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THE GEOLOGY
AND
MINERAL DEPOSITS
OF THE
KARIBIB AREA
South West Africa

An Explanation of Sheet No. 79 (Karibib, S.W.A.)

BY

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THE GEOLOGY AND MINERAL DEPOSITS OF THE KARIBIB AREA, SOUTH WEST AFRICA

CHAPTER I INTRODUCTION

The area described in the following pages is situated between 15° and 16° east longitude, and $21^{\circ} 30'$ and 22° south latitude; Karibib (B. 4) in the south-eastern part of the area and Usakos, just below the 22° latitude line, form the major social centres. Both towns are on the main railway line between Windhoek and Swakopmund, while Usakos is also the junction station for the narrow-gauge railway line to Grootfontein and Tsumeb. The area was geologically surveyed in 1928 by Drs. T. W. Gevers and H. F. Frommurze. During 1937 Mr. P. J. Rossouw was commissioned to revise the area and to pay special attention to and re-map portions of economic significance.

The initials in brackets at the end of the paragraphs refer to the contributions of the different writers of this publication.

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We also wish to tender our thanks to mine-owners such as Messrs. Ortner (Kranzberg), Pieters (Pietershill), Kliem (Davib tin mine), le Roux (Sandamap) and Sharp (Sandamap Dumps and Amcib); claimholders such as Messrs. Meyer (Erongo), Buck (Erongo Schlucht), Brusius, Hassellund and Epsen (Klein Spitzkop). These gentlemen conducted us around their mining areas and claims and helped in every way to make the survey pleasant and successful. In addition, we wish to mention Mr. Potgieter, of Cameroon, who gave us valuable information regarding the country and mineral occurrences south and west of the Spitzkoppe and Mr. Wilson, of Karibib, who advised us about the Karibib marbles. We appreciate the help and kindness of many others as, for example, Mr. and Mrs. van Wyk, Mr. and Mrs. Louw, Mr. and Mrs. Ebrecht, Mrs. Wilson, Mrs. Grueber, Mr. and Mrs. Odendaal, and Mr. and Mrs. Rübner.

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CHAPTER II

PHYSIOGRAPHY

MORPHOLOGICAL FEATURES

area embraces, as does the Omaruru area, two very distinct country, there being a marked difference between the western ern portions. While the eastern part is densely clad with e western portion is an arid desert. A stretch of country of width exhibiting intermediate characters separates the east west. In the surroundings of the Erongo mountains the bush-clad type of country protrudes for a considerable distance transition belt owing to the higher rainfall occasioned by rains.

general nature of each of these three belts has been described explanation to Sheet 71 (Omaruru) and in Geological Survey No. 7.

he *Namib*, magnificent examples of the inselberg type of Klein Spitzkoppe (B. 1) and Gross Spitzkoppe (B. 1) (5,717 other examples are afforded by remnants of parallel diabase ch as the Schwarz Spitzkoppje (A. 1), ridges at Sandamap aterhole, and Schwarze Kuppe (B. 1).

eastern limit of the *Transitional belt* may be approximately by an imaginary line drawn from Ukerenz (A. 2) past the stern spurs of the Erongo mountains to Karibib (B. 4).

erous inselbergs dominate the bush-clad plains. Besides s small ones (granite) on Tumib 20 (A. 2) and Kudubis 19 here are several large tors west, south-west and south of the ountains, such as the diabase dyke on the western boundary sis 22 (A. 2), the big dyke on Springbockfontein 21 (A. 2), b 1 and 2 (B. 2) (granite) and neighbouring granite hills, p berg (B. 2) (marble), Gross Spitzkoppe (B. 1), Klein e (B. 1), and the Rooiberg (Ganoabberg) (B. 3) (Damara t). Good examples near Karibib (B. 4) are the Dernburg range and a big granite hill some 5 miles south-south-west of the (P.J.R.)

Plains of Northern Damaraland.—To the north-east the tract y just dealt with merges into vast expanses of almost level e tree steppe, broken by a number of important mountain id by numerous isolated eminences of the inselberg type). Very characteristic of the area under review is the frequent e of huge pointed antheaps. These attain heights of over id afford striking testimony to the geological significance of e trees of the plains are mainly acacias.

The Erongo mountains rise in the form of a mighty buttress from the surrounding plains. Their outline is oval and the highest elevations lie along their outer edge, which rises with a precipitous escarpment to great heights (Plate VI). Their gradient towards the interior is gentle and leads down to an elevated interior plateau surrounded by a complete ring of hills and mountains. This interior Otjimissauna (A. 3) plateau has an elevation of 1,400 to 1,600 feet above the plains around the Erongo. In the west, south and south-east the Erongo mountains are bounded by precipitous escarpments, thousands of feet in height, and representing some of the most magnificent scenery to be found in South West Africa. The Bockberg (A. 3), situated near the south-western corner of the Erongo, is the highest point with an elevation of 7,713 feet, while the T.P. Erongo (A. 4), forming the south-eastern corner, is not very much lower (7,283 feet). Between these two outposts are situated the Hohenteln (A. 3) (7,670 feet), the Onguati Ecke (B. 3) (6,564 feet) and the Etiro Spitze (A. 4) (6,564 feet). Another prominent elevation is afforded by Tumib (A. 3) (6,206 feet) on the western side of the Erongo. The height of the bounding escarpment gradually decreases northwards towards the north-eastern corner of the mountains. Where the outer ring-wall is cut by the Otjimissauna (A. 3) river, it has decreased to only 4,900 feet.

The Kranzberg (A. 4) (5,662 feet) represents an isolated outlier of the Erongo mountains and is capped by Erongo sediments and melaphyres. Two prominent mountains, commonly known as the Grober Gottlieb I and II, morphologically may still be regarded as part of the Erongo mountains, forming a northern spur of these. (T.W.G.)

The Marble series of the Damara system usually forms conspicuous ridges owing to the weather-resisting nature of the marble. Intense folding of these ancient sediments has thrown them in the form of several parallel ridges, frequently in close proximity. One of these compound ridges runs from the Rooiberg (Ganoabberg) (B. 3) in an easterly direction across Onguati 52 (B. 4), Rivierplaats 97 (B. 4), and Etiro 50 (B. 4). The Dernburg range is continued past Karibib as a line of intermittent marble hills composed of marble and Damara quartzite to Okawayo (B. 4). A belt of marble and schist ridges, shot through by granite, runs south of the railway from Karibib (B. 4) in an easterly direction across Okatjimukuju 55 (B. 4). (H.F.F., T.W.G. and P.J.R.)

DRAINAGE

The area is drained in the east and central part by the Khan river and its tributaries, some of the largest of which are the Etiro river and the Davib river. A river flowing west past the Spitzkoppe (B. 1) drains the country round Sandamap (B. 2) and Gross Spitzkoppe (B. 1). Tributaries of the Omaruru river, such as the Otjimissauna river, Omandumba river, and the numerous sandy river-courses north

Spitzkoppe effect the drainage of the northern portions of the Omaruru river itself cuts across the extreme north-western of the Karibib area. The rivers are not perennial streams only after a substantial rainfall. For the rest of the year they are dry, sandy water-courses. (P.J.R.)

RAINFALL

A list of rainfall normals computed over the period 1900-01 to 1936 by Mr. Zelle, Assistant Meteorologist in Windhoek, it is to be noted that there is a marked decrease in the quantity of precipitated rain from the east to the west. Proceeding westwards from the Erongo mountains, the rainfall normals are as follows: Etiro (B. 4) 243 mm., Karibib (B. 4) 184 mm., Goabeb (B. 2) 120 mm., and Spitzkoppe (B. 1) 120 mm. The whole of the Erongo mountains and their immediate surroundings receive a considerably more rainfall than the localities along the same lines of longitude some distance away from the mountains. Thus we have the following: Etiro (A. 4) 265 mm., Erongo West (A. 4) 242 mm., Etiro (A. 4) 242 mm., Onguati (B. 4) 375 mm., Ameib (B. 3) 209 mm., and Daviberg (B. 3) 242 mm. From the east, across the Erongo, to the west a marked decrease of rainfall is very definitely seen in the amount of rainfall; thus Onduruquea (A. 4) 220 mm., Erongo Ost (A. 4) 220 mm., Erongo West (A. 4) 242 mm., Ombu (A. 3) 253 mm., Etiro (A. 2) 162 mm., and Spitzkoppe (B. 1) 120 mm. The rainy season is very short and lasts from November to April. (P.J.R.)

WATER SUPPLY

On account of the absence of surface water, except for short periods, the beds of the rivers are wide and filled with sand and gravel of considerable thickness. On account of the porous nature of these beds they contain large quantities of underground water at considerable depths even during times of drought. Open water is invariably absent with the presence of natural barriers. At Onguati (B. 4) a barrier of hard marble forces the ground-water to the surface. At the Klein Spitzkoppe (B. 1) a dyke of Erongo age dams up the ground-water in the sandy bed of the small river. The open water at Guikas is found at a point in a river where an Erongo dyke crosses the granite.

Water is also obtained from wells and boreholes sunk along the beds of sand-filled rivers such as the Khan, Etiro, Ameib, Daviberg, and Spitzkoppe rivers. Boreholes put down at such localities generally yield considerable quantities of water at shallow depths. As examples of the best noted boreholes on Etiro (A. 4), Onguati (B. 4) and Daviberg (B. 4). On Etiro (A. 4) water was struck at 78 feet and the estimated yield of 5,360 gallons in 24 hours. Two boreholes on Daviberg struck water from 26 to 50 feet and have an estimated

yield of 28,000 and 14,000 gallons respectively in 24 hours. A borehole at Okawayo struck water at a depth of 140 feet and has an estimated yield of 6,000 gallons in 24 hours. This borehole was sunk along a river and not far from the contact of the prominent marble ridge with the overlying schists. The dip of the beds is northward.

Boring operations carried out by the Irrigation Department of the Administration in the schists and marbles have met with rather indifferent results. At Karibib (B. 4) boring has invariably failed to find substantial supplies of water although a borehole at the Magistrate's office struck water at 115 and 150 feet and has an estimated yield of 1,920 gallons in 24 hours. It is very probable that better results may be obtained if sites for boreholes be selected at places where synclines in the ancient formations form natural basins in which the ground-water can collect. However, one is never sure whether the beds are not giving abnormal twists and bends at depth owing to the extensive folding and crushing to which the strata have been subjected.

Water is very often associated with granite "banks". This term is applied to prominent cupolas or low outcrops of granite rising above the thick covering of sand. These banks occur chiefly west and south-west of the Erongo mountains, as at Hottentottenbank (A. 2), Ukerenz (A. 2), Jakalsbank (B. 2), Wilhelmsbank (B. 3), Sandanaup (B. 2), Letelbank (B. 2), Natmakbank (B. 2), and the banks round the Spitzkoppe (B. 1). Frequently water-holes occur in the sand-filled clefts of these banks as at Ukerenz. The clefts usually go down to levels considerably deeper than the surrounding sand-covered plain. The water-holes of this nature are generally not permanent, but quickly dry up after the rainy season.

The water of this area is brackish in varying degrees. Sweet water is occasionally met with in boreholes and wells sunk in areas where granite is the country-rock. (T.W.G. and P.J.R.)

CLIMATE

The climate of the area on the whole is healthy, the air being excessively dry. There is a great difference between the temperature of day and night, the nights being markedly cool. The heat becomes oppressive only in the months of October and November before the rainy season sets in. The country in the west round the Spitzkoppe (B. 1) comes under the influence of a cool sea-breeze in the afternoon after the oppressive heat of the day during late spring and the summer months. The highest normal temperature* of Usakos, just south of the area, is 43.3° C. in December while the lowest normal temperature at the same place is -2° C. in August. (T.W.G. and P.J.R.)

* We are indebted to Mr. Zelle, Assistant Meteorologist in Windhoek, for this information.