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A RECONNAISSANCE BAUXITE INVESTIGATION ON NEW HANOVER AND NEARBY ISLANDS, NEW GUINEA.

by

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ILLUSTRATIONS

INTRODUCTION

On Manus Island, small deposits of high grade bauxite have been formed by contemporary tropical weathering of a black vesicular dacite. These deposits occur on the crests of narrow spurs in the thickly forested, deeply dissected country with a high annual rainfall. Although not of economic dimensions these deposits are important in that they indicate a contemporary bauxite-forming environment which could be duplicated on many of the northern New Guinea islands. New Hanover which lies off the north-western end of New Ireland and between latitudes 2°20'S and 2°41'S is climatically, physiographically and geologically comparable with Manus Island and, if suitable parent rocks were present, seemed ideally suited for the formation of bauxite deposits of the Manus-type.

The objective of the visit to New Hanover described in this report was to ascertain quickly the possibility of contemporary bauxite occurring in deposits of economic grade and dimensions. As time was limited, the investigation was directed towards the most topographically favourable areas within easy reach from the coast.

METHOD OF OPERATION

A 30 ft. launch, the M.V. "Enuk", was chartered for one week out of Kavieng. The launch was used as a base camp and daily traverses were made inland from various anchorages. No inland camps were established. Local natives were employed as guides and no carrier lines were necessary. At several localities, indicated on Plate I, auger holes were drilled into the upper part of the weathering mantle and samples of clay were examined for gibbsite nodules or chips. Some of the samples were later assayed for silica, alumina and iron oxides.

The accompanying map is based on the military four-mile Kavieng sheet and the routes and sample localities are very roughly plotted.

After traversing the north-eastern coastline of New Hanover, several of the large islands lying between New Ireland and New Hanover were briefly visited and a quick trip was made to the central part of Djaul Island.

PHYSIOGRAPHY

New Hanover

The Tirpitz Range with peaks to about 3,000 ft. above sea level forms a rugged mountainous divide between north and south drainage. It is situated on the southern side of the island so that south-flowing streams are short and steeply graded while north-flowing streams are long and, except in their upper reaches, flow sluggishly through a broad foothill zone. Many of the north-flowing streams are navigable by light canoes for long distances.

Both from the air and from the sea the assymmetry of the island is readily apparent, with a long gently northern flank and a steep southern flank. On the northern flank there is much mature, rolling country containing large grassed areas which look prospective for bauxite or laterite. Thus attention was directed to the northern half of the island and the steep southern foothills were not visited.

Islands between New Ireland and New Hanover

Except for Selapiu Island which contains a central peak about 400 ft. above sea level, the islands between New Hanover and New Ireland are low-lying. The larger islands Baudissin and Mane have low rounded relief which suggests that they are not simply slightly raised coral platforms but more likely that they are composed of maturely eroded volcanic rocks with a fringe of

raised coral or marine sediments.

Imai Island (Kulinus Island on the Kavieng four-mile sheet), a small hilly island off the north-eastern end of Baudissin Island is composed of deeply weathered basalt.

The peak on Selapiu Island was not visited but from offshore its form suggests an eroded volcanic plug.

Djaul Island

Djaul Island has a median range which attains an altitude of about 1,000 ft. in the central portion and rapidly diminishes both east and west. Most of the island is deeply dissected by short north and south flowing streams. Even if bauxite has been formed on parts of Djaul Island, it is unlikely that it would be in commercially interesting quantities, because of the deep stream dissection over most of the island.

Northern New Ireland

As seen from the sea most of the southern arm of northern New Ireland has low and rolling relief more suggestive of maturely eroded volcanic rocks than raised limestone which is common along the north-eastern coastline.

GEOLOGY

New Hanover

The northernmost foothills of New Hanover are mostly dissected piedmont deposits composed essentially of basalt and andesite pebbles with some siliceous rocks which may be sediments indurated and silicified during vulcanism or which may be rhyolite fragments. In the areas traversed exposures are rare but olivine basalt in situ was seen near Metiai and also near Taskul. The

component boulders of the dissected northern piedmont slopes suggest that the Tirpitz Range from which the piedmont deposits are undoubtedly derived is a deeply eroded basaltic volcanic pile with some andesitic phases.

Islands between New Ireland and New Hanover

The large islands Selapiu, Baudissin and Mane are probably composed of deeply weathered deeply weathered basalt surrounded by a fringe of slightly raised coral and marine tuffaceous sediments.

Large olivine basalt boulders were seen on Imai Island at the north-eastern end of Baudissin Island and grey fine tuffaceous sediments weathering to yellow clays were noted on the south-eastern side of Mane Island. Large black rounded boulders thought to be basalt, weathering to reddish-brown soils were seen from the passing launch on the southern tip of Mane Island.

Djaul Island

Observations on Djaul Island were restricted to a short traverse inland from Sumuna in the centre of the northern coastline. The only exposures seen were weathered, finely bedded grey tuff. It is suggested that much of the high ground in the centre of the island which can be seen from the sea is basalt.

Northern New Ireland

The southern arm of Northern New Ireland has a low and maturely rounded relief probably developed on basaltic volcanic rocks. A landing was made on this arm near the southern entrance to Albatross Channel and a track cut about ½ mile inland to the top of a small hill. Basalt boulders were scattered around the flanks of this hill. A 7 ft. auger hole was drilled through purplish-red clay on the top of this hill without encountering hard rock.

Orange-coloured sands on the narrow beaches east of Albatross Channel attracted the writer's attention from the passing launch. Examination of the sands indicated that the colour was due to limonite staining of light coloured sand grains, mostly felspar and coral fragments, caused by percolation of limonite-charged seepage water from swamps behind the beaches.

WEATHERING

As on Manus Island chemical weathering is everywhere deep and thick residual soil profiles are retained. Mature ferruginous hard laterite zones were not but in many places on New Hanover and individual lateritic pisolites were concentrated at the surface, particularly on native pa ths, by the washing away of lighter fractions of the soil by rain. Light-brown, white, and pink irregular shaped accretions, presumably of gibbsitic bauxite, were seen at many localities on New Hanover both as surface concentrations and dispersed through the upper part of the residual soil profile. These accretions were similar to but generally smaller than bauxite nodules seen on Manus Island. They were particularly evident along the track between Metiai and Baisevenbum and at Baitalum and Atuat on the main track between Metiai and Kulpetau. The surface concentrations of these bauxitic nodules belied their frequency in the underlying residual soil; only rarely were the nodules encountered within the traversed, with analytical data where available, follows:-

Locality (1) - ½ mile from Metiai village on Metiai - Baisevenbum track.

Small irregularly shaped bauxitic nodules on path over low grassy hill.

0 - 6 ft. Brown clay with rare small bauxite nodules.

6 - 8 ft. Colour change at 6 ft. to brick red.

Hole abandoned, no hard rock.

Sample (1) 5-6 ft.:- SiO_2 24.2%; Fe_2O_3 14.4%;
Al_2O_3 40.7%; TiO_2 0.3%.

Locality (2) and (3) - Baitalum grassland, on track about 3 miles east of Metiai village. A few bauxite nodules and crusts on surface of path.

0-4 ft. Brown clay with dispersed small bauxite nodules.

Hole abandoned, no hard rock.

Sample (2) 1'-3 ft. - SiO_2 33.7%, FeO_3 17.3%,
Al_2O_3 30.3%, TiO_2 0.2%.

Sample (3) Bauxite nodules only - no analyses.

Locality (4) Five miles south of Metiai village on grassy hill (Tikiwun) crossed by Metiai-Baisevenbum track.

Bauxitic nodules at surface which look like gibbsitic replacements of basalt.

0-4 ft. Brick red homogeneous clay

4-7 ft. Brick red clay with few small brown nodules of bauxite.

7-10 ft. Brick red clay mottled and streaked with purple clay - no nodules.

Hole abandoned, no hard rock.

Sample 4 (a) - 1-4 ft. SiO_2 38.1%, Fe_2O_3 13.1% ,
Al_2O_3 30.8%, TiO_2 0.25%.

4 (b) - 4-7 ft. SiO_2 20.0%, Fe_2O_3 18.5%,
Al_2O_3 38.7%, TiO_2 0.4%.

Comparison of the above analytical data shows zoning within the residual soil profile with marked alumina enrichment in the 4-7 ft. zone.

Locality (5) Edge of low foothills were Matanalaua River emerges onto coastal plain. Area completely covered by rain forest. Hole located on crest of low hill - no bauxite nodules or rock boulders in sight.
0-4 ft. - mustard coloured residual soil.
Bottomed on hard quartzite or rhyolite at 4 ft.
Probably an old terrace remnant composed of basalt and siliceous boulders. No analytical data available.

Locality (6) In Putputingham village about three miles south-east of Metamin village on main track to Metian. On top of weathered terrace remnant containing andesite and basalt boulders mostly weathered to clay which commonly has relict structures inherited from component boulders.
1-2 ft. Brick red clays with few bauxite accretions.
2-4 ft. Red clays containing clusters of micaceous talc.
4-6 ft. As above
6-7 ft. Distinct colour change to bright red at 6 ft.
Hole abandoned, no hard rock. No analyses available.

Locality (7) On main track from Putputingham to coast at junction of low foothills and coastal swamp. Small ($\frac{1}{4}$" diam.) bauxite nodules at surface.
1-4 ft. mustard coloured clay with small gibbsite nodules and flakes.

Sample 7. 1-2 ft. SiO_2 23.5%, Fe_2O_3 19.8%
Al_2O_3 36.5%, TiO_2 1.0%

Locality (8) Long flat topped grassy spur about two miles south of Tashul, at former site of Negabulu village.

No bauxitic nodules at surface.

0-1 ft. dark brown soil, no nodules.

1-3 ft. light brown clay with thin gibbsite flakes up to 1 mm. thick.

3-4 ft. As above, fewer gibbsite flakes.

4-7 ft. Clay mustard coloured some mustard and grey gibbsitic replacement of (?)andesite

7-10 ft. Grades from mustard coloured to reddish-brown and mottled.

Sample 8(a) 4 ft.-7 ft. - SiO_2 21.3%, Fe_2O_3 24.6% Al_2O_3 34.6%, TiO_2 0.9%

Sample 8(b) 7-10 ft. - SiO_2 20.0%, Fe_2O_3 22.7% Al_2O_3 37.4%, TiO_2 1.0%.

Locality (9) Low lying hunai flat called Mataiung, about one mile north of Lungatun plantation. Chocolate-brown lateritic pisolites at surface.

0-1 ft. brown soil with humus.

1-3 ft. mustard coloured clay with 2" laterite band at 3 ft.

3-4 ft. mustard coloured clay.

4-7 ft. mottled brown and mustard coloured clay.

7-9 ft. Brown clay, water at 8 ft. shelly horizon at 9 ft. Lateritic profile developed on raised swamp muds.

No analytical data available.

Locality (10) About ½ mile north of locality (9) on top of grassed hill at former site of Tutulung village.

0-4 ft. mustard coloured clay.

4-7 ft. as above with some gibbsitic replacements of basalt. Bottomed on olivine basalt boulder at 7 ft.

Sample 10. 0-4 ft. SiO_2 31.3%, Fe_2O_3 21.4%, Al_2O_3 32.3%, TiO_2 1.1%.

Locality (11) Top of low hill in centre of Imai Island at north-eastern end of Baudissin Island. Olivine basalt on shore of island.

0-1 ft. brown soil with humus.

1-4 ft. reddish brown clay.

Hole abandoned, no hard rock.

No analytical data available.

Locality (12) In low wooded hills about ½ mile inland from centre of south-western coast of Mane Island.

1-4 ft. dull yellow clay

4-7 ft. dull yellow clay, grey mottling.

Hole abandoned, no hard rock.

Parent rock probably a tuffaceous marine sediment.

No analytical data available.

Locality (13) Near divide between Sumuna and Biwa on Djaul Island.

0-1 ft. brown clay much humus .

1-3 ft. brown clay grading to grey clay.

3-5 ft. grey clay, bottomed in slightly weathered grey bedded tuff.

No analytical data available.

Locality (14) On top of small hill about ½ mile inland from southern entrance to Albatross Channel, on southern arm of northern New Ireland. Olivine basalt boulders nearby.

0-1 ft. brown soil with humus.

1-4 ft. brick red homogeneous clay.

4-7 ft. brick red clay becoming increasingly mottled and streaked with purple clay.

Hole abandoned, no hard, rock, no bauxitic nodules.

No analytical data available.

CONCLUSIONS AND RECOMMENDATIONS

Although this was only a very rapid and cursory examination sufficient information has been obtained to indicate that present climatic and physiographic conditions on New Hanover favour the formation of contemporary bauxite. No deposits of high grade bauxite were discovered but it is believed that in the areas sampled favourable parent rocks were not present. In most ~~cases~~ areas clays developed on weathered conglomerates containing boulders representing several rock types were sampled. In other ~~instances~~ places clays formed over olivine basalt were tested. Little is known of the geology of New Hanover, but it is thought that the most favourable area for bauxite prospecting is on the gentle northern and north-eastern slopes of the island, farther inland than penetrated during this investigation, where thick residual soil profiles will be developed over andesitic and basaltic volcanic products.

The writer did not have access to aerial photography before this investigation. Almost complete coverage was flown by the U.S. Air Force during 1947 and 1948 and the photographs should be available through the R.A.A.F. Any further search for bauxite on New Hanover should be

preceded on aerial reconnaissance or examination of the available photo coverage and attention directed towards the large grassy areas with mature, rolling, topography and particularly to any elevated flat areas which may have good sub-surface drainage.

Observations during this survey suggest that the southern arm of northern New Ireland and the islands Mane and Baudissin between New Hanover and New Ireland may contain mature weathering profiles over basalts which under conditions of good subsurface drainage may yield nodular bauxite or bauxitic clays.

This investigation was very brief but has served its purpose and indicated the most favourable areas for further bauxite search.

NEW HANOVER

SAMPLE LOCALITY PLAN