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Sedimentology and Ichnology of a Transgressively Back-Stepped Wave-Dominated Deltaic Reservoir: Middle Jurassic Tarbert and Heather Formations, North Sea, Norway

The Tarbert and Heather formations comprise the upper part of Middle Jurassic Brent Group, the most significant hydrocarbon-bearing level in the Northern North Sea. The study area encompasses several fields flanking the eastern margin of the Viking Graben (Horda Platform).

The Tarbert Formation comprises offset and backstepped wave-dominated delta lobes displaying both retrogradational and progradational elements, deposited during incremental but progressive southwards retreat of the Brent Delta system. The overlying Heather Formation records continued incremental deepening in a shallow marine to shelf setting. The Tarbert grades upwards from the Ness Formation upper delta-plain, recording initial flooding and the onset of a major transgressive systems tract. Initial Tarbert deltaic lobes reflect progradation into restricted (brackish) basins, whereas higher cycles are fully marine, consistent with progressive transgression. Lobes in restricted basins show moderate bioturbation with sporadically distributed *Diplocraterion*, *Teichichnus*, *Thalassinoides*, *Planolites*, *Cylindrichnus*, *Skolithos*, *Palaeophycus*, and fugichnia. Lobes in marine basins are thicker, weakly and sporadically burrowed, and strongly storm-dominated. Ichnogenera diversities, however, are greater, comprising *Palaeophycus*, *Ophiomorpha*, *Macaronichnus*, *Planolites*, *Helminthopsis*, *Teichichnus*, *Chondrites*, *Siphonichnus*, *Diplocraterion*, *Skolithos*, *Asterosoma*, *Taenidium*, *Thalassinoides*, *Anconichnus*, fugichnia, and cryptobioturbation.

The Tarbert contact with the overlying Heather is strongly diachronous, varying from structurally up-dip (west) erosional onlap to structurally down-dip (east) gradational contacts, associated with fault block tilting. Complete successions show gradational contacts marked by marine flooding. The Heather Formation records incremental but short-lived progradation of shelf, offshore and lower shoreface environments during progressive deepening. Facies are pervasively bioturbated, manifest by fully diverse distal, archetypal and proximal *Cruziana* ichnofacies, respectively.