

# Hankow Reef, Bismarck Volcanic Arc, Papua New Guinea: Source of Yomba Island myth?

Lucas Wilson\*

\* 34 Fenwick Drive, Woodside, Bradford, UK

**Abstract-** Hankow Reef off the coast of Madang Province, New Guinea has been linked to a large eruption at a former island known as 'Yomba' by legends told by people living in the Madang province. However some doubts have been made about the accuracy of their comments. I present evidence for a low-lying volcanic island that may have existed at Hankow Reef and its links to the Yomba stories.

**Index Terms-** Yomba, oral tradition, volcanic collapse, phreatomagmatic, Papua New Guinea

## 1. INTRODUCTION

Legends tell of an island that once sat between the Karkar and Long islands called Yomba that erupted causing a 'time of darkness' but then sunk beneath the waves. It has been a matter of debate for decades as to whether the oral traditions of the people of New Guinea are fanciful or contain elements of truth. It is noteworthy to make mention of Russell J Blong's work on Long Island which had a major volcanic eruption 400 years ago as his work using oral tradition helped date the eruption of the volcano (Blong 1982). Much of this information is based on work by Mary R. Mennis (1981, 2005) who surveyed various settlements in the Madang area in the 1970's.

## 2. REGIONAL SETTING

Hankow Reef, located between Karkar Island and Long Island (see Figure 1), forms part of a chain of volcanoes called the Bismarck Volcanic Arc that stretches for more than 1000 km. It forms the submerged summit of a large underwater seamount, the largest in the Bismarck Volcanic Arc. The Bismarck Volcanic Arc is an intra-oceanic subduction system forming at the southern margin of the Bismarck Sea (Woodhead et al 2009). Tectonics in the Eastern (New Britain) and Western parts of the volcanic arc differ. The Western part of the volcanic arc, where Hankow Reef is located, is forming through the convergence of the Australian and South Bismarck plates in a region of arc-continent collision (Woodhead et al 2009)

The Bismarck Volcanic Arc contains the majority of Papua New Guinea's active volcanoes (Siebert et al 2010) most of which are located close to the coast of the island of New Guinea. The danger from tsunamis and pyroclastic density currents reaching the coast of New Guinea makes the area inherently at risk from a volcanic disaster.

## 3. SUMMARY OF THE YOMBA ISLAND STORY

In a comprehensive survey by Mary R. Mennis (1981, 2005) villagers in various settlements in the Madang area and surrounding islands were asked to relate the story of Yomba Island. The general story is as follows:

Before Long Island erupted (~ 400 years ago) there was an island between Crown Island and Bagabag Island, people lived on the island and made pots. Some accounts mention an earthquake which may have signalled the onset of the eruption. At some point, a vent on Yomba Island erupted, producing ash fall and pumice fall, audible noises were also heard. People living on the island escaped in canoes and on coconuts. A 'time of darkness' similar to the one reported at Long Island (Blong 1982) is also frequently mentioned. Most accounts state that Yomba then collapsed producing a tsunami. In the aftermath of the event, Yomba Island was gone.

### A. PREVIOUS INTERPRETATIONS OF EVENTS

Many of the stories related to Mennis (1981, 2005) tell of a large catastrophic eruption destroying the island of Yomba, such as the one that destroyed Krakatau in Indonesia in 1883 (Self & Rampino 1981; Simkin & Fiske 1983). Mennis (2005) infers from satellite data that there is a crater at Yomba Island; however bathymetric data does not support this. Large eruptions often leave large pyroclastic deposits (Self 2006) but none have been found in the vicinity of Yomba Island (Mennis 2006).

Nunn & Pastorizo (2007) considered the Yomba Island stories to relate to a flank collapse of the island. Collapses on volcanoes can occur from weak or unstable flanks caused by over-steepening, tectonic and fault related activity (McGuire 1996) or through hydrothermal related processes (Reid et.al. 2001; Reid 2004). A collapse at steep-sided Ritter Island Volcano in the Dampier strait between Umboi and New Britain Island in 1888 destroyed the island and left a large avalanche scar on its western flank (Ray et.al. 2014). However, no large debris avalanches were found near Hankow Reef during bathymetric surveys in the area in 2004 (Mennis 2006). This suggests that the islands geology was significantly different than has been described previously.

### 4. A NEW INTERPRETATION

Many accounts collected state that people were living on the island, this means they most likely had ready access to the sea. Several descriptions of Yomba also note that it didn't have one central volcano but a few volcanic constructs, perhaps more akin to a volcanic field rather than a typical oceanic stratovolcano. It appears that Simon Day's comments in Mennis (2006) appears

the most likely option, Yomba Island was low-lying, built up of small cones and pyroclastic fragments.

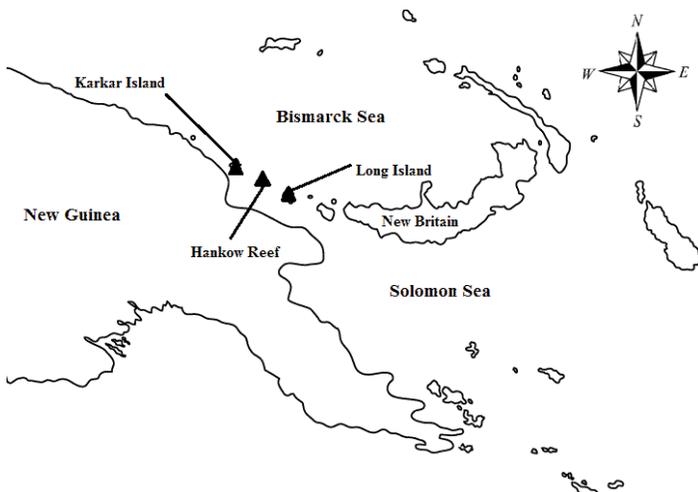


Figure 1. Map showing the location of Hankow Reef and surrounding islands.

#### A. SEQUENCE OF EVENTS

Yomba Island was most likely a low-lying island consisting of a couple of tuff rings/cones, probably less than 200 m high, sitting on a platform of pyroclastic deposits, much like the island of Mundua in the Witu islands, north of New Britain (Johnson & Blake 1972).

A violent eruption resulting from the interaction between water and magma (phreatomagmatic) may have destroyed major sections of the island leaving just a small platform of unconsolidated pyroclastic deposits. These platforms are very vulnerable to wave erosion as it consists of layers of weak fragments (Scarth 1994). Several cones produced by the same surtseyan activity thought to have formed Yomba have been quickly eroded (e.g. Cole et.al. 2001).

#### B. CONSTRAINING THE DATE OF THE ERUPTION

Many stories told by those interviewed place the date of the eruption just before the large eruption of Long Island (Mennis 2005). The eruption of Long Island took place sometime between 1640 and 1670 (Blong 1982). This may mean that the eruption of Yomba Island may have occurred only a few decades prior to the eruption of Long Island.

### 5. CONCLUSIONS

In the late 15th century or early 16th century a minor eruption took place on Yomba Island, causing islanders to flee the volcano. During the course of the eruption violent phreatomagmatic eruptions destroyed the volcanic structures on the island with the rest of the island collapsing in a series of small landslides, possibly producing small tsunamis, with the rest of the deposits being eroded by wave action.

Hankow Reef has been identified as a potentially active submarine volcano that is the source of the Yomba Island myth. More detailed work needs to be done both geologically

and orally to determine fully the accuracy of the events described. The events at Yomba Island 400-500 years ago demonstrate the volcanic hazards of the Bismarck Volcanic Arc, such as the generation of tsunamis, and more work should be undertaken on the islands to better quantify the risk of a major volcanic event in the region

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#### **AUTHOR**

**Lucas Wilson.** Lucas has been studying volcanoes in Papua New Guinea for 3 years. His current research focuses on the volcanic history of the Bismarck Volcanic Arc.

lucaswilson97@hotmail.co.uk