Musquodoboit Batholith Project: geological mapping of the Musquodoboit Harbour area (NTS 11D/14)

L. J. Ham

Introduction

The Musquodoboit Batholith is the second largest granitoid pluton (~800 km^2) in the Meguma Terrane of mainland Nova Scotia (Fig. 1). The batholith intruded Cambro-Ordovician metasedimentary rocks of the Meguma Group during the Devonian Acadian Orogeny (ca. 370 Ma; Clarke and Halliday, 1980; Reynolds *et al.*, 1981). The body roughly parallels the coastline, extending east of Halifax to Sheet Harbour, and covers parts of three National Topographic System (NTS) map areas, 11D/13, 11D/14 and 11D/15.

Bedrock mapping of the batholith was initiated to compare and contrast its lithology and mineralogy with the larger (~7300 km^2) South Mountain Batholith of southern Nova Scotia (Fig. 1). Results of the mapping project were plotted digitally on 1:10 000 scale maps which were subsequently merged (maps and databases) to create 1:50 000 scale maps. Portions of the batholith outcropping on NTS map area 11D/13 have been illustrated in two open file maps released in 1998 (Open File Maps 1998-5 and 1998-9). This report discusses results of mapping on NTS 11D/14 and illustrates those results in Figure 2. NTS map area 11D/15 is currently in

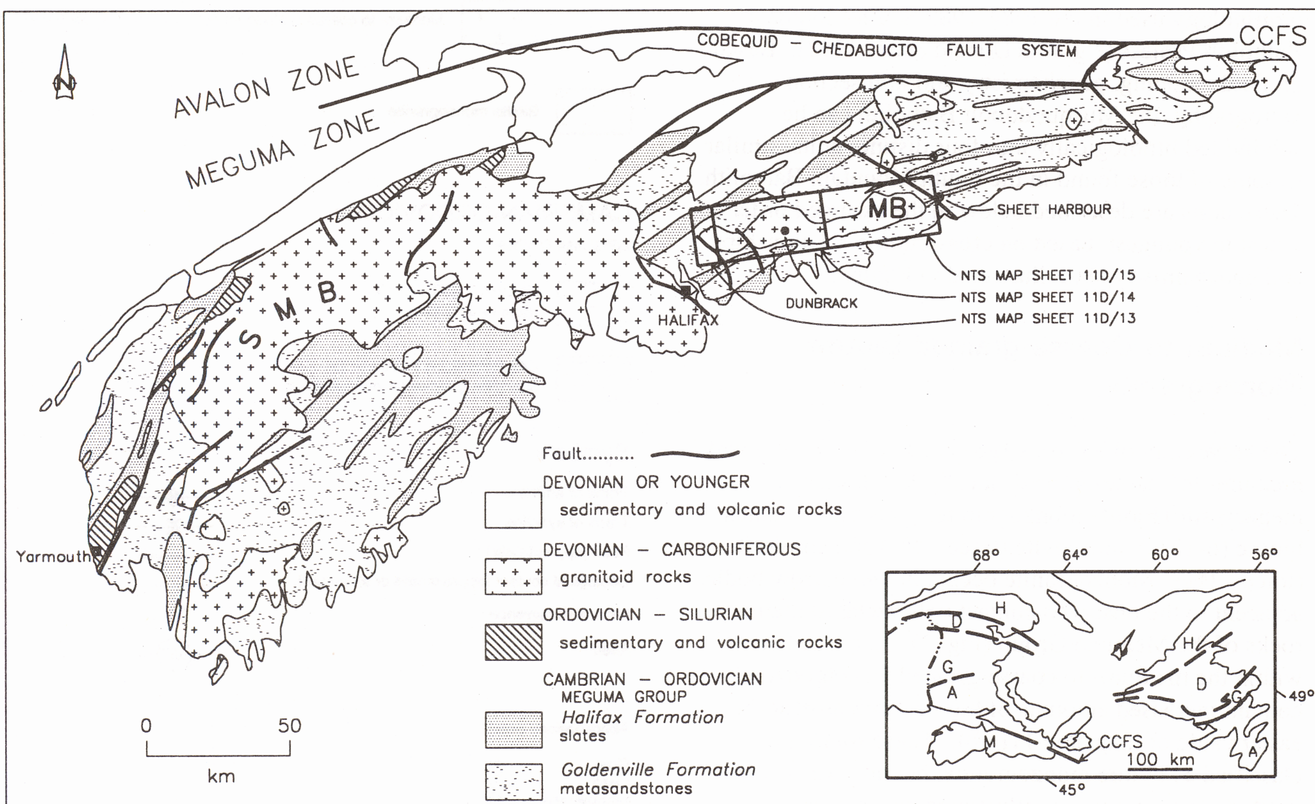


Figure 1. Simplified geological map of the Meguma Zone showing the location of the Musquodoboit Batholith (MB) and the South Mountain Batholith (SMB). The boundary between the Meguma and Avalon zones is marked by the Cobequid-Chedabucto Fault System (CCFS). Abbvreviations on the inset map are: Avalon Zone (A), Dunnage Zone (D), Gander Zone (G), Humber Zone (H) and Meguma Zone (MZ), representing zones of the Appalachians from Williams (1979).

the final stages of completion; these two maps and the final project report will be released in 1999.

Previous Work

The boundaries of the batholith were outlined by Fletcher and Faribault (1887); however, no attempt to re-map the batholith was undertaken until the 1970s, when McKenzie and MacGillivary (1974) did work as part of a larger project comparing granites along the Eastern Shore, followed by Jones and MacMichael (1976) who mapped a portion of the batholith. MacDonald (1981) studied the entire batholith as part of an M.Sc. thesis at Dalhousie University and subsequently reported on the results (MacDonald and Clarke, 1985).

Results of Mapping

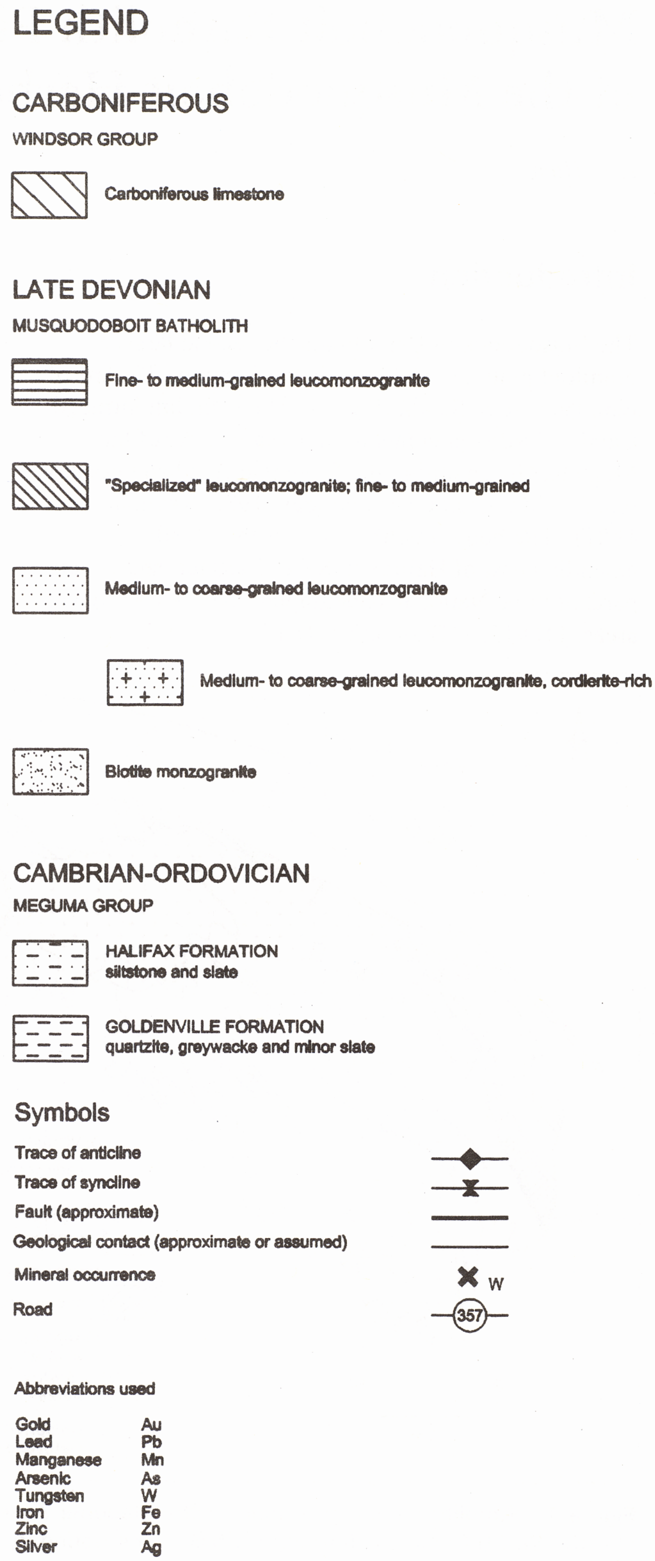
The units are subdivided following the methodology and terminology used in the 1984-1989 South Mountain Batholith Project (e.g. MacDonald *et al.*, 1992). Based on field mapping, geochemistry and thin section petrography, the Musquodoboit Batholith can be subdivided lithologically into four distinct units, similar to some of those found in the South Mountain Batholith. These units are described below in the assumed order of oldest to youngest, based on cross-cutting relationships and geochemistry, and illustrated in Figure 2.

Medium to Coarse-grained Biotite Monzogranite

The apparently oldest rock type is a buff-white and pink, medium- to coarse-grained (locally K-feldspar megacrystic) biotite monzogranite. This unit contains biotite (6-12%), muscovite (trace - 1%) and cordierite (trace - 1%). Monzogranite occurs in two narrow bodies adjacent to the observed contact with metasedimentary rocks of the Meguma Group (Fig. 2). Localized areas within the medium- to coarse-grained leucomonzogranite contain increased amounts of biotite, such as near the eastern side of map area 11D/14. These rocks are classified as biotite monzogranite, but are exposed over limited areas and are not illustrated on the map.

Medium- to Coarse-grained Leucomonzogranite

The most abundant rock type in the batholith is buff-white to pink, medium- to coarse-grained (locally K-feldspar megacrystic) biotite leucomonzogranite. It is



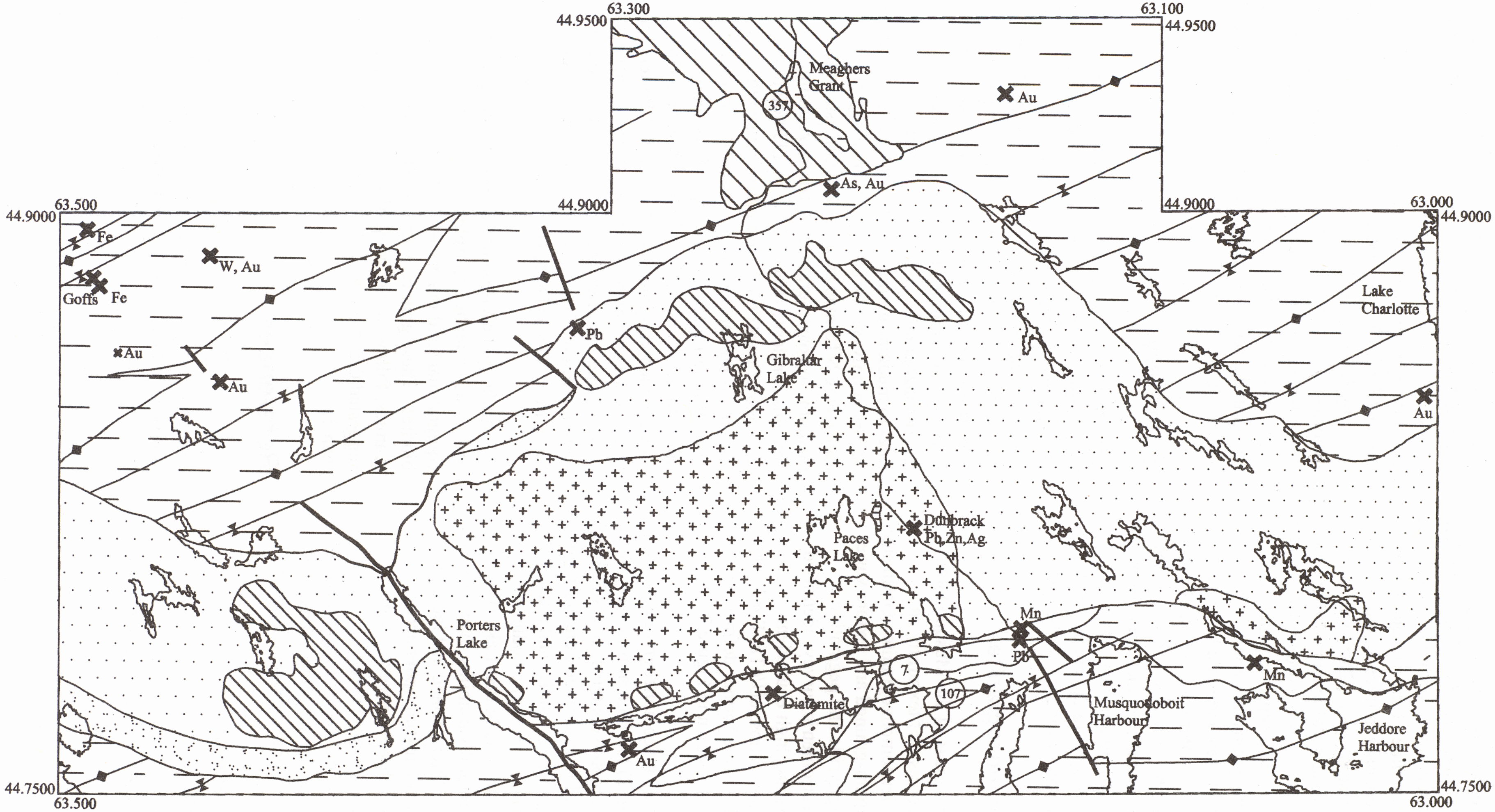


Figure 2. Simplified geology map and legend (preceding page) of NTS map area 11D/14.

mineralogically similar to the biotite monzogranite, but contains less biotite (4-8%, average 6%). This unit differs from the SMB leucomonzogranite which has 3-10% mucovite; in leucomonzogranite of the Musquodoboit Batholith muscovite occurs only in trace amounts. Cordierite is generally present (trace - 2%) in all leucomonzogranitic rocks. Two areas of leucomonzogranite have increased modal percentages of cordierite (up to 4%) and have been designated with a separate pattern (Fig. 2). Euhedral, blocky cordierite grains range in size from 0.3 - 1 cm in length. The largest area underlain by these cordierite-rich rocks (between Porters Lake and Paces Lake) was outlined in part by previous workers (Jones, 1975; MacDonald, 1981) and the contacts have been refined. The second, smaller area occurs along the margin of the batholith, adjacent to the contact with metasedimentary rocks north of Jeddore Harbour (Fig. 2).

Specialized Leucomonzogranite

This unit occurs in several areas of the Musquodoboit Batholith and typically consists of texturally and mineralogically variable leucomonzogranite. Grain size ranges from fine- to medium-grained and texture varies from equigranular to porphyritic and pegmatitic. Airborne gamma-ray spectrometric surveys identified some of these rocks as having high equivalent uranium/equivalent thorium ratios (eU/eTh; Ford, 1991; Ham, 1993). These bodies were further defined by geological mapping and are shown in Figure 2.

The area of specialized leucomonzogranite located west of Porters Lake (Fig. 2) has high muscovite (2-4%) contents, low (trace -2%) biotite contents, and is generally medium- to coarse-grained with some textural variability (e.g. fine grained, aplite) noted on individual outcrops. The two specialized leucomonzogranite bodies in the centre of the batholith north of Gibraltar Lake (Fig. 2) generally exhibit more textural variability than seen west of Porters Lake. They are finer grained and local areas have pronounced porphyritic texture (phenocrysts of K-feldspar, larger grains of biotite, rosettes of muscovite). Five small (~ 1 km^2) bodies of specialized leucomonzogranite occur along the southern margin of the batholith. These bodies are characterized by finer grain size and one body exhibits porphyritic texture.

Fine- to Medium-grained Leucomonzogranite

This unit occurs in one locality on the eastern shore of Paces Lake (Fig. 2) and consists of a buff-white to pink and red, fine- to medium-grained, equigranular to slightly porphyritic, massive leucomonzogranite. This rock was not outlined by the airborne gamma-ray spectrometric survey (Ford, 1991) as a specialized leucomonzogranite. Work by Kontak (1997) on the Dunbrack Pb-Cu-Zn-Ag deposit (Fig. 2), located to the southeast of this body, suggests that the dyke hosting the Dunbrack mineral occurrence is on strike (110°/62°N) with this equigranular leucomonzogranite, although the dyke was not traced in outcrop.

Summary

The Musquodoboit Batholith can be classified using the same terminology used for the South Mountain Batholith, although the medium- to coarse-grained leucomonzogranite is comparitively muscovite-poor in the Musquodoboit Batholith. The rock types are medium- to coarse-grained biotite monzogranite, medium- to coarse-grained biotite and biotite-cordierite leucomonzogranite, specialized leucomonzogranite, and fine- to medium-grained leucomonzogranite (which occurs in only one locality). The majority of the batholith underlying NTS map area 11D/14 consists of the medium- to coarse-grained leucomonzogranite and contains cordierite (trace - 2%), in addition to biotite (average 6%) and trace amounts of muscovite. Two areas within this unit are relatively enriched in cordierite (up to 4%). Biotite-rich rocks (average 8% biotite) occur discontinuously along the southern Meguma Group metasedimentary/granite contact west of Porters Lake, and in a narrow unit along the northern contact east of Porters Lake. Similar findings were discussed in the eastern portion of the batholith and in the Tangier Grand Lake area (NTS 11D/15; Ham, 1998).

Additional division of the leucomonzogranitic rocks was based on texture (porphyritic, pegmatitic, aplitic, equigranular) and mineralogy (abundances of muscovite, biotite). These granites were outlined as high ratio granites, following the work of Ford (1991), who suggested that these rocks have an eU/eTh ratio greater than 1.

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