and 8; Fig. 17: 6). The conical neck is less common, but an example is illustrated as Fig. 16 9, and the same form is implied by some shoulder sherds, none of which are illustrated.

A minority of jars is of a quite different shape. They have evenly bowed sides ("barrel shaped", Fig. 16: 10) or straight sides ("bucket shaped", Fig. 16: 1, 2). They are further characterised by having a cordon, ridge, or row of impressions a few centimetres below the rim (Fig. 16: 1, 2, 3 and 7), and normally the pot exterior is smooth above but roughened by slurry below this feature (Fig. 16: 1-2), a trait which is regarded as characteristic of period VI (Jensen 1967). A variant is the division of the pot into a smooth zone a few centimetres wide below the rim while the rest of the pot is slurried, with no cordon to mark the transition (Fig. 16: 4). The very large bowl, Fig. 17: 9, shows that the motif of a slurried body with smooth zone under the rim can also occur on bowls.

The form with short everted rim continued and became more universal in the earliest Iron Age (Beck-

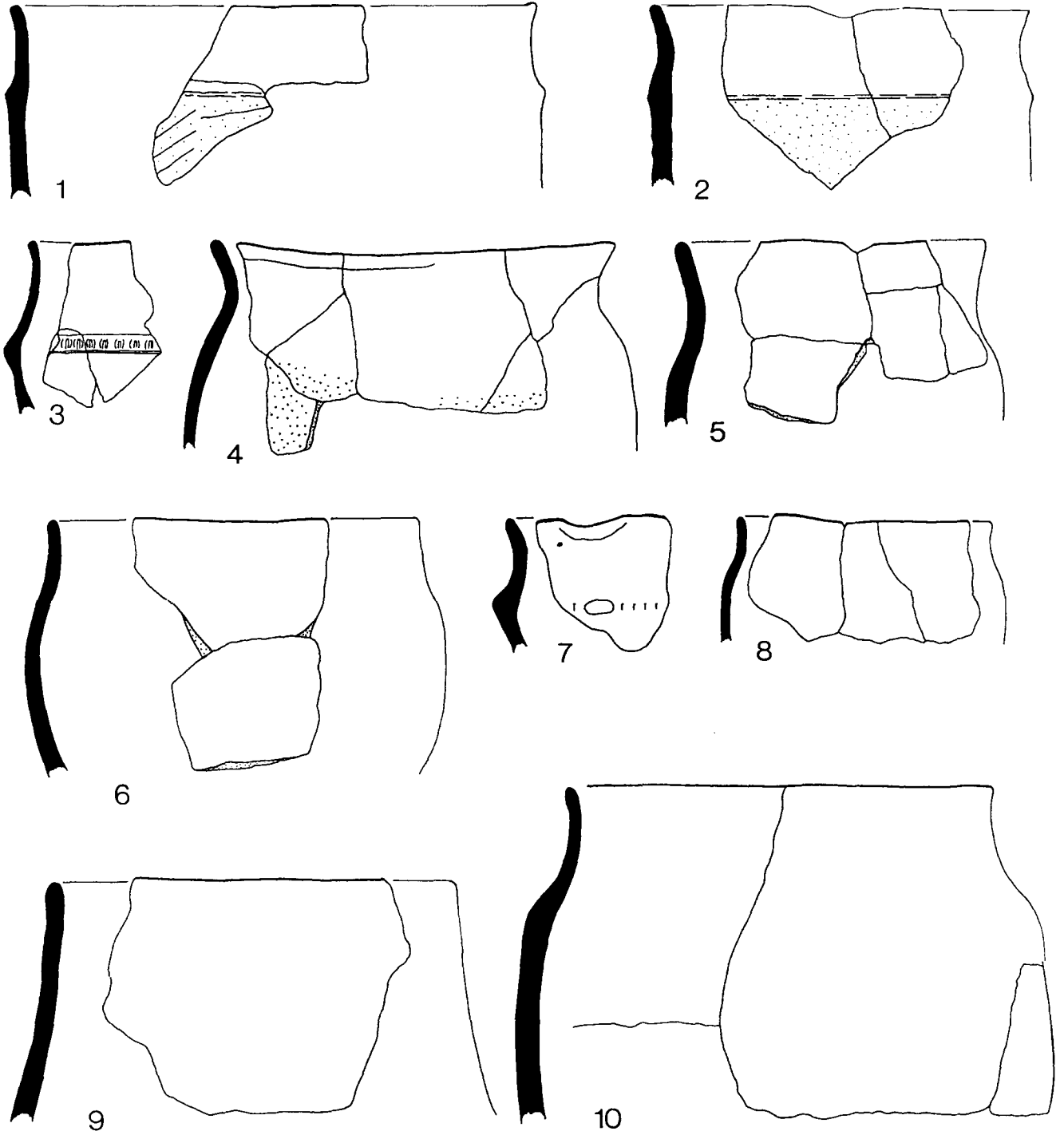


Fig. 16. Pottery from Bodbjerg. Scale 1:3.

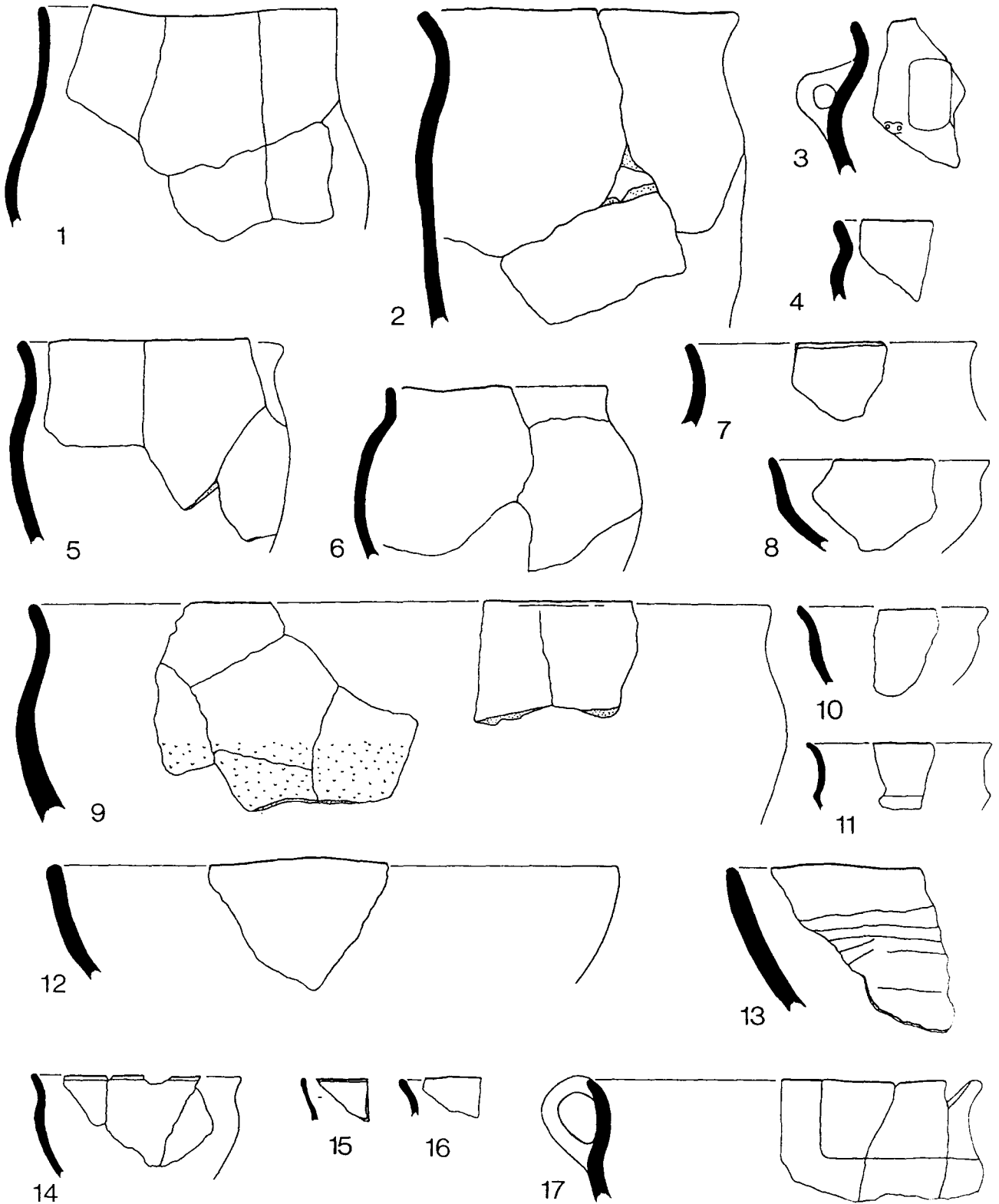


Fig. 17. Pottery from Bodbjerg. Scale 1:3.

er 1961). Fig. 17: 3, for instance, with its short everted neck and shoulder with parallel-sided handle would be quite at home at the beginning of the Iron Age.

The bowls were fewer than the jars. They are more varied in form than at the earlier sites in the dunes, and can be regarded as falling into the three subclasses of large bowls (presumably for household purposes), better bowls with concave neck bridged by a handle joining the rim to the shoulder, and small, usually fine bowls which it can be conjectured were intended for dipping into the common platter and eating from. Of the large housekeeping bowls, Fig. 17: 9 was of very thick ware and had a rounded shoulder below which it was slurried, while Fig. 17: 12-13 were wide open bowls with simple convex sides, the second with coarse, horizontal finger fluting on the body. Fig. 17: 17 represents the second subclass.

The small possibly eating bowls are represented by Fig. 17: 8, 10, 11 and 14-16, some of which are of very thin, black ware. Fig. 17: 11 is carinated as at the "Middle" site, but the others have only unemphatic shoulders.

Lugs appear as Fig. 16: 7 and handles as Fig. 17: 3 and 17, but were decidedly uncommon.

The rims were usually rounded (Fig. 16: 9-10; Fig. 17: 9-11), but the rounded flattened form also occurs (Fig. 17: 2 and 7). The rim with internal facet made by smoothing with a finger does not occur at all, and the rounded rims do not give the same impression of being a thickened lip that they do at the "Middle" site. Decoration is somewhat commoner than at the other sites, but is still not common. It is confined to surface-covering scraping, fluting, or brushing (Fig. 18) except when a cordon or ridge is notched as in Fig. 16: 3 and 7. Slurry is also present, which is another form of surface roughening decoration.

Lyngby North

In 1973 and succeeding years pottery was found by the Hirsch family at odd places along a 400 m stretch of coast, north of Lyngby (Sb 84, Hvidbjerg parish). The richest site was the northerly one given the name Lyngby North. The area has the special interest that the finds appear to be from a little-known phase of the Early Bronze Age.

The best finds were made before contact was established with the National Museum, and included part of a flint dagger blade and a flat-flaked arrowhead (Fig. 22), which are important as dating indicators, and some pottery beautifully fitted together by the finders.

In 1978 and some years preceding the main occurrence was accessible at two points about 35 m apart. Conditions are documented by the photograph, Fig. 19, which shows a section through the find layer in 1978. There was a thin, somewhat streaky layer which contained occasional pieces of charcoal, stones (usually burnt), irregular small flint flakes, and pottery.

At the other exposure 35 m further south the layer had much the same character, but was in the process of being eroded from above by the wind.

There were signs that the total settlement area was much larger than the part of it most of the finds came from. Small amounts of pottery that appear to be from the Early Bronze Age were found by the Hirsch family at various places south of Lyngby North, the remotest being about 400 m away (Sb 86, 87 and 88 of Hvidbjerg parish). Early Bronze Age material has not been observed anywhere else along the 12.5 km cliff in the investigation.

Pottery: There were recovered 512 sherds with a combined weight of 2.5 kg. Compared with the Late Bronze Age material the technology differed in that the grits were more irregular in size and distribution and were angular pieces of quartz and/or flint with very little mica. A few of the largest grits were as much as 5 mm across. There was probably also organic temper. With exceptions the ware was rather softly fired and the surface was often rather poorly smoothed. In form, colour, firing, and smoothness this material called to mind Late Bronze Age much more than earlier Late Neolithic and earliest Bronze Age ceramics.

As most of the sherds were small and could not be fitted, our knowledge of the forms is very limited. The impression is that average pot size was smaller than at the Late Bronze Age sites, but large pots did exist, as shown by the thickness and curvature of some of the unillustrated body sherds. Bowls and jars were both present. Fig. 20: 2 was a small ovoid jar with slightly upbent mouth, and Fig. 20: 1 was a small, soft-profiled, necked bowl. Other sherds show that handles



Fig. 18. Pottery decoration at Bodbjerg.

on inward-sloping necks were not uncommon (Fig. 20: 3, 4 and 6), but complete neck profiles were not preserved. The handles were parallel-sided with raised edges, like those in use later in the Bronze Age.

There is fuller information about rim treatment. The top centimetre or two of most pots bend outwards (Fig. 20: 8, 9-11 and 14). This part can be tapered or rounded (fig. 20: 10 and 12), but is most commonly squared off in a blunt way (Fig. 20: 7-9 and 14), which is a characteristic potting trait in this material.

More unusual finds were the straight-walled jar or bowl (Fig. 20: 13) and Fig. 20: 12, which recalls a common rim form from the end of the Neolithic and the earliest Bronze Age (Rasmussen 1993, Fig. 28, 30), from which it differs however in its smooth surface and relatively fine ware.

A little crude decoration is present (Fig. 21), respectively swept with a brush and with a comb-like implement. Both sherds were found at an early stage of the investigations and are not paralleled in later finds. Fig. 20: 15 and 16 recall fine decorated pottery from period V, but at the same time their ware, and especially colour, fits in well with the rest of the material from Stenbjerg North so it is unsure whether they represent later pottery or not. A little period V pottery was found a few hundred meters to the south, so

we cannot with our present knowledge exclude that these sherds could be some kind of contamination.

Other finds: The early date of this site is confirmed by the association with a flat-flaked arrowhead and a flint dagger blade. The arrowhead (Fig. 22 right) was leaf-shaped with a small semicircular notch at the base, but is damaged. The dagger blade (Fig. 22 left) is not type determinate. Flat flaked flint artifacts continue to occur until the end of Bronze Age Period II according to Rasmussen (1993), or into Period III according to Rønne (1989).

The material included also a small deposit of carbonized cereal grains recovered by the Hirsch family and identified by G. Jørgensen as six-rowed barley, indeterminate as to whether naked or hulled. In 1978 a glass bead with large hole (Fig. 20: 17) was picked up where it was weathering out of the occupation horizon. It was 7 mm in diameter and 6 mm long of matt, translucent, bottle-green glass. Unfortunately it is not much help for dating, as glass beads occur sporadically in Denmark through most of the Bronze Age (Thrane 1963, list note 29; Jensen 1965, 70-71). However Late Bronze Age beads are usually opaque and often cobalt blue, which gives some marginal support to an Early Bronze Age dating.

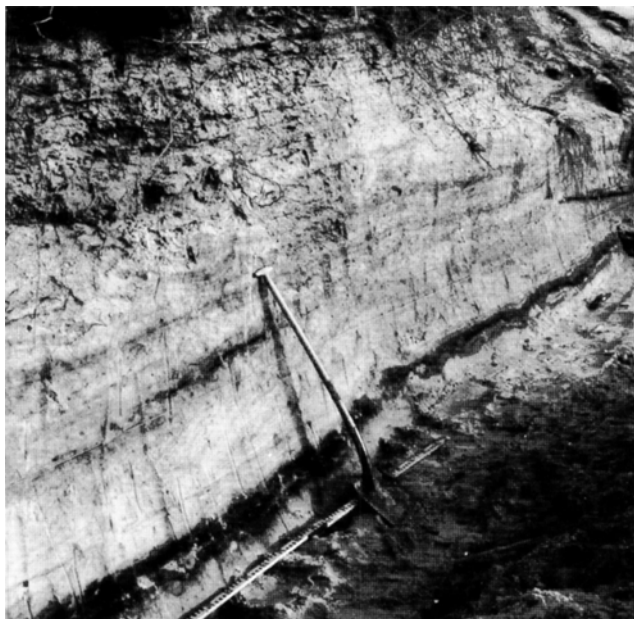


Fig. 19. View of the find layer at Lyngby North, 1978.

Fig. 20: 18 is a strange chalk pendant or amulet with grooved point which could have been meant to take a suspension cord.

Other sites

The realization that even the smallest sign of human activity was important for understanding the pattern of land use only came at a late stage of the investigation. Three minor sites have been omitted from the above survey. One was wind-blasted sherds from a re-filled blowout found by the author, another was pottery found by Klaus Hirsch at a place that could not be relocated for closer study (it may have been buried by moving sand), and the last was a site discovered by Kersten Hirsch and later excavated for a few hours, showing that it was connected with a small undisturbed part of a well-consolidated original surface. These three sites all show localised small-scale settlement, but their close dating is problematical because the pottery seems to have been lost in the changes taking place at the National Museum. It was however identified as Bronze Age when it was found.

RESULTS

Development of pottery

One of the uses of the investigations has been the study it made possible of the changes in domestic pottery over seven or eight centuries in a small area, perhaps all of it made by the same local community. In Bronze Age Denmark pottery style seems to have been a matter of habit more than of deliberate choice, and was not used to emphasise cultural identity or show awareness of the passage of time as much as in some other periods. The result is that the pottery of different parts of the Bronze Age is rather much alike, and the features, which make chronological differentiation possible, are not particularly obvious, though they do exist. It should be added that our sequence is local or possibly regional, and without further study it would not be possible to say which features were of supra-regional importance for dating.

The Bronze Age began with very coarse ceramics in Egehøj style, representing the nadir of Danish pre-historic potting. This style is represented in the dune transect at a site at Gjævhul, which will be dealt with elsewhere.

Some time in the Older Bronze Age a revolution took place in potting style and technology, and a new kind of pottery appeared. The Late Neolithic "beaker" and "bucket" tradition and fondness for cordons under the rim gave way to a style characterized by a more varied repertory of jars and bowls, which were more carefully shaped out of better prepared clay.

An early stage of the new style is seen at the site Lyngby North. One of the characteristic features was a fondness for flowing forms. The profiles recall shapes found in dated EBA contexts at Ordrup in NW Zealand (Rønne 1989, Fig.2: 1, 3, 4), and Lusehøj on Funen (Thrane 1964, Figs. 55f, 61c, 64a). Some of the features characterizing LBA pottery begin here, like the unartistic roughening of the surface by stroking, brushing, scraping etc. seen in Fig. 23. In M. Rasmussen's dating system for pottery of the Early Bronze Age (1993) Stenbjerg North would be placed in phase 4, the Oxholm phase, but it is difficult to make satisfactory comparisons so long as no Oxholm site is properly illustrated. This change in potting may well have

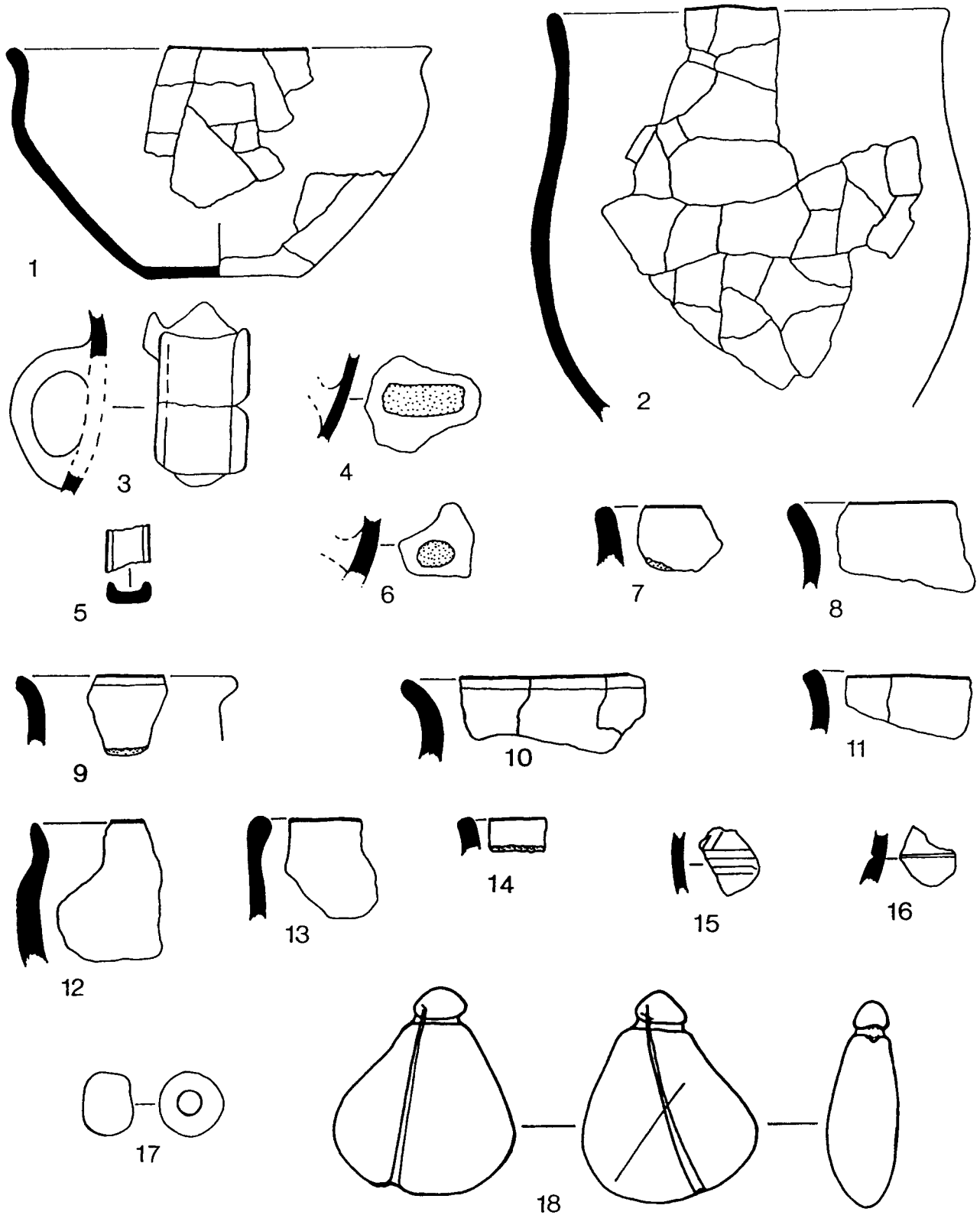


Fig. 20. Pottery from Lyngby North. 1-16 scale 1:3; 17-18 natural size.

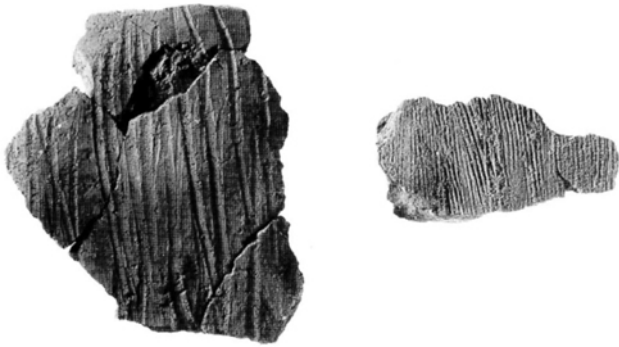


Fig. 21. Pottery decoration at Lyngby North.



Fig. 22. Flint arrowhead and part of dagger from Lyngby North.

signalled a profounder realignment of society at this stage (see Vandkilde 1996, *passim*).

Period IV is represented in our material by the "Middle" site, where two large similar but not identi-

cal assemblages were found. It is difficult to accept the radiometric datings, which separate the two occurrences far too much for two sites with such similar pottery. Bowls were more numerous than jars, and had as most characteristic feature a sharp carination recalling that of the so called "bicone" urns. Fine ware makes its first appearance at this stage. It took the form of small, thin-walled vessels of smooth blackish ware and was not at all common. Jørgen Jensen (1966) has shown that the carinated form was particularly characteristic of Period IV.

Chronologically the next settlement was the one called Stenbjerg North, which may be assigned to Period V. The fine blackish ware continued, but a second fine ware was added in the form of somewhat larger bowls of a fine brown ware with a characteristic decoration of neatly incised horizontal lines and chevrons. Similar fine decorated ware was found in period V contexts at Fragtrup in Jutland and Voldtofte on Funen. (Draiby 1985, Pl. III, 1,2,4,5; Jensen 1967, Fig. 5, 1,3,4), which date it. Fine black ware was in use throughout the LBA, but the fine, incised, brown ware in our material occurs only at Stenbjerg North. At this site, in contrast to the "Middle" site jars were commoner than bowls, but the question whether this was a general stylistic trait or only showed that different economic activities were carried out at the sites in question must remain open. The jars often had conical necks, sometimes tall ones. A common way of smoothing the rim resulted in an internal facet, and a certain tendency to thicken the rim is also met at this stage.

The next stage, represented by the midden at Bodbjerg, can be assigned to Period VI. It is found that the internally faceted rim has been abandoned and there is now a stronger tendency to evert the rim; as this trait cannot easily be combined with the conical neck, the latter fell increasingly out of fashion. The range of forms became more varied, with new kinds of bowls not seen earlier, but not the carinated Period IV form. There are now new bucket and barrel shaped forms, some with a cordon a few centimetres below the rim separating a roughed body from a smooth rim. This is a characteristic trait of period VI pottery (Jensen 1967).

The everted rim led on to the pottery of the Pre-Roman Iron Age, when a curved profile with outbent

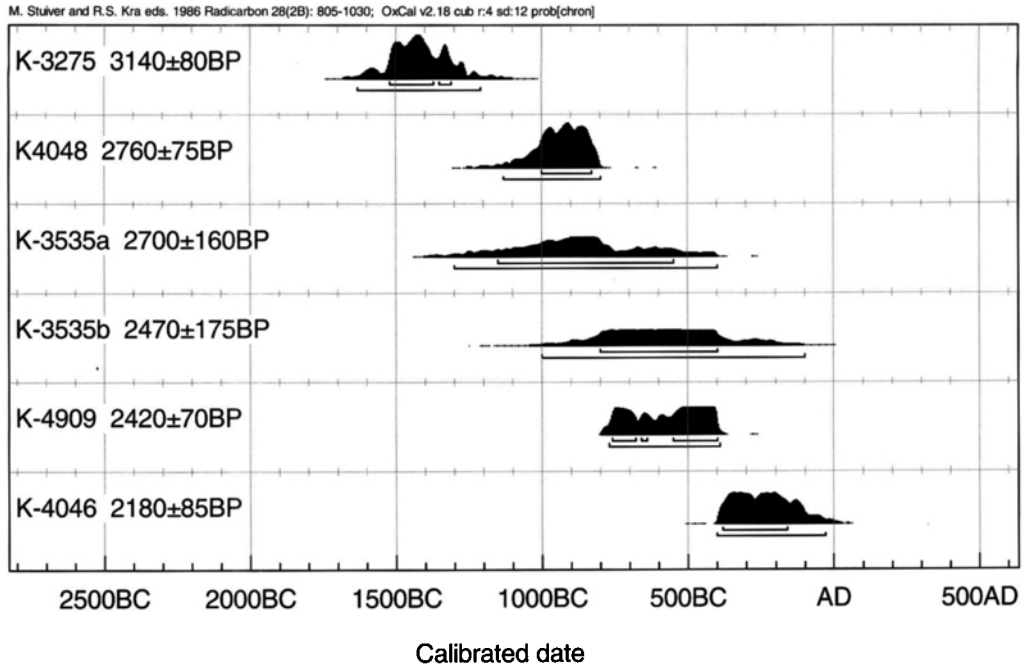


Fig. 23. Overview of relevant radiocarbon dates calibrated as probability areas according to Stuiver *et al.* (1993) using the OxCal calibration program. K-3275 = "Middle Site B", charcoal from midden; K-4048 = "MiddleSite C", charcoal from bottom of midden; K-3635a-b = Bodbjerg, two separate charcoal streaks at bottom of midden; K-4909 = Stenbjerg North, twigs in peat sealing plough layer; K-4046 = "Summerhouse Site", humus from uncultivated surface outside field.

or upbent rim above a now more rounded shoulder than before became almost universal. There is a continuous development in pottery style from the LBA to the early Pre-Roman Iron Age, and this suggests cultural continuity in a wider sense. The jar/bowl dichotomy continued, but the forms were more standardised in the Iron than the Bronze Age. Despite certain changes of potting technology the continuity is quite clear in the broader perspective.

It is hoped that this presentation will be of some use to practical archaeologists in the field. It is primarily a local sequence, and no doubt other regions had some individual features of their own.

Pattern of Settlement

In Denmark forty years ago Bronze Age settlements were a rarity and dwelling structures virtually unknown. This invited the hypothesis that the Bronze

Age inhabitants led a fleeting, nomadic type of existence leaving little archaeological trace except for graves and hoards. Opinions changed rapidly in the 60's when new excavation techniques began turning up post-built long houses from the Bronze Age not greatly different from those of the Iron Age, but not quite so solid and fewer in number (Becker 1968, 1972, 1980; Thrane 1985; J. Jensen 1988).

The new archaeological evidence seemed to show hamlets with the plans of several houses close together. Further research however showed that the house plans sometimes overlapped and the buildings were often consecutive rather than contemporary, so that what might at first seem to be a hamlet of several dwellings could on the sum of the evidence be seen as different constructional phases of the same isolated farmstead. Settlement was therefore stationary for even longer than at first supposed. On occasion there is evidence that different buildings stood at the same time, as at Højgård in south Jutland (Ethelberg 1987;

1993) or Vadgård South (Rasmussen 1995), but this only confirmed that Bronze Age settlement was not shifting or nomadic, but was characterised by a high degree of locational continuity.

Some interesting observations on settlement structure have been made by Mikkelsen (1996), based on a pipeline transect excavation, especially the part of it along the Ås ridge in eastern Thy, and they confirm points made earlier by the present author (see below). It was found that stretches of line with posthole structures and Bronze Age pottery alternated with longer stretches where no Bronze Age material was found at all. Mikkelsen's Fig. 3 shows four stippled areas on the Ås ridge with smallest short dimension about 150 m and largest large dimension about 500 m. The criteria allowing an area to be shown as stippled are not fully explained. We assume that they were areas in which thinly scattered Bronze Age pottery and/or postholes occurred, but it is unclear how reliably such areas could be determined in the field and by what methods. Mikkelsen suggested that each settlement lay in a larger territory measuring 1 to 1½ square km, which is described sometimes as a "resource area" and sometimes a little confusingly also as a "settlement area". These outer territories are regarded as being the grazing land of the community they surrounded and to which they presumably belonged. The inner settlement areas made up less than 10% of each total territory. Mikkelsen reports that altogether thirteen Bronze Age settlement areas were struck along the full 23 km of pipeline.

The studies along the coast also led to the conclusion that there existed areas up to a very few hundred meters across with scattered pottery, and in small parts of them house remains and abundant pottery, surrounded by much larger, archaeologically sterile "outer" territory. (Liversage *et al.* 1987, 79ff.; Liversage 1993, 31ff.). Settlement was thinner in the dune belt and the individual settlement areas in shorter use than on the Ås Ridge, but in both areas the overall land use pattern was the same. There were inner territories, which were directly inhabited, and outer territory, which was not. Researches along the coast have given the added the information that the inner territories were ploughed and indeed kept under cultivation for periods measureable at least in decades. The outer territory must have been used for grazing, and

provided whatever other resources might be obtained from heath, rough pasture, scrub, and woodland. This model can provide a starting point for further analysis of land use in the Bronze Age.

But first it should be noted that quite different conclusions were reached by another school that tried to approach the question from the point of view of soil fertility, unfortunately without collaborating with experts in the subject. Poulsen (1980) based a model on the principle that land could not be cultivated for more than "a couple" of years without long fallow, and that Bronze Age land use was therefore extensive rather than intensive. Hedeager & Kristiansen (1988) saw the Bronze age as a long period of deterioration caused by over-cropping and over-grazing under a system of shifting clearance farming, leading to crisis and restructuring of the productive system at B.C. 500.

Unfortunately it is a basic misunderstanding that land could only be cultivated for short periods. In reality settlement areas became not depleted, but nutrient enriched, which is the reason why phosphate mapping can be one of the best ways of finding ancient settlements (Tesch 1980). Long-term continuous cropping was quite possible when properly combined with manuring. This is backed up by written historical fact. According to Christian V's tax survey (1688) a method of cultivation was practised in several parts of Denmark called *alsæde*. *Alsæde* land lay close to the villages and was cropped continuously without ever being fallowed (Begtrup 1808-12; Frandsen 1983). It was copiously manured and a certain amount of crop rotation was practised on it. In a parallel system found in parts of Holland and NW Germany the continuously cropped land close to the village was called *Esch* or *ess* and the manure is specifically described as sods that had served already as litter in the byres. Continuous cultivation of the "infield" is also recorded in Scotland, where the occasionally cultivated "outfield" and the permanently cultivated "infield" were contrasted with one another. Yet another version was Norwegian *reitbruk* (see Kulturhistorisk Leksikon for Nordisk Middelalder), which again was an agricultural system involving enclosed, continuously cropped land close to the houses in historical times. The question of soil exhaustion in archaeological context is also discussed by J. Lüning (1980), whose conclusions were similar. There is no doubt, with all re-

spect to Poulsen and Kristiansen, that continuous cropping was widely practised in our part of Europe in early times, and the recent infield systems probably had roots going far back in prehistory.

An interesting point is that when “alsæde” at the turn of the 18th and 19th centuries was ceasing to be regarded as an appropriate farming method, it was criticized not for exhausting the soil, but for encouraging excessive weed growth (Knud Aagaard 1802). The longer land remains in cultivation, the more species of weeds will establish themselves (Groenman-van Waateringe 1979), and we should seriously consider that what mobility we find in prehistoric agriculture may have been a result not of soil depletion but of fleeing from too rich a weed flora in old fields.

However manuring was certainly necessary, and there is no reason why crop rotations of various kinds could not also have been practised in combination with it, though there is no archaeological evidence. Manure must have been plentiful in the Bronze Age. The proportionally large outfield, which on pollen analytical evidence was largely deforested, implies that grazing land was plentiful and large herds of livestock could be supported. It is hard to follow Hedeager & Kristiansen’s view that manuring was something that began suddenly in the early part of the Iron Age, when the first earthfast stall partitions appear. They envisage that manure was taken manually from the byres to the fields, but this seems intrinsically unlikely, as there was a much easier way of getting it there. Furthermore the appearance of earthfast stalls in the long houses was hardly so revolutionary, for cattle can be brought indoors without stall partitions at all, or without partitions inserted deeply enough to be detected in archaeological excavations. Nor do stalls, when they do appear, really establish that full winter stalling took place, which is the supposed background for the whole theory of manual spreading. The most obvious other way to use the byre would be for bringing the stock in at night. Winter nights are long and cold, and mortality in the herd could no doubt be substantially reduced this way. The indoor wintering hypothesis was a hasty over-interpretation originated by Hatt, and a variety of objections and alternatives have been proposed by Liversage (1980, 128).

The application of manure where and when it was needed would of course be a matter of farming tech-

nology, and we may suppose that the inhabitants knew what methods were the most suitable; but cattle have only to be penned or tethered in the fields for a few hours daily and manure will appear spontaneously, so to speak, and indeed be trampled into the ground. Begtrup was concerned that manure should be ploughed in and not be allowed to *bortdunstre* on the surface! We may suppose that the stock grazed in the rough pasture and woods of the outer territory for a good part of the day, probably under surveillance, but at some point were brought into the fields or byres. As plenty of outfield grazing was available, we may suppose it was no problem to keep herds large enough to provide in this way the full amount of manure needed to keep the infield in semi-permanent use. A necessary precondition would of course be that the pastures were properly looked after and not impoverished by overgrazing.

This is another question. We may suppose the people had the knowledge necessary to maintain their grazing land; but to be able to do so society had to function well and be able to enforce the rules. Hedeager and Kristiansen’s proposed degradation of the rough pasture, if and when it came, should be seen as a socio-political rather than a purely economic or technical problem. The Bronze and Pre-Roman Iron Ages in Denmark were in reality one continuous upward trajectory of success. If there really was a crisis resulting from deterioration of the grazing and arable land along the lines proposed by these authors, it ought rather to be connected with a possible population maximum in the Roman Iron Age, when there is indeed evidence of a slow crisis with a profound restructuring of the agricultural system to follow (Liversage 1977).

In all events as far as the Bronze and pre-Roman Iron Ages are concerned the model which best suits the evidence is that long-term infield cultivation was made possible by the possession of large herds of livestock, which grazed in the outfield and brought nutrients back to the infield. The system gave a fine ecological balance and one would think could have lasted much longer. It may have been destroyed by its own success in the form of the population growth it provided the conditions for.

This brings us to a different question. It has often been observed that the houses stood in the cultivated

areas (J.Aa Jensen 1974; Draiby 1985; Boas 1993; further cases summarised by Liversage 1980, 127). We will now briefly turn our attention to the cultivated areas, but in a different perspective. The remains of prehistoric fields were once common in the Jutland heaths as systems of surviving low banks, but nearly all have by now been ploughed up. G. Hatt saved some of the last from oblivion by survey and excavation (Hatt 1949). In this country one of the most remarkable discoveries of the second half of the twentieth century has been that patterns of colour caused by the transport by the wind of dust from the fields surfaces to their surrounding hedges often survive and are visible from the air. They are apparently very resistant to destruction even by modern farming and they must be what remains of the "infields" of prehistoric times.

The history of research into prehistoric fields in Denmark after Hatt is quickly told. In 1963 N.R. Jeanson published a list of 54 sites in Himmerland (Jeanson 1963). Further studies by Newcomb increased the number in Himmerland to 480 sure and further uncertain cases of field systems (Newcomb 1971). Some more occurrences were described by Sørensen (1973), who later published a distribution map of field systems visible from the air in Vendsyssel, giving detailed plans of three of them (Sørensen 1982).

Thus the basic facts about the visibility of old field systems from the air in Himmerland and Vendsyssel have been known since 1971 and 1982 respectively, but have not been followed up (renewed interest was shown very recently by J.N. Nielsen, 1998). This contrasts with for instance Holland, where detailed maps of all the known systems were published more than twenty years ago (Brongers 1976). Considering how important field systems are for understanding settlement patterns and land use, it is astonishing that so little has been done to follow older research up. This is all the more deplorable as they are a monument type under continual threat from farming and wind erosion, and the least one could expect in a country supposedly proud of its archaeology would be that an effort was made to find out how important they are as a historical source, and how fast they are really being destroyed. One would suppose they contain an enormous potential for further insights into the development of the cultural landscape.

CHRONOLOGY

The probability areas of the six radiocarbon dates from the sites dealt with in this paper are given in Fig. 23. They show what a radiocarbon date really means and imply that a larger number of datings would be needed to give a dependable fine chronology. This is a general fact with ¹⁴C datings. Beware of short series!

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