COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

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TULUMAN VOLCANO 1962

by

F.E.Dekker

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Fig. 1: The larger island viewed from the south.

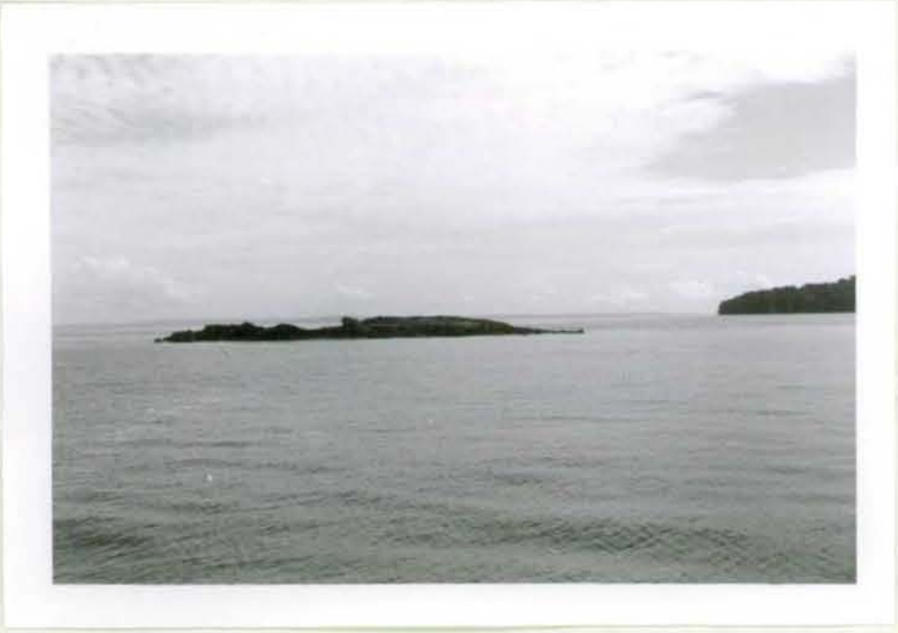

Fig.2: View of the island of Cone 3 from the main island. Lou Island in the right background.

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INTRODUCTION

In June, 1953, submarine volcanic activity commenced in the St. Andrew Strait in the Admiralty Islands. The area has been intermittently active since this date, and two islands have been formed. In June 1962 Mr. John Herlihy and I paid a brief visit to the islands, and mapped them using a plane table and telescopic alidade. The larger island is still thermally active and since 1957 has risen about 10 feet.

LOCATION AND ACCESS

The Tuluman Islands are located near 147°20'45" east longitude, 2°28'15" south latitude; the islands are about 1 mile south of the southern tip of Lou Island, and 28 miles south-south-west of Momote (Plate 1). Momote is on Los Negros Island (Admiralty Group) and has a good all-weather airstrip.

The most convenient access to the Tuluman Islands is by air to Momote and thence by vessel. The vessel we used was a workboat made available by the District Commissioner at Lorengau, Manus Island.

PREVIOUS INVESTIGATIONS

The Tuluman Islands were visited several times during eruptions from 1953 to 1957 by Vulcanologists from Rabaul and also by Administration officers from Baluan. The two main reports on these investigations are by Reynolds and Best (1957) and Reynolds (1958).

GENERAL

Lou Island to the north of the islands is heavily wooded, but vegetation on the Tuluman Islands is sparse as yet, probably due to continued thermal activity. A few coconut trees have been planted by the local natives and there are some grasses and shrubs, but growth of these plants is stunted. A few insects were found on the larger island, and seabirds have nested near the thermally active areas, where the warm sand aids in the incubation of their eggs. The climate is very hot and humid, and the future visitor would be well advised to wear sunglasses and to carry a sunshade. Reefs have not yet developed around the islands, and the beaches make good landing spots.

PHYSIOGRAPHY

The St. Andrew Strait lies across what appears to be a large sunken caldera, about 12 miles in diameter. Lou, Balaun, Pam and St. Andrew Islands are of volcanic origin, and both Lou and Baluan have ancient craters and thermally active areas.

Fig.3: The central rift showing the lava flow in the background.

Fig.4: Cross-bedding in pyrclastic deposits on the western side of the larger island.

The Tuluman Islands at the time of the visit consisted of two islands. The larger island is roughly circular and is about 2000 feet in diameter. It has a total area of about sixty acres. The smaller island is about 1000 feet north-west of the large island, and is roughly elliptical, about 150 feet long and 100 feet wide; its maximum altitude is about 12 feet (Pl. 1).

A rift, trending east-north-east in the south-western quadrant of the large island was initially inundated by the sea, but is now sealed by a sandbar, about six feet high which closes the rift at the seaward end. The rift has a flat floor, and contains pools of discoloured sea water.

Pyroclastic deposits to the north and east of the rift are remnants of volcanic cones; these deposits rise to a height of 120 feet above sea-level. In March 1955, the island was about 100 feet high. In February 1957, the Assistant District Officer, Baluan, reported uplift of up to 15 ft on parts of the island and it is estimated that a further uplift of about 10 feet has taken place since this date.

Marine erosion has formed cliffs up to 90 feet high on the western, south-western and south-eastern sides of the island. Two prominent marine terraces, 10 feet and 25 feet above sea-level respectively, indicate at least two pauses during the uplift of the island. Flat beach deposits, a few feet above sea-level bound the island on the north-western and south-eastern sides.

The lava flows are very rugged, and appear to have been fairly viscous during extrusion.

HISTORY

Seven main vents have been postulated for the volcanic activity in the area. These have been named Cones 1 - 7 (Reynolds & Best, 1957) in chronological order of their first activity, and they are briefly outlined here.

Cone 1: (4500 feet SSE of southern tip of Lou Island)

The activity here began in June 1953, being predominantly submarine. A lava dome was built up above sea-level at what was thought to be the site of Cone 1, but this subsequently disappeared in June, 1955.

Cone 2: (2500 feet SW of Cone 1)

Three small islands built up around the vent of this cone but these were covered by material from Cone 4 in February, 1955.

Cone 3: (4000 ft. west of Cone 1)

Fairly vigorous volcanic action from Cone 3 led to a large amount of lava and volcanic debris being ejected during July, 1954, and the formation of the first large island in the St Andrew Strait. Most of the pyroclastic debris has since been removed, and only a small island composed mainly of lava remains. Shallows between this island are probably due to deposition of ash from this cone onto reefs which existed before volcanic activity began.

Fig. 5: Flow banding in lava

Fig. 6: Alternating bands of glassy and scoriaceous lava.

Cone 4: (1000 ft West of Cone 2)

During February, 1955, Cone 4 was built up, and joined Cone 2. The eastern part of Cones 2 and 4 forms the major part of the larger island as it is seen today.

Cone 5: (7500 ft South of Lou Island)

Submarine activity commenced here in February, 1955. A cone was built up above sea-level, and this was linked with the island of Cone 4. Marine erosion subsequently removed most of this cone.

Cone 6: (9000 ft South of Lou Island)

Lava was extruded from this vent below sea-level from March to May during 1955.

Cone 7:

An explosive phase in November-December, 1956 marked the end of vigorous volcanic activity in the area until the present day. This phase was accompanied by the extrusion from a vent about 450 feet north of Cone 2 of a large volume of lava which covered the position of Cone 2, and joined with the island of Cones 4 and 5, resulting in the larger island as it was seen by the writer. The main point of extrusion is marked by a small peak 74 ft. above sea-level in the southern part of the main lava flows; the small rise along the northern edge of the flows is very close to the position estimated by Reynolds for Cone 7.

GEOLOGY

Pyroclastic deposits:

Half of the larger island consists of unsorted, unconsolidated volcanic agglomerate, which is a product of Cones 2, 4 and 5. (See History). Pumice and ash are cross-bedded, (Fig.4) and here contrast between adjacent bands is accentuated by varying amounts of staining. Lava bombs, ranging up to a few feet in diameter, are scattered at random throughout the deposit. An analysis of dust collected by Reynolds gave a silica content of about 70 percent.

Slump faults in the pyroclastics trend roughly parallel to the central rift, and are invariably downthrown towards the rift. The faults form well-defined scarps up to 15 feet high.

Extrusive rocks.

The lava flows on the larger island have an area of about 20 acres. The lava consists of hard, slightly vesicular obsidian displaying good flow structure, and dark grey, scoriaceous, highly vesicular rhyolite with a minor amount of flow banding. Alternating bands of these two types were observed. (Fig.6). Two specimens were analysed by the B.M.R. laboratory and were found to contain 67 percent silica. (Joplin 1963, Page 122).

A small lava flow in the south-eastern sector of the island was probably formed during eruptions from Cone 2.

Fig. 7: The area of most thermal activity off the southwestern end of the central rift, with the ancient cone of Baluan Island in the background.

Fig.8: Large thermal pool in the central rift.

The smaller island, which is a remnant of Cone 3, consists of obsidian and has loose boulders scattered around its margin. A thin veneer of ash and pumice has been deposited by sea-action on this island.

THERMAL ACTIVITY

The south-western side of the island is the most thermally-active locality in the area. A semicircle of submarine vents or springs lies just off the seaward end of the central rift of the large island. (Fig.7) This group is in the approximate position of the submarine explosions noted by Reynolds in December, 1956. The sea-water in the vicinity is highly discoloured by colloidal sulphur. The seaward end of the rift is flanked by loose boulders, among which there are numerous fumaroles. The vents below the southernmost boulders were the more active, and steam from these often rose to heights of about thirty feet. There are numerous hot springs at the southwestern end of the rift. The springs form continually bubbling, shallow pools and the rocks in the vicinity are heavily encrusted with sulphur and iron-rich deposits. Temperatures were estimated to be between 70° and 100° Centigrade.

There are a number of submarine thermal points off the main lava flows; these vents were made apparent by the discolouration and heating of the sea-water, but their exact location could not be determined.

ACKNOWLEDGEMENTS

On behalf of Mr. J. Herlihy and myself I wish to thank the Administration on Manus Island for their kind co-operation in making the trip a success, and to Mr. and Mrs. Brian Duffy on Baluan Island for their excellent hospitality.

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REYNOLDS, M.A., & BEST, J.G., 1957 - The Tuluman Volcano, St. Andrew Strait. Bur.Min.Resour. Aust. Rep.33.

REYNOLDS, M.A., 1958 - Activity of Tuluman Volcano, St Andrew Strait. Bur.Min.Resour.Aust. Record 1958/14 (unpubl.).

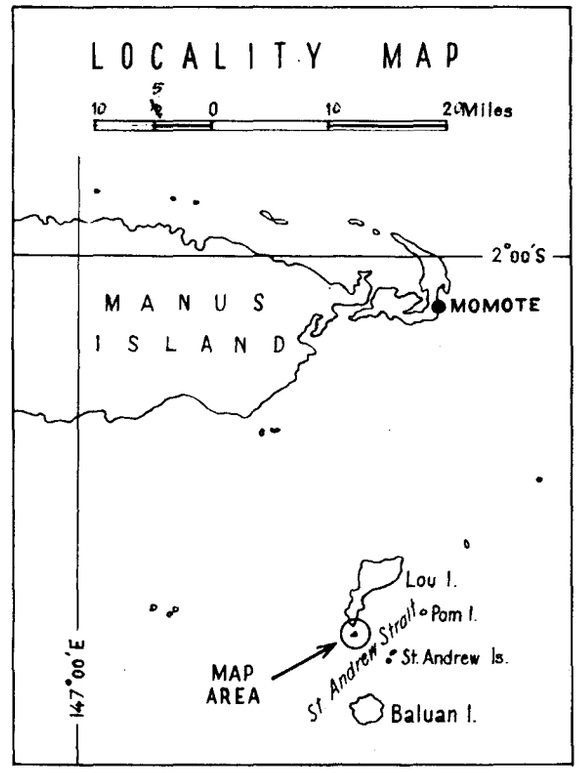
Fig.9: Panoramic view of the lava flows taken from the highest point on the island, showing Lou Island in the left background and fault scarps in the left and right foreground.

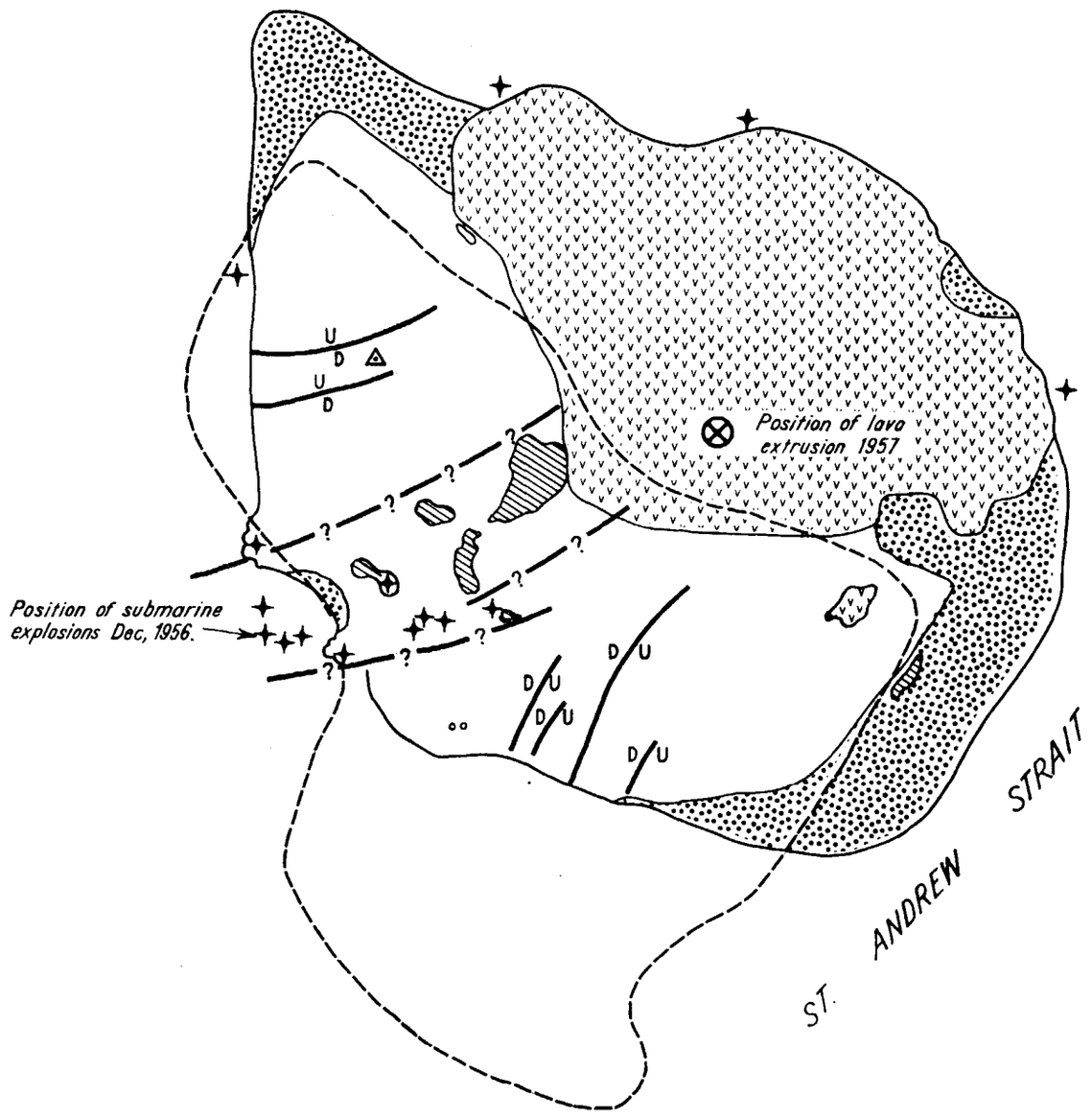
GEOLOGICAL MAP OF THE TULUMAN ISLANDS

ST ANDREW STRAIT

SCALE

200 0 500 1000 FEET





REFERENCE

- Lava
- Pyroclastics
- Littoral deposits
- Pool
- Thermal area
- U/D Fault
- Trig. beacon
- Vent
- Outline of islands as mapped Dec, 1956.

Bureau of Mineral Resources, Geology & Geophysics. Oct., 1963.

To accompany Record No 1963/

A55/A11/8 G.M.

TULUMAN ISLAND
St. Andrew Strait

T N

Reference

—70— Surface contours - interval 10 ft. - Datum, Sea level, high tide

·74 Spot height (in feet)

Pool

Cliff

Vent

Thermal area

Plane table survey June 1962

100 0 100 200 300 400 500 FEET

Bureau of Mineral Resources Geology and Geophysics September 1963

To accompany Record 1963/

A55/A11/7 PB