The Baring Granite and St. Stephen Gabbro of New Brunswick and Maine: petrology, geochemistry, and tectonic setting

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The Baring Granite and St. Stephen Gabbro are a probable comagmatic suite situated in the area of St. Stephen, New Brunswick and Calais, Maine. The intrusions are traditionally included as part of the Moosehorn Igneous Complex, in addition to the Staples Mountain Gabbro, the Calais Gabbro-Diorite and several small unnamed diorite intrusions, within the Coastal Maine Magmatic Province. They intruded the Cookson Group of the St. Croix terrane of the northern Appalachian orogen, a sequence of quartzo-feldspathic sedimentary rocks, quartzite, carbonaceous pelite, and minor mafic tuff. The age of the intrusions is not well constrained but previous U-Pb geochronology suggested a Silurian age. A suite of samples has been collected from the intrusions for more detailed investigation of the petrology, petrogenesis, tectonic setting, and age.

The St. Stephen Gabbro consists of complexly intermingled olivine gabbro, olivine gabbronorite, and olivine norite, with less abundant gabbro, gabbronorite, norite, troctolite, anorthosite, and dunite. Previous chemical studies are inconclusive with respect to chemical affinity and tectonic setting at the time of emplacement. The pluton hosts numerous discrete sulphide mineralization zones. Mineralization has been interpreted to have formed in two stages, including orthomagmatic (Ni-Cu-Co) mineralization and a later hydrothermal mineralization (Ni-Cu-Zn).

The Baring Granite is coarse-grained, hypidiomorphic, granular, and is composed of microcline, plagioclase, quartz, hornblende, and biotite. Accessory minerals include zircon, apatite, and titanite. The mafic mineral content of the Baring Granite is quite low, generally 10% or less. Locally, the Baring Granite and St. Stephen Gabbro are intensely intermingled, with inconclusive cross-cutting features, such as enclaves and dikes visible at the outcrop scale. Cuspate intermingling textures suggest that the granitic magma intruded the gabbroic rocks prior to complete crystallization. Diorite is typically present between the gabbroic and granitic rocks. The cross-cutting relationships, where a gabbro outcrop is cut by diorite and then by granite may suggest that intense intermingling occurred at the onset of granite intrusion, but became less intense as emplacement of the Baring Granite continued. Comparison of the Baring Granite and St. Stephen Gabbro to other Silurian-Devonian plutons of the Coastal Maine Magmatic Province and equivalent (?) units in New Brunswick such as the Bocabec Complex may help in the definition of terrane boundaries in southwestern New Brunswick and southeastern Maine.