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TRIP A-2, by N. Rast and R. H. Grant, The University of New Brunswick.

THE VARISCAN FRONT IN SOUTHERN NEW BRUNSWICK

INTRODUCTION

Zones of post-Carboniferous (post-Pennsylvanian) deformation in New Brunswick have been recognized for many years (Bailey, et al; 1880). Poole, (1967) has referred to the movements causing the deformation as the Maritime Disturbance. Recent work by ourselves (1973) has shown that the disturbance is associated with large-scale over-thrusting involving both the Carboniferous cover and the pre-Carboniferous basement. The excursion is planned to marshal the evidence for the post-Carboniferous movements which we correlate with the Variscan Orogeny of Europe.

STRATIGRAPHY AND SEDIMENTATION

The stratigraphic succession (Fig. 1) varies in relation to the overthrust zone. Generally Mississippian (Mispec) volcanics and the associated grey and red clastic sediments are present only to the southeast of the overthrust zone except in the Kennebecasis region where the Mississippian Kennebecasis conglomerate probably rests with an angular unconformity on the older formations. This suggests that the present-day line of overthrusting follows approximately the line of overstep of the Pennsylvanian over the Mississippian onto the older rocks. In the area affected by overthrusting the Mississippian-Pennsylvanian succession varies from place to place and in most cases the sediments appear to be proximally derived. This is especially so with respect to conglomerates where pebbles can be related to the immediately adjacent basements. The presence of abundant plant remains, especially in the Pennsylvanian, occasional coals (Wright and Clements, 1943) and coarse, often ill-sorted, angular rock debris suggests basically sub-aerial derivation. However, the presence of marine incursions can be deduced from occasional pillow lavas such as those on west Saint John (West Beach Formation). In Lepreau the rocks correlated with the Balls Lake Formation contain an extensive development of ignimbrites (welded ash-flow deposits) which can also be related stratigraphically to similar rocks of the Mount Pleasant and Harvey areas to the north (van de Poll, 1962).

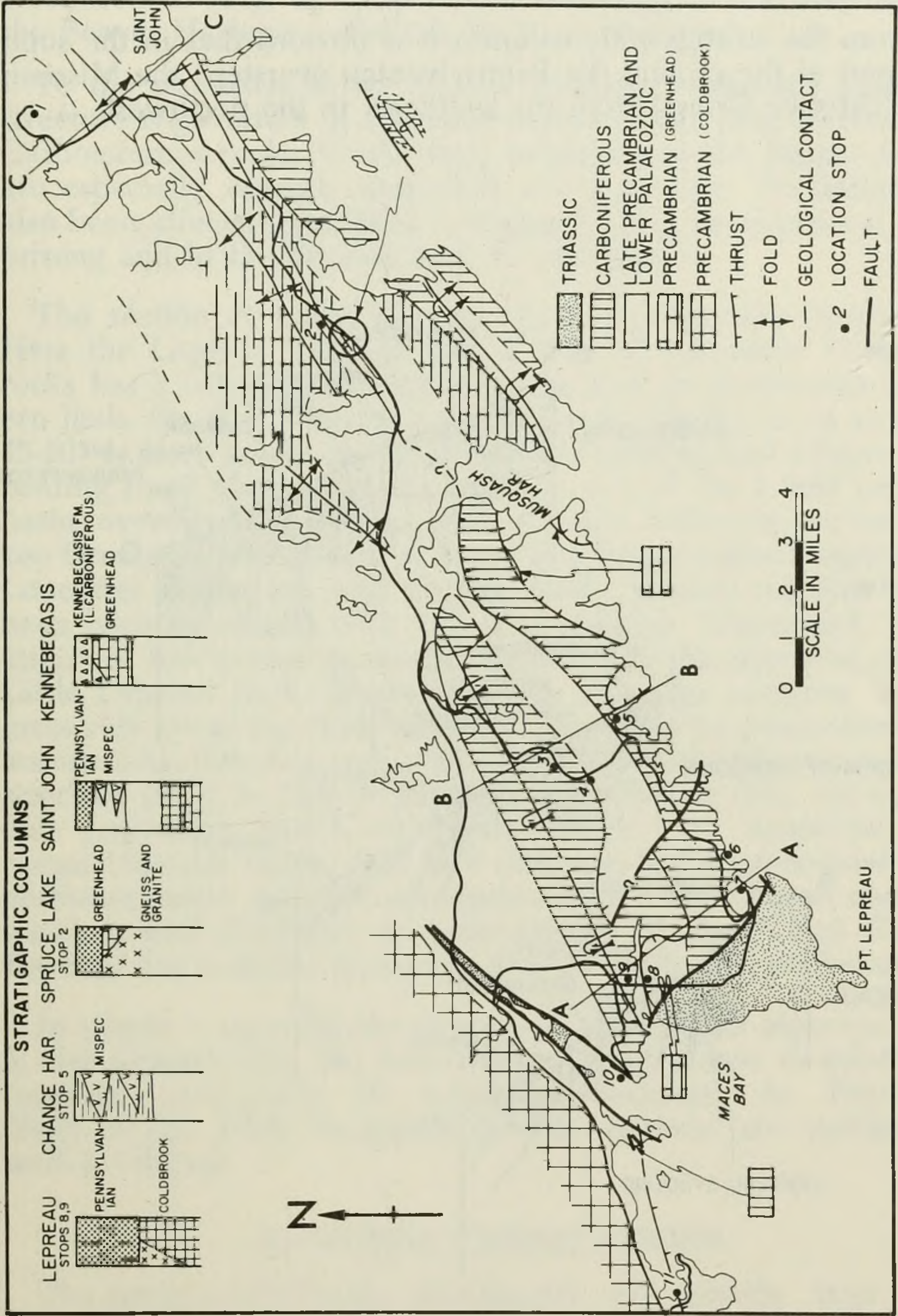


Fig. 1

Red Pennsylvanian sandstones and conglomerates at Spruce Lake (Stop 3) show the proximate nature of the deposit particularly well, since fragments in the sandstone can be directly matched with adjacent gneisses and granites.

From the stratigraphic columns it is obvious that in the southern part of the ground the Pennsylvanian oversteps the Mississippian (Mispec Group) from the southeast to the northwest.

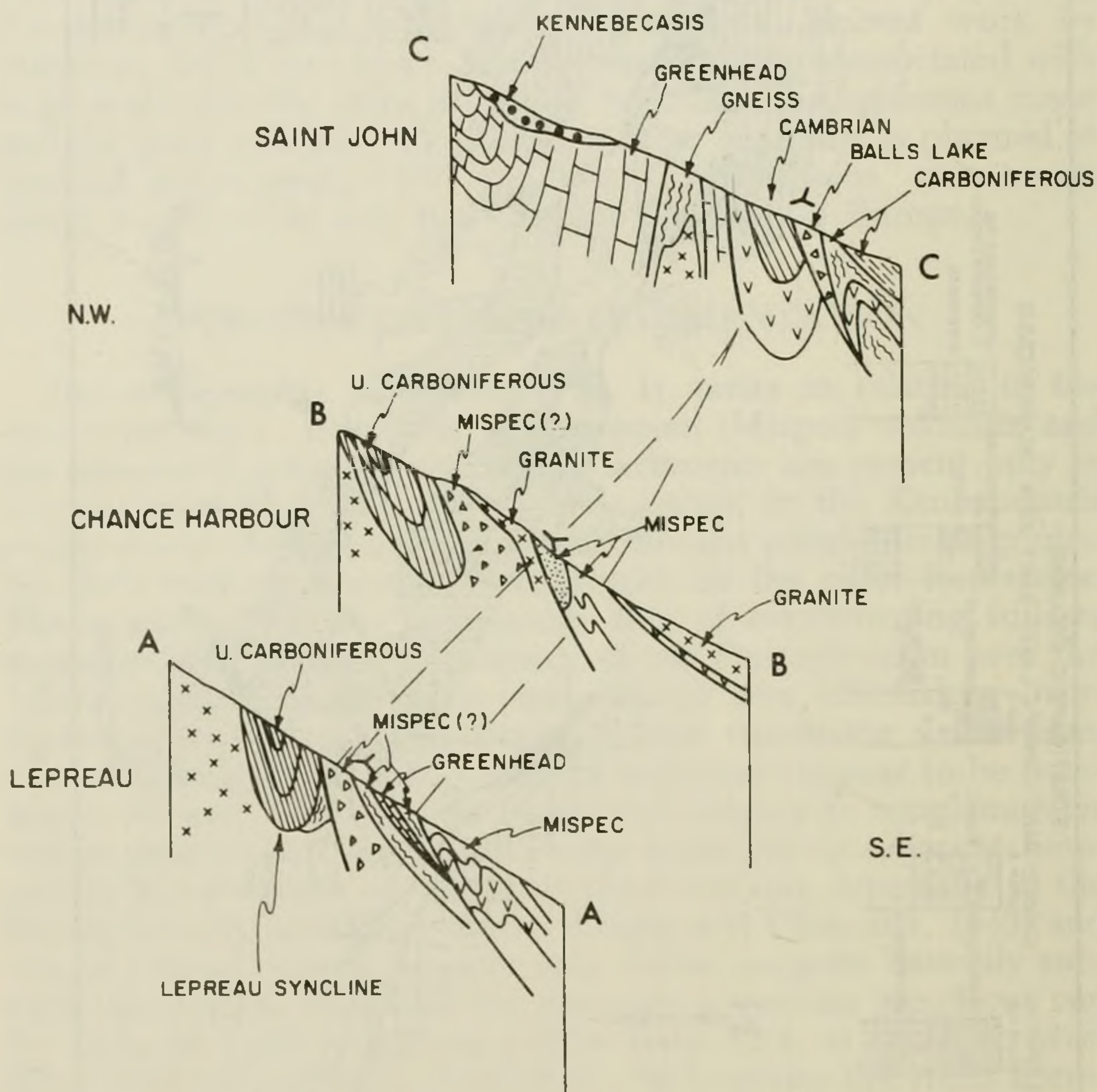


Fig. 2

STRUCTURE

The structure of the ground is regionally represented by three cross-sections (Fig. 2). Only the relationships to the southeast of the Beaver Harbour – Bellisle fault are discussed.

To the southeast of the Beaver Harbour – Bellisle fault the structure is governed by extensive overthrusting (Fig. 2) involving Carboniferous rocks. While those belonging to the Mispec Group are especially strongly deformed, the Lancaster Formation has also been affected, resulting in strong folding, in occasional overturning and in the development of cleavage.

The section at Little Lepreau Basin is especially instructive. Here the Lepreau Syncline with a core of Lancaster Formation rocks has a sub-vertical northern limb and an overturned southern limb. On the southern limb, cleavage dipping at an angle of 45-50° is more gently inclined than the bedding and affects rocks bearing fossil plants. On the southern side of the Little Lepreau basin, overturned sediments and volcanics belonging to the Mispec Group are interpreted as being in a thrust contact against the Lancaster Formation. Still further south, cleaved marbles which have been correlated with the Precambrian Greenhead Formation are interpreted as thrust slices. From the northern side of Little Lepreau Basin southwards the cleavage acquires a progressively lower dip. This cleavage appears to be penecontemporaneous with thrusting and is the first post-Carboniferous tectonic structure (S_{1c}). In Dipper Harbour it is refolded (Fig. 3a) by second generation, post-Carboniferous folds with attendant axial planar cleavage (S_{2c}). The first cleavage has a generalized east-northeast strike and a south-southeast dip. The second cleavage which is well displayed in both Dipper Harbour and Chance Harbour has a similar strike but dips gently to the northwest.

In places a sporadically developed weak third cleavage (S_{3c}) is also present (Fig. 3b) and which is axial planar to microfolds trending north-south to northwest-southeast. At Pocologan (Stop 10) the folds belonging to this episode are particularly well-developed.

REGIONAL CORRELATIONS

The post-Carboniferous movements are clearly later than Westphalian B and are pre-Triassic. Therefore we have suggested that these movements correlate on the one hand with the Appalachian deformation of southern New Brunswick and on the other

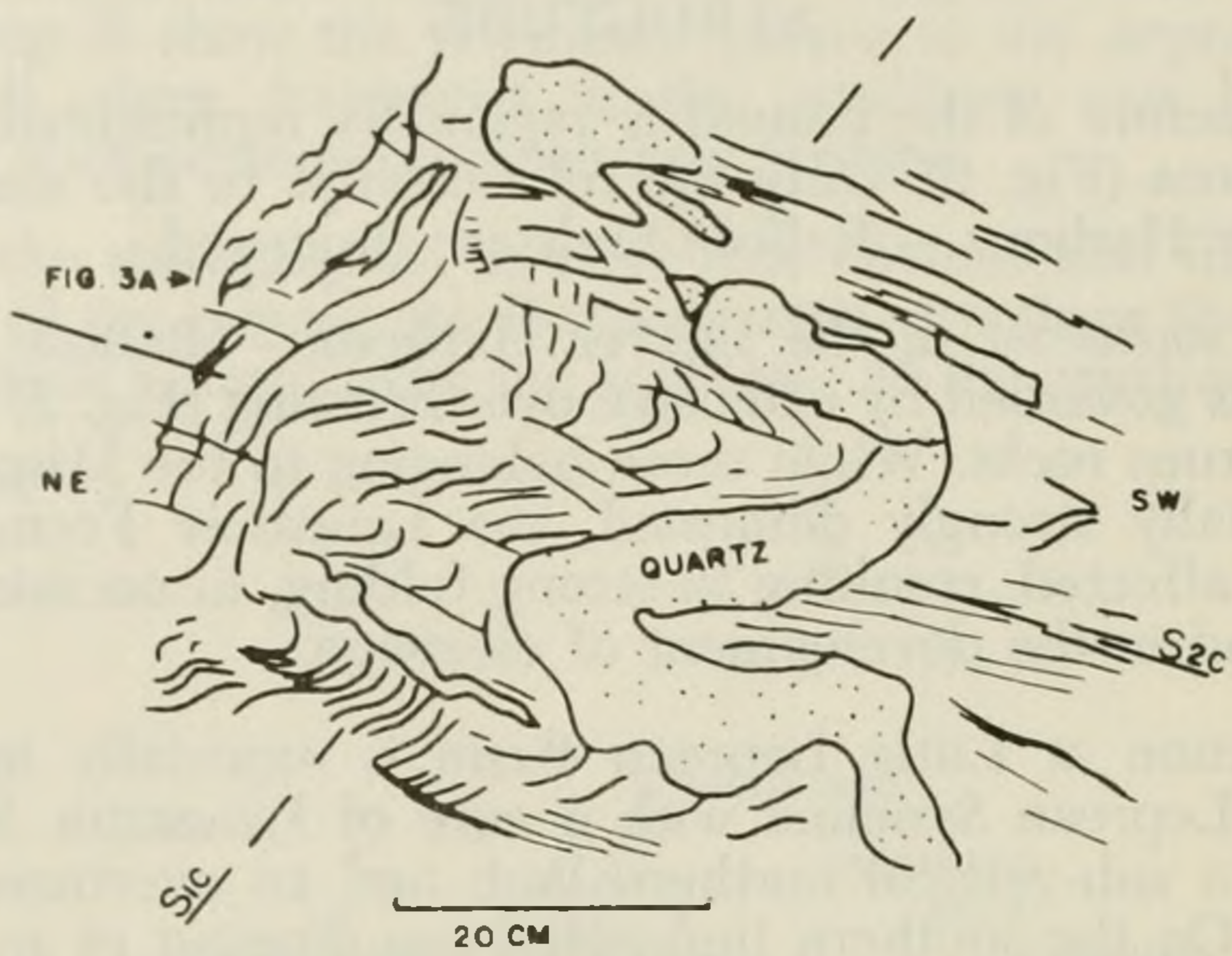
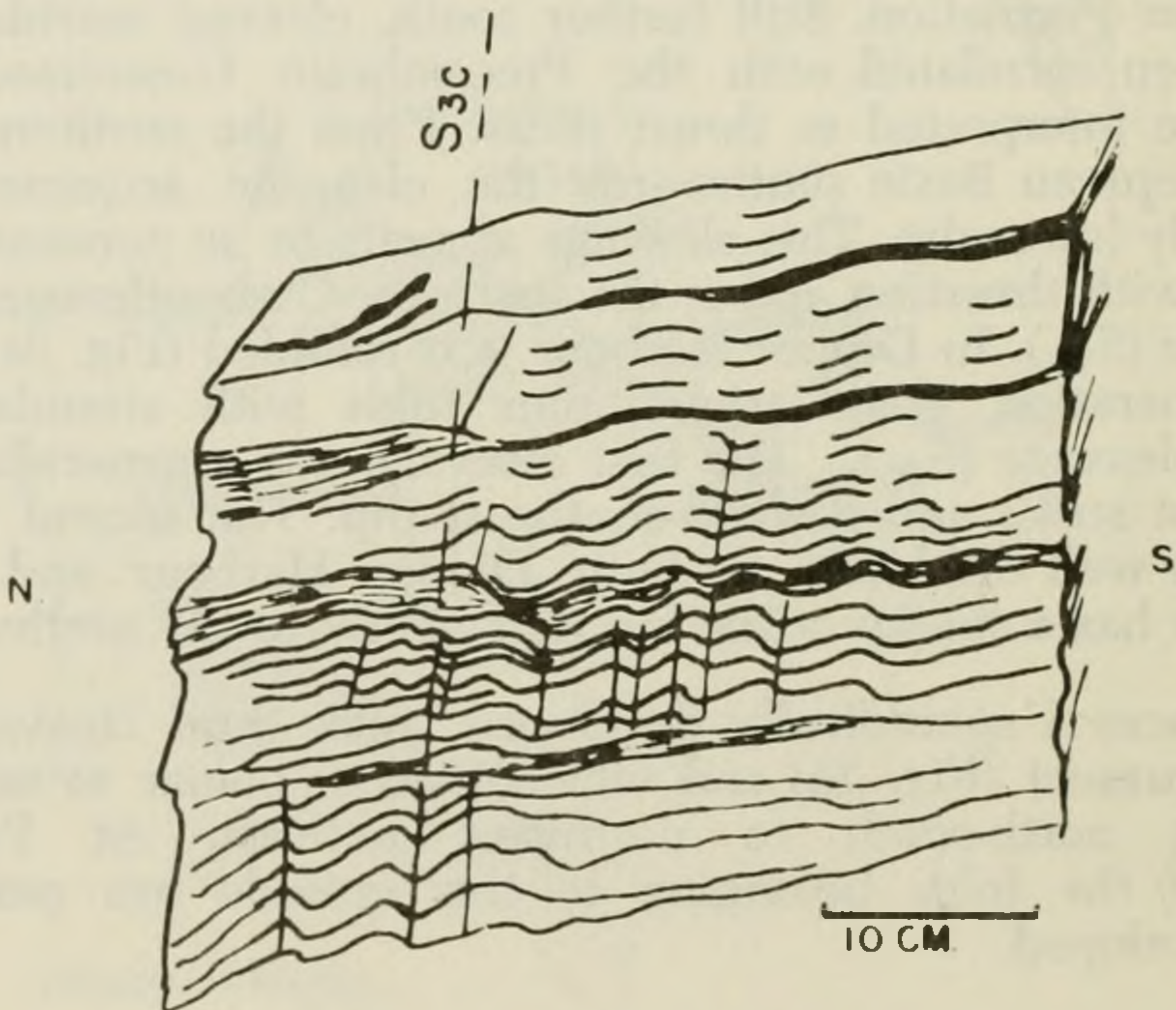


Fig. 3a



HORIZONTAL SCHISTOSITY DEFORMED BY
VERTICAL CRENULATION CLEAVAGE S_{3C}

Fig. 3b

hand with the Variscan (Hercynian) movements of the British Isles, suggesting a much closer pre-Mesozoic drift unity at least along the strike of the Caledonian – Appalachian orogenic belt.

LOG AND STOPS

MILEAGE

- 0 STOP 1 – *University Ground* – Kennebecasis Conglomerate Lower Carboniferous (Visean?) conglomerate and sandstones, bedded with gentle dip containing fragments derived mainly from Precambrian Greenhead limestones and quartzites, granites and gneisses.
- 10.2 STOP 2 – *Spruce Lake* – Steeply-dipping, overturned U. Carboniferous (Lancaster Formation) red sandstones with pebbles of granite, gneiss and feldspars in a faulted (thrust) contact against gneisses and granites related to the continuation of the Indiantown anticline.
- 24.0 STOP 3 – *Chance Harbour Road* – Steeply dipping red sandstones shales and micro-conglomerates of the Lepreau syncline. The rocks are moderately deformed.
- 24.4 STOP 4 – *Chance Harbour Road* – Reddish volcanic mudflows with interbedded sediments. Weakly cleaved. It is possible that these rocks are L. Carboniferous rather than Precambrian as indicated on the G.S.C. sheet. If they are Carboniferous then the cleavage is the expression of the second Carboniferous deformation.
- 26.4 STOP 5 – *East Chance Harbour* – Coastline exposures of refolded Carboniferous. Tight folds with first Carboniferous axial plane cleavage (S_{1C}) refolded (Fig. 4a) and cut by the (S_{2C}) crenulation cleavage. The rocks consist of Lower Carboniferous sandstones and acid volcanic tuffs (Mispec Group).
- 30.5 STOP 6 – *Round Meadow Cove* – Cleaved (S_{1C}) ignimbrites of the Mispec Group. Cleavage dips at a shallower angle than the stratification. Therefore the rocks are overturned. Sheets of diabase intrude the ignimbrites and are deformed together with them. Cycloidal joints have developed in the ignimbrites.
- 32.9 STOP 7 – *Dipper Harbour* – Deformed tuffaceous conglomerate with strongly flattened carbonate clasts is affected by S_{1C} and S_{2C} cleavages which dip at small

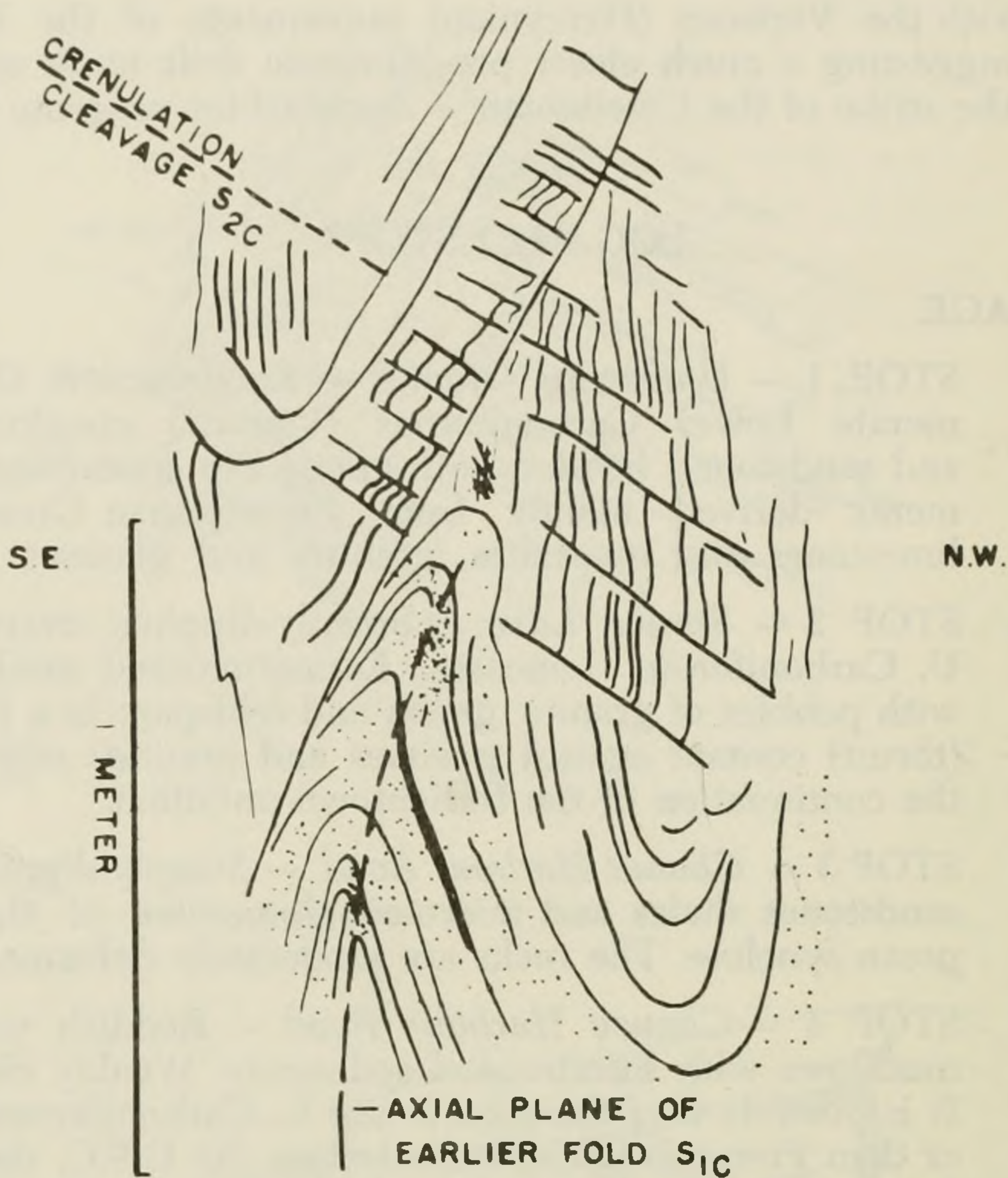
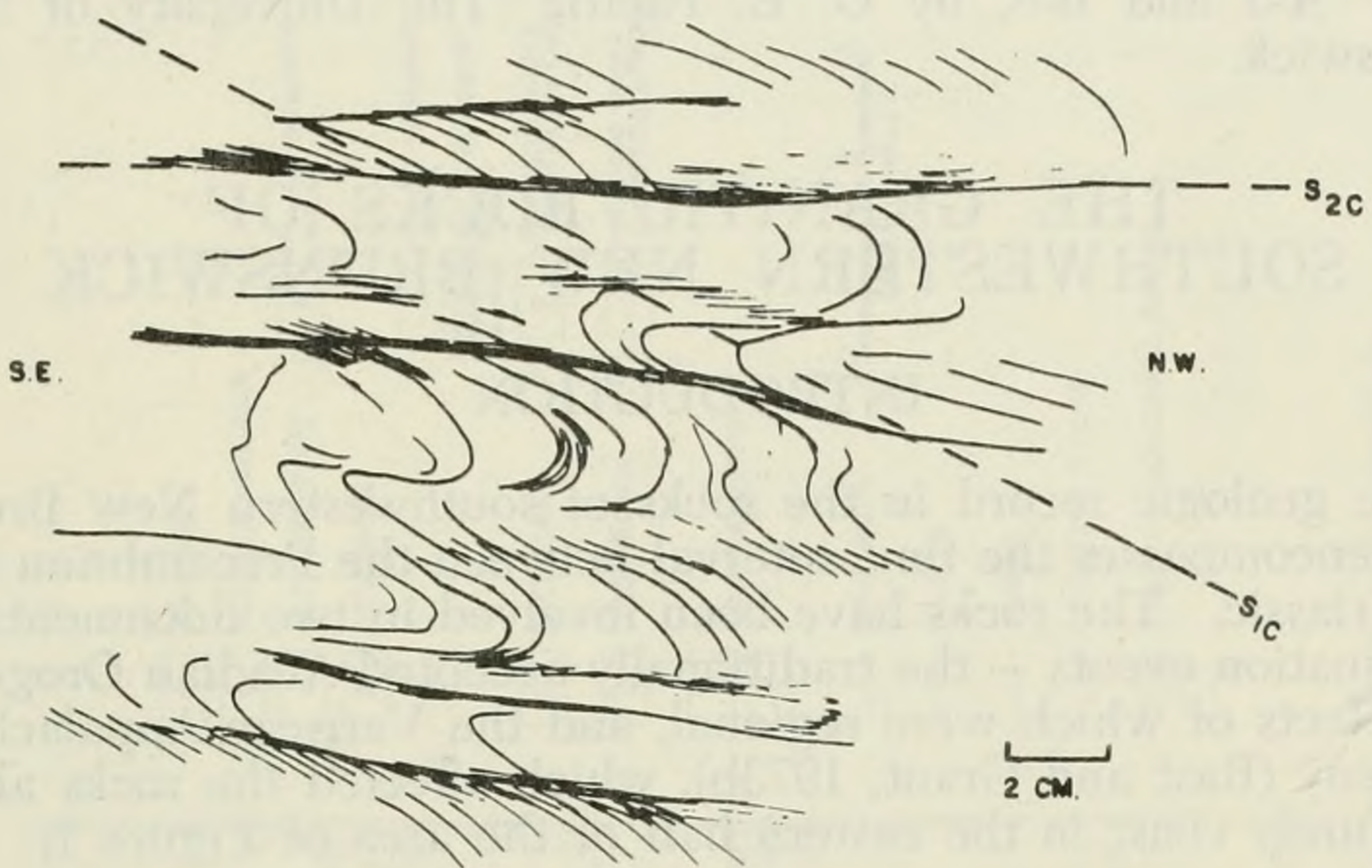


Fig. 4a

angles. Good second Carboniferous minor folds F_{2C} are observed showing a pronounced asymmetric style (Fig. 4b). The rocks here have been formerly mapped as Precambrian Greenhead Formation, but across the harbour they are clearly interbedded with rocks of the Mispec succession.

- 38.5 STOP 8 — *Little Lepreau South* — Short traverse from Little Lepreau Basin causeway to a quarry on the dirt road running due south toward Point Lepreau. Part of this succession is shown as Precambrian on the Geological Survey map, but it appears to be part and parcel of the Mispec Group. The sequence is overturned and from Little Lepreau Basin to the quarry involves ashes,



RECUMBENT CRENULATION CLEAVAGE DEFORMING EARLIER SCHISTOSITY

Fig. 4b

mudflows, flowbanded rhyolite and banded metasediments. The latter becoming younger to the north towards the junction with the Lancaster Formation. Structurally overlying the banded sediments are cleaved marbles interpreted as slices of Greenhead Formation.

- 38.7 STOP 9 – *Little Lepreau North* – Dark grey sandstone and slate of Carboniferous age representing an overturned limb of the Lancaster syncline. Bedding and cleavage strike 81 and dip 50 to 60° south with cleavage dipping slightly less than bedding. Fossil leaves well preserved.
- 41.6 STOP 10 – *Lepreau Harbour* – Coarsely current-bedded Lancaster Sandstones with plant remains and subvertical bedding younging toward the south representing the steep northern limb of the Lepreau syncline. (If tides are unsuitable this stop will be omitted.)
- 55.5 STOP 11 – *Pocologan* – Overthrust junction between the Pocologan granite and Precambrian Coldbrook volcanic rocks. The granite is brecciated and cleaved (S_{1C}) and the cleavage is refolded on folds trending between 145° and 180°. These folds are interpreted as F_{3C}.