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Studies in the Post-Glacial History of British Vegetation. VIII. Swamping Surfaces in Peats of the Somerset Levels. IX. Prehistoric Trackways in the Somerset Levels

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STUDIES OF THE POST-GLACIAL HISTORY OF BRITISH VEGETATION

VIII. SWAMPING SURFACES IN PEATS OF THE SOMERSET LEVELS

IX. PREHISTORIC TRACKWAYS IN THE SOMERSET LEVELS

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PART VIII. SWAMPING SURFACES IN PEATS OF THE SOMERSET LEVELS

1. Preface

A preliminary account has already been given of peat stratigraphy, pollen analysis, archaeological and climatic circumstances in the Wedmore-Polden basin of the Somerset Levels (Godwin 1941). It was there pointed out that the deep valleys between the Mendips, Poldens and Quantocks had been subject to marine transgression at the close of the Boreal

period, and had thereby been filled with clay to about present sea-level. Upon this flat surface there grew up, at least in the region between the Polden Hills and the Wedmore Ridge, a complex of large ombrogenous raised bogs (figure 1). It was shown that the stratigraphic sequence in these structures exhibited a general consistency, and further investigation has confirmed this. Upon the clay surface is a layer 1 or 2 m. thick of grey-black *Phragmites* peat passing upwards into *Cladium* peat: this represents a phase of wide-spread reed-swamp and sedge-fen, probably brackish in its earliest stages. Succeeding this layer is a bed of wood-peat, containing abundant remains of *Betula*, and doubtless representing the normal transition from eutrophic fen to the oligotrophic stages of raised bog. These are represented in the main by peats derived from *Sphagnum*, *Calluna*, *Eriophorum* and their usual associates, and they may achieve thicknesses of as much as 3 or 4 m.

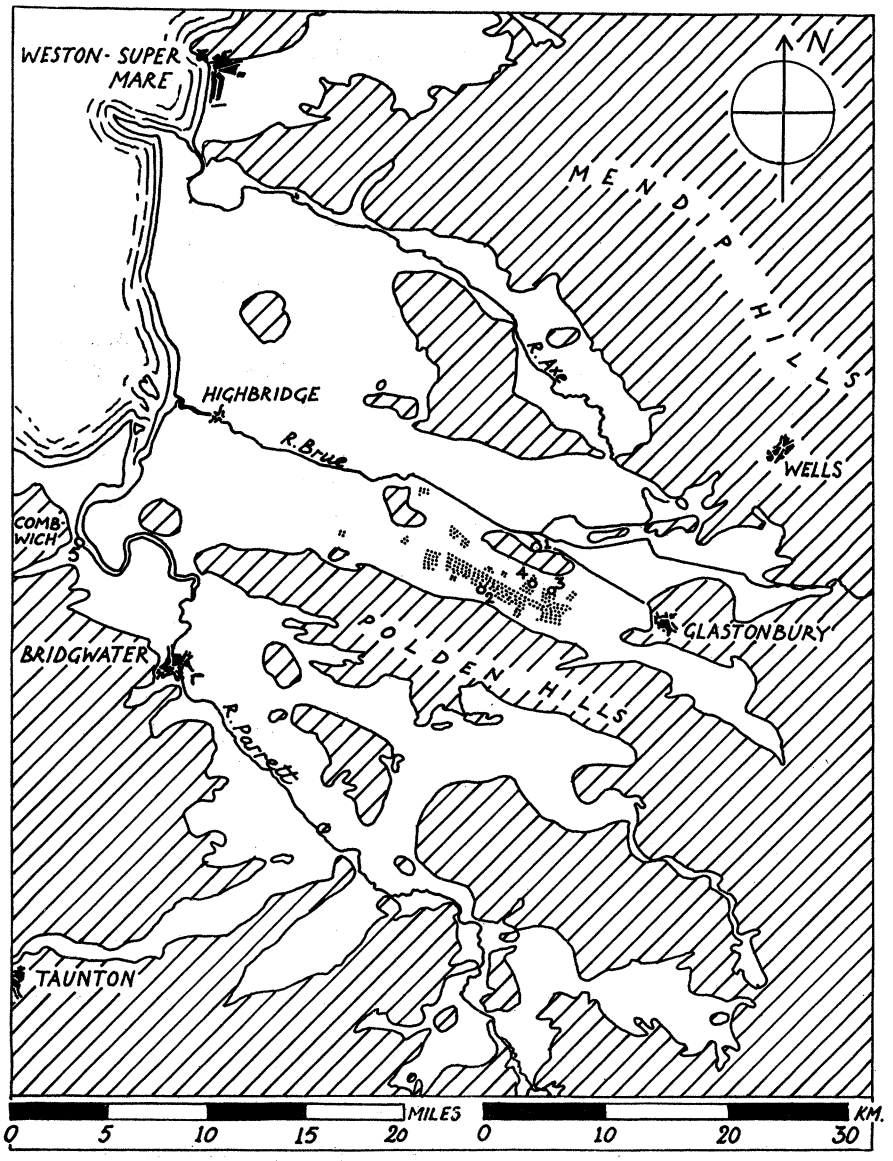

FIGURE 1. Map showing the greater part of the Somerset Levels. The dotted areas are relict raised bogs and are the region primarily investigated in this paper. The numbered circles are: (1) Meare Lake Village; (2) Shapwick Heath Roman hoards; (3) and (4) sites of prehistoric discoveries on Meare Heath.

It has already been emphasized that in the manifold peat cuttings of the region a twofold division of this more oligotrophic peat can be recognized. There is an upper layer, usually not more than 1 m. thick, of rather fresh, unhumified, light-coloured peat, of fibrous character and low density: it does not make good fuel and is exploited as litter, as a base for horticultural fertilizers and so forth. The lower layer contrasts sharply with this, being dark chocolate-brown in colour, highly humified, cheesy and dense, shrinking and hardening irreversibly with drying: this is the valuable burning peat on which economic exploitation of the moors chiefly depends, and the turf cutters naturally distinguish automatically between the two types of peat, the more readily since the boundary between the two is most commonly abrupt. In the provisional account it was

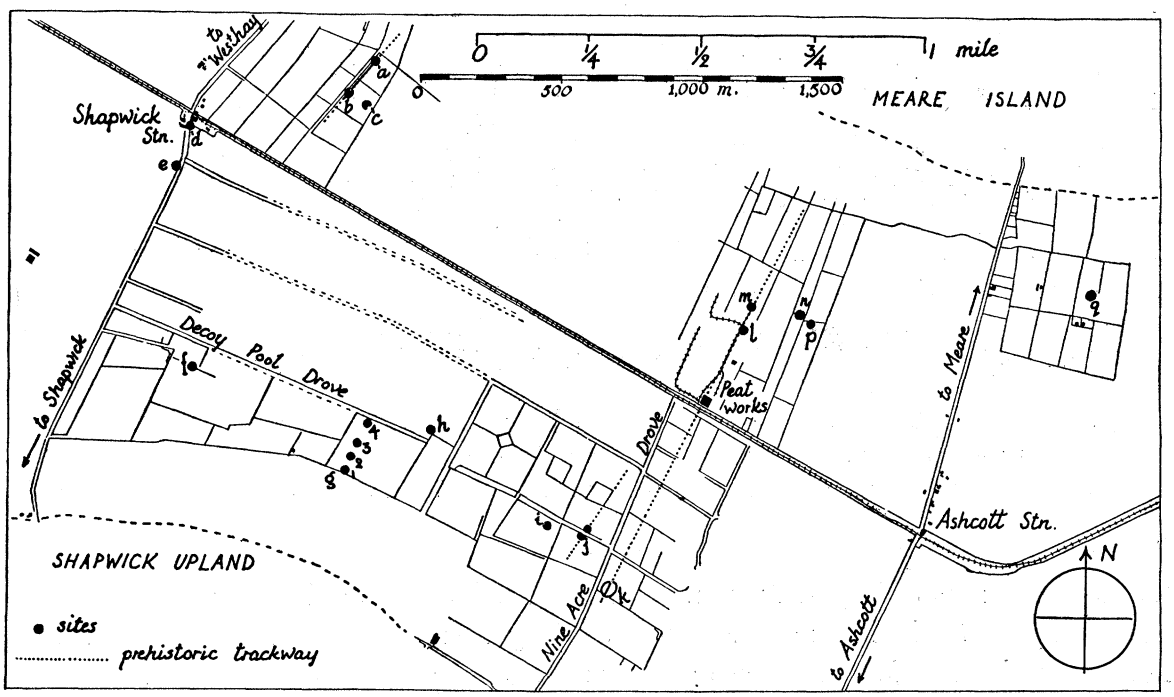

FIGURE 2. The region of Shapwick and Meare Heaths, showing sites of investigations: (*a*), (*b*), two exposures of the Westhay prehistoric trackway; (*c*), site of discovery of late Bronze Age spearhead; (*d*), site of discovery of Shapwick monoxylous boat in 1906; (*e*), boring SS. (Godwin 1941); (*f*), Decoy Pool Wood profile; (*g*), 1 to 4, borings Shapwick Heath, DB 1 to 4; (*h*), profile, Decoy Pool Drove F; (*i*), profile, Decoy Pool Drove E; (*j*), profile and boring and exposure of Shapwick Heath trackway (shown dotted); (*k*), new exposure of Meare Heath trackway (shown dotted); (*l*), site of pollen series through exposure of Meare Heath trackway; (*m*), profile; (*n*), site of bronze axe discovery, 1928; (*p*), site of discovery of La Tène bronze scabbard and approximate position of pollen series (Godwin 1941); (*q*), site of discovery of Neolithic B potsherd and pollen series (Godwin 1941).

stated that 'there can be little doubt that this twofold division of the raised-bog peat corresponds with the similar division seen in peat-bogs in many parts of north-western Europe, where the boundary is spoken of as the "Grenzhorizont", and where it is generally held to correspond with the opening of the Iron Age, and to have been caused by the "climatic deterioration" which marked the onset of the cold, wet, Sub-Atlantic climatic period after the drier Sub-Boreal.' We have now to report how far more detailed examination and analysis of these peats affect this view.

The gross features of stratigraphy are well displayed in the profile of Shapwick Heath (figure 3), taken by borings in a line 166 yd. due south of Decoy Pool Drove, and 1200 yd. due east of the main Shapwick to Westhay road (see map, figure 2). In the years 1936 to 1938, quite close to the line of borings, no fewer than five hoards were discovered by the peat cutters. All were dateable to the time of the dissolution of Roman power in Britain at the close of the fourth century A.D., and they all appeared to have been inserted from a surface not very different from the 1936 to 1938 surface of the bog, which was then tree-clad and seemed not to have been previously cut for peat.

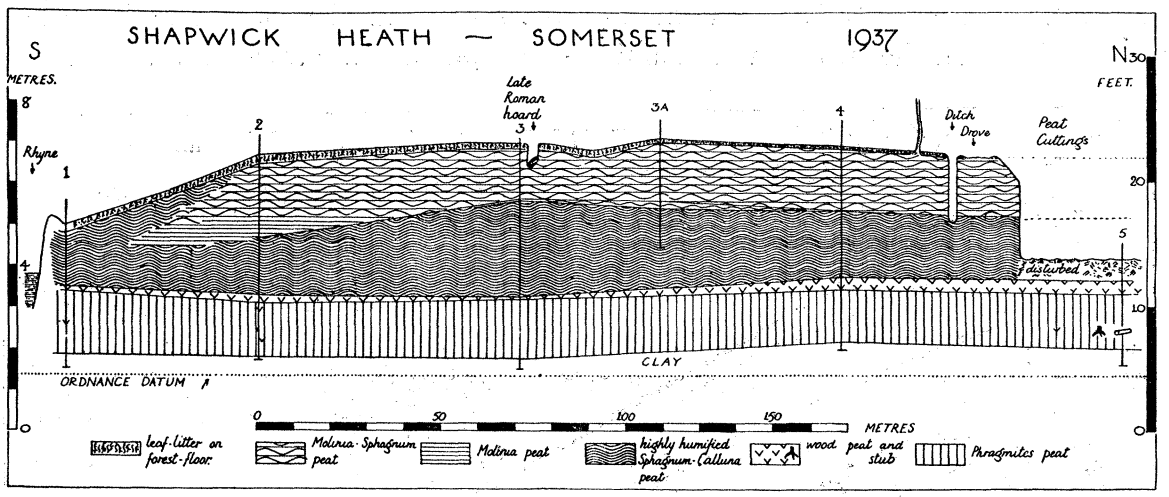

FIGURE 3. Profile of derelict raised bog at Shapwick Heath, made in 1937. The vertical lines represent borings. The stratigraphy has been much simplified. The upper *Sphagnum-Molinia* peat contains also some *Cladium*. The boundary horizon separating the lower humified peat from the upper unhumified peat is very clear.

A complete pollen diagram was made for one of the points in the profile, and this is given in figure 5. It has been zoned according to the scheme of published zones for England and Wales (Godwin 1940) and to it have been transferred archaeological horizons, transferred from sites of archaeological discoveries made in the moor around, and correlated with the Shapwick site by corresponding pollen-analysis series. It will be recognized that whilst the Neolithic horizon falls far below the boundary between the lower and upper 'Sphagnum' peats, the Meare Lake village (Iron Age) appears to overlie it, and the 'La Tène' (late Iron Age) horizon, which is only vaguely determined, could be either above or below it.

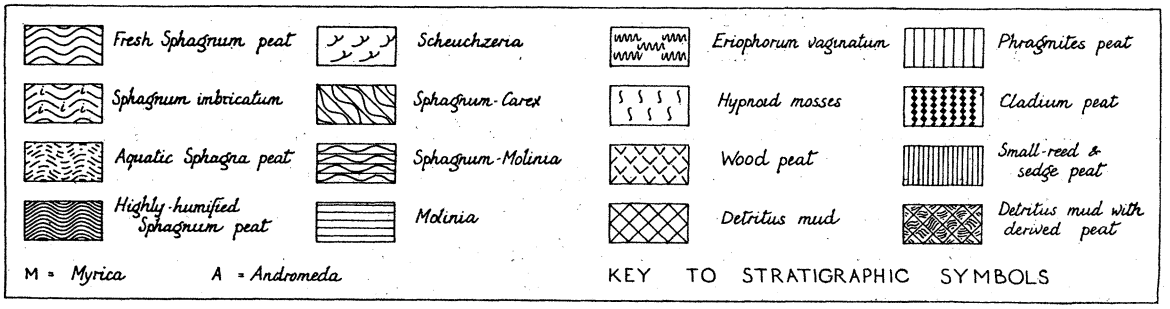

FIGURE 4. Key to the symbols employed in pollen diagrams and profiles, for the different peat types recognized.

Although, therefore, in a general way it seemed indeed probable that we were here dealing with a manifestation of the well-known 'Grenzhorizont' of Weber, the precise character of the peats above this horizon on Shapwick Heath was uncertain, and the nature of the transition layers practically unknown.

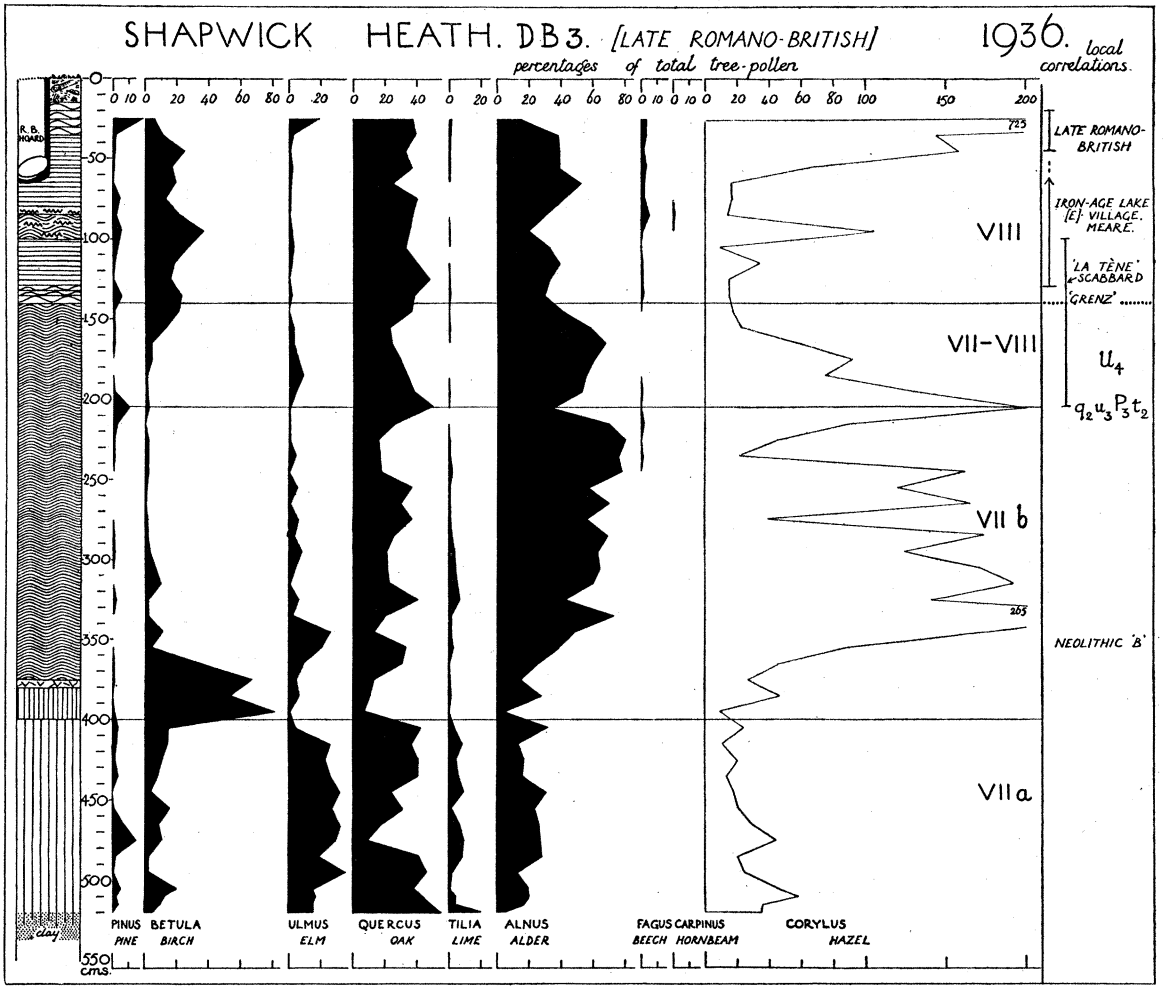

FIGURE 5. Pollen diagram on Shapwick Heath, Somerset, at the boring adjacent to the late Romano-British hoards. The presumed level of other bog discoveries in the neighbourhood has been transferred to this figure on a basis of the pollen analyses at those sites. The pollen zonation is that used for England and Wales as a whole (Godwin 1940) and the peat symbols are those set out in figure 4.

2. STRATIGRAPHY OF THE RECENT PEAT

In 1941 an attempt was made to determine the relation of a prehistoric trackway, running north and south across Meare Heath and Shapwick Heath, to the stratigraphy of the peat bogs. The results of this investigation are to be discussed later, but it will suffice for the present to say that the track was found to lie upon the upper surface of the dark-brown, highly humified *Sphagnum-Calluna* peat, and that only a short distance over it there lies a dark-brown peat containing abundant rhizomes and fruits of *Cladium mariscus*, and abundant hypnoid mosses, and twigs of *Myrica gale*. This somewhat unexpected sequence was fully borne out by the nature of the non-tree pollen diagram. It clearly indicated that not only did the bog surfaces become wetter at this time, but were inundated with base-rich water.

(*a*) *Shapwick Heath trackway site.*

This result was rapidly confirmed in the examination of a small subsidiary trackway uncovered in Shapwick Heath in April 1942, where also the trackway had been constructed upon the surface of the old *Sphagnum-Calluna* peat and was overlaid by *Cladium* peat. (Results for this trackway investigation are also given later.)

At this site, which lies close to the eastern end of Decoy Pool Drove and very near its junction with Nine Acre Drove, shallow peat cutting was in progress from what appeared to be the intact bog surface. From examination of the stacked cut turves and comparison with the peat faces, the stratigraphy for one locality was established to a depth of 80 cm. as that shown in figure 6. Although the cutting did not reach the old *Sphagnum-Calluna* peat, a boring beside the trackway seemed clearly to show that it lay below the lower *Cladium* layer shown here, and separated from it by a transition layer containing besides *Cladium*, much *Myrica*, and a good deal of 'detritus'.

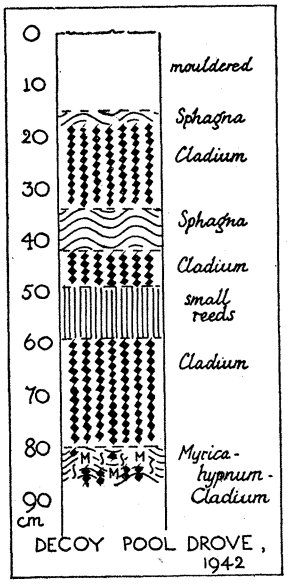

FIGURE 6. Stratigraphy of upper peat at the Shapwick Heath trackway site, established from examination of profile and cut turves.

It will be seen that the *Cladium* peat is interrupted near its upper surface by a dense layer of stems and leaves of reeds of the *Calamagrostis* or *Phalaris* type, thus emphasizing the shift of the vegetation to an aquatic and relatively eutrophic type. Above this *Cladium* layer, however, some 8 cm. of fresh, pure *Sphagnum* peat indicates return of oligotrophy, and then an upper *Cladium* layer suggests renewed flooding with base-rich water. Above this again *Sphagna* could be identified.

The complex story thus indicated, contrasted so sharply with the character of 'recurrence-surfaces' familiar in the upper layers of raised bogs, that it demanded much fuller investigation. We were at this stage fortunate to have the service of Miss W. Abery, then resident at Street, who undertook a detailed examination of a length of 240 ft. (73 m.) of the peat face in the turf cuttings at the site in question. She made examination of the peat at 12 ft. (4 m.) intervals along the peat face, and the results of her investigation have been presented in simplified form in the diagram (figure 7). The salient feature of this evidence is of course the fact that *Cladium* peat is developed in two thick and persistent layers separated from one another by fresh *Sphagnum* peat. The small-reed peat found in April was here demonstrated also to be consistently developed at the top of the lower *Cladium* peat, but only exceptionally was more *Cladium* found immediately overlying it. Of considerable interest is a local development above the small-reed peat, of lenses 5 to 10 m. across of humified *Sphagnum-Calluna* peat. This accentuates the conclusion that after the substantial flooding with base-rich water, the peat bog experienced freedom from such conditions for a substantial period of time, in which oligotrophic raised-bog communities re-established themselves as islands over the fen surface: the high humification indicates fairly dry conditions. A complete cover of fresh *Sphagnum-Calluna* peat spread over the bog after this under presumably increased atmospheric moisture, and in its upper part

this became almost pure fresh *Sphagnum* peat. The upper *Cladium* peat contains thick bands of hypnoid moss not more precisely determined.

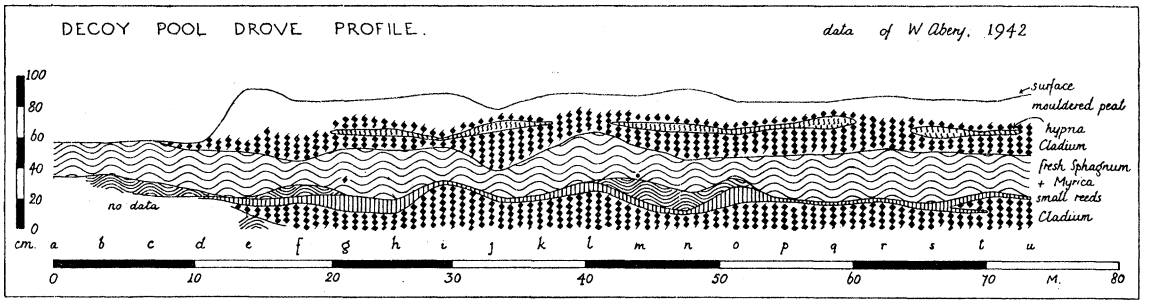

FIGURE 7. Stratigraphy of upper peat near the Shapwick Heath trackway, recorded by Miss W. Abery from examination of the cut peat faces at intervals of 12 ft. shown by letters *a* to *u*.

Whilst it would be unprofitable to set out the details of Miss Abery's individual profile records, a few features of general interest in them may be set down. The lower *Cladium* peat contains much fresh *Sphagnum*. A small amount of *Myrica* wood is present through the lower *Cladium* layer, but it is quite frequent throughout the fresh *Sphagnum-Calluna* peat: in this also seeds of *Menyanthes* occur quite commonly, thus substantiating the view that the peat surface at this time was, locally at least, quite wet. *Oxycoccus*, *Narthecium*, *Eriophorum vaginatum* and *E. angustifolium* were also encountered, but not abundantly. Leaves and twigs of *Andromeda polifolia* were recorded, sometimes in abundance either directly at the base of the fresh *Sphagnum-Calluna* peat or only a small distance from its base. Within the small-reed peat stem bases of *Molinia coerulea* were locally encountered.

It will be noted that Miss Abery's profile shows the strongly undulate character of the upper peat as a whole, an undulation of much larger wave-length than that met with in the ordinary regeneration-cycle (which indeed it accompanies). This large-scale undulation is very evident in the peat cuttings and can be seen in figures 10 and 12. It appears possibly to have had its origin in the local re-establishment of ombrogenous bog as large islands over the lower *Cladium*-reed fen.

(*b*) *Decoy Pool Wood profile*

These investigations were taken further by the examination in April 1944 of a deep peat cutting, 30 yd. north of Decoy Pool Wood, and 350 yd. from the Shapwick-Westhay road. The field notes were supplemented by pollen analysis of samples taken at intervals of only 1 in. (2·5 cm.) throughout the top 62 in. (155 cm.), from the apparently intact bog surface, and some information was also derived from microscopic investigation of the coarser plant material sieved off in the course of pollen-analysis preparation. The profile is as follows:

cm.	
0 to 15	Fairly fresh, reddish brown *Sphagnum-Calluna* peat, with abundant ericoid twigs and rootlets and occasional *Eriophorum* and small rhizome pieces: cf. *Rhyncospora alba*.
15 to 23	Very fresh *Sphagnum cymbifolium* peat with rhizomes of *Scheuchzeria palustris*.
23 to 30	*Cladium* peat with frequent rhizomes, some ericoid twigs, fruits of *Rhyncospora alba*, and abundant brown moss.
30 to 46	Banded peat with dark-brown, highly humified ericoid layers and abundant fresh *Sphagnum imbricatum* peat.

cm.	
46 to 71	Dark-brown, highly humified (*Sphagnum*)-*Calluna* peat with abundant ericoid twigs and rootlets, frequent *Calluna* flowers and fruits. At 53 to 56 cm. abundant *Dicranum Bergeri*, at 58 cm. some fruits of *Scirpus* type, at 61 cm. *Cenococcum*, and at 61 to 66 cm. *Eriophorum vaginatum*.
71 to 75	Yellow-brown, strongly laminated moss peat with ericoid rootlets, with abundant fresh *Sphagnum papillosum* and some *Aulocomnium palustre*.
75 to 91	*Cladium* peat with abundant rhizomes and roots of this plant, and frequent fruits. In top 8 cm. very abundant *Drepanocladus lycopodioides*, some *Sphagnum papillosum* and cf. *Campylopus stellatum*, frequent leaves and stems of *Myrica* throughout.
91 to 95	More laminated yellowish black aquatic peat penetrated by abundant rootlets from above: few rhizomes of *Rhyncospora* and *Sphagna*.
95	Surface of the old *Sphagnum-Calluna* peat.
95 to 154	Very highly humified black *Sphagnum-Calluna* peat with other ericaceae. At 107 to 124 cm. abundant *Eriophorum vaginatum*.

(The *Cladium* peat in places near the profile is replaced by a mixture of *Cladium*, *Myrica* and hypna in varying proportions, passing upwards into aquatic *Sphagnum* peat, or very locally into tussocks of *Molinia*.)

Figure 8 shows the non-tree pollen of local origin on the bog surface, and it will be seen that there is a striking correlation between these curves and the stratigraphy. Each of the *Cladium* layers is accompanied by a maximum of cyperaceous pollen (mostly *Cladium* itself), and the eutrophic conditions are indicated by the gaps in the curves for ericoid pollen and for *Sphagnum* spores. The pollen thus confirms the evidence of field stratigraphy, that here as well as farther east on Shapwick Heath there were two periods when the oligotrophic communities were displaced by more eutrophic. The earlier of these seems to have had the more extreme influence, as judged by thickness of the *Cladium* peat and the nature of the curves for pollen of local origin. The episode shows successive maxima of pollen of *Hydrocotyle vulgaris*, *Sphagnum* spores (presumably aquatic), fern spores, grass pollen (correlated with either local *Molinia* or the development of small-reed fen described earlier), sustained sedge pollen, and finally of *Sphagnum* spores (very possibly *S. papillosum*). The upper flooding horizon shows similar phenomena but less sharply marked, and the high grass-pollen values extend much above and below the flooding horizon.

(*c*) *Decoy Pool Drove, E*

The site of the last profile is 1700 yd. (1560 m.) distant from the site of the Shapwick Heath trackway and Miss Abery's profile: further examination was pursued at intermediate stations. The first of these was 260 yd. westwards from Nine Acre Drove, and 34 yd. south from the centre of (the continuation of) Decoy Pool Drove. The following is the field record:

cm.	
15 to 29	Black mouldered peat passing down into humified *Sphagnum-Calluna* peat.
29 to 33	Fresh aquatic *Sphagnum* peat with frequent *Scheuchzeria* and cf. *Narthecium*.
33 to 35·5	Pale yellow-orange *Hypnum* peat with seeds of *Menyanthes*.
35·5 to 38	Transitional.
38 to 51	*Cladium* rhizome peat.
51 to 58	Very fresh brown *Hypnum* peat.
58 to 76	*Cladium* peat with some hypna.

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cm.	
76 to 84	Black aquatic peat with *Cladium* roots.
84 to 89	An aquatic detritus of old decayed *Calluna* peat with twigs of *Calluna* and *Myrica*, penetrated by *Cladium* roots.
88 to 99	As above with also reed remains of *Phragmites*, a smaller reed such as *Phalaris*, and abundant leaves and twigs of *Myrica*.
99 to 109	Muddy, black aquatic rootlet peat with *Cladium*.
109 to 127	*Cladium* rhizome peat.
c. 162	Abundant *Eriophorum vaginatum* in old *Sphagnum-Calluna* peat, penetrated with *Cladium* roots.

(The surface of the old *Sphagnum-Calluna* peat was inaccessible here, but in all probability lay not far above the 162 cm. level.)

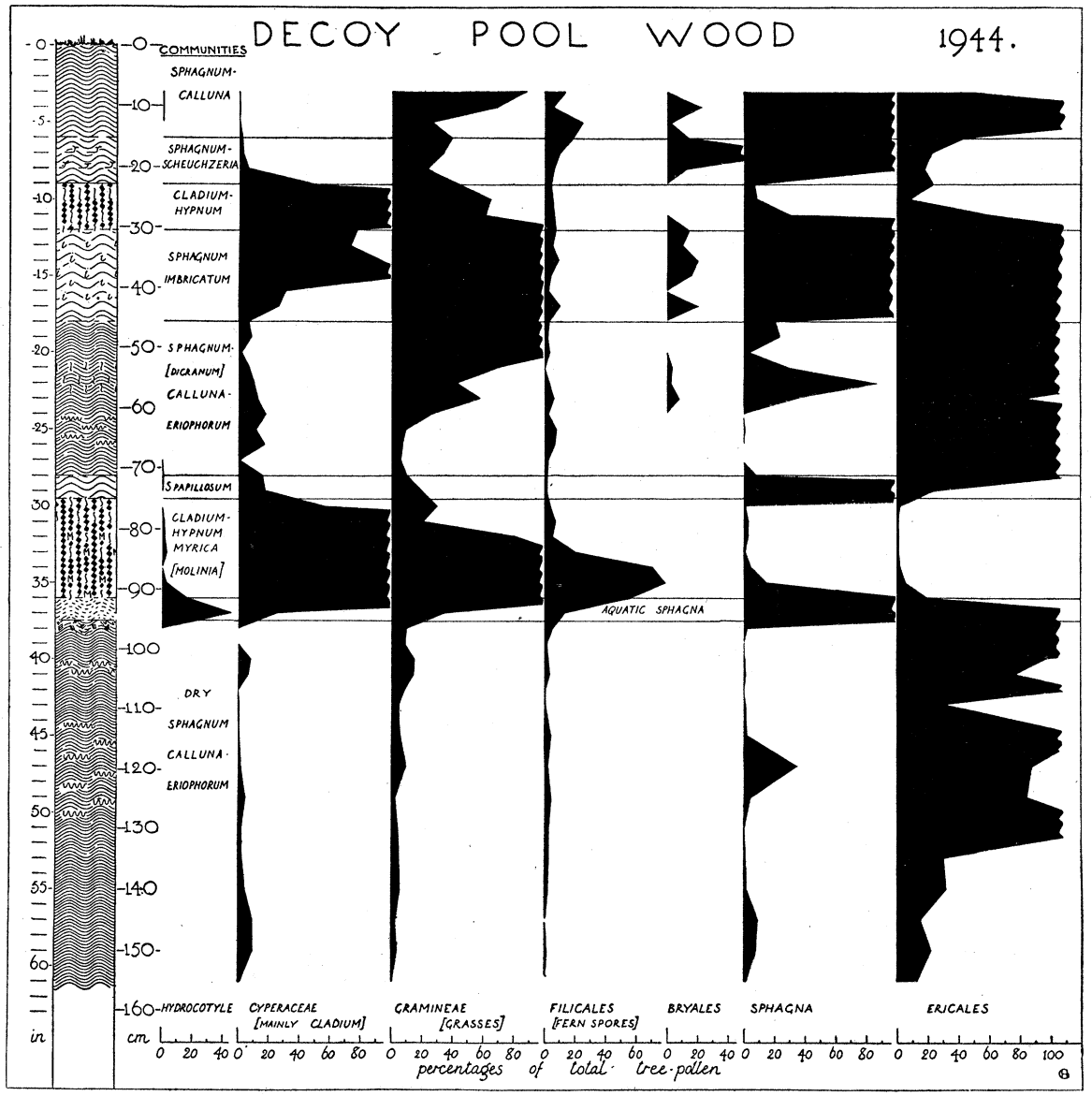

FIGURE 8. Non-tree pollen diagram for plants of local origin at Decoy Pool Wood. Peat symbols as in figure 4. The two *Cladium* peat layers indicate the two swamping-horizons in the upper peat, and it will be seen that they correspond with profound changes in the curves for the non-tree pollen types.

This profile illustrates the most extreme flooding of any site in the Westhay-Shapwick series (see figure 9). The lower and upper *Cladium* peats are very thick, and between them there is no intervention of a phase of oligotrophic communities. It is possible that this phase is here represented by the development of reed-peat, or by a thin *Sphagnum-Calluna* layer afterwards destroyed and represented only as the detritus peat with *Myrica*. It will be noted that the transition from the surface of the upper *Cladium* peat is marked by abundant *Scheuchzeria palustris*.

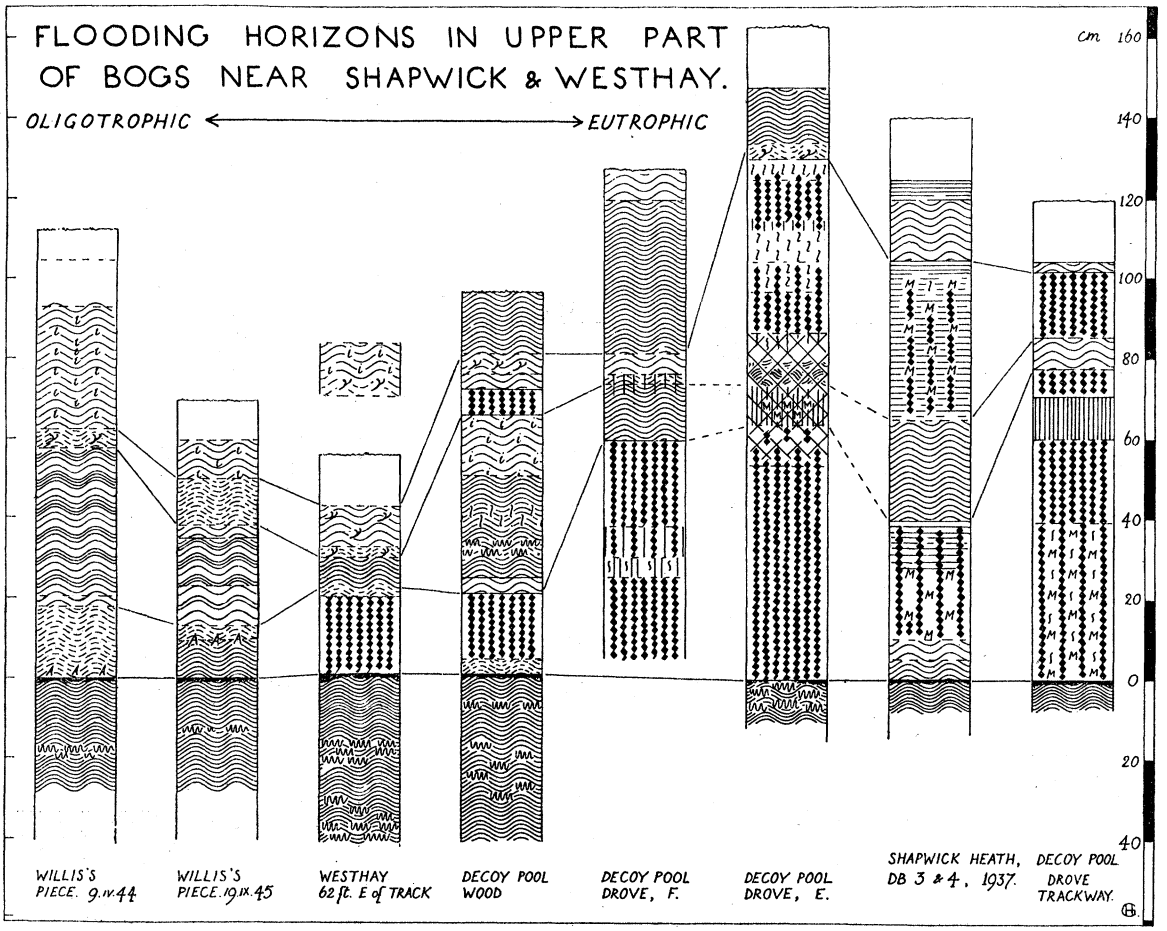

FIGURE 9. Correlation diagram of the chief bog profiles dealt with in the Shapwick, Meare Heath region. Peat symbols as in figure 4. The profiles have been arranged with the surfaces of the old *Sphagnum-Calluna* peat at the same level. The lines linking the diagrams indicate the expression of the two swamping episodes.

(*d*) *Decoy Pool Drove, F*

This site lies 837 yd. westwards from Nine Acre Drove, and 44 yd. north from the centre of Decoy Pool Drove. The peat cutting is shallower than the last, but seems equally to have been made from the uncut bog surface.

cm.	
0 to 7·5	Much mouldered but pale *Sphagnum* peat.
7·5 to 46	Very crumbly chocolate-brown *Calluna-Sphagnum* peat.
46 to 51	As above, with local cymbifolium *Sphagna*.
51 to 53	Rootlet peat with abundant *Calluna* twigs and some *Menyanthes* seeds.

cm.	
53 to 61	Humified *Calluna-Sphagnum* peat secondarily penetrated by *Phragmites*.
61 to 67	Humified *Calluna-Sphagnum* peat.
67 to 89	*Cladium* rhizome peat with some *Phragmites*.
89 to 96	Shallow reed-swamp peat with abundant rootlets including *Cladium* and *Phragmites*.
96 to 102	*Hypnum* peat with *Myrica* and reed-grass.
102 to 122	*Cladium* rhizome peat.

The section does not reach the old *Sphagnum-Calluna* peat, and it differs from profiles previously described in showing no evident double *Cladium* layer. It has been indicated in figure 9, that the layer of rootlet peat with *Menyanthes* at 51 to 53 cm. overlying peat secondarily penetrated by *Phragmites*, might represent the uppermost flooding phase, but if so it is a very feeble expression and there is no certitude in the correlation.

(*e*) *Shapwick Heath, DB* 3 *and* 4

At the time when the Shapwick Heath profile was first investigated, in 1936 and 1937, *Cladium* was recognized in small amount only, when a particularly well-preserved rhizome fragment was encountered. The field descriptions then taken suggest that greater experience would have recognized *Cladium* rootlets and possibly rhizomes as prevalent through the two layers of *Molinia* peat which were described in the borings DB 3 and 4. It is on this basis that we have constructed the amended and generalized profile set out in figure 9. It seems very probable that the original descriptions much over-valued the *Molinia* component and under-valued *Cladium*, but however this may be, it seems certain that there are represented two substantial *Cladium-Molinia* layers, separated by an oligotrophic *Sphagnum-Calluna* layer and that the lower *Cladium-Molinia* layer overlies the old *Sphagnum-Calluna* peat with the intervention of a few inches only of fresher *Sphagnum* peat. There is thus good reason to regard the data of the earlier observations as coming into line with those obtained later.

Thus within the stretch of heath running along Decoy Pool Drove some 2000 yd. (1829 m.) eastwards from the Shapwick-Westhay road, it would appear that there had been two episodes of flooding. The first, more severe, had covered the dried-out surface of the old *Sphagnum-Calluna* peat with a *Cladium* peat; the second, less severe, had produced *Cladium* peat in most places, though thin sometimes, and sometimes with *Molinia*. Possibly in high-lying places the base-rich water did not effectively displace the oligotrophic communities though they became more aquatic.

(*f*) *Westhay trackway site*

In 1944, whilst investigating a prehistoric trackway lying 400 yd. east of the Shapwick-Westhay road and 387 yd. north of the railway line, the peat stratigraphy was worked out correspondingly. The peat-cutting face just east of the trackway showed the sequence represented in figure 10. The smooth, cheesy, dark, old *Sphagnum-Calluna* peat is overlaid by a clear swamping horizon, and *Cladium* peat overlies its whole extent. This is succeeded by a banded Regeneration-Complex peat which, however, varies greatly in thickness as it rises and falls in waves of considerable amplitude, like those in a corresponding stratigraphical position on Shapwick Heath. This simplified profile shows no upper swamping

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horizon, but detailed examination of the peat face 62 ft. east of the trackway exposure gave the following sequences:

cm.	
0 to 12	Crumbly peat.
12 to 23	Fresh cymbifolium *Sphagnum* peat with *Scheuchzeria* and occasional fine ericoid rootlets.
23 to 25·5	Pale, unhumified and strongly laminated aquatic *Sphagnum* peat with *Scheuchzeria*.
25·5 to 30	Dark-brown, humified, *Calluna-Sphagnum* peat with abundant ericoid twigs.
30 to 35·5	Aquatic *Sphagnum* peat.
35·5 to 56	*Cladium* rhizome and rootlet peat.
56 to 66	A very decayed *Sphagnum-Calluna* peat, strongly laminated and penetrated secondarily by *Cladium* roots.
66 to 96·5	Very humified old *Sphagnum-Calluna* peat with abundant *Scirpus* at 79 cm., abundant *Eriophorum vaginatum* at 71 to 76, and 86 to 96·5.

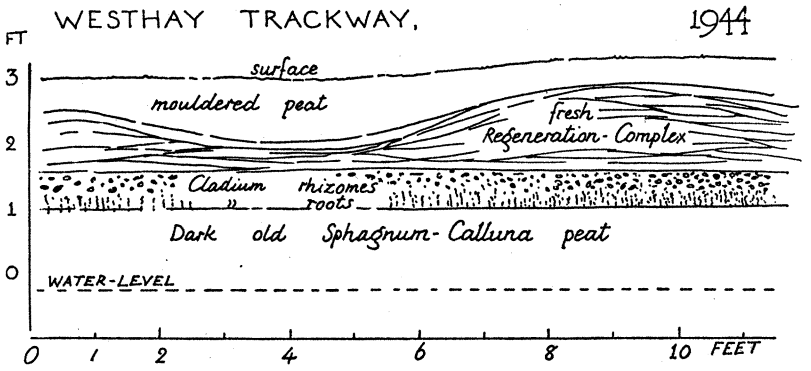

FIGURE 10. Profile of the peat face at site A of the Westhay trackway site. The track lies on the surface of the old *Sphagnum-Calluna* peat.

In this, the rather thin Regeneration-Complex peat is succeeded by aquatic *Sphagnum* peat with *Scheuchzeria*, and since this plant typically grows floating in the margins of deep pools on the surface of raised bogs, this most likely indicates an upper swamping horizon. A similar sequence has been obtained in the profiles at the trackway site itself. At both places a certain amount of the uppermost peat has been removed, although the material so removed seems to be represented by an uncut bank of peat at the field-margin: from this was recovered very abundant, very fresh *Sphagnum imbricatum* Regeneration-Complex peat, *Scheuchzeria*, and variable amounts of *Hypnum*, no doubt also part of the upper swamping horizon.

In this region therefore we apparently have the situation that at the later swamping period, although the bogs were made much wetter, they were not so affected by base-rich water as to become *Cladium* fens.

(*g*) *Willis's Piece*

The site of our next recorded observations is an area of peat being cut for the first time when we visited it in 1944. It lies adjacent to the Westhay-Catcott Burtle road, on its north side, and has a frontage about 900 to 1100 ft. along the road from Black Ditch coming towards Westhay (see map, figure 11). Long peat faces were examined there in 1944 and 1945, and they proved of especial interest in that they disclosed no eutrophic

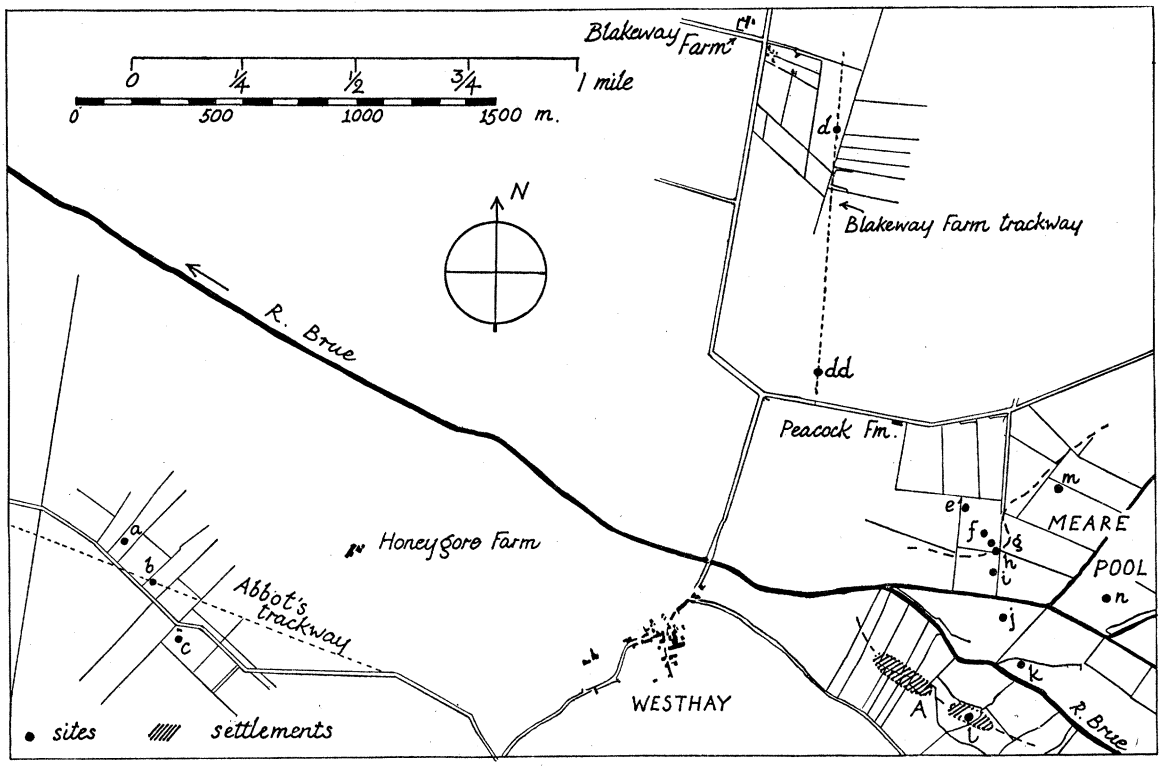

FIGURE 11. Map showing the position of sites at Willis's Piece and of the Abbott's Trackway. The lettered circles are borings or profiles: (*a*), Willis's Piece; (*b*), Grant's Piece; (*c*), Godwin's Piece; (*d*), Blakeway Farm, trackway excavation site; (*dd*), second exposure, July 1947; (*e*) to (*m*), the margins or bed of Meare Pool; (*l*), Meare Lake Village site (Godwin 1941), A marks the Meare Lake Village sites.

communities at all in the upper peat. Two typical profiles have been drawn in the comparative diagram (figure 9) and the description is given below of one which was extended by boring.

cm.	
0 to 9	Mouldered upper surface peat.
9 to 19	Dry, very fresh large-leaved *Sphagnum* (cf.) *imbricatum* peat. (At 19 cm. a sharp change.)
19 to 31	Strongly laminated, probably aquatic, *Sphagnum* peat alternating with bands of dark-brown *Calluna* peat with occasional large-leaved *Sphagna*. (A short-period Regeneration-Complex peat.)
31 to 34	As above, but with a rather conspicuous and consistent band along the peat face of very fresh, large-leaved *Sphagnum*.
34 to 46	Rather dark-brown and well-humified *Calluna* peat alternating with occasional thin pockets of fresh, large-leaved *Sphagnum*: occasional *Eriophorum vaginatum* (Regeneration-Complex peat.)
46 to 57	As above, but with much increased proportion of fresh *Sphagna*. (Rather sharp contrast at 57 cm.)
57 to 60	Very strongly laminated greyish green aquatic *Sphagnum* peat, with *Eriophorum angustifolium* and very little *Calluna*. (This layer, though frequent, is not fully consistently present along the peat face.)
60 to 64	Dark chocolate-brown ericoid peat with very abundant stems, rootlets and leaves of *Andromeda* at *c*. 60 cm.

cm.	
64 to 68	Transitional with *Scirpus*. (At 68 or 69 cm. is the upper surface of the old *Sphagnum-Calluna* peat.)
68 to 80	Very homogeneous black peat, highly humified, contracting strongly on drying, and showing vertical cracks along the peat face. Contains small ericoid twigs, *Eriophorum vaginatum*, and rather frequent *Scirpus caespitosus*. (Much blacker and less fibrous than ordinary *Calluna* peat.)
80 to 82	Transition with abundant *Eriophorum vaginatum*.
82 to 100	Rather well-humified dark-brown *Calluna-Eriophorum-Sphagnum* peat, $H = 6$, with locally abundant *Eriophorum vaginatum*.
100 to 140	Highly humified dark-brown *Calluna* peat, $H = 8$, *Eriophorum angustifolium* at 132 cm.

The rest of the sequence need not now be given: soft blue clay was reached at 318 cm.

It will be seen from this that although peats of eutrophic communities are absent, nevertheless two swamping horizons are recognizable in the form of consistent layers of aquatic *Sphagna*, the lower lying upon the disturbed surface of the old *Sphagnum-Calluna* peat. Another detailed profile (of which the field record need not be given), from the same locality is given alongside the first in figure 9, and it will be seen to display a closely similar sequence with, however, a much thicker lower aquatic *Sphagnum* peat and with *Scheuchzeria* in considerable amount associated with the upper swamping horizon.

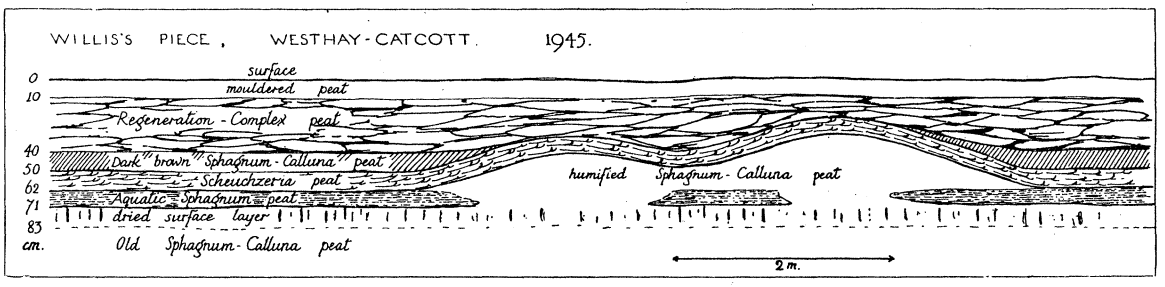

FIGURE 12. Profile of cut peat faces at Willis's Piece showing expression of the two swamping horizons as aquatic *Sphagnum* peat, and *Scheuchzeria-Sphagnum* peat.

A newly exposed peat face in April 1945 allowed the general observations recorded diagrammatically in figure 12. It will be seen that the dried surface of the old *Sphagnum-Calluna* peat is very consistently developed and is generally overlaid by the aquatic *Sphagnum* peat of the first swamping horizon. It is, however, locally absent, and at such places a humified *Sphagnum-Calluna* (Regeneration-Complex) peat has developed in big lens-shaped masses. These are overlaid by the *Scheuchzeria* peat of the upper swamping horizon. Over part of the profile, however, the aquatic *Sphagna* of the first swamping horizon are directly succeeded by the *Scheuchzeria* communities of the second, and it would therefore appear that at this site, as at Westhay and Shapwick Heath, after the first swamping of the bog surfaces the old *Sphagnum-Calluna* Regeneration-Complex re-established itself in the form of large patches or islands, but that here they did not completely coalesce.

After the upper *Scheuchzeria* phase, Regeneration-Complex re-established itself over the whole bog surface, being perhaps initiated by a phase of dryness in which more humified peat was formed.

Throughout the peat faces and in the dried cut turves of Willis's Piece, it was very conspicuous that the onset of the first swamping was accompanied by a very profuse development of *Andromeda*, the leaves and twigs of which lie in great profusion at the contact surface between the old *Sphagnum-Calluna* peat and the aquatic *Sphagnum* peat, often accompanied by smaller amounts of *Erica tetralix*.

3. Character and correlation of the swamping surfaces

The dimensions and disposition of the aquatic layers strongly suggest that the two swamping horizons at Willis's Piece correspond with those at Westhay and Shapwick Heath, but the completely oligotrophic character of communities at the first-named site indicates that they were possibly caused by changed evaporation-precipitation conditions just as with the 'Grenzhorizont' well known in west European raised bogs. The other sites to a greater or less degree, however, exhibit the effects of flooding with base-rich water. This is not difficult to understand when we consider the topography of the region and the effects which heavy increase of rainfall would be certain to produce upon it. There is a large catchment area in the Quantock, Polden and Mendip Hills, a great deal of which is Mountain Limestone or Liassic Limestone, and on the flat clay plains of the levels there had developed a great complex of raised bogs, hampering seawards drainage. Sudden increase of rainfall must have caused widespread flooding of the raised bog with calcareous water, and there can be little doubt that this is the phenomenon which the *Cladium* peats represent. Only the raised bogs, isolated from the flood-water by elevation or topographic circumstance, would be exempt from this flooding, and even they, as Willis's Piece, would reflect the changed circumstances in the development of swamping surfaces with aquatic, but nevertheless still oligotrophic, communities.

If those were indeed the circumstances, we should naturally expect to discover a gradation from place to place in the extent of eutrophic or oligotrophic influences at the swamping surfaces. These can be appreciated by the correlations suggested in figure 8. The Willis's Piece sites stand at one end of the range and Decoy Pool Drove, E at the other. In the latter the *Cladium* peats are very thick and scarcely interrupted at all by a phase of dryness, although it does indeed seem possible that the onset of the second flooding involved some destruction and reworking of older *Sphagnum-Calluna* peat. At Decoy Pool Wood and the Decoy Pool Drove trackway (=Shapwick Heath trackway) the two eutrophic *Cladium* peats are clearly developed and evidently separated by a phase of oligotrophic raised-bog development, and this is probably true also for the Shapwick Heath borings DB 3 and DB 4, although here the *Cladieta* were less pure, and much *Molinia* accompanied *Cladium*, an indication of less deep or less permanent flooding. Westhay is a site decidedly intermediate in character between Willis's Piece and Shapwick Heath, for although it displays the lower flooding horizon as a substantial *Cladium* layer, the upper is entirely oligotrophic and resembles that at Willis's Piece in consisting of aquatic *Sphagna* and *Scheuchzeria*. It is possible that the upper swamping horizon at Decoy Pool Drove, F is of this character also, but the observations here chance to be somewhat isolated and unsupported.

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We may interpolate that when pollen analyses are available for these profiles, as at Westhay, Decoy Pool Wood, Shapwick Heath, and Shapwick Heath trackway, they confirm the general contemporaneity of the commencement of the *Cladium* phase of the first flooding horizon. They are insufficient for correlating the second flooding horizon.

In the foregoing description and discussion there will have emerged some conception of the nature of the plant communities concerned with these changes of conditions, but it may be worth while to consider this point specifically, especially in view of the recognition by Jonas (1936) of a stage of 'Precursor peat' formation as part of the phenomenon constituting the 'Grenzhorizont'. This 'Vorlaufstorf' lies between the old humified *Sphagnum* peat and the upper fresh *Sphagnum* peat: it represents a stage of flooding of the old dried-out surfaces of the raised bogs, and of infra-aquatic peat formation in extensive pools upon the waterlogged surface. As seen on the Luneberger Heide, it consists of greasy grey muds of floating *Sphagna* and of mats of the papery rhizomes of *Scheuchzeria palustris*, and it is succeeded by re-establishment of the tussock-building *Sphagna* which recreate the Regeneration-Complex of active raised-bog vegetation. It is the lower surface of the infra-aquatic peat which constitutes the Boundary Horizon, and if the flooding is a slow and progressive process it is evident that the precursor peat will form soonest in the deep hollows of the old bog surface and last upon its hummocks. Thus the Boundary Horizon would be of different date at different places, and Jonas brings forward some pollen-analysis evidence in support of this. The great importance of Jonas's interpretation appears to lie in the fact that it turns attention to the task of recognizing the precise nature of the change-over in physical conditions and in vegetational cover at the Boundary Horizon. In particular, it tends to demonstrate that the effect of the climatic deterioration upon the dried-out bog surface was not a gradual reversal through those communities by which the bog had built up, but was the initiation of a totally new series of vegetation stages begun by rapid flooding.

These conclusions are borne upon by Somerset results. In the first place, there can be no doubt that between the old *Sphagnum-Calluna* peat and the renewed younger system of similar but fresher Regeneration-Complex peat there intervenes aquatic peat of one type or another. In the second place, more especially when eutrophic communities enter, there is not merely an initial catastrophic flooding but a progression of stages to maximum flooding and then stages of recovery. Lastly there is here also evidence of certain (although not great) differences in the onset of flooding in different places.

We may elaborate the second of these points, and show how the eutrophic communities of extreme flooding are sandwiched between others representing conditions less extreme. Thus at Decoy Pool Wood the old *Sphagnum-Calluna* surface was waterlogged and then colonized by *Sphagnum cuspidatum* before the *Cladium-Hypnum-Myrica* vegetation, which represented the maximum swamping, covered the surface. Recovery to the Regeneration Cycle was by way of fresh *Sphagnum papillosum*, a species not extreme in relation either to water-level or to base-status. The upper flooding episode at the same site was begun by *Sphagnum imbricatum* replacing the Regeneration Complex, and is represented at its maximum by *Cladietum*: recovery was by way of a fresh cymbifolium *Sphagnum* peat with much *Scheuchzeria*, that is to say, by conditions distinctly aquatic but less eutrophic, before Regeneration Complex was again established.

At the Westhay trackway site similarly we find the uppermost Regeneration-Complex phase separated from the earlier *Cladietum* by an intermediate stage of aquatic *Sphagnum*, and succeeded by a similar aquatic *Sphagneto-Scheuchzerietum*.

Again, at Decoy Pool Drove, E, the Regeneration Complex near the surface is separated from the underlying *Cladietum* by the transitional *Sphagneto-Scheuchzerietum*.

The picture conveyed unmistakably by sequences such as these is of a major flooding episode proceeding first by raising the water-table in the bog and waterlogging the old surfaces, then by swamping transitional conditions with some degree of base access, finally deeper flooding and more eutrophic conditions. The recession involves a drop of the water-level, invasion by more oligotrophic but still aquatic or semi-aquatic species and finally return to the oligotropic communities of normal raised-bog growth.

There are of course many variations from this story and a great deal more remains for investigation: interpretation of the data also depends upon better knowledge of the ecology of communities of the surfaces of living raised bogs.

A difficulty encountered at some sites is the nature of the transition layers at the surface of the old *Sphagnum-Calluna* peat but below the unambiguous and undisturbed layers of the first swamping episode. Sometimes, as at Decoy Pool Wood, at Westhay and Willis's Piece, the transition is direct and simple, but at others there is a layer described in field notes as a detritus peat, or a rootlet peat. It is secondarily penetrated by the rootlets of *Cladium* when the rhizome peat of that plant overlies it. It commonly contains much hypnoid moss and very abundant twigs and leaves of *Myrica*. It is often black and incoherent and contains a large bulk of dark *Sphagnum-Calluna* peat.

It seems possible that this peat represents the first effects of growth upon the swamped surfaces of the dried-out bog surfaces at the stage of partial or intermittent flooding, when disturbance and washing down of material from hummock sides and bare peat surfaces was occurring and new *Cladium* and *Myrica* communities were invading the swamped surfaces. It is this kind of peat which overlies the undisturbed old *Sphagnum-Calluna* peat at many sites on Shapwick Heath, and the high content of *Sphagnum-Calluna* peat (possibly derived) makes it difficult to state precisely the true position of the dried-out old bog surfaces. It will be shown later how tree-pollen analyses bear upon the interpretation of this phenomenon (see Part X).

PART IX. PREHISTORIC TRACKWAYS IN THE SOMERSET LEVELS

1. Preface

It has been shown in parts VI and VIII of this series that from the middle of pollen zone VII onwards, that is to say, from Neolithic times, the flat valley between the Polden Hills and the Wedmore Ridge passes from a state of reed and sedge fen into a condition of widespread cover by ombrogenous raised bogs, whose oligotrophic vegetation of *Sphagnum*, *Calluna*, *Eriophorum* and associated species flourished free from invasion by base-rich drainage water. Through the raised-bog complex the tops of intermediate low ridges of clay or sand projected in the form of the islands of Catcott, Meare, Godney and

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Glastonbury. These bogs apparently continued their growth until the end of Romano-British times, although at the opening of the Iron Age a general flooding of their surfaces by base-rich water occurred and ushered in a phase of more rapid growth. During the very intensive exploitation of the bogs for peat during the past century a great wealth of prehistoric objects has been brought to light, most of which have been described in the *Proceedings of the Somerset Archaeological and Natural History Society*. Among the prehistoric remains thus recorded are a number of timber causeways or tracks traversing the peat bogs and linking the upland ridges and the islands with one another (see map, figure 13). The evidence concerning them was collected and published by Dr Bulleid in 1933, in the course of describing in detail the structures of a massive trackway crossing Meare Heath.

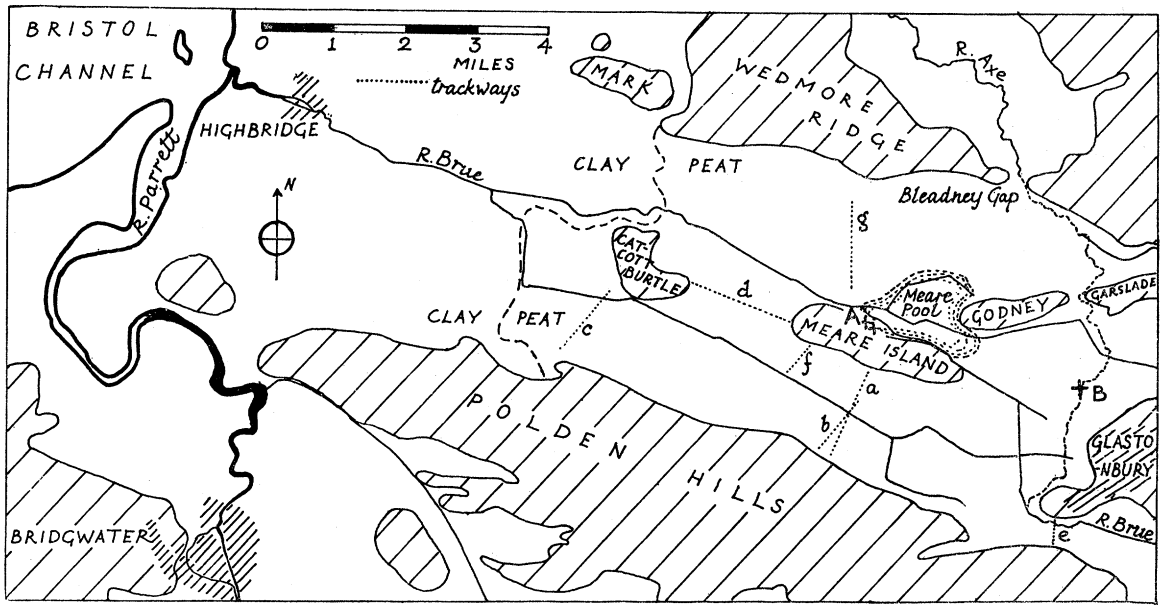

FIGURE 13. Sketch-map of Wedmore-Polden valley of the Somerset Levels, showing position of the prehistoric trackways referred to in the text: (*a*), Meare Heath trackway; (*b*), Shapwick Heath trackway; (*c*), Chilton Moor trackway; (*d*), Abbott's Way trackway; (*e*), Morland's trackway; (*f*), Westhay trackway; (*g*), Blakeway Farm trackway. The boundary between the coastal clay belt and the peat hinterland is given as a broken line, and the presumed original course of the river Brue is dotted, as is the approximate former outline of Meare Pool. A, Meare Lake Village sites, B, Glastonbury Lake Village site.

This trackway was recovered by the present authors, who record here the attempt to date it by studies of bog stratigraphy and by pollen analysis. This work led them to the discovery within the district of three further hitherto unrecorded prehistoric trackways, which were excavated and investigated by the same methods. They are referred to in the following account as the Shapwick Heath trackway, the Westhay trackway, and the Blakeway Farm trackway. For the Meare Heath, Shapwick Heath and Westhay tracks clear evidence of dating emerges, but for the Blakeway Farm trackway the account is restricted to construction and stratigraphic relationships. Accounts of the construction of these four trackways are given, together with information as to the nature of the timber employed.

We have sought on several occasions, by probing and drilling, to rediscover the well-known Abbott's trackway which ran between the islands of Catcott Burtle and Westhay,

and the course of which is given on the 6 in. O.S. Map. Its rather substantial and elaborate structure was similar to that of the Meare trackway, and it would have been of very great interest to compare its age and provenance with that of other trackways. Search has, however, hitherto been fruitless.

We have not attempted to recover the fascine trackway described as crossing Chilton Moor, nor the causeway between Glastonbury and Street discovered by Mr John Morland, and also referred to by Bulleid. The other trackways mentioned from the Polden-Wedmore valley have very indefinite character or situation.

It will be shown that all the trackways investigated belong to one short period and are strikingly related to the history of development of the peat bogs of the region.

2. Meare Heath trackway

(*a*) *Situation and circumstances*

Dr A. Bulleid, F.S.A., in 1933 published an account of the discovery of a prehistoric trackway crossing Meare Heath (Bulleid 1933). The substantial and elaborate nature of its construction, and the fact that it had not been datable by archaeological means, led us to attempt its rediscovery, its relationship to the bog stratigraphy, and its dating by pollen-analytic methods.

Dr Bulleid described the line of the trackway with close accuracy and we were able to confirm its presence along the line given by him, but far south of any exposures he had seen. Acting upon advice given by the turf cutters we saw portions of the trackway close to the boundary of Shapwick Heath next to the flank of the Polden Hills. The track was nearly parallel with Nine Acre Drove, but 140 ft. eastward from it, and was exposed along a distance of 1710 to 1820 ft. from Buscott Lane as measured along the length of the extrapolated track. From this point the track runs directly about 26° east of north towards Meare Island, passing immediately beside or under the factory of the Eclipse Peat Works, and just west of Great Plains Farm.

Through the kindness of the owners and the peat factory employees, we were able in September 1941 to expose an undisturbed section of the trackway beneath a bank left to carry a light railway. This was about 390 ft. from Great Plains Farm in a direction 15° of north from it (figure 2).

(*b*) *Construction*

As described by Bulleid, the track consisted of transverse baulks of timber, mostly oak, but also of birch and perhaps alder, laid transversely and at rather irregular intervals from complete contact to 5 ft. (1·5 m.). Most of the baulks were rectangular in section but others were trunks split in half: they were of the order of 10 or 12 in. (25 or 30 cm.) in width and 3 to 6 in. (7·5 to 15 cm.) in thickness, and below and between them was found a layer of birch and alder brushwood 10 or 15 in. (25 or 38 cm.) thick. Many beams were perforated by mortise holes, mostly square-cut, which still retained squared and sharpened vertical piles 3 to 4 in. (7·5 to 10 cm.) across, which held the track in place. Other vertical stakes and piles in line with these were driven directly into the peat: they all projected about a foot (30 cm.) above the track, and evidently held in place the very

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long squared wooden stringers which served as margins to the track and whose presence may be taken as indicative of use by wheeled traffic. Dr Bulleid has indicated to us, what indeed his published drawings suggest, that so many of the timbers are shaped and pierced by mortise holes, that the track must in large part have been built of material previously employed in another construction, such for instance as the timber substructure of the Lake Settlement at Glastonbury. Indeed it is also unlikely that such heavy and such tough timber as oak would have been employed so freely except under some such circumstances.

It is uncertain how long were the transverse baulks, but the average can hardly have been less than 6 or 8 ft. (1·8 or 2·4 m.), so that over its total length of about $1\frac{1}{2}$ miles (2·4 km.), a great weight of timber was employed. A general idea of the character of the construction can be obtained from the sketch (figure 14).

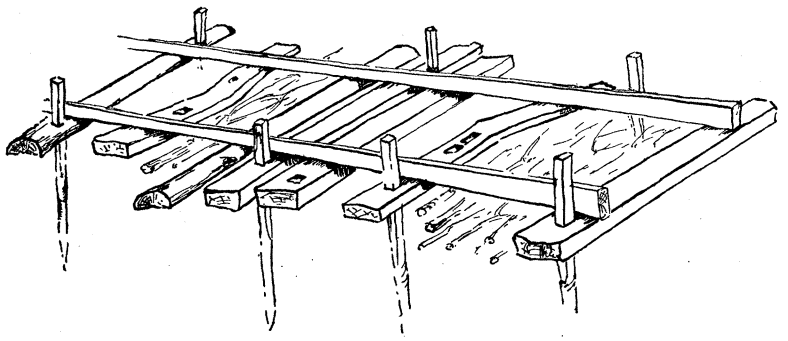

FIGURE 14. Meare Heath trackway: sketch to show construction after data given by Bulleid (1933).

At the site where we uncovered portions of the track at the south end of Nine Acre Drove, in September 1942, Mr James Baker, who had dug peat from this plot, described the track as of oak sleepers, 6 or 7 ft. long and laid about 4 ft. apart, each was a half-trunk or half-limb of oak with bark intact on the lower side. The oak sleepers were very hard and well preserved. There were also vertical stakes as thick as a man's arm, up to 6 ft. (1·8 m.) long and sharpened at the end: these were now very soft and cheesy. Baker described the track as running the full length of his piece of ground and parallel with Nine Acre Drove. The sleepers were 1 'mump' deep (*c.* 9 in. or 23 cm.) below the contact between the white and the dark peat. Thus direction, construction and stratigraphic position leave little doubt that this is part of the track described by Dr Bulleid.

(*c*) *Stratigraphy*

When Dr Bulleid saw the trackway it was covered with 18 in. to 2 ft. (46 to 61 cm.) of light-coloured peat, in part disturbed. Certainly much more overlying peat had been removed, but how much it is hardly possible to say (perhaps the estimate of the peat works foreman of 4 ft. at our exposure is the most reasonable).

The following description of stratigraphy is based upon field examination of a cut profile down to the lower surface of the trackway, and field-notes of the boring from this level downwards. These conclusions were supplemented by microscopic examination in the laboratory of the grosser material strained off during preparation of the samples for

pollen analysis, and by dissection in the laboratory of a peat-monolith cut vertically from the above trackway.

cm.	
0 to 50	Disturbed dry peat.
50 to 56	Very fresh cymbifolium *Sphagnum* with some *Scirpus caespitosus*, *Molinia coerulea*, and *Myrica* leaves towards base.
56 to 64	Dark-brown moderately humified *Cladium* peat with frequent vertical rhizomes and fruits of *Cladium*. Some *Sphagna*, *Molinia*.
64 to 72	Dark-brown fibrous *Myrica* peat with abundant twigs and leaves.
72 to 84	Blackish brown highly humified fibrous *Erica-Calluna-Scirpus* peat: frequent stem bases of *Scirpus caespitosus*, frequent leaves of *Erica tetralix*, frequent leafy shoots of *Calluna vulgaris* and occasional ericoid flowers.
83 to 84	Upper surface of trackway timbers.
84 to 95	Dark-brown, very humified (*Sphagnum*)-*Calluna* peat with decayed remains of *Scirpus*. Leaves and flowers of *Calluna*.
95	Lower surface of main trackway timbers.
95 to 100	Locally beneath the track a dense mass of decayed stems and leaves of *Sphagnum* (cf. *S. cuspidatum*), with frequent fruits of *Rhyncospora alba*: no doubt a pool deposit, elsewhere the track overlaid *Calluna* peat directly.
95 to 210	Dark-brown, very humified (*Sphagnum*)-*Calluna* peat with very decayed remains of *Scirpus caespitosus* in top 10 cm., frequent leaves and flowers of *Calluna*, leaves of *Erica tetralix* and fruits of *Rhyncospora alba*. At 182 cm., *Betula*. At 190 cm., very decayed *Eriophorum vaginatum*. At 200 cm., remains of stems and leaves cf. *Oxycoccus quadripetalus* and shoots of *Calluna*.
210	Yellow-grey reed-swamp peat with rhizomes and rootlets of *Phragmites*, rhizomes and fruits of *Cladium*. At 210 cm., fruit of *Hippuris*. At 220 cm., three cremocarps of *Hydrocotyle*, and two fruits cf. *Scirpus*.
225 to 245	Abundant bark and detritus.
245 to 265	*Cladium* sedge and *Phragmites* peat, frequent stems of *Phragmites*, frequent seeds of *Menyanthes*, occasional fruit of *Cladium*.
265 to 283	Coarse detritus peat with one *Carex* fruit and one fruit of *Scirpus* (cf. *lacustris*).
283 to 288	Laminated fine detritus with *Phragmites*.
288 to 345	Soft grey clay, with *Phragmites* diminishing downwards. At 295 cm. one seed of *Menyanthes*.

The non-tree pollen diagram (figure 15) shows a high degree of correspondence with the gross stratigraphy. High values for pollen of the Caryophyllaceae-Chenopodiaceae type in the upper layers of the soft blue clay indicate salt-marsh and the transition to fresh water is indicated not only by the *Phragmites* stems, but by the decided maximum of pollen of aquatic plants. Throughout the ensuing stage of reed-swamp and sedge-fen the percentage of fern spores is extremely high, a reflexion in part at least of the presence of local fen scrub (indicated also both in stratigraphy and in the tree pollen). The sudden transition to ombrogenous peat formation at 205 cm. is indicated by the abrupt diminution of the fern-spore curve and the expansion of the *Sphagnum* spore, and ericoid pollen curves to substantial values, retained throughout formation of the old humified *Sphagnum-Calluna* peat. There can be little doubt that up to the time when the trackway was built conditions

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were those of a raised bog in a dry condition carrying abundant *Calluna* and *Erica*, with *Scirpus* towards the end.

At the trackway level considerable changes of conditions are indicated. The *Sphagnum* spore and 'brown-moss' spore curves cease, grass pollen rises to high values and there is a short period of very high values for ericoid pollen. This corresponds with the formation of *Scirpus-Molinia* peat with abundant *Myrica* and ericoid shrubs. This deposit is too thick and too generally prevalent to be regarded as material brought in to consolidate the trackway, but represents the stage transitional to the next, that of *Cladium* fen, which undoubtedly represents a flooding of the hitherto acidic bog with base-rich water. The effect was not prolonged here, for not only does *Sphagnum* accompany the *Cladium*, but oligotrophic *Sphagneta* soon replace it, though for how long this section does not permit us to say.

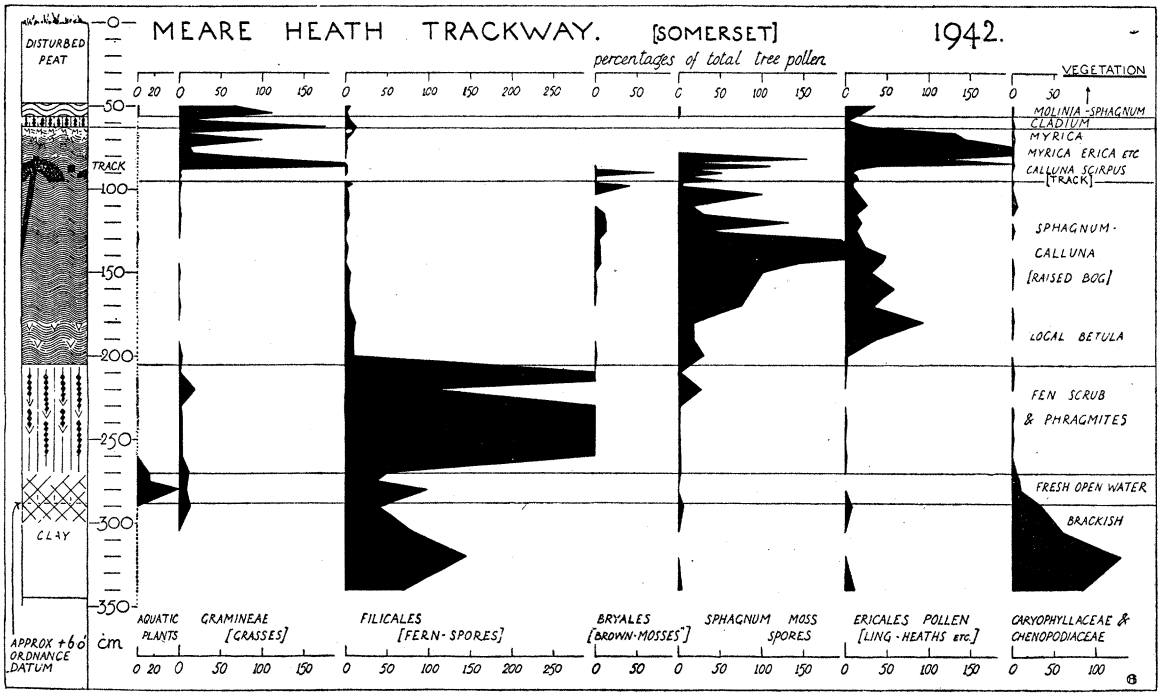

FIGURE 15. Meare Heath trackway: non-tree pollen diagram. Note the layer of *Cladium* peat of the first swamping horizon 30 cm. above the trackway. Peat symbols as in figure 4.

Some suggestion that there was a temporary increase in wetness at the time of the track construction, is afforded by the local occurrence beneath the track of fresh deposits of aquatic *Sphagnum* peat, such as are not present at deeper levels.

(*d*) *Tree-pollen zonation* (*figure* 16)

The tree-pollen diagram conforms very closely to the pattern of the long series from other parts of the Shapwick-Meare Heath region (see figure 5, part VIII). The top of the blue clay appears to correspond with the end of zone VI, although the high *Pinus* values are certainly due in part to the nature of the clay deposit. Zone VII*a* with its outstandingly high *Ulmus* and *Tilia* curves appears to end at 205 cm. and local development of *Betula* distorts the diagram within this zone and also the transition to zone VII*b*.

The opening of zone VIII appears to correspond with the flooding horizon at 64 cm., a determination supported by the falling *Alnus* and rising *Quercus* curve, together with increased *Ulmus* values. It is possible that the trackway itself coincides with the base of zone VII to VIII as shown by the broken line in figure 16, but the curves show no very striking changes and it must be remembered that the trackway itself must have hindered normal peat formation over a period of time.

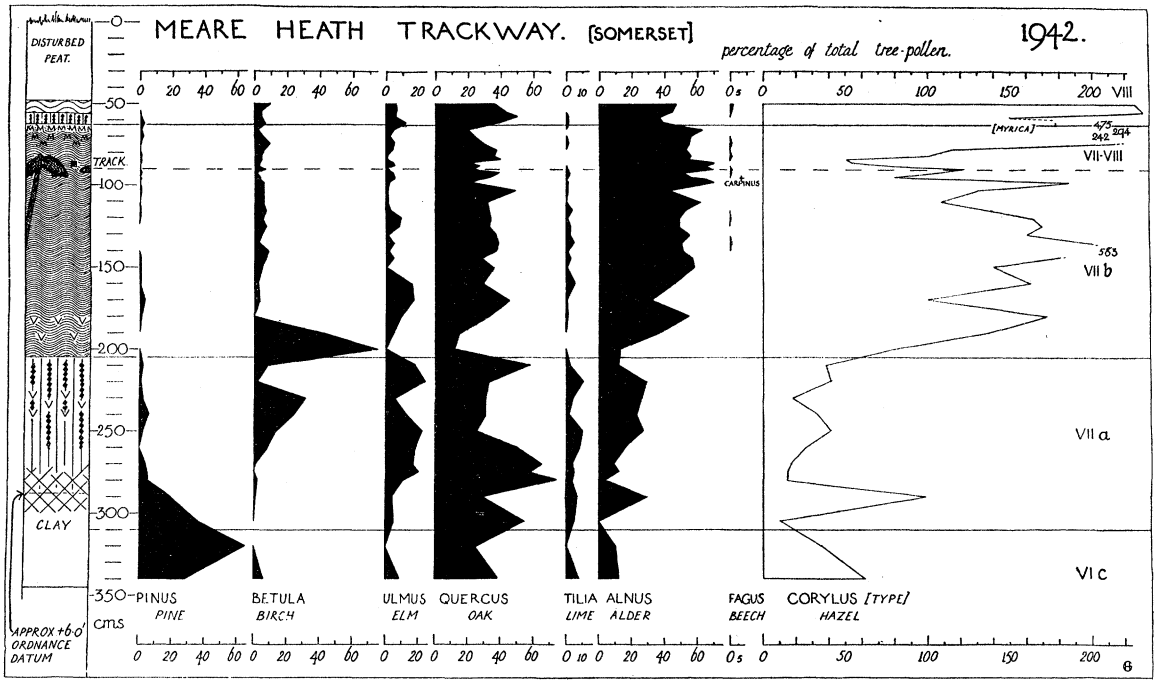

FIGURE 16. Meare Heath trackway: tree-pollen diagram. The *Corylus* type pollen is very largely that of *Myrica gale*. Peat symbols as in figure 4.

The stratigraphy, non-tree pollen curves, and tree-pollen curves combine to suggest that the track was built at a period when the bog surfaces first showed signs of alteration by increasing wetness and that the acceleration of such change is recorded in the *Cladium* fen layers at the opening of zone VIII.

3. SHAPWICK HEATH TRACKWAY

(*a*) *Situation and circumstances*

Whilst we were attempting in April 1942 to get information about exposures of the Meare Heath trackway south of the old Glastonbury Canal, Mr Foster, foreman at the works, spoke to us of a buried trackway made not of heavy timber, but of brushwood with short poles and long vertical stakes. He said that above the trackway there was consistently found a useless type of peat. Other peat cutters confirmed the position and nature of the track, saying that pointed stakes from it were frequent, but that certain lengths of the track could only be recognized by disturbed peat in the expected position. Mr Foster showed us a small piece of horizontal timber, about 2 in. (5 cm.) in diameter, which he said was part of the trackway. This lay over the old humified *Sphagnum-Calluna* peat and was overlaid by *Cladium* peat, which was the 'bad' peat referred to.

We were not able to pick up the trackway at a distance, for on one side the bog was practically uncut and on the other too much had already been removed, but the line of the track seemed very familiar to the foreman, and from the ground localities he showed us we were able to estimate the direction quite closely. The small portions we were later able to uncover confirmed this direction.

This excavation (April 1942) was 363 ft. west from the centre of Nine Acre Drove, and close to the north edge of the easterly continuation of Decoy Pool Drove (figure 2). The track from this point took a course 52° east of north. The site is approximately 1890 ft. south-west of the railway (measured normally to it).

(*b*) *Construction* (*see figure* 17)

At site A, investigated rapidly on 17 April 1942, we were able only to uncover a small fragment of the track, but its reality was evident from three sharpened stakes. The first of these, about 2 ft. 3 in. long (68 cm.), was lying horizontal and parallel with the length of the track and in its northern margin. The second, somewhat shorter stake was also horizontal but transversely across the track; the third was similar in dimension but squared as well as pointed, and was driven at a steep angle obliquely down through the track into the peat below. This latter stake and one of the horizontal ones proved on microscopic examination to be beech (*Fagus sylvatica*), whilst the third was alder (*Alnus glutinosa*). At this point the track was 2 or 3 ft. wide (60 to 90 cm.) and was mostly composed of small brushwood now much decayed, directly overlying an old surface of the dark humified *Sphagnum-Calluna* peat very rich in tussocks of *Eriophorum vaginatum*.

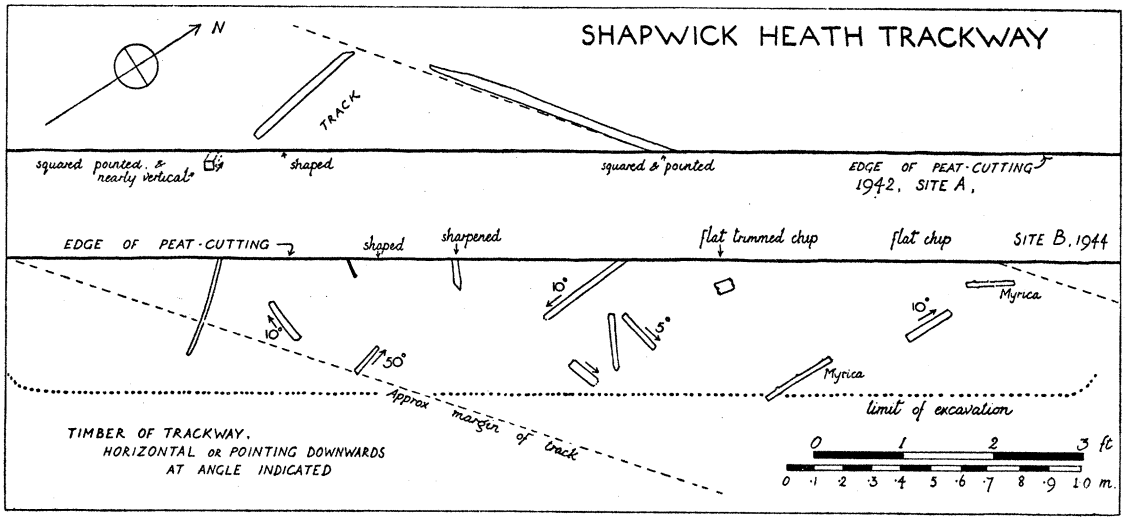

FIGURE 17. Shapwick Heath trackway: plan showing disposition of the small stakes of the trackway at the two excavations, which were made on the edges of two parallel peat faces. The arrows with an angle written alongside indicate the angle from horizontal at which the stakes are lying.

In April 1944 the trackway was exposed again on a new peat face opposite to the old one. It was uncovered for a length of about 12 ft. (3·65 m.) and a depth of 18 in. (46 cm.) as it obliquely crossed the peat face. There was a sparse scatter of small fragments of wood in a very decayed trash of brushwood of *Calluna* and *Myrica*, about 6 in. thick upon the surface of the old *Sphagnum-Calluna* peat. The sticks were generally about $\frac{3}{4}$ to 1 in. (1·7 to 2·5 cm.) in thickness and many were sharpened. Some were horizontal, but most slanted

down obliquely at a shallow angle one way or another; one or two were more nearly vertical but were neither substantial nor long, so that they presumably served to pin the brushwood in place, rather than to support it. Some of the pieces of wood seemed to be merely adventitious chips. Wood samples were microscopically identified as follows:

Corylus avellana (hazel). Four samples, one flat and trimmed.
Acer campestre (hedge-maple). Two samples, one flat, trimmed and pointed.
Fraxinus excelsior (ash). One sample.
Viburnum opulus (guelder-rose). One sample, a sharpened branch.

It is evident that this track was slender and exiguous hereabouts, but farther north it was stated to have had some large timbers.

(*c*) *Stratigraphy*

Stratigraphy was determined by a deep boring through the trackway where it entered the uncut edge of Decoy Pool Drove; field-notes were supplemented by microscopic examination of the gross plant fragments.

cm	
0 to 25	Dark-brown mouldered peat with fine ericoid rootlets. (At 25 cm. caricoid rootlets and rhizomes (cf. *Rhyncospora*).)
25 to 50	Abundant fresh *Sphagnum* leaves, and *Aulacomnium palustre*, some twigs of *Calluna* and *Myrica* in peat of varying humification.
50 to 90	Pale-brown fresh cymbifolium *Sphagnum* ($H = 3$–4) with possibly *Molinia*. (At 75 cm. seed of *Menyanthes*, and at 80 cm. leaf of *Oxycoccus*.)
90 to 100	Brown moss peat (cf. *Scorpidium*).
100 to 110	Rather fresh yellow *Cladium* peat with fruits of *Cladium* and one fruit (cf. *Rhyncospora fusca*).
110 to 125	A very fibrous rootlet peat, ericoid and *Myrica* twigs, leaves and flowers of *Calluna*, and some brown moss—probably secondarily penetrated by *Cladium*.
125 to 150	Abundant ericoid twigs and flowers, leafy shoots of *Calluna*, *Myrica* twigs and leaf-base—possibly brush from trackway. 'Almost certainly a *Cladium* peat.'
150	(Base of trackway and surface of old (*Sphagnum*)-*Calluna* peat.)
150 to 240	Dark chocolate-brown (*Sphagnum*)-*Calluna* peat $H = 5$–7, with abundant ericaceous twigs and rootlets and frequent flowers. Occasionally monocot. stems. (At 225 cm. abundant *Eriophorum vaginatum*.)
235	As above, but with abundant *Sphagnum*, and at 240 cm. abundant black moss stem, cf. *Polytrichum*, and at 250 cm. abundant *Eriophorum vaginatum*.
250 to 270	Yellow wood peat with *Sphagna* leaves and capsules, ericaceous rootlets and twigs, some monocot remains and *Camptothecium nitens*. Abundant bark, cone scales of both *Betula alba* and *B. pubescens*, some decayed leaf (cf. *Betula*).
270 to 280	Transitional humified peat with small twigs.
280 to 360	Humified black peat with abundant rhizomes and fruits of *Cladium* and occasional *Hypna*. Downwards becoming a sedge rootlet peat.
360 to 390	Yellowish peat with stem and abundant rootlets. (At 380 to 390 cm. abundant bark and some wood fragments.) At 390 and 395 cm. seeds of *Menyanthes*.
390 to 425	As above with *Carex* rootlets (and *Carex* fruits at 395 cm.). *Menyanthes* seed at 415 cm.
425 to 430	Transition.
430 to 435	Soft blue clay with abundant *Phragmites*.
435 to 450	Clay stiffening with less *Phragmites*, becoming siltier and with abundant sponge spicules.

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This sequence shows close correspondence with that already described for the Meare Heath trackway series and is supported in detail by the analyses of non-tree pollen (figure 18). The sequence from brackish to fresh water is indicated by the early maximum

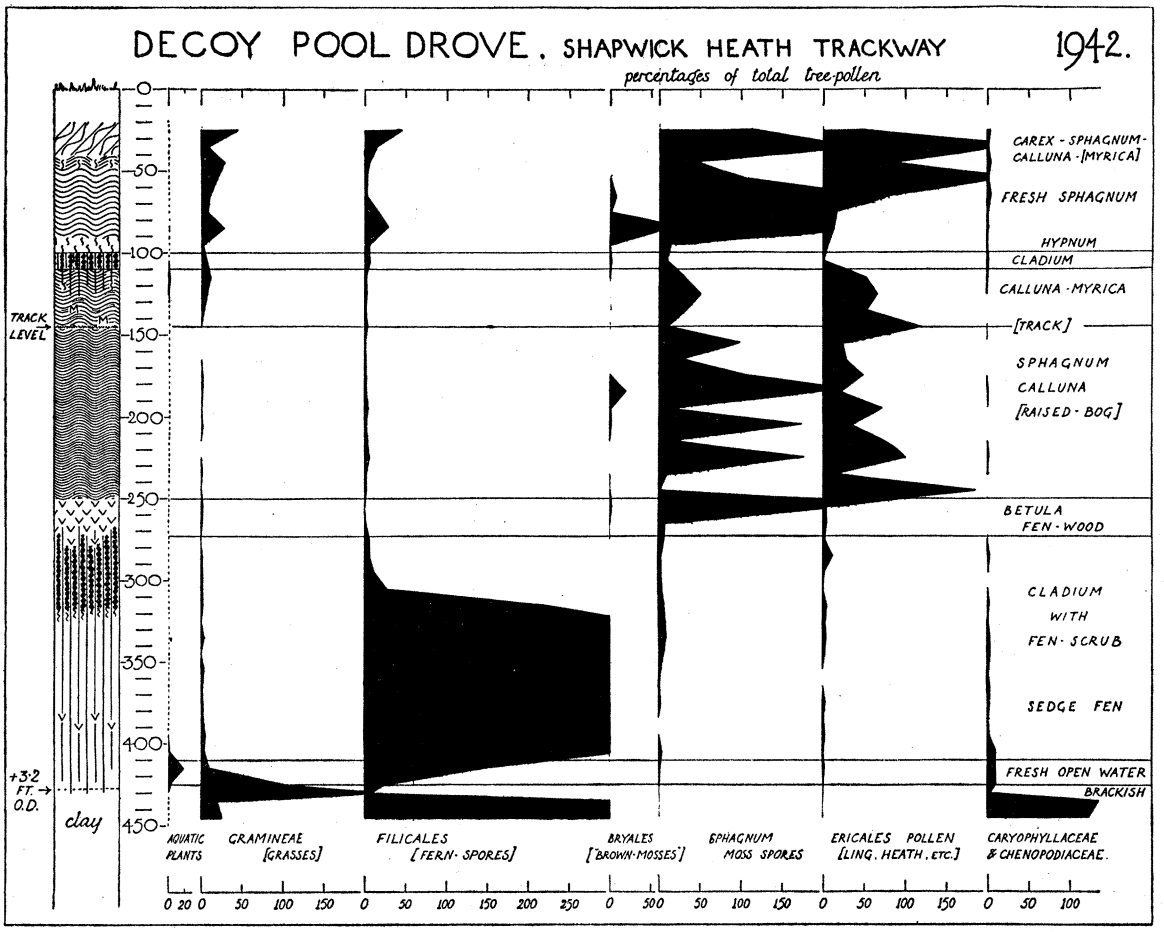

FIGURE 18. Shapwick Heath trackway (on Decoy Pool Drove): non-tree pollen diagram. The right-hand column shows the presumed sequence of vegetation types, with the *Cladium* peat of the first swamping episode about 35 cm. above the trackway: note the recession of ericoid pollen and *Sphagnum* spores at this level. The peat symbols are those set out in figure 4.

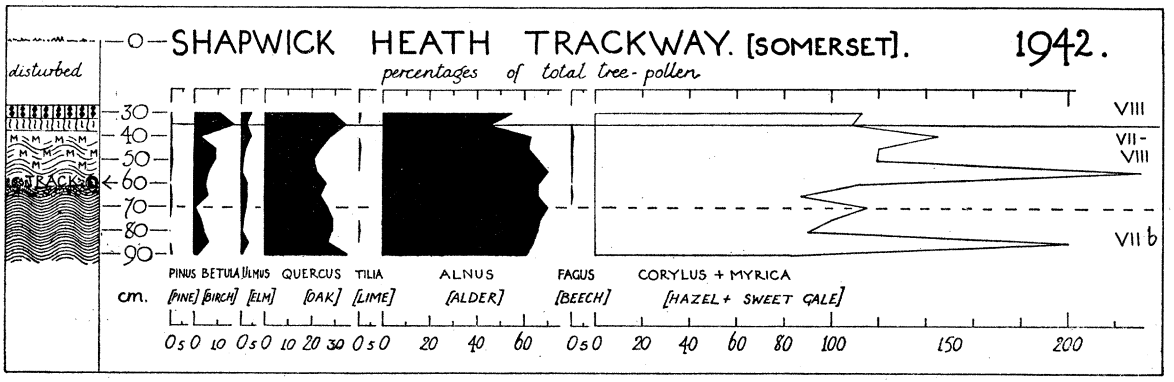

FIGURE 19. Shapwick Heath trackway: short series of tree-pollen analyses taken at trackway exposure of site A. Note the *Cladium* peat layer of the first swamping episode above the trackway. Compare the pollen zonation with that of the long series of figure 20. The bulk of the pollen in the *Corylus-Myrica* curve belongs to the latter genus. Peat symbols as in figure 4.

of Caryophyllaceae and Chenopodiaceae, giving place to maxima of grasses and of aquatic plants. As before, the *Cladium* sedge-fen stage has very high fern spore values and the onset of ombrogenous peat formation is accompanied by rise to high values of ericoid pollen and of *Sphagnum* spores. The *Cladium* peat layer above the trackway corresponds with a striking interruption in these two curves, and the vegetation type above this level (to judge from the non-tree pollen curves) is of a much more variable type than that during formation of the old (*Sphagnum*)-*Calluna* peat.

The sequence of presumed vegetation types is indicated on the right of the non-tree pollen diagram, and it will be clear how the *Cladium* stage just above the trackway here again represents a flooding of the ancient and relatively dry surfaces of the old raised bog.

A short series of pollen samples (see figure 19) was taken from the peat-cutting face at site A, and the coarse plant fragments sieved off in pollen preparation clearly indicated the same stratigraphy at the track level as that described above:

cm.	
25 to 38	Fibrous brown peat with fruits of *Cladium*, leaf and wood fragments of *Myrica* and abundant *Hypnum*.
38 to 65	Loose fibrous blackish peat with leaf and twig remains of *Myrica*, and *Calluna*, and one leaf of *Salix*. All secondarily penetrated by roots of *Cladium* from above.
65 to 90	Dark chocolate-brown peat with abundant *Eriophorum vaginatum*, frequent ericaceous twigs, flowers and rootlets.

The horizontal timber of the trackway lies at 60 cm. in this series and it is not clear how much of the material from 65 cm. upwards is introduced brush, and how much the product of growing bog vegetation. These profiles hardly emphasize enough the tendency for the track to overlie abundant tussocks of *Eriophorum vaginatum* and for these to a smaller extent to overlie it.

The detailed stratigraphy of the fresh upper peat was difficult to make out in the boring, but was readily reconstructed from the banks of cut turves along the edge of Decoy Pool Drove. This has been already described in part VIII, and illustrated in figure 6.

(*d*) *Tree-pollen zonation* (*figure* 20)

We recognize again close conformity with the other long series from Shapwick and Meare Heaths. By comparison with the diagram from Meare Heath trackway site it appears that the end of zone VI lies a few centimetres below the lowest counted sample. Zone VII*a* ends at 250 cm. with the onset of the ombrogenous peat formation, after the characteristic distortion of the curves by local birch wood development. The opening of zone VIII corresponds with the development of the *Cladium* peat of the first flooding horizon, and has been drawn at 105 cm., where the sudden displacements of the *Alnus* and *Quercus* curves is accompanied by the familiar alterations in the *Betula*, *Tilia* and *Fagus* curves. It is of great interest to note that the upper flooding horizon at the Decoy Pool Wood profile (figure 8, part VIII), is very probably represented in this diagram by the much mouldered layer above 40 cm.

The trackway itself, on the surface of the old *Sphagnum-Calluna* peat, appears to correspond with the base of the transition zone VII to VIII. It will be recognized that this trackway,

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like the massive track described by Dr Bulleid, was built at the catastrophic turn of climate which ended the Sub-Boreal and initiated the Sub-Atlantic period.

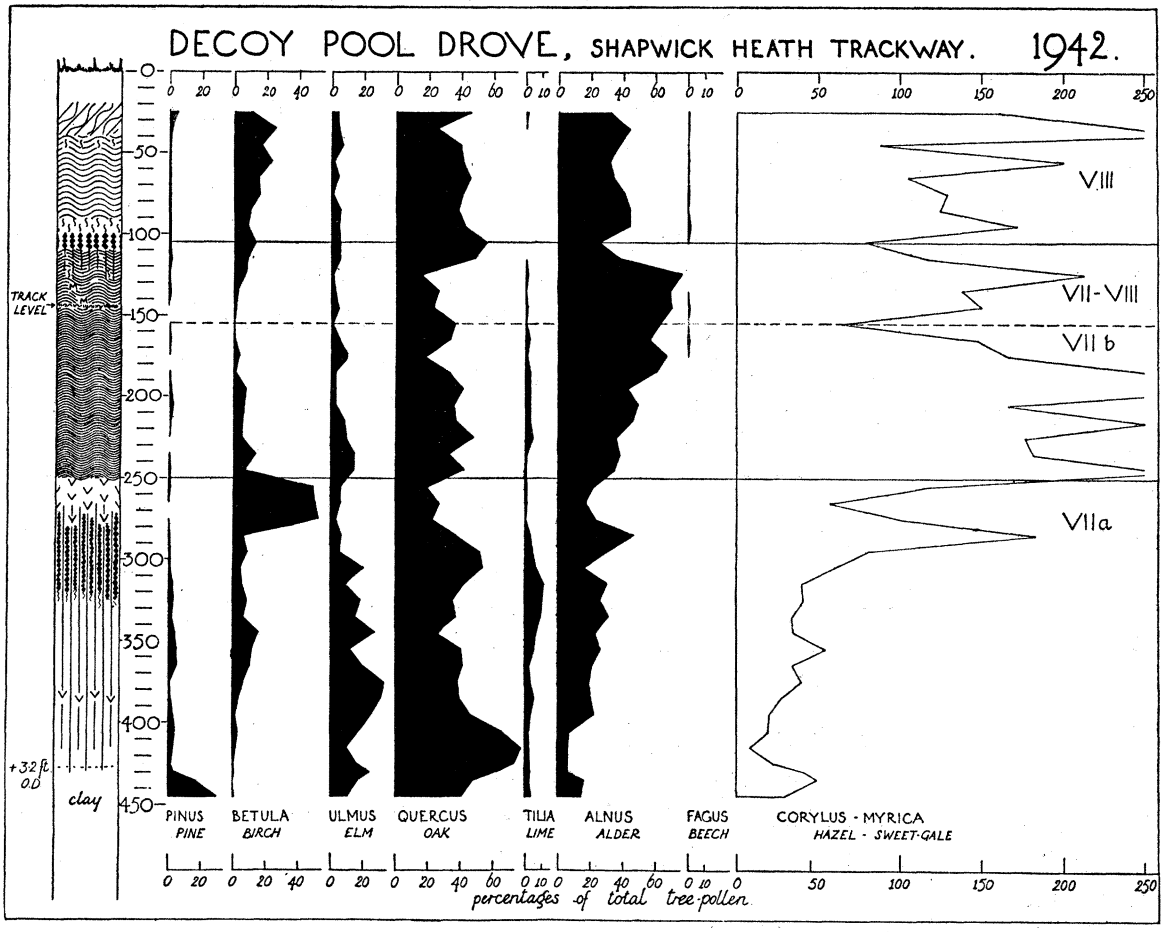

FIGURE 20. Shapwick Heath trackway: tree-pollen diagram. The bulk of the pollen in the *Corylus-Myrica* curve belongs to the latter genus. The opening of zone VIII is marked by shifts in all the tree-pollen curves, and corresponds with the *Cladium* stage of the first flooding episode. Peat symbols as in figure 4.

The purpose of the short pollen series (figure 19) was to tie in the trackway to the long pollen series with the closest exactitude possible and it will be apparent that the base of zone VIII falls at 35 cm., that is, immediately within the *Cladium-Hypnum* layer, and some 30 cm. above the base of the trackway.

It is impracticable to insert the level of the base of zone VII to VIII except in a tentative way.

4. WESTHAY TRACKWAY

(*a*) *Situation and circumstances*

In September 1943 Mr H. L. Dewar, of Catcott, drew our attention to the discovery by Mr Charles Sandford of a substantial buried trackway between Shapwick railway station and the village of Westhay. The site was visited in April 1944 and Mr Sandford kindly permitted us to excavate a section of the trackway.

Parallel with the road running north-east from Shapwick station, and about 1200 ft. away on the east there is a small drove, shown on the 6 in. O.S. map as carrying trees, and still doing so in 1944. The trackway lies again almost parallel with this drove, and we saw it in two peat faces about 370 ft. apart. Measured along the line of the drove the first site (A) lay 1160 ft. north from the railway track and 55 ft. east from the centre of the drove; the second site (B) was 1530 ft. north from the railway track and 38 ft. east from the centre of the drove (figure 2, part VIII). The bearing of the track is 41° east of north. The top timbers of the track at A were at +11·8 ft. O.D., and at B, 11·5 ft.

The trackway was exposed at each of these two sites in a long peat-cutting face at right angles to the drove, and in these faces the peat stratigraphy could be readily examined.

(*b*) *Construction*

The trackway was examined in profile at the peat faces (figure 21) and was uncovered in an excavation 5 ft. by 7 ft. (1·5 by 2·13 m.).

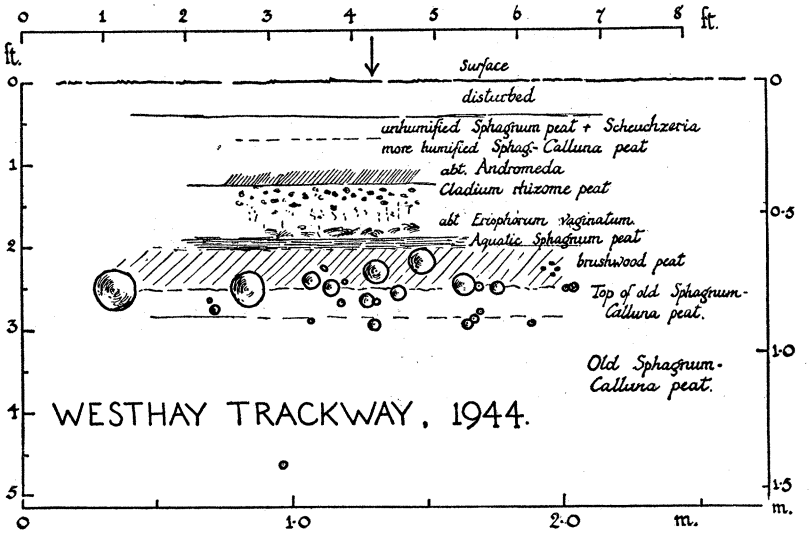

FIGURE 21. Westhay trackway: the trackway cut across transversely in the profile of the peat face. Note the *Cladium* peat layer showing the maximum of the first swamping and the *Scheuchzeria* peat of the later swamping.

The trackway was about 6 ft. (2 m.) in width and the basis of its construction was stems of birch from $\frac{1}{2}$ in. (1·2 cm.) to 6 in. (15 cm.) in diameter (figure 22). These were laid *longitudinally* and transverse pieces were rare and not large. The smaller stems tended to be less strictly longitudinal than the larger, but all were natural cylindrical stems with bark quite intact and only the lateral branches trimmed off. It was evident that brushwood had been laid between these timbers, and *Calluna* and *Myrica* twigs were recognizable in the 6 in. (15 cm.) layer of 'brush' over and between the main stems. It was evident that there had been considerable superposition of timbers, and from the fact that more stems were present on the west side of the track it seemed possible that the track might have been formed in two stages, the big timbers of the later stage having been put slightly to one side. This view was supported by the discovery that when one of these large upper

timbers was removed there was found beneath it the *top* of a small sharpened vertical stake, that could only have been inserted before the big stem was laid.

Sharpened vertical stakes of this kind, about 1 in. (2·5 cm.) in diameter, were driven downwards at intervals between the main timbers and doubtless served to pin the loose brushwood of the trackway together and to prevent lateral movement of the timbers (see figure 22). Mr Sandhurst reported that sometimes quite big vertical stakes were found.

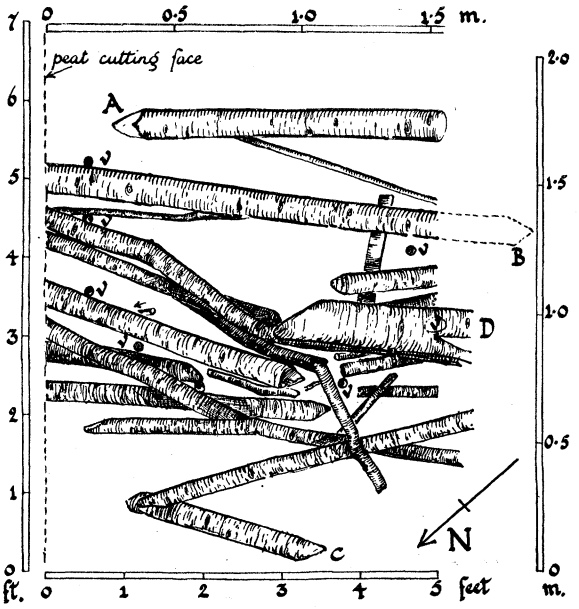

FIGURE 22. Westhay trackway: plan of excavated track showing longitudinally laid birch timbers, and small, more or less vertical stakes pinning the brush of the track to the peat below. A, B, C: ends of large timbers showing axe marks (see figure 23).

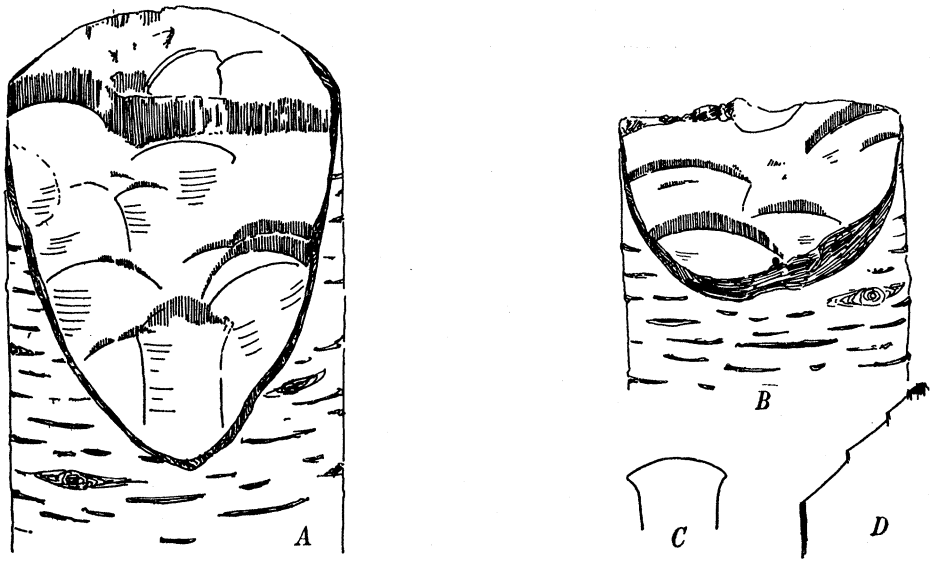

FIGURE 23. Westhay trackway: A and B, drawing of cut end of birch timbers showing marks of felling-axe; C, axe-type indicated by the markings; D, axe-cuts seen in profile. Scale: half natural size.

The longitudinal direction of the timbers seems to call for explanation. This might of course be due merely to accidental choice by the constructors, but equally it might be suggested that had there been pools of considerable size on the surface of the old *Sphagnum-Calluna* peat longitudinally laid long stems would have bridged the pools more effectively than a series of shorter transverse baulks. The extremely fresh condition of all the timbers, on upper and lower surfaces alike, indicates that they suffered neither hard wear nor decay, and it seems reasonable to suppose that the track was waterlogged not long after its construction.

A point of considerable interest is that the cut ends of the largest timbers (A, B, and C in figure 22) when washed clean, disclosed very clearly the marks of the axe-cuts that had felled them. Two of these axe-marked surfaces are illustrated in figure 23 A and B. In each the cuts were clearly made by a thick-bladed axe which gave a strongly concave surface and the curved edge of the blade was very clear. Indeed both extreme edges of the blade were so evident that the chord of the arc could be measured: in timber A it was consistently 4·0 cm. and in timber B, 5·0 cm. It is thus apparent that two different axes were used in felling stems A and B. The shape and size of axe thus indicated correspond closely with the thick-bladed cast bronze axe of the Late Bronze Age, as against the wider and flatter axe type of the Iron Age or of an earlier part of the Bronze Age.

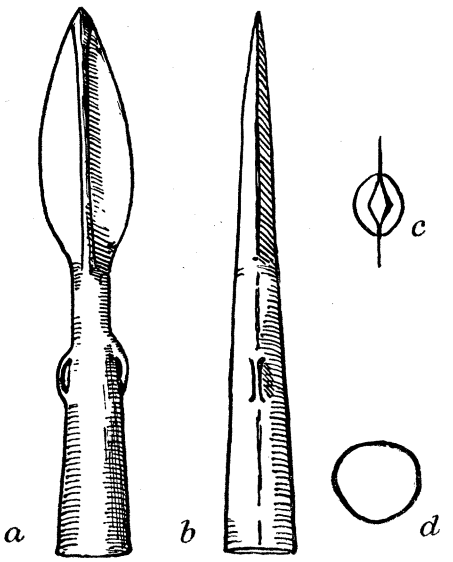

FIGURE 24. Westhay trackway: bronze spearhead found 245 ft. (75 m.) east of the trackway and at a slightly greater depth. *c*, section across blade, *d*, base of socket. Scale: $\frac{2}{3}$ natural size.

A Late Bronze Age dating for the trackway is supported by the discovery nearby of the Late Bronze Age spearhead illustrated in figure 24. This spearhead was found by Mr Sandford about 245 ft. (75 m.) east from the centre of the trackway at site A, and 'in the third mump down of "good" peat'. The mumps are measured on the peat face with considerable care and this seems to indicate that the spear was found at a level corresponding with a position 9 in. (23 cm.) or so below the main timbers of the trackway. Of course it cannot be said that this is more than generally corroborative evidence of the trackway's age.

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(*c*) *Stratigraphy*

The stratigraphy of the uppermost 3 ft. (1 m.) of peat was readily determinable on the peat-cutting faces. At site A, directly above the trackway the following sequence was recorded:

cm.	
0 to 13	Black crumbly peat, disturbed.
13 to 20	Pale fresh fine-leaved *Sphagnum* peat with rhizomes of *Scheuchzeria*, some *Oxycoccus*. From 12 to 15 cm. very abundant leaves and stems of *Andromeda*.
20 to 37	More humified *Sphagnum-Calluna* peat with frequent *Eriophorum*.
37 to 46	*Cladium* rhizome peat.
46 to 58	*Cladium* peat with abundant roots, but no rhizomes. Very wet and fibrous with abundant *Eriophorum vaginatum*.
58 to 61	Very strongly laminated aquatic *Sphagnum* peat with abundant *Sphagnum* capsules: all secondarily penetrated by *Cladium* roots from above.
61 to 76	Brushwood peat, full of fragments of *Betula* stems of all sizes and directions (one $\frac{1}{2}$ in. across and vertical). Penetrated secondarily by *Cladium* roots. (At 69 to 76 cm. one of the main timbers of the track.)

Around and between the big timbers was aquatic *Sphagnum* peat. The trackway lay directly upon the dark and disturbed surface of the humified old *Sphagnum-Calluna* peat, which also was penetrated by the *Cladium* roots from above. These relations are set out in figure 21, which also includes the measured transverse section of the trackway.

A very similar sequence was recorded on the peat face 62 ft. (19 m.) east of the trackway centre, and in the peat face, as already described (figure 10), it could be observed that after the flooding episode which had built up aquatic *Sphagna*, *Eriophorum vaginatum*, and then *Cladium* peat, above the old *Sphagnum-Calluna* surface, there had followed (with a transition through *Andromeda*) a period of building of Regeneration-Complex peat. This phase terminated in another stage of wetness in which *Scheuchzeria* was abundant.

A full sequence down to the underlying blue clay was constructed partly from examination of a new peat face exposed after excavation of the trackway, and partly by a deep boring at the same site: the field-notes were supplemented by laboratory examination of the coarser material in the pollen preparations.

cm.	
0 to 12·5	Black crumbly disturbed peat.
12·5 to 23	Fresh, yellowish brown *Sphagnum-Calluna* peat, *Sphagnum imbricatum* and *S. papillosum*, and *Sphagnum* capsules, *Calluna* twigs, ericoid rootlets, leaves of *Andromeda*, rhizomes of *Scheuchzeria*.
23 to 28	Darker brown, more humified peat with abundant ericoid twigs and rootlets. *Andromeda* leaves and possibly *Scheuchzeria*.
28 to 38	Blackish brown, very humified *Cladium* rhizome peat, fruit of *Cladium* and small dicot. leaves.
38 to 48	Aquatic *Sphagnum* peat, with abundant monocot. remains and one fruit of *Rhyncospora alba*: all secondarily penetrated by *Cladium* roots from above.

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cm.	
48 to 58	Very abundant *Eriophorum vaginatum*, some ericoid twigs and rootlets. (At 58 cm., top of big timber of trackway.)
58 to 74	Brushwood peat of trackway, *Calluna* twigs, flowers and leaves, remains of *Scirpus caespitosus* and some *Sphagna*: all penetrated by *Cladium* roots. (At 74 cm., surface of old *Sphagnum-Calluna* peat.)
74 to 107	Old *Sphagnum-Calluna* peat, much humified, $H=6$ to 7. Abundant ericoid twigs and rootlets, and frequent *Calluna* flowers. *Scirpus caespitosus*, *Eriophorum vaginatum* and *E. angustifolium* all locally present. (At 84 to 96 cm., abundant *Eriophorum vaginatum*. At 101 to 107 cm., abundant *Eriophorum vaginatum*. At 107 cm., a weak recurrence—surface.)
107 to 121	Dark humified *Sphagnum-Calluna* peat, $H=6$ to 7. Very abundant twigs, leaves and flowers of *Calluna*. (At 116 to 121 cm., abundant *Eriophorum vaginatum*.)
121 to 132	Fresh rather unhumified *Sphagnum* peat, $H=4$, some ericoid rootlets.
132 to 142	More humified *Sphagnum-Calluna* peat, $H=6$, abundant *Eriophorum vaginatum*.
142 to 175	As above, but $H=7$ to 8.
175 to 210	Yellow-grey hypnum peat with abundant fine rootlets, hypna and monocot. remains: abundant seeds of *Menyanthes*. At 205 cm., a fruit cf. *Scirpus fluitans*.
210 to 250	*Cladium* peat with rhizomes and fruits. *Menyanthes* seeds at 228, 232 cm. and reed stems at 235 cm.
250 to 290	*Phragmites* peat with fruits of *Menyanthes*, *Carex* and cf. *Comarum*.
290	Soft blue clay with *Phragmites*.

This sequence is very similar to that already described in other deep borings, and the general character of its main deposits is borne out by the non-tree pollen analyses.

In the non-tree pollen diagram (figure 25), at the upper surface of the clay the transition from brackish *Phragmites* marsh to fresh water is indicated by succeeding maxima of pollen of gramineae and of aquatic plants, as in the Shapwick Heath trackway diagram. Naturally the ericoid pollen and *Sphagnum* spores become of importance only at the onset of ombrogenous peat formation. It is possible that the relatively low values for the ericoid pollen above 130 cm. are associated with the great prevalence of *Eriophorum* above this level. The *Cladium* layer makes but a small interruption in the *Sphagnum* spore and ericoid pollen curves at 30 cm.

The pollen curve for *Plantago* pollen represents cultivation on the clay upland and it is interesting to observe that the continuous curve begins in the top of the old *Sphagnum-Calluna* peat and rises substantially after the first flooding period. (See discussion of Decoy Pool Wood profile in part X.)

In the tree-pollen diagram (figure 26) it will be recognized that the *Myrica* pollen, now separated from that of *Corylus*, closely corresponds in incidence and frequency with the development of the oligotrophic peat.

It is evident from these considerations of stratigraphy that the trackway was built upon the surface of the heath-clad bog at a time of increasing wetness, a wetness which persisted and increased until the track was buried by the peat of aquatic but oligotrophic communities and they had themselves given place to relatively eutrophic *Cladium* fen. There can be no doubt that in broad terms this flooding episode must be equated with the first and severest of the general flooding episodes described in part VIII.

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At 105 cm. there is some evidence of a weaker flooding episode, in the covering of a heath-clad surface by Regeneration-Complex peat containing much *Eriophorum*.

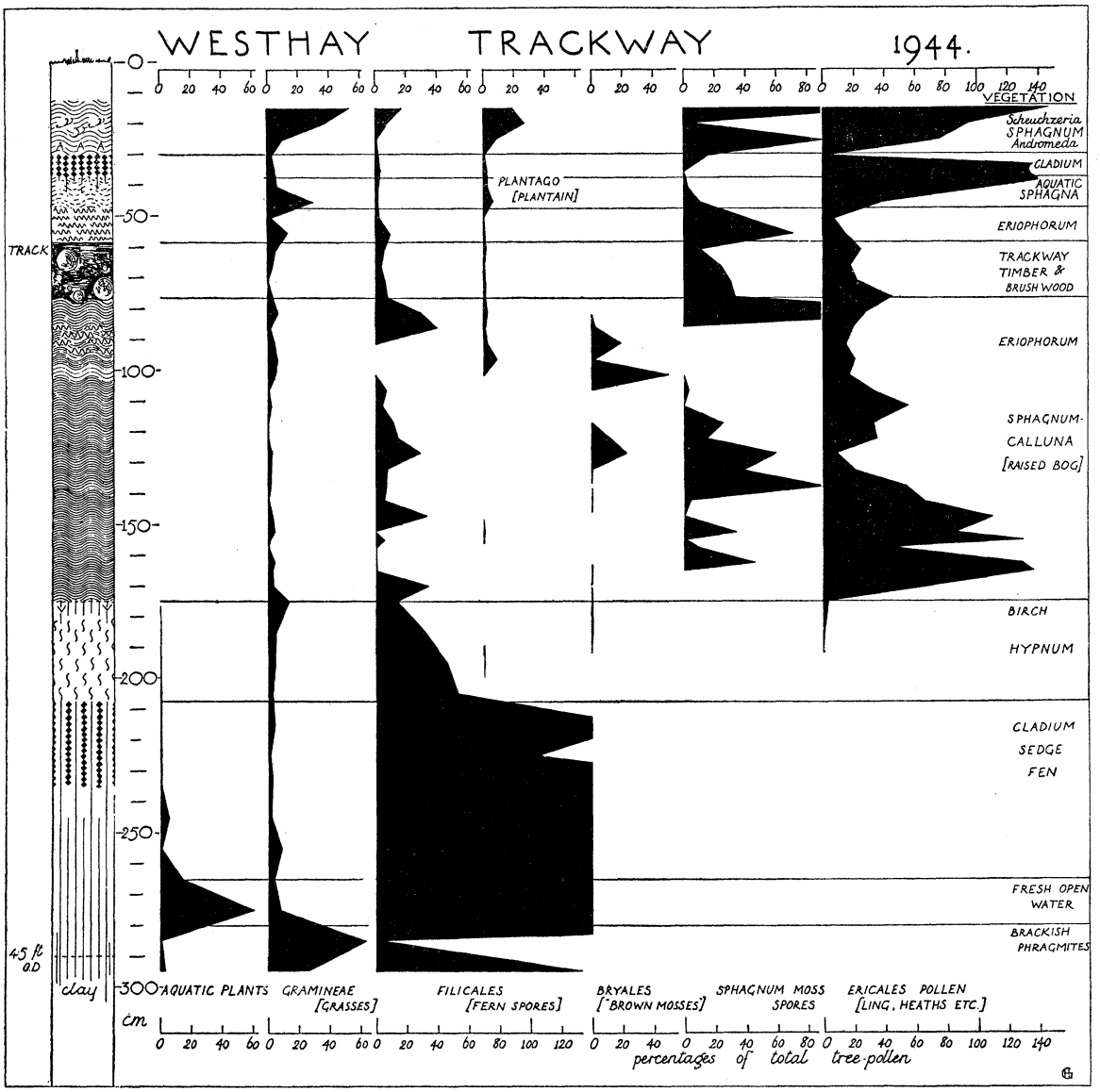

FIGURE 25. Westhay trackway: non-tree pollen diagram. Showing at the right the presumed chief vegetation characteristics. The *Cladium* peat of the maximum of the first swamping episode overlies the trackway. The *Plantago* pollen is indicative of forest clearance. Peat symbols as in figure 4.

(*d*) *Tree-pollen zonation* (*figure* 26)

It will be seen that the diagram corresponds closely with those described already. The top of zone VI is not represented, but evidently the *Phragmites* peat formation here also began early in zone VII*a*, and ombrogenous peat formation at the commencement of VII*b*. All the tree-pollen curves exhibit the familiar behaviour.

The base of zone VIII falls at the layer of *Cladium* peat exactly as at the Meare Heath and Shapwick Heath trackway sites, and it is defined here also by the falling *Alnus* and rising *Quercus* curves, the diminution of *Tilia* and the rise of *Fagus*, and the substantial

Betula values. (It seems probable that the *Betula* rise between 60 and 70 cm. is a local effect of the brushwood in the trackway.) The base of zone VII–VIII apparently lies at about 100 cm. where there are indications of an early increase of wetness in which fresh *Sphagnum*

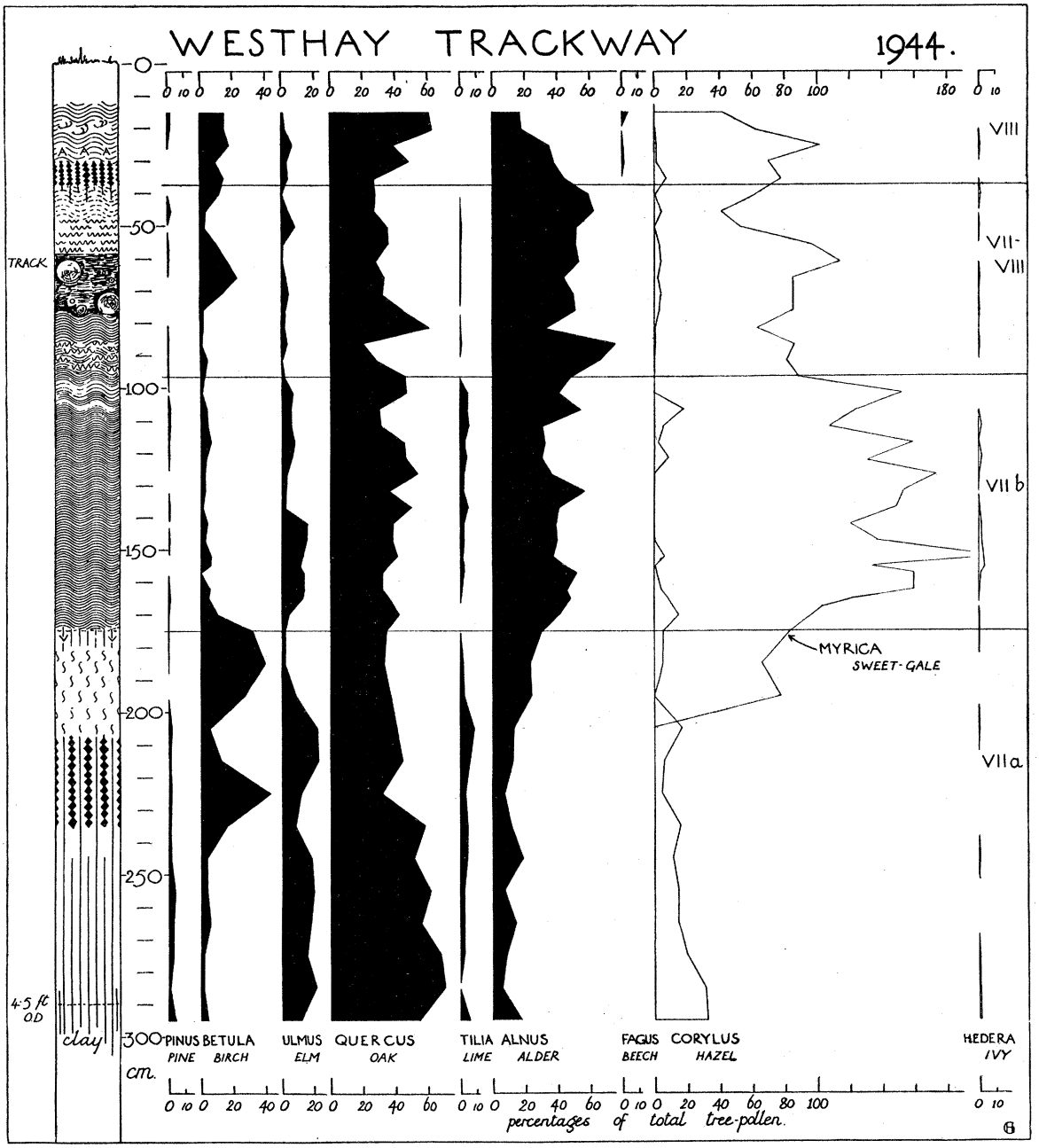

FIGURE 26. Westhay trackway: tree-pollen diagram, showing the opening of zone VIII coinciding with the *Cladium* layer. The *Hedera* (ivy) pollen tends to be a little more frequent in zone VII*b*. Peat symbols as in figure 4.

peat grew over the old humified layers. The trackway itself lies within zone VII–VIII, possibly nearer its close than its beginning, and the *Eriophorum* and aquatic *Sphagnum* peats which directly overlie it indicate the progressive swamping of the major flooding episode already demonstrated as culminating in this region at the opening of zone VIII.

5. Blakeway Farm trackway

(*a*) *Situation and circumstances*

In April 1944 Mr T. Willis of Honeygore Farm, Westhay, told us that there was a buried trackway near Blakeway Farm, and that it appeared to run between Westhay and Mudgley, close to the parish boundary. It was made of branches of 'nut-wood' laid longitudinally, without cross-ties or stakes, with wood up to 2 to 3 in. (5 to 7·5 cm.) diameter, and running 'straight as a die'. A few days later we were shown the approximate site on the land of Mr A. J. Whitcombe, of Cross Farm, Mudgley, and he kindly allowed our further investigation. A row of borings was made at intervals of 1 ft. (30 cm.) over a length of 12 yd. (11 m.) and eventually in the bore-chamber wood was encountered in six consecutive borings a few inches apart. It was at a depth of about 95 cm. and consisted of horizontal pieces of pale-yellow diffuse-porous wood from sticks up to $1\frac{3}{4}$ in. (3 cm.) in diameter. Laboratory examination proved this to be *Corylus*. Since it was then too wet to allow excavation this was postponed until September of the same year, when a good length of track was uncovered. The position thus determined is 95 ft. west from the centre of Bounds ditch, and about 3190 ft. north along this ditch from the old Toll House north of Westhay Bridge (figure 11). (The compass bearing on Blakeway Farm was 322·5° true north.) So far as could be determined along a short section of the excavated track the compass bearing of the track itself was about 2° true north.

In 3 days' excavation a length of trackway of about 14 ft. (4·25 m.) was disclosed, lying about 3 ft. (0·9 m.) from the ground surface (figures 29 and 30, plate 17).

The only means of levelling within reasonable distance was a spot level on the Westhay-Mudgley road, which gave a level of +7·7 ft. O.D., for the trackway.

(*b*) *Construction*

The trackway was approximately 2 ft. (61 cm.) in width and consisted of a single row of parallel and very straight rods of hazel (*Corylus*). These were laid closely side by side upon a thin layer of *Calluna* brush placed transversely. It was apparent that the hazel rods had been laid in successive bundles or faggots of about twenty stems, the butts of one faggot being placed to overlap the thin ends of the previous faggot by 1 or 2 ft., and it seemed probable therefore that the track had been laid from south to north. The pressure of the butts had made a zone of fracture across the more slender stems beneath them, probably during subsequent settlement rather than during use. The longest pole in the faggot was 13 ft. long (3·95 m.), but several others were from 10 to 13 ft. (3·05 to 3·95 m.) and their remarkable straightness and freedom from branching can be judged from the scale-drawing (figure 27). It is certain that they could not have grown in quantity in this shape except as secondary growth from bushes coppiced or similarly grown in vigorous competition with one another. Shade undergrowth of natural woodland could not have produced such poles. Transverse stems were extremely infrequent and clearly played small part in the structure, nor were there any vertical stakes or piles. A small number of slender stems were inserted obliquely at the side of the trackway as if to oppose the tendency for the base of the bundle of poles to splay out sideways.

At the butt ends the poles of the trackway were between 0·9 and 1·5 in. (23 and 38 mm.) in diameter, and axe-cuts upon them had left a concave surface and a curved blade mark, suggesting a small axe of considerable thickness, such as one of the Late Bronze Age.

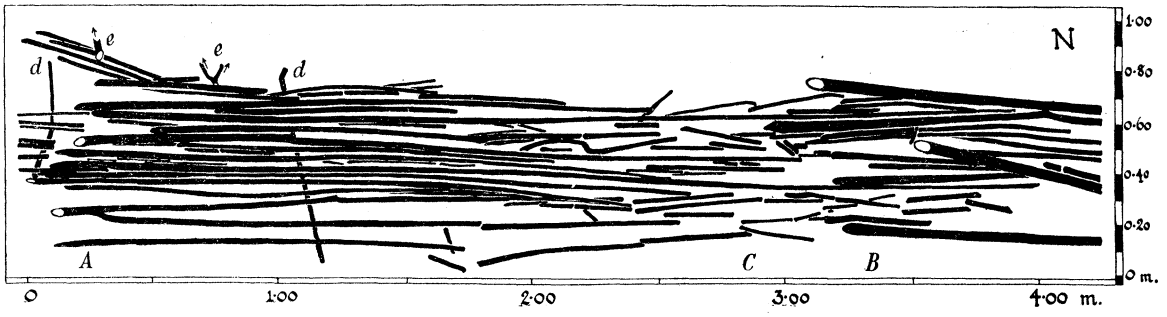

FIGURE 27. Blakeway Farm trackway: scale plan of trackway, showing two faggots of hazel poles laid longitudinally. The butts (*A*) and (*B*) of one faggot resting upon the tips of the next. At *C* note the zone of breakage next to the butts *B*. *d*, slender horizontal sticks, *e*, slender stakes pushed obliquely down into the peat at the margin of the trackway.

The butt ends of all seventeen poles of the excavated faggot were taken away for laboratory examination: sixteen were identified as *Corylus*, but the seventeenth was *Fagus*, a discovery matching that of the sharpened beech stakes from the Shapwick Heath trackway. Microscopic examination of the ring structure of the poles reveals that they range from 8 to 17 years in age. These shoots must therefore have grown very rapidly indeed to reach the lengths recorded. In all the early rings are quite remarkably wide, and the later ones extremely narrow and often locally absent; pronounced false rings are frequent. These facts all correspond with the sudden renewal of growth from cut stools, passing quickly over into the restricted growth of the coppice as the canopy closes and shoot competition hardens. In certain instances the ring pattern of two stems is so close that they must indicate shoots from the same stool. In general the false rings and locally absent rings are not recognizable through the whole collection, and appear therefore less due to the influence of a climatic control than to local conditions in the competition between the shoots of the thickening scrub.

(*c*) *Stratigraphy*

The following notes on stratigraphy are based upon the field-notes made at the boring when the pollen samples were collected, upon the coarse material sieved off from the pollen preparations.

cm.	
0 to 70	Disturbed and mouldered peat.
70 to 90	*Sphagnum* peat with very abundant stems and leaves of acutifolia *Sphagna*, a few ericoid twigs and moss leaves (cf. *Dicranum*) and one fruit of *Carex* cf. *panicea*.
90 to 95	Very dense *Eriophorum vaginatum*.
95 to 98	Trackway.
98 to 130	*Sphagnum-Calluna* peat with some *Eriophorum* $H=5$. (At 105 cm., abundant stems of a large moss.)

cm.	
130 to 190	A changed peat type. Frequent stems of *Phragmites* and *Camptothecium nitens*, occasional *Sphagna* fruits, wood, twigs and possibly leaves of *Betula*. One fruit *Menyanthes* at 176 cm. Fern sporangia frequent. (We incline to regard this as a brushwood peat formed in birch scrub on acid fen, but it may possibly be of different origin.)
190 to 225	Yellow-black aquatic rootlet peat with coarse detritus and occasional twigs. (At 205 cm., *Phragmites* and *Carex*. At 215 cm., charcoal abundant.)
225	Surface of soft blue clay with *Phragmites*. At 230 cm., seed cf. *Nymphaea*.

It was very conspicuous that in the field the trackway was covered with dense mats of *Eriophorum vaginatum*, a phenomenon seen also in other trackways.

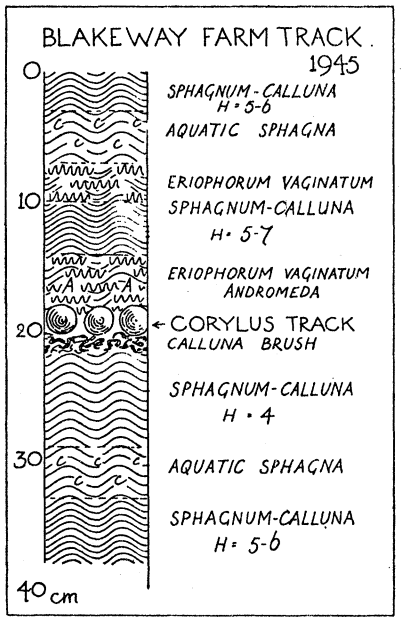

FIGURE 28. Blakeway Farm trackway: local stratigraphy revealed by dissection of peat monolith crossing the trackway. Layers of aquatic *Sphagna* indicate swamping conditions both above and below the trackway level.

A small peat monolith was extracted from the excavation for more careful analysis of the peat about the trackway level, and the results of its careful dissection are set out in figure 28. These amplify without contradicting the records for the boring. Perhaps the most salient point is the absence of highly humified *Sphagnum-Calluna* peat like that below the other trackways and indeed this is absent apparently from the whole profile and from peat faces nearby. A further point is that although aquatic *Sphagna* indicate wetter conditions about 9 and 31 cm. in each instance the layer is thin and the increased wetness can only have been temporary. One has indeed the impression that although the peat above the trackway is of a generally rather wet character, that beneath it is not necessarily indicative of much drier conditions.

It seems probable that this site belongs to a region of the levels which had a different developmental history from the Shapwick and Meare Heaths, and on this account it would be unprofitable to consider the pollen diagrams or to pursue comparisons until the stratigraphic history of the Meare Pool region has been more fully explored.

6. Age and circumstances of construction

The three trackways—Meare Heath track, Shapwick Heath track, and Westhay track—were built upon the surface of a dry *Sphagnum-Calluna* bog, and are overlaid by the deposits of a flooding episode, which in every instance culminated in eutrophic *Cladium* sedge-fen. It appears probable that this in all instances is the same flooding episode, since it corresponds with the boundary between pollen-zones VII–VIII and VIII, and since no other is so large or had the same unmistakable relation to the old *Sphagnum-Calluna* peat. In this sense then, the trackways are all of the same age, and there can be little doubt that this flooding episode was due to the increased rainfall of the phase of climatic deterioration at the Sub-Boreal Sub-Atlantic transition. As we have pointed out, in these Somerset valleys the effect of increased rainfall would be to cause general flooding with calcareous water extending more or less completely over the existing complex of raised bogs. In this flooding we find at once the reason for the building, preservation and contemporaneity of the trackways. Raised bogs in the heath-clad stage of 'Still-Stand' Complex are very readily crossed on foot, and we may suppose that in Middle to Late Bronze Age times numerous routes were habitually in use, crossing the raised-bog complex from north to south between the Mendips and the Poldens. We can also understand the reluctance to abandon such routes as they began to suffer waterlogging at the deterioration of climate, for the alternative upland routes were circuitous in the extreme. It seems highly probable that, to meet the onset of the flooding, these tracks were built, probably along already established routes across the levels, but before usage or exposure could wear or decay them they were themselves overtaken by the progress of the flooding, and were preserved in peat of more or less aquatic origin.

We may even suggest that the people who built them had no established tradition of trackway construction, so that each trackway is a new venture built according to the ideas of its constructors. Furthermore, it is not unreasonable to see in the flooding the explanation of the size and nature of material employed in the Meare Heath trackway. The flooding must certainly have caused evacuation of all river-side and lake-side colonies and the size of Meare Island must have shrunk alarmingly. Such events would indeed make available great quantities of derelict building timber, and it is possible that this was employed in building the great trackway for use more as the means of a general exodus from the low clay island than as a traffic route in constant operation over a period between the island and the Polden Hills. There has naturally been a strong tendency to assume that the substantial Meare Heath trackway was built to serve the Iron Age inhabitants of the lake-villages at Meare, and certainly the scale of the structure suggests that it was built by a large and developed community. It is impossible, however, to reconcile an Iron Age dating with the other evidence we have put forward, and it will be recognized not only that abundant finds in the peat bogs bespeak a rich Bronze Age population of the area, but that any lakeside settlements of this age must tend to have been destroyed or buried by the widespread Sub-Atlantic flooding.

It has been pointed out that the flooding developed progressively and took time to reach its worst, and that differences in height and accessibility to flood water must have caused differences in the march of response to flooding in various parts of the raised-bog system. Thus, although in a general sense contemporary, there is scope for some minor

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differences in dating between the various trackways, corresponding with the fact that the Meare Heath and Shapwick Heath trackways appear to lie close to the (uncertainly defined) opening of zone VII–VIII, and the Westhay trackway near the middle. All three presumably are of Middle to Late Bronze Age.

It is not unlikely, in view of the circumstances under which the trackways were built, that the Blakeway Farm trackway is also of this age, a suggestion a little supported by the nature of the axe-cuts in it. Similarly, should it prove possible to uncover again a part of the Abbott's trackway, it will be of great interest to discover whether it had origin at the same time in response to the same circumstances.

We may in conclusion note that if this dating of the trackways is accepted, we derive interesting evidence of the status of trees employed in their construction. Thus the recognition of cut stakes of beech (*Fagus sylvatica*) at the Shapwick Heath track (and incidentally also at Blakeway Farm), is the clearest evidence that this tree was native in Britain in pre-Roman times, and occurred naturally (although perhaps sparsely) in the west of England. This falls into line with the evidence from pollen analyses that the tree had begun to occur sporadically about this time, and with the evidence given by Hyde (1937) that beech occurs in the charcoal of an Iron Age site at Radyr in Glamorganshire. Should the Blakeway Farm trackway prove of the same age as the others it would show that in Late Bronze Age times a system of woodland treatment was in use which produced the same effects upon the hazel undergrowth as does coppicing to-day. The presence of calcicolous shrubs such as *Corylus avellana*, *Acer campestre*, and *Viburnum opulus*, together with *Fraxinus excelsior* in the Shapwick Heath trackway is not surprising for all occur still in the oak-hazel woods of the Polden Hills. The prevalence of birch in the Westhay trackway doubtless had its explanation in the local prevalence of that tree, and we may note that birch fen-wood has been shown to underlie the occupation level of the nearby east lake-village at Meare.

The authors very gratefully acknowledge the manifold assistance they have received in this work. Not only have peat diggers readily disclosed the position of trackways known to them, but they have allowed some mildly destructive excavation on their turbaries. We particularly thank the Eclipse Peat Company, Mr Charles Sandford, Mr Charles Foster, Mr J. Grant, Mr T. Willis, and Mr J. A. Whitcombe, for these courtesies. Mr H. S. L. Dewar, of Catcott, not only informed us of the existence of the Westhay track but lent his labour and archaeological experience to the excavation of this and also the Blakeway Farm trackway. Dr A. Bulleid and Mr H. St George Gray gave us the benefit of their long experience in the levels, and Dr Bulleid allowed us the use of his field maps and notes. Miss W. Abery, as mentioned in the text, made some of the detailed stratigraphical records which we present. Other students and friends assisted in field work also. Dr P. W. Richards kindly identified the sub-fossil mosses.

Boring was made by a Hillier peat drill, the property of the Royal Society of London, who also kindly made a grant to the senior author to subsidize the pollen analyses made by Mrs M. Dainty of the Decoy Pool Drove site. The Department of Scientific and Industrial Research generously subsidized the pollen-analytic work at the other sites, and this was carried out by Mrs H. M. P. Whitmore.

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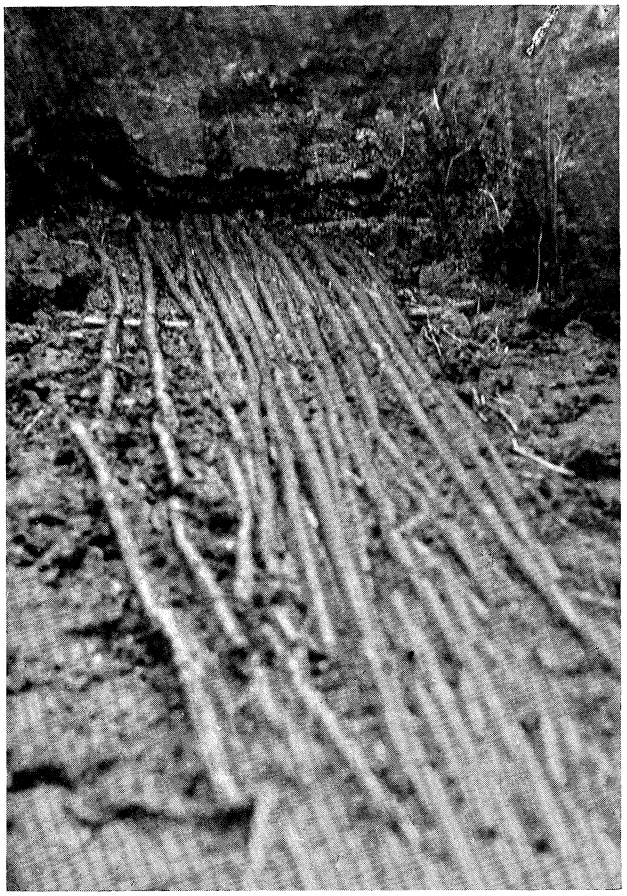

FIGURE 29

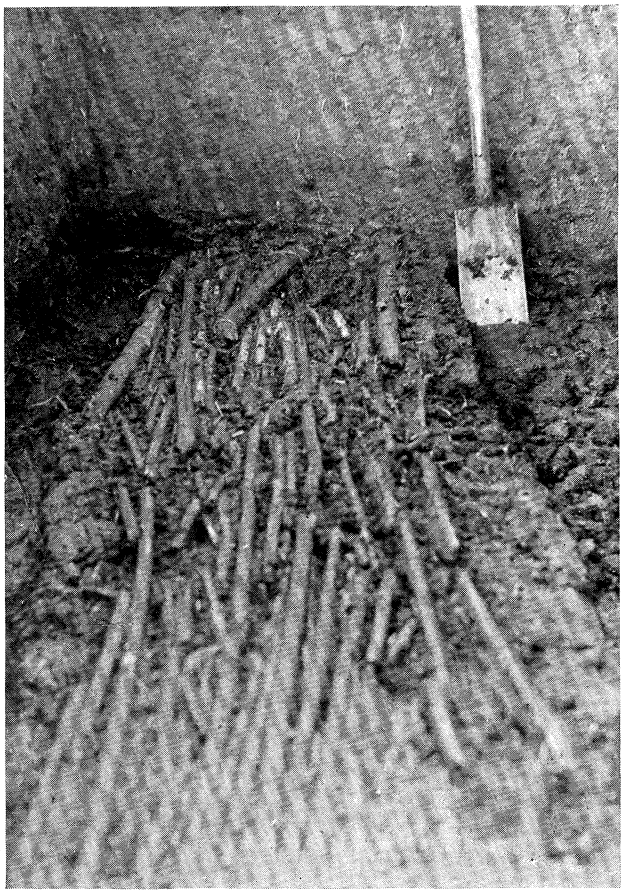

FIGURE 30

FIGURE 31

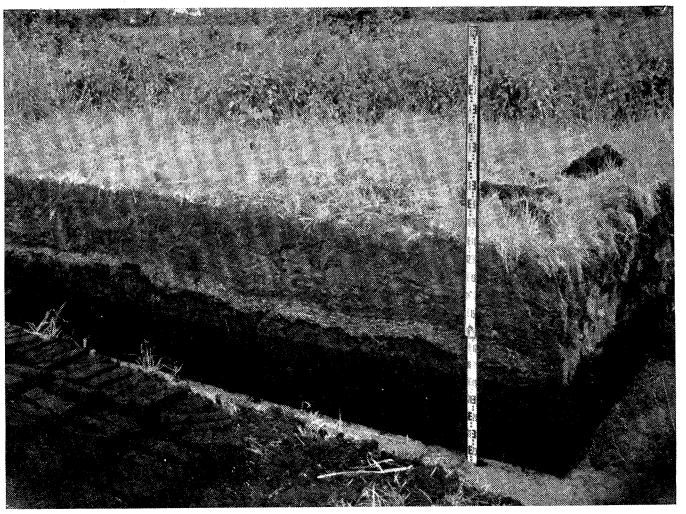

FIGURE 32

(*Facing p.* 272)

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FIGURE 33

FIGURE 34

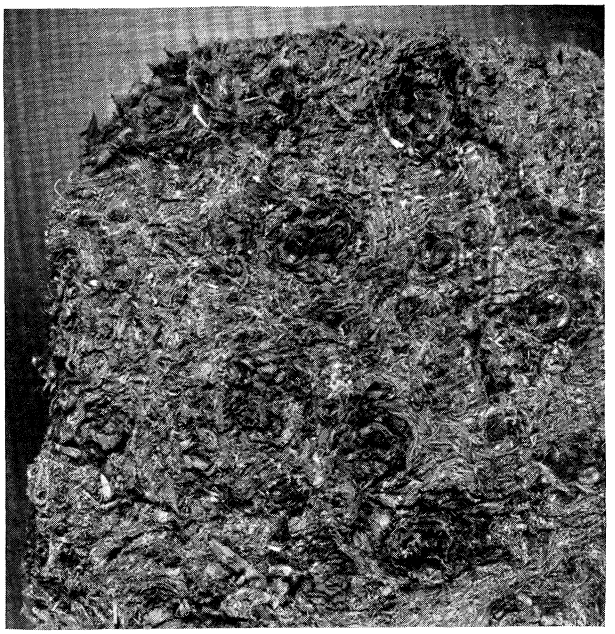

FIGURE 35

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Description of Plates 17 and 18

Plate 17

Figure 29. The Blakeway Farm trackway as excavated in September 1945, looking along its length southwards, showing one of the few and slender horizontal stems beneath the single row of straight hazel rods.

Figure 30. The same, looking north, and showing the butt end of one faggot resting upon the tapering ends of the poles of another, and causing a zone of fracture there.

Figure 31. Exposure in July 1947, of the Blakeway Farm trackway in a peat face ½ mile south of the excavation site, and near the old Toll Gate House, Westhay. (Scale in cm. and dm.)

Figure 32. Profile at Willis's Piece, near Westhay, seen in July 1947. The upper flooding horizon is here represented by the conspicuous pale band of *Scheuchzeria palustris* peat (at junction of levelling staff), overlying darker Regeneration-Complex peat (cf. figure 9).

Plate 18

Figures 33 to 35. Peat types associated with flooding horizons.

Figure 33. *Calluna* peat of the dried bog-surface immediately beneath the first flooding surface, and at the top of the old *Sphagnum-Calluna-Eriophorum* peat. Very abundant leafy twigs of *Calluna* are present, and a few stems of *Scheuchzeria*, penetrating from the immediately overlying flooding surface. Willis's Piece, near Westhay.

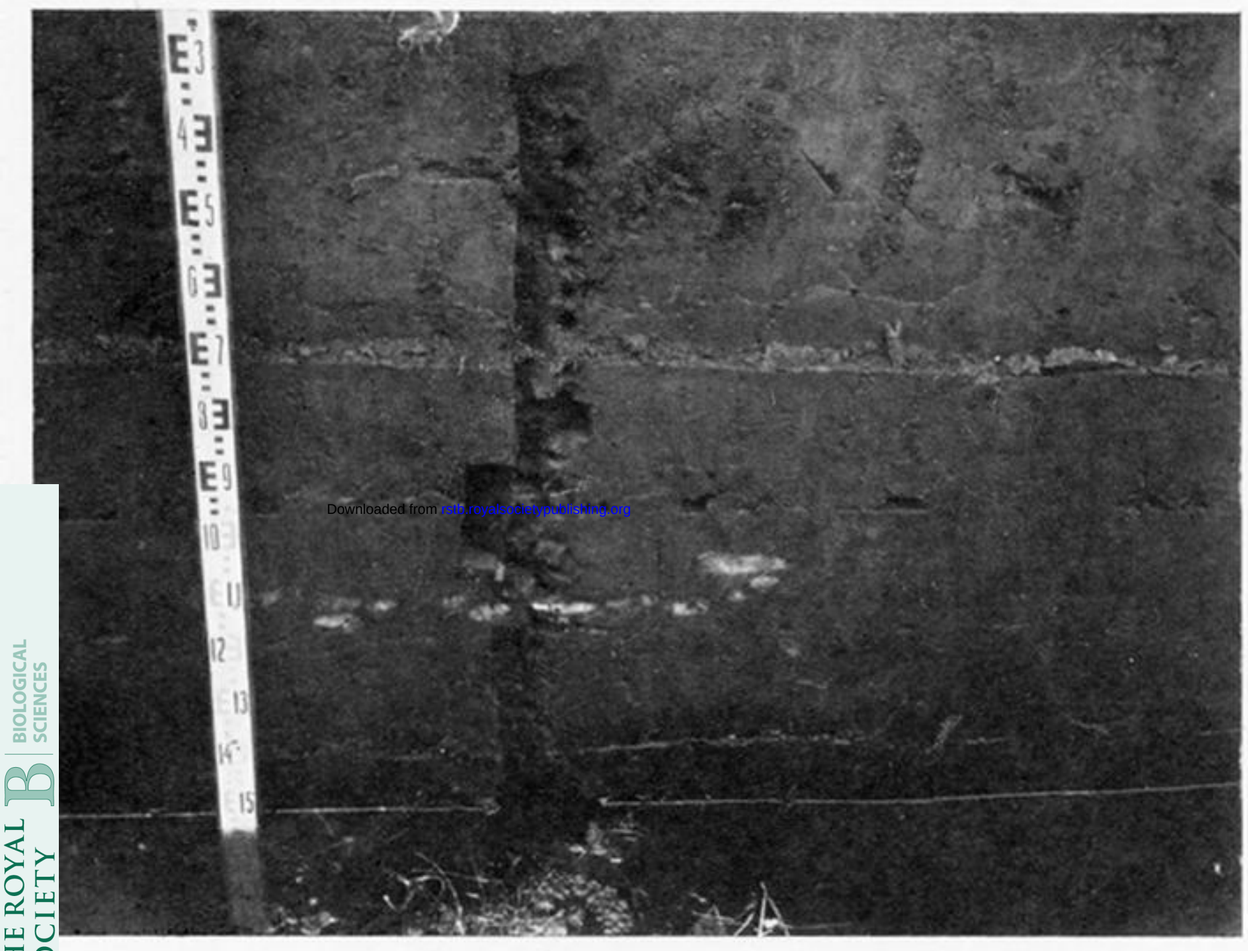
Figure 34. *Scheuchzeria palustris* peat from the upper flooding horizon at Willis's Piece, near Westhay. The papery rhizomes of the plant are very conspicuous, and are associated with aquatic *Sphagna* (cf. figure 32).

Figure 35. *Cladium-Hypnum* peat from the lower flooding horizon at Ashcott Heath (cf. figure 7). The large red rhizomes of *Cladium mariscus* are seen cut transversely.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

FIGURE 29

FIGURE 30



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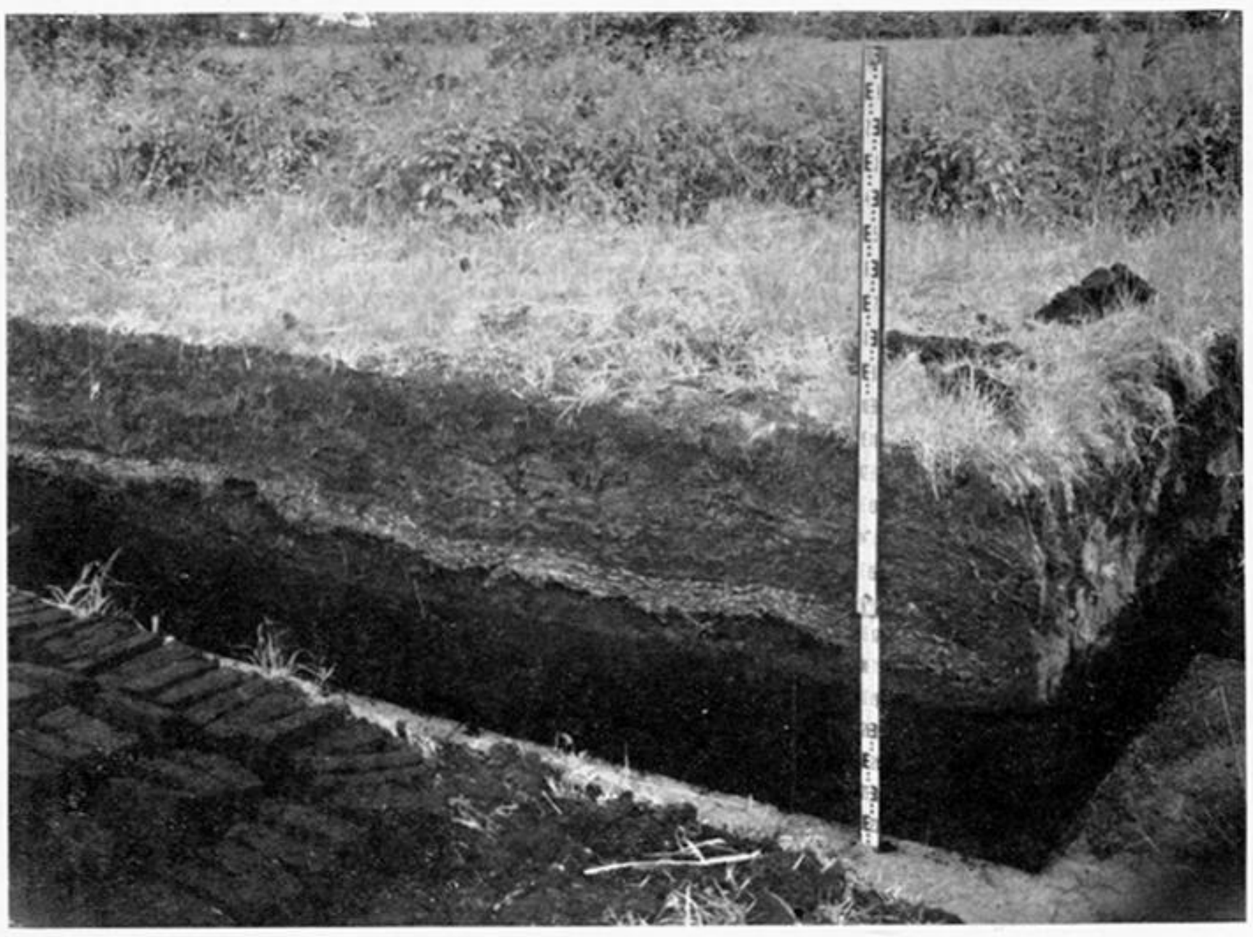

FIGURE 32

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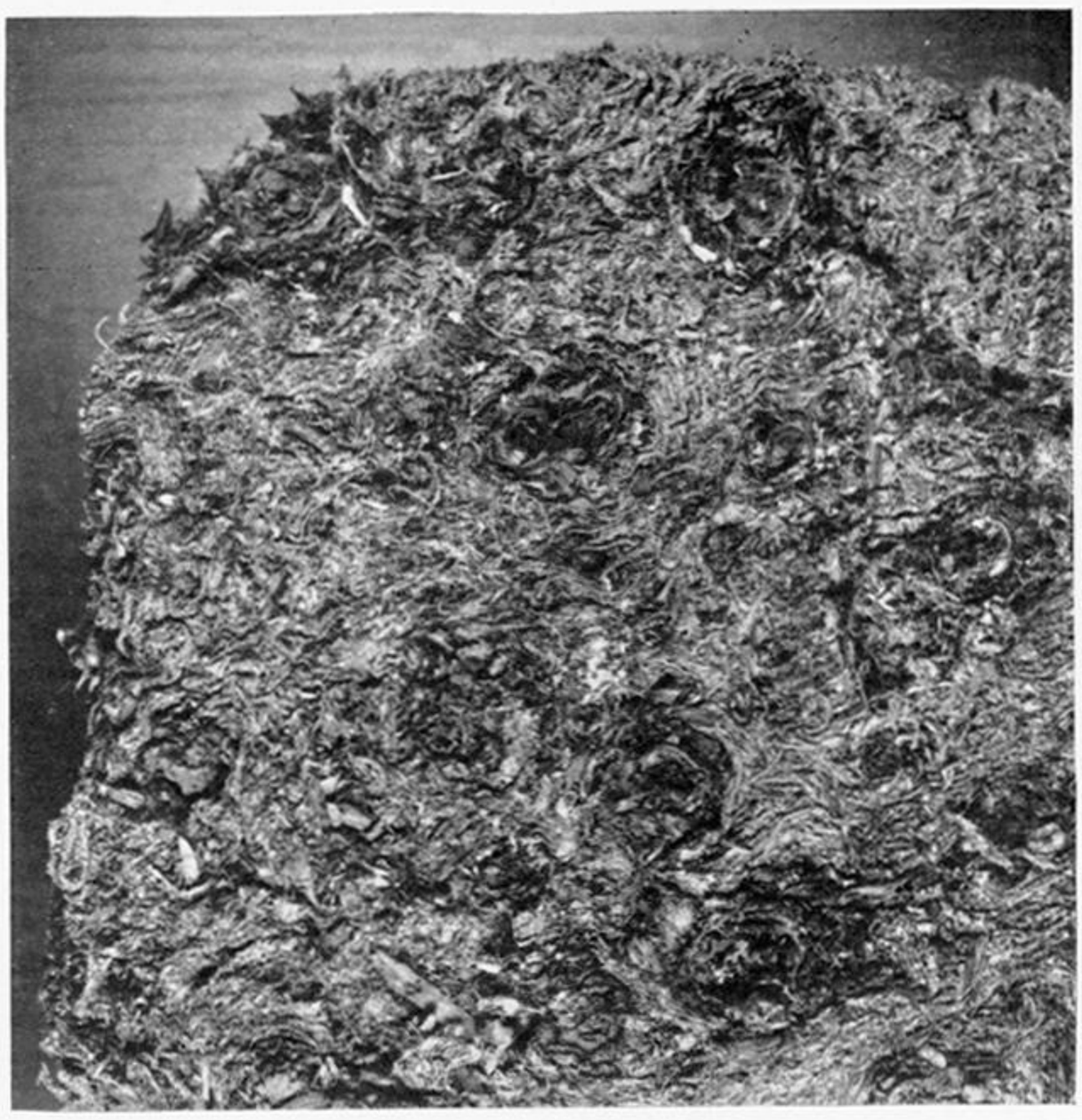

FIGURE 35

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