The North Brook Formation: A temporal bridge spanning contrasting tectonic regimes in the Deer Lake Basin, Western Newfoundland

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The North Brook Formation in the Deer Lake Basin of western Newfoundland consists of red to grey, pebble to boulder conglomerates and arkosic sandstones, and less common mudstones and limestones. These rocks represent deposition in alluvial fans, associated downfan braided and meandering (?) systems, and small, carbonate-precipitating lakes. The upper part of the North Brook Formation is believed to intertongue with the mostly lacustrine Rocky Brook Formation of Viséan age. Deposition of these nonmarine facies occurred mostly in two lateral basins, which flank elongate flower structures containing strata of the Devonian (?) - Tournaisian Anguille Group. The flower structures were squeezed up as a result of dextral transpression along the Cabot Fault Zone.

West of the flower structures there is no evidence that strike-slip faulting directly created the western lateral basin. This is based mainly on the distribution of carbonate clasts in North Brook conglomerates which matches the distribution of carbonate rocks in the adjoining basement. The western lateral basin is interpreted to have formed by a combination of gravity faulting and thermal sagging.

One area, however, in a topographically low position in one of the flower structures contains about 7 km of North Brook sediment. This stratigraphic thickness is thought to be much greater than the vertical depth to basement, an inference based on gravity measurements, which do not show an anomalously strong gravity low. This discrepancy in thickness vs. depth is interpreted in terms of a pull-apart basin, in which deposited sediment is shunted along the extension direction. The pull-apart area is believed to represent the initial deposition of North Brook sediment, when dextral motion was still in progress along this stretch of the Cabot Fault Zone. Lessening of strike-slip movements, probably in the Viséan, was accompanied by more pronounced gravity faulting and North Brook deposition in lateral basins.

La Formation de North Brook (Bassin de Deer Lake, Terre-Neuve occidentale) comprend des poudingues à granules et blocs ainsi que des grès arkosiques, gris à rouges, et une plus faible proportion de mudstones et calcaires. Ces roches représentent un dépôt dans des cônes de déjection, vers l'aval dans les systèmes tressés et à méandres qui leur étaient associés, et dans des petits lacs où précipitaient des carbonates. On croit que la partie supérieure de la Formation de North Brook s'interdigite avec la Formation viséenne à dominante lacustre de Rocky Brook. Le dépôt de ces faciès continentaux prit place surtout dans deux bassins latéraux occupant les flancs de dispositifs à double déversement allongés contenant les strates dévoniennes(?) à tournaisiennes du Groupe d'Anguille. La compression vers le haut de ces dispositifs à double déversement découla d'une transpression dextre le long de la Zone de failles de Cabot.

A l'ouest de ces dispositifs, on n'a aucune preuve qu'un décrochement soit directement responsable du bassin latéral occidental. On base ceci surtout sur la distribution des fragments carbonatés dans les poudingues de North Brook, distribution qui correspond à celle du socle adjacent. On interprète ce bassin comme la résultante de la formation de failles par gravité, combinée à un fléchissement thermique.

Cependant, un dépocentre situé en un point bas d'un dispositif à double déversement contient environ 7 km de sédiment North Brook. On croit, sur la base de mesures gravimétriques ne montrant aucune forte anomalie négative, que l'épaisseur des strates soit beaucoup plus grande que la profondeur verticale jusqu'au socle. On interprète cette disparité entre l'épaisseur et la profondeur comme l'expression d'un bassin rhomboédrique sur décrochement, au sein duquel le transit sédimentaire suit la direction de l'extension. La zone rhomboédrique pourrait représenter le dépôt initial des sédiments North Brook, lorsque le jeu dextre s'exerçait encore sur ce jalon de la zone de failles de Cabot. Une diminution des coulissages, probablement au Viséen, s'accompagnait de la formation plus active de failles normales et du dépôt des sédiments North Brook dans les bassins latéraux.

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INTRODUCTION

It is now well established that dextral strike-slip faulting played a major role in the development of the Devonian (?) - Carboniferous Bay St. George and Deer Lake basins in western Newfoundland (Belt, 1968a; Popper, 1970; Knight, 1983; Hyde, 1984; Hyde *et al.*, 1988). Both basins lie along the trace of the northeasterly trending Cabot Fault Zone, which consists of a single strand (Long Range Fault) adjacent to the Bay St. George Basin, but a collection of sub-parallel faults in the Deer Lake Basin (Fig. 1). Although lateral movement along the Cabot Fault Zone probably represents the greatest displacements, estimated on various strands of the fault zone to be between 15 km and 120 km (Knight, 1983; Hyde, 1984; Coyle and Strong, 1987), the existence of sedimentary basins at several localities suggests that there was also significant dip-slip movement (Knight, 1983; Belt, 1968a; Popper, 1970; Hyde, 1984).

The details of the tectonic evolution of the two basins have yet to be fully elucidated. One important aspect of this evolution is the timing of strike-slip movement along the fault zone. This paper attempts to constrain the timing of strike-slip movement for the Deer Lake Basin. By recognizing that almost all the evidence marshalled for a strike-slip origin of the Deer Lake Basin (i.e., a strike-slip basin - see Crowell, 1974; Reading, 1980; Christie-Blick and Biddle, 1985) occurs in the Anguille Group (Fig. 2), and that no evidence is apparent in stratigraphic units younger than the North Brook Formation, one can conclude that significant lateral movements probably terminated during deposition of the North Brook Formation.

STRATIGRAPHY AND SEDIMENTOLOGY OF NORTH BROOK FORMATION

Stratigraphic Setting of the North Brook Formation

The oldest strata in the Deer Lake Basin are known as the Anguille Group (Figs. 1, 2) (Belt, 1969; Popper, 1970; Hyde, 1983, 1984), a thick (ca. 3000 m) succession of lacustrine, lacustrine deltaic, fluvial and alluvial fan (?) deposits ranging in age from Devonian (?) to Early Carboniferous (Tournaisian). The Anguille Group was evidently deposited in elongate and relatively narrow, northeasterly trending valleys marked by the presence of one or more large lakes. Hyde (1983) subdivided the Anguille Group into six formations. One of these, the Saltwater Cove Formation, constitutes about 75% (by volume) of the entire group and consists predominantly of lacustrine and lacustrine deltaic dark-grey shale and mudstone, lighter-grey sandstone, and minor conglomerate and limestone.

The Wetstone Point and Wigwam Brook formations (Figs. 1, 2) are two minor stratigraphic units that are in fault contact with the Anguille Group. These units, which flank the Anguille outcrop belt to the southeast and northeast, respectively, contain a palynomorph assemblage suggesting a Tournaisian age. Some clasts in conglomerates in the Wigwam Brook Formation appear to have been derived from the Saltwater Cove Formation, so that evidence favours a slightly younger age for these units than the Anguille Group.

The lowermost unit of the Deer Lake Group, the Viséan (?) North Brook Formation (Figs. 1, 2) is a nonmarine sequence of conglomerate, sandstone, mudstone and subordinate limestone (alluvial fan, fluvial and lacustrine paleoenvironments). A succession of dolomitic and calcareous mudstone interbedded with a variety of carbonate rocks characterizes the Viséan Rocky Brook Formation, which has been interpreted as largely lacustrine (Belt, 1968b, 1969; Hyde, 1984). The North Brook Formation underlies the Rocky Brook Formation, but is also interpreted, in part, as an alluvial-facies equivalent of the Rocky Brook Formation lacustrine beds. More fluvial strata overlie the Rocky Brook Formation: the Humber Falls Formation in the western part of the basin and the Little Pond Brook Formation to the east (Hyde, 1983, 1984).

Completing the stratigraphic succession in the Deer Lake Basin, the Westphalian A coal-bearing Howley Formation (Figs. 1, 2) crops out in the eastern part of the basin. It is interpreted to represent a fluvial system in which high-sinuosity channels were located on a well-vegetated, but poorly drained alluvial plain (Hyde, 1984).

Age of the North Brook Formation

The North Brook Formation has not been dated paleontologically. Miospores and plants, whose presence might be expected, given the terrestrial nature of deposition, are absent, probably due to extensive oxidation and nonpreservation of carbonaceous material. The Rocky Brook Formation, however, contains well-preserved spore assemblages, which indicate a Viséan age (Barss, 1980, 1981). These spore assemblages come from grey, green and black mudstones of lacustrine origin, which are interbedded in some sections with red and brown mudstones and very fine- to fine-grained sandstones. The red and brown beds are regarded as being, broadly speaking, alluvial deposits surrounding the Rocky Brook lake. It is probable that a coarser, basin-margin facies was present in an up-paleoslope direction from the locus of deposition of the fine-grained, red and brown sediment; this coarse-grained facies could be construed as the North Brook Formation. This organization of facies seems more in keeping with facies patterns in nonmarine strike-slip basins and rift basins, than the alternative of a fluvial-alluvial fan North Brook Formation distinctly older than the mostly lacustrine Rocky Brook Formation. As such, a Viséan age is favoured for the North Brook Formation, although the base of the formation could extend down into the Tournaisian.

Regional Facies in the North Brook Formation

The entire North Brook Formation consists of the following general lithofacies: (1) grey, boulder conglomerate; (2) red to grey, pebble to cobble conglomerate interbedded with red to grey, coarse-grained sandstone; (3) red to brown, calcareous sandstone and minor mudstone; (4) grey sandstone and red to reddish-brown, calcreted mudstone arranged in fining-upward sequences; (5) micritic to sparitic limestone; (6) stromatolitic and oncolitic limestone; (7) limestone breccia; and (8) amygdaloidal, basaltic lava.

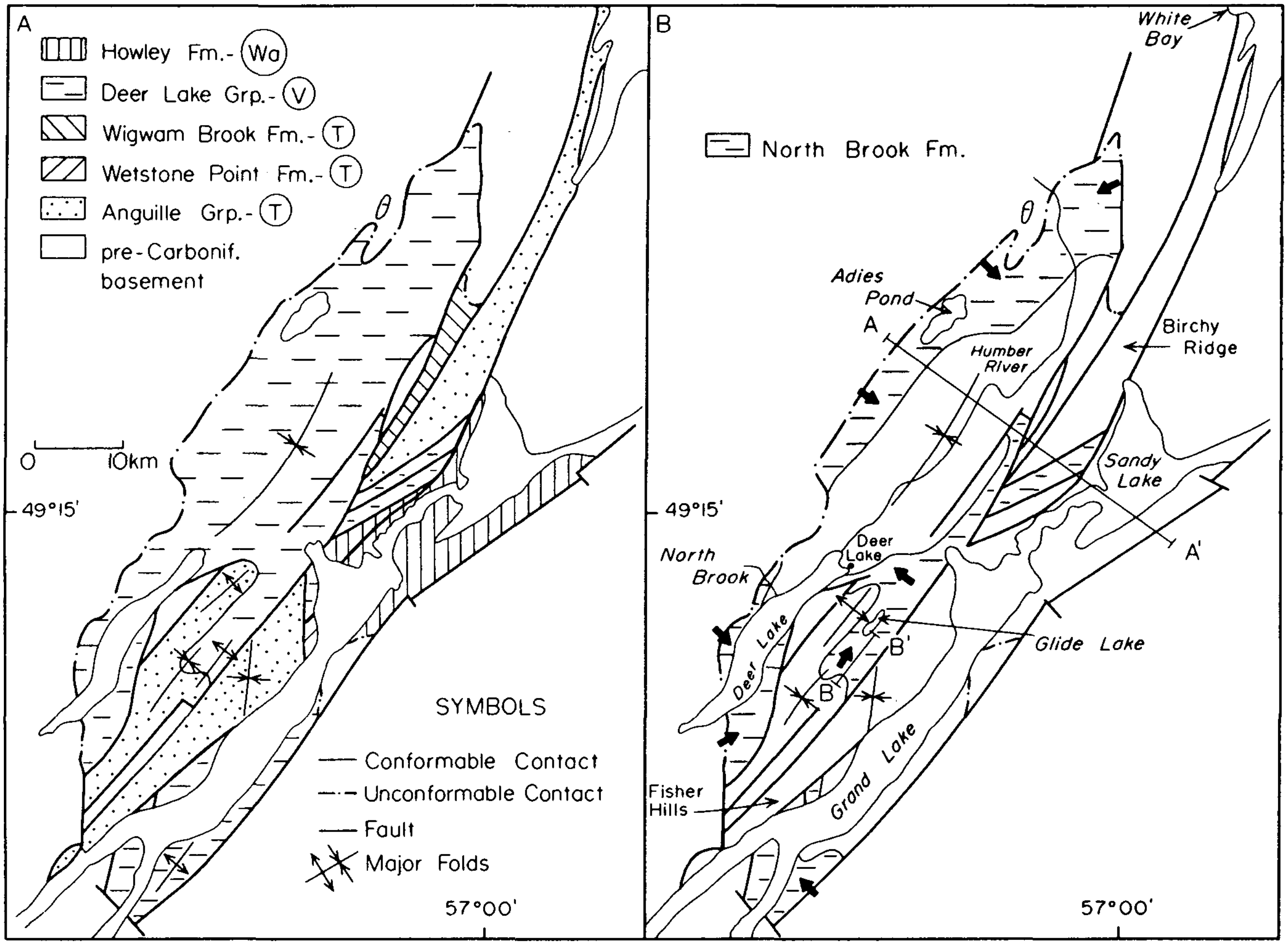

Fig. 1. Geological sketch maps showing, in A, the distribution of major stratigraphic units and major structures in the Deer Lake Basin; ages of units as follows: T - Tournaisian, V - Visean, and Wa - Westphalian; in B only the North Brook Formation is shown together with place names, generalized paleocurrent pattern (bold arrows) and section lines (A-A', B-B') for Figures 3 and 5, respectively.

Facies 1 is interpreted as the product of debris flow and streamflood deposition on alluvial fans. Facies 2 and 3 are regarded as braided channel deposits, which were probably developed near and at alluvial fan toes. Facies 4 is interpreted as a more distal braided to meandering channel deposit. Two of the carbonate facies (5 and 6) are considered to be lacustrine; deposited in small ponds developed in depressions on alluvial fan- and basin floor-surfaces. Some of the breccias of facies 7 are related to the establishment of a paleokarstic landscape on underlying Cambro-Ordovician carbonate rocks; other breccias containing large slabs of locally derived lower Paleozoic carbonates represent debris flows. The basaltic rock is a typical amygdaloidal, subaerial lava, although there are pillow-like forms, implying that some lava flowed into wet stream-channel areas.

Facies 1 to 4 are far more abundant than the remaining lithofacies, most of which have only been observed at single localities. Facies 1 and 7 are found only near the present-day outer limit of North Brook exposure. Their coarseness (boulders >1 m in size occur) suggests that these facies correspond closely to the Carboniferous basin margin. This in turn suggests that the extent and shape of the present-day lowlands underlain by the Deer Lake Group closely matches the size and configuration of the basin during North Brook deposition.

The finer, siliciclastic facies (2 to 4) were deposited closer to the basin centre, but in places there is a very rapid decrease in grain size from the inferred basin margin toward the basin centre. Thick sandstones, for example, occur less than 2 km from the inferred western basin margin. Facies 4 is present closest to the basin centre. The carbonate facies 5 and 6 are mostly associated with facies 3, but some stromatolitic carbonates are associated with facies 2 in an alluvial fan setting.

These facies were probably developed in a semiarid climate, based on the overall scarcity of plant debris and extensive development of calcretes in the red beds. Irving and Strong (1984) reported a paleolatitude for the Deer Lake Group in the Deer Lake Basin of $20^{\alpha\pm6^\circ}$S.

Paleocurrents in the North Brook Formation

Generalized paleocurrent directions are shown for the North Brook Formation at various places within the basin of deposition in Figure 1. These paleoflow directions are based on orientation measurements of trough and planar cross beds and parting lineation, on semiquantitative data of gravel-clast imbrication and on clast provenance studies. The paleocurrent patterns show

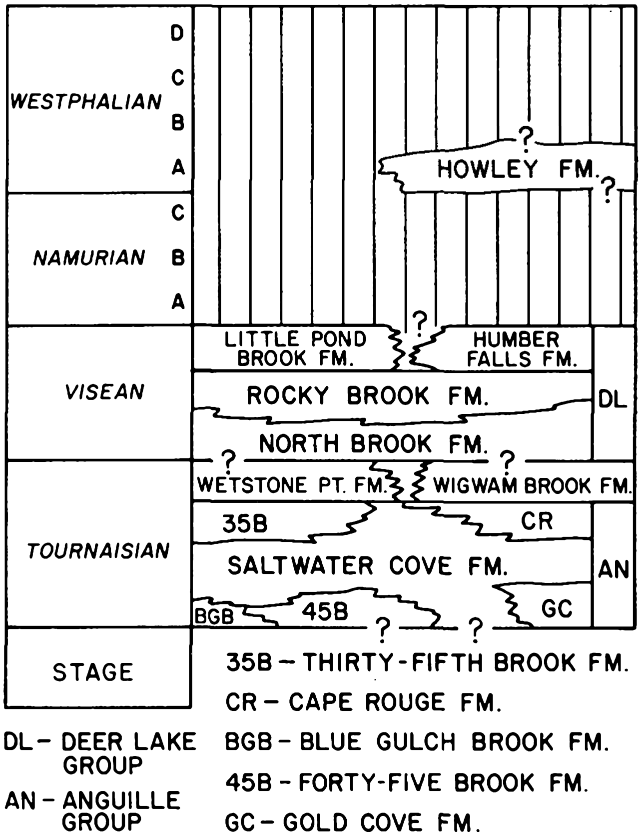

Fig. 2. Stratigraphy of the Deer Lake Basin based on Hyde (1983).

that sediment was derived from all basin sides (see also Belt, 1969; Hyde, 1984). There is only one area in the basin in which paleoflow (toward the northeast) appears to be along the inferred basin long axis. For the most part, paleocurrent data come from near basin margins so that paleoslope directions would be predictably toward, the basin centre, resulting in a predominance of paleoflow vectors transverse to the basin long axis.

TECTONIC SETTING OF NORTH BROOK FORMATION

General Consideration

To appreciate the tectonic setting of the North Brook Formation it is necessary to discuss first the inferred tectonic regime for the older Anguille Group. As mentioned earlier, the sediments of the Anguille Group appear to have been deposited in a relatively narrow valley containing one or more large lakes. The strike-slip fault origin of the valley along the Cabot Fault Zone is suggested by the following (Popper, 1970; Hyde, 1984; Hyde *et al.*, 1988): (1) faults comprising the fault zone are typical of strike-slip faults, being long, subparallel and enclosing wedges and slivers of basement rock; (2) prominent fractures, clearly perceived on areal photographs, that cut Anguille Group strata and basement rock and have demonstrable right-lateral movements, also acutely intersect a major strand of the Cabot Fault Zone, and are interpreted as Riedel shears; (3) Anguille strata occur within two, elongate structural blocks (known as Fisher Hills and Birchy Ridge) in end-on arrangement; these are analogous to piercement structures, welts or transpressive flower structures (Kingma, 1958; Lowell, 1972; Harding, 1985 for respective terminology); and (4) folds within flower structures are folded about axes oriented obliquely to the fault traces that bound the flower structures. The last point is especially compelling, because it can be shown (Hyde *et al.*, 1988) that the folds were not produced be a regional compressive event, but must have been created by more localized transpression. The orientation of the fold axes with respect to fault traces indicate dextral fault movements.

In contrast, the North Brook Formation and younger stratigraphic units in the Deer Lake Basin show a very different type of structural geology and stratigraphic setting. For the most part, these younger units are found on both sides of the Fisher Hills and Birchy Ridge flower structures, resting on pre-Carboniferous basement (Fig. 3). This suggests that this later deposition occurred in a wider basin. These later basins of deposition, whose fill is now seen to flank the flower structures on both sides, were termed lateral basins by Hyde *et al.* (1988). The names Humber lateral basin and Grand Lake lateral basin are introduced here for basins west and east, respectively, of the Fisher Hills and Birchy Ridge. (Together, these were called the Deer Lake lateral basin in Hyde *et al.*, 1988.) The lateral basins and flower structure are reminiscent of two of the three tectonic elements (basin block, central block) described by Sylvester and Smith (1976) for the Salton Trough segment of the San Andreas Fault Zone. In addition, as noted by Bradley (1982), the cross-section showing both the flower structures and the lateral basins conforms to a "steers-head" model of rift-basin formation (Dewey, 1982; Badley *et al.*, 1984; Harding, 1984; White and McKenzie, 1988), even though this type of basin development is predicted to be absent from small strike-slip basins (Karner and Dewey, 1986). An additional contrast with the Anguille Group is the fact that fold axes in the Deer Lake Group are everywhere subparallel or parallel to major through-going faults, rather than oblique as is the case with most Anguille folds. Asymmetry in two regional synclines in the Deer Lake Group that flank the Anguille structural blocks (axial surfaces of synclines dipping towards the structural blocks) is consistent with vertical movements along reverse faults (Popper, 1970).

Considering that the Deer Lake Group, including of course the North Brook Formation, shows structures that can be explained by vertical fault movements (subparallel to parallel fold/fault orientations with the expected asymmetry) and cross sections (Fig. 3) reminiscent of rift-valley profiles ("steer's-head" model), it is suggested that, with the exception of one depositional area, North Brook sedimentation in the lateral basins is more akin to deposition in basins related to thermal sagging or pure gravity faulting than strike-slip faulting. This is discussed more fully in the following section for the Humber lateral basin together with an account of a smaller area underlain by the North Brook Formation that constitutes the exception noted above.

Humber Lateral Basin

In the western part of the Humber lateral basin, the North Brook Formation rests unconformably on upper Precambrian, high-grade metamorphic and plutonic rocks (Owen, 1986) of the

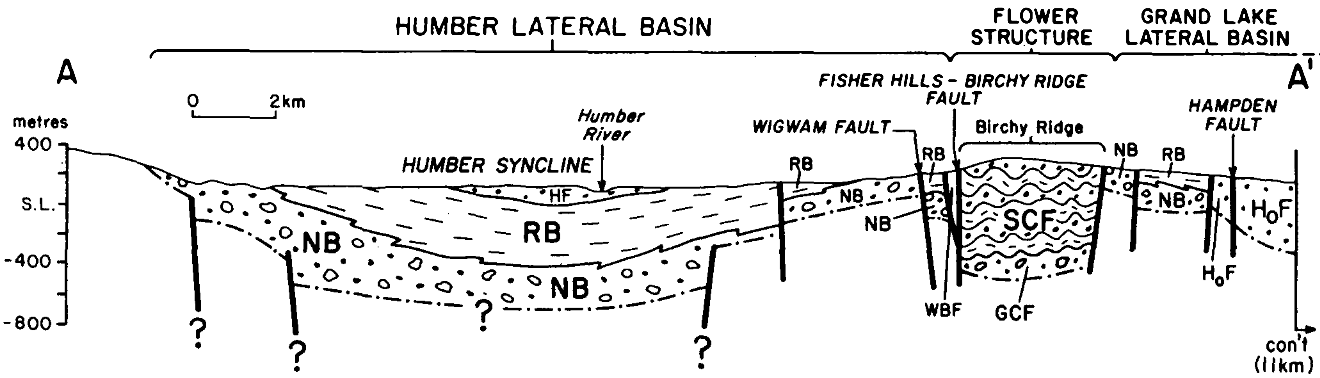

Fig. 3. Geological cross-section and topographic profile (see Figure 1 for line of section across the Deer Lake Basin) showing flower structure and lateral basins in "steers-head" profile. NB - North Brook Formation; RB - Rocky Brook Formation; HF - Humber Falls Formation; WBF - Wigwam Brook Formation; SCF - Saltwater Cove Formation; GCF - Gold Cove Formation; HoF - Howley Formation. Unornamented area below Deer Lake Basin fill represents pre-Carboniferous basement.

Long Range Inlier (part of the Grenville Province) and upon a Cambrian (?) greenschist-facies assemblage of quartzites, psammites, and carbonates. The unconformity is exposed in several places (Hyde, 1984), and is indicated by the highly irregular contact with topographically higher, pre-Carboniferous basement rocks. It is possible that there is a buried fault as suggested in Figure 3, but potential-field data (Miller and Wright, 1984) do not show a pronounced gradient at the contact, so that a thick North Brook succession sharply separated by faults from rocks of differing density and magnetic character is not indicated. In the western part of the Humber lateral basin, North Brook strata dip gently towards the axis of the Humber Syncline (Fig. 3).

Paleocurrents in the western part of the Humber lateral basin were directed toward the southeast (Figs. 1, 4), that is, toward the basin centre. A more extensive data set for the area extending a few kilometres southwest of Adies Pond (Fig. 1), has a vector mean for 23 trough cross-bed axes of 139° and a vector mean for 20 planar cross beds of 129°. As indicated earlier, textures show a pronounced fining towards the basin centre; this is also combined with an overall stratigraphically upward fining. Based on these paleocurrent data and the distribution and nature of facies, what is envisaged is alluvial fans, marking the western basin margin, giving way downslope (southeast) to a small alluvial plain - lacustrine mosaic near and at the basin centre.

The earlier assertion that lateral basin sedimentation was not directly influenced by strike-slip faulting can be examined more closely in the context of the western part of the Humber lateral basin. In particular, any faults that are buried near the western limit of North Brook outcrop, if they exist at all, do not appear to be large enough to have had significant lateral (or vertical) movements or to have influenced deposition. The Taylor Brook Fault, north of the Humber lateral basin, is buried by North Brook sediment (Belt, 1969; Miller and Wright, 1984), and was probably inactive at the time of lateral basin sedimentation.

The distribution of carbonate clasts in North Brook conglomerates along the western part of the Humber lateral basin also places several constraints on lateral movements. As shown in Figure 4, pre-Carboniferous rocks west of the Deer Lake Basin consist of lower Paleozoic metasedimentary rocks that include recrystallized carbonate rocks flanking (to the southwest and northeast) higher-grade metamorphic rocks of the Grenville Province. This arrangement is mimicked by the distribution of carbonate clasts in the North Brook Formation in this area. Figure 4 shows localities where carbonate clasts were observed in the conglomerates during field mapping and localities where carbonate clasts were not observed. There is a prominent gap in the distribution pattern of carbonate clasts in North Brook conglomerates in the vicinity of Adies Pond. The gap corresponds to the middle region west of the Deer Lake Basin underlain by the Grenvillian rocks. Lateral movements by either the block containing the source rocks, or the lateral basin, or both, should have produced a strewing-out effect on the carbonate clasts in the conveyor-belt manner outlined by Crowell (1982). Carbonate clasts should have been displaced from their adjacent source area to the northwest if significant lateral movements occurred along the western basin margin. This should have led to a mismatch in position between the clasts in the North Brook Formation and the adjacent source lithologies. Instead, there is a close spatial link between the clasts and the basement lithologies.

From the foregoing, an absence of movement along the western margin of the Humber lateral basin seems clear. However, it is very difficult to show an absence of strike-slip movement along the eastern margin of the Humber lateral basin. There must have been substantial vertical motion along the eastern margin to account for rising flower structures and deposition of the Wigwam Brook and North Brook formations. Although oblique-slip movement was probably prevalent during the formative stage of the Humber lateral basin, the basin is not regarded as being created by an extensional, stress field set up by predominantly horizontal motion. Instead, the basin probably resulted primarily from gravity faulting and thermal sagging as a relatively high heat flux during the early strike-slip phases of the Deer Lake Basin decreased (Hyde *et al.*, 1988).

Glide Lake Pull-Apart Basin

In the Glide Lake area (Fig. 1) the North Brook Formation is interpreted to overly the Anguille Group unconformably. This contact is not exposed, but nearby exposures of the two rock units have nearly orthogonal strike directions, implying an angular bedding discordance. Both the North Brook Formation and its contact with the Anguille are folded into an open synclinal -

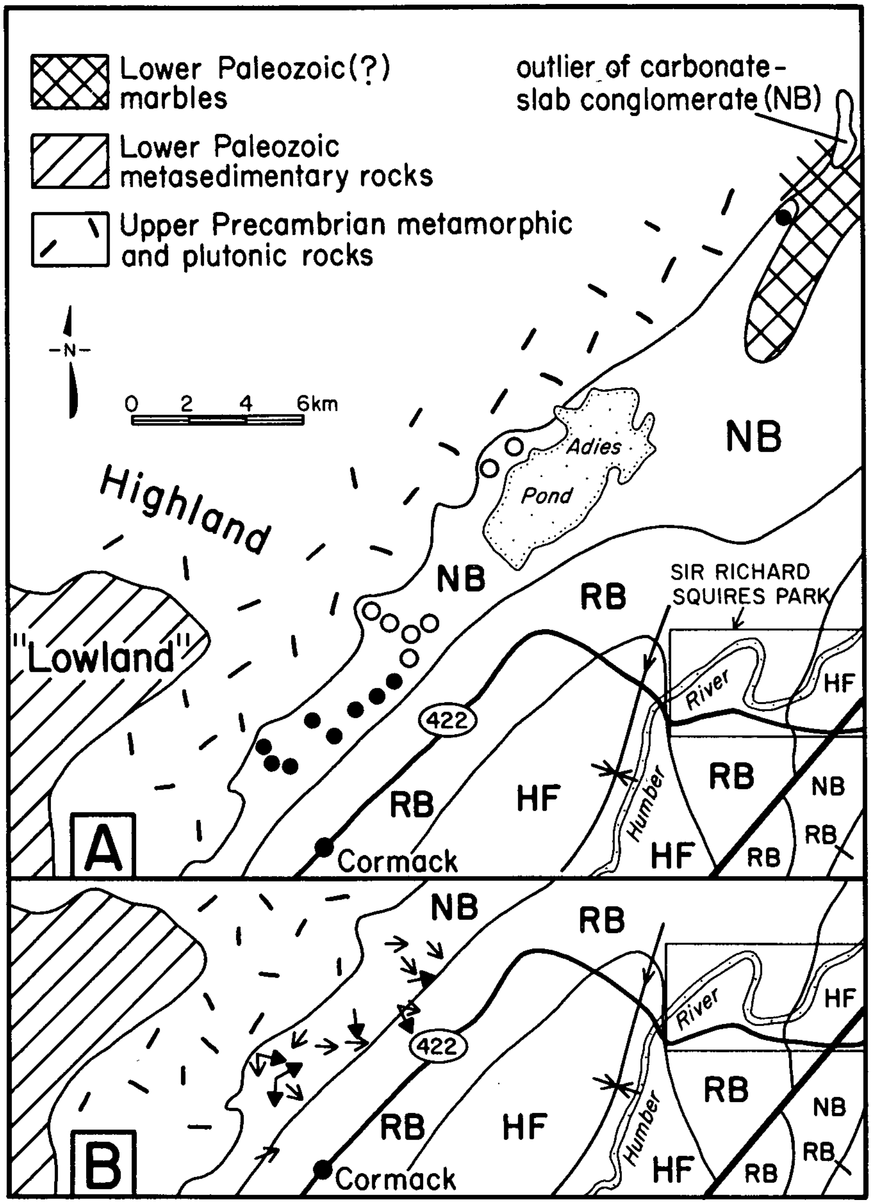

Fig. 4. Geological sketch map of the western part of the Humber lateral basin and adjacent basement area. Map A shows the distribution of carbonate clasts in North Brook conglomerate (black dots: carbonate clasts observed; circles: carbonate clasts not observed) in the Adies Pond area (Fig. 1). Map B shows the same area and measured paleoflow orientations (line arrows: planar crossbeds; block arrows: trough crossbeds). Together, diagrams show a match in the position of carbonate and carbonate-bearing basement rocks and areas where North Brook conglomerate contains carbonate clasts. Absence of a mismatch implies no strike-slip movements along the western border to the Humber lateral basin.

anticlinal pair that plunges gently to the northeast. The fold axes are subparallel or parallel to the trace of major faults. A structure section along the length of the fold axes (continuation of section line B-B' in Fig. 5) shows that the North Brook Formation dips consistently to the northeast for a distance of approximately 15 km. In contrast to the western part of the Humber lateral basin, in which dip directions of strata are normal to the basin long axis, in the Glide Lake region the dip directions are subparallel or parallel to the inferred basin long axis.

In the Glide Lake area, the boulder conglomerates (facies 1) and the carbonate facies (5-7) were not observed; otherwise facies are quite similar to those seen elsewhere. There is a rather abrupt change in facies from predominantly conglomeratic to predominantly arenaceous (Fig. 5) strata as the beds are traced in a northeasterly direction. Conglomerates contain subrounded to rounded clasts up to about 25 cm in diameter. The conglomerates are clast supported, form beds up to 2 m thick, and contain interbeds and lenses of mainly medium- to coarse-grained sandstone. Sandstones northeast of the conglomerates are predominantly red to brown in colour, micaceous, and fine- to medium-grained. These sandstones contain a variety of current-produced structures, including trough and planar cross beds, parting lineation, and asymmetrical ripples. The observed facies near Glide Lake are thought to represent deposition within a braided river system.

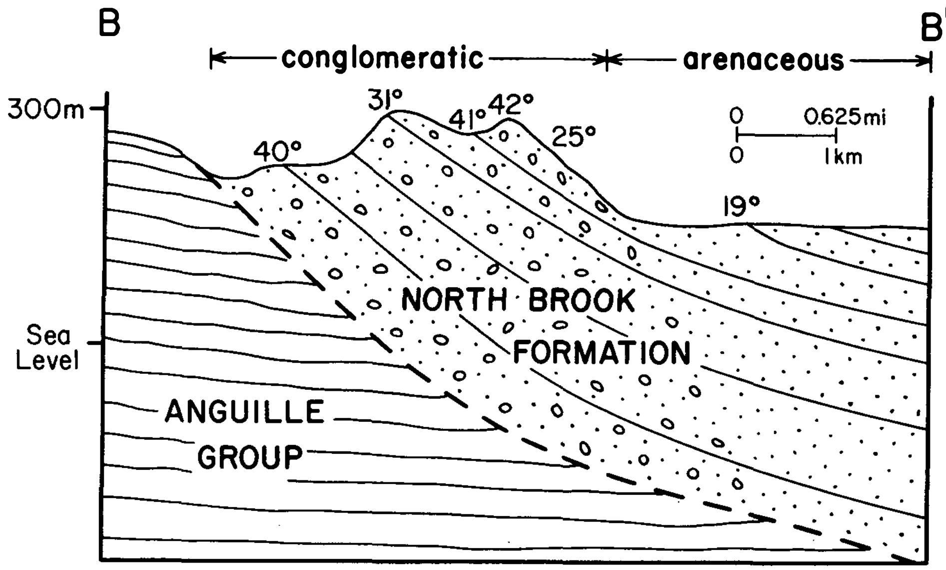

Fig. 5. Longitudinal cross-section (line of section in Fig. 1), along the Glide Lake pull-apart basin showing proximal North Brook conglomerates and more distal sandstones unconformably overlying the Anguille Group (normal faulting near the contact is also probable due to tensional stresses). North Brook sandstones continue to dip gently to the northeast (right on section), leading to a homoclinal thickness of about 7 km.

Paleocurrents in the Glide Lake area are interpreted to have been directed generally towards the northeast for the following reasons. There is a marked decrease in grain size toward the northeast, suggesting a proximal to distal change in grain size along the fluvial system. A few measurements on cross-bed orientation yield paleoflow directions only to the northeast and northwest. Finally, clasts in conglomerates comprise a wide variety of rock types including felsic to mafic volcanics, granitic rocks, and low-grade metamorphic rocks. In sandstones, lithic fragments are predominantly metamorphic and garnet grains are common. All of the lithologies seen in the conglomerates and sandstones as clasts occur as pre-Carboniferous basement to the southwest. There is an extensive tract of greenschist-facies metamorphic rocks to the southwest, the Fleur-de-Lys Supergroup, that probably served as provenance for the garnet and other metamorphic detritus. This inferred northeasterly dipping paleoslope is the only known example of along-basin-axis drainage in the North Brook Formation.

To conclude this section, evidence is presented that, unlike the lateral basins, the Glide Lake area was affected by strike-slip faulting. To begin the argument, it is very probable that the Fisher Hills - Birchy Ridge Fault, which borders the North Brook Formation to the east in the Glide Lake area, had a history of dextral strike-slip motion; this is inferred from the fold/fault pattern in the Anguille Group on the other (eastern) side of the fault.

Second, the consistent northeasterly dip of strata along the axis of the basin and away from the suspected provenance area leads to a stratigraphic (homoclinal) thickness greatly in excess of the vertical depth to basement. In the case at hand, a homoclinal section up to 7 km thick can be calculated trigonometrically from an average dip of 28° covering 15 km along the dip direction. From gravity measurements in the area (Miller and Wright, 1984), no large negative gravity anomaly, such as might be expected from a 7-km-deep "excavation", is evident. This suggests that the actual depth to basement is much less than 7 km. There is, therefore, a discrepancy between the stratigraphic thickness and the vertical depth to basement. The discrepancy is similar to that documented for other inferred strike-slip basins (Crowell, 1982), and appears to be a fundamental characteristic of strike-or oblique-slip basins. It results from shift along the basinal long axis of either the depocentre or sediment deposited from a fixed depocentre. For the Glide Lake area, corresponding to what is here called the Glide Lake pull-apart basin, it appears that dextral movement along the Birchy Ridge - Fisher Hills Fault caused deposited sediment to move or pull away northeasterly from a fixed basin marginal depocentre located to the southwest.

DISCUSSION

The North Brook Formation seems to contain evidence for deposition in two different tectonic regimes: lateral basins, which flank transpressive flower structures, represent basin widening and probably result from a combination of normal faulting and thermal sagging of the upper crust; secondly, a small pull-apart basin within an uplifted flower structure, resulting from strike-slip movements along one of the major faults of the Cabot Fault Zone.

In the Deer Lake Basin, there is no clear evidence for strike-slip faulting recorded in units younger than the North Brook Formation, but there is abundant and compelling evidence for transpressive deformation in the older Anguille Group. This suggests that North Brook deposition in the Glide Lake area preceeded deposition in the lateral basins. In this way, the sequence of deposition follows the sequence of tectonic events, and the North Brook Formation "bridges" the two contrasting tectonic styles.

It also follows from the above history that, in this part of the

Cabot Fault Zone, strike-slip movements probably ceased during the Viséan, the suspected age of the North Brook Formation. This also constrains the age for transpressive deformation of the Anguille Group to the interval Tournaisian - Viséan.

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