

Benthic foraminiferal responses to operational drill cutting discharge in the SW Barents Sea - a case study.

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Petroleum related exploration activities started in the Barents Sea 1980, reaching 97 exploration wells drilled per January 2013. The biggest operational discharge from drilling operations in the Barents Sea is the release of drill cuttings (crushed seabed and/or bedrock) and water based drilling muds including the commonly used weighing material barite (BaSO_4). Barium (Ba), a constituent of barite, does not degrade and can be used to evaluate dispersion and accumulation of drill waste.

The environmental impact associated with exploration drilling within the Goliat Field, SW Barents Sea in 2006 was evaluated via a multiproxy investigation of local sediments. The sediments were retrieved in November 2014 at ~350 meters water depth and coring sites were selected at distances of 5, 30, 60, 125 and 250 meters from the drill hole in the eastward downstream direction.

The dispersion pattern of drill waste was estimated via measurements of sediment parameters including grain size distribution and water content in addition to heavy metal and total organic carbon contents. The environmental impact was evaluated via micro faunal analysis based on benthic foraminiferal (marine shell bearing protists) fauna composition and concentration changes.

Observing the sediment parameters, most notably Ba levels, reveals that dispersion of drill waste was limited to <125 meters from the drill site with drill waste thicknesses decreasing downstream. The abruptness and quantity of drill waste sedimentation initially smothered the foraminiferal fauna at ≤ 30 meters from the drill site, while at a distance of 60 meters, the fauna seemingly survived and bioturbation persisted. Analysis of the live (Nov 2014) foraminiferal fauna reveals a natural species composition at all distances from the drill site within the top sediments (0-5 cm core depth). Furthermore, the fossil foraminiferal fauna composition found within post-impacted top sediment sections, particularly in the cores situated at 30 and 60 meters from the drill site, suggests that reestablishment of the foraminiferal fauna likely commenced shortly after cessation of drilling activity.