

THE END OF SLUITER'S CORAL REEF AT KRAKATOA

BY

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It is well known that before the famous eruption of August 1883 took place, the island Krakatoa consisted of three volcanoes, the basaltic volcano Rakata and the andesitic volcanoes Danan and Perbuwatan. With the great explosion of August 28th of that year Danan, Perbuwatan and the northwestern part of Rakata were entirely destroyed.

Since then a coral reef began to grow on the Northwestern slope of the Rakata ruin at a spot called Black Point (Zwarte Hoek), a place where the basaltic lava of Krakatoa is exposed¹).

As we know exactly the year, even the day, when this new northern boundary of the island originated, this spot seemed to be the place par excellence to study step by step the development and growth rate of a reef since its first origin.

Five years after the eruption took place SLUITER visited the spot and he reported that living corals were growing in two places²).

Firstly he mentions that at the west side of Black Point a fringe of corals, one meter broad, growing on the basaltic boulders, had developed (west of A in textfigure 1); it consisted chiefly of an *Acropora* species with branches of 20—25 centimeters in length and some colonies of *Porites* and *Favia*. When, half a year later he visited the same spot for the second time this little fringing reef had been destroyed for the greatest part by basaltic boulders that had tumbled down from the cliff and smothered the reef.

Secondly in 1888 he found in the little bay west of Black Point only very small *Montipora* colonies, but on his second visit, in 1889, he found that nearly all the larger pieces of pumice that were lying in great abundance on the bottom of the bay, served as a base for corals, being all of a branched type of growth and belonging to the genera *Acropora*, *Porites*, *Montipora*, *Pavona*. (These spots are indicated by K on SLUITER'S

¹) See the maps in:

E. D. M. VERBEEK. Krakatau 1885, fig. 1.

B. G. ESCHER. Veranderingen in de Krakatagroep na 1908. Handeling 1e Nederl. Ind. Natuurw. Congres, Weltevreden 1919.

CH. E. STEHN. Geology and Volcanism of the Krakatau group, in: Krakatau, Fourth Pacific Science Congress, 1929.

²) C. PH. SLUITER. Einiges über die Entstehung der Korallenriffen in der Javasee und Brantweinsbai und über neue Korallenbildung bei Krakatau. Natuurk. Tijdschr. Nederl. Indië, XLIX, 1890.

map, textfigure 1). Massive growth types were found only very exceptionally, only very small colonies of *Favia affinis* were found; no other *Astracid* corals and no *Fungia* occurred. The fauna had much to suffer from the pumice material that was falling down from the newly exposed wall of Rakata; according to that this fauna of only branching corals shows a typical adaptation to these unfavourable conditions. Another ex-

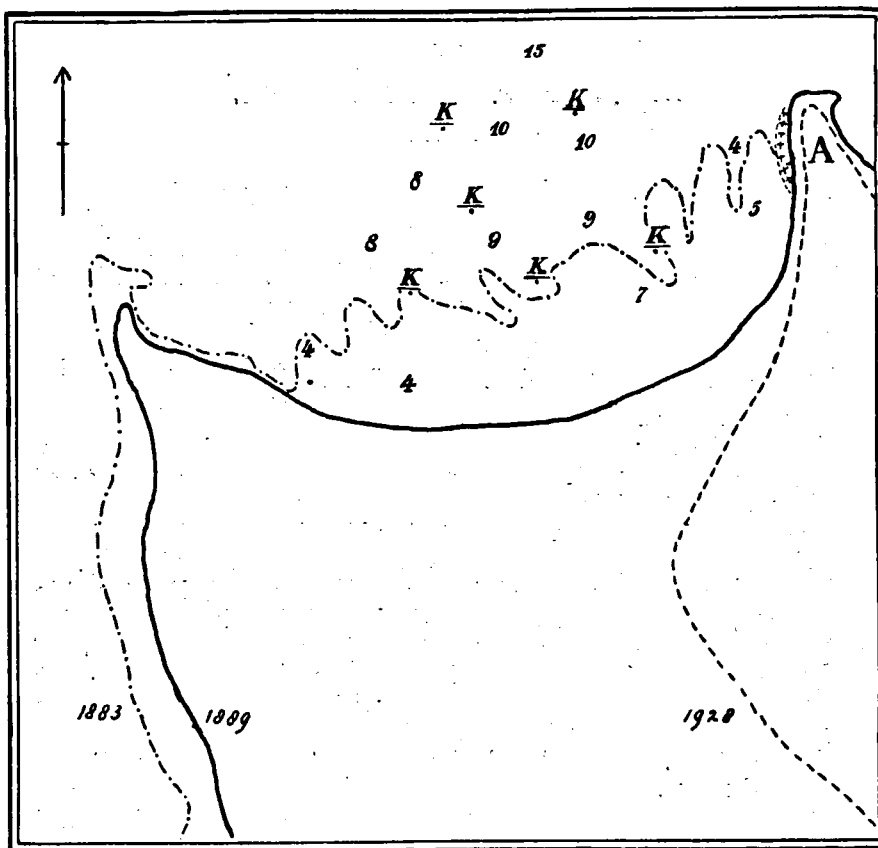


Fig. 1.

The coast of Rakata west of Black Point (A), dot-dash line in October 1883, continuous line in 1889, broken line in 1928; K, places where coral growth was found by SLUJTER in 1889. Scale 1: 20 000.

ample of a tediously uniform fauna of branching coral growth we find before the muddy estuaries along the coasts of the island Bunju (E. Borneo). From the fossil corals of Java (Tji Burial) and Borneo we know also very instructive examples of muddy layers which over a thickness of several hundred of meters contain only branched coral material. Often we find that these branching forms show moreover typical adaptations to a muddy environment in the shape of a tubular outgrowth of

the calices as I pointed out in some fossil corals of the Domaring and Menkrawit beds in E.-Borneo¹⁾.

Since my arrival in the Indian Archipelago I allways looked out for an opportunity to go and see what had become of these first reef stages. At last — nearly forty years after SLUTER had studied them — I had an occasion to visit the Krakatoa island group during the first days of the eruption of the new submarine volcano²⁾. But, alas, there was too much surf on the northern side of Rakata; it was impossible to go ashore or to make an investigation in the supposed reef area. In May 1929, however, during an excursion of the Fourth Pacific Science Congress, we landed on Rakata and accompanied by Dr. H. GERTH, Dr. T. WAYLAND VAUGHAN and Dr. J. VERWEY we climbed round the rocks of Black Point as far as possible, but without reaching a successful end. Then, captain J. KAREL of the "Wega" kindly entrusted me with a motor launch with which I cruised in the bay west of Black Point, Dr. VERWEY and I dredging

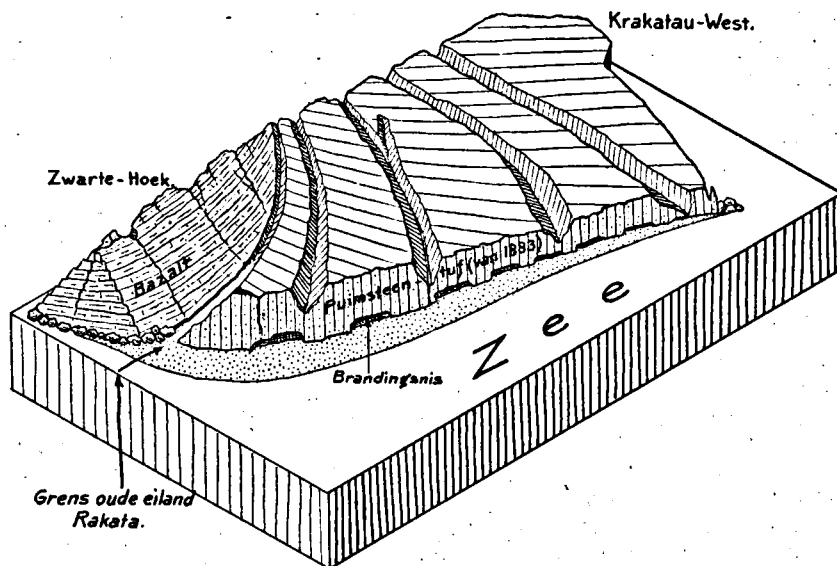


Fig. 2.

Block diagram of the western part of Rakata, after ESCHER (1919). To the left the basaltic Black Point, to the right the steep pumice cliffs with coves.

in numerous places. We found, however, not a single living coral; we only dredged pumice material. Everywhere the bottom seems to consist of that same loose and for the greatest part rather fine material. Though the sea was very calm the water was milkcoloured by the very fine pumice detritus

¹⁾ J. H. F. UMBROVE. Anthozoa van N.O. Borneo (with summary in English). Wetenschappelijke Mededeelingen No. 9, 1929, pag. 48—49 and pag. 63 and 73.

²⁾ J. H. F. UMBROVE. The first days of the new submarine volcano near Krakatoa. Leidsche geologische Mededeelingen, Deel II, 1928, pag. 323—329, fig. 1—11, Pl. 42—48.

in it. We are convinced that now absolutely no coral at all is living in the places indicated by SLUTTER on his map of 1889.

According to ESCHER Black Point is situated on the western boundary of the original Krakatoa island and he supposed that the whole part of the island west of Black Point must consist of pumice layers, fallen down during the eruption of 1883. These pumice layers are attacked by the sea and so steep pumice cliffs with hanging valleys are formed (see fig. 2, after ESCHER; a good photograph of the steep pumice walls along the shore of Rakata West is to be found in: STEHN, loc. cit. fig. 8).

Because of the very loose material of these pumice layers the marine abrasion has already taken great dimensions and as the cliffs become higher and higher when the shore line is steadily moved landward by the action of the waves, they offer an increasing quantity of sediment to the sea.

In fig. 1 I have not only given the data of SLUTTER's report, showing the coastline of 1889 (as indicated by the continuous line), but also the coastline in October 1883, after VERBEEK (indicated by the dot-dash line) and in 1928, according to the survey of the government steamer "van Gogh" and the map of the volcanological survey, (indicated by the broken line). Since then the shore line, especially west of Black Point, where indeed only pumice material occurs as supposed by ESCHER, is still more moved to the East. So in the rather short time since the eruption of 1883 a steadily increasing quantity of pumice material has fallen down from the steep cliffs that surround the little bay and it is no wonder, that every vestige of coral growth has been killed, broken or smothered by the immense quantity of material that partly covers the bottom of the bay and was partly transported by the waves further off the coast.

It is a well known fact, that around young volcanic cones no true coral reef can develop on account of the large quantities of erosion products that are continually transported into the sea¹⁾. I recently described such a case from the volcanic island Una-Una in N.-Celebes²⁾; only after the erosion of the island has reached a mature stage the development of a compact coralreef of some respectable dimension can grow up. In the case of the little reef near Black Point, where the erosion exceeds the normal, nature has demonstrated to us within a very short time this phenomenon of the smothering influence of active erosion.

¹⁾ W. M. DAVIS. The Coral Reef Problem. American Geographical Society, Special Publication No. 9, 1928.

²⁾ J. H. F. UMBROVE. Het vulkaaneiland Oena-Oena (N. Celebes) — with Summary in English. — Leidsche Geologische Mededeelingen, Deel III, pag. 249—260, Pl. 44—46, 1930.