11 K/2 1:50 000 CANADA EDITION 3 11 K/2

BADDECK
NOVA SCOTIA

Scale 1:50 000 Échelle

RECONNAISSANCE GEOLOGICAL MAP OF THE SOUTHERN CAPE BRETON HIGHLANDS – Marginal Notes to Accompany Map Sheets 116/10, 116/7, 116/2

The Cape Breton Highlands form a steep-sided, fault-bounded plateau underlain by Proterozoic to Carboniferous crystalline rocks and surrounded by low-lying Carboniferous sedimentary rocks. These three map sheets show the geology of the crystalline rocks of the southwestern Highlands between the southern boundary of Cape Breton Highlands National Park and the Cabot Trail in the vicinity of Middle River. The area is heavily forested with outcrop restricted to stream valleys and logging roads. Detailed mapping of streams and roads was undertaken between 1979 and 1981 in the area bounded by Fielding Road, the Cabot Trail, and the North Baddeck River (parts of 116/7 and 116/2); a more detailed map of this area is available on a scale of 1 : 25000 (Crowell Mountain – Middle River area). The rest of the map (parts of 116/7, 116/10) represents a survey of the Nova Scotia Forest Industries road network carried out in 1981–82; no detailed mapping has been done by this author north of Fielding Road. Overlapping areas mapped in detail by Currie (in press), Blanchard (1982), Barr and Macdonald (1982), Doucet (1983), Raeside et al. (in press), and Crew (in press) are indicated on the map.

The oldest rocks in the area are late Proterozoic metamorphic rocks including undivided gneisses (E_{gn}), George River Group metasediments (E_{gm}), and low to medium grade metavolcanic and metasedimentary rocks (E_{vm}). The gneisses are mainly semi-pelitic to pelitic in composition, with small areas of amphibolite (E_A) and tonalitic orthogneiss (E_O) recognized locally. They are compositionally banded and well foliated and contain several generations of pegmatite bodies. The main north-south trending foliation of the gneisses, defined by muscovite and biotite, is generally a second generation reclined overprint of the original gneissosity. Horizons of feldspathic quartzite within the gneisses near First Fork Brook and marble north of Middle River suggest that the high grade rocks of the central Highlands are in part equivalent to metasediments of the George River Group which occur on the eastern margin of the mapped area. Although orthoquartzite and marble characteristic of the George River Group occur in the map area, semi-pelitic compositions are more common and amphibolite and calc-silicate zones of uncertain origin have also been recorded; the correlation of these metasediments with the George River Group should be regarded as tentative. Low to medium grade metavolcanic and metasedimentary rocks underlie large parts of the western and southern Highlands. Rock types include crystal-lithic tuffs, felsic pyroclastic rocks of various types, minor rhyolitic and mafic flows, fine grained pelitic sediments, and minor semivolcanic and conglomerates. The distribution of these rocks is complex in detail and presumably partly reflects an original complex interfingering of various units. However, the present outcrop pattern of these units must be regarded as tectonic – in both the Cheticamp River and Middle River areas they have been affected by at least one generation of isoclinal folding followed by upright folding and shortening along shear zones (Crew, in press; Doucet, 1983). The rocks have been affected by greenschist to lower amphibolite facies metamorphism with grade increasing towards the central Highlands. The age of the volcanic and sedimentary rocks with respect to the gneisses is uncertain. There is no evidence of a stratigraphic unconformity in the study area, and in the Cheticamp River and Middle River areas the transition from schists and phyllites to gneisses appears gradational, with telescoping along high strain zones (Crew, in press; Doucet, 1983). The high grade rocks are intruded by the late Proterozoic Baddeck Lakes tonalite complex which shows faulted contacts against the lower grade rocks. The low grade rocks are intruded by the Cambrian Cheticamp pluton which is brecciated but not foliated and are thus probably also Precambrian. These rocks are tentatively interpreted as a volcanic and sedimentary complex coeval with the quartzites to the east in the basis of lithologies transitional between silicic pyroclastics and quartzites that occur near Rocky Brook and Sugarloaf Mountain. This implies that the entire metamorphic complex formed from a single protolithic package that underwent low to high grade metamorphism in late Proterozoic times.

The metamorphic rocks are intruded by diorites to granitic plutons of various ages. The Baddeck (Bell?) Lakes complex (E_{Bk}) is a variably foliated, medium grained tonalite to diorite complex that has been dated as 752 ± 26 Ma by Rb-Sr whole rock methods (Jamieson, in press). (Note that on National Topographic Survey maps used in 1979–82, the lakes identified as the "Bell Lakes" on sheet 116/7 were identified as the "Baddeck Lakes" and reports using this name have been published (Jamieson and Crew, 1981; Jamieson, in press).) This pluton intrudes metasedimentary rocks and is cut by mafic dykes of unknown age. It is faulted against metavolcanic rocks on its western margin, and is cut by major shear zones in the east. Its eastern limit has not been determined. Other diorites and tonalitic rocks to the north (E_{Bk}) have not been mapped in detail. They are generally similar to the Baddeck Lakes complex except for a somewhat more mafic composition. In the vicinity of North River they intrude gneisses and quartzites of the George River Group. These plutons are part of a belt of tonalites that extends from Ingonish through the eastern Highlands (Jamieson and Crew, 1983); plutons of various ages are present but few have been mapped in detail (Raeside et al., in press).

In the central part of the map area variably foliated fine, medium and coarse grained granitic rocks (E_{Bk}) are common. Their age is unknown but they must postdate the gneisses and predate undeformed Devonian granites. A medium grained, foliated, two-mica granite occurring at the northeastern limit of the mapped area ("Park Spur granite") resembles a foliated version of the Cambrian Cheticamp pluton and may be of similar age. Foliated granites of this type occur east of the Margaree Valley near John Peters Mountain (E_{Bk}). Coarse grained foliated granites with prominent K-feldspar augen (E_{Bk}) are common in the Taylors Barren – Egypt Highland area (Doucet, 1983).

Lower Paleozoic granitic rocks have been identified in the western Highlands (Cambrian Cheticamp pluton (ϵ_{γ}); Barr and Macdonald, 1982) and the eastern Highlands (Silur-Ordovician Cape Smoky pluton; Barr et al., 1982; not shown on this map) but these have not been mapped in detail by this author. Granitic rocks of uncertain age have been mapped in the southern Highlands. These include the Hunan Brook leucogranite (E_{Bk}) which may be a highly altered phase of a Devonian granite to the north, and the Leonard McLeod Brook diorite-microgranite complex (E_{Bk}). The Leonard McLeod Brook complex in places appears to be subvolcanic to Middle Devonian rhyolites (Jamieson and Doucet, 1981) but it is so deformed and altered by shear zones that most contact relationships are equivocal. The rocks are generally fine grained and well developed intrusion breccias and local hybrid textures have been observed, particularly near the North Baddeck River.

Devonian to Carboniferous granitic rocks are prominent in the central Highlands. The North River monzogranite (D_{NR}) is a medium grained biotite-hornblende monzogranite to granodiorite with local aplitic and pegmatitic phases. It is weakly foliated to undeformed and has a distinctive blank and white appearance with rare centimetre sized K-feldspar which in the east develop into megacrysts. It intrudes gneisses and foliated granites in the vicinity of the Highland Road – Fielding Road junction, and is cut by the northern extension of the Skerwin Brook shear zone. It has been dated at 401 ± 13 Ma by Rb-Sr whole rock methods (Jamieson, in press). The Salmon Pool granite (D_{SP}) is a fine grained syenogranite associated with minor gabbro extending from the Cheticamp River south to Jim Campbell's Lake. Its age is uncertain but it bears some similarity to the Leonard McLeod Brook complex, and thus may be as old as Devonian, and has also been reported to intrude the Margaree granite east of the mapped area (Currie, in press) and thus may be as young as Carboniferous. The megacrystic Margaree granite (C_{m}) is the youngest pluton in the study area. It has a distinctive rapakivi texture, and is associated with rhyolite porphyry dykes on its margins. It is offset by a major fault zone and has been dated at 350 ± 4 Ma by Rb-Sr (Jamieson, in press).

Upper Devonian to Lower Carboniferous volcanic and sedimentary rocks occur along the southern and western margins of the Highlands. In the South, rhyolites, felsic pyroclastics, siltstones, conglomerates, and minor intermediate flows occur at Macmillan Mountain (D_{MM}). These have been dated at 364 ± 10 Ma (Jamieson, in press) and appear to be unconformably overlain by buff-weathering arkose and conglomerate of the Horton Group. The Fisset Brook Formation (D_{FB}) in the western part of the study area includes basalts, rhyolites, and associated ash flow tuffs and epiclastites interbedded with red siltstone and arkose. Upper Devonian plant fossils of the genus Archaeopteris have been found in siltstones interbedded with volcanic breccia north of Forest Glen Brook (Forbes et al., in prep.). The volcanic rocks are faulted against arkose and conglomerate of the Horton Group that resemble sediments within the volcanic sequence, Lower Carboniferous sediments of the Horton and Windsor Groups (C_{H}) bound the Highlands on all sides but have not been investigated in detail. A single basalt flow occurs within the Horton Group on the North Baddeck River (C_{H}), in general, contacts between the Carboniferous sediments and older crystalline rocks are obscured by steep faults.

Ductile shear zones are of major importance in the southern Highlands, particularly in the Cheticamp River and Middle River areas where they juxtapose low grade and high grade metamorphic rocks. Major shear zones cut intrusive and volcanic rocks along Fisset Brook and Skerwin Brook; these shear zones give an Rb-Sr date of 394 ± 28 Ma which must be regarded as a maximum (Jamieson, in press). The sense of offset is sinistral but dip-slip lineations suggest a component of intruding. North-southtrending shear zones in the central part of the study area are of uncertain age but may represent an early stage of movement along the Kapp – Northeast Margaree River fault zone. Steep faults occur throughout the study area; only the major ones are shown on the map. Along the upper reaches of the Northeast Margaree River major zones of cataclasite mark the extension of the Kapp – Northeast Margaree River fault zone. These faults cut the Margaree granite with a central sense of offset; most of these faults also show evidence of vertical displacements. Thrust faults occur in the southern part of the area near Leonard McLeod Brook. They are generally not important, but may represent the latest phases of movement on the major ductile shear zones noted above.

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