PALYNOLOGICAL INVESTIGATIONS IN THE NORTHERN NETHERLANDS (THE DRENTHE PLATEAU)

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ABSTRACT: The results of c. 50 corings in depressions or small lakes, mostly pingo scars, on the Drenthe Plateau are summarized. Results of sites for which pollen diagrams were prepared are shortly reviewed. Main periods discussed are of Late Glacial, Preboreal and Boreal origin. Some attention has been paid to the Atlantic-Subboreal transition.

KEYWORDS: Drenthe Plateau, palynology, Late Glacial, pingo scar, Allerød, Bølling, Dryas, Boreal, Preboreal, *landnam*.

1. INTRODUCTION

Since W. van Zeist (1955; 1959), H.T. Waterbolk (1954) and W.A. Casparie (1972) published studies on the Late Glacial and Holocene vegetation history of the Pleistocene area of the northern Netherlands, the focus of palynological research performed by the team of the palaeobotanical department of the Biologisch-Archaeologisch Instituut, gradually shifted through Central Europe and Greece to the Near East. This does not mean that no attention was paid to the vegetation history of the northern Netherlands any more.

During the last ten years sediments have been cored especially for student courses. On the basis of the information thus collected, W. van Zeist and the second author developed a research programme that included detailed studies on the Late Glacial oscillations, on the vegetation development of the Preboreal and Boreal periods and on the transition of the Atlantic period to the Subboreal, especially with a view to trace the so-called *landnam*. The main problem in developing such a programme was to find sediments which covered the time periods mentioned. Cores were taken from pingo scars from the large number of these depressions available all over the Drenthe Plateau. Confirmation of the occurrence of promising sediment covering the various periods could only be obtained by analysis. Initially cores were mostly tested during student courses and detailed analysis was performed by advanced students afterwards. During the last ten years promising material from cores taken more or less at random by the authors and H. Woldring has been analyzed by the first author. As the general vegetation development of the area was rather well-known, the emphasis was laid on detailed investigations in the form of so-called 'luppendiagramme'. To provide such diagrams, sediments were analyzed at one to two cm intervals. It is the intention to publish this study when an extensive dating programme has been completed. In this paper some general remarks will be made.

2. THE LOCATIONS

In figure 1 the coring sites are shown including those that yielded no sediment or only negligible quantities. Such information is given in order to prevent fruitless attempts being made in the future. Of more interest are those coring sites that were successfully sampled and that produced sediments from which pollen diagrams have been prepared. The majority of the sediments originate from pingo scars, some from depressions formed by deflation.

The thirty odd pollen diagrams produced so far by E. Mook-Kamps and others cover part of the Late Glacial and/or the Holocene. Almost invariably the upper part of the peat bogs is missing due to peat digging by local owners. The lower gyttja sediments which cannot be used as fuel were generally still present, mostly representing Late Glacial and/or early Holocene deposits.

3. THE LATE GLACIAL

Complete Late Glacial sequences, covering such phases as Bølling, Allerød and the various Dryas periods, are seldom represented in the pollen diagrams that have been established. New evidence brought forward by Usinger (1985) demonstrates that often little proof is found for the existence of

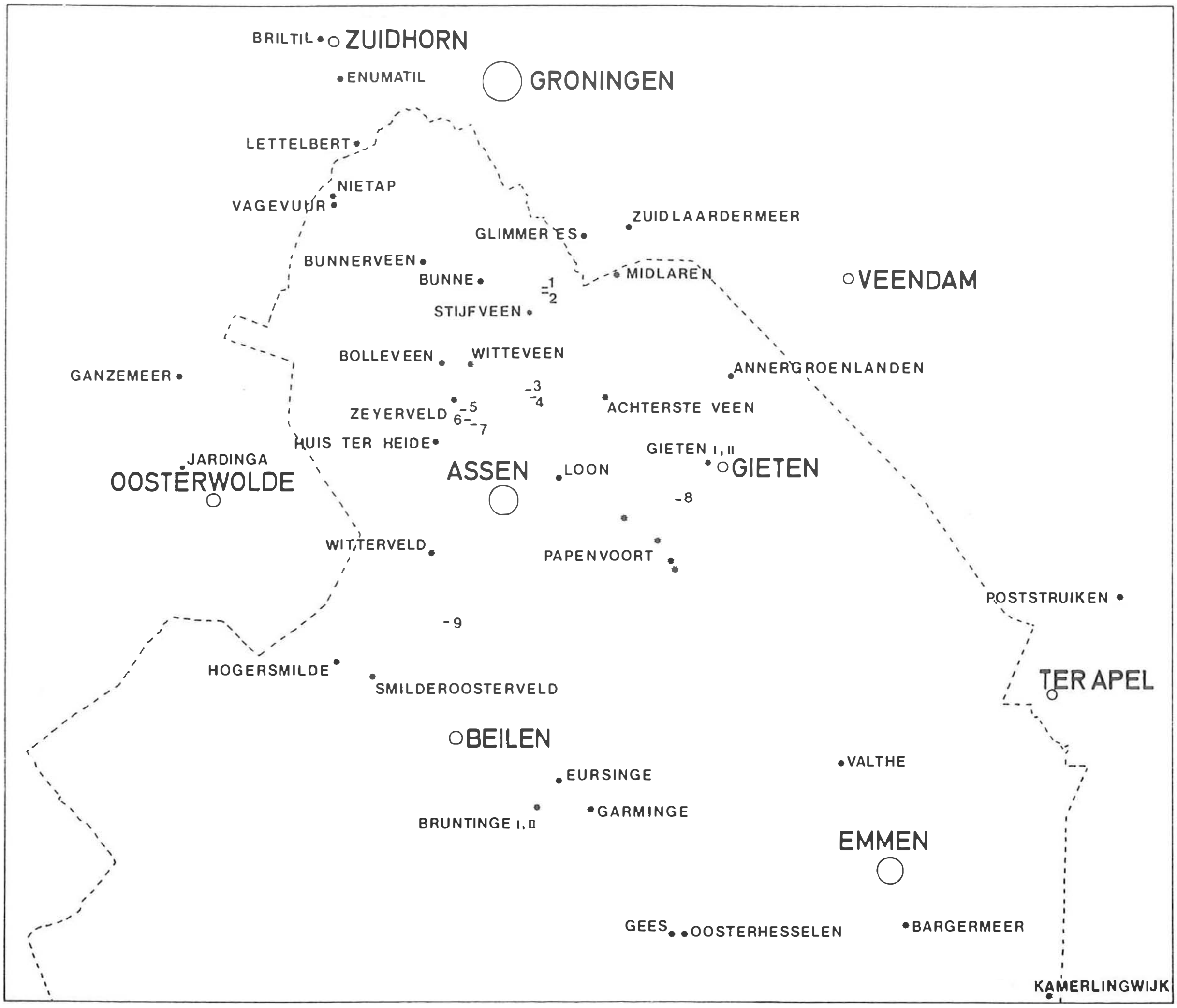

Fig. 1. Map showing the coring sites on the Drenthe Plateau.

the earliest oscillation, postulated for the older part of the Late Glacial, the Bølling. For instance, the part of the Stokersdobbe ascribed by Paris et al. (1979) to the Bølling very likely reflects a situation almost or completely devoid of local pollen, producing a spectrum formed by a combination of secondary types with perhaps some long-distance effect of *Pinus*. Rather remarkably identical secondary pollen assemblages are found in for instance the pingo scars from Zeijerveld and Vagevuur. In these cores the material from which the samples providing the spectra originate is a blue sticky clay underlying the gyttja sediment, commonly present in the lower parts of pingo scars. It is very difficult to prove or disprove the presence of a Bølling oscillation in the northern Netherlands because the majority of the pingo scars studied so far did not contain water during the early Late Glacial, as is concluded from the absence of lake sediment. The time of the first appearance of water in the pingo scars studied varies considerably and is highly dependent upon the local situation. The elevation of the bottom of the pingo scar above sea-level, the presence of boulder clay in the subsoil, as well as the steepness of the slope on which the pingo scar is found, all seem to have determined the time when water started to fill up those depressions. Some pingo scars situated on the central ridge known as the 'Hondsrug' never contained any water (pers. comm. M.W. ter Wee). The presence or absence of water in pingo scars is of interest in relation to the distribution of Late Palaeolithic or Mesolithic habitation.

The pollen percentages in Late Glacial assemblages are based on the so-called Iversen sum. In view of the character and the number of the types found, Iversen (1947) assumed that open vegetations dominated the landscape. The generally high numbers of Cyperaceae were very likely produced by sedges (*Carex* spp.), that formed part of the upland vegetation. The problem remains that sedges may have formed part of the local vegetation also. Especially in peat formed along rivers during the Late Glacial, as for instance along the Tjonger, pollen of Cyperaceae contributed to an important extent.

Surface-sample studies in Turkey (Bottema & Woldring, in prep.) demonstrate that an enormous quantity of pollen produced by a dense mat of *Scirpus* cf. *rufus* was found in the underlying peat or on the turf. However, moss cushions taken from concrete blocks about 50 cm high in the sedge vegetation showed surprisingly low values for Cyperaceae, indicating that at least in that situation dispersal was very poor and was restricted to direct precipitation.

In some of the investigations on sites located on the Drenthe Plateau absolute counting was done. One has to be very cautious with absolute counting because calculation of the sedimentation rate involves serious problems. In general sedimentation is slow and the number of radiocarbon dates is restricted very much by the limited amount of organic material available, thus hindering reliable dating.

Still, the pollen concentration in the samples that were analyzed gives some idea of the production during the Late Glacial. The authors are of the opinion that the production of arboreal pollen during most of the Late Glacial including the Allerød must have been low and varied even from one locality to another. Even in detailed studies on pingo scars in the same area, as for instance those from Waskemeer (Casparie & van Zeist, 1960) and Ganzemeer, situated c. 400 m from each other, conspicuous differences were found to exist in the ratio between *Betula* and *Pinus* for the two sites.

During the course of the Late Glacial groundwater is demonstrated at a depth of 7-8 m in some of the deeper pingo scars. Such conditions may have fulfilled the requirements for the growth of *Betula* and/or *Pinus* inside the pingo scars on the slope bordering the small lake. At the same time the upland, the plateau except for the stream valleys, was devoid of trees as is concluded from the low AP values in Allerød peat along the Tjonger near Oldeholtwolde (see also Stapert, 1986). As only some part of the pingo scars contained water during the earlier part of the Late Glacial, tree growth must have been very local.

4. THE PREBOREAL

Information on the development of the vegetation and climate during the Preboreal is greatly restricted by the scarcity of sediment permitting a detailed analysis. This scarcity of Preboreal sediment leads one to the conclusion that a dry climate prevailed. Only in pingo scars from Valthe and Bruntinge a more extended sequence was found pointing to more humid local conditions. For this period attention has been focussed on, among other things, the presence or absence of the so-called Friesland oscillation. Proof of this oscillation is only occasionally present on the Drenthe Plateau and the nature of this event remains the subject of further investigations.

5. THE PREBOREAL-BOREAL BOUNDARY

The boundary of the Preboreal and the Boreal is generally laid where the curve of *Corylus* shows its first important increase. Some authors lay the boundary between these periods at the crossing of the curves of *Betula* and *Pinus*. This crossing generally takes place shortly before the increase in *Corylus* percentages. The difference in time between the two events, defined by the amount of sediment, does not seem to be consistent and occasionally the crossing of the *Pinus* and *Betula* curves is found at the same depth as the increase of the *Corylus* curve. One may assume that both events were caused by the same change in climatic conditions. Still, the increase in *Corylus* values seems to be a better boundary indicator, because the crossing of the *Pinus* and *Betula* curves is a relative effect that may be influenced by local conditions.

6. THE ATLANTIC-SUBBOREAL TRANSITION

The transition from the Atlantic period to that of the Subboreal is marked by changes in pollen percentages that are mostly indicative of the influence of Neolithic farming and to a lesser extent of climatic change. Aaby (1983) describes a decrease in pollen values of some temperature-sensitive indicators as deceptive. He explains the lower values of for instance *Viscum* as the effect of cutting of *Tilia*, the host of this parasite. The characteristic decrease of *Ulmus* and the appearance of pollen of *Plantago lanceolata* were ascribed by Iversen and Troels-Smith to two different kinds of *landnam*. The first appearance of low percentages of *Plantago lanceolata*, the so-called Troels-Smith *landnam*, was followed by higher values for plantain, the so-called Iversen *landnam*. The different values were explained by Troels-Smith as resulting from different kinds of animal husbandry. For the Drenthe Plateau the *landnam* effect was studied on the basis of cores taken from large raised bogs (van Zeist, 1959).

Van Zeist detected the same trend as shown by Iversen and Troels-Smith. The transition from the Atlantic to the Subboreal is rarely found in small peat-bogs such as pingo scars because peat-digging has removed such information. On one occasion the transition from the Atlantic to the Subboreal was still present in the sediment. This concerned the pingo scar of Gietense Veen (fig. 1), where gyttja was still being formed during the 5th millennium. The upper part, the *Sphagnum* peat, had disappeared because of peat-digging but as the underlying gyttja had no value for fuel, the information had been preserved. This site is all the more interesting because two TRB settlements were found nearby. The pollen spectra indicating the Landnam-effect were dated 4800±40 BP (GrN-8075) (uncalibrated date). One would expect a Troels-Smith *landnam*, characterized by low *Plantago lanceolata* percentages, but instead relatively high plantain values of the Iversen *landnam* type are present.

As the activities of the early TRB farmers must have taken place close to the catchment basin they must have been expressed more clearly than in cores from the middle of large peat-bogs, far away from the farmer settlements (various authors in Behre, 1986). In the Gietense Veen samples the Troels-Smith *landnam* was of the same character as the Iversen *landnam* and the pollen assemblages do not point to different kinds of animal husbandry. The authors are of the opinion that cattle keeping in the TRB period not necessarily differed from that in the PFB period. The differences in pollen values as demonstrated for cores from large peat-bogs may be more of a quantitative effect, for instance caused by the number of settlements in both periods.

A recent dating program of the Gietense Veen sediment combined with detailed palynological investigations (A. Hagedoorn, internal report) suggests that Neolithic activity started at about 3600 BC (pers. comm. J.N. Lanting), appreciably ahead of the TRB period.

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