Journal of Danish Archaeology vol. 6, 1987, pp 87 100

A Single Grave Barrow at Harreskov, Jutland

Excavation and Pollen Analysis of a Fossil Soil

by BENT VAD ODGAARD and HANS ROSTHOLM

INTRODUCTION

In the winter 1982–83 Herning Museum excavated a Single Grave barrow at Harreskov in Assing parish, Jutland (1). The burial mound was situated in a tree belt, which was to be replanted. Prior to the planting the barrow had to be excavated, as the soil would be ploughed to the depth of 60–80 cm. The archaeological investigation resulted in 3 graves from the Single Grave Culture and 1 grave from the Early Bronze Age.

Beneath the barrow was a well-preserved fossil soil, buried about 2600 B.C. A pollen analytical study of this soil has given knowledge about the environment at the time of the erection of the barrow, about the primeval forest on dry poor soil in western Jutland, and about early heathland development. This local pollen diagram forms part of an investigation of the post-glacial vegetational history of western Jutland and supplements the pollen diagram from a soil beneath a Single Grave barrow at Skarrild, 5 km SSW of Harreskov.

The excavation was carried out in December 1982 and January 1983 by Hans Rostholm, Herning Museum. On the 10th. and 11th. January 1983 samples for pollen, physical and chemical analyses were taken by Bent Vad Odgaard, Geological Survey of Denmark.

The site

Harreskov is situated in the middle of western Jutland, about 12 km SSW of Herning (fig. 1). The area is located in the southern part of the large "hill island" *Skovbjerg Bakkeø*. The last ice-cap which covered this area was the Saalian ice (last-but-one glaciation), while the Weichselian (last glaciation) ice-border remained some tens of kilometers to the east. The original Saalian topography of the area was strongly modified by erosion and solifluction during the Weichselian.

The deposits around the Harreskov barrow are mostly meltwater sand, while scattered clay and eolian sand occur. In the low lying areas freshwater sand and peat predominate (fig. 2). The eolian sand is probably of late-glacial or Subatlantic age (Milthers 1939). Inside the area within a radius of 200 m around the barrow, which probably includes the main pollen source area of the fossil soil, only meltwater sand is found. Today the area is covered by fields and plantations, but until the late 19'th century extensive heaths dominated.

The barrow is situated about 500 m from other registrated barrows. A few kilometers to the west and

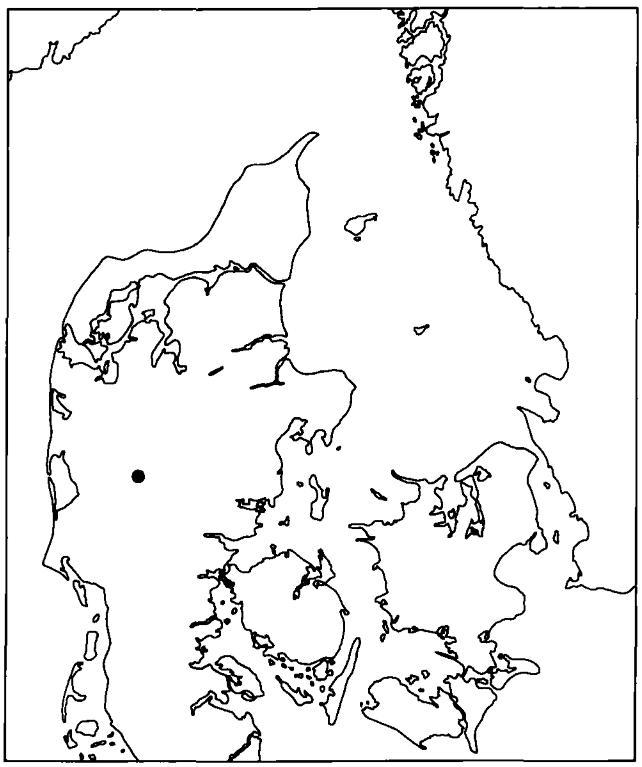

Fig. 1. The location of Harreskov.

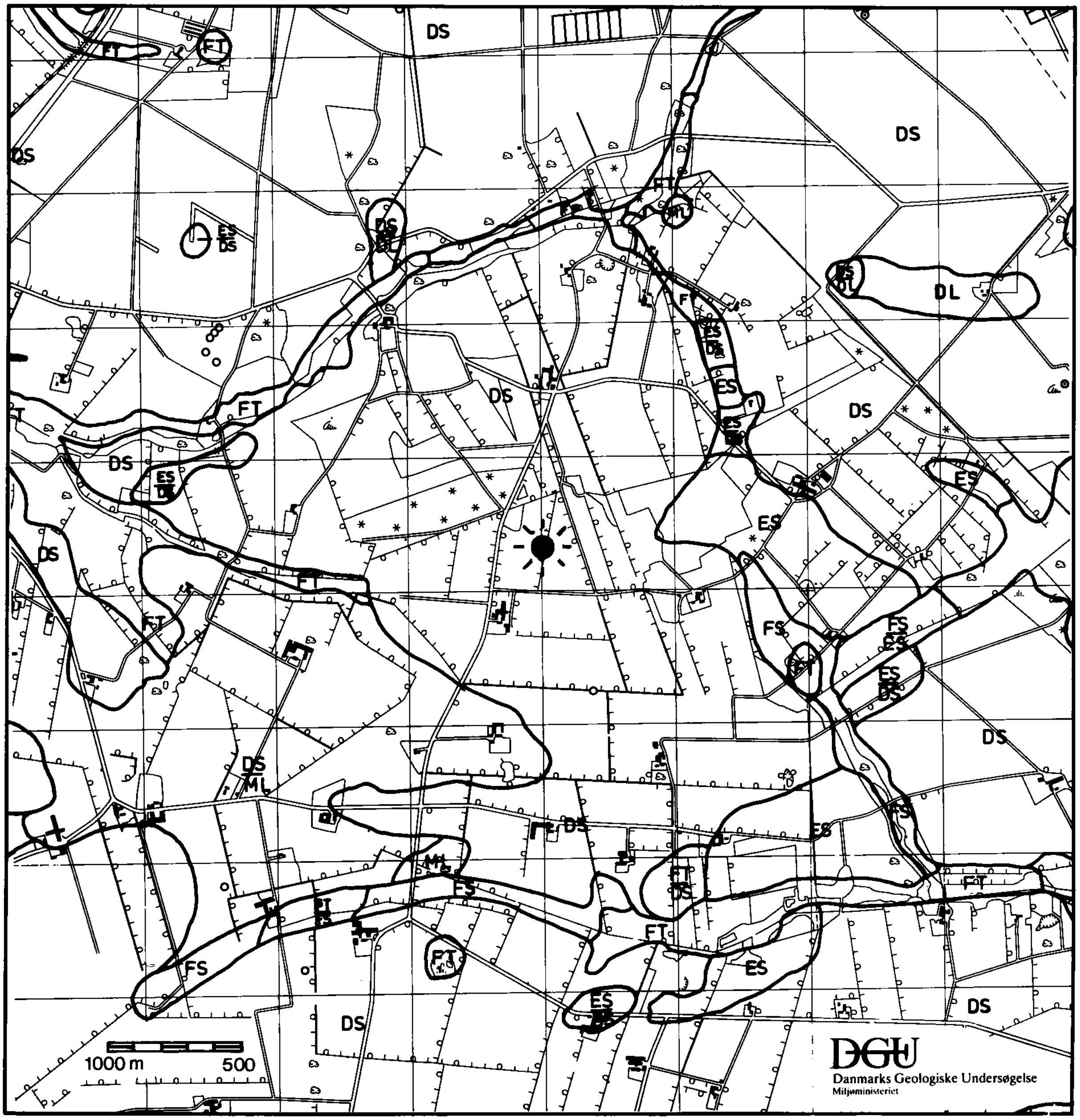

Fig. 2. Surface deposits at Harreskov. The asterisk marks the position of the investigated barrow. DL = meltwater clay, DS = meltwater sand, ES = eolian sand, FT = peat, FS = freshwater sand, ML = clayey till. Preliminary geological map produced by the Geological Survey of Denmark. Topographic map reproduced with permission from the Geodetic Institute (A. 881/71).

south-west a great number of burial mounds are known in the parishes of Assing and Skarrild. None of the burial mounds in the vicinity of the barrow in question has been excavated.

EXCAVATION

The burial mound was situated in a c. 5½ m wide tree belt, in which was left a 15 m long, 5 m wide and up to 1.6 m high barrow (fig. 3). Outside the tree belt the barrow was completely ploughed-down, but still visible as a

Fig. 3. The Harreskov Barrow seen from SSE, December 1982. The barrow lies in a tree belt, in which the trees have been felled before replanting. H. Rostholm fot.

lighter mould with an extension of approx. 4½ m and 5½ m to the west and east respectively. In the year 1894 The National Museum, Copenhagen, registrated a well-preserved barrow with a height of 1.73 m and a diameter of 17.25 m.

Most of the mound was carefully removed mechanically. No traces of graves were found in the outer part of the barrow. Therefore the excavation could be concentrated on the central area, about 5 × 4 m, and section 2 across the barrow (cf. fig. 11).

The excavation revealed 4 graves in the central area, partly overlying each other. They are named grave 73 (the oldest one), grave 16, grave 1, and grave 21 (the youngest one). The three first mentioned belong to the Single Grave Culture, and the last-named can most likely be dated to the Early Bronze Age. The plan on fig. 4 shows the excavated area, the tree belt, the barrow, the sections and the 4 graves. In the centre of the barrow was a rather new digging (No. 20), which was 140–150 cm in diameter at the top and reached to approx. 35 cm above the old soil surface (cf. fig. 5 and 10 b).

Grave 73. The earliest grave, grave 73, was placed directly upon the old soil surface. The grave fill consisted of brown or yellowish brown humic sand, dark grey humic sand, and yellow sand (fig. 10 j). This fill could be distinguished from the surrounding part of the barrow by being more mixed and by having no visible turf-structure. Furthermore the top of the old soil beneath the grave had a more uneven surface than under the rest of the barrow.

Grave 73 can be seen on plans fig. 4 and 5. The eastern end of the grave was not recognizable. The grave was approx. west-east orientated, at least 120 cm long, and 50–55 cm wide at the bottom.

In the western part of the grave, 20 cm from the end, battle-axe 75 was found (fig. 6 a). Between the battle-axe and the dark soil beneath the barrow was a c. 2 cm thick layer of the mixed grave fill mentioned above. The battle-axe lay in the direction north-south with the egg towards the north and the under side turning to the east. The battle-axe is 14.5 cm long. It belongs to Globs type H and dates the grave to the Ground Grave period of the Single Grave Culture (Glob 1945: 40f).

Grave 16 was situated approx. west-east and partly overlying the southern end of grave 73 (cf. fig. 4 and 5). The grave had a strong stone frame with external dimensions of 395 × 160 cm. The stone frame formed a 30–50 cm wide and 55–65 cm high "bank", partly with vertical sides and consisting of several stones both in the height and the width. The burial area within the stone frame was about 280 cm long and 60–100 cm wide. Leaning against the inner side of the stone frame was a sunk layer of small broken stones from grave 1. This layer also covered the bottom in the most of the grave.

Grave 16 can be seen on the plans fig. 4 and 5 and in section 2 (fig. 10 i). The lower part of the stone frame is

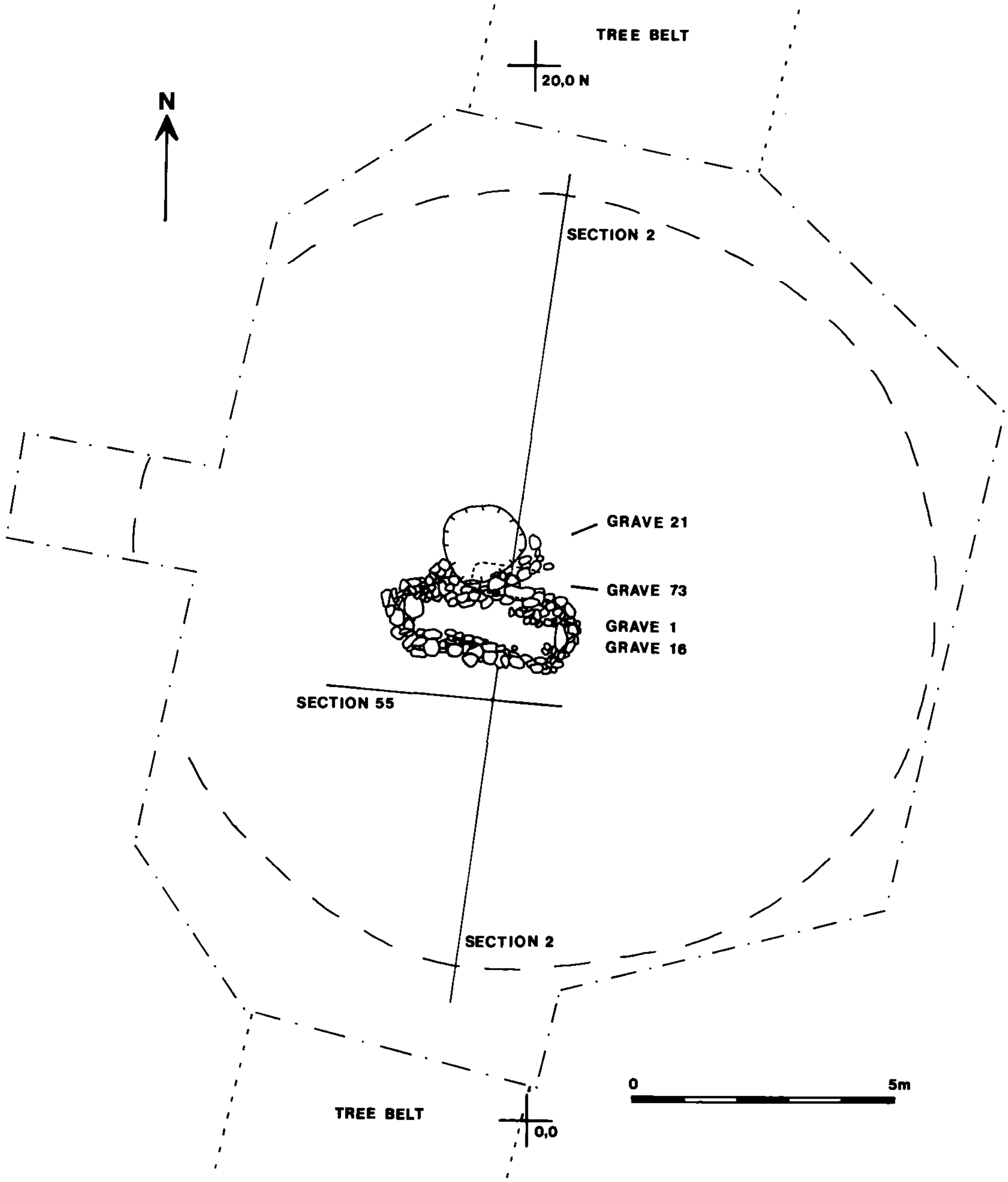

Fig. 4. Plan of the excavated area with the tree belt, the barrow, the sections and the graves 73, 16, 1 and 21. H. Rostholm and J.J. Kærgaard *del.*

shown on fig. 8. The bottom of the grave, i.e. the lower edge of the stone frame, lay 25–40 cm above the old soil surface, and the top of the stone frame reached to 90–95 cm above the old soil surface.

In the eastern end of the grave stood a big stone, measuring c. 70 × 52 × 32 cm and turning a flat side to the grave. Part of the stone can be seen on fig. 8 and 11. In the opposite end of the grave were 2 big stones, 60 cm and 48 cm high respectively. Among the stones in the stone frame were 5 fragments of quern-stones (hatched on fig. 5).

On the bottom in the western part of grave 16 lay 40 amber beads and pendants, mostly in small groups within a total area of c. 70 × 50 cm (cf. fig. 5). They have

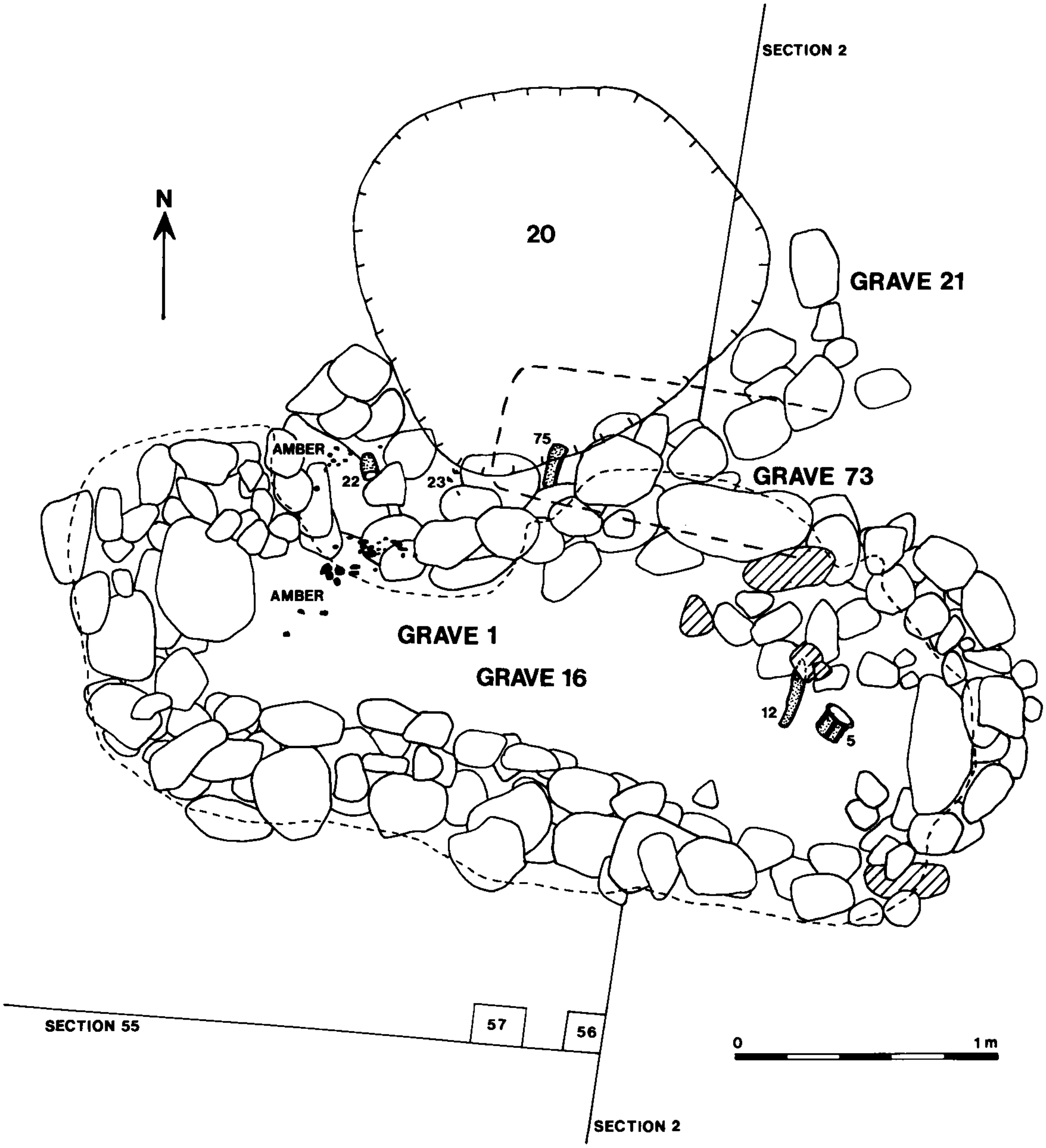

Fig. 5. Plan of the 4 graves in the central part of the barrow. *Grave 73*: battle-axe 75. *Grave 16*: 40 amber beads and pendants. *Grave 1*: straight-walled beaker 5 and battle-axe 12. *Grave 21*: beaker 22 and bronze ring 23. No. 20 is a rather new digging. In sections 2 and 55 are shown the samples 56 and 57 for pollen and other analyses. H. Rostholm and J.J. Kærgaard *del.*

the numbers 24–54 and 59–68 (fig. 7: 1–40). Nos. 30 and 31 make out one bead, found in 2 pieces (fig. 7:7).

There are 9 pendants, mainly pierced in the narrower end. 12 flat pieces are pierced from edge to edge; 5 of them are rather big, up to 4.5 cm long; amber 30–31 has one longitudinal hole and four transverse holes (fig. 7:7). Besides there are 19 small beads, one of them has cruciformed holes (No. 62, fig. 7:34) and the others are mainly short tubular beads.

Some of the amber beads lay under the stone frame, the northernmost ones were found 30–37 cm from the inner edge of the stone frame (amber 59–68, fig. 7: 31–

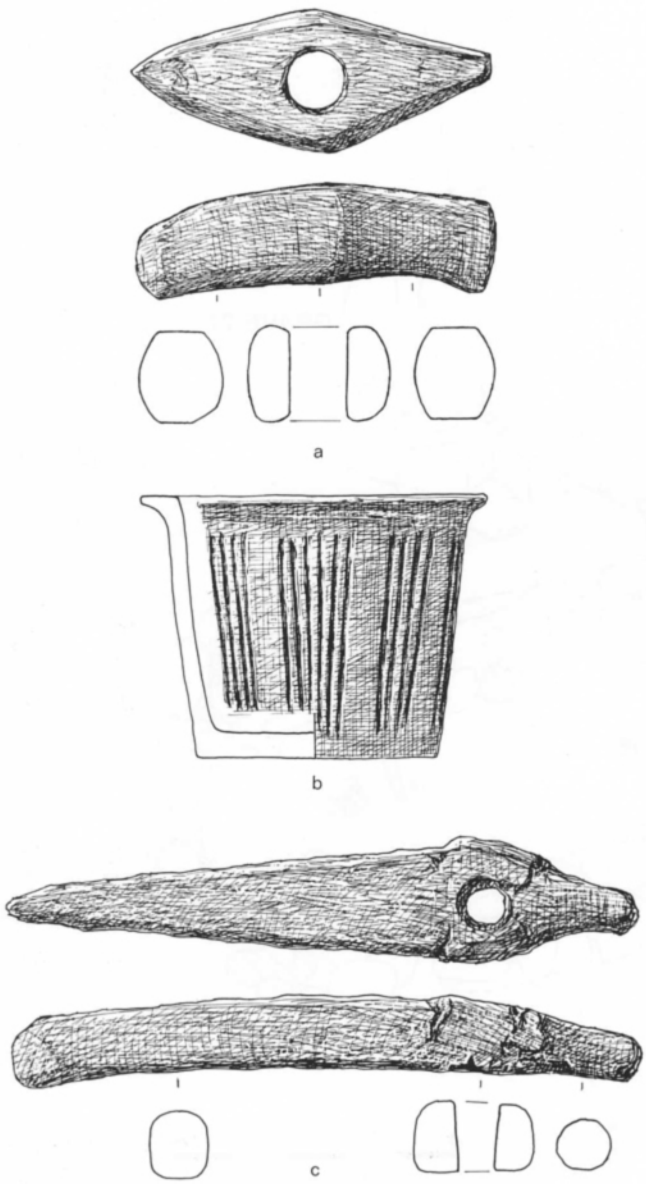

Fig. 6. Grave finds from the Single Grave Culture. *Grave 73*: battle-axe 75 (a). *Grave 1*: straight-walled beaker 5 (b) and battle-axe 12 (c). 1:3. H. Ørsnes *del.*

40). On the whole these beads were situated in the same level as the rest of the beads, but they may have been displaced and moved towards the north, when grave 21 was made.

The amber beads and pendants from grave 16 can be related to the Single Grave Culture in general. The grave can only be more precisely dated within the culture by means of stratigraphy. Grave 16 lay between grave 73 from the Ground Grave period and grave 1 from the Upper Grave period.

Grave 1 was situated in the top of the barrow exactly over grave 16. The grave was marked by a layer of small broken stones, consisting of yellowish brown and reddish brown granite (fig. 10 h). This layer was placed directly on the top of the stone frame in grave 16 (fig. 10 i). The layer of broken stones covered an area of 345 cm in the length c. west-east and 150–165 cm in the width (indicated by a dot-and-dash line on fig. 5).

Inside the stone frame the layer of broken stones had sunk and lay in a curved layer against the inner side of the stone frame and partly in a horizontal layer over the bottom of grave 16. The sunken layer of broken stones can be seen in section 2, which ran transversely to the grave (fig. 10 and 12). In section 2 the curved layer of broken stones was up to 15 cm thick (fig. 10 h). The lowest broken stones were found about 50 cm under the top of the layer. Section 2 indicates, that this layer originally was placed horizontally over the stone frame of grave 16. Thus the bottom of grave 1 lay 90–100 cm above the old soil surface. In the western end of the grave the layer of broken stones was partly situated directly on the amber beads and pendants in grave 16.

Beaker 5 and battle-axe 12 were found in the sunken layer of broken stones in the eastern end of grave 1 (fig. 8). The beaker lay in a sloping position and was nearly covered by broken stones. The beaker is 10.5 cm high, straight-walled and decorated with groups of flat, vertical grooves separated by undecorated zones (fig. 6 b).

The battle-axe, which was found in the middle of the layer of broken stones, is unusually long, 25.5 cm, and made of a very soft and badly preserved sandstone (fig. 6 c).

By means of the straight-walled beaker belonging to Globs type N and the battle-axe of Globs type L grave 1 can be dated to the Upper Grave period of the Single Grave Culture (Glob 1945: 50 and 117f).

The very close connection between the stone frame in grave 16 and the layer of broken stones in grave 1 must imply, that the 2 graves were made immediately after each other, and grave 16 could not possibly be covered by a burial mound, until grave 1 was constructed.

Collapsed graves, and sunken fill and artifacts, are not unusual in Single Grave barrows, because the tree coffins have totally disappeared and the graves often are placed directly over each other (Rostholm 1977: 99,

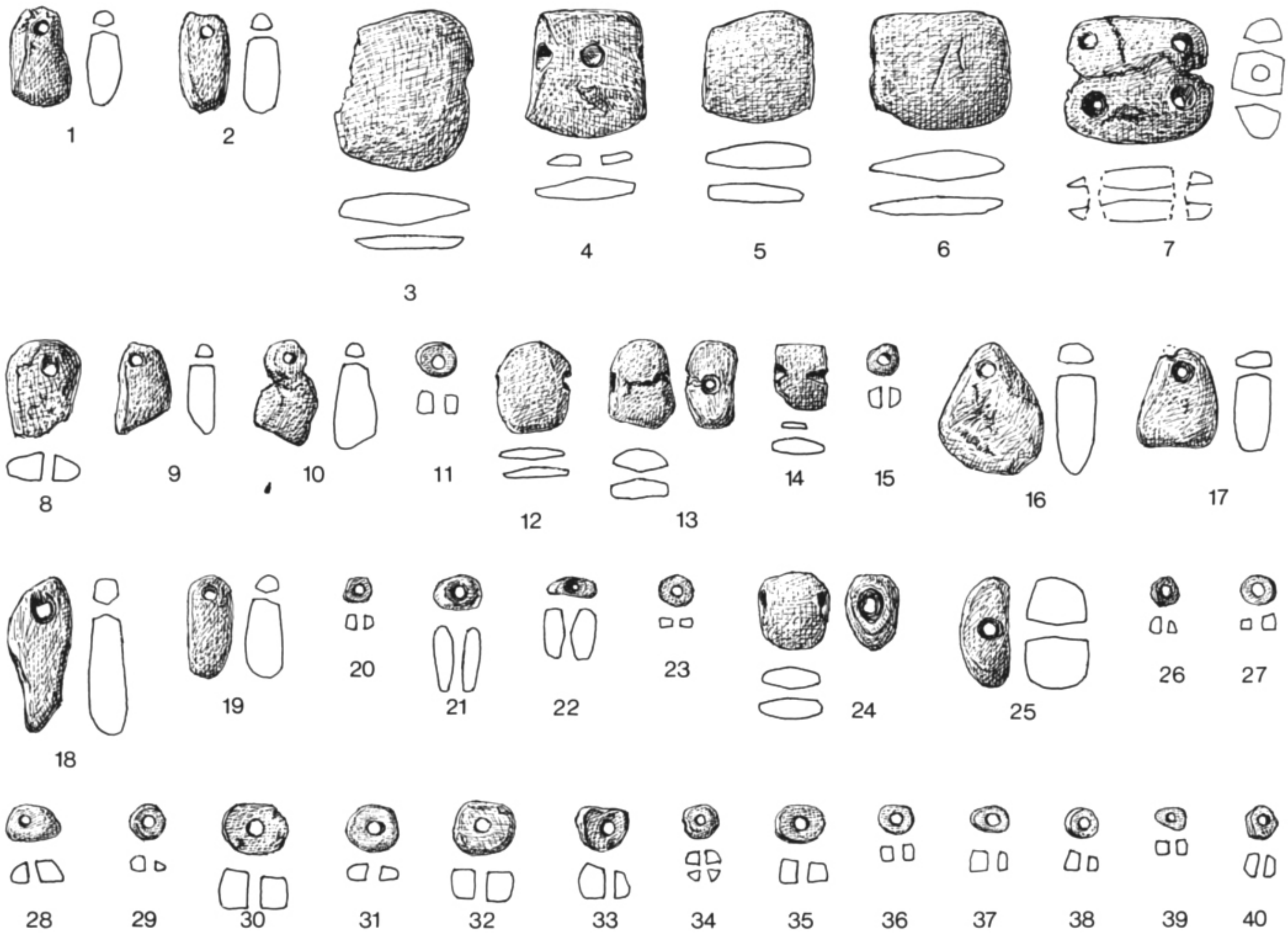

Fig. 7. Grave finds from the Single Grave Culture. *Grave 16*: 40 amber beads and pendants (Nos. 24–54 and 59–68). The bead 7 was found in 2 pieces. 1:2. H. Ørsnes *del.*

1982: 54f, and 1986: 16f). The 2 graves in the Harreskov barrow could easily be separated thanks to the thick layer of broken stones. Without this layer, grave 16 and grave 1 would most likely have appeared like a big double grave with male and female equipment in the eastern and western ends respectively.

Grave 21 was found directly to the north of grave 1 and grave 16, and partly over grave 73 (cf. fig. 5). When grave 21 was made, the northern side of the stone frame in grave 16 and the layer of broken stones in grave 1 were disturbed. The central and eastern parts of grave 21 were destroyed by a rather new digging right to the bottom of the grave (fig. 5, No. 20 and fig. 10 b).

Grave 21 had remains of a 40–45 cm high stone frame orientated approx. WSW-ENE. Only the southern side and the western end were left. Originally the length was c. 2.15 m and the width c. 1.1 m. The area inside the stone setting was about 50 cm wide. The bottom of the grave consisted of a rather uneven stone layer, c. 35 cm over the old soil surface. Beaker 22 was found on the stone layer in the western end of the grave, and bronze 23 lay about 30 cm eastwards.

The beaker is a little irregular, up to 8 cm high and undecorated (fig. 9 a). Bronze 23 consisted of 16 tiny fragments lying within an area of 5 × 3 cm. The pieces are put together to a bronze ring, 2.2 cm in internal diameter and made of a round, c. 1½ mm thick bronze bar (fig. 9 b).

In section 2, which runs across the eastern end of

Fig. 8. Battle-axe 12 and beaker 5 from grave 1 lying in the sunken layer of broken stones inside the stone frame of grave 16. To the right a big standing stone in the eastern end of grave 16. Most of the stone frame in grave 16 has been removed. H. Rostholm fot.

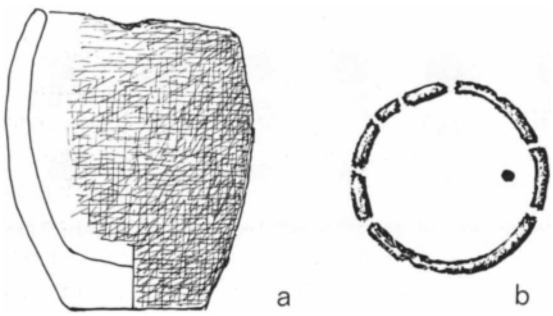

Fig. 9. Grave finds from the Early Bronze Age. *Grave 21:* beaker 22 (a) and bronze ring 23 (b). a: 1:2 and b: 1:1. H. Ørsnes *del.*

grave 21, only a few stones of the stone frame of grave 21 can be seen (fig. 10 and 12). The fill of the grave could not be separated from the fill of the second phase of the barrow, in which it was buried (fig. 10 e and f).

Grave 21 is stratigraphically younger than the 3 other graves and can most likely be dated to the Early Bronze Age.

Section 2 was made approx. south-north across the preserved part of the barrow and ran in the same direction as the tree belt (cf. fig. 4). A drawing of the section is reproduced on fig. 10. Besides fig. 11 shows the section seen from SSE and fig. 12 the central part of the section with the 4 graves.

The section indicates that the barrow has three phases, represented by different sorts of fill. The earliest barrow, phase 1, consisted of yellowish brown humic sand with distinct turfs of dark grey and partly dark brownish grey humic sand (fig. 10 f). On the drawing the dark turfs are marked in the central and southern parts of the section. The first barrow was 13 m in diameter and up to 85 cm in the height. This barrow was erected over grave 73 (fig. 10 j). Later on the 3 other graves were buried in the barrow, which twice (at least) was heightened and widened.

Phase 2 was represented by yellowish brown, spotted humic sand (fig. 10 d). No turf-structure could be recognized. Phase 2 was only found as an up to 30 cm thick layer over the earliest barrow. This layer reached a little higher than the top of grave 1 and grave 16 (fig. 10 h and i) and can most likely be connected with these 2 graves.

Phase 3 consisted of turfs with dark grey humic sand separated by thin layers of yellowish brown humic sand (fig. 10 c). On the drawing the distinct turf-structure in the central part of the barrow is marked. This fill was darker than the first phase and was found in an up to 35 cm thick layer, which was not present in the southern part of the barrow. Phase 3 and grave 21 may belong together.

Beneath the barrow the upper humic layer could be seen as a distinct, dark layer (fig. 10 k), which was sharply delimited from the fill of the barrow (cf. fig. 11 and 12). This layer is identical to the Ah-layer described below in the soil section from the pollen analysis (cf. fig. 13 and 14). The layer, too, is similar to the dark turfs in phase 1 of the barrow (fig. 10 f). The fill of the first phase of the barrow consisted of the dark, upper humus layer of that time, and by taking off the turfs they have been mixed up with the underlying yellowish brown sand.

Section 55 was made in the direction c. west-east about ½ m to the south of the graves. From the fossil soil in this section sample-series 56 and 57 for pollen and other analyses were taken (cf. fig. 5 and 10). Besides samples from the turfs in phase 1 of the barrow were taken.

Sample-series 56 and 57 come from the fossil soil, which was sealed in the Ground Grave period of the

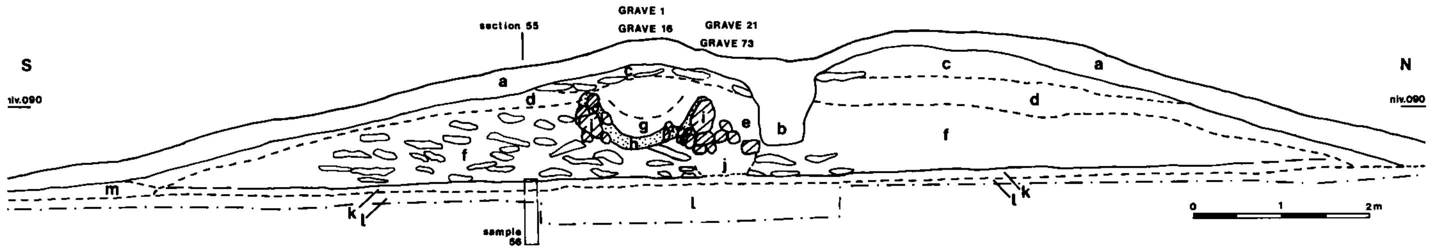

Fig. 10. Section 2 south-north across the barrow, seen from the east. a: grey and blackish grey humic sand. b: new digging, fill as a, downwards more brownish (No. 20). c: phase 3 of the barrow (see text). d: phase 2 of the barrow (see text). e: fill as d (grave 21). f: phase 1 of the barrow (see text). g: brown and brownish grey humic sand, a little darker than d. h: broken stones (grave 1). i: stone frame (grave 16). j: brown and yellowish brown humic sand and yellow sand (grave 73). k: dark grey, downwards dark brownish grey, humic sand (upper humic layer beneath the barrow). l: yellowish and reddish brown, silty-clayey sand, downwards yellow sand. m: dark brown, faintly yellowish brown humic sand. Sample 56 for pollen and other analyses can be seen in the section. H. Rostholm and J.J. Kærgaard *del.*

Single Grave Culture, about 2600 BC, when grave 73 was covered by phase 1 of the barrow. The analyses of sample-series 56 and 57 are described below.

POLLEN ANALYSIS

Introduction

Pollen diagrams from lakes, bogs, and soils provide information on vegetational changes through time. The scale of the changes reflected depend on the pollen source area, larger lakes and bogs have large source areas while very small kettleholes and soils have small ones. Well-dated pollen diagrams from large sites offer a framework of large-scale, *regional* pollen-depositional events. Although these events may have a straightforward interpretation such as a sudden and persistent appearance of new pollen types, the reconstruction of past vegetational changes from regional pollen diagrams is often hampered by a number of methodological problems. Such problems are *i.a.* 1) the ecological complexity of the pollen source area consisting of a mosaic of several vegetation types, 2) the fact that some plant species may occur in more vegetation types, 3) the fact that the same pollen type may be produced by different plant species (e.g. the grass pollen type), 4) the possibility of two or more vegetational events to occur simultaneously inside the source area which may obscure or even counterbalance each other.

Pollen diagrams from small sites on the other hand reflect pollen events inside a small area which properly chosen is homogenous in relation to geology, hydrology, topography and soil type. Hence it has probably also supported a homogenous vegetation in the past. In these *local* sites the interpretation of the pollen diagrams is greatly simplified by the reduction of the number of vegetation types to one (in soil sites) or two (in kettleholes: the kettlehole vegetation and the surrounding vegetation type).

As part of an investigation of the post-glacial vegetational history of western Jutland (Odgaard 1985a, 1985b), the present paper presents the main result of a pollen analytical study of a fossil soil buried beneath the Harreskov barrow, about 2600 BC. This local pollen diagram reveals details about the primeval forest on *dry*, poor soil in western Jutland, reflects the very first forest destruction and heathland expansion, and describes the environment at the time of the erection of the barrow. The diagram thus supplements the soil pollen diagram from a humus podzol buried beneath the Single Grave mound at Skarrild, 5 km SSW of Harreskov, which reflects the local late Atlantic/early Subboreal vegetational development on slightly *moist* soil (Odgaard 1985a).

Methods

A sample series (56) for pollen, physical and chemical analyses were taken at section 55 (figs. 5, 10). Continuous samples of 0.5–5 cm thickness were taken from 0.5 cm above the surface of the fossil soil to 70 cm below. Close nearby, at 57 (fig. 5), volumetric samples were taken. Finally 6 samples for pollen analysis were

Fig. 11. The barrow partly excavated, seen from SSE. Section 2, which runs across the barrow, shows the turfs in the fill of the barrow and the dark humus layer beneath the barrow. In the centre of the barrow part of the stone frame in grave 16 can be seen. H. Rostholm fot.

Fig. 12. Detail of section 2 in the central part of the barrow with the 4 graves and the dark humic layer beneath the barrow. Cf. fig. 10. H. Rostholm fot.

taken from humic sand layers, 'turfs', of the barrow soil (phase 1). At the laboratory the bulk samples were divided into subsamples for pollen analysis, loss on ignition, grain size analysis and chemical analysis. Loss on ignition was determined as the loss in dry weight after 3 hours at 550°C. Aluminium (Al) and iron (Fe) were extracted by 20% boiling HCl and measured by atomic absorption spectrophotometry.

The soil section

The upper humic layer of the fossil soil was clearly seen on the section as a dark band (fig. 10 k, 11 and 12), sharply delimited towards the overlying soil of the barrow.

The description of the soil section below is according to the central European system for soil classification (e.g. Scheffer *et al.* 1976). In this system Ah denotes a top layer of dark, humic soil. A Bv-layer is characterized by a brownish colour (v from German: *verbraunt*) derived from iron-oxides formed by weathering of iron-containing minerals. As another result of weathering clay-minerals are formed in a Bv-horizon, which is therefore enriched in fine particles. The C-horizon is the bottom part of the soil, untransformed by soil processes. If the soil was originally homogeneous the C-horizon is identical to the parent material of the upper layers.

0 – 7 cm	Ah. Dark grey, downwards dark brownish grey, humic sand. Upper boundary sharp.
7 – 35 cm	Bv. Reddish brown, silty-clayey sand with some pebbles. Upper boundary gradual.
35 – 52 cm	C. Yellow, medium-grained sand with a few pebbles. Upper boundary gradual.
52 – 63 cm	C. Greyish yellow, gravelly, coarse sand. Upper boundary sharp and dipping towards east.
63 – (100) cm	C. Yellow, medium-grained, well-sorted sand. Upper boundary sharp and dipping towards east.

The grain size analyses (fig. 13) show accumulation of silt/clay particles (‹0.075 mm) in the topsoil especially in the upper part of the Bv-horizon. This accumulation is probably due to *in situ* weathering of coarse particles and formation of clay minerals (cf. Nørnberg 1980). Loss on ignition decreases downwards through the Ah horizon reflecting a decreasing organic content, while the raised values of loss on ignition in the Bv horizon are probably due to dehydration of clay minerals during ignition. There is hardly any differentiation in the pH-profile while iron and aluminium concentrations show beginning eluviation from the Ah layer and raised

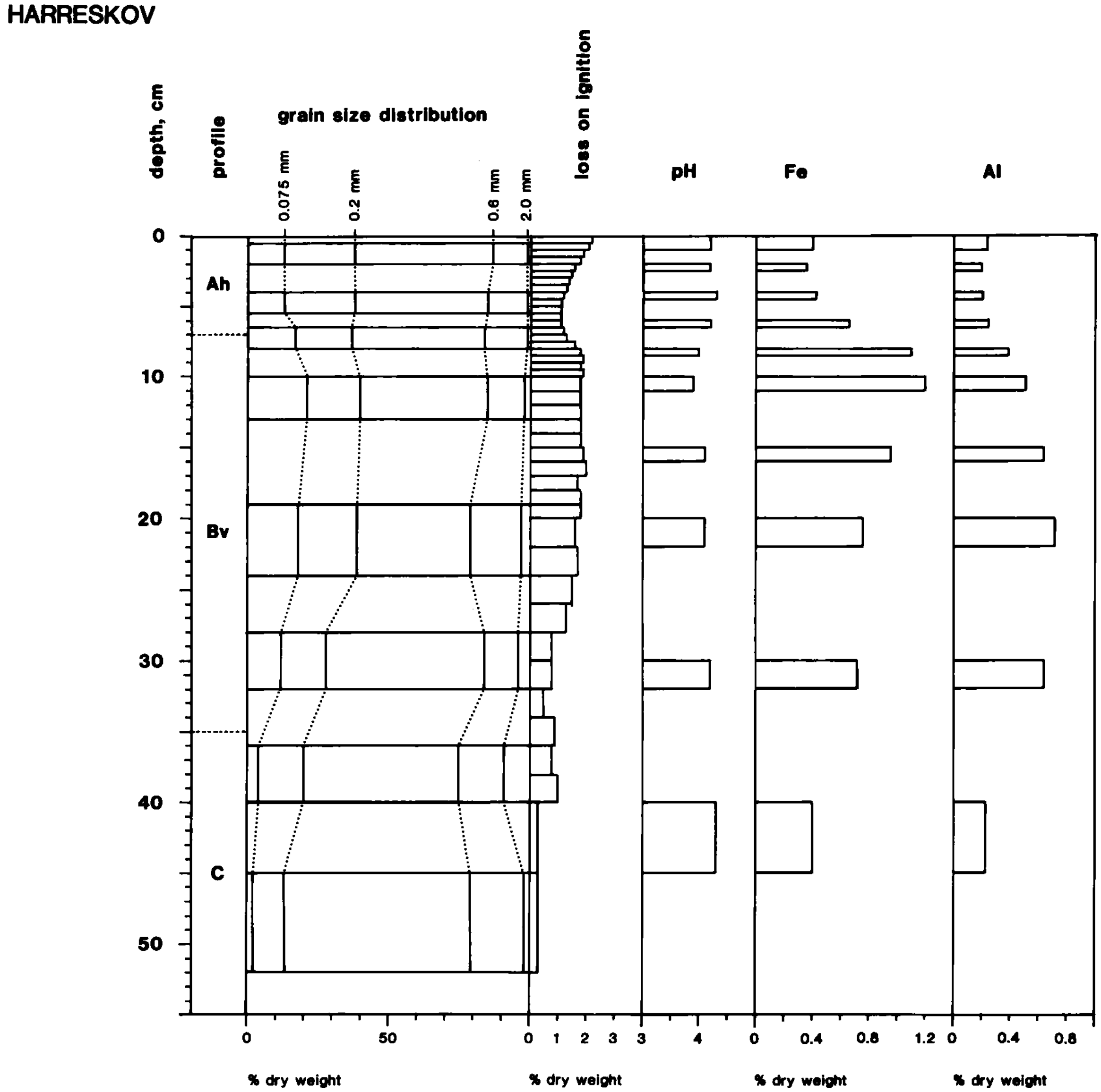

Fig. 13. Physical and chemical profiles from the Harreskov section.

values in the Bv horizon. Thus the soil can be characterized as an oligotrophic, slightly podzolized brownearth.

The pollen diagram

Fig. 14 shows the pollen profile from the upper 10 centimeters. The original pollen stratigraphy is undoubtedly somewhat disturbed by the mixing activity of the soil fauna and no zonation of the diagram has been attempted. Nevertheless the diagram shows a clear development. In the lower part tree pollen, especially *birch*, *lime* and *hazel* dominate, while herbs are represented by ca. 15% and *heather* by 25%. Charcoal values are low and cultural indicators are virtually absent. In the upper part of the diagram *heather* increases to 45% at the expense of tree pollen, *ribwort* (*Plantago lanceolata*) is represented by 0.5% and charcoal values rise strongly. Among the trees *lime* decreases while *alder*, and also *hazel*, rise.

Discussion

The well-established natural soil development from basic or slightly acid brown-earth with a rich soil fauna to acid podzol devoid of effectively mixing animals has important implications for the interpretation of soil pollen diagrams. First, pollen grains are only preserved in acid soils (pH ‹ ca. 5), and second, pollen deposited on a soil is liable to downwards transportation by soil animals (bioturbation) and percolating water.

In a comparison of three neighbouring acid forest soils, a brown-earth, a podzoloid and a podzol, Andersen (1979) found records of past vegetational stages in all soil types. But whereas vegetational changes were reflected sharply in the humus layer of the podzol these were less sharp in the mineral soil of the podzoloid, and in the brown-earth bioturbation by earthworms had made only the strongest changes detectable. This study also indicates that downwashing of pollen grains in soils is of insignificant importance.

Although a brown-earth the low pH-values as well as the beginning podzolization of the Harreskov soil indicate that large earthworms were already absent at the time of burial. The youngest pollen assemblages have therefore been incorporated only in the topmost part of the profile, which explains why vegetational changes are reflected quite sharply in the upper 3 cm of the diagram (fig. 14). Except for the time of burial, about 2600 BC, no level in the pollen diagram can be dated. Calculations based on pollen concentrations, however, indicate that the diagram represents a time span of at least a few hundred years, indeed probably more. The lower part of the diagram reflects an open forest of *birch*, *lime* and *hazel* with *heather* and grasses in the field layer. *Alder* may have been present locally as scattered individuals but the pollen recorded may also have been transported from extra-local stands. Conventionally *alder* is regarded as a tree of wet soils but the soil pollen diagram from Skarrild suggests that *alder* has been important also on slightly moist soil (Odgaard 1985a). Judging from topography and surface deposits (fig. 2) wet ground was probably not present near the Harreskov barrow, but spots of moist soil may have existed. *Oak*, *ash*, *pine* and *elm* were absent locally. The single grains of *ribwort* (*Plantago lanceolata*) found in this part of the diagram as well as the microscopical charcoal have most likely been transported down from younger assemblages, and the *birch-lime-hazel-heather*-grass forest thus represents the virgin forest on dry ground in western Jutland during the late Atlantic/early Subboreal. The composition of this forest type may seem ecologically strange since there is no modern analog. However, this open forest type is in accordance with expectations based on regional pollen diagrams, which during this period show presence of *heather*, high values of *birch* and grasses and moderate values of *hazel* and *lime* (Jonassen 1950, Odgaard 1985a).

DRY SOIL	MOIST/WET
birch-lime-hazel-heather-grass	alder-birch-(oak)-(lime)-grass

Table 1. Tentative scheme of distribution of natural late Atlantic/early Subboreal forest types on dry and moist/wet, poor soils in western Jutland.

The upper part of the diagram reflects a heath or a very open forest with extensive *heather*-dominated glades. The forest reduction manifests itself in the decrease of *lime*, while the rises of *hazel* and *alder* percentages probably are due to increasing extra-local transport as the landscape was growing more open. The increases in *ribwort* pollen and charcoal values document that the forest destruction and heath expansion was due to cultural impact, probably cutting, grazing and burning. There is no indication of tilling of the soil.

Conclusion

The soil pollen diagrams from Harreskov and Skarrild (Odgaard 1985a) give information about the late Atlantic/early Subboreal virgin forest of western Jutland on dry and slightly moist soil before farming began. Some of the results are supported by regional pollen diagrams, and although more local studies are needed a rough pattern of the distribution of natural forest types on different soils is suggested (tab. 1).

The forest on dry ground was very open with much heather in the field layer. The first cultural impact of importance was apparently grazing, burning and cutting, which gradually turned the open forest into heath. Heathland was the inevitable result of this farming practice. On slightly moist soil, like at Skarrild, *heather* was not present naturally but was "introduced" locally and favoured by early farming, and also here heathland was the result. Age calculations based on pollen concentrations at Skarrild indicate that the heath was maintained in a young *heather*-dominated stage by burning and grazing through at least two centuries (Odgaard 1985a). Based on a number of regional pollen diagrams from western Jutland, Jonassen (1950) concluded that prehistoric heathland expansions were the result of temporary arable farming. In his opinion, the expansions took place at the transition between the Subboreal and the Subatlantic, when *heather* invaded abandoned fields and persisted here favoured by an assumed cool, humid climate. However, the local pollen diagrams from Harreskov and Skarrild do not support Jonassen's hypothesis, but suggest pastoral farming as

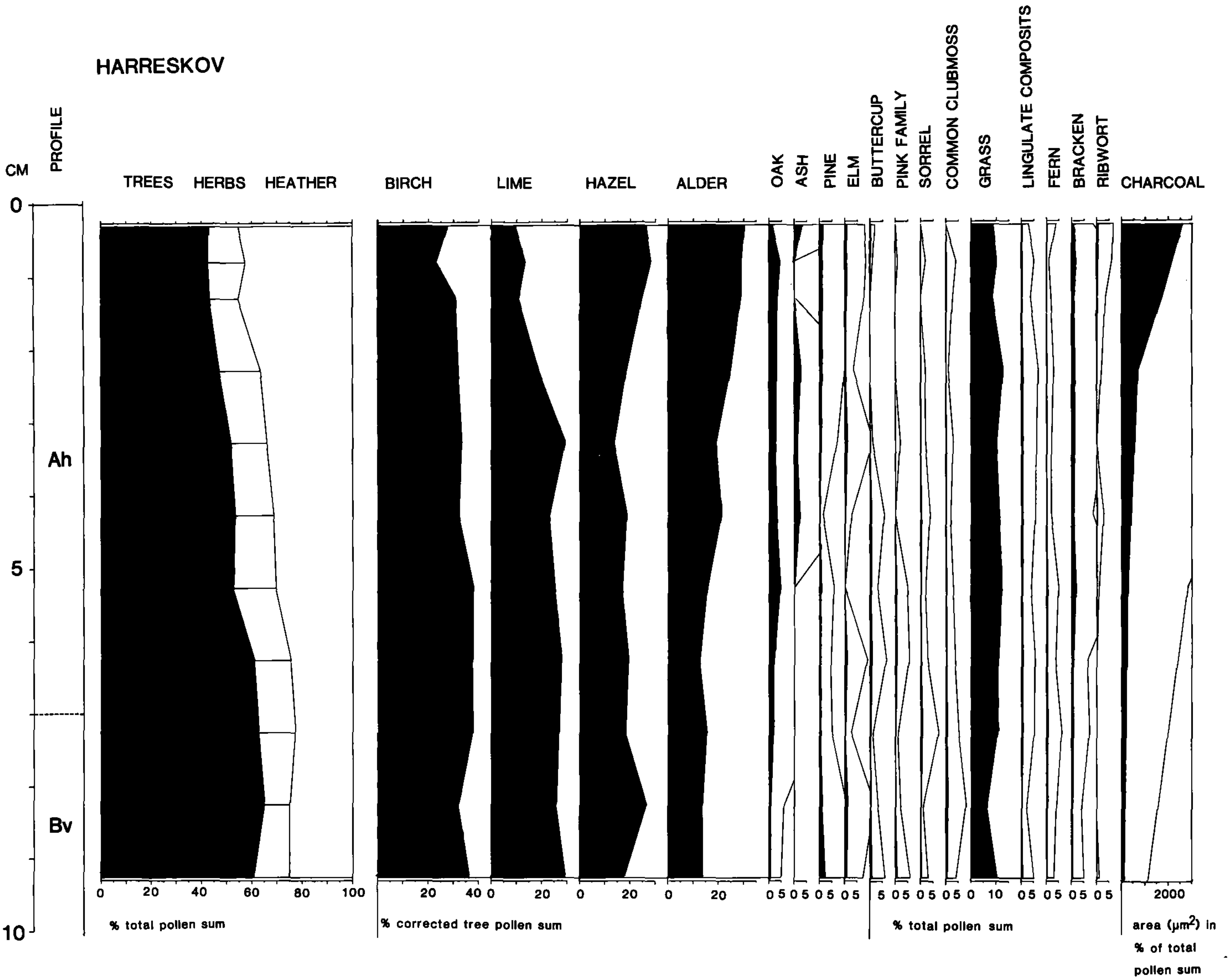

Fig. 14. Summary pollendiagram from the Harreskov soil section. The survey diagram to the left shows the relationship between pollen from trees, herbs and heather. The central tree pollen diagram is corrected for unequal pollen productivity according to Andersen (1970). The right part shows separate curves for selected herb pollen types: buttercup (*Ranunculus acris* type), pink family (Caryophyllaceae), sorrel (*Rumex acetosa* type), common clubmoss (*Lycopodium clavatum*), grass (Poaceae), lingulate composits (Cichorioideae), fern (*Dryopteris* type), bracken (*Pteridium*) and ribwort (*Plantago lanceolata*). Finally a graph for microscopical charcoal is shown.

the main cause of early heathland expansion. Furthermore, the results indicate that neolithic farmers deliberately maintained the heath, like it is known from historical time. It may be supposed that this nursing was done to provide winter grazing, in which young *heather*-dominated heath is superior to grass-dominated pasture.

Bent Vad Odgaard, Geological Survey of Denmark, Thoravej 8, DK-2400 Copenhagen NV.

Hans Rostholm, Herning Museum, Museumsgade 1, DK-7400 Herning.

NOTE

1. Harreskov, Assing *sogn*, Hammerum *herred*, Ringkøbing *amt*. Sb (Central Register) no. 47. Herning Museum 2517.

REFERENCES

ANDERSEN, S.T. 1970: *The relative pollen productivity and pollen representation of North European trees, and correction factors for tree pollen spectra.* Danmarks geologiske Undersøgelse, II. række 96: 1–99.

– 1979: Brown earth and podzol: soil genesis illuminated by microfossil analysis. *Boreas* 8: 59–73.

GLOB, P.V. 1945: Studier over den jyske Enkeltgravskultur. *Aarbøger for nordisk Oldkyndighed og Historie* 1944. København.

JONASSEN, H. 1950: *Recent pollen sedimentation and Jutland heath diagrams.* Dansk Botanisk Arkiv, Bd. 13, Nr. 7: 1–168.

MILTHERS, V. (with a contribution by K. JESSEN) 1939: *Beskrivelse til geologisk kort over Danmark. Kortbladet Brande.* – Danmarks geologiske Undersøgelse, I. række 18: 1–162.

NØRNBERG, P. 1980: Minerology of a podzol formed in sandy materials in northern Denmark. *Geoderma* 24: 25–43.

ODGAARD, B.V. 1985a: Kulturlandskabets historie i Vestjylland. Foreløbige resultater af nye pollenanalytiske undersøgelser. *Fortidsminder* 1985: 48–59.

– 1985b: A Pollen Analytical Investigation of a Bronze Age and Pre-Roman Iron Age Soil Profile from Grøntoft, Western Jutland. *Journal of Danish Archaeology* 4: 121–128.

ROSTHOLM, H. 1977: Nye fund fra yngre stenalder fra Skarrild Overby og Lille Hamborg. *Hardsyssels Årbog* 1977: 91–112.

– 1982: *Oldtiden på Herning-egnen.* Herning.

– 1986: Enkeltgravshøje. *Arkæologiske udgravninger i Danmark* 1985: 9–24.

SCHEFFER, F., SCHACHTSCHABEL, P., BLUME, H.-P., HARTGE, K.H. & SCHWERTMANN, U. 1976: *Lehrbuch der Bodenkunde.* Enke, Stuttgart. 394 pp.