
A new geological interpretation of the Antigonish Highlands, northern mainland Nova Scotia

CHRIS E. WHITE¹, SANDRA M. BARR², DONNELLY B. ARCHIBALD², KATHERIN E. VOY², TREVOR G. MACHATTIE¹, EDWIN A. ESCARRAGA², AND CHRIS R.M. MCFARLANE³

1. *Nova Scotia Department of Natural Resources, Box 698, Halifax, Nova Scotia B3J 2T9, Canada <whitece@gov.ns.ca>* ¶

2. *Department of Earth and Environmental Science, Acadia University, Wolfville, Nova Scotia B4P 2R6, Canada* ¶ 3.

Department of Earth Sciences, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada

A revised interpretation of the geology of the Antigonish Highlands has resulted from field mapping combined with petrological and geochronological data. The oldest units recognized are Late Neoproterozoic calc-alkaline volcanic and associated sedimentary rocks of the Keppoch, James River, Livingstone Cove, Morar Brook, and Chisholm Brook formations, all assigned to the Georgeville Group. Previously published U-Pb detrital zircon ages indicate that the Georgeville Group was formed between ca. 621 to 612 Ma. The Georgeville Group is intruded by a suite of comagmatic, calc-alkaline, dioritic to syenogranitic plutons, some of which were previously considered Devonian to Carboniferous in age and some of which were mapped as volcanic rocks. New and published U-Pb zircon data indicates an age range from ca. 615 to 605 Ma for intrusion of these plutons.

The dominantly sedimentary Bears Brook Formation, previously included in the basal part of the Ordovician to Devonian Arisaig Group, is now interpreted to be Late Neoproterozoic. In addition, the Malignant Cove Formation, previously included in the basal part of the Cambrian sedimentary-volcanic succession, is now considered to be part of the Bears Brook Formation, based on their similar lithologies. This interpretation is further substantiated by previously published detrital zircon U-Pb ages from the redefined Bears Brook and former Malignant Cove formations, which indicate pre-ca. 585 Ma ages.

The redefined Iron Brook Group in the northern Antigonish Highlands consists of a fault-bound package of sedimentary rocks that has yielded Early Cambrian microfossils. The previously interpreted interlayered mafic flows in this group are mafic sills whereas the volcanic rocks (Arbuckle Brook Formation) are now considered to be Late Neoproterozoic and not part of the Iron Brook Group. All of the Neoproterozoic and Cambrian rocks are intruded by the previously unrecognized but widespread ca. 485 to 470 Ma West Barneys River plutonic suite, which consists of syenite to alkali-feldspar granite and tholeiitic transitional to alkalic gabbro formed in an extensional setting.

In the northern Antigonish Highlands, north of the Hollow Fault, extension continued until at least ca. 454 Ma with the deposition of the bimodal Dunn Point

and McGillivary Brook formations. The contact of the latter formation with the overlying Early Silurian to Early Devonian Arisaig Group appears to be conformable. The Dunn Point and McGillivary Brook formations are absent south of the Hollow Fault, where the overlying Arisaig Group rests with an angular unconformably on older units, including the Bears Brook Formation.

These new field observations, petrological data, and ages have dramatically changed the previously published geological map and hence the understanding of the tectonic evolution of this part of Avalonia in the northern Appalachian orogen.