

# Submarine Surveys on the Great Bank of Newfoundland and in the Gulf of St. Lawrence

H. D. Lilly

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The Dalhousie Group, the status of which has been promoted from that of a formation, apparently lacks many of the 16 zones to be found at the type section. This group begins with a limestone unit, the Louison Creek Formation, not with conglomerate as Alcock thought. This is succeeded by a mixed acidic and basic volcanic unit, referred to as the Sunnyside Formation, to be followed by fossiliferous calcareous mudstones of the Jacquet River Formation. All of these, however, may be overlain somewhere or other by orange-coloured Archibald Settlement felsites, which closely resemble those of the Silurian Benjamin Formation.

Two fault systems, one north-south, the other east-west-trending, are prominent in the area.

Finally, a marked angular unconformity occurs between older formations and the Bonaventure conglomerate of presumed Pennsylvanian age.

Striking agreement for the lithologic units and stratigraphic succession was arrived at independently by R. R. POTTER (1964) in the Upsalquitch Forks area just to the southwest of the Charlo area.

The author is grateful to the NEW BRUNSWICK MINES BRANCH for its support of this project, as well as to many assistants and departmental colleagues for their help and suggestions. A detailed Preliminary Report and Map is now in press.

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#### Submarine Surveys on the Great Bank of Newfoundland and in the Gulf of St. Lawrence.\*

H.D. LILLY,

Department of Geology, Memorial University of Newfoundland,  
St. John's, Newfoundland.

#### Introduction

During 1964 and 1965, submarine geological and biological surveys were carried out by aqualung divers of MEMORIAL UNIVERSITY on the Great Bank of Newfoundland and in the Gulf of St. Lawrence. During this period, 30 man-hours were devoted to direct examination of the Ballard

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Bank, Virgin Rocks, Bucksport Shoal and Eastern Shoals of the Great Bank and 270 man-hours to similar work off the west coast of Newfoundland.

The vessels used on these surveys ranged from 16 to 150 tons. The latter vessel, a coastal auxiliary, proved entirely adequate for work on the Great Bank. Survey techniques employed in all areas were based upon those developed during submarine mineral exploration in Notre Dame Bay, Nfld, in 1962-1963.

#### Mapping and Survey Techniques

Two basic survey techniques were employed; one in which a "mobile grid" is placed upon any area to be examined, the other involving simple "swim and compass" traverses.

The "mobile grid" method involves establishing a base line marked by a single piece of 6-thread rope which is anchored to the rock on both ends (figure 1). The anchors are marked by buoys at the surface. Side traverses are made along a single rope cross-line which is attached to the baseline by a loop. To move along the baseline the surveyor slides the loop over the appropriate distance. The advantage of this system is that a safety boat, even if it loses sight of the divers' air bubbles, knows that the divers are within some area between the end buoys. In squally weather, a small float may be attached to the end of the crossline. Divers always ascend by either the two end buoy-lines or the cross-line.

Swim and compass surveys are similar to those on land, except that a marker float is towed along in order to ensure that a safety boat can find the diving team.

The most satisfactory method for obtaining large rock specimens is by blasting them off with 400-grain primacord. Previously marked samples for paleomagnetic work can be sliced off with this method in almost made-to-order sizes.

Dips and Strikes are taken with a waterproofed Brunton Compass in the usual manner.

#### Navigation

The most valuable navigating instruments were echo-sounder and compass. Loran was found to be rather useless on the Great Bank and was supplemented by ordinary celestial methods whenever the weather permitted.

#### Acknowledgements

The writer wishes to acknowledge the assistance of several divers who gave their time freely for the surveys on the Great Bank. JOHN SNOW, JOHN CHAPMAN and CALVIN TRICKETT of the NEWFOUNDLAND DIVING CLUB, and GERALD ENNIS and FRED GULLAGE of the Biology Department of MEMORIAL UNIVERSITY. Thanks are also extended to DR. ERNST DEUTSCH of the Physics Department who acted as recorder, safety boatman and assistant navigator on the third voyage.

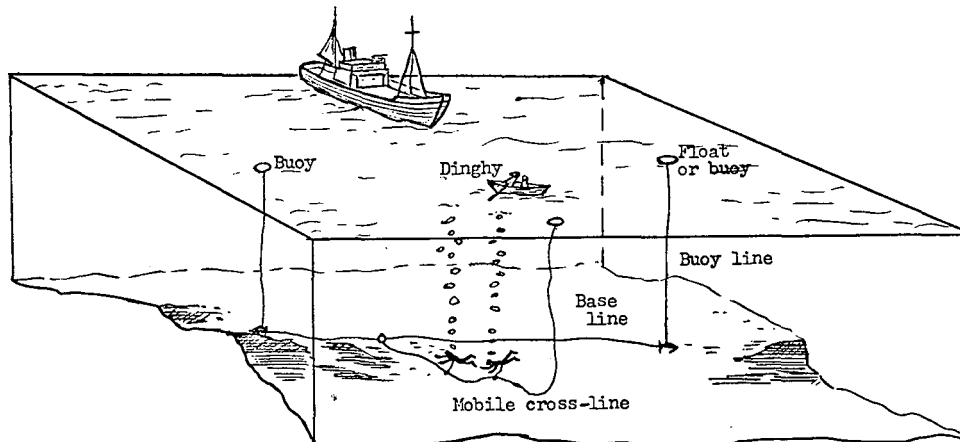


Figure 1. "Mobile grid" survey technique, showing buoys, floats, baselines and mobile cross-line in position over shoal.

## RESULTS OF THE SURVEYS

### The Great Bank

With cautious optimism, it may be demonstrated that the bedrock of the Ballard Bank, 10 miles east of Cape Race, is part of the Cabot Group which occupies the eastern border of the Avalon Peninsula; and that the Virgin Rocks shoal and Bucksport Shoal (100 and 108 miles east of Cape Race) are similar to the lower part of the Conception Group of eastern Newfoundland. The Eastern Shoals (120 miles east of Cape Race) do not resemble the rocks of the eastern Avalon but may be a latest Precambrian facies similar to the Random Formation or a winnowed member of the Cabot Group of approximately the same age.

The structural geology of the areas examined shows no intense deformation or metamorphism. Structural trends appear to be parallel to those on the Avalon Peninsula, NNE.

Seismic velocities for the rocks of the three areas would generally correspond with those of PRESS and BECKMAN (1964) and others. Hence one might speculate that Grenville-type rocks do not underlie this part of the Great Bank and also that it lies well outside the zone of Appalachian deformation.

### The Gulf of St. Lawrence

Exposures of the Clam Bank Formation (Upper Silurian) were discovered in three areas off the west coast of Newfoundland: west of the Port à Port Peninsula, Trout River and St. Paul's Inlet. In all these areas the exposures were either gently dipping or flat-lying. Between the Clam Bank exposures and the coast are areas of intensely deformed Cambro-Ordovician strata of the Humber Arm Group. Generally the contact between the two major units lies about 6 miles off the coast. The contact marks a great unconformity but also the westward border of the Newfoundland Appalachians.