17. NOTE ON CLIPPERTON ATOLL (NORTHERN PACIFIC). By REAR-ADMIRAL SIR WILLIAM J. WHARTON, R.N., K.C.B., F.R.S., Hydrographer to the Admiralty. (Communicated by Sir ARCHIBALD GEIKIE, D.Sc., LL.D., F.R.S. Read March 9th, 1898.)

[PLATES XX-XXII.]

IN the eastern part of the Northern Pacific, in lat. $10^{\circ} 17' N.$, long. $109^{\circ} 13' W.$, and 600 miles away from the nearest point of the continent of North America, is a small, lonely atoll called Clipperton. It has never been properly surveyed, but was in 1840 sketched by Capt. Sir E. Belcher, R.N.

Its lagoon, 2 miles in diameter, was then open to the sea in two places, both shallow. The remainder of the ring surrounding it was a few feet above water, forming two flat, bare, crescent-shaped islands. It was the haunt of innumerable sea-birds, as might be expected from its solitary position, and it is doubtless to these birds that the fact that no scrap of vegetation exists is due.

Since the date of Sir E. Belcher's visit the entrances have been closed by piled-up coral-sand, the ring is complete, and the lagoon is cut off from the influx of ocean-waters, except by infiltration.

So far, Clipperton Atoll only resembles many other islands of similar type and position, but there is one point which distinguishes it, so far as I know, from all other atolls, and that is the existence on one part of the ring of a mass of rock about 60 feet in height. Some atolls have an island somewhere near the centre of the lagoon, but none, as this, on the ring itself.

I have long wished to know the geological character of this rock, but it is only lately, by the kindness of Mr. J. Arundel, who visited the island in connexion with its guano-deposits, which have been for some time worked, that I have obtained specimens of it. Mr. Arundel, in sending me the hand-specimens, stated that the rock was composed of volcanic material and coralline limestone mixed, and on receiving them I imagined that he had, except in one case, sent me specimens of the calcareous rock only.

I sent the specimens to Sir A. Geikie, who showed them to Mr. Teall, and I believe that their first impression was similar to my own. They found, however, that the pale specimens did not effervesce with acid, and could not therefore be unaltered coral-rock, while the only dark specimen contained porphyritic feldspars in a finely crystalline base which they surmised to be some variety of trachyte or andesite. Mr. Teall's subsequent investigation, submitted to the Society together with the present Note, brings to light a remarkable change in the structure and composition of the apparently calcareous specimens, which have proved to be all of the same trachytic origin.

The position of this undoubtedly volcanic mass is of great interest. By no theory of the formation of atolls can the survival of a portion

of the volcanic base on the rim alone be explained. If the island has sunk, why is it not, as in all other cases, in the lagoon?

If the coral circle has grown up on the flanks of the original volcanic mound, the same difficulty presents itself. Unfortunately we know nothing of the depths around; and it is only on the somewhat vague soundings of the lagoon by the captain of a merchant vessel that the plan is based, showing that the depths there are very considerable, amounting to 50 fathoms.

If this be so, it adds another peculiarity to the atoll, for in no known case is so great a depth found in so small an atoll.

On this point Mr. Arundel writes as follows:—

‘After taking soundings in a perfectly round hole in the lagoon, which looks very much like an old crater, and where we obtained as much as 20 fathoms (a man named Antone claims to have got soundings at 26 fathoms), we started to the north-western side of the island. On the way from the circular basin, we took another sounding in what looked like a deep part, but only obtained 11 fathoms.’

The true greatest depth is thus doubtful; but even 20 fathoms is deep for so small an atoll.

The only solution which presents itself to me is that we here have the rare case of coral forming on the lip of a volcanic crater, one part of which alone, perhaps the plug, has resisted the action of the sea, which has worn the rest of it down to the limits of wave-action.

It will be remembered that the great explosion of Krakatoa resulted in the blowing away of a large part of the island situated above the hollowed-out interior, but that the margin of the actual vent remained on one side of the deep hole thus formed.

A similar incident, leaving a plug on one side of the crater-hollow, might explain the Clipperton Rock.

EXPLANATION OF PLATES XX-XXII.

PLATE XX.

Map of Clipperton Atoll, reduced from the new Admiralty chart.

PLATE XXI.

View of the rock on Clipperton Atoll, looking north-west. (From a photograph.)

PLATE XXII.

Nearer view of the same rock. (From a photograph.)

MAP OF CLIPPERTON ATOLL, REDUCED FROM THE ADMIRALTY CHART.

[The rock may be seen 4 or 5 leagues away.]

ROCK ON CLIPPERTON ATOLL, LOOKING NORTH-WEST.

NEAR VIEW OF ROCK ON CLIPPERTON ATOLL.