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OPEN FILE 2265

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(NOTE: 8 - 1:50,000 scale geological and structural maps accompany this open file report #2265)

ABSTRACT

The basement of the map area, 70 km southwest of Rankin Inlet, is formed by the Archean Kaminak Supergroup, a greenstone supracrustal sequence, overlain by the early Proterozoic Hurwitz Group. The Kaminak Supergroup is divided into two volcanic and sedimentary sequences; the Kasigialik group and the Tagiulik formation. The Kasigialik group is divided into three formations; the Atungag formation, dominated by mafic pillow lavas; the Akliqnaktuk formation with mafic pillow lavas, volcanoclastic breccias, mafic arenites and conglomerates, and felsic volcanic and volcanoclastic rocks; the Evitaruktuk formation, dominated by a quartzofeldspathic turbidite sequence. The Tagiulik formation is dominated by a quartz-poor turbidite sequence, with banded ironstones. The Hurwitz Group is comprised of the Whiterock Lake member of the Kinga Formation, an orthoquartzite succession, and the Tavani Formation, a quartzo-feldspathic succession. Mafic and felsic intrusions, of Archean or post-Archean age, occur throughout the area.

Two regional phases of Archean deformation are recognised. Localized, polyphase deformation occurs along a décollement zone at the base of the Tagiulik formation; this is progressive into D_1. D_1 is characterized by bedding-parallel high strain zones, a regionally pervasive S_1 foliation, and locally, large scale F_1 folds. D_2 is characterized by open to tight folds and steeply dipping shear zones; both trending northeast. These shear zones have a complex movement history. D_3 is Proterozoic in age, and results in the folding observed in Hurwitz Group sediments, and related structures in the basement. Metamorphic grade varies from sub-greenschist to upper amphibolite facies around granitoid complexes in the south,north, and west. A migmatite, in the west of the area, is thrust in from the west. Syngenetic and epigenetic mineralization in the area shows both stratigraphic and tectonic controls.

Granitoids were emplaced syn-D_1 and post-D_2. A quartz-feldspar porphyry, probably a sub-volcanic intrusion, is dated as, at least 2675 Ma old. A syn-D_1 granite is dated at 2677+/-2 Ma and one post-D_2 granite is dated at 2659+/-4.6 Ma.

INTRODUCTION

This report describes bedrock mapping carried out in the southwest quarter of the Tavani map sheet (55K/3,4,5,6; Universal Mercator Grid is used to reference localities on the accompanying 1:50,000 scale geological maps), between 62° and 63° 30' N and 93° and 94°W, located approximately 70 km southwest of Rankin Inlet, District of Keewatin, N.W.T (Fig. 1). Mapping, at a scale of 1:16,000, during the 1988 and 1989 field seasons, was intended to update the lithologies, lithological relationships, stratigraphy, and structure, described in the reconnaissance survey of Heywood (1973). Geochemical and geochronological studies are used to characterize the igneous rocks within the area, and to constrain the timing of the deformational events.

Geological Setting (previous work)

The map area is located in the northeastern end of the Rankin-Ennadai greenstone belt, a major NE-SW trending greenstone belt extending from northern Saskatchewan to Rankin Inlet, on the shore of Hudson Bay. Archean rocks in this greenstone belt have been referred to as the "Kaminak Group" (e.g. Heywood, 1973). Lewry et al. (1985) suggested that these rocks should be referred to as the "Kaminak Supergroup", and the term is used in this report. The Kaminak Supergroup is overlain by the early Proterozoic Hurwitz Group, a quartz arenite succession. The first geological maps of the Tavani area were included in the compilation of Lord (1953) and the geology was summarized as part of a regional study by Wright (1967). The results of a helicopter reconnaissance and a comprehensive review of earlier work were produced by Heywood (1973). This was part of a reconnaissance survey of the entire district of Keewatin, and was integrated with the neighbouring areas of the Eskimo Point, Maguse River and Kaminak Lake map sheets to the south and west respectively (Davidson 1969, 1970). The present study is part of a detailed remapping project of the relatively well exposed coast and immediate hinterland, and forms part of an effort to complete a traverse from Daly Bay, in the north, to Tavani, in the south (see Tella et al., 1986,1989; Tella & Annesley, 1987, 1988; Fig. 1). Miller (1989) has commenced detailed field and petrographic studies of gold mineralization in the Rankin-Ennadai greenstone belt; this includes the "Fat Lake" deposit in the Tavani area (GR 550875; 55K/4).

The present study reflects an integrated approach to the mapping, in which both the stratigraphy and the structure are examined together. In areas such as greenstone belts, it is not possible to determine the stratigraphic sequence without understanding the structural history of the area; conversely it is not possible to accurately determine the structural history without an understanding of the stratigraphy.

The nomenclature for the epiclastic and sedimentary rocks follows that of Crook (1974) and Folk (1980). Igneous rock names are those recommended by the IUGS Subcommission on the Systematics of Igneous Rocks (Streckeisen, 1976).

STRATIGRAPHY

Introduction

Stratigraphy of the Tavani area is constructed on the basis of recognition of distinct associations of facies, *i.e.* "a facies (as) a body or interval of rock which has a unique definable character that distinguishes it from other facies or intervals of rock or sediment" (Cas & Wright, 1987). On the mapping scale used (air photos at ca. 1:16,000), individual facies are recognised as differences in lithology and lithological assemblages. The scale of the facies defined here is dictated by the scale of mapping. Fifteen distinct associations of facies are recognised in the Archean rocks of the Tavani area (Figs 2,3), and their relations with each other are shown in the interactive stratigraphic column (Fig. 2; Cas & Wright, 1987). The informal term "association" is used in preference to "unit", "member" or "formation" because similar associations recognised in different areas are not , *a priori* , stratigraphic equivalents. The stratigraphic succession is subdivided into four formations: Atungag, Akliqnaktuk, Evitaruktuk, and Tagiulik formations (new names, see Appendix 1). The first three formations form a coherent mappable entity, the Kasigialik group (new name, see Appendix 1). The Tagiulik formation shows an allochthonous relationship to the Kasigialik group. Two distinct sedimentary facies are recognised in the early Proterozoic rocks of the Hurwitz Group (Figs 2).

Archean

1. Mafic pillow association (Fig. 3a,b).

The mafic pillow association is characterized by large, well-formed pillows and lava tubes, subordinate dykes, sills and massive lava flows with pillowed tops. These may be porphyritic or aphyric, with the latter predominating. There is little or no interpillow material, although both chert and carbonate are found locally. Pure and massive carbonate is often found as the matrix in a non-stratiform, non-stratabound brecciation of the pillow lavas and associated intrusions. There are very local, minor developments of bedded chert and fine grained chloritic metasediments, e.g. around 'Fat Lake' (GR 550875, 55K/4; Fig. 3c; cf. Miller, 1989).

This association forms the lowest stratigraphic unit throughout the map area, and corresponds to the "Lower Volcanic Unit" of Miller (1989). It is proposed that this unit be called the Atungag formation. Coastal exposures around Mistake Bay (GR 910916; 55K/3) show the best development of this facies association. The base of this unit is not exposed, and structural complexities and variable amounts of intrusive material render estimates of thickness meaningless, though it should be noted that this formation forms the depositional basement wherever it is present.

2. Mafic pillowed flows with carbonate ironstone/chert association (Fig. 3d).

This association consists of two facies, one dominated by mafic lavas and carbonate ironstones, and one dominated by chert. Massive mafic flows grade upwards into pillows with the topmost breccia having a palagonite-carbonate matrix. Interflow layers are dominated by banded carbonate ironstone (siderite+/- magnetite in a matrix of calcite and quartz) with subordinate cherts (non-ferruginous), sulphidic pelite and black slate. Where lavas are not developed the carbonate ironstones are rare, and the association is dominated by chert, with local development of mafic epiclastic sediments. Epiclastic sediments are commonly well-bedded or cross-bedded sandstones and mudstones, with local crystal clast- and lithic clast-bearing beds. This association is only developed immediately above the Atungag formation (Association 1), where bedded units may be draped over pillows on the contact (Fig. 3d). Though this association does constitute a marker horizon it is not continuous. The type area for this association lies south of the Ferguson River (GR 750880; 55K/3), where about 50 metres of lavas are interbedded with chert, carbonate ironstone and sulphidic pelite. Where lavas are absent (e.g.along the south shore of the unnamed lake at GR 550965 (55K/4), south of Last Lake) the association typically consists of a chert dominated layer less than 2 metres thick.

3. Mafic pillowed flows with breccia and mafic arenite association (Fig. 3e-k).

This association is dominated by mafic breccias (Fig. 3e,g,h,k) grading into mafic lithic wackes (quartz-poor, Crook, 1974) or siltstones (Fig. 3j). Subordinate chert, black slate and sulphidic pelites are present. Zones of massive flow units with pillowed tops overlain by breccia are widespread (Fig. 3f), but breccias are always the dominant lithology. Minor developments of conglomerate (some lensoid), dominated by felsic volcanic clasts, are widespread (Fig. 3h,i). Though pillow fragments are recognizable, and gradations from flow tops to breccia can be demonstrated, breccia clasts have incomplete selvages, and this, together with the presence of exotic clasts (granitoid, felsic volcanic, quartzite, chert), implies some degree of sedimentary reworking. Clast to matrix ratios vary, from clast supported to matrix supported types. One extreme example of a matrix supported type is seen south of the Ferguson River (GR 720825; 55K/4), where mixed angular clasts, up to a metre in diameter are present in a fine mafic matrix, that resembles an olistostrome. This association is well developed south of the Ferguson River (GR 740880; 55K/3), around the northwest end of Mistake Bay (GR 860940; 55K/3) and southwest of Gill Lake (GR 914228; 55K/6).

4. Granite conglomerate association (Fig. 31).

A matrix-supported, coarse to very coarse conglomerate (observed maximum clast size = 1.5 metre, mean clast size ≈ 30 cm) is developed at one locality in the Wilson River area (GR 816163; 55K/6). Rounded granite clasts predominate, but this association grades into the mafic volcanic breccia of Association 3, both vertically and laterally, by an increasing component of mafic volcanic clasts. Strain is accommodated by the matrix and the mafic clasts such that no assessment of original mafic clast shape can be made. The matrix is a quartz-poor, chloritic arenite. This association has a maximum thickness of 750 metres, and extends 1.5 km along strike.

5. Siliceous dolomite association.

A siliceous metadolomite, now a talc-calcite-magnesite-tremolite-quartz rock or schist (both foliated and non-foliated), occurs with chert, ferruginous schist and talc schist. Only one development (500m x 100m) of this association is known, north of the Wilson River (GR 828168; 55K/6). This association is stratigraphically below the granite conglomerate (Association 4), but separated from it by approximately 100 metres of mafic breccias (Association 3).

6. Quartz-greywacke association.

A quartz-rich sandstone to pelite succession occurs in one locality, north of the Wilson River (GR 822165; 55K/6), where it lies stratigraphically below the granite conglomerate (Association 4). It appears to be a lateral equivalent of the siliceous dolomite (Association 5). This association shows a cyclic gradation from arenite to pelite, typical of turbidites. The exposed thickness of this association is approximately five metres, with a strike length of 50 metres.

7. Variolite association (Fig. 3m-r).

This association is dominated by speckled lava-lobes (Fig. 3m-o) in a matrix of breccia consisting of hyaloclasts and fine, indistinct, chloritic material, and is best developed in the Last Lake area (GR 650994; 55K/4). Lavas are vesicular and carry a distinctive spotting due to the presence of recrystallized amygdales and feldspar porphyroblasts. Spots range up to 2 cm in diameter, and when they are recrystallized amygdales, show a concentration towards the rims of lobes. Feldspar porphyroblasts show no regular distribution. Subordinate pillow and pillow breccia, lapilli tuff and black slate are present. This association grades laterally into, and is interbedded with, a hyaloclastic breccia (see Association 8).

8. Massive flow and hyaloclastite association (Fig. 3s).

This association is dominated by thick mafic flows, often vesicular, with or without pillowed tops. Cappings of vesicular breccia are locally present. Individual flows may be up to 30 metres thick; in thicker flows the core may be diabase or fine-grained gabbro. Flows can be traced laterally into hyaloclastic breccia ramified by basalt lava-tubes and lobes, locally grading into Association 7. Interflow material consists largely of hyaloclastic breccia and pillow breccia. Pillow fragments in this breccia show complete selvages (cf. Association 3). Whole pillows often have complexly involute or in-folded shapes suggestive of rolling while still partly molten.

The main outcrop of this association (GR 630030; 55K/5 to 840150; 55K/6) is the "Happoytiyik Member" (Ameto Formation) of Heywood (1973), lying between Last Lake and the Wilson River. A more deformed outcrop of this association occurs on the Ferguson River (GR 793876; 55K/3).

9. Black slate - green arenite association (Fig. 3t).

A black slate (locally green) contains interbeds (up to 1 metre thick) of greenish, crossbedded, carbonate-bearing mafic arenite. Bedding is poorly defined in the slate, although cut slabs reveal graded bedding on a millimetre to decimetre scale. This association forms a regional marker (GR 660080; 55K/5 to 750120; 55K/6) largely within the outcrop area of Association 8. A black slate on the south shore of the Wilson River (GR 836153; 55K/6) may be a northern extension of this association.

10. Felsic volcanic and epiclastic association (Fig. 3u,v).

Felsic lavas and volcanic breccia, including quartz-eyed felsite, associated with quartzo-feldspathic sandstones and lithic wackes dominate this association. Subordinate to the felsic volcanoclastic rocks are siltstone, shale, and mafic to intermediate lavas including porphyritic andesite. Rocks of this association are best seen southwest of "East Lake" (GR 810010; 55K/6) and north of Last Lake (GR 703065; 55K/5). The top of this association is obscured by unconformable or faulted relationships, making thickness estimates difficult.

Association 2 to 10 form a mappable entity always above the Atungag formation. These association are the equivalent of the Middle and Upper Volcanic Units, and the Lower and Upper Sedimentary Units of Miller (1989). It is recommended that this mappable unit be elevated to the status of formation, with the new name - Akliqnaktuk formation.

11. Slate-greywacke, conglomerate turbidite association (Fig.3w,x).

This association consists of turbiditic cycles grading from a coarse pebble, polymict, matrix-supported conglomerate to shale/slate, with the latter usually forming the matrix to the former. Incomplete cycles grade from quartz-rich greywacke to shale/slate, with no conglomerate. The turbidites in the 'East Lake' succession (GR 845024; 55K/3), show the most extensive development of conglomerate (Fig. 3x, GR 815005; 55K/3), and they are generally slate-dominated. West of Gill Lake (GR 900230; 55K/6) the conglomerate is absent, and the cycles range from quartz-rich greywacke to shales/slates (Fig. 3w). Clasts in the conglomerate are predominantly felsite and porphyritic felsite, but clasts of mafic volcanic rocks, chert, and trachyte are also present. Clasts range in size up to 10 cm, with a mean size around 2 cm. Conglomerate units are more extensive at the base of the succession at 'East Lake', and the clast types suggest an unconformable relationship with the felsic volcanic rocks of the Akliqnaktuk formation, but the actual contact is faulted. At 'East Lake' this association is at least 800 metres thick, while at Gill Lake, neither the base nor the top are exposed, and deformation is more extensive than at 'East Lake'.

12. Arkose association.

A unit of feldspathic quartz-arenite to arkose lies above Association 11 south of "East Lake"(GR 820008; 55K/3). It is comprised of a massive, poorly bedded deposit, coarse- to medium-grained with conspicuous clasts of red potash feldspar , and granite.

Association 11 and 12 form a mappable entity and their elevation to formation status is recommended, with the new name, Evitaruktuk formation.

13. Turbidite-ironstone association (Fig. 3y,z).

This association is dominated by quartz-poor greywackes and banded magnetite-chert ironstones. Greywackes range from coarse lithic wackes and matrix supported breccias to fine lithic siltstones and shale/slate (now chloritic psammite and pelite). These show a cyclic development typical of turbidites (Fig. 4). Two facies are recognised in this association :

1) Pelite-dominated facies, with abundant ironstones that are often very thick (up to 30 m, but normally 10 cm -2 m).

2) Psammite-dominated facies, with psammite layers up to 15 metres thick. Thin pelites (less than 1 metre) and occasional ironstone occur in this subdivision.

Both psammite-dominated and pelite-dominated facies form Bouma cycles (Fig. 4), in which the coarsest psammites, occasionally matrix supported conglomerate/breccias with abundant lithic clasts, occur at the base of each cycle. Psammites usually have an erosive base, often defining channel forms. The lithic clasts include ripped-up mudstones and magnetite-chert ironstones. Few of the Bouma cycles are complete in either facies. Channelling and basal erosion associated with the coarser psammites has usually removed the upper units from the underlying cycles. Slumping is common in the uppermost layers of each cycle, and most pelites and ironstones contain features like slump folds, injection structures, and loading or dewatering structures. Both facies of this association are well exposed along the southeastern shore of "East Lake" (GR 845024; 55K/6), where allowing for faulting, the succession is at least 1000 metres thick.

14. Conglomerate/breccia association

A conglomerate/breccia with black slate, sulphidic ironstone, carbonates, and lithic psammite is present at Mistake Bay (GR 930954; 55K/3): the conglomerate/breccia is also present at Gill Lake (GR 940230; 55K/6). Clasts in the conglomerate/breccia are normally felsic volcanic rocks (rhyolite and trachyte) or porphyritic felsites. In both localities, this association lies beneath Association 13.

Associations 13 and 14 form a distinct mappable entity, with a highly strained base. It is suggested that these association be elevated to formation status, with the new name Tagiulik formation.

Three types of ironstone are recognised in the Tagiulik formation:

(a) Sulphidic-pelitic ironstone.

These consist of banded chlorite pelite in which some layers are rich in pyrite (up to 50%). Individual layers are less than 10 cm thick, and can usually be traced for 10 to 30 metres along strike. They are particularly abundant at the base of the formation around Mistake Bay (GR 930953; 55K/3), where they constitute part of Association 14.

(b) Magnetite-chert ironstone.

These consist of magnetite in a matrix of fine grained quartz, with minor and variable amounts of chlorite and epidote. Magnetite content ranges up to 50%, though is more usually 20 - 30%, varying considerably over a few centimetres within one layer. Layers are usually 10 cm - 2 metres thick, but locally reach 30 metres (GR 900990, 55K/3) where they have an aeromagnetic expression (Aeromagnetic Series Map 3485G 55K/3). These ironstones are an integral part of the complete Bouma cycles of Association 13, and are more usually preserved in the pelite-dominated facies.

(c) Magnetite-pelite ironstone.

These are fine chloritic pelites containing magnetite (up to 25%, usually around 10%) and minor amounts of pyrite (accessory). They are a minor development interbedded with the magnetite-chert ironstones.

(d) Carbonate ironstone.

These consists of chert finely interlayered with calcite-quartz layers. Siderite forms porphyroblasts (up to 1 cm diameter) in the calcite-chert layers, where it may comprise 60%. Chlorite and epidote are minor constituents, and at higher metamorphic grade grunerite appears. Layers of this chert-carbonate mixture are up to a metre thick and can be traced for 20 - 50 metres along strike. The carbonate rich interlayers are up to 5 cm thick. Minor examples of this type of ironstone occur throughout Association 13, but are particularly abundant at the base of the formation, in Association 14, around Mistake Bay (GR 950935; 55K/3).

Recommendation on stratigraphic nomenclature

The Kaminak Supergroup (Lewry *et al.* 1985) in the Tavani map-area is divided (Figs 2,5) into four formations. The Atungag formation, the Akliqnaktuk formation, and the Evitaruktuk formation form a coherent assemblage with only minor unconformable internal relationships. This corresponds to the "Last Lake formation" of Park and Ralser (1989), and we recommend replacing this informal term, with the new name, Kasigialik group. The Tagiulik formation corresponds to the "Mistake Bay formation" of Park & Ralser (1989). Structural mapping has demonstrated the allochthonous nature of its relationship to the rocks of the Kasigialik group, but the depositional relationship between the groups is completely obscured.

SEDIMENT PETROGRAPHY

Epiclastic rocks in the Akliqnaktuk formation show a broad range in composition in all the associations in which they occur. Although generally poor in lithic clasts, all suggest a volcanic source. The sublitharenite (A in Fig. 6a) is from Association 6; the remaining epiclastic rocks in the Akliqnaktuk formation are arkoses and lithic arenites. These are both from Association 10, but separate into two groups; Group B (Fig. 6a) is quartz-poor, representing the felsic epiclastic rocks developed north of Whiterock Lake (GR 935135; 55K/6), while group C, with slightly more quartz, is from an area south of Maze Lake (GR 730070; 55K/5).

The distinction between the two turbiditic successions (Tagiulik formation and Evitaruktuk formation) is well illustrated in the QFR diagram (Fig. 5a). Both successions are made up entirely of arkoses and lithic arenites: however, the Tagiulik formation turbidites are quartz-poor, whereas the Evitaruktuk formation turbidites are quartz-intermediate in composition.

The psammites of the Tagiulik formation consist of detrital feldspars (both plagioclase and orthoclase) forming single crystal, angular to sub-angular clasts, up to 5mm diameter. Clots of pure chlorite represent recrystallized lithic clasts, possibly of mafic volcanic glass. Other lithic clasts include porphyritic fine-grained mafic lavas. Large (5 - 10 mm), single grain quartz clasts are scattered throughout the psammites. Chlorite and carbonate form part of an irresolvable groundmass. Mafic grain clasts are largely chlorite pseudomorphs after (?) amphiboles. Quartz is not commonly visible in the pelitic fraction, though larger detrital feldspar clasts (up to 2 mm) are scattered throughout. Chlorite and white mica, with a carbonate rich, but largely irresolvable groundmass, form the bulk of these rocks.

The psammites of the Evitaruktuk formation are dominated by detrital quartz grains, commonly single crystals, and altered feldspars, both plagioclase and K-feldspar. Lithic clasts are composed of fine grained quartz or quartz and mica. The matrix is fine grained quartz and mica.

Lower Proterozoic

The Kaminak Supergroup is overlain by the Hurwitz Group (Fig. 2, 5), an early Proterozoic quartz-rich sedimentary sequence defined by Bell (1968), and described in Heywood (1973), Park & Ralser (1989) and Ralser & Park (1990).

Two main associations of facies are recognised in the Hurwitz Group in the Tavani area (Figs 2, 5, 7); a pure orthoquartzite corresponding to the Whiterock Lake member of the Kinga Formation (Heywood, 1973), and the lithic arkoses of the Tavani Formation (Heywood, 1973). Minor facies of limited extent are present locally, stratigraphically below the Whiterock Lake member, and within the Tavani Formation (Fig. 7).

Kinga Formation (Sub-Whiterock member)

Arenites lying conformably below the Whiterock Lake member of the Kinga Formation are informally termed the Sub-Whiterock member. They do not appear to correlate with any of the lower Hurwitz Group units described by Bell (1968), and consist of distinctive lithologies of limited extent between the orthoquartzites and the basal unconformity (Fig. 7).

The reddened sequence, north of the Wilson River (GR 860178; 55K/6, Fig. 7). Up to 25 metres of wholly or partially reddened sandstone, siltstone and red-purple shales underlie the sharp base of the Whiterock Lake Quartzite. On the western side of the outcrop of Hurwitz Group sediments one thick arenite (up to ?10m) occurs. This is a poorly (carbonate) cemented sublitharenite (Fig. 6b), in which feldspars are completely pseudomorphed by kaolinite, and the lithic clasts are predominantly composed of quartz-mylonite. Illite masses, possibly representing pore-throat plugs, are rare relics. The reddening (hematization in part), so evident in this sequence, is not seen in the overlying orthoquartzite, but does extend, associated with much hydrous alteration, into the underlying Archean muscovite phyllites.

On the western margin of the outcrop of Hurwitz Group sediments quartz arenites (Fig. 6b) occur. These differ from the overlying Whiterock Lake member of the Kinga Formation in having a much higher matrix content (up to 30%). These rocks also show some reddening and are strongly deformed.

Some degree of sedimentary working and winnowing is evident in these reddened successions. The presence of the reddened zone within the *in situ* basement on which they were deposited suggests affinities with a regolith.

Impure quartz-arenites and associated rocks, 'East Lake' and the Last Lake belt (GRs 812019; 55K/3, 640097; 55K/5, 556007; 55K/4, Fig. 7). Two metres of a grey, "dirty" quartz arenite underlie the orthoquartzite south of 'East Lake' (GR 812019; 55K/3). This rock is classified as a lithic arenite

(Fig. 6b). A similar rock also occurs just above the basal unconformity north and south of Last Lake (GR 640097; 55K/5, 556007; 55K/4). In all cases these arenites have a lithic and feldspathic component, in addition to quartz, in a fine grained clay-carbonate matrix. In the area south of Last Lake there is some reddening in this unit.

Polymictic conglomerate and breccia mass-flows with a reddened mud matrix are interlayered with, and underlie, the grey quartz arenite south of Last Lake (GR 556007; 55K/4, Fig. 8b,c). Clasts consist of local basement lithologies; granite, amphibolite and chlorite or biotite schists, along with vein quartz. These deposits appear to be related to topographic lows, possibly valleys or gullies on the sub-Hurwitz surface. Over the Last Lake granite the orthoquartzite of the Whiterock Lake member (Kinga formation) rests directly on the unconformity.

Kinga Formation (Whiterock Lake member)

The Whiterock Lake member of the Kinga Formation is the dominant unit of the Hurwitz Group in this area. It is well exposed, usually forming prominent ridges. The thickness of the unit varies from less than 100m, at the southern end of the Whiterock Syncline, to at least 800m around 'East Lake' (GR 820020; 55K/6), at the northern end of the Whiterock Syncline, and west of Whiterock Lake, on the Wilson River (Fig.7; 55K/6).

The Whiterock Lake Member is characterized by white, locally pink, very pure orthoquartzite (quartz arenites, Fig. 6b). It is generally thin-bedded, with bed thicknesses up to five centimetres. Such beds are spectacularly ripple-marked (Fig.8d,e). Locally, bed thicknesses may be in excess of 10 metres, with large scale cross bedding (Fig. 8f). In such locations it is often difficult to clearly delineate bedding.

A minor component of this part of the succession is carbonate-rich quartzite or dolostone. These occurrences are particularly common near the basal unconformity and are locally reddened. Sericitic quartzite layers occur throughout the orthoquartzite sequence, individual layers being less than 10 cm thick.

Adjacent to faults the orthoquartzite is extensively recrystallized, but otherwise the rock retains many primary or diagenetic features. Original grain shapes are clearly visible, and silica overgrowths on detrital grains, pore throat plugs of illite, and recrystallized chalcedonic pore fillings are common.

Tavani Formation

The Tavani Formation conformably overlies the Whiterock Lake member, but may be separated from it by up to one kilometre of unexposed bedrock. No exposure of the intervening Ameto Formation reported by Heywood (1973) has been observed (Fig. 7).

The Tavani Formation is characterized by white and pink lithic arenites (Fig. 6b), often very micaceous. The detrital grains, apart from quartz, are highly altered feldspars (both plagioclase and K-feldspar), very fine grained cherts, and other heavily altered rock fragments. Local red or green shale partings occur low in the succession and shale rip-up clasts are present in the pink litharenites (GR 646942; 55K/4, Fig. 8h). A polymictic, matrix supported conglomerate occurs in the southwestern end of the Whiterock Syncline (GR 639922; 55K/4, Fig. 8i). Clasts are well rounded quartzite, but minor granite and jasper clasts are also recorded.

Bedding in the Tavani Formation is commonly hard to delineate. Preserved structure is thin bedded, and ripple marks are rare. Larger scale cross bedding is present in the centre of the Whiterock Syncline (GR 648908; 55K/4, Fig. 8g).

INTRUSIVE ROCKS

Mafic Intrusive Rocks

Three suites of gabbros and related rocks are recognised; the Kiksautituk and Fat Lake suites are pretectonic and Archean in age (Fig. 2). The third suite cuts the Hurwitz Group sediments and is Lower Proterozoic in age (Fig. 2). The Archean gabbros are elongate bodies, parallel to the local structural trend. The bodies may be up to six kilometres long and two kilometres wide (across the local structural trend), most are less than one kilometre in length.

a) The Kiksautituk suite (new name, see Appendix 2), consists of diabase and fine to coarse grained gabbros, locally porphyritic, and associated with diorites, tonalites, and trondhjemites. The gabbros are the most widespread of these lithologies; the whole suite, described previously by Park and Ralser (1989), is present at the northwestern end of Gill Lake (Kiksautituk; GR 906278; 55K/6). Modified primary layering and other primary textures or their pseudomorphs are locally preserved (GR 902877; 55K/3) in the gabbros (Fig. 9a,b, c).

(b) The "Fat Lake" suite (new name, see Appendix 2), consists of porphyritic quartz gabbro and diorite. They are locally megacrystic, with both single and multiple crystal plagioclase megacrysts, up to 40cm in size (Fig. 9d). Concentrations of megacrysts define layers. Intrusions of the Fat Lake suite are not as widespread as those of the Kiksautituk suite, and are only found south of the Wilson River. At "Fat Lake" (GR 550875; 55K/4) the Fat Lake diorite contains gold-bearing quartz veins (Miller, 1989); quartz veins of this type are not present in any other intrusion of the suite.

c) Fine and even grained gabbro plugs and sills, with marginal diabase, occur near the contact of the Kinga and Tavani Formations in the early Proterozoic Hurwitz Group. The gabbro bodies are up to 1.5 x 0.5 km in size. Within the Tavani map area these are restricted to the Whiterock syncline (e.g. GR 620872; 55K/4).

Two suites of mafic dykes are recognised:

a) Predominantly north trending diabase dykes, locally porphyritic or plagioclase megacryst-bearing, are correlated with the Kaminak dyke swarm (Fig. 9f; Davidson, 1970).

b) Northwest trending diabase and gabbro dykes are correlated with the Mackenzie dyke swarm (Heywood, 1973).

Felsic Intrusive Rocks

Felsic intrusive rocks are of two types; granitoids, and quartz feldspar porphyries and microgranites. Major granitoid intrusions occur around Gill Lake, Last Lake, and Tavani; minor bodies occur at "East Lake" and north and south of Last Lake. They are subdivided, on the basis of their relationship to structural elements, into syntectonic and post-tectonic groups (see below).

Gill Lake granitoids. (new name). Three distinct intrusions are recognised around the eastern end of Gill Lake. From oldest to youngest, they are the north Gill Lake, east Gill Lake and south Gill Lake plutons (new names). All three are subsolvus, two-feldspar, relatively homogeneous bodies. The north Gill Lake pluton is a grey, fine to medium grained, nonporphyritic, locally foliated, hornblende granite-granodiorite (Fig. 10). Xenoliths are abundant (commonly of country rock) and much of the southern contact consists of schollen migmatite (Fig. 9g; Mehnert 1968). Zircon, allanite and sphene are abundant accessory phases.

The east Gill Lake pluton is a medium to coarse grained, porphyritic granite (Fig. 10), locally sheared to produce a coarse augen gneiss. It is dominated by pink orthoclase phenocrysts in a mafic matrix in which biotite is the principal phase. Locally, orthoclase is rimmed by plagioclase, and in the augen rocks, orthoclase is wholly or partially replaced by microcline. Sphene is the most abundant accessory mineral, with zircons scattered throughout, but being particularly evident in the biotite clots. The non-sheared contacts (most contacts are sheared, except south of Gill Lake, where they are poorly exposed) are diffuse zones of injection with abundant country rock xenoliths and screens.

The south Gill Lake pluton consists almost entirely of a medium grained leucogranite-granodiorite (Fig. 10). Primary hornblende is replaced, wholly or partially, by biotite and chlorite. Sphene is abundant, and the biotite commonly contains exsolved rutile (with a sagenitic texture on the 001 cleavage). In the south (GR 885142; 55K/6), a porphyritic variety is present, containing red phenocrysts of orthoclase, and with much groundmass recrystallization in the form of poikilitic microcline. The contacts with the country rock are sharp, and xenoliths of country rock are rare.

Tavani granitoids (Davidson, 1970). This poorly exposed plutonic complex is dominated by subsolvus, two-feldspar granite-granodiorite (Fig. 10), but locally quartz diorite, diorite and gabbro are also present. Some phases of granite are rich in sphene, and biotite is heavily rutilated. Primary hornblende and primary biotite bearing granites are recognised, though their relationships to each other, and the other lithologies, are hard to define precisely. In some granite phases, original orthoclase is recrystallized as poikilitic microcline.The undeformed contacts are all complex injection features, with the development of agmatite (Fig. 9h-k; Mehnert 1968).

Last Lake granitoids (new name). Other than along the southern margin of this complex pluton, bed rock exposure is very limited and relationships between the constituent parts is obscure. Most outcrop is dominated by a fine-grained, two feldspar leucogranite, cut by a medium to coarse-grained, pink granite (Fig. 10). Monzonite and quartz diorite phases are also present, and though their relative positions in the sequence of intrusions is obscure, both are intruded by the pink granite. The feldspars in the leucogranite show evidence of some sub-solidus recrystallization, with orthoclase being partly replaced by microcline, and hornblende being replaced by biotite. Amphibole, biotite and secondary chlorite are all rutilated and sphene is abundant. The southern contact is a complex marginal agmatite, produced by sheets of leucogranite and pink granite. In the southeast, adjacent to the sub-Hurwitz unconformity, the leucogranite is heavily altered, with feldspar sericitization, accompanied by extensive epidote growth and the development of abundant quartz-epidote-hematite veinlets.

Other intrusions. North of Last Lake (GR 540140; 55K/5) a coarse-grained, hornblende-biotite monzonite-granodiorite body intrudes the Atungag formation. The exposed southwestern contact is sharp, and apparently steep. A marginal development of fine-grained leucogranodiorite is present here. Most of the intrusion is drift covered, but rock float in felsenmeer is predominantly a coarse monzonite-granodiorite.

At "East Lake" a pluton (East Lake granite, new name) cuts the turbidites of the Tagiulik formation. The intrusion is single phase, consisting of a fine-grained, hornblende, two-feldspar, granite-granodiorite, rich in cognate and country-rock xenoliths (Fig. 10). The cognate xenoliths are a hornblende quartz-diorite. It is non-foliated and contacts are sharp. The granite is extensively altered, with biotite and chlorite replacing hornblende, and feldspars replaced by sericite and epidote. Sphene is abundant, and locally, the more xenolith-rich portions are tourmaline-bearing. At the northwestern margin of the intrusion, against a heavily carbonated and propylitized shear zone, the granitic wallrock to quartz-calcite-hematite veins carries aenigmatite.

Around most of the exposed East Lake granite the thermal aureole is narrow, but a broad zone of contact metamorphism extends along the shore of "East Lake" to the southwest. This, and the aeromagnetic expression [Aeromagnetic Series Maps 3485G (55K/3) and 3496G (55K/6)] suggest that the granite is a cupola developed on the northeast end of a low density body that extends beneath the outcrop of the Hurwitz Group rocks.

South of Last Lake (GR 520966; 55K/4) a porphyritic microgranite body intrudes the Atungag and Akliqnaktuk formations. This is a two-feldspar, biotite microgranite, locally carrying heavily altered K-feldspar and quartz phenocrysts. It is sheared and altered, with quartz veins, chlorite, carbonate, sericite and epidote development. Its contacts with the adjacent units are complex, involving extensive development of quartz-feldspar porphyry dykes, especially along the non-sheared eastern contact. The gradation into quartz-feldspar porphyry implies affinities with this felsic intrusive suite (see below). Similar bodies occur to the north (GR 535995; 55K/4), and on the Ferguson River below Last Lake (GR 685985; 55K/4).

Quartz-feldspar and feldspar porphyries occur thoughout the area, but predominantly in the mafic members of the Akliqnaktuk and Atungag formations. Typically, they occur as sheets two to three metres wide and tens of metres long. A range of petrographies is evident from the phenocryst types. Quartz-phenocryst bearing and quartz-phenocryst absent types overlap with one and two feldspar-phenocryst bearing types. Feldspar phenocrysts may be single crystal or multi-grained, displaying complex zonation and twinning in euhedral to sub-hedral grains. Quartz phenocrysts show resorbed margins. The matrix is often sheared or heavily altered, but when fresh, is a groundmass of plagioclase, orthoclase/microcline and quartz, with or without biotite and chlorite. Zircon and apatite are often abundant. Some heavily altered "felsites" north of 'Fat Lake' (GR 567943; 55K/4) contain stilpnomelane. Modal analyses suggest that these rocks range across the fields for granites (Fig. 10; fields 3a,b). A number of fine grained felsic dykes (up to 5m wide) cut the gabbroic rocks southwest of Maze Lake (GR 700130; 55K/5). Their relationship to other felsic rocks in the area is unknown.

Alkalic Intrusive Rocks

Biotite lamprophyre dykes (commonly northwest trending and less than one metre wide) occur throughout the area. Locally they contain abundant xenoliths of granitoid, gneiss, and quartzite. Though these lamprophyre dykes have a consistent trend across the Tavani area, two swarms can be defined on the basis of their relationship to the Kaminak mafic dykes and to deformation. Dykes of an early swarm are locally foliated and are cut by the Kaminak mafic dykes, while dykes of a later swarm are undeformed, cut the Kaminak mafic dykes and carry xenoliths of quartzite (though their relationship to the Hurwitz quartzites cannot be directly demonstrated in the Tavani area, *cf.* Fig. 2). In the classification of Rock (1977), these are minettes, though in neither swarm have olivine or diopsidic augite been identified (cf. Digel 1986).

North of Last Lake (GR 620092; 55K/5) a more substantial (50m x 10m) intrusive breccia has a complex matrix of trachyte, biotite lamprophyre, fine- and coarse-grained syenite. The trachytic and syenitic rocks contain xenocrysts of perthite, partly replaced by microcline, abundant sphene, zircon, epidote and apatite (the latter up to 10% modal). Mafic phases are dominated by red-brown biotite (rich in zircons and usually rutilated) and a pale greenish-blue amphibole. Colorless, fibrous amphibole often overgrows and replaces earlier mafic minerals. Textures resembling those seen in appinites (Bowes and Wright 1967) suggests emplacement of the breccia in a diatreme. K-feldspar replacement and abundant apatite imply some degree of fenitization. Xenoliths include an orthoquartzite, similar to the Whiterock Lake member of the Kinga Formation. The sub-Hurwitz unconformity is probably less than 50m from this point, but the relationship between the two cannot be demonstrated.

In two localities (GR 518013; 55K/4 and GR 533011; 55K/4) east trending mafic dykes (up to 5m wide and 400m long) containing abundant xenoliths of altered anorthosite (up to 15cm across) occur within the Akliqnaktuk formation (Fig. 9e). These dykes have deformed margins, indicating an Archean age.

GEOCHEMISTRY

In the absence of trace and rare earth element analyses, isotope data (except U-Pb zircon, see below) and mineral compositions, geochemical data from the rocks in the Tavani map-area can only be used to support typology based on petrographic criteria. No more sophisticated treatment is offered here, and this account should be regarded as interim in an ongoing project (for data see Appendix II).

Felsic rocks

Analyses are available for the three Gill Lake granitoids and a suite of porphyries and a microgranite, also from the Gill Lake area. These rocks were chosen for zircon separation (U-Pb geochronology) because their structural context is well defined.

The ANOR vs. Q' plot (from CIPW norm data, Streckeisen and LeMaitre 1979) reflects the modal QAP classification of the felsic rocks (Fig. 11). Different results for the granitoids reflect differing treatment of the feldspar content by the modal and CIPW methods. The south and north Gill Lake plutons straddle the granite (3b) and granodiorite (4) fields (of Streckeisen 1976), while the east Gill

Lake pluton is both more siliceous and more alkalic. The microgranite and porphyries differ substantially in this treatment from their position on the QAP diagram (Fig. 10), reflecting the difficulties in distinguishing feldspar species and accurate point counting in the fine-grained groundmass. They fall on the ANOR vs. Q' plot as granodiorite (4) and quartz monzo-diorite (9*).

The parameters ($alk + c$) and al (Niggli Nos.) are used here (Fig. 12) to distinguish the peraluminous from the peralkaline felsic rocks. The north and south Gill Lake plutons are peralkaline (($alk + c$) $> al$), while the east Gill Lake pluton varies from peralkaline (or at least metaluminous, ($alk + c$) $\approx al$) to strongly peraluminous (($alk + c$) $<< al$).

The AFM and Niggli numbers vs. Niggli *si* plots (Figs 13, 14) are presented with the intention of illustrating systematic differences and similarities between the analyzed felsic rocks. In all of them the porphyries/microgranite show as much variation across a similar range as all the Gill Lake granitoids (e.g. *al* v. *si*, *c* v. *si*, *fm* v. *si* ; Fig. 14). What is apparent, however, is that the two groups consistently differ in the form of two (or more) independent trends. The *p*, *ti*, *alk* and *k* v. *si* plots show this particularly well (Fig. 14), with the last two emphasizing the essentially more sodic nature of the porphyries and microgranite. The plots of Niggli numbers vs. Differentiation Index (in this case D. I. = CIPW Q+or+ab; Fig. 15) re-enforce this dual distinction in much the same way. The porphyries and microgranite are as strongly differentiated as the granitoids, but are considerably more sodic.

With the exception of the AFM plot (Fig. 13), these same plots permit considerable discrimination between the granitoids; particularly distinguishing the east Gill Lake pluton from the other two. The east Gill Lake pluton is consistently the most differentiated (see particularly *si* v. *alk, k, c, p, fm;* D. I. vs. *ti, k* and *si* ; Figs 14, 15). The north and south Gill Lake plutons can only be reliably distinguished on the basis of *p* and *ti* (Figs 14, 15).

On the Q-or-ab diagram (Fig. 16) the separation of the east Gill Lake pluton from the other granitoids is repeated, though all the felsic rocks lie close to the minimum melt composition (or around it for different pressures). This is consistent with the granitoids evolving from a similar source, but at different depths during the tectonic and thermal history of the area.

Mafic rocks

Geochemistry of the mafic igneous rocks (volcanic) has been investigated by Ridler (1974), and a detailed re-analysis of this data, augmented with trace and rare earth element analyses, plus material from the Rankin Inlet area, is in progress (Tella, *pers . comm.*). The present authors have initiated a further study in the Tavani map-area.

Considerable problems exist when interpreting major element data from mafic rocks in low grade greenstone belts, such as the Tavani area. Nine out of eleven samples analyzed by Ridler (1974) were breccias (identified as such in Ridler, 1974); rocks that the present study has demonstrated to be, at best, highly altered, and at worst, sedimentary. The material collected here was sampled in accordance with the criteria applied by Pearce and Cann (1973), viz: avoiding 1.) phenocrystic, 2.) xenocrystic, 3.) vesicular or amygdaloidal, 4.) obviously cumulate, 5.) weathered, 7.) oxidized, and 8.) metamorphosed material. Samples come from either the cores of large pillows or the centres of thick flows. The first five criteria are easily met by careful sampling, and by hand picking rock chips prior to fine crushing. Oxidized material can be similarly avoided by not using obviously epidotized or hematized rock. All the mafic rocks are metamorphosed, but no rocks with strong fabrics or coarse mineral growths were sampled: all have at least relict igneous textures. Nevertheless, an irreducible level of chemical change, due to alteration and low grade hydrous metamorphism, is ubiquitous. This change shows up most obviously in the major element data, particularly with respect to silica and alkali content.

On the AFM plot (Fig. 13) both gabbros and basalts plot as "tholeiitic" rocks. However, when any criteria involving silica (or related CIPW norms or Niggli numbers) are used, alteration effects are apparent. For the gabbros, on the ANOR vs. Q' plot (Streckeisen and LeMaitre 1979; Fig. 11), this silica effect causes scatter. All the rocks are gabbroic by petrographic criteria; namely, relict phases are augite and labradorite. Most mafic plutonic rocks fall in the gabbro (10b) or quartz gabbro fields (10b*). Some plot in the quartz diorite (10a) and tonalite (5b) fields, due to silica enrichment. The $K_2O + Na_2O$ v. SiO_2 plot also illustrates this point (Fig. 17). Rocks that plot as tholeiites on the AFM diagram, occasionally plot as alkaline here, while the rest show a very broad scatter through the rest of the diagram. Significantly, when parameters, such as Niggli numbers, that specifically exclude silica content and its diluting effects, are used (Fig. 17), igneous "trends" emerge. This is illustrated here by the *ti* vs. *mg*, *p* vs. *mg* , and *p* vs. *ti* plots (Fig. 17). Assessing the significance of petrogenetic trends, such as these, requires trace and rare element data (in progress).

STRUCTURE

Three phases of regional deformation are recognised, in addition to an earlier, localized phase of intense deformation at the base of the Tagiulik formation. The first two phases of regional deformation only effect the Archean basement. The final deformation phase, D_3, is Proterozoic in age, and consists of the folds and fabrics found in the Hurwitz Group sediments, and related structures in the underlying Kaminak Supergroup.

Archean

In order to describe the Archean structures, the area is divided into seven domains (Fig. 18): Domain A - the central region, either side of the Ferguson River; Domain B - the area surrounding the Tavani Complex; Domain C - northwest of "Fat Lake"; Domain D - the outcrop area of the Tagiulik formation north of Mistake Bay; Domain E - area north of the Wilson River; Domain F - the Gill Lake area; Domain G - the outcrop area of the Evitaruktuk formation west of Gill Lake. The domain boundaries are chosen for convenience of description and are to that extent arbitrary. Domains E, F, and G are separated from the rest by a broad area of non-exposed bedrock, and they are separated from each other primarily because Domain E contains all the outcrop of the Hurwitz Group north of the Wilson River. Domain F contains the dominantly volcanic rocks of the Gill Lake area, whereas Domain G contains the well bedded Evitaruktuk formation. Elsewhere, the boundary between Domains A and B corresponds to one of several shear zones. Boundaries between domains have no inherent geological significance.

Domain A

D_1: Throughout this domain, D_1 is expressed by a northeast trending foliation (Fig. 19). D_1 structures are, however, best displayed within, and by the outcrop of, the black slate/green arenite association of the Akliqnaktuk formation (see GR 650077; 55K/5, and to the northeast and southwest). On a larger scale, S_1 cleavage/bedding vergence traces northeast plunging F_1 folds (Fig. 20), while on an outcrop scale, D_1 is represented by a fine slaty cleavage (S_1) and stratabound sheath folds defined by the chloritic arenite-slate interface and the graded units in the slate (Fig. 21). S_1 is axial planar to these folds (defining a surface parallel to the X-Y plane), though it is locally transecting (Fig. 20). A steep mineral lineation lies parallel to the X axis of the sheaths, within the cleavage plane. This mineral lineation on S_1 is widespread outside the slate, but rarely conspicuous. It is always steep, usually down dip, and its relationship to the F_1 large scale folds is ambiguous. F_1 folds, with an axial planar cleavage (S_1, Fig. 22a) are well displayed in the quartzo-feldspathic arenites of Association 10 (GR 720064; 55K/5). Elsewhere in domain A, D_1 is expressed as northeast trending shear zones, which show repeated movement throughout the Archean deformation history. In the Ferguson River area (GR 735905; 55K/4) local changes on facing direction in S_2 indicate the presence of small scale F_1 fold hinges ("facing" is defined as the younging direction normal to bedding (S_0) in a specified cleavage plane (S_n)). An axial planar cleavage, S_1 (Fig. 22b), is locally associated with these folds.

D_2: The dominant D_2 feature is a northeast trending synform in the "Fat Lake" area (GR 595963; 55K/4). This synform is open, upright to inclined (to the southeast) and shallowly plunging (both to the northeast and southwest). In the eastern part of Domain A D_2 is expressed by renewed or continued movement on the northeast trending shear zones initiated during D_1. This renewal of activity here often makes it very difficult to distinguish S_1 from S_2, and the transposition of S_1 in S_2 is the rule, especially close to the shear zones.

Domain B

Domain B comprises the rocks surrounding the Tavani Complex (Fig. 18). The structures in this domain are predominantly shear zones (Fig. 22 i, j, k), of roughly similar orientation to the Tavani Complex boundary; i.e. northeast trending to the west (Fig. 19, and east trending north of the complex (Fig. 19). These shear zones display evidence of a protracted movement history, commencing in D_1 and continuing through D_2. This is indicated by the presence of both prograde and retrograde assemblages in different shear zones, and by their cross-cutting relationships. S_1 fabrics consist of prograde assemblages, but S_2 can be either prograde and retrograde. Although the shear zones show a steep mineral lineation, suggesting dip-slip movement, they also show features indicating strike-slip, predominantly sinistral, movement. The northernmost of these shear zones is the décollement at the base of the Tagiulik formation.

Faulting between the décollement at the base of the Tagiulik formation and the Tavani Complex is responsible for the occurrence of a number of small enclaves of the basal Akliqnaktuk formation within the southern part of this section which is otherwise dominated by the Atungag formation. The same faulting is responsible for the repeated interleaving of tectonic units of greenschist and amphibolite facies assemblages (Fig. 23a). Some of this faulting is demonstrably extensional in both dip-slip and sinistral strike-slip modes (Fig. 23b,c).

Closer to the Tavani granite, in the margins of the Tavani Complex, mafic pillow lavas of the Atungag formation, gabbros and quartz-feldspar porphyry minor intrusions are deformed in a broad ductile shear zone. Along the margin of the Tavani granite offshoots of the main granite body and a suite of later mafic dykes occur in this shear zone, producing a mixed, locally stromatic, felsic to amphibolitic gneiss. This is the zone of migmatite identified by Heywood (1973), and although it is in part a deformed marginal agmatite to the Tavani granite, genuine metatexites have a very restricted occurrence. This zone is over a kilometre wide and can be traced for at least 100 km around the margin of the Tavani Complex, and to the south, around the eastern and southern margin of the Wallace River Complex (Eskimo Point Map Sheet NTS 55F, Davidson 1970). Kinematic indicators suggest a complex movement history, with both dip-slip and strike-slip components. A steep mineral lineation is pronounced and ubiquitous, however, other kinematic indicators (rotated boudin) imply major sinistral strike-slip movements along this zone.

A northeast trending foliation, S_2, is locally developed north of the Tavani Complex (Figs 19,22e). West of the Tavani Complex S_1 and S_2 are subparallel (Fig. 19).

Domain C

Domain C comprises the rocks surrounding the Last Lake Granitoid complex, and rocks to the west (Fig. 18). Structurally, a similar situation occurs to that developed around the Tavani Complex (Domain B), although on a smaller scale.

D_1: D_1 is expressed as a strong foliation (S_1) on the exposed northern and southern margins of the Last Lake complex. North of the contact S_1 trends east (Fig. 19), but swings into a northerly orientation in the west, at Helika Lake (GR 510145; 55K/5). On the southern margin S_1 is northwest trending away from the immediate contact zone (Fig. 19). In the higher grade rocks adjacent to the granite contacts S_1 is defined by hornblende, while in the lower grade rocks it is defined by chlorite. Pillows in the mafic volcanic rocks become progressively more strained towards the granite contact. This correlates with the increasing intensity of S_1.

Repetitions of the Atungag formation-Akliqnaktuk formation boundary (south of the Last Lake Granite complex), where S_0 and S_1 are parallel, suggest the presence of D_1 thrusts.

D_2: D_2 consists of northeast trending shear zones (Fig. 22h), generally dipping towards the northwest. A strong down-dip mineral lineation is associated with these shear zones.

A migmatite in the west of the area (GR 490000; 55K/4) is a high grade tectonic unit lying structurally above a high-grade shear zone that dips steeply west. In the mafic volcanic rocks immediately below the migmatite (in this shear zone) an L–tectonite, defined by green hornblende, is developed. Foliations in the mafic volcanic rocks are approximately parallel to the contact of the migmatite, ranging from northwest to northeast in orientation (Fig. 19). Both the paleosome and neosome components of the migmatite were deformed during D_2 deformation, which appears to have been related to emplacement of the migmatite by overthrusting from the west.

The folding of S_1 east of Helika Lake (GR 510145; 55K/5) was a response to the D_2 deformation. At least one F_2 closure can be demonstrated, picked out by the outcrop of the Akliqnaktuk/Atungag formation boundary and S_1:S_2 and S_0:S_2 vergence changes.

Domain D

Sediments of the Tagiulik formation show the most complex structures within the area (Fig. 24). **Pre-D_1:** Near the base of the Tagiulik formation (GR 933954; 55K/3) small-scale (up to 20cm), steeply plunging, sheath folds are developed (Fig. 24a-c). Refolding relationships involving at least two generations of interfering sheath folds are apparent. These folds are all cut obliquely by the S_1 and S_2 cleavages. All the lithologies involved in this zone of progressive, intense deformation are basal Tagiulik formation sediments. The underlying rocks of the Akliqnaktuk and Atungag formations are not infolded, but are separated from the Tagiulik formation by a narrow, discrete shear zone. The interpretation offered here is that the sheath folds developed above and immediately adjacent to a décollement coincident with the stratigraphic base of the Tagiulik formation. This décollement is a very early feature (pre-F_1).

D_1: F_1 fold hinges are inferred from changes in structural facing direction on S_2. Near the base of the Tagiulik formation (GR 933954; 55K/3) tight (wavelength of 40cm, amplitude of 10m) isoclinal F_1 folds are present (Fig. 24f). The folds become more open farther from the base of the succession. F_1 fold hinges are also observed locally in some banded iron formations (GR 935983; 55K/3), and are tight or isoclinal (Fig. 24e,h). F_1 in this domain is generally east-west trending and shallowly plunging. S_1 cleavage is only observed locally in some fold hinges. D_1 deformation in the Tagiulik formation is similar to the D_1 deformation described in the Evitaruktuk formation west of Gill Lake (Domain Fi, see also Park & Ralser, 1989).

The pre-D_1 and D_1 deformations are considered to be part of the same progressive deformation event related to the translation of the allochthon (a klippe) in which these metasediments are contained.

D_2: D_2, in the Tagiulik formation, is expressed as open to tight, usually northeast trending folds with an axial planar cleavage, S_2 (Fig. 24h). The D_2 deformation becomes more intense towards the east (GR 960001; 55K/3), with tighter F_2 folds and a more intense development of S_2. In the aureole of the East Lake Granite (GR 815005; 55K/3), the S_2 cleavage is usually recrystallized, unless some form of veining or compositional segregation is developed.

Figure 25 illustrates the structures developed in the Tagiulik formation north of Mistake Bay, showing the relationship between the pre-D_1, D_1, and D_2 structures.

Domain E

Domain E comprises the northeast trending structures on the southern shore and north of the

Wilson River (Figs 18,19). In this area both D_1 and D_2 are sub-parallel, and only locally S_1 can be distinguished from S_2. The eastern side of Domain E, along Whiterock Lake, is dominated by east-west trending structures (Fig. 19). Structures in this area are dominated by northeast trending shear zones up to 25 metres wide. These shear zones are separated by comparatively undeformed mafic volcanic rocks. The shear zones are often bedding-parallel to the volcanoclastic sediments separating individual mafic flow units. The shear zones often show steep, down dip stretching lineations. However, as with other shear zones in the area, they underwent a complex movement history, involving both dip-slip and strike-slip displacement.

Domain F

The structure in the Gill Lake area is dominated by east-west trending, steeply dipping ductile and brittle shear zones (Figs 19, 26). Structures related to D_1 dominate. Layer-parallel high strain zones are characterized by the development of a composite (S_{0-1}) schistosity, considered to represent transposed bedding (Fig. 22d,g). Phyllonites, mylonites and ultramylonites are developed from gabbro, pillow lavas, mafic volcanic breccia, and quartz-feldspar porphyry (Fig. 22f,g,l). Stretching and mineral lineations are widespread in S_{0-1}, and are all steep. A high strain zone at the base of the Tagiulik formation separates it from the Akliqnaktuk formation, and in this way is similar to the high strain zone, observed in Domain D at Mistake Bay. This high strain zone is defined by a strongly deformed conglomerate. All high strain zones in this domain may represent originally horizontal detachments (Fig. 27).

D_2 structures are limited, consisting of small scale folds (wavelength of approximately three metres), with a steep axial plane trending northeast (Fig. 19). In chlorite phyllonites and quartz mylonites S_2 is a crenulation cleavage, whereas in the strongly deformed, locally phyllonitic and mylonitic mafic rocks around the south of Gill Lake, S_2 forms abundant small scale shear zones trending northeast, with a uniform sinistral sense of shear, and dilational zones filled with calcite+actinolite+/-chlorite+/-quartz.

These high strain zones show evidence for repeated movement. The Gill Lake Fault (the prominent fault south of Gill Lake, GR 940212; 55K/6) shows evidence for both ductile and brittle movements. Evidence for the older ductile movements are the development of mylonite and ultramylonite (Fig. 22f) in gabbros and mafic volcanoclastic rocks, all showing a steep stretching and/or mineral lineation. The younger movement is characterized by the development of cataclastic structures with horizontal slickensides (Fig. 22m). The multiphase nature of movement on the shear zone south of Gill Lake is well illustrated by its interaction with the east Gill Lake pluton. A high strain zone up to 100 metres wide is cut by the granite contact, and narrower high strain zones, often with brittle characteristics, run into the granite, parallel to zones of augen gneiss. The granite contact shows a stepped offset of the order of tens of metres across these zones. Some of these small offsets also affect the Kaminak mafic dykes (GR 960207; 55K/6). This indicates pre-granite emplacement (Archean), post-granite/pre-dyke (Archean-early Proterozoic), and post-dyke (post-Archean) movements.

Domain G

The well bedded Evitaruktuk formation in domain G shows a well developed interference pattern between F_1 and F_2 folds. Although D_2 related structures dominate and F_1 fold closures are not observed, their presence is deduced from changes of structural facing on S_2, and changes in vergence of S_1 and S_0. S_1 is a slaty cleavage in pelites, and a fracture cleavage (spacing of 5 to 20 mm) in psammites, showing a dominant northeast to north-south trend (Fig. 19). Some pelite layers (e.g. GR 893222; 55K/6) contain an earlier slaty cleavage (S_e), crenulated by S_1 (Fig. 22c). The significance of S_e is unknown. F_1 folds are tight, recumbent, but not isoclinal, and appear to face west or southwest (Fig. 27).

D_2 in the Evitaruktuk formation is expressed by northeast trending open to tight folds (Fig. 27), with a well developed axial planar cleavage (S_2; Figs 19,3w).

D_3

Open north-east trending folding dominates the Hurwitz Group, although locally overturned folds and east-west structures are developed. Later east-west faulting locally modifies the northeast trending structures.

Whiterock Syncline

The Whiterock Syncline is a southwest trending, shallowly plunging syncline (F_3) (Fig. 28). Bedding at the margins of the syncline is steep, approximately parallel to the orientation of the shear zones in the adjacent basement (Fig. 8a). The uppermost unit (Tavani Formation) in the syncline, is tightly folded, and locally overturned in the centre.

Cleavage (S_3) is developed in the rocks of the Tavani Formation,and its expression is strongly dependent on rock type. The micaceous sandstones of the Tavani Formation carry a well developed anastomosing cleavage defined by illite-white mica seams. Detrital grain modification is minimal, but quartz grains have mica fringes. Cleavage is better developed in the rip-up clasts of red shale found in the pink feldspathic litharenite near the base of the Tavani Formation (Fig. 29d). These clasts possessed a bedding parallel mica fabric. Where the mica fabric in the clasts is sub-parallel to bedding in the sandstone, and bedding is sub-parallel to the cleavage orientation of the host rock, fresh illite-white mica growth defines the fabric. In the instances where the original illite-mica planes are folded or orientated at a high angle to the cleavage plane, a crenulation, with fresh illite-white mica growth is distinct. Deformed reduction spots in the red shale indicate maximum elongation parallel to the cleavage plane.

Cross faulting, with an east-south-east orientation has a protracted history, commencing during deposition of the Whiterock Lake member. Such growth faulting is identified by substantial thickness changes across faults (Park & Ralser, 1989).

"East Lake"

In the "East Lake" area, at the northern end of the Whiterock Syncline, east-west trending structures are developed. The northeast trending structures of the Whiterock syncline west of "East Lake" (GR 690980; 55K/4) swing round to an easterly trend at the northeastern end of "East Lake" (GR 870040; 55K/6). F_3 folds are tighter and become overturned against the faulted northern contact.

Wilson River

Two structural trends are present in the Hurwitz Group in the Wilson River area (Fig. 26a). The first is the dominant northeast trend which extends from the Wilson River (GR 840160; 55K/6) to west of Gill Lake (GR 890220; 55K/6). The second trend is defined by a comparatively tight, fault-bounded, east trending syncline along Whiterock Lake on the Wilson River (GR 890120; 55K/6). The Hurwitz Group between these two areas unconformably overlies the south Gill Lake granite, with bedding parallel to the attitude of the underlying granite contact.

The style of the northeast trending folds varies. In the west folds are open and upright (Fig. 28), whereas in the east, the F_3 folds are overturned and an axial planar cleavage (S_3) is developed (Fig. 28, 29a). The limbs of the folds within this region are sheared out. Farther east these folds become more open and upright, with a lower amplitude

The development of cleavage is strongly dependent on the distribution of clays and sericite within the various lithologies. The S_3 cleavage, with an axial planar relationship to the large scale folds, is restricted to the sandstones, siltstones and shales of the sub-Whiterock member (Fig. 29b,c), and the sericite orthoquartzites within the Whiterock Lake member. The development of the cleavage involves the recrystallization of pre-existing illite or sericite, either a presumed detrital component, diagenetic illite, or derived from the breakdown of detrital feldspar. Some pressure solution is evident in slightly modified detrital grain shapes, and mica beards are a common feature on quartz grains. Quartz-mica shape fabrics are evident in the sericitic orthoquartzite. A strong L_3 intersection lineation (S_1 on S_0) is developed on many beds (Fig. 29e); where this lineation is parallel to ripples, the amplitude:wavelength ratio of the ripples is increased (Fig. 29f).

A bedding parallel lineation (L_S) is evident in many localities, both in the sericitic orthoquartzite and the pure orthoquartzites, it is also evident in the siltstones and shales of the sub-Whiterock member (Fig. 29b). Its geometric relationship to the folds is consistent, in that it is only seen on beds that dip steeper than 40 degrees, and is always orthogonal to the fold axes. Both the lineation (L_S) and the quartz-mica shape fabric are interpreted here as resulting from layer-parallel slip during folding.

A number of east-west shear zones cut the orthoquartzites; primary bedding and sedimentary structures are obscured near these shear zones. The orthoquartzites possess a well developed mortar texture. Complete recrystallization and abundant quartz veins testifies to large scale mass redistribution.

Last Lake belt

North and south of Last Lake a northeast trending, discontinuous belt of orthoquartzite is traced for over 15 km. North of Last Lake the belt bifurcates, enclosing an area of very distinctive metavolcanic rocks ("Happoytiyik member" of Bell, 1968, Heywood, 1973, Ridler, 1974; Associations 7,8,9 of this study). The western contact of the orthoquartzite is an unconformity (GR 556006; 55K/4, 640097; 55K/5, though in the south it is modified by a number of small, steep, eastward dipping minor faults (Fig. 28). Near the inferred eastern contact the orthoquartzite carries a distinct platy fabric (S_3), containing a down dip lineation (L_S), that dips steeply west (GR 580980; 55K/4). A similar fabric is very locally developed in the adjacent greenstones and indicates the presence of a steep, westward dipping normal fault. The nature of these two contacts give the Last Lake belt the overall form of a half-graben (Fig. 28).

In the near complete exposed section south of Last Lake a large scale fold pair (western syncline, eastern anticline), modified by faults, is present. These open, upright folds (F_3), trend northeast, parallel to the bounding eastern fault, and parallel to a number of faults developed within the belt, including the minor faults along the western margin. The major folds plunge gently to the southwest, though there is a substantial steepening of plunge across a west-north-west trending fault (GR 570984; 55K/4; Fig. 28). This fault is marked by a major topographic feature within both the orthoquartzite and the basement to the west. It cannot be traced farther than the eastern bounding fault.

The northern end of this belt is poorly defined, lying somewhere in the bog covered ground south of Maze Lake. The southern end is marked by a major east trending shear zone. This shear zone, and several associated splays are well exposed where they cut and deform a large quartz-feldspar porphyry-microgranite (GR 530970; 55K/4). Though a pronounced vertical mineral lineation is present in phyllonites developed here, other kinematic indicators, including drag-folds with a strongly developed crenulation cleavage, rotated boudins and slickensides, indicate predominantly sinistral strike-slip movement. Isolated orthoquartzite exposures at the southwest corner of the lake show bedding rotated into parallelism with this shear zone.

METAMORPHISM

Contact metamorphism

Hornfels is developed in greywackes around most of the granite plutons. In the turbidites of the Tagiulik formation, around the East Lake granite, contact metamorphism has obscured most signs of earlier cleavage by the recrystallization of fine-grained chlorite, leaving apparently pristine rocks. Scattered epidote clots are the only evidence of this metamorphism. This epidote growth becomes more prominent towards the granite (Fig. 30). Approximately 500 metres from the granite contact, diffuse, multigrain clots of epidote occur in a matrix that retains clastic textures. More coherent porphyroblasts occur nearer the contact, commonly taking the form of pure epidote pods (up to 2 cm diameter, Fig. 30). Through the same zone carbonate-bearing magnetite-chert layers in the sequence are progressively replaced by epidote. In particular layers replacement by epidote is total. Rare examples of quartz-epidote-calcite veins parallel to S_2 are recrystallized, with the appearance of stilpnomelane where these veins cut magnetite-rich layers.

Turbidites of the Tagiulik formation around the south Gill Lake granite are more quartzo-feldspathic than those in the klippe between "East Lake" and Mistake Bay. The ironstone components show similar changes to those seen at "East Lake", but the pelites and semipelites record the appearance of muscovite and epidote-actinolite some 200 metres from the contact, clinozoisite and zoisite around 50 metres, and microcline in the last 10 metres of the contact zone. Epidote clots, like those at "East

Lake" are also present. The widths of mineral zones are difficult to determine because the aureole is bounded, and modified, by later faults.

Sequential vein-fills are found both within the south Gill Lake granite and its envelope, including the major shear zone developed in deformed mafic rocks south of Gill Lake; earlier veins are deformed and cross-cut by later veins. The early fills include cummingtonite-tremolite-carbonate, followed by tremolite-zoisite and tremolite-clinozoisite. The latest vein-fills are epidote-chlorite-carbonate and epidote-chlorite-quartz. These veins are interpreted as the products of hydrothermal activity during cooling of the south Gill Lake pluton.

Contact metamorphic effects are less obviously zoned around the other granitoids, but they include the development of biotite-sillimanite in the contact zone, and in xenoliths within, the north Gill Lake and "East Lake" plutons.

Regional metamorphism

The regional metamorphism is best described in terms of the seven structural domains (Fig. 18).

Domain A: Sub-greenschist facies rocks occur in the northeastern part of Domain A (GR 720090; 55K/5) with assemblages of vesuvianite-albite-stilpnomelane-chlorite present in vesicular mafic tuffs that form part of Association 8. In the same lithology, these assemblages, in amygdales, are replaced sequentially by those carrying actinolite, and then actinolite and biotite, with vesuvianite being replaced by epidote, to the southwest towards Last Lake. Metamorphic grade increases to the north, south and west.

Domain B: Metamorphic grade increases towards the Tavani Complex. A rapid gradation is seen in mafic volcanic rocks, from epidote-chlorite assemblages, through actinolite and biotite, to hornblende-bearing amphibolites. A similar development is evident in carbonate facies ironstone, with grunerite eventually replacing chlorite-siderite-quartz at higher grades. Steps in this gradation coincide with tectonic breaks, and lower and higher grade enclaves survive within shear zones. At the highest grades close to the Tavani granite, metatexites are developed on a small scale, involving the development of leucogranite neosomes in amphibolite. From north to south across Mistake Bay (GR 930920; 55K/3) the increase in grade from greenschist to hornblende-bearing amphibolite takes place in less than one kilometre. Lower grade enclaves are present in this section. This is accommodated, in part, by normal faults with a low angle to both bedding or layering, and, in part, by the D_2 shear zones.

Shear zone assemblages are both prograde and retrograde. The prograde assemblages consist of the same paragenesis as the country rock only finer grained and more strongly isotopic, whereas the retrograde zones are marked by the development of talc-serpentine-carbonate schists from maficultramafic precursors, chlorite phyllonites from mafic-intermediate protoliths, and pyrophyllite-quartz phyllonite from granite or related felsic rocks.

Domain C: In domain C, to the west, metamorphic grade increases through upper greenschist (chlorite-green amphibole) to a narrow zone (less than 100m) of upper amphibolite facies metamorphism (biotite-black amphibole). Structurally overlying the volcanic rocks is a migmatite. Metatexites, derived by *in situ* partial melting are well exposed in a number of localities (GR 501005; 55K/4). These outcrops show the intermixing of a dark (amphibole rich) paleosome and light (plagioclase rich) neosome. The migmatite is composed primarily of albitic-plagioclase and green amphibole; the relative proportions of each varying, depending on which unit the specimen is from. Quartz comprises only a minor component, being absent in many specimens. Elsewhere in this body the lichen cover only permits recognition of granites or gabbros.

The eastern margin of the migmatite is strongly deformed, with the local occurrence of a quartz-feldspar mylonite. The westward dipping foliation, in both the migmatite and the surrounding mafic volcanic rocks, and the strong down dip lineation indicate that the migmatite was thrust in from the west. The relationship of the migmatite to the rocks in the Tavani area is unknown, but relics of pillow shapes and breccia suggest it may represent the high grade equivalent of the mafic volcanic rocks of the Atungag and Akliqnaktuk formations within the greenstone belt.

Domain D: The Tagiulik formation sediments, comprising Domain D, are metamorphosed in low to middle greenschist facies.

Domain E: This domain is metamorphosed under low to middle greenschist facies conditions, dominated by chlorite and/or epidote assemblages. On the Wilson River a quartz-talc-calcite-tremolite-magnesite assemblage, from which diopside is conspicuously absent, indicates higher temperature greenschist facies, than further south.

Domains F and G: In the Gill Lake area metamorphism occurred under middle to upper greenschist facies conditions. Green amphibole (actinolitic) appears with chlorite in pillow lavas at the west end of this lake (GR 900260; 55K/6), and clinozoisite is a common component in the same assemblage elsewhere in this area. In pelitic and semipelitic rocks chlorite is accompanied by white mica (?muscovite) and epidote.

Relics of higher grade assemblages are found in the shear zones around Gill Lake, usually in chlorite phyllonite derived from metagabbro or metadiabase. Such relics (porphyroclasts) include ophitic-textured augite-plagioclase relics, partly overgrown by hornblende-plagioclase, or by hornblende-zoisite assemblages. Actinolite-clinozoisite-chlorite assemblages overgrow these amphibolite facies relics, and are in turn replaced by chlorite or chlorite-epidote felts.

Metamorphism of Hurwitz Group rocks

Metamorphism of the Hurwitz Group rocks is up to sub-greenschist facies. This is indicated by the survival of diagenetic illite or its recrystallization as illite in the quartzites and arenites, and the presence of reduction spots in red shale. The gabbros within the Hurwitz Group contain assemblages of epidote-chlorite-actinolite, but these are not indicative of the overall metamorphic environment.

MINERALIZATION

Mineral occurrences, and suitable hosts show both stratigraphic and tectonic controls (Table 1).

1. Stratiform-types related to, or contained within discrete associations.

Magnetite - chert banded ironstones. This lithology is a component of the complete Bouma cycles developed in both sub-facies of the Tagiulik formation, both in the main outcrop northwest and west of Mistake Bay and around Gill Lake. They are more abundantly preserved in the pelite-dominated cycles, where channeling and slumping are less common. Some developments (e.g. GR 900990; 55K/3) reach a thickness of 30 metres. Magnetite content may reach 50%, though it is usually in the range 20 - 30%, and varies considerable within a single layer. Modal proportions of minor calcite vary, but influence the metamorphic assemblages, especially the development of epidote, seen in the south Gill Lake and "East Lake" aureoles. Disseminated pyrite and pyrite-quartz veinlets are sporadically developed around "East Lake", and hematization is apparent in this area, close to the sub-Hurwitz unconformity.

Carbonate banded ironstone. Banded siderite-bearing cherts occur at the base of the Tagiulik formation and sporadically higher in the sequence. In the Akliqnaktuk formation they form an integral part of the basal Association 2. At low metamorphic grade the rock consists of pure chert lamellae interbanded with siderite, or siderite-magnetite bearing chert layers. Chlorite and calcite may also be present. At higher grade (e.g. near Mistake Bay, GR 955935; 55K/3) epidote-chlorite and quartz-grunerite assemblages replace siderite. Extensive developments of this ironstone are seen in the Akliqnaktuk formation south of the Ferguson River, and in both the Akliqnaktuk formation and the basal Tagiulik formation near Mistake Bay (GR 950935; 55K/3, 930953; 55K/3).

Pelitic banded ironstone. Banded chlorite pelite with layers rich in pyrite, occurs at the base of the Tagiulik formation near Mistake Bay (GR 930953; 55K/3).

Cherts, including sulphidic chert. Pyritic cherts, finely interlayered with sulphidic pelite form part of the basal facies of the Akliqnaktuk formation in a number of places (GR 930030; 55K/6, 560968;

TABLE - 1

MINERALIZATION AND HOSTS

TYPE	*HOST*	*COMMENT*
STRATIFORM / LITHOFACIES		
Magnetite-chert BIF	Tagiulik fm	Some sulphide veins
Carbonate BIF	Basal Tagiulik fm lower Akliqnaktuk fm	
Pelite BIF	Basal Tagiulik fm	Pyrite dominated
Sulphidic chert	Basal Akliqnaktuk fm	Dominated by pyrite, some magnetite
Siliceous dolomite	Akliqnaktuk fm	disseminated Fe sulphide
STRATABOUND		
Cu-Fe sulphides (massive and disseminated)	Atungag fm	Amphibolite facies, associated with major shear zone, py-po-cpy
Carbonate-breccia (stockworks?)	Atungag fm	Fe-sulphides or magnetite
EPIGENETIC		
Au- qz veins	Fat Lake gabbro	syntectonic (early), no other gabbros of this suite carry such veins
Pb-Cu-Fe sulphides	Veins, S. Gill granite	hydrothermal system, c. 1,950 Ma, model Pb age.
Pb-Fe Sulphides	Veins Akliqnaktuk Fm	GR 528997, 55K4

55K/4, 795920; 55K/3, 512149; 55K/5). In some locations (e.g. GR 512149; 55K/5) these cherts are also tourmaline bearing. Strain is usually concentrated in these layers, producing quartz-grain fabrics showing varying degrees of mylonitization. Recrystallization makes distinction between primary features and and those produced during, or modified by, deformation difficult. Sulphide and tourmaline may imply the presence of exhalites.

Siliceous dolomite. The one occurrence of siliceous dolomite, recrystallized as magnesite-quartz-talc-tremolite schist, comprises a distinct association in the Akliqnaktuk formation on the Wilson River (Association 5, GR 828168; 55K/6). Though gossans are developed, only disseminated pyrite is recorded from this rock. This is another candidate for an exhalite.

2. Stratabound mineralization

Two types of disseminated to massive stratabound mineralization have been recorded. They are both associated with the pillow lavas of the Atungag and Akliqnaktuk formations and minor intrusions of the Kiksautituk suite. Carbonate (calcite) cemented breccia bodies of highly variable size (at outcrop - < 1m to c. 20 m across) occur among massive pillow lavas throughout the area, and most show gossan development, and carry pyrite. One example north of the Ferguson River (GR 729913; 55K/4) carries large (up to 5 mm) octahedra of magnetite. Possible deformed examples of these carbonate breccias are also seen around west Gill Lake. They appear to be pre-tectonic, syn-genetic components of the pillow lavas, and may represent stockworks beneath seafloor hydrothermal systems.

A belt of mineralization occurs in deformed Atungag formation and deformed intrusions in the western margin of the Tavani complex. Mineral showings occur from Mistake Bay (GR 930900; 55K/3)to well south of the Ferguson River (GR 767867; 55K/3 and to the southwest) on the Eskimo Point map sheet (Davidson 1970). Mineralization takes the form of disseminated to massive sulphide developments, dominated by pyrite, with minor pyrrhotite, chalcopyrite and bornite (with malachite in gossans). Host rocks include deformed pillow lavas, gabbros of the Kiksautituk suite and quartz-diorite, granodiorite and granite related to the Tavani plutons.

3. Epigenetic veins.

Quartz and quartz+carbonate+/- chlorite veins of several ages (cross-cutting relationships, and relationship to structural elements) are found throughout the area. Those listed here contain mineralization and can be placed in the deformation sequence with considerable confidence. This listing is not exhaustive.

Au-quartz +/- carbonate veins. These are developed in the "Fat Lake" quartz gabbro-diorite (GR 550875; 55K/4), and are deformed by D_1(?) or D_2 movements along the northeast trending shear zones that bound this body (Miller 1989). They were mined briefly between 1988 and 1989 (Borealis Mining Co). None of the other gabbro-quartz gabbro-diorite bodies of the Fat Lake suite, either at "Fat Lake" or elsewhere in the Tavani area, carry these veins.

Quartz + magnetite +/- chrysotile veins. These are scattered across the outcrop of the Tavani complex, particularly, but not exclusively, near the serpentinized mafic bodies south of the Ferguson River (GR 790820; 55K/3). They also cross-cut the disseminated pyrite-pyrrhotite-chalcopyrite mineralization in the margin of the Tavani complex (e.g. GR 767867; 55K/3). These veins do not appear to be deformed, and the chrysotile assemblage and its association with serpentinization suggest a relationship with the cooling of the Tavani complex.

Pb-Cu-Fe sulphides in quartz veins. Galena+chalcopyrite+/-covellite+/-tetrahedrite occurs in quartz veins cutting the south Gill Lake pluton. These north trending veins cross-cut all the vein generations carrying the hydrothermal retrogression products related to pluton cooling.

GEOCHRONOLOGY

Geochronological studies have been carried out at the Geological Survey of Canada, U-Pb zircon preliminary data provided by J. C. Roddick, model Pb data was supplied by A. R. Miller.

Gill Lake granitoids

Zircon separates have been obtained from all three granitoids at Gill Lake. A sphene fraction was analyzed from the South Gill pluton. All analyzed phases are Pb poor, indicating a U-depleted source (U ≈ 75-100 ppm). Zircon abrasion techniques have so far failed to reveal the presence of older cores.

Zircon ages from the granitoids support the relative ages deduced from field relationships. The north Gill Lake granite-granodiorite (GR 950240; 55K/6) yielded an age of 2,677 +/- 2 Ma. One sample of the east Gill Lake granite (GR 970210; 55K/6) yielded an age of 2,659+/- 4.6 Ma, while a sphene sample from the south Gill Lake granite-granodiorite (GR 925205; 55K/6) falls close to 2660 Ma (error undetermined). Zircons from the South Gill Lake granite-granodiorite (GR 925205; 55K/6) have yielded a poorly constrained discordant age in the range 2,660 - 2,640 Ma.

Quartz-feldspar porphyry

A discordant, deformed quartz-feldspar porphyry sheet was sampled from Gill Lake (GR 965215; 55K/6). Field relations suggest that this porphyry pre-dates the north Gill Lake granite-granodiorite, and relationships elsewhere indicate that these sheets cut only Atungag and the mafic lower Akliqnaktuk formations, implying that they represent sub-volcanic intrusions contemporary with the felsic members of the upper Akliqnaktuk formation. A preliminary, poorly constrained, discordant age somewhat greater than 2,675 Ma has been obtained.

Galena from veins

As part of an ongoing study on gold mineralization in the District of Keewatin, Miller (1989) has sampled galena from a number of veins in the Tavani map-area. Model Pb ages on galena have been obtained from a sphalerite-chalcopyrite bearing auriferous quartz vein within the Fat Lake quartz-gabbro at "Fat Lake", from an east trending late quartz vein at "Fat Lake" (GR , and from a chalcopyrite-pyrite-covellite-galena-tetrahedrite bearing quartz vein cutting the south Gill Lake granite. The auriferous veins within the Fat Lake quartz gabbro are demonstrably pre-D_2 on structural criteria, and therefore Archean, while the east vein, though demonstrably younger, cannot be better constrained structurally. Using the Abitibi lead model these veins yield ages of 2,652 Ma and 1,975 Ma respectively: the Western Superior lead model gives 2,694.5 Ma and 2,014 Ma for the same material Miller & Thorpe, pers. comm.).

The sample from the vein cutting the south Gill Lake granite (GR 925195; 55K/6) yielded ages of 1,892 Ma (Abitibi model) and 1,934 Ma (Western Superior model). This vein cuts all the vein sets that carry the high-temperature mineral assemblages related to the cooling of the pluton, though its relationship to the sub-Hurwitz unconformity cannot be demonstrated.

Gabbros from the Hurwitz Group

Gabbros outcropping between the Whiterock Lake member of the Kinga Formation and the Tavani Formation in the Hurwitz Group yield an age between 2039 Ma and 2094 Ma (Patterson & Heaman, 1990). These are upper intercept discordant U-Pb baddeleyite ages.

DISCUSSION

Timing of emplacement of felsic intrusive rocks

Two groups of plutons, syn-tectonic and post-tectonic are recognised on the basis of their relationship to D_2 structural elements. The post-tectonic group, emplaced late in, or after D_2 deformation, includes the east Gill Lake, south Gill Lake and "East Lake " plutons, and the monzonite-granodiorite north of Last Lake (GR 540140; 55K/5). These granitoids do not have foliated margins, and have sharp contacts (east Gill Lake excepted). S_2 cleavage is either completely obscured, or recrystallized in their aureoles (e.g. East Lake pluton), or D_2 related dilational shears are filled with vein assemblages related to hydrothermal activity associated with pluton cooling (e.g. south Gill Lake pluton).

Syn-tectonic granitoids have varied relationships to D_1 and D_2 structural elements. All are foliated to greater or lesser degrees, especially along their margins, and have diverse injection and deformation relationships with their country rock. The north Gill Lake granitoid has an extensive injection migmatite developed along its exposed southern margin. Originally an agmatite, with blocks and screens of country rock, it is thoroughly deformed and foliated as schollen migmatite (Mehnert 1968) carrying the S_1 fabric, itself folded by F_2 folds. This implies that this granitoid was emplaced prior to, or during D_1.

The injection migmatites and sheets along the margins of the Last Lake complex consist of the grey leucogranite and pink granite that intrude all the other components of the intrusion. On the southern margin they cross-cut the S_1 fabric in the marginal amphibolites, but are in turn cross-cut and deformed by narrow shear zones parallel to this schistosity. Locally, these veins become mylonitic. On the northern contact, weakly foliated apophyses of granite lie parallel to the strong S_1 foliation. This implies emplacement during D_1.

The shape of the Tavani Complex is a D_2 structure. Apophyses of the granite are deformed in D_2 shear zones, but the relationship to D_1 is ambiguous. South of the Last Lake granite apophyses are discordant to the S_1 foliation. These apophyses are deformed in narrow shear zones parallel to S_1, which are subsequently cut by D_2 shear zones. North of the Last Lake granite, apophyses of granite are concordant with the strong S_1 foliation. These apophyses are only weakly foliated, whereas at the southern contact deformed granite may be mylonitic.

Quartz-feldspar porphyries occur throughout the Atungag and Akliqnaktuk formations, particularly in the Gill Lake area. These porphyries are extensively deformed during D_1. Clasts of a similar lithology occur in the conglomerates at the base of the Evitaruktuk formation in the Tagiulik formation suggests that they were sub-volcanic intrusions related to the felsic volcanism in the Akliqnaktuk formation.

CONCLUSIONS

The Archean supracrustal rocks of the Rankin-Ennadai greenstone belt belong to the Kaminak Supergroup. This is subdivided into the Kasigialik group and Tagiulik formation; the Kasigialik group is further subdivided into a lower Atungag formation, comprised predominantly of mafic pillow lavas, a middle Akliqnaktuk formation, comprised of mafic pillow lavas and breccias, arenites, conglomerates, and felsic volcanic and epiclastic deposits, and an upper Evitaruktuk formation, comprised of quartz-intermediate turbidites. The Tagiulik formation is comprised of quartz-poor turbidites with banded ironstones. The Atungag formation, ramified by gabbros and diabase, appears to be the local depositional basement. Above this basement the lower part of the Akliqnaktuk formation represents detritus from growing, submarine mafic volcanic edifices. Both distal and proximal facies are present, with Associations 7 and 8 possibly representing a shoaling edifice. Other sources of detritus are evident (e.g. granite boulder conglomerate, Association 4), but their significance is presently unknown. The mafic volcanic edifices are capped by felsic volcanic and epiclastic rocks. The Evitaruktuk formation represents reworking of the felsic cap and burial of the volcanic complex (*cf.* Ojakangas, 1985). The Tagiulik formation represent reworking of a mafic to intermediate volcanic source, but its depositional basement is unknown, and its relations to the rocks of the Kasigialik group is also unknown.

The Kaminak Supergroup is overlain by the early Proterozoic Hurwitz Group, a quartz rich succession of littoral marine and fluviatile deposits (Aspler et al., 1989; Aspler & Bursey, 1990).

Two major phases of Archean deformation are recognised. The first of these begins with the emplacement of a nappe, from the north or northeast, containing the Tagiulik formation, on to the rocks of the Kasigialik group (Figs 31, 32). Deformation associated with this was initially located close to the décollement surface, but became more widespread, affecting both the nappe and its basement as the D_1 deformation. The north Gill Lake granite was emplaced during this time, suggesting that the age of D_1 was 2,677 +/- 2 Ma. The second phase of deformation involved widespread development of NE-SW trending shear zones, and open, upright folds. At this time the high grade Tavani complex was emplaced as a domal structure, cored by granite (Fig. 32). The western migmatite complex was also emplaced at this time, as were several late tectonic granites. The age of the latest of these granites (south Gill Lake granite), 2,660-2,640 Ma., effectively marks the end of Archean deformation in this area.

D_3 deformation affects the rocks of the Hurwitz Group. Structures in these rocks reflect a cover response to reactivation of Archean structures in the basement. The overall architecture of the reactivated faults and shear zones defines a series of half-grabens south of the Wilson River (Fig. 33), presumably related to north-south compression and complementary east-west extension. Similarly, north-south compression can account for the the structures north of the Wilson River; their trends being deflected by the Gill Lake granitoids

The quartz-feldspar porphyries appear to be sub-volcanic intrusions related to the felsic rocks of the upper Akliqnaktuk formation, with a minimum age of 2,675 Ma. The implication of this date is that all the Archean evolution of this part of the greenstone belt, from deposition of the upper Akliqnaktuk formation to the emplacement of the late-tectonic granites, took place within 20 to 30 million years.

These dates for felsic sub-volcanic intrusions accord with with those obtained for similar rocks within the Rankin-Ennadai greenstone belt in northern Saskatchewan and in the Kaminak Lake area (Chiarenzelli and Macdonald, 1986; Thorpe and Mortensen, 1987). In the Kaminak Lake area the only current constraint on the age of tectonism is a minimum provided by a Sm-Nd isotope age of 2,540+/-76 Ma for a post-tectonic alkaline complex (Cavell et al. 1987).

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APPENDIX 1 - Origin of New Names Used in this Report

In choosing place names to use in the naming of newly defined groups and formations, two facts influenced the present author's policy. Firstly, English language place names are few and widely scattered on the Tavani map sheet, and often consist of mangled versions of traditional Inuktituk words; and secondly, a Land Identification Project is currently underway in the District of Keewatin, prior to the preparation of a land rights claim by the Tungavik Federation of Nunavut. One aim of the Land Identification Project is to produce a new map, collating Inuktituk place names, thus rendering the few English language names obsolete. The present author's policy on choosing names, was from the start, to use Inuktituk names, where they were available. The invaluable expertise and assistance of Tongola Sandy, the Regional Co-ordinator of the Land Identification Project at the Tungavik Federation of Nunavut office in Rankin Inlet, are gratefully acknowledged.

Akliqnaktuk, Evitaruktuk, Kasigfiulik,Tagiulik are all place names on the Tavani map sheet, and approximate to the areas where each unit is best defined. *Akliqnaktuk* is the "Ferguson River", *Evitaruktuk* is the "Wilson River", *Kasigialik* is "Last Lake", and *Tagiulik* is "Mistake Bay". *Atungag* is not a place name; it is the word for "a traditional boot sole", used here for the basal formation.

One other Inuktituk name is used in this report, namely *Kiksautituk* , as in the "Kiksautituk suite" of gabbro and related igneous rocks intruded into the Atungag and Akliqnaktuk formations. The type locality for this suite of rocks is the northwestern arm of Gill Lake, and the Inuktituk name for this lake is *Kiksautituk*.

APPENDIX II - Major element analyses of felsic and mafic rocks from the Tavani map area.

Major element analyses were obtained from borosilicate glass beads by X-ray fluorescence on a Phillips PW1410 instrument in the Department of Geology, University of New Brunswick.

4 4
MAJOR ELEMENT GEOCHEMISTRY & CIPW NORM
GRANITES

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	total	Q	C	or	ab	an	Di	Hy	il	hm	tn	ru	ap	total
88txp087a/1	65.99	0.40	15.19	3.33	0.05	1.96	2.49	4.68	3.16	0.18	97. 43	18.94	0.98	18.67	39.60	11.12	0.52	4.88	0.11	3.33	0.04	0.33	0.42	97.43
88txp087a/2	62.73	0.38	14.24	3.22	0.04	1.84	2.43	4.39	3.01	0.17	92. 45	18.35		17.79	37.15	10.27		4.58	0.09	3.22	0.48	0.14	0.40	92.45
88txp087b/1	68.72	0.38	14.89	3.28	0.05	1.88	2.48	4.37	3.23	0.16	99. 44	23.27	0.08	19.09	36.98	11.26		4.68	0.11	3.28			0.37	99.12
88txp087b/2	66.18	0.38	14.91	3.12	0.05	1.86	2.47	4.39	3.18	0.15	96. 69	20.83	0.12	18.79	37.15	11.27		4.63	0.11	3.12			0.35	96.37
88txp087c/1	67.86	0.40	14.75	3.12	0.06	1.89	2.22	4.89	2.77	0.14	98.10	21.63	0.01	16.37	41.38	10.10		4.71	0.13	3.12			0.33	97.77
88txp087c/2	65.43	0.40	14.39	3.10	0.05	1.91	2.22	4.73	2.63	0.17	95. 03	20.73	0.14	15.54	40.02	9.90		4.76	0.11	3.10			0.40	94.69
88txp087e/1	68.10	0.40	14.80	3.22	0.05	2.00	2.12	4.89	3.09	0.17	98. 84	20.80		18.26	41.38	9.32		4.98	0.11	3.22	0.06	0.32	0.40	98.84
88txp087e/2	67.44	0.39	14.57	3.06	0.04	1.97	2.07	4.80	3.09	0.15	97.58	20.79		18.26	40.62	9.09		4.91	0.09	3.06	0.14	0.29	0.35	97.58
88txp087f/1	66.37	0.38	14.27	3.04	0.05	1.91	2.24	4.66	2.93	0.17	96.02	21.02		17.31	39.43	9.37		4.76	0.11	3.04	0.44	0.14	0.40	96.02
88txp087f/2	66.45	0.39	14.41	3.10	0.05	1.94	2.26	4.52	2.93	0.18	96.23	21.72	0.13	17.31	38.25	10.04		4.83	0.11	3.10			0.42	95.90
88txp123a	68.52	0.38	15.08	3.02	0.05	1.86	2.39	4.70	3.06	0.14	99.20	21.97	0.03	18.08	39.77	10.94		4.63	0.11	3.02			0.33	98.88
88txp123b	68.79	0.36	15.06	3.10	0.04	1.78	2.84	4.80	2.75	0.15	99.67	22.39		16.25	40.62	11.43	0.45	4.22	0.09	3.10	0.77		0.35	99.67
88txp123c	68.48	0.37	14.97	3.01	0.05	1.75	2.73	4.75	2.87	0.14	99.12	22.14		16.96	40.19	11.06	0.37	4.19	0.11	3.01	0.77		0.33	99.12
88txp123c/1	68.90	0.37	14.97	2.94	0.05	1.74	2.74	4.76	2.86	0.14	99.47	22.55		16.90	40.28	11.04	0.42	4.14	0.11	2.94	0.77		0.33	99.47
88txp123c/2	68.06	0.36	14.96	3.07	0.05	1.76	2.71	4.73	2.87	0.13	98.70	21.82		16.96	40.02	11.12	0.32	4.23	0.11	3.07	0.75		0.30	98.70
88txr100a/1	71.73	0.30	13.70	2.32	0.04	1.16	1.46	4.72	3.32	0.07	98.82	26.99	0.12	19.62	39.94	6.40		2.89	0.09	2.32	0.27	0.14	0.16	98.82
88txr100a/2	72.18	0.27	14.18	2.15	0.04	0.99	1.62	4.58	3.27	0.06	99.34	28.25	0.31	19.32	38.75	7.64		2.47	0.09	2.15			0.14	99.12
88txr100a/3	71.23	0.30	13.66	2.29	0.03	1.19	1.48	4.87	3.32	0.07	98.44	25.72		19.62	41.21	5.62	0.27	2.84	0.06	2.29	0.65		0.16	98.44
88txr100b/1	68.66	0.36	13.96	2.76	0.04	1.71	1.02	4.29	3.18	0.10	96.08	27.08	1.85	18.79	36.30	4.41		4.26	0.09	2.76			0.23	95.77
88txr100b/1(2)	72.57	0.32	13.43	2.38	0.05	1.11	1.75	4.57	3.02	0.09	99.29	29.47		17.85	38.67	7.22		2.76	0.11	2.38	0.62	0.01	0.21	99.29
88txr100b/3	72.01	0.32	14.16	2.41	0.04	1.18	1.75	4.64	3.14	0.08	99.73	27.72	0.14	18.56	39.26	8.16		2.94	0.09	2.41			0.19	99.46
88txr100c/1	71.13	0.35	14.79	2.83	0.04	1.44	1.70	4.10	3.55	0.09	100.02	28.16	1.33	20.98	34.69	7.85		3.59	0.09	2.83			0.21	99.72
88txr100c/2	71.17	0.36	14.63	2.70	0.04	1.39	1.73	4.21	3.44	0.09	99.76	27.99	1.05	20.33	35.62	7.99		3.46	0.09	2.70			0.21	99.45
88txr100d/1	71.66	0.37	15.18	2.58	0.03	1.67	1.17	4.54	3.44	0.09	100.73	27.34	2.08	20.33	38.42	5.22		4.16	0.06	2.58			0.21	100.39
88txr100d/2	71.69	0.36	14.30	2.55	0.03	1.61	1.15	4.39	3.30	0.08	99.46	28.89	1.61	19.50	37.15	5.18		4.01	0.06	2.55			0.19	99.13
	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	total	Q	C	or	ab	an	Di	Hy	il	hm	tn	ru	ap	total
88txr100f/1	70.66	0.34	14.27	2.42	0.04	1.43	1.42	4.44	3.76	0.07	98.86	25.41	0.47	22.22	37.65	6.59		3.56	0.09	2.42			0.16	98.57
88txr100f/2	70.79	0.36	14.34	2.62	0.03	1.51	1.43	4.32	3.90	0.09	99.39	25.67	0.63	23.05	36.55	6.51		3.76	0.06	2.62			0.21	99.06
88txr104a/1	70.27	0.39	14.20	2.53	0.05	1.83	1.22	4.51	3.62	0.10	98.72	25.12	0.89	21.39	38.16	5.40		4.56	0.11	2.53			0.23	98.39
88txr104a/2	69.81	0.41	14.23	2.69	0.04	1.91	1.22	4.50	3.63	0.10	98.54	24.56	0.92	21.45	38.08	5.40		4.76	0.09	2.69			0.23	98.18

88txr104b	71.02	0.32	14.14	2.04	0.04	1.66	1.07	4.71	3.81	0.08	98.89	24.50	0.52	22.52	39.85	4.79		4.13	0.09	2.04		0.19	98.62
88txr104c	70.76	0.34	15.20	2.39	0.04	1.63	1.31	4.43	4.20	0.08	100.38	23.91	1.18	24.82	37.48	5.98		4.06	0.09	2.39		0.19	100.09

PORPHYRIES & MICROGRANITES

88txp092	71.77	0.27	15.68	1.67	0.04	0.89	1.88	5.87	2.10	0.08	100.25	24.46	0.53	12.41	49.67	8.80		2.22	0.09	1.67		0.19	100.03
88txp094	70.15	0.30	15.42	2.44	0.04	1.24	1.85	6.26	1.32	0.07	99. 09	23.07	0.50	7.80	52.97	8.72		3.09	0.09	2.44		0.16	98.84
88txp098/1	70.36	0.30	15.32	2.58	0.04	1.19	2.06	6.18	1.94	0.08	100.05	21.32		11.46	52.29	8.34	0.36	2.79	0.09	2.58	0.63	0.19	100.05
88txr118/1	67.10	0.32	15.30	2.61	0.05	1.62	3.83	6.22	1.63	0.12	98.80	16.38		9.63	52.63	9.02	6.44	1.05	0.11	2.61	0.65	0.28	98.80
88txr118/2	67.04	0.32	14.90	2.63	0.05	1.61	3.88	6.10	1.62	0.13	98.28	17.15		9.57	51.62	8.50	6.99	0.77	0.11	2.63	0.65	0.30	98.28

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88txp088e	47.85	1.50	13.41	17.83	0.23	6.23	9.09	2.47	0.44	0.12	99.17	7.71		2.60	20.90	24.21	12.28	9.82	0.49	17.83	3.05	0.28	99.17
88txp099/1	52.34	1.35	12.68	14.21	0.20	4.94	10.0	2.59	0.59	0.12	99.02	12.52		3.49	21.92	21.24	18.43	3.76	0.43	14.21	2.76	0.28	99.02
88txp100/1	48.87	1.52	14.10	16.26	0.22	4.99	9.47	2.38	1.47	0.12	99.40	6.92		8.69	20.14	23.46	14.25	5.82	0.47	16.26	3.12	0.28	99.40
88txr221/1	51.99	0.87	14.71	11.16	0.17	7.47	8.20	4.63	0.13	0.08	99.41	0.65		0.77	39.18	18.98	14.65	11.81	0.36	11.16	1.67	0.19	99.41
88txr221/2	52.02	0.86	14.87	11.25	0.18	7.69	8.33	4.64	0.13	0.08	100.05	0.07		0.77	39.26	19.37	14.90	12.24	0.39	11.25	1.61	0.19	100.05
88txr231/1	51.57	0.87	14.21	11.51	0.20	7.85	9.11	3.51	0.10	0.08	99.01	4.51		0.59	29.70	22.73	15.33	12.44	0.43	11.51	1.58	0.19	99.01

BASALTS

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	total	Q	C	or	ab	an	Di	Hy	il	hm	tn	ru	ap	total
88txp116	49.61	1.49	13.12	15.62	0.22	5.98	9.21	3.02	0.83	0.15	99.25	6.02		4.90	25.55	19.80	16.03	7.46	0.47	15.62	3.05		0.35	99.25
88txp117	48.36	1.62	13.74	16.46	0.24	6.98	6.77	2.95	1.58	0.15	98.85	3.48		9.34	24.96	19.59	6.47	14.38	0.51	16.46	3.31		0.35	98.85
88txp118	50.05	1.51	13.27	14.81	0.21	6.45	7.18	3.06	1.89	0.14	98.57	4.26		11.17	25.89	16.90	10.41	11.24	0.45	14.81	3.13		0.33	98.57
88txp137	51.01	1.09	15.25	12.35	0.28	6.41	10.01	2.39	0.63	0.09	99.51	8.27		3.72	20.22	29.03	13.50	9.70	0.60	12.35	1.90		0.21	99.51
88txp148/2	48.20	1.38	14.80	13.75	0.21	6.99	10.79	2.13	0.02	0.11	98.38	7.26		0.12	18.02	30.77	14.06	10.89	0.45	13.75	2.81		0.26	98.38
88txp149	49.36	1.36	15.05	13.42	0.21	6.76	10.07	2.99	0.14	0.12	99.48	4.85		0.83	25.30	27.24	14.03	10.33	0.45	13.42	2.76		0.28	99.48
88txp151	52.55	1.33	13.87	13.17	0.22	6.16	9.78	1.90	0.11	0.10	99.19	15.29		0.65	16.08	29.00	11.75	9.89	0.47	13.17	2.66		0.23	99.19
88txr220	51.86	1.88	14.51	15.78	0.22	4.33	6.47	3.50	1.14	0.22	99.91	9.63		6.74	29.62	20.52	3.47	9.18	0.47	15.78	4.01		0.51	99.91
88txr230/1	49.42	1.03	13.96	13.03	0.20	7.07	9.28	3.26	0.47	0.10	97.82	3.55		2.78	27.58	22.08	15.96	10.21	0.43	13.03	1.97		0.23	97.82

NIGGLI NUMBERS

GRANITES

	si	al	fm	c	alk	ti	p	k	mg
88txp087a/1	294.71	39.99	18.83	11.92	29.27	1.34	0.34	0.31	0.69
88txp087a/2	296.44	39.67	18.84	12.30	29.19	1.35	0.34	0.31	0.69
88txp087b/1	315.09	40.24	18.70	12.18	28.87	1.31	0.31	0.33	0.69
88txp087b/2	304.86	40.49	18.37	12.19	28.95	1.32	0.29	0.32	0.70
88txp087c/1	313.84	40.21	18.69	11.00	30.10	1.39	0.27	0.27	0.70
88txp087c/2	308.93	40.05	19.15	11.23	29.57	1.42	0.34	0.27	0.70
88txp087e/1	310.36	39.76	19.30	10.35	30.59	1.37	0.33	0.29	0.70
88txp087e/2	312.91	39.85	19.12	10.29	30.74	1.36	0.29	0.30	0.71
88txp087f/1	312.60	39.62	18.99	11.30	30.08	1.35	0.34	0.29	0.71
88txp087f/2	312.46	39.94	19.28	11.39	29.39	1.38	0.36	0.30	0.71
88txp123a	312.75	40.57	18.03	11.69	29.71	1.30	0.27	0.30	0.70
88txp123b	310.13	40.02	17.37	13.72	28.89	1.22	0.29	0.27	0.69
88txp123c	311.72	40.17	17.22	13.32	29.30	1.27	0.27	0.28	0.69
88txp123c/1	314.02	40.22	17.05	13.38	29.35	1.27	0.27	0.28	0.69
88txp123c/2	309.94	40.16	17.40	13.22	29.22	1.23	0.25	0.29	0.69
88txr100a/1	378.14	42.57	13.89	8.25	35.29	1.19	0.16	0.32	0.66
88txr100a/2	381.12	44.13	12.24	9.17	34.46	1.07	0.13	0.32	0.64
88txr100a/3	372.20	42.07	13.90	8.29	35.74	1.18	0.15	0.31	0.67
88txr100b/1	358.91	43.02	18.93	5.71	32.34	1.42	0.22	0.33	0.70
88txr100b/1	387.23	42.24	13.83	10.01	33.92	1.28	0.20	0.30	0.6
88txr100b/3	370.75	42.97	13.90	9.65	33.47	1.24	0.17	0.31	0.65
88txr100c/1	355.23	43.54	16.20	9.10	31.16	1.31	0.19	0.36	0.66
88txr100c/2	358.09	43.39	15.71	9.33	31.58	1.36	0.19	0.35	0.6
88txr100d/1	353.31	44.12	17.18	6.18	32.52	1.37	0.19	0.33	0.71
88txr100d/2	369.40	43.43	17.44	6.35	32.78	1.40	0.17	0.33	0.71
88txr100f/1	358.29	42.65	15.60	7.72	34.04	1.30	0.15	0.36	0.69
88txr100f/2	355.32	42.43	16.37	7.69	33.51	1.36	0.19	0.37	0.69
88txr104a/1	349.94	41.68	18.53	6.51	33.27	1.46	0.21	0.35	0.73
88txr104a/2	344.47	41.39	19.21	6.45	32.95	1.52	0.21	0.35	0.73
88txr104b	359.53	42.20	16.58	5.80	35.42	1.22	0.17	0.35	0.76
88txr104c	341.84	43.28	16.24	6.78	33.69	1.24	0.16	0.38	0.72

GABBROS	si	al	fm	c	alk	ti	p	k	mg
88txp088e	131.07	21.65	44.34	26.68	7.33	3.09	0.14	0.10	0.57
88txp099/1	154.14	22.01	37.93	31.56	8.50	2.99	0.15	0.13	0.57
88txp100/1	137.88	23.45	38.77	28.63	9.16	3.23	0.14	0.29	0.54
88txr221/1	138.62	23.12	41.26	23.43	12.19	1.74	0.09	0.02	0.72
88txr221/2	136.47	23.00	41.57	23.42	12.02	1.70	0.09	0.02	0.72
88txr231/1	136.42	22.16	42.85	25.82	9.17	1.73	0.09	0.02	0.72
BASALTS									
88txp116	137.67	21.46	41.56	27.39	9.59	3.11	0.18	0.15	0.6
88txp117	134.26	22.49	46.64	20.14	10.74	3.38	0.18	0.26	0.62
88txp118	142.79	22.32	43.83	21.95	11.90	3.24	0.17	0.29	0.63
88txp137	138.35	24.38	39.16	29.09	7.37	2.22	0.10	0.15	0.66
88txp148/2	126.40	22.88	41.35	30.32	5.45	2.72	0.12	0.01	0.66
88txp149	130.06	23.38	40.32	28.43	7.87	2.70	0.13	0.03	0.66
88txp151	150.62	23.43	41.05	30.04	5.48	2.87	0.12	0.04	0.64
88txr220	161.14	26.58	39.08	21.54	12.80	4.39	0.29	0.18	0.51
88txr230/1	132.70	22.10	41.91	26.70	9.29	2.08	0.11	0.09	0.68
PORPHYRIES AND MICROGRANITE									
88txp092	353.96	45.58	9.81	9.93	34.67	1.00	0.17	0.19	0.67
88txp094	337.54	43.74	13.47	9.54	33.25	1.09	0.14	0.12	0.66
88txp098/1	331.19	42.51	13.08	10.39	34.03	1.06	0.16	0.17	0.64
88txr118/1	283.95	38.16	14.55	17.37	29.92	1.02	0.21	0.15	0.70
88txr118/2	287.49	37.66	14.71	17.83	29.79	1.03	0.24	0.15	0.70

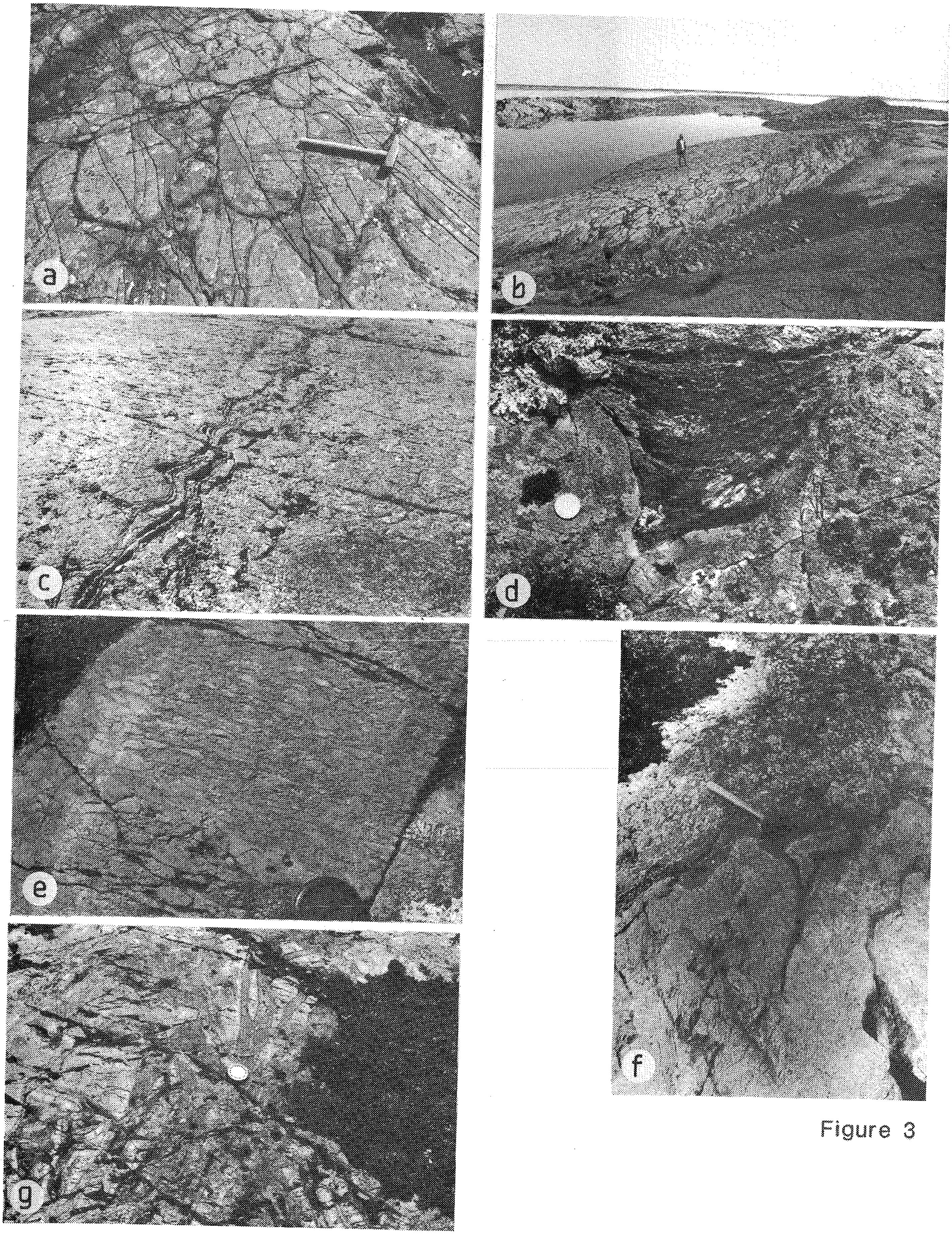


Figure 3

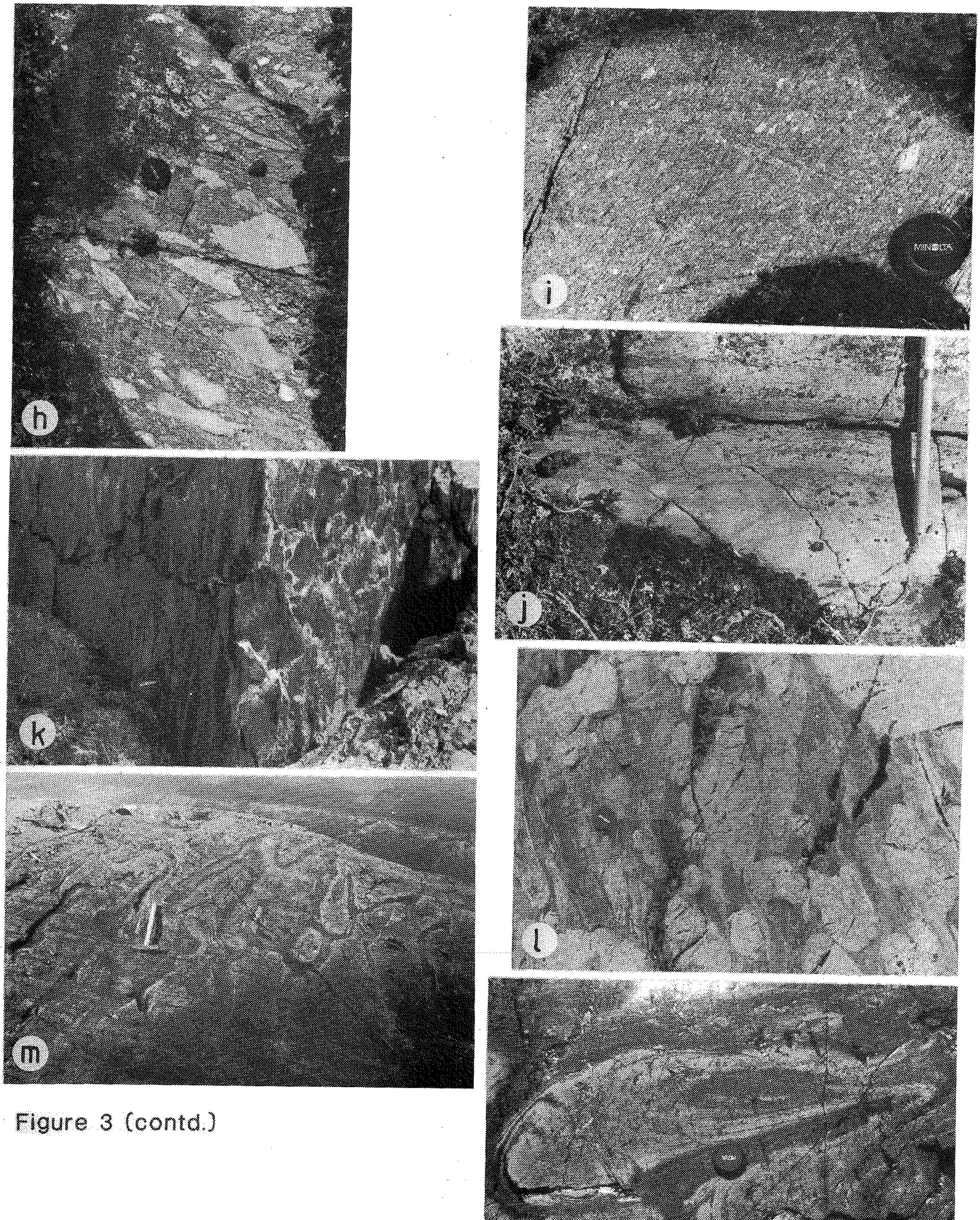


Figure 3 (contd.)

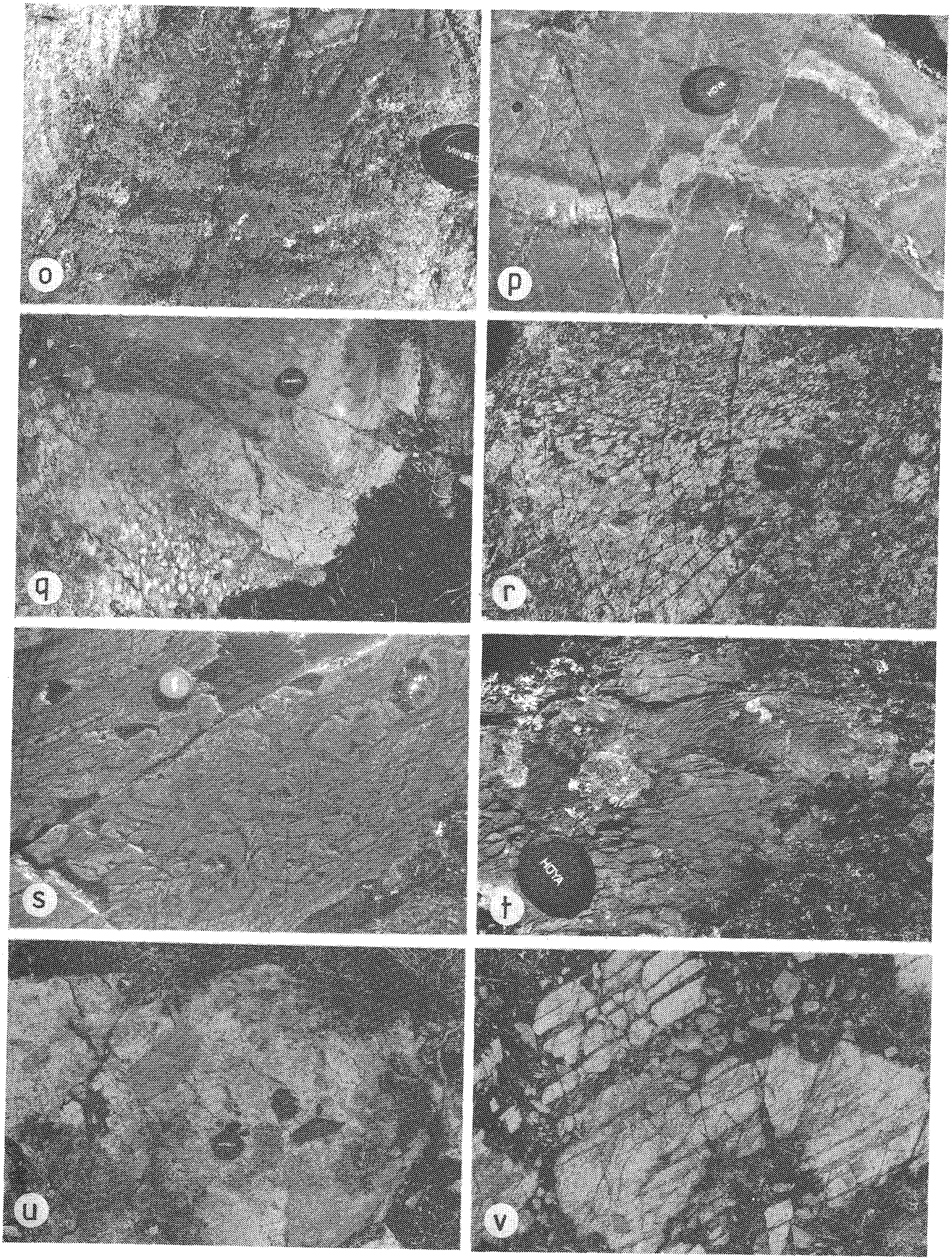


Figure 3 (contd.)

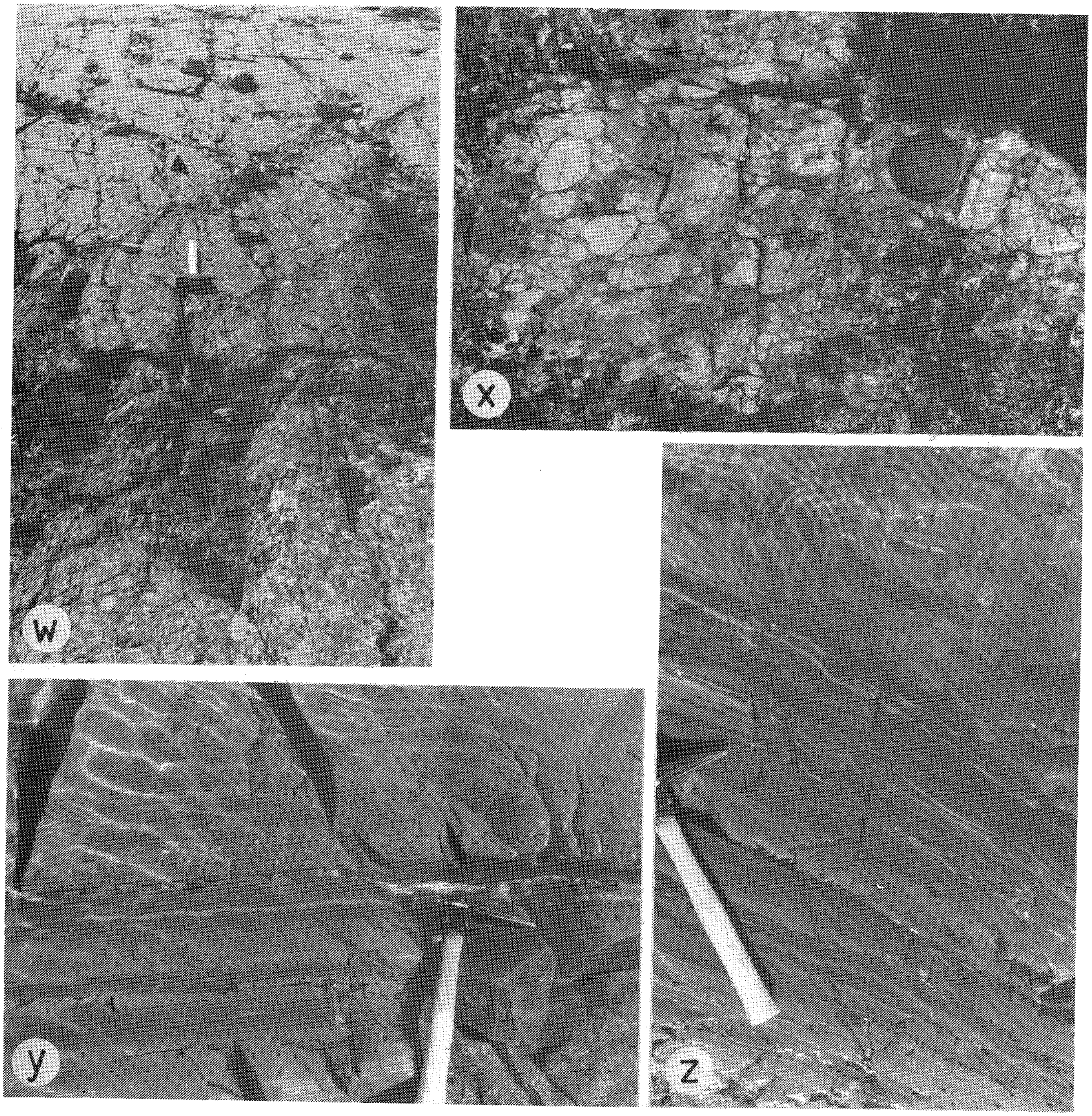


Figure 3 (contd.)

FIG. 4 Park & Ralser

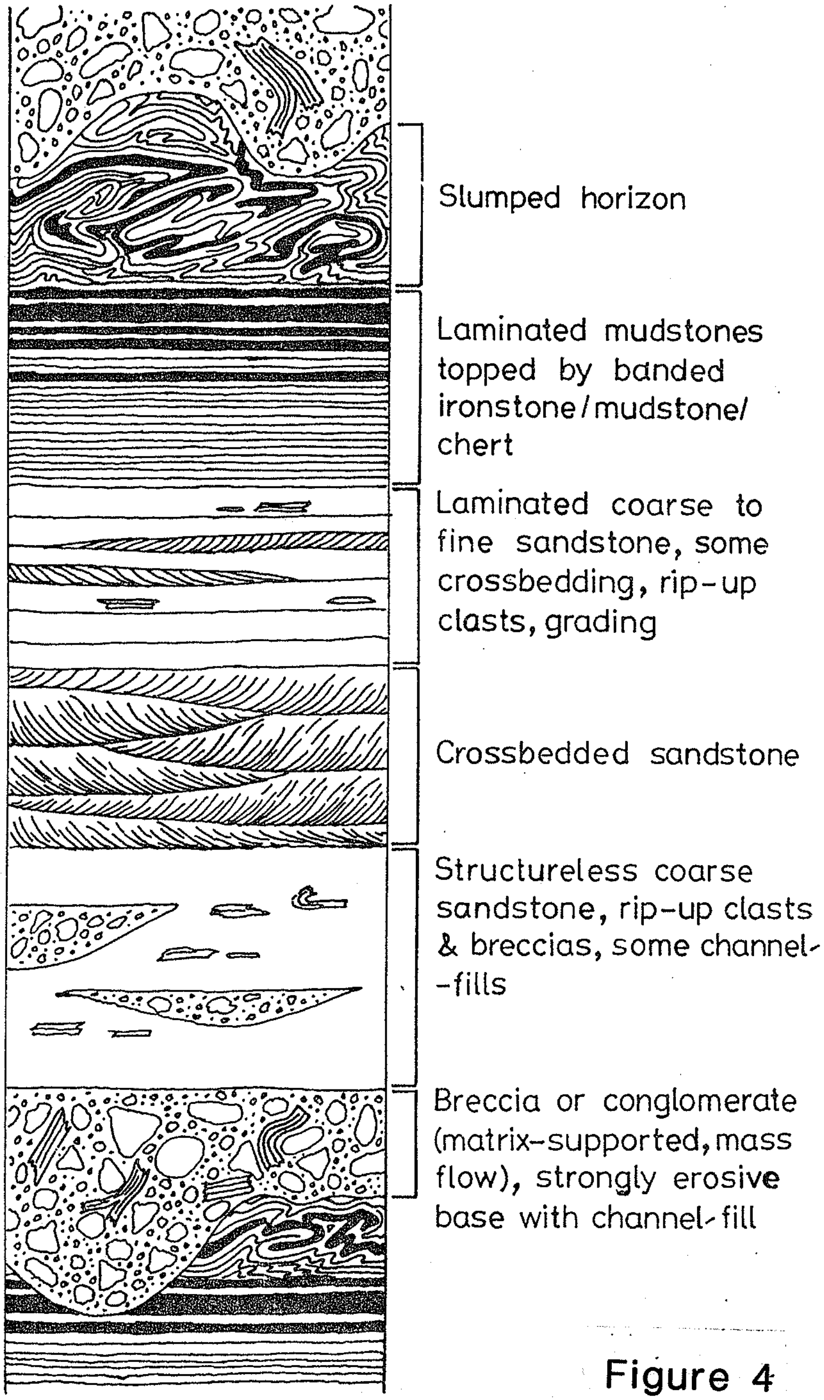
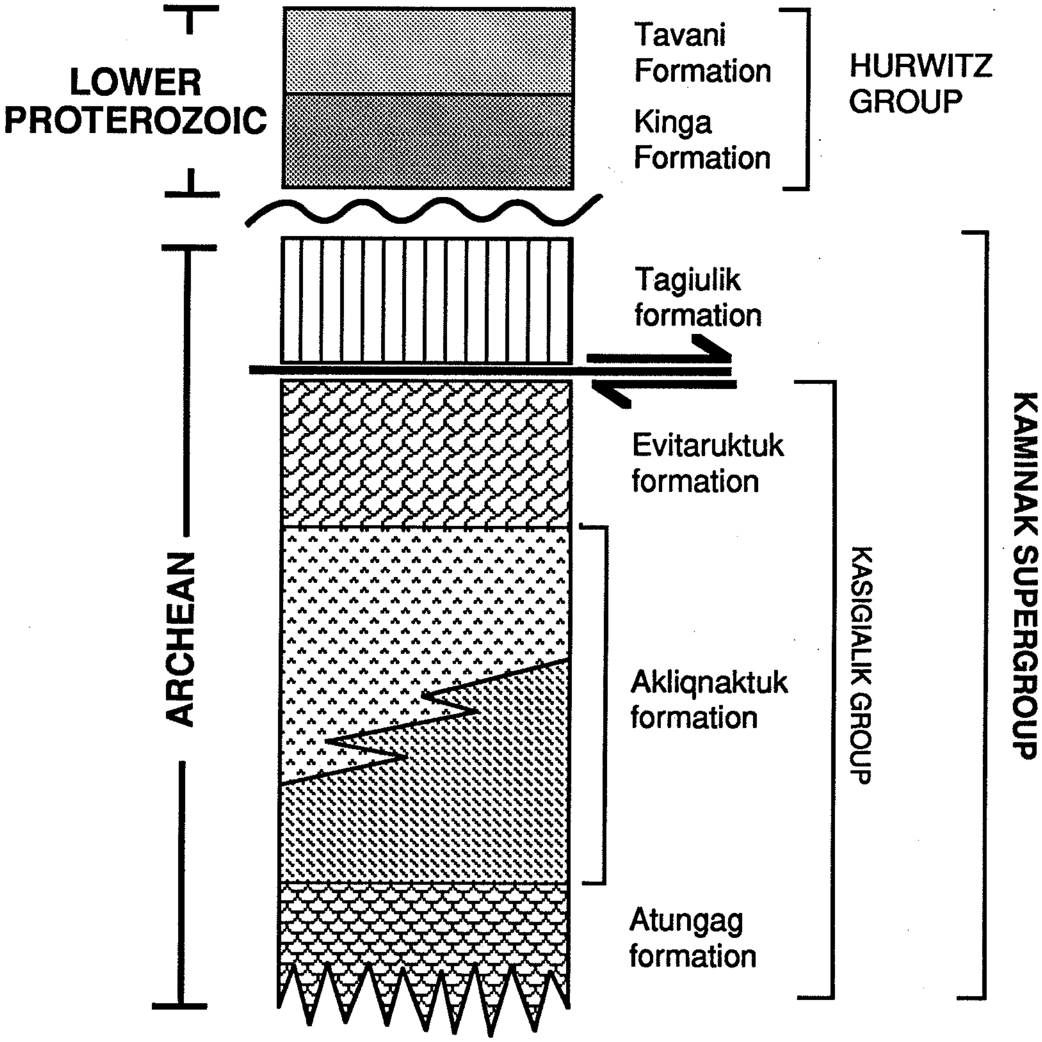


Figure 4

FIG. 4. PARK & RALSER.



LOWER PROTEROZOIC
Tavani Formation
Kinga Formation
HURWITZ GROUP
ARCHEAN
Tagiulik formation
Evitaruktuk formation
Akliqnaktuk formation
Atungag formation
KASIGIALIK GROUP
KAMINAK SUPERGROUP

Figure 5

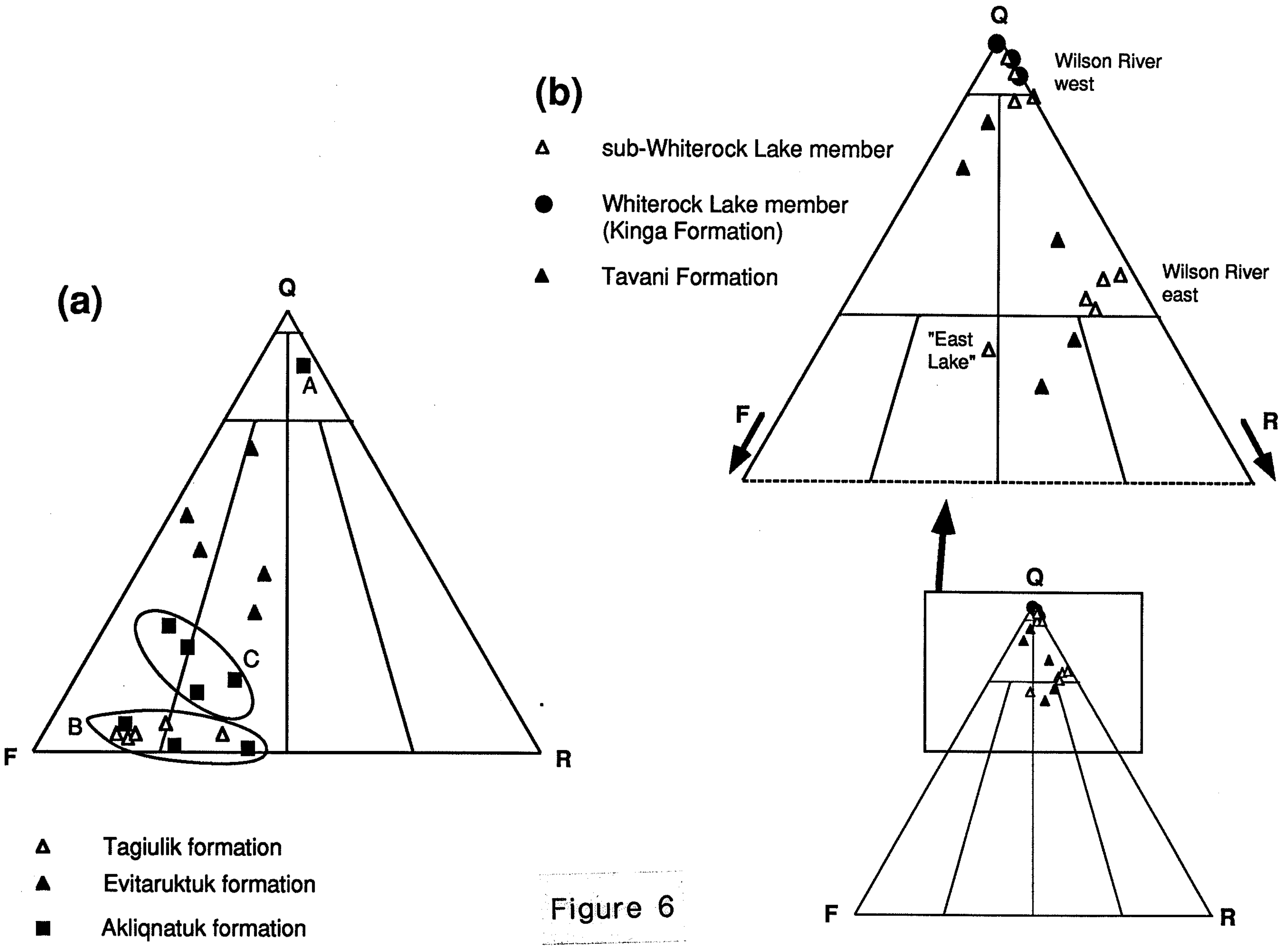

(a)
Q
A
B
C
F
R
Δ Tagiulik formation
▲ Evitaruktuk formation
■ Akliqnatuk formation
(b)
Δ sub-Whiterock Lake member
● Whiterock Lake member (Kinga Formation)
▲ Tavani Formation
Q
Wilson River west
Wilson River east
"East Lake"
F
R
Q
F
R

Figure 6

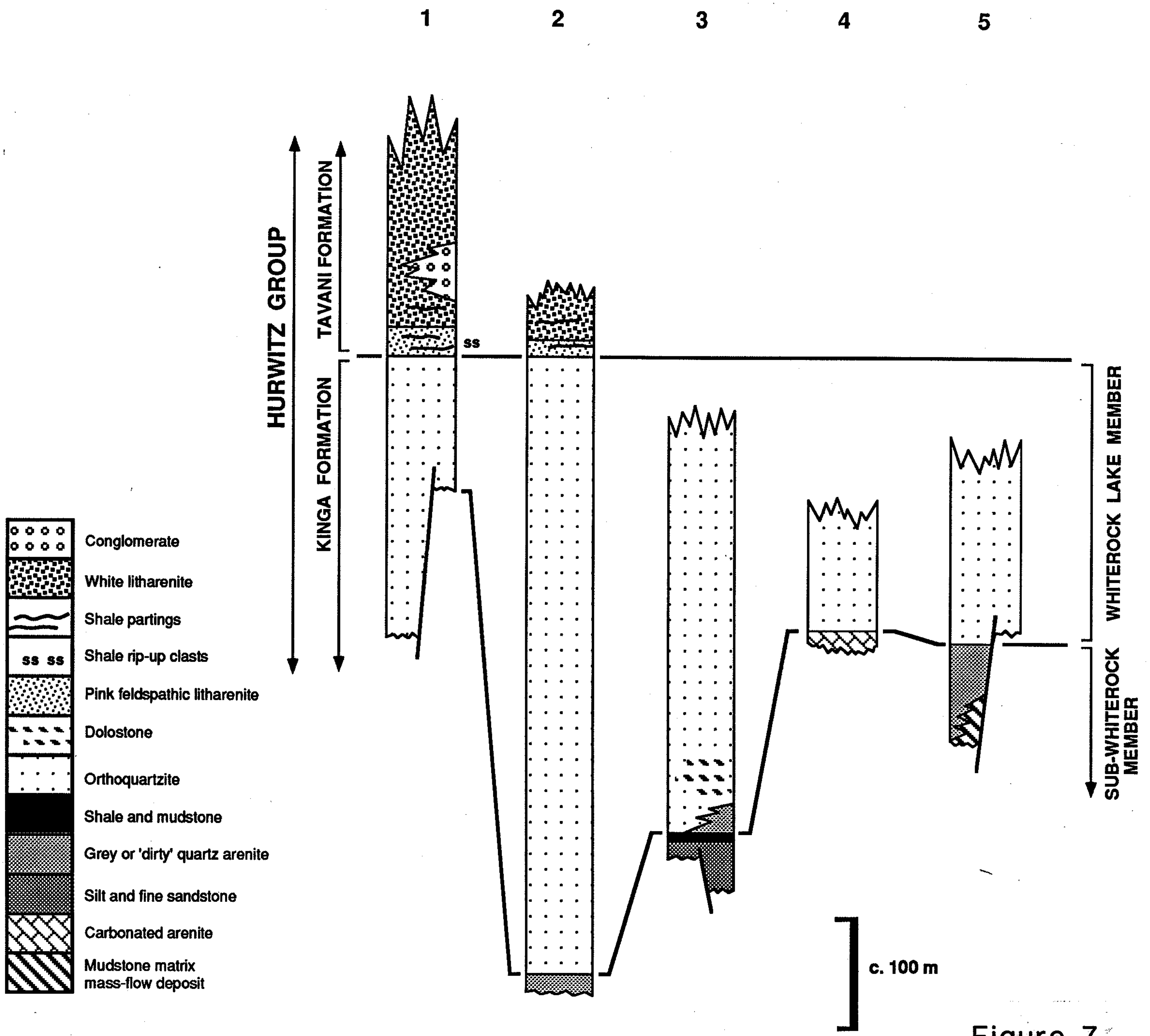

1
2
3
4
5
HURWITZ GROUP
TAVANI FORMATION
KINGA FORMATION
ss
WHITEROCK LAKE MEMBER
SUB-WHITEROCK MEMBER
c. 100 m
Conglomerate
White litharenite
Shale partings
Shale rip-up clasts
ss ss
Pink feldspathic litharenite
Dolostone
Orthoquartzite
Shale and mudstone
Grey or 'dirty' quartz arenite
Silt and fine sandstone
Carbonated arenite
Mudstone matrix mass-flow deposit

Figure 7

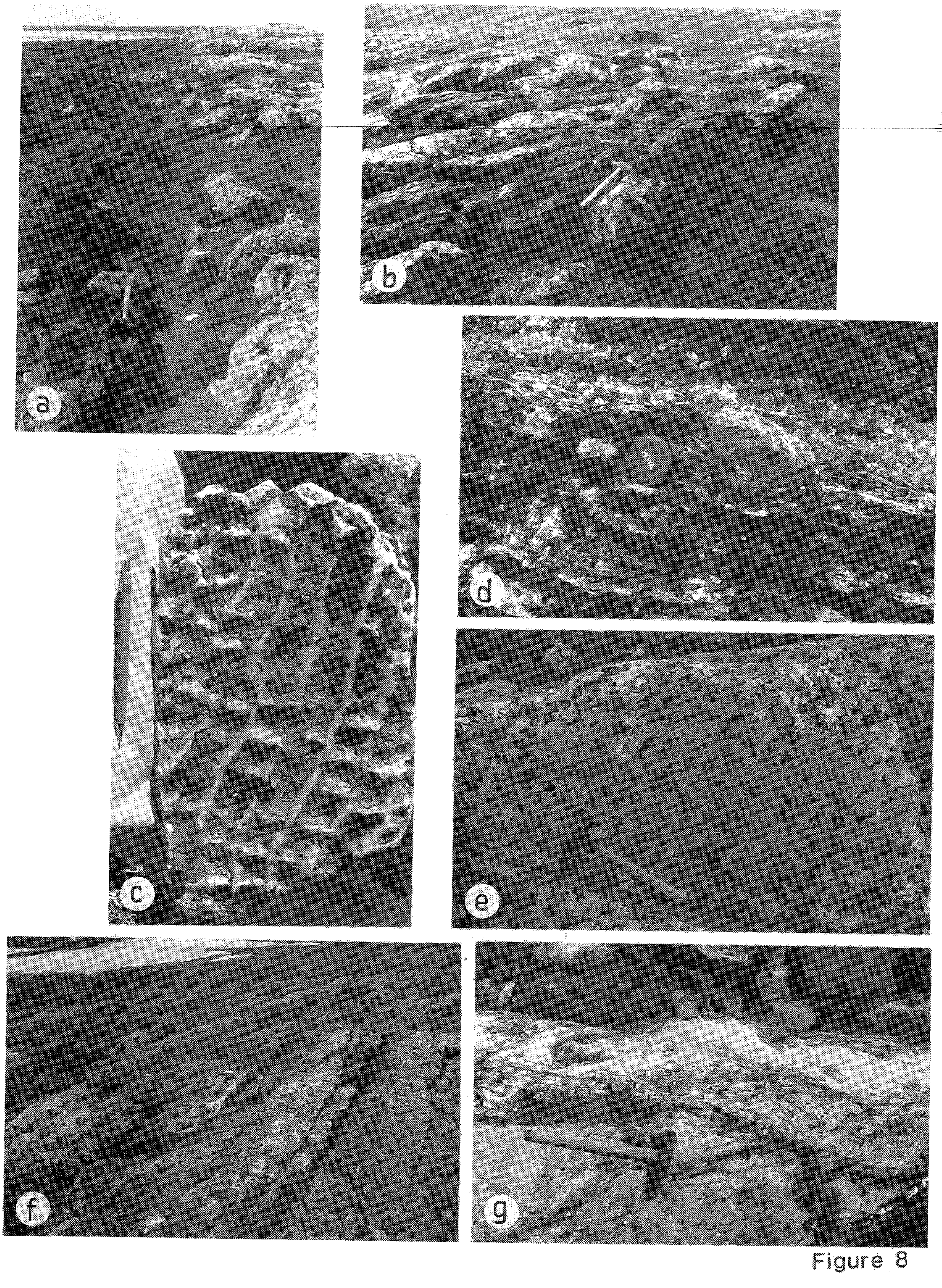


Figure 8

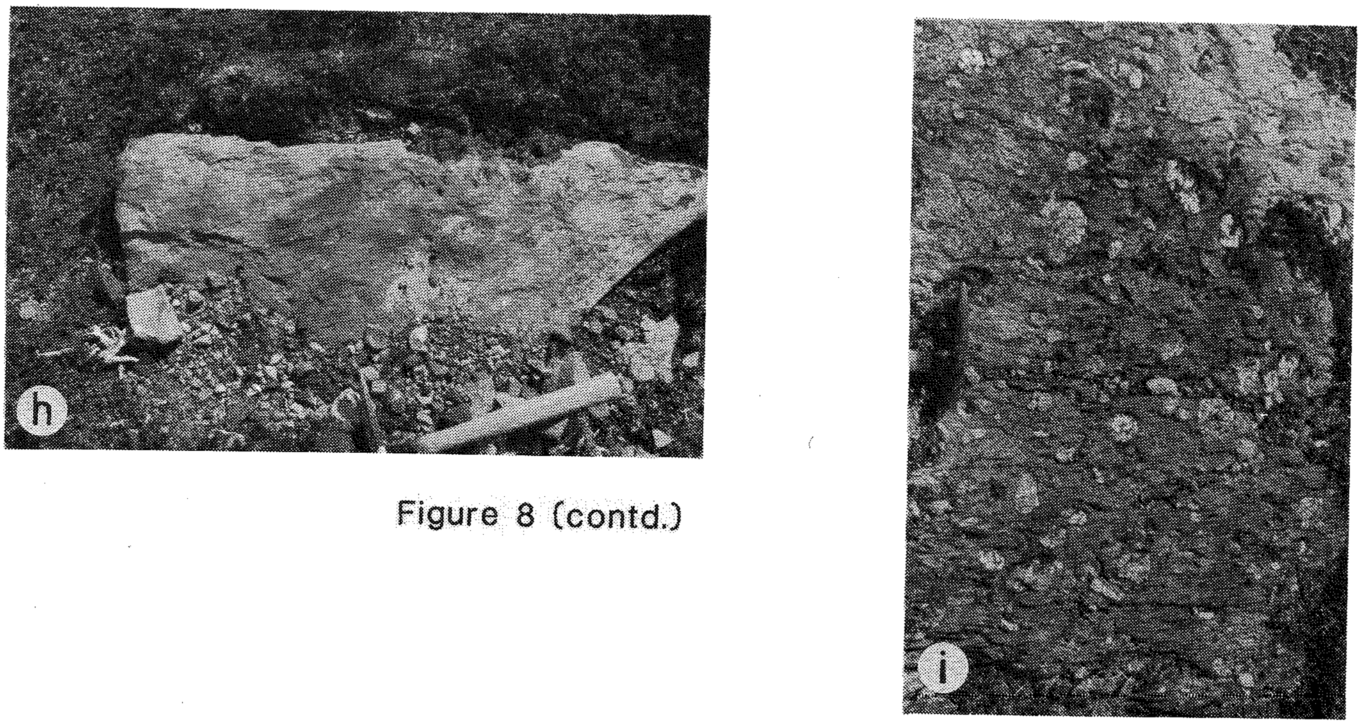


Figure 8 (contd.)

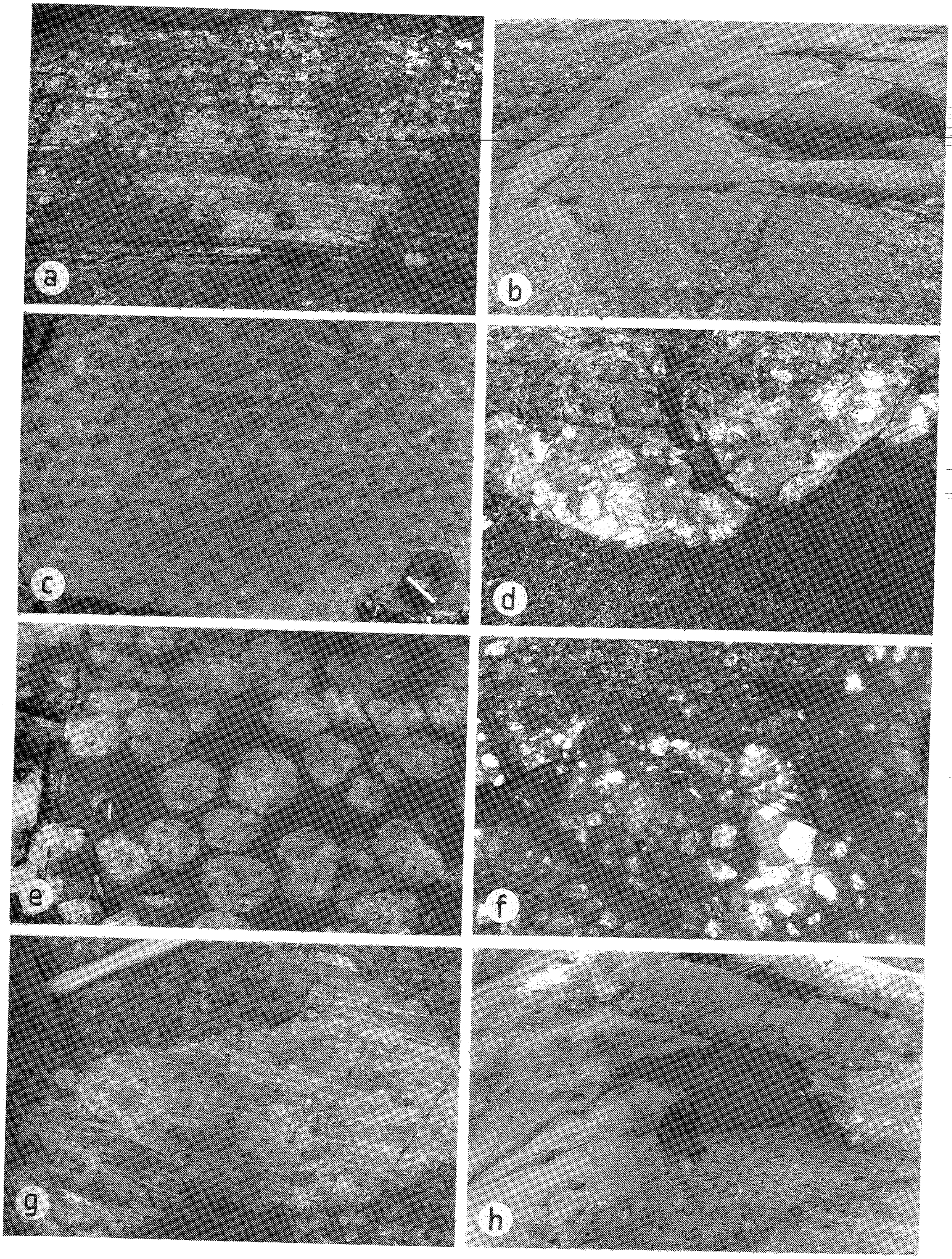


Figure 9

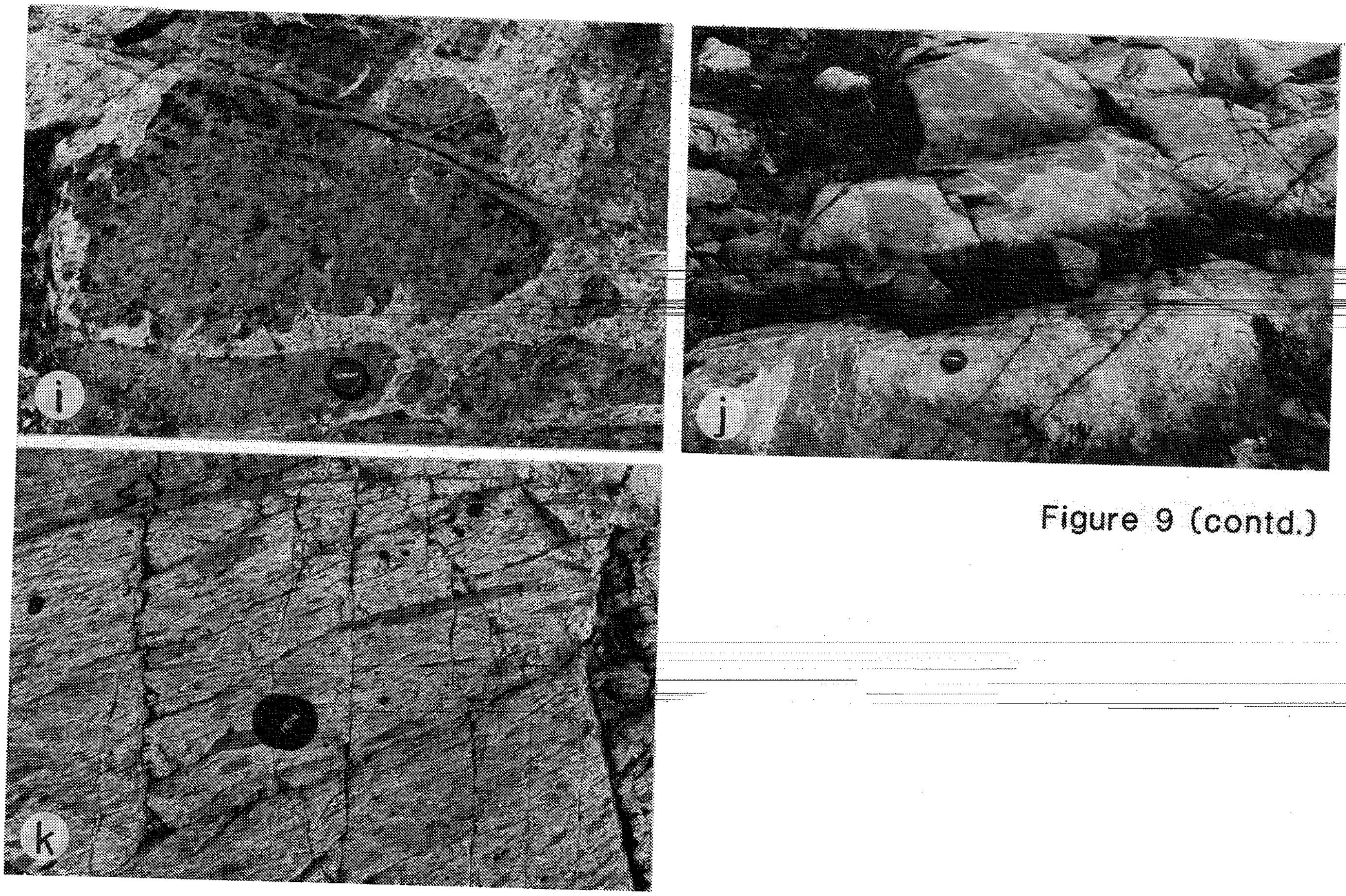


Figure 9 (contd.)

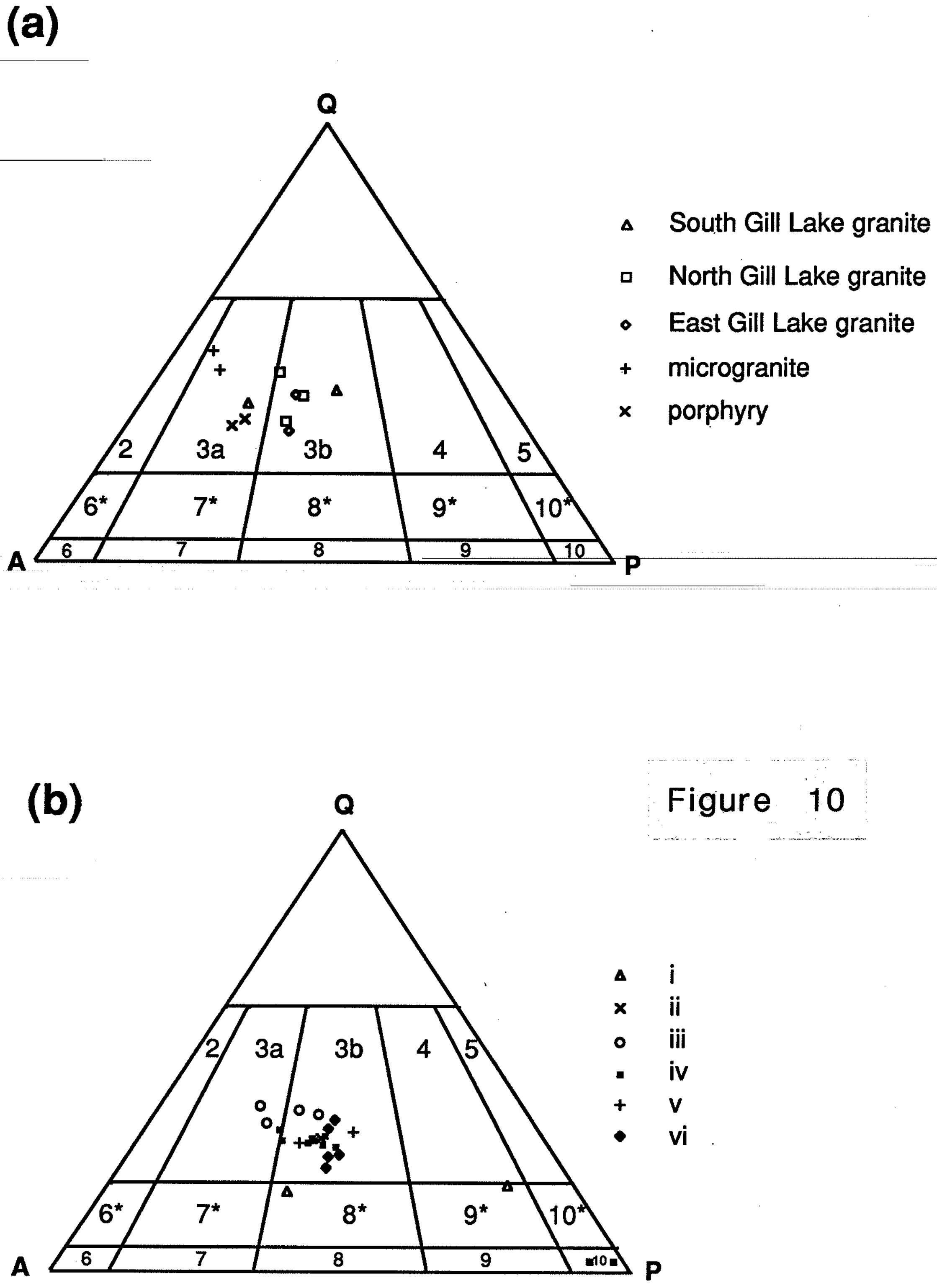
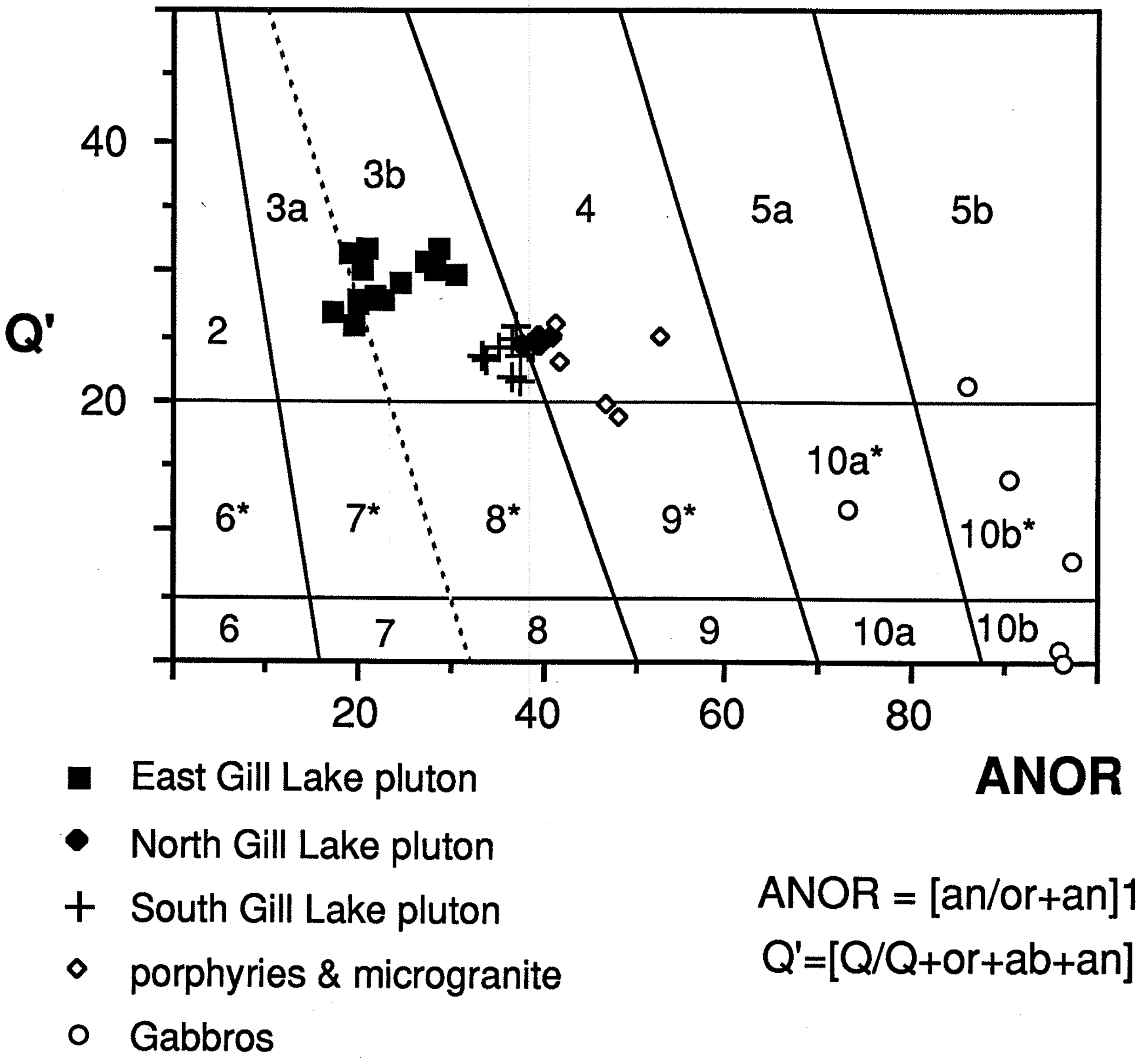

(a)
Q
A
P
2
3a
3b
4
5
6*
7*
8*
9*
10*
6
7
8
9
10
South Gill Lake granite
North Gill Lake granite
East Gill Lake granite
microgranite
porphyry
(b)
Q
A
P
2
3a
3b
4
5
6*
7*
8*
9*
10*
6
7
8
9
10
i
ii
iii
iv
v
vi

Figure 10



ANOR = [an/or+an]100

Q'=[Q/Q+or+ab+an]100

Figure 11

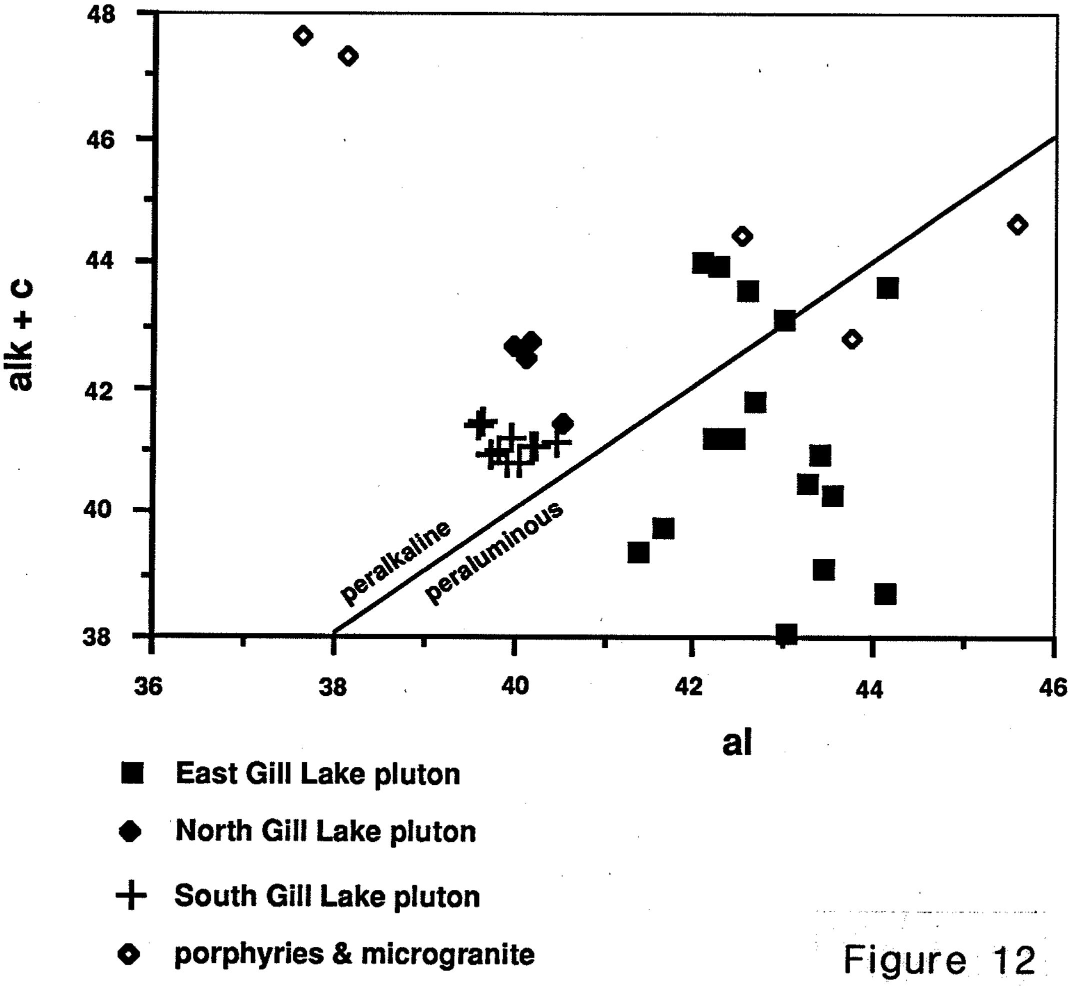

48
46
44
42
40
38
alk + c
36
38
40
42
44
46
al
peralkaline
peraluminous
■ East Gill Lake pluton
◆ North Gill Lake pluton
+ South Gill Lake pluton
◇ porphyries & microgranite

Figure 12

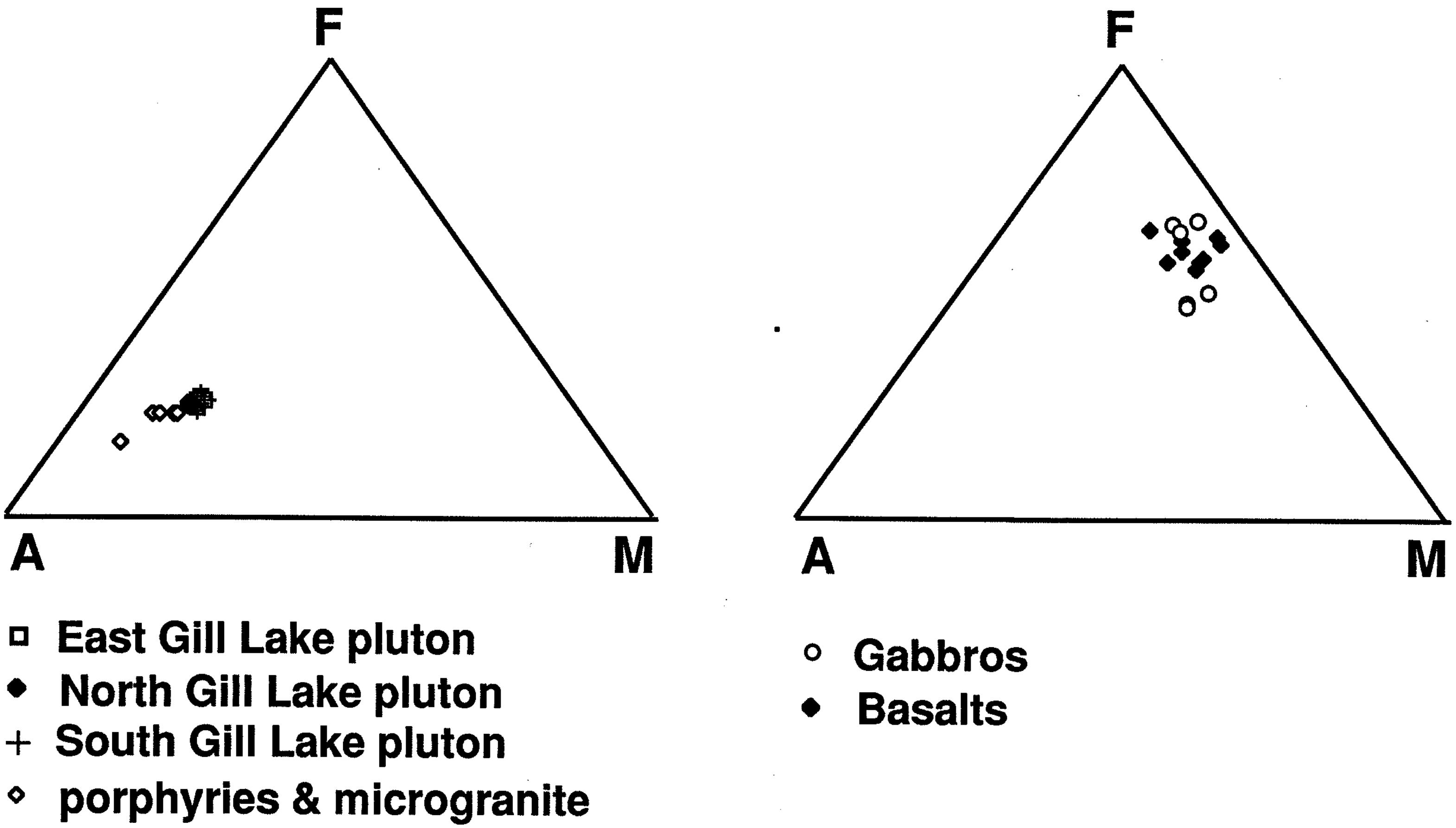

F
A
M
□ East Gill Lake pluton
◆ North Gill Lake pluton
+ South Gill Lake pluton
◇ porphyries & microgranite
F
A
M
○ Gabbros
◆ Basalts

Figure 13

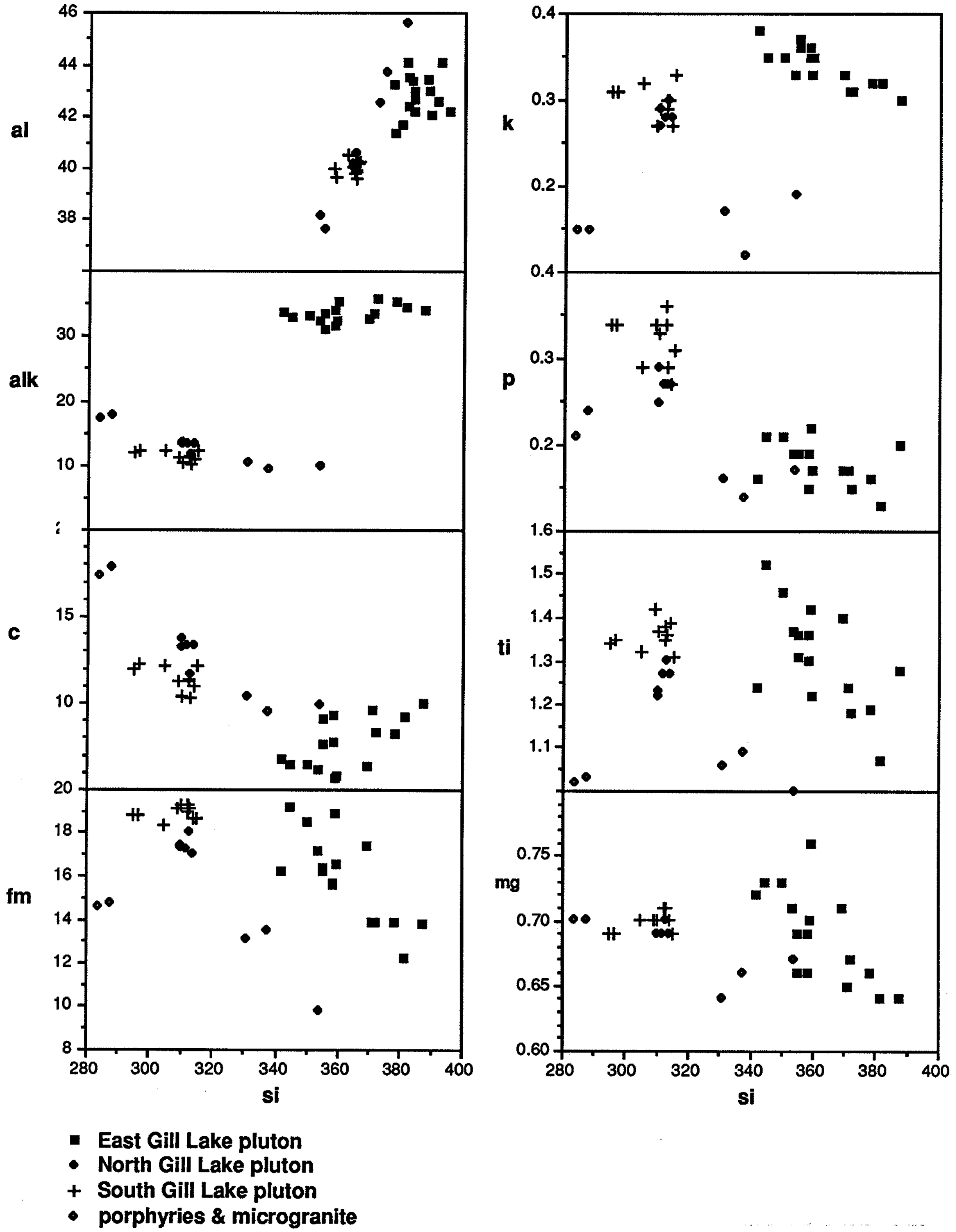

al
alk
c
fm
k
p
ti
mg
si
si
46
44
42
40
38
30
20
10
15
10
20
18
16
14
12
10
8
0.4
0.3
0.2
0.4
0.3
0.2
1.6
1.5
1.4
1.3
1.2
1.1
0.75
0.70
0.65
0.60
280
300
320
340
360
380
400
■ East Gill Lake pluton
◆ North Gill Lake pluton
+ South Gill Lake pluton
◆ porphyries & microgranite

Figure 14

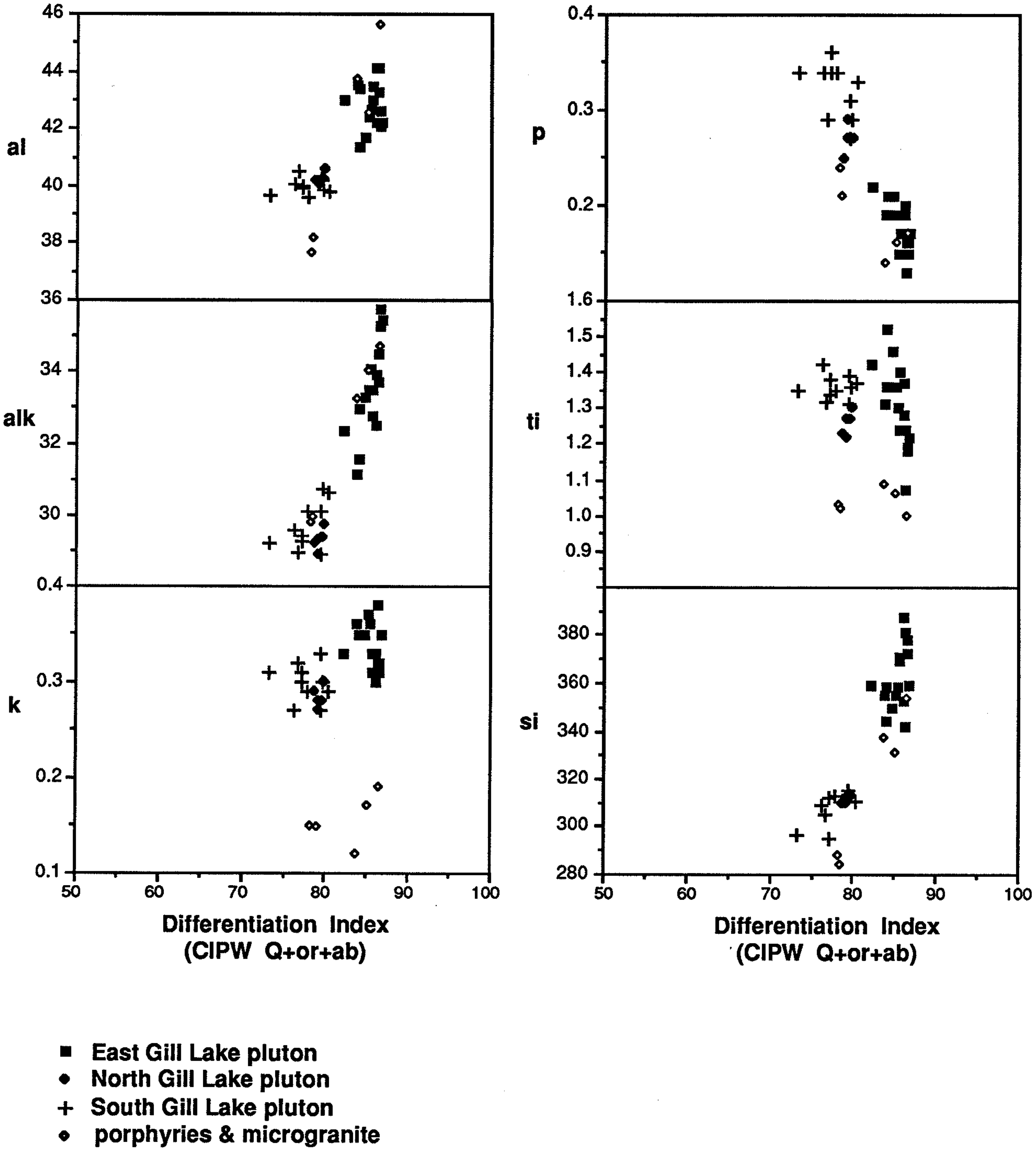

al
46
44
42
40
38
36
alk
34
32
30
0.4
k
0.3
0.2
0.1
50
60
70
80
90
100
Differentiation Index
(CIPW Q+or+ab)
p
0.4
0.3
0.2
1.6
ti
1.5
1.4
1.3
1.2
1.1
1.0
0.9
si
380
360
340
320
300
280
50
60
70
80
90
100
Differentiation Index
(CIPW Q+or+ab)
■ East Gill Lake pluton
● North Gill Lake pluton
+ South Gill Lake pluton
◆ porphyries & microgranite

Figure 15

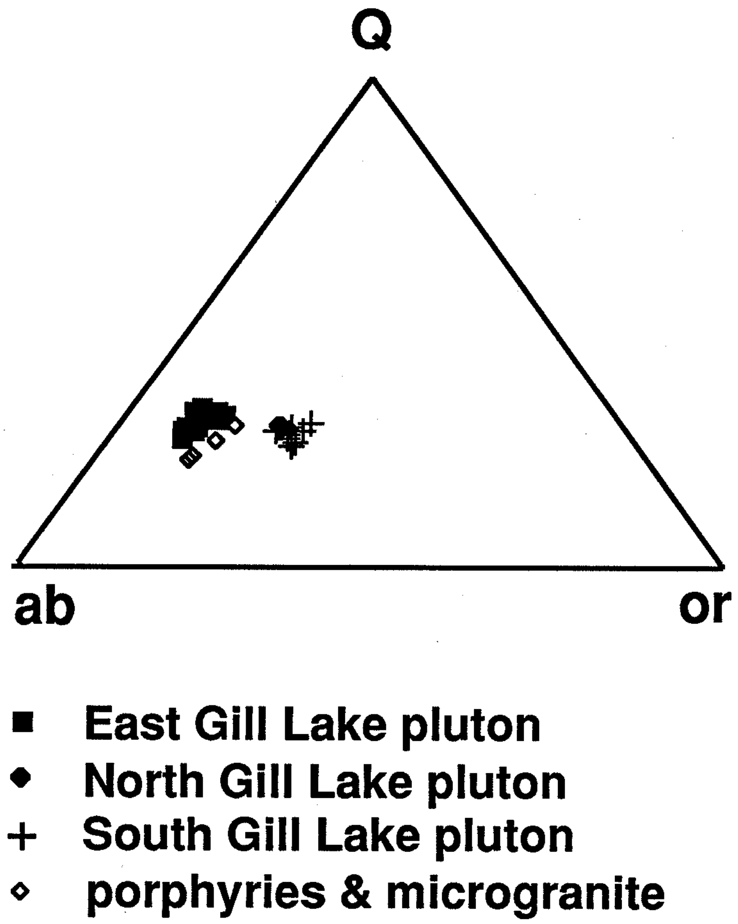

Q
ab
or
■ East Gill Lake pluton
◆ North Gill Lake pluton
+ South Gill Lake pluton
◇ porphyries & microgranite

Figure 16

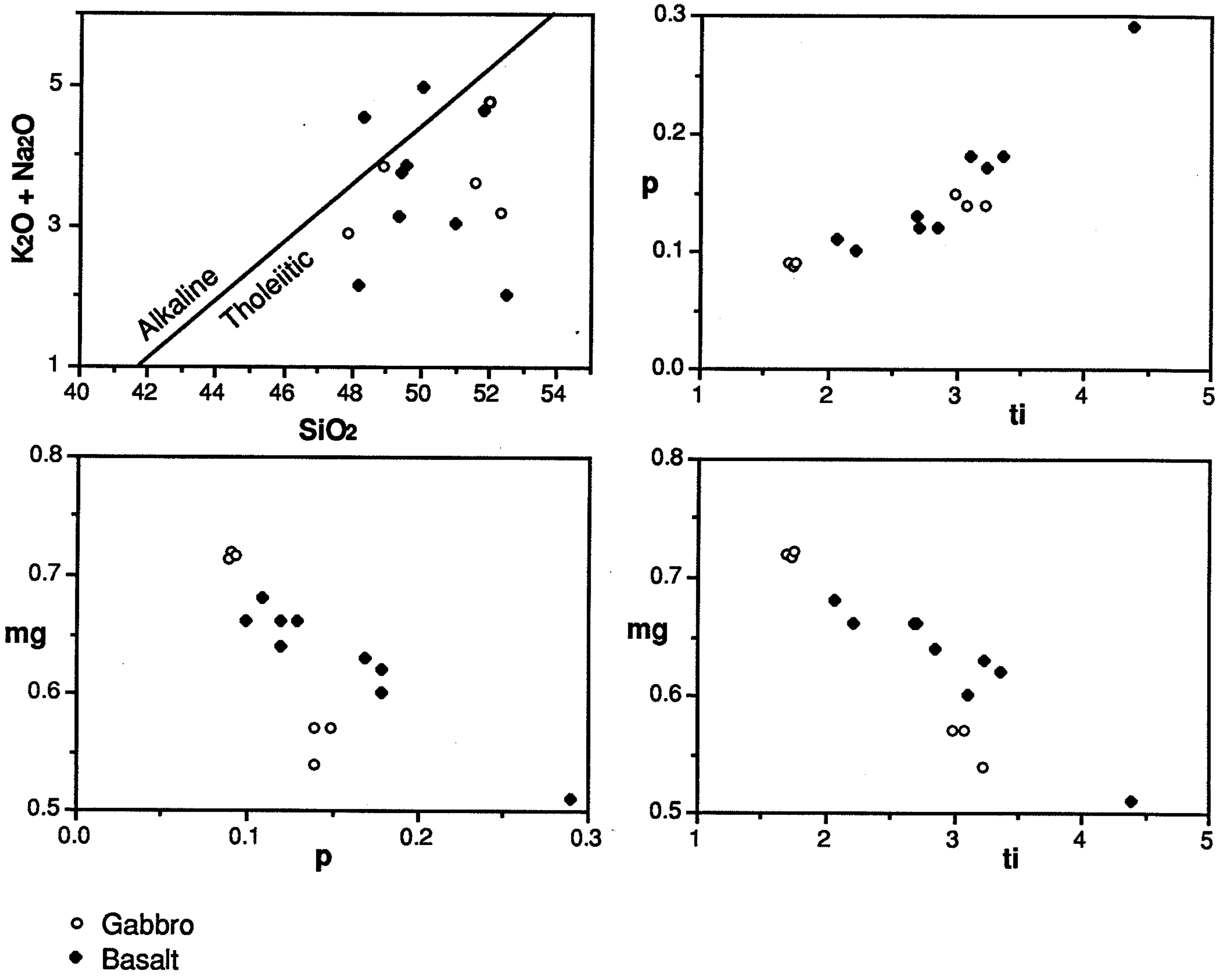

K2O + Na2O
SiO2
Alkaline
Tholeiitic
40
42
44
46
48
50
52
54
1
3
5
p
ti
0.0
0.1
0.2
0.3
1
2
3
4
5
mg
0.5
0.6
0.7
0.8
0.0
0.1
0.2
0.3
mg
ti
○ Gabbro
◆ Basalt

Figure 17

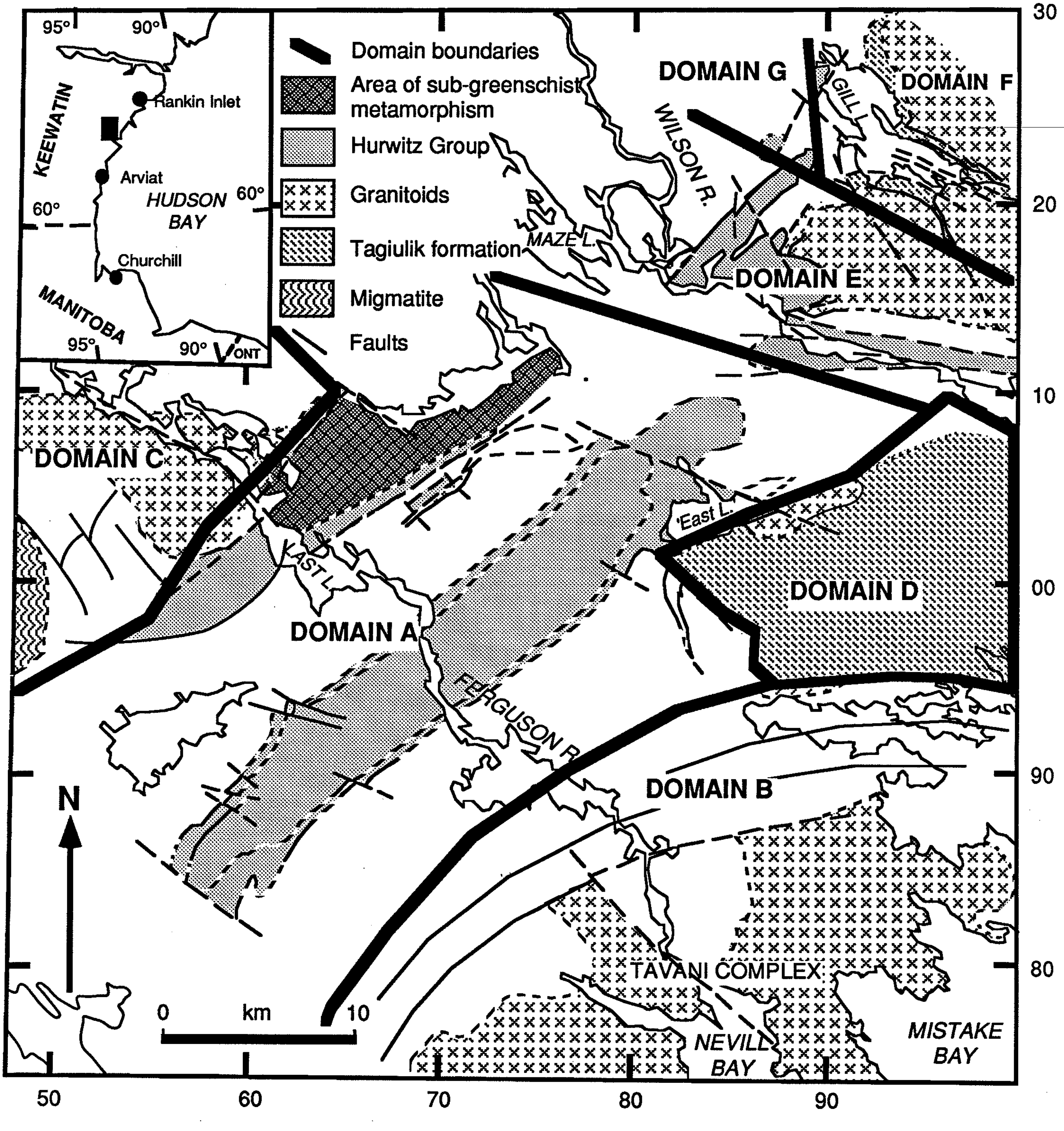

95°
90°
Rankin Inlet
KEEWATIN
Arviat
HUDSON BAY
60°
60°
Churchill
MANITOBA
95°
90°
ONT
Domain boundaries
Area of sub-greenschist metamorphism
Hurwitz Group
Granitoids
Tagiulik formation
Migmatite
Faults
DOMAIN G
DOMAIN F
GILL L.
WILSON R.
MAZE L.
DOMAIN E
DOMAIN C
'East L.
KAST L.
DOMAIN D
DOMAIN A
FERGUSON R.
DOMAIN B
N
0
km
10
TAVANI COMPLEX
NEVILL BAY
MISTAKE BAY
30
20
10
00
90
80
50
60
70
80
90

Figure 18

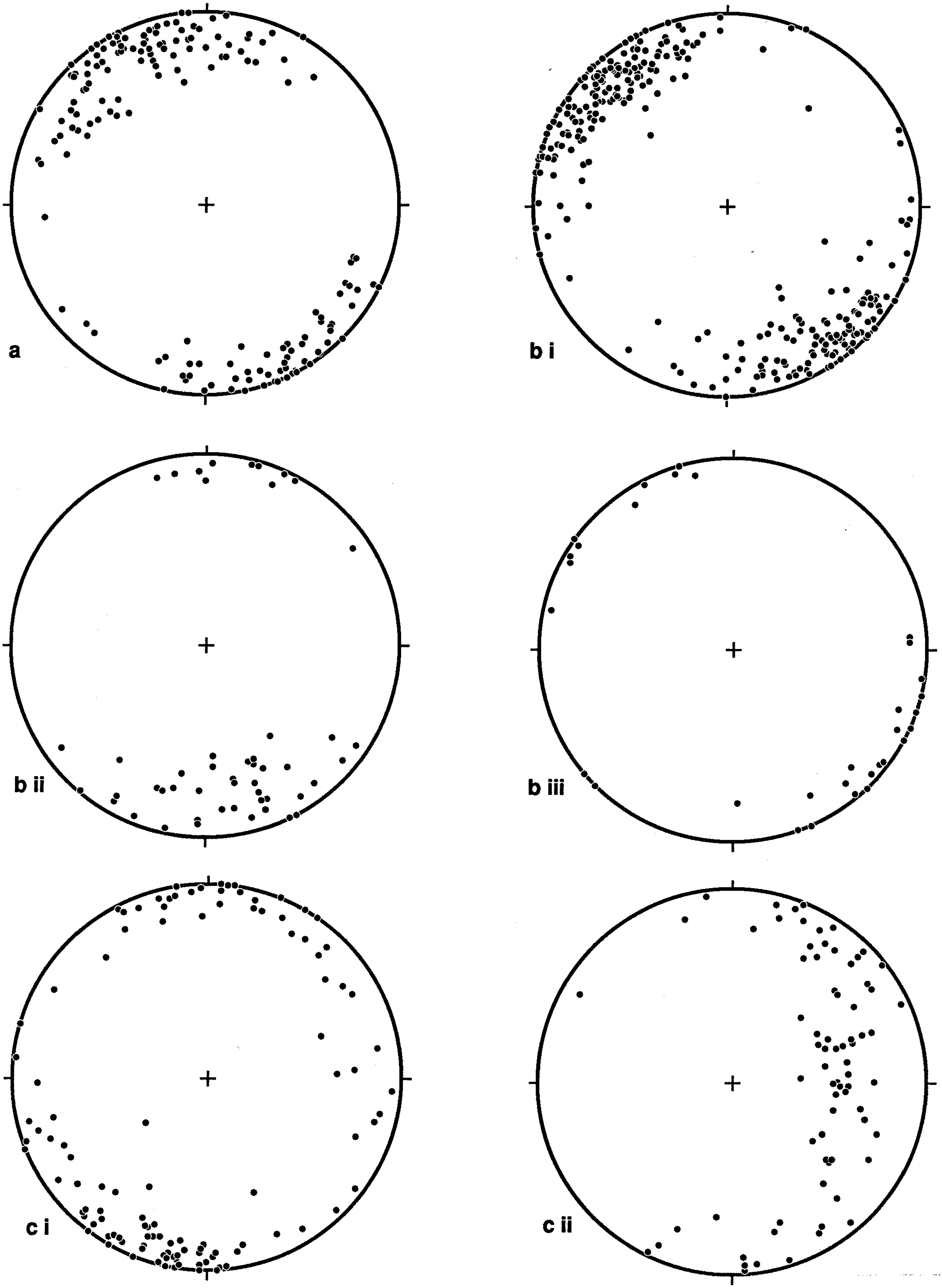


Figure 19

FIG. 20 PARK & RALSER

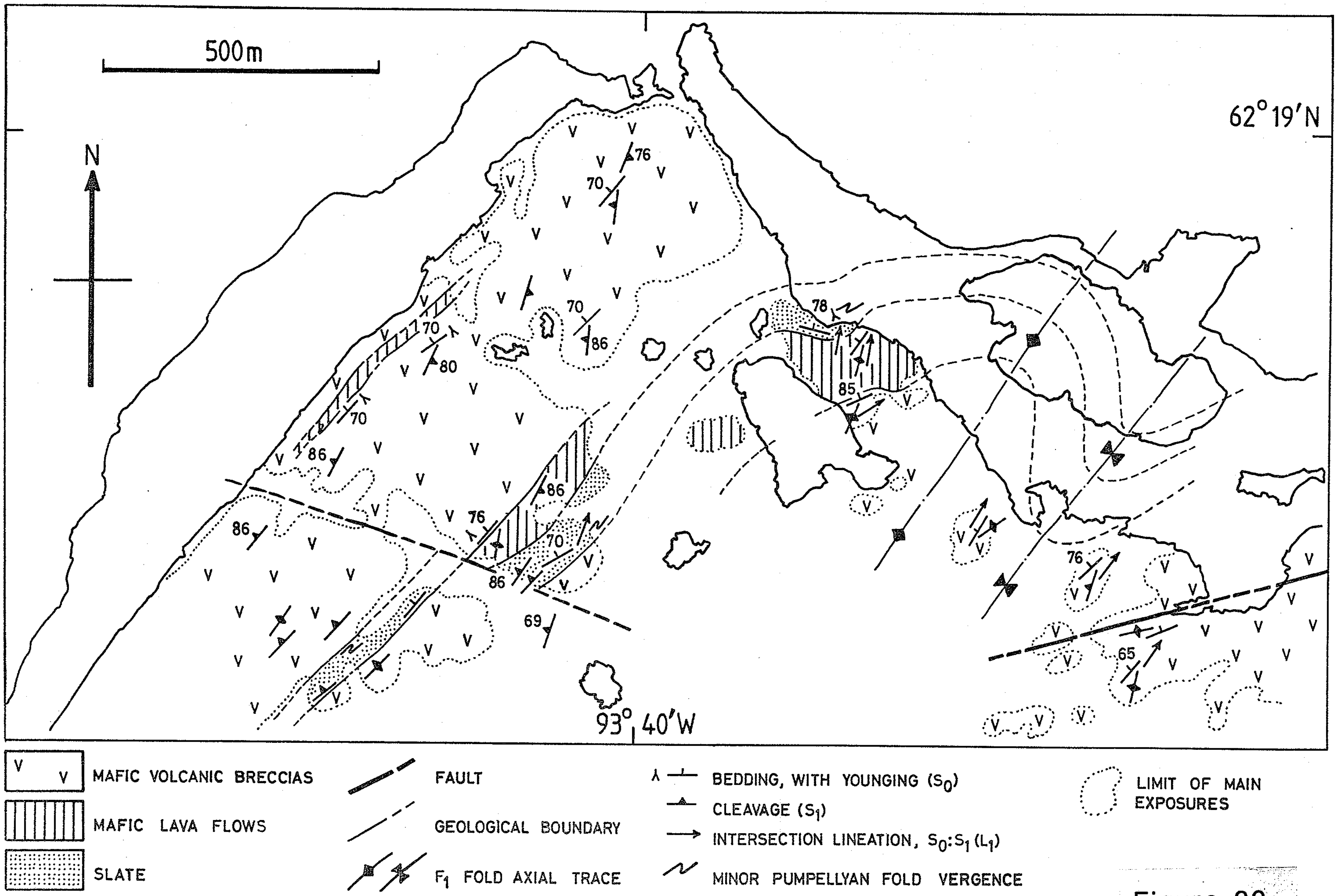


Figure 20

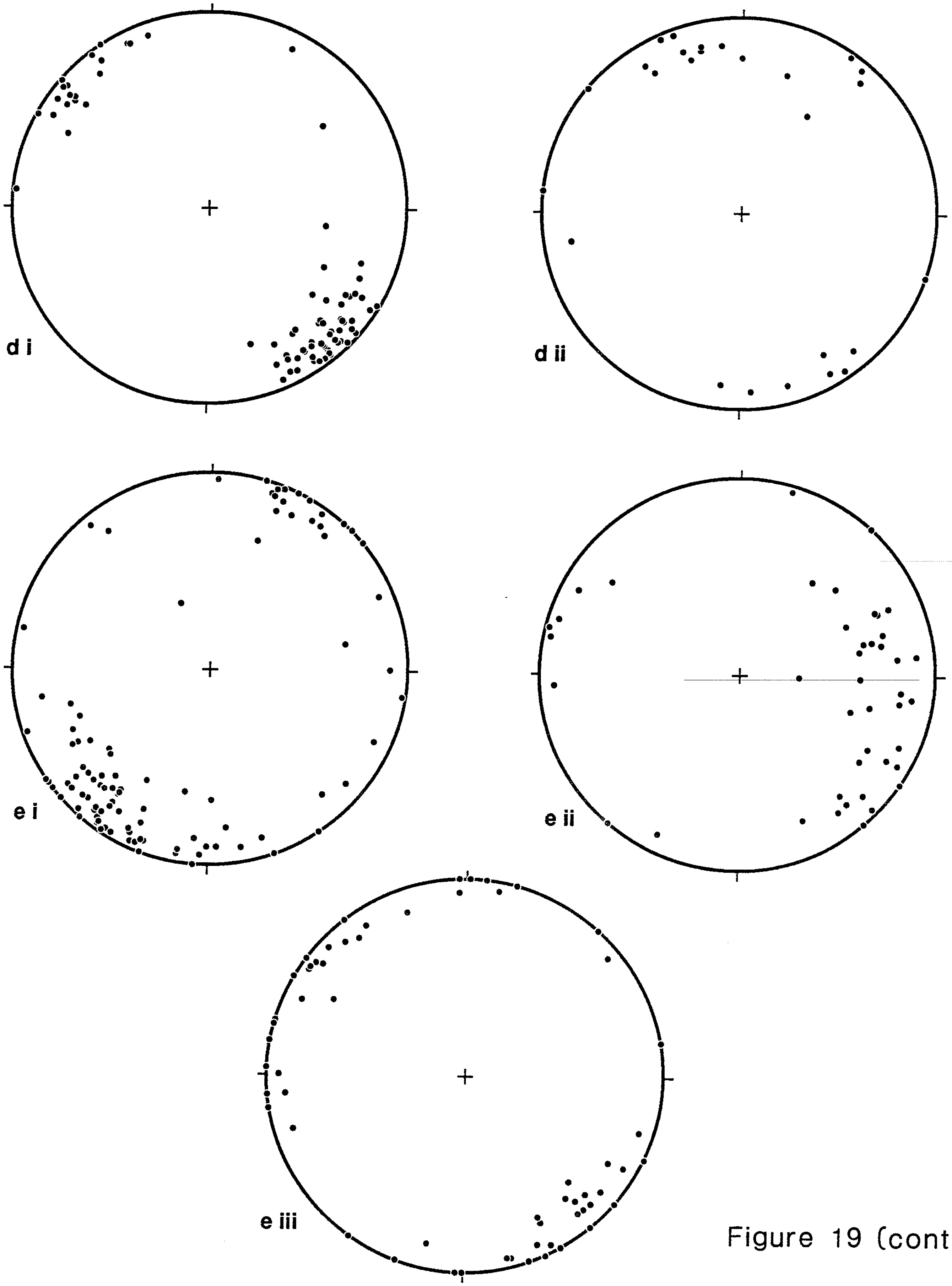


Figure 19 (contd.)

FIG. 21
PARK & RALSER

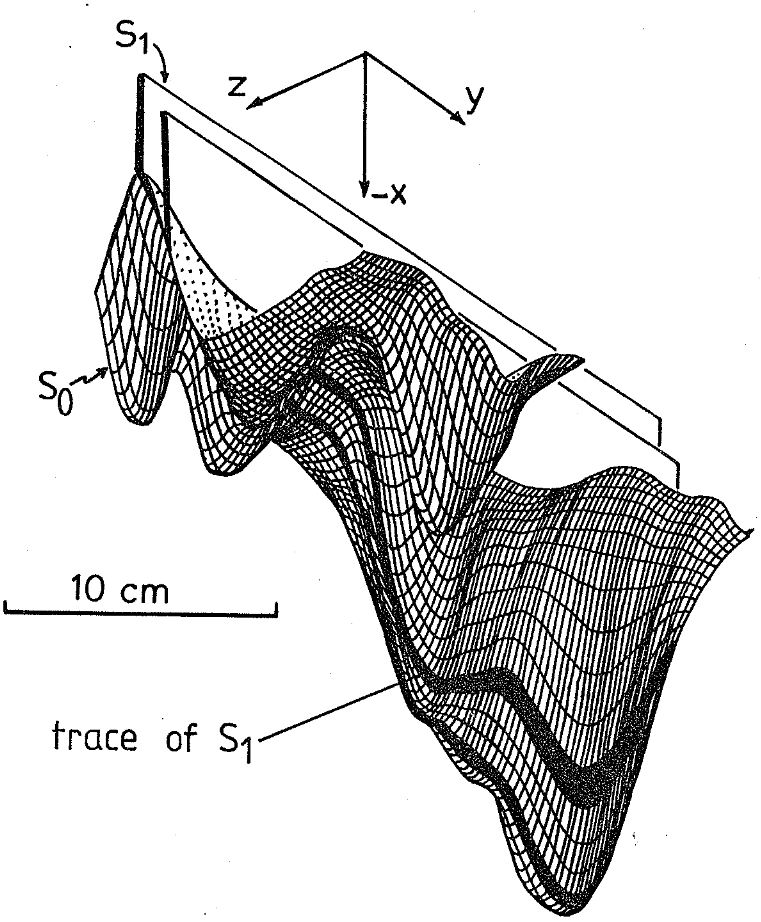


Figure 21

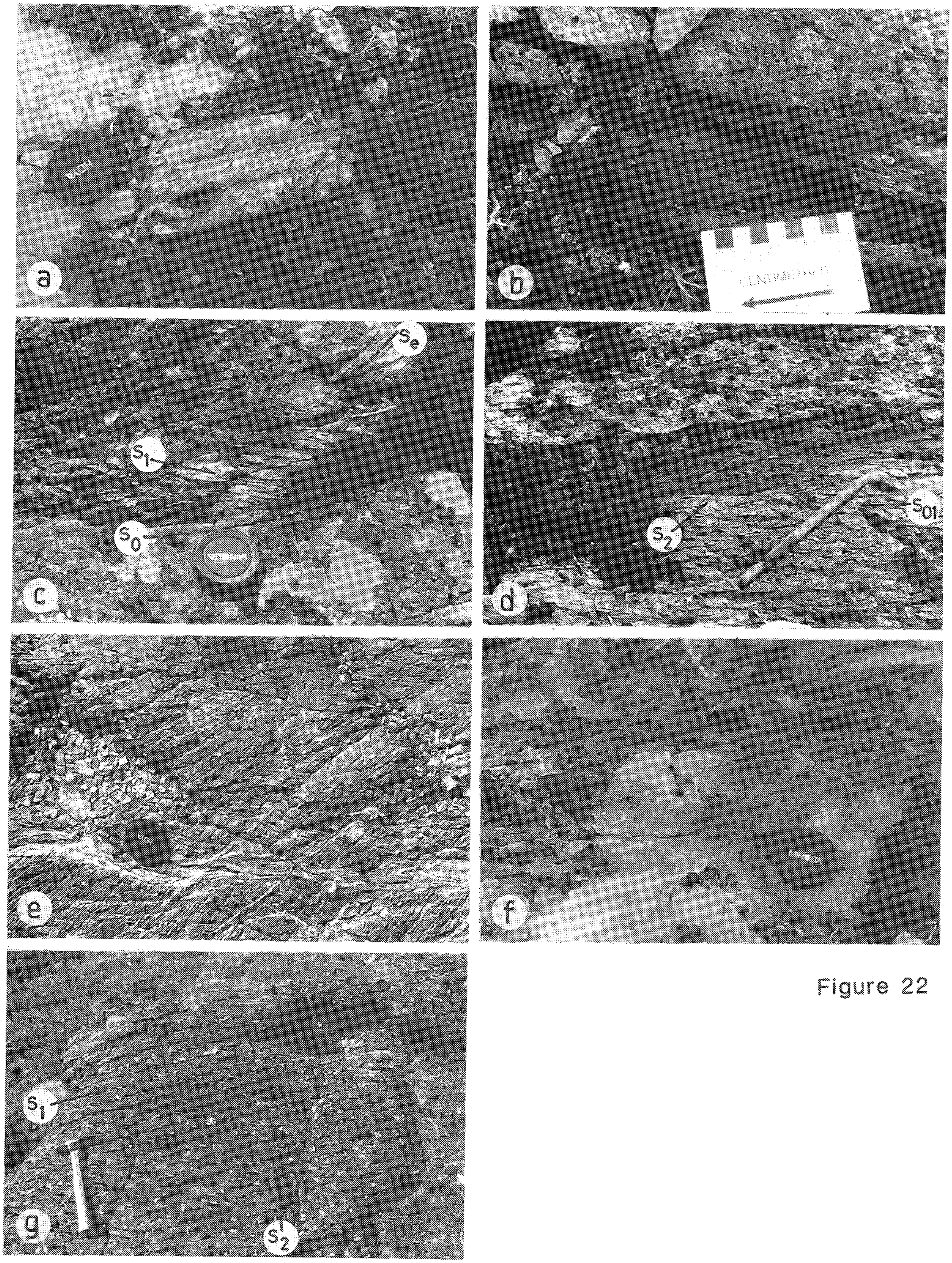


Figure 22

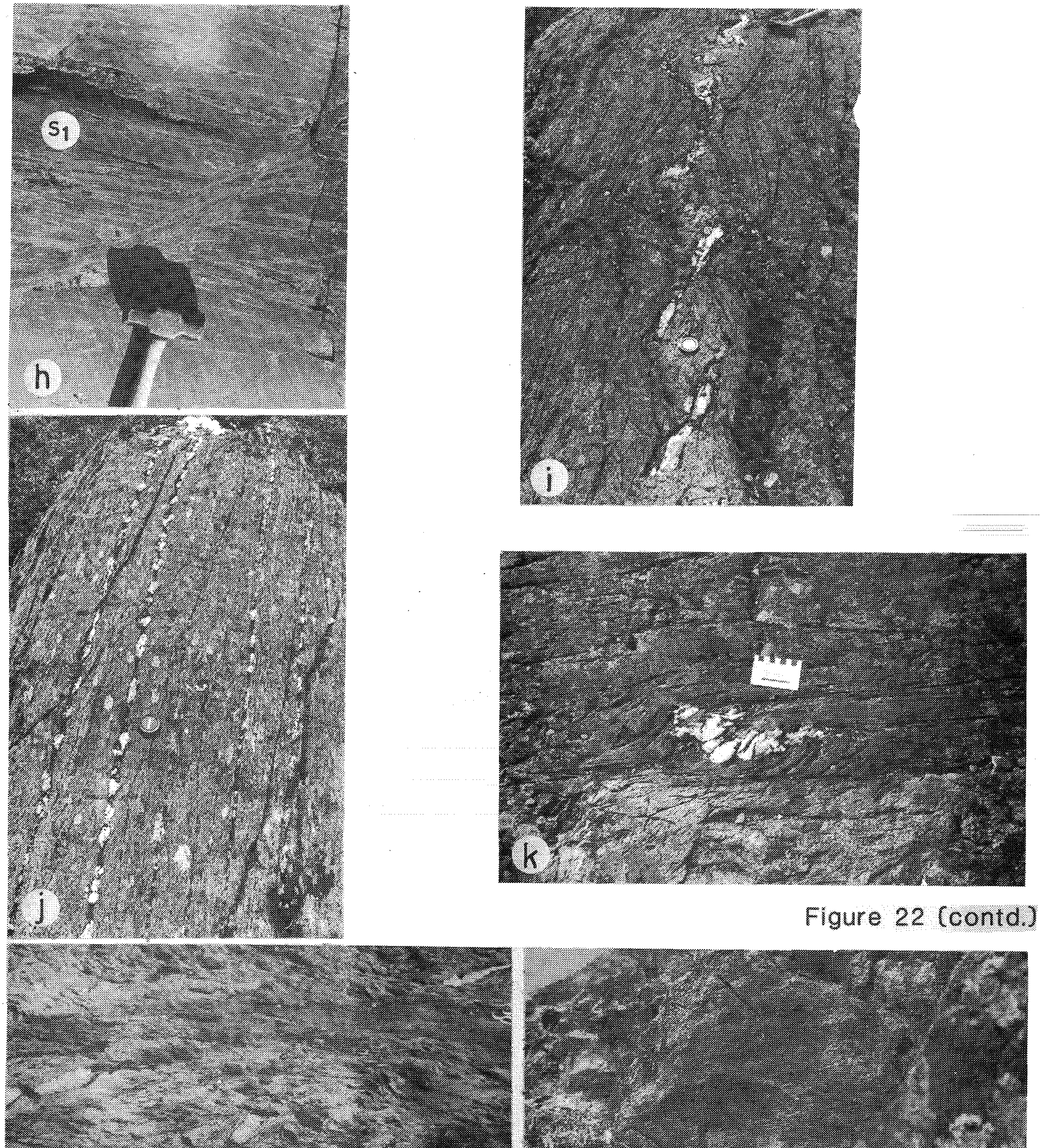
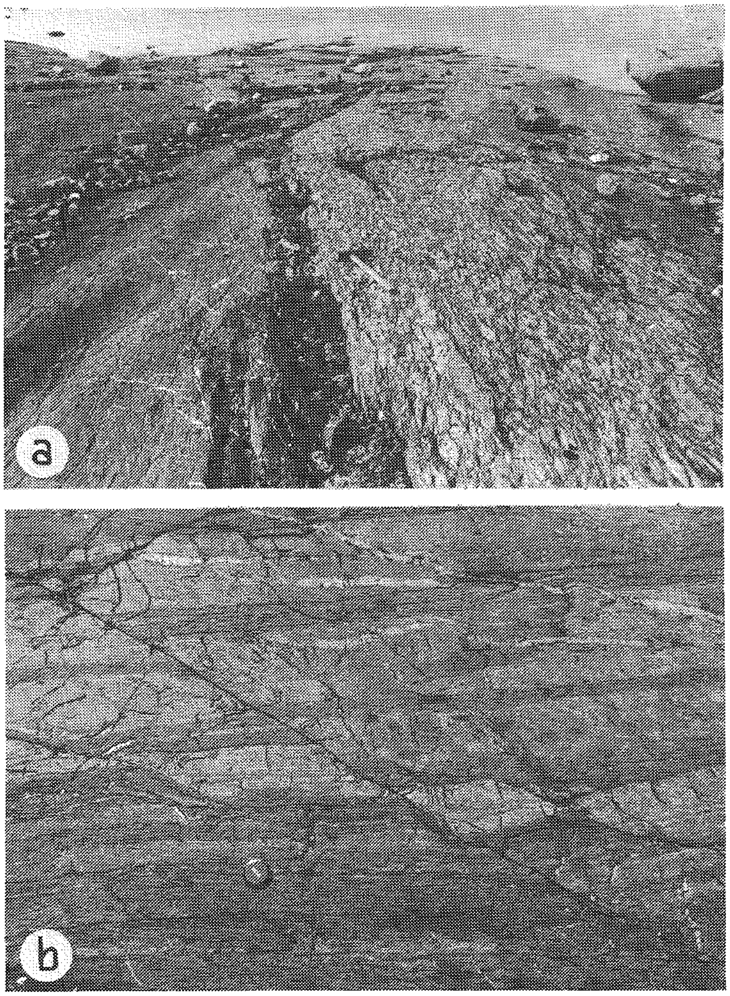


Figure 22 (contd.)



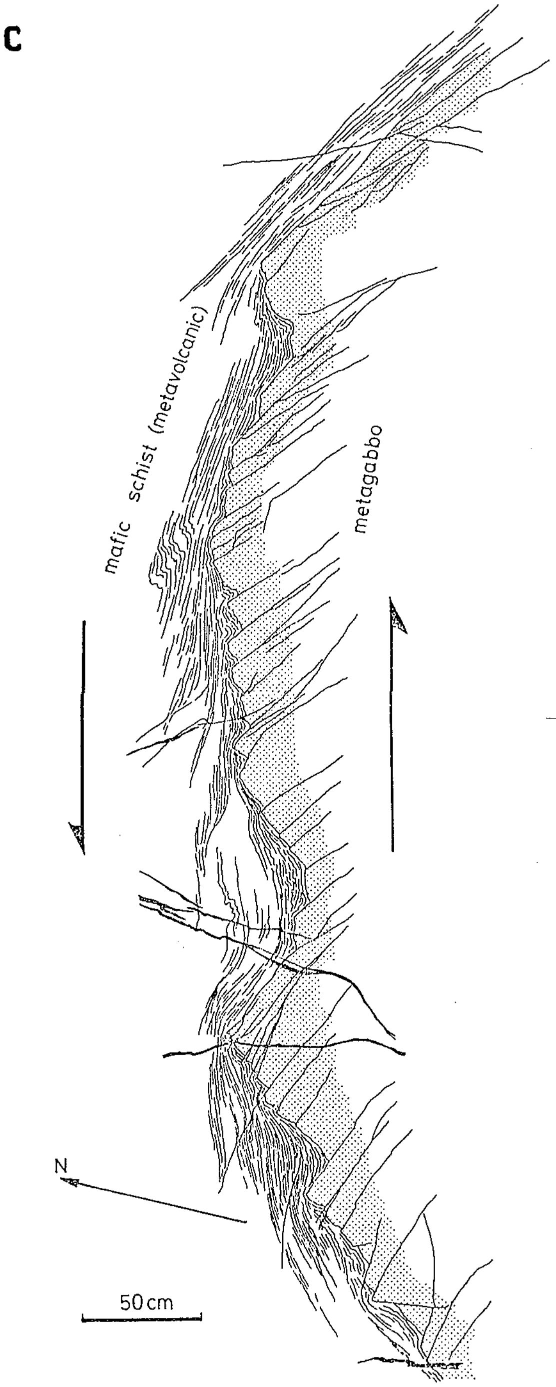


Figure 23

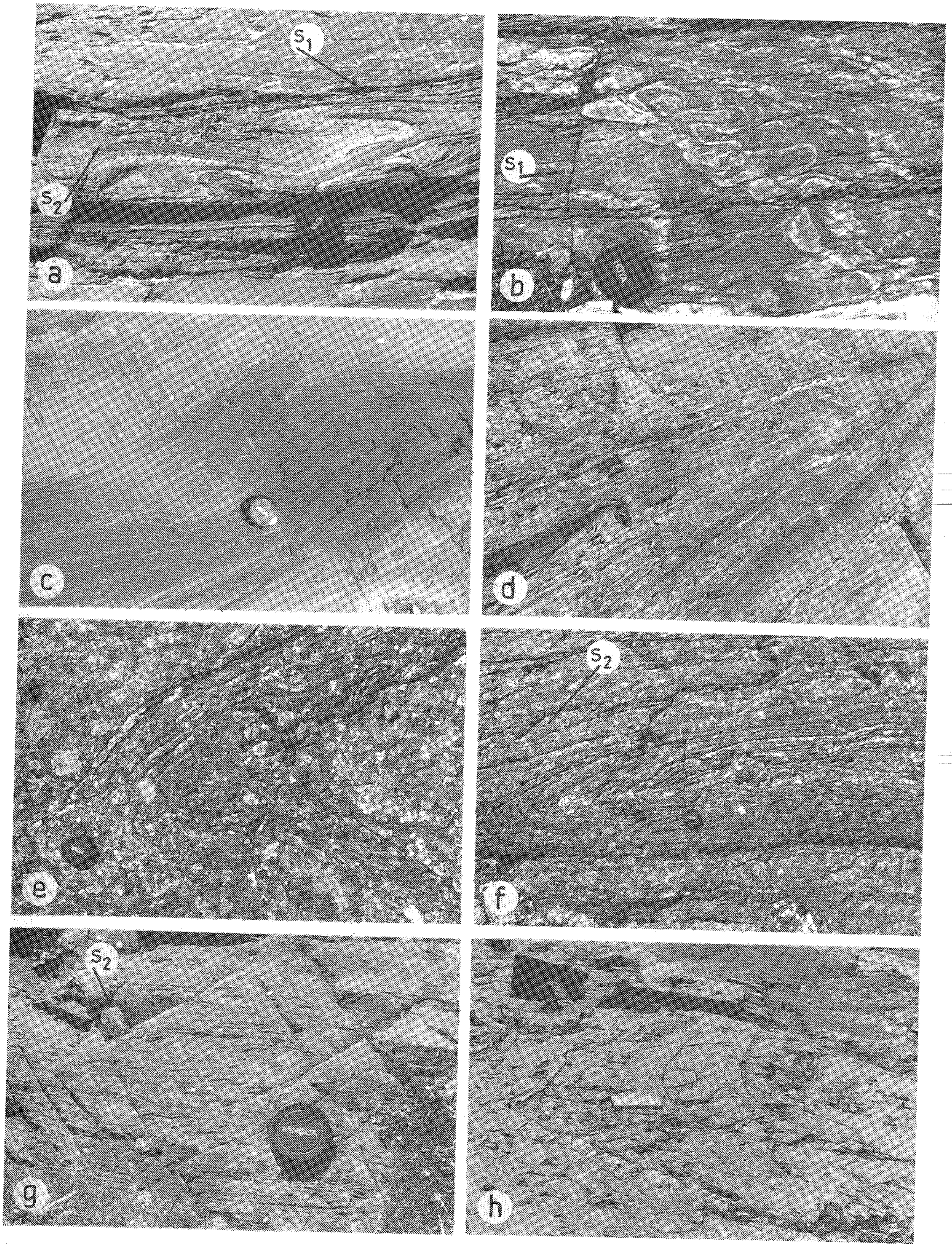


Figure 24

FIG. 25 PARK & RALSER

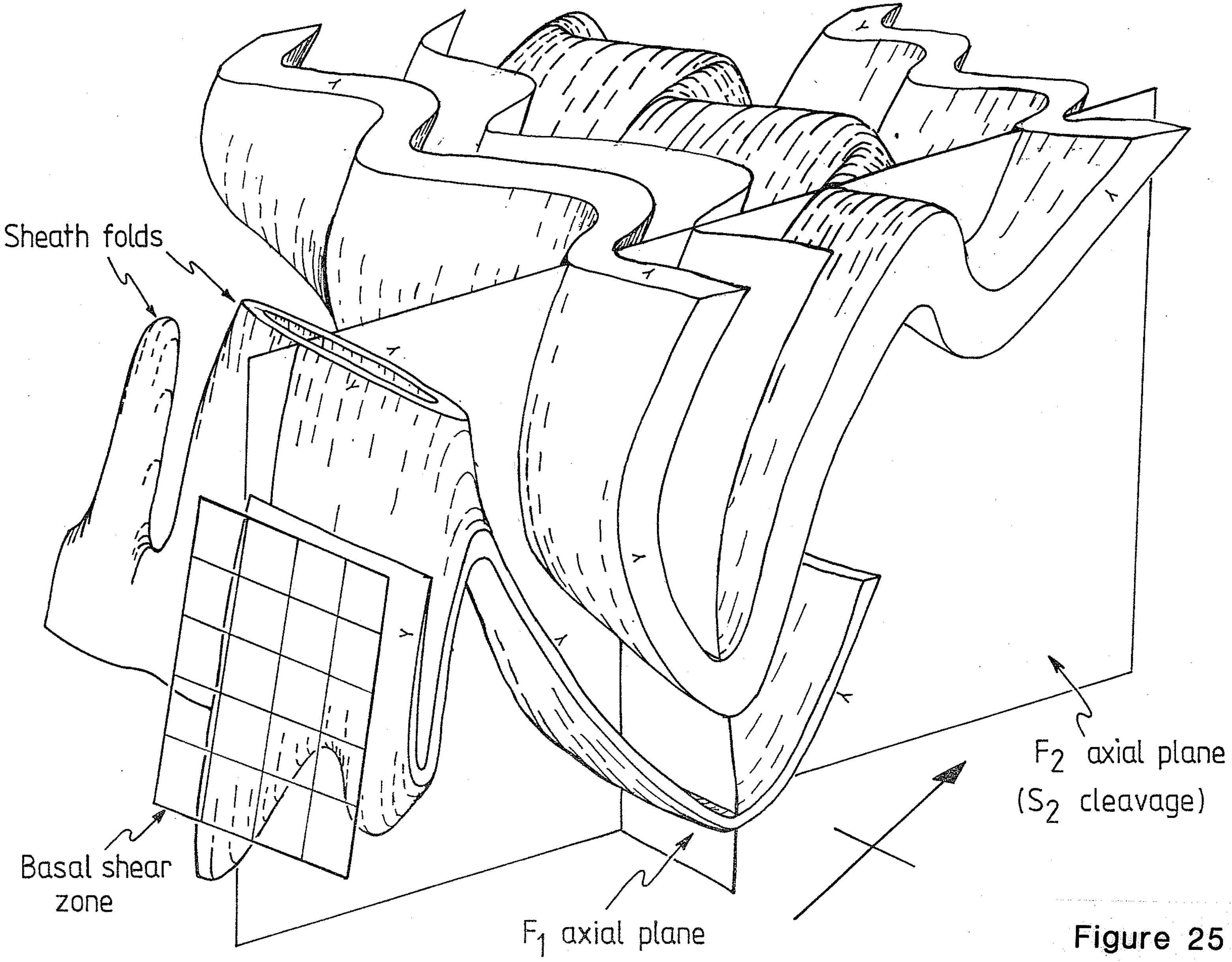


Figure 25

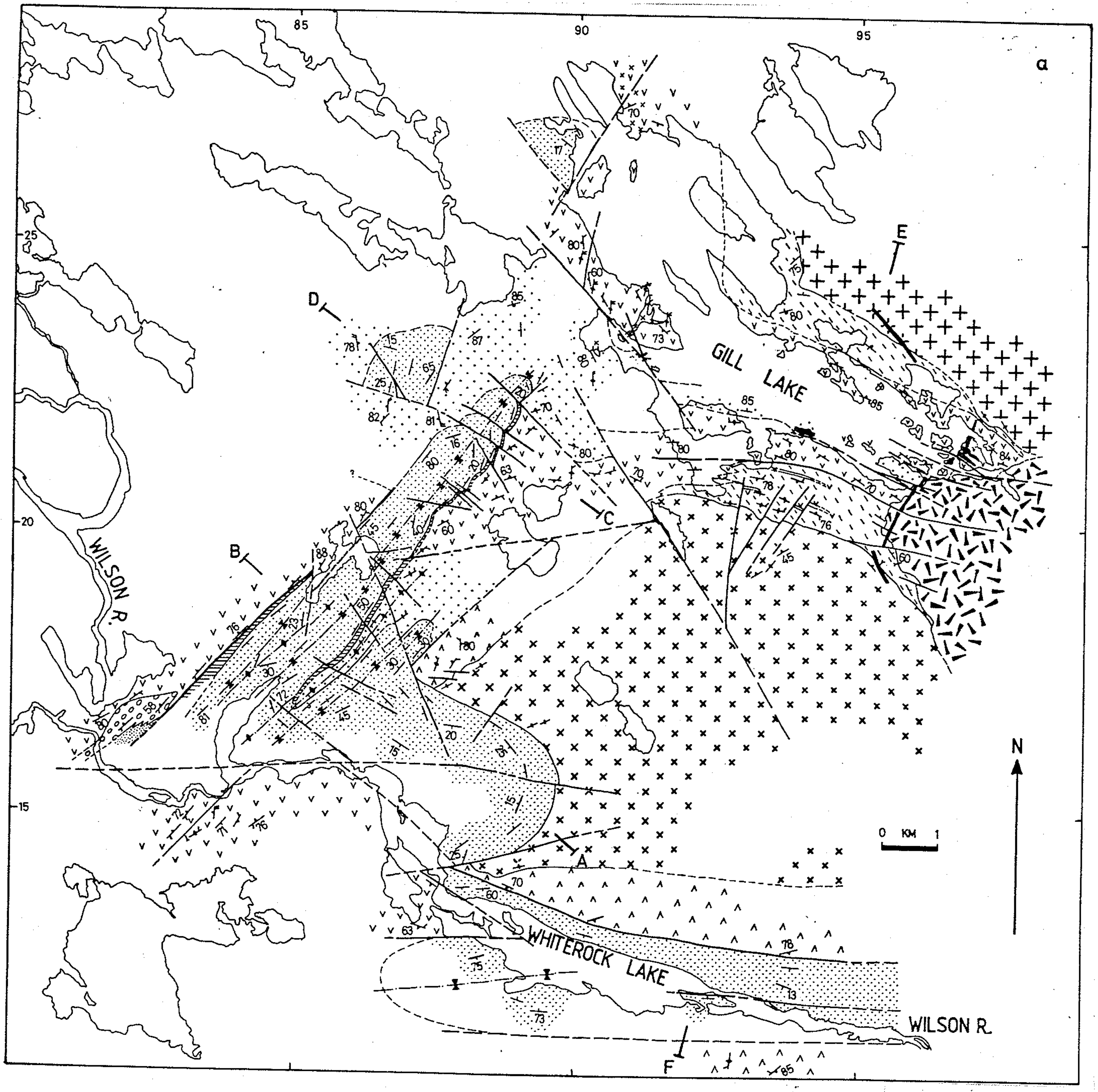
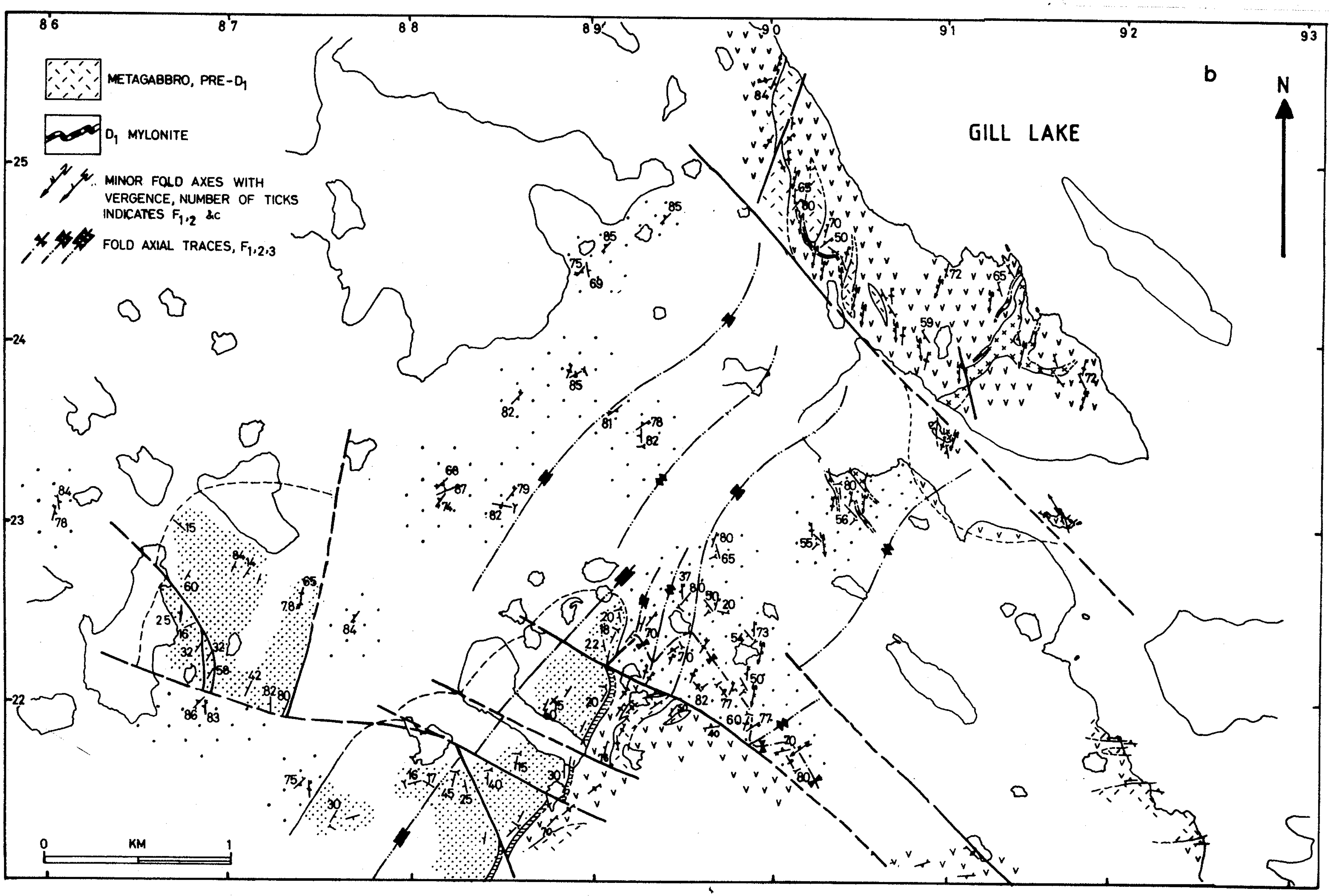

a
85
90
95
25
20
15
WILSON R.
WILSON R.
GILL LAKE
WHITEROCK LAKE
A
B
C
D
E
F
N
0 KM 1

Figure 26

Figure 26 (contd.)



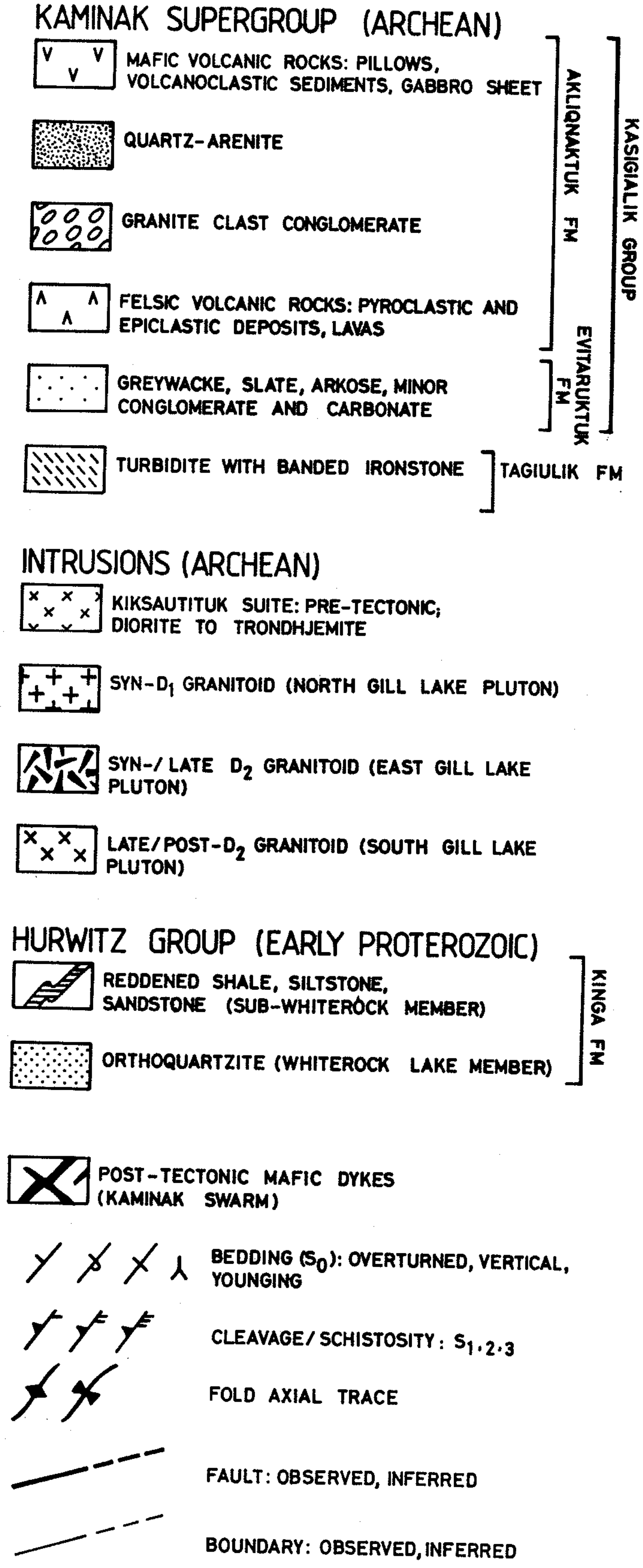


Figure 26 (contd.)

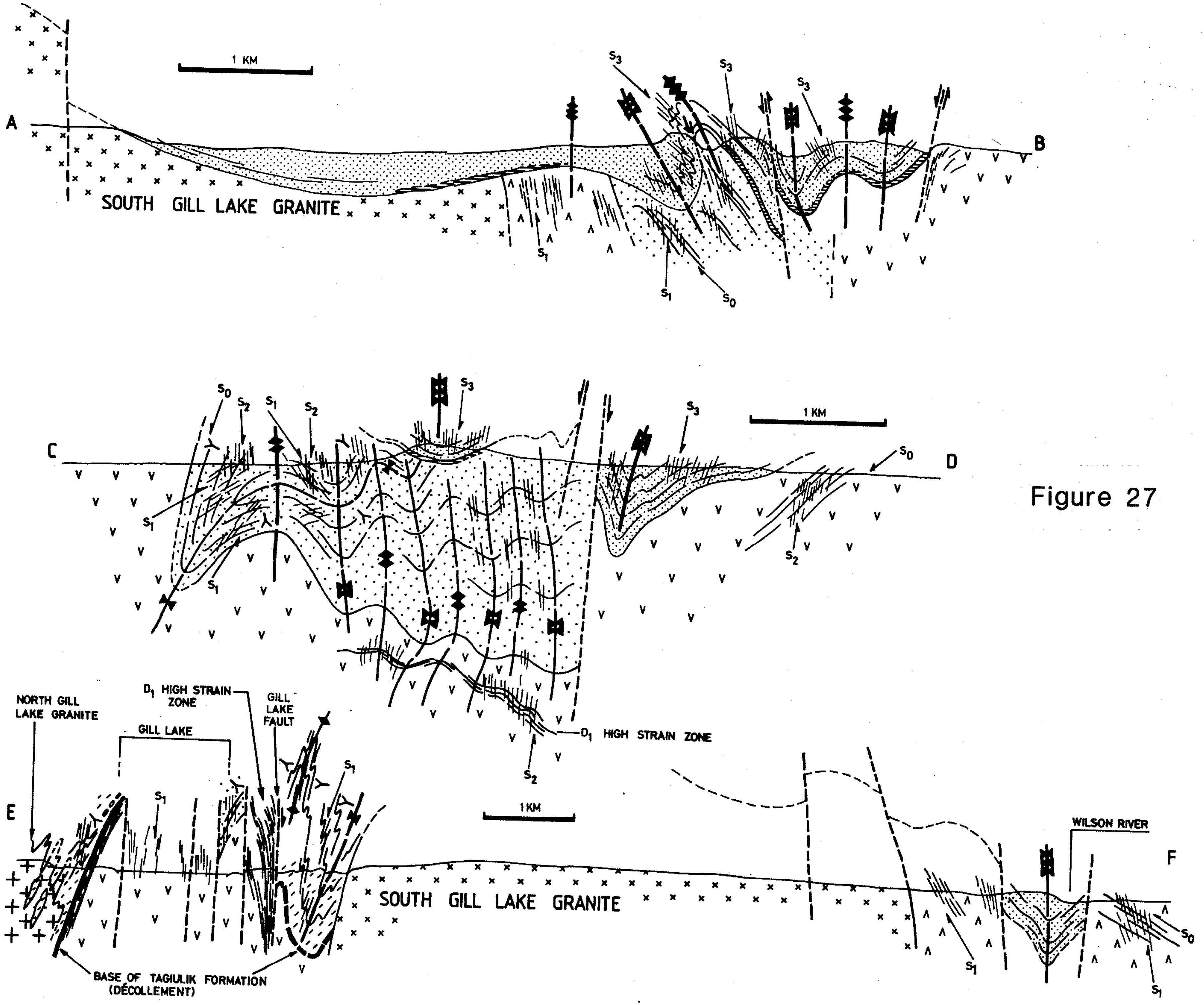

1 KM
A
B
SOUTH GILL LAKE GRANITE
S3
S3
S3
S1
S1
S0
1 KM
C
D
S0
S2
S1
S2
S3
S3
S0
S1
S1
S2
D1 HIGH STRAIN ZONE
S2
NORTH GILL LAKE GRANITE
D1 HIGH STRAIN ZONE
GILL LAKE
GILL LAKE FAULT
S1
S1
E
1 KM
WILSON RIVER
F
SOUTH GILL LAKE GRANITE
BASE OF TAGIULIK FORMATION (DÉCOLLEMENT)
S1
S0
S1

Figure 27

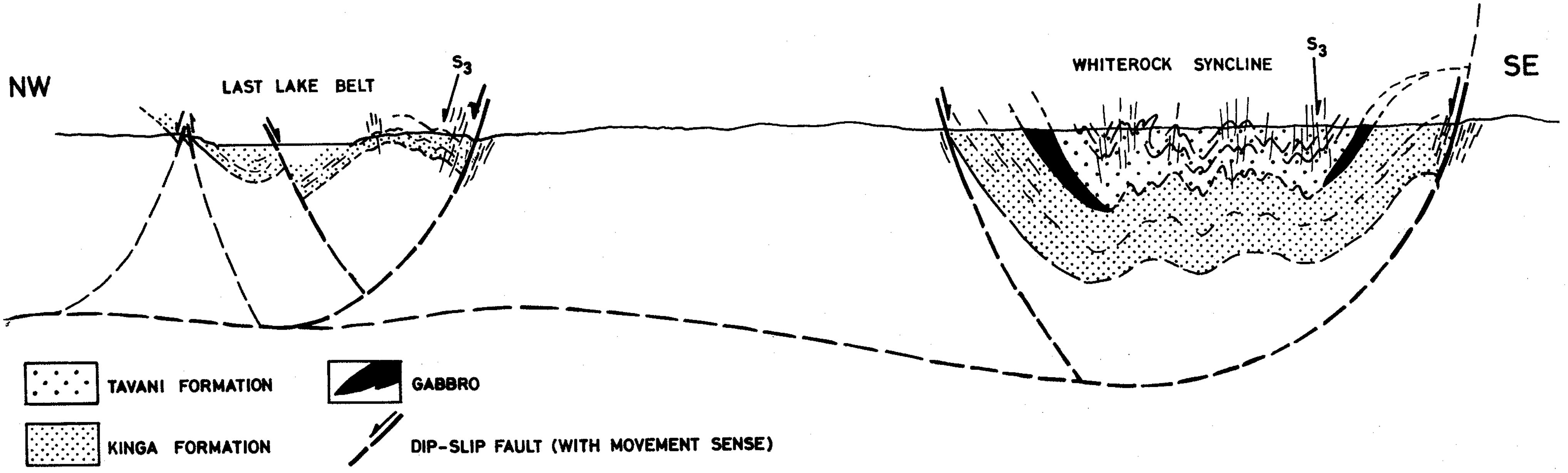

NW
LAST LAKE BELT
S_3
WHITEROCK SYNCLINE
S_3
SE
TAVANI FORMATION
GABBRO
KINGA FORMATION
DIP-SLIP FAULT (WITH MOVEMENT SENSE)

Figure 28

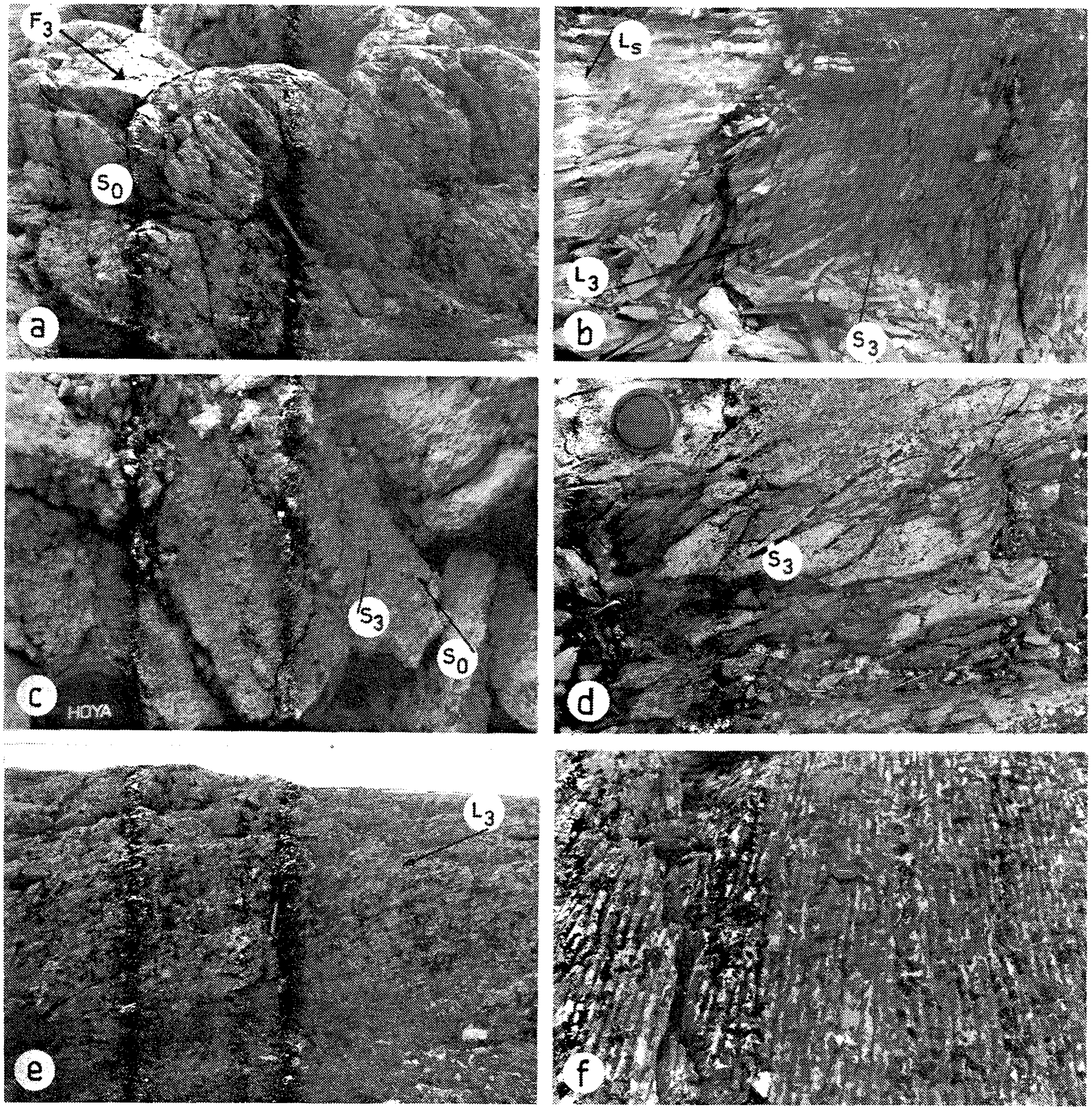


Figure 29

Figure 30

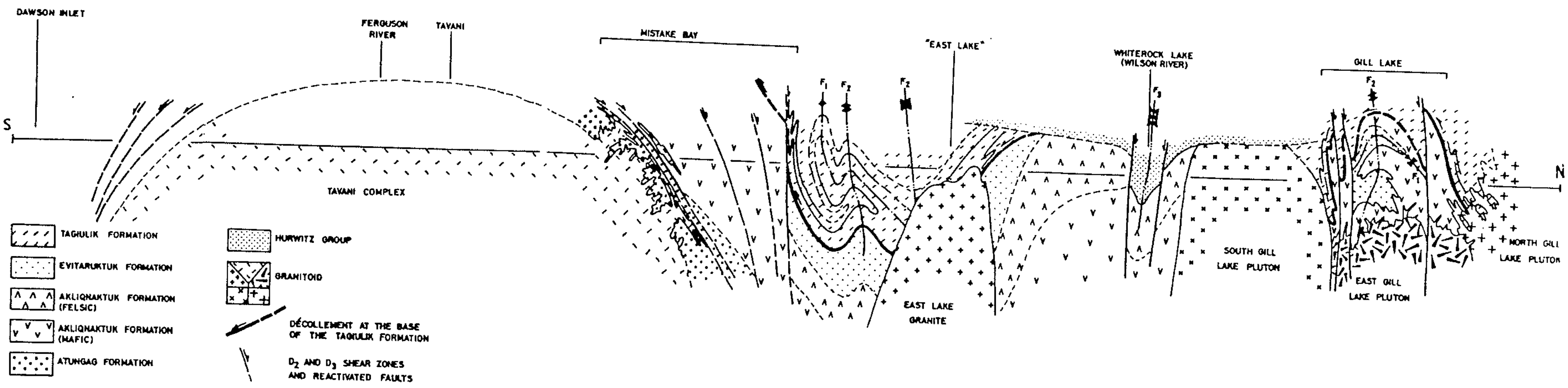
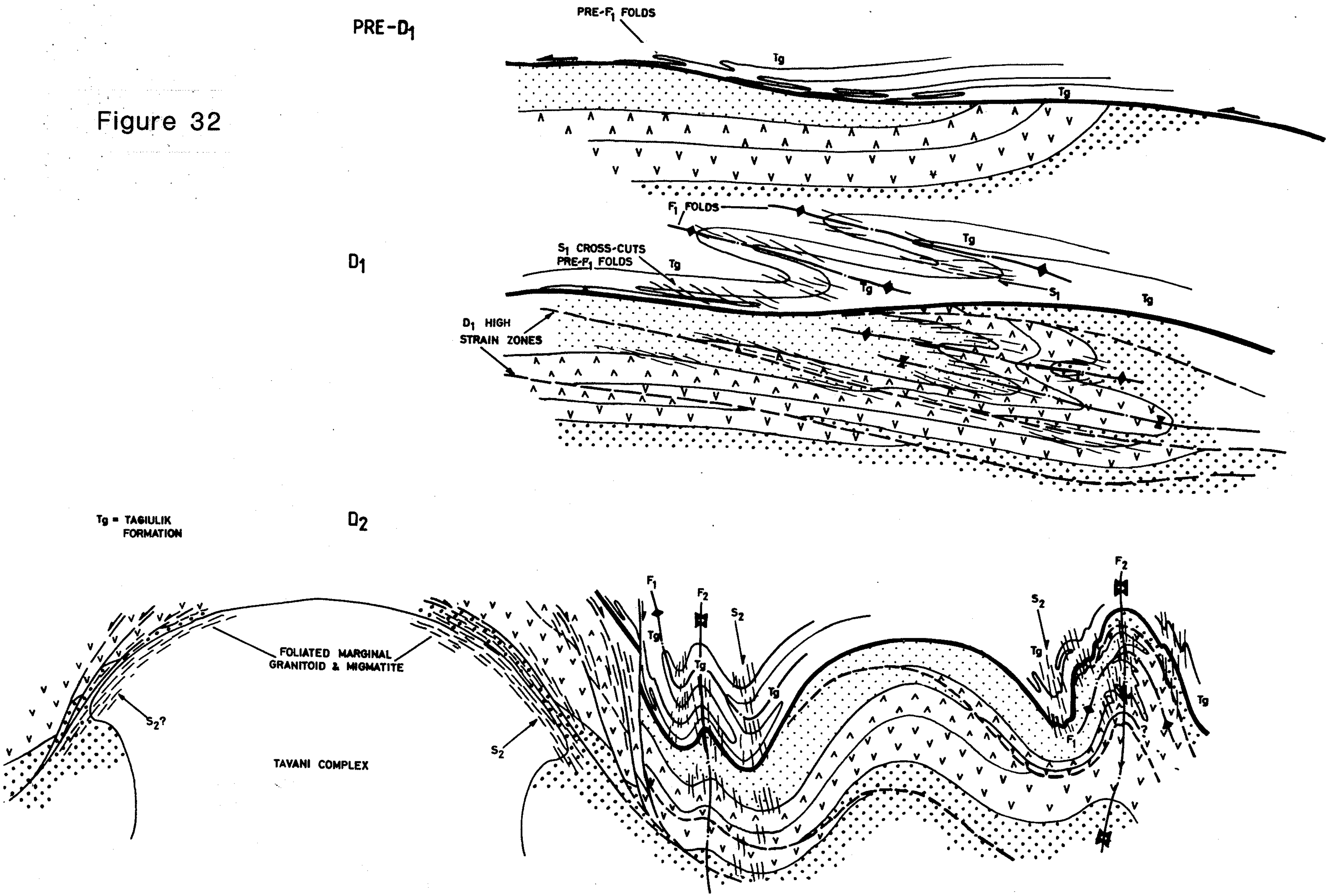
DAWSON INLET
FERGUSON RIVER
TAVANI
MISTAKE BAY
"EAST LAKE"
WHITEROCK LAKE (WILSON RIVER)
GILL LAKE
S
N
F1
F2
F3
TAVANI COMPLEX
EAST LAKE GRANITE
SOUTH GILL LAKE PLUTON
EAST GILL LAKE PLUTON
NORTH GILL LAKE PLUTON
TAGIULIK FORMATION
EVITARUKTUK FORMATION
AKLIQNAKTUK FORMATION (FELSIC)
AKLIQNAKTUK FORMATION (MAFIC)
ATUNGAQ FORMATION
HURWITZ GROUP
GRANITOID
DÉCOLLEMENT AT THE BASE OF THE TAGIULIK FORMATION
D2 AND D3 SHEAR ZONES AND REACTIVATED FAULTS

Figure 31

Figure 32


PRE-D$_1$
PRE-F$_1$ FOLDS
Tg
Tg
D$_1$
F$_1$ FOLDS
Tg
S$_1$ CROSS-CUTS PRE-F$_1$ FOLDS
Tg
Tg
S$_1$
Tg
D$_1$ HIGH STRAIN ZONES
Tg = TAGIULIK FORMATION
D$_2$
F$_1$
F$_2$
S$_2$
Tg
Tg
Tg
F$_2$
S$_2$
Tg
Tg
F$_1$
?
FOLIATED MARGINAL GRANITOID & MIGMATITE
S$_2$?
S$_2$
TAVANI COMPLEX

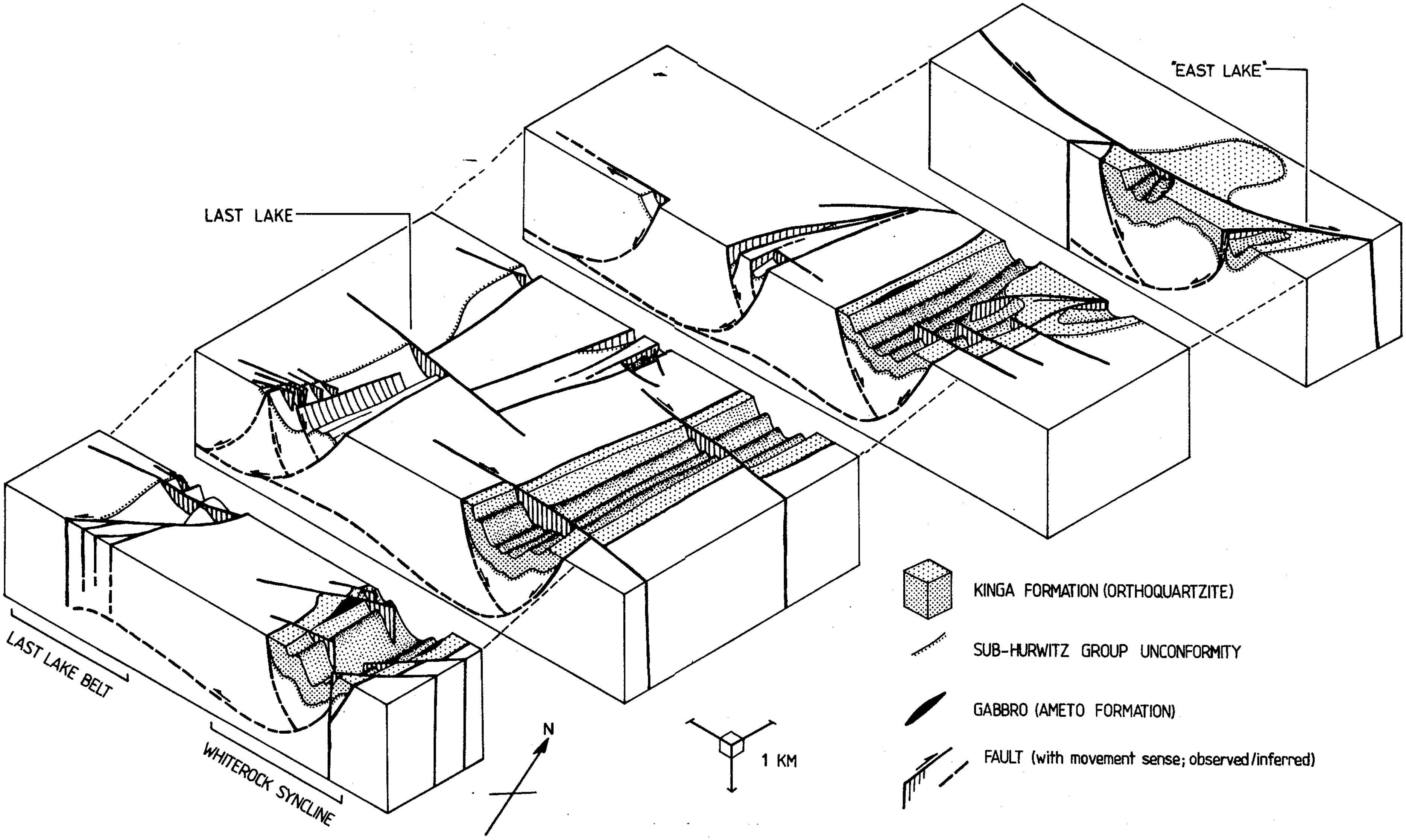

"EAST LAKE"
LAST LAKE
LAST LAKE BELT
WHITEROCK SYNCLINE
N
1 KM
KINGA FORMATION (ORTHOQUARTZITE)
SUB-HURWITZ GROUP UNCONFORMITY
GABBRO (AMETO FORMATION)
FAULT (with movement sense; observed/inferred)

Figure 33