KONINKRIJK BELGIË

MINISTERIE VAN ECONOMISCHE ZAKEN

**Mijnwezen - Aardkundige Dienst van België**

**13, Jennerstraat - 1040 Brussel**



# A new approach to the evolution of the So-Called SURFACE PEAT in the WESTERN COASTAL PLAIN of BELGIUM

by

C. BAETEMAN and C. VERBRUGGEN

in collaboration with

M. DAUCHOT-DEHON, J. HEYLEN and M. VAN STRYDONCK

Professional Paper 1979|11

No 167

BELGISCHE GEOLOGISCHE DIENST - PROFESSIONAL PAPER 1979/11 - N° 167

# A NEW APPROACH TO THE EVOLUTION OF THE SO-CALLED SURFACE PEAT IN THE WESTERN COASTAL PLAIN OF BELGIUM.

by C. BAETEMAN* and C. VERBRUGGEN**
in collaboration with
M. DAUCHOT-DEHON, J. HEYLEN and M. VAN STRYDONCK.***

*: Belgische Geologische Dienst, Brussel.

**: Rijksuniversiteit - Gent, Seminarie voor Regionale Aardrijkskunde, Krijgslaan 271, blok S8, 9000 Gent.

***: Koninklijk Instituut voor het Kunstpatrimonium, Jubbelpark 1, 1040 Brussel.

# A NEW APPROACH TO THE EVOLUTION OF THE SO-CALLED SURFACE PEAT IN THE WESTERN COASTAL PLAIN OF BELGIUM.


## Abstract

From two localities in the Western coastal plain of Belgium situated close to each other the most important peat sequence was palynologically investigated and dated by 14-C.
The paleobotanical results as well as the data concerning the different depositional sedimentary environments occurring in the period between about 5000 and 2000 y. B.P. were connected with the sea-level changes.
These paleoecological results were compared with the extensive botanical study by Stockmans & Vanhoorne which was established in the same area.

## Samenvatting

In de Westelijke kustvlakte van België werd van twee dicht bij elkaar gelegen plaatsen de belangrijkste veensequentie palynologisch onderzocht en met behulp van 14-C gedateerd.
De paleobotanische resultaten alsmede de gegevens betreffende de verschillende afzettingsmilieus die voorkomen in de periode tussen ongeveer 5000 en 2000 B.P. werden in verband gebracht met veranderingen van het zeeniveau.
Deze paleoecologische resultaten werden vergeleken met de omvangrijke botanische studie van Stockmans & Vanhoorne uitgevoerd in hetzelfde studiegebied.

## Résumé

Cet article présente une étude palynologique de la plus importante séquence de tourbe et les résultats obtenus par datations au 14-C. Les prélèvements proviennent de deux localités, proches l'une de l'autre, situées dans la partie ouest de la plaine côtière de Belgique.
Les résultats paléobotaniques tout comme les données relatives aux différents milieux de dépot sédimentaire durant la période comprise entre 5000 et 2000 B.P. sont correlés aux changements du niveau de la mer.
Les résultats paléoécologiques sont comparés avec l'étude botanique détaillée effectuée par Stockmans & Vanhoorne dans la même région.

## 1. Introduction

On the occasion of the systematical geological mapping on the marine Holocene sediments in the Western coastal plain of Belgium, special attention was drawn on the occurrence of the several peatlayers and more specific on the significance of the upper peatlayer (surface peat) with regard to Holocene sea-level changes.
Palynological investigations, completed by 14-C dates were made on the upper peatlayer to reconstruct the paleogeographical and -ecclogical evolution.

In the Belgian literature the Holocene stratigraphy always has been represented in a rather simplified way. Thanks to the soil mapping the coastal plain has been investigated in the years 1950 whereby tree main stratigraphical components were distinguished : the Calais deposits (a lower clastic layer), the surface peat (an intermediate peat layer) and the Dunkerque deposits (an upper clastic layer). This tripartition remained the classical picture in the Belgian stratigraphy for a very long time.

The Calais deposits always has been considered as one single sedimentation sequence deposited during one single transgression which was named the Flandrian transgression. The surface peat on the contrary was related to a regression dividing the Holocene sequence into the Flandrian transgression on the one hand and the Dunkerque transgressions on the other hand. Tavernier & Moormann in 1954 cited some thorough arguments to indicate the occurrence of a transgressive phase in this peat sequence. However this new idea never has been taken up or investigated again in other following publications, even not by the same authors.

The Dunkerque deposits representing more or less the upper two meters of the whole Holocene sequence were studied in a more detailed way on the occasion of the soil mapping. In 1948 Tavernier made a subdivision of 'de Assise van Duinkerke' in 3 phases which later on has been named 'Duinkerke transgressions'. These transgressions were distinguished on the base of lithological differentations and dated by means of archeological data from investigations made in Walcheren en Westland (the Netherlands) by Bennema in 1948. Ultimately in 1978 the archaeologist Thoen completed the geographical extension and dates of the several transgressions on the base of archeological evidence found in Belgium.

The first and very thorough paleobotanical study on the marine Holocene sediments was made by Stockmans & Vanhoorne (1954) whereby especially the upper peatlayer was investigated. Since that study, now more than 25 years ago, no thorough paleobotanical investigation on the Flemish coastal plain has ever been published again in Belgium.

## 2. Location (fig. 1)

Two localities situated 2,5 km from each other has been studied. These are : an undisturbed cored boring (Avekapelle B 363) situated just NE of the village of Avekapelle and an open section (Booitshoeke) excavated on the occasion of the highway construction (Brugge-Calais) in the area of Booitshoeke. The two localities are found in the area studied at the time by Stockmans & Vanhoorne (1954). They are situated half-way the outcropping Pleistocene area and the present-day shore.

## 3. Stratigraphy of the marine Holocene sediments.

The systematical geological mapping of the Western coastal plain by means of undisturbed cored borings till the base of the Holocene sediments yielded quite new ideas about the Holocene stratigraphy.

The Pleistocene surface is almost covered by the 'basic peat', consisting of a peatlayer, a sandy peat or just a soilhorizon developed in the Pleistocene sediments. Its thickness can vary from a few centimeters up to about 1,50 m in favourable places as in former gullies or in the vicinity of the outcropping Pleistocene area. The basic peat at Avekapelle occurring at -7 m was dated 7.155 ± 270 y. B.P. (mean date of Hv 8797 and Hv 8798).

The basic peat is covered by clastic sediments deposited in tidal flat environments in the areas in the vicinity of the sea and along the several tidal gullies entering the plain deeply. In more sheltered areas nearby the outcropping Pleistocene area lagoonal environments were dominant. According to the radiocarbon dates this period of uninterrupted clastic sedimentary sequences prevailed until about 6.300 y. B.P. and is named 'the under clastic sequence' according to the new stratigraphical system from Barckhausen, Preuss & Streif (1977).

From about 6.300 y. B.P. the plain was characterized by a quite different sedimentary environment. In the sediments this is shown by an alternation of peatlayers and lagoonal deposits. In general the upper peatlayer is the most important one in thickness and lateral extension.
It is almost occurring between -1 and +1 m.
Only in the very neighberhood of the sea and along the few tidal gullies tidal flat sediments are dominating and less peatlayers are occurring.
Concerning sea-level movements the several peatlayers are not necessarily to be considered as regressive phases in the meaning of a lowering of the sea-level. The lagoons were characterized by sedimentation and became more and more shallow while the marine influence on the plain decreased mainly due to the morphology of the plain and the coastline so that reed could start growing leading to peatformation. Indeed all the deeper peatlayers consist mainly of *Phragmites communis*. This sequence of clastic layers with intercalated peat-layers prevailed until about 3.000 y. B.P. and is called 'the splitting up sequence' (Barckausen *et al.*, 1977).

After 3.000 y. B.P. the plain was characterized by increasing wet conditions leading to lagoonal environments which later on was transformed into a dominating tidal flat environment. Thise tidal flat sediments reach a much greater lateral extension than all the older Holocene sediments and form the limit of the actual coastal plain.
They are called 'the upper clastic sequence' (Barckhausen *et al.*, 1977).

## 4. Palynological investigation. (fig. 2 and fig. 3)

In Avekapelle the upper peatlayer is occurring between 1,80 m and 0 m. (fig. 4). The base and top are respectively dated : 3.290 ± 80 (Hv 8793) and 4.800 ± 80 (Hv 8794). The peatlayer rests upon a thin layer of lagoonal sediments which cover tidal flat sediments.
The section in Booitshoeke shows a quite different picture (fig. 5).
The so-called surface peat is not longer represented by one continuous peat-layer. It is splitted up by a claylayer of about 70 cm which is wedging out to the east into a very thin layer. The base and top of the successive peatlayers were dated (IRPA) at two different places (see fig. 6).

According to the pollendiagrams, the sites of Booitshoeke and Avekapelle can be very well compared with each other. It is true that the diagram of Booitshoeke in its entirety shows somewhat wetter circumstances.

In both diagrams two main parts can clearly be distinguished.
These are : an eutrophic and an oligotrophic part. Moreover in each of those parts wetter and drier phases can be recognized.

Eutrophic part

Avekapelle : from spectrum No. 1 to 35 ; Booitshoeke : from spectrum No. 1 to 18.

Upon the whole the eutrophic part is characterized by fen-wood conditions. Typical are the very high values of the ferns of the *Dryopteris-type* and relative important percentage of *Salix* pollen at certain different levels. The representation of the Q.M.-components and *Corylus* are to be mentioned.

The occurrence of the *Salix* pollen at certain levels points to the fact that the water level of the swamp was not continuously at the same level, but probably subject to sea-level fluctuations. These alterations in local conditions were most probably due to changes occurring outside the peat area, as shifting of a tidal channel, displacement or rupture of the natural barriers. The higher values of *Chenopodiaceae*, compared to inland situations, make suppose that a great part of the pollen are coming from halophyte species. This implicates that marine conditions still exerted some influence when brackish conditions temporarily could predominate as e.g. in drier periods. As for the abundance of the ferns they are an indication that the ecological conditions in the coastal plain were different from those in the inland mires. The coastal plain was most probably characterized by the occurrence of more open patches favourable for their developmennt.

Some places of the coastal plain must have been suitable for the growth of the Q.M.-trees. Indeed it is stricking to find such relative high values of trees, namely *Quercus, Ulmus* and *Tilia*, as the distance from the investigated sites to the nearest outcropping Pleistocene area at that time is about 7,5 km. Comparing to inland diagrams (C. Verbruggen, 1971) from small depressions and abandonned riverbeds, it is known that there the *Quercus* values are somewhat higher but *Alnus* also is dominant.

As for the values of *Corylus* they are obviously higher in the inland which is in agreement with their preferred drier living-conditions. In the coastal plain on the other hand the *Ulmus* and especially the *Tilia* percentages are smaller. *Fraxinus* is much better represented, while the regular presence of the *Taxus* is also to be mentioned.

All these evidence point to the fact that during the fen-wood stage and even later, locally there were favourable conditions in the coastal plain for the growth of the Q.M.-trees, and especially the *Quercus*. These favourable conditions most probably were formed in better drained places free from any peat cover like the broad levees and borders formed by the former tidal channels.

As mentioned above the eutrophic part can be divided into 3 phases corresponding to wetter and drier conditions. However in Booitshoeke the drier phase (2$^{nd}$ phase) does not clearly find expression.

Phase 1. (Avekapelle : spectrum No. 1 to 14)
The base of the peatsequence in Avekapelle is characterized by a very quick disapperance of *Chenopodiaceae* while *Phragmites* and later on *Sparganium* and *Cyperaceae* become dominant. This implicates that the direct marine influence decreased very quickly so that the area could be transformed into a lagoonal environment. However this lagoonal environment evoluted very quickly into fen-wood conditions. The onset of this fen-wood stage is characterized by the ferns of the *Dryopteris-type* followed by *Alnus*.

Phase 2. (Avekapelle : spectrum No. 15 to 24).
The replacement of *Alnus* by *Betula* and some *Myrica*, a first apparition of *Ericaceae* and the presence of the ferns *Polypodium* and *Osmunda* indicate that this phase, compared to the first one, is characterized by drier conditions.

Phase 3. (Avekapelle : spectrum No. 25 to 35 ; Booitshoeke : spectrum No. 14 to 18).
In Booitshoeke phase 3 shows a totally different picture from the sequence in Avekapelle. It is represented by a claylayer which is characterized by a *Chenopodiaceae* peak and by a more regional pollenrain as *Pinus, Quercus* and *Corylus* gain importance at the expense of *Alnus*.

In Avekapelle there is no single evidence of an intercalation of clastic material in the peat. However there are, in the peat sequence itself, obvious elements of a wetter phase. This is characterized by the absolute dominance of *Alnus* and the occurrence at certain levels of peaks in the curves of the waterplants.

At the beginning of this wet phase *Salix* contributes to the expansion of the fen-wood vegetation.

Oligotrophic part

Avekapelle : from spectrum No 36 towards the top ; Booitshoeke : from spectrum No 19 towards the top.

In this oligotrophic part a fundamental and sudden change takes place in the peat growth evolution : *Betula* and *Myrica* replace *Alnus*, while *Osmunda* becomes the most important fern. To the top *Ericaceae* and *Sphagnum* reach high values.

Phase 4. (Avekapelle : spectrum No 36 to 49)
This phase of the pollendiagram can be compared with the first dry period (phase 2) in the peat sequence (spectrum No 15), but this dry period shows a much greater intensity in dryness.
In Avekapelle *Betula* and *Myrica* accompanied by ferns show a nearly absolute dominance in the vegetation. However the edaphic drought was so important that it hampered the normal peat growth. Indeed this part of the peat is represented as a black earth-like sedentate which grew up very slowly.
This phase is even more pronounced in Booitshoeke than in Avekapelle. The transformation into such an oxidised black layer implicates a standstill in sedentation most probably due to a lowering of the groundwater-level and consequently a considerable diminishing of the influence of the drainage gullies.

Phase 5. (Avekapelle : from spectrum No 50 towards the top)
In Avekapelle phase 5 is characterized by again wetter conditions which is typically anounced by the presence of *Menyanthes* between spectrum No 46 and 49. From spectrum No 50 towards the top a raised bog stage with *Calluna* and *Sphagnum* is dominating. Thanks to those wetter conditions the peat growth has resumed its normal rate. The question whether or not this last phase of the peat growth was the onset to a real raised bog will be discussed later.

The end of the peat growth.

The top of the peat sequence shows a very abrupt end as well on a botanical as on a genetical point of view. In the peat sequence itself there is no single evidence of a normal gradual transition to marine conditions.

It appeared from the systematical geological mapping that the peat is almost covered by an organic clay layer of about 20 cm thick.
This claylayer was investigated in detail on the occasion of an archaeological excavation from the '*Vereniging voor Oudheidkundig Bodemonderzoek in West-Vlaanderen*' in Leffinge under the direction of H. Thoen.

This claylayer was also recognized by Stockmans & Vanhoorne who described it as 'tourbe argileuse'. Their analyses of the clay on the basis of macrorests and fruits and seeds revealed that the vegetation growing on that sediment consisted on the one hand of wet elements of the previous bog : *Erica, Andromeda, Juncus* spec., to which on the other hand mesotrophic and less exigent elements of a fen were added : *Menyanthes, Hydrocotyle, Sparganium, Carex* spec., *Rumex* spec., *Caryophyllaceae* spec., *Lychnis flos cuculi, Ranunculus* spec. . However the most stricking fact in the pollendiagram of Leffinge as well as in the data of Stockmans & Vanhoorne is the sudden stop of the *Sphagnum* vegetation, the expansion of *Pinus* and again the increase of *Alnus* and *Corylus*. It looks like that the vegetation could maintain, but that the real peat growth was stopped.

The area at that moment is to be considered as a very shallow lagoon in which very slow clay sedimentation took place.

Both the land drainage and the sea contributed to this sedimentation. The land drainage is reflected in the slight increase of nutrients and the steep rise of *Fagus* pollen (diagram 189 of Stockmans & Vanhoorne) which were brought down by landwater discharge (according to Cleveringa, oral communication).
The marine influence is clearly shown by the presence of *Suaeda maritima* (point 189 of Stockmans & Vanhoorne). Both influences are expressed separately and on different places, depending however without any doubt, upon local conditions and situations. For instance *Chenopodiaceae* pollen are lacking at the site of Leffinge, a place very near the outcropping Pleistocene area.

The shallow lagoon, covering the peat, most probably came into existence due to a rise of the groundwater-level influenced by landwater discharge and a positive sea-level movement.
A much too high groundwater-level, the supply of minerogenic material as well as a slight influence of eutrophic and or brackish water must have caused the death of the moss vegetation. Anyhow all these influences hampered the vegetation in such a degree that the real peat accumulation was stopped and replaced by a strong organic clay formation.

## 5. The problem of the raised bog.

Stockmans & Vanhoorne (1954) provided the basic data to premise the occurrence of extensive raised bogs over considerable areas in the coastal plain thanks to their discovering of well developed *Sphagnum* peat in the upper part of the peatlayer. Since then the idea of raised bogs was generally accepted in all the publications concerning Holocene deposits of the Belgian coastal plain. The concept of the raised bog has been wrongly interpreted from a topographical point of view. It was put forward that at certain places the peat grew up as high domed raised bogs and this aspect was often used to explain indistinct morphological phenomena. Moormann & Ameryckx (1950) pretended that in the area of the Moeren the peat grew up so high that it never has been flooded by later transgressions.

This general idea of a 'high domed raised bog' remains still in vogue in the Belgian literature. Even recently Ameryckx (1978) pretends that the thickness of the peat reached at least 4 meters and he supposes that a considerable greater thickness can be premised. The author even makes an estimation that in De Moeren 150 $m^3$ peat was excavated.

In the framework of a stratigraphical study in the Eastern coastal plain, De Grootte (1969) made a pollen analysis of the 'surface peat' and came to the result that raised bog peat was occurring. Consequently the author concluded that the raised bog formation was not restricted to the area Pervijze-Nieuwpoort (area studied by Stockmans & Vanhoorne) but more extending to the North.

A close comparison of the results of this new palynological investigation and those of the study by Stockmans & Vanhoorne* revealed that high domed raised bog complexes never came into existence in the Belgian coastel plain. The oligotrophic character, as pointed out in the phase 5, will be discussed by no means. More problematic are the topographical and geomorphological interpretations.

The very raised bog part is restricted to the upper 30 cm of the peat sequence in Avekapelle and only to the last 10 cm in Booitshoeke. As the organic clay layer is lacking in both the sites erosion at the top may be supposed. The abrupt end of the botanical evolution support that supposition.

Concerning the ecological subdivision of the peat, it can be deduced that Stockmans & Vanhoorne put the beginning of the raised bog at the point where in this study the boundary between the eutrophic and the oligotrophic part was made. In their study the authors indicate the beginning of the raised bog in their description of the botanical evolution of the peat, added to every boring, and in the stratigraphical scale of the pollendiagrams of the same borings. Moreover a closer examination of their pollendiagrams and their elaborate tables of macrorests and fruits and seeds yielded as result that also their pollendiagrams can be subdivised into phase 4 and phase 5 as it was proposed in this study. Indeed it is very clear, specifically in the tables of points 189 and 198, that the beginning of the raised bog part is put at the level where *Eriophorum* appears. However it is only much closer to the top of the peat that *Sphagnum* species and *Calluna* are found abundantly. The *Eriophorum* apparition represents the beginning of phase 4, while the *Sphagnum-Calluna* level coincides with the start of phase 5.

The interpretation of the pollendiagrams of Stockmans & Vanhoorne initially poses a problem as 30 years ago only the arboreal pollen was taken into account. Fortunately the authors made an exception for point 198 of which a complete table of the pollenspectra is given. In there it was a pretty surprise to encounter such a high numbers of *Myrica* pollen in the part of the sequence which can be compared to phase 4. It is our belief that also the pollendiagrams of points 40 and 99 b show the same conformity.

---

* : The pollendiagrams, descriptions and tables of the most representative points from the study by Stockmans & Vanhoorne are reproduced in fig. 7, fig. 8, fig. 9, fig. 10, fig. 11a and fig. 11b.

Most probably it can be assumed that the abnormal high percentages for *Corylus* -over 100% in the diagrams 40 and 99b- are due to determination confusion between *Myrica* and *Corylus*. There is a striking difference between on the one hand the very low *Corylus* percentages of diagram 198, where *Myrica* is recognized and on the other hand the very high percentages of *Corylus* in the other diagrams, where *Myrica* is completely absent. Moreover from an ecological view-point the important presence of *Corylus* on the oligotrophic peat also seems very improbable.

The ecological subdivision of the peat sequence proposed in this study is indeed fully confirmated by the elaborate botanical data of Stockmans & Vanhoorne. It looks apparent that the raised bog vegetation came into development only in the latest phase of the peat growth which implicates that it only had short time to develop.
Indeed the mean thickness of the peatsequence, which is supposed to be complete when the overlaying clay layer is present, amouts to 2 meter.
This thickness is found both in the borings of Stockmans & Vanhoorne and in the site of Avekapelle.

Taking into account a lifetime of about 2000 years, 2 m of peat may be considered as a 'normal' growth. This implicates to some extent that strong compaction of this surface peat did not take place. Indeed until nowadays the peat always remained beneath the groundwater level. To avoid any confusion it should be stressed that there exist a very big difference in consequences when real high domed raised bogs are drained. It is known that in such cases strong compaction occurs. In this respect it is very interesting to remark that in at least 50% of the borings where Stockmans & Vanhoorne found peat layers of more than 2,50 m thick (until 3,40 m), the authors describe the sequence over its whole length as fen peat. Consequently one should expect a raised bog development for peat sequences with a considerable thickness.

It must be pointed out that the situation in the Belgian coastal plain was completely different. Indeed no high domed raised bogs occurred ; the peat surface was flat and never rose more than a few decimeter above the groundwater-level.

Within a broader geographical context the hypothesis was put forward (C. Verbruggen, 1979) that in the postatlantic time Flanders was generally just outside the great North and North-West European raised bog area.
Small decrease of evapotranspiration at some periods can have moved the boundary of this area to the South-West.

## 6. Chronology of the peat sequence

The peat sequence was dated by 14-C. The general principles of radiocarbon dating have been described by Libby (1955) : Radiocarbon is produced by the cosmic rays in the upper atmosphere. It then becomes uniformly distributed throughout the atmosphere, the biosphere (i.e animal and plant life) and the oceans (fig. 14) (Tite, 1972). Radioactive carbon is assimiled only by living beings. At their death the assimilation process stops, 14-C lost by radioactive decay is not replaced and therefore its concentration slowly decreases. If we measure this impoverishment, the time interval since their death can be calculated.

The dating method used in different laboratories contains three parts : pretreatment, combustion and counting. Pretreatment removes any extraneous contamination by 'modern' or 'old' carbon, by treatment with hydro-chloric acid for the calcium carbonates, and with sodium hydroxide for the humic acids. Combustion converts samples into a gas form, carbon dioxide, by burning or other means. In our laboratory, carbon dioxide is transformed into methane by hydrogenation.
Counting consists in introducing the purified methane into a proportional counter (Houtermans & Oeschger, 1955 & 1958) and to count it. The net activity of the sample (gross counts per minute minus background counts per minute) is then compared with the activity of a modern standard prepared by National Bureau of Standards to stimulate the atmosphere 14-C activity of the year 1950. An age determination is computed together with a statistical limit of accuracy. The procedure for calculating is according to the equation :

$$A = A_0 e^{-\lambda t} \quad (1)$$

$A$ = the activity of the sample when measured

$A_0$ = the original activity of the sample (as reflected by a modern standard)

$\lambda$ = decay constant = 0,693/T1/2 with T1/2 the half-life
T1/2 = 5570 ± 30 years (Radiocarbon, vol. 10, 1968)

Then we can write the equation (1) for a routine calculation

$$t = \frac{5570}{0,693} \ln \frac{Ao}{A} \quad (2)$$

The peat sequence was sampled at both localities Booitshoeke and Avekapelle. The results are brought together in fig. 12. All the ages are in 14-C years B.P., not calibrated.

At the site of Booitshoeke the peatsequence was dated on the one hand at the place where the intercalated claylayer reaches its maximum thickness (Booitshoeke-Vaart) and on the other hand where it is wedging out into the peat (Booitshoeke-Zeedijk). As well the base as the top of the two successive peatlayers were dated.

In the same way the base and top of the peatlayer of the site of Avekapelle were dated as well as the peat at the characteristic pollen spectrum numbers 25 to 28 and 32 to 35 which show respectively the beginning and the end of the wet phase, palynologically corresponding to the intercalated clay layer in Booitshoeke (fig. 12).

Tabel

| No IRPA | Samples | Radiocarbon dates |
|---|---|---|
| 285 | Booitshoeke Zeedijk, top peat sequence | 2080 ± 135 |
| 286 | Booitshoeke Zeedijk, beginning peat growth | 3735 ± 135 |
| 287 | Booitshoeke Zeedijk, end peat growth | 3965 ± 190 |
| 288 | Booitshoeke Zeedijk, base peat sequence | 4770 ± 215 |
| 289 | Booitshoeke Vaart, top peat sequence | 3250 ± 150 |
| 290 | Booitshoeke Vaart, beginning peat growth | 4025 ± 395 |
| 291 | Booitshoeke Vaart, end peat growth | 4260 ± 210 |
| 292 | Booitshoeke Vaart, base peat sequence | 4295 ± 195 |
| 334 | Avekapelle, peat between pollen spectrum nos. 32-35 | 3450 ± 180 |
| 335 | Avekapelle, peat between pollen spectrum nos. 25-28 | 4240 ± 190 |
| 336 | Avekapelle, peat between pollen spectrum nos. 60-58 ; almost top peat sequence | 3335 ± 170 |

The age of the base of the peat in Avekapelle and Booitshoeke-Zeedijk is situated at about 4800 B.P. The age of Booitshoeke-Vaart, 4295 ± 195 BP is deviating from that result. It can be supposed that in this case the 14-C result is too young as the top of this peatlayer is dated 4260 B.P., which date agrees with the corresponding level in Avekapelle. The wrong date most probably comes from the presence of rootlets in the peat, which are a source of modern carbon.

Yet other age determinations of the base of the same peatlayer at about the same level, but situated somewhat closer to the outcropping Pleistocene area, are more correspondingly as in :

- Leffinge (archaeological excavation) : 4465 ± 220 (IRPA-282)
- Lampernisse (boring) : 4640 ± 65 (ANTW 249)
- Leffinge (high way excavation) : 4630 ± 140 (ANTW-102)
- Leffinge (big oak trunk under base of the peat) : 5190 ± 140 (ANTW-105)

From these results it can be concluded that the peat growing started at 4500-4800 B.P.

The age of the first end of the peat growth in Booitshoeke and the beginning of the wetter conditions in Avekapelle varying from 3965 until 4260 B.P. are in rather good agreement for the 3 sites. However the results of the ages of the second start of the peatgrowth and the end of the wet conditions (Avekapelle) show smaller correspondence. Avekapelle is 300 years younger than Booitshoeke-Zeedijk which in its turn is about 300 years younger than Booitshoeke-Vaart. At Booitshoeke an age deviation of 300 years is very improbable for two sites which are only 700 m separated from each other. However it should be mentioned that the result of Booitshoeke-Vaart has a rather great standard deviation of 395. This great standard deviation comes from the dilution of the sample (the amount of sample was not sufficient to fill the counter and an important quantity of anthracite has been added).

The age of the top of the peatsequence is nearly identical in Avekapelle (3290 ± 80)* and in Booitshoeke-Vaart (3250 ± 150).

---

*: This age was determined in Hannover. But as the pollenspectrum numbers were dated by IRPA, the top has been dated again (3335 ± 170, IRPA-336) for reason of comparison between the results. Both determinations yielded identical results.

On the other hand there is a big difference with the result of Booitshoeke-Zeedijk (2080 ± 135).

The comparison with a series of 14-C dates from the top of the peat shows a striking similarity with the age in Avekapelle and Booitshoeke-Vaart :

- IRPA-337 : 3340 ± 185 y. B.P. (Leffinge)
- IRPA-338 : 3225 ± 160 y. B.P. (Leffinge)
- IRPA-283 : 3140 ± 165 y. B.P. (Leffinge)
- Hv-8800 : 2960 ± 50 y. B.P. (Leffinge)
- ANTW-163 : 3550 ± 36 y. B.P. (pine stump in upper part of peat layer, Lampernisse).

On the other hand the result of Booitshoeke-Zeedijk (2080 ± 135) also shows similarity with an other series of 14-C dates from the top of the peat :

Lampernisse (boring) : ANTW-248 : 2040 ± 60
Lampernisse : ANTW-191 : 2340 ± 54

From this preliminary investigation it can be concluded that after a general stop of the peat growth about 3.200 B.P. locally there was a resume until 2.000 B.P.

Vanhoorne (Vanhoorne & Van Strydonck, 1977) also seemed to be confronted with those 2 series of 14-C dates. He dated wood from the upper part of the peat from point 189 from the former study by Stockmans & Vanhoorne (1954) : ANTW-191 : 2340 ± 54 and ANTW-163 (which is a mean value of 4 age determinations from the same pine stump) : 3.550 ± 36, whereby the author remarks that this date seems to be 1.000 years too old.

The occurrence of an alteration of dryer and wetter phases in the peat sequence brought forward the attempt to make a comparison with the existing chronological subdivisions of the Holocene and more specific with the transgressive regressive time intervals elaborated by respectively Roeleveld (1974) for Groningen and Griede (1978) for Friesland (fig. 13).
It must be noticed that the elaborate time scales of both authors are made on base of frequency histograms of a great numbers of 14-C dates while in this study only a limited number of 14-C dates are available. But some similarities are worthwile to mention. As the age of the base of the peat is situated at 4500-4800 B.P. it can be accepted that the peat growth started at the end of the C III transgressive interval.

The more pronounced wet phase (phase 3), represented by the clay intercalation in Booitshoeke, seems to correspond with the C IV-B transgressive interval. As the first dry period in the peatsequence (phase 2) is not dated, it is not clear whether it can be compared to the H III or to the H IV-A regressive interval. The most pronounced dry period (phase 4) may correspond with the H IV-B regressive interval.
The general end of the peatgrowth, situated at 3.000 - 3.300 B.P., seems to be caused by the DO transgressive interval ; quite older than the D II (1650 B.P.), date which still is maintained in the Belgian literature.

## 7. Conclusions.

This new investigation of the so-called surface peat yielded quite new results.

Both sites, Avekapelle and Booitshoeke reflect almost a complete peat evolution of the so-called surface peat.

The peat growing never evolved to a high domed raised bog.
As the groundwater was always close to the surface the peat sequence can not be considered as a regression (in the meaning of a sea-level drop).
On the contrary the continuous accumulation of about 2 m of peat during a period of 1800 years implicates that the groundwater-level was rising too under the influence of a rising sea-level, it is true with some fluctuations.
The peat was able to develop during about the 2000 years most probably thanks to a coastal barrier system protecting the plain from the open sea. It is likely that the coastal barrier system was not always closed and protecting as much during the whole period of peat growth.

The presence of the clay intercalation even shows evidence of direct marine influence and is to be considered as a transgressive phase in the peat sequence. However this very well pronounced marine influence is occurring very locally. But in the continuous peat sequence itself different phases showing alternating dryer and wetter conditions were found.

The start of the peat growth itself also happened under increasingly wet conditions during a transgressive interval. Moreover the great lateral extension of this peatlayer as it expanded over the neighbouring lowlying Pleistocene sand is an indication of the transgressive tendency.

This study also revealed new results concerning 14-C dates for the end of the peat growth and the genetic circumstances responsable for it. The top of the peat is covered almost everywhere in the plain by an organic mud.
At these places the peat never has been flooded directly by the sea and is not covered directly by the clay and sand deposits of the so-called Dunkerque II transgression as it is still believed in the Belgian literature.

In fact a strong and quick rise of the groundwater-level under predominantly oligotrophic conditions is responsable for the end of the peat growth.
By that the landscape was transformed into a shallow lagoonal environment and only later on it developed into a tidal flat environment.

However the most important results concerning the end of the peat growth are the 14-C dates. Till now it was accepted that all over the plain the peat was 'inundated' by the Dunkerque II transgression dated 4th. century A.D. (1650 y. B.P. until 1550 y. B.P.). However several 14-C dates established on behalf of this study revealed that the peat growth was stopped at 3000-3300 y. B.P., a period corresponding with the D 0 transgression, somewhat 1000 years earlier.

The investigations of the peat sequence gave a rather clear reflection of the paleoecology of the period between 5000 and 3000 B.P. . Until now however, it was not possible to show an even clear picture for the period between 3000 and 2000 B.P.

Acknowledgement.

The authors are much obliged to Drs. P. CLEVERINGA (Instituut voor Aardwetenschappen, V.U. Amsterdam). The chronostratigraphical and ecological interpretation of the peat sequence are mainly based on discussions with him.

The authors also wish to express their thanks to Dr. M.A. GEYH (Niedersächsisches Landesamt für Bodenforschung, Hannover) for kindly providing the radiocarbon data of the Avekapelle boring, and to Dr. H. THOEN (Universiteit Gent) for the admission using the radiocarbon data from the archaeological excavation in Leffinge.

The Geological Survey of the Netherlands kindly offered the Avekapelle cored boring. We are very grateful for that helpful contribution.

References

AMERYCKX, J. (1978) - De Moeren : historisch - geografische schets. - Het Ingenieursblad, 47, 9, 221-222.

BAETEMAN, C. (1978) - New evidence on the marine Holocene in the Western Belgian coastal plain. - Bull. Belg. Ver. Geologie, 87, 1, 49-54.

BARCKAUSEN, J., PREUSS, H. & STREIF, H. (1977) - Ein lithologisches Ordnungsprinzip für das Küstenholozän und seine Darstellung in Form von Profiltypen. - Geol. Jb., A44, 45-74.

BENNEMA, J. (1948) - De bodemkartering op Walcheren. - Boor en Spade, 2, 43-46.

BRUNEEL, D. (1979) - Bijdrage tot de kennis van de historische geografie van de Moeren. - Licentiaatsthesis, Gent, 159 p.

DE GROOTTE, V. & MOORKENS, Th. (1969) - Mikroskopisch onderzoek (Palynologie & Foraminiferen) van een kwartair monster van Uitkerke. - Nat. wet. Tijdschr., 51, 3-8, 94-110.

GRIEDE, J. (1978) - Het ontstaan van Frieslands Noordhoek. - Proefschrift, Amsterdam, 186 p.

HOUTERMANS, F. & OESCHGER, H. (1955) - Helvetica Physica Acta, 28, 464.

HOUTERMANS, f. & OESCHGER, H. (1958) - Helvetica Physica Acta, 31, 117.

KRA, R.S. (ed.) (1968) - Editorial Statement. - Radiocarbon, 10, 1.

LIBBY, W.F. (1955) - Radiocarbon dating. - The University of Chicago Press, 175 p.

MOORMANN, F. & AMERYCKX, J. (1950) - De bodemgesteldheid van de zeepolders. - Verslag I.W.O.N.L., 4, 37-60.

OVERBECK, F. (1975) - Botanisch-geologische Moorkunde. - Neumunster, 719 p.

ROELEVELD, W. (1974) - The Groningen Coastal Area : A study in Holocene geology and low-land physical geography. - Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek, 20-21, 7-25 & 24, 7-132.

STOCKMANS, F. & VANHOORNE, R. (1954) - Etude botanique du gisement de tourbe de la région de Pervijze (Plaine maritime belge). - Kon. Belg. Inst. Natuurwetensch., Verhandeling nr. 130, 144 p.

TAVERNIER, R. (1948) - De jongste geologische geschiedenis der Vlaamse Kustvlakte. - Handelingen der Maatschappij voor Geschiedenis en Oudheidkunde te Gent, Nieuwe reeks, 3, 2, 107-115.

TAVERNIER, R. & MOORMANN, F. (1954) - Les changements du niveau de la mer dans la plaine maritime Flamande pendant l'Holocène. - Geologie en Mijnbouw (NW. SER.), 16, 201-206.

THOEN, H. (1978) - De Belgische kustvlakte in de Romeinse tijd. - Verh. Kon. Acad., 40, 88, 255 p.

TITE, M.S. (1972) - Methods of Physical Examination in Archaeology. - Seminar Press London and New-York, 389 p.

VANHOORNE, R. & VAN DONGEN, W. (1976) - Antwerp University radiocarbon dates I. - Radiocarbon, 18, 2, 151-160.

VANHOORNE, R. & VAN STRYDONCK, M. (1977) - Antwerp University radiocarbon dates II. - Radiocarbon, 19, 3, 383-388.

VANHOORNE, R. & VAN STRYDONCK, M. & DUBOIS, A. (1978) - Antwerp University Radiocarbon dates III. - Radiocarbon, 20, 2, 192-199.

VERBRUGGEN, C. (1971) - Postglaciale landschapsgeschiedenis van Zandig Vlaanderen. - Doctoraatsproefschrift, Gent, 440 p.

VERBRUGGEN, C. (1979) - Deux cas de differences eco- climatiques entre la Flandre et ses régions voisines, septentrionale et occidentale, au Postglaciaire. - Volume des communications, IV Symposium de l'A.P.L.F., Paris (in print).

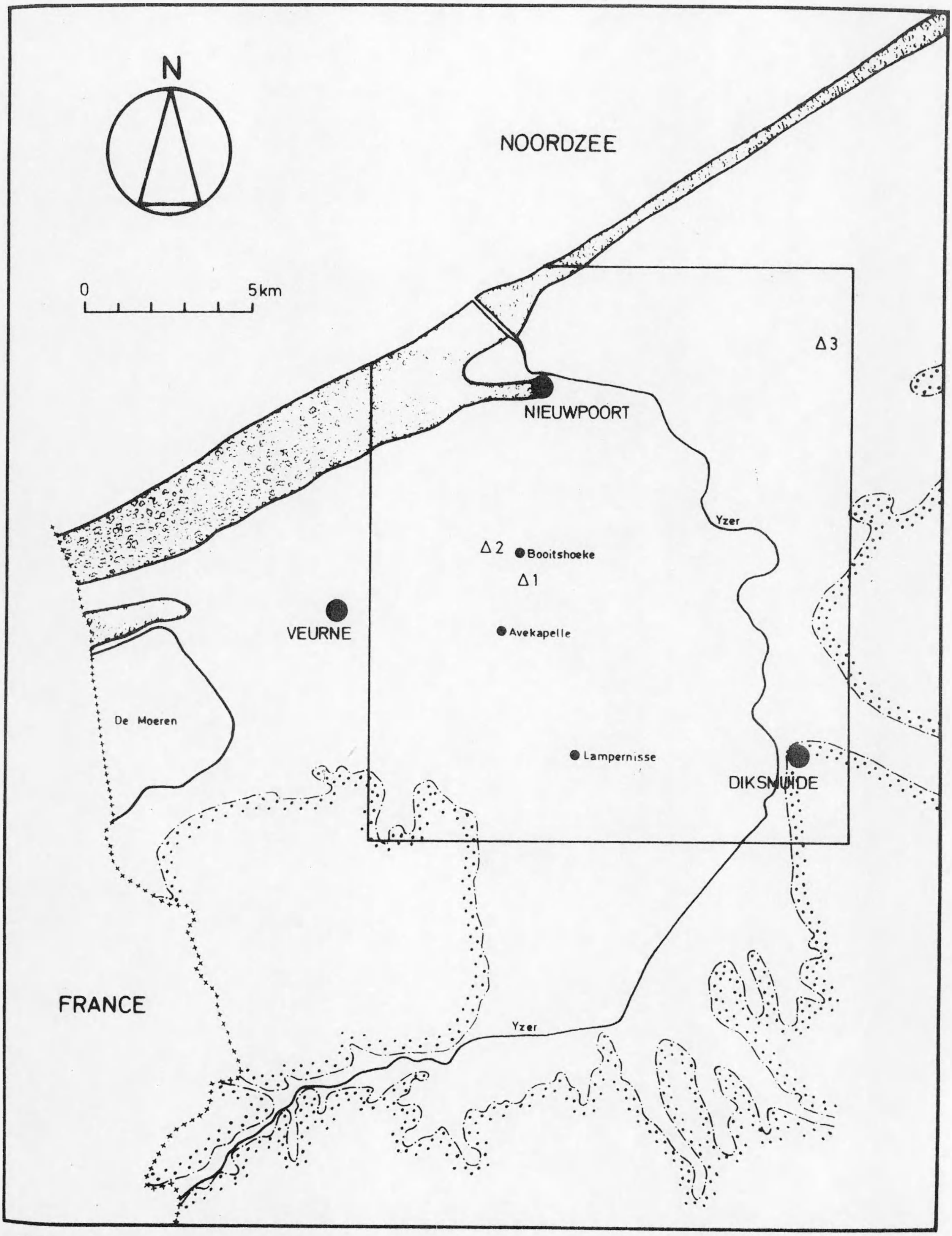



FIG. 1. Location map

PP 1979/11 No 167

Dunes

Outcropping Pleistocene area

area studied by Stockmans ∝ Vanhoorne

Δ 1 boring Avekapelle

Δ 2 Outcrop Booitshoeke

Δ 3 archeological excavation Leffinge

# AVEKAPELLE 363

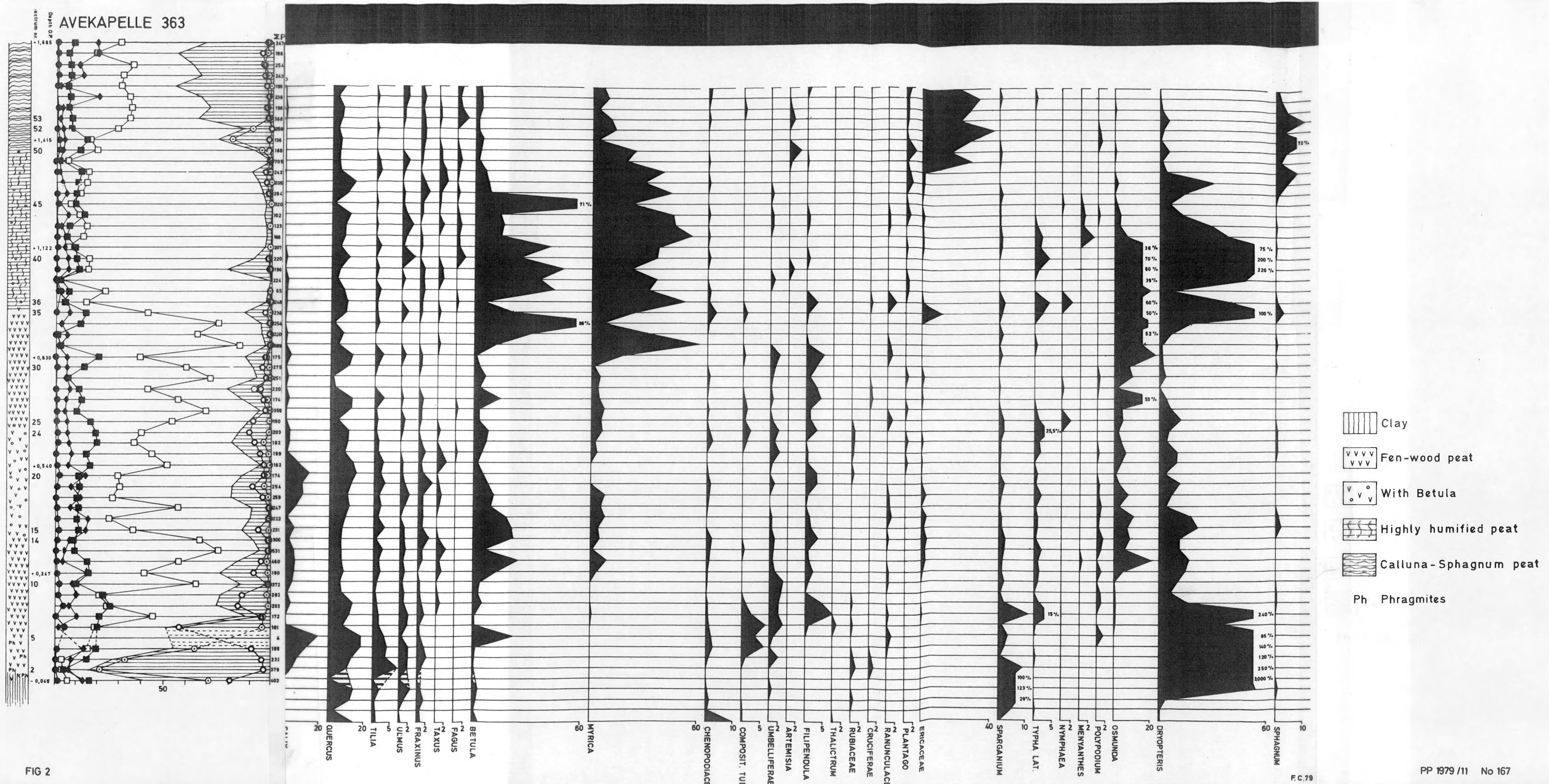
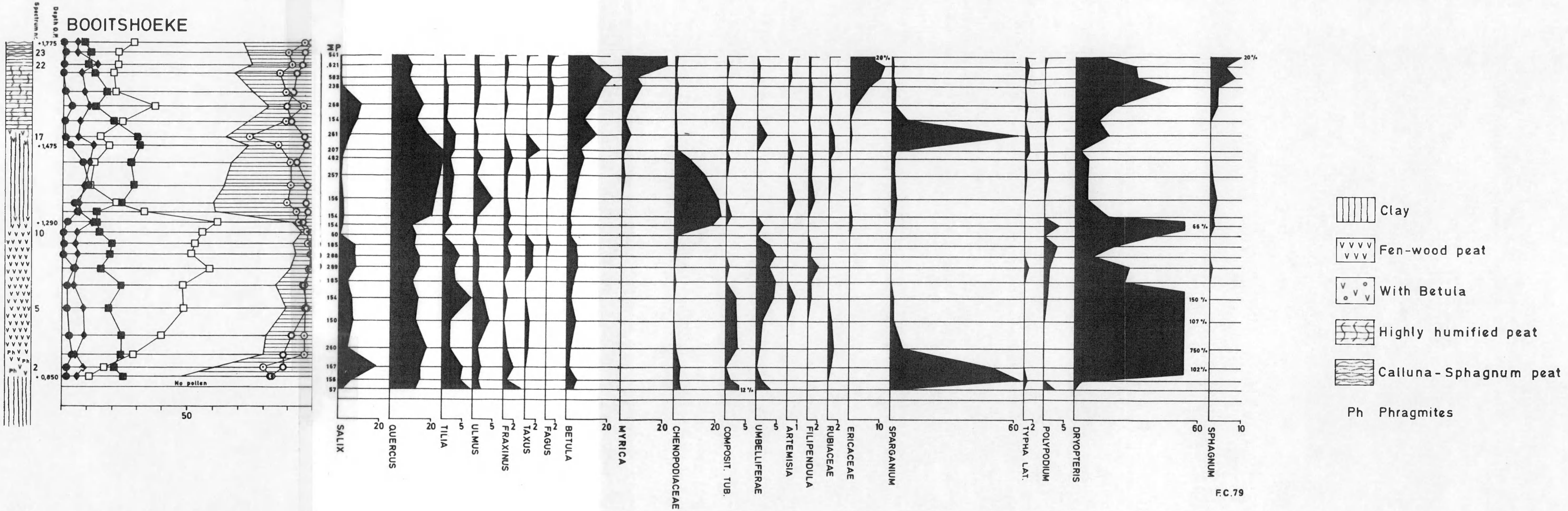



FIG 2



BOOITSHOEKE
Spectrum nr.
Depth O.P.
No pollen
50
ΣP
SALIX
QUERCUS
TILIA
ULMUS
FRAXINUS
TAXUS
FAGUS
BETULA
MYRICA
CHENOPODIACEAE
COMPOSIT. TUB.
UMBELLIFERAE
ARTEMISIA
FILIPENDULA
RUBIACEAE
ERICACEAE
SPARGANIUM
TYPHA LAT.
POLYPODIUM
DRYOPTERIS
SPHAGNUM
F.C.79
Clay
Fen-wood peat
With Betula
Highly humified peat
Calluna-Sphagnum peat
Ph Phragmites


FIG 3

PP 1979

# BORING AVEKAPELLE

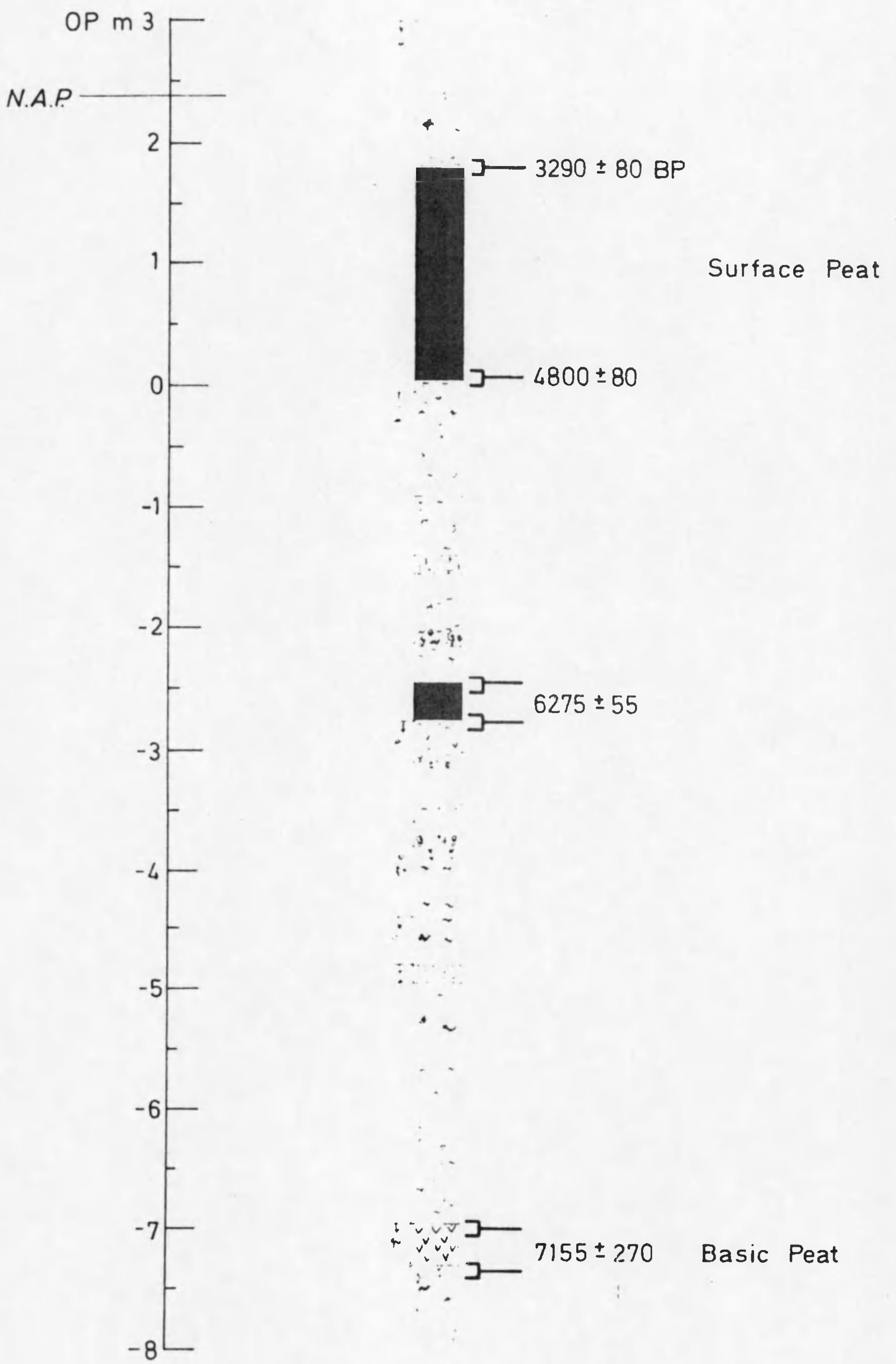


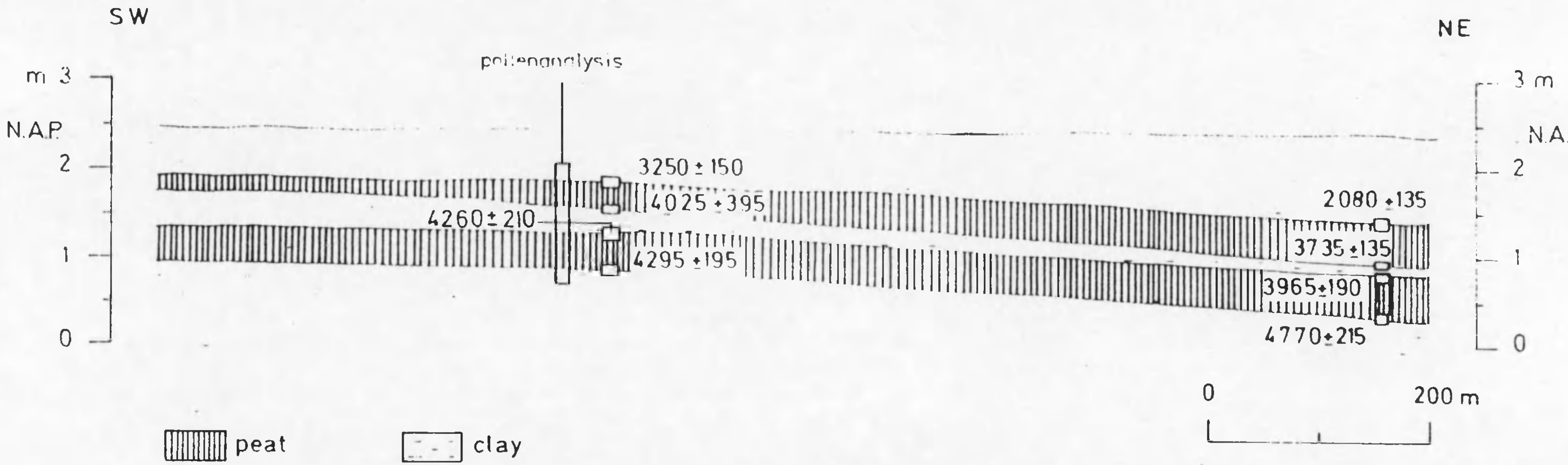

fig. 4

General view of the outcrop

Intercalated claylayer in the peat sequence

Fig. 5 PEAT SEQUENCE AT BOOITSHOEKE.

# BOOITSHOEKE




Schematic cross-section of the peat sequence
(age in 14-C y.B.P.)

fig. 6

Pollendiagram and description of point 40.

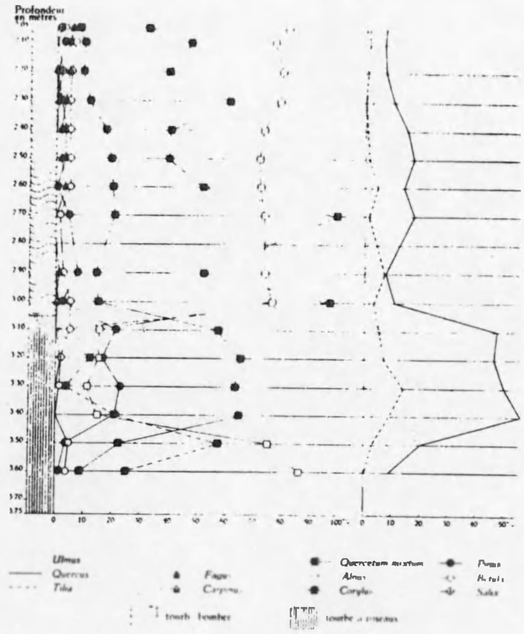



Fig. [illegible]. — Diagramme pollinique établi pour la tourbe observée au point 40 (Ramskapelle).

**Point 40.** — Prairie à Ramskapelle (1950). Pl. Nieuwpoort au 20.000e; angle inférieur gauche, 179 mm E, 86 mm N.

Coupe.

| | Profondeur en mètres | Épaisseur en mètres |
|---|---|---|
| Argile couleur mastic | de 0 à 1,15 | 1,15 |
| Sable gris jaune avec inclusions tourbeuses à 1,50 m | de 1,15 à 1,85 | 0,70 |
| Argile grise | de 1,85 à 2,05 | 0,20 |
| Tourbe | de 2,05 à 3,75 | 1,70 |
| Boue tourbeuse | de 3,75 à 3,85 | 0,10 |
| Argile sableuse bleue avec roseaux. | | |

Eléments observés dans la tourbe.

Entre 2,05 m et 2,55 m : tourbe grumeleuse. *Sphagnum* sp., *Aulacomnium palustre* abondant, *Dicranum Bonjeani*, brindilles d'Ericacées.

Entre 2,55 m et 3,05 : *Eriophorum vaginatum* abondant, *Sphagnum acutifolium* (*sensu lato*), brindilles d'Ericacées. Reconnu à 3 m des pollens de *Pinus*, *Corylus*, *Betula*, *Alnus*, *Quercus*, *Ulmus*, *Tilia cordata*, de Graminacées, d'Ericacées et des spores de *Sphagnum* et de *Lastrea Thelypteris*.

Entre 3,05 m et 3,75 m : tourbe à roseaux, dans le bas très humifiée, lisse. Des fibres diverses avec verrues. Reconnu à 3,20 m : des pollens de *Pinus*, *Salix*, *Corylus*, *Betula*, *Quercus*, *Ulmus*, *Tilia cordata*, *Lysimachia*, *Myriophyllum*, *Menyanthes*, de Graminacées et de Chénopodiacées. En outre, des spores de *Lastrea Thelypteris* et de mousses.

Sous 3,75 m : substrat boueux.

Evolution de la tourbière. — Roselière. — Tourbière bombée.

Remarque. — Ce sondage a été exécuté là où M. Mourlon en indique un sur la Carte géologique au 40.000e publiée en 1896. Cet auteur donne pour ledit point :

| | | |
|---|---|---|
| Argile des polders inférieure (*alp1*) | 1,00 m, soit de 0 m à 1,00 m. |
| Argile sableuse grise passant au sable dit sable mou supérieur (*alr2*) | 0,80 m, soit de 1,00 m à 1,80 m. |
| Tourbe | 1,40 m, soit de 1,80 m à 3,20 m. |

From: Stockmans & Vanhoorne (1954)

Fig. 7

Pollendiagram and description of point 99 b.

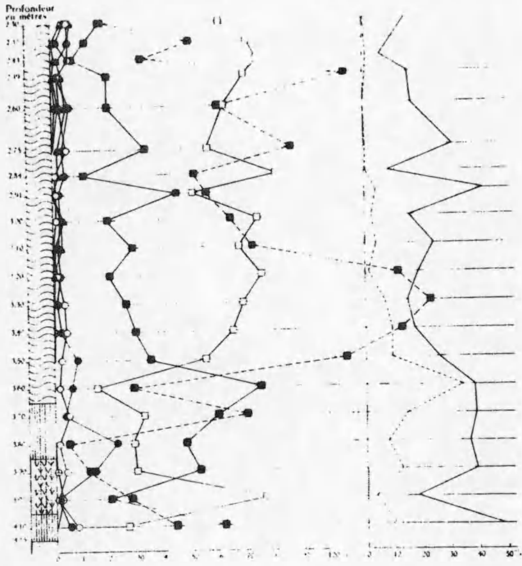



FIG. [illegible]

Diagramme pollinique établi pour la tourbe observée au point 99b (Stuivekenskerke).
Pour la légende, voir figure 7.

**Sondage b** (appareil de Dachnowski).

| | Profondeur en mètres | Épaisseur en mètres |
|---|---|---|
| Coupe. | | — |
| Argile couleur gris mastic. | | |
| Tourbe | de 2,30 à 4,20 | 1,90 |
| Argile gris-bleu avec roseaux. | | |

Éléments observés dans la tourbe.

Entre 2,30 m et 3,05 m : tourbe à *Sphagnum*. Reconnu vers le haut quelques débris d'Éricacées, puis successivement dominants : *Sphagnum imbricatum*, *Sphagnum cuspidatum*, *Sphagnum imbricatum*, *Sphagnum cuspidatum*, jusqu'à 2,70 m. Ensuite *Sphagnum acutifolium* (*sensu lato*), *Eriophorum vaginatum*, *Polytrichum strictum* avec nombreux restes d'Éricacées. De 2,37 m à 3,05 m : *Eriophorum vaginatum*, Éricacées, *Entodon Schreberi* (?), *Aulacomnium palustre*, *Polytrichum strictum*.

Entre 2,05 m et 3,85 m : tourbe grumeleuse avec nombreux roseaux, des fougères, des racines de *Carex* sp., des feuilles de *Calliergon* sp. cf. *C. giganteum*.

Entre 3,85 m et 4,10 m : tourbe grumeleuse avec feuilles de Dicotylédonées, brindilles et tiges de fougères.

Entre 4,10 m et 4,20 m : tourbe avec roseaux.

Evolution de la tourbière. Roselière. Forêt fangeuse. Tourbière bombée.

From: Stockmans & Vanhoorne (1954).

Fig. 8

Pollendiagram of point 189 and point 198.

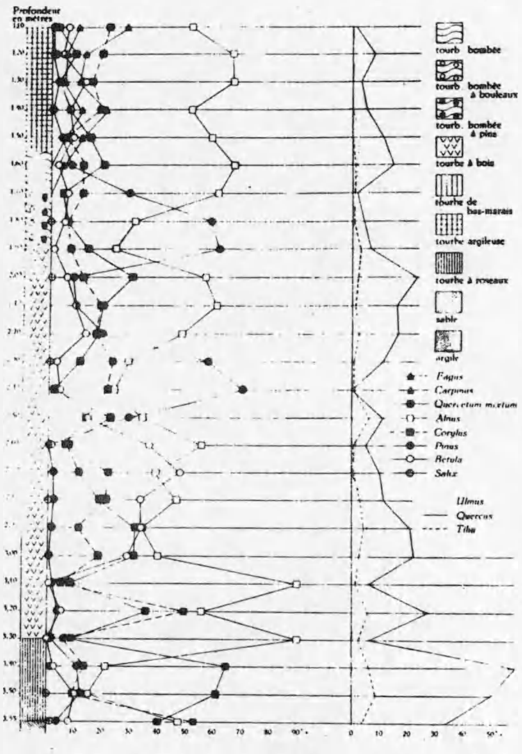



Fig. 7 — Diagramme pollinique établi pour la tourbe observée au point 189 (Oudekapelle)

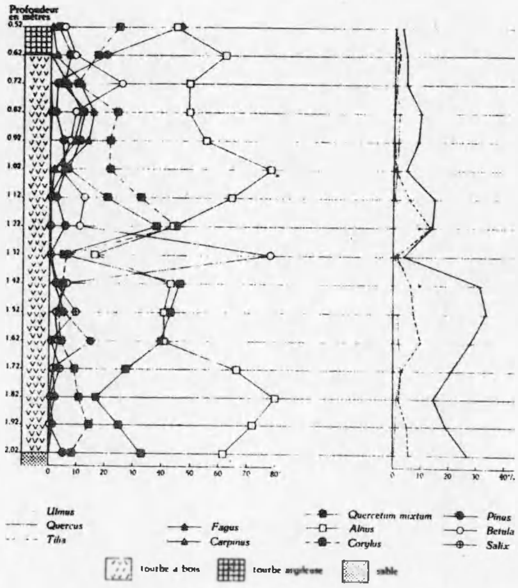



Fig. 3 — Diagramme pollinique établi pour la tourbe observée au point 198 (Sint-Jacobs-Kapelle)

From: Stockmans & Vanhoorne (1954)

Fig. 9

| Profondeur en mètres | *Pinus* | *Salix* | *Carpinus* | *Corylus* | *Betula* | *Alnus* | *Fagus* | *Quercus* | *Ulmus* | *Tilia* | « *Quercetum mixtum* » | Σ AP | *Sphagnum* | *Osmunda regalis* | *Lastrea Thelypteris* | *Polypodium* | *Typha* | *Sparganium* | *Potamogeton* | *Gramineæ* | *Cyperaceæ* | ***Myrica*** | ***Rumex*** | ***Chenopodiaceæ*** | ***Caryophyllaceæ*** | ***Ranunculus*** | ***Umbelliferæ*** | ***Ericaceæ*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,10 | 2 | 3 | 16 | 33 | 11 | 79 | 43 | 4 | .. | .. | 4 | 159 | 45 | .. | .. | .. | .. | .. | .. | 2 | .. | 6 | .. | 6 | .. | .. | .. | **52** |
| 1,20 | 2 | 3 | 10 | 33 | 8 | 112 | 22 | 13 | 2 | .. | 15 | 174 | 79 | .. | 1 | .. | .. | .. | .. | 11 | 1 | 25 | .. | 3 | 1 | 1 | .. | **50** |
| 1,30 | 5 | .. | 9 | 26 | 21 | 116 | 19 | 6 | .. | .. | 6 | 176 | 72 | .. | 3 | .. | .. | .. | .. | 1 | .. | 10 | 1 | 5 | .. | 4 | .. | **71** |
| 1,40 | 2 | .. | 20 | 33 | 13 | 91 | 36 | 12 | 1 | .. | 13 | 178 | 73 | 1 | 2 | .. | .. | .. | .. | 9 | 2 | 17 | 1 | 5 | .. | 3 | .. | **85** |
| 1,50 | 6 | .. | 7 | 9 | 12 | 87 | 17 | 17 | 4 | .. | 21 | 150 | 62 | .. | 4 | .. | .. | .. | .. | 5 | .. | 37 | .. | 6 | .. | 1 | .. | **53** |
| 1,60 | 12 | .. | .. | 19 | 4 | 102 | 6 | 24 | 3 | 2 | 29 | 153 | 44 | 1 | 1 | 1 | .. | .. | .. | .. | .. | 39 | .. | 1 | .. | .. | .. | **116** |
| 1,70 | 46 | .. | .. | 20 | 11 | 100 | .. | 3 | 2 | 2 | 7 | 164 | 3 | 3 | 2 | .. | .. | .. | .. | 3 | .. | 47 | .. | 3 | .. | .. | .. | **51** |
| 1,80 | 130 | 1 | .. | 12 | 11 | 69 | .. | 9 | 4 | 1 | 14 | 225 | 2 | 6 | 2 | .. | .. | .. | .. | 1 | .. | 30 | .. | 1 | .. | .. | .. | **10** |
| 1,90 | 93 | .. | .. | 11 | 2 | 37 | .. | 11 | 5 | 5 | 21 | 153 | .. | 40 | ∞ | .. | .. | .. | .. | .. | 2 | ∞ | .. | .. | .. | .. | .. | **2** |
| 2,00 | 14 | 1 | .. | 17 | 10 | 89 | .. | 38 | 4 | 4 | 46 | 160 | .. | 43 | ∞ | .. | 1 | .. | .. | .. | 5 | ∞ | .. | .. | .. | 1 | .. | **1** |
| 2,10 | 7 | .. | .. | 13 | 7 | 43 | .. | 12 | 1 | 1 | 14 | 71 | .. | 3 | ∞ | .. | 1 | .. | .. | .. | .. | ∞ | .. | .. | .. | .. | .. | .. |
| 2,20 | 31 | .. | .. | 27 | 21 | 75 | .. | 26 | .. | 4 | 30 | 157 | .. | 170 | 25 | .. | .. | .. | .. | .. | 2 | ∞ | .. | 1 | .. | .. | .. | .. |
| 2,30 | 87 | 1 | .. | 35 | 4 | 44 | .. | 17 | .. | 1 | 18 | 154 | .. | 185 | 7 | 1 | .. | .. | .. | 1 | 2 | ∞ | .. | 1 | .. | .. | .. | .. |
| 2,40 | 134 | .. | .. | 40 | 8 | 45 | .. | 2 | .. | 2 | 4 | 191 | .. | ∞ | 14 | .. | .. | .. | .. | .. | 1 | 45 | .. | .. | .. | .. | .. | .. |
| 2,50 | 46 | .. | .. | 21 | 23 | 54 | .. | 18 | 8 | 10 | 36 | 159 | .. | 223 | ∞ | 1 | .. | .. | .. | .. | 2 | 8 | .. | 1 | .. | .. | .. | .. |
| 2,60 | 1 | 2 | .. | 11 | 70 | 107 | .. | 11 | 2 | 2 | 15 | 195 | .. | 26 | 153 | 3 | .. | .. | .. | .. | .. | 4 | .. | .. | .. | .. | .. | .. |
| 2,70 | 3 | .. | .. | 34 | 74 | 60 | .. | 17 | .. | 1 | 18 | 155 | .. | 39 | ∞ | 1 | 1 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. |
| 2,80 | 3 | 1 | .. | 33 | 51 | 71 | .. | 18 | 6 | 5 | 29 | 155 | .. | 35 | 31 | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. | 1 | .. | .. |
| 2,90 | 2 | .. | .. | 19 | 54 | 55 | .. | 35 | 9 | 7 | 51 | 162 | .. | .. | 179 | 1 | .. | .. | .. | 1 | 2 | .. | .. | .. | .. | .. | .. | .. |
| 3,00 | 1 | .. | .. | 28 | 43 | 59 | .. | 34 | 10 | 3 | 47 | 150 | .. | .. | ∞ | .. | 18 | .. | .. | 4 | .. | .. | .. | 3 | .. | 1 | .. | .. |
| 3,10 | 3 | .. | .. | 14 | 1 | 230 | .. | 15 | 2 | 4 | 21 | 255 | .. | .. | ∞ | .. | 1 | .. | .. | 1 | .. | .. | .. | .. | .. | 1 | .. | .. |
| 3,20 | 5 | .. | .. | 77 | 8 | 87 | .. | 43 | 2 | 11 | 56 | 156 | .. | .. | 3 | 2 | .. | 1 | 4 | 287 | 1 | .. | .. | 1 | .. | .. | 1 | .. |
| 3,30 | .. | .. | .. | 11 | 2 | 150 | .. | 10 | .. | 4 | 14 | 166 | .. | .. | 125 | 2 | 1 | .. | .. | 11 | 1 | .. | .. | 2 | .. | .. | .. | .. |
| 3,40 | 8 | .. | .. | 10 | 2 | 16 | .. | 43 | .. | 5 | 48 | 74 | .. | .. | .. | .. | 1 | .. | .. | 56 | 6 | .. | .. | 6 | 1 | .. | 2 | .. |
| 3,50 | 19 | 1 | .. | 17 | 17 | 24 | .. | 79 | 4 | 14 | 97 | 158 | 1 | .. | 1 | .. | 1 | .. | .. | 197 | 62 | .. | .. | 17 | .. | .. | .. | .. |

Relevé stratigraphique des grains de pollen et spores rencontrés **au point 189**.

**Légende : ∞ = plus que 500.**

From: Stockmans & Vanhoorne (1954)

Fig. 10

| Nature des sédiments | Profondeur en mètres | Oogones | Fruits et graines | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Chara* sp. | *Taxus baccata* L. | *Sparganium ramosum* Huds. | *Sparganium* sp. | *Potamogeton* sp. | *Potamogeton* sp. | *Potamogeton* sp. | *Alisma Plantago* L. | *Carex pseudo-Cyperus* L. | *Carex paniculata* L. |
| Tourbe argileuse | 0,52-0,57 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 0,57-0,62 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Tourbe | 0,62-0,67 | .. | .. | 1 | 2 | .. | .. | .. | .. | 6 | .. |
| | 0,67-0,72 | .. | .. | .. | 2 | .. | .. | .. | .. | 12 | .. |
| | 0,72-0,77 | .. | .. | .. | 8 | .. | .. | .. | 9 | 34 | 1 |
| | 0,77-0,82 | .. | .. | 1 | 12 | .. | .. | .. | 37 | 35 | 1 |
| | 0,82-0,87 | .. | .. | .. | 1 | .. | .. | .. | 2 | 3 | 1 |
| | 0,87-0,92 | .. | 2 | .. | .. | .. | .. | 13 | 31 | .. | 3 |
| | 0,92-0,97 | .. | .. | .. | .. | .. | .. | 2 | 16 | .. | 1 |
| | 0,97-1,02 | .. | .. | .. | 5 | .. | .. | .. | .. | .. | 1 |
| | 1,02-1,07 | .. | .. | .. | 2 | .. | .. | .. | .. | 1 | 4 |
| | 1,07-1,12 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. |
| | 1,12-1,17 | .. | .. | .. | 2 | .. | .. | .. | .. | 3 | 11 |
| | 1,17-1,22 | .. | .. | .. | 2 | .. | .. | .. | .. | .. | 9 |
| | 1,22-1,27 | .. | .. | .. | 5 | .. | .. | .. | .. | 15 | .. |
| | 1,27-1,32 | 60 | .. | 1 | 5 | 1 | .. | .. | 4 | 8 | 2 |
| | 1,32-1,37 | 8 | .. | .. | 7 | 1 | .. | .. | 1 | 7 | .. |
| | 1,37-1,42 | 29 | .. | .. | 16 | 4 | .. | .. | 1 | 7 | .. |
| | 1,42-1,47 | 1 | .. | .. | 5 | 2 | .. | .. | 2 | 7 | 6 |
| | 1,47-1,52 | .. | .. | .. | 2 | .. | .. | .. | .. | 3 | 7 |
| | 1,52-1,57 | 1 | .. | .. | .. | 1 | 1 | .. | 2 | 3 | 5 |
| | 1,57-1,62 | .. | .. | 1 | .. | 3 | .. | 1 | 6 | 3 | 6 |
| | 1,62-1,67 | .. | .. | 4 | .. | 2 | 2 | .. | 10 | 6 | 4 |
| | 1,67-1,72 | .. | .. | 8 | .. | 2 | 1 | .. | 12 | 2 | 1 |
| | 1,72-1,77 | .. | .. | .. | .. | .. | .. | .. | 2 | 1 | .. |
| | 1,77-1,82 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| | 1,82-1,87 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,87-1,92 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Sable fin | 1,92-1,97 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,97-2,02 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |

| Nature des sédiments | Profondeur en mètres | Fruits et graines | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Carex elongata* L. | *Carex riparia* Curt. | *Carex* sp. | *Carex* sp. | *Carex* sp. | *Carex* sp. | *Scirpus lacustris* L. | *Scirpus* sp. | *Iris pseudacorus* L. | *Betula pubescens* Ehrh. | *Betula* sp. | *Alnus glutinosa* Gaertn. |
| Tourbe argileuse | 0,52-0,57 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| | 0,57-0,62 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. |
| Tourbe | 0,62-0,67 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 21 |
| | 0,67-0,72 | 5 | .. | .. | .. | 3 | 3 | .. | .. | .. | .. | 4 | 253 |
| | 0,72-0,77 | 1 | .. | .. | .. | 24 | 11 | .. | .. | .. | .. | 62 | 723 |
| | 0,77-0,82 | .. | .. | .. | .. | 46 | 37 | .. | .. | .. | .. | 72 | 461 |
| | 0,82-0,87 | .. | .. | .. | 3 | 11 | 10 | .. | .. | .. | .. | 55 | 236 |
| | 0,87-0,92 | .. | .. | .. | 4 | 6 | .. | .. | .. | .. | .. | 3 | 20 |
| | 0,92-0,97 | .. | .. | .. | 1 | 1 | .. | .. | .. | .. | .. | 9 | 3 |
| | 0,97-1,02 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 11 | 17 |
| | 1,02-1,07 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 7 | 42 |
| | 1,07-1,12 | .. | .. | .. | .. | 2 | .. | .. | .. | .. | .. | 1 | 25 |
| | 1,12-1,17 | .. | .. | .. | .. | 5 | .. | .. | .. | .. | .. | 1 | 15 |
| | 1,17-1,22 | .. | .. | .. | 12 | .. | .. | .. | .. | .. | .. | 2 | 4 |
| | 1,22-1,27 | .. | .. | .. | 9 | 3 | .. | .. | .. | .. | .. | 9 | 52 |
| | 1,27-1,32 | .. | .. | .. | .. | 1 | 1 | 1 | .. | .. | 3 | 39 | 276 |
| | 1,32-1,37 | .. | .. | .. | .. | 2 | .. | .. | 1 | .. | .. | .. | 91 |
| | 1,37-1,42 | .. | .. | .. | .. | 2 | .. | .. | .. | .. | .. | .. | 162 |
| | 1,42-1,47 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 123 |
| | 1,47-1,52 | .. | .. | .. | .. | 3 | .. | .. | .. | .. | .. | .. | 22 |
| | 1,52-1,57 | .. | .. | .. | 11 | 15 | 3 | 1 | .. | .. | .. | .. | 208 |
| | 1,57-1,62 | .. | .. | .. | 18 | 21 | 9 | .. | .. | 3 | .. | .. | 42 |
| | 1,62-1,67 | 1 | 1 | .. | 10 | 30 | 6 | .. | .. | .. | .. | .. | 29 |
| | 1,67-1,72 | 2 | 2 | .. | 1 | 6 | 9 | .. | .. | .. | .. | .. | 142 |
| | 1,72-1,77 | .. | .. | 8 | 1 | 4 | 2 | 1 | .. | .. | .. | .. | 108 |
| | 1,77-1,82 | .. | .. | 4 | .. | 2 | .. | .. | .. | .. | .. | .. | 43 |
| | 1,82-1,87 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | 2 |
| | 1,87-1,92 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Sable fin | 1,92-1,97 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 |
| | 1,97-2,02 | .. | .. | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. |

| Nature des sédiments | Profondeur en mètres | Fruits et graines | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Rumex* sp. | *Chenopodiaceæ* | *Lychnis Flos-cuculi* L. | *Nymphæa alba* L. | *Ranunculus repens* L. | *Ranunculus Flammula* L. | *Rubus cæsius* L. | *Rubus fruticosus* L. | *Rubus Idæus* L. | *Rubus* sp. | *Potentilla* sp. | *Prunus Padus* L. | *Prunus spinosa* L. | *Rhamnus frangula* L. |
| Tourbe argileuse | 0,52-0,57 | 1 | 2 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. |
| | 0,57-0,62 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. |
| Tourbe | 0,62-0,67 | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 5 | .. | .. | .. | 1 |
| | 0,67-0,72 | 1 | .. | 1 | .. | .. | .. | .. | .. | .. | 11 | .. | .. | .. | 10 |
| | 0,72-0,77 | .. | .. | 5 | .. | 4 | .. | .. | .. | .. | 11 | .. | .. | .. | 14 |
| | 0,77-0,82 | .. | .. | 2 | .. | .. | .. | .. | .. | .. | 5 | .. | .. | .. | 8 |
| | 0,82-0,87 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 8 | .. | .. | .. | .. |
| | 0,87-0,92 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 5 | .. | .. | .. | .. |
| | 0,92-0,97 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 0,97-1,02 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 |
| | 1,02-1,07 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,07-1,12 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,12-1,17 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,17-1,22 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 | .. | .. | .. |
| | 1,22-1,27 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,27-1,32 | .. | .. | .. | 30 | .. | .. | .. | .. | .. | 1 | .. | .. | .. | 8 |
| | 1,32-1,37 | .. | .. | .. | 32 | .. | .. | .. | .. | .. | 1 | .. | .. | .. | 31 |
| | 1,37-1,42 | .. | .. | .. | 11 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | 95 |
| | 1,42-1,47 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 32 |
| | 1,47-1,52 | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. |
| | 1,52-1,57 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,57-1,62 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 9 |
| | 1,62-1,67 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 |
| | 1,67-1,72 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,72-1,77 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,77-1,82 | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. |
| | 1,82-1,87 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 2 | .. |
| | 1,87-1,92 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Sable fin | 1,92-1,97 | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. |
| | 1,97-2,02 | .. | .. | .. | .. | .. | .. | 3 | 1 | 1 | .. | .. | .. | .. | .. |

| Nature des sédiments | Profondeur en mètres | Fruits et graines | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Viola* sp. | *Myriophyllum* sp. | *Hydrocotyle vulgaris* L. | *Œnanthe peucedanifolia* Poll. | *Œnanthe aquatica* Poir. | *Œnanthe* sp. | *Lysimachia vulgaris* L. | *Lysimachia thyrsiflora* L. | *Lysimachia* sp. | *Menyanthes trifoliata* L. | *Scutellaria galericulata* L. | *Lycopus europæus* L. | *Mentha* sp. | *Solanum dulcamara* L. | *Viburnum Opulus* L. | *Eupatorium cannabinum* L. |
| Tourbe argileuse | 0,52-0,57 | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 0,57-0,62 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Tourbe | 0,62-0,67 | .. | .. | .. | .. | .. | 22 | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. |
| | 0,67-0,72 | .. | .. | .. | .. | .. | 280 | .. | .. | .. | .. | .. | 5 | .. | .. | .. | .. |
| | 0,72-0,77 | .. | .. | .. | .. | .. | 368 | .. | .. | .. | .. | 2 | 10 | .. | .. | .. | .. |
| | 0,77-0,82 | .. | .. | .. | .. | 457 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. | .. |
| | 0,82-0,87 | .. | .. | .. | .. | 25 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 0,87-0,92 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | 19 | .. | .. | .. | .. | .. | .. |
| | 0,92-0,97 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | 2 | .. | 4 | .. | .. | .. | .. |
| | 0,97-1,02 | .. | .. | .. | .. | 10 | .. | .. | .. | .. | .. | 1 | 1 | .. | .. | .. | .. |
| | 1,02-1,07 | .. | .. | .. | 1 | 19 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,07-1,12 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,12-1,17 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 | .. | .. | .. | .. | .. | .. |
| | 1,17-1,22 | .. | .. | 3 | .. | 1 | .. | .. | .. | .. | 4 | .. | .. | .. | .. | .. | .. |
| | 1,22-1,27 | .. | .. | 5 | 1 | 10 | .. | .. | .. | 1 | 22 | 10 | 3 | .. | .. | .. | .. |
| | 1,27-1,32 | .. | .. | 2 | .. | 14 | .. | .. | .. | .. | 13 | 1 | 1 | .. | .. | .. | .. |
| | 1,32-1,37 | .. | .. | .. | .. | 21 | .. | .. | .. | .. | .. | 1 | 5 | .. | .. | .. | .. |
| | 1,37-1,42 | .. | .. | .. | .. | 33 | .. | .. | .. | .. | .. | 2 | 7 | .. | .. | .. | .. |
| | 1,42-1,47 | .. | .. | .. | .. | 23 | .. | .. | .. | 1 | .. | .. | 11 | .. | .. | 1 | .. |
| | 1,47-1,52 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | 41 | .. | .. | .. | .. |
| | 1,52-1,57 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 34 | 3 | 9 | .. | 3 |
| | 1,57-1,62 | .. | .. | .. | 3 | 1 | .. | 1 | 2 | 7 | .. | .. | 32 | 3 | 5 | .. | .. |
| | 1,62-1,67 | .. | .. | .. | 3 | 2 | .. | .. | .. | 4 | .. | .. | 33 | .. | 18 | .. | 1 |
| | 1,67-1,72 | 1 | 1 | .. | 4 | 10 | .. | .. | .. | 5 | .. | .. | 16 | 2 | 19 | .. | .. |
| | 1,72-1,77 | .. | .. | .. | 2 | 13 | .. | .. | .. | .. | .. | .. | 8 | 2 | 4 | .. | .. |
| | 1,77-1,82 | .. | .. | .. | 2 | 3 | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. |
| | 1,82-1,87 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,87-1,92 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 | .. | .. | .. | .. |
| Sable fin | 1,92-1,97 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,97-2,02 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |

| Nature des sédiments | Profondeur en mètres | | Rhizomes | Feuilles | Tiges feuillées | | Sporanges ou feuilles | Sporanges |
|---|---|---|---|---|---|---|---|---|
| | | Nombre des graines déterminées Total : 6.475 | *Phragmites communis* Trin. | *Salix* sp. | *Calliergonella cuspidata* Loeske | *Amblystegium riparium* (Hedw.) Bruch et Schimper | *Osmunda regalis* L. | *Lastrea Thelypteris* Bory |
| Tourbe argileuse | 0,52-0,57 | 7 | .. | .. | .. | .. | .. | .. |
| | 0,57-0,62 | 3 | .. | .. | .. | .. | .. | .. |
| Tourbe | 0,62-0,67 | 61 | .. | + | .. | .. | .. | .. |
| | 0,67-0,72 | 590 | .. | + | .. | .. | .. | + |
| | 0,72-0,77 | 1.287 | .. | .. | .. | .. | + | + |
| | 0,77-0,82 | 1.178 | .. | .. | .. | .. | .. | + |
| | 0,82-0,87 | 355 | .. | .. | .. | .. | .. | .. |
| | 0,87-0,92 | 107 | .. | .. | .. | .. | + | + |
| | 0,92-0,97 | 40 | .. | .. | .. | .. | .. | .. |
| | 0,97-1,02 | 47 | .. | .. | .. | .. | .. | .. |
| | 1,02-1,07 | 76 | .. | .. | .. | .. | .. | + |
| | 1,07-1,12 | 29 | .. | .. | .. | .. | .. | .. |
| | 1,12-1,17 | 40 | .. | .. | .. | .. | .. | + |
| | 1,17-1,22 | 40 | .. | .. | .. | .. | + | + |
| | 1,22-1,27 | 146 | .. | + | + | .. | + | + |
| | 1,27-1,32 | 472 | .. | + | + | .. | + | + |
| | 1,32-1,37 | 209 | .. | + | .. | + | + | + |
| | 1,37-1,42 | 370 | .. | + | .. | + | + | + |
| | 1,42-1,47 | 214 | .. | + | .. | .. | + | + |
| | 1,47-1,52 | 80 | .. | .. | .. | .. | .. | .. |
| | 1,52-1,57 | 301 | .. | .. | .. | .. | .. | + |
| | 1,57-1,62 | 176 | .. | .. | .. | .. | .. | + |
| | 1,62-1,67 | 167 | .. | .. | .. | .. | .. | + |
| | 1,67-1,72 | 246 | + | .. | .. | .. | .. | + |
| | 1,72-1,77 | 156 | + | .. | .. | .. | .. | .. |
| | 1,77-1,82 | 59 | + | .. | .. | .. | .. | .. |
| | 1,82-1,87 | 7 | + | .. | .. | .. | .. | .. |
| | 1,87-1,92 | 3 | + | .. | .. | .. | .. | .. |
| Sable fin | 1,92-1,97 | 2 | + | .. | .. | .. | .. | .. |
| | 1,97-2,02 | 7 | .. | .. | .. | .. | .. | .. |

— Relevé stratigraphique des différents restes macroscopiques observés à Sint-Jacobs-Kapelle (point 198).

Fig. 11 b.

| …r des sé… | Profondeur en mètres | Chara sp. (Oogones) | Taxus baccata L. | Pinus silvestris L. | Sparganium simplex Huds. | Sparganium minimum Fries | (?) Potamogeton coloratus Vahl | Potamogeton sp. | Potamogeton sp. | Alisma Plantago L. | Carex pseudo-Cyperus L. | Carex paniculata L. | Carex Hudsonii A. Benn. | Carex vesicaria L. | Carex sp. | Carex sp. | Carex sp. | Carex sp. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A… | 1,05-1,10 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,10-1,15 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,15-1,20 | .. | .. | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,20-1,25 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Tourbe | 1,25-1,30 | .. | .. | .. | 1 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| argi- | 1,30-1,35 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | 1 | .. | .. | .. | .. | .. | .. |
| leuse | 1,35-1,40 | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,40-1,45 | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,45-1,50 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,50-1,55 | .. | .. | .. | .. | .. | .. | .. | .. | 16 | .. | .. | .. | .. | 1 | .. | .. | .. |
| | 1,55-1,60 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,60-1,65 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,65-1,70 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,70-1,75 | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,75-1,80 | .. | .. | 30 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,80-1,85 | .. | .. | 48 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 1,85-1,90 | .. | .. | 57 | .. | .. | .. | .. | .. | .. | .. | 24 | .. | .. | .. | .. | .. | .. |
| | 1,90-1,95 | .. | .. | 50 | 6 | .. | .. | .. | .. | .. | .. | 919 | .. | 25 | .. | .. | 9 | 90 |
| | 1,95-2,00 | .. | .. | 97 | 5 | .. | .. | .. | 1 | .. | 3 | 838 | .. | 53 | .. | .. | 9 | 64 |
| | 2,00-2,05 | .. | .. | 6 | 9 | .. | .. | .. | 4 | .. | 19 | 2.106 | .. | .. | 4 | .. | .. | 2 |
| | 2,05-2,10 | .. | .. | 10 | 25 | .. | 2 | .. | .. | .. | 91 | 1.211 | .. | .. | 26 | .. | .. | .. |
| | 2,10-2,15 | .. | .. | 11 | .. | .. | .. | .. | .. | .. | 5 | 49 | .. | .. | 3 | .. | .. | .. |
| | 2,15-2,20 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | 1 | 1 | .. | .. | .. | .. | .. | .. |
| | 2,20-2,25 | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 26 | .. | .. | .. | 16 | .. | .. | .. |
| | 2,25-2,30 | .. | .. | .. | 3 | .. | .. | .. | .. | .. | 126 | .. | .. | .. | 50 | .. | .. | .. |
| | 2,30-2,35 | .. | .. | 6 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 2,35-2,40 | .. | .. | 3 | .. | .. | .. | .. | .. | .. | 1 | 2 | .. | .. | .. | .. | .. | .. |
| | 2,40-2,45 | .. | .. | 144 | .. | .. | .. | .. | .. | .. | 1 | 214 | .. | .. | .. | .. | .. | .. |
| | 2,45-2,50 | .. | .. | 180 | .. | .. | .. | .. | .. | .. | .. | 721 | .. | .. | .. | .. | .. | .. |
| | 2,50-2,55 | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. | 1.099 | .. | .. | .. | .. | .. | .. |
| Tourbe… | 2,55-2,60 | .. | .. | .. | .. | .. | .. | .. | .. | 3 | 11 | 451 | .. | .. | 28 | .. | .. | .. |
| | 2,60-2,65 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 6 | 23 | .. | .. | 6 | .. | .. | .. |
| | 2,65-2,70 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | 5 | .. | .. | 4 | .. | .. | .. |
| | 2,70-2,75 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 7 | 85 | .. | .. | 1 | .. | .. | .. |
| | 2,75-2,80 | 5 | .. | .. | 10 | .. | .. | .. | .. | 3 | 25 | 1 | .. | .. | 2 | .. | .. | .. |
| | 2,80-2,85 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 16 | .. | .. | 1 | .. | .. | .. |
| | 2,85-2,90 | .. | 2 | .. | 6 | .. | .. | .. | 2 | .. | 6 | 278 | .. | 1 | 19 | .. | .. | .. |
| | 2,90-2,95 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 6 | 660 | .. | .. | 1 | .. | .. | .. |
| | 2,95-3,00 | .. | .. | 9 | .. | .. | .. | .. | 4 | 1 | 58 | 1.155 | .. | .. | 16 | .. | .. | .. |
| | 3,00-3,05 | .. | .. | 6 | .. | .. | .. | .. | 5 | 1 | 75 | 1.107 | .. | .. | 14 | .. | .. | .. |
| | 3,05-3,10 | .. | .. | 26 | .. | .. | .. | .. | 3 | .. | 54 | 205 | 2 | .. | 7 | .. | .. | .. |
| | 3,10-3,15 | 2 | .. | 8 | .. | .. | .. | .. | .. | .. | 5 | 2 | 1 | .. | 1 | .. | .. | .. |
| | 3,15-3,20 | .. | .. | .. | .. | .. | .. | 2 | .. | .. | 3 | .. | 1 | .. | .. | .. | .. | .. |
| | 3,20-3,25 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | 3,25-3,30 | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 13 | .. | .. | .. | .. | 17 |
| | 3,30-3,35 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 4 | .. | .. | 18 | .. | .. |
| | 3,35-3,40 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. | .. | .. |
| | 3,40-3,45 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | 15 | .. | .. |
| | 3,45-3,50 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | 19 | .. | .. |
| | 3,50-3,55 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 9 | .. | .. |
| | 3,55-3,60 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 12 | .. | .. |
| V… | 3,60-3,65 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | 1 | 11 | .. | .. |

Fruits et graines (suite)

| Profondeur en mètres | Eriophorum vaginatum L. | Rhynchospora fusca Roemer et Schultes | Rhynchospora alba Vahl | Scirpus maritimus L. | Scirpus fluitans L. | Juncus Gerardii Loisel. | Juncus bufonius L. | Juncus lamprocarpus Ehrh. | Juncus effusus L. | Juncus sp. | Iris pseudacorus L. | Myrica Gale L. | Corylus avellana L. | Betula sp. | Alnus glutinosa Gaertn. | Urtica dioica L. | Rumex sp. | Suæda maritima Dumort. | Chenopodiaceæ | Lychnis Flos-cuculi L. | Mœhringia trinervia Clairv. | Caryophyllaceæ | Ranunculus sceleratus L. | Ranunculus repens L. | Ranunculus Lingua L. | Rubus sp. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,05-1,10 | .. | .. | 1 | .. | .. | 48 | 3 | .. | 11 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. | .. | .. | .. | .. |
| 1,10-1,15 | .. | .. | .. | .. | .. | 98 | 24 | .. | 23 | 3 | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. | .. | .. | 1 | 1 | 1 |
| 1,15-1,20 | .. | .. | 9 | .. | .. | 93 | 4 | .. | 7 | .. | .. | .. | .. | .. | .. | 1 | 28 | 5 | .. | .. | .. | .. | 3 | .. | .. | 1 |
| 1,20-1,25 | .. | .. | .. | .. | .. | 422 | 41 | 1 | .. | 20 | .. | .. | .. | 1 | .. | .. | 45 | 22 | 1 | .. | .. | 60 | 2 | .. | .. | 3 |
| 1,25-1,30 | .. | .. | 18 | 1 | .. | 394 | 44 | .. | .. | .. | .. | 1 | .. | .. | 1 | .. | 79 | 57 | 5 | 1 | .. | 42 | .. | .. | .. | 2 |
| 1,30-1,35 | .. | .. | 5 | .. | .. | 11 | 7 | 1 | 2 | .. | .. | .. | .. | .. | .. | .. | 2 | 7 | 1 | .. | .. | 8 | 1 | .. | .. | .. |
| 1,35-1,40 | .. | .. | 17 | .. | .. | 112 | 32 | .. | .. | .. | .. | .. | .. | .. | 5 | .. | 3 | 44 | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,40-1,45 | .. | .. | 19 | 1 | 2 | 64 | .. | .. | .. | .. | .. | 4 | .. | .. | 3 | .. | 9 | 42 | .. | .. | .. | .. | 1 | .. | .. | .. |
| 1,45-1,50 | .. | 8 | 7 | .. | .. | 17 | 6 | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 3 | 16 | .. | .. | .. | 8 | .. | .. | .. | 2 |
| 1,50-1,55 | .. | 23 | 22 | .. | .. | 48 | .. | .. | .. | .. | .. | 2 | .. | .. | 5 | .. | 8 | 28 | .. | .. | .. | 80 | .. | .. | .. | 1 |
| 1,55-1,60 | 1 | .. | 25 | 2 | .. | 6 | 2 | .. | .. | .. | .. | .. | .. | .. | 1 | 1 | 4 | 7 | .. | .. | .. | 1 | .. | .. | .. | .. |
| 1,60-1,65 | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 2 | 1 | .. | .. | .. | .. | .. | .. | .. |
| 1,65-1,70 | .. | .. | 4 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 1 |
| 1,70-1,75 | 5 | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,75-1,80 | 15 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 9 | .. | 23 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,80-1,85 | 13 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 63 | .. | 78 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,85-1,90 | 10 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 127 | .. | 101 | .. | .. | .. | .. | .. | 43 | .. | .. | .. | .. | .. | .. |
| 1,90-1,95 | 6 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 540 | .. | 216 | .. | .. | .. | .. | .. | 891 | .. | .. | .. | .. | 1 | .. |
| 1,95-2,00 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 654 | .. | 290 | 3 | .. | .. | .. | .. | 600 | .. | .. | .. | .. | .. | .. |
| 2,00-2,05 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 262 | .. | 538 | 2 | .. | .. | .. | .. | 536 | .. | .. | .. | .. | 1 | .. |
| 2,05-2,10 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 190 | .. | 94 | 1 | .. | .. | .. | .. | 38 | .. | .. | .. | .. | 1 | .. |
| 2,10-2,15 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 95 | .. | 295 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 2,15-2,20 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 145 | .. | 2.454 | 7 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 2,20-2,25 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 132 | .. | 580 | 4 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 2,25-2,30 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 840 | .. | 936 | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 2,30-2,35 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 404 | .. | 1.103 | 12 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 |
| 2,35-2,40 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 107 | .. | 56 | 54 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| 2,40-2,45 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 110 | .. | 102 | 47 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| 2,45-2,50 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 195 | 17 | .. | .. | .. | .. | 294 | .. | .. | .. | .. | .. | 6 |
| 2,50-2,55 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 421 | 43 | .. | .. | .. | .. | 252 | .. | .. | .. | .. | .. | .. |
| 2,55-2,60 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 15 | 13 | .. | .. | .. | .. | 20 | .. | .. | .. | .. | .. | 14 |
| 2,60-2,65 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 554 | 236 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| 2,65-2,70 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.713 | 329 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 6 |
| 2,70-2,75 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 248 | 66 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 2,75-2,80 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 116 | 121 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 2,80-2,85 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.620 | 520 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| 2,85-2,90 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 228 | 84 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 2,90-2,95 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 28 | 28 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3 |
| 2,95-3,00 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 282 | 105 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 |
| 3,00-3,05 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 435 | 117 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| 3,05-3,10 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 330 | 130 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 |
| 3,10-3,15 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 3 | 1.540 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 3,15-3,20 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | 3.495 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 3,20-3,25 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4.321 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 6 |
| 3,25-3,30 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | 740 | 1.719 | .. | .. | .. | .. | 95 | .. | .. | .. | .. | 12 |
| 3,30-3,35 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 7 | 82 | .. | .. | .. | .. | 18 | .. | .. | .. | .. | .. |
| 3,35-3,40 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 3,40-3,45 | .. | .. | .. | 33 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. |
| 3,45-3,50 | .. | .. | .. | 48 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | 15 | .. | .. | .. | .. | .. | .. | .. |
| 3,50-3,55 | .. | .. | .. | 120 | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | 1 | .. | 112 | .. | .. | 3 | .. | .. | .. | .. |
| 3,55-3,60 | .. | 4 | .. | 64 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 15 | .. | .. | .. | .. | .. | .. | .. |
| 3,60-3,65 | .. | .. | 5 | 4 | .. | 1 | 2 | .. | .. | .. | .. | .. | .. | 1 | 19 | .. | .. | .. | .. | .. | .. | 3 | .. | .. | .. | .. |

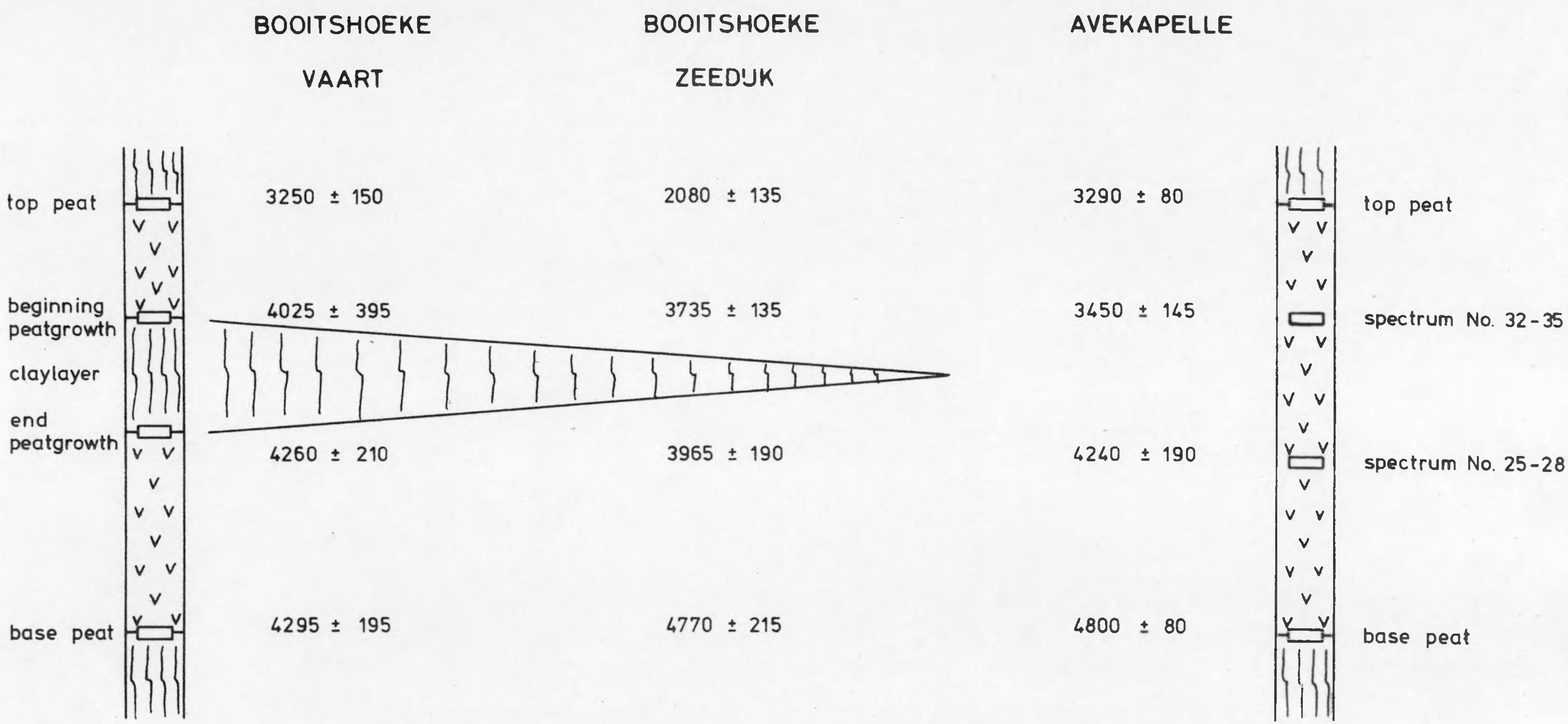
Fruits et graines (suite)

| Profondeur en mètres | Comarum palustre L. | Potentilla sp. | Rhamnus frangula L. | Hydrocotyle vulgaris L. | Cicuta virosa L. | Œnanthe sp. | Andromeda polifolia L. | Calluna vulgaris Hull | Erica tetralix L. | Lysimachia sp. | Menyanthes trifoliata L. | Scutellaria galericulata L. | Stachys paluster L. | Lycopus europæus L. | Mentha sp. | Solanum dulcamara L. | Pedicularis palustris L. | Viburnum Opulus L. | Valeriana dioica L. | Eupatorium cannabinum L. | Compositæ | Nombre des graines déterminées Total : 68.421 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,05-1,10 | .. | .. | .. | .. | .. | .. | .. | 2 | 8 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 77 |
| 1,10-1,15 | .. | .. | .. | .. | .. | .. | .. | .. | 60 | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 215 |
| 1,15-1,20 | .. | .. | .. | 3 | .. | .. | .. | .. | 578 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 736 |
| 1,20-1,25 | .. | .. | .. | 60 | .. | .. | 3 | 4 | 795 | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 1.484 |
| 1,25-1,30 | .. | .. | .. | 43 | .. | .. | 11 | 12 | 568 | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.282 |
| 1,30-1,35 | .. | .. | .. | 3 | .. | .. | 5 | 3 | 56 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 114 |
| 1,35-1,40 | 1 | .. | .. | 8 | .. | .. | 8 | 256 | 1.776 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 2.264 |
| 1,40-1,45 | .. | .. | .. | 34 | .. | .. | 9 | 80 | 1.488 | .. | 1 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 1.759 |
| 1,45-1,50 | .. | .. | .. | 4 | .. | .. | 1 | 38 | 640 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 753 |
| 1,50-1,55 | .. | 1 | .. | 20 | .. | .. | 4 | 208 | 1.104 | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.573 |
| 1,55-1,60 | .. | .. | .. | .. | .. | .. | 7 | 117 | 473 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 647 |
| 1,60-1,65 | .. | .. | .. | .. | .. | .. | 8 | 261 | 478 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 752 |
| 1,65-1,70 | .. | .. | .. | .. | .. | .. | 4 | 104 | 47 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 162 |
| 1,70-1,75 | .. | .. | .. | .. | .. | .. | 56 | 632 | 2 | .. | 3 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 703 |
| 1,75-1,80 | .. | .. | 1 | .. | .. | .. | 312 | 182 | .. | .. | 111 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 683 |
| 1,80-1,85 | .. | .. | 2 | .. | .. | .. | 1.044 | 160 | .. | .. | 215 | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | 1.624 |
| 1,85-1,90 | 61 | .. | .. | .. | .. | .. | 58 | 2.048 | .. | 1 | 126 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2.656 |
| 1,90-1,95 | 98 | .. | .. | 7 | .. | .. | .. | 90 | .. | .. | 145 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 3.063 |
| 1,95-2,00 | 204 | .. | .. | 4 | .. | .. | .. | .. | .. | .. | 209 | .. | .. | .. | .. | .. | 8 | .. | 1 | .. | .. | 3.043 |
| 2,00-2,05 | 746 | .. | .. | 27 | .. | .. | .. | .. | .. | .. | 247 | .. | .. | .. | .. | .. | 18 | .. | 13 | .. | .. | 4.540 |
| 2,05-2,10 | 113 | .. | .. | 1 | 4 | 1 | .. | .. | .. | .. | 119 | .. | .. | .. | .. | .. | 27 | .. | .. | .. | .. | 1.954 |
| 2,10-2,15 | 4 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 462 |
| 2,15-2,20 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2.610 |
| 2,20-2,25 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 768 |
| 2,25-2,30 | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.958 |
| 2,30-2,35 | .. | .. | 1 | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.531 |
| 2,35-2,40 | .. | .. | 25 | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 251 |
| 2,40-2,45 | 12 | .. | 7 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 639 |
| 2,45-2,50 | 5 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 139 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.557 |
| 2,50-2,55 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 50 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1.868 |
| 2,55-2,60 | .. | .. | 1 | .. | .. | 3 | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 561 |
| 2,60-2,65 | .. | .. | 3 | .. | .. | 22 | .. | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. | 2 | .. | .. | .. | 858 |
| 2,65-2,70 | .. | .. | .. | .. | .. | 6 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2.067 |
| 2,70-2,75 | .. | .. | 1 | .. | .. | 2 | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 410 |
| 2,75-2,80 | 3 | .. | 7 | .. | .. | 420 | .. | .. | .. | .. | .. | 1 | .. | 4 | .. | .. | .. | .. | .. | .. | .. | 718 |
| 2,80-2,85 | .. | .. | 7 | .. | .. | 62 | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | 2.231 |
| 2,85-2,90 | 80 | .. | .. | 80 | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 787 |
| 2,90-2,95 | 327 | .. | .. | 31 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 1.088 |
| 2,95-3,00 | .. | .. | .. | 21 | .. | .. | .. | .. | .. | .. | .. | 2 | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 1.777 |
| 3,00-3,05 | .. | .. | 1 | 13 | 1 | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | .. | .. | 1.655 |
| 3,05-3,10 | .. | .. | 1 | 10 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 774 |
| 3,10-3,15 | .. | .. | 2 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 | 1 | .. | .. | .. | .. | .. | .. | .. | 1.570 |
| 3,15-3,20 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | 1 | .. | .. | .. | .. | .. | 3.507 |
| 3,20-3,25 | .. | .. | 8 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | 4.336 |
| 3,25-3,30 | .. | .. | 9 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | 28 | .. | .. | .. | 65 | .. | 2.702 |
| 3,30-3,35 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | .. | .. | 10 | .. | 142 |
| 3,35-3,40 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 5 |
| 3,40-3,45 | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 | .. | .. | 5 | 2 | 100 | 1 | .. | .. | .. | .. | .. | 161 |
| 3,45-3,50 | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | 2 | 365 | .. | .. | .. | .. | .. | .. | 455 |
| 3,50-3,55 | 1 | .. | .. | .. | .. | .. | .. | 1 | 12 | .. | .. | .. | .. | 2 | 115 | .. | .. | .. | .. | .. | .. | 380 |
| 3,55-3,60 | .. | .. | .. | .. | .. | .. | .. | 1 | 3 | .. | .. | .. | .. | .. | 219 | .. | .. | .. | .. | .. | .. | 318 |
| 3,60-3,65 | .. | .. | .. | .. | .. | .. | .. | 1 | 40 | 1 | .. | .. | .. | 4 | 94 | .. | .. | .. | .. | .. | .. | 191 |

| Profondeur en mètres | Phragmites communis Trin. (Rhizomes) | Eriophorum vaginatum L. (Fibres) | Salix sp. (Feuilles) | Sphagnum acutifolium Ehrh. (Tiges feuillées) | Sphagnum cuspidatum Ehrh. | Sphagnum imbricatum Russow | Sphagnum palustre L. | Dicranum Bergeri Bland. | Aulacomnium palustre (Hedw.) Schwartz | Amblystegium riparium (Hedw.) Bruch et Schimper | Drepanocladus sp. | Calliergon giganteum (Schimp.) Kindberg | Calliergonella cuspidata (Hedw.) Loeske | Eurhynchium striatum (Hedw.) Schimper | Hylocomium sp. | Polytrichum strictum Banks | Osmunda regalis L. (Sporanges ou feuilles) | Lastrea Thelypteris Bory (Sporanges) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,05-1,10 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,10-1,15 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,15-1,20 | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,20-1,25 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,25-1,30 | + | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,30-1,35 | + | + | .. | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,35-1,40 | + | + | .. | + | .. | + | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,40-1,45 | + | + | .. | + | .. | + | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,45-1,50 | + | + | .. | + | .. | + | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,50-1,55 | + | + | .. | + | .. | + | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,55-1,60 | + | + | .. | + | .. | + | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,60-1,65 | + | + | .. | + | .. | + | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,65-1,70 | + | + | .. | + | .. | + | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,70-1,75 | + | + | .. | + | .. | + | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,75-1,80 | + | + | .. | + | .. | .. | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1,80-1,85 | + | + | .. | + | + | .. | + | .. | + | .. | .. | .. | .. | .. | .. | + | .. | .. |
| 1,85-1,90 | + | + | .. | .. | .. | .. | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 1,90-1,95 | + | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | + | .. | .. | + | .. | + | + |
| 1,95-2,00 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | .. | .. | .. | + | + |
| 2,00-2,05 | + | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | .. | .. | .. | + | + |
| 2,05-2,10 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | + | .. | .. | .. | + | + |
| 2,10-2,15 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | .. | .. | .. | + | + |
| 2,15-2,20 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | + |
| 2,20-2,25 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | .. | .. | + | + |
| 2,25-2,30 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | + |
| 2,30-2,35 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | + |
| 2,35-2,40 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,40-2,45 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,45-2,50 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,50-2,55 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,55-2,60 | + | .. | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,60-2,65 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,65-2,70 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,70-2,75 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,75-2,80 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | .. | .. | .. | .. | .. | + |
| 2,80-2,85 | + | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,85-2,90 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,90-2,95 | + | .. | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 2,95-3,00 | + | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 3,00-3,05 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 3,05-3,10 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 3,10-3,15 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 3,15-3,20 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 3,20-3,25 | + | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | .. | .. | + |
| 3,25-3,30 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 3,30-3,35 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 3,35-3,40 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 3,40-3,45 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 3,45-3,50 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 3,50-3,55 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + |
| 3,55-3,60 | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 3,60-3,65 | + | + | .. | .. | .. | + | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. |

— Relevé stratigraphique des différents restes macroscopiques observés à Oudekapelle (point 189).

Fig. 11 a.




Radiocarbon dates established on behalf of this study.
(age in 14-C y. B.P.)

Fig. 12

CHRONOLOGY OF THE PEATSEQUENCE

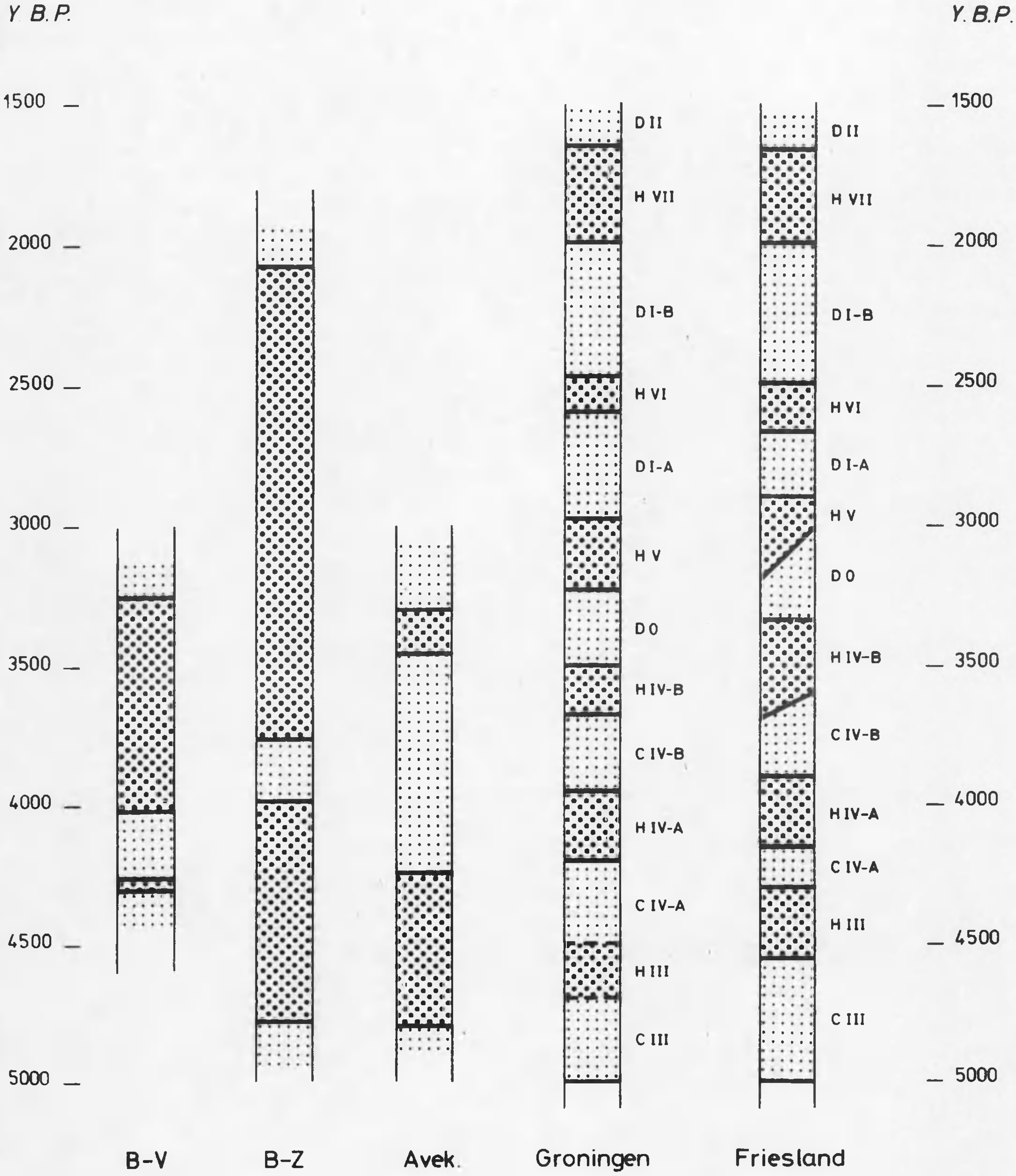



Fig. 13

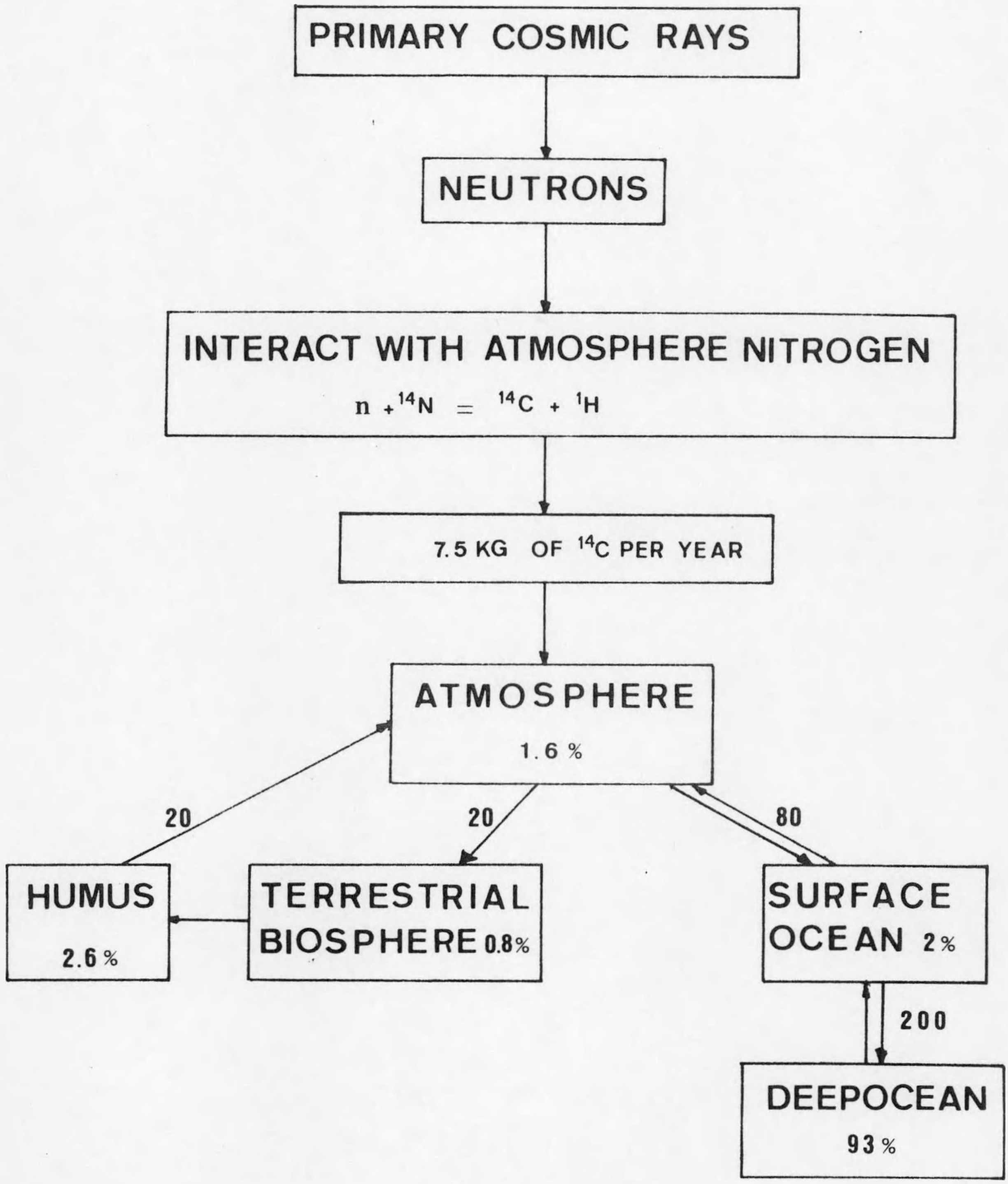



Fig. 14. Production process for $^{14}C$ and the carbon exchange reservoir. The yearly transfer of natural carbon between the compartments of the reservoir is expressed in units of $10^9$ tons. The percentages refer to the natural carbon in each compartment, the total natural carbon in the reservoir being $40 \times 10^{12}$ tons.