ROYAUME DE BELGIQUE

MINISTERE DES AFFAIRES ECONOMIQUES ET DE L'ENERGIE
ADMINISTRATION DES MINES – SERVICE GEOLOGIQUE DE BELGIQUE

13, rue Jenner - 1040 BRUXELLES

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1. INTRODUCTION

Outcrops in the coastal plain seldom reach pleistocene deposits, so that stratigraphical schemes in this area used to depend merely on borings.

On such basis, R. TAVERNIER (1947) recognised about 10 m. of holocene deposits, comprising both formations of Dunkirk and Calais, overlying another 10 m. of pleistocene deposits. The lower part of it is the Formation of Ostend which is considered to be of Eemian age (R. TAVERNIER, 1954). This formation is thought to wedge out against the rising tertiary substratum at a few kilometres from the present polder limit and at a depth of 16 m. below Ostend Datum (O. D.). Above this formation , the same author qualified a series of sands and loams of Würmian age, for which the connotation, Formation of Leffinge was introduced. This latter formation could be followed far beyond the polder rim allowing a connection with the coversand area.

J. B. AMERIJCKX represents on the soil map, sheet HOUTAVE, 22 E (1958) several islands of undeep pleistocene in the polder area. They usually border the polder limit, and occur generally in and around the Moere of Meetkerke, the latter being a former area of (holocene) peat extraction.

More recently, W. DE BREUCK, G. DEMOOR and R. MARECHAL (1969) published a geological section through this part of the coastal plain. It is essentially based on borings reaching the tertiary substratum. Here the deposits underneath the Moere of Meetkerke are reconsidered and a Holocene age is assumed for all formations below the Holland peat surface : Formation of Zuienkerke, Formation of Meetkerke. Only at a depth of - 6 m O. D. (8 m. below the surface), Late Glacial and Pleniglacial Weichselian deposits are believed to exist : Formation of Wenduine and Formation Uitkerke. Both rest on the paniselian substratum, at a depth of - 10 m. O. D. roughly. The Formation of Uitkerke yielded a so-called reworked Eemian fauna while the formation of Wenduine was dated 11. 349 $\pm$ 364 y. B. P. (W. DAUCHOT and J. HEYLEN, 1969). In the same article, the importance of the Wenduine formation was stressed because of its constant presence in the coastal plain.

R. PAEPE (1971) published the geological section of the traject west of Jabbeke of the motorway from Bruges to Calais. He came to the conclusion that in a fringe of 2 to 3 km along the polder border, Eemian and Weichselian deposits very often underly immediately the Holland (surface) peat. Herewith, he reaffirmed J. B. AMERIJCKX 's statement about the presence of undeep pleistocene deposits in the costal plain.

For the first time, it was possible to observe these pleistocene sediments, directly underneath the Holland peat, at the excavation in the Moere of Meetkerke, more exactly in between borings M B 7 and M B 9 of the work executed by DE BREUCK, DEMOOR and MARECHAL (Fig. 1).

2. LITHOSTRATIGRAPHY AND PALAEONTOLOGY OF THE MEETKERKE OUTCROP (Fig. 2)

The lithostratigraphical sequence can be summarised as follows (from top to base) :

- polder clay (Dunkirkian)
- peat (Holland peat)
- homogeneous yellowish sands (Weichselian)
- fossiliferous sands with an upper and lower crag (Eemian)
- cross-bedded sands and loams (Eemian)
- clay and loam with shell beds at the base (Eemian)
- glauconiferous sands with Cardita planicosta (Aalter Sands - Lower Paniselian, P1c - Tertiary).

In order to understand the chronological interpretation which is added to the lithostratigraphical subdivision, a further explanation will be given hereunder.

In the detail drawing of the section, one may observe clearly the presence of a large frost wedge at the contact between the homogeneous sands and the crag layers. This periglacial feature leaves no doubt about the pleistocene age of the sediments below this level. Other minor frost wedges and periglacial disturbances at this level were found in other places of the excavation. Only the pleistocene age of the homogeneous sands above it and below the Holland peat may still be discussed. Yet the morphological aspect of this deposit, characterised by the lack of any fluvial transport points to its coversand origin. Because of its position above the large frost wedge level, it must be accounted for Upper-Pleniglacial in age (R. PAEPE, 1968). The large frost wedge level then should be situated at the level of desert pavement 3 (BEUNINGEN GRAVEL BED), coinciding with the maximum cold of the Weichselian. No equivalent of these sands is described in the paper by DE BREUCK, DEMOOR and MARECHAL. A podzol has been developed in its top.

The next questionable deposits are the sands with the crags. The latter mainly consist of Cardium edule, bivalved and thus in situ. Also Hydrobia ulvae occurs , but sporadically. This is confirmed by the borings from the above mentioned authors who gave the name Zuienkerke formation to it. However, the same authors leave some doubt about the correlation of these deposits at the very place of Meetkerke with places elsewhere in the coastal plain. Therefore they conclude that, despite the generally accepted Atlanticum age for the Zuienkerke formation (highest sealevel) the deposits in the geometrical extension of it at Meetkerke, and overlying the Formation of Meetkerke, could date of the (Weichselian) Late Glacial. One may wonder if it was not somewhat overhasty to attribute formal formation names to deposits of which the chronological and lithostratigraphical position was not entirely clearified.

It is, however, sure now that the crag layers underneath the large frost wedge level, is Pleistocene in age. Also, it is a beach-formation revealing as was stated before a highest sealevel. This should point at least, to interglacial climatical conditions for its development. Indeed, in the light of to-day's world wide investigations on shoreline development, it is hardly to conceive that such high sealevel rises could have happened within a glacial period. Therefore the question rises : Eemian or older ?

Next the cross bedded sands and loams are typical of deposits in tidal gullies of a sand-mud flat. The tidal (wadden) character is very much proved by the rapid alternation of sand and loam layers congruent to the channel form, as well as by the numerous bioturbate structures, in more subhorizontally disposed layers. Sporadically, one may find shells, of which Amygdala aurea eemiensis is the most typical.

Towards the basis of these wadden deposits, an increase in finer textured material is found together with an abundance of shell layers : clay and loam with shells. One of us, R. VANHOORNE, carried out the palaeontological study of these deposits with the collaboration of M. GLIBERT (Royal Institute of Natural Sciences, Brussels) and J.H. VAN VOORTHUYZEN (Geological Survey of the Netherlands, Haarlem).

A primary word should be said about the though scarcely represented, palaeobotanical content of these layers. Several seeds of Suaeda maritima, one of Carex and one of Chenopodium were found. Suaeda maritima is a typical element of the actual tidal flat vegetation.

Next comes the malacological study. The following species have been identified :

- Ostrea edulis LINNAEUS
- Ensis sp.
- Cerastoderma edule LINNAEUS
- Amydala decussata LINNAEUS
- Amygdala aurea eemiensis NORDMANN, which is probably not a real synonym of Amygdala senescens COCCONI
- Scrobicularia plana DA COSTA
- Macoma baltica LINNAEUS
- Mactra corallina plistoneerlandica VAN REGTEREN ALTENA
- Hydrobia ulvae PENNANT
- Rissoa membranacea ADAMS
- Bittium reticulatum DA COSTA
- Hinia reticulata LINNAEUS

The most characteristic elements are Amygdala aurea eemiensis NORDMANN, which ressembles to Amygdala senescens, Mactra corallina plistoneerlandica and Bittium reticulatum DA COSTA, which actually have desappeared on the Belgian coast and which limit of northern extension is situated in the channel.

There is no doubt about the autochtonous character of this fauna since most of the specimens of Amygdala aurea eemiensis NORDMANN are double shaled. Doubled shaled Amygdala (Tapes) senescens were found for the first time by R. PAEPE (1965) in a boring at Stalhille, somewhat 5 km to the NW of the present site and at a depth of say 12 m. below O. D.

The foraminifera also occur in great abundance at depths of 5. 50 m and 7. 00 m below the surface, with respectively 109 and 99 specimens:

- Quinqueloculina seminula var. jugosa CUSHMAN
- Elphidium excavatum TERQUEM
- Elphidium gunteri
- Nonion depressulum WALTER et JACOB
- Ammonia beccarii LINNAEUS
- Bucella frigida

The high percentages of Nonion depressulum WALTER et JACOB and especially of Elphidium gunteri point once more to a tidal flat sedimentation as is corroborated by the occurrence of Suaeda maritima.

The rarity of foraminifera in the uppermost crag layers may be interpreted by the distruction of the tests in a beach deposit.

Thanks to the presence of high amounts of Amygdala aurea eemiensis and Bittium reticulatum, the occurrence of Bucella frigida and again, high percentages of Quinqueloculina seminula var. jugosa, a Late Pleistocene, more especially Eemian age is assumed for both wadden and beach deposits.

It is clear now that DE BREUCK, DEMOOR and MARECHAL designed the whole of these tidal eemian deposits by Formation of Meetkerke for the upper part and by Formation of Uitkerke for the lower part. However, the fauna in the Uitkerke formation is thought to be composed of reworked Eemian elements, which lead to the assumption of a Weichselian age, by these authors. Moreover, for these authors, the rapid alternation of sand and loam should then point to a niveo-eolian and niveo-fluvial transport. The age of the Meetkerke formation remains even more dubious to them, although the tidal character of the sedimentation is in agreement with our observations. The most probable age is Atlanticum, although it is believed that it could be older than 11.349 y. B. P. given the fact that the Zuienkerke formation could be Late (Weichselian) Glacial. This would locate the Meetkerke formation with respect to the age of the Uitkerke formation somewhere in the middle of the Weichselian.

The whole problem roots in the acceptance of the radio-carbon dating of a layer (Wenduine formation) which is considered as a reference layer because of its constancy in the Coastal Plain. Either the dating is wrong and the lateral correlation correct, or vice versa, or still both may be wrong. But then, one may wonder about the interpretation of the faunal content of the Uitkerke formation.

3. CONCLUSION

In the coastal plain around Meetkerke, two pleistocene deposits occur directly underneath the Holocene Peat : - eolian coversands of Pleniglacial Weichselian age, underlain by the large frost wedge level representing the maximum cold.

- a twofold Eemian marine deposit comprising a beach crag in the top zone and tidal deposits with a rich fauna at the base.

This situation accors in many places along the rim of the coastal plain, especcially, north of the place of Oudenburg (R. PAEPE, 1971).

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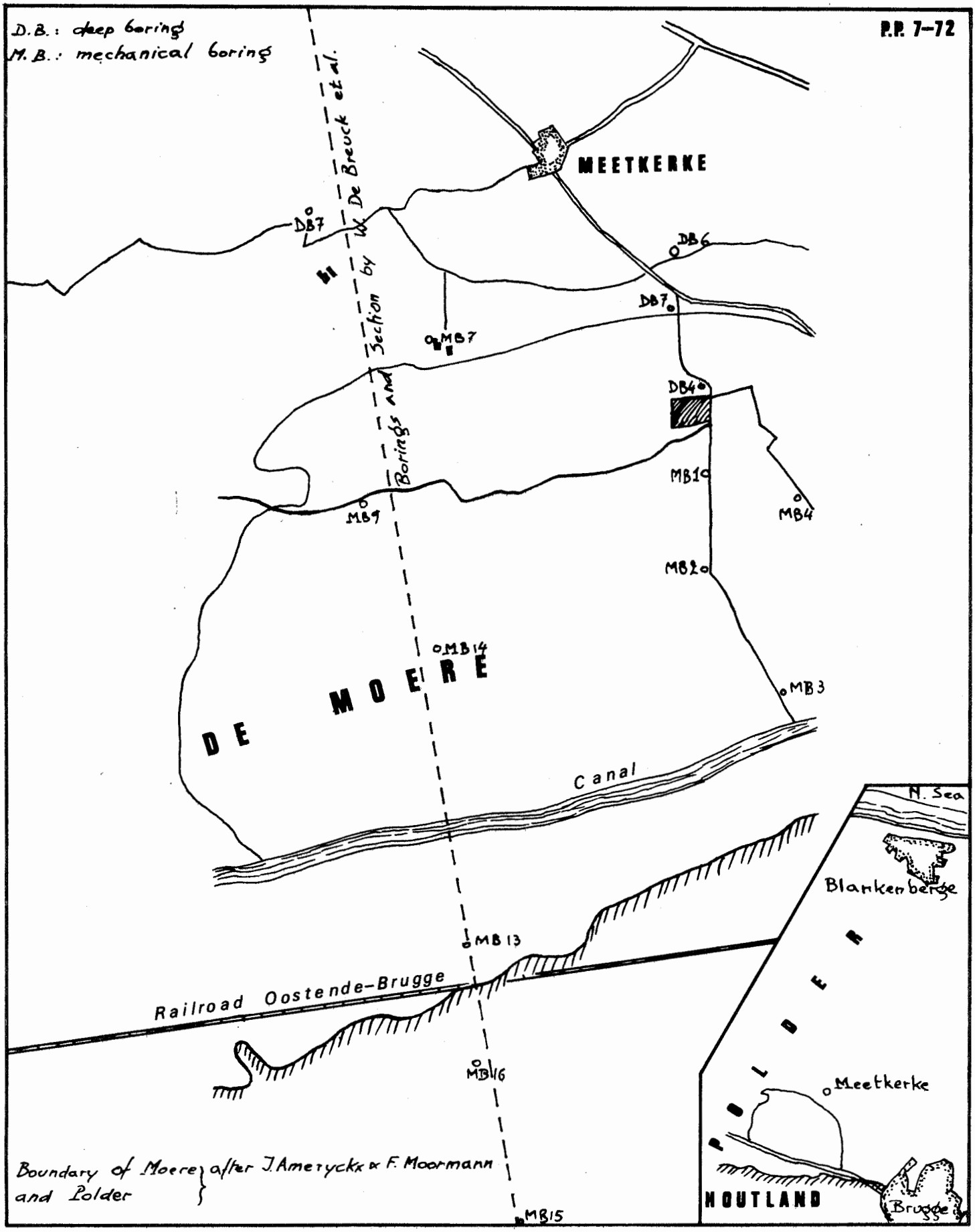
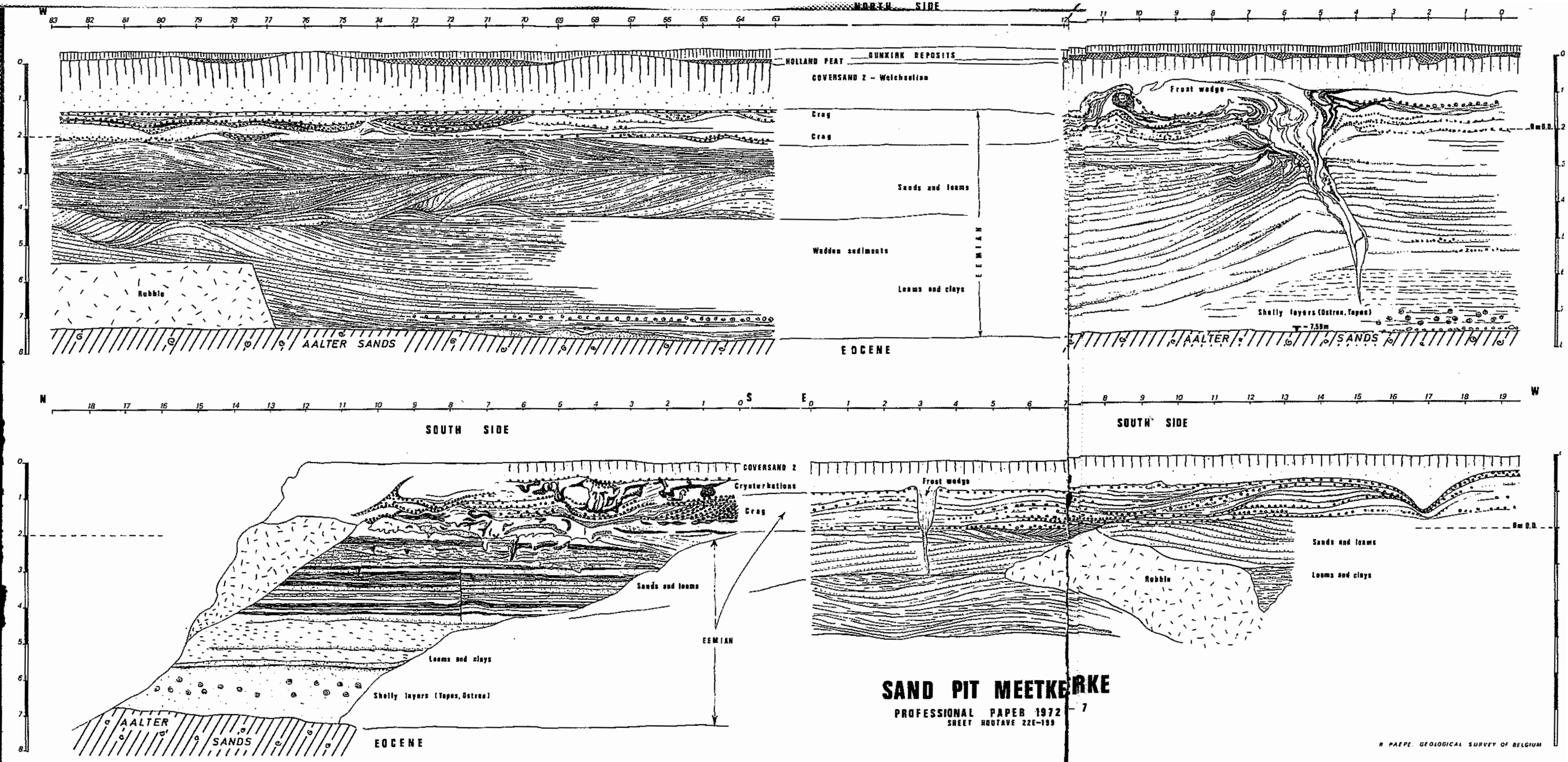

D.B.: deep borings
M.B.: mechanical borings
P.P. 7-72
MEETKERKE
DB7
DB6
DB7
DB4
MB7
MB1
MB9
MB4
MB2
MB14
MB3
DE MOERE
Canal
N. Sea
Blankenberge
MB13
Railroad Oostende-Brugge
POLDER
MB16
Meetkerke
HOUTLAND
Brugge
MB15
Section by De Breuck et al.
Borings and
Boundary of Moere and Polder after J. Ameryckx & F. Moormann



SAND PIT MEETKERKE

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SHEET HOUTAVE 22E-199

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