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THE GOMWA BAY (B'ENTRECASTEAUX ISLANDS) EARTHQUAKES: July - September, 1955.

by

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I. INTRODUCTION

Taylor (1955) has recently prepared a report on volcanic activity and thermal areas in the D'Entrecasteaux Islands. This report gives the major earthquakes whose epicentres were at or near the eastern end of Papua and the D'Entrecasteaux Islands since 1913. It also includes a list of tectonic shocks of lesser intensity felt since October 1953, including the first of those which form the subject of this report. This present paper, therefore, contains only the details of the earthquakes which originated on 31st July 1955 and the aftershocks which continued until September.

The two strongest earthquakes felt during the period under discussion occurred at 1230 and 1315 hours (local time) on 31st July. Neither of these were felt greater than Strength 6 (Mercalli Modified Intensity Scale) in any of the places situated near the epicentre. Residents, therefore, were not unduly alarmed at that time. The numerous aftershocks, which were still occurring in September, caused some unrest, particularly among those natives who had been in the Mt. Lamington area prior to and during the eruption in 1951. The writer spent ten days in the D'Entrecasteaux Islands during August, checking thermal areas and reassuring local inhabitants that there was no evidence to suggest that there was going to be an immediate eruption.

The results of examinations of volcanic areas in the D'Entrecasteaux Islands are to be given in a separate report.

II. DESCRIPTION OF EARTHQUAKES AND THEIR EFFECTS

The information given hereunder has been prepared from reports from the Assistant District Officer at Esa'ala, Mr. D. Grove, and from data supplied to the writer during his visit. Where unspecified, place names referred to are shown on the map accompanying the report.

1. Preliminary Earthquakes (?Foreshocks), July 31st:

There is some evidence that small shocks occurred on 31st July prior to the first strong earthquake at 1230 hours. Details available are as follows:

(a) A large landslide occurred at about 1030 hours at the northern end of Dobu Island. Although there have been no reports of earthquakes at this time, the movement is attributed to seismic activity of small intensity.

(b) Residents at Kedidia felt a definite earthquake about one hour before the main shock at 1230 hours. Several movements of lesser intensity were felt during the intervening period.

(c) The monthly Vulcanological Return from Gehua reported tremors of Strength 3 (Mercalli) at 1220 and 1230 hours on 31st July.

2. Major earthquakes at 1230, 1315 hours, July 31st:

The two strongest shocks on 31st July were felt at most places in

the D'Entrecasteaux Island group, and the first was also felt at Gehua on the Papuan mainland. Features which were common to most localities near the epicentre were the sharp "jolts and shakes", and the noise "like rumbling of thunder" which preceded them. The directions and strengths of movements at different localities are outlined hereunder:

(a) Normanby Island:

(i) Esa'ala - The Assistant District Officer, Mr. Grove, stated that movements were in a northeast-southwest direction and that each was of Intensity 4 (Mercalli). When more facts became available this intensity figure was amended to 5.

(ii) Sawataitai - At 1231 hours there was a shock of "medium strength", duration 6 seconds and initial movement from southeast to northwest. The second shock at 1316 hours was not as strong and of 4 seconds' duration; direction of movement was indeterminable. Natives at Darabia and Miadeba coastal villages, 3 and 10 miles respectively to the northwest of Sawataitai, did not feel the earthquakes according to reports received. In all probability the natives questioned were outdoors at the times of the shocks.

(iii) Ubuia Island - Residents reported the two main shocks but no other information.

(b) Fergusson Island:

(i) Sebulugomwa - The intensity of the earthquakes has been estimated at 5-6; Mr. E. W. Harrison reported that movements were in a north-south direction.

(ii) Budoia Roman Catholic Mission - The strength and direction of movement of both shocks were the same as at Sebulugomwa. Father Atchison also reported that noises preceding tremors on 31st July appeared to originate north of Budoia whereas they later originated from the south.

(iii) Kedidia - Mr. L. Evernett stated that the initial movements and preceding noises were from the north-east. The Mercalli Intensity was at least 5.

(iv) Salamo Methodist Mission - Although movement during the earthquakes was roughly north-south, the preceding rumbles came from the east. The strength of the shocks was estimated to be 5-6 (Mercalli).

(v) The main shocks were felt at native villages on the east coast of Fergusson Island and inland from Salamo. They were not felt noticeably at Mapamoiwa near the south-western end of the island. Natives of Numa Numa Bay reported that preceding rumbles and initial movements came from the north-east.

(c) Dobu and Neumara Islands:

Missionaries from Dobu Island were conducting services on Neumara Island at the time of the earthquakes. Natives present were alarmed but did not leave the service; the movement appeared to be southwest-northeast. At Dobu, where the movement appeared to be roughly north-south, natives hurriedly left the church. Whereas the European missionaries were conducting the service at Neumara, however, a native teacher was in charge at Dobu and the reactions of the people cannot therefore be regarded in determining the difference in intensity at the two centres. When the effects on inanimate objects were considered, it was decided that the strengths of the earthquakes at Dobu Island (about 5) were greater than at Neumara. Natives who live along the northeast coast of Dobu

thought that the movements came from the east.

(d) Goodenough Island: Small intensity shocks were felt at Mud Bay and Wataluma; at the latter place associated rumbling was heard. It was also reported that the only people who felt the shocks on the north side of Goodenough Island were those living on the coastal coral limestone portion; the earthquakes were not felt by natives living in the mountainous country composed of metamorphic and igneous rocks to the south.

In addition to the landslide at Dobu Island attributed to preliminary shocks, there were landslides during the major earthquakes from the southern and western rims of Oiau Crater and in the Du'una area, inland from the Salamo Mission. The Assistant District Officer at Esa'ala gave the following details of damage in his report D.S. 1/8-269: "Slight damage was caused to the waterreticulation system at Esa'ala, small cracks appeared in the concrete church at Dobu Island, cracks have also been reported in concrete house-posts at Salamo Methodist Mission (Fergusson Island) and in a cement church at Gomwa Village (near Salamo)." The writer obtained some additional information during his visit; Mr. E. W. Harrison reported that it was the first time in 41 years that he had suffered any damage to his buildings at Sebulugomwa. Due to the earthquake movements, the earth had been slightly moved away from his house supports and the ramp from the wharf to the store had been displaced 2 inches. The latter was attributed to sinking of the wharf piles. At Budoia Mission, the concrete floor of the hospital had been cracked, one of the windows of the missionaries' residence had been dislodged and there was some other minor damage. On Dobu Island, there was movement of light furniture and dishes in mission houses; no damage other than minor cracking along joints in the concrete floor of one house was done. Some medical supplies were lost at the Salamo Mission dispensary, where bottles were dislodged from shelves and broke in falling.

Small tidal waves noticed at Budoia Mission at 2110 hours on July 31st were preceded 10 minutes earlier by a strong roar of surf from the reef near Sebulugomwa, according to Father Atchison. These phenomena were not mentioned by Mr. Harrison at Sebulugomwa, and their significance is not known.

3. Aftershocks:

There were numerous aftershocks, which, according to the Monthly Vulcanological Returns from Esa'ala, were still being felt in September. The preliminary rumbling noises and short, sharp movements experienced with the main shocks were also features of the aftershocks. On some occasions rumbling noises were heard, but were not followed by noticeable tremors. Although intensities have never been greater than 3 (Mercalli), the frequency of the aftershocks during August caused panic, and there were evacuations from Sebulugomwa and Dobu Island. The greatest number of aftershocks were felt at Sebulugomwa, where in the first week after the main shocks the ground was "continually

shaking and trembling." Large numbers of aftershocks were reported also from Budoia, Dobu Island and Esa'ala. A list prepared from reports from Esa'ala is given hereunder.

Date	No. of aftershocks	Remarks
July 31	34	Many other minor tremors during night not recorded.
Aug. 1	12	)
2	21	) More aftershocks were felt on Oiau
3	9	) Peninsula (Sebulugomwa, Budoia.)
4	5	) Most of those listed were felt at Dobu,
5	7	) Salamo, Kedidia; a lesser number
6	11	) were felt at Ubuia and Sawataitai.
7	15	)
8	2	)
9	3	Earth movement continuous at Sebulugomwa
10	5	Two of these felt only at Sebulugomwa
11-18	8	Reported from Sebulugomwa; one only, on 16th, felt at Esa'ala.
23	1	Reported from Sebulugomwa.
30	1	
31	1	
Sep. 1	1	
3	1	
10	6	
13	2	Reported from Sawataitai only.
15	9	" "
20	1	

III. DETERMINATION OF EPICENTRE

Isoseismic lines based on determinations of intensities (Mercalli) of the first major shock at different localities are shown in the figure accompanying this report. These lines are idealised to conform with all facts available. The diagram indicates that the epicentre was at about the centre of Gomwa Bay. Although the directions reported somewhat arbitrary, they conform in some cases to directions which would be expected from transverse waves emanating from the epicentre determined. The directions of the initial movement felt at Sawataitai and Kedidia correspond to those which would be given by the longitudinal primary waves in a state of dilatation. It is unfortunate that the direction of the transverse waves which would have followed the initial movement were not noticed at these two places.

The two main shocks on 31st July have been referred to earlier as "major earthquakes" to distinguish them from other shocks of lesser intensity. They cannot, however, be called "world shakers" since seismograph stations in America have not recorded them in provisional bulletins. The traces of the two shocks on seismograms at Brisbane and Riverview did not show phases clearly. The Provisional Bulletin from Brisbane, however, reported the initial phase (iP 02 34 28) and some indeterminable phases of the first, and (i 03 18 50) for the second. The primary phases of the two shocks were not clearly impulsive on the Benioff seismograms obtained at Rabaul. Primary phases were recorded as

eP Z 02 31 34
,eiP Z 03 15 56

By using the epicentre as determined from the construction of isoseismic lines and the above information, the following details were established:

1.	Provisional Epicentre	9°41'S Lat., 150°49'E Long.
	Time at origin	02h 30m 06s G. M. T.
	Depth	Surface
	Magnitude	4½
2.	Provisional Epicentre	9°41'S Lat., 150°49'E Long.
	Time at origin	03h 14m 28s G. M. T.
	Depth	Surface

Foreshocks and aftershocks reported were not recorded on seismograms.

IV. CONCLUSIONS

1. The intensity of the two major earthquakes and the large number of aftershocks felt in the Gomwa Bay area can be attributed to the nearness of the epicentre and the shallow origin of the movements.
2. The earthquakes were tectonic in origin; a later report will show that there was no indication of an increase in volcanic potential in the area at the time.

These conclusions are supplementary to those of Taylor (1955), and it is important that his recommendations should be observed.

Reference:

Taylor, G.A. "Notes on Volcanic Activity and Thermal Areas in the D'Entrecasteaux Islands," Dept. Nat. Dev., B. M. R. Records 1955/75.

EARTHQUAKE DISTRIBUTION AND ISOSEISMIC LINES
EASTERN PAPUA AND D'ENTRECASTEAUX ISLANDS
for 1230 hours, 31st July, 1955 (local time).

● Epicentre
◎ Earthquake felt - strength (Mercalli) determined.
◎ Earthquake felt - strength not determined.