

**GEOLOGY OF THE SOUTH-CENTRAL CAPE BRETON
HIGHLANDS
(PARTS OF NTS SHEETS 11K/07 AND 11K/10),
INVERNESS AND VICTORIA COUNTIES, NOVA SCOTIA**

by

R. J. Horne

ABSTRACT

Bedrock mapping (1:10 000 scale) of pre-Carboniferous rocks in the south-central Cape Breton Highlands was undertaken during the 1990 and 1991 field seasons. The mapped area occurs mainly within the Aspy Terrane, which is underlain by low- to high-grade, Ordovician to older, metastratified units and Ordovician to Devonian or younger plutons. A small area included in the Bras d'Or Terrane, occurring in the northeastern part of the mapped area, is underlain by Precambrian diorite. The results of this mapping, including unit subdivisions, structure, metamorphism and economic geology are presented and the preliminary results of new U-Pb (zircon) age dates for three plutonic units are given.

Medium- to coarse-grained diorite in the northeastern corner of the mapped area belongs to the Kathy Road dioritic suite (E_{KR} ; 560 ± 2 Ma, U-Pb, zircon, Dunning et al., 1990). A fault contact is interpreted between this unit and younger rocks of the Aspy Terrane which dominate the mapped area. Aspy Terrane units include: the primarily metasedimentary, low- to medium-grade (garnet-staurolite zone) Jumping Brook metamorphic suite (EO_{JB}), and medium- to high-grade (kyanite±sillimanite zone) Middle River metamorphic suite (EO_{MR}); gneissic (kyanite±sillimanite zone) Pleasant Bay complex (EO_{PB}), including the Late Ordovician Belle Côte Road orthogneiss (O_{PBbc} ; 442 ± 3 Ma, U-Pb, zircon, G. Dunning, personal communication, 1995); the primarily metavolcanic, low grade (garnet zone) Sarach Brook metamorphic suite (S_{SB} ; $433 \pm 7/-4$ Ma, U-Pb, zircon, Dunning et al., 1990); the foliated Taylors Barren pluton (S_{TB} ; 430 ± 2 Ma, U-Pb, zircon, G. Dunning, personal communication, 1995); and unfoliated Devonian to Carboniferous intrusions, including the West Branch North River pluton (D_{NR} ; 399.6 ± 4.6 Ma, Rb-Sr whole rock, O'Beime-Ryan and Jamieson, 1986; 385 ± 5 Ma and 381 ± 5 Ma, $^{40}\text{Ar}/^{39}\text{Ar}$, biotite, Reynolds et al., 1989), the Bothan Brook pluton (D_{BB} ; 376 ± 3 Ma, U-Pb, zircon, G. Dunning, personal communication, 1995), the Boundary Line intrusive suite (DC_{BL}), the Margaree pluton (DC_{MP} ; 343 ± 17 Ma, Rb-Sr whole rock, O'Beime-Ryan et al., 1986; 368 Ma and 375 Ma, $^{40}\text{Ar}/^{39}\text{Ar}$, biotite, Reynolds et al., 1989) and the Peters Brook pluton (DC_{PB}).

Field relations and geochronology provide constraints on the depositional, structural, metamorphic and plutonic history of the Aspy Terrane in the mapped area. The Belle Côte Road orthogneiss is interpreted to have intruded the Jumping Brook and Middle River units and paragneiss of the Pleasant Bay complex, therefore constraining their age as Ordovician or older. A similar metamorphic, structural history is displayed by the Jumping Brook metamorphic suite, Middle River metamorphic suite and Pleasant Bay complex, with matrix-porphyroblast relations indicating development of two metamorphic fabrics. The Pleasant Bay complex was intruded by the foliated (augen) Taylors Barren

pluton. The principal fabric in the Jumping Brook, Middle River, Pleasant Bay and Taylors Barren units and transposed intrusive contacts between the Belle Côte Road orthogneiss and older units (inferred) and the Taylors Barren pluton and the Pleasant Bay complex are roughly parallel indicating regional deformation overlapped intrusion of the Belle Côte Road orthogneiss and Taylors Barren pluton, i.e. Late Ordovician to Early Silurian. Folding of the principal fabric in these units defines a regional U-shaped map pattern. The age of this deformation is constrained between emplacement of the Taylors Barren pluton and West Branch North River pluton, the latter of which truncated the regional fold pattern, i.e. Early Silurian to Early Devonian. Other Devonian or younger, unfoliated intrusions, including the Bothan Brook, Margaree and Peters Brook plutons intruded earlier, foliated units. The Sarach Brook metamorphic suite does not exhibit evidence of the regional deformation found in the above units and has been juxtaposed adjacent to the Middle River unit by movement on the mylonitic Southern Highlands shear zone (SHSZ). Shear fabrics indicate oblique movement on the north-northeastward-trending, moderately westward dipping SHSZ, however the sense of displacement is unclear. The SHSZ deforms, and may be partly coeval with, the Late Devonian Bothan Brook pluton. The mylonitic, northward-trending, steep Coinneach Brook shear zone (CBSZ) deforms the Jumping Brook metamorphic suite and West Branch North River pluton in the northern part of the area and is probably coeval with the SHSZ. Oblique, dextral/west-sideup movement is indicated for the CBSZ. Late, steep, brittle (cataclastic) faults deform the shear zones and commonly form unit boundaries. Geochronological data indicate progressive regional cooling, from 650°C in the Late Silurian to 300°C in the Late Devonian. Unroofing during this interval is consistent with the change from ductile (foliations) to brittle-ductile (mylonites) to brittle (cataclastic faults) deformation.

Several mineral occurrences and alteration zones occur within the study area. Most mineralization and alteration overprint tectonic fabrics and are probably related to the Devonian-Carboniferous granitoids.