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INTRODUCTION AND SUMMARY OF THE STRATIGRAPHICAL AND SEDIMENTOLOGICAL RESULTS OF BORING ALLIANCE-28 IN THE COASTAL PLAIN OF SURINAM (DUTCH GUIANA)

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(with 1 diagram, 1 microlithological profile and a location map)

The boring Alliance-28 (fig. 1) was drilled in 1959 and, although this is barely ten years ago, it already ranks as one of those rare discoveries which suddenly invalidate traditional views. This boring revealed that in the coastal-plain area of Surinam the basement-complex, which belongs to the Pre-Palaeozoic core of the South American continent, is not everywhere overlain directly by a rather thin veneer of Quaternary and Holocene sediments, as had always been assumed. Here, for the first time, a more than 1000 m. thick series of Tertiary and Late-Cretaceous sediments was found between the basement and the thin covering layer of Quaternary. (van Voorthuysen, 1960).

In the same year (1959) Cruys reported the occurrence of Paleocene rocks in the Basses Plaines of French Guiana, topping between 10 and 80 m. and having an overall thickness of about 50 m. The top of the Paleocene in the boring Alliance-28 lies at about 260 m. This would suggest a certain amount of downwarping of the basement in Surinam and in former British Guiana in Post-Paleocene times. In 1960 Drooger published Foraminifera from the Paleocene of French Guiana.

Besides Foraminifera several other types of fossils were found: pollen and spores (Wijmstra), Mollusca (Van Regteren Altena), Ostracoda (Noordermeer and Wagner), Bryozoa (Lagaaij) and a microproblematicum (Hughes Clarke). In the field of sedimentology, analyses were made of the boron content and the clay minerals (Porrenga). The more exhaustive study on the clay minerals published in this issue was written by Hartman. Most of the papers have been presented at the Seventh Guiana Geological Conference, held in Paramaribo (Surinam) in November 1966. The author had the privilege to read a paper during the Conference about the results of our team of specialists.

Some of these results are shown in the diagram (fig. 2). The geochronology was established by Wijmstra, except for the marine intervals (Holocene and Paleocene). The boundary between the Miocene and Pliocene cannot be pinpointed certain, and that between the Eocene and the Oligocene is also open to question.

The right-hand half of the diagram represents the lithology, or rather the microlithology, because most of the data were obtained with a microscope. A more detailed microlithological profile has been added to this publication (fig. 3).

The palaeontological results obtained by the members of our research team are also published in this issue.

The peaks of high salinity observed in the different parts of the diagram might at a first glance suggest the presence of as many marine transgressions, but this is probably not true in all cases. Porrenga agrees that the boron content can only reflect the salinity, but does not necessarily indicate transgressions and regressions.

The *Paleocene* is for the greater part marine, at least shallow marine. The boron peak of high salinity at about 293.50 m. (sample no. 31066) coincides with that part of the sedimentary sequence which

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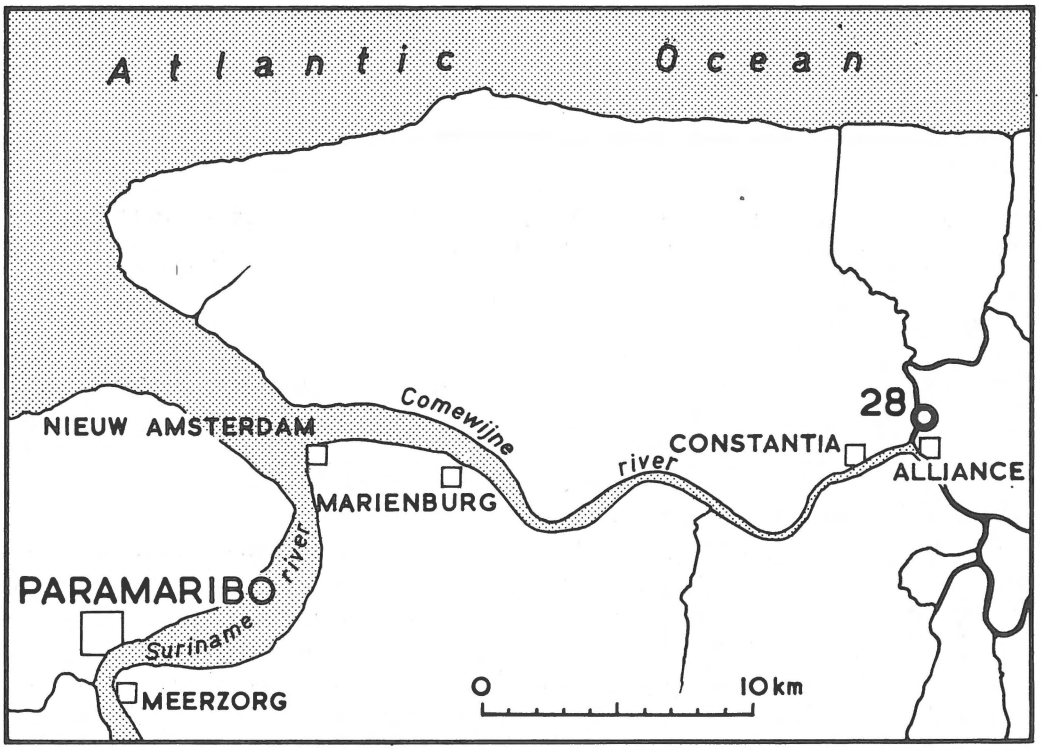


Fig. 1

Location of the boring Alliance-28 in Surinam (Dutch Guiana)

includes non-calcareous sediments that do not contain glauconite, but browncoal and some gypsum. Most probably these sediments were deposited under lagoonal conditions with very high salinity. The waterdepth of the marine part of the Paleocene could not have been more than 20 m. and was probably less. There are practically no planktonic Foraminifera, which is also an indication of littoral conditions. The occurrence of Bryozoa, according to Lagaaij, also suggests shallow marine conditions. The monospecific assemblages point to a shallow inner neritic environment (4-20 m.) together with slightly reduced salinity (< 33‰).

The Ostracoda studied by Mrs. Noordermeer and Wagner also point to an inner neritic environment. So the different faunal groups are in close agreement as to their environment. If this environment indication is correct, it is evident that the palaeosalinity peak at about 293.50 m. is not the result of a transgression, but of a regression with lagoonal conditions with very high salinity. The latter presumption seems to be contradicted by the occurrence of browncoal, both at the base and at the top of the thin clay layer in which Porrenga found his salinity peak, but the plant- and/or tree-remains could have been derived from elsewhere during the sedimentation of the sandy layers; moreover this clay layer of about 20 cm. contains gypsum crystals.

In the *Eocene* there are two peaks of high salinity at 240 m. (sample no. 31023) and one at 223 m. (sample no. 31013). At 243 m. some agglutinated Foraminifera have been found, but they are the same forms as occur in the Paleocene and may have been derived from the underlying deposits of that age. From 223 m. down to the base the sediments are not calcareous and do not contain a marine fauna or fish remains. Only the upper part is slightly calcareous, but locally also contains browncoal and kaoline; furthermore some ostracods, molluscs and fish remains have been found, but no tests of Foraminifera.

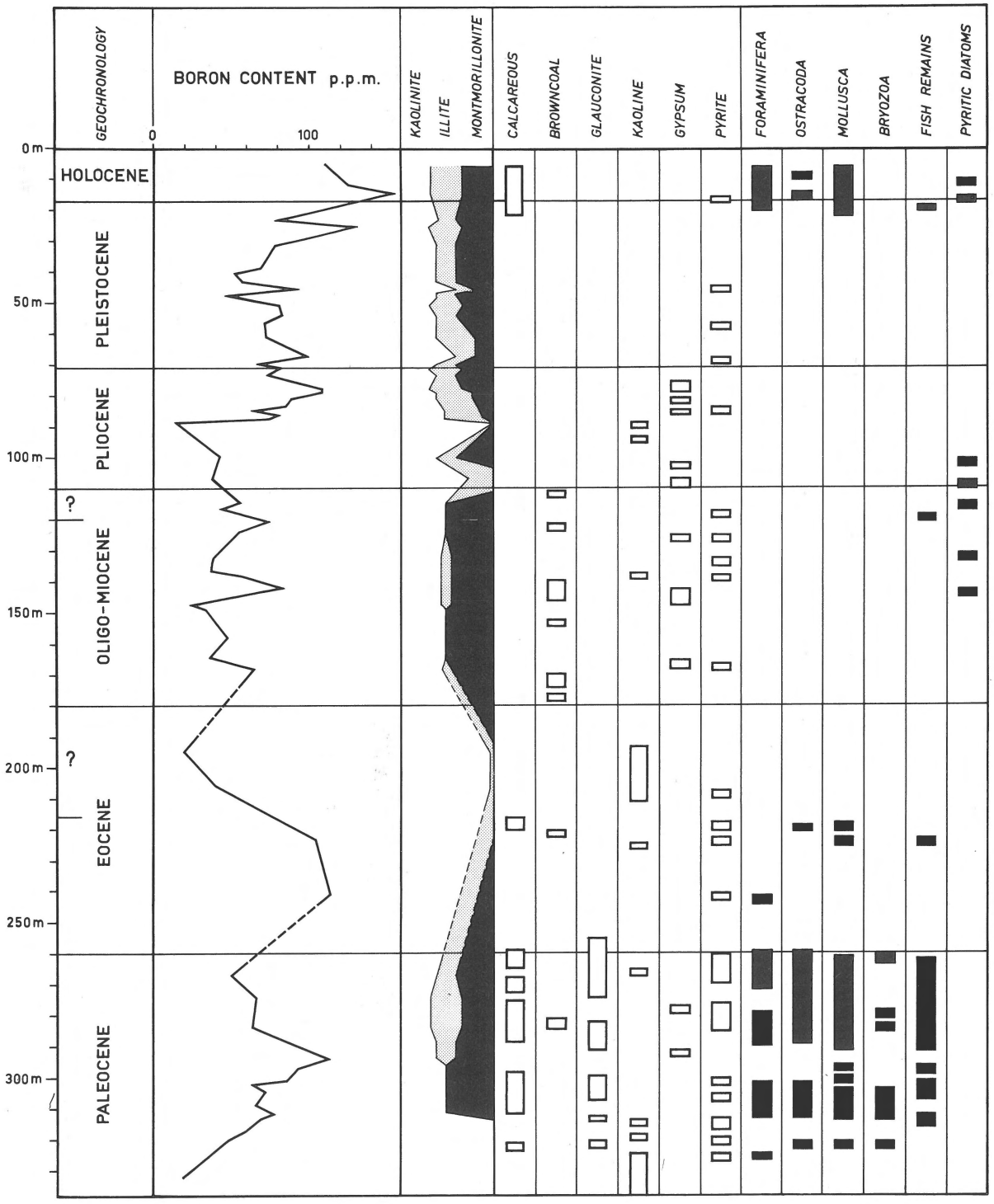
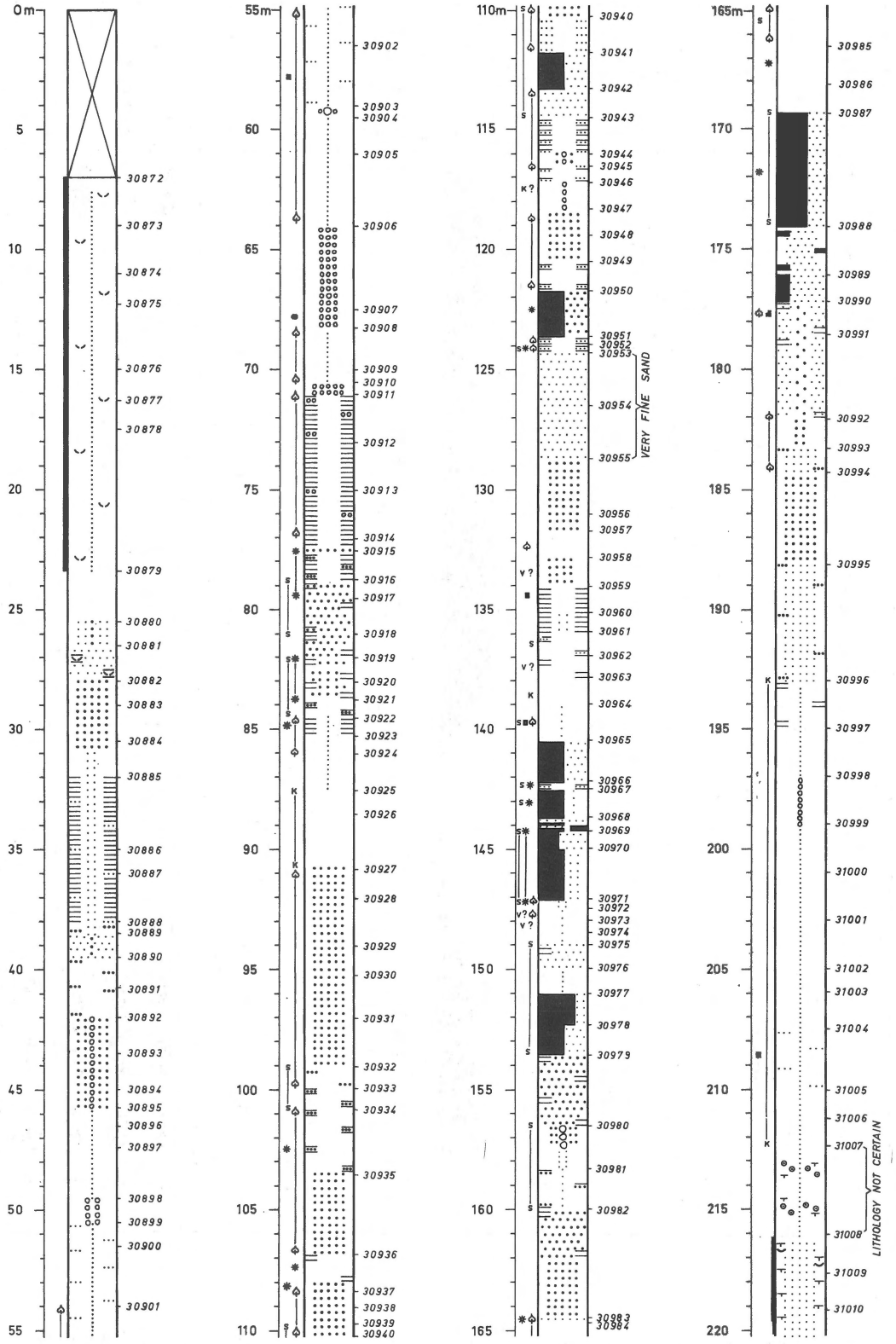
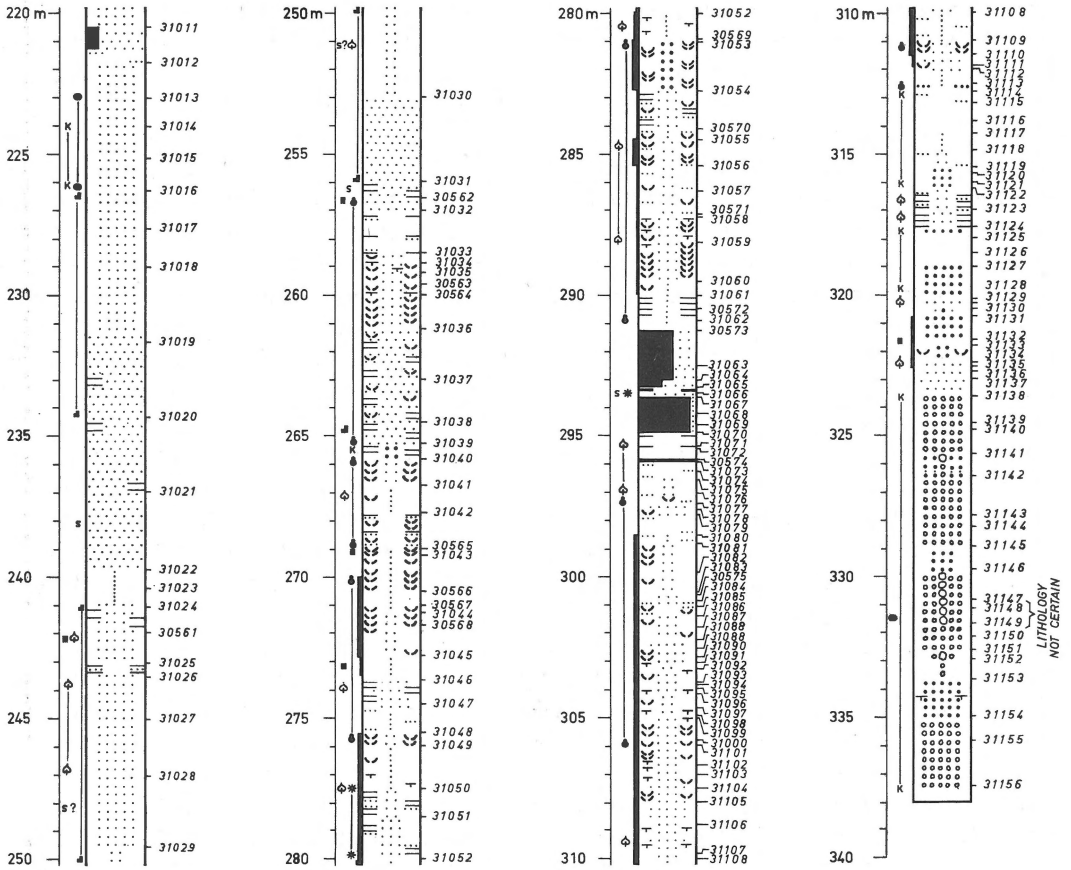


Fig. 2

Compilation of the sediment petrological and paleontological results of boring Alliance-28 in Surinam (Dutch Guiana).


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LITHOLOGY NOT CERTAIN



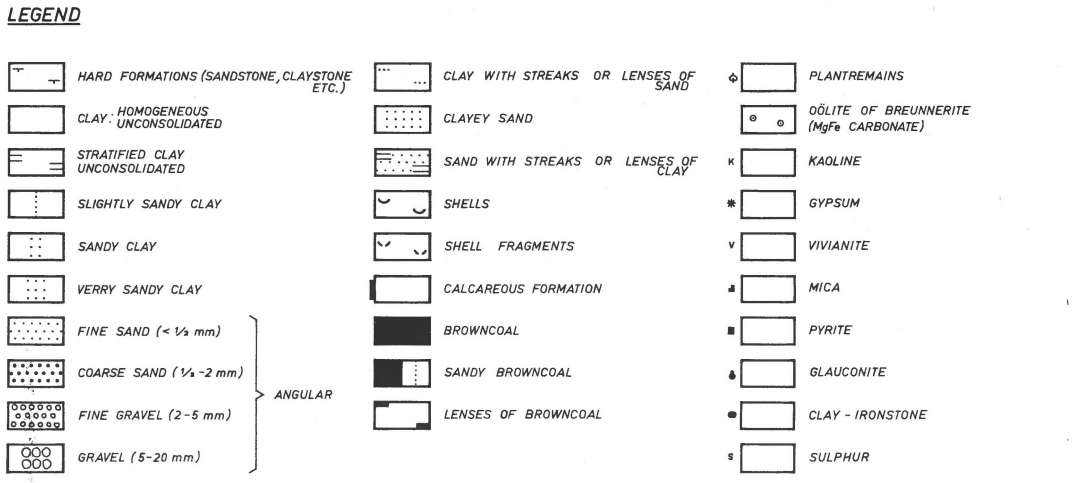


Fig. 3

Micro lithological profile of boring Alliance-28 in Surinam (Dutch Guiana).

Therefore it remains uncertain whether these peaks of high salinity indicate a transgression with subsequent decalcification of the sediments or lagoonal conditions with very high salinity. The few arenaceous Foraminifera may have derived from the underlying Paleocene, but this is difficult to prove; no gypsum has been found. So for the present it must remain an open question whether the Eocene interval in this boring is of marine origin and was decalcified later on, or whether sedimentation took place in a terrestrial environment.

The *Oligo-Miocene* and *Pliocene* are terrestrial with browncoal layers and some kaoline. The peaks of high salinity in this interval coincide with the occurrence of gypsum, which points to strong evaporation; not a single trace of marine life has been found.

Near the top of the *Pleistocene* occurs another peak of high salinity at about 25 m. (sample no. 30880). Here it is also doubtful if this peak represents a marine transgression. According to Porrenga this may be explained by assuming a lagoonal environment of a rather high salinity (hypersaline tidal flats or lagoons). The rest of the Pleistocene down to the base could also have been laid down under lagoonal conditions, but only on the basis of the boron content of less high salinity, although high enough to discourage any form of marine life. The flora may yield more information on the environmental conditions during Pleistocene times.

The *Holocene* boron peak at about 15 m (sample no. 30876), however, does indeed coincide with a transgression. The depth of the sea could be estimated from the Foraminifera association at between 10 and 20 m. According to Van Regteren Altena the molluscs seem to have lived at a depth of about 20 m., off the coast in and on a muddy clay bottom with occasional sandbars, but without hard rock.

As tar sands have been found in a water well about 40 km. due west of Paramaribo in the terrestrial Oligo-Miocene interval it seems worthwhile to try to trace the oil source rock. As far as we are informed now the only place to look for it in the Tertiary of the coastal plain, may be the shallow marine Paleocene. In this Tertiary series the marine part is not more than about 70 m. thick and the environment points to a very shallow sea with a rather poor fauna and with a regression giving rise to very saline conditions with gypsum and browncoal in between. Moreover the presence of glauconite points to turbulent waters with very slow sedimentation and moderate anaerobic conditions. This environment indication is in good accordance with the occurrence of monospecific Bryozoa, which also point to a shallow sea, slow sedimentation and somewhat reduced salinity. In a tropical sea with highly oxegenated water and oceanic salinity we may expect corals, Bryozoa, Mollusca and a much richer foraminiferal life. As a matter of fact we did not find corals at all, only two species of Bryozoa and a few fragments of molluscs.

To sum up, the Tertiary and probably the Late-Cretaceous of the coastal plain of Surinam are unlikely to contain source beds which can generate oil, as this series represents the continental borderland with a terrestrial and slightly littoral-estuarine facies of a large Tertiary and Late-Cretaceous basin farther north and now covered by the sea. It seems likely that the continental shelf offers more favourable conditions to find oil source rocks than the coastal plain. On the other hand the terrestrial sediments of the coastal plain contain good reservoir beds with permeable sands.

REFERENCE

J.H. van Voorthuysen (1960) – Een verrassende stratigrafische ontdekking in de kustvlakte van Suriname. Geol. en Mijnbouw, 39, no. 2, p. 51.