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## **Paleoenvironmental interpretation of the Danian-Selandian transition (Paleocene) in the North Sea Basin based on foraminifera**

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The Danian–Selandian boundary (~60 Ma) marks the cessation of 40 million years of carbonate deposition in the North Sea Basin and a shift to siliciclastic deposition. On the basis of variations in lithology, benthic and planktonic foraminifera and calcareous nannofossil assemblages in three cores from Storebælt in the eastern part of the North Sea Basin, we have reconstructed the paleoenvironmental changes across the boundary. The benthic foraminiferal faunas belong to the “Midway-type fauna”. They are extremely rich and more than 260 species have been recognized. Q-mode cluster analysis groups the benthic assemblages into four biofacies, which correspond fairly closely to lithological units. Correlation of the Storebælt records with marine paleorecords from the Danish Basin and the North Sea Basin indicates that the transformation of the North Sea from a carbonate- to a siliciclastic basin occurred in four steps. The most important external factors involved in the change was, firstly, a major fall in the relative sea level during the late Danian leading to the disappearance of bryozoans from the North Sea Basin and an increase in the proportion of marginal marine coccoliths and to non-deposition and erosion in many areas. The relative abundance of the planktonic foraminifera decreased, whereas the benthic foraminifera show very little change. Secondly, coinciding with the Danian–Selandian boundary, an uplift of the Scotland–Shetland area resulted in a massive input of siliciclastic material into the North Sea Basin, and the sediments changed from carbonate to marl. The marginal marine coccoliths disappeared, indicating a return to more normal marine conditions. In the foraminiferal faunas, the boundary marks an increase in the density of both planktonic and benthic foraminifera and an increase in the proportion of epifaunal morphotypes. Thirdly, during the early Selandian, inversion

of the Sorgenfrei–Tornquist Zone and Mesozoic basins in the southern and eastern part of the North Sea Basin resulted in a huge influx of reworked Cretaceous chalk and an almost complete stop of carbonate production. The influx of both planktonic foraminifera and *in situ* coccoliths showed a drastic decline. The proportion of infaunal benthic morphotypes increased. Finally, later in the early Selandian, in connection with a general sea-level rise and a reduction in the gateway between the North Sea Basin and the Tethys Sea, the sea bottom conditions became colder and more acidic. This resulted in partial dissolution of the carbonates. Despite the great environmental and sedimentological changes, the species composition of the benthic foraminifera remained remarkably similar during the Danian-Selandian transitional interval. Very few species appeared or disappeared. The changes consisted almost exclusively of variations in their relative abundance. Comparison with records from the Western Pyrenees, the Nile Basin, and the eastern North America suggests that sea-level changes across the Danian–Selandian boundary were primarily of eustatic nature.