

A submerged beach in the northern part of the North Sea

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A submerged beach bordering the North Sea Plateau towards the Norwegian Trench has been traced for more than 100 km at water depths of about 150 m (at 61°15'N), decreasing slightly to the south. The formation of this strandline is tentatively dated to 12,000 years B.P. by correlation with a radiocarbon age for shell material in sand from the British sector.

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It is well established that sea level during the last glaciation was considerably lower than today. In the offshore zone of Norway, several authors have indicated the occurrence of submerged beaches (Holtedahl 1940, Bugge et al. 1974, Dekko 1975), but very little is known about their regional extension and age. The purpose of this note is to describe a submerged beach observed in the northern part of the North Sea.

Water depths in the Norwegian part of the North Sea Plateau, the Norwegian Trench, and its western slope are shown in Fig. 1. Of particular interest is the upper part of the slope and the bordering plateau where the surface is remarkably even and flat. The water depths are about 130–160 m, and the plateau has a distinct edge towards the slope of the Norwegian Trench. Sparker profiles reveal that stratified, apparently soft sediments are built out along the edge. Thus, there is a distinct boundary between such sediments and the underlying overconsolidated material on the plateau. Fig. 2 shows selected sections from the sparker profiles. Both the strandline and the plateau have a northward gradient of approx. 0.3 m/km, probably due to isostatic changes.

Both the bathymetric data and the sparker profiles indicate that at least the northern part of the North Sea Plateau assumed its shape by wave erosion during a period of considerably lower sea level than today. The present surface is thought to correspond to the sea level at the time it was formed. Considering the flatness and extension of the plateau, the water depth must have been within a range capable of giving the waves sufficient force to level the surface. The conditions were perhaps in some degree comparable to shallow water regimes of tidal

flats. However, the impact force of the waves probably was much stronger as the area was exposed to the open sea to the north, east, and west (Fig. 1). The erosive action of the waves must therefore have been considerable.

The occurrence of the strandline indicates an increase in water depth in the order of 130–160 m in this part of the North Sea since it was formed.

Since most of the North Sea is shallower than the strandline, large areas must have been above sea level at least once during the course of the last glaciation. Sampling in the northern parts of the plateau (e.g. on Statfjordfeltet) has revealed only a thin discontinuous cover of sand above overconsolidated clays (Løken 1976).

Since sampling has not been carried out on the strandline, the dating is somewhat speculative. In the British sector, north of 61°N, Milling (1975) records, at a depth of 160 m, 10–15 cm of fine to medium grained sand overlying about 30 cm of sand with abundant shell fragments with overconsolidated clay below. Analysis of foraminifera and marine mollusk assemblages in the shell layer indicate that they lived in a water depth of less than 20 m. Radiocarbon dating of material from the shell layer gave an age of $11,950 \pm 290$ years B.P. (Milling 1975). This age corresponds with an ice readvance reported both from southern and northern Norway (Mangerud 1977, Rokoengen et al. 1977).

As the increase in sea level at Milling's locality corresponds closely to the present depth of the strandline, it seems reasonable to suggest a more or less contemporaneous formation, though at present other possibilities cannot be ruled out.

The regional mapping program of Institutt for kontinentalsokkelundersøkelser consists of compilation of bathymetric charts in cooperation

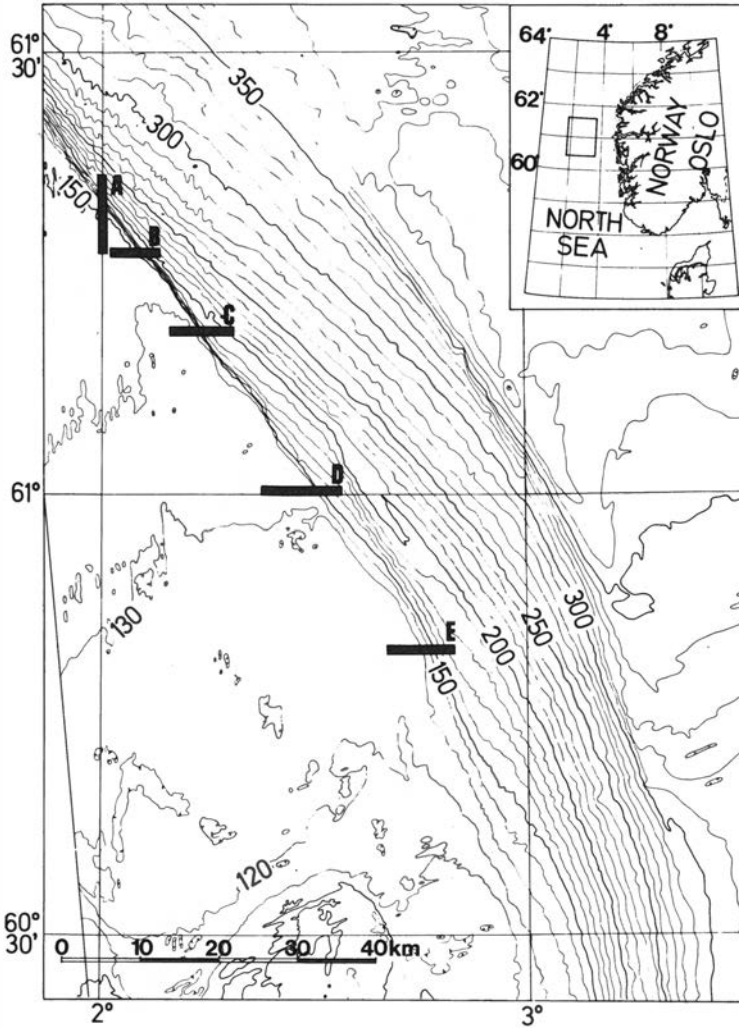


Fig. 1. Location map showing the bathymetry of parts of the northern North Sea, with the sections shown in Fig. 2 indicated. Depth contours are based on soundings by Norges Sjøkartverk.

with Norges Sjøkartverk (Bugge 1975), shallow seismic profiling, and sampling.

Data from the first two phases of the work form the basis for this paper. It is hoped that future work will enable the strandline to be traced further south and that sampling will enable more precise dating.

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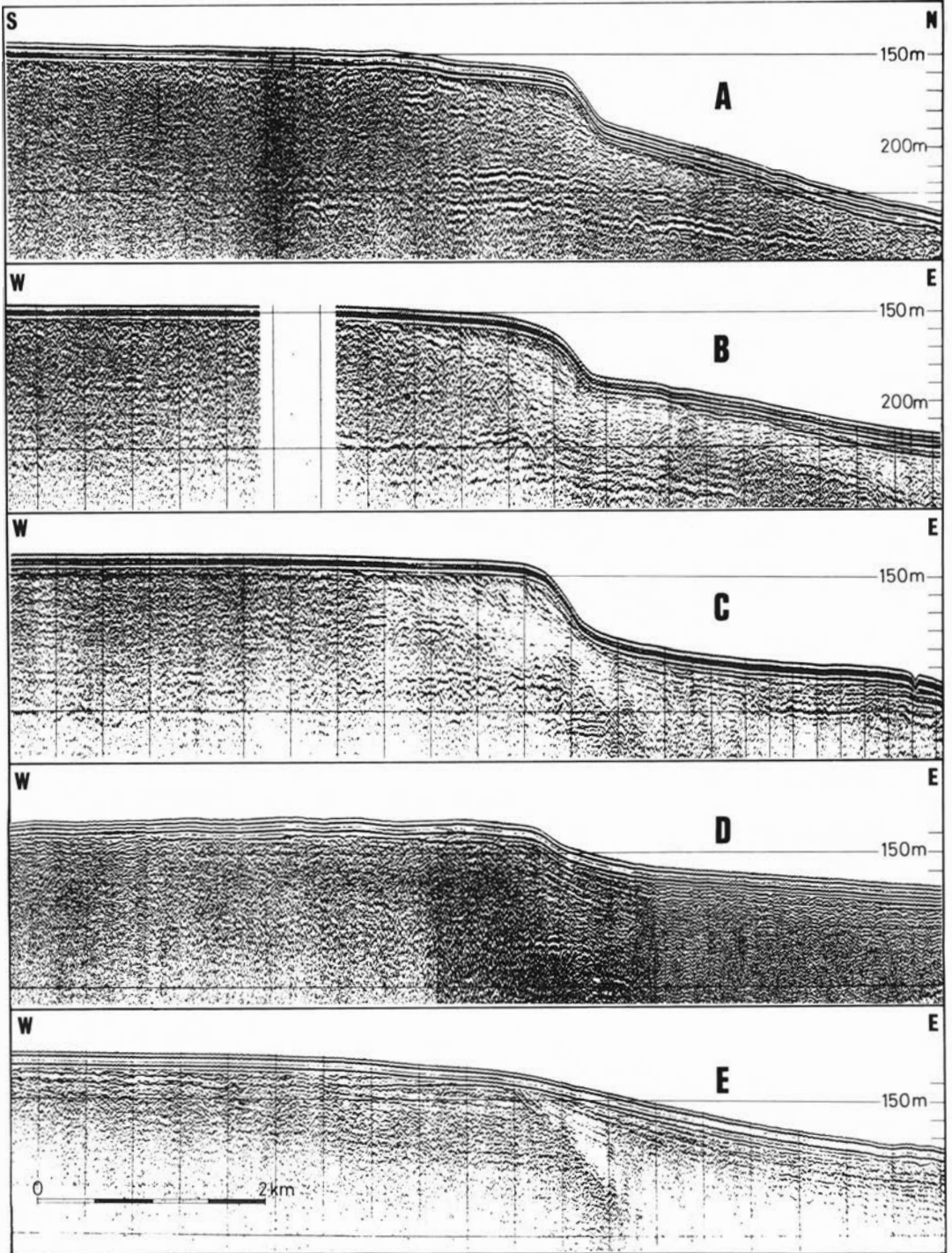


Fig. 2. Selected sparker profile sections showing the submerged beach. Vertical exaggeration approximately 16x.

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