

THE UPPER ORDOVICIAN OF HADELAND

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The Ordovician stratigraphy of Hadeland bears few similarities to that around Oslo and thus caused problems when attempts were made to force the Oslo stratigraphical scheme upon it. The dominantly shaly Cambrian to middle Ordovician succession is tightly folded, whereas more open folds plunging westwards characterise the upper Ordovician and Silurian

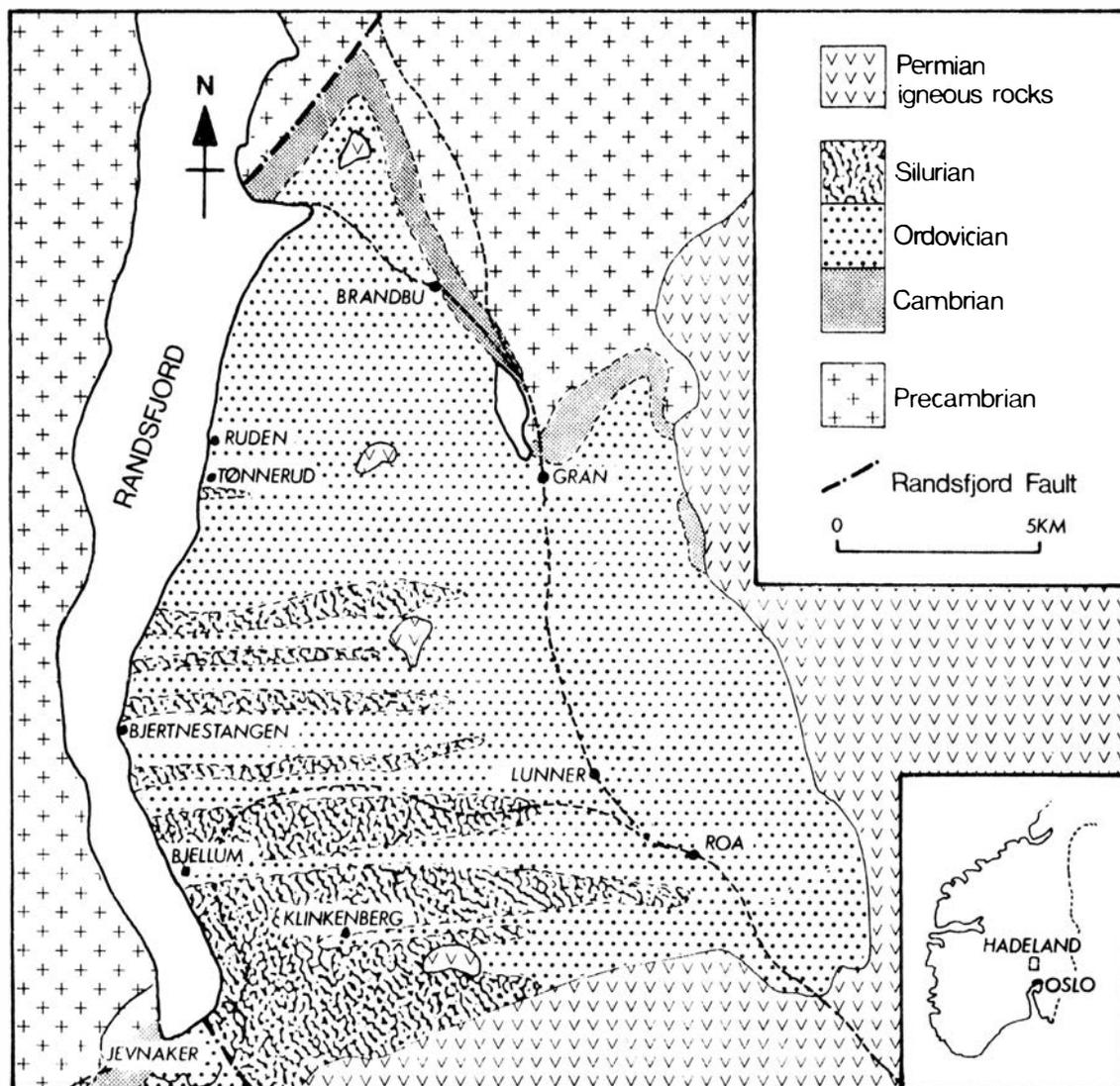


Figure 1. Simplified geological map of Hadeland (modified after Owen 1978).

sequence. This part of the succession comprises several thick, competent units and has been affected by extensive strike faulting, some of which is high angle reverse, and by a set of wrench faults. There is an overall younging of the Lower Palaeozoic succession towards the south-west (Fig. 1). The aim of this excursion is to examine briefly the upper Caradoc to lower Llandovery succession in Hadeland in order to establish a broader context for the very spectacular development in the Mjøsa area.

The history of research on the Ordovician of Hadeland was summarised by Owen (1978), who introduced a modern lithostratigraphical terminology (Fig. 2). The Llanvirn to middle Caradoc sequence is composed largely of shales, the Kirkerud group. The upper part of this is similar lithologically and in some faunal elements to the Furuberg Formation which underlies the Mjøsa Limestone to the north. The Kirkerud group

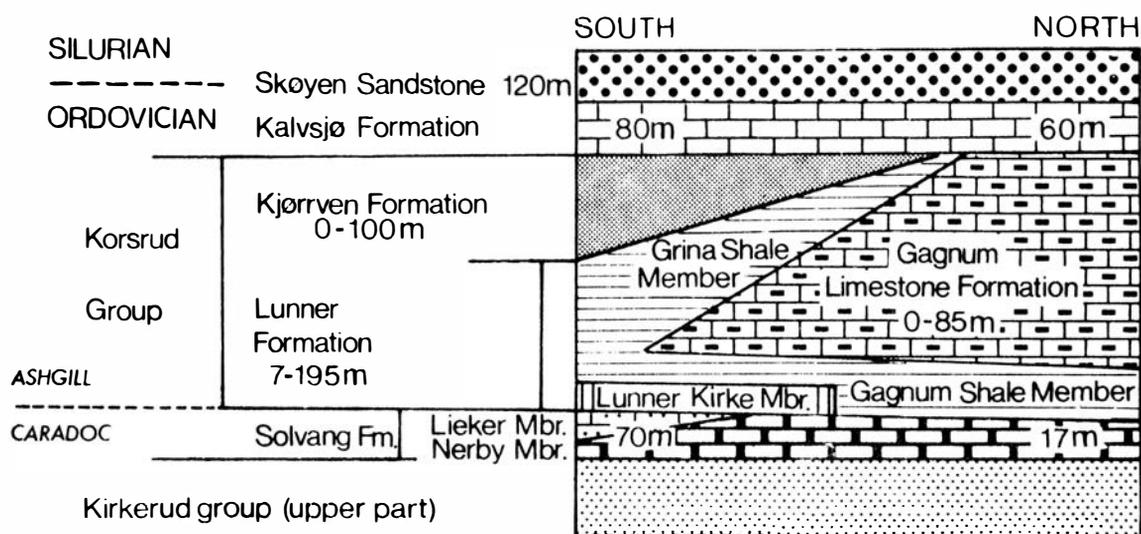


Figure 2. The upper Ordovician stratigraphy of Hadeland. Note that the Kirkerud group extends down to the lower Llanvirn.

in Hadeland is overlain by the Solvang Formation which comprises nodular limestone (the Nerby Member) over most of the area. The uppermost part in the south is, however, developed as bedded limestones and shales (Lieker Member) similar to the development around Oslo (= 'Upper Chasmops Limestone'). The Solvang Formation has a late Caradoc (to lowest Ashgill in part of Ringerike) fauna (Bruton & Owen 1979) and is a partial lateral

equivalent of the Mjøsa Limestone (see Opalinski & Harland 1981). The Ashgill succession in Hadeland shows a dominantly limestone sequence in the north passing southwards into a thicker, more shaly succession (Fig. 2). It is capped over the whole district by the Skøyen Sandstone, a supraformational unit which extends into the Silurian. Much of the Ashgill is absent in the Mjøsa area but the Llandovery arenaceous unit overlying the Mjøsa Limestone is a lateral equivalent of the upper Skøyen Sandstone.

The itinerary follows the Randsfjord which lies along the fault-line here marking the western edge of the Oslo Graben. Outcrops of Llandovery sandstones and red and green marine shales are seen en route.

- 1:1 BJELLUM (NM 78058280) The Skøyen Sandstone is well exposed here. The strata are vertical and locally tectonised but show the thick calcareous sandstones near the base of the unit passing up into thinner bedded sandstones with shale division. These are succeeded by bioclastic limestones of the overlying formation which are packed with comminuted brachiopod and bryozoan debris and overlain by banks composed largely of pentamerid brachiopods. The Skøyen Sandstone is one of the best exposed units in Hadeland and shows a wide variety of sedimentary structures indicating high-energy shallow marine deposition. Brachiopods, crinoids, gastropods, corals and rare trilobites occur at various levels in the unit. Several other roadside outcrops of the Skøyen Sandstone and the overlying units are seen on the 10 km between Bjellum and the second locality, Tønnerud.
- 1:2 TØNNERUD (NM 8259225) The road cutting here affords a continuous section from the upper Kirkerud group to the Gagnum Limestone Formation and is part of the most northerly outlier of late Caradoc and younger rocks in Hadeland. A similar profile on the nearby shore of the Randsfjord was described by Kiær (1926) and has been studied in detail recently by Dr. J.F. and Mrs. T. Bockelie.
- Some 20 m of the upper Kirkerud group crops out in the northern part

of the road section and yields a diverse fauna dominated by the trilobites Toxochasmops extensus, Lonchodomas aff. rostratus and Stenopareia glaber, the brachiopods Leptestiina indentata, Sowerbyella hadelandica and Leptaena strandi and the bryozoan Diplotrypa sp. Corals, crinoids and gastropods also occur. A 1.2 m thick bed of tightly nodular limestone within shales and limestones of the uppermost part of the group is seen here and throughout Hadeland, and is anticipatory of the lithology of the overlying Nerby Member of the Solvang Formation. This unit constitutes the lowest part of Kiær's 'Sphaeronid Limestone' - a tripartite unit now viewed in terms of the lithostratigraphical scheme applied to the rest of Hadeland.

The Solvang Formation at Tønnerud is 16-17 m thick and is poorly fossiliferous. The overlying Gagnum Shale Member of the Lunner Formation is 7 m thick and contains a fauna including the cystoid Haplosphaeronis kiaeri, the brachiopod Leptaena minuta and the trilobites Tretaspis ceriodes angelini, Platylichas cf. laxatus and Atractopyge progemma. Bryozoans, gastropods and bivalves are also known. The Tretaspis species suggests that the base of the Lunner Formation is diachronous and is older here than elsewhere in Hadeland. Approximately 25 m of the Gagnum Limestone Formation is exposed at Tønnerud and contains a diverse but generally sparse fauna dominated by cystoids, trilobites and brachiopods. The top of the formation is not exposed at Tønnerud but limestones of the overlying Kalvsjø Formation crop out a short distance to the south.