

# Thick Carboniferous Conglomerate Units with Arisaig Group Fossiliferous Clasts Formed in an Extensional Setting During Docking of the Meguma and Avalon Terranes, Isle Madame, Nova Scotia

*S. M. Barr<sup>1</sup>, A. J. Boucot<sup>2</sup>, W. D. Boyce<sup>3</sup>, E. Force<sup>4</sup>, E. Landing<sup>5</sup> and C. E. White*

Isle Madame, located off the southern coast of Cape Breton Island, exposes anomalously thick, Carboniferous clastic sedimentary sequences that include over 5000 m of conglomerate. The thick conglomerate units occur in the Horton, Windsor, and Mabou groups. Also anomalous in the area are three long narrow belts of metamorphic rocks, together with voluminous chloritic microbreccia and minor semi-ductile mylonite, which are separated from the conglomerate-dominated sequences by faults. The angular relations between the cataclastic rocks and the thick dipping conglomerate units, combined with incorporation of cataclasite clasts in conglomerate and evidence of dip-slip faults within the basin, suggest an extensional setting, where listric normal faults outline detachment allochthons. Allochthon geometry requires two stages of extension, the older completed in early Windsor Group time (Viséan) and including most of the island, and a more local younger one completed in Mabou Group time (Namurian). These features are interpreted to have developed within a broad zone of Carboniferous dextral oblique convergence between the Avalon and Meguma terranes, in a localized transtensional basin within a transpressional regime. The two-stage history on Isle Madame allows us to see the deeper parts of one of the Horton-age extensional basins of the Maritimes basin, others of which have been described as half-grabens based on their shallower exposures.

Fossiliferous clasts occur in Carboniferous conglomerate in the Horton Group in western Isle Madame and in the Mabou Group in eastern Isle Madame. Most of the clasts examined (21 of 23) are calcareous siltstone and sandstone that contain Silurian-Lower Devonian faunas comparable to those in the Arisaig area, northern mainland Nova Scotia, although the lithologies are coarser grained and less calcareous than those of the Arisaig section. These middle Paleozoic faunas are well constrained to the Silurian (uppermost Llandovery through Pridoli) and lowest Devonian and are characteristic of those known from shallow siliciclastic-dominated platforms of the Avalon microcontinent in Wales and England. The remaining two clasts have abundant inarticulate brachiopod shells that indicate provenance from Middle Cambrian proximal marine facies on the Avalonian marginal platform. No clasts were found that are likely to have been derived from the Torbrook Formation, and thus from the Meguma terrane in southwestern Nova Scotia, as has been previously reported. The association of relatively large, reworked fossiliferous clasts in Carboniferous conglomerate on Isle Madame suggests local derivation from lower and middle Paleozoic units not presently exposed, although probably present as basement under the Carboniferous units.

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<sup>1</sup>Department of Geology, Acadia University, Wolfville, NS B4P 2R6

<sup>2</sup>Department of Zoology, Oregon State University, Corvallis OR 97331, USA

<sup>3</sup>Geological Survey of Newfoundland and Labrador, PO Box 8700, St. John's, NL A1B 4J6

<sup>4</sup>Center for Mineral Resources, University of Arizona and US Geological Survey, Tucson, Arizona, 85721, USA

<sup>5</sup>New York State Museum, Madison Avenue, Albany, NY 12230, USA