Geological setting of the area around Wager Bay

The region around Wager Bay was mapped in reconnaissance by Heywood (1967), and a fault along the south coast of Wager Bay, the Meadowbank Fault, was drawn by Heywood and Schau (1977) as the boundary between the Committee Bay and Arnit Lake blocks. Henderson *et al.* (1986) mapped dextral mylonites coincident with a prominant linear aeromagnetic anomaly along the south coast of Wager Bay (Geological Survey of Canada, 1984), and renamed the structural feature the "Wager Bay shear zone"; for brevity the feature is now referred to as Wager Shear Zone (Henderson and Broome, 1990).

The Wager Shear Zone postdates a 1.82-1.83 Ga calc-alkaline granitoid suite (LeCheminant *et al.*, 1987) that intrudes Early Proterozoic and Archean gneisses, including the Aphebian Penrhyn Group quartzite, pelitic gneiss, marble, and calc-silicate gneiss composing the Hudsonian Foxe Belt (Fig. 1). The Base Camp Granite, at the southwest corner of Wager Bay (Map Unit 5), is structurally isotropic except where it is cut by the shear zone forming its south margin. U-Pb zircon dating of the granite (Henderson and Roddick, 1990) yielded an $1808^{+10}/_{-5}$ Ma age, which is considered to be a maximum age for the shear zone. All rock units are cut by mafic dykes of the 1267±2 Ma Mackenzie swarm (LeCheminant and Heaman, 1989).

West of Wager Bay, northeast trending magnetic anomalies (Henderson and Broome 1990), apparently related to belts of abundant paragneiss, bend to the right and merge with a slightly concave-north belt of magnetic anomalies that correlate with the westward extension of the shear zone. The Wager Shear Zone apparently steps to the right (i.e. north) in several parallel segments, and vanishes near 92° W longitude (Henderson and Broome, 1990). The western limit of aeromagnetic anomalies correlated with Wager Shear zone is about 75 km south of the eastern limit of aeromagnetic anomalies correlated with the dextral Amer shear zone. Broome (1990) showed a continuous zone of positive Bouguer gravity gradient connecting the two shear zones suggesting that they are kinematically linked by an extensional stepover.

On Southampton Island, east of the limit of aeromagnetic coverage, geological mapping and aerial photo interpretation showed progressive right-bending of lineaments into an east-west trending zone (Heywood and Sanford, 1976), and structural mapping in the area confirmed the presence of steeply-dipping, east striking mylonites with subhorizontal dextral shear-sense indicators in line with the Wager Shear Zone on the mainland (Henderson and Broome, 1990). On this basis the shear zone trace was extended 170 km east of the limit of aeromagnetic data for a minimum strike length of 450 km (Fig. 1).

Geology of the Wager Shear Zone

In the area of structural mapping (Fig. 2) three terranes from north to south were defined on the basis of mineral fabrics and structural geometry: (1) a *Pink and Grey Gneiss Terrane* with older supracrustal and plutonic gneiss components intruded by weakly foliated to unfoliated granitic rocks; (2) the 2-5 km wide, east-west striking *Wager Shear Zone* composed of pervasively sheared subvertical mylonites, and (3) a variably mylonitized *Patchy Granulite Terrane.*

Pink and Grey Gneiss Terrane (PGG)

Pink and grey layered granodiorite and tonalite gneisses are the most abundant lithologies in the region north of the Wager Shear Zone. Based on an age in excess of 2.7 Ga (unpublished U-Pb zircon dating by C. Roddick, Geological Survey of Canada) from grey tonalite gneiss collected along the Wager Bay coast, the layered tonalite-granodiorite and subordinate supracrustal gneisses immediately north of Wager Shear Zone are interpreted to form an Archean basement complex into which discordant calc-alkaline granitoid rocks were emplaced during the Early Proterozoic Hudsonian orogeny. A weakly deformed pegmatite intruding the tonalitic gneiss gave a U-Pb zircon age of $1849^{+9}/_{-3}$ Ma (unpublished U-Pb zircon dating by C. Roddick, Geological Survey of Canada). The 1808 Ma Base Camp Granite is a young component of the calc-alkaline granitic suite, and is characterized by an anomalously high gamma-radiation signature compared to other granites in the area.

Gneissosity, foliation, mineral lineations and fold axes measured in the Pink and Grey Gneiss Terrane vary in orientation, although west of the Base Camp Granite planar structural fabrics and magnetic lineaments (Henderson *et al.*, 1986; Henderson and Broome, 1990) bend to the right as the Wager shear zone is approached from the north. The change in strike may be the result of progressively increasing dextral shear, assuming that the shear zone steps north, because the Base Camp Granite is sheared only along its southern margin. East of the Base Camp Granite, beneath Wager Bay, magnetic lineaments are truncated against the northern margin of the magnetic-gradient anomaly coincident with the shear zone.

Wager Shear Zone (WSZ)

The Base Camp Granite undergoes a fabric transition over less than 100 m from structurally isotropic, coarsely hypidiomorphic-granular granite into mylonitized granite with ribbon-quartz lenses. Feldspars in mylonitized granite form a bimodal size population consisting of large rounded porphyroclasts, and small recrystallized oriented inclusions within ameboid quartz grains composing the ribbon-quartz lenses. The foliation and lineation mark the combined flattening and shear planes and extension direction in the Wager Shear Zone mylonites.

Planar fabrics within the Wager Shear Zone are predominantly oriented 090°/90°, and linear fabrics are mainly horizontal (Fig. 2). Locally at Masivak Creek (Fig. 2), the shear zone mylonites strike about 045°. Along the exposed length of the Wager Shear Zone, the mylonite foliation is folded parallel to subhorizontal mineral lineations forming a-type folds (cf. Malavielle, 1987).

The majority of shear-sense indicators observed within the Wager Shear Zone are mesoscale δ-type porphyroclasts (cf. Passchier and Simpson, 1986) of microcline, kinematically consistent rolling structures (cf. Van Den Driessche and Brun, 1987) commonly more than a metre in diameter, asymmetrical boudins (cf. Hanmer, 1984; 1986), and duplex-like packets of mylonitic foliation (cf. foliation fish of Hanmer, 1986, and shear lenses of Ghosh and Sengupta, 1987). All of the shear-sense indicators display dextral shear. Axial planes of intrafolial folds, as well as traces of mylonitic aplite dykes consistently make small angles with the surrounding mylonites and indicate dextral vergence.

In many places the pervasive dextral mylonite fabric bends to the left into vertical, generally northeast-striking, discrete sinistral shears 1-2 m wide and 10-20 m long. The macroscale geometry of discrete shears is shown in Figure 3; they occur throughout the area mapped, but are most abundant in the Wager Shear Zone and the region to the south. The dominant orientation of sinistral shears is 058°/90°, although the strikes are scattered over an entire quadrant. Discrete dextral shears are scattered, but seem to form two sets: a major set oriented 086°/90° subparallel to the Wager Shear Zone, and a minor set at 145°/90°.

Patchy Granulite Terrane (PGT)

South of Wager Bay, the southern margin of the shear zone cannot be accurately positioned in most places because the fabrics in the gneisses trend generally parallel to the shear zone mylonites (Fig. 2), and lichen cover obscures subtle shear-sense indicators. South of Cape Dobbs on the Hudson Bay coast, lichen-free outcrops are abundant, and some gneisses show ribbon-quartz aggregates, but the rocks are not pervasively mylonitized. Asymmetrical fabric elements are rarely present, except in discrete mylonitic shear zones.

Hypersthene has a patchy, discontinuous occurrence within amphibolite-grade rocks in the Patchy Granulite Terrane. Derome (1988) mapped the northern occurrence of hypersthene-bearing rocks extending in a line for about 25 km westward from Cape Dobbs (Fig. 2). Recrystallized hypersthene occurs within discrete sinistral shear zones in the Patchy Granulite Terrane (Derome, 1988), but the isograd is south of the southern limit of the zone of pervasive dextral mylonites characterizing the Wager Shear Zone. It appears that the sinistral shears are part of the Wager Shear Zone movement picture, and therefore that hypersthene was stable at the time of dextral shearing along the Wager Shear Zone.

Broome (1989) modelled the depth extent of a positive magnetic anomaly related to the Patchy Granulite Terrane, and showed that it can be explained by a wedge-shaped body south of the Wager Shear Zone about 10 km thick and tapering to the surface 30 km to the south.

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Description of Map Units

Unit 1. Supracrustal, mafic and ultramafic rocks occur mainly north of Wager Shear Zone, and apparently form the oldest rock assemblage in the terrane dominated by pink and grey weathering layered orthogneisses. Metasedimentary rocks include quartzite, garnet-sillimanite-biotite-bearing pelitic gneiss, and magnetite-quartz iron formation.

Unit 2. Pink and grey weathering granitoid orthogneisses of biotite quartz diorite and biotite quartz monzonite compositions are abundant in the terrane north of the Wager Shear Zone, and are assigned a Late Archean age. The gneisses are medium to coarse grained, variably foliated and well layered.

Unit 3. Foliated pink-weathering granite, plagioclase porphyritic granodiorite, quartz diorite, and biotite-hornblende diorite form a suite of calc-alkaline plutons and batholiths that are abundant within the Wager Shear Zone and in the terrane to the north. Commonly form extensive sills interleaved with Unit 1 and Unit 2.

Unit 4. Thin discontinuous dykes and boudins of amphibolite and pyroxenite occur throughout the Wager Bay region.

Unit 5. Weakly foliated, homogeneous pink granite, pink granite pegmatite dykes, and pink aplite dykes occur within and north of Wager Shear Zone.

Unit 6. Mylonite and mylonitic gneisses occur within Wager Shear Zone and in discrete mylonitic shear zones in the Patchy Granulite Terrane to the south. The mylonitic rocks are predominantly quartzofeldspathic, but mafic mylonites, and mylonitic pelitic gneisses and quartzites are locally found in the Wager Shear Zone.

U-Pb zircon weakly deformed pegmatite $1842\ ^{+9}_{-3}$ Ma

U-Pb zircon Unit 5 $1808\ ^{+10}_{-5}$ Ma

GEOLOGY OF THE REGION AROUND WAGER BAY, DISTRICT OF KEEWATIN (Parts of 46E and 56H)

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(Sheet 1 of 2)

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