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A Buried Valley System in the Strait of Dover: Appendix. Palynology of the Quaternary Sediments in Borehole V050

M. T. Morzadec-Kerfourn

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Appendix. Palynology of the Quaternary sediments in borehole V050

By M. T. Morzadec-Kerfourn

(*a*) *Methods of study*

Samples taken at representative levels from the cores of borehole V 050 have been treated for pollen analysis. Standard methods of removing organic and inorganic material have been employed, followed by concentration of the spores and pollen using a heavy liquid (bromoform-ethanol, D 2.1). The pollen and spores were determined at each level, the results being shown in the accompanying diagram as percentages of total tree pollen, rather than as absolute percentages.

(*b*) *Conditions of sedimentation*

The presence at all the levels studied of Chenopodiacean pollen grains, reflecting saltmarsh communities, and the occurrence of Dinoflagellate cysts confirms the estuarine character of the deposits (D. J. Carter, personal communication; Destombes & Shephard-Thorn 1972). On the basis of the above conclusion it may be relevant to consider here the origin and dispersal of pollen in estuarine environments. In estuaries, wind is the most important agent for transporting pollen. Thus anemophilous pollen of trees and shrubs, in particular the winged pollen of conifers, tends to be favourably represented at the expense of herbaceous pollen. Water transport is also important, though here the pollen is chiefly from plants of aquatic or stream-bank habitats with fern spores and freshwater algae (e.g. *Pediastrum*). Finally, the presence of

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pollen reworked from older organic deposits should not be overlooked. Normally it is easy to detect reworked pollen that is Neogene or older in age.

(*c*) *Pollen analysis*

The pollen content is homogenous throughout the sequence of samples from V 050 examined, i.e. from 15.40 to 58.80 m below sea-bed. The presence of up to 20 % (total pollen) of Cretaceous pollen, spores and dinoflagellates evidences considerable reworking of the rocks forming the

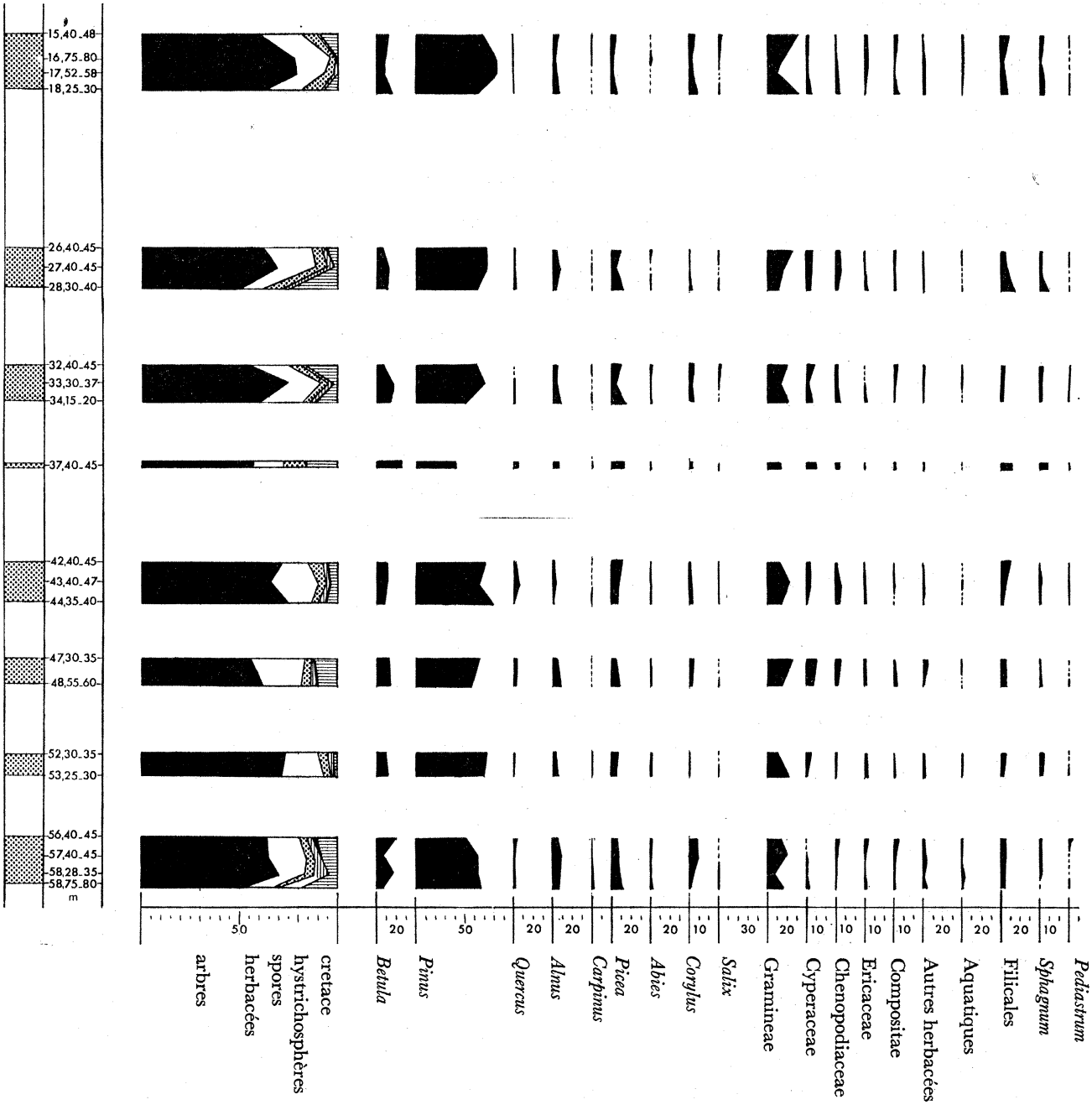

FIGURE 5. Pollen diagram of the Quaternary sediments of borehole V 050.
Detroit du Pas de Calais – Sondage V 050 – 30.5 m N.G.F.

solid substratum of the buried valley. More recent reworking seems improbable in the light of the homogeneity of the Quaternary pollen spectra. The Quaternary forest vegetation preserved in this deposit is dominated by the conifers *Pinus* and *Picea* and by *Betula*; but thermophilous trees such as *Quercus*, *Corylus*, *Alnus* and *Carpinus* are also represented. The herbaceous species are relatively few, comprising essentially Graminae, Cyperaceae, Chenopodiaceae and Ericaceae.

(*d*) *Climatic interpretation*

The dominance of tree pollen of Boreal character, *Pinus* and *Betula* indicates a colder climate than at present day. The appreciable decline of thermophilous trees (*Quercus* and *Corylus*) towards the top of the sequence shows that this deposit belongs to the end of an interglacial or interstadial. The strong representation of the Ericaceae is very suggestive of relatively open vegetation. One should remember here that herbaceous pollen is always under-represented in an estuarine environment as discussed above.

(*e*) *Stratigraphic interpretation*

The presence of *Carpinus* and *Picea* and the weak representation of *Abies* links this deposit with those of late Eemian and early Weichselian age in Holland (Florschütz 1957; Zagwijn 1961). The recognition of two types of *Picea* pollen, the first attributed to *P. excelsia* (height of airsacs, 70–75 μm) and the second, much smaller, referred to *P. omorikoides* (Weber) (height of airsacs 42–50 μm), permits the possible attribution of a Brørup age to the pollen spectra. In the Netherlands *P. omorikoïdes* is apparently known only from this early Weichselian interstadial (Zagwijn 1961). Precise correlation is hindered by the over-representation of *Pinus* pollen and the complementary under-representation of herbaceous pollen in the estuarine environment. But here, as in Holland, *Quercus*, *Alnus*, *Corylus* and *Carpinus* are feebly represented.

Thus the infilling of the buried valley seems to have occurred relatively late in the Brørup interstadial period. If the pollen grains are reworked, it could be more recent.

(*f*) *References*

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Discussion

B. C. Worssam (*Institute of Geological Sciences, 5 Princes Gate, London SW7 1QN*)

Mr B. C. Worssam asked whether a partially neo-tectonic origin had been considered for the depressions alined north-northeast. He remarked that a cross-section on display in connexion with the paper appeared to show that one side of one of these depressions was a fault scarp. Recent work on the denudation history of the Weald (*Rep. Inst. Geol. Sci.* no. 73/17) had raised the possibility that some of the large east–west faults of the central Weald might have moved during the Pleistocene uplift of the area, but evidence was lacking. Offshore, where erosion was less dominant, evidence for recent tectonic movements might be expected to be better preserved than on land.

Dr Shephard-Thorn agreed that the sections drawn from 'Sparker' profiles across the buried valleys (figure 3) lent some support to a neotectonic role in their origin. However, he and his co-authors could not at this time produce substantiative evidence of neotectonic activity

in the Strait of Dover (apart from rare, minor earth tremors) and would not like to go beyond a certain measure of fault-control in determining the location of the buried valleys.

Dr C. Turner (*Botany School, Downing St., Cambridge*)

A plethora of possible glacial features on the floor of the Thames estuary, the Strait of Dover and the English Channel has been reported in the foregoing papers. Already more than one stratigraphical horizon has been proposed for such extensions of glaciation beyond the generally accepted southern limit. Clearly the dating of these phenomena is in disarray.

Dr D'Olier's deep channels resemble the tunnel-valleys of Anglian age found onshore in East Anglia at no great distance and at much the same latitude. An Anglian age seems probable, if these really are glacial features.

The buried valley within the Strait of Dover appears to be associated with the initial breaching of the chalk ridge linking Britain to the Continent. The authors propose a 'Warthe' age for the feature (i.e. the glacial period immediately preceding the Eemian–Ipswichian interglacial). Independently, biological evidence from both marine molluscan faunas and from terrestrial floras supports this suggestion, with Britain joined to Europe during the Hoxnian interglacial but severed by a sea link between the North Sea and the English Channel during the Eemian. However, reappraisal of the East Anglian glacial stratigraphy suggests that this Hoxnian–Ipswichian interval did not support such an extensive glaciation as the pre-Hoxnian Anglian glacial period. Ice reached the Midlands and may or may not have impinged on northern East Anglia but even that is controversial. This tallies with Dr Oele's report, in earlier discussion, of a distinct limit of glacial deposits, believed related to this time, which can be traced from Holland across the floor of the North Sea in a northwesterly direction, and significantly not east–west to link Holland with East Anglia. Stratigraphical evidence from several sources thus sheds doubt on an ice advance into the Strait of Dover at this time. Can a glacial hypothesis then really be invoked to explain this buried valley? The pollen spectra recorded from the infill of the valley are too featureless to assist in arguments over the age of its downcutting.

Finally, Dr Kellaway suggests a 'Saalian' age for a glaciation entering the English Channel from the west. There is potential confusion because he regards the Saalian as equivalent to the pre-Hoxnian Anglian glaciation, largely because the latter appears to be the most extensive hitherto detected in Britain. Since Hoxnian deposits at numerous sites contain not simply a pollen record, but, further species of plants, ostracods, freshwater molluscs and mammals which are strictly confined to pre-Saalian interglacial deposits on the Continent, this correlation is deeply dubious. A more important fact is that the interesting phenomena described by Dr Kellaway, particularly the distribution of reworked erratic boulders, cannot by their very nature yield good stratigraphic information. They do suggest an ancient and extensive glaciation, certainly pre-Hoxnian in age, but perhaps rather more extensive than fits our existing knowledge of the Anglian glaciation. It is all too often not appreciated that there is now good stratigraphic evidence of extensive 'pre-Cromerian' glaciation of Denmark and the North German Plain (Goedeke, Grüger & Beug 1966), and that in this instance this opens up entirely different possibilities.

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