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ADDITIONAL NOTES ON VOLCANIC ACTIVITY AND THERMAL AREAS IN

THE D'ENTRECASTEAUX ISLANDS.

by

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D'ENTRECASTEAUX ISLANDS

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(M. A. Reynolds) Rabaul

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ADDITIONAL NOTES ON VOLCANIC ACTIVITY AND

THERMAL AREAS IN THE D'ENTRECASTEAUX ISLANDS.

I. INTRODUCTION:

The writer visited the D'Entrecasteaux Island in August 1955 to ascertain whether there had been any alterations in thermal activity as a result of the earthquakes which originated at Gomwa Bay on 31st July. In a report prepared since the visit, the earthquakes were classed as tectonic (Reynolds, 1955). Information obtained, additional to the notes prepared by Taylor (1955), and the temperatures at thermal areas during August are given hereunder.

The co-operation of the Assistant District Officer, Mr. D. Grove of Esa'ala is acknowledged. The provision of a native interpreter, Leitani, who accompanied the writer on investigations, was also appreciated.

II. RECENTLY ACTIVE CRATERS:

- 1. <u>Lamonai Crater</u>: There were no changes in the condition of this crater as a result of the seismic activity.
- 2. Oiau Crater: The structure of this crater and the form of the lava flow occupying the bowl of the crater were determined by field observations and later examination of aerial photographs. Contour-form lines and the outline of the crater rim are shown in Figure I which is based on Map PNG 16A-2 of Taylor's report (1955). Figure 2 is an enlargement of the crater with contour-form lines showing the topography of the crater rim. The outline of the lava flow is also shown, but to avoid confusion, form lines were not extended over this area; shading by stippling has been employed instead to show the form of the lava flow. The extent of the flow in the north-western sector, as determined from aerial photographs, was not certain, and a complete boundary has not been drawn. Fractures shown in photographs have been included as broken lines.

The aerial photographs (dated February 1943) showed both the surface of the lava flow and crater rim denuded of vegetation. In August 1955, the lava flow was covered by small trees which resembled a type of eucalypt, and the crater rim was overgrown mostly by kunai grass.

There have been at least two phases of activity at this crater. The first was a period of intense explosive activity during which a cone of fragmental material, mostly pumiceous dust, and a large crater were formed. Fragments of black volcanic glass, similar to those found on the lower, outer slopes of Lamonai Crater, were noticed in the dust deposit. The composition of Oiau Crater resembles in appearance that of the Tuluman Islands which have been built up above submarine cones.

During the second phase of activity, there were several flows of lava, and at least one explosive period. The flows and products of explosive activity appear to have been superimposed upon one another, and the last flow only has been represented in Figure 2. The uncertainty of the outer limit of the lava flow in the north-western section may be due to the last flow only partly covering earlier

flows and deposits. Detail available concerning the nature of this activity was obtained from a small vertical cliff section near a creek which fellows the outer margin of the south-eastern portion of the lava flows and then flows east to Numanuma Bay. The base of the section only was accessible, and the following notes were made:

Upper 20 feet consisted of lava flows. Only sample available (R6202) was taken from blocks which had fallen from lowest section during the earthquake. The rocks were finely banded light and dark grey lavas with colourless plagioclase phenocrysts.

Underlying the lava flows there was a bed of indurated pumice dust and agglomerate. The maximum thickness was 15 feet. Sample R6201, collected from the base, was composed of light green pumice dust with numerous fragments of green-grey pumice and rare small fragments of black volcanic glass.

The lowest bed exposed consisted of a finely banded, brown-grey vesiculated lava, six feet thick. Sample R6200 was collected from this flow, and showed that the lava contained phenocrysts of colourless plagioclase.

The base of the section was at a height of 270 feet above sea level.

During the earthquakes on 31st July, there were landslides from the southern and western walls of the crater, and many cracks appeared along the rim. This is attributed to the unconsolidated nature of the pumice dust of which the walls are composed.

3. Dobu Island: Only the eastern rim of the main crater and the northernmost of two small adjoining craters in the south-east of the island were examined during August. The inner walls of the main crater were almost vertical on the northern and eastern sides, and rose to a height of 700 feet above sea level to the eastern rim. The northern rim was higher and extended to the north-east above the area where it was joined by the eastern rim. The reason for this flat area just south of the northern rim was not obvious, but it may have been due to a small explosion vent in the vicinity. Samples Nos. R6206 (a) to (d) were collected from the eastern outer slopes just below the rim of Oiau Crater, and are typical examples of the larger blocks of ejected material to be found in the vicinity.

The structures of the central, western and southern sections of the main crater could not be defined when viewed from the eastern rim because of the dense vegetation. Aerial photographs which were examined later failed to show any definite structures; it was apparent, however, that explosive activity had occurred from a number of vents extending from the main crater to the small bay at the south of the island.

The two small craters in the southeastern portion of Dobu Island were visible in the aerial photographs, and there was also an indication that activity at one stage had extended to the south coast. (The line of weakness along which these small craters had formed is parallel to the line formed by joining the main crater to the bay to the south-south-east.) The northernmost of the small craters was composed

of fragmentary material; pumice fragments which were formerly embedded in the crater walls have been washed down and deposited on the floor of the crater. The fact that there is still slight thermal activity in this crater suggests that the most recent volcanic activity on Dobu Island was here. The lava flow which outcrops at the coast at the south-east end of Dobu Island originated from the adjoining crater to the south. Sample No. R6207 was collected from here.

- 4. West Fergusson Island: The two isolated hills shown in the map (Figure 4) of the Iamelele thermal areas are considered to be volcanic in origin. Fragments of black volcanic glass and banded lavas were found near thermal areas around the lower, southern slopes of the cone in the southeastern portion of the area.
- of two extinct volcanic areas on Goodenough Island. The first of these was a lava flow on the east coast near Aituia; the native name for the area is Miwaiaukala. Sample No. R6210 was collected from where this flow reaches the coast. The second place visited was Waigipa Island at the southeast end of Goodenough Island, where a volcanic cone occupies the central portion of the island. Although no outcrops were sighted on the northern and western slopes, a sample (No. R6211) was collected from boulders cleared from an area which was being prepared by natives for gardening. The predominant rock type appeared to be a vesiculated fine grained olivine basalt. The northwestern end of the island was delineated by a low ridge of agglomerate composed of basalt fragments in a matrix of pumiceous dust (Sample No. R6212). This ridge represented the remnant of an older crater rim. On the south side of Mud Bay, west of Waigipa, were three small structures which appeared to be of volcanic origin; these were not investigated.

III. THERMAL AREAS

- A. East Fergusson Island: Thermal areas at the eastern end of the island were examined during the August investigations. The individual areasare described hereunder in the same order asgiven by Taylor (1955), and are also numbered in Figure 1 to correspond with his map PNG 16A-2. Slightly different positions are shown for some areas. These are based on actual visits or determinations from aerial photographs. The positions of small creeks and tributaries and additional contour form lines are given in Figure 1 to facilitate further investigations in this area.
 - 1. Deidei Area (see Figure 3): The points numbered 1 to 7 are the same as those staked by Taylor during his visit in June 1955. Three other points, Nos. 8 to 10, were also established during August.

Temperatures measured and corresponding remarks are given hereunder -

- No. 1 101°C Geyser-like upwelling of water at intervals of about 3 seconds.
- No. 2 98°C Geyser active at one minute intervals; water ejected to between 5 and 10 feet above surface. Geyser at easternmost end of fissure more active during August and water ejected to heights of up to 15 ft. above surface.

No.	3 101	5	Continuous gas ebullition from spring in fissure 10 feet long and 5 feet wide. Water level 7 to 8 feet below surface.
	4 55	i 1	Northwesternmost of several pools in large area overlain by shallow layer of water. There is slow gas escape from these pools.
	5 859	1	An elongated area about 10 yards long; temperature taken at western and in clear hot water; the eastern and contained mud.
3	6 97		Central portion of main southern zone.
	7 102		Vestern portion of main southern zone.
i	8 100°		Eastern portion of main southern zone.
× (9 959	C	A small mud spring at eastern end of small thermal area east of main northern zone.
10	o _. 80°		Temperature at western end of small thermal area described for Point 9.

The temperatures at most points measured by Taylor in June were less during August.

- 2. Atunapara: The maximum temperature measured was 95°C. A sample of typical rock type in the vicinity (R6203) was collected.
- 3. The water in the lagoon at the mouth of the Iabui River was quite cool, and temperatures were not measured.
- 4. Three areas were examined about ½ mile north of Atunapara. The first was on the left bank of a creek which flows from east of Numa Numa Bay to west to join the Iabui River. Gas and vapour were escaping from fissures in rock outcrops at temperatures of 89°C., 90°C. and 78°C. Samples Nos. R6204 (a) and (b), R6205 were collected here. The second area was situated north-northwest of and 40 feet above the first. Gas and vapour were escaping from fissures in lava which had been altered by thermal activity. The maximum temperature measured here was 78°C., but the temperatures at lower, inaccessible positions below the fissures would have been nearer 100°C. A larger area to the north-north-west occupied a small gully near a tributary to the creek mentioned above. This zone is called Bwabwawana by local natives. The walls of the gully are steep and over 50 feet high at the eastern end. The highest temperature, 100°C., was measured at the western end where there was an accumulation of large boulders through which steam and gaswere escaping with a loud roar. There were some other small thermal areas around the northern rim of this gully.
- 5. and 6. These areas which were seen from the air when returning to Rabaul were not mentioned by local natives during the period of investigation.

Their positions have been determined by examination of aerial photographs.

Two small areas of hot ground at the eastern end of the southern rim of Oiau Crater were examined and temperatures of 42°C. and 40°C. were measured. These points were at heights of 360 feet and 250 feet above sea level.

B. Southern and Western Fergusson Island; Goodenough

Island: The only examination of thermal areas in this portion of the D'Entrecasteaux Group was conducted at Iamelele. Warm springsat Nade, KaloKalo and Bolu Bolu were not visited. It was not known until aerial photographs were examined later that the Iamelele thermal areas were so extensive. The main areas examined are numbered 1 to 4 in Figure 4 which has been prepared from the ground survey and from oblique aerial photographs.

Area No. 1 extends for a distance of about 400 yards between a small lake of stagnant water to the south and small hillyprotrusions on the northern side. The most active points were on the lower slopes of the hilly section; temperatures of 96°C., 90°C. and 96°C. were obtained at a boiling spring at the eastern end (Native name - Italautaliagu) and two small sulphur-encrusted vents to the southwest. The thermometer became jammed in a fissure at a depth of about 3 feet from the surface at the next point examined, and could not be extricated. It was estimated that the temperatures here and further west along the slopes were near 100°C. The flat area between the southern margin of the hilly section and the lake was encrusted with siliceous material and undermined in many places. Mud pools and small vents surrounded by mounds of sinter were common in this area.

Area No. 2 was separated at its northeastern end from Area No. 1 by a shallow swamp-like lake; a low ridge separated the two areas further south. It is estimated that Area No. 2 extended over an area of at least 30 acres. Numerous solfataras were scattered over this flat, sparsely vegetated area. Steam and gas escaped mostly from small vents around which small mounds of sulphur and siliceous material had been formed; there was, however, some gasebullition from muddy water pools in the northern part of the area. A new thermometer had been obtained by the time this area was reached, and temperatures at the sulphur-encrusted vents measured either 99°C. or 100°C.

Area No. 3 is south-south-east of Area No. 2 and is reached by a native track which passes through two small creeks. On the right bank of the southernmost creek and near the track is a small thermal area from which there was a strong smell of sulphuretted hydrogen. Area No. 3 is situated in a gully denuded of vegetation and containing boiling springs and mud pools. One grey mud pool on the west side of the track was about 30 feet long. Due to subsidence around the margin, no attempt was made to measure temperatures here. Steam escaping from a small sulphur-encrusted vent nearby was at a temperature of 100°C. There were other smaller mud pools on the eastern side of the track, and some boiling springs along the northern margin of the gully had a sibilant escape of steam. Maximum temperatures recorded were 100°C.

There were several small areas with white, silica encrusted surfaces and sparsely covered by vegetation near the track between Areas Nos. 3 and 4. Some of these were briefly inspected, and found to be decadent thermal areas. Fragments of glassy basalt and other effusive rock types were common in these areas, and just west of Area No. 4 pebbles of these had become cemented into the bed of a small creek by a thick deposit of white siliceous material.

Area No. 4 was the easternmost of thermal areas inspected. The southern half, which was covered by a shallow layer of water, contained large pot holes. The maximum temperature obtained at points of steam and gas emission was 100°C. The northern portion was covered mostly by sinter terraces, but there were some mud pools, hot springs and small vents around the margin. Some vents were surrounded by small mounds of siliceous material and resembled small volcanic cones.

C. Dobu Island: There had been no change in thermal activity at points 7 and 8 shown in Map PNG 16 A-2 of Taylor's report (1955) when visited in August. Another thermal area (No. 9, Figure 1) in the northernmost of two small craters on the southeastern portion of Dobu Island was examined during August. This is a decadent thermal area made up of two small zones on the floor of the crater, and one narrow zone on the inner wall of the crater on the northwest side. There was a faint smell of sulphuretted hydrogen, and small amounts of sulphur had been deposited near vents. Unfortunately, no thermometer was available for temperature measurement.

Dobuan natives mentioned that a large vent, covered at the mouth by a boulder, existed on the eastern rim of the main crater, but they were unable to locate it when the crater rim was examined.

IV. SUMMARY AND CONCLUSIONS:

- 1. This report gives information additional to that obtained by Taylor (1955) on the volcanic cones and thermal activity in the D'Entrecasteaux Islands.
- 2. There were no changes in thermal areas due to seismic activity which commenced on 31st July 1955.
- 3. Some of the thermal areas in the islands visited showed signs of decadence.

V. REFERENCES:

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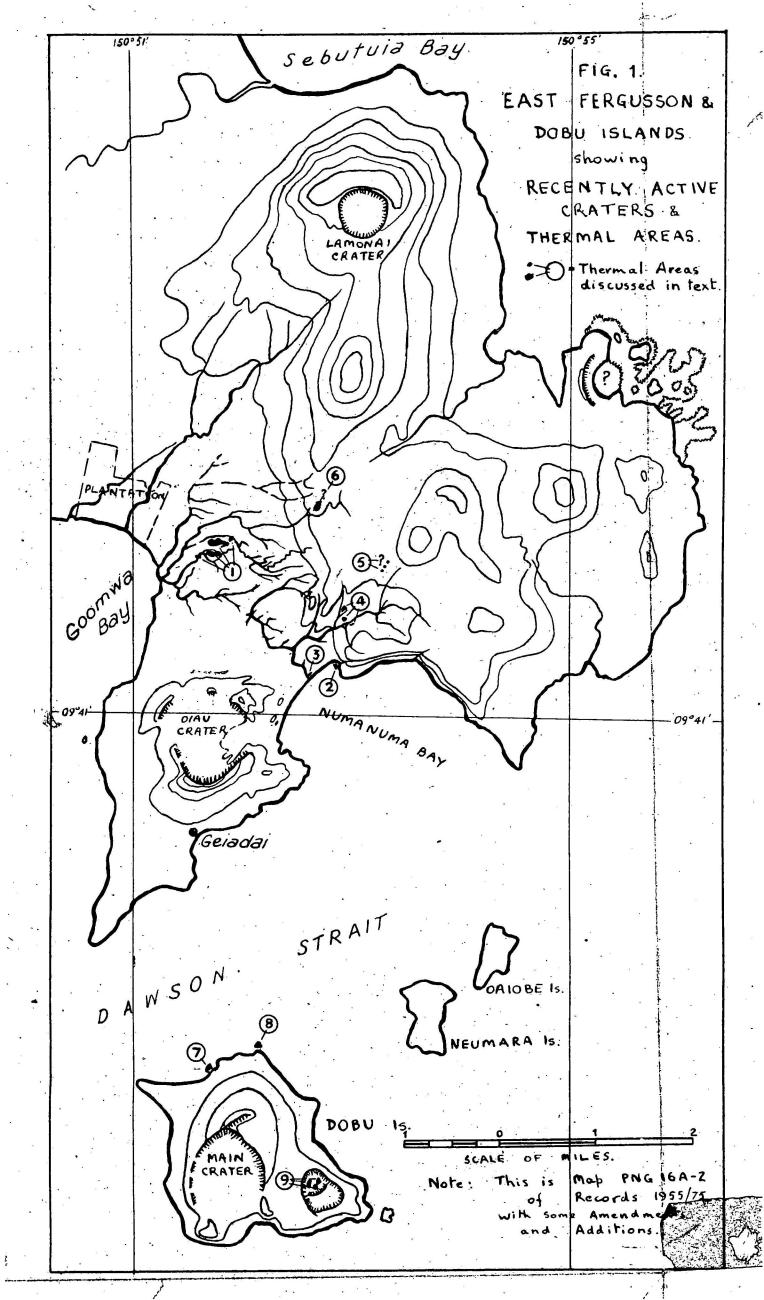


FIGURE 2: OIAU CRATER.

Reference:

Crater shown by contour-form lines.

Lava flow shown by stippling.

Fractures represented by broken lines.

(Detail taken from merial photographs dated Feb., 1943).

