

THE FURNEAUX GROUP OF ISLANDS.By F. Blake.CONTENTS.

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THE FURNEAUX GROUP OF ISLANDS

I. INTRODUCTION

(1) Preliminary Statement.

Flinders and Cape Barren Islands have been steady, though small, contributors to the tin output of this State over a period of 45 years. During this time no outstanding mining events have taken place and the development has proved to be of slow progression. No large mines are in existence and mining generally has been confined to the winning of alluvial tin on a small scale.

Flinders Island is better known for the splendid grazing areas along the west coast belt, which are so suitable for dairy-farming, and cattle and sheep raising.

(2) General Statement.

The field work in the Furneaux Group was carried out during the period between the 6th May and 29th June, 1935.

The time available was not enough to allow of a thorough geological survey of the whole district, but attention was given to detail in the more important parts.

Two geological maps, covering over 1,000 square miles of country, have been compiled to illustrate the geological relations of the rock formations. The mapping was accomplished with the aid of the mineral and land charts of Flinders Island North, Flinders Island South, and Cape Barren Island. The topographical features were altered and added to in several instances. Hill features and heights are adopted from the Admiralty charts of Bass Strait.

II. PREVIOUS LITERATURE AND HISTORY -

No Departmental publications dealing with the Furneaux Group have been published. Chas. Gould, Government Geologist, visited Flinders Island in 1871 but did not publish an official report. In 1899, J. Harcourt Smith Government Geologist, proceeded to the district with the object of making a geological examination, but unfortunately he died while on Clarke Island. L.L. Waterhouse, Assistant Government Geologist, investigated reported occurrences of molybdenite, and carried out a geological reconnaissance of the principal islands in 1916. Before presenting a full report, he resigned owing to ill health. A short summary of his work is included in the annual report of the Assistant Government Geologist, which is incorporated in the Report of the Secretary for Mines, 1916.

The following list includes several typewritten Departmental reports dealing with small areas of the islands, and other published works in which references are made regarding certain geological features of the district.

Typewritten Reports

- Scott, J.B. - Report on Rooks River Tin Deposit, Cape Barren Island. 30th September, 1926.
- Scott, J.B. - Report on Babel Island Tin Deposit. 30th September, 1926.

- Scott, J.B. - Report on Hard Luck Alluvial Deposit, Cape Barren Island, 28th March, 1927.
- Scott, J.B. - Report on Battery Bay Alluvial Tin Deposit, Cape Barren Island. 29th March, 1927.
- Nye, P.B. - Report on Underground Water at "Wingaroo", Five Mile Lagoon District, Flinders Island. 7th January, 1931.
- Nye, P.B. - Report on Underground Water at the Butter Factory, Whitemark, Flinders Island. 10th February, 1931.
- Nye, P.B. - Report on Underground Water on the Property of Mr. A. R. Cooper, Emita. 10th February, 1931.
- Blake, F. - Underground Water at Reservation, Cape Barren Island 1935.
- Blake, F. - Boring for Underground water at the Reservation, Cape Barren Island. 21st November, 1935.
Publications.
- De Strzelecki,
P.E. - Physical Description of New South Wales and Van Dieman's Land. 1845.
- Gould, C. - The Islands in Bass Straits, Papers and Proceedings Roy. Soc. Tas. 1871.
- Johnston,
R.M. - Notes on Certain Tertiary and Post Tertiary Deposits on Flinders, Barren, Badger and other islands in Bass Strait. 9th April, 1878.
- Johnston,
R.M. - Systematic Account of the Geology of Tasmania, 1888.
- Singleton, F.A.
& Woods, N.H. - On the Occurrence of the Pelecypod Genus. Miltha in the Australian Tertiary. (Proceedings of the Royal Society of Victoria, Vol. XLVI (New Series) Part II, p.210).

The history of settlement on the Furneaux Group dates back to the early eighteen twenties when whalers and sealers resided occasionally in rough homes on the islands, principally on Cape Barren Island. In the thirties the Government made Flinders Island into an aboriginal settlement, but abandoned it for that purpose about 1846. In 1850, Captain Malcolm Laing Smith obtained a grazing lease of Flinders Island from the Crown for the sum of £50 per annum. The rent was subsequently reduced to £30 per annum and Captain Smith retained the tenancy until 1862 when it was handed over to a Mr. Robinson. Subsequently Flinders Island was rented to J. J. H. MacLaine whose family ultimately settled on Clarke Island, where they still reside as tenants of the Crown.

During 1886, when the lessees were F. E. Abbott and R. Gardner, the Government decided to throw open the whole of Flinders Island for sale under the Waste Lands Act of 1870. The date fixed on which applications should be received was August 1st, 1888, and numerous areas were immediately purchased by various people.

Although stream tin was recorded as occurring on various parts of Flinders Island and Cape Barren Island by Charles Gould in 1871, it was not until 1882 that the first tin was produced. In the latter year small workings were commenced near Tanners Bay at Flinders Island, and at Rooks River on Cape Barren Island. It was 16 years later that tin winning operations started at Pats River and in the interval the occurrence of tin had been reported from various other localities.

From that period up to the present, small amounts of alluvial tin oxide have been produced, at intervals, from those and other centres.

With the possible exception of a few small parcels of alluvial gold no other minerals are known to have been marketed from the Furneaux Group.

III. GEOGRAPHY AND PHYSIOGRAPHY

(1) Location and Extent -

The Furneaux Group of islands is situated at the eastern entrance of Bass Strait to the north-east of Tasmania and has a population of 1,003 persons.

The southernmost part of the group is 16 miles north-east of Cape Portland across Banks Strait.

From north to south in order of decreasing size the three main islands are Flinders Island, Cape Barren Island and Clarke Island.

Flinders Island has an area of 802 square miles, supporting a population of 750 people. Its greatest length from north to south is 40 miles and the width 23 miles. The chief industry is dairying and cattle raising, and the population is generally scattered along the west and south coastal regions.

Cape Barren Island with an area of 172 square miles lies $3\frac{1}{2}$ miles due south of Flinders Island. The population is approximately 200 and tin mining, together with cattle and sheep raising, in a minor capacity, are the principal occupations. During the autumn mutton-bird gathering is resorted to as a seasonal pursuit on adjacent islands. From east to west the island is 25 miles in length, while the greatest width is 12 miles.

Situated 2 miles south of Cape Barren Island is Clarke Island, of 44 square miles in extent, on which a family gains a livelihood from sheep raising. Strewn about the coasts of these larger islands are numerous small islets, the more important of which are, East Sister, West Sister, Hummock, Kangaroo, Green, Chappel, Badger, Long, Woody, Tin Kettle, Little Dog, Great Dog, Little Green, Vansitart, Preservation, Forsyth, Passage and Babel Islands.

(2) Access. -

From Launceston, the largest northern port of Tasmania, a small steamer trades to Flinders Island fortnightly and a ketch weekly.

Passenger aeroplanes flying from Tasmania to Victoria land at Flinders Island every second day and on the return journey from Victoria to Tasmania on the alternate days.

At the small settlements of Whitemark and Emita on the west coast of Flinders Island, jetties are available to accommodate the trading vessels during high tide and in favourable weather. On the south coast at Lady Barron settlement, a deeper water and more sheltered jetty is provided.

A motor road provides means of transport from Palana in the north to Trouser's Point in the south parallel with the west coast and passes through Emita and Whitemark on the route. To the south-east of the latter another road deviates from the coastal road and connects via Forest with Lady Barron.

Short bye-roads join the main highways at intervals.

At the Reservation, Cape Barren Island, both trading vessels call but owing to the lack of a suitable jetty passengers and goods have, of necessity, to be landed by means of small auxiliary craft.

The only metalled road on Cape Barren Island is at the Reservation where it connects the Post Office with the landing jetty at "The Corners", a distance of 24 chains. Partly formed roads extend from "The Corners" southerly to Thunder and Lightning Bay and easterly to Rooks River.

A landing ground for small aeroplanes has been constructed at the Reservation but no regular plane service is in existence.

No roads exist on the other adjacent islands.

(3) Topography

(A) Flinders Island.

(a) General Description. This island is comparatively long and narrow having a general direction from north-north-west to south-south-east. The topography varies greatly in different parts, some being of very high relief, while others are of very low relief. It is essentially that of a district with a drainage system composed of small streams of short length running directly to the coast line from a main watershed closer to the west than the east side. The areas of low relief are generally restricted to the east and west coastal belts while the areas of high relief are chiefly limited to the central, south-western and north-western portions of the island. The highest point is that of Strzelecki Peak which attains a height of 2,550 feet above sea level.

(b) Mountains. The central portion of the island is distinguished by a broken chain of mountains and hills trending with the longer axis. Several prominent units exist, namely :-

Strzelecki Range - This mountain mass covers almost the whole of the south-west corner of the island, its northern limits being Reid and Barclay Hills immediately south of the road from Whitemark to Lady Barron. For the most part it consists of high rugged peaks the principal points of which are Strzelecki Peaks (2,550 feet), Butcher Peak, Mt. Belstead (2,285 feet) and Razorback Mountain.

Darling Range - This is a northerly discontinuation of Strzelecki Range being disconnected by a comparatively low-lying plain of 2 miles in between. The range has a general meridional trend, is 5 miles in length, and like Strzelecki Range is made up of numerous high prominent peaks. From south to north these are Mt. Harland, Pillinger Peak, Mt. Counsel (1,636 feet) and Mt. Leventhorpe (1,600 feet).

The Dutchman (630 feet) constitutes an outlier of the range, one mile to the south-east.

West Coastal Hills - A range of hills commencing at the north-west end of Strzelecki Range continues parallel to the west coast, on eastern edge of the coastal plain, as far as Settlement Point. An easterly extension from this locality junctions with northern end of Darling Range by means of Mt. Arthur (1,117 feet) and Brougham Sugar-Loaf (1,472 feet). North of Mt. Arthur, after a low break for two miles, the hills continue north-westerly at approximately 500 feet above sea level to Mt. Boyes (880 feet).

Killiecrankie Range - This constitutes the high country in the north-west part of the island from Cape Frankland to North Point and includes Mt. Tanner (1,080 feet), The Paps (670 feet and 580 feet), Mt. Killiecrankie (1,035 feet), Mt. Blyth (895 feet) and Quoin (810 feet).

Near the east coast The Patriarch, a small range having three distinct peaks, rise abruptly from plain level, four miles to the west of Rosella Point. The northern peak is 772 feet and the southern 628 feet above sea level.

(c) Plains. Two main plains occur, both of which have apparently been formed under marine conditions. Both are composed, in different parts, of unconsolidated sands, loosely compact sandstone and argillaceous limestones containing marine shells. It would appear that these areas had at one time been occupied by the sea and during that period large sand accumulations had been brought about. Subsequently, those parts now covered by the plains were raised above sea level owing to a slow upward movement of the land relative to the sea.

West Coastal Plain - With the exception of the two miles of country between Sawyer Bay and Emita a narrow low lying plain borders the west coast line from Trouser's Point in the south to Tanner Bay towards the north. The plain varies from half a mile to two miles in width and generally presents a flat surface with a slight fall from the edge of the coastal hills to sea level.

An easterly extension of the plain gradually rises over a distance of several miles, in a narrow belt, up the valley of Pats River to the north of Whitemark.

East Coastal Plain - This plain is much more extensive than the one occurring on the west side of the island.

Commencing in the south-east in the vicinity of Lady Barron, it extends north-westerly following the east coast to its northern limit and occupies almost the whole of the eastern half of the island. In numerous places it attains a width of nine miles and is seldom less than 6 miles wide, although at the northern end it narrows considerably. To the west of south end of Marshall Bay this plain is only separated from the west coastal plain by a low divide. In the vicinity of The Patriarchs the plain decreases in width to two and a half miles and passes between the former and north end of Darling Range.

The plain is generally flat and in a poorly drained condition with numerous swamps and lagoons distributed over its surface.

(d) Drainage No large drainage systems occur on Flinders Island. The drainage is effected by means of numerous short streams flowing from the mountain ranges and hills directly towards the ocean. The most important stream is Pats River which rises in the form of two main branches in the Darling Range, namely North and South Pats River respectively. These flow in a general south-westerly direction until they coalesce to form Pats River at one mile from the east coast. From the mouth to a short distance below the junction estuarine conditions exist. The stream for the last three miles of its course flows over rising plains, into which it is entrenched to a depth of twenty feet.

Big River, Reddins Creek and Samphire Rivulet all take their rise in Strzelecki Range and run southerly to the south coast.

In the north-west region Pratts Rivulet originates in the form of several heads from Mt. Killiecrankie and Mt. Blyth and after combining flows north-westerly to the sea at Palana. The waters of Killiecrankie Creek are shed from Mounts Tanner and Blyth and the stream flows north-west to empty into Killiecrankie Bay. Another creek commences at Mt. Boyes and runs southerly to Tanner Bay.

On the east coastal belt many small creeks have their source in the Darling Range, Mt. Boyes and the lower intervening hills. These descend rapidly to plain level but, on doing so, the speed is arrested and the waters spread out along indeterminate drainage lines and in numbers of cases become stagnant to form swamps and lagoons. The more important of the ill-defined streams of the east coast are Arthur River (North-East River), Foo Choo Creek and East River. Arthur River, in the extreme north, is subject to estuarine conditions up to six miles from the mouth and runs parallel to the coast in a north-westerly course for that distance. East River, towards the southern end, empties into Cameron Inlet.

In addition to the named streams, throughout the island, there are numerous other short and unnamed ones which assist with the drainage. The catchment areas are so small and the descent to the coastal plains, in some cases and the sea in others, is so steep that these creeks flow only after rains.

(e) Lagoons These are very prevalent on the coastal plains particularly that on the east side. On the western plain at Whitemark sand dunes extending along the beach line have blocked the outlet for drainage from the hills to the east. Lagoons have thus been formed behind the dunes at this point. At the east coast similar conditions prevail but in several notable instances, viz., Logan Lagoon and Cameron Inlet, outlets to the sea have been maintained.

Burnett Lagoon and North and South Chain Lagoons have no direct connection with the sea.

Further inland, on the east coastal plain, Nelson Lagoons and Five-mile Lagoons have been formed owing to the flat nature of the country, bringing about a state of indeterminate drainage. Portions of these have been artificially drained by ditches and the land used for agricultural purposes.

(B) Cape Barren Island

(a) General Description - Cape Barren Island presents much the same topographical features as Flinders Island of which it was, at one time, an integral part. It generally presents a high barren area much longer from east to west than from north to south. The coast line, with the exception of the east coast, is rugged and much indented. The eastern end of the island is low lying while the western end is moderately so. Most of the streams flow to the north and the south, directly to coastal bays, and the main lower portions of the valleys are wide and flat.

(b) Mountains - The Mt. Munro range in the north-west constitutes the most outstanding feature of the island. It trends east and west and consists of a ragged mountain mass culminating about the centre in Mt. Munro, 2,348 feet above sea level. Double Peak (1,679 feet) at the south-eastern end of the range forms another prominent eminence. The northern side of the range presents a steep face to the coast line in that direction, while high spurs stretch to the south-west and south.

Another distinctive topographical feature, towards the south-east of the island, is Mt. Kerford range which trends northerly from the south coast near Core Point, and reaches its highest point at Mt. Kerford (1,644 feet). Further north the range quickly decreases in height and eventually terminates in the form of low hills, on the north coast opposite Puncheon Head Island. The terminal point of an easterly spur from Mt. Kerford forms Hogan Hill (1,285 feet).

From the low northern portion of Mt. Kerford range a broken line of hills extends westerly to eventually junction with the eastern foothills of Double Peak. Higher points along this line include Big Stony (807 feet) and Phil Hill (967 feet).

To the north of Battery Bay a range of hills up to 900 feet in height descends to the south coast in the vicinity of Sloping Point.

(c) Plains. On the eastern side of Cape Barren Island, from Puncheon Point in the north and almost to Cape Barren in the south, a low-lying coastal plain is in evidence. Sand dunes which fringe the coast line and interfere with natural lines of drainage have brought about the formation of lagoons parallel to and on the inland side of the dunes.

Near the west side of the island a slightly elevated and undulating plain extends from Sandford Bay, on the north coast, in a southerly direction to Thunder and Lightning Bay. To the north of Mt. Stanley an arm of this plain stretches towards the west coast-line. Eastern boundary of the plain is contiguous with western foothills of Mt. Munro range.

The lower reaches of the principal streams flow over wide plain-like valleys. These appear to represent ancient inlets of the sea, since raised by slow land movements to their present positions above sea level.

(d) Drainage. Drainage is effected chiefly by means of short creeks rising by way of numerous small heads in the high inland country.

They then fall swiftly to unite and form the main streams in open low-lying valleys below, before finding their way along courses, often sinuous and poorly defined, to the sea.

The named streams flowing to the north coast are Dover River, River Lee and Rook River while those flowing to the south coast are Rice River, Battery Creek, Rocky Head Creek and Modder River.

(C) Clarke Island

The distinguishing feature of Clarke Island is a flat central plateau of an average height of 350 feet above sea level. The island is bordered along the south, west and north coasts by lines of hills rising about 200 feet above the plateau. The highest point occurs on an east and west trending ridge in the north west of the area and attains a height of 676 feet above sea level.

Much of the east coastal area is comparatively low lying and sand dunes are forming at several points.

Few permanent streams exist on Clarke Island and they are all small. The central plateau is a large marshy plain over which the drainage is most indefinite. Indeterminate drainage also exists towards the north-east where numerous shallow lagoons occur.

(4) Climate and Meteorology

The climate of the Furneaux Group is mild and equable, the only disturbing feature being strong westerly winds during certain seasons of the year.

Snow is unknown in the low-lying coastal areas, but it falls occasionally at higher altitudes without accumulating. Frosts are rare occurrences especially in those areas adjacent to the coastline.

The annual rainfall is moderate and varies from 2,630 points to 3,104 points at different places. The greatest fall is distributed fairly evenly over the eight months of the year from March to October, while the least rain falls between the months of November and February.

IV. GEOLOGY

(1) Summary

The oldest rocks occurring in the Furneaux Group are the quartzites and slates (Mathinna Series) referred to the Silurian period. They are intruded on a large scale by granite of Devonian age, which is a northern outlier of the batholith of North-Eastern Tasmania. Narrow basic dykes, also of Devonian age, occur intrusive into the above rocks.

Small isolated areas of Tertiary basalt overlies the Silurian sedimentary rocks and Devonian granite. East of Whitemark the basalt is underlain by gravels and clays of Tertiary age. In other places small areas of similar gravels and clays appear at surface overlying Devonian granite.

Tertiary limestones, sandstones, clays and sands overlies the older rocks principally along the coastal belts.

Recent alluvium has been deposited in the beds of the present streams, and sands are accumulating along the low-lying coastal areas.

(2) The Sedimentary Rocks

(a) Silurian System. The rocks of this system consist of quartzites, sandstones and slates. The quartzites and sandstones predominate almost to the exclusion of the slates as the latter only appear as occasional narrow beds intercalated with the former.

The quartzites are hard, fine-grained, siliceous types of a dark grey colour. In places light coloured sandstones outcrop at surface, which, at depth, are represented by quartzites. This alteration from quartzites to sandstones is apparently due to superficial weathering.

The slates are generally dark coloured and thinly laminated varieties. Cleavage planes are not prominent but where they are in evidence they coincide with the bedding.

These rocks occupy a relatively small portion of the district. The largest area thus occupied is on Flinders Island, to the north of Whitemark. They form there an irregular tract of country with a general east and west trend, which is bounded to the west, east, and part of the south by granite. This area attains its greatest width in the north, where it is $8\frac{1}{2}$ miles across the strike of the rocks. Several smaller areas of these rocks occur, namely, on the south coast to the west of Badger Corner, north side of Whitemark-Lady Barron road near the road to Nelson Lagoon, Long Point, west side of ridge to the east of Whitemark, and north-east foothills of Darling Range.

On Cape Barren Island quartzites and slates occur in the north-east part, and outcrop along the greater portion of the coast line from Apple Orchard Point for 5 miles to the east.

The central plateau and most of the eastern portion of Clarke Island is covered by quartzites and associated slate bands. They outcrop also on parts of Green, Badger, Tin Kettle, Vansittart, Pelican, Puncheon Head and Passage Islands.

This series of rocks was intruded by a large mass of deep seated granite and small basic dykes, during Devonian times, but has since been so denuded that only small remnants now remain.

The general strike of the strata is north-north-east to south-south-west, but in one area, it is slightly west of north. The dips are at high angles in both easterly and westerly directions. Although no good sections are visible it seems evident that the strata are highly folded into anticlines and synclines and that faulting probably exists.

No fossils have been found in this series of rocks in the Furneaux Group so that their age cannot be definitely determined.

Lithologically and structurally they are similar to the Mathinna Series of slates and quartzites as developed in north-eastern Tasmania and which extend southwards from Lyndhurst to the South Esk River. Up to the time of the last publication dealing with the Mathinna Series no fossils had been discovered in the rocks but they have generally been regarded as being of Cambro-Ordovician age. In 1934, the writer disclosed several poorly preserved fossil plant remains in weathered slates of the Mathinna

Series at Mara Station, near Warrentinna. These were submitted for identification to R. A. Keble, F.G.S., Palaeontologist to the National Museum, Melbourne. After examination Mr. Keble stated that "they are remarkably like Psilophytales that we are getting from our Silurian beds. They have never been found in any part of the world lower than the Silurian, and would seem to indicate from their association in Victoria that the Mara beds are Silurian." Until further fossil evidence is obtained it appears advisable to regard the age of the Mathinna Series as Silurian.

(b) Tertiary System. Small isolated deposits occur on Flinders Island which are referable to the Tertiary period. They consist of gravels clays and grits of inconsiderable thickness. To the east of Whitemark, at 400 feet above sea level, deposits of this age are overlain by a flow of Tertiary basalt. They attain there a maximum thickness of 15 feet and consist of large boulders of reef quartz set in a matrix of clay, small quartz pebbles and granite drift. The deposit occupies the bed of a former stream which appears to have followed a south-easterly course in the direction of Badger Corner.

Another formation which may be of similar age is that of the gravels and drifts situated between the upper branches of Reddins Creek in the south of the island. It occurs at a high altitude within the present valley and represents the remnants of a former stream deposit, having a course somewhat similar to Reddins Creek.

Two small areas of shallow gravels occurring at high altitudes on the eastern fall of Strzelecki Range are also correlated with the above deposits.

Miocene to Pleistocene. A series of sedimentary formations at various localities occur within the Group which probably vary in age from Miocene to Pleistocene. These are found principally in low lying regions in which exposures are few, thus rendering correlation of the sequence difficult. A comprehensive survey was not undertaken and only isolated areas were examined in detail.

Marine Series. Extensive deposits belonging to this series exist on Flinders Island while smaller areas occur on Cape Barren Island, Clarke Island and many of the smaller islands of the Group.

The rocks consist of horizontal beds of limestone, arenaceous limestone, calcareous sandstone, clays, sands and fine gravels in various stages of consolidation.

At Flinders Island these deposits occupy the wide plains extending inland from the east coast, the narrow coastal plain on the west side together with some of the lower hills up to a height of 500 feet along its eastern border, and large tracts in the north of the island. Although no well defined exposures are visible, this series of rocks appears to overlie Tertiary basalt at the southern end of the flow to the east of Whitemark.

In Five Mile Lagoon district on the east coastal plain of Flinders Island a collection of fossil shells was obtained by P. B. Nye, Government Geologist, in 1931. The fossils were recovered from a bore hole, 80 feet deep, put down in sand beds of the series underlying clays and thin beds of limestone. The greater number of the shells were submitted to Mr. F. Chapman (Commonwealth Palaeontologist) who concluded that the age of the fossils was Upper Pliocene (Werrikooian).

At Cape Barren Island the greater part of the Half Cast Reserve, along the west coast belt, is occupied by limestones, calcareous sandstones, sands and clays. Identification by I. Crespin (Commonwealth Palaeontologist) of foraminifera and bryozoa from the limestone has placed the age of these beds as Middle Miocene. Small areas of similar rocks fringe the western part of Clarke Island.

Estuarine Series. Sediments occur at numerous localities adjacent to the coast at Flinders Island and Cape Barren Island, principally in the lower portions of wide valleys connecting with bays and inlets of the sea. These deposits consist of horizontal beds of granite drifts, sands, clays and gravels, which with few exceptions rest on granite bedrock and vary in thickness from five to fifty feet. These formations have proved to be the chief repository of the alluvial tin ore of the Furneaux Group. On Flinders Island they constitute the isthmus between Tanners Bay and Killiecrankie Bay. Similar sediments occur in the valley of Pats River, and in the vicinity of Bootjack Flat and the adjacent Samphire River, in the south of this island. The series is represented at Cape Barren Island in the valleys of Rocks River, Modder River, Lee River, Dover River, Rice River, Dyas Corner River, Battery Creek and other localities adjacent to Kent Bay, Munro Bay and Franklin Sound.

Inland from Petrification Bay on the south coast of Flinders Island the Estuarine Series is underlain by Tertiary basalt.

With the exception of some lignitised wood in the lower layers no fossils have been found in the beds.

In consideration of the position of the deposits, in low-lying valleys adjoining coastal bays, it is indicated that they were laid down under estuarine conditions.

The relation between the Marine Series and the Estuarine Series has not been established but the latter appears to be younger and is here tentatively correlated with the Pleistocene deposits of Mowbray Swamp near Smithton. It also corresponds in character and probably in age with the sands and gravels of Great Northern Plain at Gladstone.

(c) Recent. Alluvial deposits of Recent age occurring along the streams of the district are of very limited extent and are generally too small to indicate on the geological maps.

Sand dunes are forming at many localities around the coast lines of the larger islands and have been designated in a general manner on the accompanying maps. They are pronounced along the greatest length of the east coast of Flinders Island and Cape Barren Island and are due to the influence of strong easterly winds.

(3) The Igneous Rocks.

(a) Devonian.

(1) Granite. The bedrock of the greater portion of the Furneaux Group of Islands consists of granite. At Flinders Island this rock occurs at the surface as a number of isolated outcrops the largest of which are in the southern half at Strzelecki Range, Darling Range

and the Patriarchs. In the north, granite forms Mt. Boyes, Mt. Blythe, Mt. Killiecrankie and the country between Mt. Tanner and Paps. Numerous smaller outcrops occur in the vicinity of the larger bodies. At Cape Barren Island granite comprises the central and higher parts of the island as well as much of the coastal region. Although disconnected at surface these granite masses unite at depth and together with those on adjacent islands form a northerly extension of the granite batholith of North-Eastern Tasmania.

A considerable number of types occur throughout the islands. The commonest type is the usual medium to coarse grained one containing quartz, plagioclase with lesser orthoclase and biotite. This type often contains numerous large porphyritic crystals of felspar and is the typical rock at Cape Barren Island. In places it is characterised by dark nodules standing out conspicuously on weathered surfaces. The nodules consist of a fine grained mixture of biotite, quartz and plagioclase in which the former predominates. Micro-granite occurs on Flinders Island as irregular masses about the contact with Silurian sedimentary rocks.

The granitic rocks are distinguished by veins and dykes of aplite, the latter often being of considerable width. Veins of pegmatite and quartz are also present but in much smaller amount. On Cape Barren Island tin-bearing granites of aplitic facies occur at Mt. Munro and have also been reported at Mt. Kerford.

The separated bodies of granite together with adjoining areas of Silurian sedimentary rocks are generally surrounded by rocks of Miocene to Pleistocene age and originally stood out as islands in a former sea.

The granitic rocks are intrusive into slates and quartzites of Silurian age. Contact phenomena is marked by the formation of microgranite and other fine-grained types. No other evidence of age is available, but in conformity with other granites in Tasmania those in the Furneaux Group are regarded as having been intruded in the Devonian period.

(ii) Basic Dykes. Several narrow basic dykes trending both to the north east and north west occur on Flinders and Cape Barren Islands. These generally consist of dolerite, but dykes of felspar porphyry also occur. In most cases they are intrusive into granite but they also traverse slates and quartzites. In places the dyke rock contain pyrite. Quartz veins carrying traces of gold and silver occur along the walls of some of the dykes and these appear to have a close genetic relationship.

(b) Tertiary.

Several isolated outcrops of basalt occur on Flinders Island. The largest flow occupies a plateau 400 feet above sea level and is situated $2\frac{1}{2}$ miles to the east of Whitemark where it attains a maximum thickness of 50 feet. On the south coast, at Petrification Bay, basalt is exposed along the shore line and in the same locality is visible along the course of Samphire River for one mile inland. Other small areas of basalt occur on the east coastal plain near the foot-hills of Darling Range, and in low-lying regions along the west coast belt near Pats River, Tanners Bay and Killiecrankie Bay.

In hand specimen these basalts are generally similar. They are fine-grained, dense types, and are often vesicular. No minerals are recognisable in the ground mass but porphyritic crystals of olivine are present in places. Under the microscope they are found to be holocrystalline, even and fine-grained in texture, with the ophitic structure developed to some extent. They consist of laths of plagioclase felspar, grains of augite and grains and needles of ilmenite or magnetite.

No possible source of the basalts was observed in the district and the flows are probably due to fissure eruptions.

The basalt flow to the east of Whitemark overlies Tertiary sediments and in turn appears to be overlain at the south end by limestones sands and gravels probably of Miocene age. The Petrification Bay basalt is overlain by Pleistocene sands and gravels.

A definite horizon for the Furneaux Group basalts cannot be given, but they probably occur high in the Tertiary system and possibly in the Pliocene division.

V. ECONOMIC GEOLOGY

(1) Introduction

The most important deposits of metallic minerals in the Furneaux Group are those of tin in the form of cassiterite. The tin ore is found in association with large areas of granite and occurs both as primary and secondary or alluvial deposits.

Alluvial tin has been exploited on Flinders Island and Cape Barren Island for many years past but no primary deposits have reached the production stage.

Gold in association with Silurian quartzites and slates has been located in small quantities. This metal occurs in primary and alluvial deposits but up to the present has not proved of economic importance.

Molybdenite is found in several localities in the district but the known occurrences are so small that they are nothing more than of mineralogical interest.

Topaz are plentiful in Tanners Bay alluvial tin deposits.

Ilmenite is a frequent associate of tin in the alluvial deposits.

(2) Secondary Tin Deposits.

Secondary tin deposits ranging from Lower Tertiary to Recent ages have been formed within the district. Those of Pleistocene age are most extensive and were formed on a gradually sinking floor, in estuaries or inlets of the sea at a time when the land was much lower in relation to the sea than it is at present. These deposits now fringe the coast-line.

Those of Lower Tertiary age were distributed along the courses of former stream systems. Only two such occurrences have been located, one of which is overlain by Tertiary basalt.

Shallow tin-bearing deposits of Recent age are found along the courses of some of the existing streams.

(a) Pats River Tinfield

Location and Access - Pats River alluvial tinfield is situated on Flinders Island, three miles north-north-west of Whitemark. A formed and partly metalled road connecting with the area, deviates from the main coastal road at $1\frac{1}{2}$ miles north of Whitemark.

Topography - The area is represented by an arm of the west coastal plain extending north-easterly up the valley of Pats River and its tributaries. It has an undulating surface and is dissected to a slight extent by South Pats River and North Pats River which join to form the main stream at one mile from the mouth.

History - Tin was first discovered in Officer Creek, a small affluent of North Pats River, in the year 1896 and reward sections of 80 acres each were granted to J. L. Virieux and C. M. Officer. During the following four years several other areas along North Pats River were acquired and small workings were established. In 1900 a section was taken up on the fall into South Pats River and a little sluicing was accomplished. At intervals from that date to the present, small amounts of tin have been produced from the field.

Geology - The bedrock in the greater part of the area is Devonian granite. It is intrusive into Silurian slates and quartzites, the junction being to the north of North Pats River.

Pleistocene grits, containing tin oxide gravels and sands, occur in Pats River valley in the vicinity of the workings and adjacent regions. Recent gravels and alluvium are deposited in places along the courses of the streams.

The Workings - Along the slopes bordering North Pats River and its tributaries numerous small alluvial workings have been opened at different periods from stream level to heights of 50 feet above. The majority of these are contained within the mineral sections which have been taken up from time to time.

The tin-bearing deposits consist generally of fine quartz grits, sands and a little clay, distributed through which are gravels, ranging from one inch to two feet in size, with an average size of three inches. In places bands occur in which the gravels predominate. The pebbles consist chiefly of waterworn quartz in which tourmaline is sometimes present but quartzite and granite pebbles are also found.

These deposits vary in depth from 3 feet to 40 feet and are thickest in the lower parts of the area towards the west. Large areas of the lower portions of the grits and gravels are cemented and in places are extremely hard. Very few attempts have been made to work these consolidated deposits, so that, in many instances, the workings have not been carried down to the underlying granite.

The numerous small and scattered workings suggest that the tin content of these alluvials is erratically distributed. Small rich areas have been obtained but only over short lengths. Well defined gutters are rare occurrences and the tin is often concentrated in pot-holes. The tin is generally of fine grain size and only slightly waterworn. It is usually black in colour but ruby and resin varieties also occur. Ilmenite, magnetite and zircon are the common associates of the tin.

The only ground being worked at present (1935) is that on the 5 acre mineral lease No. 11100/M in the name of J. Walker. A small face $1\frac{1}{2}$ chains by $\frac{3}{4}$ of a chain has been opened up at 2 chains north-east of the south-west corner of the section, where two men are treating the deposit by ground sluicing methods. The deposit as exposed in the workings consists of 1 foot of sandy loam underlain by 4 feet of fine quartz gravel and clay, through which are distributed quartz pebbles averaging $2\frac{1}{2}$ inches in size. The latter are more concentrated in the bottom 12 inches and it is from this portion that most of the tin is being obtained although a little tin is contained in narrow seams higher up in the drift. It is stated that the ground averages half a pound of tin oxide to a cubic yard.

Granite bedrock is not exposed here and old workings in the immediate vicinity expose cemented grits and gravels extending to a maximum depth of 15 feet.

Gravels can be traced at surface in parts of the undulating country between North Pats River and South Pats River. On the fall the latter shallow alluvial workings expose a small area of partly cemented grits and gravels to a depth of 6 feet above granite bedrock.

On the open grass-tree plain to the north of North Pats River quartz gravels have been penetrated in several places by pits to a depth of 4 feet, but have not exposed the rock bottom.

Method of Working. - In most instances ground sluicing appears to have been the method by which the tin has been won. Hydraulic sluicing with nozzles was attempted in a small way in several places but was not undertaken extensively owing to lack of water and insufficient head pressure.

Water Supply - Want of a permanent and adequate water supply to enable the deposits, particularly the cemented portions, to be hydraulically sluiced in a large way has mitigated the many attempts to successfully mine the alluvials of Pats River tinfield. Many years ago, a water race (1770/W) was constructed over a distance of 3 miles from the head waters of South Pats River to workings on the fall to North Pats River. This scheme has been augmented by other shorter races but has proved inadequate for the requirements.

(b) Tanners Bay Tinfield

Location and Access. This tinfield is situated one mile and three quarters north of Tanners Bay in the north-west of Flinders Island. Access is gained by means of the motor road from Whitemark to Palana, which passes through the area at 21 miles from Whitemark.

Topography. An extension of the west coastal plain stretches inland from Tanners Bay in a narrow belt through to Killiecrankie Bay. From the innermost point of Tanners Bay the plain rises gradually in a northerly direction to an approximate height of 300 feet in a distance of $2\frac{1}{2}$ miles, and then falls regularly to Killiecrankie Bay. Small creeks running to both bays have slightly dissected the plain. To the east of the area Mt. Boyes rises to a height of 880 feet, and to the west the high country in the vicinity of Mt. Tanner reaches a maximum height of 1,080 feet above sea level.

History - The first discovery of tin on Flinders Island was made in this district in the year 1882. It was disclosed almost simultaneously by A. Smith at Killiecrankie Bay and near Tanners Bay by P. Brewer and F. T. Miles, and mineral leases were obtained for both areas. Prospecting at Killiecrankie Bay proved that area to be unprofitable but, at Tanners Bay, alluvial tin has been won at intervals, with variable success up to the present date.

Geology - Everywhere in the district the bedrock consists of Devonian granite. The granite over the plain area is covered by Pleistocene grits, gravels and sands containing varying proportions of cassiterite. Two small areas of Tertiary basalt are poorly exposed at lower altitudes. The relation between the basalt and the grits, etc., is doubtful but the latter appear to overlie the basalt. Granite occupies the surface of the higher country about Mt. Boyes and Mt. Tanner to the east and west of the plain respectively.

The Pleistocene sediments were originally laid down on a sea floor between the granite masses, which at that time stood out as separate islands. A rise in the strand line has since brought the grits, gravels and sands to their present position above sea level.

Sand dunes of recent origin are forming inland from the bays and gravels and alluvium are distributed over the lower parts of the stream beds.

The Workings - The principal alluvial tin workings in the district are situated 2 miles north of Tanners Bay and occur along the course of the small stream flowing southerly to the bay. Numerous mineral leases have been held in the past but, at present, (1935), only two are in existence. Section No. 11270/M of 20 acres in extent is leased by K. H. Blythe and south-east and adjoining is section No. 11253/M of 5 acres held by F. Jackson.

The most extensive workings occur in these leases on either side of the creek bed, now confined to bottom of the worked area and used as an outlet for tailings.

The sluiced area varies from one to two chains in width over a distance of 15 chains, and has a maximum depth of 14 feet. The deposit here consists of quartz grits and sand with occasional narrow bands of clay. No well defined bodies of wash are in evidence but quartz pebbles from $\frac{1}{4}$ inch to 3 inches in size are scattered through the grits and sand. Topaz, locally known as "Killiecrankie diamonds" are plentiful and occur throughout the deposit, but are more numerous in the bottom layers. Several feet of the bottom drifts are coloured black and contain varying amounts of lignitic wood in association with pyrite. In places, the drifts have been cemented by infiltration of solutions carrying silica and iron oxides, and appear in various stages of consolidation.

Granite bedrock is exposed in some portions of the workings but in others a small thickness of the bottom drifts is left unworked. In some instances this was probably due to lack of adequate water pressure to enable the cemented parts to be disintegrated. In other cases insufficient fall for tailings gravitation has been the deciding factor for the abandonment of the lower drifts. South of the leases there is ample fall in the creek bed for the disposal of tailings but becomes much flatter in bottom of workings.

At the south end of section 11253/M a tail race has been excavated in granite to a depth of 8 feet over a short distance and has thus enabled portion of the southern end of the workings to be sluiced to bedrock.

If the remainder of the bottom drifts are to be mined it will either be necessary to deepen and extend the tail race, or the drifts will have to be elevated to sluice boxes and the tailings stacked.

The tin contained in the deposit is fine in grain and generally of a black colour but small amounts of red and amber coloured tin occurs. The greatest quantities of the tin occur in the lower 7 feet of the drifts, particularly in the dark coloured portions with which are related the lignite and pyrite.

The leased areas are now being worked to a small extent by tribute parties under ground sluicing conditions.

Immediately south of the leases the alluvial ground is much shallower over a length of 20 chains, where a number of small areas have been worked along the east side of the creek to an average depth of 4 feet. Underlying cemented grits, the bottom layer is here represented by a well defined bed of quartz pebbles of $2\frac{1}{2}$ inches average size.

In the valley of a small creek, rising to the north of Mt. Tanner and flowing to Killiecrankie Bay, mineral sections aggregating 120 acres were held between 1893 and 1895 by W. Williams and others, and some prospecting pits were sunk with the object of testing the gravels etc. for their tin content. From 1914 to 1916, 20 acres of this land was leased by C. C. Robinson. At one stage a small amount of sluicing was accomplished, but with little apparent success.

The area covered by the grits, gravels and sands extends for one mile to the east of mineral lease No. 11270/M and for one mile and a half to the west, where the boundaries in these directions are the foothills of Mt. Boyes and Mt. Tanner respectively. Two miles to the north, on the fall to Killiecrankie Bay, the grits etc., give place to Tertiary limestone.

Water Supply - The creeks of the district have only small catchment areas and at no time of the year are any large quantities of water available for sluicing purposes.

Two short water races have been constructed from small eastern branches of the creek flowing south to Tanner Bay.

Another race of over two miles in length taps Killiecrankie Creek to the north of the workings.

(c) Rooks River Tinfield.

Location and Access - This tinfield is situated on the north side of Cape Barren Island and occurs on the south-east side of Rooks River, adjacent to Deep Bay. Access is gained by means of a recently formed road from the landing jetty at The Corners, a distance of approximately nine miles to the west. The field is also accessible from vessels via Deep

Bay where landings are made by means of row-boats, and where the tin concentrates are loaded by that method.

Topography - The area constitutes an open plain rising to a height of 250 feet in a distance of 60 chains from the shores of Deep Bay to the steep northern foothills of Double Peak, at the eastern end of Mt. Munro range. The surface after abruptly attaining a height of 30 feet above high water mark continues on an even grade to southern edge of plain. The north western boundary coincides with Rooks River, a stream rising on Mt. Munro and flowing north-easterly to Deep Bay. Along the eastern side of the plain East Creek flows northerly from the vicinity of Double Peak and a low ridge on the east side of this watercourse defines the periphery of the area in that direction.

History - The mining history of Rooks River tinfield dates back to the year 1882 when alluvial tin was first discovered and worked to a limited extent by J. Simmers and E. T. Miles. From that time up to the present different individuals and syndicates have operated with varying success and tin has been produced throughout the years in an intermittent manner. No official records of production are available for this area.

Geology - Granite of Devonian age outcrops over the highlands to the south, east and west of the area. The rock generally consists of normal biotite granite but varies in places to porphyritic types. At Lode Hill to the north of Double Peak fine grained granite and tin-bearing aplites occur. In the lowlands Pleistocene drifts represented by sands, clays, grits and fine gravels overlie the granite to depths varying from 5 feet to 50 feet.

The Workings - This tinfield has been developed to a larger extent than other tinfields of the Furneaux Group and, to date, has proved to contain greater concentrations of tin oxide. Three comparatively large workings have been opened up at different periods in close proximity to each other, and several smaller ones occur widely separated through the area. The main workings are developed on the south-east side of Rooks River, at a point 100 feet above and 60 chains to the south-west of the mouth of the stream.

Several adjoining mineral leases are now held (1935) by C. and A. M. Perry in this vicinity but mining is only progressing on No. 8803/M of 5 acres in extent. E. Webb has obtained a tribute from the lease holders and is working the ground by means of hydraulic sluicing. X

The workings extend south-westerly for 11 chains and vary in width from one to five chains, being widest in the newer portion at the western end. The drifts exposed in the old workings at the eastern end show a thickness of 5 feet but deepen towards the west to 11 feet. The present working face further west is much deeper and the deposit there reaches a thickness of 25 feet.

A section of the drifts at this point is as follows:-

Surface sands	-	1 ft. 6 in.
Sands and quartz grits with small distributed pebbles	-	20 ft.
Coarse sands quartz pebbles lignite and pyrite with tin oxide showing freely in places.	-	3 ft. 6 in.
Hard cemented nodules of pyrite carrying tin oxide	-	3 in.

The top portion of the deposit is light in colour, while the bottom 10 feet is almost black due to the presence of lignite and pyrite. In places the drifts are partly cemented by silica and oxides of iron, and difficulty is often experienced in disintegrating the material.

The granite bottom is found to be irregular having no defined gutter but occurring in a rolling manner with frequent pot holes.

Mining is carried out by means of hydraulic sluicing methods under a head pressure of 60 feet. Sluice boxes 380 feet in length are used for saving the tin, which is of a moderately fine grain size.

A deep tail race, excavated in granite carries the tailings to Rooks River for disposal.

Nodules of hard cemented pyrite from the bottom layer, often rich in tin, are stacked and, in time, become partially disintegrated by weathering agents, when portion of the tin is liberated. The latter is passed through screens and streamed, while the remainder is treated to several applications of boiling caustic soda to remove the pyrite. After streaming, three grades of tin concentrates are collected, the firsts average 74% tin, seconds 72% tin and thirds 51% tin.

Over a period of 7 months, 14 tons 14 cwt. 3 qrs. 18 lb. of tin concentrates were won from an estimated amount of 12,154 cubic yards of drifts, at Webb's workings on Section No. 8803/M.

Old workings, carried out by Clark and Davis on Section 10952/M of 10 acres, are situated 5 chains to the south-east of and are roughly parallel to Webb's workings. This excavation is 5 chains long over an average width of one chain and averages 20 feet in depth. The drifts are similar to those described except that the bottom 3 to 7 feet above the granite, consists of cemented wash with granite and quartz pebbles of 3 inches average size, together with grits, sand, lignite and pyrite. Although this cemented portion contains tin oxide it has only been worked to a limited extent.

The bottom has a slight dip to the south and the wash is deepening in that direction.

Two chains further to the south-east Watson's old workings on Section 11193/M of 5 acres extend over a distance of 4 chains on a bearing of 30°, and are one

chain wide. This face is now collapsed and overgrown.

A thickness of 20 feet of fine sands and grits overlies 10 feet of cemented drifts containing granite pebbles of 4 inches average size. The granite bottom is not exposed since little of the lower drifts have been mined.

Near the mouth of Rooks River at north boundary of Section 11398/M a sluicing face has recently been opened up by G.G. Fisher in old workings. The area sluiced is 2 chains long over a width of 2 chains and the drifts vary from 15 to 20 feet in thickness. Above the granite bottom 15 inches of wash and grits contain a large proportion of the tin oxide content in association with quantities of fine grained ilmenite.

At the mouth of East Creek and along the stream in abandoned Section 6030/M, shallow drifts have been worked to a small extent in the past. Small amounts of tin are present in beach sands along Deep Bay shoreline about the mouth of Rooks River. A boring campaign was instituted about the year 1927, but results were not published.

Water Supply - Water supply for sluicing the main workings at Webbs tribute is obtained from Gorge Creek, a branch of Rooks River, and conveyed by race for approximately one mile to within 10 chains of the face. Sufficient water is thus obtained for use during wet months. X

To allow for continuous sluicing throughout the year conservation is needed. This could be accomplished by constructing a dam at a suitable position below the two upper branches of Rooks River, about 200 feet above sea level.

Water is also available from East Creek and a race commencing at the 200 feet level on that stream conveys it to the old workings on Perry's sections.

A race with intake at Rooks River, below Webb's tail race, supplies the present requirements for sluicing on G. G. Fisher's lease.

(d) Modder River Tinfield.

Location - This area is situated at Cape Barren Island on the south side of Mt. Munro Range, about the upper reaches of Modder River.

Access - This is by means of an unmetalled road from "The Corners" jetty southerly through the Reservation to within a half mile of Thunder and Lightning Bay, where a cart track degrades easterly and terminates at the workings in a total distance of 9 miles.

Topography - The field occupies the upper portion of a wide low lying valley through which the stream known as "Modder River" flows, on a south-westerly course from its source between Mt. Munro and Double Peak, to the sea at Thunder and Lightning Bay.

The floor of the valley forms a plain, up to one mile wide, in which Modder River and its branches are entrenched to depths ranging from 20 to 50 feet.

The northern limits of the plain conform with

the bottom of the steeply rising foothills of Mt. Munro and Double Peak, while it is confined to the east and west by high southern trending spurs of the same mountains.

History - Tin was discovered in this area prior to 1909, in which year Barrett and Graham produced the first marketable product. At intervals several attempts have since been made to mine the tin; notably by Mansfield and party in 1918 and again in 1934 by Gardener and Barrett.

About 1927 a small area in the vicinity of the workings was bored to an average depth of 22 feet. It is said that the holes averaged $2\frac{1}{2}$ lb. of tin oxide to the cubic yard and that the best result for a single bore showed 12 lb. per cubic yard.

The boring was instituted by private enterprise and results are not officially recorded.

It is estimated that 10 tons of tin concentrates have been produced from this area.

Geology - The bedrock of the district consists of Devonian granite. It outcrops on the hill slopes to the east and west of the plain and composes the whole of Mt. Munro range. Pleistocene tin-bearing drifts are spread over the plain to a maximum depth of 50 feet. In places the underlying granite is exposed along beds of the streams. Along the lower portion of the valley towards Thunder and Lightning Bay the drifts give place to Tertiary sands and limestones.

The Workings - About the junction of the upper branches of Modder River 210 acres of land are held as mineral leases in the names of Gardener and Barrett, and 2 acres (8310/M) are leased by C. J. and T. J. Barrett. In addition an area of 5,000 acres surrounding the leases has been granted to G. D. Gardener for prospecting purposes. No extensive workings have been carried out in the area and only two comparatively small faces have been sluiced. These occur on a small tributary to the west of the main stream.

The oldest workings exist within Section 11168/M of 80 acres, near the south boundary of Section 11128/M, where the drifts consist of sands and quartz grits with small pebbles of quartz, tourmaline, cairngorm and granite in the bottom layers. The thickness of the deposit at this point is variable but reaches a maximum of 13 feet, and averages 8 feet, over the sluiced area extending for 3 chains long by one chain wide. Granite is exposed in bottom of workings with a slight dip of the surface to the east, and in places is overlain by large partly decomposed boulders of the same rock. The upper 3 to 4 feet of the drifts are unconsolidated but the lower portion has become partly cemented. The latter was not worked in the early stages of mining in 1909 but in 1934 was sluiced to bedrock. Tin oxide in association with ilmenite is contained in the drifts from surface downwards but is more concentrated in the lower portion. It is reported locally that 3 tons of tin were won from these workings.

At twenty chains further south, along east side of the creek, other workings exist on Section 8310/M of 2 acres in extent, and leased by C. J. and T. J. Barrett. The northern portion of these workings now caved, consisted of an adit and approach thereto driven easterly into the low hillside for 75 feet. It is reported that 11 bags of tin were recovered from drifts encountered in the adit.

South and adjoining adit workings a small face sluiced by Archer produced 1 ton of tin oxide. Immediately to the south of the latter the newer workings of the main face expose sands, grits and narrow clay bands to a maximum thickness of 20 feet. Small pebbles of quartz, cairngorm, tourmaline and granite are distributed through the lower 8 feet, while some boulders up to 15 inches in size occur near granite bedrock. Quantities of fine-grained ilmenite also occur throughout the deposit. Some of the sands and grits in the upper portion are cemented to a slight degree but not sufficient to interfere with sluicing. These workings extend for one chain and a quarter in length over a width of $\frac{3}{4}$ of a chain and have been mined at different periods. The grain size of the tin is generally moderately fine, averaging $\frac{1}{32}$ of an inch, but in places pieces up to $\frac{1}{4}$ of an inch are found, sometimes adhering to quartz. It is reported that production from this face amounted to $5\frac{1}{2}$ tons of tin concentrates.

The last mining was here carried out in 1934 by the present lessees who employed a Lanz tractor engine of 16 H. P. to pump sluicing water to the face and also elevate the drifts to boxes. Although the maximum capacity of the plant was considered to be 20 cubic yards per day the amount actually treated averaged 10 cubic yards per day and was found to be insufficient for economic working.

At the time of inspection (1935) the lessees were engaged in a vigorous hand-boring campaign over large portions of their holdings. The first line of 6 holes, along north boundary of Section 11168/M was completed and showed an average depth of 26 feet.

Water Supply - Without conservation, water supplies for sluicing, except on a small scale, are inadequate. A short race from east branch of Modder River conveys water to the southern face but supplies are not perennial and head pressure is insufficient for sluicing without pumping. Two other water rights have been granted, one each from the east and west branches of the river, but races have not yet been constructed.

To augment the supply it will be necessary to construct dams about the intakes of the proposed races.

(e) Battery Bay Tinfield.

Location and Access.- This area lies immediately to the north of Battery Bay an inlet on the south side of Cape Barren Island.

Landings can be made on the beach at Battery Bay from vessels by means of row boats. Access is also gained from the Corners by way of Modder River cart road for 5 miles and thence by horse track, following the coast line for a further 7 miles.

Topography - A small plain extends north from Battery Bay over which Battery Creek flows to the sea. The creek commences as two branches in a range of hills 900 feet high at one mile and a half inland. Low cliffs up to 20 feet high extend along the foreshore, above which the plain rises gradually to the foot of the inland hills.

History - The first tin oxide was produced about 30 years ago and since that period several attempts have been made to mine the tin but with little success.

Geology - Granite comprises the bedrock of the district and outcrops along the hills bordering the plain. Sands, grits and clays of Pleistocene age overlie granite on the east side of Battery Creek and along the valley of a small creek to the west.

Low cliffs above high water mark along the bay expose the drifts where they have been cemented by oxides of iron, etc. It is reported that bores put down along the beach proved the drifts to a thickness of 20 feet below high water mark.

The Workings - Several attempts, in a primitive fashion, have been made to work the drifts where exposed along the beach; but were unsuccessful owing to the presence of much fine ilmenite.

On the east bank of Battery Creek, at 5 chains above the mouth, a small face has been opened up to a depth of 10 feet by ground sluicing methods. The drifts consist of sands, quartz grits and clay overlying large granite boulders. Tin and ilmenite are present in the drifts and approximate one ton of tin is reported to have been recovered in these workings.

Owing to a small catchment area water supplies are scarce and during dry periods are almost non-existent.

(f) Other Alluvial Tin Areas on Cape Barren Island

A number of areas occur on Cape Barren Island in which alluvial tin has been proved to exist but which have not been tested or developed to the same extent as those already described.

Generally, they occur as low lying valleys adjacent to the coast line, are covered by drifts of Pleistocene age, and are occupied by small streams draining the higher granite country of the interior.

Lee River empties into Deep Bay two miles east of Rooks River, on the north coast. It flows mainly over a wide flat plain and is joined on the west side by Ransom Creek before reaching Deep Bay. About 1926 a small quantity of tin was recovered from shallow deposits in the upper portion of Ransom Creek. At present (1935) T. J. Gunter and S. M. Mansell are prospecting in this vicinity and have been granted 240 acres of land as mineral leases 11508/M, 11509/M, 11524/M and 11544/M together with 4,000 acres of Lee River watershed as a Special Prospecting Claim. A dam site and water rights have also been acquired and it is reported that developmental work will shortly be undertaken.

Dover River runs over a wide plain to an inlet on the north coast, at $3\frac{1}{2}$ miles to the east of Lee River. Slates and Quartzites of Cambro-Ordovician age outcrop along the shore and are exposed in places along the stream bed for a distance of one mile and a quarter inland. Further to the south low surrounding hills are occupied by Devonian granite. Pleistocene drifts are spread over these rocks on the floor of the valley. At the mouth of the stream, on the east bank, a small amount of tin was won several years ago from the drifts which are here exposed to a depth of 9 feet, and consist of sands and grits with a few small waterworn pebbles of quartz and quartzite. Tin in small quantities together with ilmenite and traces of gold are present. Old tin workings of small extent also occur in the Dover River watershed 2 miles to the south-east. A little fine tin and specks of gold have been detected in beach sands along the foreshore, west of Dover River mouth.

In 1935 a series of bore holes was sunk in the Dover River basin with the object of proving the tin and gold content of the drifts. The results of this campaign are not available.

Other areas in which alluvial tin has been located are Rhodes Creek on the east side, Rice River on the south, and Munro Bay, in the north of the island.

(g) Reddins Creek Area, Flinders Island

This area is situated one mile and three quarters west-south-west of Badger Corner and is reached by means of a cart track from Whitemark-Badger Corner road. Reddins Creek flows southerly to the coast, opposite Tin Kettle Island after taking

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its rise in the foothills of Strzelecki range.

The bedrock of the area is Devonian granite and this rock is in contact with quartzites and slates of Silurian age along a north-easterly line, slightly to the east of the area.

Between the upper branches of Reddins Creek the granite is overlain by a narrow longitudinal belt of Tertiary grits and gravels, approximately 30 chains in length. Tin oxide in a fine state of division, together with small quantities of gold are contained in the grits and gravels.

The deposit has been treated to a limited extent by means of ground sluicing for the recovery of these minerals. The sediments, as exposed in the workings, attain a maximum thickness of 9 feet, but as bedrock is only showing in a few places, it is possible that a greater thickness is present along the main gutter. In the deeper exposed portions towards the south of the workings, the bottom appears to be dipping to the east and suggests that the gutter is several feet to the east at that point. The lower layers of the deposit are in a cemented condition and have only been worked to a small extent.

Lack of adequate water supplies appears to have been a factor in the decision to suspend mining operations in 1934. These workings are covered (1935) by mineral lease 11008/M of 10 acres extent in the name of J. R. Hay.

(h) Cann Hill Area, Flinders Island.

Cann Hill represents the northern end of a low ridge one mile and a half to the east of Whitemark. It is drained by O'Doherty Creek which rises in the foothills of Darling Range and flows to the west coast.

The metalled road from Whitemark to the property known as "Thule" serves the area.

The basement rock consists of granite and is overlain on the east side of the hill by tin-bearing gravels, (Tertiary) below a thin covering of basalt.

Alluvial tin was discovered here by H. O'Doherty in 1898 when a reward claim was granted.

An adit 90 feet in length, on Section 8125/M, was driven northerly, from the hill slope falling to O'Doherty Creek, to test the sub-basaltic lead. The granite wall of the old gutter was penetrated for a short distance before passing below 7 feet of basalt into large quartz boulders, grits and clays constituting the lead.

The latter was found to contain coarse tin but at the point of operations the gutter proved to be both shallow and narrow. Small quantities of tin were recovered by discarding the boulders and carting the grits and clays to the creek for washing in sluice boxes.

Of later years an attempt was made to mine the deposit by open cut methods about the adit approach. Some tin was recovered in a primitive manner but the prospect proved uneconomical to work, since no adequate supply of water was available for sluicing and the handling of the large boulders in the deposit was found to be too costly.

(3) Primary Deposits.

(a) Tin.

(i) Clarke Island - On the plain near the centre of Clarke Island a tin-bearing lode was disclosed about the year 1886 by Maclaine and Donovan, when prospecting was carried out by means of shafts and trenches. Nearly 30 years later attention was again directed to the lode. Ten tons of the ore were shipped to Victoria for crushing, and it is reported that the parcel averaged $\frac{1}{2}\%$ tin oxide.

The rocks enclosing the lode consist of grey coloured quartzites of Silurian age. The strike of these rocks is slightly to the east of north and they dip to the south-east at 50° .

The lode comprises a pegmatite vein consisting of an intimate mixture of felspar, quartz and muscovite crystals with felspar predominating. Cassiterite is distributed in places through the vein in coarse black aggregates. The lode dips to the north-west at 30° and can be traced along the outcrop on a general bearing of 201° over a distance of 12 chains, showing a variation in width from one to eight feet.

It is cut at intervals by shallow trenches and a surface stope, while two vertical shafts intersect the vein on the west side at depths of 40 feet and 15 feet respectively.

(ii) Cape Barren Island - Aplitic granite containing blebs and small irregular patches of tin oxide is located at Mt. Munro and Mt. Kerford. On the northern slopes of Mt. Munro at Lode Hill on Rooks River watershed, tin-bearing aplitic is exposed in several small open cuts. The tin is here associated with small quantities of chalcopyrite and molybdenite. None of these minerals appear to be sufficiently concentrated for economic exploitation.

(b) Gold and Silver.

(i) Brown's Reef, Long Point.- Long Point is situated on the west coast of Flinders Island at 5 miles to the north-west of Whitemark. The reef occurs on 24 acres 3 roods 33 perches purchased from the Crown by E.E. Brown, near east boundary of the block.

The rocks in the vicinity consist of quartzites of Silurian age which strike at 15° and dip to the north-west at 75° .

In 1931 the owner discovered a small quantity of moderately coarse gold in detrital gravel on north-east side of the house. Prospecting by means of shallow trenches failed to locate further gold in the gravel, but a quartz reef was found several chains to the south-west.

A shaft 10 feet deep at the north end, and 5 trenches, spaced at intervals, proved the reef to extend on a general bearing of 16° over a distance of 7 chains.

In the shaft and two adjacent trenches the reef consists of white reef quartz ranging from one foot to two feet wide, showing no mineralisation. Further south it is represented by numerous veinlets and quartz impregnations along the strike of the enclosing rocks, over a maximum width of four feet.

Coarse gold is said to have been visible as small vughs in the quartz, but none could be distinguished during the examination.

Owing to unfavourable conditions, sampling of the reef was impossible, but representative samples of quartz from spoil-dumps of the shaft and 4 trenches were obtained. Results of assays carried out by the Government Chemist and Assayer showed traces of gold in two cases and no gold in the remainder.

(ii) Silver Hill Lode, Flinders Island - Silver Hill, on Darling Range, represents a south-eastern spur from Mt. Counsel at an elevation of 1,100 feet above sea level.

About the year 1893 a lode carrying silver was discovered in the locality and the reward lease 725/91M of 80 acres was granted to J.J.H. Maclaine. During 1898 two reward claims for gold, 1243/93G and 1244/93G, to the north-east of the above, were secured by R. O'Brien and J. Fisher.

The rocks of the area consist of fine to medium grained biotite granite of Devonian age. A dolerite dyke of similar age intrudes the granite on a bearing of 243° and can be traced at surface 10 feet wide, over a distance of 18 chains.

A vertical quartz reef developed on the eastern wall of the dyke follows it for 15 chains from the south-west to the north-east side of the hill. At 40 feet below the hill top, on the eastern fall, a small open cut exposes the reef over a width of 30 inches. It consists there of grey coloured quartz charged with arsenopyrite, chalcopyrite and pyrite. The walls, composed of dolerite and fine grained granite respectively, show a decided silicification for several inches on either side of the reef. A sample taken across 30 inches of the reef gave the following result:-

Gold	Trace
Silver	0 oz. 13 dwt. 2 grs.

Along the remainder of the outcrop no sulphides are visible and the quartz is of the dense milky variety.

At 10 chains north-east from the open cut and 500 feet lower an adit follows a quartz vein in granite on a bearing of 237° for a distance of 40 feet. The vein dips at a steep angle to the north-west and averages 8 inches in width. The quartz cannot be traced at surface and does not appear to be connected with the reef outcropping further west.

A sample of quartz taken across the vein in

the adit on being assayed showed neither gold or silver.

(iii) Badger Corner Area, Flinders Island - About one mile and a half west of Badger Corner a low longitudinal trending ridge rises 200 feet above the coastal plain and forms foothills of Strzelecki Range.

The rocks consist of quartzites and thin slate bands, belonging to the Silurian period, which are intruded a short distance to the west by granite of Devonian age.

Near the hill top, on the fall to Samphire Creek, several quartz veins traversing quartzites are poorly exposed in trenches and a shaft. Traces of gold are said to have been found in the veins which are narrow and can only be traced over short distances. Sampling was impossible owing to water-logged condition of shaft and unsatisfactory exposures in trenches.

Alluvial gold found in small quantities in affluents of Samphire Creek, and Reddins Creek to the south, has evidently been shed from quartz veins in this area.

(iv) Lowery Reef, Cape Barren Island - This reef occurs on the north coast line, about $2\frac{1}{2}$ miles east of Dover River and is embraced by mineral section 10542/M. It outcrops at high water mark and can be traced for several chains into the bay, when the tide is low. Any possible inland continuation is masked by sand dunes, twenty feet in height. The rocks of the area consist of Silurian quartzites striking north-easterly and dipping to the north-west at a high angle.

The reef cuts across the bedding planes of the rocks on a bearing of 282° and dips to the south-west at 75° . As exposed along the outcrop, it consists of white milky quartz with no other visible minerals. In a shaft, now caved, immediately above high water mark, it is reported that solid quartz extended down to 8 feet from surface. It then gave place almost wholly to dense arsenopyrite for a further 7 feet and continued to a depth of 20 feet as pyrite, with some arsenopyrite.

It is said that samples of the pyritic ore showed traces of gold by assay.

Five specks of gold are reported as having been obtained from beach sands in this vicinity.

(4) Graphite

At 16 chains south-east of Dover Point, on the north coast of Cape Barren Island, two mineral sections 2498/93M and 2499/93M of 20 acres and 80 acres respectively were acquired in 1898 for the purpose of mining graphite. The Tasmanian Blacklead Mining Company was formed with a capital of £5,000 and a limited amount of development work was accomplished. A small tonnage was mined and a parcel of the material sent to England for testing purposes, but a market for the output could not be established.

The main shaft, 50 feet deep, and two shallow shafts in close proximity, 15 feet above high water mark, are now inaccessible. The spoil dumps consist

chiefly of broken quartzite and black slate with occasional pieces of graphitic slate.

Rocks exposed below high water mark in the vicinity consist of narrow dark coloured slate bands interbedded with massive quartzites of the Silurian period. The strike of the beds is 12° and they dip at 80° both to the east and west.

The slate is a fine grained carbonaceous type which in places more closely assumes the characteristics of graphite, but in general appears to be of indifferent quality for commercial purposes.

(5) Peat at Flinders Island

A deposit of peat occurs on the low-lying coastal plain in the property of H. B. Briant at Badger Corner.

When a lagoon of 25 acres in extent was being drained a peaty substance was disclosed, extending over the area to a depth of 2 feet and overlying sandy loam and water-worn gravels. Subsequently fires destroyed the greater part of the material. The deposit consists of cork-like matter, of low specific gravity, containing small amounts of sandy soil and fine roots. It is black when damp but dries on exposure to a light brown colour. It is apparent that the material has been formed as a decomposition product of accumulated vegetable matter in the lagoon. A dried sample of the material, cleaned of roots and soil, was tested with the following results:-

Proximate Analysis.

	Per Cent.
Moisture	5.50
Volatile combustible matter	68.88
Fixed carbon	19.27
Ash	6.35
Sulphur	1.21

Crude Oil, etc. Test

Yield on distillation	73.8 Gals. per ton
Specific gravity	0.957
Sulphur	0.71

Fractionation Test of Crude O.l. etc.

0° to 150° C	11.76
150° C to 200° C	5.88
200° C to 250° C	29.41
250° C to 310° C	40.00
Water	2.94
Residue	10.00

The small quantity available excludes the deposit from any economic importance.

A similar occurrence in North-West Tasmania at Alcomie was examined in 1931 during the survey of Smithton district.

VI. CONCLUSION

The survey of Furneaux Group of Islands has resulted in the production of the geological maps of Flinders Island and Cape Barren Island, together with several of the smaller islands. 700A
700B

The bedrock of the district consists of sedimentary rocks of the Silurian system intruded by portion of a large granite batholith of Devonian age. The sedimentary rocks have been greatly denuded and only comparatively small areas now exist.

Intruding the granite and Silurian rocks is a series of basic dykes of later date than the granite, but also belonging to the Devonian era of igneous intrusives. Over-lying the basement rocks extensive deposits of Tertiary sediments occur. The lower members of these are again overlain, in places, by small flows of Tertiary basalt.

Quartz veins traversing the Silurian sedimentary rocks show traces of gold in several instances, and in the same series of rocks, at Clarke Island, cassiterite is distributed through an intruding pegmatite vein.

Cassiterite is sparsely distributed through granitic rocks of Cape Barren Island and possibly those on Flinders Island. Tin oxide also occurs in a pegmatite vein traversing granite on Babel Island. Deposits of Pleistocene drifts, gravels etc., resulting from denudation of the granite and to a less extent of the Silurian rocks, have been formed in a number of places. These deposits contain alluvial tin which on Flinders Island and Cape Barren Island have been worked to a small extent at intervals over the past 50 years. Owing principally to inadequate supplies of water for sluicing, due partly to lack of conservation, mining has not been performed on a large scale.

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