Annales de la Société Géologique de Belgique, T. 105 - 1982, pp. 41–44 Juin 1982

THE LATE GLACIAL AND PREBOREAL IN THE HINKELSMAAR POLLEN DIAGRAMS : A COMMENT [1]

by

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(1 figure)

ABSTRACT.- In this comment Bastin's pollen diagram from Hinkelsmaar (Eifel) is compared with the earlier pollen diagram of Straka. Bastin's interpretation is discussed. The Piottino oscillation in his diagram must be the Younger Dryas ; his Younger Dryas must reflect a temporary climatic deterioration in the Allerød.

RESUME.- Dans ce commentaire le diagramme palynologique de Bastin est comparé avec le diagramme de Straka. L'interprétation de Bastin est discutée. L'oscillation de Piottino dans son diagramme doit être le Dryas récent, et son Dryas récent est une phase de péjoration climatique pendant l'Allerød.

1.- INTRODUCTION

Based on a palynological study of a new boring carried out in the Hinkelsmaar in the Eifel, Germany, B. Bastin (1980) subdivides the Late Glacial into the five classic phases, Older Dryas, Bölling, Earlier Dryas, Allerød, Late Dryas. The Preboreal he divides into the zones a, b (Piottino), c.

In this comment on his chronozonation I shall put forward arguments for another interpretation of his diagram. These will be based on a comparison of his results with those of H. Straka (1960), who analysed a section from the Hinkelsmaar.

In figure 1, the two pollen diagrams are brought together in a somewhat simplified form. Column A represents Bastin's diagram, column B the local pollen zones with the new interpreted chronozones (after F. Firbas (1949)), column C Straka's diagram and column D Straka's chronozonation (also after Firbas).

As figure 1 illustrates, Bastin's and Straka's pollen diagrams are largely in agreement with each other.The course of the individual curves is in both diagrams nearly identical, in spite of the broad-spaced character of Straka's diagram. The pollen zones a, b, c (column B) in Bastin's diagram correspond with the chronozones Ia, Ib, Ic and in Straka's one with Ia.

Bastin's division of zone I is in agreement with that made by Van Der Hammen (1951), based on vegetation. After the herb maximum at the base of zone Ia the percentage of herbs decreases and birch pollen increases to a maximum of about 20 $^{o}/o$. This represents the Bölling oscillation. At the transition from chronozone Ib into chronozone Ic there is a striking *Salix* peak. *Juniperus* is present also.

Bastin puts the transition into chronozone II at a depth of 488 cm. Straka puts this transition at a depth of 468 cm. Bastin's division of chronozone I is more in agreement with what is known about the development of the vegetation during that period.

Concerning the pollen zones d, e (not present in Straka's diagram), f, g and h, there is no agreement between Bastin and Straka (fig. 1).

The chronozonation of these pollen zones will be discussed below.

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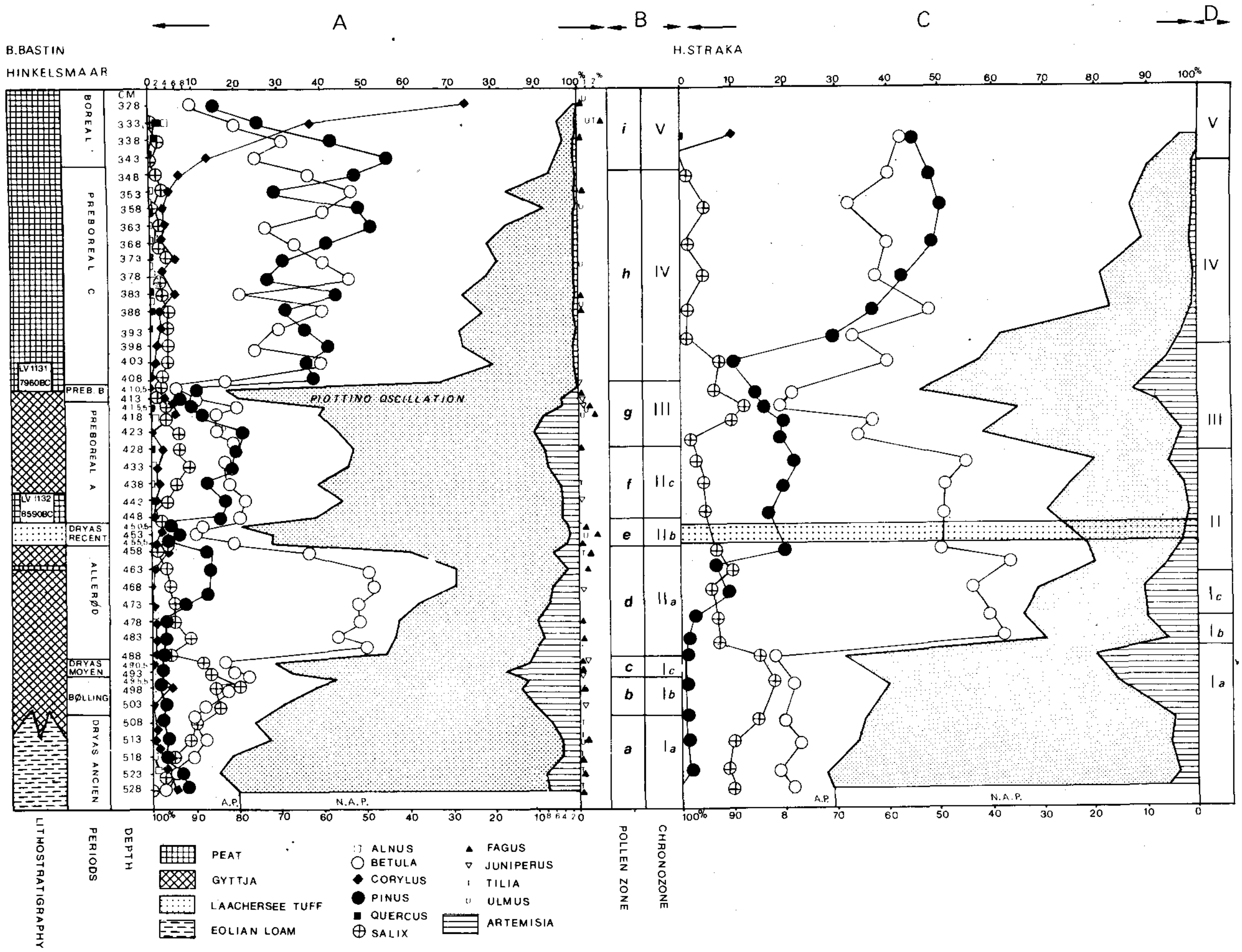

Figure 1.- Pollendiagram of the Hinkelsmaar.
Column A according to B. Bastin. Column C and D according to H.Straka.

2.- COMMENTS ON THE CHRONOZONATION OF THE POLLEN DIAGRAMS

2.1. THE TRANSITION BETWEEN LATE GLACIAL AND POST GLACIAL

At the transition point between Late Glacial and Post Glacial a very sudden and steep rise in temperature occurred which transformed the open landscape with the heliophilic elements, like *Artemisia*, of the Younger Dryas period into a continuous *Pinus* forest of the Preboreal. This phenomenon is observed in many pollen diagrams in this part of Europe. The boundary between the Younger Dryas and the Preboreal is fixed at about 10.000 B.P.

In Bastin's diagram the curve of *Artemisia* and most of the other curves for herbs are depressed at a depth of 408 cm. *Pinus* expands. His ^{14}C dating Lv 1131, 9910 ± 90 B.P. lies around 10.000 years B.P., especially when the possibility of a rejuvenation of the sample is considered (see 2.2). Consequently, if the transition between Late Glacial and Holocene in Bastin's diagram is placed at 408 cm and not at 448 cm, his diagram aligns with Straka's. This implies that pollen zone g cannot be the Piottino oscillation, but must represent the Younger Dryas. The *Artemisia* maximum and the presence of *Juniperus* support this interpretation. Straka also places zone g in the Younger Dryas.

In general the minor and short lived climatic oscillations such as the Piottino, Older Dryas and the middle part of the Allerød are difficult to demonstrate by pollen analysis for the reason that most of the diagrams are not closely spaced enough to make changes in the vegetation visible. Moreover minor fluctuations on a rapidly rising temperature curve, as in the case of the Preboreal, will cause a minor change in the vegetation. Further, edaphic and other climatic factors will determine if, following a drop in temperature, a threshold will be crossed leading to a change in the vegetation.

This is one of the reasons why the Piottino oscillation is only weakly expressed in a rather limited number of pollen diagrams. Küttel (1977, 1979) has repeatedly drawn attention to this. In my opinion it is improbable that the Piottino oscillation created a change in the vegetation that was better expressed than the Younger Dryas as Bastin's interpretation suggests.

It is to be expected that only in the Allerød a short-lived climatic oscillation is more effective on the vegetation. Bastin's Younger Dryas must be the temporary climatic deterioration in the middle of the Allerød (see 2.2).

2.2. THE ALLERØD

It is my opinion that the pollen zones d, e and f all belong to the Allerød. Straka puts the Allerød in the upper part of zone d, (e), and f. As mentioned in the introduction I agree with Bastin that the transition between pollen zone c and d is the transition from the Earlier Dryas into the Allerød. In this section the curve of the herbs is depressed with a striking minimum of *Artemisia.*

It is possible to divide Straka's Allerød into a zone of *Betula* dominance and a zone in which *Pinus* expands. The same trend is perceptible in Bastin's Allerød, but here that development is interrupted by a strongly expressed curve of the herbaceous pollen. This climatic deterioration coincides with the Laacher See Tuff 5. Numerous Allerød profiles in which this Laacher See Tuff is interbedded show during the *Pinus* expanding phase an increase of *Betula* or herbaceous plants. The deposition of the Laacher See Tuff happened during these advances or shortly after (Bertsch, 1961 ; Müller, 1965 ; Usinger, 1975, 1978 ; Wegmüller & Welten, 1973 ; Welten, 1952). These particles of volcanic ash provide a well-defined time-marker horizon dating at about 11.000-11.300 years B.P. (Firbas, 1953 ; Frechen 1959 ; Wegmüller & Welten, 1973 ; Wegmüller, 1977).

Nevertheless in his section Bastin puts the Laacher See Tuff in the Younger Dryas. He supports this interpretation by his ^{14}C dating Lv 1132 : 10.440 ± 90 B.P. from the overlying 8 cm thick peat layer. This means that the underlying Tuff is older, exactly how much older is not known. Bastin puts the transition Younger Dryas into the Preboreal at the base of the peat layer, because peat formation has to start in the Preboreal (p. 90). This implies that his ^{14}C dating seems 300 years too old.

^{14}C datings have to be considered with great care. The possibilities for contamination are numerous, both with respect to rejuvenation and aging of the samples. In this case, I think, rejuvenation has occurred. This suspicion is supported by the fact that during the two periods of cooling and just below the ^{14}C dated samples *Corylus* reaches percentages between 4-6 °/o and *Fagus* between 2-3 °/o. These data point to a rejuvenation of the age of the deposition.

Küttel (1977) observed that the very datings which fall in the periods of climatic deterioration are apparently too young. This is explained by an increased ^{14}C level during the formation of the sediment concerned. See also Karlen & Denton (1976) and Suess (1968).

Bastin's radiocarbon datings are obtained from 8 cm thick peat samples. A date obtained in this fashion will relate to the average age of the whole sample thickness and not to the base and thus will be younger than the time of initial organic deposition.

The degree of rejuvenation depends upon the rate of sedimentation. What do we know in this about the seepage of water through the sandy volcanic tuff layer ; water carrying humic acids ?

For the reasons set out above I believe that the deposit in Bastin's section of the Hinkelsmaar between 428-448 belongs to chronozone IIc. I should like to further point out that in a number of pollen diagrams where the Laacher See Tuff is interbedded a tripartition of the Allerød is a common phenomenon. (Müller, 1965 ; Usinger, 1977).

3.- CONCLUSION

The arguments put forward by Bastin are too weak to justify a more differentiated interpretation of the general picture of the vegetation history during the Late Glacial and Preboreal. In this way he creates a strongly pronounced Piottino oscillation in the Hinkelsmaar deposits.

ACKNOWLEDGEMENT

The author wants to express his gratitude to Dr. A. C. Imeson (Amsterdam) for correcting the English text.

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