Paleocurrent and Basin Analysis of the Meguma Group, Nova Scotia*

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Progress Report

Introduction

The Meguma Group (lower Paleozoic) underlies approximately one third of mainland Nova Scotia (Figure 1). The group comprises the basal Goldenville Formation and the conformably overlying Halifax Formation. The Goldenville, at least 18,000 feet thick, consists of greywacke with chloritic slate and minor polymictic greywacke conglomerate and black limestone. The Halifax Formation, at least 12,000 feet thick, consists of black slate with quartzite. In general, the Meguma Group has a eugeosynclinal, flysch aspect.

The deposit is of scientific importance in the light of recent studies of the depositional environment of ancient geosynclines. Despite this and its obvious economic importance, detailed study of the Meguma mass has only begun. Recent papers have investigated in a broad manner its structure (FYSON, 1966) and its metamorphism (TAYLOR and SCHILLER, 1966). Depositional environment, basin geometry, thickness, provenance, dispersal, fauna, and age of the Meguma are still either unknown or in serious doubt. To correct this, the authors began in 1966 the first, regional, sedimentological-stratigraphical study of the Meguma Group.

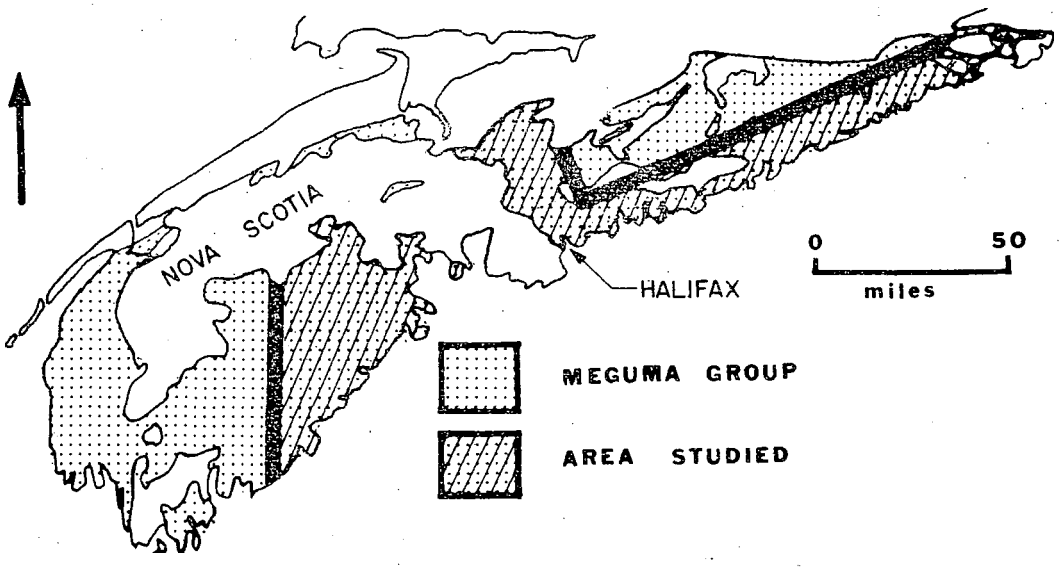

Figure 1 Location map showing a real distribution of the Meguma Group and the area studied to date

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Procedure

In order to ensure complete coverage and a statistical base, a 3-mile grid system was placed over the Meguma outcrop area. The intersections of grid lines established station localities. At each station, the closest outcrop of the Meguma is examined in detail. A graphic check list is used in the field to note colour, general lithology, maximum and minimum thicknesses of sedimentary units, maximum and minimum thicknesses of beds, degree of metamorphism, classification of primary sedimentary structures and their trend, classification of other primary sedimentary structures, and maximum grain size. Several photographs and arenite samples are taken at each outcrop. The orientated samples are from the base of arenite strata. In the laboratory, thin-sections of these samples are studied to determine mineralogy, grain size, shape, variety of quartz grains and sandstone classification. Fauna is sought both in the field and in the laboratory by dissagregation of low-metamorphic slate.

Detailed study of selected sections is planned using a Bouma-type, centimetre-by-centimetre field log (STANLEY andBOUMA, 1964).

To date, 2,300 square miles along the southeastern coast of Nova Scotia (CAMPBELL, 1966) and 4,000 square miles of central and southwestern Nova Scotia have been covered (Figure 1).

Preliminary Results

A large area of Meguma outcrop is yet to be studied in this preliminary, reconnaissance manner. Any results are very tentative as the data have not yet been analyzed statistically.

CAMPBELL (1966) concluded that turbidity currents deposited the bulk of the Goldenville Formation along the coastal strip of southeastern Nova Scotia. The orientation of primary sedimentary structures, mainly groove casts, indicates that paleocurrents flowed from the south-southwest, toward the east-northeast, with minor contributions from the north and south. The Meguma paleocurrent pattern in that area is strikingly parallel, indicating longitudinal transport. The source of the sediments apparently lay to the southwest. The lithological uniformity of the thick Goldenville Formation may suggest rapid sedimentation or environmental stability. The sedimentary basin appears to plunge northeastward.

In general, the Meguma Group displays all but one of the twelve diagnostic features of flysch (DZULYNSKI and WALTON, 1965, p. 3-4). The exception is that the sandstones usually contain less than 10 percent matrix and so classify as quartz arenite rather than wacke (WILLIAMS, TURNER, and GILBERT, 1955, p. 293). The arenites have been metamorphosed so that the texture is chemical but without any evidence of the size or shape of the original, allogenic, quartz grains. Microscopic grain-size measurement appears impractible. NATLAND (1967, p. 87-88) would classify most of the sandstones as tractionites rather than turbidites; HOLLISTER and HEEZEN (1967, p. 35) would classify them as contourites with some probable turbidites. Schenk is attempting to retain an open mind!

The fossil content of the Meguma Group is very important in determining age and depositional environment. Campbell found several excellent specimens of the enigmatic Astropolithon hindii (DAWSON). These are arenite cones with elliptical cross-sections. The size of the major axis of this ellipse ranges from less than

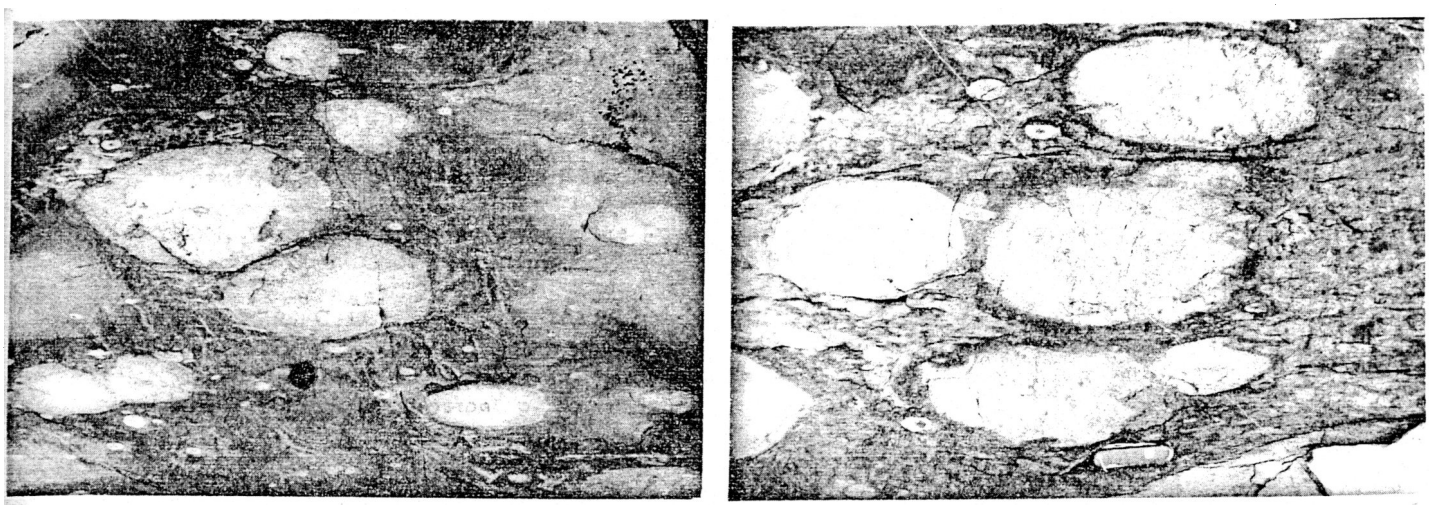

Figure 2 **Astropolithon hindii (Dawson). Outcrop surface is parallel to the stratification and is located at the arenitelutite gradational zone of a sedimentation unit. Near Liverpool, Nova Scotia.**

1 cm to more than 100 cm (Figure 2). Internally, the structure is radial with some concentric ridges. Campbell found specimens which are randomly orientated, as if they had been carried into the area with the sediment. Schenk found that most often the cones are orientated with the cone-axis perpendicular to stratification, and major axis of the eliptical cross-section orientated parallel to paleocurrent sense. The bodies are of organic rather than concretionary origin and may be worm mounds, or less probably a primitive echinoderm. As seen in the photograph, worm trails and burrows are associated with the cones. Any information on similar forms will be greatly appreciated. DAWSON (1890, p. 605) found these structures in the Quebec Group near Metic, Quebec. Careful searching revealed no trace of graptolites such as Dictyonema flabelliforme (Eichwald) found near Kentville, Nova Scotia. Search continues for microfauna in the slightly metamorphosed slates of the Meguma Group.

Campbell believes that the absence of fossils and associated debris may indicate a deep-water origin for these sediments. Volcanism was very active at the close of Meguma deposition in the western end of the province. Pyroclastic debris in the Meguma Group of southeastern Nova Scotia has not yet been definitely established.

In central and southwestern Nova Scotia, paleocurrent directions become more confused but the general northeastward trend along both the axis of the province and structural strike is maintained. Schenk intends to continue the grid over the western half and then the northeastern half of the province during the summer of 1967.

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