

## Stratigraphy and structure of the Humber Arm allochthon, southwestern Bay of Islands, western Newfoundland

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The Humber Arm allochthon consists of westerly transported thrust slices of lower Palaeozoic rocks, remnants of the Iapetus Ocean and its Laurentian continental margin. Upper thrust slices represent oceanic mantle and crust of the Bay of Islands Ophiolite, and igneous rocks of the Little Port and Fox Island River complexes of island arc affinity. Intermediate thrust slices consist of sedimentary rocks belonging to the early Cambrian Blow-Me-Down Brook Formation, which may have underlain the passive margin succession in a rift basin. The lower thrust slices are composed of sedimentary deposits of the evolving lower Palaeozoic continental margin, as well as flysch deposited in the foredeep formed during the emplacement of the allochthon in the Taconic orogeny. Mélange zones, characterized by the mixing of rock from different formations, occur at the bases, and within, the intermediate and upper thrust slices.

Little detailed work has been carried out on the stratigraphy and structure of the sedimentary successions within the western frontal part of the Humber Arm allochthon. These successions have tentatively been correlated with lithostratigraphic units of the Humber Arm Supergroup defined in the eastern part of the allochthon, and their structure is generally considered to be chaotic.

The Rope Cove area comprises the westernmost sedimentary rocks of the allochthon. Two sedimentary assemblages have been recognized. The Blow-Me-Down Brook Formation consists of thick-bedded, green arkosic sandstone, and minor red and black shale. It has an early Cambrian age based on the presence of the trace fossil

*Oldhamia*. The Bear Cove assemblage is a Tremadocian limestone-shale association divided into three sub-assemblages based on lithological features.

The structure of the study area represents a southwesterly verging imbricate thrust stack, with a complex internal geometry. The thrust slices contain thin lithological sections of very limited chronostratigraphical range and large stratigraphic intervals of the sedimentary succession are not represented in the thrust stack. In addition, thin slices of pillowed basalt, assigned to the Fox Island River volcanics, are interleaved with thrust slices of the Bear Cove assemblage. Also, the early Cambrian Blow-Me-Down Brook Formation is structurally interleaved with the much younger Bear Cove assemblage.

Structures within the imbricated rocks record polyphase deformation with  $F_1$  isoclinal folds overprinted by northwest verging  $F_2$  folds. Locally, folds in the Bear Cove assemblage may include syn-sedimentary slump folds. The architecture of the imbricate stack is related to the  $F_2$  phase, and folded  $F_1$  thrust surfaces are observed locally. Open  $F_3$  folds affect second generation thrust surfaces. The arrangement of the assemblages in the thrust stack indicates that the  $F_2$  event led to fine-scale re-imbrication of pre-existing duplexes, which isolated limited stratigraphic sections of the lower Palaeozoic succession. The inclusion of the Fox Island River volcanics in the middle of the thrust stack implies that the floor thrust of the upper igneous structural slices was breached during the  $F_2$  event.