

## 7. The structure of the granitic rocks of the Little Mt Horror area

P.W. Baillie

The area mapped consists of a 58 km<sup>2</sup> (28 square miles) area whose southern boundary is 6.4 km (4 miles) north of Winnaleah. Access is gained from the N-S trending Winnaleah-Tomahawk road and from several small good-weather tracks that branch from it. Banca is 14.5 km (9 miles) by road from Winnaleah.

The main purpose of the study was to determine the form of the mass of fine-grained granite that occurs in an area consisting predominantly of porphyritic biotite granite/adamellite. This was completed by the author in four field weeks during the period 22 June - 31 July 1970; the map (fig. 6) is a combination of this work with previous work by D.I. Groves and G.P. Pike. Wherever possible the contact was walked, and the boundary plotted on a 1:31,680 contour map. Other boundaries were generally plotted from interpretation of aerial photographs with some ground control.

## STRATIGRAPHY

## Mathinna Beds

The oldest rocks exposed in the area are contact metamorphosed arenites, that are strongly folded with near vertical dips and a general NNW strike. They are poorly exposed and generally occur as angular blocks in a shallow clayey soil that contains many sand and pebble grade particles of quartz derived from the sedimentary rocks and cross-cutting quartz veins.

## Tertiary

Tertiary sediments crop out over about one-quarter of the mapped area and form low rounded hills and button grass plains. Soils are usually thin with many quartz pebbles and boulders lying on the surface.

Jack (1968) reports a maximum thickness of 3 m at Banca tin mine but with an average depth of 1-1.3 m. This is quite thin for north-east Tasmania and is probably thicker in other parts of the mapped area.

Silicified sandstone of probable Tertiary age was found at [690457]\*. This appears to be similar to clinker as reported by Warin and Appleby (1964). In this section (70-86) it consists of quartz grains (average sphericity 7, roundness 4) of average diameter 0.15 mm associated with minor grains of sericite, biotite and apatite. The matrix occupies 10% of the volume of the rock.

The Tertiary deposits fill depressions in the bedrock surface and are therefore variable in thickness.

## Quaternary

Sands and alluvium of Quaternary age occupy the valleys of the two present river systems i.e. the Tomahawk and Boobyalla rivers. Soils are thin and black due to the organic matter derived from the dominant button grass vegetation. Relief over such deposits is subdued with gentle slopes and poor drainage.

\* All localities lie within the 100-kiloyard grid square 59. zone 7.

## Devonian

The granitic rocks of the mapped area form part of the Blue Tier Batholith of north-east Tasmania that has been isotopically dated as Upper Devonian by McDougall and Leggo (1965). The granitic rocks are predominantly porphyritic biotite granites and adamellites that are intruded by finer grained biotite-muscovite granites and adamellites.

*Porphyritic Biotite Granite/Adamellite*

This granitic rock is easily identifiable in the field due to its usually highly weathered state. It crops out as rounded boulders with lumpy surfaces caused by differential weathering of the K-feldspar phenocrysts. Relatively fresh material could only be obtained from road cuttings.

In hand specimen the rock is light pinkish to grey in colour and is coarse-grained holocrystalline with phenocrysts of K-feldspar averaging about 10% by volume of the rock. Average dimensions of the phenocrysts are 25 x 20 x 15 mm. X-ray diffraction of the phenocrysts indicates that they are orthoclase (D.I. Groves pers. comm.). A large phenocryst (e.g. 70-77) typically contains inclusions of euhedral-subhedral biotite up to a maximum size of 0.2 x 1.0 mm; subhedral-anhedral albite up to a maximum size of 0.3 x 1.0 mm and quartz. Many of the quartz grains (0.1 mm) are arranged in rows showing that they were included during a hiatus in the phenocryst growth. The inclusions commonly occupy about 10% of the phenocrysts which are generally single Carlsbad twins.

Thin section examinations of the non-porphyritic components of the porphyritic biotite granite/adamellite indicates that they are holocrystalline with a hypidiomorphic granular texture. The average grain size is 2 mm. Plagioclase is often zoned having a cloudy centre and showing undulose extinction. Where twinning and relief were observable the composition was shown to be albite/oligoclase.

A preliminary point count analysis was taken on three sections (70-75, 70-78, 70-89) that did not contain phenocrysts. Because of the cloudy nature and general lack of twinning on the plagioclase a staining method was used as described by Holmes (1921) and F.L. Sutherland (pers. comm.). The sections were first etched in hydrofluoric acid and then stained with sodium cobaltinitrite. The analysis was then made under reflected light.

The average composition obtained from the above analysis is:

Quartz	36%	Plagioclase	28.6%
K-feldspar	29.6%	Biotite	5.7%

If a K-feldspar phenocryst concentration of 10% is assumed the normal porphyritic biotite granite/adamellite would have a composition of:

Quartz	32%	Plagioclase	26%
K-feldspar	37%	Biotite	5%

This indicates that the rock has a marginal composition between granite and adamellite.

*Fine-grained Granite*

On petrographic grounds four rock types are recognised: aplite, biotite-muscovite granite, fine-grained biotite-muscovite adamellite and quartz porphyry.

The adamellite and quartz porphyry are the only types distinguished in the field. Due to the limited extent and weathered nature of the porphyry it was not examined in thin section. The fine-grained granite usually crops out as blocky, relatively fresh boulders. Occasional phenocrysts of K-feldspar are present. Whereas muscovite was not observed in the porphyritic adamellite it is almost ubiquitous in the fine-grained granite. Petrographic examination (e.g. 70-80, 70-84) shows the muscovite to occur as anhedral grains that formed prior to the crystallisation of quartz and as smaller irregular grains associated with biotite. Tourmaline often occurs as nodules up to 50 mm in diameter. It is mainly confined to aplite.

The four rock types are grouped on the map as 'fine-grained granite' since they could not always be readily distinguished in the field.

#### Aplite (70-73)

This is flesh-pink in colour and medium-grained. The rock has an even grain size, averaging 0.5 mm. Larger crystals of quartz up to 3 mm in diameter make up less than 1% of the rock.

A preliminary point count analysis shows the composition:

Quartz	56%	Plagioclase	7%
K-feldspar	36%	Muscovite	1%

The plagioclase composition based on albite twin extinction angles, negative relief and biaxial negative interference figure is that of albite-oligoclase.

The texture is allotriomorphic; myrmekitic intergrowth between quartz and feldspar is present in places.

#### Biotite-Muscovite Granite (70-84)

This is similar to aplite with respect to colour but has a different composition and a hypidiomorphic granular texture. The estimated composition is:

Quartz	40%	Plagioclase	12%
Orthoclase	35%	Biotite	10%
Muscovite	3%		

#### Biotite-Muscovite Adamellite (70-91)

This was only observed near the creek at [659493] where it crops out over a small area. In hand specimen the rock is fine-grained and medium grey in colour. It is the most mafic rock seen in the mass. Clusters of biotite 0.4 mm in diameter make up 2% of the rock, and phenocrysts of quartz (0.3 mm) and feldspar (10 mm in length) also occur. The groundmass is composed of even-grained quartz, K-feldspar, plagioclase, biotite and muscovite with an average grain size of 1 mm.

Petrographic examination shows that the rock has a hypidiomorphic granular texture and that there are two generations of both quartz and biotite. The plagioclase is oligoclase which is often zoned, having a cloudy centre. K-feldspar may have a myrmekitic contact with quartz.

The estimated composition based on both the hand specimen and thin section is:

Quartz	30%	K-feldspar	30%	Oligoclase	30%
Biotite	6%	Muscovite	2%	Magnetite	2%

*Nature of the granite/granite contact*

At most of the contacts observed an intermediate granite/adamellite occurs possibly resulting from reaction between the two partially solidified magmas. These intermediate types vary both in composition and thickness.

Specimen 70-81 is taken as an example. It is light grey in colour, fine-grained with a slightly porphyritic texture. Phenocrysts of both feldspar and quartz make up 5% by volume of the rock. The average grain size of the groundmass is 1 mm. The largest phenocryst observed was of K-feldspar and measured 25 x 12 mm. Quartz phenocrysts are usually c. 0.7 mm in diameter

In thin section the rock has a hypidiomorphic granular texture. K-feldspar shows simple Carlsbad twinning but plagioclase (oligoclase where determinable) shows albite, pericline and Carlsbad twinning or it may be untwinned. Zoning is common and the centre of the plagioclase is often cloudy due to alteration.

The estimated composition is:

Quartz	40%	Plagioclase	25%	Muscovite	2%
Orthoclase	25%	Biotite	8%		

The outcrop of this intermediate granite attains its greatest width at the south-east corner of the fine-grained mass where it is about 0.2 km wide. At other places [e.g. 673483] the contact is very sharp, the transition from fine-grained granite to porphyritic granite occurring within 3 m.

The contact is nearly flat from the northern central margin around the western flank to the southern central margin of the mass. The intermediate zone is about 3-9 m wide.

Regionally the fine-grained granite mass appears to be a flat sheet intruding porphyritic adamellite. The point of intrusion is near the southern margin of the fine-grained mass where the contact between the two types is almost vertical; from here the fine-grained granite spread out in tongue-like form to the north with nearly flat contacts.

The small mass of porphyritic adamellite observed on the top of Little Mt Horror suggests that this is the top of the intrusion giving a thickness of 100-120 m as the thickness of the fine-grained granite mass.

*Lamprophyre*

Lamprophyre crops out in three localities in the north-west section of the mapped area [623518, 619527, 617534]. These outcrops lie in a straight line suggesting that a dyke has been intruded after the last granite emplacement. The horizontal extremities could not be found but the dyke could not have a width greater than about 6 m. In all three localities the rock has exactly the same appearance: it was dark green when fresh but dark grey when weathered. Grain size was too fine to permit mineral determination.

Thin section 70-92 shows the rock to be porphyritic with a panidiomorphic granular texture. The dominant phenocrysts are orientated laths of albite up to 0.5 mm in length whose rims are often corroded due to reaction with the groundmass prior to solidification. Olivine also occurs as phenocrysts and shows wide reaction rims that consist of a dark brown glassy

material. The olivine is rarely enclosed in albite. Other minerals occurring as phenocrysts are lamprobolite and pyrite.

The phenocrysts occupy 25% of the rock and consist of albite 80%, olivine 15%, lamprobolite 4% and pyrite 1%.

The groundmass is extremely fine-grained and is made up largely of 10µm euhedral crystals of a faintly green mineral that probably has medium birefringence, high relief and parallel to nearly parallel extinction. This suggests an amphibole, possibly actinolite.

#### Tertiary

#### Basalt

A basalt flow overlies Tertiary sediments and in turn is overlain by later Tertiary sediments on a hill in the extreme central western portion of the mapped area.

Warin and Appleby (1964) report that basalts from nearby areas are of the alkali olivine type.

#### ACKNOWLEDGMENTS

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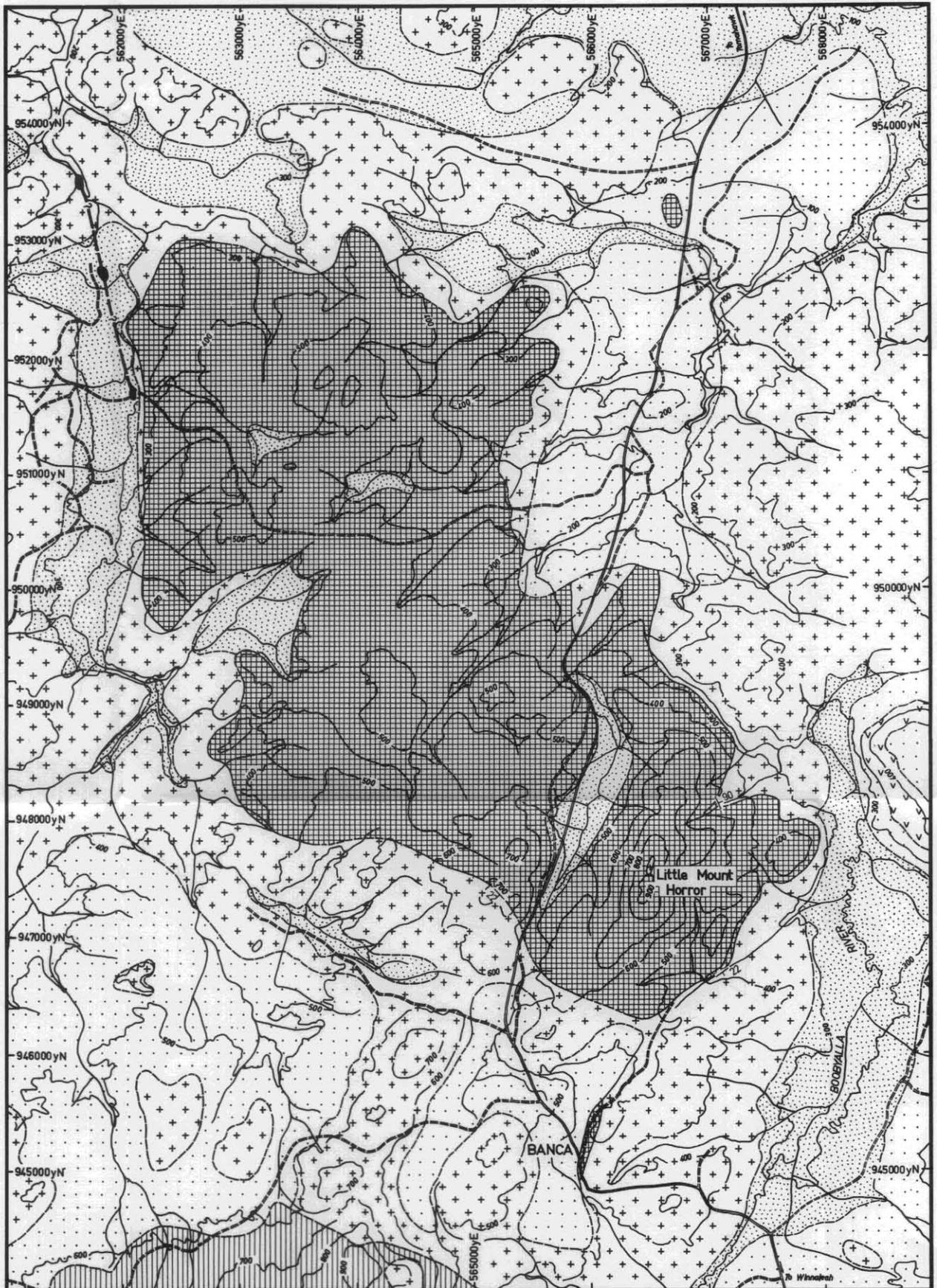
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#### Interpretation

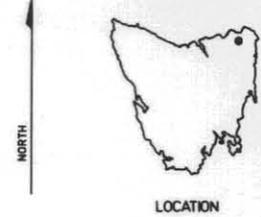
Lampyrite crops out in three localities in the north-west section of the mapped area (Fig. 1). These outcrops lie in a straight line suggesting that a dyke has been intruded after the last granite emplacement. The horizontal extent of the dyke could not be determined. In all three localities the rock has a width greater than about 5 m. It was dark green when fresh but dark grey when weathered. Grain size was too fine to permit mineral determination.

This section 70-92 shows the rock to be porphyritic with a granitic texture. The dominant phenocrysts are orientated along a line up to 0.5 mm in length which are often corroded due to reaction with the groundmass prior to crystallisation. Olivine also occurs as phenocrysts and shows wide reaction rims that consist of a dark brown glassy



- QUATERNARY** River alluvium and sands
- TERTIARY** Gravels and sands  
 Basalt
- DEVONIAN** Lamprophyre  
 Granite, aplite, quartz porphyry and fine grained biotite adamellite  
 Porphyritic adamellite
- SILURO-DEVONIAN** Mathinna Beds
- Geological boundary - observed  
 - - - Geological boundary - approximate
- 100— Contour interval 100 feet  
 - .22 Dip and strike of granite contact

### GEOLOGY LITTLE MT HORROR AREA



Geologists : P. BAILLIE and D.I. GROVES  
 Draughtsman : T.R. BELLIS  
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Figure 6.

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