

GEOLOGY OF THE HORSE ISLANDS (12L/4, northern portion), NEWFOUNDLAND

by James Hibbard and John Bursnall

INTRODUCTION

The Horse Islands, situated in the North Atlantic approximately 25 km northeast of the mouth of Baie Verte, were included in the geological survey of the Baie Verte Peninsula during the summer of 1978. Reconnaissance mapping of the islands at a 1:50,000 scale was undertaken during the last week of June, 1978 and completed, with the use of a helicopter for one day, late in July.

The islands are accessible by boat or by helicopter. Shelter can be found in the abandoned townsite of Horse Islands, where a few cabins are maintained by transient fishermen.

The islands have been included on geological maps of Newfoundland and shown to be underlain by rocks of the Fleur de Lys Supergroup (Baird, 1954; Williams, 1967), but there is no previous description of the geology of the area.

GENERAL GEOLOGY

The newly proposed Horse Islands group is an assemblage of polydeformed metasedimentary rocks and greenschists confined to the Horse Islands. These rocks are lithologically and structurally very similar to rocks of the Fleur de Lys Supergroup on the Baie Verte Peninsula and are thus confirmed as being part of the supergroup. The Horse Islands group is informally separated into two divisions, the Eastern Island sequence, dominantly composed of semipelitic schists and greenschists, and the Hit or Miss Point sequence, composed of alternating psammitic and semipelitic schist layers. Rocks of the Eastern Island sequence are intruded by unmetamorphosed diabase dikes.

Eastern Island sequence (Unit 1)

The Eastern Island sequence is a varied assemblage of semipelitic and psammitic schist and greenschist that underlies approximately two-thirds of Eastern Island and outcrops on Black Rock, approximately 2 km north of the island. The semipelite is dominantly a gray to brown quartz-feldspar-biotite schist with local interlayers of fine grained quartz-rich psammite. Locally, tourmaline occurs in the metasediments. Greenschist (1a) interlayers up to 400 m wide occur throughout the metasedimentary sequence. The contacts between the greenschist and the semipelitic schist are, in most places, gradational and at the east end of the island, semipelite adjacent to the greenschist contains angular epidote-chlorite clasts. Epidote-chlorite nodules and rounded hornblende clasts also occur locally within the greenschists. Along the north coast of Eastern Island, marble bands up to 10 cm wide are interlayered with thinly (cm scale) banded greenschist. All of these characteristics suggest an extrusive origin for the greenschists. In the cove east of the Horse Islands community, a black tourmaline vein crosscuts banding in the greenschists.

The greenschists are strikingly similar to parts of the Birchy Group on the Baie Verte Peninsula (Hibbard and Bursnall, this volume).

Hit or Miss Point sequence (Unit 2)

This unit is a monotonous sequence of steeply dipping, alternating layers of psammitic and semipelitic schist with local intercalations of pelitic schist. It outcrops on the western portion of Eastern Island and on all of Western Island, where at least 3000 m of the sequence is exposed. The unit is typically banded on a centimetre scale up to 1 m, though locally, as at Hit or

Miss Point, psammites range up to 2 m thick. The psammites are locally pebbly, containing blue quartz and feldspar clasts. In many places, the semipelitic schists are epidote rich and contain feldspar porphyroblasts. On the east end of Western Island, chlorite rich pelitic schist zones up to 10 m wide are interlayered with psammitic schists. The volume of pelitic material increases eastwards; similar relationships are found in the Fleur de Lys Supergroup on the Baie Verte Peninsula.

The Hit or Miss Point sequence is in conformable transitional contact with the Eastern Island sequence on both the north and south coasts of Eastern Island. The stratigraphic sequence of the two units is uncertain due to the structural complexity of the rocks; a few sparsely distributed facing determinations from pebbly psammites in the Hit or Miss Point sequence are south facing, suggesting that the Hit or Miss Point sequence may, in part, overlie the Eastern Island sequence.

Diabase dikes (Unit 3)

Four buff to maroon weathering diabase dikes crosscut deformed rocks of the Eastern Island sequence on the southeast portion of the island. One dike, at Horse Islands community, has been warped by a late deformation; the others are apparently undeformed. The dike at Horse Islands community is composed of a dark, charcoal gray, diabasic phase that is brecciated and included in a medium gray, younger diabasic phase. The largest dike, which occurs on the south shore of Pigeon Inlet, is approximately 1.5 m wide and can be traced for at least 200 m along the coast. It is massive and contains sparsely distributed plagioclase phenocrysts that are up to 4 cm long.

The diabase dikes resemble mafic dikes that intrude the Siluro-Devonian Mic Mac Lake Group south of Baie Verte.

STRUCTURE AND METAMORPHISM

The Horse Islands group has undergone at least three phases of deformation and at least two phases of metamorphism. There is a distinct contrast in structural style between the two islands; structures related to the main deformational phase (D_M) are relatively simple and prominent on the Western Island, whereas structures due to at least two later phases of deformation (collectively, D_L) strongly overprint D_M structures on Eastern Island.

On both islands, layering and the main penetrative

fabric (S_M) are generally parallel and steeply dipping; they trend consistently to the northeast on the Western Island, whereas on the Eastern Island their trend is variable due to complex later structures. Folds related to S_M are generally tight to isoclinal and locally, an earlier fabric (S_E) is folded around the hinges of F_M minor folds. A strong mineral lineation is associated with S_M in massive psammites on the northeast corner of Western Island and the western part of Eastern Island.

On Western Island, a spaced crenulation cleavage (S_L), with associated open to close folds, consistently trends north-northeasterly and overprints D_M structures. F_L folds do not regionally deflect D_M structural trends on this island. Late structures on Eastern Island are more complex than those of Western Island. D_M structures are intensely overprinted by at least two heterogeneously developed, spaced crenulation cleavages (collectively S_L) with associated open to close folds. Conflicting evidence regarding the relative age of the two cleavages suggest that they may be genetically related (conjugate pair) or that further deformation has disrupted the original relationship. In places, S_M is heterogeneously intensified by D_L , thus forming complex relationships between cleavages.

The Horse Islands group has been metamorphosed to the upper greenschist facies. Unaltered garnets up to 5 mm in diameter occur in semipelites in the central portion of Eastern Island; along the east coast of the island, the garnets are completely altered to chlorite.

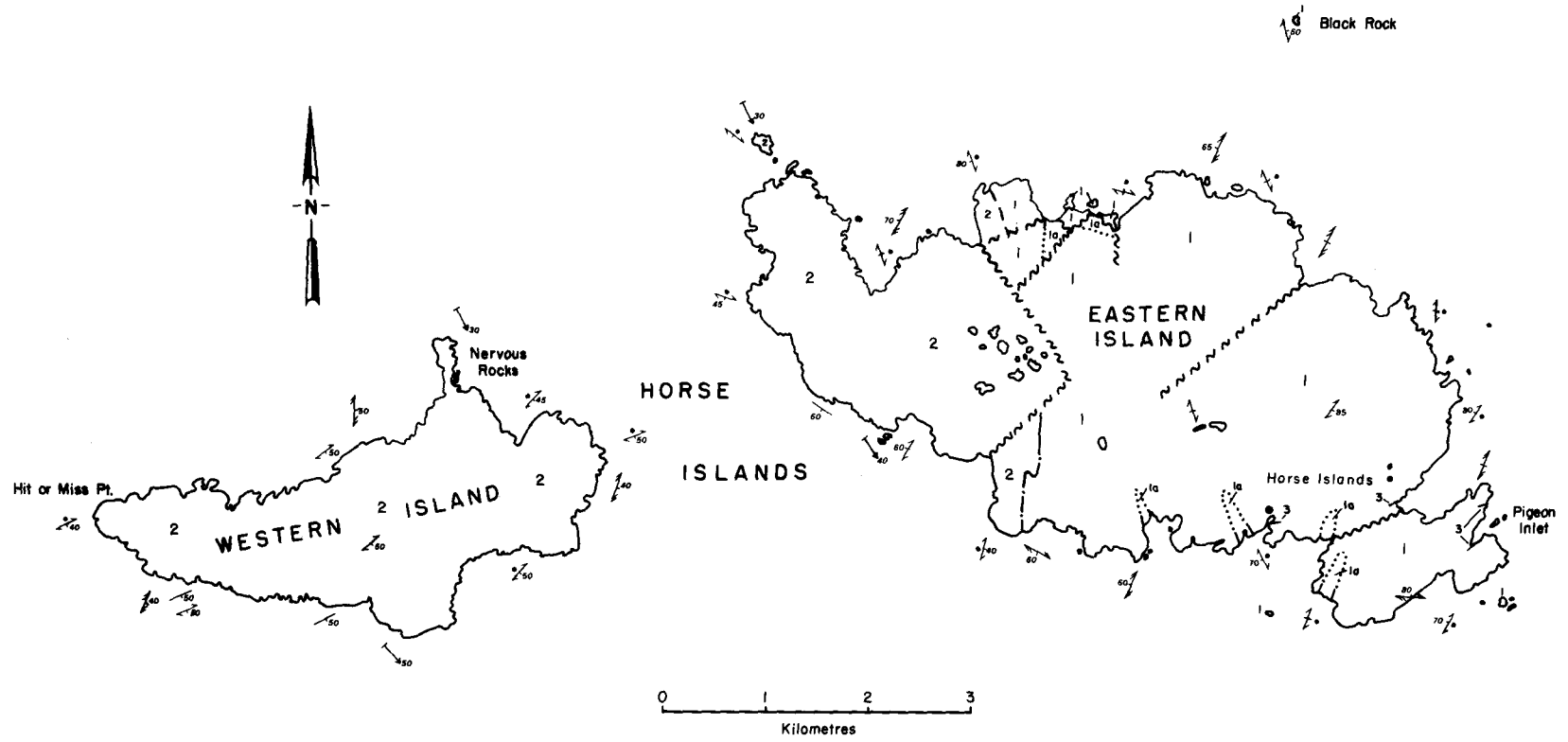
ECONOMIC GEOLOGY

No significant mineral occurrences were found; disseminated pyrite is common within the greenschist units.

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REFERENCES

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LEGEND

SILURIAN-DEVONIAN(?)

3 Diabase dikes, locally containing feldspar phenocrysts.

EOCAMBRIAN-MIDDLE ORDOVICIAN(?)

Fleur de Lys Supergroup

Horse Islands group

2 Eastern Island sequence: Mainly pelitic and semipelitic schists, locally garnetiferous, with minor thin mafic schist and psammite interlayers; 2a, mafic schist with minor marble.

1 Hit or Miss Point sequence: Dominantly monotonous, alternating layers of psammite and pelite.

SYMBOLS

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| Geological boundary (defined, assumed, transitional)..... | |
| Bedding, tops known | |
| Main schistosity, parallel to layering (inclined, vertical)..... | |
| Main schistosity (inclined, vertical)..... | |
| Secondary schistosities (inclined, vertical) | |
| Mineral lineation (inclined)..... | |
| Axes of minor folds (inclined) | |
| Fault (defined, assumed) | |