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Preliminary catalogue of tsunamis for the New Guinea / Solomon Islands region, 1768–1972

by I.B. Everingham

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SUMMARY

A catalogue of tsunamis for the period 1768-1972 has been compiled for the New Guinea/Solomon Islands region. This catalogue includes the results of Iida, Cox & Pararas-Carayannis, and data from local newspapers, government Administration reports, recently installed seismograph stations, and miscellaneous sources. The data are most complete for the Papua New Guinea region.

Results are that: (a) nine tsunamis were noted before, and 56 since, 1900; (b) tsunamis have occurred along the coastline around the Solomon Sea, particularly in the northern and western regions, and along the northern New Guinea coastline, but only one has been noted on the south coast of mainland Papua New Guinea; (c) only three tsunamis were caused by volcanoes and four by distant earthquakes, whereas the majority, 54, resulted from local earthquakes; (d) of 14 waves that reached a maximum height of 4 m or more and could be considered dangerous, the most disastrous resulted from a volcanic explosion at Ritter Island in 1888, when the wave height reached about 12 m; (e) tsunamis with a maximum height of around 2 m are relatively frequent, and have occurred on an average of once every two years; (f) tsunamis generally occur as steady rises and falls of sea level, and the most damaging waves from earthquake-induced tsunamis usually occur in relatively small areas where a large build-up of sea level is due to topographic irregularities.

A simple precaution against tsunami damage is to construct buildings about 3 m above the highest tide level. Because of the uncertainty where disastrous waves will strike, it is difficult to devise precautions against them.

1. INTRODUCTION

Zones of strong earthquake activity near an ocean or a sea are also zones of tsunami (seismic sea wave) occurrences; thus, as it lies within the highly active circum-Pacific belt of earthquakes, the New Guinea/Solomon Islands region should have a relatively high risk from this type of sea wave. However, danger from tsunamis has not been evaluated locally, for two main reasons: firstly, past evidence for such events has been difficult to locate, and has certainly not been publicized; and secondly, spectacular tsunamis have been rare during the last few decades. Nevertheless, seismic sea waves do occur, and the cost of tsunami damage will escalate as the country develops. The development is rapid; it is becoming increasingly urgent to take precautions now against damage and loss of life from the tsunamis which are sure to occur in the future.

The purpose of this report is to list basic tsunami data (Table 1), in particular for Papua New Guinea, to produce a preliminary catalogue of tsunamis (Table 2), to discuss the general features of tsunamis, and to evaluate the danger from them.

It is stressed that this is a preliminary catalogue; events are almost certainly missing from the lists given here, but it is hoped that this Report will stimulate interest in tsunamis to the extent that other researchers will improve the catalogue, or, at least, that information on tsunamis of the past and future will be brought to the attention of the Port Moresby Geophysical Observatory or some other relevant organization.

Places mentioned in older reports have been difficult to locate, and several whose names are either obscure or have been changed since early in the century are missing from the locality maps (Plates 1 to 6). Efforts will be made to include all localities in a later version of this catalogue.

2. TSUNAMI FEATURES

Definition and general description

At this stage it is perhaps advantageous to define a tsunami and discuss typical features. In the International Dictionary of Geophysics, Wadati (1967) states:

'Tsunami is a large wave caused in the sea or a lake subsequent to an earthquake, volcanic eruption, etc. The term in English is "tidal wave" or "Seismic sea wave" and in Spanish "Maremoto", but the term "tsunami" now is almost universally accepted. A large water wave induced by violent meteorological factors such as a "storm surge" or "abnormal tide" is not a part of this category.

' "Tsunami" is originally a Japanese word, "tsu", denoting harbour and "nami" a wave, thus a large wave arising rapidly as it approaches the coast.'

The United States Department of Commerce, Coast and Geodetic Survey (USCGS) in their publication on tsunamis (1965) give the following information.

'Every island and coastal settlement in the Pacific Ocean area is vulnerable to the onslaught of seismic sea waves. The waves of 1868 and 1877 devastated towns in northern Chile, and caused death and damage across the Pacific. A series of seismic sea waves generated by the eruption and collapse of Krakatoa in 1883 killed more than 36 000 persons in the East Indies.' (A similar type of event described in this Report occurred off the coast of New Guinea in 1888). 'Japan lost 27 000 lives to the wave of 1896 and 1000 more to that of 1933. There have been hundreds more whose effects were less spectacular but which took many lives and did much damage.'

'The phenomenon we call "tsunami" is a series of travelling ocean waves of extremely long length and period. In the deep ocean their length from crest to crest may be a hundred miles or more, their height from trough to crest only a few feet. They cannot be felt aboard ships in deep water, and they cannot be seen from the air. But the kinetic energy - the energy of movement - represented by a tsunami is impressive. A tsunami "feels the bottom" even in the deepest ocean, and it appears that the progress of this imperceptible series of waves represents the movement of the entire vertical section of ocean through which the tsunami passes. In the deep ocean they may reach speeds of 600 miles per hour.

'As the tsunami enters the shoaling water of coastlines in its path, the velocity of its waves diminishes and wave height increases. The arrival of a tsunami is often (but not always) heralded by a gradual recession of coastal water, when the trough precedes the initial crest; or by a rise in water level of about one-half the amplitude of the subsequent recession. This is nature's warning that more severe tsunami waves are approaching. It is a warning to be heeded, for tsunami waves can crest to heights of more than 100 feet and strike with devastating force.

'Tsunamis are believed to originate as vertically displaced columns of ocean water, but the displacing agent has not been positively identified. Seismic or volcanic alterations of the ocean floor, provided they impart some vertical movement to the water column, may cause tsunamis. It has also been postulated that submarine avalanches on the slopes of the Pacific trenches produce tsunamis.

'The speed of tsunamis varies with water depth, and it is this relationship which permits prediction of tsunami arrival times at all points in the Pacific Ocean area. But no definite correlation has been possible between the configuration of specific regions of the ocean floor and tsunami configuration in those regions. It is not completely clear, for example, why a tsunami's waves may be of negligible size at one point along a coast, and of much larger proportions at other coastal points nearby. Nor is it possible to predict whether the destructive component of a tsunami will lie in its powerful surge across a beach, or in a gradual rising of sea level followed by a rapid draining back to sea.'

'Thus it is impossible to say with any certainty what shape a tsunami will assume at specific locations, or how it will accomplish its destructive work. In treating tsunamis exceptions are the rule.'

Grover's (1955) interesting report on tsunamis in the Solomon Islands region is reproduced in the Appendix because similar effects may be expected in New Guinea and elsewhere.

The size of a tsunami

The following widely adopted table was originated by Imamura (1949) to classify the magnitude (m) of tsunamis:

Magnitude m	Maximum height of tsunami (metres)	Damage potential
-1	0.5	Nil
0	1	Very little damage
1	2	Shore and ship damage
2	4-6	Some inland damage and loss of life
3	10-20	Severe destruction over 400 km of coast
4	30	Severe destruction over 500 km of coast

Most seismic sea waves are generated by near-coastal earthquakes, and their magnitudes and natures depend primarily on the following factors:

(a) The focal depth of the earthquake. For a given earthquake magnitude, the greater the focal depth (H) the smaller the sea wave; earthquakes deeper than 80 km are unlikely to cause tsunamis.

(b) The magnitude (M) of the earthquake. For 1900-1960 Japanese earthquakes:

$$m = 2.6\,M - 18.4 \quad . \quad . \quad . \quad . \quad . \quad \text{(Iida, 1963)}$$

A shallow earthquake with M7.8 or more is required to cause a damaging or disastrous tsunami, but an earthquake with M less than 6 is unlikely to generate a sea wave.

(c) The mechanism of the earthquake. Most tsunamis are associated with dip-slip faulting (Iida, 1970), presumably because it tends to cause large vertical ground deformations. Whether the first wave is positive (water advances towards the coast) or negative (water recedes) depends on the relation of the point of observation to regions of uplift or subsidence caused by the faulting.

(d) The depth of water (h) and the structure of the seabed in the epicentral region. There is a limiting magnitude (m) of a tsunami for water depth at the generating area:

$$m = 1.66 \log h - 1.62 \quad . \quad . \quad . \quad . \text{ (Iida, 1963)}$$

The above factors contribute to the size and form of the primary waves, but the behaviour of the waves on arrival at the coast or in a harbour depends on the submarine topography there. The primary tsunami travels across the ocean as a normal gravity wave with small amplitude and a period of some tens of minutes. Its velocity, $(gh)^{\frac{1}{2}}$, depends on the depth of water, and reaches about 300 m/s over deep ocean basins. Upon reaching the shallower water near the coast, its velocity decreases and amplitude increases, so that a high, breaking wave may be produced, with disastrous consequences. At other places, the submarine topography might cause the sea to ebb and flow quietly, as with a tide, without a breaking wave.

A further complication to the form of the waves at points along the coast is caused by seiching, wherein enclosed or restricted bodies of water having natural periods of oscillation depending on their dimensions interact with the tsunami waves.

3. TSUNAMI REPORTS

As a starting point, the New Guinea and Solomon Islands events appearing in the Hawaii Institute of Geophysics (HIG) 'Preliminary Catalogue of Tsunamis in the Pacific Ocean' (Iida, Cox & Pararas-Carayannis, 1967) were extracted and listed. To this list were added tsunami data contained in unpublished Papua New Guinea Administration 'Earthquake Records' and 'Earthquake Notes' for the period 1915-1940, in official reports and letters of the Administration authorities, in newspaper reports, and in other miscellaneous sources as shown in the references. Similar blank forms (but used in different areas), the Earthquake Records and Notes were filled in as a routine by government staff whenever they experienced an earthquake. On the forms an estimate of the intensity was given along with remarks on the earthquake effects. They were a fruitful source of tsunami reports.

Each unpublished report is reproduced in full in Table 1. Relevant extracts from available papers are given; because of their descriptions of spectacular tsunamis, parts of Sieberg's (1910) and de Miklouho-Maclay's (1884) papers, and the full text of Wharton's (1889) paper, are also included.

Many previously unpublished events were discovered for the Papua New Guinea region because this research was carried out at Port Moresby, where documents pertaining to Papua New Guinea are relatively easily available. Nevertheless, further research is still required because only the most easily accessible data have been used. Not much was added to HIG's tsunami data for Irian Jaya and the British Solomon Islands because local documents could not be inspected.

4. CATALOGUE OF TSUNAMIS

The results of Table 1 are interpreted and summarized in Table 2, in which details of the earthquakes that were considered to have caused tsunamis were derived from Duda (1965); Gutenberg & Richter (1954); International Seismological Summary (ISS), International Seismological Centre (ISC), and Environmental Research Laboratories (ERL) catalogues; and the Riverview Observatory (Sydney) results given by Rheinburger (1939). The Riverview results, covering the period 1913-1936, were particularly useful because intensities, maximum amplitudes registered on the Riverview standard seismogram, and epicentres calculated from phase times from many seismic stations were listed; they also included the information in the Earthquake Notes and Earthquake Records supplied by the Papuan and New Guinean Administration staffs.

To investigate the relation between earthquakes and resultant tsunamis, the following data were extracted from the above sources and assembled in Table 3:

(a) All earthquakes during the period 1900-1972 with M greater than 6.9

(b) All known tsunamigenic earthquakes since 1900 with M less than 7.0

5. DISCUSSION OF RESULTS

Frequency of tsunamis

The catalogue (Table 2) lists 65 tsunamis, and contains treble the number given by Iida et al (1967) for the period covered in common, 1768-1967. The breakdown of tsunamis according to magnitude is:

m	No.	m	No.
-1	3	1 to 2	12
0	21	2	10
0 to 1	2	2 to 3	3
1	12	3	1

Only one tsunami has no recorded magnitude, and, of the five for which magnitudes have been recorded in more than one area in the New Guinea/Solomon Islands region, the highest magnitude is listed for the breakdown above.

Certainly many tsunamis with magnitudes less than 2 are missing from the catalogue, and it is possible that unrecorded tsunamis with magnitudes of 2 have occurred, particularly before 1900. However, it is considered unlikely that tsunamis with magnitudes of 3 or greater during the past 100 years were not recorded.

Volcanic tsunami sources

During the period 1768-1972 the most disastrous tsunami (m = 3) was caused by the volcanic explosion at Ritter Island in March 1888; over the same period all earthquake-induced tsunamis were of smaller magnitude. From this evidence, the greatest risk from disastrous tsunamis might appear to be from those generated by volcanic explosions. However, this is not deemed to be so, because major volcanic explosions, such as those at Ritter Island and Krakatoa (1883), are rare events. Tsunamis generated by volcanic eruptions (e.g., in Rabaul Harbour, 1878, 1937) are not particularly hazardous because they do not take the population by surprise, they affect only a small area, and the submarine or near-submarine eruptions that produce them are infrequent. Plate 7 indicates the position of volcanoes which have caused tsunamis.

Tsunamis from distant sources

Sea waves with amplitudes up to 2 m were noted in the New Guinea/Solomon Islands region after the great M8.3 Chile earthquake of 22 May 1960 (Taylor & Barrie, 1960; Brooks, 1961). Large earthquakes in other areas, such as Alsaka, Kamchatka, Japan, the Aleutian Islands, and Irian Jaya have also generated large tsunamis whose effects were minor or unnoticeable in the New Guinea/Solomon Islands region.

Tsunamis having magnitudes in the range 4-5 were generated in some of the overseas areas noted above, and it is unlikely that much worse effects could be expected from future tsunamis generated there. On the other hand, large tsunamis have not been generated during the last 100 years in the Caroline, Philippine, and New Hebrides Islands, so that it is uncertain whether or not large sea waves from these areas could affect Papua New Guinea.

In view of the record of their effects, tsunamis with distant sources do not appear to constitute a major risk. Indeed, the risk of damage in New Guinea and the Solomon Islands from distant-source tsunamis may be likened to that for New Zealand, where better documented evidence suggests that disastrous effects are very improbable but flooding of low-lying regions, particularly in bays and harbours, could occasionally happen (Eiby, 1968).

Local tsunamigenic earthquakes

Plate 7 shows the epicentres of the tsunamigenic earthquakes in the New Guinea/Solomon Islands region during the period 1875-1972; boundaries (based on 1964-1972 results) of zones of earthquakes having depths less than 50 km are also shown. With few exceptions the sources lie within the very seismically active tectonic zone which extends along the Solomon Islands chain, the New Britain/Bougainville Island arc-and-trench structure, and across northern New Guinea.

The earthquake which occurred on 23 December 1930 is unusual because it is the only earthquake with M less than 7.0 which generated a large tsunami. It must have been very shallow and associated with dip-slip fault movement or submarine volcanism (see Table 1) to have caused surface deformations large enough to generate a magnitude 2-3 tsunami. Although the epicentre of the event is considered relatively inaccurate - Gutenberg & Richter (1954) do not list the earthquake and there is no check on Rheinburger's (1939)

determination - felt reports suggest that the epicentre was very close to the southern Ninigo Islands in the zone of weak seismicity which passes from the northern New Guinea coast near longitude 144°E to the north of Manus Island (Denham, 1969).

Data in Table 3 indicate that about only one in five of the major earthquakes (M greater than 6.9) generated a tsunami. Why are tsunamis not recorded for all the high-magnitude events? The following facts are relevant:

(a) Some earthquakes precipitate strike-slip faults, which are poor tsunami generators; thus Ripper's (1975) focal mechanism solutions for earthquakes in the Bismarck Sea seismic zone as transcurrent faults may explain the rarity of tsunamis in this zone.

(b) About half the earthquakes were situated beneath land, e.g. northern New Guinea.

(c) Many earthquakes were too deep; shallow earthquakes are most likely to generate major tsunamis, yet only about 20 percent of earthquakes in the New Guinea/Solomon Islands region occur at depths less than 33 km. Again, for a focal depth of, for example, 60 km, an earthquake would have to have a large magnitude (M8.2) to generate a noticeable tsunami.

(d) Tsunamis might have occurred without being observed or recorded, or the record of the event has not been discovered yet.

The difficulty in assessing when and where tsunamis will be generated is illustrated by the earthquakes of December 1930 and October 1970. In the first, a relatively low-magnitude earthquake in a very weak zone of seismicity caused one of the worst sea waves; and in the second, strike-slip faulting beneath an inland region caused a minor tsunami, which, on the evidence of broken submarine cables and changes in water depth, Everingham (1975a) suggested had been caused by submarine sliding of deltaic sediment on the steeply sloping region offshore from the coastline in the Madang area.

The erratic behaviour of tsunamis is further illustrated by the one generated by the earthquake of 23 December 1930 in the western Bismarck Sea. Here, some islands and one small area of the New Guinea coast about 350 km south of the epicentre were devastated, while the waves were hardly noticed at other places. Similarly,

large differences in maximum wave height were noted at places along eastern New Britain, southern New Ireland, and western Bougainville Island coastlines after the north Solomon Sea earthquakes of July 1971; and along the shores of the Solomon Islands after the earthquake of April 1939.

Submarine slumps

As indicated by the 1970 Madang earthquake, slumping of submarine sedimentary masses may generate sea waves. However, where sedimentation is rapid, as it is in parts of New Guinea, slumps may occur without the triggering aid of earthquakes. Thus, a tsunami resulting from a submarine slump unassociated with an earthquake was observed in the Huon Gulf at Lae during August 1972 (Everingham, 1973).

Conclusions

Preliminary conclusions from the investigation of tsunamis which occurred in the New Guinea/Solomon Islands region during the 100-year period ending in December 1972 are:

(a) Sixty-two tsunamis were recorded.

(b) Tsunamis have occurred along the coastline around the Solomon Sea, particularly in the northern and western regions, and along the northern New Guinea coastline. Only one tsunami has been noted on the southern coast of mainland Papua New Guinea.

(c) Tsunamis may be caused by volcanic eruptions, large earthquakes around the Pacific Ocean, local shallow submarine or near-coastal earthquakes with magnitude M6.5 or more, and submarine slumps near certain river deltas. Three tsunamis were caused by volcanic activity, four by overseas earthquakes, 54 by large local earthquakes, and one by submarine slumping.

(d) Waves from only 14 tsunamis reached a maximum height of 4 m or more and could be considered dangerous. Of these, the most disastrous resulted from a volcanic explosion at Ritter Island in 1888, when the wave height reached about 12 m.

(e) Tsunamis with a maximum height of around 2 m are more frequent.

(f) A feature of local tsunamis was that the sea receded first in almost every event where the first motion was observed.

(g) The badly damaging waves from earthquake-induced tsunamis usually occur in relatively small areas. The tsunami generally occurs as a steady rise and fall of sea level. A breaking wave is unusual and is observed only where local topography causes a large build-up of sea level.

(h) The period between successive rises and falls is generally between four and 30 minutes.

(i) The first wave is not necessarily the wave with greatest amplitude.

6. PRECAUTIONS

Tsunamis from local earthquakes

The wave can be expected to arrive a few minutes, or at most about one hour, after the earthquake, so that a national warning system would be ineffective unless expensive communications were installed. The best warnings are given by the shaking caused by the earthquakes, and the recession of the sea. Should an earthquake be felt strongly or with medium strength for a long period (e.g. about two minutes) coastal residents should prepare for a tsunami.

When the sea recedes from the shore an observer should anticipate a subsequent rise in sea level, with fluctuations for several hours. Safe tsunami lookout points, and evacuation routes to high ground, should be selected.

Buildings should be about 2-3 m vertically above high-water level to avoid inundation by the waves. The chances of a large damaging tsunami are slight, but should not be ignored when siting buildings that supply essential services, even in areas previously unaffected.

Tsunamis from major overseas earthquakes

Reference has already been made to tsunamis generated in the New Guinea/Solomon Islands region by large overseas earthquakes; they do not appear to constitute a major risk.

Buildings should be about 2-3 metres vertically above high-water level to avoid damage from this type of tsunami.

Tsunamis from volcanic eruptions

These are very infrequent and may be predictable. The potential danger from erupted materials is generally much greater than the potential danger from sea waves.

Buildings 2-3 metres above high-water level should be safe from sea waves, except after the rare occurrence of major volcanic explosions of the Krakatoa and Ritter Island type.

Tsunamis from submarine slumping

Submarine slumps with near-coastal sources may cause minor tsunamis. Slumping can occur naturally or, more commonly, as a result of an earthquake. The shores of the Huon Gulf and Astrolabe Bay are prone to this type of tsunami.

Buildings 2-3 metres above high-water level should be safe.

7. ACKNOWLEDGEMENTS

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Thanks are also due to Mr J.R. Horne, and to the Papua New Guinea Administration's Archives Branch of the Department of Social Development and Home Affairs, for information on the 1895 Buna tsunami and the 1930 Bismarck Sea tsunamis respectively.

TABLE 1
DESCRIPTIONS OF TSUNAMIS (1768-1972)

Year	+Date (150°E)	Place	Observer or Reference
1768	June 22	New Ireland	Sieberg, 1932
	*Remarks: 'No details'.		
1856		New Guinea	
		Maclay coast (Aralu village)	de Miklouho-Maclay, 1884

Remarks: 'Talking about earthquakes, the natives informed me, that on a former occasion, before my arrival on the coast in 1871, a village named Aralu (situated on the coast between the rivers, Kabeneu and Koli) had been completely swept away by the waves after an earthquake. All the huts and the cocoanut trees surrounding them, were broken down and carried away by the tidal waves, and the inhabitants, men, women and children were drowned

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+ A time that accompanies a date is that reported by an observer of the tsunami; some are approximate, while others are probably unreliable or incorrect. Local time (150°E) is at present 10 hours ahead of both Greenwich Mean Time and Universal Time.

* Remarks of Iida et al. (1967)

(it occurred during the night). A few men belonging to the village and who happened to be away at the time on a visit to some neighbouring village, would not attempt to rebuild their huts on the old place, but went to live at Gumbu now Yeimas , also a coastal village but which had escaped destruction being built further inland. The destruction of Aralu was remembered by not very old people and it took place I suppose about the year 1856. The natives on the Maclay-Coast complained about the sickness in the villages on the coast which appeared soon after the destruction of Aralu. The sickness amongst them, I believe, was the result of decomposition of animal and vegetable matter left behind on shore after the inundation produced by the high tidal wave, as has been observed on some islands of the Pacific.'

1856		New Guinea Dampier Strait Astrolabe Bay Geelvink Bay	Sieberg, 1932

*Remarks: 'Tsunami observed on both shores. Aralu village overwhelmed.'

1864		NW New Guinea	Wichmann, 1918 Sieberg, 1932 Heck, 1947 Souter, 1963

Remarks: Mansman Is (0° S, 134°E) wiped out. Effects reported at Geelvink Bay, Malaysia, New Guinea.

1873	(Spring)	New Guinea	Sieberg, 1932

Remarks: No details.

1873-1876	June	New Guinea Maclay coast	de Miklouho-Maclay, 1884

Remarks: 'The natives told me that during my absence they had experienced on the coast and the mountains several earthquakes, on which occasions some natives were killed by the falling of cocoanut trees in the villages, which in falling destroyed the huts. The villages on the coast suffered more on account of unusually big waves which followed soon after the earthquake, breaking down the cocoanut trees and sweeping away a few huts nearest to the beach. In revisiting the coast villages, I found many not unimportant changes: stretches of destroyed forest by tidal waves after the earthquake; alteration in the direction of some small streams, the old mouths of which had been closed by bars of sand left behind by waves.' He noted intensive landsliding which suggested an epicentre in the Finisterre Range - Author.

1875		New Guinea Lub (or Hermit) Island	de Miklouho-Maclay, 1884

Remarks: 'A case of great sickness and mortality on the Island Lub (or Hermit Island), in 1875, after the inundation of some low islands of the group by a tidal wave, has been communicated by me in a letter about the Island Lub, to the Imp. Russ. Geogr. Soc. (Investiya of the Imp. Russ. Geogr. Soc., Vol. XV.) I have heard about a similar case which happened on the Island Mafia (or St. David's Island), some twenty or thirty years ago.'

1878	Feb. 04	New Britain Blanche Bay	Fisher, 1939

Remarks: 'The eruption of 1878 is well described by both Dr. George Brown and Mr. Wilfred Powell.... Dr. Brown writes that it was reported to him on the 30th January that the old volcano in Blanche Bay was in eruption. On the other hand, in his description he says that on Sunday night, the 3rd February, very violent earthquakes were felt, followed by tidal waves on the Monday morning. Soon afterwards, clouds of steam were seen rising from the bay in a direct line between Tavurvur and Vulcan, and as the submarine crater increased in strength, these steam clouds ceased and the old crater burst out with terrific power.'

1878	Feb. 04?	New Britain Vulcan, Tavurvur	Sapper, 1927 Heck, 1947

*Remarks: 'Two "flood waves"; probably two waves of a tsunami and not tsunamis as interpreted by Heck. Heck gives Feb. 4 date, but Sapper says only that the waves occurred during eruption which lasted four days starting February 4.'

1888	Mar. 12	New Guinea/ New Britain Dampier Strait coasts Ritter Island explosion	Sapper, 1927 Sieberg, 1932 Heck, 1947

*Remarks: 'Place of observations - New Britain, Dampier Strait coasts. Great damage and some loss of life. Mar. 12 given by Heck, who does not mention volcanic explosion.'

1888	Mar. 13	New Britain	Fisher, 1939

Remarks: 'On the 13th March, 1888, according to the Pacific Islands Pilot, Volume I, a seismic wave up to 30 feet high was experienced along the northeast coast of New Guinea from Hatzfeldt Harbour to Cape King William. This was also felt along the whole coast of New Britain, and at Matupi Island the sea receded at times up to 10 feet below the level of the lowest tide, and then rose in several waves to the same height above high water mark. No earth tremors accompanied this phenomenon and the weather was clear with a mild south-east breeze. This wave originated in Dampier Strait at the western end of New Britain, 300 miles from Rabaul, and was caused by Ritter Island, the previously dormant volcano, 2,600 feet high, bursting into explosive eruption and blowing most of the mountain away.'

1888	Mar. 13 0600	New Guinea New Britain	Wharton, 1889

Remarks: 'Volcanic Sea Wave: The following account from the Berlin Annalen der Hydrographie, 1888, p. 518 with reference to the wave observed in the

regions about the north-east of New Guinea, already briefly noticed in Nature (vol. xxxviii, p. 491), is of interest.

'The data given are too vague to permit of definite conclusions as to the probabilities of the disturbances felt at Sydney and Arica having originated in a volcanic eruption in New Guinea, but it may be observed that, assuming that the volcanic centre was from 200 to 400 miles north of Hatzfeldt Harbour, in which direction sounds were heard at 6 a.m. on the 13th, followed in forty minutes by a wave, the disturbance recorded at Arica Chile at 5 p.m. on the 14th would have travelled the intervening distance of 10,000 geographical miles at a speed of 416 miles an hour, a velocity which agrees very fairly with the probable mean depth of ocean traversed. To Sydney, on the other hand, assuming the first disturbance to have occurred at 6 a.m. on the 15th, the speed would only have been about 60 miles an hour, which is much too low a velocity for the depth.

'It will be observed that the waves both at New Guinea and Arica were of short period, and in this respect quite unlike the long distance waves emanating from Krakatoa in 1883. W.J.L. Wharton

> "With regard to the extraordinary tidal wave that was observed in the Bismarck Archipelago, and on the coast of New Guinea, on the 13th of March, Heft iii. of the 'Notices of Kaiser Wilhelm's Land and the Bismarck Archipelago' relates as follows:
>
> > "After the Expedition which had been undertaken for the discovery of Herren von Below and Hunstein, who had attempted an exploration to the west coast of New Pomerania (New Britain), had returned without finding any trace of them, a second Expedition, consisting of seven officers and fourteen Miocese, under the command of the surveyer, V. Brixen, was despatched on the 17th of March from Finsch Hafen to the west coast of the above-mentioned island. This discovered, on the 18th of March, the spot where Below's Expedition had landed, which was easily recognized by the objects lying there partly covered with sand - a tent, torn pieces of clothing, and bent bits of metal. A part of the Expedition then repaired to a ruined village near the place where the missing persons (according to the account of the two

Miocese who had been saved) had encamped during the night of the 12th-13th of March on the shore. At this place the land falls very steeply, about 25 metres, to the sea, and there is only a narrow strip of flat coast between the declivity and the sea. The tidal wave had even occasioned a landslip, large stones and trees being torn away from the slope so that here escape could have been scarcely possible, and according to the two Miocese, the catastrophe happened before daybreak. With the exception of a few bamboos cut by a knife, no trace of an encampment was perceptible. An excavation, attempted on the 19th of March, led to no result. Sea-sand, stones, and things washed up by the sea, covered the former level of the shore for more than 4 feet. On the 20th of March parties were despatched into the interior in a north-easterly and southerly direction,who came upon the encampment of the natives who had escaped from the above-named village. As these confirmed, by gestures and signs, the accounts of the Miocese, hardly any doubt can remain that Below and Hunstein had fallen victims to the tidal wave. On the 21st of March a large cross, therefore, was erected at the place of the misfortune, and, to provide for necessity, two boxes with provisions and drink were buried under a large and marked tree near the landing-place. The tidal wave on this portion of New Pomerania had rendered completely desolate a coast formerly covered with dense forest for a breadth of about 1 kilometre. Large spaces had been reduced to a swamp covered with trees heaped above one another, broken coral rocks, sea-sand, and a quantity of putrid fish. Measurements made at the declivities here give a height for the tidal wave of 12 metres (39 feet).

"As was to be expected, the tidal wave had also left its mark on other coasts of the German Protectorate, without having, however, caused any serious damage. In Hatzfeldt Hafen, on the coast of New Guinea, a noise like firing was heard on March 13, shortly after 6 a.m., from a north-north-easterly direction, and at 6.40 a.m. came an

astonishingly high tidal wave from the north that rose 2 metres (6½ feet) above the highest flood-mark, and then receded with such violence that half the port was dry. The sea now rose and fell at intervals of three to four minutes, which lasted until 9 a.m.

"At 8 a.m. the height of the tidal wave stood at 7 to 8 metres (23 to 26 feet), so that the station was in imminent danger. In the course of the forenoon the movement gradually subsided, although the water still continued to rise and fall with steady intervals until 6 p.m., when it resumed its normal condition.

" In Kelana Kelanoa , the newly-established plantation near Cape King William, the phenomenon occurred from north-east at 6.30 a.m. The first wave forced itself 25 feet on the land, the fourth, however, 35 feet; this was the greatest of the twenty waves observed, which came about every three minutes. The phenomenon was not observed here to be longer than an hour in occurring. No other circumstance of a striking nature was perceptible. The weather was calm and dull. On the morning of the 14th of March the whole coast to some distance was strewn with small pumice stones.

"From Matupi it was reported that from 8.15 until near 11 a.m. the sea receded at times from the island 12 to 15 feet below the lowest water mark, and then rose in several waves to the same height above high water mark. The phenomenon appeared chiefly on the south-east and north side of the island, the west side remaining untouched. The waves came partly from south, partly from west-north-west. The water appeared disturbed in its depths; it had a dark appearance, and carried discoloured foam. Neither earthquakes nor any subterranean rumblings were noticed. The weather was clear, with a gentle south-east breeze. On the south side of Gazelle Peninsula the phenomenon was also noticed by a ship lying at anchor.'

"So far the report in the 'Notices of Kaiser Wilhelm's Land and Bismarck Archipelago'. Of the further movement of the tidal wave, nothing is as yet known, although it is not improbable that it spread further.

"In Sydney (Australia) and Arica (South America), extraordinary commotions of the sea were observed between the 14th and 17th of March, which may possibly have been in connection with this tidal wave. In Arica, as appeared in the "Mercurio" of Valparaiso of the 23rd of March, an immense wave was observed on the 14th of March towards 5 p.m., in the distance, which, increasing as it drew nearer, broke with great force near the pier. Three great waves followed quickly, one after another. Of the vessels busied in taking in cargo, several were shattered, and others capsized. The sea was for some time so agitated that the shipping of merchandize was attended with difficulty. On the island in front of the port the sea broke for a still longer period with great violence.

"According to the English journal NATURE (vol. xxxviii, p. 491) the tidal curves on the self-registering water-gauge in Sydney, showed on the 15th, 16th, and 17th of March, deviations from their customary form which may have been caused by the waves of an earthquake." '

1888	Mar. 13	New Guinea New Britain	Sieberg, 1910

Remarks (translated from Sieberg's German text): In the Dampier Strait, volcanic events are closely related to thrust-faulting. The magma is squeezed between the fault blocks. Thus Hansche reports that the volcano on Tupinier Island erupted the day before the earthquake of September 15th 1906 occurred. A great catastrophe occurred on March 13th 1888 - very similar to that of the Krakatoa eruption. In the early morning a gigantic tidal wave occurred at Finschhafen, Hatzfeldhafen, Kelaua, and Matupit as the consequence of a strong earthquake. In rapid change the water retreated away from the coast and reappeared, thereby damaging coastal buildings. The west coast of Neupommern (New Britain) was terribly devastated and the topography had changed considerably owing to slides and slumps.

The coastal native villages had disappeared and only some stilts were still in place. The expedition by Below and Hunstein from the Neuguinea-kompani also disappeared. All the coastal villages along the Dampier Strait, on the islands of Ruk and Tupinier were destroyed by the tidal wave. On the island of Ruk, a strongly marked area, 40 to 50 feet above sea level, was still recognizable two years later and marked the height of the tidal wave. The cause of the tidal wave was the explosion of the tiny volcanic Ritter island in the vicinity of Ruk and Tupinier. Before the explosion the island had the form of a truncated cone with a considerable height to base-diameter relation. After the explosion the crater on the western side was open and more than 100 m deep. The height of the island was reduced and the base enlarged.

1888	Mar. 13	New Guinea Finschhafen	Anonymous, 1888

Remarks (translated from the German text): At Finschhafen, on the morning of the 13th March.... the sea became violently agitated, and a reef off the harbour was exposed. the water returning in three or four minutes. The wave appears to have been caused by a volcanic outburst at Vulcan Island. The Captain of the Ottilie arriving two days later could not recognize the spot (Vulcan). Reefs were altered, the level country, with its villages, had disappeared, while towards the mountains the land was strewn with pumice and shattered trees.

Heft contains further details of the ravages caused on the southern coast of New Britain by the tidal wave. The absence of seismic records is noted. Mention is made, in addition, of the tidal disturbances registered in South Africe (America - Author) on the 14th March, and at Sydney on 15-17 March. No mention is made of the relationship of these to the Bismarck volcanic disturbance.

1895	Mar 06	Trobriand Islands (Solomon Sea) Kavataria Simsim Island Papua Porlock Bay	Winter, 1896

Remarks: 'At twenty-five minutes to seven on the evening of the 6th March, when anchored in the Trobriand Group off the small island of Yaga on our way from Dobu to Kavatari now Kavataria; lat 8° 32.5'S, long. 151° 02.5'E , we felt the shock of an earthquake. The ship heaved and trembled for over a minute. The motion was slight but marked, and was very like the motion imparted to the ship by the action of the screw when it is reversed and the fore part of the ship is aground.

'So far as I saw, the shock did not affect the surface of the sea near the vessel. On our arrival at Kavatari next morning we found that the earthquake had been felt on shore at that place. It had caused the trees to sway and a cavity had been formed near the village. The cavity, a few yards in diameter and about four feet deep at its deepest part, had apparently been due to the giving way of the covering of an underground hollow.

'When on the following day we reached the island of Sim-Sim we learnt that earthquake shocks had in the evening of the 6th been felt there, and that the island had also suffered from a wave of the sea. The island consisted of a small hill of a rocky nature, with a tongue of flat land stretching out from its northern side. The account given us by an intelligent native of the earthquake and the wave was this: A little after sunset they experienced a shock, then followed a loud booming sound apparently not very far off, then another shock. After this there was a lull for a short time, and then they heard the noise of the advancing wave, which almost immediately afterwards swept over the flat. The waters knocked the frail native houses down and swept portions of them, together with household goods, into the sea. One little child was drowned, and one man that we saw had received some severe abrasions of the skin. Those of the natives who did not manage

to grasp the trunks of trees were washed into the sea. Our informant said that he caught hold of a cocoanut tree, and that the water reached to his armpits. A large number of fish were left on the island, some of which I saw. The wave had struck the island on its western side. The shore of the flat on this side is higher than the rest of the flat, because this is the most exposed side, and the continuous action of the sea has raised the beach, the top of which is several feet above sea level. I could not ascertain whether the wave came from a west-by-north or a west-by-south direction, but from the appearance of the beach I am inclined to think that it came from west-by-south. The sea from north-west to south-west of the island is for many miles of a fairly uniform depth of about ten fathoms. The most remarkable thing about this wave was the force with which the water had swept the bottom of the sea before it reached the dry land of the island. A large quantity of coral and marine debris had been thrown up; but the momentum of the water along the bottom of the sea will perhaps be better realised by the following examples:- Crawfish, crabs, beche-de-mer, and ground-feeding fish had been thrown on to the island. A large block of coral, which must at least once in every twenty-four hours have been, when it was in its previous position, covered by salt water, was lying on the beach several feet from the margin of the sea. I estimated that this block of coral weighed at least half a ton, but others of our party thought it weighed over a ton. The top of a mushroom-shaped piece of coral, of which the stem was about a foot in diameter, and the tabular-shaped portion of which must have weighed several hundredweight, was lying on the beach several feet clear of the water with its flat top against the ground and the broken stem upwards. The column of solid hard coral which formed this stem had been snapped in two. It struck me that to snap such a thickness of coral the pressure of the water must have been exerted in an upward and lateral direction, and that the full impetus of the force have struck the coral at the apex of the angle formed by the under side of the flat top and the stem. A solid block of slate-coloured stone, containing about eight cubic feet must have been raised by the water at least two feet off the ground, as the stone was resting against a tree, in which one of its edges had cut a notch and had deeply scored the tree for a

distance of two feet above the notch. Although some of the shrubs and plants on the flat had been broken or washed out, none of the cocoanut palms or large trees had been uprooted or injured. As this island of Kawa, to which we went next day, lies some twelve miles to the south-west of Sim-Sim we fully expected to find that the force of the wave had been even greater there than at Sim-Sim. To our surprise we learnt that, although they had experienced some shocks of earthquake, there had been no wave at all. Our own observation confirmed this. We rowed round this little island. There was no sign of the sea having risen above its usual level, but in four places large masses of the overhanging portions of the coral cliffs had been detached and had fallen into the sea.

When we reached Cape Vogel lat. 9° 42'S, long. 150° 02'E, on the 21st March, we learnt from the natives there that a short time back a great wave had struck the shore, apparently in Porlock Bay lat. 9° 02'S, long. 149° 03'E, at the base of Mount Victory. News of the catastrophe had come down the coast to Cape Vogel. The natives could not give the date, but the time they gave was a little after dark, which corresponds with the time the water swept on Sim-Sim. The natives said that four small villages in Porlock Bay which are close to each other were washed away and some people drowned. A line from Sim-Sim drawn in a south-westerly direction would strike Porlock Bay. It has occurred to me that possibly these waves may have been due to an upheaval of the bed of the sea. An upheaval of the ocean bed in a north-westerly and south-easterly direction, at some point between Sim-Sim and Porlock Bay, would, I presume, project a volume of water north-easterly towards Sim-Sim, and another volume of water south-westerly towards Porlock Bay.'

1895 Papua MacGregor, 1899
Gona Bay

Remarks: 'The population, formerly scattered thence by a tidal wave some four or five years ago, has returned to Gona Bay and it now contains a great number of people.'

1895 Papua Richmond, 1907
Buna Bay

Remarks: '"Bami" a native of Buna village, says that about 11 years ago (1895) the water came up in the same way but very much higher, and he gave me the names of 26 people of Buna who lost their lives. When the water receded they all ran into the bush, but the water overtook them and some were dashed against trees and some were carried out in the backwash.'

1895		Papua Gona Bay	J.R. Horne, pers.comm., 1972

Remarks: 'My information indicates that it was a true earthquake-induced tidal wave or tsunami - the sea receded some distance before the wave came in. The wave travelled inland some four miles south to about the area of Ononda (see map p. 44 of New Guinea Research Bulletin No. 13) and, even today so I am told, lumps of coral can be found in the area covered by it.

'With your letter and the information I had, I interviewed MacKenzie on 14.9.71. He was not able to tell me a lot except that his father was a small boy at the time (this fits in with Winter's date and Dakeyne's age estimate), and that the wave was probably about 20 ft high and it had left Nixon in some thorn bushes.'

1899		New Ireland E. coast	Sieberg, 1932

*Remarks: 'Several houses wrecked'.

1900	Sep. 12	New Britain Blanche Bay Matupi Island	Sieberg, 1932

*Remarks: 'No details.'

1900	Sep. 12 0800	New Britain Rabaul	Anonymous, 1902

Remarks: 'A severe earth tremor was felt in the Rabaul area at 8 a.m. of 12th September 1900.

European homes were damaged, and some lightly built houses collapsed. The shock was accompanied by a tidal wave which did not cause any damage. The tremor appeared to originate near the volcanoes "Father and Son". Minor tremors persisted throughout the day.' Date reported should be 11th - Author.

1900	Sep. 11 a.m.	New Britain Ralum	AAAS Seismological Committee, 1902., p.42

Remarks: 'While the engineer, chief officer, captain, and passengers were discussing the peculiarity of the atmosphere, a severe shock of earthquake was felt, lasting for fully a minute. Everyone thought the ship was aground. Looking towards the shore, they saw the people rushing out of their houses. After an interval of 20 minutes, another shock was felt for about 20 seconds, and at irregular intervals shocks continued all day until 9 p.m., 32 distinct shocks being felt. The water receded out of the bay after the first shock, leaving the boats on dry land. The natives rushed out for fish, myriads of which were lying high and dry, but their sport was short-lived, as a tidal wave rolled in. Luckily for them the wave was not of great force or volume. After the first shock the lead over the stern showed the three-fathom mark awash, but the water came gradually back, and half an hour after six fathoms was obtained. The vessel was then shifted out half a mile into deep water. Captain Tornaros learned afterwards from Mr. Hernsheim that they believed the island Malapia had been lifted four feet.' The report stated that the event occurred on Sep. 18 but the description of weather and time of occurrence suggest that the date given is one week in error - Author.

1900	Sep. 11 0730	New Britain Reperstshoh	AAAS Seismological Committee, 1902., p. 42

Remarks: 'A terrific shock happened at 7.30. The earth felt as if it had been suddenly lifted up several feet and dumped down again with a thud. The disturbance lasted about three minutes. During

the upheaval the sea receded fully 50 feet from the shore, and after an interval of ten minutes rushed in again. So great was the volume of water which receded that the German mail steamer Stellin, which was lying at anchor at Reperstshoh, distinctly touched bottom several times, to the great consternation of those on board'.

1906 Sep. 15 NW Solomon Sea Sieberg, 1910

Remarks (translated from Sieberg's German text): Even the transition of the tectonic zone from Kaiser Wilhelm Land towards Neu-Pommern indicates that the epicentre is situated on the bottom of the sea between the two islands. This assumption is supported by the fact that the shock was felt by the yacht Siar in Finschhafen. Furthermore, a tidal wave affected the whole coast from Heldsbach in the north to Busega on the Schollen-bruchspitze on the Huon Gulf, as well as the Tami and Siassi Islands. According to observations in Finschhafen, the sea roared enormously for about 15 minutes after the first tremor and a spring tide appeared. The water level rose to 1.2 to 1.5 m above highest sea-level mark, and the low-lying coastal areas were flooded; a causeway constructed from massive coral blocks from the mainland to the island of Madang was completely washed away. After remaining at the highest level for about half a minute, the flood ran off as quickly as it appeared. The following low tide was about 1.50 m below the normal spring low tide during the change of the monsoon. The high tide returned several times; the unusual low tide remained until 10 a.m. Thereafter the water level rose slowly to normal. The natives from the island villages, Quamquam, Sisalum, etc., fled from the flood wave to the mainland and did not return to their villages for days. Especially important may be the report from Missionary J.G. Pfalzer (observation by Missionary Hansche) that no flood wave occurred on the island of Ruk; on the contrary the water retreated there. Is there not a possibility that sudden submarine slumping may have caused the movement of the water masses? Also Missionary G. Bamler locates the epicentre between Kaiser Wilhelm Land and Neu-Pommern and considers a block downthrust. In this connection it is also remark-

able that according to Missionary Hansche, on the day before the earthquake, on September 14th, smoke emerged from the volcano on the island of Tupinier.

1906	Sep. 15 0130	New Guinea Dampier Strait Huon Peninsula and Gulf Finschhafen Tami Siassi and Rooke Is. New Britain - west coast	Sieberg, 1910 1932 Heck, 1947 Gutenberg & Richter, 1954

*Remarks: 'Widespread destruction. Oscillations continued until 1000.'

1906	Oct. 02 1300	Papua Buna Bay	Richmond, 1907

Remarks: 'Buna Bay is on the north-east coast of the Territory of Papua in latitude south 8 degrees, 39 minutes, 30 seconds; longitude east 148 degrees 28 minutes. At 11.35 a.m. on the 2nd October, 1906 the earth shook and rocked considerably for about 3 minutes. At 1 p.m. the tidal disturbances commenced. It was then about half tide; the sea was very calm, and but little wind blowing. The water suddenly ran out about 30 feet further than the lowest usual low water mark, and as suddenly ran back to considerably higher than the usual high water level, flooding all the surface of the foreshore of Buna Bay, and flowing under all the houses to a depth of about six inches. The ebb and flow continued at intervals of about 3 minutes for about half an hour. During this time some excitement prevailed, as it was impossible to judge how far each succeeding flow might rise. At the lowest point during the ebb the reefs in the bay were all exposed to view, apparently about 2 feet more than at usual lowest tides.

'At the flow the water broke in great waves against the western side of the Bay, and came in a steady flood gradually but quickly rising on the eastern side of the bay. The total rise and

fall of water (as nearly as I could estimate at the time) was 8 feet. The tidal disturbance after the first half-hour gradually became less severe and at longer intervals until about 4 p.m. it was very slight. The village natives all ran to the bush in terror, and all the women left the villages in the evening and slept in the bush for fear of a higher flood at night. "Bami" a native of Buna village, says that about 11 years ago the water came up in the same way but very much higher, and he gave me the names of 26 people at Buna who lost their lives. When the water receded they all ran into the bush, but the water overtook them and some were dashed against trees and some were carried out in the backwash.

'The general level of the foreshores of Buna Bay is now more than about 2 feet above highest water level in ordinary tides. The other white people at Buna Bay in addition to myself were Mr. A.L. Joubert and on the western side of the Bay Mr. E. Oates and Mr. J. Seymour'.

1906	Oct. 02 noon	New Guinea Finschhafen	Sieberg, 1910

Remarks (translated from Sieberg's German text): The earthquake affected the area from Sattelburg to Astrolabe Bay, and was even noticed on the French islands. The very strong shocks were again followed by a flood wave, which was of two hours duration. The harbour of Finnschhafen was nearly dry during that time. Although the flood wave rose only about 1.0 m above normal, the general sea swell was much stronger than in the previous month.

1906	Oct. 02	Solomon Sea Finschhafen Buna Bay	Milne, 1913 Sieberg, 1910, 1932 Heck, 1947

*Remarks: 'Strong seismic wave associated, according to Sieberg, with an aftershock of the Sep. 15 earthquake. Gutenberg & Richter (1954) do not list the aftershock. Heck listed the tsunami at Buna Bay and associated it with an earthquake at 2°N, 153°E, but himself questioned this association.' Probably associated with M7.7 event listed by Duda (1965), but with epicentre of 7° S, 148° E - Author.

1907	May 07	Bismarck Sea Aitape	McCarthy, 1963

Remarks: No details.

1907	Dec. 16 early a.m.	New Guinea Aitape	Carey, 1935

Remarks: 'This would probably be the earthquake during the night of 15-16 December 1907, when subsidence took place along the coast, so that there are now lakes and lagoons where there were formerly native villages. The fact that the 1907 'quake was associated with a great tidal wave, while the present 'quake (1935), although more severe, was not, suggests that the former 'quake was submarine, perhaps caused by movement along the thrusts emerging at the foot of the scarp of the continental shelf off Aitape, whereas the latter shock was within the Torricellis themselves.'

1910	Feb. 25	New Britain Rabaul	Fisher, 1939

Remarks: ' "During the night of 24th February, 1910, there was a severe earthquake in Matupi Harbour. It began with a severe shock four seconds long and about a minute later the phenomenon was repeated, the second shock being six seconds long. The first had been immediately followed by a moderately heavy swell from the south-east." ' There are no records of the precise details of this earthquake - Author.

1911	May 08	New Britain Blanche Bay	Sieberg, 1932

*Remarks: 'No details".

1913	Oct. 11	Solomon Sea Near east end of New Guinea	Heck, 1947

*Remarks: 'No record'. See Aug. 1915 - Author.

1914	May 27 0023	Irian Jaya N coast	Heck, 1947

*Remarks: 'No record'.

1914	May 27	Irian Jaya Geelvink Bay	Berninghausen, 1969

Remarks: 'Buildings destroyed on Japen Island (01° 45'S, 136° 15'E). Ansoes (01°44'S, 135° 49'E) and Pom (01° 36'S, 135° 44'E) reported a wave. A few persons were killed.'

1915	Aug.	New Guinea Salamaua	Pacific Islands Monthly, July, 1938

Remarks: 'Writing to Melbourne Argus on June 27, Mr. C.H. Nelson of St. Kilda, said it was inexplicable to him that Mr. Hughes should recommend Salamaua as the new capital site for the Mandated Territory. Had Mr. Hughes seen the effects of the extensive earthquake disturbances in August, 1915, around the Huon Gulf, and especially at Salamaua, he would not have been so anxious to accept interested local opinions. Salamaua was then a primitive native village, but the tidal effects wiped out nearly the whole locality, and what happened 23 years ago could happen again today, with even worse results than the Rabaul disaster. "There is no harbour, limited building space, and a dangerous surf coast, with almost no shelter", says Mr. Nelson.' Possibly 11 Oct. 1913 - Author.

1916	Jan. 01 2330	Rabaul	Earthquake notes

Remarks: ' "The water in Rabaul harbour fell 15 feet in a few moments and rose again with tremendous rapidity. The small steamer Siar was lifted bodily from Rabaul to Matupi Harbour across the place where the strongly build causeway had existed previously. This causeway entirely disappeared, leaving a depth of 15 feet" (H.M.A.S. Una, 1916).'

1917	Jul. 30 0758	Aitape	Earthquake notes

Remarks: 'The sea rose about 3 feet.'

1919	May 07 0540	New Britain Kokopo	Administrator, Rabaul, memo of 20 May 1919

Remarks: 'A tidal wave of some magnitude was experienced at Kokopo where S.S. Nusa was compelled to hastily put to sea in order to prevent being swept up on to the beach. The wave took up and tossed a large whale boat upon the wharf, and then receded so far as to leave the wharf entirely out of the water for the time being. Even at Rabaul, the wave was of such proportions as to leave thousands of fish stranded above the high tide mark. In spite of extensive damage done to property, it is remarkable that not a single casualty has been reported.'

1919	May 07 0540	New Britain Rabaul Kokopo	Earthquake notes

Remarks: 'Thousands of fish stranded above H.W.M. Large whale boat tossed upon the wharf. Sea receded leaving wharf entirely out of water. At Rabaul wharf the water fell 6 to 8 feet, then rose rapidly. (N.I.O. 1919).'

1919	May 07 0540	New Britain Rabaul	Fisher, 1939

Remarks: ' "A similar earthquake and wave took place at 5.40 a.m. on the 5th May, 1919. At Rabaul Wharf the water fell 6 to 8 feet and rose again rapidly. The causeway to Matupi is now (September, 1919) only knee deep and can be waded across." (N.I.O. 1919).'

1920	Feb. 02 2112	S New Britain Gasmata	Report from District Office, Gasmata, 9 February 1920

Remarks: 'On the night of Monday last, 2nd instant, at 9.12 pm a very severe earthquake shock passed over Gasmata. It was, according to Commonwealth Meteorological Forms, about strength 8 or 9, and lasted about 1 minute 10 seconds. Everyone rushed from their houses, and the natives were somewhat terrified. The newly re-built jetty was semi-demolished; fissures about 2 inches wide appeared in parts of the Island; many bottles of drugs and medicines in the hospital were broken; the old troops bungalow in the middle of the island has jumped forward off its studs, and broke stringers and cross-pieces. After the quake the harbour water rushed out the main entrance into the sea in a swift torrent but DID NOT RETURN, the result has been that the tides now reach about 20 to 24 inches lower than previous high-water mark. Much dead fish were left stranded on the reefs, and with an unfavourable wind the stench from same is still very strong. On the morning of the 2nd inst., a very heavy swell set in from SSW and continued all day, although no bad weather had happened around here. Whether this had anything to do with the quake I cannot say. The quake seemed to come from that direction, and seemed to pass away towards Talasea. The rumbling and trees knocking in the mountains inland could be heard for minutes afterwards. At Lindenhafen, two of the three houses (European built) collapsed like a pack of cards (which speaks well of the work put in on our bungalow, built by Pte. Burston), and Mr. Ross the Manager, had a narrow escape from injury.

For 48 hours after the main quake (which did all the damage) tremors of from 30 to 40 seconds duration happened half-hourly, and since then they have happened about six daily. Gasmata Island is now joined to Abelle Island - previously separated by water.

The tremors in this District before this time were practically nil, perhaps one or two per year, just faintly perceptible. The natives say that, about 20 years ago, there was a tidal wave, which did much damage to life and property.'

1922	Jan. 20 0800	Papua Sumai	Meteorological Observers' report, Daru, 5 February 1922

Remarks: 'Parumi, native mission teacher at Sumai, reports the first shock ("about 8 in the morning") to have been the worst at that place. It shook the houses of the village and broke some of the coconut trees. One big wave came right into the village and then receded. The wave was about six feet high. Some of the people (natives) were "going mad". Natives ran inland from their houses afraid of the tide coming in. Women and children were crying. One house fell down. There were two small shocks after dinner (midday). The people again left their houses. "About 5 p.m." there was a bad shock. The men lay down on the ground; some canoes were filled with water and sank. The people were terrified. The roofs of some of the houses were broken by this or preceding shocks. This man thought that the shocks came from the north.'

1923	Nov. 03 0718	New Britain Rabaul	Dept of Agriculture Rabaul, report of 6 November 1923

Remarks: 'After the first shock, water in Blanche Bay and Simpson Harbour (Rabaul), which was at about high tide, receded rapidly to about low water mark, returning within about 15 minutes; repeating the process within half an hour.'

1923	Nov. 04 1020	New Britain Natava Plantation	Dept of Agriculture Rabaul, memo of 5 November 1923

Remarks: 'Whilst I was visiting NATAVA plantation (north coast) on Sunday 4th inst. there occurred about 10.20 a.m. several earthquakes. A few seconds after the first shock commenced the sea receded again. This occurrrd many times, the water surface during this time being in a very disturbed state. After the second shock on Sunday the 4th no report of any disturbance of the water of the bay at Rabaul was recorded, but a somewhat similar disturbance is reported on the north coast of New Britain about 18 miles from Rabaul by an officer of this Department who happened to be there.'

1923	Nov 03, 04	Bougainville Kieta district	Dept of Agriculture Kieta, memo of 21 December 1923

Remarks: 'No sea waves.'

1926	Sep. 17 0359	Solomon Islands Guadalcanal Kokomaruki	Sieberg, 1932 Heck, 1947

*Remarks: 'Port of Guadalcanal inundated. 3 waves. Whole island of Kokomaruki inundated. Date shown is date of earthquake according to Gutenberg & Richter (1954). Heck gives data as September 18, and Sieberg uses Greenwich date of September 16.'

1930	Oct. 01 0721	Bismarck Sea Kar Kar Island	Earthquake notes

Remarks: 'Reported that on western coast of the island tidal wave experienced, the sea rising and falling about four times and finally dropping about 2 feet from previous level.'

1930	Dec. 24 early a.m.	Bismarck Sea Awin Island	South Pacific Post, 27 February 1957

Remarks: 'Interview with S. Thompson. Sea receded, then a (4? metre) wave came from the east.'

1930	Dec. 24 0815	Bismarck Sea Kar Kar Island	Earthquake notes

Remarks: 'On Kar Kar Island, the results were worse on the east, north and western parts. The waves destroyed a bridge at one station and wiped out parts of the foreshore taking away palms, and leaving thousands of fish stranded at others. One informant was "swamped and placed high and dry on the beach" with the boat he was in at the time, a small dinghy. 15 natives were reported lost at sea by swamping of a canoe but whether the sea roughened due to weather or due to the earthquake could not be stated.'

1930	Dec. 24	New Guinea North Coast 144°-146° E	Administration Report to Prime Minister's Department, Canberra, 2 January 1931.

Remarks: 'Accompanied by the abovementioned personnel departed from Madang per the M.V. Stella Maris at 3.30 p.m. on 27th December and proceeded via Sek Mission to Sapara, arriving at 11 a.m. next day, here Father E. van Baar, in company with his brother of the Mugil Mission and Father Koster of the Bogia Mission was met with.

'Father van Baar reports: that at about 7.30 a.m. on Wednesday the 24th December he was in the school at Sapara preparing lessons for the small school boys when one of his teachers came and told him that "the sea was no good" and that it had come "on top" and run underneath his (van Baar's) house.

'Going outside he saw the sea receding and he went to the beach where most of the natives were gathering, and watched the water go back a long way in the bay leaving the place where the Stella Maris usually anchors and all the reefs quite dry.

'He did not think there was any danger - in fact whilst the sea was receding he sent a couple of "boys" into the store to prepare the next day's rice issue and some of the natives started to look for fish in pools left by the receding waters.

'The sea after going back about a quarter of a mile or so, turned, and gaining height started to run towards the shore again. There was a general call to run for safety and everyone scattered and ran into the bush or climbed coconut trees. Van Baar ran back and thence along the main road towards Meriman - looking backwards he saw his house and the large newly constructed Church collapsing. He continued on towards Meriman and was met with a wave coming from that direction. He then turned and ran into the bush. The water swirled about him waist deep and he managed to make some high ground which soon became an island.

'After the water had subsided natives began looking for their families and a search was made amongst the debris for the bodies of missing natives.

'Two badly injured females - Awob, wife of Kumaula of Mambuan, and Painabai, wife of Walpui of Aitape - were located under the wreckage of houses and carried to where Father van Baar was in the bush. The former did not live long and when she died her body was taken to Rurunat and buried. The latter was tended by Father van Baar, during the day and night in the bush. Next morning her husband got other natives to assist him to carry her to Korak, where he was stationed, and she died on Saturday evening at about 7 o'clock and was buried at Korak. The search was continued throughout Wednesday until darkness set in, but without success. On Thursday morning the body of Sukumung, wife of Saiau of Mombuan sic , and the body of an adult female, who belonged to the inland village of Pipour, were discovered under the wreckage of houses at Sapara. The former was buried by Father van Baar in the cemetery at Meriman and the latter was carried inland for burial at Pipour.

'On Friday the search was continued and the body of Tomis, a young mission student, was discovered under a mass of debris about 250 yards inland and on the following afternoon the body of Waret, wife of

Undiem of Moira, was found beneath the wreckage of a house in Sapara village. Both bodies were buried by Father van Baar adjacent to where they were found.

'All other natives of Sapara Mission and village are accounted for except Witau, the small son of Salex of Sapara. All debris has been thoroughly searched and to date there has been no trace of the body. It is believed he was carried out to sea by the receding waters and drowned.

'No other casualties were known of except for 3 aged natives of Meddibur and a young female of Tawulti who were reported to be injured.

'Indications show that the water attained a height of 20 to 25 feet at Sapara and swept inland to a depth of approximately two to three hundred yards, washing masses of coral reef ashore and wrecking everything in its path except for full grown coconuts and large isolated trees. All the houses and buildings at Sapara Mission station and village (numbering 10 and 22 respectively) were completely demolished and swept away - the debris being strewed over the whole of the affected area, making a scene of utter desolation.

'Great loss was suffered by Father van Baar. Not only was his newly constructed church, with seating accommodation for approximately 1000 natives, and his residence wrecked but all his furniture, personal effects, clothing and private papers and records were washed away and strewn everywhere over the affected area, and he was left with only the clothes he was wearing at the time of the disaster.

'To the north of Sapara the village of Simbini suffered the most damage - 24 houses being destroyed. Other places affected to a lesser degree together with the number of houses destroyed are: Meriman 2, Rurunat 7 and a large newly constructed bridge, Mere 2, Malala 3 and a newly constructed bridge, J. Reid of Cape Gordon, labour house and store, Busip 4, Kelaua Plantation 2 labour houses and the foot bridge across the river in front of the house, Wangol 3 and Bimat 3.

'At Bogia the wave broke over the wharf and through the plantation and copra store but did not wreck anything.

'At Awar Plantation Mr. Wauchope reports that the wave attained a height of about 12 feet, swept away the beds of a sun-drier, poured through the copra store, wherein 300 bags of copra were stacked, burst through the labour house, carrying away the front and back walls and partitions and deposited boxes, beds, blankets and effects 150 yards inland. The pinnace was cast up into the plantation and huge masses of coral reef were washed ashore above high water mark. Canoes belonging to Nubia and Sisimungan were destroyed.

'No casualities were suffered at any of the above-mentioned places.

'To the south of Sapara - Madeibur, which is situated on the southern side of the bay from Sapara Mission, received the effects of the back wash of the wave and 12 houses were destroyed, and yet a section of bush between Sapara Village and Medeibur did not suffer any damage. Of the 3 natives injured at Medeibur: 1 aged male was found to have a bad compound fracture of his leg; his wife had a bad leg injury and another female had a minor injury. Dr. Platt rendered first aid and a stretcher was improvised and the two former were carried along the road to Ulingan (where the Stella Maris had repaired for the night's anchorage). The Doctor then set the leg and dressed the other injury. Owing to the bad state of the native's leg due to the fracture the Doctor decided to proceed by road with the injured, next morning, en route to Madang so that proper medical treatment could be afforded the injured.

'At Ulingan the villages of Torto and Meiwak situated on the north and south headlands of the harbour were unaffected by the water. At the head and to the northern side of the inlet the 13 houses comprising the village of Ulingan, together with the mission school and house, at the immediate head of the inlet, were completely demolished and washed inland. Lumps of coral reef were washed up on the shore and the roadway was washed away.

'A small bay and acres of virgin bush to the north of Korak apparently received the full force of the wave which penetrated to a depth of approximately four to five hundred yards laying waste the bush and full grown trees which completely blocked the road for the best part of a mile and huge masses of coral reef were cast up on the beach. The water breaking sideways at the head of the bay demolished a copra store, lately erected by Mr. J.S. Reid and scored out a channel where the shed stood previously and upended full grown trees.

'At Korak and Tawulti - 18 and 7 houses respectively were destroyed. At the latter place a young female had her arm broken. She was attended to by Dr. Platt and taken by road, in company with the other injured, to Madang.

'South of Tawulti no houses were destroyed, but at the Mugil Mission the pinnace, which was at anchor was cast ashore into the bush and damaged.

'Practically all native canoes at the affected places were either broken or damaged and there was a fairly heavy toll of pigs, fowls and dogs.

'Except for minor instances native gardens were not affected or damaged but all Kapiaks, Betelnut, banana paw-paw and other natural products growing on areas affected by the wave have died from the effects of the salt water.

'Three canoes, containing 18 natives on a trading expedition from Kar Kar, were wrecked at Murakanum - the canoes were smashed but all the natives got ashore uninjured. They made their way to the Mission Station at Mugil and on the return trip of the Stella Maris they were returned to Kar Kar.

'The natives whose houses have been destroyed are at present living in the houses at their gardens or with friends - there is no shortage of food supplies.

'The Mission have decided to abandon the mission station at Sapara and also the area applied for at Meriman and it is intended to apply for an area of approximately 10 to 15 hectares in the vicinity of Ulingan in lieu of same. An area has been marked out and the natives were willing to agree to the transfer.

'Natives report that a similar occurrence happened 40 to 50 years ago and there is no doubt that the knowledge of the previous event minimised casualties, in that when the sea began to recede the majority of the natives ran into the bush. The 1888 tsunami from the Ritter Island explosion - Author.

'The road at Korak has been cleared of debris and made trafficable.'

1930	Dec. 24	New Guinea Ninigo Group	Administration Report to Prime Minister's Department, Canberra, 21 January 1931

Remarks: 'I left Rabaul in the M.V. Ralum at 12.45 a.m. on the 2nd January, 1931, accompanied by a Medical Assistant and 2 native police, and arrived at Maty Island at 5.30 a.m. on the 6th inst. and went ashore at 6 a.m.

'I saw at once that the island had not been visited by the tidal wave, and the manager of Agita Plantation confirmed this. The 24 December had been a fine day and there had been no earthquake and no tidal wave. I walked across the island and found a similar state of affairs on the other side.

'Later I saw the two Luluais and they reported all well. The ship sailed for Aua island at 8 a.m. arriving there at 11.15 a.m. the same morning. I went ashore at 11.25 a.m. and found the same conditions as at Maty Island. The owner of the Plantation there reported that there had been nothing in the nature of a seismic disturbance. At 1.15 p.m. the same day the ship sailed for Allison Island arriving there four hours later. I landed and found all in order, the manager of the plantation reporting that there had

been no disturbance of any kind. I left Allison at 6.5 p.m. the same evening and arrived at Mal Island at 7.30 o'clock on the following morning, the 7th January.

'I went ashore at 8.30 a.m. and was met by the Manager, Mr. Vincent, who told me that on Wednesday the 24th December, at about 7.45 a.m. a severe earthquake shock shook Mal and surrounding islands, followed immediately by two tidal waves. He was in the house at the time of the shock and the motion seemed to be an up and down one, lifting the house off the piles and bumping it down again until he thought it must collapse. A large water tank at the side was thrown from its supports, and fell against the house. He ran outside and his attention was drawn to the S.E. end of the island by a loud hissing noise as of steam escaping, and on looking out to sea he saw two large dense clouds of smoke or steam hanging over the sea. At the same time he observed two huge waves, one of which was coming towards the S.E. end of the island, and the other appeared to be going due east.

'The wave from the S.W. struck the end of the island, sweeping it clear and uprooting coconut palms and big trees for a distance of about a quarter of a mile. It then ran down the island on the seaward side and swept the bush and debris clean and carried stones from the reef on to the island. The second wave went almost due east, and in line with Numu, a small uninhabited island which was completely swept away. This island was about two acres in extent, and had on it some very large casuarina trees. These were uprooted, smashed and carried away, and the whole island down to its coral bed below water was swept clean, only the huge upended roots of the big trees being left like jagged teeth. Fortunately, Mr. Vincent's house and the houses of the native labourers were at the other end of the island, which was untouched although part of the second wave seemed to approach the station, but by the time it reached there its force was expended, and it merely washed upon the beach. At the time of the occurrence the tide was low, and it is doubtless due to that fact that the loss of life was so slight.

'Mr. Vincent told me that he had made an inspection immediately after the waves had finished, and found that the S.E. end of Mal was swept clear. (This is not correct, for at the time of my visit that end of the island had the appearance of having been thinned out, and Mr. Vincent told me that he estimated he had lost about 200 palms). The sun drier and the copra hut had been demolished, and about half the island from there on covered with debris and sand from the reef. He said that all the other islands of his group were undamaged, with the exception of Sumasuma, the point of which was swept, and buildings (native material) knocked down. His copra cutters (indentured labourers) were caught in the tail end of the wave and had to swim, but all escaped without injury.

'At the time of the occurrence, he told me that some of the natives of the neighbouring island of Lau were engaged in cutting copra for him, and as they were nearer the end of the island they were not so fortunate. One child and one man were drowned. The natives employed by Hann, a trochus fisher, were caught in the wave, but all escaped though some of them were bruised and bumped by the floating debris. Some of these men tried to save themselves as they were being washed across the end of the island, by catching at the fronds of the coconut palms. As the palms are about 30 to 40 feet in height this will give some idea of the size of the wave. Mr. Vincent continued his story by saying that as soon as possible after the waves had occurred he sent all the Lau natives back to their island. They were naturally very frightened, but were regaining confidence and as they had plenty of food and money they were in need of nothing.

'Mr. Vincent told me that there were shocks during the whole of the 24th December, numbering about thirty and they continued for days, gradually becoming less frequent and less violent, until they became mere earth tremors and at the time of my visit had ceased altogether.

'I visited the island of Lau and found the natives in good health and apparently recovered from their shock. The luluai showed me a blow hole towards the centre of the island which had appeared at the time of the disturbance. He said that when it was first discovered it was quite a deep hole, but when I saw it it had been turned into a wallow by the pigs. All around the spot the foliage had been killed, just as though it had been subjected to a

blast of hot air, and there was a deposit of yellowish whitish sandy clay. This was much more prevalent in the island of Pihun, and a sample of it was brought to Rabaul for analysis.

'On Lau Island I met the luluai Porso, who is the head luluai of the Ninigo Group of islands. I told him that I intended to visit Pihun, and said that I wanted him to come with me. I then left the island on the ship's pinnace, and set off for Pihun, but on the way Porso told me that the people of Pihun had deserted the island and had gone to two islands inside the lagoon. I therefore made for the island of Amot, where I was given to understand the majority of people were. On arrival there I found that they had built houses for themselves, and appeared to be fairly comfortable. The Luluai Lebbia was not on that island, and I sent a message to him that he was to meet me the following morning at Longan Plantation where I intended to go to make some arrangement with Mr. Johns, the Manager, in case relief was necessary.

'The people of Pihun, who were then living on Amot Island, told me that they could not go back to their island as the stench from the numberless dead fish made it an impossibility. They also informed me that their swamp taro (hula) gardens had been destroyed. I decided to go and see for myself, and, accompanied by Porso, I set out for the island which was a few miles away. I went to the north end first, and found it had not been touched. I then went down to the south and landed at the luluai's station, and found that that also was intact, but on penetrating the bush to the south of it I found that the sea had been inside, and as we went towards the end of the island the state of affairs got worse. Only about one tenth of the island was thus affected, and I could see no reason why the natives should not return. There were no signs of dead fish, and no smell, save from the deposit of which I have already spoken, and that smell was not very strong or unpleasant. There was no doubt that where the sea had been, there, any vegetation had been destroyed. Whether this was due simply to the action of sea water, or whether it was caused by some chemical action of the deposit, I am unable to say. The appearance, as I said before, was similar to that which might have been caused if a

blast of very hot air had passed through the bush. Everything was withered and dead or dying, except foliage which had been above water possibly.

'As far as the condition of the island is concerned, there is no reason why the people should not return, and I put it to Porso that they should do so. He said he would use his influence to induce them to return. Naturally they are very nervous still, and, having had no experience of such an occurrence before, they probably feel they are safer inside the lagoon.

'I then returned to the ship as it was getting late, and the next morning at daybreak we left for Longan, arriving there at 8.45 o'clock.

'I went ashore and met Mr. Johns, the manager of Longan Plantation, and Mr. Hann, the fisherman already mentioned. Luluai Lebbia of Pihun arrived shortly after me.

'Mr. Johns told me that he had done all he could for the natives of Pihun, giving them permission to live on the islands they are at present occupying, which are the property of Carpenter & Company. He told me that he had issued them with three bags of rice, in case they were short of food, but at the time of my visit there was still some of this rice left, as they were not at all short of food. Porso informed me the previous day that he had plenty of food, and that he was helping the Pihun people. Mr. Johns told me that he would provide the people with all the work they needed and that there was no need for them to be short of anything.

'I then had a talk with the luluai and ascertained from him what the losses had been. There were three deaths and four people were injured, the most serious of these being a broken leg. All these injured people are at present in the hospital on Pelleluhn Pelleluhu Island, which is in the charge of Mr. Bruce, a Medical Assistant employed by Carpenter & Company, where they will receive proper attention at the expense of the Government.

'Later I discussed the question of returning to Pihun with Lebbia, and he said that he would go back and most of the people would go with him. Owing to time, I could not superintend the return, and it is possible they will not return for some time yet, but even if they do not do so, there will be no

harm done as in all probability many of them will be cutting copra for the plantation and in such cases they prefer to live on the scene of their work.

'Both Lebbia and Porso told me that Liot Island, on which they both have gardens, had been affected by the wave, and that about half of their foods had been destroyed, and that they would be glad if I could make some arrangement with Mr. Johns for the loan of his cutter to go across and gather what was left. The day previous to my arrival at Longan some natives of Pihun who had been across to Liot to see what the state of affairs was there, had returned and made the report. I spoke to Mr. Johns and asked him if it would be possible for his cutter to go, but he said that it was too uncertain in the northwest, and that he very much regretted that he could not manage it. Mr. Hann then said if I would give him the necessary benzine for the trip he would take some of the natives across and let them gather all the food available and bring it back to Pihun. I asked him how much benzine he wanted for this trip, and issued him two cases, and thanked him on behalf of the Administration for his kindness.

'I returned to Mr. Johns the three bags of rice he had issued to the natives, and left with him a ton and a half for issue, if necessary. I have also arranged with him to send a short report to Rabaul by each available mail of the general position with regard to native welfare.

'The ship then left for Liot Island, which I wanted to see, and arrived there at 3 p.m. but as there was a dangerous swell, and no anchorage and no proper landing place save at a spot remote from the scene of the damage, which appeared to be the extreme S.W. point of the island, and as it would have taken at least a day to examine the island thoroughly, I decided not to go ashore, and the ship left for Rabaul, arriving there between midnight and dawn on the 15th inst.

'There are two items of interest in connection with the disturbance of which I have not mentioned; one is that on the reef close to the place where the island of Nunu sic formerly was, is a large rock which was apparently blown up from the bottom of the sea, as no one ever saw it before. I was not able to get close to it, but from a distance it looks very white and new, and quite different from anything else in the vicinity.

'The other interesting thing is that those men on Mal who were actually in the tidal wave, told me that the water was fresh water, and not salt water. I questioned them closely on this point. Although it seems remarkable, I cannot doubt them, for it is not the kind of thing a native would think of for the purpose of making a good story.

'To sum up, the position as far as the District of Manus is concerned, is that it has had a very fortunate escape. Had the waves occurred at high tide it seems almost certain that the loss of life, and damage to property would have been very much greater, and must have been in the nature of a calamity. As it is, there has been no loss of European life and no Europeans injured. The natives losses are five drowned and four injured. The loss to property, both native and European, cannot be called great.'

1931	Aug. 07 1140	New Guinea Aitape	Earthquake notes

Remarks: 'Beach from Aitape to Ulau reported fissured and ingress of water.'

1931	Aug 12 2200	New Ireland Namatanai	Earthquake notes

Remarks: 'Reporter on stone jetty noted violent agitation of water on shallow reef and waves from there to jetty.' Probably not a tsunami - Author.

1931	Oct. 04	Solomon Islands	Jones, 1931 Newmann, 1932 Gutenberg & Richter, 1936 Powers, 1946 Heck, 1947 Gutenberg & Richter, 1954

*Remarks: '18 villages destroyed. 50 dead.'

1931	Oct. 04	Solomon Islands	Grover, 1951

Remarks: 'One eyewitness whom you all probably know, has given an account of the 1931 earthquake on San Cristobal. He described the sensations of heavy rumbling all around as though his ship were running on full throttle without load, the landslides on the mountains which run close to the coast here near Marunga Harbour, the slowly rising seismic seawaves which followed the withdrawal of the sea from the coastline, and the areas of forests which were swept to sea from the harbour area. The description of churned up sand from the sea floor would indicate that the epicentre was not far distant in this case; and the ship was described as being beyond the 40 fathom line at the time. Evidence of trees being battered by passing objects to a height of 25 ft. testify to the size of the wave, and the mangrove oyster beds of Star Harbour dying due to complete submergence at low water gives an indication that some subsidence took place in this eastern part of San Cristobal. The accompanying loss of life among the natives, and destruction of villages adds weight to the old San Cristobal mountain chief's statement that "only fools live near the sea".'

1934	Dec. 13 0015	New Britain Rabaul	Pacific Islands Monthly, January 1934

Remarks: 'Early on Wednesday morning, December 13, Rabaul was visited by a severe earth tremor. The time of the shock was 12.15 a.m. The first tremor was of an up-and-down nature; and was followed later by spasmodic shakes from various directions. Landslides occurred on the various main roads and a small tidal wave was reported from Nodup Nodup .'

1935 Sep. 20 N Coast of New Guinea Aitape McCarthy, 1963

Remarks: '"The sea! - Look at the sea!" I heard some natives shout and I saw that the ocean seemed to be receding from the beach. After the first series of shocks the tremors diminished until they were barely discernible, but the sea was now pulled back until the whole of the foreshore was dry; then as I watched the tide started to return. It came in great breakers although the outer sea remained calm. The great waves swept up over the coast towards me and in places flooded inland. Where the land was low the sea went many hundreds of yards in shore.'

1937 May 28, 29 New Britain Rabaul Fisher, 1939

Remarks: 'Another phenomenon which occurred about 2 o'clock on Friday afternoon, following and probably consequent to the earthquake shock, was a fluctuation in level of the waters of the harbour, which first receded gently up to 100 yards out from the shore and then returned to their normal place. At Vulcan Island the water went out slowly and came in again 150 yards past highwater mark, then receded back to normal, leaving many stranded fish. At Keravia Bay at this time (1.30 p.m.) the water came up over the road, 6 feet or so above the usual water level.....

'Between 7 and 9 p.m. on the Saturday, 29th May, the waters of the harbour at Rabaul rose and fell continuously, taking some four to five minutes between the least and greatest depth. At least three of the waves produced ranged from 7-8 feet below to the same distance above ordinary high-water mark. The schooner Induna Star, drawing 6 feet of water, was floated by one of the waves over the small low wharf at the back of the Burns, Philp's store, carrying it away by its weight. Several small boats were left high and dry and one or two others disappeared. R. Kendall, Captain of the Induna Star, observed that the rise and fall of the water appeared to coincide with the more active periods of eruption. He further remarks -

"At about 7 p.m., however, definite periods of active eruption were followed each time by corresponding periods of dormant steaming, and it was during this period, and prior to the rising of the rim of the crater above sea level that the tidal waves were observed.

"During the dormant periods enormous quantities of water must have been pouring into the crater itself, and the harbour, holding a comparatively small quantity of water, was thus lowered considerably. This was followed each time by a violent and sustained eruption which stopped the flow of water into the crater....

"When the rim of the crater appeared above the sea, the waves ceased and I proceeded to sea..." '

1938	May 13 early a.m.	New Guinea Salamaua	Pacific Islands Monthly, 25 May 1938

Remarks: 'The whole of the north-eastern section of the New Guinea mainland was shaken by a severe earthquake early on Friday morning, May 13. The Morobe district suffered most of the shock. Small tidal waves inundated the northern end of Salamaua and the bulk stores of Burns Philp and Co., Ltd., W.R. Carpenter and Co. Ltd., N.G. Goldfields Ltd., and Vacuum Oil Co., Ltd., suffered considerable damage. Numerous native houses collapsed and the natives fled in terror to the higher ground. Flood waters for a time cut off Salamaua from the Aerodrome. There was much minor damage, including the dislocation of telephone services. Numerous drums of petrol were swept by the tidal waves from the waterfront stores into the swamp. Boats and launches were stranded.'

1939	Jan. 30	Solomon Islands Faisi	Pacific Islands Monthly, 15 February 1939, p. 4

Remarks: 'There was a very severe earthquake in the earthquake belt between New Guinea and the Solomon Islands on the 31st January (1939). Faisi in the northernmost Solomons had a violent shaking and a tidal wave. Some damage was done to wharves and old buildings but nothing serious has been reported. Residents in most of the Solomon Islands were a little startled by the tremors and natives in a number of places fled howling into the bush. Date should be 30th - Author.

'The Morobe coast of New Guinea directly opposite the northern Solomons was shaken in an alarming way and some minor damage was reported in Salamaua. Residents of the latter place prepared themselves for the usual tidal wave; but on this occasion the sea remained quiet' ' Different earthquake - Author.

1939 Jan. 30 1220 — Bougainville Buin — Earthquake notes

Remarks: 'Fissures have opened in many places to a maximum width of twelve inches and there are signs that the coastline from near Buin Police Post northeast for 5 miles has fallen perhaps a foot.'

1939 Jan. 31 1730 — New Britain Kokopo — Earthquake notes

Remarks: 'At 1730 the sea receded lower than an ordinary low tide then rapidly rose above normal high tide level. This occurred three times in approximately 20 minutes.' Date should be 30th - Author.

1939 Apr. 30 1256 — Solomon Islands Russell Islands Guadalcanal

Remarks: 12 drowned.

1939 Apr. 30 1600 — New Britain Gasmata — Earthquake notes

Remarks: 'At Au village the sea washed under the houses, the rise in level being about five feet. The disturbance lasted one hour. Other coastal villages reported smaller waves.'

1939	Apr. 30 1630	New Britain Rabaul	Earthquake notes

Remarks: 'Sea wave observed.'

1939	Apr. 30 1300	Solomon Islands Beaufort Bay Guadalcanal	Grover, 1955

Remarks: 'Perhaps the best illustration of this protection afforded by reefs, islands, projecting headlands or shallow areas is the way in which the tsunami which destroyed Lavoro Plantation House in 1939 and reached a measured height of 35 feet on the shores of Beaufort Bay, yet caused no damage whatever at Visale Mission on the same coast, a few miles to the northward, and was only about six feet high along the northcoast of Guadalcanal.'
See Appendix.

1941	Jan. 14 0228	New Britain Rabaul	Fisher, 1944

Remarks: 'A tidal rhythm was set up in Rabaul Harbour and is shown by the tide-gauge recording to have had a maximum amplitude from trough to crest of 1 foot and a period of 10 minutes. The total duration of the tidal disturbance was from 2.30 a.m. to 7 a.m., the maximum movement occurring between 3 and 4 a.m. Similar phenomena were reported from the north coast and from the Bainings, the water receding slowly to leave reefs high and dry and then returning to gush over them.'

1949	Oct. 20	New Britain Rabaul New Guinea Dregerhafen	Zerbe, 1953

Remarks: 'Tide gauge record. Rabaul - height of 0.1 m, period 1.4 min. Dregerhafen - height 0.1 m, period 20 min.'

1950	Nov. 08 1218	Solomon Islands	Grover, 1955

Remarks: See Appendix.

1951	Early in the year	Aitape	Port Moresby Observatory file D610

Remarks: One reliable observer stated that early in 1951:

'There had been intermittent earth tremors all day. The wave came up suddenly in the afternoon, swept away three wards of the old hospital, which was built of native materials. Waves approximately 20 ft. high. No casualties.'

The Assistant District Officer remembered only the gradual influx of water, perhaps 6 ft at highest, during the morning; it may have been another event. Earthquake listed by ISS (Feb.22 0146 UT); relation to tsunami probable.

1952	Nov. 05 1130	New Britain Rabaul Siassi Islands Bougainville Kieta	Rabaul Volcanological Observatory monthly report for November 1952

Remarks: 'At 030826 hours (150° E time) on the 5th a tremor commenced recording and continued recording for 58 minutes. Subsequently at approximately 1130 hours a series of tidal waves arrived in Simpson Harbour; maximum elevation of water level was approximately 3.5 feet. Damage caused was only slight, several electric motors and one bulk store situated close to the shore being partially inundated. A maximum vertical rise in tide level of 8 feet was reported from Kieta, whilst in the Siassi Islands a rise of approximately 2.5-3 feet was experienced. From the record made by the Department of Works tide gauge at Kokopo it appears that the tidal disturbance lasted for about 48 hours. The float actuating this instrument is housed in a well which communicates with the outside water by means of a hole one thousandth the diameter of the well. This con-

stricted opening allows the water level in the well to accompany normal tide variations, but prevents surge etc., from affecting the record. Thus whilst the successive tidal waves are indicated on the chart the absolute variations in water level were not recorded. On the afternoon of the 5th the Department of Works stationed one of their officers at the Main Wharf. A graph of his readings taken every two minutes accompanies this report.'
This graph shows waves with trough-peak amplitude of 3 ft; period 28 minutes from 1430-1720 - Author.

1952 Nov. 05 Solomon Islands Grover, 1958
Tulagi
Auki Harbour

Remarks: 'A great earthquake (at 52½° N, 159° E) near the coast of Kamchatka in the Northern Pacific at 16-58-20 GMT on 4th November, 1952, initiated a seismic sea wave which swept the Hawaiian Islands, causing some damage. This tsunami reached the Solomon Islands on the evening of the 5th November and was noted at Tulagi, and Auki Harbour (on Malaita). Both points are on the sheltered lee side of the islands away from the direction of approach, and no damage was reported. Unfortunately the District Commissioner's report gave no details of heights or times of arrival of the crests of the waves. It is interesting to note that this wave impulse travelling due south for 4,200 miles took about 13 hours approximately to reach the shores of the Solomon Islands, which indicates an average speed of about 325 miles per hour.'

1953 Apr. 24 New Britain Sydney Morning Herald, 25 April 1953
Rabaul

Remarks: 'The upheaval caused water to be sucked from Simpson Harbour in which Rabaul nestles. It ebbed and flowed several times before the level became normal.'

1955	Sep. 08 1327	Solomon Islands Fauro Island	Grover, 1958

Remarks: 'On 8th September, 1955 a shock lasting more than a minute occurred at 03-27-14 GMT (Queensland T.O.O.); this was felt strongly at Fauro Island and on the central east coast of Choiseul some 100 miles to the east. A tsunami (or seiche) was reported at Fauro, the gentle rises and falls of sea level continuing for several hours.'

1955	Oct. 11 1000	New Britain Rabaul	Rabaul Volcanological Observatory monthly report for October 1955

Remarks: 'There were reports of small tidal waves at Sulphur Creek and along the northern margin of Simpson Harbour. These were first noticed about one hour after the main shock.'

1957		Aitape	Administration report

Remarks: 'The waters of the Aitape River close to its mouth are said to have risen no more than about 1 ft - 1 ft 6 ins. It appears that the Sub-District Office received word that this tidal wave was to come from somewhere in the direction of the Philippines. People on low lying areas and on the Aitape offshore islands were advised to go to higher ground or even to climb trees should there be no high ground available. However, as stated above, the wave was not large and there was no loss of life or damage to property.' May have been caused by Aleutian Island earthquake of Mar. 09 at 1422 UT - Author.

1957	Early June	New Ireland	Rabaul Volcanological Observatory file 1/6/2, 25 September 1957

Remarks: 'At the beginning of June water to a depth of two feet was reported to have passed through a survey camp which was situated about 60 yards from a beach on southern New Ireland.'

1957	June 23	Admiralty Islands Seeadler Harbour Manus Island	Rabaul Volcanological Observatory file 1/6/2, 25 September 1957

Remarks: 'On 23rd June a six foot tidal wave was reported in Seeadler Harbour on the north coast of Manus Island. It is believed to have originated from an earthquake disturbance off the coast of Dutch New Guinea ($1\frac{1}{2}^{O}$ S, 137^{O} E).'

1957	Nov	Solomon Islands	Grover, 1960

Remarks: 'Tsunamis were reported in November 1957 from Malaita: from Afio, and from Fauabu Fauaba , where the waves were estimated by an observer to be about 9 ft high at low tide.'

1959	Aug. 18 0805	Solomon Islands Vella Lavella I. Ganongga I.	Grover, 1965

Remarks: 'The seismic seawave must have been generated somewhere off the west coast of Ranongga Ganongga . At Vori on the northern end of Ranongga, immediately after the great shock, great seawaves were observed travelling northwards at speed at right angles to the shoreline in the deep sea beyond the reefs. The sea receded 15 yards, and advanced to its original position but the waves passed by without otherwise affecting the bay. Rounding the north end of Ranongga, the tsunami continued down the east coast, entering Emu Harbour, sweeping the eastern shores: and not the west, which only caught the backwash: at the inner narrow end of Emu Harbour the wave was slightly higher - about four feet - and many fish were left high and dry among the first and second lines of coconuts back from the shore.

'Across Beagle Channel on the south coast of Vella it rounded Serulando Point to Supato village, whose people observed waves travelling swiftly out at sea square to the coastline, the wave ends dragging back by the friction effect along the shallow shores, where they appeared to be about "50 feet" apart.

The west side of Supato Bay and all that coastline further NW for three miles or so had just subsided by about 12 inches, and was immediately swept by the wave, which damaged houses along the shore. At Liapari plantation again the sea was observed to retreat from the shore for " a few feet", but the wave passed by beyond the reef without affecting the harbour. It was not observed at the east, north, or west coasts of Vella, although Mr. Garner reported confused and dangerous tide rips off the east coast later that morning: although he wanted to get out of it he was unable to risk turning his ship around. Simbo Island also reported a heavy and confused sea that morning.

'At Binskin Islet (or Inia,) south of Vella and off the north coast of the small Baga Island, the wave approached from Supato in the east, through the Beagle Channel. Mrs. Binskin, who has been in the area since 1910, reports that the quake was much worse than anything before. To the accompanying rumble from the Vella Mountains, her house shook "N-S and then E-W", and all people were thrown to the ground crawling on hands and knees. Shelves and tables were emptied, except two small kitchen shelves that had an "earthqua! e" bar across the front. The two jetties in the harbour were observed to subside slowly into the water. All coral boulder retaining walls disintegrated. A small seed box (12" x 8" x 8") containing soil, was thrown from its position on the branches of a low tree about 4 feet high: to the ENE a measured 16 feet distant. A minute or so afterwards many islanders were heard to shout in their own language "everyone stand by their canoes, the water is coming." The sea retreated and came in unbroken: but so rapidly that some were unable to undo their canoe ropes in time: they cut them adrift with their pangas. The water rose about 3½ feet above the present low water mark: about 8½ feet above the old pre-earthquake low water mark: into Mrs. Binskin's house through open doors, one of which had been shaken off the hinges: and having reached a depth of 9 inches it swept out very quickly removing nearly all of her household effects with it. The two jetties were destroyed, only one shore section of one jetty remaining intact, being braced and strongly made. From here it was possible to compare the water levels as before and after the quakes: where previously 5 feet deep it was now

about 9 feet 11 inches - representing a submergence of 4 feet 11 inches. The present low water mark is higher than the old high water mark, and there are now fresh water lakes on the island, whose area is now much less than the original 5 acres, and still being eroded. One other observation is of importance: for the two weeks of the earthquakes the sea was always disturbed outside the harbour, and during all this time the sea level was up six inches higher than at present. When the quakes ceased early in September the sea level fell six inches and has remained constant since.

'Not all of Binskin Island has subsided as much as 5 feet, however. The more solid coral rock section of it bordering the Beagle Channel appears to have submerged only about one foot. The reason for the submergence of the mainland side of this small Island may be found partly in that it is made ground, reclaimed from mangrove swamp and held by retaining walls. Consolidation of the underlying material and lateral spreading of that loose material above water level by the severe shaking, and the erosion effects of the seismic sea wave, have all contributed. The force of the current at the sudden withdrawal of each wave was such as to snap off the coral "nigger heads" in the channel between the island and the mainland mangroves; the growing stag-horn coral (Acropora) was also snapped off and laid down on the channel bed pointing in one direction. The channel is now deeper and safer as a result of the tsunami.

'Further to the NW of Paramata, on the mainland, the sea retreated about 15 yards and the seawave rose to high water mark. There was no damage.

'The wave, initiated off the west coast of Ranongga, was thought by observers to be "a few feet high". It caused no serious damage, and passed by sheltered inlets protected by offshore reefs and facing away from the oncoming wave.'

1960	May 23-25	New Guinea Papua Solomon Islands	Brooks, 1961 Taylor & Barrie, 1960

Remarks: The Chilean earthquake of May 22 (UT) generated sea waves which, in the Solomon Islands, were preceded by a recession of the sea, had a maximum height of about 1.5 m, and caused damage due to scouring. In Papua New Guinea, Brooks notes:

> 'At Wewak on the north coast of New Guinea, tidal fluctuations of "up to six feet in twenty minutes" were reported, causing some flooding of roadways.
>
> At Lombrum in the Admiralty Islands, the Naval Office reported that the abnormal effects were noted at 0300 EST 24th (1700 GMT 23rd), followed by further surges at 2045, 2145, 0000, 0115, 0245, 0320 GMT, reaching a height of about 4 feet above and below normal high and low water. These fluctuations having an approximate 45 to 60-minute interval between each high-low-high cycle, continued until the early hours of Wednesday 25th May (EST).
>
> A series of small tsunamis began arriving in Rabaul (New Britain) between 1700 and 1800 GMT on the 23rd and reached a maximum height of about 4 feet above high water. These waves caused some damage to merchandise when bulk stores were flooded.
>
> Reports of unusual fluctuations were also received from stations on Bougainville and New Ireland.'

1960	Jun. 12 0114	South Solomon Sea Woodlark Island	Rothe, 1969

Remarks: 'Uncommon epicentre between the d'Entrecasteaux and Solomon Islands; felt on Woodlark Island; numerous aftershocks for several weeks; several small tsunamis on the south-east coast.'

1961	Mar. 18, 19	Solomon Islands	Grover, 1965

Remarks: 'In March 1961 several shocks were reported from the San Cristobal area on the 5th, and a very small shock was felt on Guadalcanal on 10th and at Honiara on 19th: as though the effects were migrating westward. Seismic seawaves swept villages situated about 12 feet above sea level on the SE coasts of both San Cristobal and Guadalcanal on 18th and 19th March: damage was done to leaf houses, some being destroyed, and personal property lost by the islanders. No details of these waves were obtained.' Earthquakes not listed for 18th or 19th - Author.

1961	Aug. 01 1540	Solomon Islands	Grover, 1965

Remarks: 'Small tsunamis about 3 feet high swept the south coast at this time.'

1964	Mar. 29 0125	New Britain Rabaul	Branch, 1967

Remarks: 'A seismic sea wave generated by the great Alaskan earthquake of 28 March 1964 arrived in Rabaul at 0125 L.T. on the 29th. The initial wave height was 4 inches. A possible second seismic sea wave arrived at 0723 and a wave at 0933 had a crest to trough height of 16 inches. A maximum double amplitude of 24 inches was recorded at 1330, possibly caused by oscillations from the first and second seismic sea wave groups coming in phase. Oscillations of sea level due to this earthquake lasted four days. The velocity of the first seismic sea wave was calculated to be 480 miles per hour, and the average ocean depth between Alaska and Rabaul as 15,500 feet.'

'A series of symmetrical oscillations were recorded, with a period of 30 to 33 minutes...' Tide guage record shown in fig. 12 of Branch, 1967.

1964	Nov. 17	New Britain Rabaul	Rabaul Volcanological Observatory monthly report for November 1964

Remarks: 'A small seismic sea wave generated by the earthquake on the 17th was recorded on the Rabaul tide gauge with a wave height of two inches.'

1967	Jan. 01 0815	Solomon Islands Vanikolo	BSI Geological Survey files

Remarks: 'Height 2 to 2½ feet.'

1967	Aug. 14 0815	New Britain Rabaul	Heming, 1969

Remarks: 'The tidal effects measured at Rabaul after the 1967 earthquakes were very small. The maximum height of the tidal rhythm was only four inches and the effects lasted for less than two hours. The disturbance followed the 0815 hours earthquake only; no measurable disturbance followed the 0254 hours earthquake.' Tide gauge record shown in fig. 3 of Heming, 1969.

1969	Aug. 02 afternoon	Lae	Post Courier, 4 August 1969, p. 3 Everingham, 1973

Remarks: 'A number of small tremors hit Lae on Saturday afternoon causing a minor tidal wave along the coast near the town.' Slumping near Lae induced the wave - Author

1970	Nov. 01 0353	New Guinea	Everingham, 1975a

Remarks: Up to 3-metre waves along coast in Madang/Kar Kar Island area. Sea initially receded. One person drowned when boat capsized. Submarine slumping severed Madang-Cairns OTC cables. Strike-slip fault-plane solution.

1971	Jul. 14 1611	E New Britain S New Ireland W Bougainville	Everingham, 1975b

Remarks: Waves about 1 to 2 m high were reported in the north Solomon Sea area. Sea initially receded at Rabaul. One person drowned. Tide gauge records for Rabaul, Alotau, and Arawa. Dip-slip fault-plane solution.

1971	Jul. 26 1123	E New Britain S New Ireland W Bougainville	Everingham, 1975b

Remarks: 8-metre wave reported at Wide Bay. Waves (10 metres) swept over Metlik Plantation, southernmost New Ireland. Rabaul +2.5 metres, -4.0 metres. About 2-3-metre waves in north Solomon Sea area. Sea initially receded at Rabaul, Pomio, and Kavieng. Tide gauge records for Rabaul, Alotau, Arawa, and Aitape. Visual observations at Kavieng (±0.6 metres). Dip-slip fault plane solution.

1971	Jul. 26	New Britain Wide Bay	Report of the Department of the Administrator

Remarks: 'Damage in the Wide Bay area was confined to a narrow strip between Talkon hamlet, four miles south of Karlai Plantation, and Siplangen hamlet, four miles north-north east of Karlai Plantation. Talkon and Long hamlets suffered damage, due to abnormal rises and falls in sea level over a period of five minutes which, at one stage, exposed reefs in Wide Bay, while at the other stage the water rose between 15' and 20' above normal, flooding the villages. Siplangen, Brown Island Isthmus, and Kamandran Plantation were all damaged; firstly by a huge wave between 20' and 25' which engulfed Brown Island Isthmus and parts of Kamandran and Siplangen, and secondly by three abnormally high rises and falls in sea level, which initially exposed reefs, then rose to such an extent that the sea travelled as far as 300 yards into Kamandran Plantation. The power of the water was such, that it bodily lifted the Manager's house and carried it 50 yards further back into the plantation, where it is now lying at an angle of thirty degrees to the ground, against some trees.

'While a number of poultry and pigs have disappeared, no reports of any human lives lost or serious injuries have been received.'

1971	Jul. 26	New Ireland Cape St George	Report of the Department of the Administrator

Remarks: 'Much of the quake damage was concentrated around the Cape St. George and villages and plantations adjacent to it. The villages most affected were Lamassa and Lambom. Both villages were hit by the tidal wave that swept across the tip of Cape St. George. The other villages namely - Matkamalagir sic , Bakum, Bakok sic , Morukon and Taron weren't hit by tidal wave. Much of the damage in the latter villages were caused by the tremor alone.

'Metlik Plantation - (a) Buildings - all except one completely washed away by tidal wave. The condition of the remaining buildings appears to be bad.
(b) Coconut Palms - counting only the palms adjacent to the site of the manager's house there are about 15 palms down on the ground.
(c) Motor Vehicles - a tractor and a Landrover were seen lying on their sides half buried in sand.'

1971	Sep. 25 1438	New Guinea Salamaua	Port Moresby Observatory file D610 Everingham, 1973

Remarks: 'At the time of the earthquake the sea was quite calm. A few minutes after the 'quake the sea at Bayern Bay, south and southeast of the Salamaua Isthmus suddenly appeared turbulent as if a sudden strong wind had brought the water into motion. For about five minutes the surf breaking onto the beaches approached the June-July-August high tide mark (about six feet higher than is customary for September and October). The turbulence then subsided although high waves continued for about another ten minutes.'

Slumping in Huon Gulf induced the tidal effects, which were recorded on Lae tide gauge.

1972	Aug. 18 1000	New Britain S coast Bougainville Island W coast	Port Moresby Observatory intensity questionnaires

Remarks: Pomio - sea water receded and advanced for five hours (0.6-surge reported to Civil Defence).
Tol Plantation - water was completely drained out of the rivers, then high tide came in but did no damage.
Karoola Plantation - rapid sea-level fluctuations of about 20 cm occurred on the reef.

1972	Aug. 26 1810	New Guinea Lae	Everingham, 1973

Remarks: 'During daylight, at about 0815 UT (1815 local time) on 26 August 1972, unusual sea waves were noted at the Lae small-boat harbour at Voco Point... An observer stated that the sea surged into the fairly open bay which forms the boat harbour, receded, and surged in again to a greater extent, sinking one boat and beaching anonther. He estimated that the time interval between the two surges was about two minutes and that the sea rose 5 ft (1.5 m) and fell 3 ft (0.9 m) respectively above and below its normal level at Voco Point. He stated that minor surging waves.

'Three kilometres from Voco Point at the main Lae wharf a Bristol tide gauge registered a sharp decrease in sea level at 0810 $\pm$ 3 1810 $\pm$ 3 local time . The decrease in sea level lasted for about 10 minutes; the maximum amplitude registered on the gauge was only 4 cm. It is possible that the decrease was preceded by a minor upward surge of very short-period, but that details of this wave and other rapid fluctuations in the sea level were unrecorded because the instrument is not designed to efficiently record waves with periods of the order of a minute.

'Between 0811.5 and 0830 1811.5 and 1830 local time the Bureau of Mineral Resources' seismograph, sited about 8 km inland near the Lae Institute of Technology, recorded ground vibrations which were not from an earthquake but were considered to be due to a submarine landslide (submarine, because of the lengthy period over which sliding occurred). This landslide would have certainly been the cause of the anomalous sea waves, which were of the same type as the tsunamis commonly notes as a result of of the anomalous sea waves, which were of the same type as the tsunamis commonly noted as a result of submarine slides caused by earthquakes.'

TABLE 2

PRELIMINARY CATALOGUE OF TSUNAMIS IN THE NEW GUINEA/SOLOMON ISLANDS REGION (1768-1972)

			Earthquake				Tsunami		
Year	Earthquake Date UT	Tsunami Area	Epicentre Lat.°S	Long.°E	Mag. (M)	Depth (km)*	Mag. (m)	Period (min)	Remarks
1768	Jun. 22	New Ireland	-	-	-	-	-		
1856	-	New Guinea: Maclay Coast, Astrolabe Bay, Dampier Strait. Irian Jaya: Geelvink Bay.	-	-	7-8	-	2		
1864	-	NW New Guinea.	-	-	-	-	1-2		
1873	Spring	New Guinea: Maclay Coast.	-	-	-	-	1?		
1875	-	New Guinea: Maclay Coast, Hermit Islands.	(6)	(147)	7-8	-	2		Epicentre from damage reports
1878		New Britain: Rabaul.	Volcanic eruptions - Vulcan, Tavurvur - on Feb. 03 UT				0		
1888		New Guinea: Huon Peninsula.	Volcanic explosion - Ritter Island - at about 2015 UT on Mar. 12.				3	3-4	Largest sea waves recorded in Papua New Guinea region
		New Britain. Ritter Island.							
1895	Mar. 06 0835	W Solomon Sea: Simsim Island.	(9)	(150)	7-8	-			Epicentre from felt reports
		Papua: Porlock Bay,					2		
		Buna Bay.					2		
1899	-	New Ireland: E coast.	-	-	-	-	1?		

* s = shallow depth; accurate depth not known

TABLE 2 (cont'd)

Year	Earthquake Date UT	Tsunami Area	Earthquake Epicentre Lat.°S	Long.°E	Mag. (M)	Depth (km)*	Tsunami Mag. (m)	Period (min)	Remarks
1900	Sep. 10 2130	New Britain: Rabaul.	4.0	152.0	(6.8)	s	2		Approximate epicentre from felt effects
1906	Sep. 14 1604	New Guinea: Dampier Strait, Huon Gulf, Finschhafen, Siassi Islands.	7.0	149.0	8.4	s	1-2		
1906	Oct. 02 0252	New Guinea: Finschhafen, Astrolabe Bay. Papua: Buna Bay.	7.0	148.0	7.7	s	1-2	3	Aftershock of Sep. 14 event. Duda's (1965) 4.0 S, 149.0 E unlikely
1907	May 07 1016	New Guinea Aitape.	2.8	144.5	7.0	s	1-2		
1907	Dec. 15 1735	New Guinea: Aitape.	3.1	142.5	7.4	s	2?		
1910	Feb. 24 1400	New Britain: Rabaul.	-	-	-		0		Possibly seiches
1911	May 08	New Britain: Blanche Bay.	-	-	-		0?		
1913	Oct. 11 0406	NW Solomon Sea.	7.0	148.0	(6.8)		2?		Noted at Honolulu; period 17 minutes
1914	May 26 1423	Irian Jaya: N coast.	2.0	137.0	7.9	s	2		Noted at Honolulu
1915	Aug.	New Guinea: Salamaua.					2		Probably Oct. 11 1913 event listed above
1916	Jan. 01 1321	New Britain: Rabaul.	4.0	154.0	7.9	s	2		
1917	Jul. 29 2152	New Guinea: Aitape.	3.0	143.5	(7.7)	-	0		

TABLE 2 (cont'd)

Year	Earthquake Date UT	Tsunami Area	Earthquake Epicentre Lat.°S	Long.°E	Mag. (M)	Depth (km)*	Tsunami Mag. (m)	Period (min)	Remarks
1919	May 06 1941	New Britain: Rabaul.	5.0	154.0	8.1	s	1-2		
1920	Feb. 02 1122	New Britain: Gasmata Island.	6.5	150.0	7.7	s	0?		ISS epicentre; Duda's (1965) too far NE. Permanent sea level change -0.6 m
1922	Jan. 19 2158	Papua: Daru area.	7.0	143.0	(7.5)	s	1		ISS epicentre adjusted on basis of felt reports
1923	Nov. 02 2108	New Britain: Rabaul area.	4.5	151.5	7.2	50	0	30	
1923	Nov. 04 005	New Britain: Rabaul area, N coast.	5.0	152.0	7.2	s	0?		
1926	Sep. 16 1759	Solomon Is.: Guadalcanal, Kokomaruki.	11.5	160.0	7.1	50	1-2		
1930	Sep. 30 2121	New Britain: Kar Kar Island.	4.5	146.0	(7.0)	s	1?		Gutenberg & Richter (1954) epicentre
1930	Dec. 23 2136	New Guinea: N coast 145°-146°E, Kar Kar Island. Ninigo Island group.	1.4	144.3	(6.5)	-	2-3 2 2-3		Epicentre from felt reports
1931	Aug. 07 0211	New Guinea: Aitape.	4.0	142.0	7.1	s	0		
1931	Oct. 03 1913	Solomon Is.: San Cristobal	10.5	161.8	8.1	s	2-3?		Recorded at Honolulu: period 15 minutes
1934	Dec. 12 1415	New Britain: Rabaul.	-	-	-		0?		Unconfirmed

TABLE 2 (cont'd)

Year	Earthquake Date UT	Tsunami Area	Earthquake Epicentre Lat.°S	Long.°E	Mag. (M)	Depth (km)*	Tsunami Mag. (m)	Period (min)	Remarks
1935	Sep. 20 0147	New Guinea: Aitape.	3.5	141.8	7.9	s	1		Simonett's (1967) epicentre 3.4°S, 142.1°E
1937		New Britain: Rabaul.	Volcanic eruption - Vulcan at 0400 UT on May 28				1	10	Pulsational volcanic eruptions
1938	May 12 1539	New Guinea: Salamaua.	6.0	147.8	7.5	s	1-2		
1939	Jan. 30 0218	Bougainville I.: Buin.	6.5	155.5	7.9	s	1		Nil effect observed at Salamaua
		Solomon Islands: Faisi.							
		New Britain: Kokopo.					0	6	
1939	Apr. 30 0255	Solomon Is.: W Guadalcanal, Russell Islands.	10.5	158.5	8.1	s	2-3		
		New Britain: Gasmata Island.							
1941	Jan. 13 1628	New Britain: Gazelle Peninsula.	4.5	152.5	7.0	s	0	10	
1949	Oct. 19 2100	New Britain: Rabaul.	5.5	154.0	7.25	60	0?	1.4	Recorded Hawaii: period 16 minutes
		New Guinea: Dregerhafen.						20	
1950	Nov. 08 0218	Solomon Is.:	10.0	159.5	7.25	s	0		
1951	Feb. 22 0146	New Guinea: Aitape.	3.7	142.2	-		1-2?		Earthquake listed ISS BCIS, but relation to tsunami unconfirmed
1952	Nov. 04 1658	Kamchatka.	52.8N	159.5	8.4	s	4		Kamchatka earthquake. Travel time to Rabaul, 8 h 30 m Mean velocity, 750 km/h
		Bougainville: Kieta.					1		
		New Britain: Rabaul.					0	28	
		New Guinea: Siassi Islands.					0		
		Solomon Islands: Tulagi, Auki.							

TABLE 2 (cont'd)

Year	Earthquake Date UT	Tsunami Area	Earthquake Epicentre Lat.°S	Long.°E	Mag. (M)	Depth (km)*	Tsunami Mag. (m)	Period (min)	Remarks
1953	Apr. 23 1624	New Britain: Rabaul.	4.0	154.0	7.5	5	0-1?		
1955	Sep. 08 0327	Solomon Is.: Fauro Island.	6.9	155.7	6.5	s	0		
1955	Oct. 10 0858	New Britain: Rabaul.	5.0	152.5	7.3	s	0		
1957	Mar. 09 1422	Aleutian Is. New Guinea: Aitape.	51.3N	175.8W	8.2	s	3.5 -1		Aleutian earthquake. Relation to New Guinea tsunami doubtful
1957	early Jun.	S New Ireland.	-	-	-		0?		Doubtful tsunami. Unidentified earthquake
1957	Jun. 22 2350	Admiralty Is.: Seeadler Harbour.	1.5	137.0	7.3	s	1		Irian Jaya earthquake, but no reports from that area
1957	Nov.	Solomon Is..	-	-	-		1-2		Date uncertain
1959	Aug. 17 2125	Solomon Islands: Vella Lavella Island, Ganongga Island.	7.5	156.0	7.25	s	1-2		
1960	May 22 1911	Chile. New Guinea. New Britain. Solomon Islands. Admiralty Islands.	39.5	74.5W	8.3	s	4.5 1 0-1 1 0-1		Chilean earthquake. Travel time to Rabaul, 22 hr. Mean velocity, 600 km/h
1960	June 11 1514	Solomon Sea: Woodlark Island.	9.4	152.3	6.6	s	0?		
1961	Mar. 18-19	Solomon Is.	-	-	-		1-2	-	No earthquakes listed for this period

TABLE 2 (cont'd)

Year	Earthquake Date UT	Tsunami Area	Earthquake Epicentre Lat.°S	Long.°E	Mag. (M)	Depth (km)*	Tsunami Mag. (m)	Period (min)	Remarks
1961	Aug. 01 0540	Solomon Is.	9.8	160.5	6.6	50	0		
1964	Mar. 28 0335	Alaska.	61.1N	147.6W	8.5	20	5.0		Alaskan earthquake.
		New Britain: Rabaul.					0	32	Travel time to Rabaul, 11 h 49 m. Mean velocity 770 km/h
1964	Nov. 17 0816	New Britain: Rabaul.	5.7	150.7	7.3	45	-1		Relation to earthquake uncertain
1967	Jan. 01	Solomon Is.: Vanikolo.	-	-	-	-	-1-0		No earthquake listed
1967	Aug. 13 2215	New Britain: Rabaul.	4.4	152.5	6.4	30	-1	25	
1969	Aug. 02 0430	New Guinea: Lae.	6.6	146.9	5.4	17	0		
1970	Oct. 31 1753	New Guinea: Madang, Kar Kar Island.	4.9	145.5	7.0	42	1		
1971	Jul. 14 0611	Solomon Sea: N coastline.	5.5	153.9	8.0	47	1-2	25	
1971	Jul. 26 0123	Solomon Sea: N coastline.	4.9	153.2	8.0	48	2	25	
1971	Sep. 25 0436	New Guinea: Salamaua.	6.5	146.6	6.7	115	0-1		
1972	Aug. 17 2344	New Britain: Pomio.	6.0	152.9	7.1	10	0		
1972		New Guinea: Lae.	Submarine slump at Voco Point, Lae at 0810 UT on Aug. 26				1		Not triggered by earthquake

TABLE 3

EARTHQUAKES WITH M>6.9, AND TSUNAMIGENIC EARTHQUAKES, NEW GUINEA/ SOLOMON ISLANDS REGION (1900-1972)

(See footnotes for interpretation of symbols)

Year	Date	UT	Lat. °S	Long. °E	Depth (km)	Mag. (M)
1900	Jul. 29	06 59 00	10.0	165.0	s	8.1
	*Sep. 10	21 30	4.0	152.0	s	(6.8)
	Oct. 07	21 04 00	4.0	140.0	s	7.8
1902	Jan. 24	23 27 00	8.0	150.0	s	7.8
1905	Mar. 04	16 00 20	4.0	149.0	s	7.1
	Mar. 04	23 17 30	4.0	149.0	s	7.2
	May 18	13 45 06	4.0	149.0	s	7.5
1906	Feb. 19	01 59 33	14.0	160.0	s	7.2
	Aug. 26	05 59 31	4.0	149.0	s	7.4
	*Sep. 14	16 04 18	7.0	149.0	s	8.4
	Sep. 17	08 38 00	4.0	149.0	s	7.1
	*Oct. 02	02 52 00	7.0	148.0	s	7.7
1907	Feb. 03	19 34 57	6.0	148.0	s	7.2
	May 04	06 51 00	6.0	153.7	s	7.7
	*May 07	10 16 00	2.8	144.5	s	7.0
	*Dec. 15	17 35 00	3.1	142.5	s	7.4
1909	Apr. 27	12 44 00	0.0	147.0	s	7.3
	May 30	21 01 18	8.0	131.0	100	7.2
	Dec. 09	15 33 00	8.0	161.0	s	7.2
	Dec. 09	23 23 00	10.0	165.0	s	7.7
1910	Sep. 07	07 11 18	6.0	151.0	80	7.25
	Dec. 10	09 26 00	11.0	162.5	50	(7.5)
1911	Dec. 31	06 07 00	2.0	143.5		(7.0)
1912	Sep. 01	04 10 00	4.5	155.0	430	7.0
1913	May 30	11 46 46	5.0	154.0	s	7.5
	Jun. 04	09 57 00	1.5	150.0		(7.0)
	*Oct. 11	04 06 03	7.0	148.0		(6.8)
1914	Apr. 11	16 30 00	12.0	163.0		(7.2)
	*May 26	14 22 42	2.0	137.0	s	7.9
1916	*Jan. 01	13 20 36	4.0	154.0	s	7.9
	Jan. 13	06 18 16	2.0	137.0	s	8.1
	Jan. 13	08 20 48	3.0	135.5	s	8.1
	Aug. 03	01 30 02	4.0	144.5	s	7.5
1917	*Jul. 29	21 52 24	3.0	143.5		(7.7)
1918	Jul. 03	06 52 05	3.5	142.5	s	7.5
	Oct. 27	17 06 40	2.0	148.0	50	7.4
1919	*May 06	19 41 12	5.0	154.0	s	8.1
	May 07	05 13 38	6.0	153.0	s	(7.0)
1920	*Feb. 02	11 22 18	6.5	150.0	s	7.7
	May 13	01 48 25	4.0	144.5	s	(7.5)

Table 3 (Cont'd)

Year	Date	UT	Lat. °S	Long. °E	Depth (km)	Mag. (M)
1922	*Jan. 19	21 58 50	7.0	143.0	s	(7.5)
	Dec. 14	23 03 48	3.5	146.5	s	(7.0)
1923	*Nov. 02	21 08 06	4.5	151.5	50	7.2
	*Nov. 04	00 04 30	5.0	152.0	s	7.2
1925	Jun. 09	13 40 41	3.0	140.0	s	7.0
1926	Jan. 25	00 36 18	9.0	158.0	s	7.4
	Mar. 27	10 48 30	9.0	157.0	s	7.2
	Apr. 12	08 32 28	10.0	161.0	s	7.5
	*Sep. 16	17 59 12	11.5	160.0	50	7.1
	Oct. 26	03 44 41	3.5	138.5	s	7.9
1927	Jun. 03	07 12 11	7.0	131.0	150	7.4
	Aug. 10	11 36 15	1.0	131.0	s	7.1
1928	Mar. 13	18 31 52	5.5	153.0	100	7.0
1930	Jun. 11	00 49 35	5.5	150.0	s	7.1
	*Sep. 30	21 20 45	4.5	146.0	s	(7.0)
	*Dec. 23	21 35 36	1.4	144.3	s	(6.5)
1931	*Aug. 07	02 11 30	4.0	142.0	s	7.1
	*Oct. 03	19 13 13	10.5	161.8	s	8.1
	Oct. 03	21 55 10	11.0	163.0	s	7.0
	Oct. 03	22 47 40	11.0	161.5	s	7.3
	Oct. 10	00 19 53	10.0	161.0	s	7.7
1932	Jan. 09	10 21 42	6.2	154.5	380	7.3
	Jan. 29	13 41 10	6.0	155.0	s	7.0
1934	Feb. 28	14 21 42	5.0	150.0	s	7.2
	Mar. 24	12 04 26	10.0	161.5	s	(7.3)
	Jul. 19	01 27 26	0.5	133.3	s	7.0
1935	*Sep. 20	01 46 33	3.5	141.8	s	7.9
	Sep. 20	05 23 01	3.3	142.5	s	(7.4)
	Dec. 15	07 07 48	9.8	161.0	s	7.6
1936	Feb. 15	12 46 57	4.5	133.0	s	7.3
	Apr. 19	05 07 17	7.5	156.0	40	7.4
	Jun. 10	08 23 21	5.5	147.0	176	(7.0)
	Dec. 29	14 47 56	4.5	153.5	100	(7.2)
1937	Jan. 23	10 55 51	4.5	153.0	s	7.0
	Jan. 25	06 34 00	10.0	163.0	s	7.1
	Sep. 15	12 27 32	10.5	161.5	80	7.3
	Sep. 23	13 06 00	6.0	154.0	60	7.4
1938	Feb. 01	19 04 18	5.3	130.5	s	8.6
	*May 12	15 38 57	6.0	147.8	s	7.5
1939	*Jan. 30	02 18 27	6.5	155.5	s	7.9
	Feb. 03	05 26 20	10.5	159.0	s	7.1
	*Apr. 30	02 55 30	10.5	158.5	s	8.1

Table 3 (Cont'd)

Year	Date	UT	Lat. °S	Long. °E	Depth (km)	Mag. (M)
1940	Sep. 12	13 17 10	4.5	153.0	40	7.0
1941	*Jan. 13	16 27 38	4.5	152.5	s	7.0
	Sep. 04	10 21 44	4.8	154.0	90	7.1
	Sep. 12	17 02 04	0.5	132.5	s	7.0
1942	Jan. 27	13 29 08	4.5	135.0	s	7.1
1943	Mar. 21	20 35 43	5.8	152.3	s	7.3
	Nov. 06	08 31 37	6.0	134.5	s	7.6
	Dec. 01	06 04 55	4.8	144.0	120	7.2
	Dec. 23	19 00 10	5.5	153.5	50	7.3
1944	Jan. 07	02 49 20	4.5	143.5	120	7.1
	Mar. 31	02 51 43	7.0	130.5	60	7.0
	Apr. 26	01 54 15	1.0	134.0	50	7.2
	Apr. 27	14 38 09	0.5	133.5	50	7.4
	May 19	00 19 19	2.5	152.8	50	7.2
	May 25	12 58 05	2.5	152.8	s	7.5
	Dec. 27	15 25 49	6.5	152.0	90	7.0
1945	Sep. 05	21 48 45	5.0	153.5	50	7.1
	Sep. 22	09 10 05	4.0	147.0	50	7.0
	Dec. 08	01 04 02	6.5	151.0	s	7.1
	Dec. 27	04 41 05	6.0	151.0	40	7.0
	Dec. 28	17 48 45	6.0	150.0	s	7.8
1946	Jan. 17	09 39 35	6.2	147.7	100	7.2
	May 03	22 23 43	6.0	154.0	s	7.4
	Sep. 23	23 30 00	6.0	145.0	100	7.2
	Sep. 29	03 01 55	4.5	153.5	s	7.75
1947	Feb. 07	08 40 35	10.0	161.5	50	7.0
	Mar. 02	19 09 26	5.0	144.5	50	7.0
	Apr. 02	05 39 11	1.5	138.0	s	7.4
	May 06	20 30 32	6.5	148.5	s	7.6
	May 27	05 58 54	1.5	135.3	s	7.25
1948	Nov. 26	05 36 37	5.0	145.0	70	7.0
1949	Mar. 16	22 15 13	5.5	151.0	60	7.0
	Mar. 17	21 05 03	5.5	151.0	60	7.0
	*Oct. 19	21 00 19	5.5	154.0	60	7.25
1950	Jul. 29	23 49 02	6.5	155.0	70	7.1
	*Nov. 08	02 18 12	10.0	159.5	s	7.25
	Dec. 04	16 28 03	5.0	153.5	110	7.2
1951	Feb. 17	21 07 07	7.0	146.0	180	7.3
	*(Feb. 22)	(01 45 42)	(3.7)	(142.2)		
	May 21	08 27 20	6.0	154.5	150	7.0

Table 3 (Cont'd)

Year	Date	UT	Lat. °S	Long. °E	Depth (km)	Mag. (M)
1952	May 09	17 47 41	6.5	155.0	50	7.0
	Dec. 06	10 41 18	8.0	156.5	s	7.1
	Dec. 24	18 39 38	5.5	152.0	s	7.0
1953	Feb. 26	11 42 28	11.0	164.5	s	7.0
	*Apr. 23	16 24 17	4.0	154.0	s	7.5
	Aug. 25	02 04 15	5.2	152.4	s	(7.0)
1954	Mar. 03	06 02 55	5.8	142.5	s	7.0
1955	May 26	16 23 14	10.0	161.0	s	7.0
	Aug. 16	11 47 03	6.0	155.0	210	7.0
	*Sep. 08	03 27 16	6.9	155.7	s	(6.5)
	*Oct. 10	08 57 47	5.0	152.5	s	7.3
	Oct. 13	09 26 49	10.0	160.8	70	7.3
1956	Jan. 31	09 17 14	3.5	152.0	350	(7.2)
	Jul. 18	06 19 35	5.5	130.0	190	7.5
1957	Mar. 23	05 12 40	5.5	131.0	150	7.3
	*Jun. 22	23 50 23	1.5	137.0	s	7.3
1959	Mar. 01	16 49 13	0.5	134.5	100	7.0
	*Aug. 17	21 24 40	7.5	156.0	s	7.25
	Aug. 24	21 30 46	10.5	161.0	s	7.0
	Nov. 19	11 08 41	5.5	146.0	100	7.0
1960	*Jun. 11	15 14 09	9.4	152.3	s	(6.6)
1961	*Aug. 01	05 39 49	9.8	160.5	50	(6.6)
1962	Jul. 30	17 16 44	3.3	143.9	25	7.0
1963	Feb. 26	20 14 09	7.5	146.2	171	7.25
1964	Apr. 23	03 32 50	5.3	134.0	33	7.2
	*Nov. 17	08 15 39	5.7	150.7	45	7.3
1966	Jun. 15	00 59 46	10.4	160.8	31	(7.2)
	Dec. 23	15 50 20	7.1	148.3	43	(7.2)
1967	*Aug. 13	22 15 10	4.4	152.5	30	(6.4)
	Dec. 25	01 23 34	5.3	153.7	64	(7.0)
1968	Feb. 12	05 44 48	5.5	153.2	74	(7.2)
1969	Jan. 05	13 26 40	8.0	158.9	47	(7.1)
	*Aug. 02	04 30 29	6.6	146.9	17	(5.4)
1970	*Oct. 31	17 53 09	4.9	145.5	42	(7.0)
	Nov. 08	22 35 47	3.4	135.6	33	(7.0)
1971	Jan. 10	07 17 04	3.1	139.7	33	(8.0)
	*Jul. 14	06 11 29	5.5	153.9	47	(8.0)
	Jul. 19	00 14 45	5.7	153.8	42	(7.0)
	*Jul. 26	01 23 21	4.9	153.2	48	(8.0)
	*Sep. 25	04 36 14	6.5	146.6	115	(6.7)
1972	*Aug. 17	23 44 05	6.0	152.9	10	(7.1)

* Tsunami generated
(7.0) Magnitude not obtained from Duda (1965)
*( ) Unsure if tsunami generated
s Shallow; accurate depth not known

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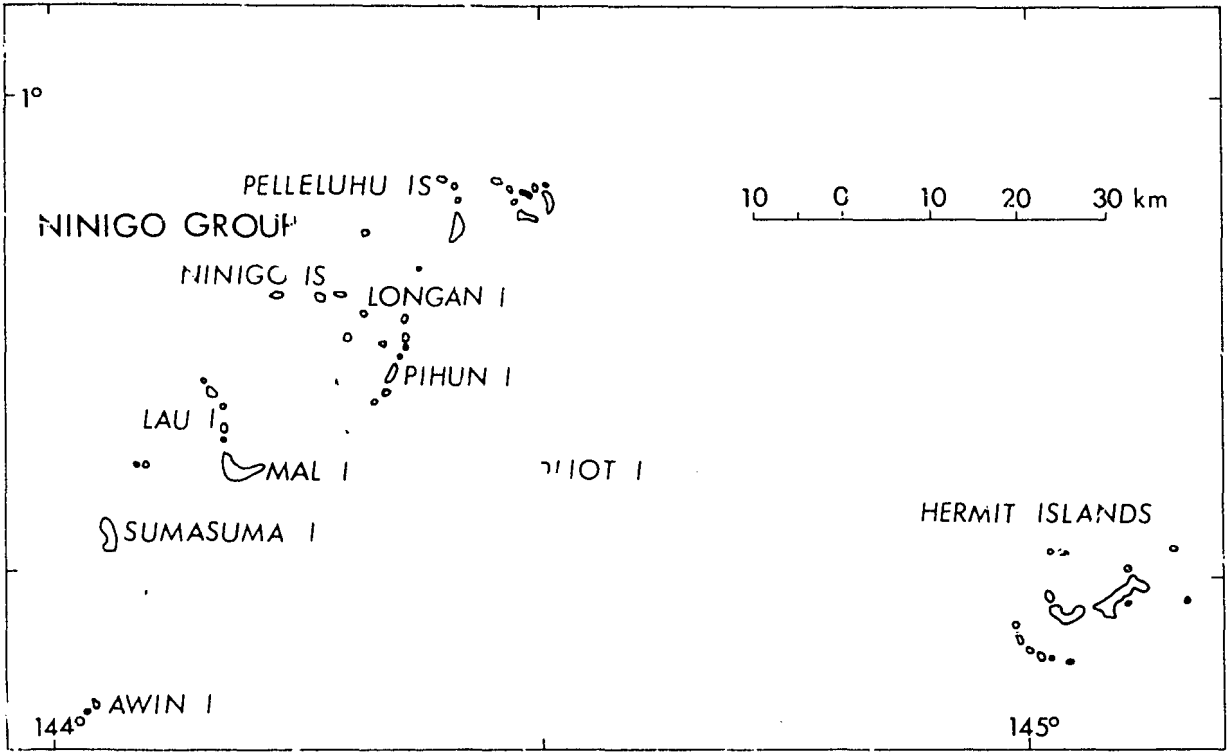

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PLATE 1 LOCALITY MAP—NINIGO GROUP

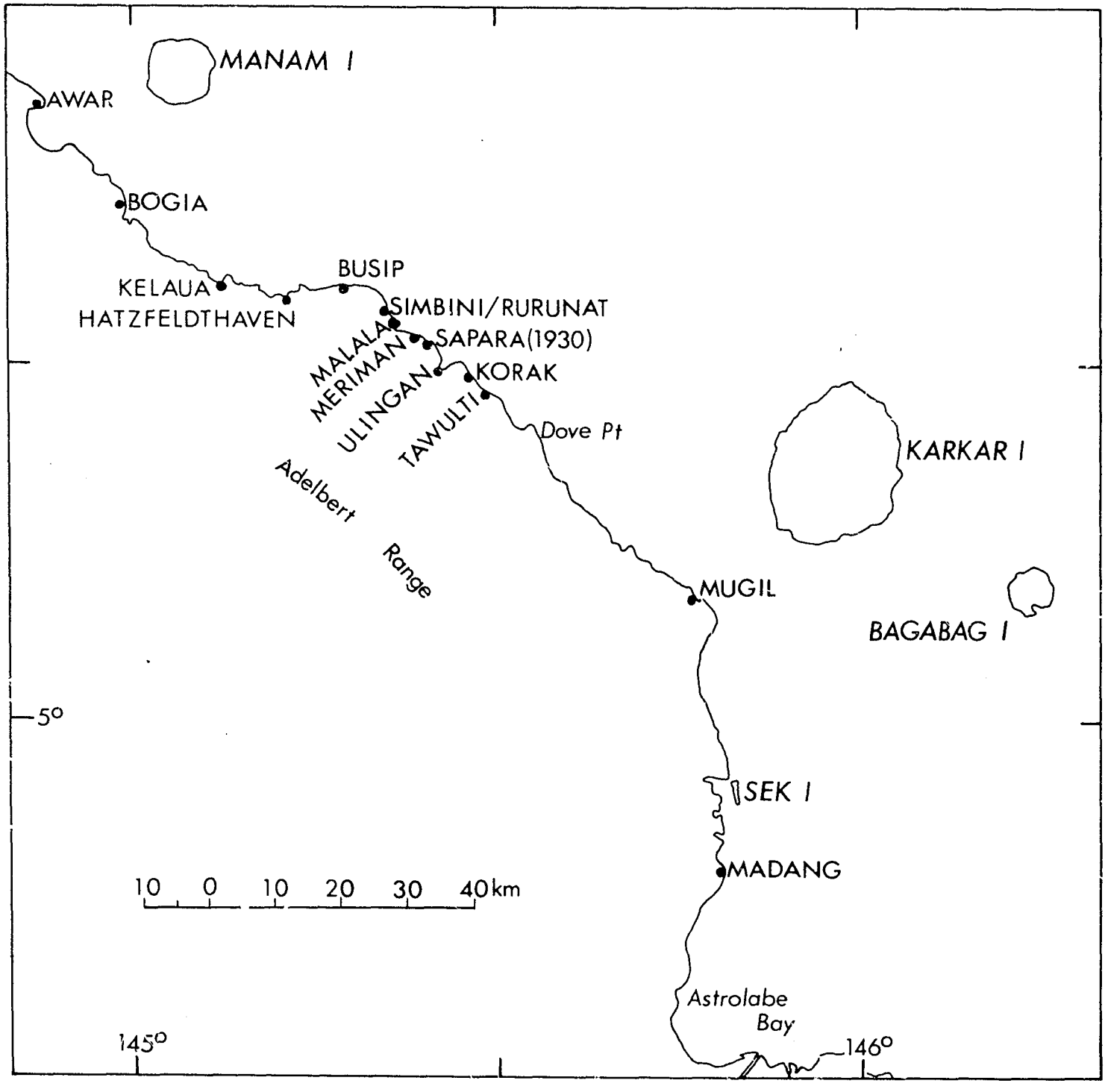

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PLATE 2 LOCALITY MAP – NORTHERN NEW GUINEA COAST (AWAR TO ASTROLABE BAY)

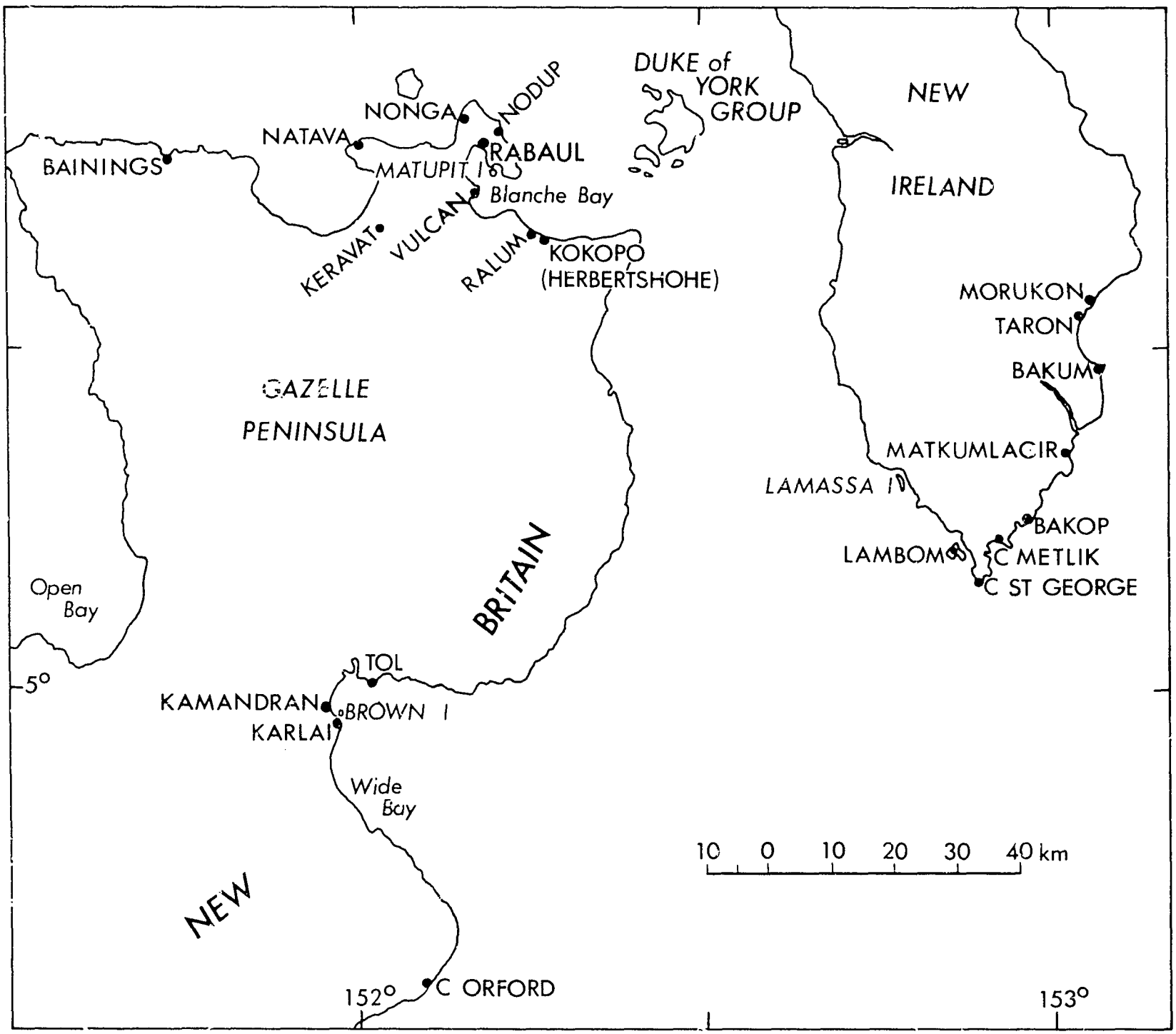

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PLATE 3 LOCALITY MAP—GAZELLE PENINSULA/ SOUTHERN NEW IRELAND

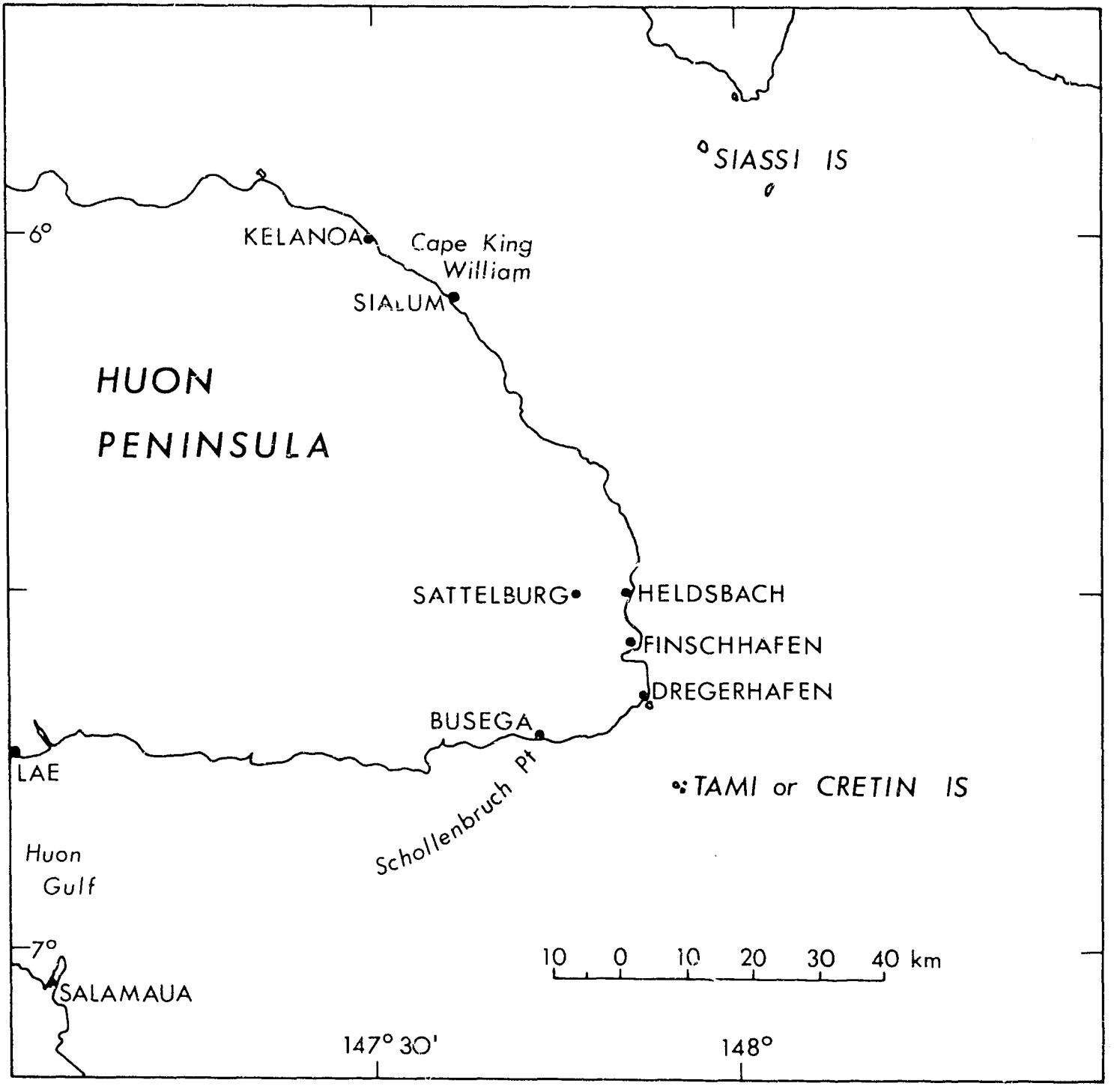

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PLATE 4 LOCALITY MAP – HUON PENINSULA

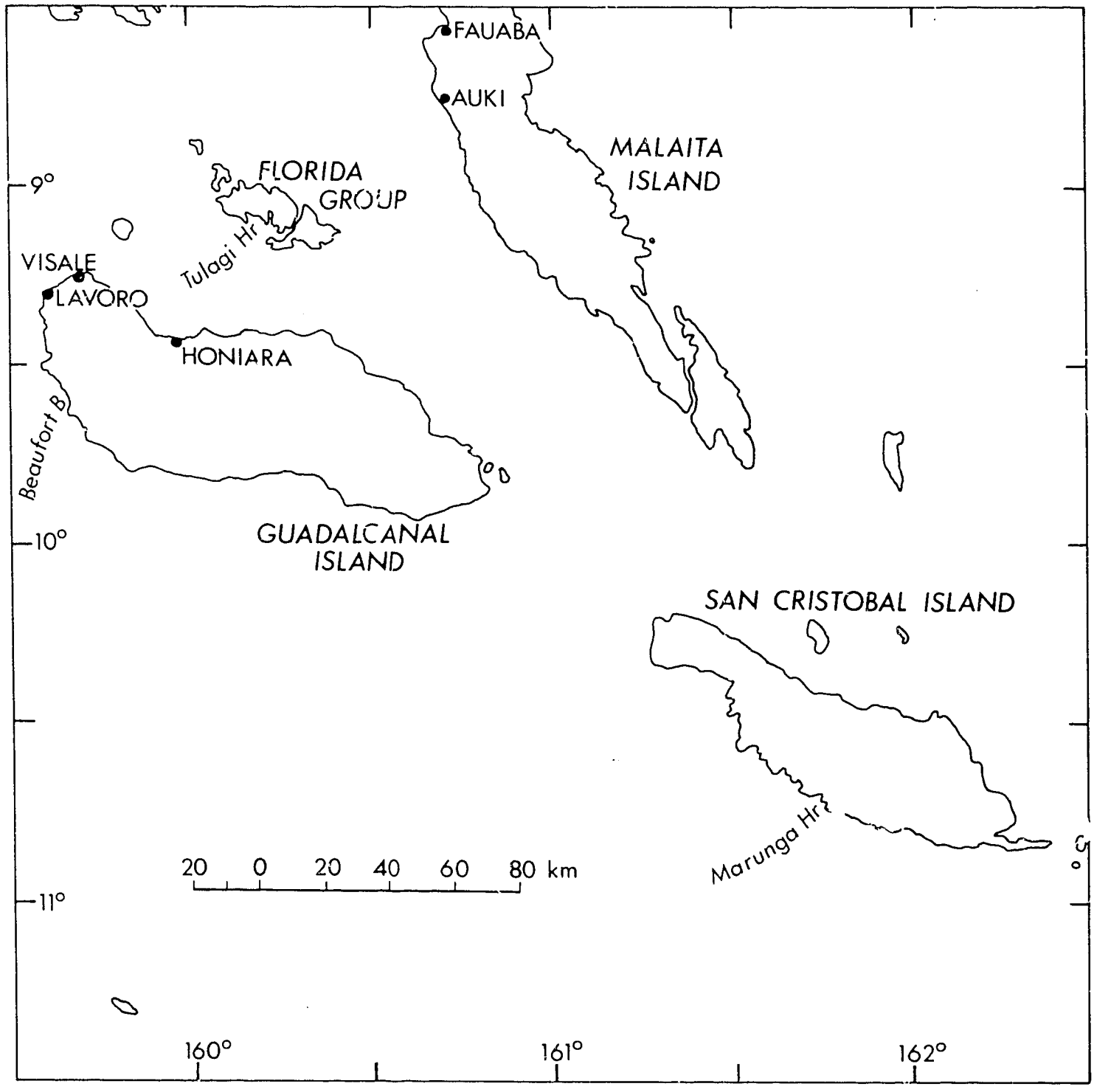

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PLATE 5 LOCALITY MAP – SOUTHERN SOLOMON ISLANDS

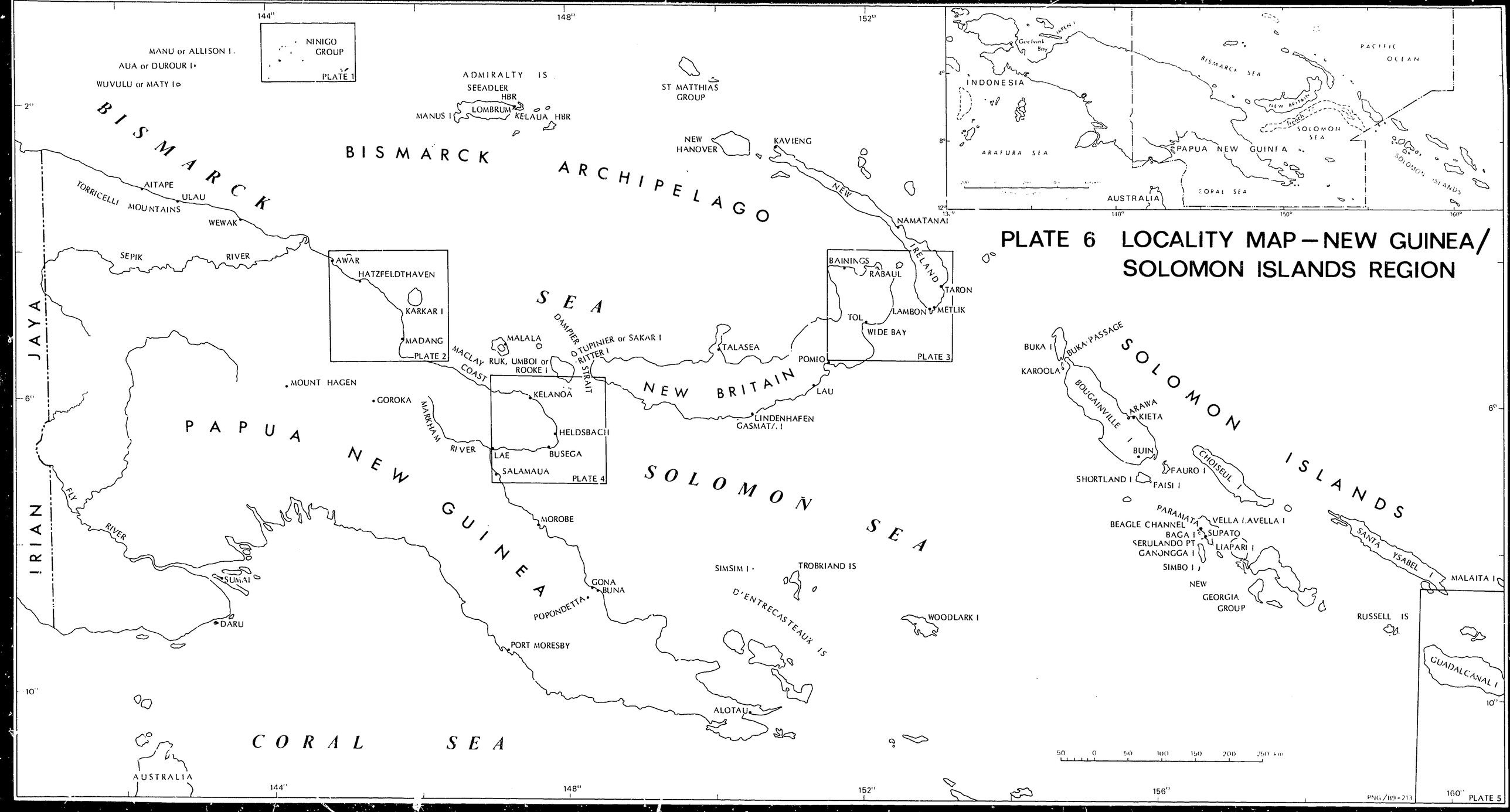

PLATE 6 LOCALITY MAP—NEW GUINEA/ SOLOMON ISLANDS REGION

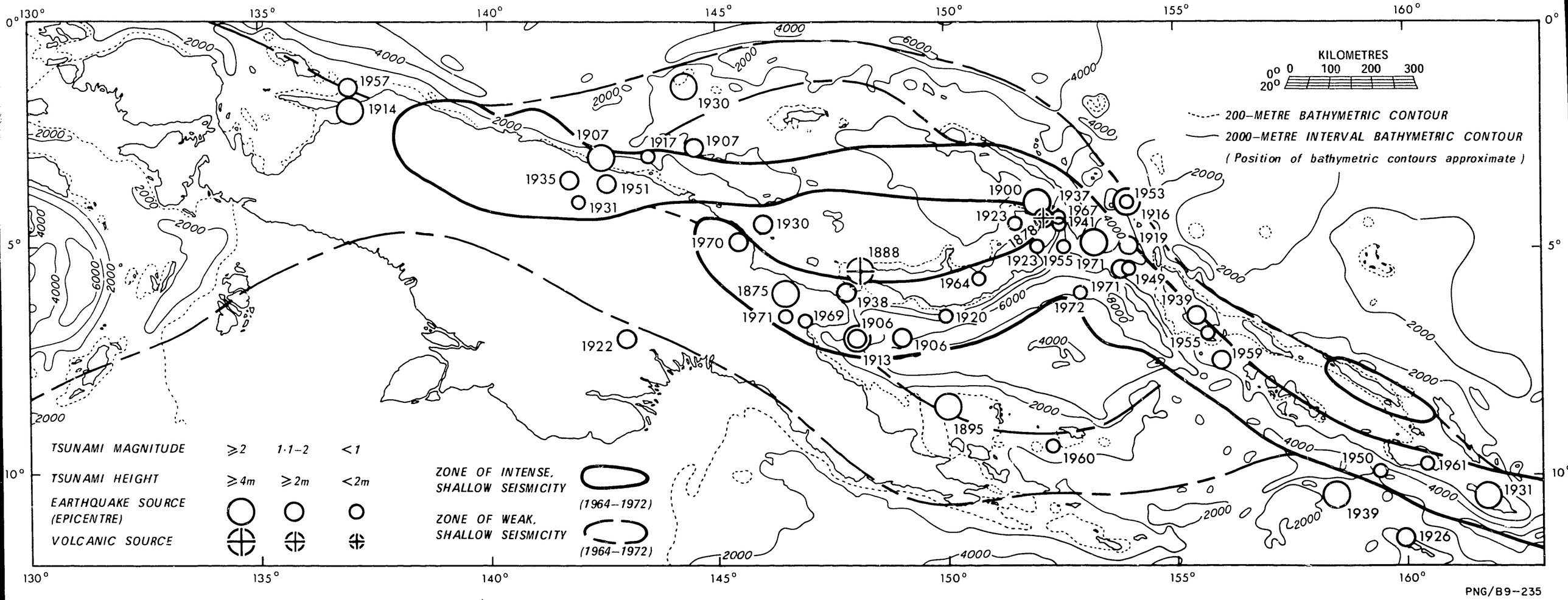

PLATE 7 TSUNAMI SOURCES IN THE NEW GUINEA / SOLOMON ISLANDS REGION, 1875–1972