

shore lines of emergence. The width of the emerged coastal terraces is comparable to the width of the sublittoral platform, and it is inferred that these terraces were planed off by wave erosion during periods of time comparable to the time that elapsed during the making of the sublittoral platform. The emerged terraces are of Quaternary age and are probably Pleistocene, as along the south coast they are strongly dissected and at some places entirely obliterated.

NORTH PLAIN.

EXTENT AND GENERAL FEATURES.

The name North Plain has been applied since the early colonial period to the plain that extends along the north coast of the Département du Nord from Acul Bay eastward to the Dominican border. Its length is about 65 kilometers and its width is 5 to 20 kilometers. Its eastward prolongation in the Dominican Republic, which extends from the international boundary and Manzanillo Bay southeastward to Samaná Bay, is called the Cibao Valley. The western part of the Cibao Valley, adjoining the North Plain, is called the Valley of Rio Yaque del Norte. Between Acul Bay and Cap-Haïtien Bay the North Plain is separated from the sea by a short, rugged mountain range called the Morne du Cap. Elsewhere the plain fronts the sea. The southern border of the plain is the steep and very irregular mountain front of the Massif du Nord. From an altitude of 50 to 150 meters above sea level, at the base of the mountains, the plain slopes gently northward to the sea.

LAND FEATURES.

The North Plain comprises four divisions, each of which has distinct surface features: (1) an alluvial plain, which has little or no relief, adjacent to the shore line; (2) a dissected plain composed of gravels of Quaternary age; (3) low hills composed of bed-rock; (4) a rock platform of irregular width at the base of the mountains.

UNDISSECTED ALLUVIAL PLAIN.

The seaward part of the North Plain is an undissected alluvial plain composed principally of deposits of Recent age, built by streams that flow northward in shallow trenches and that probably inundate large areas during floods. This part of the plain is widest along the Dominican border north of Ouanaminthe and narrows westward, terminating in the marshes on the right bank of Rivière Haut du Cap near Cap-Haïtien.

DISSECTED PLAIN.

Back of the undissected plain, in the region east of the longitude of Fort-Liberté, lies a dissected plain composed principally of stream gravels of Quaternary, probably Pleistocene, age. This plain is a conspicuous

feature northeast of Acul Samedi and extends eastward to Ouanaminthe. Large areas of the plain consist of grassy or bushy savannas. The ravines and narrow stream valleys are entrenched 5 to 10 meters below the general level of the plain. The transition from this dissected plain to the lower and flatter undissected plain along the coast is gradual.

LOW HILLS.

Small hills or groups of hills composed principally of many kinds of igneous and metamorphic rocks rise above the plain at several localities. Some of the hills, such as that on which the Gendarmerie post at Ouanaminthe is situated and Morne Beckly, east of Limonade, are so low and rounded that they scarcely break the continuity of the plain. Others, such as Morne Grande-Gille, north of the road from Limonade to Milot, and Morne Pelé, east of the railroad between Grande-Rivière du Nord and Cap-Haïtien, rise more steeply to altitudes of 50 meters or more above the plain. East of the head of Acul Bay low bedrock hills are very numerous.

ROCK PLATFORM.

A narrow rock platform, 75 to 150 meters above sea level, extends along the extremely irregular front of the Massif du Nord. This platform is particularly conspicuous in the vicinity of Les Perches and south of Ouanaminthe. The surface of the platform grades imperceptibly into the gravel-covered plain that bounds it on the north, and the platform itself is at many places so thoroughly covered with a thin veneer of alluvium and residual soil that it may easily be overlooked. It is exposed along the road from Cap-Haïtien to Ouanaminthe, about 5 kilometers east of Terrier-Rouge, where the road skirts the base of a spur that projects out into the plain from the mountains. At this place the rock platform has an altitude of perhaps 75 meters above sea level. The rock platform, like the gravel-covered plain that lies in front of it, is dissected by the present streams, but the valleys, being entrenched in bedrock, are generally narrower than the valleys in the plain. The metamorphic volcanic rocks and quartz diorite that floor the platform are exposed in many road cuts and in ravines. Along the foot of the mountains south of Les Perches, where a deep, rounded embayment of the plain extends into the mountains, the rock platform has an altitude of about 100 meters above sea level. Here it is cut entirely in quartz diorite, which is exposed in the ravines and at many localities along the trails. At some localities the floor is covered with soil and alluvial débris that is as much as 5 meters thick. Along the trail from Ouanaminthe to Mont-Organisé the rock platform has an altitude of about 150 meters above sea level. Quartz diorite crops out along the trail and in the ravines.

The rock platform along the front of the Massif du Nord is apparently an abrasion platform cut by wave erosion when the sea stood at a higher

level, and some of the features of the steep, irregular front that faces the platform are believed to be due to the cutting of sea cliffs. In other parts of Haiti rock platforms that are known to be abrasion platforms cut by wave erosion are veneered with coralliferous limestone or beach shingle. No deposits that are obviously marine were seen on the rock platform at the rear of the North Plain, but some of the gravels on it may be of marine origin. As the cliffs along the shore of this supposed abrasion platform were very high, detrital rock material may have been carried into the sea too rapidly to permit the growth of corals on the inner part of the platform, the only part that is now exposed.

The cutting of this platform apparently determined the present outline of the southern border of the North Plain. As the platform is higher near the Dominican border than it is farther west, the emergence that followed the cutting of the platform was progressively less westward. The outer part of the emerged platform was covered with stream gravels that now underlie the dissected plain adjacent to the platform. The trenching of the streams in this plain and in the platform indicate renewed emergence, probably at the end of Pleistocene time. The undissected seaward plain probably is wholly of Recent age. Some of the shore features indicate later submergence.

SHORE FEATURES.

From the Dominican border to Cap-Haïtien the shore of the North Plain consists principally of low sandy beaches. The shore line of the western part is indented by Caracol Bay. East of Caracol Bay the shore line is straighter but is broken by Fort-Liberté Bay.

Fort-Liberté Bay is the only bilobate pouch-shaped harbor in the Republic. It was not examined during the reconnaissance, but its features as shown on the coast charts indicate that it is similar to the Cuban pouch-shaped harbors, the origin of which has recently been considered by Vaughan.¹ The outline of Fort-Liberté Bay is probably due to submergence following the emergence that caused the streams to trench the inner part of the plain, but its history can not be given until field studies have been made. The mouth of Rivière Massacre, the largest stream in the region, is not embayed, and the streams that enter the digitations of the bay are very small. These features indicate that the history of this pouch-shaped harbor is more complex than the history of the Cuban harbors.

SUBLITTORAL FEATURES.

At the Dominican border a wedge of deep water extends into the head of Manzanillo Bay between the extensive platform of Monte Cristi bank

¹ Vaughan, T. Wayland, Contributions to the paleontology of the Canal Zone, Panama, and geologically related areas in Central America and the West Indies: U. S. Nat. Mus. Bull. 103, pp. 280-286, 1919.

and the coast of the Republic of Haiti. A very narrow sublittoral platform extends westward along the coast from the Dominican border. Between Fort-Liberté Bay and Caracol Bay the platform widens, as its outer edge maintains a northwesterly direction, diverging somewhat from the shore line opposite the shallow inlet of Caracol Bay. The significance of the narrow platform off Fort Liberté is not known. In other parts of the Republic shore lines of submergence have wider sublittoral platforms or show traces of a submerged terrace scarp.

MASSIF DU NORD.

NAME AND EXTENT.

The name Massif du Nord is here used for the northern mountain system of the Republic. It comprises a complex group of mountains and mountain ranges that extend from the Dominican border westward to the vicinity of Gros-Morne. The Massif du Nord is the northwestward prolongation of the Cordillera Central of the Dominican Republic. In the Republic of Haiti the belt of mountains is narrower, and as it occupies the northern part of the Republic a name similar to that given it in the Dominican Republic would be inappropriate. Many of the peaks and short ranges in the Massif du Nord have separate names, but no names are known for the major ranges.

The eastern half of the massif is bounded on the north by the North Plain and on the south by the Central Plain. The western half is bounded on the north by the sea and on the south by the Montagnes Noires, from which it is imperfectly separated by a gap that is traversed by the road from Gonaïves to St.-Michel de l'Atalaye. The deep trough of the valleys of Les Trois Rivières and Rivière la Quinte separates the massif from similar mountains in the eastern part of the Northwest Peninsula. The total length of the massif is about 120 kilometers, and its width is 25 to 40 kilometers.

GENERAL FEATURES.

The Massif du Nord constitutes one of the largest mountainous regions in the Republic. Some peaks in its western part attain estimated altitudes of 1,200 to 1,500 meters above sea level. In its central and eastern parts the altitudes range from 600 to 1,000 meters above sea level. The valleys are deep, and the crests of the mountains rise 300 to 1,000 meters above the valley floors. The relief is greater in the western and central parts than in the eastern part.

The mountains comprise a mass of peaks, short ridges, and longer ranges, the arrangement of which appears systematic only when considered with regard to the structure and the distribution of the surface rocks. As a whole, the massif is a complex northwestward-trending anticline. Many of the minor surface features have a corresponding northwestward trend.