GEOLOGY OF THE MUGFORD GROUP, NORTHERN LABRADOR

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Introduction

The Mugford Group, a sequence of sedimentary and volcanic rocks exposed in the spectacular Kaumajet Mountains in remote northern Labrador, was mapped during the 1975 field season. The Mugford Group has been visited by most of the sea-faring geologists on the Labrador (Daly, 1902; Coleman, 1921; Krank, 1939; Christie, 1952; Douglas, 1953) and more recently by Taylor (1971) and Barton (1975). However, apart from a few partial sections describing the lower black slates and mafic volcanics, the stratigraphy of the Group as a whole and its mineral potential remained largely unknown. In a recent study, Barton (1975) obtained a K-Ar whole rock age of 1490 m.y. and a Rb-Sr whole rock age of 2369 m.y. from the basalts. He also reported minor copper occurrences in the volcanics. This work renewed interest in the copper potential of the Group and the possibility of the Group being Lower Proterozoic in age made it a good prospecting area for uranium mineralization. Eight weeks were spent mapping the Group to investigate these possibilities. Shoreline exposures and accessible sections in the steep mountain valleys were mapped on a 1:50,000 scale.

Stratigraphy

The Mugford Group unconformably overlies Archean gneisses and granites of the Nain Structural Province (Taylor, 1971). The Group is divisible into four major units, namely; Lower Sedimentary Unit, Lower Volcanic Unit, Middle Sedimentary Unit, and Upper Volcanic Unit. Each unit comprises a number of mappable formations. A composite stratigraphic section is shown in Table 1.

Archean Complex

The Archean Complex underlies the Mugford Group. It consists of a strongly deformed sequence of high grade gneisses and schists. The dominant lithology is a grey quartzo-feldspathic gneiss with lesser amounts of amphibolite, layered ultramafic and semi-pelitic gneiss, cut by syn- and post-tectonic granites. The syntectonic granites are coarse-grained, pink, porphyritic granites and are confined to linear zones. A post-tectonic, medium-grained, equigranular, biotite granite cuts the gneisses on Coopers Island.

The gneisses in the Mugford area show lithological similarities to the supracrustal sequence of gneisses described by Bridgewater et al. (1975) from Saglek Bay, 80 km. to the north.

UNIT	LITHOLOGIES	THICKNESS
UPPER VOLCANIC UNIT	Basaltic breccias, agglomerates and tuffs — Minor basaltic sills	450-600 m. 600 m.
MIDDLE SEDIMENTARY UNIT	Argillite and tuff Flow or sill Calcareous argillite, argillite and minor tuff	10 m. 6 m. 24 m. 40 m.
LOWER VOLCANIC UNIT	Massive and blocky lava flows, breccias, minor tuffs and agglomerates — Minor basaltic sills Pillow lavas Green volcanigenic tuffs, argillites and cherts — Numerous basaltic sills	300 m. 60 m. 60 m. (sills) 10 m. (sediment) 430 m.
LOWER SEDIMENTARY UNIT	Calcareous argillite, chert, intraformational breccias — up to five basaltic sills Black shales / Mudflow (W) (E) Purple flaggy sandstones Basaltic flow Basal grey sandstones and minor conglomerates (north) (south)	30 m. 90 m. 24 m. 6 m. 5 m. 155 m.
	(Thin Regolith locally below shales)	Maximum thickness of Mugford Group 1225 m.
	ARCHEAN COMPLEX - gneisses and granites	

TABLE 1: Stratigraphic section of the Mugford Group

Mugford Group

The Unconformity

The unconformity between the Mugford Group and the Archean Complex was only observed at the northern extremity of the group on the north and south sides of Sunday Run and on the west side of Finger Hill Island, where conglomerates and sandstones overlie unweathered gneiss. To the south, black shales rest on the gneisses but the actual contact is buried below scree debris. A thin regolith, up to 3 m. thick, is locally developed in the Archean Complex below the unconformity at the southwest and southeast sides of Mugford Tickle and south of Anchorstock Harbour. The regolith is characterised by buff to brown weathered gneisses and granites cut by a network of carbonate veins. The veins, which locally contain magnetite, are preferentially developed parallel to the gneissic banding.

A breccia up to 30 m. wide composed of a chaotic mixture of blocks, boulders and cobbles of gneiss and granite in a dirty sandstone and carbonate matrix occurs within a fault bounded block in the Archean Complex at the northeast side of Mugford Tickle. The breccia is probably related to the unconformity.

Lower Sedimentary Unit

This unit consists of a sequence of sandstones, black shales, cherts, calcareous argillites, breccias, and minor tuffs. The base of the unit is marked by a southward thinning conglomerate - sandstone formation north of Cod Bag Harbour and by black shales to the south. Up to five basaltic sills occur within the unit.

Thin pebble and cobble conglomerate beds and lenses containing well rounded clasts of quartzite and granite (70%), amphibolite (10%), basalt (10%), argillite and chert (5%) locally overlie the Archean Complex and also occur within the basal sandstones. The basal sandstones are grey to white, medium- to coarse-grained, well sorted, and cross-bedded. They pass up into purple, medium- to fine-grained flaggy sandstones with a carbonate-rich matrix. Cross-bedding and ripple marks are locally developed. At the southwest side of Finger Hill Island the contact between the grey and purple sandstones is marked by a 6 m. thick, red-weathered, massive basalt flow.

The purple flaggy sandstones fine upwards into black argillites and shales. The black shales are identical to those that form the base of the Mugford Group south of Cod Bag Harbour. The shales are generally cleaved, rusty-weathering and locally contain thin pyrite laminations. The shales are overlain by calcareous argillites, grey, green and red cherts, and green argillites.

Lateral facies variations are common above the shales, and intra-formational breccias, mudflows and slump folds indicate instability during deposition. A thick, coarse,unsorted mudflow unit occurs within the shales

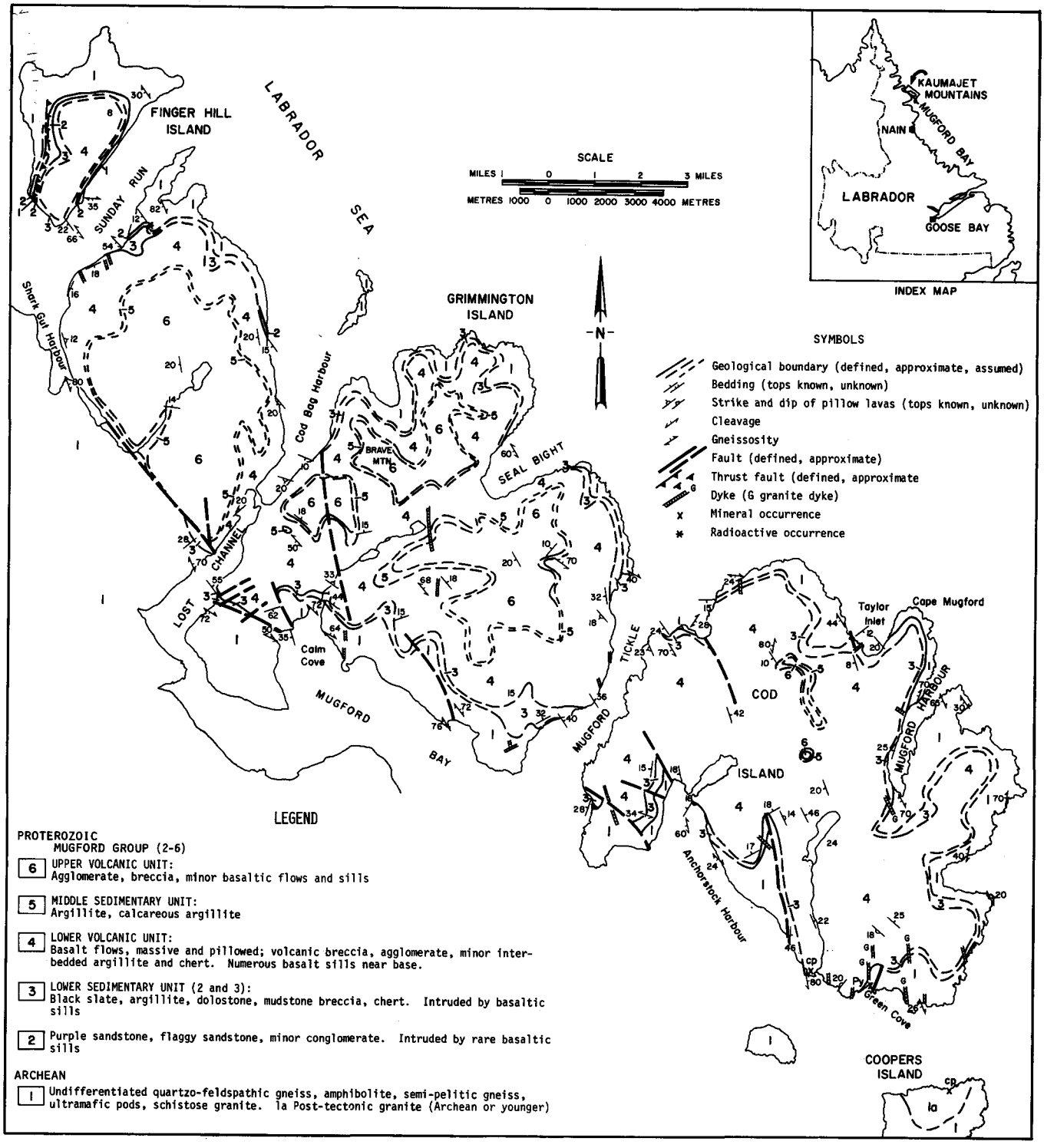

Fig. 1 - Geological map of the Kaumajet Mountains, northern Labrador

at the northwest side of Mugford Tickle and at Mugford Harbour. At Mugford Harbour the mudflow is up to 30 m. thick but thins rapidly to the west. The mudflow contains angular and rounded clasts from block to pebble size, of shale (60%), basalt (25%), chert (10%), and argillite (5%) in a black shale matrix. In exposures along the western side of the group thin, well-bedded breccia units occur above the shales.

Lower Volcanic Unit

This unit consists of volcanogenic sediments and pillow basalts at the base overlain by massive and brecciated subaerial volcanic flows with intercalated pyroclastic rocks. Basaltic sills are common, especially below the first pillow lavas in the green volcanogenic sediments. Some of the sills may in fact be flows; however, they lack features of extrusive flows, are fine-grained, homogeneous, and commonly exhibit cross-cutting relations, and columnar jointing.

The sills are fine-grained, dark green rocks of basaltic composition (Barton, 1975). They are amygdaloidal in places and locally the amygdules are aligned parallel to sill contacts. A fine-grained, serpentinized black ultramafic sill(?) approximately 6 m. thick occurs near the base of the unit at the south west side of Mugford Tickle. This rock was analysed by Barton (1975) and found to be a basaltic komatite. East facing flow fronts described from this stratigraphic level at Sunday Run by Barton (1975) are the eastern limits of sills. The western limits of the same sills can also be found about 1000 m. to the west.

The pillow lavas are first encountered from 15 to 30 m. above the base of the unit. The pillow basalts are fresh, grey to green, with large, generally elongate, bulbous pillows. They are commonly amygdaloidal and locally contain large (up to 4 cm.) plagioclase phenocrysts.

A thick sequence of fine-grained, light green, massive and blocky basaltic flows with intercalated breccias overlies the pillow lavas. The breccias consist of monolithic, angular, basalt fragments from pebble to block size, and grade into massive basalt. They show features typical of flow breccias formed by subaerial flow. Locally, thin beds of tuff and bedded agglomerate are interbedded with massive flows and breccias.

Middle Sedimentary Unit

A unit of buff to brown weathered, grey, medium- to fine-grained calcareous argillite, argillite, and tuff forms a distinct map unit above the Lower Volcanic Unit. The unit is most accessible south of Shark Gut Harbour but was also examined on the south side of Brave Mountain, northwest of Mugford Tickle and on Cod Island.

The argillites are well-bedded on a 30 to 60 cm. scale, cross-bedded, graded, laminated and display small slump folds. Calcareous nodules and

thin lenses of volcanic pebble breccias are locally present. The carbonate content of the argillites decreases upwards and the uppermost beds are predominantly green, siliceous argillites.

Upper Volcanic Unit

This unit comprises approximately 600 m. of mafic breccias and agglomerates, with minor tuffs, argillites and basaltic sills, and forms the top of the Mugford Group. It was only examined west of Finger Hill and west of Mugford Tickle due to inaccessibility.

The breccias are in most places thick, unsorted and angular. Grading and high angle cross-bedding are locally developed in the agglomerates. Rare, fine-grained, light green and grey basaltic sills are present.

Igneous Rocks

A series of north to northeast-trending diabase dykes cuts the Mugford Group. Dykes in the black shales were seen to feed overlying sills on the west side of Finger Hill Island.

Coarse-grained quartz-feldspar porphyry dykes cut the Archean Complex and the Mugford Group at the south end of Cod Island. These dykes clearly penetrate the lower two units of the group exposed there. They are not confined to the basal black shales and do not mark an unconformity within the group as suggested by Douglas (1953). The relationship of the silicic dykes to the post-tectonic granite exposed on nearby Coopers Island is not known.

Structure

The Mugford Group occupies a large open northwest trending, symmetrical syncline. Dips are generally in the order of 25° to 35°. At the southwest end of Cod Island, the folds are tighter and a series of open, northwest-plunging anticlines and synclines is developed.

A steeply dipping, axial planar, slaty cleavage is developed in association with the folding in the incomptent units, e.g., black shales, Middle Sedimentary Unit, and in intercalated argillite and tuff horizons.

Minor easterly directed thrusts are developed in the black shales and sills of the lower unit at the northwest side of Mugford Tickle. A westerly directed thrust repeats the basal unconformity along the west side of Finger Hill Island. The thrust can be traced inland for over 2000 m.

Northwest-trending, normal faults are common in the area, but displacements are generally small. The western margin of the Mugford Group is marked by a normal fault from Shark Gut Bight to Calm Cove, and west of Anchorstock Harbour.

Mineralization

No significant copper showings were located in the volcanics. Local chalcopyrite disseminations and veins occur at the intrusive contact of basaltic sills with argillites and cherts at the base of the Lower Volcanic Unit.

Thin pyrite laminations occur in cherts of the Lower Sedimentary Unit at Green Cove and at the southwest side of Mugford Tickle.

A radioactive showing (12 times background) was discovered in the basal clastic rocks south of Sunday Run. The radioactive zone occurs about 3 m. above the unconformity with the Archean Complex in black shales and interbedded fine-grained black sandstones. The zone is about 6 m. long and up to 1 m. thick.

Chalcopyrite in veins and disseminations occurs in the post-tectonic granite on Coopers Island.

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