

Of arctic shores, ghost rivers and *Hippopotamus* landscapes: fossil shells reveal successive landscapes in the subsurface of the Maasvlakte area

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Fossil shells from beach finds and boreholes in the sand extraction pits for Maasvlakte 2 reveal a succession of landscapes from the Mid Pleistocene onwards. The base of the studied succession is composed of Middle Pleistocene coarse grained fluvial deposits that yield a warm-temperate freshwater fauna dominated by *Corbicula*. The Late Pleistocene succession between ~-31m and -27m depth consists of an alternation of coarse-grained gravelly sands and finer-grained sediments. The succession mainly represents fluvial reworked marine deposits. It contains common optimum Eemian (MIS 5e) warm-temperate marine taxa. From fishing expeditions in the region we conclude that locally patches of in-situ marine Eemian deposits must still be present.

In the Late Pleistocene intervals, well preserved cold-boreal faunas dominated by *Astarte borealis* are present. In some intervals we found in situ shells (paired bivalves) that we attribute to the cool *Astarte borealis* fauna. This cool fauna is therefore younger than the optimum Eemian (MIS 5e). This cold interval may also be the source or some of the very cold mammal species found on the Maasvlakte beach, viz. Walrus and Beluga. Also some extremely well preserved freshwater faunas occurred in some of the boreholes within this Late Pleistocene interval. Possibly we have a complete MIS5e-MIS5a interval (c 125-80 Ka) showing progressive cooling and lowering of sea levels and a transformation of warm temperate (temperature regimes comparable to present day Biscaye region) to cool temperate (present-day conditions in Mid Norway) conditions.

Within the fluvially reworked intervals much older fossils were sporadically found (up to Paleozoic fossils). Most of these indicate a Rhine-Meuse origin, but strongly reworked Eocene fossils (including *Venericor planicosta*, *Haustator solanderi*) indicate the presence in the area of an ancient Schelde River. The Eocene fossils derive from the Gent region (Vlaanderen, Belgium). Ancient Schelde deposits and their residual reworked faunas are known from the subsurface of the Westerschelde and Oosterschelde area (Koewacht Formation) but at times this Schelde River must have reached the Maasvlakte area as well. Finally, the succession is topped by Holocene marine deposits and faunas.

The fossil mollusk fauna of the Maasvlakte region gives insight into a succession of Middle-Late Quaternary landscapes.