5. FURTHER RECONNAISSANCE MAPPING OF THE PRECAMBRIAN SHIELD ON DEVON ISLAND, DISTRICT OF FRANKLIN

Project 760023

Thomas Frisch
Precambrian Geology Division

Frisch, Thomas, Further reconnaissance mapping of the Precambrian Shield on Devon Island, District of Franklin; in Current Research, Part A, Geological Survey of Canada, Paper 81-1A, p. 31-32, 1981.

Abstract

The Precambrian basement of eastern Devon Island appears to consist of alternating, broad, easterly-trending belts of biotite- and hypersthene-bearing granulites and chiefly pelitic metasediments, all in the granulite facies of metamorphism. The easterly structural grain in eastern Devon Island contrasts with the predominantly northerly trends in the adjacent basement terrane of southeastern Ellesmere Island and Coburg Island. Paleozoic carbonate rocks, previously unknown east of the Devon Ice Cap, were found over an extensive area on western Philpots Island.

Introduction

Project 760023 involves the reconnaissance mapping, at 1:250 000 scale, of the Canadian Shield on Ellesmere, Devon and Coburg islands, which constitutes the northernmost part of the Churchill Structural Province. Mapping on Ellesmere and Coburg islands was completed in 1977 (Frisch et al., 1978). Geological reconnaissance of eastern Devon Island (Fig. 5.1) was begun in 1978 and focused on the crystalline areas of the south coast and west of Sverdrup Glacier on the north coast (Frisch, 1979). Completion of the mapping was planned during a two-week period in 1980, using a helicopter under charter to the Polar Continental Shelf Project. Reconnaissance of the eastern coast and of Philpots Island was completed but persistent low cloud prevented access to much of the nunatak terrain in the interior of Devon Island.

Crystalline Basement

The crystalline basement terrane along the eastern coast consists essentially of alternating tracts of biotite-hypersthene granulite and metasediments. Gneissic trends, which parallel the margins of the tracts, generally strike east to northeast. The easterly preferred orientation contrasts markedly with the northerly trends in the adjacent granulite facies basement on Coburg Island and southeastern Ellesmere Island.

Granulite and granulite gneiss underlie the north coastal area from Belcher Point to Sverdrup Inlet and occur, on the east coast, between Johnson Point and Cape Parker and on southern Philpots Island. These are relatively homogeneous, medium grained, quartzofeldspathic rocks, greenish on fresh, and brown or red on weathered surfaces. Garnet is locally an important constituent and, where abundant, may signify a metasedimentary origin. Pink granite is almost invariably associated with the granulitic rocks. It forms veins, sheets, and larger intrusions, and predates the main deformation. Major granitic bodies, suspected to be hypersthene-bearing, occur along the coast westward from Cape Hardy.

Two major metasedimentary tracts form the coast between Belcher Point and Johnson Point and from south of Cape Parker to central Philpots Island. The presence of metasedimentary terranes around the head of Sverdrup Glacier and east of Sverdrup Inlet, on strike with the northern of these two tracts, suggests that the tract is at least 150 km long. Clearly, much of eastern Devon Island consists of supracrustal rocks.

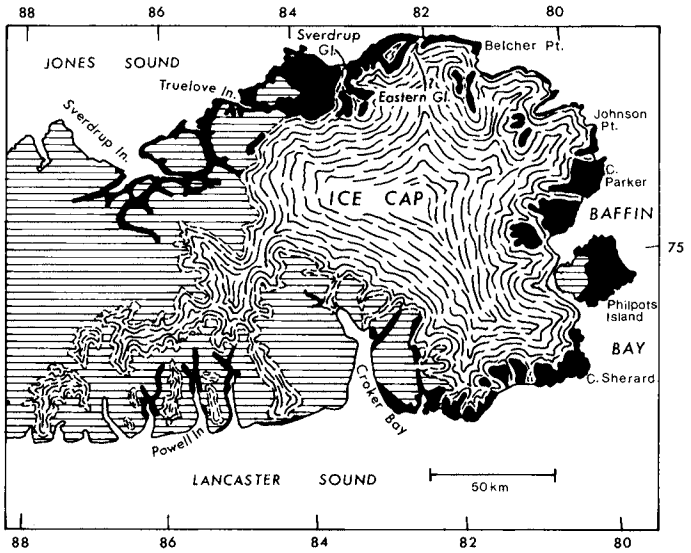

Figure 5.1. *Geological sketch-map of eastern Devon Island, showing the areas of Precambrian crystalline basement (black) and Paleozoic rocks (lined) and localities mentioned in the text.*

The metasedimentary belts are dominated by pelitic garnet-biotite schists and gneisses, commonly with sillimanite. Subordinate rocks include schistose psammitic rocks (metaquartzite and metagreywacke) and fine grained, garnetiferous, banded rocks possibly of metavolcanic origin. Amphibolite is relatively uncommon and only one thin marble bed was seen. The scarcity of marble provides another sharp contrast with the basement of Ellesmere and Coburg islands.

Pretectonic granite and pegmatite vein the supracrustals. A white weathering, garnetiferous, pegmatitic granite mass, several hundreds of metres thick, is associated with metasedimentary rocks east of the snout of Eastern Glacier.

All the metamorphic rocks appear to be in the granulite facies.

Diabase Dykes

Easterly- and southeasterly-trending diabase dykes form impressive swarms between Sverdrup Glacier and Truelove Inlet and on northern Philpots Island. They are present in smaller numbers throughout the rest of the Precambrian terrane.

Basement-Paleozoic Contact in Powell Inlet

Strongly weathered Precambrian basement rocks below basal Paleozoic sediments in steep cliffs on the eastern shore of Powell Inlet were first recognized by U. Mayr and R. Thorsteinsson of the Geological Survey of Canada, Calgary (personal communication, 1978). This occurrence is, in the author's experience, unique in the Ellesmere-Devon basement terrane.

The locality was briefly visited in 1980. About 35 m below essentially flat-lying Paleozoic strata, little-weathered Precambrian metasedimentary rocks grade rapidly into deeply-weathered material, some of which resembles fault gouge. Cutting the weathered zone are numerous shear planes, between some of which slivers of less altered rocks remain. The strong weathering was probably promoted by intense shearing, apparently of only local extent. Less than 20 km to the south, at the mouth of Powell Inlet, Proterozoic sedimentary rocks rest on fresh, hard granulite gneiss.

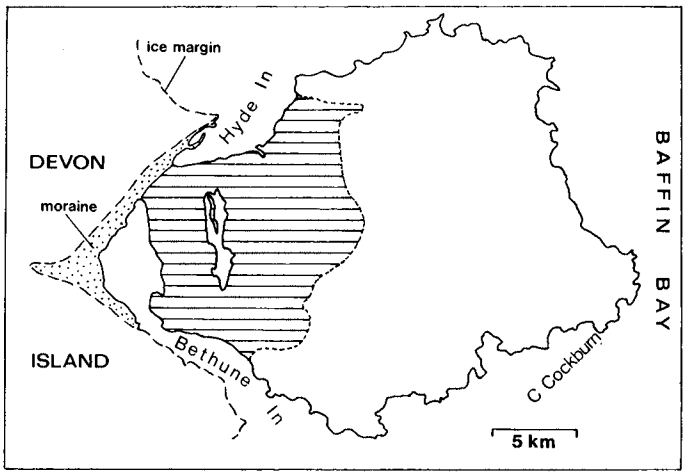

Figure 5.2. *Geological sketch-map of Philpots Island, showing the area underlain by Paleozoic rocks (lined). The eastern boundary of the Paleozoic area is interpretive, being based on limited outcrop and topography. The remainder of Philpots Island consists of Precambrian crystalline rocks.*

Paleozoic Rocks on Philpots Island

Prior to the present work, Philpots Island was generally considered to be underlain entirely by Precambrian crystalline rocks. However, on the basis of airphoto interpretation, L. Lazic (Petro-Canada, Calgary) recently suggested (personal communication to R.L. Christie, 1979) the presence of younger sedimentary, probably Paleozoic, rocks in the western part of the island, a low, swampy area of poor exposure. A brief visit by the author fully bore out Mrs. Lazic's prediction: scattered outcrops (now chiefly rubble), up to 5 m high, of flat-lying buff and orange dolomite and thin patches of felsenmeer of similar lithology occur in the area delineated in Figure 5.2. From samples and descriptions given him by the author, R. Thorsteinsson (Geological Survey of Canada, Calgary) considers it likely that the rocks belong to the Cass Fjord Formation of Middle Cambrian to Early Ordovician age. The nearest Paleozoic outcrops on Devon Island lie some 60 km to the west. There, the Cass Fjord Formation outcrops extensively near the base of the Paleozoic Arctic Platform sequence, in which it is generally separated from the Precambrian basement by thin Cambrian sandstones. On Philpots Island, no contact with the basement was seen.

The possibility remains that the sedimentary rocks on Philpots Island are Proterozoic in age, correlative with strata at the mouth of Powell Inlet, 155 km to the west, and on Bylot Island, 150 km to the south. However, lithologic differences render such correlation unlikely. Furthermore, easterly-trending diabase dykes, which postdate the Proterozoic, and predate the Paleozoic, strata of the region, are numerous in eastern Philpots Island; none was seen in the sedimentary terrane to the west.

Acknowledgments

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