A BRIEF NOTE ON THE DEPTHS OF THE SEA IN THE VICINITY OF THE MARIANA ISLANDS.

by

CAPTAIN R. SIGEMATU, I. J. N. (RETIRED).

(Extract from *Records of Oceanographic Works in Japan*, Vol. V, N° 2, Tokyo, June, 1933)

THE MARIANA TRENCH.

The first sounding in the Mariana Trench was made by the British exploring ship *Challenger* at her station 215 on March 23, 1875. The *Challenger*, which began the sounding at 12 h. 30 m. p. m., found the bottom of 4475 fathoms (8183 m.) and finished the work at 3 h. p. m. This, her deepest sounding, is known as the Challenger Deep.

The shape of the Mariana Trench, as illustrated by O. KRÜMMEL in his *Handbuch der Ozeanographie, Bd.* 1, seems to have been derived from the soundings obtained by the U. S. S. *Nero* in 1899 and the solitary sounding made by the *Challenger* just mentioned. In his chart, the 6000 metre area extends as a narrow trench just as far to the north-east of the *Nero* sounding as the *Challenger* sounding is south-west of it.

In 1899 the *Nero* discovered also a depth of 6575 m. in lat. 23° 50' N., long. 143° 35' E. east of Minami-Iwô Sima. This deep is known after KRÜMMEL as the South Bonin Deep.

Upon the suggestion of the late Professor N. YAMASAKI, the surveying ship *Mansyû*, under the command of the present author, began soundings along the east side of the Mariana Islands on her homeward voyage from Saipan in October 1925, in order to determine the shape of the expected Mariana Trench. But this plan could not be carried out successfully owing to the stormy weather that prevailed during the voyage, so that only two soundings near Medinilla I. were obtained.

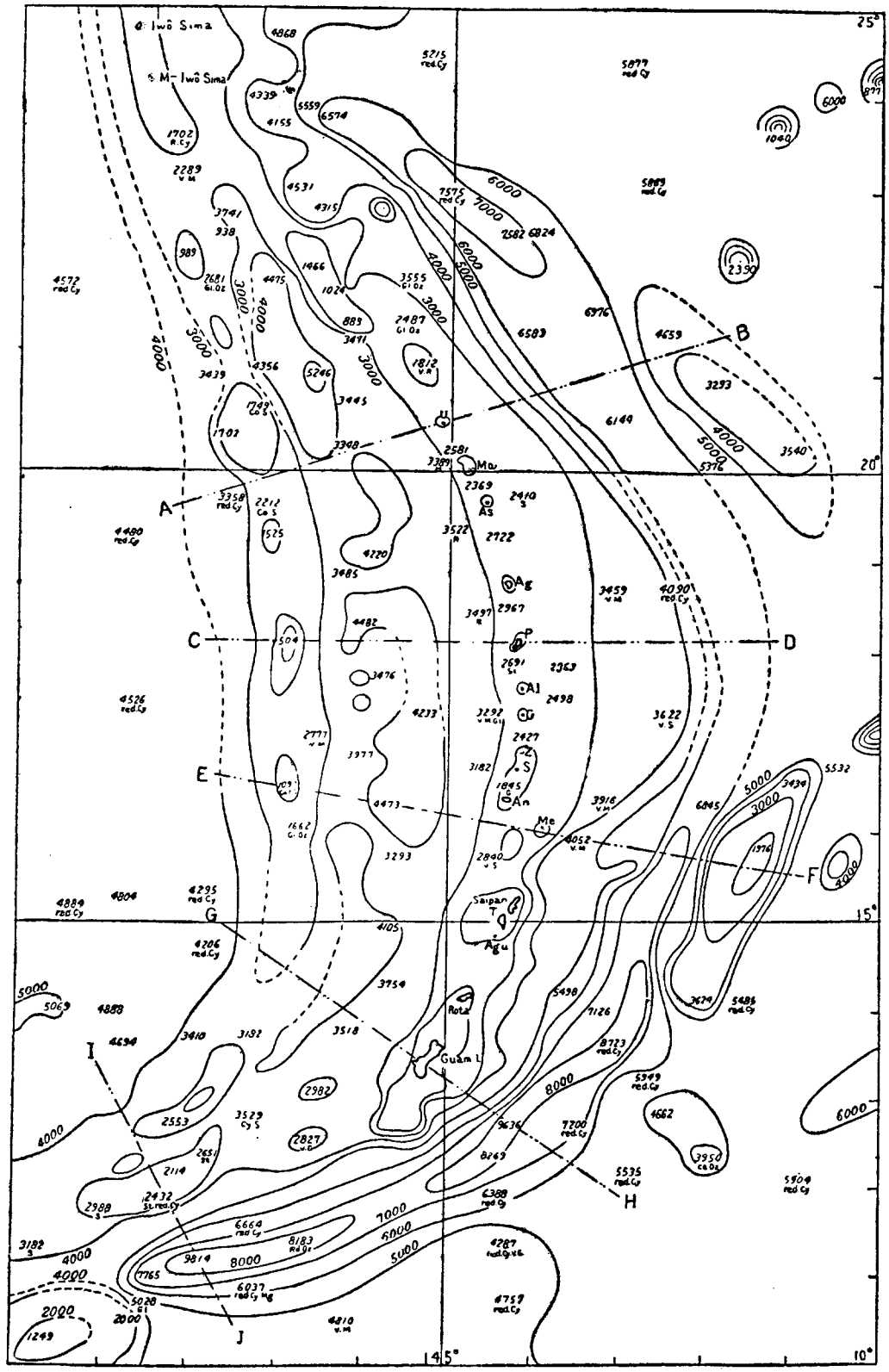
Date.	*Depth.*	*Bottom.*	*Lat. N.*	*Long. E.*
October 1925.....	4052 m.	v M	15° 56.5'	146° 29'
»	3916	»	16 22	146 52.5

In October 1926 the *Mansyû* obtained a sounding of 7575 m. red Cy. in lat. 23° 02' N., long. 144° 57.5' E., about 90 miles S.E. of the South Bonin Deep. My belief at that time was that these deeps extended farther to the south and ultimately joined the Mariana Trench.

In November 1927 the *Mansyû*, commanded by Capt. H. SATÔ, crossed this supposed trench, and made two soundings (4659 m., v S, lat. 21° 32' N., long. 147° 31' E.; 3459 m., v S, lat. 18° 42.5' N., long. 146° 52' E.) in the north and south sides of the trench. Interruptions through stormy weather prevented sounding being made at the expected position of the trench, but what soundings were made indicated that the South Bonin Deep might probably be unconnected with the Mariana Trench.

In 1931 the surveying ship *Kôsyû* took soundings eastward of the Mariana Islands, and obtained (1) 3622 m. v S, lat. 17° 20' N., long. 147° 33' E.; (2) 4090 m., red Cy., lat. 18° 42' N., long. 147° 35' E.; (3) 6824 m., lat. 22° 36' N., long. 146° 05.5' E. In the same year, some results of sonic soundings by the U. S. S. *Ramapo* were published in the Pilot Chart (*) of the North Pacific Ocean some of which are already incorporated in the revised charts of the Hydrographic Office, Washington (**). The Mariana Trench, as it appears in Fig. 1, is naturally the result of incorporation of all such available data.

(*) *H. O. (U. S. A.) Pilot Chart, North Pacific Ocean, May*, 1931.
(**) *H. O. (U. S. A.) Chart* N° 529, 1932.



U. Uracus, Ma. Maug, As. Assongsong, Ag. Agrigan, P. Pagan, Al. Alamagan, G. Guguan, Z. Zealandia, S. Saligan, An. Anatahan, Me. Medinilla, T. Tenian, Agu. Aguigan

Fig. 1

In the south-western part of the Mariana Trench, a sounding of 9814 m. was obtained by the *Mansyû* in October 1925, in lat. 11° 13.5' N., long. 142° 09.5' E., about 70 miles west of the Challenger Deep, while at approximately the same position soundings were repeated by the same ship in November 1927, and a depth of 9818 m. recorded. In both cases unfortunately the lead was lost. The Japanese Hydrographic Department adopted the former (9814 m.) in its charts. This depth of 9814 m. is the deepest sounding by the *Mansyû* and is also the greatest depth so far recorded from the Mariana Trench.

The following soundings have also been recorded in the region of this trench by Japanese vessels.

Ship's name.	*Year.*	*Depth.*	*Bottom.*	*Lat. N.*	*Long. E.*
Mansyû	1925	5028 m.	Gl. Oz.	10° 43.5'	141° 32'
»	»	6664	red Cy.	11 36.5	142 44
»	1927	7765	—	11 02	141 35
»	»	6037	red Cy.	10 53	142 47
Yodo	1924	2000	Br. Oz.	10 31	141 23

From these data the shape of the area has been accurately determined. It is shown in Fig. 1.

Further, new soundings taken from the middle part of the trench are shown in the following table.

Ship's name.	*Year.*	*Depth.*	*Bottom.*	*Lat. N.*	*Long. E.*
Mansyû	1926	6388 m.	red Cy.	11° 56'	145° 36'
»	»	8269	—	12 22	145 34.5
»	1928	5949	red Cy.	13 16	147 20
»	»	8723	»	13 39	146 55
»	1929	5498	—	14 14	146 24
»	»	7200	red Cy.	12 43	146 29

The shape of this region as deduced from these data (see Fig. 1) differs somewhat from that given in KRÜMMEL's chart.

THE DEPTHS OF THE SEA WESTWARD OF THE MARIANA ISLANDS.

For the western offing of the Mariana Arc, many soundings are indicated in the chart in the area along the meridian approximately northward of Guam Island. They are soundings made by the *Nero* in 1899, and show a depth of about four thousand metres. The *Mansyû* made soundings in 1926, about 30 miles distant from and nearly parallel to the Mariana Arc, and obtained a depth contour of 3000 m.

In 1881 the U. S. S. *Alert* discovered two banks, one 1494 m. in lat. 22° 13' N., long. 141° 53' E., and the other 1280 m. in lat. 17° 59' N., long. 143° 08' E., in the prolonged line of the Volcano Islands, while shallow water of about 70 m., gray mud (lat. 15° 51' N., long. 143° 08' E., P.A.), was reported from this line by the U. S. S. *Volunteer* in 1926. The *Mansyû* searched for this reported shoal, first in 1927, when she recorded the very shallow depth of 1662 m. in lat. 16° 04' N., long. 143° 18' E., and later in 1929 one of 1708 m. in lat. 16° 04' N., long. 143° 23' E. The inconsistency in the report of the *Volunteer* as compared with results of the soundings of the *Mansyû* can be explained only by some unknown changes in the sea floor caused by submarine volcanic eruptions.

The *Mansyû* made some important soundings in these regions on her homeward voyage from Saipan in February, 1928, as listed below.

Depth.	*Bottom.*	*Lat. N.*	*Long. E.*
2777 m.	v. M.	17° 03'	143° 30.5'
504	—	18 08.5	143 07
1409	co. S.	18 11	143 06
2212	»	19 40	142 52
1749	»	20 44	142 45.5
2681	Gl. Oz.	22 04	142 13.5
2289	v. M.	23 15	141 52.5

From these results, the shape of the bottom of this area, especially the existence of a chain of submarine volcanes, was brought to light, as may be seen in Fig. 1.

CONCLUSION.

The Mariana Islands are to be divided into two groups. The northern group, extending from Uracas to Anatahan, stands in a very regular arc, the volcanic mountains being nearly all extinct and in part destroyed. Only Uracas, Assongsong, Pagan and Guguan are still active, while Maug may be said to be a shattered volcanic ruin.

The southern group, extending Medinilla to Guam, lies in another arc which is almost in a straight line on the outer side, or about 50 km. off the northern arc. Volcanic activity in these islands has practically been extinct for a long time. Apparently they experienced frequent elevations, as indicated by the coral lime disposed in several terraces and covering the islands to a great height. They may be coral islands.

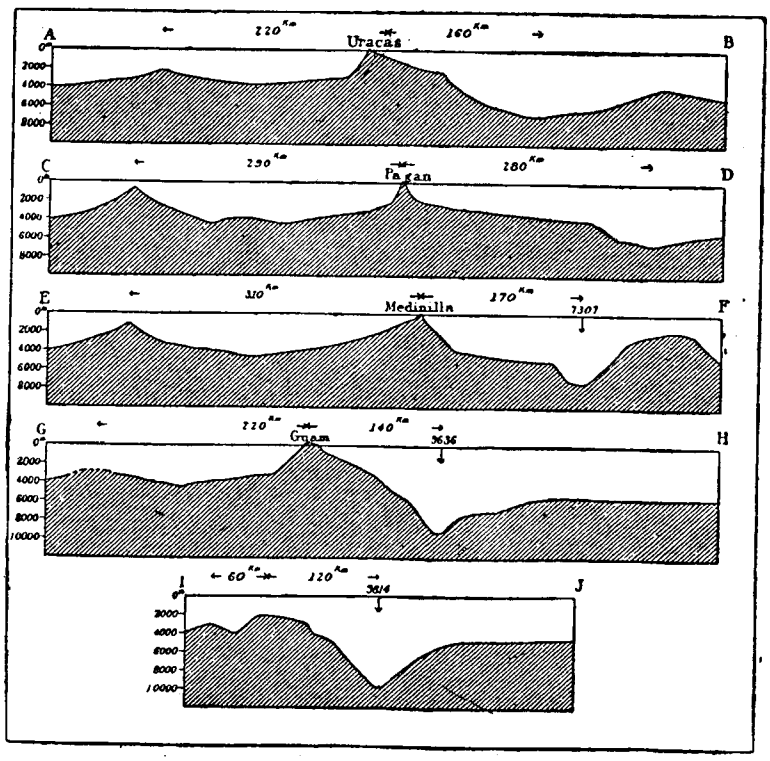


FIG. 2

Many geographers have hitherto believed the Mariana Islands to be merely a part of the "Huzi" volcanic chain. From Fig. 1, it is very clear that south of Minami-Iwô Sima, the chain is divided into two branches, one elongated to the northern part of the south-western end of the Mariana Trench as a chain of submarine volcanoes, and the other to the so-called Mariana Arc, with a narrow basin of about 4000 m. in depth and lying between these two arcs. These, together with the Mariana Trench itself, are outstanding features of the diagrams.

The shape of the Mariana Trench is an almost semi-circular arc comparable to the crescent moon. The curvature of arc of the trench exceeds that of the Mariana Chain, while the chain of submarine volcanoes has the largest radius of curvature.

The striking features of the Mariana Trench are that the depth of the southern part exceeds that of the northern part, and also that this conspicuous deep in the trench approaches to within a comparatively short distance from the raised islands of coral formation. These outstanding features, as well as the main features of the two volcanic chains and the basin, may readily be appreciated by reference to the accompanying diagrams in Fig. 2.