

THE GEOLOGY IN THE LONGYEARBYEN AREA

Lower Cretaceous and Tertiary (Paleocene and Eocene) age sediment are widely exposed on the mountain slopes and plateaus in Longyearbyen and its surroundings.

The Cretaceous Carolinefjellet Formation was deposited in prodelta to distal marine shelf conditions succeeding the fluvial and delta progradation of the underlying Helvetiafjellet Formation. Along the road from the airport to Longyearbyen shales and sandstones of the Langstakken Member of the Carolinefjellet Formation crops out. The member consists of alternating shales, siltstones and flaggy, thin-bedded grey sandstones deposited in inner shelf conditions.



Figure 1 Gruvefjellet on the eastern side of Longyeardalen. The light coloured beds in the middle part of the mountain side are sandstones of the Firkanten Formation (note the mine entrance), followed by the shales of the Basilika Formation. Sandstones of the Grumanybyen Formation crops out in the steep cliffs at the top of the mountain (photo A. Mørk)

On the mountain sides along Longyeardalen, Tertiary sediments of the Firkanten and Basilika Formations can be seen (Figures 1 and 2). The uppermost parts of the mountain sides and the plateaus consist of the Grumantbyen Formation. The Firkanten Formation in this area is subdivided into the Todalen and Endalen members. The lower Todalen Member consists of some 3-5 rhythmic upwards coarsening developments from shale – siltstone – sandstone – coal. This member contains the commercially most important coal deposits of Svalbard. The rhythmic successions represent repeated progradations and retrogradations of a deltaic system, which built out mainly from the north-east and east of

the basin. The overlying Endalen Member crop out in the steep cliffs on top of the mountainsides. It consists of stacked series of sandstones, which often show an upward-coarsening trend. The sandstones are well bioturbated or cross-stratified, with interbedded thin conglomerates, clay ironstones and minor shales. Competent sandstone intervals represent transgressive and regressive development of a deltaic to barrier shorelines, building out from the north-east.

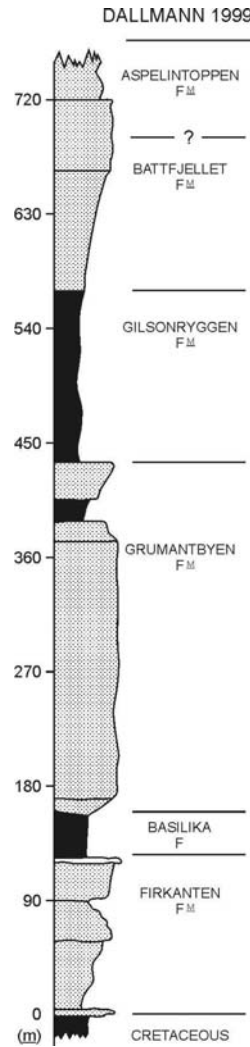


Figure 2 General stratigraphy of the Tertiary succession in the Longyearbyen area (from Steel 1977)

The succeeding Basilika Formation consists primarily of shales, mudstones and siltstones, usually organized in repeated, upward-coarsening succession. Rounded dropstones of metamorphic basement and dolerite lithologies are common and thin bentonite interbeds are present. The unit represents muddy shelf conditions, with repeated influx of silty

sediments from the east and north-east. The overlying Grumantbyen Formation consists of highly bioturbated sandstones deposited as an offshore bar complex.

At Nordenskiöldfjellet to the south of Longyearbyen the Grumantbyen Formation is followed by the shales of the Gilsonryggen Formation and the sandstones of the Battfjellet Formation (Figure 3). The shales represents the deeper water deposits of the foreland basin adjacent to the growing Tertiary foldbelt, while the sandstones represents a late stage of coastal progradation and infill of the basin, when sediment input finally outpaced subsidence and the basin was filled to sea level.

A BARRIER SHORELINE - SHELF
TRANSITION
BATFJELLET / GILSONRYGGEN
FORMATIONS (TERTIARY)

Svalbard (R.J. Steel)

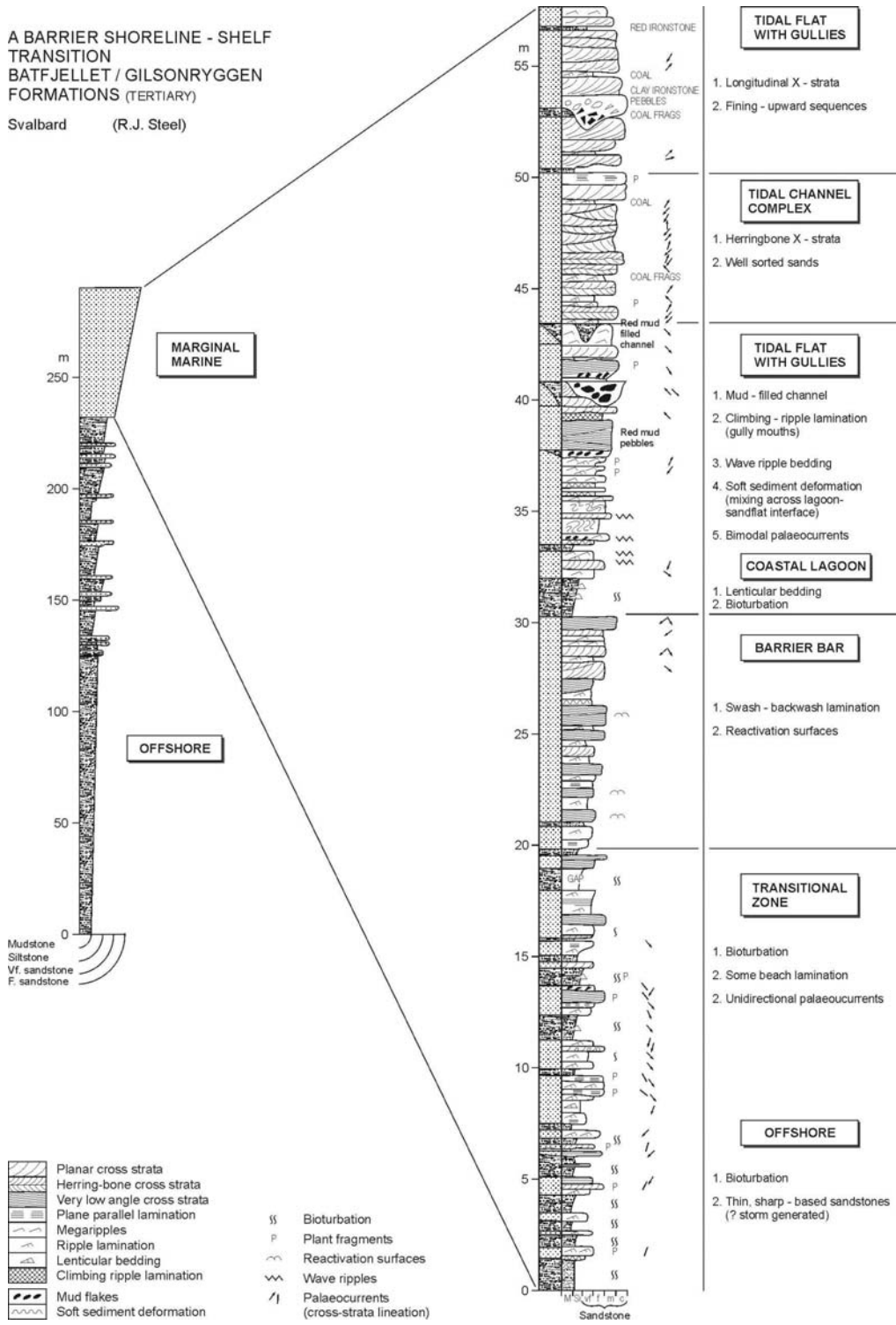


Figure 3 The Battfjellet Formation at Nordenskiöldfjellet (from Steel 1977)