

QUARTZ-SILLIMANITE KNOTS AND METAMORPHISM  
AT SOUTHERN INDIAN LAKE, MANITOBA

*A Thesis*  
*Submitted to the*  
*Faculty of Graduate Studies and Research*  
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*In Partial Fulfillment*  
*of the Requirements for the Degree of*  
*Master of Science*

*by*  
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## ABSTRACT

All outcrops in the area surrounding the northern portion of Southern Indian Lake were mapped during the summers of 1969 and 1970, and a report with accompanying geologic maps has been prepared for the Manitoba Mines Branch. Quartz-muscovite-microcline-plagioclase-sillimanite nodules occurring in five outcrops of Sickle-type metasediments were mapped and sampled in detail. Twenty thin sections were studied and six chemical analyses done.

The almost spherical knots are late or post tectonic, formed subsequent to two periods of folding. The metamorphic grade reached during the first period of folding (intense, isoclinal) is uncertain, however, extensive recrystallization occurred. The metamorphic grade reached during a second period of deformation (north-east trending) was the upper amphibolite facies of the low or medium (cordierite bearing) pressure facies series. Actual knot formation presumably was by simple metamorphic differentiation and segregation in beds of a suitable composition during increasing metamorphism or, less likely, was the result of potash realkalization of quartz-sillimanite knots formed in an earlier dealcalization event. Quartz muscovite knots occurring elsewhere in the Lynn Lake District appear to have formed at somewhat lower metamorphic grade.

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Fig. 20. Light coloured reaction rims on pebbles in Sickle-type conglomerate; where potash-feldspar has been removed. Area of thesis-study east of Strawberry Island.

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## INTRODUCTION

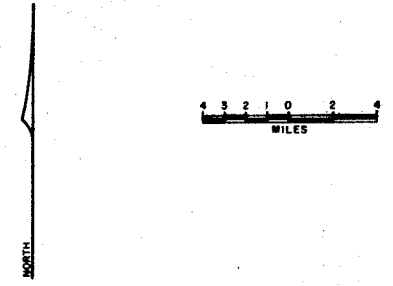
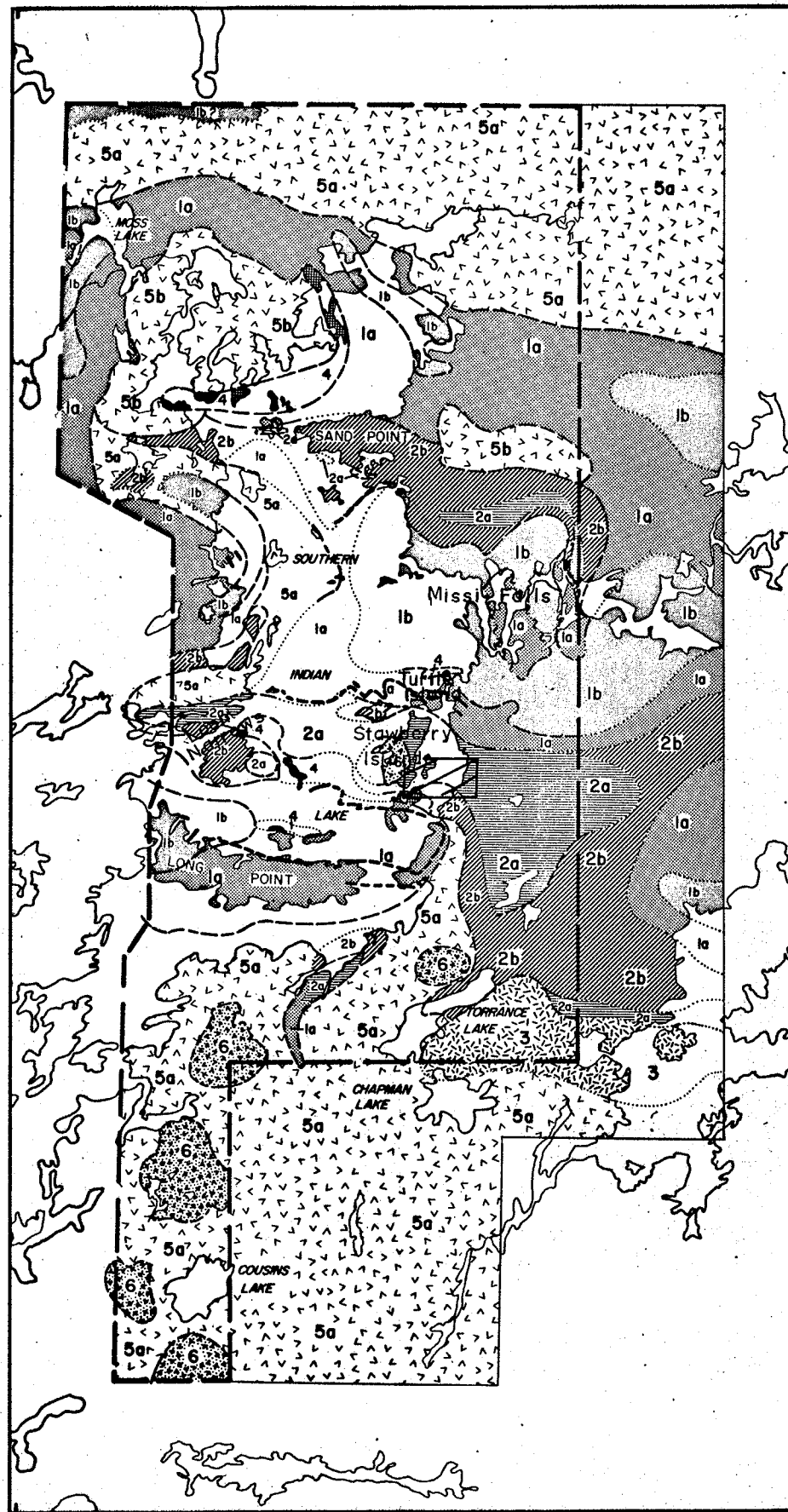
The thesis area (longitude  $98^{\circ}15'$ , latitude  $57^{\circ}15'$ ) is situated on the eastern shore of Southern Indian Lake (Fig. 1).

Extensive drift-cover restricts rock outcrop to shoreline exposure.

Previous mapping in the locality was carried out on a reconnaissance scale by the Geological Survey of Canada (McInnes, 1913 and Quinn, 1959). During 1969 and 1970, the writer conducted a more comprehensive study of the area for the Province of Manitoba (Cranstone, 1971).

Sickle Group rocks in the Lynn Lake area (to the west of the area delineated in Fig. 1) have metamorphic assemblages which are non-diagnostic of metamorphic grade. Thus, the infrequent occurrence of quartz-muscovite-microcline-plagioclase-sillimanite knots in Sickle-type rocks in the map area is of considerable interest. Detailed mapping and sampling of one such outcrop (Fig. 2) was done in the hope of determining the precise metamorphic grade involved; the relationship of the nodules to the regional tectonic history; and possible origins of such nodules in the thesis locality, and elsewhere in the Lynn Lake area.





**LEGEND**

- POST SICKLE INTRUSIVE ROCKS**
- 6 Porphyritic - biotite quartz monzonite
  - 5b Fine grained magnetite (hornblende - biotite) quartz monzonite
  - 5a Porphyritic - hornblende quartz monzonite
  - 4 Gabbro, diorite, quartz diorite, granodiorite (all genetically related)
  - 3 Quartz diorite (perhaps pre-unit 2)

- SICKLE GROUP ROCKS**
- 2b Potassium feldspar metatexite, diatexite and anatectic quartz monzonite
  - 2a Arkoses, conglomerates, sandstones, and derived layered gneisses

- WASEKWAN GROUP ROCKS**
- 1b Plagioclase diatexite, plagioclase anatectite
  - 1a Plagioclase gneiss, plagioclase metatexite

Area of thesis study

**MAP SYMBOLS**

- Wasekwaw calc-silicate horizon
- Approximate geological boundary
- Assumed geological boundary
- Fault
- Boundary of map area

Figure 1. Generalized geologic interpretation and correlation for the northern and eastern portions of Southern Indian Lake.

Data from geologic maps 646I, 646B, 646S, 6462(E), 6467E, 64610E, 64815E and figures of this report.

SOUTHERN



INDIAN

DRIFT

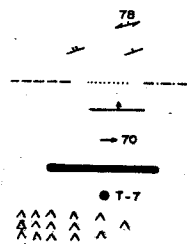
DRIFT

DRIFT

LAKE

DRIFT

### LEGEND



Foliation.  
 Bedding (tops known, tops unknown).  
 Geological boundary (defined, approximate, assumed, gradational).  
 Geological boundary with dip.  
 Long axis of pebble stretch.  
 Shoreline.  
 Station location.  
 Decreasing sillimanite knot occurrence

### POST SICKLE INTRUSIVES



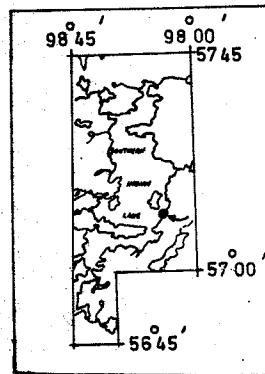
Pegmatite.  
 Meta-gabbro.  
 Porphyritic meta-gabbro. } BLACK TROUT 'DIORITE ?

### SICKLE GROUP SEDIMENTS



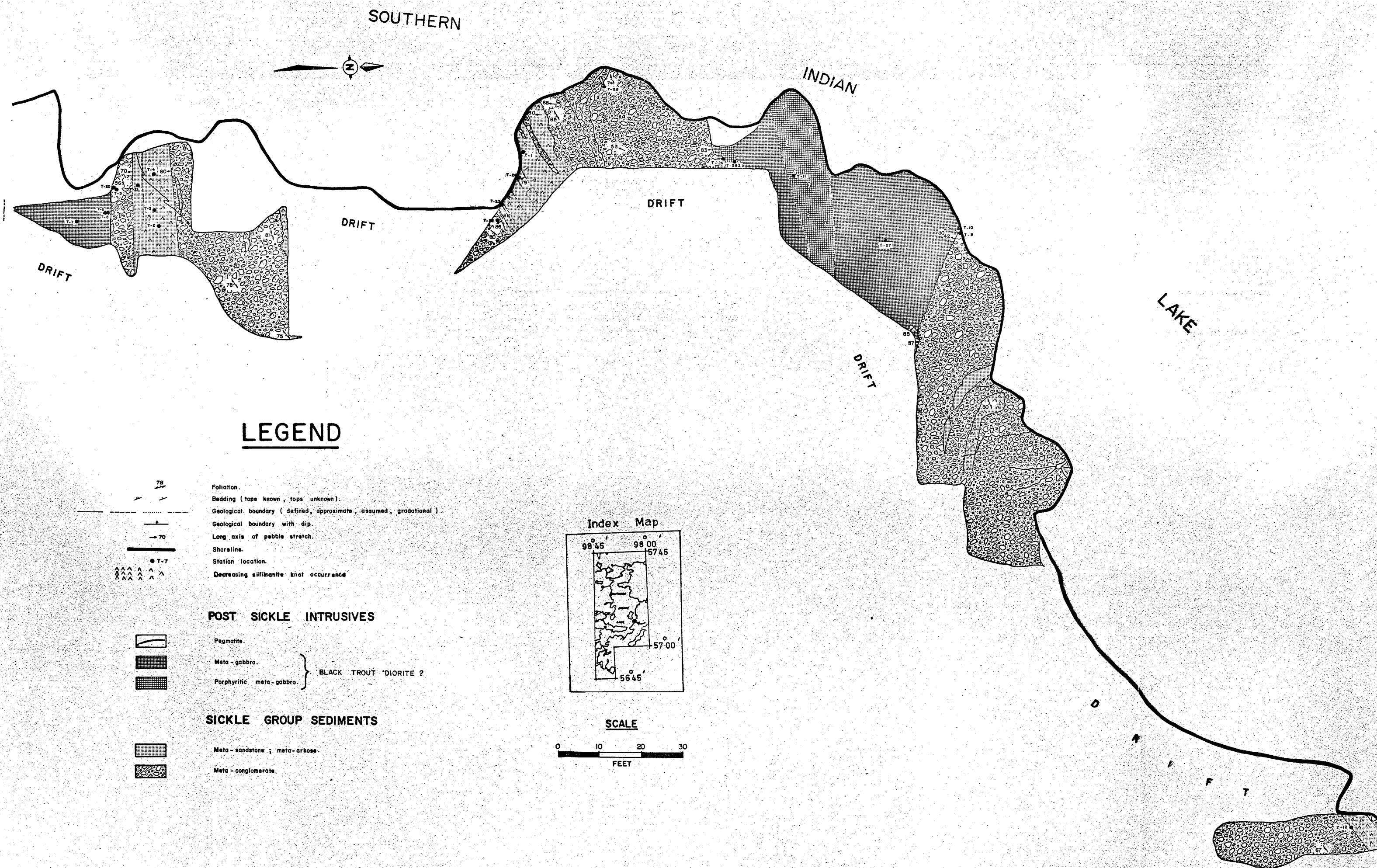
Meta-sandstone; meta-arkose.  
 Meta-conglomerate.

### Index Map

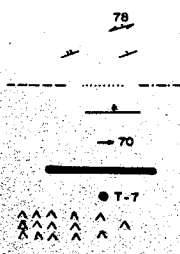


### SCALE



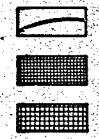


**LEGEND**



Foliation.  
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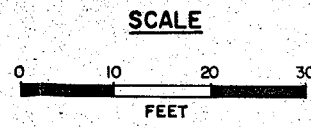
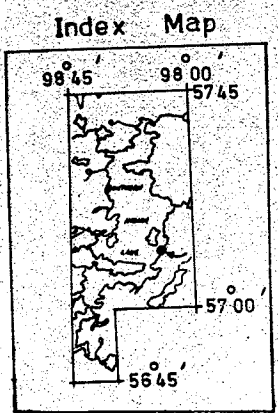


Fig. 2 Detailed map of a typical sillimanite knot bearing outcrop