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Ian A. Brookes

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Reports

Late-Wisconsin Readvance of Piedmont Glaciers in Southwest Newfoundland

IAN A. BROOKES
Department of Geography, York University, Downsview, Ontario

In 1971 the author began an investigation of the geomorphology and surficial geology of the lowland drained by Grand and Little Codroy Rivers and the adjacent Anguille and Long Range Mountains, in southwest Newfoundland (Fig. 1). Examination of coastal sections in Pleistocene deposits between Cape Ray and Cape Anguille revealed an uppermost unit of mixed till and stratified drift expressed in the land surface as gently swelling, low hummocks and depressions characteristic of moraine. This landform, between Long Range Mountains and Little Codroy River estuary, and associated sediments exposed in sea cliffs near Wreckhouse Brook, can readily be related to piedmont glaciers which fed ice from the Newfoundland Ice Cap around whale-backed nunatak summit areas, through glacial troughs in the mountain front, on to Codroy Lowland. Farther north along the mountain front contemporary piedmont ice tongues stood in contact with a rapidly wasting body of lowland ice whose meltwaters were depositing outwash in the Codroy lowland axis. Near Codroy village hummocky morainic terrain has been accentuated by collapse of till and stratified drift into solution hollows in gypsum masses within Mississippian Codroy Group clastics (Gillis, 1972). The glacigene sediments near Codroy contain very little crystalline material from the Long Range Mountains and, therefore, were probably deposited by ice with a trajectory down Codroy Lowland, rather than by ice crossing the lowland from the east.

Immediately north of the mouth of Wreckhouse Brook, the upper two-thirds of a coastal cliff section 15 m high exposes predominantly stratified drift of pinkish hue beneath the morainic land surface (Fig. 1 inset). The lower part of the section exposes a grey, blocky till with an abundance of large, facetted, crystalline clasts of Long Range rock types - gneiss, granite-gneiss, and granite. This till overlies striated and polished crystalline bedrock along this coast, south to Bear Cove. Striae along a 1.5-km stretch of coast near Red Rock Point are oriented at right angles to the coast so that ice responsible for this lower till could have moved towards or from the present land area. However, the absence of Carboniferous material in its clasts suggests westward flow. The till is overlain by kame gravels, indicative of ice stagnation at the present coast.

In the section near Wreckhouse Brook the lower part of the pinkish, mainly stratified, glacigene unit contains irregular 'pods' of clean gravelly sand and brown sandy mud with local concentrations of shells. Those collected are identified as follows: *Balanus* sp., *Mya* truncata*, *Macoma calcarea*, *Hiatella arctica*, *Serripes groenlandicus*, *Amauropsis islandica**, *Astarte* sp.*, *Oneopta* sp.*, and columellas* of unidentified gastropods. (*Identified by A.H. Clarke, National Museums of Canada). All *Balanus* shells, being relatively robust, are intact and range from 1-2.5cm in length, while, of the more fragile mollusc shells, only one valve of *Hiatella arctica* was found intact. These mollusc shells are also distinctly smaller than those of similar species found farther north along the Newfoundland coast between St. George's and Bonne Bays.

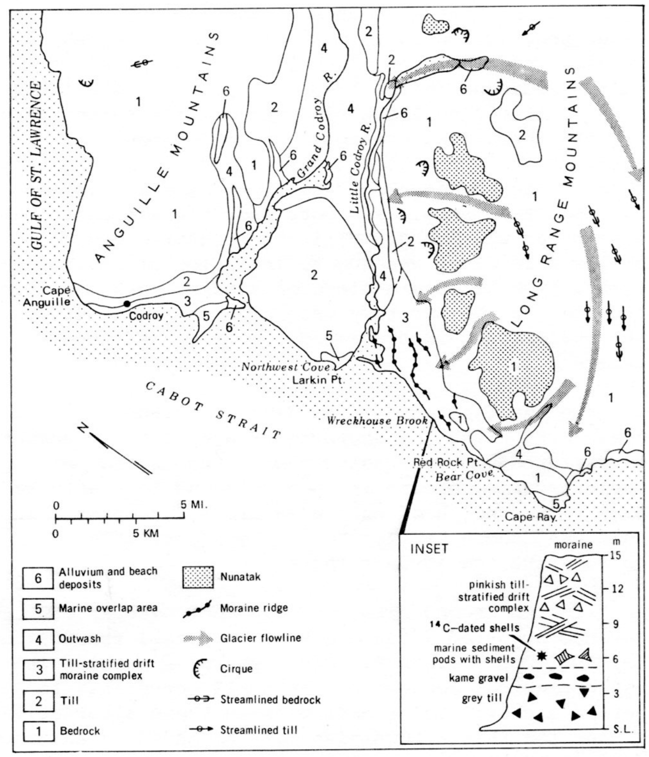

Fig. 1. Cabot Strait coast of Newfoundland and its hinterland, showing places mentioned in text, surficial geology, glacial landforms and (inset) coastal cliff section at Wreckhouse Brook.

These shells are regarded as contemporary with the enclosing sediment 'pods'. The fauna lived on a sea floor ranging from medium gravel to sandy mud. Shells of *Macoma calcarea* and *Macoma* sp. from this collection have been radiocarbon-dated at 13,800± 260 years B.P. (GSC-2113, unpublished). The date provides a minimum age for deglaciation and marine submergence of this coastline when it was isostatically depressed, following deposition of the subjacent grey, blocky till by ice probably moving westwards from Long Range Mountains. It is slightly older than dates on deglaciation of St. George's and Port au Port Bays farther north, which range from 13,200 to 13,600 years B.P. (Brookes, 1969). The inclusion of shell-bearing 'pods' of marine sediment in the lower part of this glacigene unit indicates that the piedmont glacier responsible for its deposition overrode marine sediment in its readvance to a position a little beyond the modern coast. The radiocarbon date provides a maximum age for that readvance. Any more specific age assignment depends on whether death of the creatures whose shells were dated was due to inclusion of their substrate into till as a piedmont glacier advanced into the sea, or whether they were dead sometime before the shells were incorporated into the glacigene sediment.

In the first case, the date of 13,800 ± 260 years B.P. gives the approximate age of the piedmont glacier readvance. Radiocarbon dates on deglacial marine overlap around St. George's and Port au Port Bays to the north of this area are all younger than this, and there is therefore no evidence of a correlative ice advance there.

In the second case, the piedmont glacier readvance occurred after death of the shell fauna at 13,800 ± 260 years B.P. Since there is nothing in the geological context of the shell occurrence to permit a choice to be made between these alternatives, a case for this alternative must be based on an argument for correlation with other readvances in the region which incorporated marine sediment into till.

Brookes (1974) assigned an age of approximately 12,750 years B.P. to the Robinsons Head readvance around St. George's Bay, which moved into a sea standing at about +25 m, on the basis of an assumed rate of relative sea level fall to that elevation from a 42 m marine limit dated at 13,500 ± 210 years B.P. (GSC-1200) at Robinsons Head. Grant (1969) mapped moraines in the Northern Peninsula of Newfoundland built by piedmont glaciers moving out of Long Range troughs across a then-submerged coastal lowland. Later, he tentatively placed this readvance within a chronology of falling relative sea level for the peninsula at about 13,000 years B.P. and suggested correlation with the Robinsons Head readvance (Grant, 1972).

If this second alternative is chosen - that is, the piedmont readvance identified here correlates with the Robinsons Head (Brookes, 1974) and Piedmont (Grant, 1972) readvances farther north - it followed initial marine submergence of the Cabot Strait coast after a delay of approximately 1000 years.

There is only scant evidence of the level attained by postglacial marine submergence of the Cabot Strait coastline. In a cove immediately south of Red Rock Point, brown silt-clay rhymites with *Macoma calcarea* valves were recorded up to 5 m asl (above sea level), above grey till and below horizontally stratified sands and gravels of possible marine origin that reach 10 m asl. The top of the section comprises pinkish till similar to that associated with piedmont moraines along this coast. Therefore, marine submergence to 5 m, and possibly 10 m asl, is indicated at this section. The marine pelite layer had been buried by slumping when the author returned to make a shell collection. At the head of Northwest Cove, north of Little Cordroy River estuary, similar clays, but without shells, outcrop to 3.5 m asl. These are likely, but not definitely, marine.

Landform evidence of the vertical extent of marine overlpa has either been eradicated by glacier readvance or is too weakly developed to be traceable. If 5 m is a reasonable estime - and a conservative one, based on the upper limit of muddy marine sediment - and a minimum age of 13,800 years is adduced for deglaciation of the Newfoundland coast of Cabot Strait, then at least 70 m of isostatic recovery has occured there since (using estimates of eustatic sea level rise since that date by Shepard (1963) and Morner (1969). This is a minimum since the effect of isostatic subsidence due to water loading has not been evaluated in an area where water deepens to 500 m, 30 km offshore.

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