

New occurrences of mega-lenses of the Särsv Nappe in northern Trøndelag, Norway

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The Särsv Nappe can be traced westwards from Jämtland into Trøndelag where it reappears as large scale lenses. The latter are dominated by tholeiitic dikes intruded into feldspathic sandstones. The internal structure of these lenses is revealed in the orientation of the dikes, showing that the units have been rotated. The existence of these lenses provides new evidence of pinch-and-swell deformation of the nappe pile.

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The Särsv Nappe (Strömberg 1955, 1961) is a rootless tectonic unit overlying the Offerdal and associated nappes and underlying the Seve-Köli Nappe Complex. Its main composition is that of a feldspathic sandstone sequence intruded by a tholeiitic dike-swarm, the Ottfjäll dolerites. Until recently this nappe was thought to be restricted to Sweden, thinning westwards and wedging out near the Norwegian border. However, in 1977, Gee described a Särsv unit in the western limb of the Tømmerås Antiform, about 35 km southwest of the area dealt with in this paper.

During mapping of the southwestern margin of the Grong-Olden Culmination from Torrön in Jämtland, Sweden, to Store Øyingen in northern Trøndelag, Norway (Fig. 1), units comparable with the Särsv Nappe were found in four isolated occurrences. In all cases they are overlain by Seve amphibolites and schists and underlain by Offerdal Nappe meta-arkoses and schists or underlying units. In the southernmost part of the area, the Särsv Nappe, composed of concordant meta-sandstones and greenstones, wedges out northwards but reappears at the same tectonic level as a small lens north of Grønningen, in the eastern limb of the Tømmerås Antiform. Further to the northwest, on the northern side of Store Øyingen, in the western limb of the antiform, the Särsv-like unit reappears again as two mega-lenses. These lenses were rapidly mapped in 1977 and are the subject of further studies. The eastern unit (Turtbakkjørna lens) is better exposed (Fig. 2, 3) and is described further below. The western lens (Svarttjørna) and its relation-

ship to the overlying and underlying units is less well known.

The Turtbakkjørna lens

This lens extends over an area of 4×2.5 km. (Figs. 2, 3). It has a maximum sediment thickness of about 2000 metres and is dominated by basic dikes (c. 75%) with subordinate meta-sediments. On Foslie's map (1959) this unit is marked as porphyrite or amphibolite. Springer Peacey (1964) describes it as a unit of amphibolite, thinning and disappearing northwards. The airphoto reveals clearly the orientation of the dikes, which strike northwest-southeast and with a general dip at high angles to the southwest; they totally dominate the internal structure of the lens. Close to its margins, the dikes are deflected – to the east at the southern margin and to the west at the northern one. In these contacts mylonites are developed. In the inner parts of the lens the dikes cut the bedding of the sediments at approximately right angles. Towards the outer parts of the lens the bedding and the dikes are rotated towards each other and they tend to be conformable at the margin. At the margins a schistosity is developed cutting through dikes and sediments. Folding on a small scale occurs.

The dikes

The dikes have generally a basic composition; their texture varies from porphyritic to aphanitic.

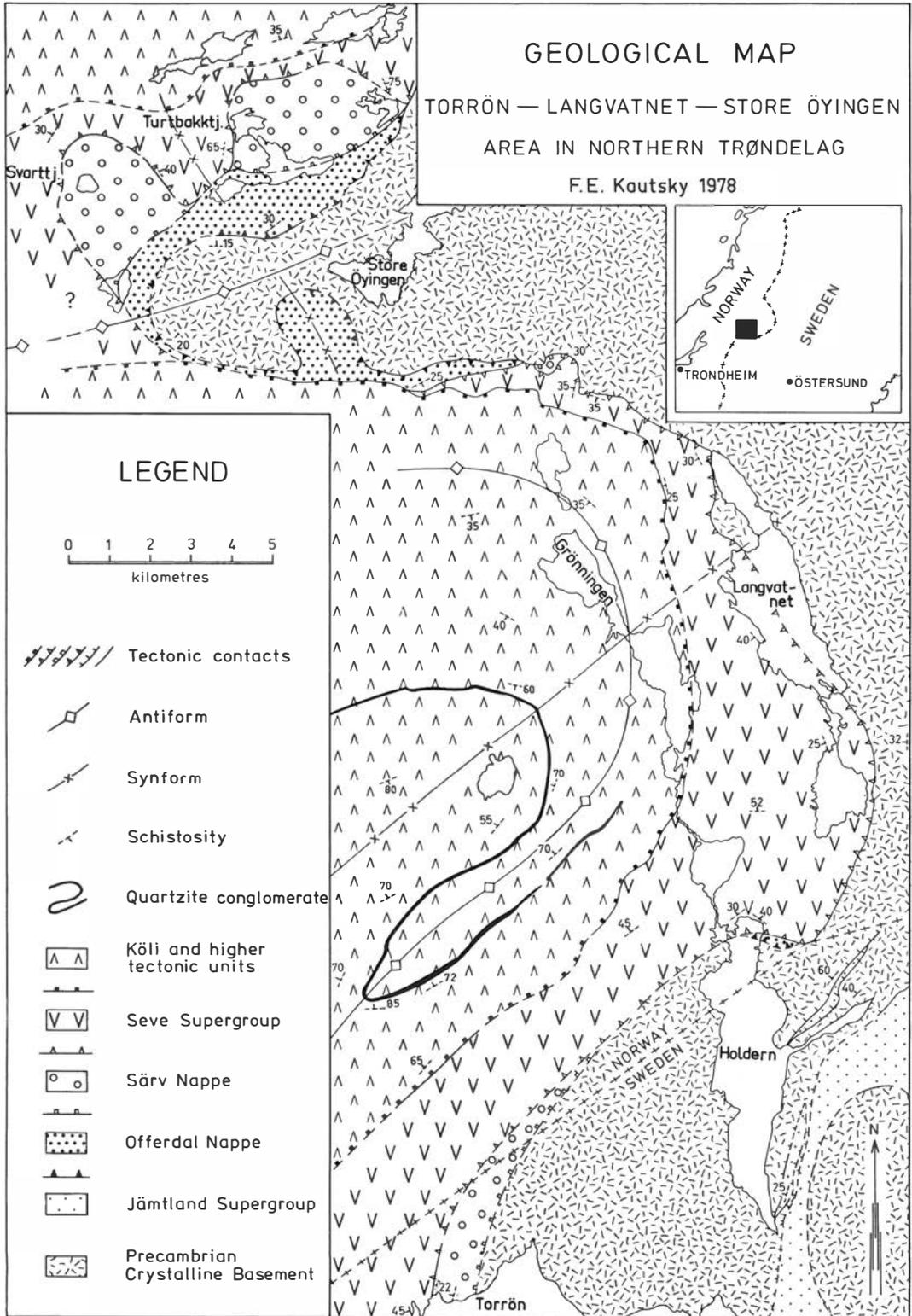


Fig. 1. Geological map.

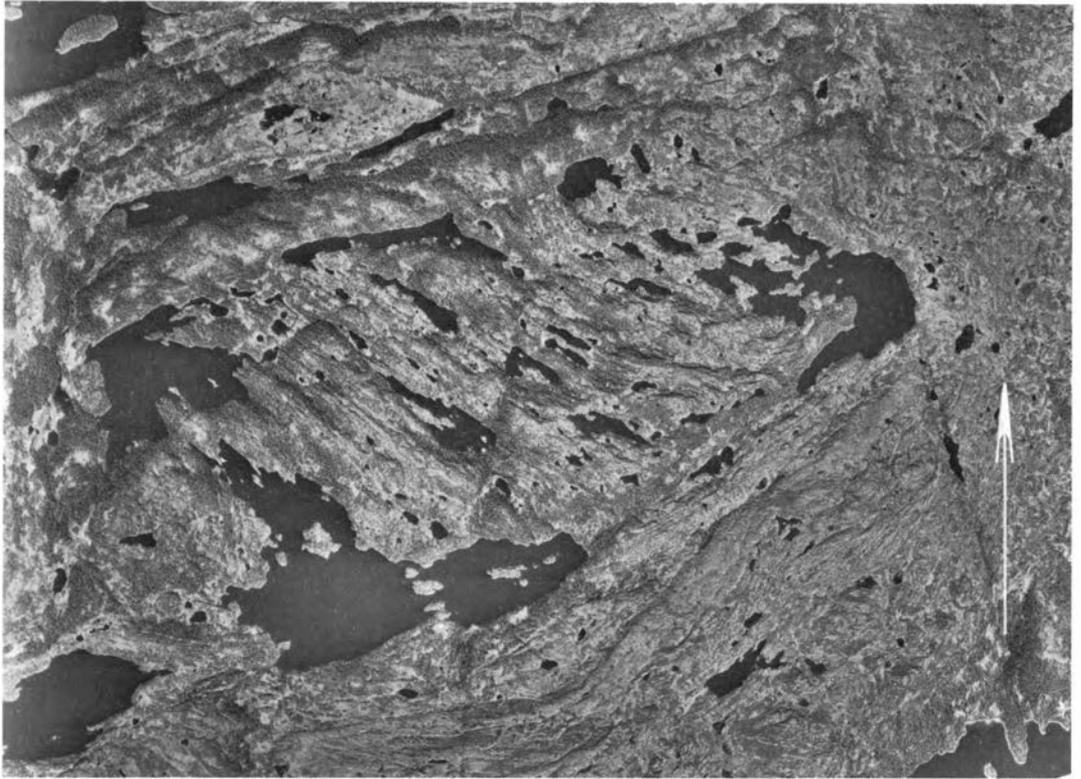


Fig. 2. Vertical air-photo of the Turtbakkjørna lens. (Published by permission of NGO.)

tic. The predominating dike is a fine-grained porphyritic variety, locally with very abundant plagioclase phenocrysts. Composite dikes are frequent and chilled margins are often well developed. Xenoliths of early, coarser phenocrystic dolerite can be observed in the younger dikes.

Thin-sections taken in a profile across the lens show a successive alteration of the plagioclase phenocrysts towards the contact. In the centre of the lens, phenocrysts of a zoned plagioclase $An_{17}-An_{33}$ (oligoclase-andesine) are preserved containing small needles (clinozoisite?). The groundmass consists of amphibole, plagioclase, quartz, epidote, clinozoisite and white mica. Small chloritized garnets are mainly concentrated to the rim of the phenocrysts. Sphene, leucoxen and opaque minerals also occur. Highly altered clinopyroxene (to amphibole) has been observed. Towards the margins of the lens, the plagioclase is successively altered and, at the contact, consists mainly of epidote and clinozoisite. In the groundmass biotite starts to grow. Garnets are more abundant in the periphery parts of the lens than in the centre.

Geochemical analyses (Z. Solyom, pers. comm.) show that these dikes have a tholeiitic composition similar to the Ottfjäll dolerites of the Särvi Nappe in the main area of development in Sweden.

The sediments

The sediments are clearly subordinate to the dikes and are less well exposed. They occur in small valleys and gullies between the dikes. Often the sediments are only exposed in direct contact with the dikes. Sometimes it is possible to observe xenoliths of sediment with preserved cross-bedding in the dikes. As is apparent from the map, the sediments generally dip $30-50^\circ$ to the northwest. They consist mainly of a feldspathic sandstone with minor intercalations of pelitic material. Banded quartzites occur and in the northern parts there is a calcareous horizon. Cross-bedding indicates that the sequence within the lens is the right way up. The amount of biotite is high and chloritized garnets are widespread.

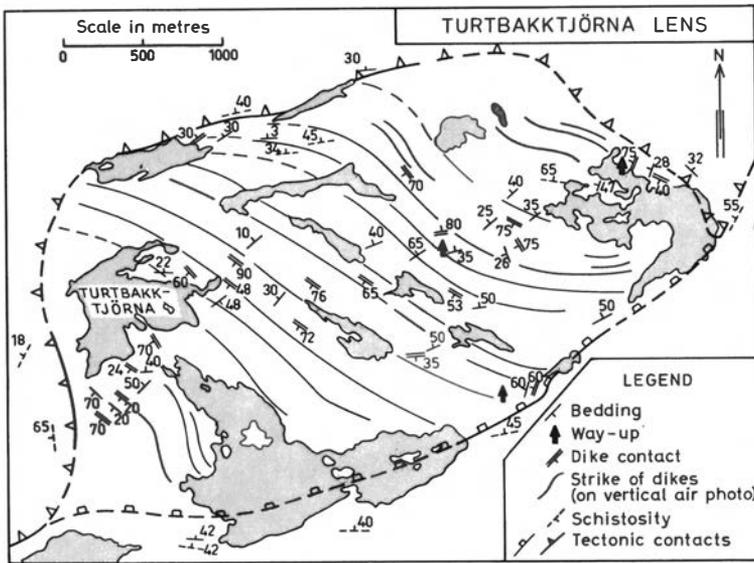


Fig. 3. Orientation of sediments and dikes in the Turtbakktjörna lens.

Concluding remarks

The wedging out of the Särvi Nappe in the south-eastern part of the area described here and its reappearance as lenses in the same tectonic position further northwest provide evidence of large scale boudinage (Fig. 1). Both overlying and underlying tectonic units also display necking and wedging which indicates that stretching of the nappe pile occurred after the thrusting together of the nappes. One possible mechanism for this has been discussed elsewhere (Ramberg 1976, Gee 1976, 1977). They support the idea that gravitational collapse (Ramberg 1966) has played major role in the late stages of nappe displacement towards the east. Another possible mechanism for the deformation of the units is related to the doming of the basement, causing a layer-parallel shearing movement (Dixon 1975) in the overlying nappes and resulting in necking and lensing of the units.

The existence of Offerdal, Särvi, and Seve units along the southern basement margin of the Grong-Olden Culmination provides further evidence for the correlation of these units from the Sylarna Antiform at the Norwegian-Swedish border to the Tømmerås Antiform (Gee 1977) in northern Trøndelag.

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