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Tin mineralisation in the Blue Tier Region, N.E. Tasmania

by G. Urquhart

Eleven reports, written by different authors between the years 1886 and 1943, describe tin mineralisation in the Blue Tier region of north-eastern Tasmania. The bulletin by Reid and Henderson (1928), and the report by Thomas (1943) together give a comprehensive account of the physical, general and economic geology, and also describe the twenty-five mining properties which constituted the known primary cassiterite deposits contained in an area of twenty square miles.

Summarising their work, it may be said that the Blue Tier forms an undulating granite plateau at an altitude of about 2500 feet, and having a relief in the order of 100 feet. Thirteen of the mines were situated on or near the plateau surface; the remaining twelve tin deposits were mined on the steep dissected flanks of the Blue Tier at varying altitudes down to 800 feet.

GEOLOGY

Two granitic rocks are present on the Blue Tier, each having a characteristic type of associated ore deposit.

Porphyritic granite and associated aplite and pegmatite

These rocks are not tin bearing but are intruded by, or have formed within them, quartz, quartz-mica, greisen, aplite and pegmatite veins of a later generation which may be tin bearing.

Quartz and quartz-greisen lodes in porphyritic granite, which have been worked in the past, can be considered under the following classes:

(a) A series of parallel veins;

(b) Intersecting systems of veins;

(c) Bulges on greisen veins;

(d) Quartz veins.

The quartz lodes may be fissure fillings but the quartz-mica greisen lodes appear to be of replacement origin.

Tin granite

This granite intrudes the porphyritic granite although the field relationships proving this are difficult to establish at the present day. It is much finer grained than the porphyritic granite and in places more altered, especially where associated with tin.

By far the majority of the deposits are in tin granite, the tin occurring as:

(a) Seams, which in places are thin and nearly vertical.

(b) As disseminations in the rock; very often in flat floors, or formed beneath flat-lying bodies of porphyritic granite.

(c) Greisen-quartz veins which are tin bearing and cut indiscriminately through the two granite types.

Generally the tin-bearing portions, because of the pneumatolytic and hydrothermal reactions associated with the introduction of tin, are contained in altered greisen granite which may or may not be softer than the barren portions. Most of the tin enrichments were discovered during sluicing operations of detrital deposits which revealed the susceptibly weathering underlying greisen zones.

Much of the bedrock in the area is not exposed, and it is quite conceivable that mineralised zones are hidden by the thin soil cover, or that in exposed areas of tin granite the tin-bearing greisen zones may not reach the surface.

The sequence of events affecting tin deposition may be simply stated as follows:

1. Intrusion of porphyritic granite which is not tin bearing.
2. Intrusion of tin granite into the porphyritic granite with a pneumatolytic phase attending the introduction of tin into both rock types.

MINERALOGY OF THE DEPOSITS

The only metal of commercial importance in the region is cassiterite. Scattered sulphides associated with tin consist mainly of molybdenite, chalcopyrite or bornite (Anchor mine), but only in small amount, probably less than two per cent. Introduced or altered non-metallic minerals consist in places of topaz, pinite, fluorspar, apatite, chlorite, talc and sericite.

Anchor Mine.

The following statement on tin mineralisation at the Anchor mine has been compiled after referring to the logs of twelve diamond drill holes submitted to the Department of Mines by the Aberfoyle Tin Development Partnership (fig. 1).

Mineralisation is of the 'floor' type, with cassiterite concentration being virtually confined to the tin granite rock unit.

The tin enrichments in altered rock exist at depths as much as 90 feet below a sub-horizontal contact of the finer grained tin granite with the overlying porphyritic granite. The detailed logging of the cores by Dr R. G. Taylor is notable for showing that tin is concentrated (maximum value recorded = 3.98% Sn over 5 feet) in zones of altered tin granite.

Alteration of the host rock encompasses a range from relatively unaltered fine-grained tin granite, through granite/greisen to greisen, in which alteration has been most intense and has resulted in the elimination of the feldspar constituent and increase in biotite content in places.

The enrichment in cassiterite is a function of the degree of alteration in the host rock, the relationship being very clearly borne out by the correlation of assay results with rock types in drill holes 6, 7 and 9. In these holes higher tin values are almost restricted to greisen zones, of which there may be a number, separated by bands of leaner granite/greisen or other rock types.

Chalcopyrite, and to a lesser extent bornite, are the sulphide minerals most consistently associated with the mineralised zones, although in small amounts. Molybdenite and fluorite are distributed more sporadically through the core sections.

CONTACT RELATIONSHIPS OF ROCK TYPES IN THE CORE

Contacts between coarse grained (porphyritic) granite and tin granite are not preserved. The fine grained granite is invariably altered to greisen or granite/greisen and the contact with the coarse grained granite, although diffuse, may yet be sharp and marked in places by a concentration of biotite on either side of the contact. In several intersections of the transition zone between these rock types in drill hole 7, the coarse grained granite becomes increasingly pink over the last few feet and shows a corresponding loss of biotite near the contact. This 'pinking' and loss of biotite is also recorded in coarse grained granite near a pegmatite contact (drill hole 6).

A pegmatite band, a foot thick or less, separates the coarse grained granite from greisenised rock in drill holes 6, 9, 10 and 12. The boundaries may be gradational, or diffuse but nevertheless sharp. In drill hole 6 a feldspar crystal in the pegmatite penetrates the contact with granite/greisen. A number of pegmatites show compositional banding (e.g. drill hole 6, 86'–86'6"), or an enrichment in biotite on either side of a particular contact (e.g. drill hole 12, 76'6"–78'3"). These modes of occurrence are taken to indicate that some of the pegmatites at least may be formed by metasomatic alteration, rather than by dilation or metamorphic segregation.

The change from granite into greisen is shown to be gradational in many sections of core.

Coarse grained (porphyritic) granite is relatively unaltered in much of the core, except near the margins with fine grained greisenised granite. The conclusion therefore is that it is the earlier granite, affected either by the emplacement of tin granite or by pneumatolysis at a later stage.

The optimum tin assays of the twelve diamond drill hole cores are shown below:

Drill hole	*Width (ft)*	*Grade (%Sn)*	
1	9	0.84	
2	3	0.29	
3	6	0.60	
4	3	0.50	
5	-	Trace	
6	5	1.15	
	10	0.84	
7	5	1.27	) consecutive
	5	3.98	) widths
	5	0.44	)
8	-	Trace	
9	10	1.69	
10	10	2.13	
11	5	0.57	
12	10	1.44	

CONCLUSIONS

The concentration of tin in the Anchor mine area, indicated by the assays, warrants the geological search for similar granite structures elsewhere, i.e. flat-lying bodies of tin granite beneath a cover of porphyritic granite. Such a structure is known to exist in the Don mine, but mapping and exploration of the dissected southern flank of the Blue Tier along the contact of the two granites may reveal structures favourable for the finding of a new deposit.

REID, A. M.; HENDERSON, Q. J. 1928. Blue Tier Tin Field. *Bulletin Geological Survey Tasmania* 38.

THOMAS, D. 1943. Tin deposits of the Blue Tier district. *Unpublished Report Department of Mines Tasmania* 1943:35–73.

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ANCHOR MINE — DRILLING GRID