

LITHO- AND BIOSTRATIGRAPHICAL STUDY OF QUATERNARY DEEP
MARINE DEPOSITS OF THE WESTERN BELGIAN COASTAL PLAIN.

POLLEN ANALYSIS

by C. VERBRUGGEN (★)

Samples have been taken from the borings 193DB5, DB6, 117DB15, DB6, DB8, DB7, DB9, DB12, DB13, DB14.

The total number of samples is about 650. Since only the lower part of the sediments below -17 m relates to the main question of this study, the number of samples was reduced to 250. For comparison 15 pollenslides of samples above -17 m were made. The samples below the -17 m level that have been investigated palynologically represent nearly 40 % of the available stock.

To determine the palynological character of the sediments, initially only organic and/or clayey samples were treated. The good preservation of the pollen grains, the undisturbed character of the spectra and the interesting results lead to a taking into consideration of the predominant number of coarse sandy samples. By using samples of 50 gr. or more, most levels yielded good pollenslides. Some were extremely poor even pollenless. They are indicated on the pollenplots by a sign (-) together with the number of pollen grains that have been found.

The pollensum represents the A. P. Contamination caused by the coring method where small quantities of the overlying levels may have been mixed with the underlying material, did not seem to have altered the pollenspectra significantly.

The pollen grains which showed the most striking differences were those of *Hippophae*. Their generally excellent state of preservation distinguished them from other pollen. They were found in corings which were carried out in April and May, the flourishing time of the sea buckthorn which actually covers the dunes in the study area. For this reason *Hippophae* was given a particular place in the pollendiagrams. In spite of these limitations and in the absence of reference investigations the following conclusions seem to be valid :

- there is a perfect agreement between the pollenspectra of the peaty-clay of 193DB5 and the C14 dating of this layer;
- the results of the analysis of sandy samples fit closely with those obtained for the clayey sequences.

A systematical description and

interpretation of the pollendiagrams following the rank of the geological transect is given below. The samples are numbered beginning from the base.

193DB5

Under the -17 m level, the pollen spectra show a typical "boreal" composition with a dominance of *Corylus*. The relative abundance of *Ulmus* and the absence of *Alnus* and *Tilia* is also characteristic; there is a continuous curve for *Hedera*. Fresh water plants occur together with *Chenopodiaceae*. Certain samples show a clear evidence of Tertiary remaniation. The sediments of this sequence are generally clayey, sometimes rather organic. In sample 3 the high percentages of *Cyperaceae* point to marshy conditions. The C14 dating of the sample : 7795 + 130 BP. is in perfect agreement with the Late Boreal pollenspectra.

The uppermost sample, above the -17 m level, seems to be much younger with *Alnus*, *Tilia* and especially *Fagus*.

195BB6.

This diagram is similar to that of 193DB5. There is again the clear difference between the "boreal" lower part and the post atlantic upper part, above the -17 m level.

117DB15.

The sediments under the -17 m level are poor in pollen. Only the spectrum of sample 3 is shown. *Chenopodiaceae* are relatively abundant. From sample 3 onwards the pollencontent points to post-atlantic conditions.

117DB6.

The diagram can be subdivided in three parts.

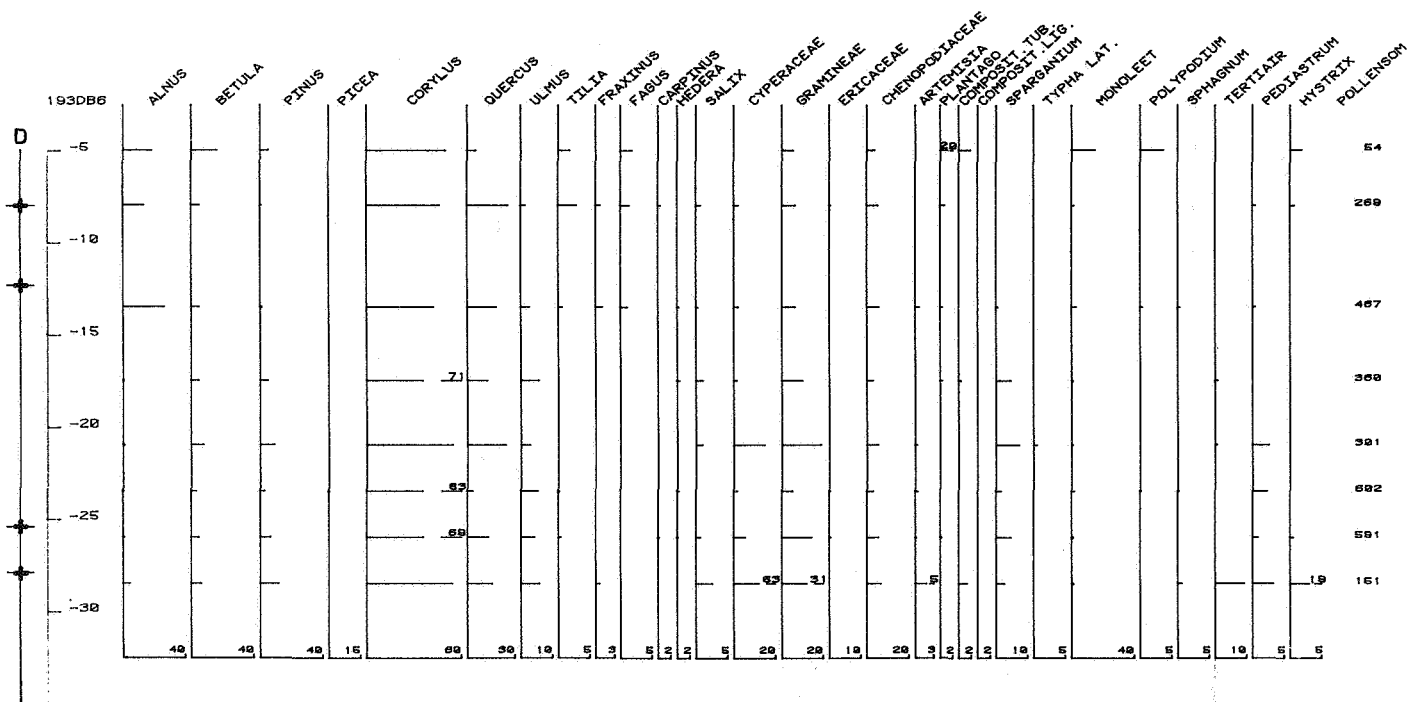
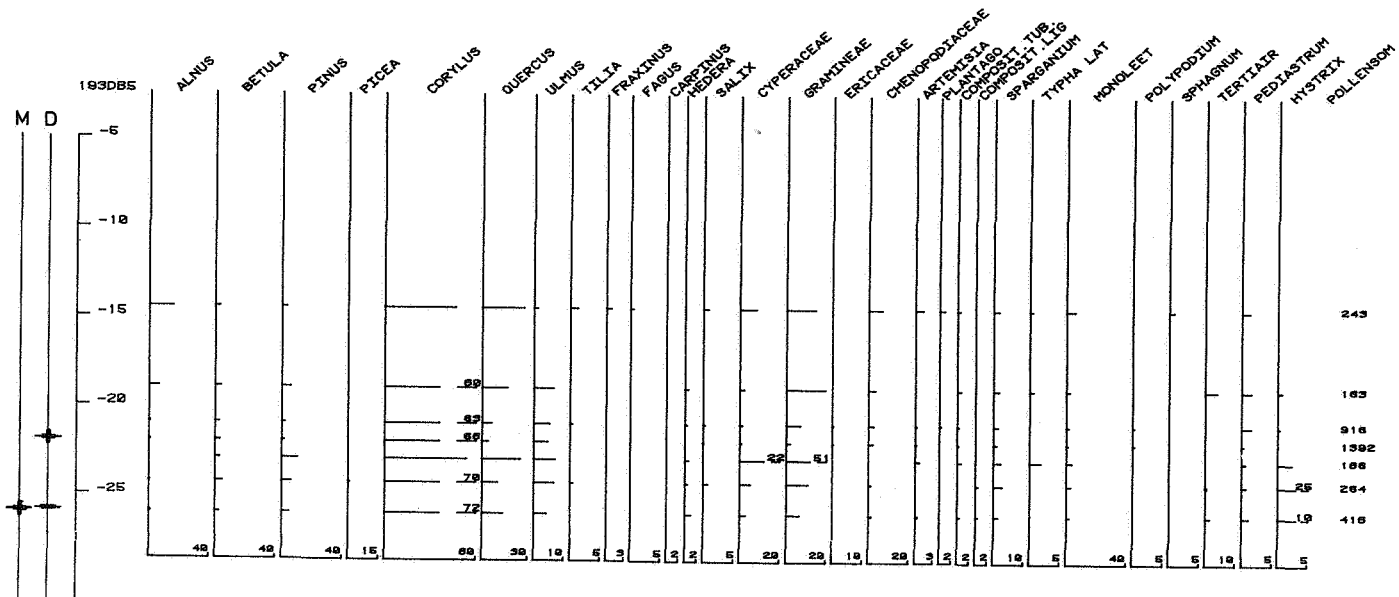
1. Sample 1 and 2.

The characterizing elements are *Pinus*, *Picea*, *Carpinus* and *Ericaceae*. They occur together with the trees of the atlantic forest; *Betula* is rather important. Such a composition prevailed at the end of the Eemian.

2. Samples 3, 4 and 5.

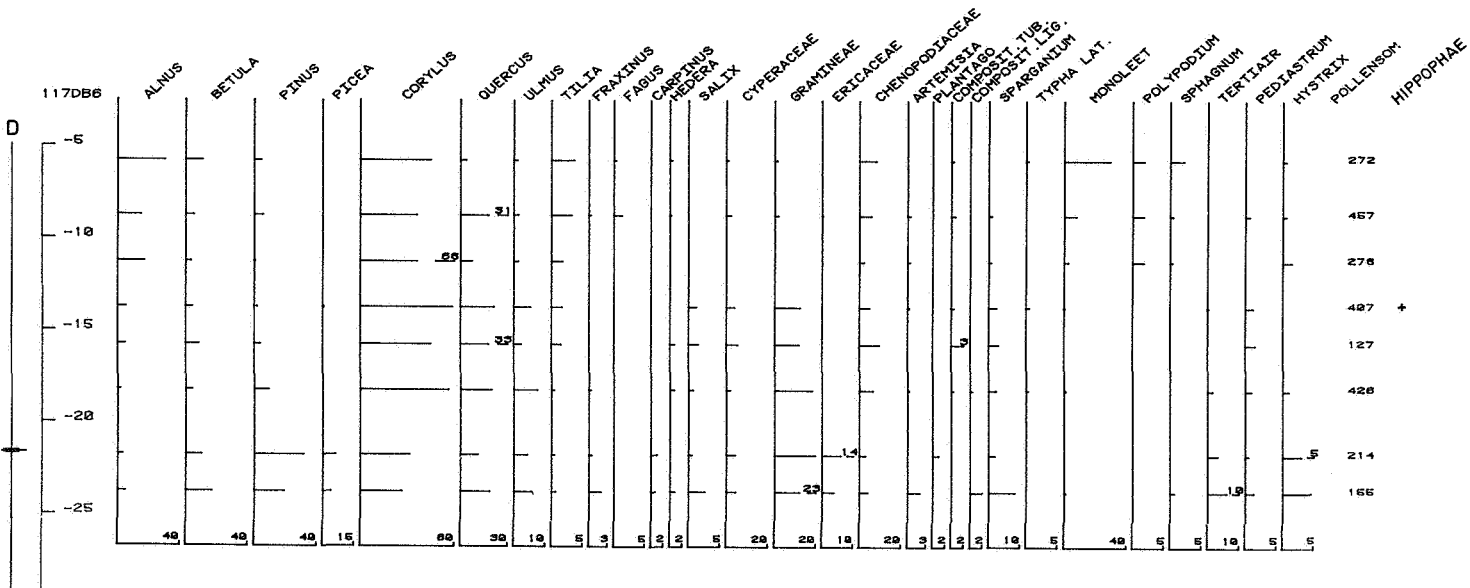
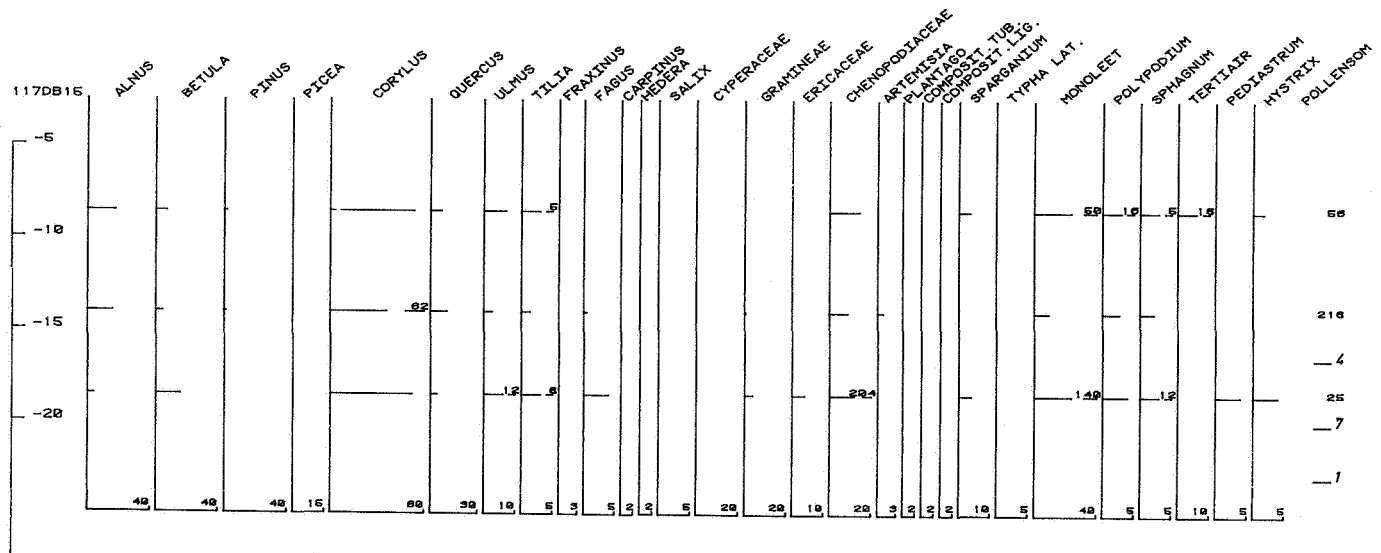
A late Boreal or early Atlantic composition is recognized on the basis

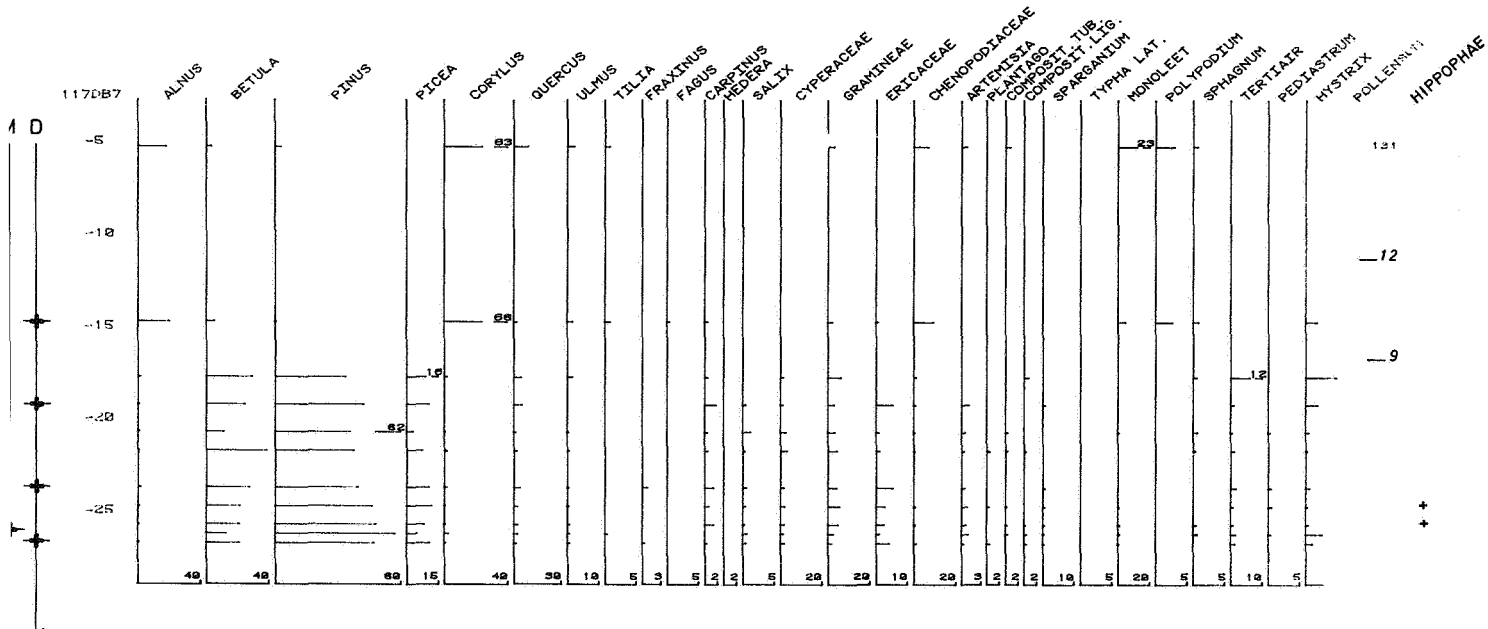
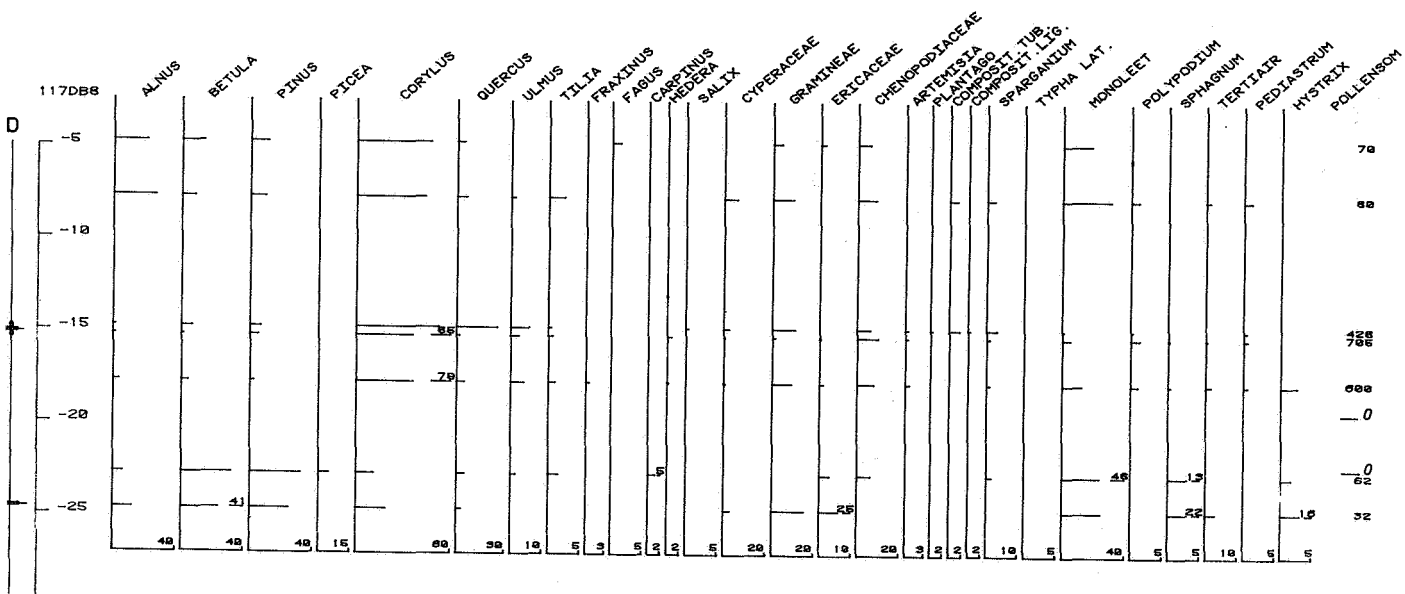
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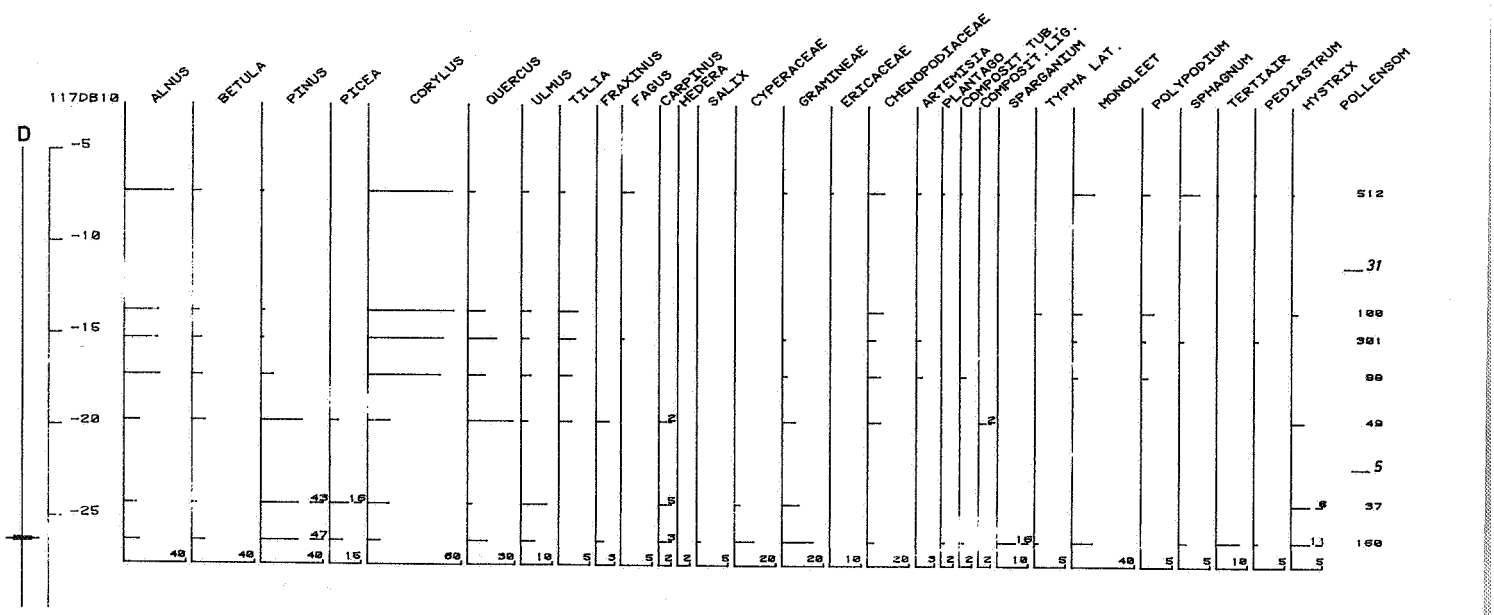
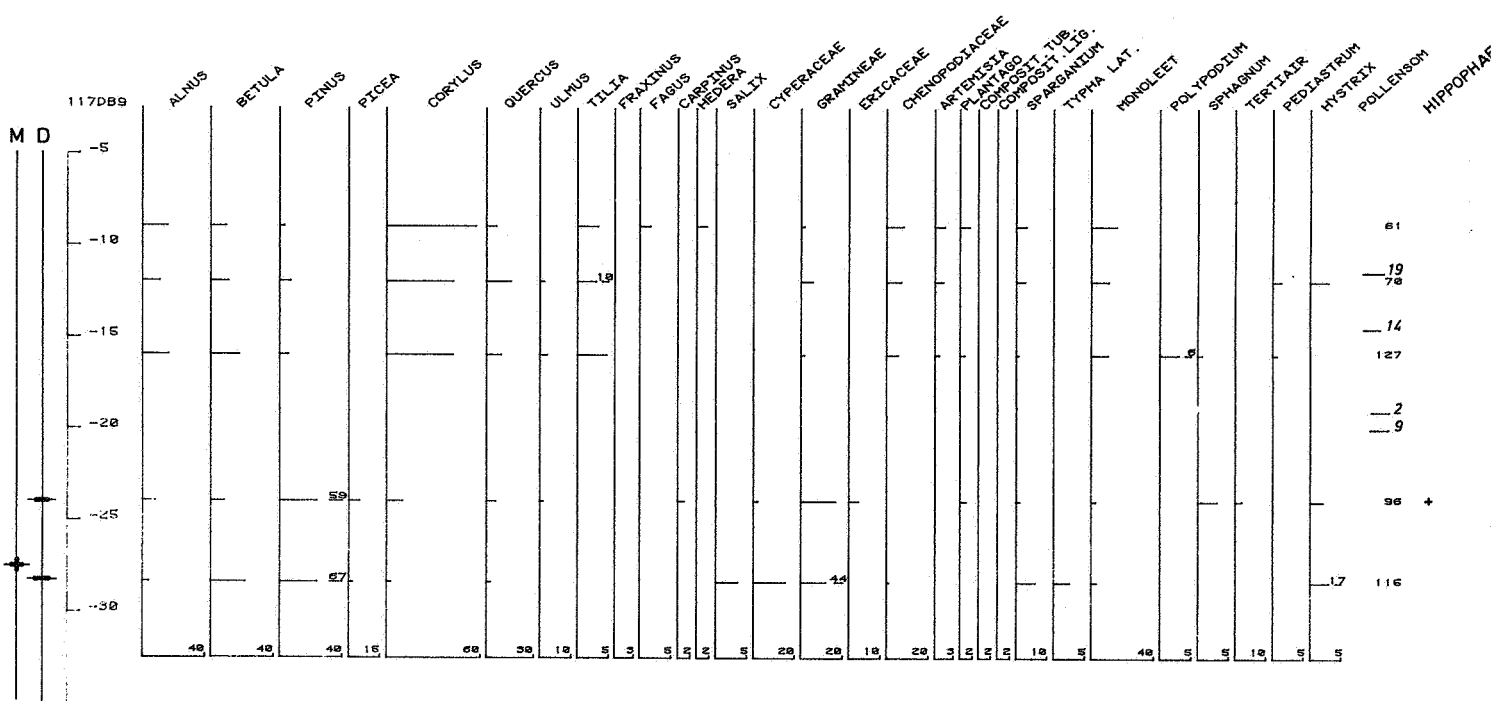


D : Diatom sample + positive
 - negative

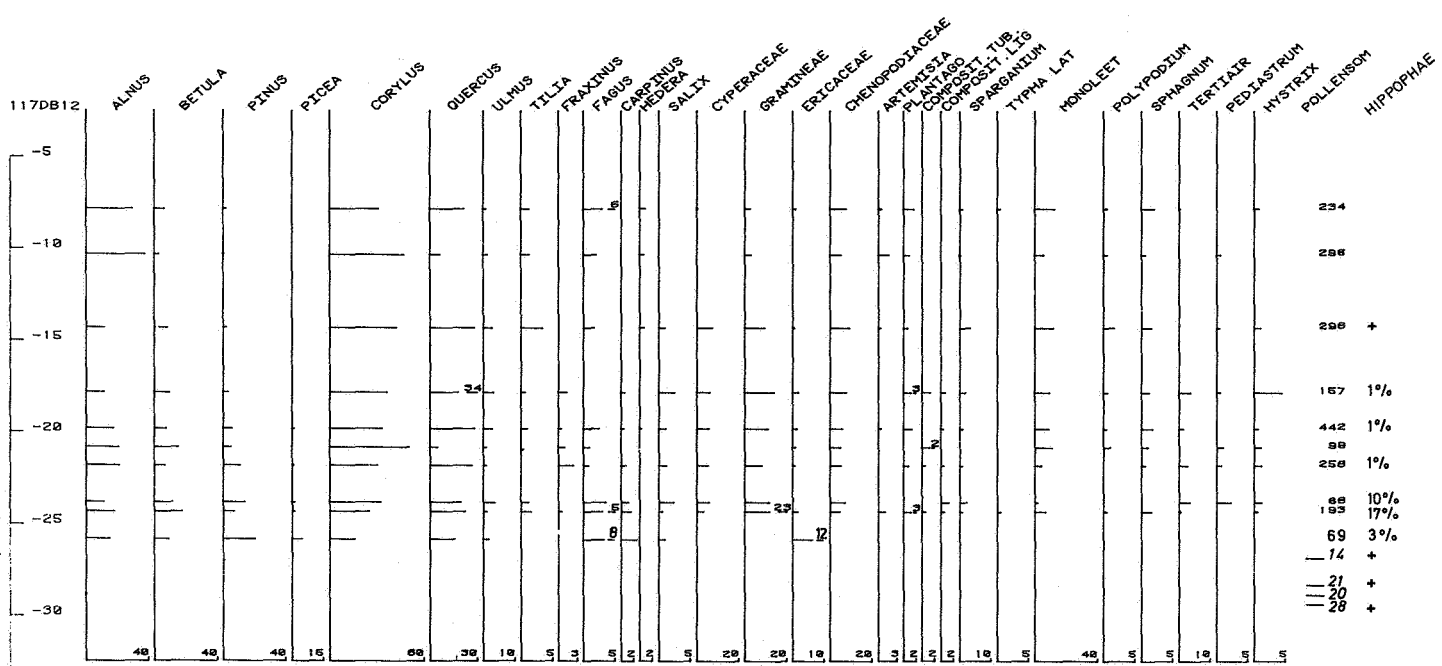
M : Mollusc sample



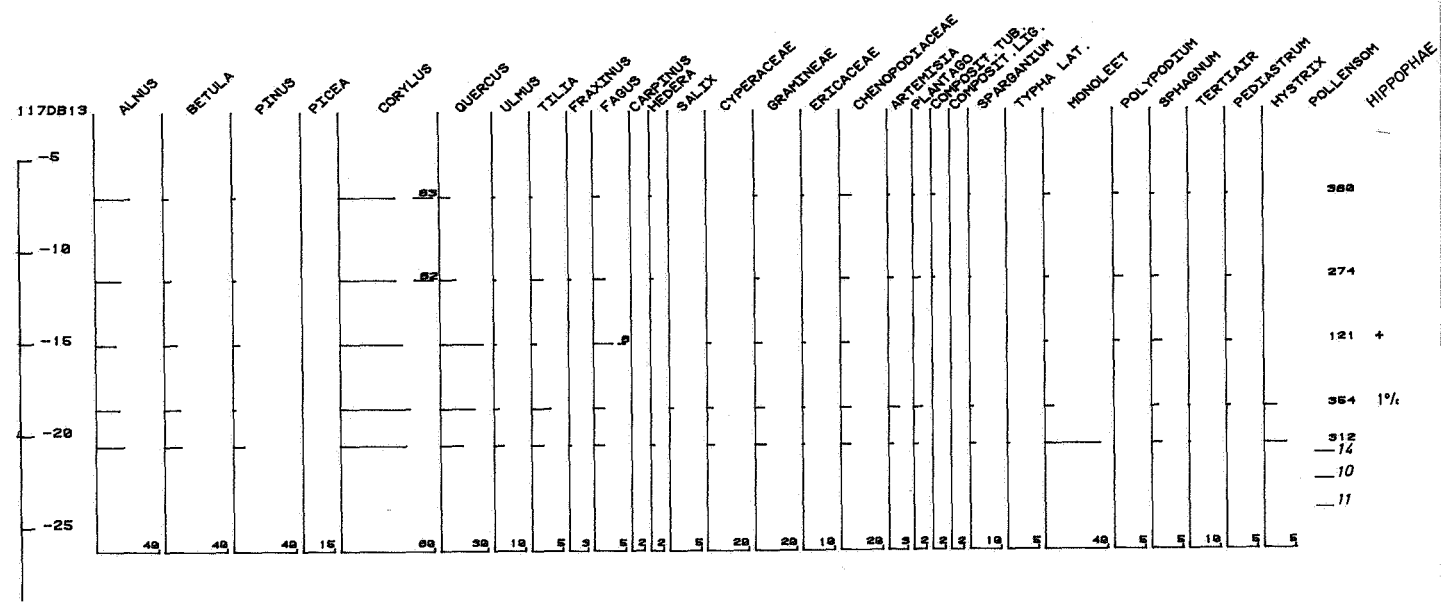


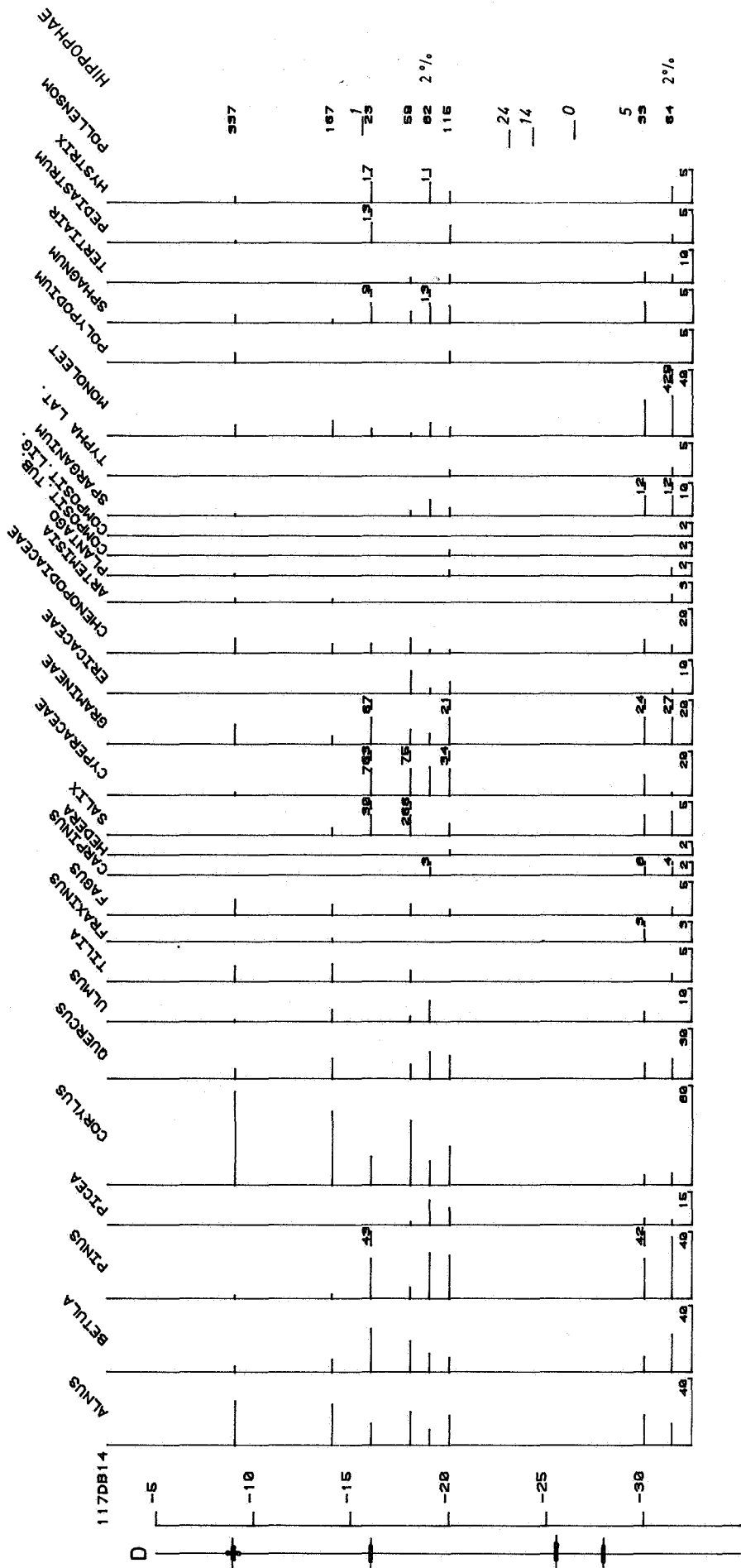


I D



M





of the high values of *Corylus* and *Ulmus* and the low values of *Alnus* and *Tilia*.

3. Sample 6, 7 and 8.

Alnus and *Fagus* as well as the QM-components indicate a post-atlantic time.

117DB8.

In spite of the low pollenfrequencies in the lower part of the sequence, a subdivision similar to that of coring 117DB6 may be recognized.

1. Sample 1 and 2 : Late Eemian composition.
2. Sample 3 , 4 and 5 : Late-Boreal, early Atlantic composition.
3. Sample 6 and 7 : Post-Atlantic composition.

117DB7.

Under the -17 m level all the pollenspectra have a similar composition : *Pinus*, *Betula* and *Picea* are the dominant elements. Thermophilous trees are scarcely represented. Other characteristics are the continuous curves for *Carpinus*, *Salix*, *Ericaceae* and *Artemisia* as well as the very low values of *Chenopodiaceae*. Such a vegetation belongs to cold temperate conditions such as at the end of the Eemian or in the Early Weichselian.

The two spectra on top of the -17 m level have a post-Atlantic composition.

117DB9.

Samples 1 and 2 have a late Eemian composition.

The three plotted samples up to the -17 m level reflect an atlantic to post-atlantic age.

117DB10.

Samples 1 to 4 are late Eemian.

The higher samples are atlantic to postatlantic.

117DB12.

The lowermost samples are poor in pollen. However the few pollen that are present, point to a similar composition as this of the overlaying samples. The nearly continuous curve of *Fagus* indicates a Subatlantic age for the whole sequence. In the samples below -20 m *Picea* is present in noticeable numbers.

117DB13.

This sequence shows great similarity with 117DB12.

117DB14.

This sequence too may be compared with the two preceding-ones. An uncommon zone of clayey-sediment with high percentage for *Salix*, *Cyperaceae* and *Gramineae* occurs between -20 m and -16 m. Under that zone the pollencontent is generally low. *Fagus* is only present in some samples, but the *Picea* curve is continuous.

CONCLUSIONS (see fig. 1).

The pollendiagrams allow to distinguish four different pollen assemblages. The presence of a considerable number of *Chenopodiaceae* all over the sequences proves that all the sediments are from marine origin.

1. An Atlantic to Postatlantic assemblage for all the samples up to the -17 m. It is evident that we are dealing here with the Calais-deposits. It is remarkable that *Fagus* is often present in the deepest layers of these deposits. If the dating of this deep presence of *Fagus* is comparable with the dating of the appearance of *Fagus* in coastal peat sequences, a sedimentological gap between early atlantic times and late sub-boreal ones has to be supposed. This pollen assemblage also occurs in the borings 117DB12, 117DB13 and 117DB14, at depths well below the -17 m level. Together with the relative high percentages of *Fagus*, high numbers of *Hippophae* have been found. The fact that these findings were made closest to the sea (they are on the beach) lead to the supposition that deep marine erosion has taken place there during the Subatlantic. In the light of this, the explanation about the strange behaviour of the *Hippophae* pollen grains, as given in the introduction has to be revised. (see also the stratigraphical conclusions).

2. A Boreal assemblage.

It is very characterized by its botanical composition, and confirmed by the radiocarbon date. An extrapolation to the base of boring 193DB5 results in an age of 8500 BP for the sealevel at -26 m TAW (+ -28 m NAP). Early atlantic sediments are probably present in the top samples under the -17 m level in the borings 117DB8 and 117DB6.

3. A late Eemian or early Weichselian assemblage.

It is only present in boring 117DB7. It is very pronounced too over the total length of the sequence. It points to sediments of the regressing Eemian Sea.

4. A late Eemian assemblage.

In all the borings, with exception for assemblages 2 and 3 the deepest sediments are generally poor in pollen. Nevertheless sufficiently data could be collected to conclude that these sediments are of an older origin than Holocene. The fact that together with the late Eemian pollenflora some grains of typical cold plants like *Selaginella* were found, could indicate that these marine late Eemian sediments have been reworked in Weichselian times.

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- BAETEMAN, C. & VERBRUGGEN, C. (1979) - A new approach to the evolution of the So-called SURFACE PEAT in the WESTERN COASTAL PLAIN of BELGIUM. *Prof. Paper, 1979, 11, nr. 167, 21 p.*

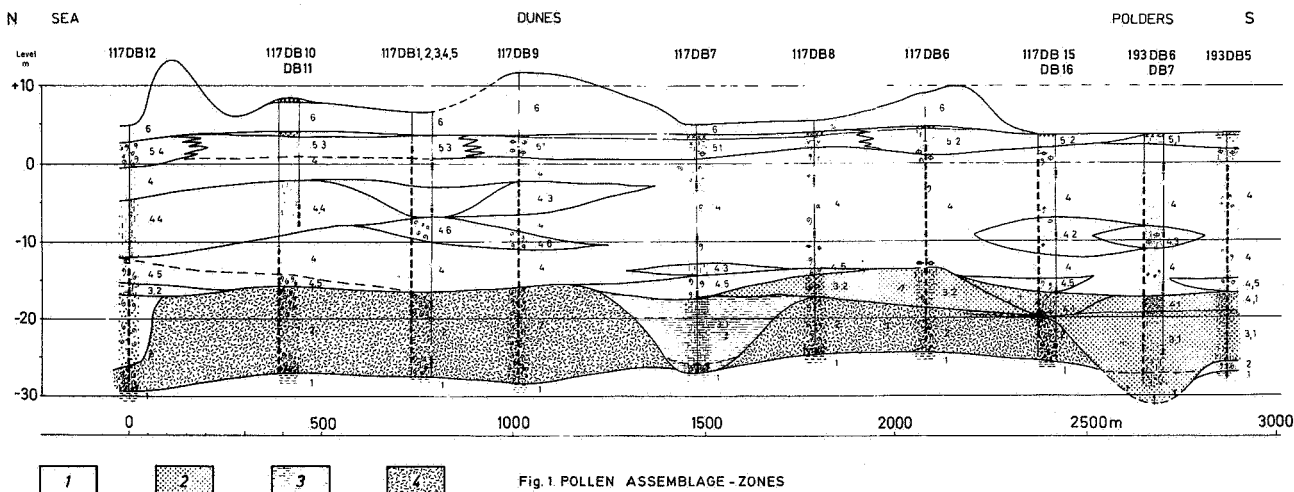


Fig. 1. POLLEN ASSEMBLAGE - ZONES

GENERAL CONCLUSIONS.

The biostratigraphical study, comprising pollen, diatom and mollusc investigations, sheds more light on the age and the genesis of the deposits below level -17.

The pollen analysis gives the most accurate geochronological order for the sediments. The medium to coarse medium sand (layer 2) corresponds with the Late Eemian assemblage. The clay-silt complex (layer 3) not only varies in grain-size distribution, thickness and level of occurrence but also contains three different pollen assemblages :

- a Late Eemian or Early Weichselian assemblage in boring 117DB7 between the levels -17 and -27;
- a Boreal assemblage in borings 193DB5 and 193DB7 between the levels -19 and -27;
- an Early Atlantic assemblage in the borings 117DB8 and 117 DB6 between the levels -14 and -18.

It is difficult to interpret the presence of *Fagus* and *Hippophae* in the medium to coarse medium sands (layer 2) in the borings on the back-shore. One explanation may be that this few pollen are present because of stronger vertical groundwaterflow in the Belgian coastal plain (L. LEBBE, 1981).

The diatom analyses indicates the presence of four kinds of sediments :

- marine-brackish to marine Calais deposits of tidal flat origin above the level -17.

- sediments of possible Eemian age with a somewhat different diatom flora, laid down under similar conditions (the deeper sediments of 117DB7);
- Calais sediments with a marked fresh water influence below the -17 level (193DB5 and 193DB6);
- diatom-free sediments (also containing very few pollen grains).

These interpretations are still considered tentative due to the limited amount of material examined.

The mollusc investigation did not lead to similar results. Besides the reasons that were put forward previously our limited knowledge of Belgian mollusc faunas does not allow more precise conclusions. Indeed when out of a total amount of 113 marine species, 21 i. e. nearly 20 %, have never been recorded before, obviously further investigations are necessary to classify the problems left by this study.

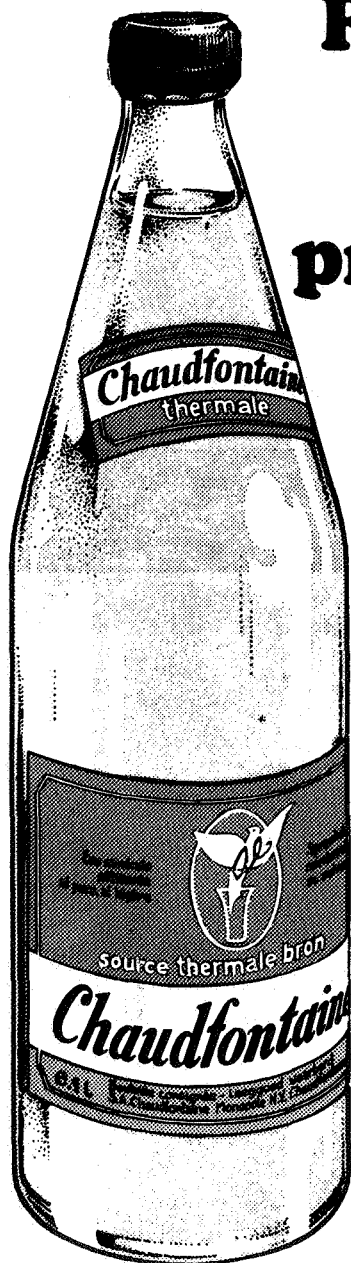
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