

Caledonian granitoids on the island of Smøla, central Norway

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Granitoid batholiths are an important part of the upper allochthons in the Scandinavian Caledonides. In central Norway, the Smøla-Hitra Batholith covers a substantial area, stretching approximately 150 km from Grip and Smøla islands in the southwest to Halten in the northeastern part of the Froan archipelago.

Recent structural studies, along with a drilling campaign, have been conducted on Smøla island. This research is part of the BASE (Basement Fracturing and Weathering on- and offshore Norway) project, funded by the Norwegian Research Council. As a smaller component of this project, we have also investigated the granitoid rocks on Smøla and the nearby northern islands. The region was previously surveyed in the late 1960s (Fediuk & Siedlecki, 1977), and a summary of the batholith was published by Gautneb & Roberts (1989). Detailed mapping of the southwestern areas of Smøla and the adjacent islands was carried out by Gautneb (1988).

The intrusive relationships on the Smøla island are best studied along the coast where outcrops are excellent. In contrast, the flat-lying interior parts of the island offer very few and scattered outcrops, making it challenging to verify the lithological variation as depicted on the printed map of Fediuk & Siedlecki (1977). The rocks are virtually undeformed and may have a well-defined mineral orientation or weak foliation. Some shear zones and brittle faults, probably related to late- or post-Caledonian tectonics, are present.

Apart from an area with mainly gabbroic rocks in western Smøla, the predominant rock types are diorite to tonalite. Granite and granodiorite are subordinate. Over large areas, the diorites show evidence of complex magma mingling and locally mixing, forming breccia-like rocks with several generations of mafic to felsic lithologies. Several types of dykes are common and include dolerite, fine-grained to porphyritic diorite, composite dykes, granophyre dykes, and aplite/pegmatite.

Representative samples collected from the central to northern parts of Smøla were analyzed for major and trace elements including REE. The investigated samples vary in composition from mafic gabbro to diorite and leucocratic tonalite and granodiorite. The rocks are low-K calcic to calc-alkaline and magnesian in composition, like major plutonic units from Hitra and Frøya. There are also examples of high-K calc-alkaline quartz-monzonite like those reported by Gautneb & Roberts (1989) from southwest Smøla as well as from the Froan archipelago north of Frøya.

There are few modern geochronological data from the Smøla. Available results from the entire Smøla-Hitra Batholith show that the low-K calc-alkaline rocks from Hitra, Frøya and Smøla, that intruded older meta-supracrustal rocks and gneisses, are late Ordovician to possibly early Silurian in age. The alkali-calcic plutons in the Froan archipelago, as well as in southern Smøla, are probably somewhat younger and were emplaced in the early to middle Silurian. Additional geochronological and isotopic data would be required to better constrain the plutonic evolution and tectonic models for the Smøla-Hitra Batholith. Samples for Ar-Ar dating is in progress, awaiting results.

References

- Fediuk, F. & Siedlecki, S. 1977: Smøla. Description of the geological map 1321 I – 1:50000. NGU Bulletin 330, 1-26.
- Gautneb, H. 1988: Structure, age and formation of dykes on the island of Smøla, Central Norway. *Norwegian Journal of Geology* 68, 277-288.
- Gautneb, H. & Roberts, D. 1989: Geology and petrochemistry of the Smøla-Hitra Batholith, Central Norway. NGU Bulletin 416, 1-2.