

Mountains to sea in the Late Ordovician: sequential synorogenic basins near the Red Indian Line suture in Notre Dame Bay, Newfoundland, Canada

BRIAN H. O'BRIEN

*Geological Survey of Newfoundland and Labrador, Department of Natural Resources, P.O. Box 8700, St. John's,
Newfoundland and Labrador A1B 4J6, Canada*

Several unique tracts of inhomogeneously deformed and variably metamorphosed strata ranging from the late Darriwilian to the late Katian comprise the progressively younger submarine fill of three regionally extensive basins in west-central Notre Dame Bay. Different parts of these relict basins have been locally preserved within the regional hanging wall and footwall sequences of the Red Indian Line suture.

The Sops Head basin, the Rocky Brook basin and the Badger basin are dominated by immature quartz wacke turbidites hosting recycled fragments of carbonate-encrusted basalt or flow-banded rhyolite or bioclastic limestone. The transport of extrabasinal plutonic or metamorphic detritus into these basins was achieved by the formation and downslope movement of arenaceous or argillaceous debrites. The late Middle Ordovician Sops Head basin and its alkali gabbro sill complex were initially juxtaposed with the magmatic rocks of composite Laurentia in the latest Darriwilian. Much of the exotic broken formation and pebbly mudstone produced during this period of accretion came from sub-seafloor thrust sheets carrying calc-alkaline rhyolite and normal mid ocean ridge basalt. Tectonosomes and olistostromes distinguished by these types of lava had been mainly, though not exclusively, sourced from within the adjacent early-middle Darriwilian Catamaran Brook succession (a peri-Laurentian Red Indian Lake Group correlative).

In tectonic distinction, the Late Ordovician Rocky Brook basin had a more restricted development; its felsic pyroclastic strata and interbedded sulphidic argillites having filled a subsiding graben that was possibly incrementally stretched during volcanic flare ups. Located farther northwest in Notre Dame Bay than the Darriwilian basin, the mainly Sandbian Rocky Brook basin fill accumulated, nevertheless, above the same late Middle Ordovician (Catamaran Brook) volcanic arc and ophiolite sequence that had flanked the Sops Head shortening basin. The depositional substrate of the non-volcanic Badger basin had originated in the peri-Gondwanan realm. During the Late Ordovician, indurated sedimentary strata from the Sop Head basin and the adjacent Exploits arc – back arc complex became redeposited as clasts in certain conglomerates of the lower Badger Group.

During the Late Ordovician, synorogenic marine sedimentary basins proximal to the Dunnage Zone's Red Indian Line became tectonically incorporated into a developing thrust stack that had retreated from the margin of the Sops Head basin and then advanced past the margin of the Badger basin. They record the successive opening, arching, erosion and closure of discrete subduction zone-related depocentres situated near the hinterland's northwest-dipping Late Taconian mountain front.