GOVERNMENT OF WESTERN AUSTRALIA.

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GEOLOGICAL SURVEY OF WESTERN AUSTRALIA,
BEAUFORT STREET,
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Extracted from G.S.W.A. Ll/43.

REPORT BY MR. J. C. DULFER

ON VISIT TO THE ISLANDS OF THE RECHERCHE ARCHIPELAGO -

WESTERN AUSTRALIA.

Accompanied by Mr. F.G. Forman Government Geologist for Western Australia, a visit was made to Christmas Island and various other islands in the Archipelago. On this trip, extending from the 8th February to 22nd February, 1943 no landing could be made on Salisbury Island because of rough seas and surf. Between 24th February and 4th March, 1943 further visits were made to the vicinity of Salisbury Island and in the final trip the sea was calm enough to enable a party to go ashore and collect specimens of the Island rocks.

Copy made 5 Nov. 1943
H Brooks
GG.

ISLANDS OF THE RECHERCHE ARCHIPELAGO - WESTERN AUSTRALIA.

The Recherche Archipelago is a group of Islands off the south coast of Western Australia, between longitude 121°36'E. and longitude 124°6'E. The Islands are chiefly of granite and vary in size from low rocks less than an acre in area to islands up to 3 miles long. The granite islands are either devoid of vegetation or have patches of stunted shrub in places where soil has accumulated on depressions in the granite. Other islands particularly Christmas, Pasley, Figure of Eight, Salisbury, etc. have secondary deposits of limestone, sandstone, sand and soil overlying the granite. On these islands low grade phosphate rock or guano occurs.

During our visit the only birds observed were Cape Barron Geese and a few penguins, shags and sea gulls. However, on some islands there were abandoned mutton bird burrows showing that at times mutton birds nest on these islands but not in great numbers.

PREVIOUS EXAMINATIONS.

In 1904 Captain James Sale brought samples of high grade phosphate rock from Christmas Island, but his later samples were poor. In 1907, the Australian Phosphate Company Ltd. obtained phosphate mining rights on several islands of the Archipelago, but, apparently they did not remove any phosphate rock from the islands.

In 1908, the Acting Government Geologist, Mr. H.P. Woodward, under instructions from the Western Australian Government, surveyed the deposits on Christmas Island of the Eastern Group. During the survey many sample holes were dug and a bed of phosphorised travertine covering an area of 32 acres was disclosed. Except where the soil and sand cover was considerable, the percentage of calcium phosphate in the travertine was low.

Mr. Woodward estimated that the following quantities and qualities of phosphatic material were available:

(a) Phosphorised Travertine and Ferruginous Limestone just below surface

Section	Area	Volume c.yds.	$Ca_3(P_2O_4)_2$ Average %	$CaCO_3$ Average %
Northern Area	-	50,600 est.	9.74 est.	46.80 est.
Central Area	5 ac.	15,500	29.47	24.70 "
Southern Area	-	36,300	25.10	16.40 "

(b) Rock Phosphate on Beach.

1,000	51.61	8.07

Mr. Woodward suggested that the southern area probably contained better values, and that the beach outcrop may extend under the southern area. Small picked samples of rock phosphate from veins and incrustations contained 59.4% to 69.9% of calcium phosphate.

DETAILS OF SURVEY MADE IN FEBRUARY, 1943.

1. CHRISTMAS ISLAND.

(a) Beach Outcrop.

This consists of a number of large angular rocks composed of quartz and felspar grains and crystals cemented together with phosphate of lime. As well as the phosphate rocks there are a number of water worn granite boulders in the outcrop. Holes and trenches were dug between the outcrop and the 30' high limestone cliff to the east of it. These excavations indicated that the phosphate rock did not extend underneath the limestone of the southern area.

To the south of the outcrop and in line with the submerged ledge between Christmas Island and New Years Island a quantity of large granite boulders were seen. The spaces between the boulders were filled with dead shell and sand. It is probable that the phosphate rock on the beach was originally similar to this formation, and that the shells were converted into phosphate of lime, through bird deposits on the bare rocks above, being carried on to the shell by rain water. Afterwards the island subsided beneath the sea and the phosphorised shells were converted into solid rock, on which the sedimentary limestones were deposited. Later the island was again raised and the rock phosphate appeared above sea level. It is estimated that the quantity available on the outcrop is 500 cu. yds. equal to approximately 1,000 tons. An average sample of the outcrop was obtained by breaking pieces off the large rocks throughout the outcrop. The analysis of this sample showed 53.3% of calcium phosphate and 1.3% of water.

Samples containing larger percentages of calcium phosphate can be obtained by selecting the material from small veins in the rocks, but these veins form such a small percentage of the whole that their relatively higher quality is of no importance.

(b) Southern Area.

Holes were dug on this area and samples of brown nodules and the underlying rock analysed on the field. The percentage of calcium phosphate was small.

(c) Central Area.

This area is in a shallow depression and the phosphorised travertine is covered with an average thickness of 30" of sand and soil. On the surface of the travertine there is a layer of brown resinous phosphate about 1/32" thick. This layer contains more calcium phosphate than the travertine, but it forms an extremely small proportion of the deposit.

Field test of the travertine shows that it contains less than 25% of calcium phosphate.

2. SALISBURY ISLAND.

Salisbury Island is a narrow island 3 miles long from northeast to southwest and lies parallel to the direction of the most frequent winds in the area. Unlike most of the islands in the Recherche Archipelago the granite, where visible, only raises from 10 to 20 feet above sea level. For a width of from 50' to 250' the granite is bare and forms a serrated reef on which the surf breaks continuously.

Overlying the granite base of the island sedimentary beds of limestone and calcareous sandstone rise steeply from the granite base. The upper surface of the island is formed of

travertine, wind blown sand and sandy soil, on which stunted vegetation grows profusely.

Low grade phosphate rock was found in the eroded cliff face approximately 3500' from the north eastern point of the island, and situated between the granite and sedimentary beds, where the calcareous sandstone cliffs were undercut for a depth of 4 to 6 feet.

Description and quality of this material is as under:

(a) Soft calcareous sandstone with a maximum thickness of 18" containing 7.24% of calcium phosphate and 7.2% of water.

(b) White chalky material approximately 12" thick containing 34.27% of calcium phosphate and 6.8% of water.

(c) Hard brecciated rock about 12" thick and similar to Christmas Island rock phosphate. The analysis of a grab sample of this material showed it to contain 50.9% of calcium phosphate and 5.7% of water.

3. PASLEY ISLAND.

A number of shallow caves in the limestone have deposits of sandy guano but the quantity is very small.

4. GOOSE ISLAND.

Limited quantities of sandy guano occur in shallow caves as at Pasley Island.

5. MIDDLE ISLAND.

This is the largest island in the Archipelago. It is formed of granite, quartzite, sand ridges and sedimentary beds of sandstone and limestone. The latter are covered with very dense shrub and mallee. Neither mutton bird burrows nor birds were seen on the island and no phosphate rock deposits were located.

6. FIGURE OF EIGHT.

North of the granite hill at the south end of the island sandy soil overlies a bed of ferruginous sandstone nodules and sandstone. This material contains 12.4% of calcium phosphate and 6.2% of water.

A deposit of approximately 10 tons of sandy guano was found on the western side of the narrowest portion of the island. Mutton bird burrows were fairly plentiful but no birds were seen.

7. BOXER ISLAND.

No phosphate rock was found but shallow caves contain small quantities of sandy guano.

8. NEW YEARS ISLAND
BELLINGER ISLAND
STATION ISLAND
MAINLAND at ISRAELITE BAY

These places were visited but nothing of importance was found.

SUMMARY.

The phosphate deposits of the islands of the Recherche Archipelago are generally of low grade and contain large proportions of calcium carbonate and/or silica.

Christmas Island has been thoroughly investigated and except for the beach outcrop of approximately 1,000 tons contains nothing of economic value, even at the present time.

The narrow beds of low grade phosphate found in the cliff face at Salisbury Island are not encouraging in quality. To determine the quantity available a large amount of tunnelling or drilling would be necessary. If substantial deposits exist, the grade needs to be comparatively high to offset the high cost of underground mining, shipping facilities and probably delays to shipping because of unfavourable seas, of which we had good evidence during our visit to the Archipelago.

Melbourne,

19th April, 1943.