DESCRIPTIVE NOTES

INTRODUCTION

This 1:100 000 scale map and the accompanying Open File 1794 mapsheet 2 (NTS 56 P (North)) present results of bedrock mapping undertaken by the Canada-Nunavut Geoscience Office and Geological Survey of Canada under the Targeted Geoscience Initiative (TGI) during the summer of 2002. The objectives of the project were to upgrade geoscience knowledge of the prospective Committee Bay area (Fig. 1) and provide modern, 1:100 000 scale geological maps for the region. The Ellice Hills map area (NTS 56 P) is underlain by northeast-trending rocks of the Archean Prince Albert group (PAg: Heywood, 1967), a clastic-dominated supracrustal belt characterized by an association of quartzite and komatiite. Previous investigations of the Committee Bay belt (Figs. 1,2), include reconnaissance mapping (1:506 880) of Heywood (1962) and the subsequent 1:250 000 scale mapping in parts of the Laughland Lake (NTS 56 K) and northern Walker Lake (NTS 56 J) map sheets (Schau, 1982). The proposal to establish a new national park at Wager Bay (Fig. 1), including the headwaters of the Brown River, led to a mineral resource assessment by the Geological Survey of Canada (Jefferson and Schau, 1992; Chandler et al., 1993). As a result of the Committee Bay Targeted Geoscience Initiative Project, bedrock maps and related petrological and structural studies are available for: 1) Laughland Lake (56 K; Sandeman et al., 2001a-c; Johnstone, 2002; Johnstone et al., 2002; MacHattie, 2002); 2) Walker Lake and Arrowsmith River 56 J(N) and 56-O(S), respectively (Sanborn-Barrie et al., 2002; Skulski et al., 2002; Skulski et al., 2003a); and 3) Ellice Hills (56 P; this map; Sanborn-Barrie et al., 2003; Skulski et al., 2003b). Lithogeochemical prospecting results are available across the belt (Hyde et al., 2002; Sherlock and Deyell, 2002; Deyell and Sherlock, 2003), as are results of surficial mapping and drift prospecting (Little, 2001; Little et al., 2002; McMartin et al., 2002, 2003; Ozyer and Hickock, 2002; Utting et al., 2002; Giangioppi et al., 2003). An aeromagnetic survey that covered 85,300-line km, was flown along northwest-trending, strike-perpendicular flight lines, and spaced at 400 m along a pre-calculated drape surface with a mean terrain clearance of 150 m (Kiss et al., 2002a-g; Miles et al., 2002). These datasets have been integral in the production of this map, particularly in regions of extensive Quaternary drift.

REGIONAL GEOLOGICAL SETTING

The north-central Rae domain of the western Churchill Province, lying west of Hudson Bay, contains a discontinuous, ca. 1000 km long, northeast-trending zone of polydeformed and metamorphosed Archean supracrustal belts with a diagnostic quartzite komatiite association, that includes the Woodburn and the Prince Albert groups (Fig. 1). The supracrustal rocks are inferred to have formed in a continental setting, reflected by local evidence for deposition on older sialic basement (e.g., 2.87 Ga, Zaleski et al., 2001) and the presence of older Meso- to Paleoarchean detrital zircon in widespread quartzites (e.g., Ashton, 1988; Davis and Zaleski, 1998; Skulski et al., 2003b). Volcanic rocks within this northeast-trending corridor include komatiite, basalt, andesite, dacite, and rhyolite; the latter two yielding U/Pb ages in the Woodburn Lake and Committee Bay area between 2.73 and 2.69 Ga (Zaleski et al., 2001; Skulski et al., 2003b and references therein; Skulski et al., unpublished). Archean plutonic rocks in the region appear to be dominated by calc-alkaline granitoid plutons emplaced between ca. 2.64 and 2.58 Ga (Ashton, 1988; LeCheminant and Roddick, 1991; Zaleski et al., 2001; Skulski et al., 2003b) with lesser synvolcanic tonalite.

Outliers, or possibly klippe of platformal to basinal facies, Paleoproterozoic metasedimentary rocks are found throughout the region (Fig. 1). These include: the > 1.85 Ga Amer Group (Tella, 1994); the ca. 1.88 Ga Penrhyn Group (Henderson, 1983); the Chantrey Group (Frisch, 2000) and; the Folster Lake Formation (Frisch, 1982). In the Committee Bay area, small outliers of Paleoproterozoic metasedimentary rocks include < 2.50 Ga quartzite in the Laughland Lake area (NTS 56 K), and < 2.32 Ga arkose and calc-arenite in the Ellice Hills sheet (SHRIMP U/Pb detrital zircon; Skulski et al., unpublished; Table 1). These Paleoproterozoic sedimentary sequences have sustained Proterozoic deformation and are locally metamorphosed to amphibolite facies.

Archean and Paleoproterozoic strata in the region have a prominent northeast-striking tectonic fabric that is constrained in the Committee Bay and Woodburn Lake areas to have formed between ca. 1.85 and 1.82 Ga (Zaleski et al., 2001; Sanborn-Barrie et al., 2002; 2003). This predominant northeast fabric is interpreted to have resulted from regional D_2 deformation in the hinterland of the Trans-Hudson orogen. D_2 strain is generally superimposed on earlier D_1 fabrics and folds that formed after 2.6 Ga, but before 1.85 Ga (Fig. 2; Carson et al., 2003; Sanborn-Barrie et al., 2003). D_2 deformation was accompanied by regional greenschist to upper amphibolite metamorphism. Dextral, and locally oblique-slip, east-striking shear zones in the region overprint D_2 fabrics and include the Amer (Tella, 1994), Wager Bay (Henderson and Broome, 1990), and Walker Lake shear zones (Johnstone, 2002: Figs. 1,2).

In the Committee Bay area, Paleoproterozoic intrusive rocks include late- to post-tectonic ca. 1.82 Ga calc-alkaline granites and granodiorites of the Ford Lake batholith (LeCheminant et al., 1987) and similar age biotite magnetite ± fluorite monzogranites in the study-area (Skulski et al., 2003a,b). Plutonic units equivalent to the ca. 1750 Ma Nueltin Suite (Peterson et al., 2002) have not been documented in this part of the Rae domain, however, a small elliptical pluton of microcline megacrystic biotite-fluorite monzogranite was mapped in 56 K to the southwest and is inferred to be correlative with the Nueltin Suite. The northwest- trending, ca. 1.267 Ga gabbroic MacKenzie dykes cut all lithological units and structures.

GEOLOGY OF THE COMMITTEE BAY AREA

The Committee Bay area is generally underlain by three, lithologically distinct, northeast-trending crustal domains (Skulski et al., 2002, 2003a,b; Fig. 2): the central Prince Albert Group subdomain, the northern migmatite subdomain and the southern Walker Lake intrusive complex. The central domain includes a main, northeast-trending belt of supracrustal rocks belonging to the Prince Albert group (unit PAg), herein collectively called the Committee Bay supracrustal belt, that extends from the Laughland Lake area in the southwest to the Curtis River area in the northeast. Metasedimentary and volcanic rocks of the Committee Bay supracrustal belt (Fig. 2) in the NTS 56 P map sheet are mainly exposed in the southern part of the mapsheet, although thin, discontinuous rafts, lenses, and xenoliths occur farther north, the largest of which is termed the Ellice Hills belt (Fig. 2). The PAg comprises abundant semipelite, psammite and quartz arenite, less common iron-formation and ultramafic rocks and uncommon phyllite, basalts and intermediate to felsic volcaniclastic rocks. These supracrustal rocks are flanked immediately to the northwest and southeast by medium-grained, variably foliated syn- to post-volcanic tonalite that intrudes the supracrustal rocks. Collectively, these rocks are intruded by areally extensive, equigranular, and microcline-porphyritic ca. 2.60 Ga granodiorite and monzogranite.

The southern domain is underlain by the regionally extensive, potassic, Walker Lake intrusive complex, which is dominated by potassium-feldspar porphyritic to augen granodiorite and monzogranite. The areal extent of the northern domain is difficult to determine in the map area. Much of the area lying immediately North of the Committee Bay supracrustal belt is underlain by voluminous, homogenous, moderately foliated, and lineated potassium-feldspar-phyric biotite granodiorite. North of the Atorquait fault, the granodiorite persists, but it, along with the tonalite and supracrustal units, is widely intruded by a range of younger, variably foliated granodiorite through syenogranite. Some of the latter are characterized by peraluminous mineral assemblages (muscovite ± garnet), and may represent plutonic derivatives from a package of higher-grade metasedimentary rocks at depth.

The metamorphic grade in the main supracrustal belt varies from upper greenschist in the southwest to amphibolite facies in the northeast. It is difficult to evaluate the regional metamorphic grade in 56 P (north) owing to a lack of rocks that contain diagnostic mineral assemblages. However, in the northwest (56-O (south)), the grade increases to upper amphibolite facies with consequent development of metasedimentary diatexites and paragneisses with peraluminous melt lenses. Intrusive units that may be interpreted as cogenetic with the volcanic rocks, range from rare gabbro through common quartz diorite and diorite, abundant tonalite to granodiorite and rare granite. A similar lack of appropriate lithologies and diagnostic mineral assemblages makes determination of metamorphic grade in the southern domain difficult, however, widespread hornblende in plutonic rocks and local garnet in metasedimentary inclusions suggests amphibolite facies metamorphic conditions.

GEOLOGY OF THE ELLICE HILLS AREA (56 P)

SUPRACRUSTAL ROCKS OF THE PRINCE ALBERT GROUP (PAg)

Amphibolite and mafic volcanic rocks (unit Aas)

On the basis of preliminary U-Pb geochronology and stratigraphic relationships, basaltic rocks appear to form the lowermost sequence in the PAg. These are less abundant than ultramafic rocks, occur predominantly in the northern part of the map area (Ellice Hills belt) and typically comprise hornblende ± actinolite ± chlorite schists characterized by knobbly and irregular surfaces resulting from preferential weathering of ankerite and calcite. The mafic rocks typically form thin (40 m thick) horizons in biotite psammite throughout the region and are commonly interlayered with oxide and silicate facies iron-formation. Primary volcanic features such as pillows, lava shelves, or amygdales have been observed at very few localities in the western, lower-grade part of the belt but were rarely recognized in the 56 P map area (Fig. 3, sheet 2).

Intermediate volcanic rocks (unit Aiv)

Intermediate volcanic rocks are rare in 56 P and typically occur as laminated tuffaceous rocks that are interlayered with semipelite or psammite (unit Aps), basalt (unit Amv) and ultramafic rocks (unit Ak) southwest of Kinngalugjuaq Mountain (Fig. 2). Primary volcanic features were not identified.

Komatiite (unit Ak)

Ultramafic rocks are typically the most abundant (volcanic?) igneous rocks comprising the PAg. They commonly form thick (200 m), prominent high ridges relative to the surrounding metasedimentary units. These rocks comprise thin, metre-scale komatiitic flows locally exhibiting green-weathering spinifex zones and brown-weathering cumulate horizons. They are interlayered with semipelite, psammite, and iron-formation (Fig. 4, sheet 2) dominate the Ellice Hills belt but have a restricted presence southwest of Kinngalugjuaq Mountain (Fig. 2). These units locally exhibit schistose, talc-serpentine or talc-anthophyllite margins.

Iron-Formation (unit Aif)

Iron-formation occurs locally throughout the PAg as discontinuous, ~ 50 m wide units, and includes: finely laminated magnetite and chert (oxide facies: Fig. 5); centimeter to decimetre scale layered garnet-amphibole-rich layers (silicate facies), and minor sulphide facies characterized by the presence of either disseminated or fracture controlled sulphide minerals. Iron-formation commonly occurs as interlayered combinations of the aforementioned types and locally as iron-rich chloritic schists. Sulphides, mostly pyrrhotite and pyrite with minor arsenopyrite and chalcopyrite are locally associated with secondary quartz veining. Iron-formation is commonly interlayered with semipelitic or ultramafic rocks but locally occurs in association with quartz arenite and/or volcaniclastic rocks.

Quartz arenite (unit Aqz)

Quartz arenites are common in the southern, Committee Bay supracrustal belt, and form prominent hills in the southwest and central parts of the map sheet. These comprise muscovitic, white to grey, decimetre scale bedded quartz arenite that structurally overlies predominant psammite and semipelite with less common garnet + grunerite silicate and magnetite iron-formation, and ultramafic horizons. Collectively the quartz arenite units form laterally continuous marker horizons that locally exhibit primary structures (grading, scours) indicating stratigraphic younging. In the southwestern Committee Bay belt, quartz arenite units locally contain abundant fuchsitic mica. These were interpreted by Schau (1982) as accumulations of detritus from paleo-weathering of adjacent ultramafic and felsic rocks. In the Kinngalugjuaq mountain and the Curtis River areas, quartz arenite commonly contains cm-scale muscovite-quartz-magnetite knots that locally exhibit relict sillimanite. These faserkiesel (Fig. 6) locally define S_1, but are commonly re-oriented, defining S_2/L_2.

PAg (undivided: unit Aps)

The most abundant rock-types of the PAg comprise fine-grained, biotite ± garnet psammite and semipelite that are interbedded on mm- to dm-scale (Fig. 7, sheet 2). These rocks occur throughout the PAg, generally form recessive, low rubbly outcrop and dispersed rubble and comprise grey to brown metasandstone containing quartz, plagioclase, biotite, rare garnet, and local muscovite. They occur interlayered (~ 50 cm) with rare pelitic, arenitic, phyllitic, and metavolcanic units. Although bedding is commonly preserved, unequivocal younging indicators are rare but include pebble lags, graded beds and crossbeds. Conglomerates were not observed in the 56 P map area. A specimen of psammite, interlayered with komatiite and komatiitic basalt at the Mitten showing (Fig. 2), yielded a SHRIMP, U-Pb zircon maximum age of ca. 2.687 Ga (Table 1, sheet 2)) indicating that the northern belts in 56P may be part of the upper Prince Albert group (Skulski et al., 2003b).

PLUTONIC UNITS

Peridotite sills (unit Apr)

A second variety of ultramafic rock that occurs throughout the Committtee Bay belt in 56 P consists of layer parallel, < 50m thick bodies of orthopyroxene-porphyritic and oikocrystic peridotite (Fig. 8). These generally do not show internal textural variations and are interpreted to represent late-volcanic, bedding-parallel ultramafic sill complexes that may be comagmatic with the komatiite flows.

Diorite and gabbro (unit Adi)

Mafic to intermediate plutonic rocks occur throughout the map area and comprise weakly to moderately foliated, medium-grained, commonly plagioclase porphyritic diorite, quartz diorite and rare gabbro, intruded by foliated and foliation parallel veins and dykes of biotite tonalite (Fig. 9, sheet 2). These rocks are collectively cut by foliated, irregular intrusions of fine- to medium-grained, reddened biotite + titanite ± magnetite monzogranite, and less commonly granodiorite. The gabbros and diorites typically form discontinuous rafts and xenoliths in younger tonalite and granodiorite.

Tonalite (unit At)

Tonalitic rocks are common throughout the map area and typically occur in close proximity to the supracrustal belts. These comprise moderately foliated and lineated, grey to pink, generally medium-grained biotite ± hornblende ± magnetite tonalite (Fig. 10). Tonalitic rocks typically contain outcrop-scale schlieren, inclusions and rafts of diorite or gabbro (unit Adi), amphibolite (unit Aas), ultramafic rocks (unit Ak), quartzite (unit Aqz) and psammite to semipelite (unit Aps) and, where these are highly strained, a gneissic texture is locally developed. Tonalite is cut by all of the plutonic units, with the exception of gabbro-diorite and gneissic tonalite. U-Pb geochronology from the western part of the Committee Bay belt has indicated tonalitic rocks are generally post-volcanic at 2.61 Ga, but may also be syn-volcanic at 2.72 Ga (Skulski, unpublished data).

Central granodiorite (unit Agd)

The dominant rock-type in the map area is variably foliated and lineated, grey to pink, medium-grained, biotite ± hornblende ± magnetite, potassium feldspar-porphyritic granodiorite (Fig. 11). This unit dominates the central and northern parts of the map area north of the Committee Bay supracrustal belt. Map-scale rafts and outcrop-scale xenoliths of tonalite, gabbro-diorite, amphibolite, ultramafic rocks, and metasedimentary rocks are common throughout. The granodiorite is cut by younger biotite ± magnetite monzogranite (unit Ag), biotite ± muscovite granite (unit Amg) and potassium feldspar-megacrystic biotite ± magnetite monzogranite to granodiorite (unit Akg).

Potassium feldspar megacrystic monzogranite (unit Akg)

North of the Committee Bay supracrustal belt and, in particular, north of the Atorquait fault are several oblate plutonic masses of biotite ± magnetite potassium feldspar-megacrystic granodiorite to monzogranite (Fig. 12, sheet 2). Typically, potassium feldspar megacrysts (~ 4 cm) are weakly flattened and along with biotite, form a weakly to moderately developed foliation. The age of this unit is not well defined, but it may represent a textural varient of unit Ag (see below).

Monzogranite (unit Ag)

Throughout the central and northern parts of the map area, particularly north of the Committee Bay Supracrustal belt, all supracrustal units and the majority of the plutonic rocks are cut by unit Ag. This unit comprises typically fine- to locally medium-grained, pink to white, variably foliated and lineated biotite ± magnetite monzogranite (Fig. 13, sheet 2). It forms irregularly shaped sheets, dykes and sills in most other rock types and is commonly accompanied by reddening of the adjacent host rocks.

Peraluminous granites (unit Amg)

Unlike the two map sheets to the southwest (Sandeman et al., 2001c; Skulski et al., 2003b), the Ellice Hills map area contains no recognized exposures of migmatitic upper amphibolite facies supracrustal rocks, in contrast to the western part of the belt where migmatite is exposed in the southern 56-O (Carson et al., 2003) and in the Kuaguat Complex (Schau, 1982; Sandeman et al., 2001b and c). In northernmost 56 P, widespread tonalitic and granodioritic intrusions are cut by large plutonic masses of variably foliated, biotite ± muscovite ± garnet-bearing, commonly K-feldspar porphyritic monzogranite and syenogranite (unit Amg: Fig. 14, sheet 2) which may represent partial melt products from these migmatitic domains. These peraluminous plutons carry a weakly to moderately developed, undulating foliation, in contrast with well foliated adjacent tonalitic and granodioritic units. A U-Pb SHRIMP determination on zircon from a small muscovite-biotite monzogranite (unit Amg) sill that cuts psammite at the Mitten showing (Fig. 2: Table 1, sheet 2) yielded an age of ca. 2.577 Ga, suggesting the peraluminous granitoids may represent syn- to late-D_1 intrusions.

Walker Lake Intrusive Complex (unit AWLK)

Lying south of and intruding the Committee Bay supracrustal belt is the regionally extensive Walker Lake intrusive complex. This comprises a shallow- to moderate-dipping, composite sequence of plutonic units ranging from rare gabbro to tonalite intruded by voluminous sub-horizontal sheets of granodiorite and monzogranite. The oldest rock-types observed comprise strongly foliated to gneissic tonalite, diorite, and amphibolite, that occur as rafts, screens, and inclusions in sub-horizontal sheets of well-foliated potassium feldspar augen, biotite + magnetite ± hornblende granodiorite to monzogranite (Fig. 15). The latter unit is the dominant rock-type in the southern parts of the map area. Although these rocks have not been dated in the map area, correlative units to the southwest in the NTS 56 K yielded SHRIMP U-Pb ages (zircon) of ca. 2.610 Ga (foliated augen granodiorite: Skulski et al., 2003a).

Gneissic granodiorite (unit Agn)

The oldest rock types of the Walker Lake intrusive complex comprise map-scale rafts and screens of moderate west- to northwest-dipping, heterogeneous, fine- to medium-grained, strongly foliated and gneissic biotite ± hornblende ± magnetite tonalite to granodiorite (Fig. 16). These rafts and screens have abundant, outcrop-scale schlieren and rafts of strongly foliated amphibolite, psammite, diorite, and rare gabbro. The gneissic units are cut by near-horizontal sheets of well-foliated potassium feldspar augen, biotite + magnetite ± hornblende granodiorite to monzogranite (ca. 2.610 Ga), and massive, biotite-magnetite ± fluorite monzogranite (ca. 1.82 Ga).

PROTEROZOIC ROCKS

Proterozoic monzogranite (unit Pgr)

Rocks of the Walker Lake intrusive complex (unit AWLK), and less commonly, other units of the Committee Bay region are cut by a range of variably foliated but typically massive, fine- to medium-grained, biotite + magnetite ± fluorite potassium feldspar phyric monzogranite (Fig. 18). In the Walker Lake intrusive complex, these typically form sheet-like, laccolithic bodies that have massive interiors and gradational margins with abundant ghost schlieren and country rock inclusions. One of these units from the southeastern part of the Committee Bay region has been dated (SHRIMP U-PB zircon) at ca. 1.821 Ga (Skulski et al., 2003a,b), comparable in age to texturally similar Hudsonian granites from near Wager Bay (ca. 1.825 Ga: LeCheminant et al., 1987; Peterson et al., 2002).

Proterozoic Dykes (unit PMd)

North-northwest-trending, fine- to medium-grained, tholeiitic MacKenzie diabase gabbro dykes exhibit chill margins and cut all stratigraphic elements in the Committee Bay region.

STRUCTURE

The structural geology of the Ellice Hills map area can be considered in terms of three principal structural domains, delimited on the basis of the orientation of planar and linear structural elements, and on the phases of deformation recorded by rocks in each domain. The central domain includes rocks proximal to, and including, the Committee Bay supracrustal belt and contains the most complex structure attributed to three main deformation events (D_1, D_2, D_3). The northern structural domain is dominated by plutonic rocks that typically carry northeast-trending D_2 fabrics and are structurally less complex, largely owing to their initial isotropic character and to a lower degree of accumulated finite strain. The southern structural domain, which includes the Walker Lake intrusive complex, is characterized by south-trending, west-dipping fabrics attributed to D_1, with only mimimal effects of superposed D_2 strain.

D_1 structures

The earliest tectonic elements S_1 and L_1 are best represented in the southern part of the map area, where south-striking, shallow west-dipping $L_1 = S_1$ fabrics are penetratively developed. These S_1 fabrics consistently dip shallowly (10°) to moderately (55°) to the west, except in the far southwest corner of the map sheet, where S_1 foliation dips locally to the east. Mineral lineations in the southern structural domain are less well developed relative to other parts of the map area and plunge moderately west. Rare macroscopic folds are generally symmetrical and are defined by compositional layering and by folded inclusion trails in the granitoid rocks. S_1 fabrics are also prevalent at two localities in the central supracrustal domain, where composite S_0-S_1 fabrics define the hinge zones of regional F_2 folds.

D_2 structures

The dominant northeast structural fabric of the central and northern Ellice Hills map area is related to penetrative D_2 deformation that has been bracketed between ca. 1.86 Ga and 1.81 Ga (Carson et al., 2003; Skulski and Sanborn-Barrie, unpublished data, 2002). This northeast structural grain is defined by the orientation of the supracrustal belts and intervening plutonic domains, and also by the macroscopic structural elements (S_2, F_2, L_2) that characterize these rocks. Penetrative D_2 deformation involved northwest-directed shortening that resulted in upright to inclined northwest-vergent F_2 folds and northeast-striking, moderately southeast-dipping foliations. Two major northeast-trending, southwest-plunging F_2 folds within the Committee Bay supracrustal belt are defined by facing reversals and folded S_0-S_1 fabrics. In the Kinngalugjuaq Mountain area, southeast-striking, moderately southwest-dipping S_1 foliation surfaces collectively define the hinge zone of a major, southwest-plunging F_2 anticline, an observation supported by isolated evidence of northward and southward younging in quartzite along its north and south flanks, respectively. At a number of localities along its hinge zone, a variably oriented S_1 foliation is transected by a second-generation foliation (S_2) that trends 70–80°E, axial planar to the anticlinal trace. In the Curtis River area, variably oriented (steeply west-dipping to near-vertical) bedding-parallel foliation planes define an open fold closure which is complementary to S_1S_0 trends in the Kinngalugjuaq Mountain area. Opposing stratigraphic facing across the supracrustal belt in the Curtis River area suggest a major synclinal structure that folds S_0-S_1. The inclined, northwest-vergent Curtis River F_2 syncline exposes quartzite-semipelite in its limbs and mainly plutonic rocks with inclusions of metasedimentary rocks in its hinge.

L_2 lineations plunge mainly to the southwest throughout the central supracrustal structural domain and plunge mainly southeast in lower strain rocks of the northern structural domain. A notable exception to this occurs in the northeastern part of Committee Bay supracrustal belt where shallow northeast-plunging lineations may reflect modification by an F_3 fold. Variations in the intensity of D_2 strain between these domains suggests that during D_2, strain was preferentially partitioned into the low-competency, highly anisotropic supracrustal rocks of the Committee Bay belt.

D_3 structures

Subsequent D_3 deformation of supracrustal rocks has resulted in the widespread development of open, conjugate, kink-style F_3 folds, and tight chevron folds. These are attributed to layer-parallel shortening of anisotropic metasedimentary rocks. Attitudes of F_3 folds throughout the central domain are consistent with late-stage, northeast-directed shortening across the Committee Bay belt.

Other faults

A series of north north-west-trending brittle faults transect all of the rocks in the area with the exception of the MacKenzie dykes. These faults are commonly not observed on the ground and occur in topographically low lineaments. Moderate reddening of the host rocks is locally observed as are variations in structural trends or significant stratigraphic offset across the faults.

METAMORPHISM

The Committee Bay belt is characterized by a general increase in metamorphic grade from greenschist-facies in the southwest (56 K) through upper-amphibolite-facies to the northwest and northeast (56 P: Schau, 1982; Berman et al., in press). The lowest grade part of the belt is represented by upper-greenschist facies rocks that flank the synvolcanic tonalite in 56 K (Fig. 2). To the northeast of this tonalite, talc-serpentine ultramafic volcanic rocks preserve cumulate and quench (spinifex) textures (MacHattie, 2002), and to the west, metapelitic rocks contain chlorite-chloritoid-muscovite and chlorite-kyanite-muscovite assemblages (Schau, 1982). A relatively steep metamorphic gradient to the west and north, and gentle gradient to the east passes through lower-amphibolite-facies St-Grt-Bt ± Ms and And-Bt ± Ms metapsammites and metapelities, reaching mid-amphibolite facies (Grt-Sil-Bt ± Ms metapelites) within large portions of the central domain (including that in 56 P), and upper- amphibolite facies (Kfs-Sil-Gt ± Crd metapelites) in the northern domain. Low-pressure facies-series metamorphism is indicated by the widespread occurrence of andalusite in lower-amphibolite-facies rocks and Grt-Crd-Kfs at the highest metamorphic grades, reached locally in the northern subdomain exposed in 56-O south (Carson et al., 2003).

This general metamorphic pattern is interpreted to be the product of at least two major metamorphic events (Carson et al., 2003; Sanborn-Barrie et al., 2003; Berman et al., in press). For instance, in the 56 P map sheet, S_1 fabrics are defined by aligned biotite and muscovite in pelite and quartzite, with local biotite alignment and quartz elongation in plutonic rocks. In addition, numerous localities display bedding-parallel S_1 defined by aligned, elongate white-weathering aluminous nodules (Fig. 6) that represent sillimanite porphyroblasts subsequently retrogressed to muscovite and locally reoriented by D_2 strain. These relationships indicate that early mid-amphibolite-facies metamorphism (M_1) of < ca. 2.71 Ga supracrustal rocks in the Ellice Hills area was pre- to syn-D_1. A subsequent metamorphic event, M_2, is attributed to widespread growth of garnet porphyroblasts that overgrow S_1 and are wrapped by sillimanite-biotite S_2 fabrics, indicating mid-amphibolite-facies M_2 event synchronous with D_2. Ongoing *in situ* U-Pb geochronology studies of monazite reveal three main periods of monazite growth at ca. 2.35 Ga, ca. 1840–1820 Ma and ca. 1.78 Ga that may correspond to regional M_1 (D_1?), M_2 (D_2), and local M_3 metamorphic events in the Committee Bay region (Berman et al., in press).

ECONOMIC GEOLOGY

In contrast with the lithologically comparable, auriferous Woodburn Lake group to the southwest (Henderson et al., 1991; Zaleski et al., 2001), the Committee Bay belt has, over the past decade, received only modest mineral exploration (Dusfresne and Williamson, 1997; Sherlock and Deyell, 2002; Deyell and Sherlock, 2003). A recent major increase in the acquisition of prospecting permits and mineral claims in the region has, however, significantly raised the metallogenetic prospectivity of the belt. Numerous prospects for base metals and gold have been identified in the Committee Bay area but, the most favorable setting for mineralization is auriferous sulphide mineralization associated with iron-formation. Significant occurences in 56 P include the Peanut, Mist-Koffy, and Inuk showings (Fig. 2). The geology of these showings is discussed in detail by Deyell and Sherlock (2003).

Auriferous, sulphidized oxide and silicate facies iron-formation in the Committee Bay area (Hyde et al., 2002; Deyell and Sherlock, 2003) is inferred to be part of an upper, ca. 2.71 Ga supracrustal sequence. Detailed mapping and sampling from numerous gold occurrences along the belt has highlighted an association between auriferous iron-formation and polydeformed rocks. In these areas, gold is localized within D_2 structures, such as hinge zones of shallow northeast- plunging F_2 folds and/or shear zones parallel to northeast-striking F_2 axial planes.The Inuk gold occurrence (Fig. 2) is associated with ultramafic rocks, iron-formation and clastic metasedimentary rocks intruded by granodiorite. The supracrustal rocks and biotite granodiorite are interlayered and have been folded together into a moderately to steeply NNE-plunging fold. Gold is associated with silicic and sulphidic iron-formation at the contact between ultramafic rocks and iron-formation. Localization of gold at this contact within the hinge of a F_2 fold suggests that alteration and mineralization are syn-D_2. During folding, this contact may have been a dilational site allowing access for hydrothermal fluids, alteration, and mineralization. In support of this proposal, is the recognition of small D_2 shear zones axial planar to F_2 that commonly have narrow auriferous sulphidation haloes. Supracrustal rocks at the Mist-Koffy showing (Fig. 2) consist of clastic sedimentary rocks interbedded with ultramafic rocks, quartz arenite and a thin interval of iron-formation. Ultramafic rocks are restricted to the northern margin of the supracrustal sequence and are weakly to strongly foliated and locally exhibit large orthopyroxene megacrysts. High strain zones that developed during D_2 are mainly localized in iron-formation intervals at the contact with the ultramafic rock. Iron-formation within the high strain zones are sulphidized and silicified, and locally contain auriferous sulphiditic quartz stringers. Locally, stretched and distorted ultramafic wallrocks and boudinaged dykes of monzogranite pegmatite were observed. The Mist showing exhibits some similarities to Inuk, with gold localized at lithologic contacts within dilational sites caused by flexural slip along lithological contacts during D_2 folding. Near the Peanut showing (Fig. 2), supracrustal rocks are dominated by quartzite that cores a major F_2 fold, the Kinngalugjuaq Mountain anticline. South of the quartzite, thin bands of ultramafic rock and iron-formation are interlayered with a thick sequence of psammite. Gold at Peanut is hosted in sulphidic iron-formation where mineralization is concentrated in high strain zones developed at lithologic contacts, likely along the limbs of minor F_2 folds. Gold is associated with sulphides (pyrite-pyrrhotite) that locally are disseminated throughout magnetite- and amphibole-rich layers within iron-formation. These findings, along with similar temporal relationships from the Woodburn Lake area (Meadowbank gold deposit) to the SW, suggest that Paleoproterozoic (ca. 1.85–1.81 Ga) deformation of Neoarchean (ca. 2.71 Ga) supracrustal rocks has played a significant role in the localization of gold mineralization in the Committee Bay area, and elsewhere throughout the western Churchill Province.

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