Studies on the fauna of Curaçao, Aruba, Bonaire, and the Venezuelan Islands

STUDIES ON THE FAUNA OF CURAÇAO, ARUBA, BONAIRE AND THE VENEZUELAN ISLANDS

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PROEFSCHRIFT

TER VERKRIJGING VAN DEN GRAAD VAN DOCTOR IN DE WIS- EN NATUURKUNDE AAN DE RIJKS-UNIVERSITEIT TE UTRECHT OP GEZAG VAN DEN RECTOR MAGNIFICUS Dr. F. H. QUIX, HOOGLEERAAR IN DE FACULTEIT DER GENEESKUNDE, VOLGENS BESLUIT VAN DEN SENAAT DER UNIVERSITEIT TEGEN DE BEDENKINGEN VAN DE FACULTEIT DER WIS- EN NATUURKUNDE TE VERDEDIGEN OP MAANDAG 8 JULI 1940 TE 15 UUR

DOOR

PIETER WAGENAAR HUMMELINCK
GEBOREN TE VLAARDINGEN

N.V. DRUKKERIJ P. DEN BOER – UTRECHT

Aan mijn ouders
Aan de nagedachtenis van mijn grootouders

„Wij kunnen niet allen metselaar zijn;
er moeten er ook zijn die de steenen aandragen."

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Obtainable from
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STUDIES ON THE FAUNA OF CURAÇAO, ARUBA, BONAIRE AND THE VENEZUELAN ISLANDS: No. 1—3.

GENERAL INFORMATION.

A SURVEY OF THE MAMMALS, LIZARDS AND MOLLUSKS.

ZOOGEOGRAPHICAL REMARKS.

STUDIES ON THE FAUNA OF CURAÇAO, ARUBA, BONAIRE AND THE VENEZUELAN ISLANDS: No. 1.

GENERAL INFORMATION

The region which forms the field of these studies lies between Trinidad and the Goajira-peninsula, off the northcoast of South America, comprising of seventeen islands or island-groups with a total area of about 2000 square kilometers. It is a part of the Venezuelan Republic, excepting Curaçao, Aruba and Bonaire, which is Netherlands territory. The total number of inhabitants can be estimated at 164000, chiefly confined to Margarita (70000), Curaçao (61000), Aruba (24000), Bonaire (5500) and Coche (3000).

This region was visited in 1936 and 1937 with the main object of studying the land and freshwaterfauna, excluding birds and the greater part of the insects. For comparison some parts of the adjacent continent were also visited.

Already in 1868, a clergyman, G. J. Simons, gave an enumeration of 265 kinds of animals, occurring on the island of Curaçao; the value of this list however is very doubtful.

Scientific surveyance of the Leeward Group began in 1885, by an expedition of Prof. K. Martin, geologist, and Prof. W. F. R. Suringar, botanist, both of the Leyden University,

with an entomologist, J. R. H. Neervoort van de Poll, and two students.

In 1899 J. Boeke was send to the Dutch West Indies to study the fisheries; in 1921—1922 the geologist G. J. H. Molengraaff examined Curaçao, and in 1922 C. J. van der Horst, conservator of the Zoological Museum at Amsterdam, stayed for some time on the same island to make a study of the sea-fauna. All three brought back a small collection of land animals.

The U. S. A. has given more proof of their permanent interest in the zoology of the Leeward Group. Several official institutions, principally the Field Museum of Natural History and the University of Michigan Museum of Zoology, have sent their staff-members and collectors to this region and have encouraged private research. In this connection only the names of Henry R. Raven (abt 1870), J. E. Benedict and W. Nye (1884), Wirt Robinson (1895), Austin H. Clark (1901), Ned Dearborn (1908), John F. Ferry (1909), Horace Burrington Baker (1922), Paul Bartsch (1929) and Horace G. Richards (1939) may be mentioned. The works of Ernst Hartert (1892) and Percy R. Lowe (1904, 1906), and the researches of Adolf Ernst (1871, 1873, 1874), J. S. Gibbons (1877), Ernst Peters (1890), Alfons Gabriel (1922-25) and Alf Wollebæk (1925) show however, that also other nationalities were fascinated by this desert-island animal world.

The author's interest in the Caribbean Islands off the Venezuelan coast was roused by the news, that Prof. L. M. R. Rutten, with his wife and five students of the Utrecht University, had planned a geological excursion to Curaçao, Aruba and Bonaire. After acceptance as a member of this party, we had a glorious time, camping in western Curaçao (14.IV.—4.V.), Bonaire (10.V.—10.VI.) and Aruba (16.VI.—9.VII. 1930). After a wonderful excursion through the mountains of Táchira and Falcón, as guests of the Caribbean Petroleum Company, we returned to Curaçao where the „Utrechtsche Antillen Excursie 1930" came to an end.

During this trip birds were collected by M. G. Rutten and L. W. J. Vermunt, while H. J. MacGillavry spent his spare time collecting insects. After the departure of my fellow-travellers, I again visited Bonaire, from August 20th until December 7th.

Most of my time was devoted to the study of marine fauna, although much attention was given to inland-waters. The results of this trip, appearing under the title of "Zoologische Ergebnisse einer Reise nach Bonaire, Curaçao und Aruba, im Jahre 1930" were published in the "Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere", vol. 64, 1933 (Nr. 1—12) and vol. 67, 1936 (Nr. 14—22), the "Capita Zoologica", vol. 8, 1936 (Nr. 23), 1937 (Nr. 24), 1939 (Nr. 25—27), and "Mémoires du Musée Royal d'Histoire Naturelle de Belgique" ser. 2, part 2, 1935 (Nr. 13). In this series publications of W. Michaelsen (Nr. 2, Oligochaeta), H. Augener (Nr. 3, Polychaeta), Walter Rammner (Nr. 4, Phyllopoda), Walter Klie (Nr. 5, Ostracoda), P. A. Chappuis (Nr. 6, Harpacticoida), Friedrich Kiefer (Nr. 7, Cyclopoida), K. Stephensen (Nr. 8, Amphipoda), C. Willmann (Nr. 10, 20, Oribatidae), Max Beier (Nr. 21, Chernetes) and M. Sanders (Nr. 22, Pisces) dealt with the land and freshwaterfauna.

In 1936 and 1937 I again visited the same islands, the main object being to investigate the land and freshwaterfauna. The field was however extended to the Venezuelan islands and a short visit was made to some parts of the adjacent continent for comparison.

Margarita was traversed by car, with Porlamar as head-quarters (10.V.—8.VI., 20—24.VI., 29.VI.—18.VII., 4.VIII.—13.VIII. '36). The islands South and East of Margarita, and the coast of the state of Sucre were visited by a 4 ton sailing boat (21.V., 9.VI.—19.VI., 25.VI.—28.VI.); the islands to the West, as far as the Aves de Barlovento, were reached by a 10 tonner (19.VII.—4.VIII.). On Curaçao (21.VIII.—12.XI., 16.XI.—2.XII. '36, 3—12.III., 2—4.IV. '37), Aruba (4.XII. '36—13.I. '37, 29.I.—

13.II., 25.II.—2.III. '37) and Bonaire (13—15.XI. '36, 22.III.—1.IV. '37) I stayed at Piscadera Baai, Oranjestad and Kralendijk. A coaster brought me to Las Piedras, whence I visited the interior of the peninsula of Paraguaná (14.II.—24.II. '37), and to Puerto López, from where I crossed the peninsula of La Goajira to Rio Hacha and the Cabo de la Vela (14.I.—28.I. '37).

My grateful thanks are due to the Netherlands and Venezuelan authorities whose kind assistance made travelling with heavy luggage smooth and pleasant, and to everybody else who facilitated my work. My weakness for the West Indies has been really intensified by the friendly and helpful attitude of the natives, which I encountered even in the most remote spots of the Caribbean.

With special gratitude I must refer to the kind gesture of Dr. E. Heldring, through whom the useful and helpful services of Mr. Chr. L. Bakker, inspector of the Royal Dutch Steamship Company at Caracas, were placed at my disposal. Mr. Bakker officially prepared my visit to Margarita and Paraguaná and brought me in touch with the family Abouhamad at Porlamar, who were very kind to me during my stay in Margarita and whose help proved indispensable. The kind assistance of Clemente Sibú and his family, whilst staying at "Hotel Central" in Porlamar, must also be mentioned. On Paraguaná I was the guest of the Mene Grande Oil Company's Terminal Las Piedras.

My thanks too must be offered for the car placed at my disposal by Mr. L. Wagemaker and Mr. J. M. St. van Eps, the "gezaghebbers" of Aruba and Bonaire, but the greatest piece of luck was when the "N.V. Curaçaosche Petroleum Industrie Maatschappij", represented by Mr. W. van Eijk, spontaneously loaned me a car for three months, and in that way made possible an extensive exploration of the island of Curaçao.

Lastly I should like to emphasize that, without the unending generosity and interest shown by my parents, my neotropical investigations would be altogether out of the question.

CLIMATE.

The islands are strongly exposed to the tradewinds, which blow with great steadiness nearly the whole year, directions not differing much from ENE and E, with a mean velocity of about 5 m sec. (3,4 Beaufort) [Table 1 and 2]. The seawind blows with only slightly diminished force also during the night, rendering the heat less oppressive than the high daily means of temperature would suggest. Only one temperature maximum occurs in the course of the year, August and September being considered the hottest months, January and February the coolest; the difference between highest and lowest monthly means however, rarely exceeds 4° C [Table 3].

The islands are just S of the most southernly hurricane-tracks, only occasionally cyclones exert their influence at a fairly safe distance.

According to its marine situation, the mean relative humidity is always rather high, the year-mean for Curaçao being about 75 %. The degree of cloudiness is rather low. Even in the rainy season drizzling weather is rare and the rain falls in short-lived showers, followed by a rapid clearing. Cloudiness is highest in the morning, lowest at noon and again increasing before sunset. On Margarita the highest part of the mountains are frequently wrapped in clouds during twilight, night and dawn.

The mean evaporation of a free watersurface on Curaçao, calculated from monthly means by M o l e n g r a a f f, may be estimated at 4.5 (Dec.)—7.5 (Aug.) mm a day.

The Leeward Group wholly falls within the area of low rainfall which extends along the N-coast of South America, between the mouths of the Río Orinoco and that of the Magdalena. The climate of this isolated dry region belongs to the "steppe-climates" of K ö p p e n, which are defined by a rainfall of 340—680 mm a year, if the annual temperature is 27° C. Several scattered smaller areas are certainly still dryer and may therefore fall within the "desert-climates" of K ö p p e n. The higher mountains of Margarita and, in less degree, also the highest tops of Tamarindo and Curaçao, may receive considerably more rain and form wet islands in a dry surrounding.

TABLE 1.

Wind at Willemstad (from Braak, 1935)

	Jan.	Febr.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Fort Amsterdam, 1910—Juni 1921 (surrounding buildings made the site of observation unfavourable)													
Mean windforce (Beaufort)	2.6	2.7	3.0	3.1	3.2	3.5	3.3	2.9	2.7	2.1	1.8	2.2	2.8
Mean windvelocity (m. p. s.)	3.5	3.7	4.4	4.5	4.8	5.3	4.8	4.1	3.6	2.7	2.2	2.8	3.9
Direction wind-vector (N...E)	85°	85°	84°	86°	87°	87°	87°	88°	89°	89°	87°	86°	87°
Stability (%)	97	97	98	98	98	99	98	97	98	94	95	98	97
Cas Chiquito, July 1921—1926 (a little farther from the sea but in a more favourable position)													
Mean windforce (Beaufort)	3.1	3.1	3.5	3.9	4.1	4.0	3.8	3.6	3.2	2.6	2.4	2.6	3.3
Mean windvelocity (m. p. s.)	4.5	4.5	5.3	6.1	6.5	6.3	5.9	5.5	4.7	3.5	3.1	3.5	4.9
Direction wind-vector (N...E)	94°	94°	90°	94°	96°	94°	97°	97°	98°	99°	91°	91°	95°
Stability (%)	93	94	93	96	95	96	94	92	90	84	88	91	92

TABLE 2.

Frequencies of windforce and winddirection, numbers for 10000 observations, at Willemstad (Fort Amsterdam), 1910—Juni 1921.

(from Braak, 1935; surrounding buildings made the site of observation unfavourable)

Beaufort	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	Total
0	—	—	—	—	—	—	—	—	—	—	—	—	—	474
1	4	2	63	164	596	51	35	4	14	1	6	—	2	942
2	3	1	88	389	1460	60	54	3	5	2	2	—	—	2067
3	2	1	81	544	3223	66	29	2	2	2	3	—	3	3958
4	—	—	24	247	1771	20	7	—	—	—	1	1	—	2071
5	—	—	6	59	383	4	—	—	—	—	—	—	—	452
6	—	—	—	6	27	1	1	—	—	—	—	—	—	35
7	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	9	4	262	1409	7461	202	126	9	21	5	12	1	5	10000

TABLE 3.

Temperature

Willemstad from Braak, 1935; Maracaibo from Jahn, 1934.
Las Piedras from the original records of the Mene Grande Oil Co. C.a.

	Las Piedras (1927-29, 1931-36)			*Willemstad* (1910-1933)					*Maracaibo* (1915-1931)		
	Mean	Mean min.	Mean max.	Mean	Mean min.	Mean max.	Abs. min.	Abs. max.	Mean	Mean min.	Mean max.
Jan.	26,5	21,8	31,2	25,8	23,1	28,6	20,1	30,5	27,1	23,7	31,0
Febr.	27,0	22,2	31,8	25,8	23,1	28,7	19,0	32,6	27,2	23,9	31,3
March	27,9	23,0	32,8	26,2	23,5	29,2	17,0	32,2	27,6	24,5	32,0
April	28,7	24,0	33,4	26,8	24,3	29,7	20,1	32,5	28,2	25,2	32,4
May	29,5	24,8	34,2	27,5	25,0	30,4	21,0	35,5	28,1	25,7	33,0
June	29,7	25,0	34,4	27,6	25,1	30,5	21,5	34,3	28,8	25,9	33,1
July	30,0	25,2	34,8	27,7	25,0	30,5	22,0	34,5	29,1	25,8	33,4
Aug.	30,4	25,4	35,4	28,1	25,4	31,1	21,5	35,0	29,0	25,8	33,4
Sept.	30,6	26,0	35,2	28,5	25,8	31,5	21,5	35,6	28,6	25,5	32,4
Oct.	30,7	25,6	35,8	28,2	25,5	31,0	21,0	34,5	28,1	25,0	31,5
Nov.	28,6	24,6	32,6	27,5	24,6	30,2	20,0	33,5	27,6	25,0	30,9
Dec.	26,8	22,6	31,0	26,7	23,9	29,2	20,4	32,3	27,5	24,4	30,9
Year	28,9	24,2	33,6	27,2	24,5	30,0	17,0	35,6	28,1	25,0	32,1

In Curaçao, Aruba, Bonaire and, probably, the neighbouring islands as far as Orchila, the rainfall is scarce from February till September. On Curaçao the precipitation in the dry-season is about 200 mm, against 350 mm in the wet-season, October till January. A similar relation exists in Paraguaná and La Goajira. On the eastern Venezuelan Islands however, the heaviest rain falls later in the season, while the midsummer-rains are also important, being the main water supply of the opposite mainland [Table 4]. The distribution of the rainfall is rather irregular, owing to the frequent occurrence of local showers.

On Curaçao the number of rain-seasons, in which the precipitation is less than the mean rainfall, is larger than the number in which it is more. If, during the rain-season there is less than the mean, we might add these four months to those of the dry-season, getting in this way the notion of dry-period, which lasts at least 8 + 4 + 8 months. By a succession of poor rain-seasons

TABLE 4.

Mean Rainfall

Carúpano, La Asunción in part, Cumaná, Coro and Maracaibo from Pittier, 1936; Kralendijk, Willemstad and Oranjestad from Braak, 1935; La Asunción in part and Las Piedras from the original records.

	Carúpano (1920-33)	La Asunción (1920-29, 1931-35)	Cumaná (1919-31)	La Guaira (1920-33)	Kralendijk (1905-33)	Willemstad (1894-1933)	Oranjestad (1901-1933)	Coro (1920-33)	Las Piedras (1927-29, 1931-36)	Maracaibo (1915-31)
Jan.	45	**93**	5	27	55	55	50	19	12	3
Febr.	30	41	4	20	27	26	14	5	9	1
March	27	25	4	28	15	22	14	17	4	4
April	19	6	3	20	16	21	14	11	5	15
May	55	10	10	33	12	12	11	30	16	59
June	**162**	42	25	56	16	22	13	12	8	61
July	**132**	44	43	38	26	30	23	35	8	54
Aug.	109	36	**56**	33	24	34	23	21	16	53
Sept.	71	32	**51**	65	39	32	35	44	41	75
Oct.	58	31	29	42	70	**90**	**67**	**59**	**87**	**121**
Nov.	77	48	47	**74**	**122**	**126**	**109**	**75**	**99**	79
Dec.	92	**99**	44	62	**90**	**89**	**74**	42	49	13
Year	877	507	321	498	511	559	447	370	354	538
Minim.	439 (1920)	96 (1924)	56 (1919)	201 (1930)		137 (1930)		107 (1920)	138 (1929)	256 (1930)
Maxim.	1431 (1933)	1271 (1927)	851 (1931)	1403 (1927)		1075 (1906)		763 (1932)	663 (1933)	1179 (1931)

such a dry-period may extend for several years. M o l e n g r a a f f determined, largely on rainfall-observations of the last 200 years, the following dry-periods for Curaçao: 3 periods of 68 months, 3 of 56, 3 of 44, 3 of 32 and 10 of 20 months. Probably such unfavourable conditions also occur in other parts of this dry region.

SURFACE-WATER.

The drainage area being mostly hilly and little wooded, the weathered surface layers thin and the showers heavy, much rainwater runs straight to sea. Therefore many valleys are dammed for agricultural purposes, changing the surfacewater into groundwater. The accumulated water usually gets a bad composition and dries up; often wells are dug behind the dams for drinking and irrigation purposes.

In the limestone region most of the rainwater quickly reaches the watertable and often runs along the surface of the underlying and more impervious rock. Where this horizon is exposed springs are to be expected. These hillside springs are often permanent, although clearly influenced by the rainfall (e.g. Hato and San Pedro on Curaçao, Fontein in Bonaire and Aruba).

In the lower limestone regions, every hole and fissure which reaches the watertable, may be connected with large cavities filled with fresh or brackish water. The cavern-water has pushed aside the seawater and is often clearly in balance with it. In the limestone-plateau of southern Bonaire the watersurface in such holes after rains quickly reaches again its normal level, scarcely lowering in the dryest periods. In several of these holes, as far as and more than 1 km from the shore (Pos Calbas), oscillations of the watertable may be observed, which must be associated with the tide.

In the non-calcareous regions permanent springs are less frequent. On Curaçao four or five occur in the neighbourhood of the Seroe Christoffel and on Bonaire one exists on the northern slope of the Brandaris. On Aruba there are more, even forming rivulets, which however are of little importance owing to their high salinity.

On Margarita, several small streams find their way down from

the Cerros de Copey, swelling no doubt during rains to torrents, but in the dry season they become rather insignificant brooklets, drying up long before reaching the sea, and are scarcely sufficient to supply the more populated centres with drinkwater.

VEGETATION.

Resulting from the unfavourable rainfall-conditions, the "tropical dry-forest" vegetation has a pronounced xerophytic character, dominated by deciduous and thorny shrubs of Euphorbiaceae, Mimosaceae, Papilionaceae, Rubiaceae and cactuses. Frequently it has been developed as an open vegetation with scattered shrubs and occasional small trees. In Venezuela this type is called "espinares" or "cardonales", characterized resp. by a predomination of thorny shrubs and columniferous cactuses; on the Dutch Islands it may be generally called "Croton-vegetation", determined by *Croton flavens* and *Acacia*. The ground is very exposed, in a few places only a more coherent plantcovering has been more or less artificially obtained. Where desert conditions prevail or the soil is fully exposed to the tradewind, a very scanty plantlife may be observed. The sabana's of La Goajira and northern Falcón are very poor, having a richer grassy covering in wintertime only.

A poor "tropical semi-deciduous forest" vegetation may be found in a few protected places with more favourable rainfall-conditions. In the Cerros de Copey on Margarita a more abundant vegetation occurs, occasionally even being comparable with "tropical rainforest".

Along the sea-shore, also bordering the inland bays, a beach-vegetation may be found, often connected with a considerable growth of mangroves. Beach-vegetation appeared to be the only covering of several small islands, and the isolated rocks of Centinela and La Sola even were devoid of all plant life.

SOIL.

Nearly 30 % of the Leeward Group area consists of quaternary coralrock or coral-detritus; a very small area only is formed of older calcareous rock. On Curaçao, Aruba and Bonaire the higher

situated beds must have belonged to a limestone-cap, extending over the greater part of the islands, which is rarely more than 30 m thick. These beds are bordered by lower and younger limestone terraces near the sea. The limestone generally shows a "lapiés" or "Karren" habit, while the rock has been weathered into a reddish-brown substance which has been washed into caverns or removed by the wind. Many caves exist, often still filled with the groundwater, which are made accessible by collapse of the roof or exposure through an escarpment. In the higher parts, water and wind have created a cuesta-landscape, broad valleys with steep escarpments or narrow gorges, while near the coast the sea has modelled chasms and large coves. Tortuga, Las Aves, Klein Bonaire, Klein Curaçao and the Roques Islands, with exception of El Gran Roque, consist of corallogeneous material only. No limestone exists on the Testigos Islands, Los Frailes, Los Hermanos and Centinela.

The non-calcareous soil consists of igneous and sedimentary rock of various composition. In the dry season a rather constant aerial drift of finely weathered material may be observed, depriving the hills of their most valuable soilmaterial, which enriches the detritus-deposits towards the W and SW, but for the greater part is lost in the sea.

HISTORY.

Margarita was discovered by Cristóbal Colón in 1498; Curaçao by Alonso de Ojeda in 1499.

The interest of the visitors was keenly focussed on gold, pearls and slaves. At first the northcoast of South America was only occasionally ransacked, but soon this was more systematically done by the Spaniards from the settlements of Cumaná (1522), Coro (1527) and Santa Marta (1525), ably assisted by the Welser-firm from Augsburg until 1546. At this time the chief trade of the Spaniards had already been transferred to more inland centres, such as Caracas, Valencia, Mérida and Bogotá.

The pearlfisheries near Margarita were primarily organized from Cumaná; at first they were very profitable and even the

desert-island of Cubagua founded a settlement, but soon the great profits were cut down and Cubagua was abandoned. Nowadays, the pearlfisheries South of Margarita, strictly controlled by the Venezuelan Government, are still of importance, whilst those on the western coast of the peninsula of La Goajira have more obviously decreased.

The original inhabitants of Curaçao, Aruba, Bonaire and the opposite mainland, were the Caquetios, belonging to the Arowaks, while the inhabitants of Margarita and the adjacent continent were the Guaiqueris, belonging to the Caribs. The small part which survived the first contact with European civilisation was soon assimilated, only the indians from the Goajira-peninsula remained.

Curaçao was seized by the Dutch in 1634, as a base against the Spaniards. They searched for salt and logwood. Salt was chiefly taken from the pans of Punta de Araya and of Tortuga; later their want was provided by the salt industry of Bonaire, Curaçao and St. Martin. Logwood (*Haematoxylon Brasiletto*) was especially collected on Bonaire, Tortuga, Curaçao and Paraguaná.

Owing to its favourable situation and excellent anchorage, Curaçao soon became a centre of illicit trading and an important slave-market. Besides all this, much attention was given to planting. After the emancipation set-back in 1862 many experiments were carried out to improve agriculture and cattle-breeding, but without lasting success, leaving the shipping of Willemstad the only important feature of the colony. Some phosphate- and goldmining in Aruba, already stopped in 1916, and a more endurable exploitation of the phosphate-layers of Curaçao brought new profits, whilst the opening of the Panamá-canal greatly improved Curaçao's position in world-trade. The most drastic alterations however were connected with the development of the petroleum industry in the Maracaibo-basin, which gave rise to the establishment of large refineries on Curaçao and Aruba.

Margarita has seen fewer changes. Agriculture largely filled the local wants but has never been very important, and the mining of magnesite near Paraguachí was short-lived. The salt industry, a government monopoly, is extensively carried out along

the coasts of Sucre, Falcón and Zulia, on the island of Coche and on the western shore of La Goajira.

It is rather difficult to get an idea of the island-region vegetation in former days. The interest of the visitors was obviously concentrated on useful plants and the statements of the inhabitants were invariably biased. Although the first travellers already do not give a very cheerful account of the vegetation, yet it is without doubt that human agency has badly influenced the plantlife of this region. Especially in the beginning much has been carelessly cut down for private use, commerce or arable land. Charcoal-burning was always an important business. Goats were kept on a large scale and permitted to run wild even on the smallest island.

Along the Venezuelan mainland-coast the "espinares" and "cardonales" are distinctly spreading at the cost of the dry-forest, whilst the enormous extension of xerophytic associations in the basin of the Río Tocuyo is also due to wood-destruction. Very probably the greater part of the island-area is covered with second-growth, which might be rather poor in comparison with the original vegetation. It is not certain that this vegetation will even re-establish itself; in the mean time the weathered soil has been largely removed by wind and water and because of this much ground is hopelessly spoilt.

It is not impossible that, by altering the vegetation, human agency has noticeably changed the macro-climate, although there are no data which point to such a change in historical time. The occurrence of an isolated dry region along the northern coast of South America is generally explained by the presence of cold water, welling up from deeper layers, because the equatorial-current has been forced to move away from the continent beyond Trinidad; therefore it is not very probable that the climatological conditions have changed much since pleistocene time. On the other hand, the common occurrence of extensive weathered dripstone formations and the lack of important active dripstone deposits, show that the climate of Curaçao, Aruba and Bonaire must have been considerably less arid for some time, after the emergence of the lower limestone terraces.

It is clear that the arrival of man with his wood-destruction, land-cultivation and introduction of plants, cattle, fowl and domestic animals, has seriously impaired the local fauna. Animal life was constantly threatened. Turtles nowadays are very rare near the Dutch Islands, but in 1737 their slaughtering in Willemstad was prohibited because of the nasty smell. An order was issued the same year, protecting the booby's which occured in great numbers on Klein Curaçao, but which have at the present time entirely disappeared from this and the neighbouring islands. In 1926 several useful animals were protected in the territory of Curaçao; in 1931 this too was extended to some which were becoming extinct.

THE TERRITORY.

LOS TESTIGOS.

Eleven islands or island-groups, seven being of considerable size. Greatest distance between two islands estimated at 10 km; total area est. 4 km². Highest point abt. 200 m. Only the Morro de la Iguana and Tamarindo inhabited.

Morro de la Iguana.

Situated 11°21'30" N. Lat., 63°5'30" W. Long. Gr.; 1½ km S of Tamarindo, 70 km from the continent; separated from the latter by water of 60 m deep. Greatest length est. 1½ km, width ⅔ km; area est. ⅔ km². Highest point est. 100 m. Inhabitants (1936) 44.

Consisting of granitic rocks. Higher parts with a considerable growth of shrubs and small trees. A minor centre of fisheries.

Chiwo.

Situated 11°21'30" N. Lat., 63°5'30" W. Long.; 200 m N of the Morro de la Iguana. Greatest length est. 300 m, width 100 m; area est. $^1/_{50}$ km². Highest point est. 20 m.

Consisting of granitic rocks. With some growth of shrubs and small trees.

Angoletta.

Situated 11°22' N. Lat., 63°5'30" W. Long.; 200 m S of Tamarindo, 1 km N of Chiwo. Greatest length est. 80 m, width 25 m; area est. $^1/_{1000}$ km². Highest point est. 10 m.

Consisting of porphyrites. With a considerable growth of herbs and shrubs.

Tamarindo (Testigo Grande).

Situated 11°22'—11°24' N. Lat., 63°5'—63°7' W. Long.; 72 km from the continent, 155 km WSW of Grenada; separated from the former by water of 60 m deep, from the latter by water of abt. 1000 m. Greatest length est. 4 km, width 1 km; area est. 2½ km². Highest point abt. 200 m. Inhabitants (1936) 3.

Consisting of granitic rocks. Lee-side covered by a considerable growth of shrubs, the higher parts even rather densely wooded with small trees.

Isla de Conejo.

Situated 11°24' N. Lat., 63°5' W. Long.; 2½ km NNE of Tamarindo. Greatest length est. 1¼ km, width ½ km; area est. ½ km². Highest point est. 80 m.

Consisting of porphyrites. Lee-side with a rather considerable growth of shrubs and small trees.

LA SOLA.

Situated 11°20' N. Lat., 63°34' W. Long. Gr.; 24 km NE of Puerto Real, 50 km W of Tamarindo; separated from both by water of 40—50 m deep. Greatest length estimated at 30 m, width 15 m; area est. $^1/_{3000}$ km². Highest point est. 7 m.

Consisting of an unknown kind of rook. Devoid of plant-life. (not visited)

LOS FRAILES.

Seven islands of considerable size and several rocks. Greatest distance between two islands estimated at 9 km; total area est. 1½ km². Highest point est. 100 m. Uninhabited.

Puerto Real.

Situated 11°11′—11°12′ N. Lat., 63°43′40″—63°44′50″ W. Long. Gr.; 13½ km NE of Margarita; separated by water of 30 m deep. Greatest length est. 2½ km, width ½ km; area est. ¾ km². Highest point est. 100 m.

Consisting of diabases and diorite. The vegetation is rather scanty, the lee-side only has often a considerable growth of low shrubs, cactuses predominating.

La Pecha.

Situated 11°12′—11°12′30″ N. Lat., 63°45′—63°45′30″ W. Long.; ¾ km NE of Puerto Real. Greatest length est. 1¼ km, width ²/₅ km; area est. ¼ km². Highest point est. 60 m.

Consisting of porphyrites. Lee-side with a considerable growth of low shrubs.

COCHE.

One large island and a couple of rocks.

Situated 10°44′—10°47′50″ N. Lat., 63°53′40″—63°59′50″ W. Long. Gr.; 9 km S of Margarita, 9 km from the continent; separated from the former by water of 50 m deep, from the latter by water of 10 m. Greatest length 11⁴/₅ km, corresponding width 5³/₅ km; area 50 km². Highest point abt. 60 m. Inhabitants (1926) 2865; San Pedro. Exports: salt.

The island is flattened and consists chiefly of thick deposits of non-calcareous debris lying on weathered schists.

The vegetation is very scanty, mainly composed of scattered shrubs and cactuses.

Centre of salt-manufacture and pearl-fisheries.

CUBAGUA.

One large island and a couple of rocks.

Situated 10°47′50″—10°50′20″ N. Lat., 64°8′40″—64°13′50″ W. Long. Gr.; 9 km S of Margarita, 15 km from the continent; separated from the former by water of 30 m deep, from the latter by water of 60 m. Greatest length 9²/₅ km, corresponding width 4²/₅ km; area 26½ km². Highest point abt. 60 m. Inhabitants (1936) abt. 30.

The island is flattened and consists chiefly of limestones.

The vegetation is very scanty, scattered cactuses predominating.

Recently inhabited by fishermen. The spanish settlement of Nueva Cádiz was abandoned in the 16th century.

MARGARITA.

One large island, one small islet and a couple of rocks.

Situated 10°51′40″—11°10′35″ N. Lat., 63°47′—64°24′40″ W. Long. Gr.; 22 km N of the continent; separated by water of 50 m deep. Greatest length

70 km, corresponding width 33 km; area, without inland-waters, abt. 850 km². Highest point 990 m (El Copey). Inhabitants (1926) 69392; Porlamar 10547, Punta Piedras 9060, La Asunción 7744, Juan Griego 4169, Santa Ana 3992, San Juan Bautista 3505, El Valle 3201, Pampatar 2722. Exports: dividivi, pearls, dried fish, straw hats, goatskins.

The island is composed of two parts, connected by a long, narrow wall of sand and coral-debris, between which is the large Laguna de Arestinga.

The central part of eastern Margarita consists of several metamorphic rocks, e.g. gneisses, mica-schists, serpentine-schists and marbles; in some localities other rocks occur which are very probably of granitic origin. In the SE there are considerable areas of calcareous shales and sandstones. The western part of the island, Macanao, also has a crystalline basement. In the S and the W thick layers of sand and non-calcareous debris have been deposited. Coral-limestone terraces occur in SW-Macanao and, in a lesser degree, at a few places near the S- and N-coast.

The vegetation of the coastal plains is usually very scanty; the lee-side of the hills however, is often covered by a considerable growth of shrubs, while the upper parts of the Cerros de Copey are densely wooded, with large trees in favourable localities. In some higher valleys the vegetation may even be rather hygrophytic.

The greater part of the inhabitants of San Juan Bautista, El Valle, La Asunción and Santa Ana are agriculturalists; principle products being corn, sugar cane, beans, bananas, coconuts, cotton, yuca, batates, dates, pineapple, mango, guayaba and citrus fruit.

Isla Blanca.

Situated 10°57'50" N. Lat., 63°47'50" W. Long.; 2 km E of Margarita; separated by water of 16 m deep. Greatest length 100 m, width 50 m, area estimated $^1/_{400}$ km². Highest point abt. 30 m. Uninhabited.

Consisting of phosphatized clastic rock, with guano-deposits. Only a few plants of *Philoxerus vermicularis* occurring.

LOS HERMANOS.

Five islands of considerable size and one small island, some accompanied by a couple of rocks. Greatest distance between two islands estimated at 15 km; total area est. 4 km². Highest point abt. 200 m. Uninhabited.

Morro Fondeadero.

Situated 11°44' N. Lat., 64°25' W. Long. Gr.; 22 km E of Blanquilla, 75 km N of Margarita; separated from the latter by water of probably more than 200 m deep. Greatest length est. 1 km, width ¾ km; area est. ½ km². Highest point est. 80 m.

Consisting of amphibolites, diorites and gabbros. With a rather considerable growth of shrubs and cactuses on the flattened top.

Morro Pando (Orquilla).

Situated 11°48' N. Lat., 64°26' W. Long.; 16 km E of Blanquilla, 7 km N of Morro Fondeadero; separated from the former by water of probably 100 m deep.

Greatest length est. 2 km, width 1¾ km; area est. 2 km². Highest point abt. 210 m.

Consisting of diorites. Lower lee-side covered by a considerable growth of shrubs, cactuses predominating; other parts with a more scanty plantcovering.

BLANQUILLA (Isla Blanca).

Situated 11°49′—11°55′ N. Lat., 64°35′—64°39′ W. Long. Gr.; 155 km E of Orchila, 115 km NE of Tortuga; separated from both by water of probably more than 1000 m deep. Greatest length 11½ km, corresponding width 6½ km; area abt. 45 km². Highest point abt. 60 m. Inhabitants (1936) 8.

The greater part of the island consists of a flat diorite landscape with gently sloping hills. Nearly 25 % of the area is occupied by coral-limestone, broadly capping the older rocks along the E-coast, and occurring as a very narrow, frequently interrupted border along the S- and SE-shore.

The landscape often has a sabana-like appearance, with grassy diorite hills and scattered bushes. The bays on the S-coast are lined with mangroves.

There is some cattle-breeding and several small coconut-groves occur in the S.

TORTUGA.

One large island with four small islets N and NW, a couple of rocks and a fragmentary reef along the S-coast.

Situated 10°54′30″—11°0′ N. Lat., 65°12′—65°24′30″ W. Long. Gr.; 77 km E of Centinela, 83 km from the continent; separated by water of abt. 200 m deep. Greatest length 23 km, corresponding width 10 km; area abt. 140 km². Highest point abt. 30 m. Usually uninhabited.

The island consists of coral-limestone in which three terraces of varying height may be distinguished.

It generally has a rather considerable growth of shrubs and small trees with cactuses. The S-shore is often lined with mangroves.

The SE-coast is frequently visited by fishermen and has abandoned salt-pans.

CENTINELA.

One small island with a rock-flat of abt. 2 m high, estimated at 300 m NNW.

Situated 10°48′ N. Lat., 66°6′ W. Long. Gr.; 110 km S of Orchila, 25½ km from the continent; separated from the former by water not exceeding 1000 m, from the latter by water of abt. 90 m deep. Greatest length est. 100 m, width 50 m; area est. 1/300 km². Highest point est. 20 m. Uninhabited.

Probably consisting of hornstone. Devoid of plant-life.

ORCHILA.

One large island, four islands of considerable size and several small islands and reef-fragments. Greatest distance between two islands 14 km; total area estimated at 32 km². Highest point abt. 120 m. Uninhabited.

The smaller islands are formed by a low terrace of coral-rock or are sandy keys with walls of coral-debris and low dunes. The most northern island was exploited for guano about 50 years ago.

Huespen.

Situated 11°47′—11°49′ N. Lat., 66°6′—66°13′30″ W. Long. Gr.; 52 km E of El Gran Roque, 128 km from the continent; separated from the former by

water of abt. 1400 m deep, from the latter by water probably not exceeding 1000 m. Greatest length 13½ km, corresponding width abt. 3 km; area abt. 25 km². Highest point abt. 120 m.

The island consists of several outcrops of granitic rocks and gneisses, connected by a very low limestone terrace, occupying abt. 70—80 % of the area, which is partly covered by sand and other detritus.

It has a scanty vegetation with some scattered cactuses and a few low shrubs.

LOS ROQUES.

One large island (according to the map), several islands of considerable size and a hundred or more small islands and reef-fragments. Greatest distance between two islands abt. 35 km; total area of the smaller islands estimated at 5 km², together with the large island — generally indicated on the map as "Cayo Grande" but not found by the author — possibly abt. 60 km². Highest point 123 m. Only El Gran Roque inhabited.

El Gran Roque.

Situated 11°57′—11°58′ N. Lat., 66°40′—66°42′ W. Long. Gr.; 77 km E of Ave de Barlovento, 145 km from the continent; separated from the former by water of probably more than 1000 m deep, from the latter by water of abt. 1200 m. Greatest length 3⅕ km, corresponding width 1 km; area, without inland waters, 1⅓ km². Highest point 123 m. Inhabitants (1936) 320.

The rocky part, consisting of granitic rocks, amphibolites and phosphorites, is very steep and has only on its SE-side considerable deposits of debris, which gradually pass into a sandy beach enclosing some shallow lagoons.

The rocky soil has a very scanty vegetation, without ordinary shrubs or trees. The detritus has only beach-vegetation with remnants of a considerable growth of *Rhizophora*.

A rather important centre of fisheries. The W-part has phosphorite-veins which are of little commercial value.

Isla Larga.

Situated abt. 11°54′ N. Lat.., 66°48′ W. Long.; abt. 6 km SW of El Gran Roque. Greatest length est. 5 km, width 1/10 km; area est. 1/5 km². Highest point est. 5 m.

Consisting of a wall of coral-debris, running E—W, with low dunes, occasionally broadened to a sandy area. It has beach-vegetation with some growth of *Rhizophora*.

Cayo de Agua.

Situated abt. 11°53′ N. Lat., 66°55′ W. Long.; abt. 25 km WSW of El Gran Roque. Greatest length est. 2 km, width 1/3 km; area est. 1/3 km². Highest point est. 10 m.

A sandy key, running E-W, with dunes; the W-part being connected to the main-part by a narrow sandspit of 200 m long, submerged at high tide. It has beach-vegetation, excepting seven miserable date-palms growing in the centre, and seven poor coconuts which occur in the W-part of the island.

LAS AVES.

Two or three islands of considerable size and a hundred or more small islands and reef-fragments, distinguished as Aves de Barlovento and Aves de Sotavento. Greatest distance between two islands abt. 30 km; total area estimated at 1½ km². Highest point est. 5 m. Probably uninhabited.

Ave de Barlovento.

Situated 11°27′ N. Lat., 67°25′ W. Long. Gr.; 85 km E of Bonaire, 24 km E of Ave de Sotavento, 152 km from the continent; separated from the former by water of probably more than 1000 m deep, from the latter by water of abt. 1800 m. Greatest length est. 3 km, width 1/7 km; area est. 1/10 km². Highest point est. 4 m.

Consisting of a wall of coral-debris, running E-W, which in the S. is broadened to a sandy area with very low dunes. It has beach-vegetation with a considerable growth of *Rhizophora*.

BONAIRE.

One large island and one much smaller island.

Situated 12°2′—12°19′ N. Lat., 68°12′—68°25′ W. Long. Gr.; 40 km E of Curaçao, 87 km from the continent; separated from the former by water of 1500 m deep, from the latter by water of 1700 m. Greatest length 35 km, corresponding width 11 km; area, without inland-waters, abt. 265 km². Highest point 243 m (Brandaris). Inhabitants (1937) 5565; Kralendijk, Rincón. Exports (1937): charcoal (59000 fl.), aloe-resin (58000 fl.), goats and sheep (15000 fl.), dividivi (12000 fl.), salt (5500 fl.), manure (4500 fl.).

The island mainly consists of: 1. The "Washikemba" formation, diabase and porphyrite, lavas and tuffs, with intercalations of cherts and limestones; forming the greater part of the hills, including the highest top. 2. A series of limestones and conglomerates, called "Rincón" formation and "Soebi Blanco" conglomerate, occurring only in small areas in the central part. 3. A deposit of upper-eocene marl SE of Fontein. 4. A quaternary limestone formation which occupies 65—70 % of the island area, encircling the older formations, forming table-mountains (up to 143 m) and a large plateau in the NE and in the S. In the NW hand-shaped bays occur; they are separated from the sea by a wall of coral-shingle and may be of considerable depth or entirely dry.

The greater part of the southern limestone plateau has beach-vegetation; this gradually passes into a *Croton*-vegetation which, in the higher parts, changes into a more forestlike type. Cereoidea are still more predominant than on the other islands, often entirely covering the hills. Bordering the Lac, probably the largest beach-forest of the Leeward Group occurs, its 1½ km² of *Rhizophora* being comparable only to the mangrove growth in the Laguna de las Maritas on Margarita.

A considerable part of the inhabitants are agriculturalists. Fruitgrowing is confined to small irrigated areas, called "hofjes", at Fontein and Bronswinkel.

Klein Bonaire.

Situated 12°9′—12°10′ N. Lat., 68°17′30″—68°19′30″ W. Long.; ¾ km W of Bonaire, separated by water of 42 m deep. Greatest length 4 km, corresponding width 2½ km; area abt. 7 km². Highest point 6 m. Uninhabited.

Consisting of a limestone-plateau. It has *Croton*-vegetation with some scattered trees.

KLEIN CURAÇAO.

Situated 11°59′—12°0′ N. Lat., 68°38′30″—68°39′ W. Long. Gr.; 11 km ESE of Curaçao, 61 km from the continent; separated from the former by water of 600 m deep, from the latter by water of 1400 m. Greatest length $2^2/_5$ km, corresponding width ¾ km; area abt. $1^1/_5$ km². Highest point nearly 3 m. Inhabited by 3 coast-guards.

Consisting of a coral-limestone plateau. It has a very poor beach-vegetation. In former days extensive guano-deposits have been levelled off.

CURAÇAO.

Situated 12°2′—12°23′30″ N. Lat., 68°44′30″—69°10′ W. Long. Gr.; 76 km E of Aruba, 64 km from the peninsula of Paraguaná, separated from the former by water of 1300 m deep, from the latter by water of 1400 m. Greatest length 59 km, corresponding width 11 km; area, without inland-waters, abt. 425 km². Highest point 372 m (Seroe Christoffel). Inhabitants (1937) 60.883; Willemstad 29000, Emmastad 24000. Exports (1937): oilproducts (117.382.000 fl.), phosphate (Tafelberg St. Barbara, 873.500 fl.), straw hats (291.000 fl.), dividivi (23000 fl.), orange-peel (2500 fl.), salt (1500 fl.).

The island mainly consists of: 1. A formation of diabases, exposed in two large areas, E and W, which are usually deeply weathered and much denuded. 2. The "Knip" beds, chiefly cherts and tuffaceous beds, cropping out in the most eastern part and forming the higher tops. 3. A few small areas of upper-cretacic "Seroe Teintje" limestone in the northern part of the island. 4. A somewhat larger deposit of upper-eocene "Seroe di Cueba" limestone in the N and probably also an eocene marl in the S, forming the Seroe Mainsjie. 5. The "Midden Curaçao" beds, composed of conglomerates, sandstones, shales and marls, chiefly occurring in the middle of the island. 4. A limestone formation which occupies 25—30 % of the island-area, partly encircling the older formations and forming conspicuous table-mountains (up to 230 m). Several hand-shaped bays occur, they may be of considerable depth or entirely dry.

The vegetation of Curaçao is nearly the same as that of Bonaire. On the diabase-hills in the E only a very scanty plant-life may be observed; the W however, is often rather densely wooded. The higher parts of the Seroe Christoffel have a rather different vegetation, more comparable with that of the lower parts of the Cerros de Copey.

Owing to shipping and industries, agriculture has been greatly neglected. Fruitgrowing in several "hofjes", and a little horticulture near Willemstad, is of local importance.

ARUBA.

Situated 12°24′30″—12°37′30″ N. Lat., 69°52′3″—70°4′ W. Long. Gr.; 27 km N of the peninsula of Paraguaná, 200 km E of the peninsula of La Goajira, separated from both by water of 180 m deep. Greatest length 30 km, corresponding width 8 km; area abt. 175 km². Highest point 188 m (Jamanota). Inhabitants (1937) 23.719; Oranjestad, St. Nicolaas. Exports (1937): oilproducts (149.303.000 fl.), aloe-resin, manure.

The island mainly consists of: 1. A diabase-schist-tuff formation, the principal rocks being diabases, cropping out in a hilly landscape which includes the highest top. 2. A quartzdiorite batholith with its differentiates, occupying the

greater part of the island. In distinction from the diabase landscape the diorite area is generally flat; one of the differentiates, "hooibergite", occurs as more or less steep hills (Hooiberg, 164 m), 3. A limestone formation which occupies abt. 35 % of the island area, partly encircling the older formations and forming rather conspicuous table-mountains (up to 135 m). A few handshaped bays occur, they are either entirely or almost dry. Dunes occur locally along the N- and E-shore. Along the S-coast lies a frequently interrupted shore-reef with a wall of coral-shingle and sand, up to 3 m above sea-level.

The vegetation of Aruba is largely comparable to that of Bonaire and Curaçao. The island is very scantily wooded; especially in the non-calcareous region in the N and the E a very scattered vegetation may be found. The reef has beach-vegetation with some growth of mangrove.

The agriculture was less affected by the industries than in Curaçao; the cultivation of *Andropogon Sorghum* is still of importance. Fruitgrowing is practically confined to the "hofje" of Fontein. The mining of gold and phosphate (Seroe Colorado) was of great importance until 1916.

LOS MONGES.

Three or four small islands and several rocks; distinguished as Monges del Sur, two islets to abt. 70 m high, Monge del Este, abt. 45 m high and Monges del Norte, seven rocks to abt. 45 m high. Greatest distance between two islands 14½ km; total area est. at ¼ km². Uninhabited. Monge del Sur consists of hornblende-rock and has little plant-life. (not visited)

CONTINENTAL COAST OF SUCRE.

Peninsula de Puerto Santo.

10°44′ N. Lat., 63°10′ W. Long.; connected with the mainland by a 1½ km long, sandy wall; length 1 km, width ½ km, area ¼ km²; highest point estimated 100 m. Uninhabited. Crystalline schists and marble. Considerable growth of herbs and shrubs with scattered small trees.

Morro de Puerto Santo.

10°44′ N. Lat., 63°10′30″ W. Long.; 200 m from the mainland, separated by water est. 5 m; length est. 1 km, width ⅔ km, area est. ⅓ km²; highest point est. 100 m. Uninhabited. Crystalline schists. Grassy plantcovering with scattered shrubs.

Morro de Esmerarda.

10°39′ N. Lat., 63°30′30″ W. Long.; 200 m from the mainland, separated by water est. 10 m; length ¾ km, width ½ km, area abt. ¼ km²; highest point est. 70 m. Uninhabited. Crystalline schists. Rather dense growth, cactuses rather predominating.

Morro de Chacopata.

10°41′—10°43′ N. Lat., 63°48′—63°49′30″ W. Long.; connected with the mainland by a 4 km long, sandy wall; length 3¼ km, width 2¼ km, area abt. 3 km²; highest point abt. 45 m. Inhabitants: est. 300. Thick deposits of non-calcareous debris with a few outcrops of schists. Very scanty vegetation.

Isla de Caribes.

10°42′ N. Lat., 63°51′30″ W. Long.; 2½ km from the continent, separated by water of 3½ m; length 1¼ km, width 2/5 km, area abt. 1/3 km²; highest point abt. 30 m. Inhabitants: est. 50. Chiefly schists. Scanty plantcovering with scattered bushes.

Lobos.

10°42′ N. Lat., 63°53′ W. Long.; 2¼ km E of Isla de Caribes, 6 km from the continent, separated by water of 18 m; combined length of the two islets ½ km, width ¼ km, area abt. 1/20 km²; highest point abt. 30 m. Usually uninhabited. Mainly schists. Considerable growth of herbs with scattered shrubs.

PENINSULA DE PARAGUANA.

11°36′—12°12′ N. Lat., 69°48′—70°18′30″ W. Long.; connected with the mainland by a broad, 25 km long wall of sand and coral-rock; length 68½ km, width 60 km, area abt. 2570 km²; highest point abt. 800 m. Inhabitants: estimated at 25.000. Limestones, marls and detritus-deposits, broadly encircling several outcrops of gabbroid rocks. Vegetation generally very scanty, cactuses often predominating. Exports: dividivi, goats. A crude oil transhipment-station at the bay of Las Piedras.

PENINSULA DE LA GOAJIRA.

Abt. 11°35′—12°28′ N. Lat., 71°6′30″—abt. 72°15′ W. Long.; connected with the mainland by a low plain of 40 km breadth; length abt. 120 km, width 75 km, area abt. 7000 km²; highest point abt. 800 m. Inhabitants: est. at 10.000. Several mountain-complexes of igneous and metamorphic rocks, often with considerable layers of sandstone and limestone, encircled by detritus-plains with occasional quaternary limestone-terraces. Vegetation generally very scanty, cactuses often predominating, only the protected central part with a richer plantcovering. Exports: some cattle, dividivi.

THE LOCALITIES.

A few localities in which collecting has been done in 1930 (cf. *Zool. Jahrb. Syst. 64,* pp. 289—326, 1933), are included without special numbering. A capital-letter after the station-number indicates a different habitat or a comparable habitat in another locality; an ordinary-letter indicates that the same habitat has already been studied before. — The water-temperature is given only if a constant value could be expected. Netherlands Governmental maps were used for the altitudes in Curaçao, Aruba and Bonaire; other values were estimated and therefore must be considered as inexact.

Proper names are not translated, therefore it may be useful to explain a few common terms which often have a special local significance:

spanish — papiamento or netherlandish — english
aljibe — pos, put — deep well
cerro — seroe, berg, heuvel — mountain, hill

cueva — cueba, spelonk, grot — cave
laguna — tanki; lagoen, lagune — large pond, lake; lagoon
manantial — bron — spring
morro — morro, klip, rots — rock, rocky island
poza — tanki, plas, vijver — pond
pozo — pos, put — well
quebrada, arroyo — rooi, dal, rivierbed — gully
saliña — salinja, zoutmeer, zoutvlakte — saltlake, salty mud-flat

At the same time attention may be drawn to the significance of the following terms which are often quite differently used:

West Indies — Antilles, Bahamas, Florida Keys, Bermuda, Cayman I.ds, Swan I.d, Old Providence, St. Andrews
Antilles — chain of islands from Cuba to Trinidad and Aruba
Greater Antilles — islands from Cuba to Puerto-Rico
Lesser Antilles — islands from Virgin I.ds to Trinidad and Aruba
Leeward Islands — from Virgin I.ds to Dominica
Windward Islands — from Martinique to Grenada
Caribbees — from the Anegada Passage and Sombrero to Grenada
Windward Group — from Virgin I.ds to Grenada (Bovenwindsche Eilanden, Islas de Barlovento, Inseln oben dem Winde)
Leeward Group — from Los Testigos to Aruba and Los Monges (Benedenwindsche Eilanden, Islas de Sotavento, Inseln unter dem Winde).

KEY TO THE FRESH AND BRACKISH WATER HABITATS.

I *Underground water*
A Connected with limestone: 56, 73; 40, 47, 48, 53, 54, 55, 57, 58, 61, 71, 72, 74, 76, 79, 80, 92, 94, 95, Pepe, Jatoe Largoe, Guajaká L., Gabriel, Blauwduif, Guajaká K.B.

II *Springs*
A Connected with limestone: 48, 71, 72, 74, 76, 77, 79, 80; 75, 93
B Unconnected with limestone: 44A, 86, 87, 102, 104; 15, 16, 17, 19, 21, 26, 88, 103

III *Running water*
A Rapidly or rather quickly streaming, or more quiet pools
A Connected with limestone
a at spring
bb rivulet 48, 71, 72, 76
b near spring
bb rivulet 71A, 72A, 74, 76A, 79
c at some distance of spring
cc brooklet 2
B Unconnected with limestone
a at spring
aa watertrack 104
b near spring
bb rivulet 17, 19, 88, 104A
c at some distance of spring
bb rivulet 15, 22, 27
cc brooklet 21, 26, 103

B Slowly or very slowly streaming

A Connected with limestone
a at spring
bb rivulet 77, 80
b near spring
aa watertrack 76B, 77A, 80A
B Unconnected with limestone
a at spring
aa watertrack 44A
bb rivulet 86, 102
b near spring
aa watertrack 87
bb rivulet 102A, 104B
c at some distance of spring
bb rivulet 16, 23
dd river 1, 115

IV *Stagnant water*

A With more or less regular underground water-supply
A Connected with limestone or coralsand
a in dark caves
aa never dry 56, 73
b connected with dark caves
aa never dry ..... 40, 47, 53, 54, 55, 57, 58, 61, 92, 93, 94, 95, Shiki, Pepe, Jatoe L., Guajaká L., Gabriel, Blauwduif, Guajaká K.B.
c with restricted underground circulation
aa probably never dry 9, 36, 39, 49, 52, 60, 64, 75, 112
bb probably rarely dry ..... 59, 64A, Oranjepan
B Unconnected with limestone or coralsand
a′ deeply or rather deeply dug
aa probably never dry 11, 14, 20, 29, 37, 41, 42, 45, 65, 84
b′ free or superficially dug
aa probably never dry ..... 35, 44, 66, Hoeba, Chikitoe
B Without more or less regular underground water-supply
A Connected with limestone or coralsand
aa probably never dry 63, 81, 105, 107, 108, 109
bb probably rarely dry 70, 96, 106
dd usually dry for several months a year ... 43, 62, 68, 69, 90, 91
B Unconnected with limestone or coralsand
aa probably never dry 13, 18, 38, 50, 78, 82, 83, 100, 110, 114
bb probably rarely dry 28, 30, 31, 32, 46, 67, 89, 101, 111, 113
cc usually dry for a few months a year 3, 4, 5, 6, 8, 10, 12, 24, 25, 51, 65A, 85
dd usually dry for several months a year 7, 33, 34, 97, 98, 99

KEY TO THE LAND HABITATS.

I *Strongly influenced by seawater*
- *1* Small island
  - aa rocky 156, 200, 200A
  - bb sandy 177, 178, 179, 179A, 278
- *2* Part of larger island or continent
  - aa rocky 247A, 253A
  - bb sandy 180, 247, 285, 287, 291

II *Not strongly influenced by seawater*
- 1 Island, more than 5 km from continent
  - *A* Usually swamped or moistened by groundwater
    - *a'* seriously affected by cultivation
      - a with limestone 192, 193
      - b without limestone 194
    - *b'* not seriously affected by cultivation
      - b without limestone 150, 161, 236
  - *B* Not usually swamped or moistened by groundwater
    - A Average rainfall more than 800 mm a year
      - *a* well protected from trade-wind
        - *b'* not seriously affected by cultivation
          - b without limestone 143, 144, 149
      - *b* rather protected from trade-wind
        - *b'* not seriously affected by cultivation
          - b without limestone 163, 163A, 163B, 234
      - *d* fully exposed to trade-wind
        - *b'* not seriously affected by cultivation
          - b without limestone 145, 146
    - B Average rainfall less than 800 mm a year
      - A' In cave-depth
        - a with limestone 141, 142, 183, 183A, 188, 189, 209, 218, 219, 219A, 250, 251, 251A
      - B' Not in cave-depth
        - *a* well protected from trade-wind
          - *a'* seriously affected by cultivation
            - a with limestone 216
            - b without limestone 155, 245
          - *b'* not seriously affected by cultivation
            - a with limestone 139, 140, 208, 238, 263
            - b without limestone 165, 197, 198, 233, 235
        - *b* rather protected from trade-wind
          - *a'* seriously affected by cultivation
            - a with limestone 257, 274, 220
            - b without limestone 147
          - *b'* not seriously affected by cultivation
            - a with limestone 173, 190, 207, 211, 213, 220, 231, 240, 244, 260A
            - b without limestone 136, 157, 162, 167, 168, 204, 205, 243A, 246

c rather exposed to trade-wind
a' seriously affected by cultivation
a with limestone 186, 259, 264
b without limestone 148, 172, 172A, 230
b' not seriously affected by cultivation
a with limestone 138, 173A, 175, 184, 184A, 185, 185A, 187, 190A, 191, 199, 199A, 201, 202A, 206, 210, 212, 215, 217, 221, 223, 224, 227, 228, 229, 232, 240A, 241, 242, 242A, 242B, 243, 248A, 249, 255, 256, 260, 260B, 265, 272, 272A, 275, 276
b without limestone... 131, 132, 133, 135, 151, 158, 160, 166, 169, 201A, 204A, 222, 229A, 245A, 268, 268B, 269, 277
d fully exposed to trade-wind
a' seriously affected by cultivation
a with limestone 258A, 262A, 265A, 271
b' not seriously affected by cultivation
a with limestone 130, 152, 153, 171, 172B, 181, 182, 195, 196, 202, 203, 213A, 214, 225, 226, 237, 239, 248, 253, 254, 258, 261, 262, 266, 267
b without limestone 129, 134, 137, 154, 159, 164, 168A, 170, 174, 176, 252, 252A, 268A, 270, 270A, 273

2 Continent, or island less than 5 km from continent
B Not usually swamped or moistened by groundwater
A Average rainfall more than 800 mm a year
a well protected from trade-wind
b' not seriously affected by cultivation
a with limestone 123, 124
b rather protected from trade-wind
b' not seriously affected by cultivation
a with limestone 125
d fully exposed to trade-wind
b' not seriously affected by cultivation
b without limestone 126
B Average rainfall less than 800 mm a year
b rather protected from trade-wind
b' not seriously affected by cultivation
a with limestone 122, 279
b without limestone 281
c rather exposed to trade-wind
b' not seriously affected by cultivation
a with limestone 282, 292, 293
b without limestone 121, 283, 288, 289, 294
d fully exposed to trade-wind
b' not seriously affected by cultivation
a with limestone 280, 290A
b without limestone 127, 128, 284, 286, 290

TABLE 5.

Water Analyses

„Rijksbureau voor Drinkwatervoorziening", Utrecht,
through the kind offices of Dr. L. H. Louwe Kooymans.
(from samples of 80 cc)

Station:	Cl′ mg/l	HCO_3′ mg/l	Total hardness German degr.	Station:	Cl′ mg/l	HCO_3′ mg/l	Total hardness German degr.
1	40	170	7	63	120	100	5
2	290	420	27	63a	850	330	17
4	490	140	23	64	530	430	19
5	200	170	8	64A	5050	—	200
6	380	160	15	65	200	470	24
8	930	230	31	65A	210	540	26
9	1550	560	46	66	1980	450	95
10	550	590	47	67	790	550	50
11	55	430	18	68	40	190	8
12	120	260	9	69	60	310	12
13	70	150	3	70	690	400	27
14	1850	540	130	71	310	400	20
15	80	460	23	72	210	280	16
16	4400	—	280	73	160	250	12
17	270	760	42	73a	160	230	12
18	150	160	5	74	320	200	17
19	80	95	4	75	450	230	13
20	110	690	29	75a	380	225	12
21	50	100	5	76	230	290	17
22	120	200	10	76Aa	240	300	18
23	390	590	32	77	150	320	16
24	85	160	4	78	310	260	19
26	60	150	5	79	360	400	21
28	55	120	5	80A	460	440	24
29	790	390	23	81	260	170	11
30	460	550	10	82	470	700	36
31	95	270	10	83	710	680	41
32	30	190	8	84	270	600	31
33	30	160	8	85	430	880	44
34	15	220	9	86	600	500	49
35	1450	500	47	87	2100	340	90
36	1650	660	22	88	3500	800	200
37	840	560	24	89	3200	780	160
38	970	690	31	90	44	190	10
39	1340	870	49	91	80	300	45
40	190	350	17	92	400	290	18
41	2100	730	63	93	400	300	19
42	3650	910	100	94	960	390	26
43	1350	680	46	95	720	430	26
44	530	420	14	96	1570	120	22
45	450	520	20	97	60	140	4
46	40	160	6	98	80	170	5
47	350	320	15	99	170	350	6
48	350	350	22	100	35	130	4
48a	360	370	20	101	3500	950	48
49	2400	640	60	102	3250	550	55
50	60	200	4	102A	3300	950	60
51	230	340	14	103	3150	900	50
52	160	190	10	104	1300	600	36
52a	1400	290	33	105	140	200	8
53	230	100	8	106	170	250	9
53a	860	330	30	107	190	250	7
55	880	450	32	108	50	200	6
56	1500	500	45	109	120	250	5
57	2600	350	65	110	110	180	7
57a	2500	380	65	111	890	1000	60
58	540	360	22	112	65	300	12
59	1500	400	45	113	85	250	11
60	370	320	16	114	820	450	19
61a	410	270	17	115	85	350	10

FRESH AN BRACKISH WATER HABITATS.

[Table 5]

N. E. Venezuelan Continent.

1 Río Chuspa, 30.7.1936.
2 Río Guanta, 7.4.1937.
3 Puddle in Bromeliaceae, 10.6.1936.
4 Estanque Arriba de Manglillo, 26.6.1936.
5 Estanque Abajo de Manglillo, 26.6.1936.
6 Estanque de Chacopata, 27.6.1936.
7 Poza de Chacopata, 27.6.1936.

Coche.

8 Poza de la Represa, 25.6.1936.

Cubagua.

9 Pozo de la Ranchería, 21.5.1936.

Margarita.

10 Poza de la Laguna Dulce, 20.5.1936.
11 Aljibe de la Laguna Dulce, 20.5.1936.
12 Poza Baranca, 20.5.1936.
13 Estanque Lato, 20.5.1936.
14 Aljibe de Diego Aguilera, 13.7.1936.
15 Manantial de Güiri, 13.7.1936. (26° C)
16 Manantial de Las Aguas Saladas, 11.8.1936. (29° C)
17 Toma de Agua de Encañado, 13.7.1936. (28° C)
18 Laguna Honda, 16.5.1936.
19 Toma de Agua de Tacarigua, 11.8.1936. (26° C)
20 Aljibe del Río de la Fuente, 11.5.1936.
21 Toma de Agua de La Asunción, 6.7.1936. (25° C)
22 Río Asunción, 3.7.1936.
23 Río Asunción, 11.5.1936.
24 Poza al Sur de Los Robles, 27.5.1936.
25 Puddle in Bromeliaceae, 10.7.1936.
26 Toma de Agua del Valle, 4.7.1936. (abt. 25° C)
27 Casa de Agua del Valle, 4.7.1936.
28 Peila del Cerrito, 27.5.1936.

Los Testigos.

29 Pozo del Puerto de la Iguana, 14.6.1936.
30 Poza del Morro de la Iguana, 14.6.1936.
31 Pozo del Puerto Real de Tamarindo, 15.6.1936.
32 Poza Inglés de Tamarindo, 15.6.1936.
33 Puddle on top of Tamarindo, 16.6.1936.
34 Puddle on top of Tamarindo, 16.6.1936.

Blanquilla.

35 Pozo de Valuchu, 21.7.1936.
36 Pozo de la Playa del Jaque, 22.7.1936.
37 Pozo de la Cocotería, 22.7.1936.
38 Poza de Aguada, 22.7.1936.

Orchila.

39 Pozo Grande de Huespen, 24.7.1936.
40 Pozo Chiquito de Huespen, 24.7.1936.

Los Roques.

41 Pozo de la Vaca, Gran Roque, 25.7.1936.
42 Pozo de la Cabecera, Gran Roque, 26.7.1936.
43 Puddle, Cayo de Agua, 26.7.1936.

Bonaire.

44 Pos Bronswinkel, 27.3.1937.
44a Pos Bronswinkel, 31.5.1930.
44A Bron di Pos Bronswinkel, 27.3.1937. (27° C)
Pos Hoeba, 26.5.1930.
Pos Chikitoe, 26.5.1930.
45 Dos Pos, 27.3.1937.
46 Tanki Onima, 13.11.1936.
46a Tanki Onima, 23.5.1930.
47 Pos Letin, 13.11.1936.
47a Pos Letin (Pos Onima), 29.5.1930.
48 Bron Fontein, 13.11.1936. (abt. 28° C)
48a Bron Fontein, 30.3.1937. (28° C)
48b Bron Fontein, 21.5.1930. (28° C)
49 Pos Boven Bolivia, 24.3.1937.
49a Pos Boven Bolivia, 23.11.1930.
50 Tanki di Nene George, 25.3.1937.
51 Tanki Kerkhof, 31.3.1937.
52 Pos Ichi, 14.11.1936.
52a Pos Ichi, 31.3.1937.
52b Pos Ichi, 30.9.1930.
53 Pos Baca, 14.11.1936.
53a Pos Baca, 31.3.1937.
53b Pos Baca, 17.5.1930.
54 Pos Baca Chikitoe, 14.11.1936.
Pos Shiki, 3.12.1930.
55 Pos Calbas, 1.4.1937.
56 Grot Watapana, 1.4.1937.
Pos di Pepe, 29.8.1930.
Pos Jatoe Largoe, 29.8.1930.
Pos Guajaká, Lima, 29.8.1930.
57 Pos Caranja, 14.11.1936.
57a Pos Caranja, 31.3.1937.
57b Pos Caranja, 17.5.1930.
58 Pos Francés, 31.3.1937.
58a Pos Francés, 3.9.1930.
Pos Gabriel, 3.9.1930.
59 Pos Oranjepan, 26.3.1937.
Pos Oranjepan, 3.12.1930.
60 Pos Lansberg, 26.3.1937.
60a Pos Lansberg, 8.6.1930.

Klein Bonaire.

61 Pos di Cas, 15.11.1936.
61a Pos di Cas, 23.3.1937.
Pos Blauwduif, 17.10.1930.
62 Sheet of water, 15.11.1936.
63 Tanki Calbas, 15.11.1936.
63a Tanki Calbas, 23.3.1937.
63b Tanki Calbas, 9.6.1930.
Pos Guajaká, 17.10.1930.

Klein Curaçao.

64 Pos N. of Lighthouse, 29.8.1936.
64A Pos N. of Lighthouse, 29.8.1936.

Curaçao.

65 Pos di Hofje Fuik, 9.9.1936.
65A Bak di Hofje Fuik, 9.9.1936.
66 Tanki di Cas Klein St. Joris, 6.9.1936.
67 Bak di Groot St. Joris, 20.10.1936.
68 Puddle, Piscadera, 10.10.1936.
69 Puddle, Piscadera, 10.10.1936.
70 Tanki Koenoekoe Hatoen, 15.10.1936.
71 Boca Spelonk di Bak Ariba, 13.10.1936. (30° C)
71A Bak Ariba, Hato, 13.10.1936.
72 Boca di Leeuw, Hato, 13.10.1936. (30° C)
72A Bak di Boca di Leeuw, 13.10.1936.
73 Grot van Hato, 16.9.1936. (abt. 27° C)
73a Grot van Hato, 5.10.1936. (abt. 27° C)
74 Bron Cajoeda, 1.10.1936. (29° C)
75 Tanki Mamaja, 6.10.1936.
75a Tanki Mamaja, 11.10.1936.
76 Bron Wandongo, 6.10.1936. (28° C)
76A Bron Wandongo, 6.10.1936. (28° C)
76Aa Bron Wandongo, 11.10.1936. (28° C)
76B Bron Wandongo, 11.10.1936.
77 Bak Rincón, Hato, 11.10.1936. (29° C)
77A Bak Rincón, 11.10.1936.
78 Tanki Monpos, 11.10.1936.
79 Bron San Pedro, 22.10.1936. (30° C)
80 Bron San Pedro, 22.10.1936. (abt. 30° C)
80A Bron San Pedro, 22.10.1936.
81 Pos di Wanga, 9.11.1936.
82 Pos Europa, Dokterstuin, 27.10.1936.
83 Pos Ariba, Dokterstuin, 27.10.1936.
83a Pos Ariba, 29.10.1936.
84 Pos di Hofje St. Kruis, 24.10.1936.
85 Tanki St. Kruis, 24.10.1936.
86 Pos Sorsaka, 10.11.1936. (abt. 28° C)
87 Bron di Rooi Sánchez, 11.11.1936. (abt. 28° C)

88 Bron di Rooi Beroe, 10.11.1936. (abt. 28° C)
89 Tanki di Hofje Savonet, 29.10.1936.
90 Puddle, Westpunt, 27.10.1936.

Aruba.

91 Puddle, Quadirikiri, 9.2.1937.
92 Pos Fontein, 23.12.1936. (abt. 29° C)
93 Bron di Fontein, 23.12.1936. (29° C)
93a Bron di Fontein, 2.7.1930. (29° C)
94 Pos Grandi, 12.2.1937.
95 Pos W. of Rooi Lamoenchi, 11.12.1937.
96 Tanki Chikitoe, 12.2.1937.
97 Tanki Mon Plaisir, 15.12.1936.
98 Tanki di Hofje Westpunt, 9.12.1936.
99 Tanki di Goudmijn Tibusji, 9.12.1936.
100 Tanki Leendert, 16.12.1936.
101 Tanki Rooi Canashito, 7.12.1936.
102 Bron di Pos di Noord, 30.12.1936. (abt. 29° C)
102A Pos di Noord, 30.12.1936.
102Aa Pos di Noord, 28.6.1930.
103 Bron di Rooi Bringamosa, 6.1.1937.
104 Bron di Rooi Prins, 9.1.1937. (abt. 29° C)
104A Bron di Rooi Prins, 9.1.1937. (abt. 29° C)
104B Bron di Rooi Prins, 9.1.1937.
104Ba Bron di Rooi Prins, 4.7.1930.

Paraguaná.

105 Poza de la Compañia, 15.2.1937.
106 Poza de San Antonio, 16.2.1937.
107 Poza Supideo, 16.2.1937.
108 Estanque de Moruy, 18.2.1937.
109 Estanque de Santa Fé, 18.2.1937.
110 Estanque de Santa Ana, 16.2.1937.

La Goajira.

111 Pozo de Macaralpao, 14.1.1937.
112 Pozo del Cabo de la Vela, 22.1.1937.
113 Pozo del Arroyo de Appará, 27.1.1937.
114 Laguna del Pájaro, 21.1.1937.
115 Rio Calancala, 17.1.1937.

LAND HABITATS

N. E. Venezuelan Continent

121 Cabo Blanco, 19.8.1936. (20 m)
122 Rio Guanta, 15.8.1936. (2—4 m)
123 Península de Esmerarda, 10.6.1936. (2—5 m)
124 Morro de Esmerarda, 10.6.1936. (1—5 m)
125 Península de Puerto Santo, 12.6.1936. (20 m)
125A Península de Puerto Santo, 12.6.1936. (80 m)
126 Morro de Puerto Santo, 12.6.1936. (60 m)
127 Morro de Chacopata, 27.6.1936. (45 m)
128 Isla de Caribes, 26.6.1936. (25 m)

Coche

129 El Guamache, 25.6.1936. (20 m)

Cubagua

130 N. W. Cubagua, 21.5.1936. (15 m)

Margarita

131 Morro de Robledar, 20.5.1936. (30 m)
132 Punta Ausente, 14.5.1936. (20 m)
133 Near Alta Gracia, 14.5.1936. (120 m)
134 Mina de Magnesite, 13.5.1936. (120 m)
135 Paraguachí, 13.5.1936. (60 m)
136 Near the Cerro Guayamuri, 11.5.1936. (180 m)
137 Near Matasiete, 27.5.1936. (150 m)
138 Near El Cerrito, 27.5.1936 (120 m)
139 Cerro de Marmoleta, 13.5.1936. (150 m)
140 El Piache, 10.7.1936. (100 m)
141 Cueva Honda del Piache, 10.7.1936. (300 m)
141A Near Cueva Honda, 10.7.1936. (300 m)
142 Cueva Honda, 10.7.1936 (300 m)
143 Below Toma del Valle, 4.7.1936. (250 m)
144 Toma de Agua del Valle, 4.7.1936. (250 m)
145 S.W. of La Asunción, 3.7.1936. (300 m)
146 W. of La Asunción, 3.7.1936. (250 m)
147 W. of La Asunción, 3.7.1936 (200 m)
148 Near Toma de La Asunción, 12.7.1936. (250 m)
149 Above Toma de La Asunción, 12.7.1936. (350 m)
150 Toma de Encañado, 13.7.1936. (150 m)
151 W. of San Antonio, 16.5.1936. (20 m)
152 Punta Mosquito, 4.6.1936. (20 m)
153 Gaiquire, 8.7.1936. (5—15 m)
154 S. of Los Robles, 18.5.1936. (5 m)
155 Patio, 25.5.1936. (2 m)
156 Isla Blanca, 9.6.1936. (25 m)

Los Testigos

157 Morro de la Iguana, 14.6.1936. (40 m)
158 Morro de la Iguana, 14.6.1936. (100 m)
159 Chiwo, 15.6.1936. (5—20 m)
160 Angoletta, 15.6.1936. (5—10 m)
161 Inglés, Tamarindo, 16.6.1936 (20 m)
162 Morro Grande, Tamarindo, 16.6.1936 (150 m)
163 Morro Grande, Tamarindo, 16.6.1936. (200 m)
163A-B Morro Grande, Tamarindo, 16.6.1936. (200 m)
164 Isla de Conejo, 17.6.1936. (80 m)
165 Cave on Isla de Conejo, 17.6.1936. (30 m)

Los Frailes

166 Puerto Real, 18.6.1936. (60 m)
167 Puerto Real, 18.6.1936. (40 m)
168 La Pecha, 19.6.1936. (40 m)
168A La Pecha, 19.6.1936. (60 m)

Los Hermanos

169 Morro Fondeadero, 20.7.1936. (80 m)
170 Morro Pando, 20.7.1936. (200 m)

Blanquilla

171 N. of Valuchu, 21.7.1936. (20 m)
172 Grove of El Jaque, 22.7.1936. (2 m)
172A Grove of El Jaque, 22.7.1936. (1 m)
172B Puerto El Jaque, 22.7.1936. (6 m)

Tortuga

173 S.W. Tortuga, 1.8.1936. (20 m)
173A S.W. Tortuga, 1.8.1936. (1 m)

Orchila

174 S.W. Huespen, 23.7.1936. (40 m)
175 S.W. Huespen, 23.7.1936. (1 m)

Los Roques

176 El Gran Roque, 25.7.1936. (15 m)
177 Isla Larga, 26.7.1936. (½—1 m)
178 Cayo de Agua, 26.7.1936. (2 m)

Las Aves

179 Ave de Barlovento, 27.7.1936. (2 m)
179A Ave de Barlovento, 27.7.1936. (2 m)

Bonaire

180 Cay, 29..3.1937. (½ m)
181 Zuidpunt, 26.3.1937. (1 m)
182 N.W. of Lansberg, 26.3.1937. (¼ m)
183 Grot Watapana, 1.4.1937. (½—1 m) (28½° C., moist. 85 %)
183A Grot Watapana, 1.4.1937. (½ m) (29½° C., moist. 95 %)
184 Lima, 14.11.1936.
184A Lima, 31.3.1937. (2 m)
185 Lima, 14.11.1936. (½ m)
185A Baca, 27.9.1930. (1½ m)
186 Deenterra, 25.3.1937. (3 m)
187 Near Spelonk, 24.3.1937. (6 m)
188 Cave of Spelonk, 24.3.1937. (7 m) (27½° C, moist. 80 %)
189 Cave of Spelonk, 24.3.1937. (7 m) (28½° C, moist. 90 %)
190 Fontein, 25.3.1937. (50 m)
190A S. of Fontein, 20.5.1930. (80 m)
191 Ruïns of Fontein, 30.3.1937. (40 m)
192 Tunnel of Fontein, 13.11.1936. (25 m)
193 Hofje Fontein, 30.3.1937. (22 m)
194 Tanki Onima, 13.11.1936. (3 m)
195 E. Boca Onima, 13.11.1936. (6 m)
196 W. Boca Onima, 13.11.1936. (8 m)
197 W. of Seroe Brandaris, 27.3.1937. (30 m)
198 Bronswinkel, 27.3.1937. (35 m)

Klein Bonaire

199 S.E. Klein Bonaire, 15.11.1936. (3 m)
199a S.E. Klein Bonaire, 23.3.1937; 199b id. 14.5.1930.
199A Tanki Calbas, 15.11.1936. (1 m)

Klein Curaçao

200 Klein Curaçao, 29.8.1936. (1 m)
200A Klein Curaçao 29.8.1936. (2 m)

Curaçao

201 Ronde Klip, 20.10.1936. (125 m)
201A S. of Ronde Klip, 20.10.1936. (40 m)
202 Seroe di Boca, 7.9.1936. (40 m)
202A Seroe di Boca, 7.9.1936. (5—10 m)
203 Seroe Mainsjie, 7.9.1936. (40 m)
204 Oost Seinpost, 9.9.1936. (25—40 m)
204A Fuik, 9.9.1936. (25 m)
205 Rooi Manzalienja, 4.9.1936. (2—3 m)
206 Tafelberg, 4.9.1936. (140—160 m)
207 Near Grot van Newport, 2.9.1936 (7—9 m)
208 Grot van Newport, 2.9.1936. (6 m)
209 Grot van Newport, 2.9.1936. (5—6 m)
210 Kabrietenberg, 16.10.1936. (25 m)
211 Fort Beekenburg, 16.10.1936. (10—15 m)
212 Schaarloo, 26.10.1936. (30—35 m)
213 Seroe Pretoe, 9.10.1936. (30 m)
213A Seroe Domi, 12.4.1930. (75 m)
214 Jack Evertszberg, 10.10.1936.
215 Seroe Spreit, 23.10.1936. (10—40 m)
216 Hofje Hato, 13.10.1936. (10 m)
217 Near Grot van Hato, 17.9.1936. (30 m)
218 Grot van Hato, 21.9.1936. (50 m)
219 Grot van Hato, 16.9.1936. (50 m)
219A Grot van Hato, 16.9.1936. (50 m)
220 Bron Wandongo, 6.10.1936. (10 m)
221 Groote Berg, 22.10.1936. (75 m)
222 Koenoekoe Abau, 9.11.1936. (70 m)
223 Hermanos, 9.11.1936. (40—50 m)
224 Seroe Kabritoe, 9.11.1936. (40—50 m)
225 Seroe Cabajé, 9.11.1936. (30—50 m)
225a Seroe Cabajé, 14.4.1930.
226 San Pedro, 22.10.1936. (10—15 m)
227 Seroe di Cueba, 29.10.1936. (40—45 m)
227a Seroe di Cueba, 30.4.1930.
228 Calbas Boshi, 29.10.1936. (10 m)
229 Seroe Bartool, 29.10.1936. (45—50 m)
229A W. of Seroe Bartool, 29.10.1936. (45 m)
230 St. Silvester, 22.11.1936. (15 m)
231 Seroe Teintje, 27.10.1936. (30 m)
232 Tafelberg, 10.11.1936. (60—70 m)

233 Rooi Sorsaka, 8.11.1936. (25—35 m)
234 Seroe Christoffel, 7.3.1937. (340 m)
235 Seroe Christoffel, 10.11.1936. (200 m)
236 Rooi Sánchez, 11.11.1936. (190 m)
237 Boca Tabla, 27.10.1936. (7 m)
238 Boshi di Westpunt, 27.10.1936. (2 m)
239 Westpunt, 27.10.1936. (7 m)
240 N. of Plaja Abau, 6.11.1936. (10—15 m)
240A N. Plaja Abau, 6.11.1936. (7 m)
241 S. Plaja Abau, 6.11.1936. (7 m)
242 Seroe Djerimi, 6.11. 1936. (35—45 m)
242A Seroe Djerimi, 6.11.1936. (25—30 m)
242B Near Seroe Djerimi, 6.11.1936. (9 m)
243 N. St. Kruis Baai, 24.10.1936. (8—12 m)
243A Seroe Commandant, 24.4.1930. (120 m)
244 Plaja Chikitoe, 24.10.1936. (5—8 m)
245 Hofje St. Kruis, 24.10.1936. (2 m)
245A St. Kruis, 24.10.1936. (5—15 m)

Aruba

246 Rooi Prins, 9.1.1937. (20 m)
247 Dunes of Boca Prins, 9.1.1937. (20 m)
247A W. Boca Prins, 9.1.1937. (6 m)
248 E. Boca Prins, 9.1.1937. (12 m)
248A S. of Fontein, 5.7.1930. (35 m)
249 Quadirikiri, 9.2.1937. (15 m)
250 Grot van Quadirikiri, 9.2.1937. (25 m) (25—30° C, moist. 78 %)
251 Grot van Quadirikiri, 9.2.1937. (25 m) (29° C, moist. 93 %)
251A Grot van Quadirikiri, 9.2.1937. (25 m)
252 Vader Piet, 9.2.1937. (25 m)
252A S.E. of Fontein, 9.2.1937. (25 m)
253 Boca Grandi, 5.1.1937. (25 m)
253A Boca Grandi, 5.1.1937. (10 m)
254 Culebra, 5.1.1937. (30 m)
255 Rooi Spoki, 6.2.1937. (45—55 m)
256 Savaneta, 5.1.1937. (5 m)
257 Grove in Rooi Lamoenchi, 29.12.1936. (3 m)
258 Near Pos Grandi, 29.12.1936. (2 m)
258A W. of Rooi Lamoenchi, 29.12.1936. (25 m)
259 Isla, 29.12.1936. (25 m)
260 Baranca Alto, 29.12.1936. (40—50 m)
260A Rooi near Baranca Alto, 29.12.1936. (25 m)
261 E. Spaansch Lagoen, 5.1.1937. (6 m)
262 W. Spaansch Lagoen, 5.1.1937. (5 m)
262A Balashi, 29.12.1936. (25 m)
263 Rooi Francés, 6.1.1937. (20—25 m)
264 Rooi Barcadera, 5.1.1937. (8 m)
265 Rooi Perkietenbosch, 5.1.1937. (5 m)
265A N.W. of Rooi Perkietenbosch, 5.1.1937. (5 m)

266 Seroe Canashito, 7.12.1936. (55 m)
267 Seroe Canashito, 7.12.1936. (45—65 m)
268 Hooiberg, 21.12.1936. (120—130 m)
268A Hooiberg, 21.12.1936. (160 m)
268B Hooiberg, 5.12.1936. (60 m)
269 Santa Cruz, 21.12.1936. (40 m)
270 Jamanota, 3.1.1937. (185 m)
270A Seroe Cristal, 10.2.1937. (60—70 m)
271 Seroe Plat, 10.2.1937. (85—90 m)
272 Hudishibana, 9.12.1936. (10—20 m)
272A Annaboei, 9.12.1936. (15—25 m)
273 Tibushi, 9.12.1936. (3 m)
274 Hofje Westpunt, 9.12.1936. (1 m)
275 Solito, 16.12.1936. (20—25 m)
276 Heintje Croes, 14.12.1936. (4 m)
277 Mon Plaisir, 15.12.1936. (3 m)
278 Reef of Boekoeti, 8.2.1937. (½—2 m)

N.W. Venezuelan Continent (Paraguaná)

279 Quebrada de la Compañia, 15.2.1937.
280 Cerro Transverso, 16.2.1937. (40 m)
281 W. of Santa Ana, 16.2.1937. (50 m)
282 E. of Santa Fé, 18.2.1937. (50 m)
283 N.E. of Moruy, 18.2.1937. (50 m)
284 Cerro de Machuruca, 16.2.1937. (300 m)

N.E. Colombian Continent (La Goajira)

285 Punta Tucacas, 14.1.1937. (2 m)
286 Laguna de Tucacas, 15.1.1937. (2 m)
287 Castilletes, 14.1.1937. (3 m)
288 Uribia, 17.1.1937. (10 m)
289 Rancheria del Cabo, 22.1.1937. (6 m)
290 Cabo de la Vela, 22.1.1937. (20 m)
290A Cabo de la Vela, 22.1.1937. (30 m)
291 N. of El Cardón, 22.1.1937. (2 m)
292 N.E. of Rio Hacha, 20.1.1937. (2 m)
293 S. of Rio Hacha, 18.1.1937. (5 m)
294 S. of Rio Hacha, 18.1.1937. (25 m)

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Wright, Irene, A., 1935. Nederlandsche Zeevaarders..., 2. *Werken Hist. Gen. Utrecht (3) 64*, 272 pp.

MAPS.

(nautical)

U.S. Hydrographic Office Charts; especially Nos. 2319, Coast of Venezuela 1 : 953.000, and 2035, Margarita Island 1 : 188.000.

Netherland Government Charts.

British Admirality Charts.

(topographical)

Topographische Kaart van Curaçao, 1 : 20.000, 18 sheets (surveyed by **L. Lens** and **J. Werbata**, 1906—1909).

Topographische Kaart van Aruba, 1 : 20.000, 8 sheets (surveyed by **L. Lens** and **W. A. Jonckheer Jr.**, 1909—1910).

Topographische Kaart van Bonaire, 1 : 20.000, 10 sheets (surveyed by **L. Lens** and **W. A. Jonckheer Jr.**, 1911—1912).

Croquis de las Islas Margarita y Coche, 1 : 100.000, in **Aguerrevere**, 1937.

Mapa Topográfico... de la Isla Gran Roque, 1 : 5.000, in **Aguerrevere et López**, 1939.

(geological)

Geologische Kaart van het Eiland Curaçao, 1 : 40.000, 2 sheets, in **Molengraaff**, 1929.

Geological Map of Aruba, 1 : 50.000, in **Westermann**, 1932.

Bonaire. Geological Map..., 1 : 65.800, in **Pijpers**, 1933.

Croquis Geológico de las Islas Margarita y Coche, 1 : 200.000, in **Aguerrevere**, 1936.

Mapa... Geológico de la Isla Gran Roque, 1 : 5.000, in **Aguerrevere et López**, 1939.

Island of Blanquilla, 1 : 74.000, in **Lowe**, 1911.

Die Orchilas-Inseln, 1 : 175.000, in **Rost**, 1938.

Geologische Übersichtskarte der Insel Gran Roque, 1 : 16.000, in **Rost**, 1938.

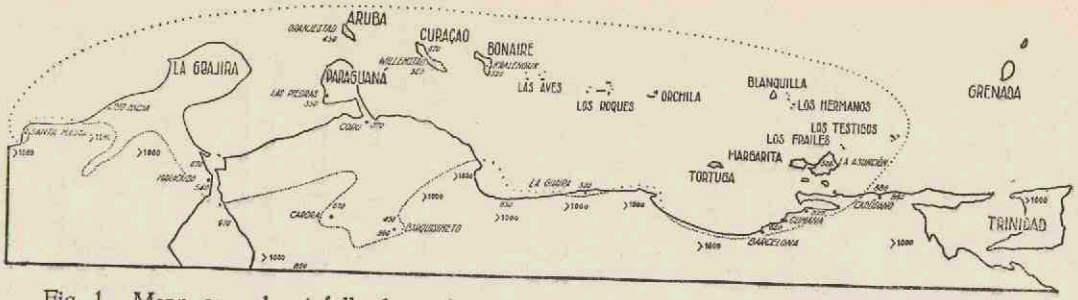

Fig. 1. Mean annual rainfall along the northcoast of South America. The climate of the indicated dry region belongs to the "steppe-climates" of Köppen, which are defined by a rainfall of 340—680 mm a year, if the annual mean-temperature is about 27°C. Several districts are still dryer and may therefore fall within the "desert-climates".

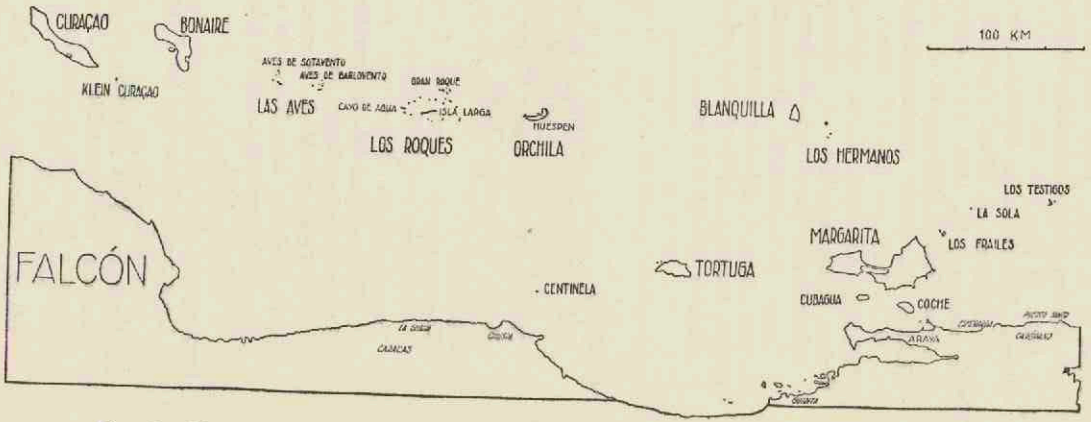

Fig. 2. Venezuelan Islands, Bonaire and Curaçao. (from U. S. Hydr. Off. chart)

Fig. 3. Peninsulas of Paraguaná and La Goajira with Aruba and Los Monges; with mainland-stations. (from U. S. Hydr. Off. and Netherl. Govern. charts)

Fig. 4. Chief part of Testigos-islands, roughly surveyed.

Fig. 5. Frailes-islands, roughly surveyed.

Fig. 6. Hermanos-islands, roughly surveyed.

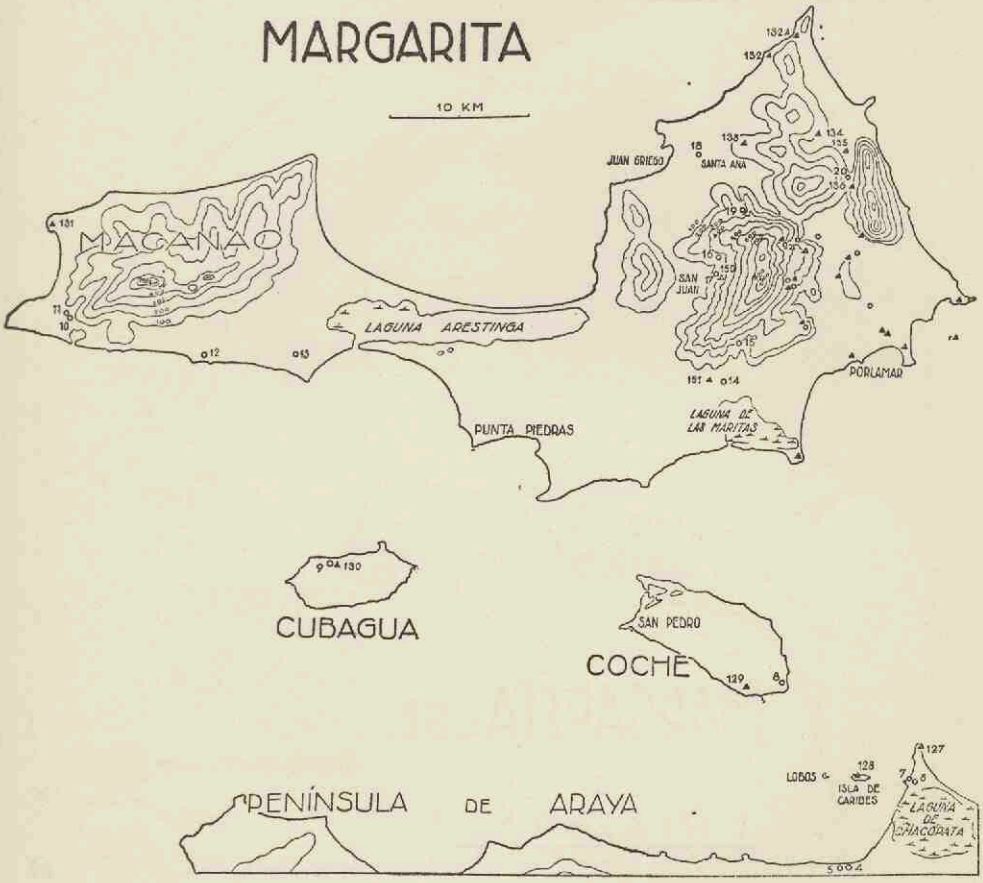

Fig. 7. Margarita, Cubagua, Coche and a part of the Araya-peninsula; with stations. (from U. S. Hydr. Off. chart, contour intervals from estimations as given on Aguerrevere's map)

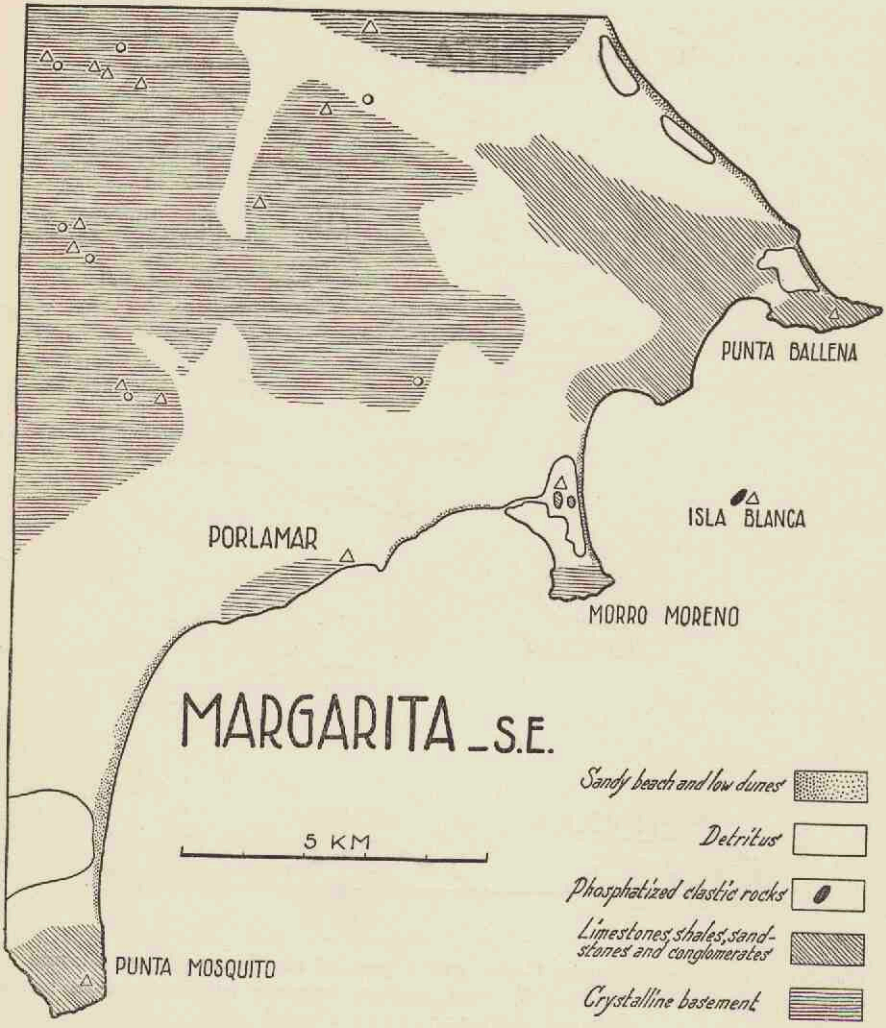

Fig. 8. Southeastern Margarita.

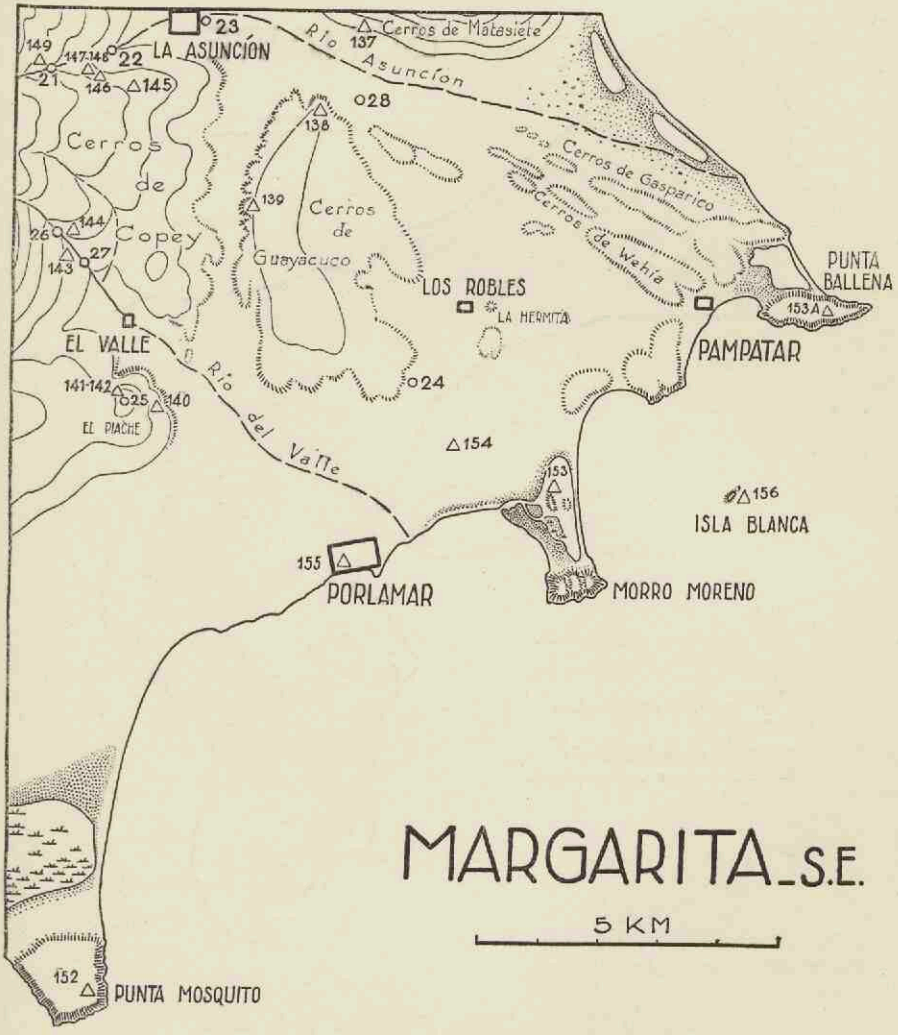

Fig. 9. Southeastern Margarita; with stations.

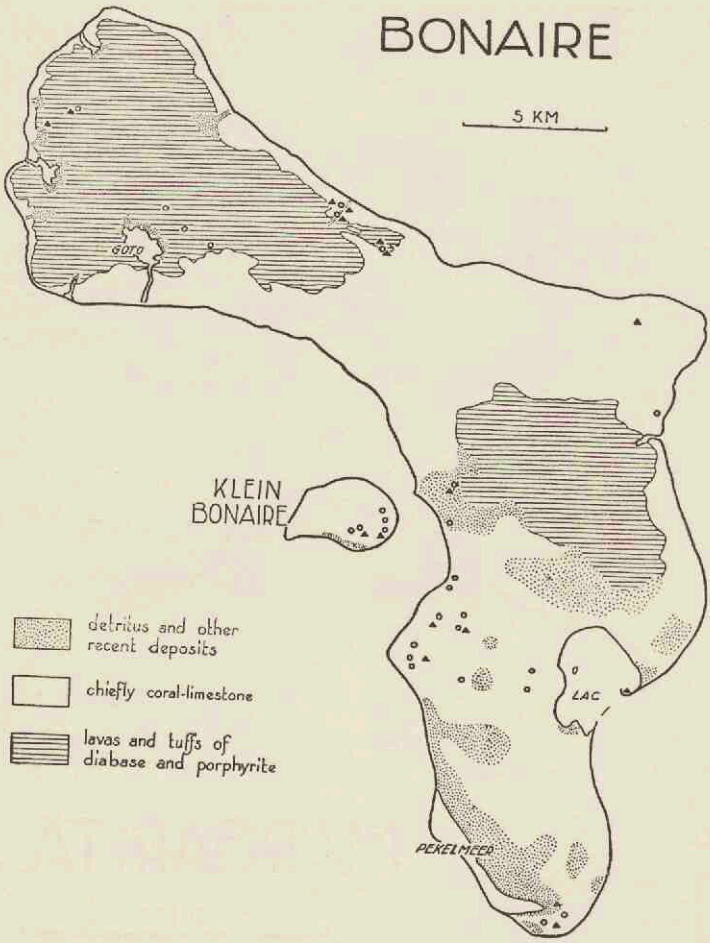

Fig. 10. Bonaire. (from Pijpers' geol. map)

Fig. 11. Bonaire; with stations, contour intervals of 50, 100 and 150 m. (from Netherl. Govern. maps)

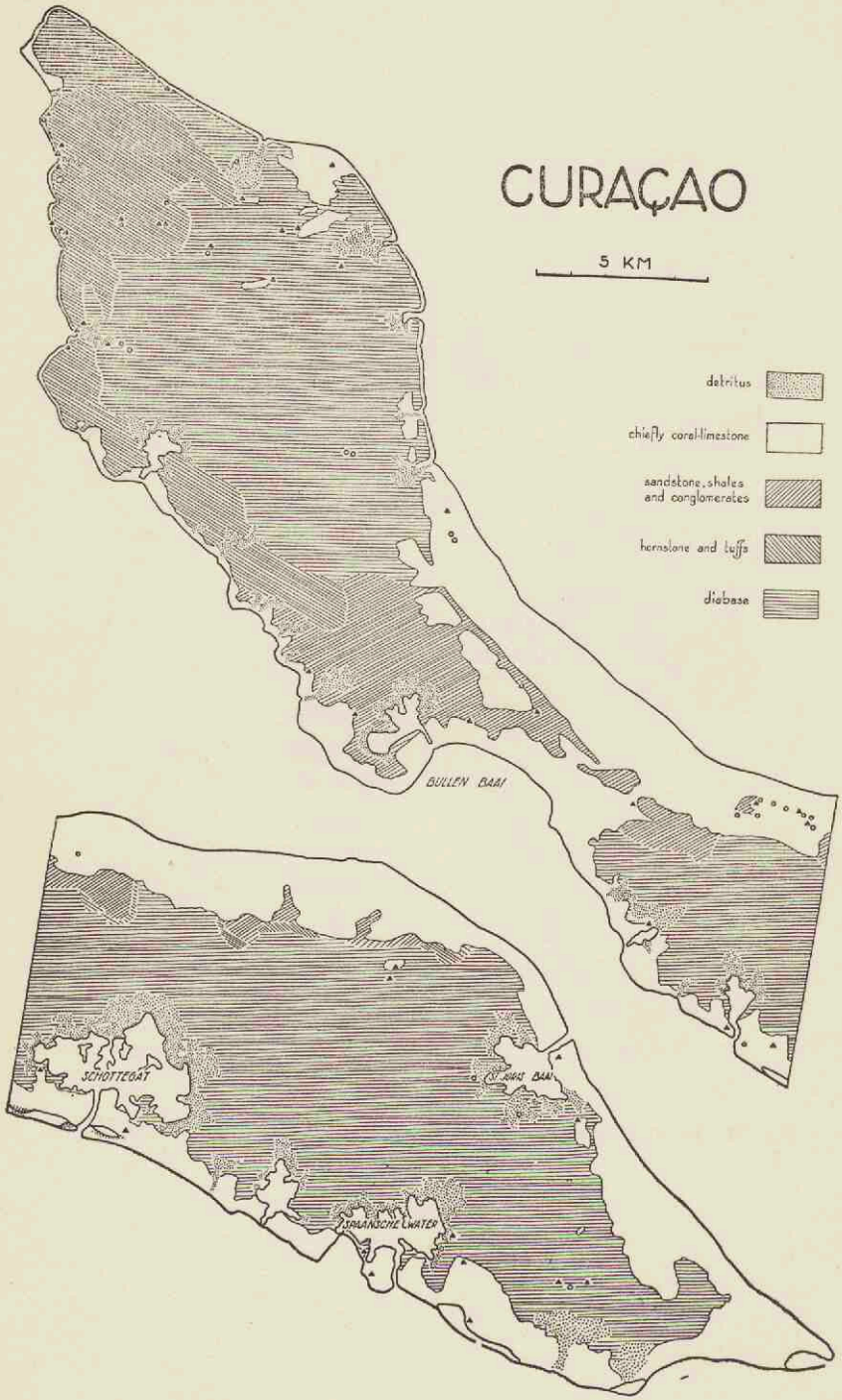

Fig. 12. Curaçao. (from Molengraaff's geol. map)

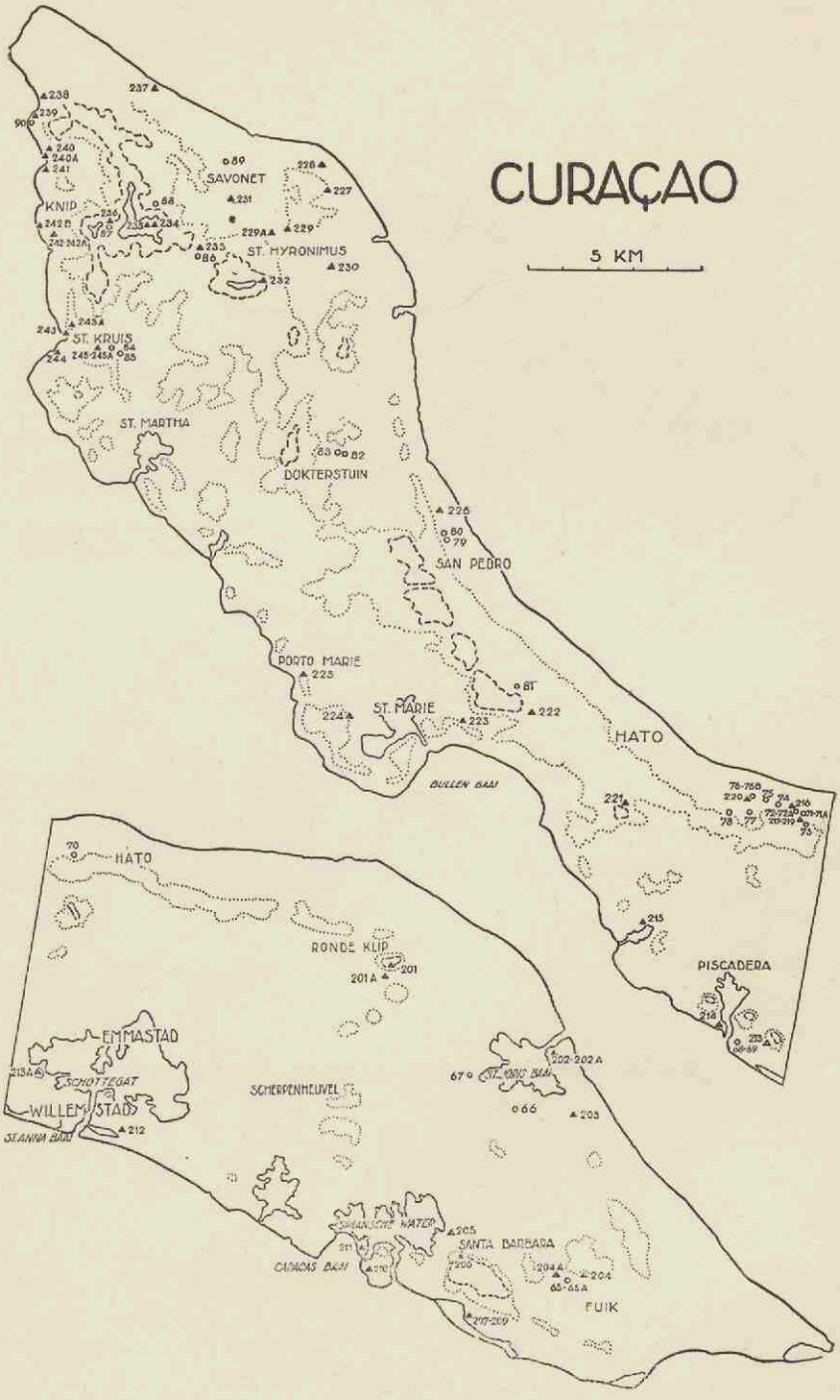

Fig. 13. Curaçao; with stations, contour intervals of 50, 100 and 200 m. (from Netherl. Govern. maps)

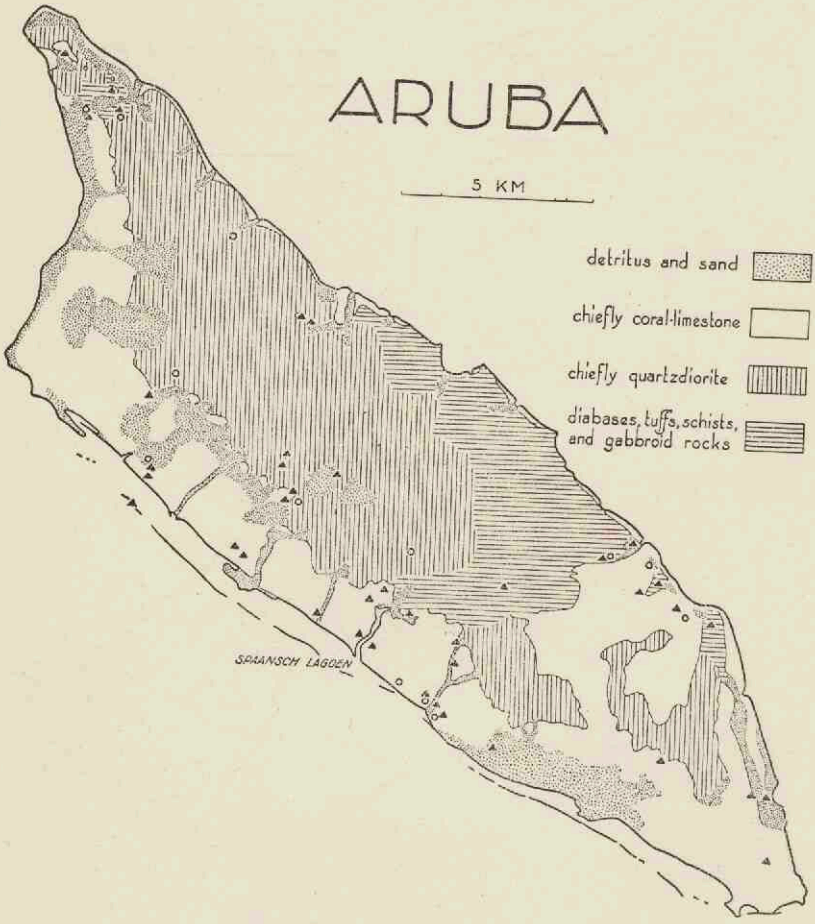

Fig. 14. Aruba. (from Westermann's geol. map)

Fig. 15. Aruba; with stations, contour intervals of 50, 100 and 150 m. (from Netherl. Govern. maps)

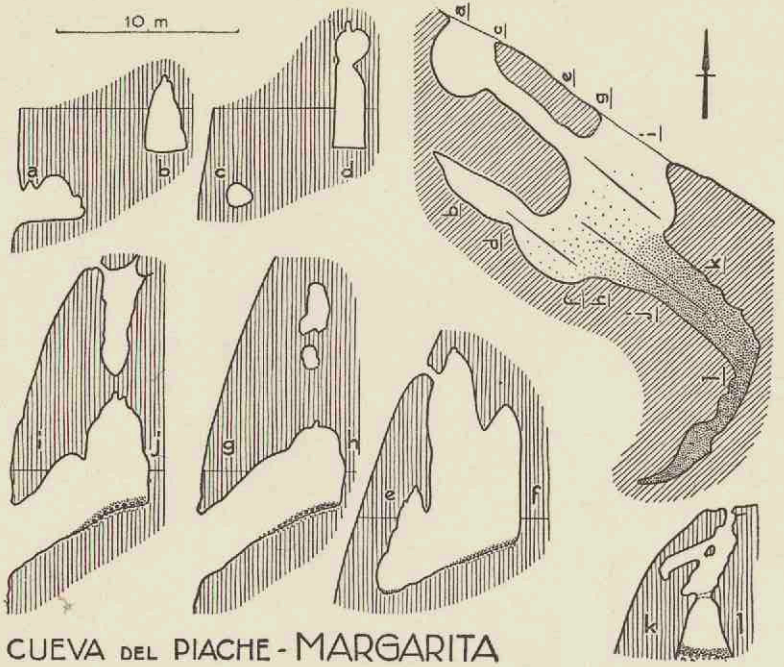

Fig. 16. Cave of El Piache, Margarita, roughly surveyed; marble-schists, abt. 300 m high. In the groundplan the stippling indicates an accumulation of bat-manure; the straight lines indicate the strike of the principle, nearly vertical rock-fissures. Stat. 141 is situated near the entrance, St. 142 in the most southern part of the cave.

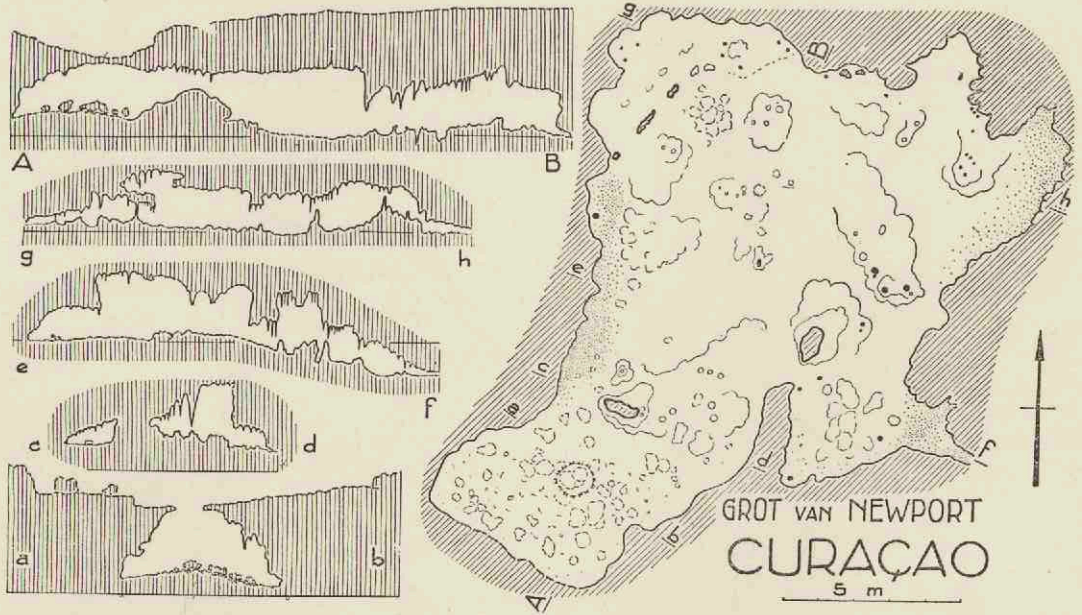

Fig. 17. Cave of Newport, Curaçao; coral-limestone, 3—7 m high. Stat. 208 is situated near the entrance, St. 209 in the northeastern part of the cave.

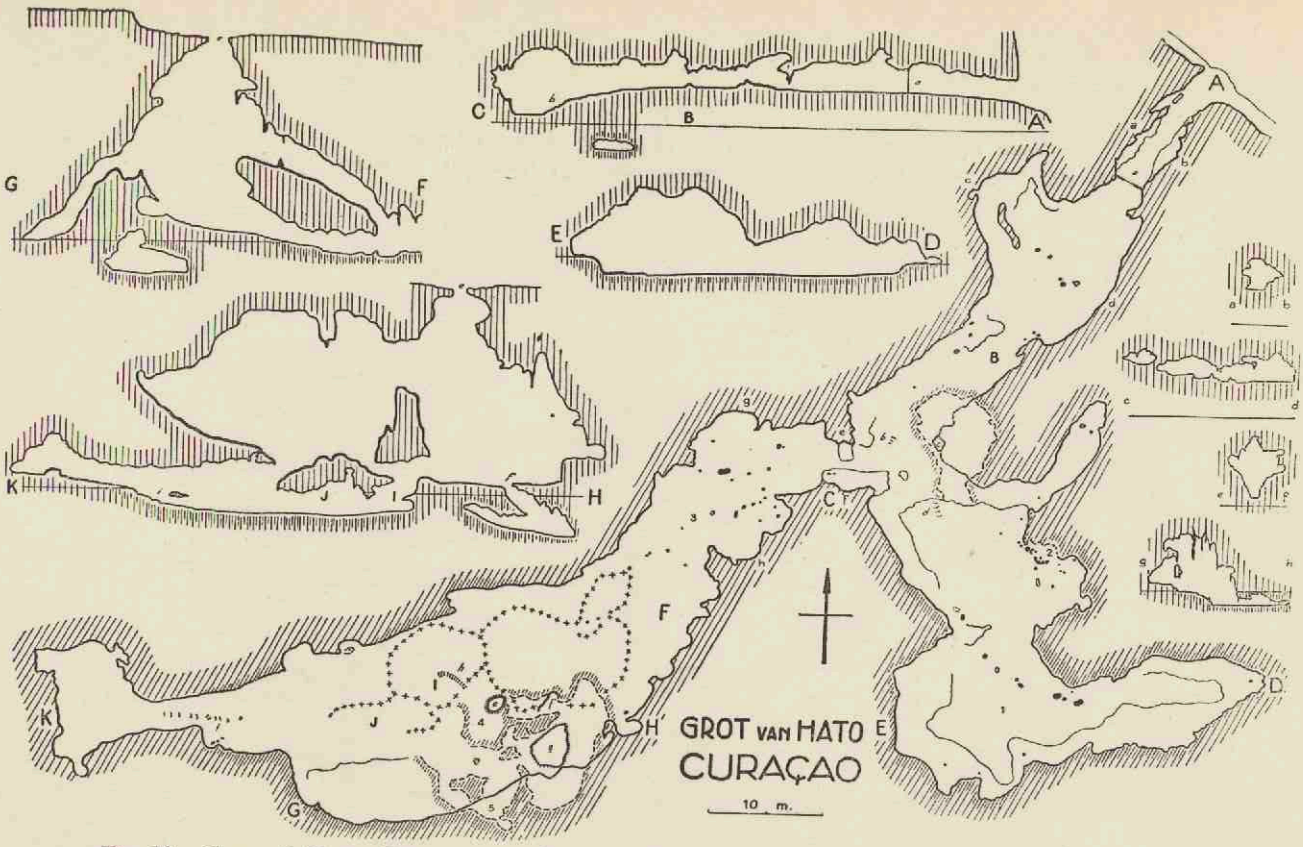

Fig. 18. Cave of Hato, Curaçao; coral-limestone, 45—67 m high. 1 - Kamber di Noche, Stat. 219A; 2 - exposure of cavern-water in the Kamber di Awa, St. 73; 3 - Kamber di Pilar, St. 219; 4 - Kamber di Ventana, St. 218. a - door, giving admittance; b, d, h, i - roughly hewn steps; c, f, g - apertures in the floor, giving admittance to lower caverns; e - opening in the roof.

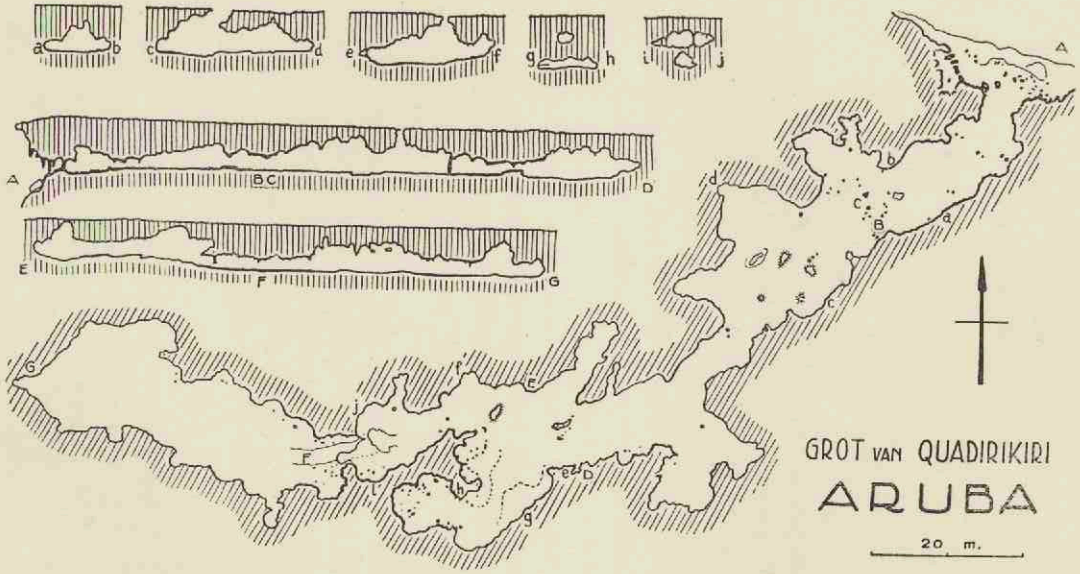

Fig. 19. Cave of Quadirikiri, Aruba; coral-limestone, 24—32 m high. Stat. 250 is situated at cross-section, e-f, St. 251—251A at length-section F-G.

STUDIES ON THE FAUNA OF CURAÇAO, ARUBA, BONAIRE AND THE VENEZUELAN ISLANDS: No. 2.

A SURVEY OF THE MAMMALS, LIZARDS AND MOLLUSKS.

This annotated list of the mammals, lizards and mollusks of the Leeward Group, is based on author's collection and therefore includes additional mainland-records of the island-species.

As a rule a short commentary is given only as a guide to the adopted nomenclature and classification, in case of controversial data which are not yet settled, if important for our knowledge of regional distribution, mentioning vernacular names. Regarding the mammals, all known material-records are included.

Species of *Peropteryx, Gonatodes, Phyllodactylus, Anolis, Ameiva, Cnemidophorus, Gymnophthalmus, Potamopyrgus,* and especially those of *Odocoileus, Sylvilagus, Tudora* and *Cerion* are more extensively treated.

Generally new synonyms are separately listed behind sole bibliographical references. Station-numbers of mollusk-records are printed in italics if living specimens have been collected. Other specimens which were not obtained in a fresh state are only approximatively dated. Important new localities are indicated by an exclamation-mark.

I am much indebted to Tera van Benthem Jutting (Amsterdam), Horace Burrington Baker (Philadelphia) and Horace G. Richards (Trenton, N.J.) for their help in naming some difficult mollusks, to L. D. Brongersma (Leiden) for some herpetological information, and to M. A. C. Hinton (London) for examining a few small rodents.

The greater part of the material has been presented to the Netherland State Museum, Leiden, the Zoological Museum of

Amsterdam and the Zoological Museum of the State-University in Utrecht.

MAMMALIA

PRIMATES

CEBIDAE

Cebus margaritae Hollister, 1914

Robinson, 1896, p. 651 (sub *apella*); Allen, Gl. M., 1902, p. 97 (sub *fatuellus*); Hollister, 1914, p. 105.

MARGARITA, 13.VII.1895, 1 spec., teste Robinson et Hollister. Margarita.

ARTIODACTYLA

CERVIDAE

Odocoileus Rafinesque, 1832

Cervinae, with distal portion of lateral metacarpals persisting, naviculo-cuboid of tarsus free from cuneiform, vomer dividing aperture of posterior nares, upper canines lacking, sub-basal snag rising from inner surface of complex antlers, spotted young. Alaska to Perú, Bolivia and northern Brasil.

Key to the South American species

[chiefly from literature]

1a Pelage long-haired, hairs on back to 35—55 mm long; greyish colours predominating (— in the mountains at higher altitudes —) 2

1b Pelage short-haired, hairs on back to 20—30 mm long; yellowish and brownish colours predominating (— in the mountains at low altitudes and in the lowlands —) 3

2a Blackish eye-ring, complete of fragmentary; dark spot on base of foot, dark line in front of underpart of leg; no metatarsal-gland (— Colombian Andes, Sierra de Mérida —) ..... *Od. columbicus* (Fitzinger, 1879) [*Od. lasiotis* Osgood, 1914]

2b Whitish eye-ring; without dark markings on leg; no metatarsal-gland (— Andes of Ecuador, Perú, Bolivia and probably northern Chile —) .... *Od. peruvianus* (Gray, 1874)

3a Greyish-brown colours predominating; upperparts often varied with much black; hairs on back to 30 mm long, rather erect, not stiff; probably no metatarsal-gland (— Guyana, northern Brasil and probably eastern Venezuela —) ..... *Od. spinosus* (Gay et Gervais, 1846) [*Cervus savannarum* Cabanis et Schomburgk, 1848]

3b Yellowish or reddish-brown colours predominating; upperparts varied with little black; hairs on back to 20 mm long, smoothened, stiff; no metatarsal-gland (— Venezuela, Colombia, Curaçao, Margarita and probably Guyana and northern Brasil —) ..... *Od. gymnotis* (Wiegmann, 1833) [?? *Cervus mangivorus* Schrank, 1818. ? *Cervus goudotii* Gay et Gervais, 1846. *Gymnotis wiegmanni* Fitzinger, 1879. *Odocoileus margaritae* Osgood, 1910]

Key to the subspecies of *Odocoileus gymnotis*

[data on *Od. gymn. tropicalis* from literature]

1a Outside of ears well haired; reddish-brown colours predominating (—western Colombia; type-locality: Valley of the Dagua —) .... *Od. gymnotis tropicalis* Cabrera, 1918

1b Outside of ears sparsely haired; yellowish or brownish-yellow colours predominating (— eastern Colombia, Venezuela, Curaçao and Margarita —) 2

2a Outside of ears rarely nearly naked in centre; upperparts generally brownish greyish-yellow; usually a very small blackish spot in upper postorbital region; frequently a small but distinct black antorbital spot; often a rather distinct blackish neckstreak 3

2b Outside of ears often nearly naked in centre; upperparts generally greyish brownish-yellow; no blackish spot in upper postorbital region; no distinct black antorbital spot; sometimes a rather distinct blackish neckstreak 4

3a Generally a small but distinct black antorbital spot; usually a rather distinct blackish neckstreak (— Curaçao; type-locality —) .... *Od. gymnotis curassavicus* subsp. nov.

3b Probably no distinct black antorbital spot; without a rather distinct blackish neckstreak (— La Goajira and probably Santa Marta district —) ..... considered identical with *Od. gymnotis curassavicus*

4a Frontals usually rather abruptly elevated and rather strongly ridged medially, probably rarely deeply indented between base of pedicel and orbit (— assumed to occur in northern Venezuela only; type-locality: "Gegend des Orenoco" —) ... *Od. gymnotis gymnotis* (Wiegmann, 1833)

4b Frontals usually abruptly elevated and strongly ridged medially, usually deeply indented between base of pedicel and orbit (— Margarita; type-locality —) ..... *Od. gymnotis margaritae* Osgood, 1910

Rising from our incomplete and often confusing knowledge of South American deer, the accepted species and subspecies are delimitated in a rather arbitrary way.

General data on *Odocoileus gymnotis*

[Observed in Curaçao (c), Margarita (m), the mainland of Venezuela (v) and The Hague, from specimens which were brought from the Venezuelan mainland, state of Sucre (n).]

The first 2—3 months of their life, the young have a conspicuous white-spotted coat, the hairs generally are soft and more erect than in older specimens, the upperparts are rather equally vivid yellowish-brown, often with a slight reddish tinge (c, v, n). After the first moult the pelage is still rather soft, but in other respects is quite the same as those of the adults (c, v, n). Resulting from the design of the hair, the brown or brownish-yellow colour is more obvious in the fresh-moulted pelage. Vague remnants of the white spots may be observed in adult state in mediodorsal region (c, m, v, n). — Impregnation may occur at the age of 1 year (n); the gestation being about 7½ months (n). Whelping occurs in February (c, n), March (n), April (n), June (v, n),

TABLE 6.

Skull-measurements in adult *Odocoileus gymnotis*
(in mm; distances in straight lines; left and right averaged)

Locality	Curaçao						Margarita			
Number	5	6	7	8	9	v.d.H.	14	15	16	17
Sex	m.	m.	m.	m.	m.	m.	f.	m.	m.	m.
tip of premaxilla — supraoccipital process	235	232	251	248	256	248	209	240	240	233
tip of premaxilla — back of occipital condyle	222	220	236	232	—	235	197	229	230	221
tip of premaxilla — intercondyloid incision	205½	202½	217	217	—	217	183	213	214	207
tip of premaxilla — anterior edge of auditory canal	200	197	210	209	215	209½	179½	204	205	200
tip of premaxilla — anterior border of choana	143	140	150½	151	156	153	—	149	149	145
crown-length of upper molariform series	70½	72	72?	72	71½	71½	(66)	68½	70½	69
crown-length of upper M^1-M^3	41	42½	42	42	41	42	39	32	40½	40
tip of premaxilla — front of P^1	71	69	75?	75½	78	76½	(66)	72	71	71
alveolar-lenght of upper molariform series	68½	68½	69?	69½	67½	67	(66½)	67	67	65½
between inner-edges of P^1-alveoles	24½	25	31½	29	32	27	(25)	30	30	28
between outer-edges of P^1-alveoles	45	47	53½	50	50	49½	(41)	49	47½	49
between inner-edges of M^2-alveoles	35½	37	39½	37	42	35	33	39	41	40
between outer-edges of M^2-alveoles	64½	67½	73?	68½	72	69	60	68	69	67½
tip of premaxilla — median tip of nasalbone	54	54	57½	56	57	55½	54	54½	57	55½
median tip of nasalbone — supraoccipital process	*190*	*187*	*203*	*200*	*208*	*200*	*163*	*194*	*191*	*185*
median length of nasalbone	*68½*	*66½*	*71½*	*73½*	*74*	*73½*	*51½*	*70½*	*66½*	*67*
breadth of nasalbone	18	17	21	21	20	20	14½	17½	17½	17
tip of premaxilla — anterior border of orbit	122	120	127	129	130	127	107	121	122	119
width of orbit, parallel to skull-axis	37	37	40	38	39	40	39	39	40	39½
height of orbit, perpendicular to skull-axis	35	36	37	39	39	39	34½	38	39	37½
posterior border of orbit — supraoccipital process	97	98	111	104	112	104	82	100	101	97
between borders of orbits	55	55	64	61	61	59½	44	57	58	55
between outside of zygomatical arches	98	100	111	109	113	110	85	105	105	101
breadth near mastoid prominences	73	70	80	80	85	80	64½	84	83½	77
between paraoccipital processes	53	51	52	55	—	47	42	51	52	49
height of braincase across parietalbone and basisphenoid	59	61	59	63	64	65	52½	63	60½	60
supraoccipital process — nuchal tubercles	32	32	34	32	—	33	26½	33½	31½	31½
nuchal tubercles — opposite innerside of foramen magnum	20½	19½	19	20	—	20	19	19	18½	19½
between inner-edges of occipital condyles	20	18	15½	19	—	18½	16½	15½	17	16
between outer-edges of occipital condyles	44	44	43	45½	—	44½	36½	41	44½	42½
top of forehead — basal-level	90	90	95	85	90	94	75	90	85	80
diameter of pedicel, averaged on narrowest part	16	19	23	22	26	22	×	35	25	20
top of mandible — coronoid process	191	194	—	—	207	206	171	—	—	—
top of mandible — dentary condyle	179	178	190	—	191	188½	163	—	—	—
tip of mandible — angular process	175	174	185	—	184	183	160	—	—	—
tip of mandible — front of P^1	58½	56½	(65½)	—	70	70½	(52½)	—	—	—
alveolar-length of lower molariform series	77½	79½	74	—	72	72½	73½	—	—	—
top of coronoid process — basal-level	96	93	101?	—	—	110	87	—	—	—

TABLE 6.

Skull-measurements in adult *Odocoileus gymnotis*
(in mm; distances in straight lines; left and right averaged)

Locality	Curaçao						Margarita			
Number	5	6	7	8	9	v.d.H.	14	15	16	17
Sex	m.	m.	m.	m.	m.	m.	f.	m.	m.	m.
tip of premaxilla — supraoccipital process	235	232	251	248	256	248	209	240	240	233
tip of premaxilla — back of occipital condyle	222	220	236	232	—	235	197	229	230	221
tip of premaxilla — intercondyloid incision	205½	202½	217	217	—	217	183	213	214	207
tip of premaxilla — anterior edge of auditory canal	200	197	210	209	215	209½	179½	204	205	200
tip of premaxilla — anterior border of choana	143	140	150½	151	156	153	—	149	149	145
crown-length of upper molariform series	70½	72	72?	72	71½	71½	(66)	68½	70½	69
crown-length of upper M^1-M^3	41	42½	42	42	41	42	39	32	40½	40
tip of premaxilla — front of P^1	71	69	75?	75½	78	76½	(66)	72	71	71
alveolar-lenght of upper molariform series	68½	68½	69?	69½	67½	67	(66½)	67	67	65½
between inner-edges of P^1-alveoles	24½	25	31½	29	32	27	(25)	30	30	28
between outer-edges of P^1-alveoles	45	47	53½	50	50	49½	(41)	49	47½	49
between inner-edges of M^2-alveoles	35½	37	39½	37	42	35	33	39	41	40
between outer-edges of M^2-alveoles	64½	67½	73?	68½	72	69	60	68	69	67½
tip of premaxilla — median tip of nasalbone	54	54	57½	56	57	55½	54	54½	57	55½
median tip of nasalbone — supraoccipital process	*190*	*187*	*203*	*200*	*208*	*200*	*163*	*194*	*191*	*185*
median length of nasalbone	*68½*	*66½*	*71½*	*73½*	*74*	*73½*	*51½*	*70½*	*66½*	*67*
breadth of nasalbone	18	17	21	21	20	20	14½	17½	17½	17
tip of premaxilla — anterior border of orbit	122	120	127	129	130	127	107	121	122	119
width of orbit, parallel to skull-axis	37	37	40	38	39	40	39	39	40	39½
height of orbit, perpendicular to skull-axis	35	36	37	39	39	39	34½	38	39	37½
posterior border of orbit — supraoccipital process	97	98	111	104	112	104	82	100	101	97
between borders of orbits	55	55	64	61	61	59½	44	57	58	55
between outside of zygomatical arches	98	100	111	109	113	110	85	105	105	101
breadth near mastoid prominences	73	70	80	80	85	80	64½	84	83½	77
between paraoccipital processes	53	51	52	55	—	47	42	51	52	49
height of braincase across parietalbone and basisphenoid	59	61	59	63	64	65	52½	63	60½	60
supraoccipital process — nuchal tubercles	32	32	34	32	—	33	26½	33½	31½	31½
nuchal tubercles — opposite innerside of foramen magnum	20½	19½	19	20	—	20	19	19	18½	19½
between inner-edges of occipital condyles	20	18	15½	19	—	18½	16½	15½	17	16
between outer-edges of occipital condyles	44	44	43	45½	—	44½	36½	41	44½	42½
top of forehead — basal-level	90	90	95	85	90	94	75	90	85	80
diameter of pedicel, averaged on narrowest part	16	19	23	22	26	22	×	35	25	20
top of mandible — coronoid process	191	194	—	—	207	206	171	—	—	—
top of mandible — dentary condyle	179	178	190	—	191	188½	163	—	—	—
tip of mandible — angular process	175	174	185	—	184	183	160	—	—	—
tip of mandible — front of P^1	58½	56½	(65½)	—	70	70½	(52½)	—	—	—
alveolar-length of lower molariform series	77½	79½	74	—	72	72½	73½	—	—	—
top of coronoid process — basal-level	96	93	101?	—	—	110	87	—	—	—

July (v), August (c, v) and December (n); number of young as a rule 1 (c, v, n), rarely 2 (v). The first rubbing of the antlers happens at about 13 (n) or 10 (n, abnormal) months; their growth takes about 3 months yearly at quite regular intervals (n); they are shed in March (v, n), July (n, abnormal), November (c) and December (v.).

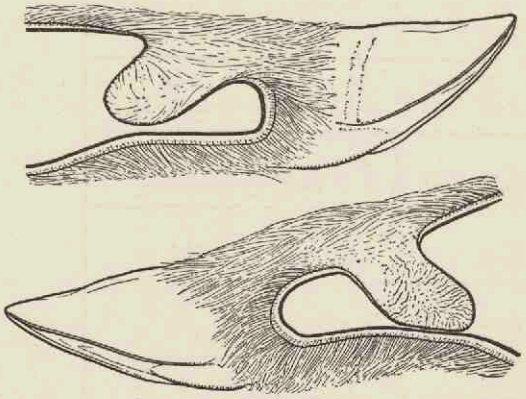

Fig. 20. Length-section of left forefoot (above) and left hindfoot (below) of a 5 months old male *Odocoileus gymnotis gymnotis*; showing the well developed pedal-glands. (nat. size)

Odocoileus gymnotis margaritae Osgood, 1910

Osgood, 1910, p. 24 (sub *margaritae*); Cabrera, 1918, p. 307.

MARGARITA, Vicinity of Puerto Manzanillo (P. Viejo), 1 male, killed at New York, May 16, 1910, abt. 1½ year old, teste Osgood; vicinity of Puerto Manzanillo, born abt. May 1935, died in Porlamar at the fall of 1936 (Odocoileus 14, female, skull); Boca del Pozo, Macanao, V. 1936 (Odoc. 15, male, skull); Laguna Dulce, Macanao, V. 1936 (16—17, males, skulls; eastern Margarita, V. 1936 (18—20, females, skins).

Venado, venao.

Characters. Outside of ears sparsely haired, often nearly naked in centre, the skin usually rather darkly coloured; upperpart of body yellowish or greyish-brown; no blackish spot in upper postorbital region, no distinct black spot above anterior eye-corner; a long blackish neckstreak. Condylobasal-length of skull abt. 225 mm, equals abt. 2,2 zygomatical-breadth; frontals usually abruptly elevated, strongly ridged medially, frequently deeply indented between base of pedicel and orbit.

Though I am not convinced that the cranial characters, in which, according to Osgood, *Odocoileus margaritae* differs from its relative of the mainland, should even justify a separation as subspecies, lack of material prohibits a definite decision in this matter.

Occurring in Margarita in rather limited numbers, probably more common in Macanao and along the southern slopes of the Cerros de Copey.

Odocoileus gymnotis curassavicus subsp. nov.

Cervus capreolus, Simons, 1868, p. 155. *Odocoileus margaritae* Osgood, van der Horst, 1924, p. 6, fig. p. 5. *Odocoileus gymnotis* (Wiegmann), Hummelinck, 1938, p. 209, fig. p. 38.

Holotype: Rijksmuseum van Natuurlijke Historie, Leiden, collector's number Odocoileus 5 (skeleton, skin, tongue, liver, kidneys, genital organs; tab. IX). Type-locality: Island of Curaçao. Description: Adult male with shedded antlers, about 40 kg; large pedal-glands in fore- and hindfeet, well developed tarsal-glands, no metatarsal-glands. Condylobasal-length of skull 222 mm, preorbital-length 122 mm, zygomatical-breadth 98 mm; hindfoot 350 mm, foreleg 465 mm. Upperpart of body yellowish-grey, slightly brown, finely punctuated with dark-grey or black; between ears with a rather conspicuous concentration of black, about 1½ cm broad, narrowing to a vague dark line which fades towards centre part of neck; a pair of distinct black, oval spots in antorbital region, about 2½ × ½ cm; no blackish spot in upper postorbital region; outside of ears rather dark greyish, finely punctuated with black and somewhat yellow, regularly though sparsely covered by thin, to 5 mm long hairs, the central part rather naked at first sight, more densely haired towards margin and base, the anterior part and margin somewhat darker, slightly blackish, the skin rather lightly coloured.

Paratypes: Rijksmuseum van Natuurlijke Historie, Leiden, coll. nr. Odoc. 2 (rather juvenile female, skeleton, skin, tongue, heart and lungs, digestive tract, kidneys; tab. X); Zoölogisch Museum, Amsterdam, cf. van der Horst, 1924, fig. p. 5, Curaçao (adult male, skull, skin); id. Curaçao (female, skin); id., Curaçao (skin).

Diagnosis. Outside of ears sparsely haired, occasionally nearly naked in centre, the skin rather lightly coloured; upperpart of body generally brownish greyish-yellow; usually a small blackish spot in upper postorbital region, a distinct black spot above anterior eye-corner; a short, vague, blackish neck-streak. Condylobasal-length of skull abt. 230 mm, equals abt. 2,2 zygomatical-breadth; frontals rather abruptly elevated, distinctly ridged medially, rather deeply indented between base of pedicel and orbit.

CURAÇAO, St. Silvester, St. Hyronimus, 22.XI.1936 (Odocoileus 5, shot by H. J. Paffen, male, skull, skin, skel., etc.); Savonet, born VIII.1936, brought to The Hague IV.1937, died 20.V.1937 (Odoc. 2, van der Linde Schotborgh don., female, skull, skin, etc.); Knip (cf. van der Horst, 1924, fig. p. 5, male, skull, skin); Curaçao (Amsterdam, female, skin); Curaçao (Amsterdam, skin); St. Hyronimus, XI.1936 6, male, skull, skel.); Savonet, X.1936 (7, male, skull); Savonet, X.1936 (8—9, van der Linde Schotborgh don., males, skulls); Savonet, X.1936 (10, antlers); Savonet, V.1930 (11—11a, antlers); Curaçao, XI.1936 (12—13, St. Thomas College don., antlers). CURAÇAO?, II.1937 (3, de Wit don., juv., female?, skull, headskin, feet); II. 1937 (4, de Wit don., juv., male?, skull, headskin, feet). — GOAJIRA, Serrania Macuire, Puerto López, born. abt. VIII. 1936, died in Curaçao II. 1937 (1, male, skull, headskin, feet). — Tab. IX—X.

Biná, binaar, binau, hert (Cur.); venado, iráma (Goaj.).

The Goajira-specimen (Odoc. 1) and the two juveniles from Curaçao? (Odoc. 3—4), which might be imported from northeastern Colombia, have no black antorbital spot and no trace of neckstreak; they are, therefore, only provisionally reckoned to this subspecies.

Occurring in western Curaçao in very limited numbers only, especially on the plantations St. Hyronimus, Savonet, Knip and St. Kruis; probably rather common in the northern part of the peninsula of La Goajira and South of Rio Hacha. On Curaçao, their number might be estimated at about 100 in 1930, at about 100—150 in 1936; formerly they appear to have been more numerous and were also found in the eastern part of the island. In 1931 shooting and keeping was prohibited by the Government. — Mainland-fawns are not unfrequently kept by the inhabitants of the islands; on Curaçao and Aruba most of these came from the Santa Marta region and La Goajira, on Bonaire and Margarita Venezuelan specimens may be found. In consequence of the keeping-prohibition, a few captive mainland-specimens have been set free on Curaçao.

RODENTIA

LEPORIDAE

Sylvilagus Gray, 1867

Hares, with small tail, interparietal generally persisting as a distinct bone, ear shorter than hindfoot, postorbital process united with cranium and enclosing a narrow foramen, sole densely furred. Southern United States to northern Argentina.

Key to the North Venezuelan, Northeast Colombian and Curaçoan species and subspecies

1a Nape deep black; hindfoot *78—85* mm, forefoot *37—39* mm; condylobasal-length of skull *61—64½* mm;
interorbital-breadth *13½—15¼* mm, nasalbone *30½—31½* mm, outer edges of upper P^1-alveoles *16½—17¾* mm;
ear-length *52½—56* mm, ear-width *36—38* mm;
zygomatical-breadth *33½—34½* mm, lower alveolar-length *13¾—14¾* mm, breadth of lower I *5¼—5½* mm (— Curaçao, Aruba; type-locality Aruba —) ..... *Sylv. nigronuchalis nigronuchalis* (Hartert, 1894)

1a' Probably the same characters (— Falcón, northern Zulia; type-locality vicinity of Maracaibo —) ..... *Sylv. nigronuchalis continentis* Osgood, 1912

1b Nape light yellowish-brown; hindfoot *85—90* mm, forefoot *40—45—46* mm; condylobasal-length of skull *65—68—70½* mm 2

2a Interorbital-breadth behind posterior supraorbital processes *12½—14¼* mm, length of nasalbone *32—34* mm, distance between outer edges of upper P^1-alveoles *17¾—18* mm, condylobasal-length *65—67* mm;
ear-length *55—57* mm, ear-width *41—42* mm, forefoot *43—45* mm;
zygomatical-breadth *33¾—35½* mm, lower alveolar-length *14¼—15* mm, breadth of lower I *5¾—6* mm.
(— La Goajira, Santa Marta district; type-locality Bonda, near Santa Marta —) .....

..... *Sylv. cumanicus superciliaris* (J. A. Allen, 1899) comb. nov.

2b Interorbital-breadth behind posterior supraorbital processes *14¾—15—15½* mm, length of nasalbone *35½—38* mm, distance between outer edges of upper P^1-alveoles *19—20¼—21½* mm, condylobasal-length *66½—68—70½* mm 3

3a Ear-length from notch 63 mm, ear-width 47 mm, forefoot 40 mm; condylobasal-length 70 mm;

zygomatical-breadth 36¼ mm, lower alveolar-length 15½ mm, breadth of lower I 6 mm (— Sucre, prob. Aragua, Carabobo and Falcón; type-locality Cumaná —) ..... *Sylv. cumanicus cumanicus* (Thomas, 1897)

3b Ear-length from notch *53—54—57* mm, ear-width *38—39—40* mm, forefoot *44—45—46* mm; condylobasal-length *66½—68—70½* mm 4

4a Zygomatical-breadth *36¼—36½* mm, alveolar-length of lower molariform series *16—16¼* mm, combined breadth of lower I at top *6¾—7* mm, condylobasal-length *66½—69½* mm (—Los Testigos; type-locality Testigo Grande —) .....

..... *Sylv. cumanicus avius* Osgood, 1910 comb. nov.

4b Zygomatical-breadth *35¾—37½* mm, alveolar-length of lower molariform series *14¾—15¾* mm, combined breadth of lower I at top *6—6* mm, condylobasal-length *68—70½* mm (—Margarita; type-locality —) ... *Sylv. cumanicus margaritae* (Miller, 1898) comb. nov.

Characters of *Sylv. nigron. nigronuchalis* from 19 specimens, of *cum. superciliaris* from 5 spec. (La Goajira), of *cum. cumanicus* from 1 spec. (Araya), of *cum. avius* from 5 spec., of *cum. margaritae* from 6 spec.

It is certain that the relation of species and subspecies will prove to be much more complicated than this synopsis lead us to suppose. The relation between these species and the many other named forms of South-American *Sylvilagus* is still very vague.

Sylvilagus nigronuchalis nigronuchalis (Hartert, 1894)

Hartert, 1894, p. 40 (sub *Lepus nigr.*); Osgood, 1910, p. 28 (sub *nigr.*); van der Horst, 1924, p. 5 (sub *Sylvilagas nigr.*). — *Lepus cuniculus*, Simons, 1868, p. 156.

CURAÇAO, Malpays, 30.XI.1936 (Sylvilagus 21—23); Dokterstuin, 27.X.1936 (Sylv. 24); Dokterstuin, 23.X.1936 (25); St. Hyronimus, 21.XI.1936 (26); St. Silvester, St. Hyronimus, 25.XI. 1936 (27); Eastern Curaçao, V.1920 (cf. van der Horst, 1 spec.); Curaçao, 1908 (1 spec., teste Osgood). ARUBA, Oranjestad, 14.XII.1936 (28); Oranjestad, 2.I.1937 (29—30); Santa Cruz, 2.I.1937 (31); Droemidera, Fontein, 9.I.1937 (32—33); Falcón near Tanki Leendert, 26.XII. 1936 (34—36); Fontein, 29.VI.1930 (37—38); Oranjestad?, 8.I.1937 (39); Aruba, 1892 (1 spec., teste Hartert); Aruba, 1909 (3 spec., teste Osgood). — Tab. X.

Kaniensjie, konijntje.

According to the description of Osgood, *Sylvilagus nigronuchalis continentis* may be practically identical with the insular form.

Rather commonly found on the islands of Curaçao and Aruba, rare in well-populated districts. Very probably not occurring on Bonaire.

Sylvilagus cumanicus margaritae (Miller, 1898) comb. nov.

Robinson, 1896, p. 651 (sub *Lepus brasiliensis*); Miller, 1898, p. 97 (sub *Lepus marg.*); Osgood, 1910, p. 29 (sub *marg.*).

MARGARITA, Los Robles, 5.VI.1936 (Sylvilagus 12—13); San Antonio, 27.V.1936 (Sylv. 14); Laguna Dulce, Macanao, 20.V.1936 (15—16); Porlamar, 2.VI.1936 (17—20); Margarita, VII.1895 (1 spec., teste Miller et Robinson); Margarita, 1909 (13 spec., teste Osgood). Conejo.

Rather often occurring in the easten part of Margarita, more common in te western part.

Sylvilagus cumanicus avius Osgood, 1910 comb. nov.

Osgood, 1910, p. 29 (sub *avius*).

TESTIGOS, Isla de Conejo, 17.VI.1936 (Sylvilagus 7—11); Tamarindo (Testigo Grande), 14.II.1909 (1 spec., teste Osgood).

Common on the small, uninhabited Isla de Conejo of Los Testigos; not found on Tamarindo, the type-locality of this insular form.

Only differing from *Sylv. cum. margaritae* in having a broader skull with heavier dentition.

SCIURIDAE

Sciurus nesaeus Gl. M. Allen, 1902

Robinson, 1896, p. 651 (sub *aestuans hoffmanni*); Allen, Gl. M., 1902, p. 93; Osgood, 1910, p. 26.

MARGARITA, El Valle, 8.VII.1901 (1 spec., teste Allen et Robinson); El Valle, 1909 (2 spec., teste Osgood).

Margarita.

MURIDAE

Epimys rattus (Linné, 1766)

Simons, 1868, p. 156 (sub *Mus rathus*); Allen, Gl. M., 1902, p. 94 (sub *Mus alexandrinus*); Sánchez, 1921, p. 67 (sub *Mus*).

MARGARITA, El Valle, 1901 (1 spec., teste Allen); Porlamar, 29.V.1936 (Epimys 1—4); near Porlamar, 26.V.1936 (Epim. 5—6, M. A. C. Hinton et R. W. Hayman det.). CURAÇAO, Piscadera, 28.XI.1936(7).

Rata, rata casera (Marg.); rata, djaka, rat, huisrat (Cur.).

Widely spread; Margarita, Curaçao.

Epimys norvegicus (Erxleben, 1777)

Martin, 1888 I, p. 119 (sub *Mus decumanus*).

CURAÇAO, 1885 (1 spec., mus. Leiden, cf. Martin). Doubtful.

Widely spread; Curaçao?

Mus musculus Linné, 1766

Simons, 1868, p. 156; Martin, 1888 I, p. 119; Allen, Gl. M., 1902; Sánchez, 1921, p. 67.

MARGARITA, 1901 (4 spec., teste Allen); Porlamar, 22.V.1936 (Mus 1—2, with 5 juv.); Porlamar, 26.V.1936 (Mus 3—4); Porlamar,

1.VI.1936 (5—6); Porlamar, 1.VII.1936 (7). CURAÇAO, Willemstad, 1885 (6 spec., mus. Leiden, cf. Martin); Bloemhof, Willemstad, 1.XI.1936 (8); Piscadera, 20.X.1936 (9).

Ratón, ratón de casa (Marg.); raton, muis, huismuis (Cur.).

Widely spread; Margarita, Curaçao.

CRICETIDAE

Oryzomys spec.

MARGARITA, Cueva Honda del Piache, 10.VII.1936 (mandibles). CURAÇAO, Grot van Hato, 21.IX.1936 (mandibles, M. A. C. Hinton et R. W. Hayman det.).

Hesperomys? spec.

ARUBA, Vader Piet near Fontein, 9.II.1937 (1 spec. juv., M. A. C. Hinton et R. W. Hayman det.).

OCTODONTIDAE

Echimys flavidus (Hollister, 1914)

Robinson, 1896, p. 651 (sub *Loncheres* spec.); Hollister, 1914, p. 143 (sub *Loncheres*).

MARGARITA, El Valle, 9.VII. 1895 (1 spec., teste Hollister et Robinson).

Margarita.

XENARTHRA

DASYPODIDAE

Dasypus novemcinctus Linné, 1766

MARGARITA, El Valle, 22.VI.1936 (Dasypus 1, male).

Cachicamo.

Texas to northern Argentina, Trinidad, Grenada; Margarita!.

CHIROPTERA

EMBALLONURIDAE

Peropteryx canina trinitatis (Miller, 1899) comb. nov.

Miller, 1899, p. 178 (sub *trin.*); Allen, Gl. M., 1902, p. 95 (sub *Peropteryx* spec.); Pittier et Tate, 1932, p. 270 (sub *canina*).

MARGARITA, El Valle, 13.VII.1901 (1 spec., teste Allen, cf. Pittier et Tate); Guatamare, near El Valle, 25.V.1936 (Peropteryx 1—49).

Murcielago (collective noun for bat in Venezuela).

According to Miller, *P. trinitatis* is distinguished from *P. canina* by its small size; the differences, however, may hardly justify a separation as subspecies. The species *canina* is widely distributed on the continent, from Guatemala to the Mato Grosso, only intruding the West Indies from the South as far as Trinidad and Grenada; the specimens from the latter localities (*P. trinitatis* and *P. canina phaea*) are very closely related or probably identical to those from the adjacent mainland. Margarita.

TABLE 7.

Variation in *Peropteryx canina trinitatis*

(females in ordinary numbers, males in thick type)

tibia, in mm (external measurement, with foot turned back)	forearm, in mm (external measurement with folded thumb)											totals	
	38½	39	39½	40	40½	41	41½	42	42½	43	43½		
16½	1												1
17			2			1						1	2
17½		1	2	2		2	1					3	5
18		1	1	2	21	5	6	8		2		22	6
18½								2	4	1		7	
19								1			1	2	
totals	1	2	5	4	1 2	8	7	11	4	3	1	35	14

PHYLLOSTOMIDAE

Chilonycteris parnelli (Gray, 1843)

Tomes, 1861, p. 66 (sub *osburnii*); Peters, 1873, p. 360; Rehn, 1904, p. 194.

MARGARITA, Cave of El Piache near El Valle, 10.VII.1936, St. 142 (Chilonycteris 1—3).

Probably belonging to this species, though differing from the Jamaica-specimens (cf. Tomes et Rehn) by longer extremities (forearm 58½—61 mm, tibia 22—22½ mm, in males).

Jamaica (*C. parn. parnelli*), Cuba (*C. parn. boothi*), Puerto-Rico (*C. parn. portoricensis*), once recorded from Puerto Cabello, Venezuela (teste Peters); Margarita!.

Mormoops megalophylla megalophylla Peters, 1864

MARGARITA, Cave of El Piache near El Valle, 10.VII.1936, St. 142 (Mormoops 1—6).

Mexico to Ecuador and Venezuela, Trinidad; Margarita!.

Mormoops megalophylla intermedia (Miller, 1900)

Miller, 1900, p. 160 (sub *interm.*); Rehn, 1902, p. 170; Osgood, 1910, p. 30.

CURAÇAO, Cave of Hato, 29.IV.1900, and other parts of the island (164 spec., teste Miller); Curaçao, 1908 (80 spec., teste Osgood). ARUBA, Cave of Quadirikiri, 29.VI.1930 (Mormoops 7); Cave of Quadirikiri, 9.II.1937, St. 251 (Morm. 8—10).

Raton die anotsjie (collective noun for bat in Curaçao, Aruba and Bonaire).

Curaçao, Aruba!.

Micronycteris megalotis (Gray, 1842)

Robinson, 1896, p. 651 (sub *Schizostoma megalotes*); Allen, Gl. M., 1902, p. 96.

MARGARITA, El Valle, 12.VII.1895 (2 spec., teste Robinson et Allen); Cave near El Valle, 13.VII.1901 (2 spec., teste Allen).

Honduras to Bolivia and Brasil; Margarita.

Glossophaga soricina (Pallas, 1766)

Martin, 1888 I, p. 119; Allen, Gl. M., 1902, p. 96. — *Glossophaga elongata* Miller, 1900, p. 124; Miller, 1900, p. 159; Miller, 1913, p. 423.

TESTIGOS, Isla de Conejo, 17.VI.1936, St. 165 (Glossophaga 1—9). MARGARITA, Cave near El Valle, 13.VII.1901 (2 spec., teste Allen). BONAIRE, Cueba Watapana, 1.IV.1937, St. 183 (Gloss. 10—12). CURAÇAO, Willemstad, 4.XII.1899 (some spec., teste Miller, 1900); Cave of Hato and other localities, 1900 (27 spec., teste Miller, 1900; Cave near Hermanus, 1885 (3 spec., mus. Leiden, cf. Martin); Cave of Hato, 16.IX.1936, St. 219 (13—14). ARUBA, Seroe Canashito, 7.XII.1936 (15—16); Cave near Fontein, 1885 (1 spec., mus. Leiden).

The specimens do not agree with the description of *G. elongata*, though partly coming from the type-locality of that species; *G. elongata* is therefore provisonally treated under *G. soricina*. The specimens from the Testigos-islands, which, on geographical grounds, could be attributed to *G. longirostris* Miller, differ from those of Bonaire, Curaçao and Aruba in having larger ears and a longer free tip of tail.

According to Miller, 1913, *G. soricina* is distributed over the entire continent from Brasil and Paraguay to central Mexico, with the Tres Marias-islands and Jamaica; *G. longirostris* appears to be restricted to the coast-region of northern South America and the southern Caribbees; *G. elongata* is confined to Curaçao. Los Testigos!, Margarita, Bonaire!, Curaçao, Aruba!.

Leptonycteris curasoae Miller, 1900

Miller, 1900, p. 126; Trouessart, 1904, p. 114 (sub *curacaoae*).

CURAÇAO, 1899? (1 spec., teste Miller). ARUBA, Cave of Quadirikiri, 29.VI. 1930 (Leptonycteris 1—7).

Curaçao, Aruba!.

NATALIDAE

Phodotes tumidirostris (Miller, 1900)

Miller, 1900, p. 160 (sub *Natalus*); Osgood, 1910, p. 30.

CURAÇAO, Cave of Hato, 1.V.1900 (2 spec., teste Miller); Curaçao, 1908 (2 spec., teste Osgood).

Curaçao. A subspecies *continentis* Thomas has been described from the mainland of Venezuela; the related species *stramineus* (Gray), distributed from Mexico to Brasil, has been recorded from Dominica and Hispaniola.

VESPERTILIONIDAE

Myotis nigricans (Wied, 1823)

van der Horst, 1924, p. 5. — *Myotis nesopolus* Miller, 1900, p. 123; Osgood, 1912, p. 65.

CURAÇAO, Willemstad, 4.XI.1899 (1 spec., teste Miller); Fort Beekenburg, 8.IV.1920 (1 spec., mus. Amsterdam, cf. van der Horst); Willemstad, spring 1940 (1 spec., fr. M. Realino don.; doubtful).

Finding no differences to justify the existence of a *M. nesopolus*, this species is treated provisionally under *M. nigricans*.

Mexico to Brasil, Argentina and Bolivia, West Indies; Curaçao. *M. nesopolus* should be confined to Curaçao.

Rhogeëssa minutilla Miller, 1897

Robinson, 1896, p. 651 (sub *Vesperugo parvulus*); Miller, 1897, p. 139 (non viso); Allen, Gl. M., 1902, p. 95.

MARGARITA, 8.VII.1895 (1 spec., teste Allen et Robinson); El Valle, VII.1901 (1 spec., teste Allen).

Margarita. Very closely related to *R. tumida* H. Allen and *R. io* Thomas from the Venezuelan mainland.

MOLOSSIDAE

Molossus major (Kerr, 1792)

Allen, Gl. M., 1902, p. 96 (sub *obscurus*); Werner, 1925, p. 556 (? sub *rufus*).

MARGARITA, El Valle, VII.1901 (3 spec., teste Allen); Guatamare, near El Valle, 25.V.1936 (Molossus 1—2). BONAIRE, 1925 (?teste Werner); Dos Pos, 5.VI.1930 (Moloss. 3—5); Hofje Fontein, 22.V.1930 (6—7); Kralendijk, 24.X.1930 (8).

Werner's record of *M. rufus* from Bonaire might possibly refer to this species.

M. major, narrowly delimitated according to Miller, 1913, occurs in Dominica, Trinidad and northern Venezuela; in its wider sense, considered identical with *M. obscurus* Geoffroy, it has a distribution from Central America and the West Indies to Perú and Brasil. Margarita, Bonaire!.

Molossus pygmaeus Miller, 1900

Miller, 1900, p. 162; Miller, 1913, p. 92.

CURAÇAO, Willemstad, 16.I.1900 (1 spec., teste Miller); Hofje Porto Marie, 18.IV.1930 (Molossus 9).

Possibly confined to Curaçao, but with several resembling forms on the continent.

MARSUPIALIA

DIDELPHYIDAE

Philander trinitatis venezuelae (Thomas, 1903)

Allen, Gl. M., 1902, p. 92 (sub *Caluromys philander*); Pittier et Tate, 1932, p. 253.

MARGARITA, El Valle, 12.VII.1901 (1 female, 3 juv., teste Allen).

Sucre; Margarita.

Marmosa mitis robinsoni Bangs, 1898

Robinson, 1896, p. 651 (sub *Didelphys murina*); Bangs, O., 1898, p. 95 (sub *robinsoni*); Allen, Gl. M., 1911, p. 194 (sub *robinsoni*); Tate, 1933, p. 118.

MARGARITA, El Valle?, 12.VII.1895 (3 spec., teste Bangs et Robinson).

Sucre; Margarita.

SAURIA

GEKKONIDAE

Gonatodes albogularis (Duméril et Bibron, 1836)

Cope, 1885, p. 180, 182 (sub *Goniodactylus*); Stejneger, 1917, p. 265; de Rooy, 1922, p. 250; Ruthven, 1923, p. 2; Cochran, 1934, p. 4.

GOAJIRA, Tucacas, St. 286 (Gonatodes 76—79); Cabo de la Vela, St. 290 (Gonat. 80—81); Uribia, St. 288 (82—86); Rio Hacha, 18.I.1937 (87). ARUBA, teste Cope. CURAÇAO, Pietermaai, II.1940 (88—91; fr. Realino don.); mus. Amsterdam, cf. de Rooy; teste Cope, Ruthven, Cochran.

Machurito, curumachár, culumasár (Goaj.); totekkie, toertiekie (Cur.).

The records for Curaçao and Aruba might possibly refer to recently introduced specimens.

Colombia, Venezuela; Aruba, Curaçao.

Gonatodes vittatus (Lichtenstein, 1856)

Boulenger, 1885 I, p. 60; Ruthven, 1923, p. 2.

PARAGUANÁ, Carirubana, 15.II.1937 (Gonatodes 1—7); Cerro Transverso, St. 280 (Gonat. 8). LA GUAIRA, Cabo Blanco, St. 121 (9—10). GUANTA, St. 122 (11—12). CARÚPANO, Esmerarda, St. 124 (13—14); Puerto Santo, St. 125 (15—19). ARAYA, Chacopata, St. 127 (20—22); Isla de Caribes, St. 128 (23). COCHE, St. 129 (observed). CUBAGUA, St. 130 (24). MARGARITA, La Asunción, St. 148 (25); Porlamar, St. 155 (26—35); Porlamar, 4.VIII.1936 (36—37); Morro Moreno, 8.VII.1936 (38); Isla Blanca, St. 156 (39—43). TESTIGOS, Morro de la Iguana, St. 158

(44); Chiwo, St. 159 (45—51); Angoletta, St. 160 (52—54); Isla de Conejo, St. 165 (55). FRAILES, Puerto Real. St. 166 (56); La Pecha, St. 168 (57—61). CURAÇAO, mus. Leiden, Schilt coll.; teste Boulenger. ARUBA, Heintje Croes, St. 276 (62—67); Oranjestad, 22.XII.1936 (68—69); Oranjestad, 24.XII.1936 (70); Oranjestad 4.I.1937 (71); Oranjestad (72—75). — Tab. XII.

Mea-mea (E. Venez.); lagartija (Parag.); totekkie, toertiekie (Ar.).

The records for Curaçao were perhaps based on introduced specimens or may be due to inexact labelling.

Colombia, Venezuela, Southern Lesser Antilles; Margarita!, Coche!, Cubagua!, Los Testigos!, Los Frailes!, Curaçao?, Aruba.

Gonatodes spec. (? **albogularis** aff.)

TORTUGA, St. 173 (Gonatodes 92—94). ORCHILA, Huespen, St. 175 (Gonat. 95).

Mea-mea.

Tortuga!, Orchila!.

Gonatodes spec. (? **vittatus** aff.)

ROQUES, Gran Roque, St. 176 (Gonatodes 96).

Mea-mea.

Los Roques!.

Gonatodes spec. (? **Gymnodactylus** aff.)

HERMANOS, Morro Pando, St. 170 (Gonatodes 97—100; 97 and 100 in Rijksmuseum van Natuurlijke Historie, Leiden; 98—99 in Zoölogisch Museum, Amsterdam); Morro Fondeadero, St. 169 (observed).

Mea-mea.

Characters. Snout acutely pointed, somewhat concave mediodorsally, 3—3½ mm long, equalling height of head, ¾ headwidth, ½ distance from tip of snout to ear, 1¼ distance from ear to posterior eye-border; tip of snout to vent 23—25 mm; length of foreleg abt. 7 mm, of hindleg abt. 10 mm; generally 12 lamellae beneath fourth finger, 14 beneath fourth toe; about 40(—45) scales between anterior border of foreleg and vent; tubercles in gular region abt. ⅔ size of those in middorsal region; upperparts greyish (in life reddish), without any well marked design, underparts much lighter. — Juveniles with a well marked laterodorsal, dark-brown stripe, abruptly beginning in occipital region, narrowing and becoming more vague on tail; each stripe with an irregular series of several spots in groundcolour medially, with a little yellow dot in each centre anteriorly; two narrow yellow stripes below and above the eye, disappearing in occipital region.

Los Hermanos!.

Gymnodactylus antillensis van Lidth de Jeude, 1887

van Lidth de Jeude, 1887, p. 129; de Rooy, 1922, p. 250; Ruthven, 1923, p. 2; Werner, 1925, p. 534; Cochran, 1934, p. 4.

ORCHILA, teste Cochran. AVES, Ave de Barlovento, St. 179A (Gymnodactylus 1—17); Ave de Barlovento, St. 179 (Gymnod. 18—32). BONAIRE, Bronswinkel, St. 198 (33—36); Salinja Tam. 23.XI.1930 (37); Dos Pos, 24.V.1930 (38—41); Dos Pos, 7.VI.1930 (42); Tanki Onima, St. 194 (43—46); Fontein, St. 191 (47—49); Spelonk, 23.XI.1930 (50—51); Spelonk, St. 187 (52); Kralendijk, 21.VIII.1930 (53—54); Kralendijk, 14.IX.1930 (55—56); Kralendijk, 29.IX.1930 (57—67); Kralendijk, 6.X.1930 (68—70); Kralendijk, 1.XII.1930 (71—80); Lima, St. 184 (81). KLEIN BONAIRE, 10.IX.1930 (82). KLEIN CURAÇAO, St. 200 (83—90). CURAÇAO, Ronde Klip, St. 201 (91); S. Mainsjie, St. 203 (92—93); Seinpost, St. 204 (94—96); Tafelberg, St. 206 (97); Newport, St. 207 (98—99); Newport, St. 208 (100); Quarantaine, St. 210 (101); Willemstad, V.1939 (102); S. Pretoe, St. 213 (103—104); Piscadera, 8.IX. 1936 (105—106); Piscadera, 10.III.1937 (107); Evertszberg, St. 214 (108); Hato, St. 217 (109—111); S. di Cueba, St. 227 (112); Hofje Savonet, 4.V.1930 (113); Westpunt, St. 238 (114); S. Djerimi, St. 242 (115); S. Pieter, Lagoen, 22.IV.1930 (116—118); Pietermaai, II.1940 (119—127, fr. Realino don.); Scherpenheuvel, II.1940 (128—135, fr. Realino don.); Brakke Put Ariba, II.1940 (136—155, Realino don.). — Tab. XII.

Toertiekie, totekki (Cur., Bon.); mea-mea (Aves).

Referring to the type-locality of this species, van Lidth de Jeude stated that "Many specimens were captured in Curaçao and Aruba"; further investigations proved, however, that the latter locality may be safely excluded. The occurrence on Orchila could not be ascertained.

Curaçao, Klein Curaçao, Bonaire, Klein Bonaire, Las Aves!, Orchila.

Phyllodactylus martini van Lidth de Jeude, 1887

van Lidth de Jeude, 1887, p. 130; de Rooy, 1922, p. 250 (sub *julieni*); Ruthven, 1923, p. 3 (sub *pulcher*); Parker, 1935, p. 482. — *Phyllodactylus pulcher*, Ruthven, 1926, p. 2; Stejneger, 1933, p. 49, Cochran, 1934, p. 4 [p. p.: Bonaire]. *Phyllodactylus julieni*, Hummelinck, 1938, p. 209.

BONAIRE, Kralendijk, 5.XII.1930 (Phyllodactylus 15). KLEIN BONAIRE, teste Ruthven, 1923. CURAÇAO. S. Mainsjie, St. 203 (Phyllod. 16—17); Seinpost, St. 204 (18); Newport, St. 207 (19); Newport, St. 208 (20—21); Emmastad, IX.1930 (22); S. Pretoe, St. 213 (23); Piscadera, 1.IX.1936 (24); Evertszberg, St. 214 (25); S. Spreit, St. 215 (26); Hato, St. 217 (27); S. Teintje, St. 231 (28); S. Pieter, Lagoen, 22.IV.1930 (29—30); Scherpenheuvel, II.1940 (38—39, Realino don.); Brakke Put Ariba, II.1940 (40—48, Realino don.).

Toertiekie pega-pega, totekkie pegapega, pega-pega.

Characters (together with 8 additional specimens from Curaçao). Large-tubercles on back well developed, distinctly keeled, escutcheon-shaped, sharp, central ones in well defined longitudinal rows, slightly and gradually smaller towards sides; region between eye and ear with irregularly placed, strongly developed, sharp large-tubercles; supraocular tubercles slightly or distinctly enlarged, the largest exceeding those of frontal region; 2 postmentals, usually

broadly in contact; upper postnasals as a rule separated by 3 tubercles, the middle-one equalling the others or smaller, sometimes with two small tubercles in centre; (16—)18—20(—22) longitudinal dorsal rows of large-tubercles between anterior border of forelimb and level of vent; (18—)20—24(—26) longitudinal ventral rows of scales; (38—)40—44(—46) transversal ventral rows of scales, between anterior border of forelimb and vent; 11—13 transverse lamellae beneath fourth toe, about 10—11 beneath fourth finger.

Curaçao, Bonaire, Klein Bonaire; Puerto-Rico?.

Phyllodactylus julieni Cope, 1885

Cope, 1885, p. 180; Ruthven, 1923, p. 3 (sub *pulcher*) [p. p.: Aruba]; Burt et Burt, 1933, p. 9 (sub *spatulatus*) [p. p.: Aruba]; Parker, 1935, p. 482. — *Phyllodactylus spatulatus*, Ruthven, 1926, p. 2. *Phyllodactylus pulcher*, Cochran, 1934 [p. p.: Aruba].

ARUBA, Fontein, 2.VII.1930 (Phyllodactylus 31); Rooi Spoki, St. 255 (Phyllod. 32); S. Canashito, St. 266 (33); S. Jamanota, St. 270 (34—35); Baca Morto, Oranjestad, 16.XII.1936 (36); Tibusji, St. 273 (37). — Tab. XIII.

Totekki pegapega, pega-pega.

Characters. Large-tubercles on back well developed, distinctly keeled, escutcheon-shaped, rather sharp, central-ones in rather well defined longitudinal rows, distinctly smaller towards sides; region between eye and ear with rather regularly placed, rather well developed, rather sharp large-tubercles; supraocular tubercles slightly or rather distinctly enlarged, the largest exceeding those of frontal region; usually 3 postmentals, sometimes 2, which are narrowly in contact; upper postnasals commonly separated by 3 tubercles, the middle-one nearly equalling the others or smaller, very often separated by 4 tubercles, with two small tubercles in centre; about 24—26 longitudinal dorsal rows of large-tubercles; about 34—42 transversal dorsal rows of large-tubercles, between anterior border of forelimb and level of vent; 22—26 longitudinal ventral rows of scales; about 38—44 transversal ventral rows of scales, between anterior border of forelimb and vent; about 12—13 transverse lamellae beneath fourth toe, 11—12 beneath fourth finger.

Aruba.

Phyllodactylus mülleri H. W. Parker, 1935

Parker, 1935, p. 483.

ARAYA, Isla de Caribes, St. 128 (Phyllodactylus 1). MARGARITA, Punta Mosquito, St. 152 (Phyllod. 2—4); Porlamar, 7.VI.1936 (5); Porlamar, 12.VII.1936 (6); Porlamar, 4.VIII.1936 (7); Morro Moreno, Porlamar, 8.VII.1936 (8—9).

Salamanqueja.

Characters. Large-tubercles on back well developed, distinctly keeled, escutcheon-shaped, sharp, central-ones in well defined longitudinal rows, slightly and gradually smaller towards sides; region between eye and ear with rather irregularly placed, well developed, sharp large-tubercles; supraocular tubercles subequal, the largest smaller than those of frontal region; 2 postmentals, broadly in contact; upper postnasals separated by 2 or 3 tubercles, the middle-one

smaller and situated anteriorly; 16—18 longitudinal dorsal rows of large-tubercles; 24—30 transversal dorsal rows of large-tubercles, between anterior border of forelimb and level of vent; 20—24 longitudinal ventral rows of scales; 40—46 transversal ventral rows of scales, between anterior border of forelimb and vent; 13—14 transverse lamellae beneath fourth toe, about 10 beneath fourth finger.

Northern Venezuela, Patos Island near Trinidad; Isla de Caribes near Cochel, Margarital.

Phyllodactylus rutteni sp. nov.

Holotype: Rijksmuseum van Natuurlijke Historie, Leiden, collector's nr. Phyllodactylus 11. Type-locality: Isla Blanquilla (Venezuela), Valuchu. Description: Rather juvenile female?, with broad transverse bands of white and brown; tip of snout to vent 31 mm, regenerating tail 24 mm, 3 postmentals, upper postnasals separated by 3 tubercles, about 28 longitudinal dorsal rows of large-tubercles, about 42 transverse rows of large-tubercles between anterior border of forelimb and level of vent, about 26 longitudinal ventral rows of scales, about 46 transversal rows of scales between anterior border of forelimb and vent, 12 transverse lamellae beneath fourth toe, 10 beneath fourth finger.

Paratypes: Rijksmuseum van Natuurlijke Historie, Leiden, coll. nr. Phyllod. 12, topotypical, and Phyllod. 10. Zoölogisch Museum, Amsterdam, coll. nr. Phyllod. 13, topotypical, and Phyllod. 14. — Named in honour of Prof. Dr. L. M. R. Rutten, geologist, Utrecht.

Diagnosis (compared with *P. martini, P. julieni* and *P. mülleri*). Large-tubercles on back weakly developed, indistinctly keeled, round, blunt, central-ones in ill defined longitudinal rows, rapidly smaller and becoming indistinguishable towards sides; region between eye and ear with scattered, weakly developed, flat large-tubercles; supraocular tubercles very slightly enlarged, the largest usually exceeding those of frontal region; 3 or 2 postmentals; upper postnasals separated by 3 tubercles, the middle-one equalling the others or smaller and situated anteriorly; about 26—30 longitudinal dorsal rows of large-tubercles; about 36—46 transversal dorsal rows of large-tubercles, between anterior border of forelimb and level of vent; about 24—30 longitudinal ventral rows of scales; about 44—50 transversal ventral rows of scales, between anterior border of forelimb and vent; about 12—13 transverse lamellae beneath fourth toe, about 11 beneath fourth finger.

HERMANOS, Morro Pando, St. 170 (Phyllodactylus 10). BLANQUILLA, Valuchu, St. 171, 21.VII.1936 (Phyllod. 11); El Jaque, 22.VII. 1936 (12—13). TORTUGA, St. 173? (observed). ROQUES, Gran Roque, St. 176 (14).

Salamanqueja.

Los Hermanos!, Blanquilla!, Los Roques!.

Thecadactylus rapicaudus (Houttuyn, 1782)

Martin, 1888 I, p. 141; Ruthven, 1923, p. 3; Werner, 1925, p. 535.

TESTIGOS, Isla de Conejo, St. 165 (Thecadactylus 1—2). BONAIRE, teste Martin, Ruthven, Werner. CURAÇAO, S. Teintje, St. 231

(Thecad. 3—4); Curaçao, s.d. (5). ARUBA, Santa Cruz, 23.XII.1936 (6); Oranjestad, 21.XII.1936 (7—9); Oranjestad, VI.1936 (10). TRINIDAD, Tetron Bay, St. 295 (11).

Salamanqueja (Test.); pega-pega (Cur., Ar.).

Tropical South America, Central America, West-Indies, Trinidad; Los Testigos!, Bonaire, Curaçao, Aruba.

IGUANIDAE

Anolis lineatus Daudin, 1802

Ruthven, 1923, p. 7; Barbour, 1930, p. 131.

CURAÇAO, Seinpost, St. 204 (Anolis 147—148); Tafelberg, St. 205 Anol. 149); Tafelberg, St. 206 (150); Newport, St. 207 (151); Newport, St. 208 (152); Scherpenheuvel, 12.IX.1936 (153—159); Emmastad, X.1930 (160); Piscadera, 10.III.1937 (161); Evertszberg, St. 214 (162—164); S. Spreit, St. 215 (165); Hato, St. 217 (166—173); S. Cabajé, St. 225a (174); Dokterstuin, 27.X.1936 (175); S. di Cueba, St. 227 (176—177); S. di Cueba, St. 228 (178—179); Zevenbergen, 23.IV.1930 (180—181); Hofje Savonet, 27.IV.1930 (182—183); Boca Grandi, 30.IV.1930 (184); Westpunt, St. 238 (185—187); Plaja Abau, St. 241 (188); St. Kruis, 21.IV.1930 (189—191); Curaçao, s. d. (192—194); Scherpenheuvel, II.1940 226—227, fr. Realino don.). ARUBA, Fontein, 5.VII.1930 (195—197); Rooi Lamoenchi, St. 257 (198—204); S. Canashito, St. 266 (205); Hooiberg, 20.VI.1930 (206—211); Pos di Noord, 26.VI.1930 (212—215); Westpunt, St. 274 (216); Solito, St. 275 (217—219); Bubali, 22.XII.1936 (220); Heintje Croes, 18.VI.1930 (221—222); Oranjestad, 17.VI.1930 (223—224); Oranjestad, 5.VII.1930 (225). — Tab. XIV.

Waltaka, kako, ragadiesjie die paloe.

Curaçao, Aruba.

Anolis bonairensis bonairensis Ruthven, 1923

Anolis bonairensis Ruthven, 1923, p. 4; Werner, 1925, p. 536. — *Anolis leachii,* Hartert, 1902, p. 294 [prob.]. *Anolis alligator,* Meek, 1910, p. 416 [prob.].

AVES [prob.], teste Meek. BONAIRE, Dos Pos, 24.V.1930 (Anolis 29—30); Rincón, 25.V.1930 (Anol. 31—59); Fontein, 21.IX.1930 (60—61); Spelonk, 23.XI.1930 (62); Bolivia, 2.IV.1937 (63—75); Kralendijk, 25.IX.1930 (76—101); Kralendijk, 28.IX.1930 (102—137); Kralendijk, 20.XI.1930 (138—140); Kralendijk, 28.III.1937 (141). KLEIN BONAIRE, 17.X.1930 (142); Klein Bonaire, St. 199 (143—145); Klein Bonaire, St. 199a (146).

Ragadiesjie die paloe, kako.

Characters (compared with *A. bonairensis blanquillanus*). As a rule with black crossbars, rarely vermiculated with black; design generally distinct on head and whole back; adult males about 60—70(—75) mm, females 50—55 (—60) mm from tip of snout to vent; distance from snout-tip to anterior border of ear *1,25* length of tibia; occipital scale usually in contact with one or two

pairs of the scales of the supraorbital semicircles; scales of supraorbital semicircles often separated, commonly one pair, very often two pairs in contact; (22—)23—*25*—26(—27) lamellae under phalanges II and III of fourth finger.

Bonaire, Klein Bonaire, Las Aves?.

Anolis bonairensis blanquillanus subsp. nov.

Holotype: Rijksmuseum van Natuurlijke Historie, Leiden, collector's nr. Anolis 15. Type-locality: Isla Blanquilla (Venezuela), El Jaque. Description: Adult male; tip of snout to vent 81 mm, id. to ear 21 mm, tibia 18½ mm, hindleg 56 mm, foreleg 35 mm, tail 133 mm regenerating; 23 lamellae under phalanges II and III of fourth finger, 27 under those of fourth toe; occipital scale in contact with 3 scales of the supraorbital semicircles, two pairs of scales of the supraorbital semicircles in contact; greyish, on headtop and sides of neck with distinct black vermiculations, gular appendage rather large, in life yellow with whitish speckles (in females much smaller and whitish), tail-tip abnormal white in colour.

Paratypes: Rijksmuseum van Natuurlijke Historie, Leiden, coll. nr. Anolis 7, 16—17. Zoölogisch Museum, Amsterdam, coll. nr. Anolis 8—10. Zoölogisch Museum, Utrecht, coll. nr. Anolis 1—3, 6, 28.

Diagnosis (compared with *A. bonairensis bonairensis*). Usually vermiculated with black, sometimes with black crossbars; design generally distinct on head and anterior part of back only; adult males about 80—85 mm, females 60—65 mm from tip of snout to vent; distance from snout-tip to anterior border of ear *1.15* length of tibia; occipital scale in contact with, as a rule, two pairs of the scales of the supraorbital semicircles; scales of supraorbital semicircles never separated, usually two pairs in contact; (22—)23—*23.5*—25(—26) lamellae under phalanges II and III of fourth finger.

LOS HERMANOS, Morro Fondeadero, St. 169 (Anolis 1—6). BLANQUILLA, Playa Valuchu, 21.VII.1936 (Anol. 7); Plantió del Jaque, St. 172, 22.VII.1936 (8—28).

Los Hermanos!, Blanquilla!.

Anolis chrysolepis Duméril et Bibron, 1837

Hartert, 1902, p. 294.

CURAÇAO, teste Hartert.

Referring possibly to an introduced specimen.

Venezuela, Trinidad, Guyana, Brasil; Curaçao?.

Iguana iguana iguana (Linné, 1758)

Boulenger, 1885 II, p. 189 (sub *tuberculata*); Meek, 1910 (sub *tuberculata*); Dunn, 1934, p. 1.

GOAJIRA, Rio Hacha, 19.I.1937 (Iguana 1—3). PARAGUANA, Carirubana, 16.II.1937 (Ig. 4). CARÚPANO, Puerto Santo, St. 125 (5). ARAYA, Isla de Caribes, St. 128 (6—9). MARGARITA, Guatamare, near El Valle, 26.V.1936 (10—12, 29—34); Porlamar, 31.V.1936 (13, 16—25,

TABLE 8.

Variation in *Anolis bonairensis bonairensis* (ordinary numbers) and *Anolis bonairensis blanquillanus* (in thick type)

tip of snout to anterior border of ear, in mm

tibia, in mm

	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½	18	18½	19	19½	20	totals
11	1		**1**																							1 **1**
11½			1																							1
12		1			1																					2
12½				3	1																					4
13					2																					2
13½					1	3	2																			6
14						1	6	5	**1**																	12 **1**
14½							2	5	1	**1**																8 **1**
15							1	4	9	**12**			**1**													15 **3**
15½								1	2	1	1	**1**	**1**													5 **2**
16											3	**1**														3 **1**
16½											1	2	2													5
17											1	4	4	1	21	**3**										12 **4**
17½												1	6	2	**2**	**1**	**1**									9 **4**
18													1	5	7	1										14
18½														1	3	2	2									8
19															1	3	41					1				8 **2**
19½																1										1
20																	1									1
20½																							**1**			**1**
21																				1	**1**		**2**	**1**		1 **4**
21½																							**1**		**2**	**3**
22																							**1**			**1**
totals	1	1	1 **1**	3	5	4	11	15	12 **1**	2 **3**	6	7 **2**	13 **2**	9	13 **3**	7 **4**	7 **2**			1	**1**	**1**	**5**	**1**	**2**	118 **28**

28, 35—36); Porlamar, 27.V.1936 (14—15, 37—39); Porlamar, 19.V.1936 (26—27); Laguna Dulce, Macanao, 20.V.1936 (40). TESTIGOS, Morro de la Iguana, St. 157 (41—42); Tamarindo, St. 162 (52); Isla de Conejo, St. 164 (observed). FRAILES, Puerto Real, St. 167 (observed); La Pecha, St. 168 (43). HERMANOS, Morro Pando, St. 170 (44—46); Morro Fondeadero, St. 169 (observed;? 47—50). BLANQUILLA, Valuchu, St. 171 (51). TORTUGA, St. 173 (observed). ORCHILA, Huespen, St. 175 (observed). ROQUES, Gran Roque (observed). AVES, teste Meek. BONAIRE, Lima, 24.VIII.1930 (53—54); Lima, 29.VIII.1930 (55); Rooi Lamoenchi, 15.X.1930 (56); Rincón, 10.V.1930 (57); Slagbaai, 3.XI.1930 (58); Slagbaai, 11.XI.1930 (59). KLEIN BONAIRE, St. 199 (observed). CURAÇAO, St. Kruis, 25.IV.1930 (61—62); S. Cabajé, Porto Marie, 19.IV.1930 (60, 63—67). ARUBA (observed).

Iguana (adult), camaleón (juvenile) (Venez., Colomb.); joewana (Cur., Ar., Bon.), tjoetjoe (juvenile) (Bon.).

The adult specimens of the Frailes Islands are in general noticeably obscured by a dull brownish grey; those of Blanquilla often vary, but might even be blackish. The adults of the Hermanos Islands, however, are largely smoky-black, only the broad bands on the tail being indistinctly visible.

Central and northern South America, Central America, West Indies; Margarita, Los Testigos!, Los Frailes!, Los Hermanos, Blanquilla, Tortuga!, Orchila, Los Roques!, Las Aves, Bonaire, Curaçao, Aruba.

Tropidodactylus onca (O'Shaughnessy, 1875)

Boulenger, 1885 II, p. 97; Ruthven, 1922, p. 59; Cochran, 1934, p. 40.

GOAJIRA, Cabo de la Vela, St. 290 (Tropidodactylus 1—2); Rancheria de la Vela, St. 289 (Tropidod. 3); El Cardón, St. 291 (4). PARAGUANA, Las Piedras, 24.II.1937 (5—7); Carirubana, 20.II.1937 (8—9); Carirubana, 24.II.1937 (10—11); Santa Ana, St. 284 (12); Barunú, Buena Vista, 18.II.1937 (13). MARGARITA, La Asunción, St. 147 (14—15); Los Robles, St. 154 (16—18); Los Robles, 11.VIII.1936 (19); Morro de Moreno, 8.VI.1936 (20); Porlamar, 27.V.1936 (21—34).

Ocório (Goaj.); aguacero (Parag.); camaleón (Marg.).

Adpressed hind-limb reaching from posterior border of tympanum to anterior border of orbit, may sometimes be shorter or longer; (8—)9—10(—12) labials to below of eye-centre. — The scales of the occipital region in the Margarita specimens are in general noticeably smaller than in those of the continent; in addition several specimens of this island show no traces of rhomboidal spots on the back, but are darkly punctuated or vermiculated.

Northern South American; Margarita.

Tropidurus torquatus hispidus (Spix, 1825)

Meek, 1910, p. 416 (sub *hispidus*); Burt et Burt, 1933, p. 48; Cochran, 1934, p. 40.

CARÚPANO, Puerto Santo, St. 125 (Tropidurus 1); Esmerarda, St. 123 (Tropidur. 2). ARAYA, Isla de Caribes, St. 128 (3); Morro de Chacopata.

St. 127 (observed). COCHE, St. 129 (observed). MARGARITA, Boca del Pozo, Macanao, 20.V.1936 (4—8); Laguna Dulce, Macanao, 20.V.1936 (9—15); Puerto Manzanillo, 11.V.1936 (16); Porlamar, 27.V.1936 (17—19); Porlamar, 29.V.1936 (20—48). TESTIGOS, Tamarindo, St. 162 (49—51); Tamarindo, St. 163 (52); Isla de Conejo, St. 164 (53—55). FRAILES, Puerto Real, St. 167 (observed); La Pecha, St. 168 (observed). AVES, teste Meek.

Guaripete.

Meek's record of this species from the Aves Islands is remarkable.

Northern South America, Margarita, Coche!, Los Testigos!, Los Frailes!, Las Aves.

TEIIDAE

Ameiva bifrontata bifrontata Cope, 1862

Cope, 1862, p. 67 (sub *bifr.*); Ruthven, 1922, p. 61 (sub *bifr.*); Ruthven, 1923, p. 7 (sub *bifr.*); Barbour et Noble, 1915, p. 469; Ruthven, 1924, p. 6. — *Cnemidophorus divisus* Fischer, 1879, p. 99 (non viso). *Ameiva divisus,* Ruthven, 1913, p. 1. *Ameiva bifrontata divisus,* Ruthven, 1922, p. 60. *Ameiva bifrontata divisa,* Ruthven, 1924, p. 6. *Ameiva insulana* Ruthven, 1924, p. 1. *Ameiva bifrontata insulana,* Ruthven, 1924, p. 6. *Cnemidophorus arubensis,* de Rooy, 1922, p. 252 [p. p.: female Aruba].

GOAJIRA, Puerto López, St. 285 (Ameiva 1); Cabo de la Vela, St. 289 (Am. 2); Rio Hacha, 18.I.1937 (3—128). PARAGUANÁ, Carirubana, 19.II.1937 (129—179); Santa Ana, 16.II.1937 (180). CARÚPANO, Puerto Santo, St. 125 (181—187). ARAYA, Isla de Caribes, St. 128 (observed). CUBAGUA, St. 130 (188). MARGARITA, Boca del Pozo, Macanao, 20.V.1936 (189—192); Laguna Dulce, Macanao, 20.V.1936 (193—194); Puerto Manzanillo, 11.V.1936 (195—205); Punta Ballena, Pampatar, 9.V. 1936 (206—214); Los Robles, St. 154 (215); Guatamare, 28.V.1936 (216—219); Porlamar, 19.V.1936 (220—223); Porlamar, 28.V.1936 (224—248); Porlamar, 30.V.1936 (249—250); Porlamar, 5.VIII.1936 (251—257). TESTIGOS, Morro de la Iguana, St. 157 (258—315); Tamarindo, St. 161—163 (316—326); Isla de Conejo, St. 164—165 (327—333). FRAILES, Puerto Real, St. 166—167 (334—335); La Pecha, St. 168 (observed). ARUBA, Hofje Bubali, 22.XII.1936 (336); Oranjestad, 23.XII.1936 (337).

Mato (Venez.); bizure (Parag.); mato, lobo (Goaj.).

The specimens of the Testigos Islands, described by Ruthven as *Ameiva insulana,* might be separable as some lower taxonomic unit from the more typical specimens, principally on the pronounced discontinuity of the brachials and antebrachials. This is the only character in which the specimens of Los Frailes differ from the average-specimen of Puerto Manzanillo, Margarita. — The variation of *Ameiva bifrontata* suggests a rather doubtful value of the distinguishing characters of the subspecies *divisa* Fischer. — The specimens of Aruba are typical in scalation; the black spots being absent or practically absent as in some specimens of Paraguaná.

Northern Venezuela, Colombia, northern Perú; Margarita!, Cubagua!, Los Testigos, Los Frailes!, Aruba.

Ameiva ameiva (Linné, 1758)

Werner, 1900, p. 266 (sub *surinamensis*); Meek, 1910, p. 417 (sub *surinamensis*).

AVES, teste Meek. CURAÇAO, teste Werner.

Both records might possibly be due to an inexact indication of locality or to introduced specimens.

Central, northern and northeastern South America.

Cnemidophorus lemniscatus lemniscatus (Linné, 1758).

Werner, 1900, p. 266 (sub *lemn.*) [prob. excl. Curaçao]; Burt, 1931, p. 30; Cochran, 1934, p. 44.

GOAJIRA, Puerto López, St. 285 (Cnemidophorus 1—2); Cabo de la Vela St. 289 (Cnemid. 3—6); Rio Hacha, 19.I.1937 (7—55). PARAGUANA, Carirubana, 17.II.1937 (56—60); Carirubana, 15.II.1937 (61); Carirubana, 20.II.1937 (62—73); Carirubana, 19.II.1937 (74—112). LA GUAIRA, 19.VIII.1936 (113—115); Cabo Blanco, St. 121 (116). CARÚPANO, Puerto Santo, St. 125 (117—119); Puerto Santo, St. 126 (120). ARAYA, Chacopata, St. 127 (121); Isla de Caribes, St. 128 (122—128). COCHE, St. 129 (observed). CUBAGUA, St. 130 (129). MARGARITA, Boca del Pozo, Macanao, 20.V.1936 (130—135); San Juan Bautista, 11.VIII.1936 (136); Puerto Manzanillo, 11.V.1936 (137—149); Punta Ballena, Pampatar, 9.V.1936 (150); Cerrito, St. 138 (151); Porlamar, 19.V.1936 (152—157); Porlamar, 28.V.1936 (158—176); Porlamar, 5.VIII.1936 (177); Playa Brava, Porlamar, 4.VI.1936 (178). TESTIGOS, Morro de la Iguana, St. 157—158 (179—180); Angoletta, St. 160 (181—182); Tamarindo, St. 162—163 (183—191). FRAILES, Puerto Real, St. 166—167 (192—195); La Pecha, St. 168 (observed).

Lagartija (Venez.); bizure (Parag.); lagartija, lobo, culu (Goaj.).

Werner cites Curaçao; this probably refers to an introduced specimen or inexact labelling.

Central America, Colombia, Venezuela, Guyana, northern Brasil, Trinidad, Tobago; Margarita, Cubagua!, Coche!, Los Testigos!, Los Frailes!.

Cnemidophorus lemniscatus nigricolor (Peters, 1873)

Meek, 1910, p. 417 (sub *nigr.*) [p. p.: excl. Aruba et prob. Margarita]; Burt, 1931, p. 40; Eisentraut, 1933, p. 228; Cochran, 1934, p. 44.

HERMANOS, Morro Fondeadero, St. 169 (observed); Morro Pando, St. 170 (observed). BLANQUILLA, Playa Valuchu, 21.VII.1936 (Cnemidophorus 196—203); Puerto del Jaque, 22.VII.1936 (Cnemid. 204—207); El Jaque, St. 172 (208—215). TORTUGA, St. 173 (216—221). ORCHILA, Huespen, St. 174—175 (222—232). ROQUES, Gran Roque, St. 176 (233—239); Isla Larga, St. 177 (240); Cayo de Agua, St. 178 (observed). AVES, Ave de Barlovento, St. 179—179A (241—271).

Lagartija.

According to Burt *nigricolor* intergrades with typical *lemniscatus* on Margarita Island, an observation which could not be confirmed.

Los Hermanos!, Blanquilla, Tortuga!, Orchila, Los Roques, Las Aves.

TABLE 9.

Variation in *Ameiva bifrontata*

Locality	Goajira	Paraguaná	Puerto Santo	Margarita	Testigos
Specimens (Ameiva)	128 (1—128)	52 (129—180)	7 (181—187)	69 (189—257)	76 (258—333)
Brachials discontinuous with antebrachials	very rarely	very rarely	rather often	often	nearly always
Postbrachials small and rounded	rarely	often	rather often	very often	generally
Posterior supraoculars not entirely surrounded with granules	very often	often	rarely	often	often
hind-leg reaching to anterior border of ear or further	often	often	often	very often	generally

TABLE 10.

Variation in *Cnemidophorus*

Locality	Continent	Margarita, Testigos, Frailes	Blanquilla, Orchila, Tortuga, Roques, Aves	Bonaire, Klein Bonaire	Curaçao, Klein Curaçao	Aruba
Specimens (Cnemid.)	128 (1—128)	66 (130—195)	76 (196—271)	51 (272—322)	30 (323—352)	28 (353—380)
Longitudinal rows of ventral plates	as a rule 8, rarely 10	as a rule 8, rarely 10	commonly 8, very often 10	usually 12, sometimes 10, often tending to 14	usually 10, rather often 12	usually 8, rather often 10
Femoral pores	18—23—27	21—23—27	24—28—31	36—39—43	26—29—33	28—31—35
Brachials with antebrachials	usually continuous	generally continuous	generally narrowly continuous	always widely discontinuous	as a rule widely discontinuous	generally narrowly discontinuous
Postbrachials enlarged	generally somewhat	generally somewhat	generally slightly	never	very rarely slightly	generally slightly
Species	*lemniscatus lemniscatus*		*lemniscatus nigricolor*	*murinus ruthveni*	*murinus murinus*	*lemniscatus arubensis*

Cnemidophorus lemniscatus arubensis (van Lidth de Jeude, 1887) comb. nov.

van Lidth de Jeude, 1887, p. 132 (sub *arub.*); de Rooy, 1922, p. 252 (sub *arub.*) [p. p.: excl. female]; Werner, 1925, p. 537 (sub *arub.*) [p. p.: excl. Curaçao]; Burt, 1931, p. 51 (sub *murinus arub.*); Cochran, 1934, p. 43 (sub *murinus arub.*). — *Cnemidophorus lemniscatus*, Martin, 1888 I, p. 141. *Cnemidophorus nigricolor*, Meek, 1910, p. 417 [p. p.: Aruba].

ARUBA, Quadirikiri, St. 250 (Cnemidophorus 353); Fontein, St. 252A (Cnemid. 354); Boca Grandi, St. 253 (355); Culebra, St. 254 (356—357); Rooi Lamoenchi, St. 257 (358); Daimari, 3.VII.1930 (360—361); Santa Ana, 26.VI.1930 (362); Punta Braboe, 22.VI.1930 (363—367); Oranjestad, 17.VI.1930 (368—371); Oranjestad, 21.XII.1936 (372); Oranjestad, 23.XII. 1936 (373—377); Aruba s.d. (378); Boekoeti, St. 278 (379—380). — Tab. XIII.

Blausana, ragadiesjie.

Aruba.

Cnemidophorus murinus murinus (Laurenti, 1768)

Werner, 1900, p. 266 (sub *mur.*); Meek, 1910, p. 417 [p. p.: Curaçao]; de Rooy, 1922, p. 252 [p. p.: Curaçao]; Burt, 1931, p. 46; Cochran, 1934, p. 44 [p. p.: Curaçao]; Burt, 1935, p. 1.

KLEIN CURAÇAO, St. 200A (Cnemidophorus 323). CURAÇAO, S. di Boca, St. 202 (Cnemid. 324); Scherpenheuvel, 10.IX.1936 (325—343); Emmastad, 11.IV.1930 (344); Emmastad, 15.V.1930 (345); Bloemhof, 17.X.1936 (346); Schaarloo, St. 212 (347); Paradijs, 23.IX.1936 (348—349); Piscadera, XII.1936 (350); Dokterstuin, 27.X.1936 (351—352).

Blausana, ragadiesjie.

Some records may be taken to indicate that *C. murinus* occurs in Venezuela, Trinidad and Guyana (cf. Werner, de Rooy; Burt, 1931); they probably refer to introduced specimens or are caused by inexact labelling.

Curaçao, Klein Curaçao.

Cnemidophorus murinus ruthveni Burt, 1935

Hartert, 1902, p. 294 (sub *mur.*); Meek, 1910, p. 417 (sub *mur.*) [p. p.: Bonaire]; Werner, 1925, p. 537 [p. p.: Bonaire]; Cochran, 1934, p. 44 (sub *mur. murinus*) [p. p.: Bonaire]; Burt, 1935, p. 14.

BONAIRE, Dos Pos, 31.V.1930 (Cnemidophorus 272); Dos Pos, 6.VI. 1930 (Cnemid. 273—282); Dos Pos, 3.VI.1930 (283—286); Fontein, 21.IX.1930 (287); Boven Bolivia, 31.III.1937 (288—292); Boven Bolivia, 2.IV.1937 (293—307); Kralendijk, 23.V.1930 (308—312); Kralendijk, 25.VIII.1930 (313—314); Kralendijk, 5.IX.1930 (315—316); Kralendijk, 27.IX.1930 (317); Kralendijk, 20.X.1930 (318—319). KLEIN BONAIRE, 10.IX.1930 (320); Klein Bonaire, 17.X.1930 (321); Klein Bonaire, St. 199a (322).

Ragadiesjie, blausana.

Bonaire, Klein Bonaire.

Gymnophthalmus lineatus (Linné, 1758)

Andersson, 1900, p. 16; Werner, 1925, p. 538 (sub *quadrilineatus*); Burt et Burt, 1930, p. 34.

BONAIRE, Dos Pos, 24.V.1930 (Gymnophthalmus 2); Fontein, St. 193 (Gymnophth. 3—4); Spelonk, 23.XI.1930 (5—7). CURAÇAO, Tafelberg, St. 206 (8); Scherpenheuvel, 10.IX.1936 (9); S. Cabajé, St. 225a (10); S. di Cueba, St. 227 (11); Scherpenheuvel, II.1940 (13—14, fr. Realino don.).

Colebra die mispel, colebra meesteri.

Characters (together with 30 additional specimens from Curaçao). 15 longitudinal scale-rows across abdomen; (34—)36—37(—39) transversal scale-rows between occiput and vent; nasal entire, rather often with a faint indication of a lower suture, rarely with a lower suture; (5—)6 femoral pores on each side, in males; 2 yellowish-white longitudinal bands on each side.

Brasil, prob. northeastern South America; Bonaire, Curaçao.

Gymnophthalmus laevicaudus (Cope, 1870)

Ruthven, 1922, p. 64 (sub *sumichrasti*); Burt et Burt, 1930, p. 33.

AVES, Ave de Barlovento, St. 179 (Gymnophthalmus 1). ARUBA, St. Nicolaas, VII.1937 (Gymnophth. 12).

Madre de culebra (Aves); colebra die mispel (Ar.).

Characters. 13 longitudinal scale-rows across abdomen; 33—35 transversal scale-rows between occiput and vent; nasal entire, with a faint indication of a lower suture, or not entire; about 6 femoral pores on each side; 1 yellowish-white longitudinal band on each side anteriorly. — On the continent possibly not clearly separated from *G. lineatus* (cf. Ruthven).

Central Chile to southern Mexico, Venezuela; Aruba!, Las Aves!.

Tretioscincus bifasciatus (Duméril, 1851)

Cope, 1885, p. 181; Ruthven, 1922, p. 63; Ruthven, 1923, p. 9.

MARGARITA, La Asunción, St. 148 (Tretioscincus 1). HERMANOS, Morro Pando, St. 170 (observed). ARUBA, teste Cope et Ruthven, 1923.

Madre de culebra (Marg.).

Northeastern Colombia and northwestern Venezuela; Aruba, Los Hermanos!, Margarita!.

GASTROPODA

ARCHAEOGASTROPODA

HELICINIDAE

Alcadia dysoni (Pfeiffer, 1859)

Baker, 1923, p. 14; Richards, 1938, p. 174.

GUANTA, Stat. 122. CARÚPANO, St. 123. MARGARITA, 135, 138, 139, *139A*, 140, *141, 144, 145, 146*, 154A, 155. TESTIGOS, *157*, 158, *162*.

Venezuela, Trinidad, Bay Islands of Honduras; Los Testigos!, Margarita!.

Lucidella lirata (Pfeiffer, 1847)

Baker, 1923, p. 22.
GUANTA, Stat. 122. MARGARITA, St. 138, 140, *143, 144, 150.* BONAIRE, Riscado near Goto, 1930. CURAÇAO, *234, 235,* Bak Rincón near Hato, 1936.
Venezuela, Central America, West Indies; Margarita!, Bonaire!, Curaçao!.

Stoastomops walkeri Baker, 1924

Baker, 1924. p. 33.
BONAIRE, Stat. 184, *190;* Klein Bonaire, teste Baker.
Bonaire, Klein Bonaire.

MESOGASTROPODA

CYCLOPHORIDAE

Poteria translucida (Sowerby, 1843)

Baker, 1923, p. 31.
MARGARITA, Stat. 141, *143, 144.*
Venezuela, Colombia, Trinidad; Margarita!.

LITTORINIDAE

Tectarius muricatus (Linné, 1758)

CURAÇAO, Stat. *74A.* — Very common on the rocky shores of Curaçao, Aruba and Bonaire, often occurring at a considerable distance from the water-line, as far as the salt-water spray reaches, rarely with *Cerion* and *Tudora;* in this case a living specimen was found in a small fresh-water pool, about 700 m from the sea.

POMATIASIDAE

Cistulops raveni (Crosse, 1872)

Baker, 1924, p. 37. — *C. raveni arubana* Baker, 1924, p. 40.
CURAÇAO, Stat. 201, 212, 213, 213A, *225, 227, 232, 242,* 243A, *244.* ARUBA, St. 248A, *249, 250, 253, 255, 257, 260, 263.*
The specimens do not justify a subdivision of the species.
Curaçao, Aruba.

Tudora Gray, 1850

In the present paper the genus *Tudora* is considered to include only the species listed below and *T. plicatula* (Pfeiff.) from Venezuela, fide H. B. Baker, 1924. The shell has a simplex peristome without breathing devices, the operculum is channelled at the perimeter, the calcareous part consists of vertical growth-lamellae which coalesce at their distal edges. Curaçao, Aruba, Bonaire and mainland of North Venezuela.

Key to the Subgenera and Species,
based on the shell and the operculum.

1a Last part of whorls solute; operculum subcircular, more or less convex, nucleus not markedly eccentric .....
..... *Bonairea* H. B. Baker, 1924 (type: *T. maculata)*
Altitude of shell 2½—2¼ minor-diameter, 4½—4 whorls retained, apical-angle generally 15—25°; operculum about 4 whorls, calcareous-plate somewhat larger than chondroic base; no tendency to accentuate spiral-ridges in umbilical-region;
umbilicus narrow or rather narrow; margin of peristome somewhat thickened, not reflected; larger growth-riblets often crested at summit; outer-margin of opercular whorls usually not corroded; average males somewhat smaller than females .....
..... *Tudora maculata* H. B. Baker, 1924

1b Last part of whorls adnate; operculum subovate, more or less concave, nucleus markedly eccentric ..... *Tudora* s.s. 2

2a Altitude of shell 2—1½ minor-diameter, 4½—3½ whorls retained, apical-angle generally 30—60°; operculum 4½—4 whorls, more or less concave, with parietal angle rounded or somewhat angular, nucleus rather markedly eccentric, calcareous-plate somewhat smaller than chondroic base; tendency to accentuate spiral-ridges in umbilical-region; (sect. *Tudora* s.s.)
umbilicus narrow or rather wide; margin of peristome usually thin and strongly reflected in columellar region; growth-riblets not thickened or crested at summit; outer margin of opercular whorls not corroded; average males smaller than females, measurements of sexes intergrading .....
..... *Tudora megacheilos* (Potiez et Michaud, 1838)

2b Altitude of shell 2¼—2 minor-diameter, 6½—6 whorls retained, apical-angle generally 25—35°; operculum 3½—3 whorls, more or less concave with parietal margin reclined, with parietal angle angular, nucleus very markedly eccentric, calcareous-plate much smaller than chondroic base; marked tendency to accentuate spiral-ridges in umbilical-region; (sect. *Tudorata* H. B. Baker, 1924; type *T. muskusi* Baker) 3

3a umbilicus narrow; margin of peristome usually thick, very short in columellar region; growth-riblets with distinct tendency to form sutural buttresses at summit; outer surface of operculum rather distinctly concave with parietal margin markedly reclined, outer margin of whorls usually slightly corroded; average males distinctly smaller than females, measurements of sexes slightly intergrading ..... *Tudora aurantia* (Wood, 1828)

3b umbilicus very narrow, often closed; margin of peristome usually thin, short and strongly reflected in columellar region; growth-riblets or costae with no or indistinct tendency to form sutural buttresses at summit; outer surface of operculum slightly or very sligthly concave with parietal margin somewhat reclined, outer margin of whorls usually strongly corroded; average males distinctly smaller than females, measurements of sexes generally not intergrading ..... *Tudora rupis* H. B. Baker, 1924

Tudora megacheilos megacheilos (Potiez et Michaud, 1838)

Cyclostoma megacheilos Potiez et Michaud, 1838, p. 237, tab. 24 fig. 9—10 ed. 1836.
Cyclostoma simile Sowerby I, 1843, p. 103, tab. 24 fig. 48—49.
Cyclostoma megacheilum, Pfeiffer, 1846, p. 33.
Cyclostoma megachilum, Pfeiffer, 1848, p. 66.
Tudora similis (Sow.) Gray, 1850, p. 48.
Tudora megachila (Pot. et Mich.) Pfeiffer, 1852 (Consp.), p. 38 „Var.: *C. cancellatum* Menke. Curaçao."
Cyclostoma roridum, *C. proteus*, *C. cancellatum*, Pfeiffer, 1852 (Monogr.), p. 244 [nomina nuda, in syn.]
Cistula megacheila (Pot. et Mich.) Adams et Adams, 1856, p. 294.
Cyclostoma megachila, Reeve, 1860, p. 198.
Tudora megacheila, Bland, 1861, p. 28.
Tudora megachilos, Martens, 1873, p. 219.
Tudora megacheilos, Kobelt, 1880, p. 286.
Tudora megacheilos megacheilos, Baker, 1924, p. 55 ..., fig. 27, tab. 13 fig. A.
Tudora megacheilos spreitensis Baker, 1924, p. 58 ..., fig. 35, tab. 13 fig. C.
Tudora megacheilos rondeklipensis Baker, 1924, p. 60..., fig. 36, tab. 13 fig. D.
Tudora megacheilos kabrietensis Baker, 1924, p. 61 ..., tab. 13 fig. E.
Tudora megacheilos f. *desculpta* Baker, 1924, p. 56 ..., fig. 34, tab. 13 fig. B.
Cistula megachila, Fischer, 1885, p. 748.
Cyclostoma megachile, Martin, 1888 (2), p. 97.
Chondropoma megacheila (Pot. et Mich.) Dall, 1905, p. 209.
Tudora megacheilus, Gratacap, 1907, p. 117.
Tudora megachile, van der Horst, 1924, p. 2.
Tudora fossor Baker, 1924 (Naut.), p. 94.
Tudora fossor fossor, Baker, 1924, p. 63 ..., fig. 37, tab. 13 fig. G.
Tudora fossor djerimensis Baker, 1924, p. 65 ..., tab. 12 fig. I.
Tudora fossor westpuntensis Baker, 1924, p. 66 ..., tab. 13 fig. H.
Tudora fossor arubana Baker, 1924, p. 68 ..., fig. 38, tab. 13 fig. K.
Tudora fossor canashitensis Baker, 1924, p. 69 ..., tab. 13 fig. I.
Tudora megacheile, van Benthem Jutting, 1925, p. 30.

CURAÇAO, St. *201, 201A, 202, 203, 204A, 205, 207, 210, 211, 212, 213,* 213A, *214, 215, 217, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229,* 229A, *230, 231, 232, 233, 236,* 237, 239, *240, 240A, 241, 242, 242A, 243, 243A, 244, 245A.* ARUBA, St. *246, 247A,* 248, *249, 250,* 253, 253A, 254, *254A, 255, 256, 257, 258, 259, 260, 260A,* 260B, *261, 262, 262A, 263, 264,* 265, 265A, *266, 267, 268, 270, 271, 272, 272A, 275, 276.*

Cocolishi cabritu, kokoliesjie kabritoe (Cur.).

Characters. Altitude of shell, excluding apical-whorls, about 2 times minor-diameter; apical-angle of retained whorls generally 30—45°.

Curaçao, Aruba. — Subfossil or fossil specimes of quaternary age have been found in cave-deposits and loose soil.

Tudora megacheilos pilsbryi H. B. Baker, 1924 comb. nov.

[?] *Cyclostoma megacheilus* Sowerby I, 1843, tab. 31 fig. 276.
[?] *Cyclostoma sowerbyi* Pfeiffer, 1847, p. 56 [other name for *C. megach.* Sow.]
Tudora pilsbryi Baker, 1924 (Naut.), p. 94. [see also: Baker, 1924, p. 62 ..., 113 ... fig. 39, 44, tab. 13 fig. F]
CURAÇAO, St. *206, 207.*

Characters. Altitude of shell, excluding apical-whorls, about 1½ times minor-diameter; apical-angle of retained whorls generally 50—65°.

Curaçao, confined to the Tafelberg St. Barbara. — A fossil specimen of quaternary age has been found in a pocket of phosphate at Hato.

If we compare specimens from the type-localities of Baker's subspecies of *Tudora megacheilos* and *Tudora fossor,* and his species of *Tudora pilsbryi* we find, it is true, several more or less noticeable differences, in which the populations of these localities often may be distinguished from those of other regions; — in other localities however, the different forms are quite intergrading and the various characteristics occur in such varying combinations, that a division of *Tudora megacheilos* in lower systematical categories becomes a rather endless occupation. Only Baker's *Tudora pilsbryi* appeared striking enough to justify a separate denomination.

Key to the Subspecies of *Tudora rupis*

1a Axial-sculpture consists of growth-riblets which are quite regular in size and place, they are small, low and rounded, about as broad as their interspaces, generally 9—6 per mm; spiral-ridges usually narrower than their interspaces, broader than the growth-riblets (— from East Curaçao —) ..... *Tudora rupis rupis* H. B. Baker

1b Axial-sculpture consists of growth-costae which are quite irregular in size and place, they are small or large, low and rounded or high and rather angular, broader or narrower than their interspaces, generally 6—1 per mm; spiral-ridges broader or narrower than their interspaces, broader or narrower than the growth-costae (— from Middle and West Curaçao —) 2

2a Axial-sculpture dominating the spiral-sculpture (— from West Curaçao —) ..... *Tudora rupis muskusi* H. B. Baker

2b Axial-sculpture nor spiral-sculpture dominating (— from Middle Curaçao and the northern part of West Curaçao —) ..... *Tudora rupis grandiensis* H. B. Baker

2c Spiral-sculpture dominating the axial-sculpture (— from Middle Curaçao —) ..... *Tudora rupis hatoensis* subsp. nov.

Tudora rupis rupis H. B. Baker, 1924

Tudora rupis Baker, 1924 (Naut.), p. 93.
Tudora rupis rupis, Baker, 1924, p. 49 ..., fig. 29, tab. 12 fig. E.
Tudora rupis newportensis Baker, 1924, p. 50 ..., fig. 30, tab. 12 fig. D.
CURAÇAO, St. *206, 207.* — Tab. XV.
Curaçao, confined to the Tafelberg St. Barbara and surroundings.

Tudora rupis muskusi H. B. Baker, 1924 comb. nov.

[?] *Cyclostoma costatum* Pfeiffer, 1846, p. 47. [see also: Pfeiffer, 1848, p. 64, tab. 9 fig. 9—10 ed. 1847]
[?] *Tudora costata* (Pfeiff.) Pfeiffer, 1852 (Monogr.), p. 244.
[?] *Cistula costata* (Pfeiff.) Adams et Adams, 1856, p. 294.
Tudora costata, Vernhout, 1914, p. 180.
Tudora muskusi Baker, 1924 (Naut.), p. 93.
Tudora muskusi muskusi, Baker, 1924, p. 51 ..., fig. 31, 41, 43, tab. 12 fig. C.
Tudora rupis Baker, van Benthem Jutting, 1925, p. 30 [identical with *T. musk. bullenensis* Baker]

CURAÇAO, St. *227, 228, 242, 242A, 243.* — Tab. XV.

Curaçao, confined to the western part.

Tudora rupis grandiensis H. B. Baker, 1924 comb. nov.

Tudora muskusi grandiensis Baker, 1924, p. 53 ..., fig. 32, tab. 12 fig. F.
Tudora muskusi bullenensis Baker, 1924, p. 54 ..., fig. 33, tab. 12 fig. G.

CURAÇAO, St. *224, 225,* 226, *229, 237.* — Tab. XV.

Curaçao, confined to the central and northwestern part.

Tudora rupis hatoensis subsp. nov.

Holotype: Rijksmuseum van Natuurlijke Historie, Leiden (empty shell). Type-locality: Island of Curaçao, Hato (collector's Station 217). Description: Adult female with 5¾ retained whorls, altitude 16¼ mm, minimum-diameter 7½ mm, maximum-diameter 8½ mm, width penultimate whorl 5¼ mm, altitude of peristome 6½ mm; pale reddish yellow, aperture internally orange; tab. XV.

Paratypes: Rijksmuseum van Natuurlijke Historie, Leiden, coll. St. 217, topotypical. Zoölogisch Museum, Amsterdam, coll. St. 223.

Diagnosis. Axial-sculpture consists of growth-costae which are quite irregular in size and place, generally 6—2 per mm; spiral-sculpture dominating the axial-sculpture; 8—*6,6*—5½ retained whorls, altitude 17½—*(15½* females) *14,5(12½* males)—11½ mm, minimum-diameter *7½—6,5*—5 mm.

CURAÇAO, St. 217, before the cave of Hato, 17.IX.1936; St. 223, Hermanus, 9.XI. 1936 (somewhat resembling *T. rupis grandiensis).* — Tab. XV.

Curaçao, confined to the central part!.

The animals of this species group themselves into large colonies within an apparent homogeneous territory. If the centres of the different forms should be isolated, e.g. by inundation of the interlying regions, then most malacologists would without hesitation distinguish at least five species: *rupis, hatoensis, grandiensis, bullenensis* and *muskusi,* — each species being confined to a single island or to several neighbouring islands of the archipelago. The present state of affairs, however, shows a clear intergrading between the different forms; with exception of *T. rupis rupis,* owing to the isolation of its area. — The subspecies *muskusi, grandiensis, hatoensis* and probably also *rupis* may be put on a par with geographical races in the sense of Rensch a.o.; together they form a "Rassenkreis" as given by that author.

TABLE 11.

The occurrence of spinose shells in *Potamopyrgus parvulus* in the low limestone-region of southern Bonaire and Klein Bonaire.

localities	light conditions	estimated range of salinity, in mg Cl/l	numbers of specimens	more or less spinose shells in %
Pos Jatoe Largoe . . .	shady, nearly no direct sunlight .	300— 600	200	½
Pos Guajaká, Lima . .	shady, little direct sunlight . . .	400— 600	40	0
Pos Guajaká Chikitoe .	shady, little direct sunlight . . .	? 400— 600?	20	0
Pos Guajaká, Kl. Bon. .	dusky, nearly no direct sunlight .	? 300— 700	40	0
Pos Lansberg (St. 60) .	plenty direct sunlight	300— 700	80	0
Pos Francés (St. 58) . .	shady, with direct sunlight . . .	400— 700?	1000	10
Pos Gabriel	shady, with direct sunlight . . .	400— 700?	60	20
Pos Antonica	dusky, no direct sunlight	? 400— 800	20	70
Tanki Kinkoe	plenty direct sunlight	? 400— 900?	20	0
Pos di Cas, Lima . . .	shady, with direct sunlight . . .	? 400— 900	60	10
Pos di Cas, Kl. Bon. (St. 61)	shady, no direct sunlight	400—1000	300	70
Pos Ichi (St. 52) . . .	plenty direct sunlight	150—1500	600	¼
Pos Baca (St. 53) . . .	direct sunlight	200—1500	200	0
Pos Baca Grandi . . .	plenty direct sunlight	? 300—1600	20	0
Pos Baca Chikitoe (St. 54)	shady, with direct sunlight . . .	300—1600	200	0
Pos Oranjepan (St. 59) .	shady, little direct sunlight . . .	? 800—1600	40	0
Pos Oranjepan	shady, little direct sunlight . . .	? 800—1600	20	0
Pos Calbas, Lima (St. 55)	shady or dusky, no direct sunlight	800—1000	20	20
Pos Blauwduif	dusky, no direct sunlight	?1500—3000	100	10
Pos di Booi	shady, no direct sunlight	?2000—4000	10	100
Pos Caranja (St. 57). .	shady, little direct sunlight . . .	2000—4000	250	100
Pos Caranja Grandi . .	dusky, no direct sunlight	2000—5000	10	100
Pos di Salinja Martinus .	shady, with direct sunlight . . .	? 600—8000?	200	5
Pos Shiki	plenty of direct sunlight	? 600—8000?	100	0
Pos di Hoop	plenty of direct sunlight	?1000—8000?	150	0

Hybrids of species, judged from shell-characters, have only been observed between *Tudora megacheilos megacheilos* and *Tudora rupis muskusi*. In 1922 H. B. Baker (1924, p. 54, tab. 12 fig. H) found a single shell (*"Tud. fossor djerimensis* × *Tud. muskusi"*) on the Seroe Djerimi and one on the Seroe di Boca, St. Martha, and in 1936 three specimens were collected near the Seroe Djerimi (St. 242, 242A) and four near the St. Kruis Baai (St. 243).

Tudora aurantia (Wood, 1828)

Turbo aurantius Wood, 1828 (Suppl.), p. 19, tab. 6 fig. 23.
Cyclostoma aurantium (Wood) Wood, 1828 (Refer.), p. 36.
Cyclostoma aurantiacum Sowerby[1], 1843, p. 103, tab. 24 fig. 46—47.
Cyclostoma versicolor Pfeiffer, 1846, p. 33 [substituted for *C. aurantiacum* on account of *Annularia aurantiaca* Schumacher, 1817].
Cyclostoma carneum Pfeiffer, 1848, p. 65, tab. 9 fig. 11—12.
Cistula versicolor (Pfeiff.) Gray, 1850, p. 58.
Tudora versicolor (Pfeiff.) Pfeiffer, 1852 (Consp.), p. 38.
Tudora versicolor var. *carneum* Pfeiff., Pfeiffer, 1852 (Consp.), p. 39.
Tudora aurantiaca (Wood) Smith, 1898, p. 113, 116.
Tudora aurantia, Schepman, 1915, p. 480.
Tudora aurantia aurantia (Wood), Baker, 1924, p. 45 ..., tab. 12 fig. A.
Tudora aurantia wassauensis Baker, 1924, p. 48 ..., fig. 28, tab. 12 fig. B.
Cyclostoma megachile, Pijpers, 1933, p. 45.

BONAIRE, St. *181, 184 184A, 185A, 186, 187, 190, 195, 196, 197;* Klein Bonaire, *199, 199A.* — Tab. XVI.

Bonaire, Klein Bonaire. — Subfossil or fossil specimens of quaternary age have been found in pockets of phosphate and limestone beds.

Tudora maculata H. B. Baker, 1924

Tudora maculata Baker, 1924 (Naut.), p. 92. [see also: Baker, 1924, p. 42 ..., fig. 22—24, 40]

BONAIRE, St. 184, *187,* 190, 190A, *191,* 194; Klein Bonaire, 199. — Tab. XVI.

Bonaire, Klein Bonaire.

HYDROBIIDAE

Potamopyrgus parvulus (Guilding, 1828)

Baker, 1924, p. 70; Baker, 1930, p. 31; Hummelinck, 1933, p. 319.

HIGUEROTE, St. *1.* ROQUES, *41, 42.* BONAIRE, *44, 45,* 46, *47, 48, 49, 52, 53, 54, 55, 57, 58, 59, 60;* Klein Bonaire, *61.* CURAÇAO, *71, 71A, 72, 72A, 76, 76A, 76B, 80, 83, 89.* ARUBA, *92, 93, 94, 95, 96, 101, 102, 102A, 103, 104, 104A, 104B.*

Weakly or distinctly spinose shells frequently occur in the limestone-region of southern Bonaire and Klein Bonaire; they are also to be found in El Gran Roque and, more rarely, in Curaçao.

Venezuela, West Indies; Los Roques!, Bonaire, Curaçao, Aruba.

BASOMMATOPHORA

PHYSIDAE

Physa cubensis Pfeiffer, 1839

Jutting, 1925, p. 28; Baker, 1930, p. 42.
CURAÇAO, St. *72A*, 216.
Venezuela, West Indies; Curaçao.

PLANORBIDAE

Planorbis circumlineatus Shuttleworth, 1854

Baker, 1924, p. 71 (sub *pallidus*); Jutting, 1925, p. 28; Hummelinck, 1933, p. 320.
MARGARITA, St. 10, *13, 18, 20, 23.* BONAIRE, *45,* 46, 50, 52, *53,* 57, 58. CURAÇAO, *66, 67, 70, 71A, 72, 75,* 78, *81, 82, 83,* 89. PARAGUANA, *105, 106,* 107, *108, 109.* GOAJIRA, *114.*
West Indies, Trinidad, Paraguaná!, N.E. Colombia!; Margarita!, Bonaire, Curaçao.

STYLOMMATOPHORA

VAGINULIDAE

Vaginulus linguaeformis Semper, 1885

Hoffmann, 1925, p. 250 (sub *Sarasinula*).
MARGARITA, St. *150, 155.* (H. B. Baker det.)
Argentina, Brasil, Guyana, Bolivia, Ecuador; Margarita!.

Vaginulus spec.

CURAÇAO, Tanki Wishi near Willemstad, 1937. (fr. Realino don.)

SUCCINEIDAE

Succinea barbadensis Guilding, 1828

Jutting, 1925. p. 27.
CURAÇAO, St. 213A, 227A? 235, 242, 244. (van Benthem Jutting det.)
Lesser Antilles; Curaçao.

Succinea gyrata Gibbons, 1879

Jutting, 1925, p. 27.
BONAIRE, St. 191, 198, 199; Klein Bonaire, s.n. CURAÇAO, St. 213A, 215, *216.* (van Benthem Jutting det.)
Curaçao, Bonaire.

Succinea tamsiana Pfeiffer, 1850

Baker, 1925, p. 3.
MARGARITA, St. 139. (H. B. Baker det.)
Venezuela; Maragarita!.

Succinea spec.

CARÚPANO, St. 123, 124, 125. MARGARITA, 136, 140. TESTIGOS, 158, 159, *160*. HERMANOS, 169, 170. BLANQUILA, 171. PARAGUANA, 279, 282, 283.

The material apparently belongs to different species which are often very similar to the species of this genus cited before.

VERTIGINIDAE

Gastrocopta barbadensis (Pfeiffer, 1853)

Pilsbry, 1916, p. 83. — *G. barbadensis hojeda* Pilsbry, 1924, p. 65.
MARGARITA, St. 136, 150. ORCHILA, *175*. CURAÇAO, *216, 217*. PARAGUANA, 282, *283*. GOAJIRA, 288, 292, 293, 294.

Judging from literature, *Gastrocopta barbadensis* must be considered identical with *G. servilis* (Gould, 1843); both names probably being in synonymy with *G. rupicola* (Say, 1821). The var. *hojeda* Pilsbry of *G. barbadensis* could not be maintained.

West Indies, Trinidad, Paraguaná!, La Goajira!; Margarita!, Orchila!, Curaçao.

Gastrocopta curacoana Pilsbry, 1924

Crosse, 1873, p. 42 (sub *Pupa longurio*); Pilsbry, 1924, p. 62.
BONAIRE, St. 184, 185A, *187*, 190A, *194*; Klein Bonaire, 199. CURAÇAO, 201, *206*, 208, 210, 212, 213, 213A, *215, 217*, 218, *227*, 236, *242*, 243A. ARUBA, 246, *249*, 250, *253, 255*, 257, *263*, 275, *276*.

Curaçao, Bonaire, Aruba.

Gastrocopta geminidens (Pilsbry, 1917)

Pilsbry, 1917, p. 228.
MARGARITA, St. 145.

Venezuela; Margarita!.

Gastrocopta iheringi (Suter, 1900)

Suter, 1900, p. 336; Pilsbry, 1916, p. 101.
CARÚPANO, St. 123, *124, 125*. MARGARITA, 131, 132, 136, *138, 139, 140, 144*. TESTIGOS, 157, *158, 162*. FRAILES, 168. PARAGUANA, 279. GOAJIRA, 292, *293, 294*.

Previously reported from Brasil only. This species proved to be very variable in form and size of teeth; the specimens from Rio Hacha (St. 292—294) were especially noticeable for their strong development of the parietal and columellar-lamellae and a curious arrangement and often increasing number of the palatal and basal-plicae. This species might be identical with one or more species of the subgenus *Immersidens*; probably also in synonymy with *G. uvulifera* (Guppy, 1868).

Brasil, Venezuela!, N.E. Colombia!; Margarita!, Los Testigos!, Los Frailes!.

Gastrocopta octonaria Pilsbry, 1924

Pilsbry, 1924, p. 64.

HERMANOS, St. *169, 170.* BLANQUILLA, *171,* 172, 172A, 172B. ORCHILA, *174.* BONAIRE, 184, *187, 191, 194.* CURAÇAO, 202A, 204, 206, 210, 213, 213A, 228, *234, 235, 236, 242,* 243A. ARUBA, *246,* 249, 250, *253, 255, 260, 263,* 268, *268B, 276, 278.* GOAJIRA, 293.

La Goajira!; Aruba, Curaçao, Bonaire, Orchila!, Blanquilla!, Los Hermanos!.

Pupoides marginatus (Say, 1821)

Pilsbry, 1924, p. 61 (sub *P. marginatus nitidulus*); Baker, 1935, p. 200 (sub *P. m. nit.*).

GUANTA, St. 122. CARÚPANO, 125. MARGARITA, 132. BLANQUILLA, *171.* TORTUGA, *173.* ORCHILA, 175. BONAIRE, 185, *191, 198*; Klein Bonaire, teste Baker. CURAÇAO, *213A, 217,* 225, *227.* ARUBA, *255, 256, 263, 276, 277.* PARAGUANÁ, *279, 283.* GOAJIRA, 292, 293, 294.

West Indies, Venezuela, N.E. Colombia!; Margarita!, Blanquilla!, Tortuga!, Orchila!, Bonaire, Curaçao, Aruba.

Bothriopupa tenuidens (C. B. Adams, 1845)

Pilsbry, 1917, p. 229.

MARGARITA, St. 145, 146.

Greater Antilles, Venezuela; Margarita!.

FERUSSACIIDAE

Caecilioides consobrina (Orbigny, 1845)

Pilsbry, 1908, p. 39; Baker, 1925, p. 3.

MARGARITA, St. 136, 139, *140, 144.* BONAIRE, Goto, Salinja Tam. CURAÇAO, *210,* 213, *235,* 236. ARUBA, *263, 268B.* GOAJIRA, 292, *293,* 294.

Several specimens closely resemble *C. iota* (C. B. Adams) from Jamaica.

West Indies, Venezuela, N.E. Colombia!; Margarita!, Bonaire!, Curaçao!, Aruba!.

Caecilioides gundlachi (Pfeiffer, 1850)

Pilsbry, 1908, p. 43.

CURAÇAO, St. *216.*

West Indies, Guyana; Curaçao!.

SUBULINIDAE

Lamellaxis gracilis (Hutton, 1834)

Pilsbry, 1906, p. 198 (sub *Opeas gracile*); Jutting, 1925, p. 27 (sub *Opeas gracile*); Baker, 1927, p. 7 (sub *Opeas gracile*).

MARGARITA, St. *155,* BONAIRE, Fontein. CURAÇAO, *216,* Porto Marie, St. Kruis. ARUBA, Fontein. GOAJIRA, Rio Hacha.

South America, Central America, West Indies; Margarita!, Bonaire!, Curaçao, Aruba!.

Lamellaxis micra (Orbigny, 1835)

Pilsbry, 1906, p. 193 (sub *Opeas*); Baker, 1924, p. 108 (sub *Opeas*); Baker, 1927, p. 10 (sub *Opeas*).

LA GUAIRA, St. 121. MARGARITA, 136, 139, 140, *155*. TESTIGOS, 158, 163B, 165. CURAÇAO, 216, *245*. ARUBA, Fontein. PARAGUANA, 279. GOAJIRA, 294.

South America, Central America, Florida, West Indies; Margarita!, Los Testigos!, Curaçao, Aruba!.

Synopeas beckianum (Pfeiffer, 1846)

Pilsbry, 1906, p. 189 (sub *Opeas*); Baker, 1927, p. 7 (sub *Opeas*).

GUANTA, St. 122. CARÚPANO, 123, 124, *125*, 126. MARGARITA, 133, 134, 135, *136*, 137, 138, 139, *140*, 141, 141A. TESTIGOS, 159, *162*. BLANQUILLA, *171*. PARAGUANA, *282*. GOAJIRA, *292, 293, 294*.

Venezuela, Colombia, Central America, Mexico, West Indies; Margarita!, Los Testigos!, Blanquilla!.

Subulina octona (Bruguière, 1792)

Pilsbry, 1906, p. 222; Baker, 1927, p. 2.

GUANTA, St. 122. CARÚPANO, 123, 124, *125*, 126. MARGARITA, 136, 138, 139, *140*, 141, 141A, *145, 146, 147, 148, 150, 155*, TESTIGOS, *162, 163A*.

Tropical America, Asia and Africa; Margarita!, Los Testigos!.

Subulina striatella (Rang, 1831)

Rang, 1831, p. 38 (sub *Helix*); Pilsbry, 1906, p. 75.

MARGARITA, St. *143, 144, 149*.

The specimens perfectly agree with the description and figures of *S. striatella* from Middle West Africa; they are probably closely related or, possibly, identical with *Subulina parana* Pilsbry, 1906, p. 225, which has been described from young specimens from Brasil.

Tropical Africa; Margarita!.

Neosubulina gloynii (Gibbons, 1879)

Baker, 1924, p. 88. — *N. harterti* Smith, 1898, p. 115; Baker, 1924, p. 86. — *N. scopulorum* Baker, 1924, p. 89.

BONAIRE, St. 190, 190A, *191, 193*, 194. CURAÇAO, 201, *205, 206, 207, 208*, 210, 212, 213, 213A, 214, 216, *217, 218, 219, 225*, 227, *232, 234, 235*, 236, *238, 242*, 243A. ARUBA, *246, 255, 260*, 263, *267, 268*.

N. harterti must be considered identical with *N. gloynii*; also *N. scopulorum*, from Aruba, is probably not specifically separable.

Bonaire, Curaçao, Aruba.

Leptinaria lamellata (Potiez et Michaux, 1838)

Pilsbry, 1907, p. 288; Baker, 1927, p. 22.

MARGARITA, St. *144*.

Tropical South America, West Indies; Margarita!.

Luntia insignis E. A. Smith, 1898

Smith, 1898 (J. Conch.), p. 28; Pilsbry, 1906, p. 218.
ARUBA, Fontein.
Trinidad; Aruba!.

OLEACINIDAE

Spiraxis blandi (Crosse, 1873)

Crosse, 1874, p. 66 (sub *Ravenia*); Tryon, 1885, p. 52; Pilsbry, 1907, p. 19; Baker, 1939, p. 11.
ROQUES, teste Crosse.
Described after a single specimen which was collected by H. Raven; anatomy unknown. A curious record; this locality looks like a most unsuitable habitat for *Spiraxis*. A strong similarity to *Pseudosubulina decussata* H. B. Baker from the state of Táchira should be noted.
Los Roques.

SAGDIDAE

Thysanophora crinita (Fulton, 1917)

Fulton, 1917, p. 240 (sub *Trichodiscina*); Baker, 1924, p. 78. — *T. crinita arubana* Baker, 1924, p. 77.
CURAÇAO, St. 235, *236*. ARUBA, 257, *263*, 268. PARAGUANA, 279. GOAJIRA, 293, *294*.
The material does not show any reason to justify a subspecies *arubensis*.
Paraguaná!, La Goajira; Curaçao, Aruba.

Thysanophora plagioptycha (Shuttleworth, 1845)

Baker, 1916, p. 13.
MARGARITA, St. *144*. (H. B. Baker det.)
Tropical America; Margarita!.

Thysanophora vanattai H. B. Baker, 1924

Baker, 1924, p. 79; Baker, 1926, p. 15.
ARUBA, St. *255*.
Aruba.

ZONITIDAE

Guppya gundlachi (Pfeiffer, 1840)

Baker, 1925, p. 7.
MARGARITA, St. *140, 143, 144, 145, 146*. (H. B. Baker det.)
Tropical America; Margarita!.

Guppya molengraaffi Baker, 1924

Baker, 1924, p. 76.
CURAÇAO, St. 234, 235. (H. B. Baker det.)
Curaçao.

Habroconus ernsti (Jousseaume, 1889)

Baker, 1925, p. 9 (sub *Euconulus*).
MARGARITA, St. 146. (H. B. Baker det.)
Venezuela; Margarita!.

Scolodonta starkei H. B. Baker, 1925

Baker, 1925, p. 26.
MARGARITA, St. 140, 146. (H. B. Baker det.)
Venezuela; Maragarita!.

BULIMULIDAE

Bulimulus cacticolus (Reeve, 1849)

Pilsbry, 1897, p. 60; Pilsbry, 1901, p. 144.
MARGARITA, St. 137, 138, *139*, *152*, 154A. GOAJIRA, *288*, 290, 294. (H. B. Baker det.)
Venezuela, N.E. Colombia; Maragarita!.

Bulimulus constrictus Pfeiffer, 1841

Pilsbry, 1897, p. 80.
MARGARITA, St. 140, 141. (H. B. Baker et H. G. Richards det.)
Venezuela; Margarita!.

Bulimulus dysoni Pfeiffer, 1846

Pilsbry, 1897, p. 56; Pilsbry, 1901, p. 144.
MARGARITA, Los Vagras, VIII, 1939, H. G. Richards coll. et det.
Venezuela, Central America, Yucatán; Margarita!.

Drymaeus meridanus (Pfeiffer, 1846)

Pilsbry, 1898, p. 303.
MARGARITA, St. 140, 141. (H. B. Baker et H. G. Richards det.)
Venezuela; Margarita!.

Drymaeus multilineatus (Say, 1825)

Pilsbry, 1899, p. 27; Baker, 1924, p. 108.
CARÚPANO, St. 124. MARGARITA, 138, *139*, 140, 141, 143, 154A, 155. TESTIGOS, 162. CURAÇAO, teste Baker. GOAJIRA, *288*, 294.
Florida and Yucatán to Colombia and Venezulea; Margarita!, Los Testigos!, Curaçao.

Drymaeus virgulatus (Férussac, 1821)

Pilsbry, 1899, p. 24 (sub *elongatus*); Baker, 1924, p. 80.
ARAYA, Manglillo. CARÚPANO, St. 124. MARGARITA, 138, 139, *139A*, 140, 141. TESTIGOS, 162. BLANQUILLA, *171*. BONAIRE, 184A, 190A, 197, *s.n.* CURAÇAO, *206*, *207*, 212, *217*, *220*, *221*, *225*, *227*, *228*, *229*, *230*, *231*, 234, *238*, *239*, *240A*, *242*, 243, *243A*, *245A*. ARUBA, *263*, 267. GOAJIRA, 287. ST. MARTIN, 299.
West Indies, N. Venezuela, N.E. Colombia!; Margarita!, Los Testigos!, Blanquilla!. Bonaire, Curaçao, Aruba.

Oxystyla maracaibensis (Pfeiffer, 1856)

Pilsbry, 1899, p. 137; Pilsbry, 1901, p. 164; Baker, 1924, p. 85 (sub *O. mar. imitator*).

ARAYA, Manglillo, MARGARITA, St. 134, 136, 137, 138, 139, *139A*, 140. ARUBA (subfoss.) 250, 252B, W. shore. PARAGUANA, 279. S. FALCÓN, s.n. GOAJIRA, 290, *294*.

Venezuela, Colombia; Margarita, Aruba.

Liguus virgineus (Linné, 1767)

Vernhout, 1914, p. 179.

CURAÇAO, "Dr. Epp" coll., cf. Vernhout. The single specimen on which this record is based, might be recently introduced, if not wrongly labelled.

Northern America, Greater Antilles; Curaçao?.

Auris distortus (Bruguière, 1789)

Baker, 1926, p. 32.

GUANTA, St. 122. MARGARITA, 139, 140, 141, 143.

Brasil, Venezuela, Colombia, Trinidad; Margarita!.

Tomigerus cumingi Pfeiffer, 1849

Pilsbry, 1901, p. 109; Baker, 1926, p. 46.

MARGARITA, St. 140, 141, *143, 145, 146*.

Brasil, Venezuela; Margarita!.

CERIONIDAE

Cerion Röding, 1798

The more striking peculiarities of *Cerion*, besides the more or less pupiform, compact and calcareous shell, are: the low entrance of the epiphallus into the penis, the eccessive long and free vas deferens, the diverticulum of the spermathecal duct, the rather long, oblong kidney, with very extensive lumen. Florida, Bahamas, Cuba, Cayman Islands, Hispaniola, Puerto-Rico, Virgin Islands †, St. Croix †, Bonaire, Curaçao, Aruba.

Key to the Subgenera,
based on the shell.

1a Whorls strongly compressed in the direction of the axis, separating septa nearly horizontal;
axial and parietal lamella or teeth present;
parietal-tooth in the angle between columella and parietal wall, entire, rarely penetrating over half of a whorl; axial-lamella long, ascending for several whorls (— recent and of quaternary age; Bonaire, Klein Bonaire, Curaçao, Aruba —) ..... *Cerion* s.s. (one species)

1b Whorls more or less compressed in the direction of the axis, separating septa usually dipping for about 30° 2

2a axial and parietal lamella or teeth lacking (— of upper tertiary age; Florida —) ..... *Eostrophia* Dall, 1890 (one species)
2b axial and parietal lamella or teeth present, rarely one lacking ... 3

3a parietal-tooth near middle of parietal wall, entire, rarely penetrating over one third of a whorl; axial-lamella short or long, ascending the columella for one to several whorls (— recent and of quaternary age; Florida, Bahamas, Cuba, Cayman Islands, Hispaniola, Puerto-Rico, Virgin Islands †, St. Croix † —) .... *Strophiops* Dall, 1894 (many species)
3b parietal-tooth near middle of parietal wall, entire or divided, often penetrating over half of a whorl, often with a small accessory tooth within at the columellar side; axial-lamella rather long, sometimes ascending the columella for several whorls (— recent: Inagua, Cuba —) ..... *Diacerion* Dall, 1894 (several species)

Cerion uva (Linné, 1758)

Cochlea alba, ventricosa, bidens, strijs eminentibus exasperata Lister, 1688, tab. 588 fig. 47.
Olivaris striata & fasciata Americana Petiver, 1709, tab. 27 fig. 2 (Cat. p. 4).
Turbo integer, fimbriatus, cylindroidaeus, per longitudinem striatus, ... Gualtieri, 1742, tab. 58 fig. D.
Oxy-strombus. Asper. Clathratus. Albus, ... Klein, 1753, p. 33.
Apiarum [p. p.] Seba, 1758, p. 153, tab. 55 no. 21 fig. interm.
Turbo uva Linné, 1758, p. 765.
Turbo testa cancellata ovata obtusa ... Gronow, 1781, p. 328.
Bulimus mumia Bruguière, 1792, p. 348 [cf. Bruguière, 1789, Encycl. Méth. Vers 1, p. 291].
Cerion vulgare Röding, 1798, p. 90 [p. p., non Lister].
Cerion uva (Linné) Röding, 1798, p. 90.
Cerion uva desculptum Pilsbry et Vanatta, 1896, p. 328, tab. 11, fig. 1.
Cerion uva var. *desculptum*, Baker, 1923, p. 7.
Cerion uva uva, Baker, 1924, p. 98 ..., tab. 18.
Cerion uva uva f. *diablensis* Baker, 1924, p. 100, tab. 18 A2.
Cerion uva uva f. *hatoensis* Baker, 1924, p. 100, tab. 18 F6.
Cerion uva knipensis Baker, 1924, p. 102 ..., tab. 19.
Cerion uva knipensis f. *djerimensis* Baker, 1924, p. 103, tab. 19 A1.
Cerion uva arubanum Baker, 1924, p. 104 ..., tab. 20.
Cerion uva bonairensis Baker, 1924, p. 105 ..., tab. 21.
Cerion uva bonairensis f. *kralendijki* Baker, 1924, p. 106, tab. 21 A2.
Cerion uva diablensis, Baker, 1925, p. 42.
Cerion uva hatoensis, Baker, 1925, p. 42.
Pupa uva (Linné) Lamarck, 1801, p. 88.
Helix uva (Linné) Férussac, 1821, p. 62.
Cochlodon uva (Linné) Sowerby I, 1825, p. 40.
Clausilia uva (Linné) Anton, 1839, p. 47.
Helix pentodon Menke, 1846, p. 128 [*Cerion* spec. juv., *C. uva*?].
Strophia uva (Linné) Albers, 1850, p. 203.
Pitys pentodon (Menke) Adams et Adams, 1855, p. 114 [*C. uva*?].
Scalaria curassavica Simons, 1868, p. 150 [nomen nudum].

BONAIRE, St. *181, 184, 184A, 186, 187, 195, 196, 197*; Klein Bonaire, *199, 199A*. CURAÇAO, *201, 201A, 202, 203, 204, 205, 206, 207, 210, 211, 212, 213, 214, 215, 217, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 237, 238, 239, 240, 240A, 241, 242, 242A, 243, 244, 245A*. ARUBA, 253A, *256, 258, 258A, 259, 260B, 261, 262, 262A, 264, 265*. — Tab. XVI.

Cocolishi di carné, kokoliesjie die kalakoena (Cur.)

Cerion uva does not show such morphological differences, which justify a subdivision of the species in subspecies.

A few specimens of *Cerion uva* were found together with a number of recent freshwater-organisms, several marine shells which were clearly imported for food or ornamentation, and other prehistoric remains of people inhabiting the shore of the Lago de Valencia (Berry, 1934, p. 392). The evidence is inadequate to prove if this species really lived in this region, or that it was imported by human agency from the Dutch islands, some 400 km north-northwest.

Bonaire, Klein Bonaire, Curaçao, Aruba. — Subfossil or fossil specimens of quaternary age have been found in loose soil, limestone beds, cave-deposits and pockets of phosphate. — In Aruba limited to the limestone region between Savaneta and Baca Morto, irregularly distributed; dead specimens occur at the Boca Grandi; subfossil or fossil specimens are common to the southern and eastern limestone portion of the island, from Oranjestad as far as the Cerro Colorado and Fontein. H. B. Baker found during his visit in 1922, the living cerions on Aruba restricted to one colony at the Baranca Alto and to another just North of Perkietenbosch. In 1936 however, living *Cerion* occurred in a much larger area, which was centred in some degree round these two localities, although the Baranco Alto itself did not yield a single shell. This may be an indication that recently the cerion-population of Aruba is again increasing and spreading over a larger area.

UROCOPTIDAE

Brachypodella hanleyana (Pfeiffer, 1847)

Pilsbry, 1903, p. 73.

MARGARITA, St. 138, 139, *140*.

Venezuela, Colombia; Margarita!.

Brachypodella leucopleura (Menke, 1847)

Pilsbry, 1903, p. 74; Baker, 1927, p. 27.

MARGARITA, St. 138, 139, *140*.

In some localities *B. leucopleura* and *B. hanleyana* give the impression of well-defined species; in other populations, however, the species can not be distinguished with certainty.

Venezuela; Margarita!.

Brachypodella raveni (Crosse, 1872)

Baker, 1924, p. 90; Jutting, 1925, p. 26. — *B. raveni sanctaebarbarae* H. B. Baker, 1924, p. 91. — *B. raveni knipensis* H. B. Baker, 1924, p. 92. — *B. raveni arubana* H. B. Baker, 1924, p. 93. — *B. gibbonsi* H. B. Baker, 1924, p. 94.

BONAIRE, St. 184, 187, *190*, 190A, *191*; Klein Bonaire, teste Baker. CURAÇAO, *201*, *202A*, 203, *206*, *207*, *210*, *212*, 213, 214, *215*, *217*, 218, *225*, 226, *227*, 232, 242, *244*. ARUBA, 249, *255*, *260*. *266*, *267*.

The material from Curaçao and Aruba do not justify a subdivision into subspecies; nor is *B. gibbonsi* from Bonaire specifically separable.

Bonaire, Curaçao, Aruba.

Microceramus bonairensis (Smith, 1898)

Baker, 1924, p. 95. — *M. bonairensis curacoana* H. B. Baker, 1923, p. 6. *M. bon. curacoanus*, Baker, 1924, p. 96. — *M. bonairensis arubanus* H. B. Baker, 1924, p. 97.

BLANQUILLA, St. 171, 172B. TORTUGA, 173. BONAIRE, 190A, *191*, 194; Klein Bonaire, *199*. CURAÇAO, *201*, 203, *206*, *207*, *210*, *212*, 213, 213A, *214*, *217*, *225*, 227, *242*. ARUBA, 249, *255*, 260, *263*, *266*, *267*. PARAGUANÁ, 279.

The specimens from Curaçao, Aruba and Bonaire do not justify a subdivision into subspecies. The shells from Blanquilla and Tortuga are stronger calcificated than those from the former islands and the growth-riblets are more regular, more numerous and well-defined.

Paraguaná!; Blanquilla!, Tortuga!, Bonaire, Curaçao, Aruba.

STREPTAXIDAE

Streptaxis glaber Pfeiffer, 1849

Baker, 1925, p. 39.

CARÚPANO, St. 124. MARGARITA, 138, 140, *143*, 145, 146.

Brasil, Guyana, Venezuela, Trinidad, Barbados; Margarita!.

Ennea bicolor Hutton, 1834

Tryon, 1885, p. 104; Gibbons, 1879, p. 130.

CURAÇAO, St. 212.

East Indies, China; Lesser Antilles, Trinidad; Curaçao!.

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STUDIES ON THE FAUNA OF CURAÇAO, ARUBA, BONAIRE AND THE VENEZUELAN ISLANDS: No. 3.

ZOOGEOGRAPHICAL REMARKS

Much has been said of the geographical relations and the origin of the West Indian fauna, especially as to that of its vertebrates and mollusks. Mostly the islands off the Venezuelan coast, for the greater part within sight of the South American continent, remained out of question, although obvious differences between the fauna of Curaçao and that of the adjacent mainland were rather quickly noticed and its affinity towards the fauna of the Greater Antilles even emphasized (Bland, 1861; Baker, 1924).

Without going into the West Indian fauna as a whole, or the current theories that try to explain its distribution, an attempt is being made to find out what palaeogeographical indication is given by the fauna of the Leeward Group, by careful examination of the distribution of its mammals, reptiles, amphibians, fishes and mollusks, — these being the only groups, perhaps with exception of the birds, which are sufficiently well known to serve as a base for zoogeographical considerations. Biocoenoses were not studied, only the distribution of species and subspecies was taken into account. The biotopes usually being very small and scattered by many isolating factors formed by accidental circumstances, the fauna being very poor and the biology of the species practically unknown, it will be clear that we have to be unpretentious in our aim and very careful in our conclusions.

TABLE 12.

Distribution of the Mammals.

	Morro de la Iguana	Chiwo	Angoletta	Tamarindo	Isla de Conejo	Puerto Real	La Pecha	Margarita	Morro Fondeadero	Morro Pando	Blanquilla	Tortuga	Huespen	Gran Roque	Isla Larga	Cayo de Agua	Ave de Barlovento	Ave de Sotavento (?)	Bonaire	Klein Bonaire	Klein Curaçao	Curaçao	Aruba	Los Monges	Paraguaná	N. Venezuela, Trinidad, N. E. Colombia	other part of American continent	other Antilles
Cebus margaritae								0																				
Odocoileus gymnotis margaritae								×																				
Odocoileus gymn. curassavicus																						×				?		
Sylvilagus nigron. nigronuchalis																						×	×		?	?		
Sylvilagus cumanicus margaritae								×																				
Sylvilagus cumanicus avius				0	×																							
Sciurus nesaeus								0																				
Epimys rattus								×														×				0	0	0
Epimys norvegicus																						?				0	0	0
Mus musculus								×														×				0	0	0
Oryzomys spec.								×														×						
Hesperomys ? spec.																						?	×					
Echimys flavidus								0																				
Dasypus novemcinctus								×																		0	0	0
Peropteryx canina trinitatis								×																		0	?	
Chilonycteris parnelli								×																		0	0	
Mormoops meg. megalophylla								×																		0	0	
Mormoops megaloph. intermedia																						×	×					
Micronycteris megalotis								0																		0	0	
Glossophaga soricina					×			×											×			×	×			0	0	0
Leptonycteris curasoae																					0	×						
Phodotes tumid. tumidirostris																					0							
Myotis nigricans																						×				0	0	0
Rhogeëssa minutilla								0																				
Molossus major								×											×							0	?	0
Molossus pygmaeus																						×						
Philander trinitatis venezuelae								0																		0		
Marmosa mitis robinsoni								0																		0		

× collected
0 from literature, very doubtful records omitted
? doubtful

DISTRIBUTION OF THE SPECIES.

The evidence of the terrestrial **mammals** will be considered first. Of these 13 (16) species or subspecies are included in the present list. Three may be at once dismissed as being introduced by human agency, namely *Epimys rattus, Epimys norvegicus* and *Mus musculus*. Possibly *Odocoileus gymnotis curassavicus* should be added. The same subspecies is not unfrequently carried to Curaçao from northeastern Colombia and, furthermore, it may be concluded from the situation of the coral-limestones, that more than three-quarters of the island-area were certainly submerged in quaternary time, which probably precluded the survival of these animals.

It is doubtful what significance may be attached to the occurrence of the small Cricetine *Hesperomys? (launcha* aff.) on Aruba, since this genus is southern in range, none being found in northern South America. Also about the *Oryzomys,* of which only skull-fragments were found in the caves in Margarita and Curaçao, nothing can be said with certainty. Several members of this genus occur in Venezuela, but in the Antilles they appear to be known from Jamaica and St. Vincent only.

All other terrestrial species occur on the adjacent mainland or are represented by closely related forms. It is, of course, possible that some of them have been introduced by man, but there is no known evidence to support this supposition.

Turning to the bats, we find 12 species or subspecies recorded. On some islands local forms appear to have been developed, which phenomena was formerly emphasized by a still larger amount of „insular species". Well defined local forms are *Leptonycteris curasoae* and *Mormoops megalophylla intermedia,* both occuring in Curaçao and Aruba. *Molossus pygmaeus, Phodotes tumidirostris* and *Rhogeëssa minutilla* are probably not confined to these islands but are, as all other forms, common to the South American mainland and partly to the Caribbees. *Chilonycteris parnelli* occurs on the Greater Antilles and, furthermore, was once recorded from Venezuela.

Contrary to the former group, the **lizards,** of which 23(26) species or subspecies are listed, form a most conspicuous element in the island animal-world.

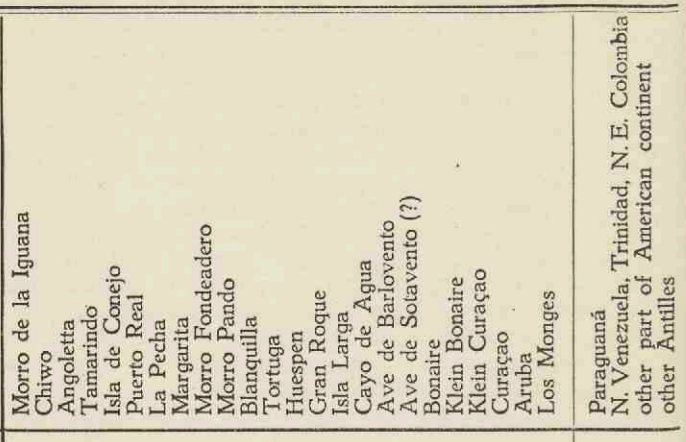
Among these, we know that the gekkos, which hide in or under the bark of trees, enter and abide in human habitations, are at times moved about fortuitously by human agency. On Curaçao and Aruba, the distribution of *Gonatodes albogularis,* which seems to be confined to the towns of Willemstad and Oranjestad, suggests recent introduction from the mainland. The occurrence of *Gonatodes vittatus* on Aruba gives, in this respect, also some ground for supposition, whilst the single museum-record of this species from Curaçao may be due to introduction or to inexact labelling.

It is not impossible that *Thecadactylus rapicaudus* owns its wide distribution through tropical America to fortuitous dispersal.

Another species which is reputed to be unsuitable for zoogeographical purposes is *Iguana iguana iguana,* not only common to South and Central America, but also widely, though very irregularly, distributed throughhout the West Indies. The iguanas are very good swimmers and often do not hesitate to plunge into the water when this is the only way of escape. Furthermore, they are often taken aboard the little coasters as fresh food supply, the legs fractured or tightly fastened round the body, and it may be freely assumed that

TABLE 13.

Distribution of the Lizards.



	Morro de la Iguana	Chiwo	Angoletta	Tamarindo	Isla de Conejo	Puerto Real	La Pecha	Margarita	Morro Fondeadero	Morro Pando	Blanquilla	Tortuga	Huespen	Gran Roque	Isla Larga	Cayo de Agua	Ave de Barlovento	Ave de Sotavento (?)	Bonaire	Klein Bonaire	Klein Curaçao	Curaçao	Aruba	Los Monges	Paraguaná	N. Venezuela, Trinidad, N.E. Colombia	other part of American continent	other Antilles
Gonatodes albogularis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	0	.	.	×	.	.
Gonatodes vittatus	×	×	×	.	×	×	×	×	.	.	.	.	.	.	.	.	.	.	.	.	.	?	×	.	.	×	×	.	?
Gonatodes (? albogularis aff.)	.	.	.	.	.	.	.	.	.	.	.	.	×	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Gonatodes (? vittatus aff.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Gonatodes (? Gymnodact. aff.)	.	.	.	.	.	.	.	.	+	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Gymnodactylus antillensis	.	.	.	.	.	.	.	.	.	.	.	.	0	.	.	×	.	×	×	×	×	.	.	.	.	.	.	.	.
Phyllodactylus martini	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	×	.	×	.	.	.	.	.	.	?
Phyllodactylus julieni	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	.
Phyllodactylus mülleri	.	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.
Phyllodactylus rutteni	.	.	.	.	.	.	.	.	.	×	×	?	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Thecadactylus rapicaudus	.	.	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	0	.	.	×	×	.	.	×	0	0	
Anolis lineatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	×	.	.	.	.	.	.
Anolis bonairensis bonairensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	?	×	×	.	.	.	.	.	.	.	.	.
Anolis bonairensis blanquillanus	.	.	.	.	.	.	.	×	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Iguana iguana iguana	×	.	.	×	+	+	×	×	+	×	×	+	+	+	.	.	.	0	×	+	.	×	+	.	.	×	×	0	0
Tropidodactylus onca	.	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	×	.	.
Tropidurus torquatus hispidus	.	.	.	×	×	+	+	×	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	.	.	.	×	0	.
Ameiva bifrontata bifrontata	×	.	.	×	×	×	+	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	×	×	0	.
Cnemidophorus lemn. lemniscatus	×	.	×	×	.	×	+	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	×	0	.
Cnemidophorus lemn. nigricolor	.	.	.	.	.	.	.	.	+	+	×	×	×	×	+	×	0	.	.	.	.	.	.	.	.	.	.	.	.
Cnemidophorus lemn. arubensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	.
Cnemidophorus murinus murinus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	×	.	.	.	.	.	.
Cnemidophorus murinus ruthveni	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	×	.	.	.	.	.	.	.	.
Gymnophthalmus lineatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	×	.	.	.	.	.	0	.
Gymnophthalmus laevicaudus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	×	.	.	.	0	0	.
Tretioscincus bifasciatus	.	.	.	.	.	.	.	×	.	+	.	.	.	.	.	.	.	.	.	.	.	.	0	.	.	.	0	.	.

× collected
\+ observed, not collected

0 from literature, very doubtful records omitted
? doubtful

they, even in this condition, more than once escaped their fate. Still the smaller Venezuelan islands, Los Testigos excepted, probably possess rather independent populations, as their members often clearly show the phenomena of island-melanism.

It should be noted that the fauna of all islands in question, which consist wholly of coral-rock, or are built up of sand and coral-debris, must have been introduced in comparatively recent time. In conformity with this, the known reptiles of Tortuga are identical with those of Orchila and other neighbouring islands, whilst the *Cnemidophorus nigricolor*, which inhabits the keys of Los Roques also occurs on Gran Roque and the adjacent island-groups. The Aves Islands have apparently derived their fauna from Bonaire as well as from the little islands to the East, but, besides this, the records of *Tropidurus torquatus hispidus* and *Gymnophthalmus laevicaudus*, not known from the neighbouring islands, point to introduction from the opposite mainland. As expected, the fauna of Klein Bonaire is the same as that of the main island, whilst the two species of Klein Curaçao are also to be found in Curaçao.

The doubtful species of *Gonatodes*, which occur on Los Hermanos, Orchila, Tortuga and Los Roques are probably local forms, about which as yet nothing can be said. The occurrence of *Gymnodactylus antillensis*, endemic to Curaçao, Bonaire and Las Aves, and once recorded from Orchila, is most interesting. On the mainland this genus is southern in range, no species being found in Venezuela or Colombia, whilst in the West Indian region one has been rarely found in the Caribbees.

In *Phyllodactylus* several species may be discerned, *P. rutteni*, *P. martini* and *P. julieni*, which are peculiar resp. to the region Los Hermanos-Los Roques, Bonaire-Curaçao and Aruba, whilst *P. mülleri* occurs on the mainland as well as on Margarita. The mutual relation of these species and their connection with other species is rather obscure, the more so because in other Antilles, specimens were found which were even considered identical with the species from Curaçao.

The anoles belong to two very different species: *Anolis lineatus* in Curaçao and Aruba, *Anolis bonairensis bonairensis* in Bonaire and probably Las Aves, *Anolis bonairensis blanquillanus* in Blanquilla and Los Hermanos. Here also, nothing can be said on the relationship to other species.

Tropidodactylus onca and *Tropidurus torquatus hispidus* have not been found West of Margarita, excepting a single record of the latter species from the Aves-Islands.

It is interesting that the widely distributed genus *Ameiva* does not occur on the islands between Margarita and Aruba. Most of the Antilles have been found to support a peculiar species; the Margarita-species, however, is not different from that of the opposite mainland, whilst that of the Testigos-Islands, although slightly different from the typical *Ameiva bifrontata*, is not considered to represent an endemic species or subspecies. On Aruba *A. bifrontata* has only been found in very limited numbers in the neighbourhood of Oranjestad, which suggest introduction from the adjacent continent.

In contrary to the former genus, *Cnemidophorus* is common to every island-group. *Cnem. lemniscatus lemniscatus* from the continent occurs on Margarita and the islands to its East and South; to this form *Cnem. lemn. nigricolor*, peculiar to the islands between Margarita and Bonaire, is very narrowly re-

TABLE 14.

Distribution of the Snakes, Crocodiles, Amphibians and Fishes.

	Morro de la Iguana	Chiwo	Angoletta	Tamarindo	Isla de Conejo	Puerto Real	La Pecha	Margarita	Morro Fondeadero	Morro Pando	Blanquilla	Tortuga	Huespen	Gran Roque	Isla Larga	Cayo de Agua	Ave de Barlovento	Ave de Sotavento (?)	Bonaire	Klein Bonaire	Klein Curaçao	Curaçao	Aruba	Los Monges	Paraguaná	N. Venezuela, Trinidad, N. E. Colombia	other part of American continent	other Antilles
SNAKES																												
Leptotyphlops albifrons																			X							0	0	0
Dromicus antillensis																						0						0
Leimadophis triscalis																						X				X		
Leptodeira annulata																							X			X		
Crotalus terrificus	1 spec.			2 spec.				6 spec.															X			X	0	
other species																		1										
CROCODILES																												
Crocodylus intermedius								X																		0		
AMPHIBIANS																												
Pleurodema brachyops								X											X	X		X	X			X		
other species								2																				
FISHES																												
Cyprinodon dearborni																			X			X				X		
Rivulus cylindraceus														X					X									0
Rivulus hartii								X																		0	0	0
Mollienisia vandepolli																			X			X	X					
Lebistes reticulatus								X																		0		
Eleotris pisonis																			X								0	0
Awaous banana																						X				0	0	0
Agonostoma monticola																						X					0	0

X collected
0 from literature, very doubtful records omitted
[Fishes according to **L. F. de Beaufort** (Amsterdam)]

lated. *Cnem. lemniscatus arubensis* from Aruba shows some intermediate position between the first species and *Cnem. murinus murinus* from Curaçao and *C. murinus ruthveni* from Bonaire, which are generally considered as being the most primitive types of the genus.

The irregular distribution of *Gymnophthalmus lineatus, Gymn. laevicaudus* and *Tretioscincus bifasciatus* is very puzzling; all three are common to the mainland and are apparently lacking in the Antilles.

For completeness something must be said on the **snakes, crocodiles, amphibians** and **fishes,** although no detailed study of these groups could be made.

Firstly it should be noted that all the snakes observed in Margarita and the Testigos Islands, are also common to the mainland. One of these species, *Drymobius boddaertii,* was reported from Las Aves by Meek, 1910. Bonaire, Curaçao and Aruba are inhabited by different species, which are often widely distributed throughout tropical America.

Remains of an old and a very young specimen of *Crocodylus intermedius* from the Laguna de las Maritas, left little doubt as to its occurrence in Margarita.

Pleurodema brachyops, occurring in Margarita, Aruba and the neighbouring mainland, was accidently introduced in Curaçao about 1910, by sand from Aruba, used in building the Wilhelmina-wharf, Emmastad. In 1928 specimens were brought to Bonaire and soon afterwards were widely spread over this island. A *Bufo* and a *Hyla* occur in the more wooded central part of Margarita.

Lebistes reticulatus and *Rivulus hartii* are the only fishes in Margarita. The first has been observed in fresh and oligohaline water, the second even in rather strong mesohaline water. The distribution of *Lebistes reticulatus* has been strongly influenced by man, because of its general use as a destroyer of mosquito-larvae.

The other fishes of the Leeward Group are even less susceptible to salt water, perhaps with exception of *Agonostoma monticola,* whose occurrence in Pos Ariba, a oligohaline pond in central Curaçao, is most puzzling. It is curious, that the only species, which appears to be peculiar to the Leeward Group, *Mollienisia vandepolli,* often occurs in marine lagoons and in saltlakes, in water of more than 30 g Cl/l, together with *Cyprinodon dearborni,* the latter being the most hardy of all.

The **snails,** of which 58 species are listed, form a second conspicuous element of the island-fauna, which is zoogeographically of the highest interest.

All the 35 species occurring on Margarita are also known from the adjacent continent of South America, with exception of *Subulina striatella* which, however, is probably closely related to *Subulina parana* from Brasil. The scanty mollusk-fauna of the smaller islands E. and S. of Margarita also do not show any positive differences.

Contrary to this, the islands West of Margarita show a noticeable independency from the mainland-fauna. There is a high percentage of endemism, typical South American groups are absent or very scantily represented, and several Antillean groups form conspicuous components of the population.

Physa cubensis, Lamellaxis gracilis, Lamellaxis micra, Drymaeus multilineatus and *Liguus virgineus* are certainly introduced by human agency; this probably is also the case with *Caecilioides gundlachi, Luntia insignis* and *Ennea bicolor.*

Lucidella lirata, Potamopyrgus parvulus, Planorbis circumlineatus, Gastrocopta barbadensis, Gastrocopta octonaria, Pupoides marginatus, Caecilioides conso-

TABLE 15.

Distribution of the Snails.

	Morro de la Iguana	Chiwo	Angoletta	Tamarindo	Isla de Conejo	Puerto Real	La Pecha	Margarita	Morro Fondeadero	Morro Pando	Blanquilla	Tortuga	Huespen	Gran Roque	Isla Larga	Cayo de Agua	Ave de Barlovento	Ave de Sotavento (?)	Bonaire	Klein Bonaire	Klein Curaçao	Curaçao	Aruba	Los Monges	Paraguaná	N. Venez., Trinid., N.E. Col.	other part of American cont.	other Antilles
Alcadia dysoni	×			×				×																		×	0	
Lucidella lirata								×											×			×				×	0	0
Stoastomops walkeri																			×	0								
Poteria translucida								×																		0		
Cistulops raveni																						×	×					
Tudora megacheilos																						×	×					
Tudora rupis																						×						
Tudora aurantia																			×	×								
Tudora maculata																			×	×								
Potamopyrgus parvulus														×					×	×		×	×			×		0
Physa cubensis																						×				0		0
Planorbis circumlineatus								×											×			×			×	×		0
Vaginulus linguaeformis								×																			0	
Vaginulus spec.																												
Succinea barbadensis								?														×			?			0
Succinea gyrata								?		?									×			×			?	?		
Succinea tamsiana								×																		×		
Succinea spec.	×	×	×					×	×	×	×														×			
Gastrocopta barbadensis								×					×									×				×		0
Gastrocopta curacoana																			×			×	×					
Gastrocopta geminidens								×																		0		
Gastrocopta iheringi	×			×			×	×																		×	0	
Gastrocopta octonaria									×	×	×		×						×			×	×			×		
Pupoides marginatus								×			×	×	×						×	0		×	×			×		0
Bothriopupa tenuidens								×																		0	0	
Caecilioides consobrina								×											×			×	×			×		0
Caecilioides gundlachi																						×					0	0
Lamellaxis gracilis								×											×			×	×			×	0	0
Lamellaxis micra	×			×	×			×														×				×	0	0
Synopeas beckianum		×		×				×			×															×	0	0
Subulina octona				×				×																		×	0	0
Subulina striatella								×																			?	
Neosubulina gloynii																			×			×	×					
Leptinaria lamellata								×																		0	0	0
Luntia insignis																							×			0		
Spiraxis blandi														0														
Thysanophora crinita																						×	×			×		
Thysanophora plagioptycha								×																		0	?	?
Thysanophora vanattai																							×					
Guppya gundlachi								×																		0	0	0
Guppya molengraaffi																						×						
Habroconus ernsti								×																		0		
Scolodonta starkei								×																		0		
Bulimulus cacticolus								×																		×		
Bulimulus constrictus								×																		0		
Bulimulus dysoni								0																		0	0	
Drymaeus meridanus								×																		0		
Drymaeus multilineatus				×				×													0					×	0	0
Drymaeus virgulatus				×				×		×									×			×	×			×		×
Oxystyla maracaibensis								×														×			×	×		
Liguus virgineus																					0						0	0
Auris distortus								×																		×	0	
Tomigerus cumingi								×																		0	0	
Cerion uva																			×			×	×					
Brachypodella hanleyana								×																		0		
Brachypodella leucopleura								×																		0		
Brachypodella raveni																			×			×	×					
Microceramus bonairensis												×	×						×			×	×			×		
Streptaxis glaber								×																		×	0	0
Ennea bicolor																							×			0		0

× collected

0 from literature, very doubtful records omitted

brina, Synopeas beckianum, Thysanophora crinita and *Drymaeus virgulatus* are common to the adjacent mainland and are often widely spread; in certain cases their discontinuous distribution on the western islands of the Leeward Group arouses the suspicion of fortuitous dispersal. On Aruba *Oxystyla maracaibensis* appears to be entirely subfossil. The genus *Succinea* is very imperfectly known and is therefore excluded from further consideration.

The element which appears to be peculiar to the Leeward Group is confined to Bonaire, Curaçao and Aruba, with two exceptions which may be first considered. *Spiraxis blandi* has been described in 1873 from Los Roques, after a single specimen; anatomy unknown. Though this record, at first suggests an affinity to the Greater Antilles, a strong similarity to *Pseudosubulina* (= *Spiraxis) decussata* from the mainland should be noted. *Microceramus bonairenis* has been found in a more or less subfossil state on the peninsula of Paraguaná, which denotes the possibility of the occurrence of living specimens in this, and perhaps also other calcareous regions of the continent. The specimens from Blanquilla and Tortuga are probably subspecifically separable from those of the Dutch Islands, which also show some slight differences.

Two genera, *Stoastomops* and *Cistulops*, three subgenera, *Bonairea, Neosubulina* s.s. and *Cerion* s.s., and 12 species are, as far as known, endemic to Curaçao, Aruba and Bonaire. Of these *Guppya molengraaffi* was found only on the Seroe Christoffel, the region which approaches nearest to the rainforest of Antilles and South America, inhabited by closely allied species. The other are all more or less xerophytic and generally show a marked preference for limestone-rock. *Tudora megacheilos, Tudora aurantia, Gastrocopta curacoana, Neosubulina gloynii* and *Cerion uva* invade the more heavily wooded parts in the higher hills of non-calcareous rock, but they are much rarer in these places than on limestone in apparently more arid conditions. A similar type of habitat has been studied in the neighbouring islands and in different places on the adjacent northcoast of South America.

It is most noticeable that in the mollusk-fauna of Curaçao, Aruba and Bonaire an obvious Antillean element may be observed. *Cerion* is practically limited to the Bahamas and the Greater Antilles, occurring in subfossil state as far South as St. Croix. *Microceramus* is another Antillean genus which reaches the mainland of North America, but is apparently lacking in most of the Lesser Antilles and in the mainland of South America, with exception of Paraguaná. *Stoastomops* and *Cistulops* also appear to have their nearest relatives on the Greater Antilles. The *Chondropominae* are a characteristically Antillean group, although they reach the mainland in many places around the Caribbean Sea and the Gulf of Mexico. On the other hand the members of this group appear to be most closely related to those of northern South America.

The genus *Neosubulina* is known only from the Dutch islands of the Leeward Group and northern South America, while *Brachypodella raveni* belongs to the mainland group of the genus. The relation of *Gastrocopta curacoana* is uncertain, and also about that of *Thysanophora vanattai*, the type of the subgenus *Hojeda* H. B. Baker, nothing can be said with certainty.

As already fully discussed by H. B. Baker, 1924, Curaçao can be divided into several faunal areas. Most distinct is the area of the Tafelberg Santa Barbara, which is, above all, characterized by the presence of *Tudora megacheilos pilsbryi* and *Tudora rupis rupis*. The other areas are less marked. Their boundaries generally correspond with the sunken valleys which cut up the limestone rim into a series of quite isolated ridges.

AFFINITIES OF THE FAUNA.

The known Mammals of the Leeward Group consist of 25 (28) species or subspecies. One half of these (50 %) are common to the South American mainland and, partly, also to the other Antilles. A few species (10 %) are known to be introduced by human agency. — The other forms (40 %) are local species or subspecies which are represented on the adjacent mainland by narrowly related forms and do not belong to any peculiar Antillean genus or species.

The known Lizards of the Leeward Group consist of 23 (26) species or subspecies. One half of these (50 %) are common to the South American mainland and, for a very small part only, also to the other Antilles. A single species is supposed to be introduced by human agency. — The other forms (50 %) are local species or subspecies which, for the greater part, are not represented on the adjacent mainland by narrowly related forms and do not obviously belong to any peculiar Antillean genus or species. — The species and subspecies which are peculiar to the Leeward Group, are confined to the islands West of Margarita; this region may be divided in smaller areas which possess a more or less different faunistical character: Los Hermanos-Blanquilla, Orchila-Tortuga, Los Roques, Bonaire, Curaçao, Aruba.

The Snakes, Amphibians and Fishes which inhabit Margarita and Los Testigos are probably all mainland-species. Those which occur in the other islands, are for the greater part also common to South America. The only species which appears to be peculiar to Curaçao, Aruba and Bonaire, is a fish, by no means confined to freshwater only, which is represented on the mainland by rather closely related forms.

The known Mollusks of the Leeward Group consist of 58 (60) species. Three quarters of these (75 %) are common to the South American mainland and, for nearly their half, also to the other Antilles. A few species are supposed to be introduced by human agency. — The other forms (25 %) are local species

which, for the greater part, are not represented on the adjacent mainland by narrowly related forms and, in a few cases, belong to peculiar Antillean genera. — The species which are peculiar to the Leeward Group, are practically confined to the islands Bonaire, Curaçao and Aruba; each island possessess a somewhat different faunal character. Bonaire and Klein Bonaire together forming the most distinct of all areas. — Margarita, and the islands to its East and South, have a fauna which shows no differences to that of the adjacent mainland, whilst the islands to its West apparently have a somewhat closer relationship with that of Curaçao.

Fig. 21 The Leeward Group. — The punctuated line indicating the isolated dry region along the northcoast of South America, with a rainfall of less than 680 mm a year.

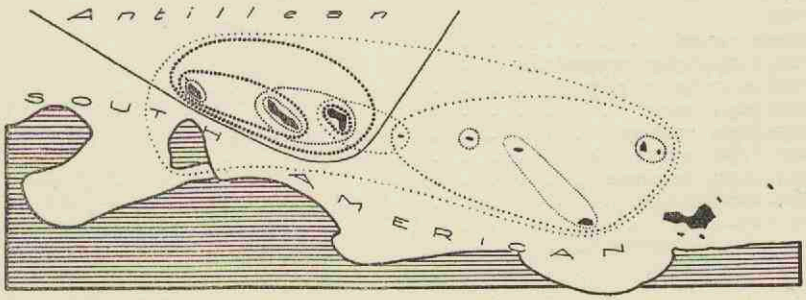


Fig. 22 Affinities of the older elements in the fauna of the Leeward Group. — The punctuated lines indicating the areas of endemic species.

TABLE 16.

Distribution of the endemisms of Mammals, Reptiles, Fishes and Snails.

	Los Testigos	Los Frailes	Margarita	Los Hermanos	Blanquilla	Tortuga	Orchila	Los Roques	Las Aves	Bonaire	Curaçao	Aruba	Los Monges	Paraguaná	N. Venez., Trinid., N.E. Col.	other part of American cont.	other Antilles
MAMMALIA																	
Cebus margaritae			0												—	-	
Odocoileus gymnotis margaritae			×												—	-	
Odocoileus gymnotis curassavicus											×				×	-	
Sylvilagus cumanicus margaritae			×											-	—	-	
Sylvilagus cumanicus avius	×													-	—	-	
Sylvilagus nigronuchalis nigronuchalis											×	×		—	—	-	
Sciurus nesaeus			0												—	-	?
Echimys flavidus			0												—	-	?
Mormoops megalophylla intermedia											×	×			-	-	-
Leptonycteris curasoae											0	×			?	-	
Phodotes tumidirostris tumidirostris											0				—	-	-
Rhogeëssa minutilla			0												—	-	?
Molossus pygmaeus											×				—	—	-
REPTILIA																	
Gonatodes (? albogularis aff.)						×	×								—	-	?
Gonatodes (? vittatus aff.)								×							—	-	?
Gonatodes (? Gymnodactylus aff.)			×												-	-	?
Gymnodactylus antillensis							0		×	×	×				-	-	-
Phyllodactylus martini											×	×			-	-	—
Phyllodactylus julieni												×			-	-	-
Phyllodactylus rutteni			×	×	?		×								-	-	-
Anolis lineatus											×	×			-	-	-
Anolis bonairensis bonairensis									?	×					-	-	-
Anolis bonairensis blanquillanus			×	×											-	-	-
Cnemidophorus lemniscatus nigricolor			×	×	×	×	×	×							—	—	-
Cnemidophorus lemniscatus arubensis												×			—	—	-
Cnemidophorus murinus murinus											×				-	-	-
Cnemidophorus murinus ruthveni											×				-	-	-
PISCES																	
Mollienisia vandepolli											×	×			-	-	-
GASTROPODA																	
Stoastomops walkeri											×						
Cistulops raveni												×					
Tudora megacheilos megacheilos												×			-	-	
Tudora megacheilos pilsbryi												×			-	-	
Tudora rupis rupis												×			-	-	
Tudora rupis muskusi												×			-	-	
Tudora rupis grandiensis												×			-	-	
Tudora rupis hatoensis												×			-	-	
Tudora aurantia											×				-	-	
Tudora maculata											×				-	-	
Gastrocopta curacoana											×	×	×		-	-	-
Neosubulina gloynii											×	×	×		-	-	
Spiraxis blandi								0							-	-	-
Thysanophora vanattai													×		-	-	-
Guppya molengraaffi												×			—	—	—
Cerion uva											×	×	×		-	-	-
Brachypodella raveni											×	×	×		-	-	-
Microceramus bonairensis						×	×				×	×	×	×	-	-	-

× own observation
0 from literature

— closely related form
- same genus, no closely related form
? doubtful

Isla de Caribes ($^1/_3$ km^2)

Lizards 6. Snakes 1.

The fauna shows no differences to that of the adjacent mainland.

Coche (50 km^2)

Lizards 3. Amphibians 1.

The fauna shows no differences to that of the adjacent mainland.

Cubagua (26½ km^2)

Lizards 3.

The fauna shows no differences to that of the adjacent mainland.

Margarita (850 km^2)

Mammals 17(18). Lizards 8. Snakes 6. Amphibians 3. Fishes 2. Mollusks 34(36).

The fauna shows no obvious differences to that of the adjacent mainland. The species or subspecies which appear to be confined to this island are closely related to mainland-forms and might hardly deserve special denomination.

Only known from Margarita: *Cebus margaritae* (not verified), *Odocoileus gymnotis margaritae, Sylvilagus cumanicus margaritae, Sciurus nesaeus* (not verified), *Echimys flavidus* (not verified), *Rhogeëssa minutilla* (not verified).

Los Testigos (5 islands: 3½ km^2)

Mammals 2. Lizards 6. Snakes 1. Mollusks 8.

The fauna shows no obvious differences to that of the adjacent mainland. The subspecies which appears to be confined to these islands is closely related to mainland-forms and hardly deserves special denomination.

Only known from Los Testigos: *Sylvilagus cumanicus avius.*

Los Frailes (2 islands: 1 km^2)

Lizards 5. Mollusks 1.

The fauna shows no obvious differences to that of the adjacent mainland.

Los Hermanos (2 islands: 2½ km²)

Lizards 6. Mollusks 1(2).

The fauna shows some obvious differences to that of Margarita and the adjacent mainland and is very closely related to that of Blanquilla.

Only known from Los Hermanos: *Gonatodes (? Gymnodactylus* aff.). Only known from the Leeward Group: *Phyllodactylus rutteni, Anolis bonairensis blanquillanus, Cnemidophorus lemniscatus nigricolor.*

Blanquilla (45 km²)

Lizards 4. Mollusks 5(6).

The fauna shows some obvious differences to that of the adjacent mainland and is closely related to that of the neighbouring islands.

Only known from the Leeward Group: *Phyllodactylus rutteni, Anolis bonairensis blanquillanus, Cnemidophorus lemniscatus nigricolor. Microceramus bonairensis* (incl. Paraguaná).

Tortuga (140 km²)

Lizards 4. Mollusks 2.

The fauna shows some obvious differences to that of the adjacent mainland and is closely related to that of the northern islands.

Only known from the Leeward Group: *Gonatodes* (? *albogularis* aff.), ? *Phyllodactylus rutteni, Cnemidophorus lemniscatus nigricolor, Microceramus bonairensis* (incl. Paraguaná).

Orchila (25 km²)

Lizards 4. Mollusks 3.

The fauna shows some obvious differences to that of the adjacent mainland and is closely related to that of the neighbouring islands.

Only known from the Leeward Group: *Gonatodes* (? *albogularis* aff.). *Gymnodactylus antillensis* (not verified), *Cnemidophorus lemniscatus nigricolor.*

Los Roques (3 islands: 1½ km²)

Lizards 4. Fishes 1. Mollusks 2.

The fauna shows some obvious differences to that of the adjacent mainland and is closely related to that of the neighbouring islands.

Only known from Los Roques: *Gonatodes* (? *vittatus* aff.), *Spiraxis blandi* (not verified). Only known from the Leeward Group: *Phyllodactylus rutteni, Cnemidophorus lemniscatus nigricolor.*

Las Aves (2 islands: ½ km²)

Lizards 6. Snakes 1.

The fauna shows a few obvious differences to that of the adjacent mainland and is related to that of the neighbouring islands.

Only known from the Leeward Group: *Gymnodactylus antillensis,* ? *Anolis bonairensis bonairensis* (not verified), *Cnemidophorus lemniscatus nigricolor.*

Bonaire (265 km²)

Mammals 2. Lizards 7. Snakes 1. Amphibians 1. Fishes 4. Mollusks 17.

Klein Bonaire (7 km²)

Lizards 5. Amphibians 1. Mollusks 10.

The fauna shows several obvious differences to that of the adjacent mainland and is rather closely related to that of Curaçao. The occurrence of *Cerion, Stoastomops* and *Microceramus* suggests some relationship with the fauna of the Greater Antilles, while *Anolis bonairensis* and *Tudora* also might represent an Antillean element; this Antillean affinity is, however, rather insignificant when compared with the much closer relationship to the South-American mainland-fauna.

Only known from Bonaire: *Anolis bonairensis bonairensis* (? incl. Las Aves), *Cnemidophorus murinus ruthveni, Stoastomops walkeri, Tudora aurantia, Tudora maculata.* Only known from the Leeward Group: *Gymnodactylus antillensis, Phyllodactylus martini, Mollienisia vandepolli, Gastrocopta curacoana, Neosubulina gloynii, Cerion uva, Brachypodella raveni, Microceramus bonairensis* (incl. Paraguaná).

Curaçao (425 km²)

Mammals 11(13). Lizards 8(9). Snakes 2. Amphibians 1. Fishes 4. Mollusks 27.

Klein Curaçao (1¼ km²)

Lizards 2.

The fauna shows several obvious differences to that of the adjacent mainland and is rather closely related to that of Bonaire and Aruba. The occurrence of *Cerion, Cistulops* and *Microceramus* suggests some relationship with the fauna of the Greater Antilles,

while *Tudora* also might represent an Antillean element; this Antillean affinity is, however, rather insignificant when compared with the much closer relationship to the South-American mainland-fauna.

Only known from Curaçao: ? *Odocoileus gymnotis curassavicus, Phodotes tumidirostris tumidirostris* (not verified), *Molossus pygmaeus, Cnemidophorus murinus murinus, Tudora megacheilos pilsbryi, Tudora rupis rupis, Tudora rupis muskusi, Tudora rupis grandiensis, Tudora rupis hatoensis, Guppya molengraaffi.* Only known from the Leeward Group: ? *Sylvilagus nigronuchalis nigronuchalis, Mormoops megalophylla intermedia, Leptonycteris curasoae, Gymnodactylus antillensis, Phyllodactylus martini, Anolis lineatus, Mollienisia vandepolli, Cistulops raveni, Tudora megacheilos megacheilos, Gastrocopta curacoana, Neosubulina gloynii, Cerion uva, Brachypodella raveni, Microceramus bonairensis* (incl. Paraguaná).

Aruba (173 km²)

Mammals 5. Lizards 10. Snakes 2. Amphibians 1. Fishes 1. Mollusks 19.

The fauna shows several obvious differences to that of the adjacent mainland and is rather closely related to that of Curaçao. The occurrence of *Cerion, Cistulops* and *Microceramus* suggests some relationship with the fauna of the Greater Antilles, while *Tudora* also might represent an Antillean element; this Antillean affinity is, however, quite insignificant when compared with the much closer relationship to the South-American mainland-fauna.

Only known from Aruba: *Phyllodactylus julieni, Cnemidophorus lemniscatus arubensis, Thysanophora vanattai.* Only known from the Leeward Group: ? *Sylvilagus nigronuchalis nigronuchalis, Mormoops megalophylla intermedia, Leptonycteris curasoae, Anolis lineatus, Mollienisia vandepolli, Cistulops raveni, Tudora megacheilos megacheilos, Gastrocopta curacoana, Neosubulina gloynii, Cerion uva, Brachypodella raveni, Microceramus bonairensis* (incl. Paraguaná).

Paraguaná

The fauna shows no obvious differences to that of the neighbouring part of the mainland. The occurrence of *Microceramus* suggests some relationship with the fauna of the Greater Antilles, while *Tudora*, which occurs in other parts of Venezuela, also might represent an Antillean element.

La Goajira

The fauna shows no differences to that of the neighbouring part of the mainland.

PALAEOGEOGRAPHICAL CONCLUSIONS.

In the f a u n a of the Leeward Group three elements may be discerned: 1. a southern, modern element; 2. a southern, older element; 3. a northern, still older element.

1. The "southern, modern element" consists of species common to the South American continent or having closely related mainland-forms. This element cannot be distinctly separated from a "more widely spread, modern element", consisting of species of unknown origin. The fauna of Margarita and the islands to its South and East is wholly composed of this element, which is probably fortuitously scattered over the other islands. This very strongly suggests the existence of a well-wooded land-connection between the continent and Margarita in quaternary time. The scanty fauna of Cubagua, Coche, Los Frailes and Los Testigos is not contradictory to a similar supposition.

2. The "southern, older element" consists of endemic species of presumably South-American origin (e.g. *Phyllodactylus, Cnemidophorus, Neosubulina, Brachypodella)*. It forms a considerable part of the island-fauna West of Margarita. This strongly suggests a long geographical isolation of this region, probably even since late-tertiary time. The region probably was soon scattered. It is possible that Bonaire, the most distinct of all areas, was loosened before the connection between, other islands was dissolved (W e r n e r, 1925). The Venezuelan Islands, in general, were populated from the East, the Dutch Islands from the West.

3. The "northern, still older element" consists of endemic species of presumably Antillean origin (e.g. *Stoastomops, Cistulops, ? Tudora, Cerion*). It forms a noticeable part of the fauna of Bonaire, Curaçao and Aruba (B a k e r, 1924). This suggests a land-connection with a territory inhabited by an ancient Antillean fauna, possibly as early as middle-tertiary time. There is little to indicate that this Antillean fauna inhabited parts of the South-American continent, although it is not impossible that a thorough study of the northern coast may bring a number of these "relics" to light. At the moment it seems to be more probable that these presumable traces of Antillean element in the

northern part of South America intruded from the north, along the same way which brought the "southern, older element" to the island-region, or that possibly it entered this country via Central America since pliocene time.

The flora of Margarita is identical in appearance with that of the adjacent mainland. Although more than 30 % of the 644 plants reported from Margarita in 1909 (Johnston), were not known from the continent at that time, it may be concluded from later investigations that a large part of them certainly occurs on the mainland. The flora of Margarita appears to be wholly composed of a southern, modern element, which is mixed with species more widely spread throughout tropical America. This strongly suggests the existence of a land- connection between the continent and Margarita in quaternary time. The scanty flora of Cubagua, Coche, Los Frailes and Los Testigos is not contradictory to a similar supposition.

The flora of the Venezuelan Islands West of Margarita shows some differences with that of the adjacent mainland, in having a few species, which appear to be peculiar to the Leeward Group, in common with the Dutch Islands. The islands show rather obvious differences. There are little data for palaeogeographical conclusions.

The flora of Bonaire, Curaçao and Aruba shows some obvious differences with that of the adjacent mainland (Boldingh, 1914). There is a rather high percentage of endemism. It has a noticeable affinity with that of the other Antilles; this, however, appears to be rather insignificant if compared with the much closer relationship of the South-American mainland-flora. The islands show some differences. This suggests a rather long geographical isolation of the region, a former land-connection with South America and, possibly, another land-connection explaining Antillean affinities.

A topographical classification, based on the depth of the sea, agrees with our faunal experiences, as Margarita and the islands to its South and East are lying in a shallow sea and are not separated from the mainland by much deeper water as in

the case of the other islands. In this unstable region, other conclusions on topographical data are hardly to be expected. Aruba is separated by a narrow channel of not more than 200 m deep from the shallow mainland-waters; this situation does not correspond with the considerable differences in the fauna of this island and that of the continental-coast.

From a geological point of view all the islands, with exception of Margarita, Cubagua, Coche and possibly Tortuga, belong to the Antillean province, differing markedly from northern and middle Venezuela by lacking geosynclinal development of tertiary deposits. On most of these islands abyssal and, partly also, hypoabyssal rocks are found, derived from a quartzdioritic magma, clearly differing from the rocks of the Caribbean coast-range. It is possible that the peninsulas of Paraguaná and La Goajira belong to the same province.

The greater part of Paraguaná and La Goajira was submerged in early quaternary or pliocene time. The fauna, as far as known, does not suggest a long geographical isolation of the archipelagos which must have represented the mountainous region of these peninsulas.

Cubagua, Tortuga, Los Roques with exception of El Gran Roque, Las Aves, Klein Bonaire and Klein Curaçao, wholly consist of quaternary coral-rock or are built up of sand and coral-debris. According to this, the fauna is composed of the same species which occur in the neighbouring islands or on the mainland.

It might be assumed that the submarine plateau, from which Margarita, Cubagua, Coche, Los Frailes and Los Testigos arise, was above sea level in early pleistocene time. During this period the schisty bases of Coche and southern Macanao were eroded, on which afterwards, probably in connection with a positive change of the sea level, the detritus-masses were deposited, nowadays covering this region as well as Cubagua and a part of the Araya-peninsula. An upheaval, in connection with a considerable and still continuing differential movement followed, and a part of the sediment was again removed, giving Margarita, Coche

and Cubagua their present shape. The modern, continental fauna of Margarita and Los Testigos fully complies with this notion of geological history in later time.

Practically no data exist from which we can derive any idea of the palaeogeography of the island-region between Margarita and Bonaire. Blanquilla is still limestone-capped at its eastern side, but there is no indication that this older formation of coral-rock extended over the whole island. In Los Hermanos, Orchila and the Gran Roque no older limestone occurs. These islands may be remnants of a large stretch of land, according to the general exposure of ancient rocks, implying a strong denudation. The steep slopes of the smaller islands and the considerable depth of the sea in their immediate vicinity suggest strong tectonical movements in subrecent time. According to the fauna, it is not likely that a direct or indirect land-connection with the mainland existed in quaternary time.

In Bonaire, Curaçao and Aruba, a positive change of sealevel in early quaternary time, by which the greater part of the islands was submerged, caused a deposition of limestone upon the denuded and abraded older rocks. After that, a slight upwarping of the limestone took place and the coral-rock of the central part, with underlying rocks, were largely removed. Afterwards there were several slow changes in level, both in a positive and in a negative way and some tectonical movements, continuing until the present time. Roughly estimated from the situation of these limestone-beds, more than $^4/_5$ of each island-area were under sea in early pleistocene time. According to the fauna it can be taken for granted that Bonaire, Curaçao and Aruba were not wholly submerged.

From geological indication, the most recent land-connection with a large stretch of land in the South is of uppermost cretacic age, when the Soebi Blanco-conglomerates and the Midden Curaçao-beds were deposited. Small areas of upper-eocene limestone prove that in older tertiary time the former landconnection had disappeared and the region was wholly submerged. From the younger Tertiary practically nothing is known. An upwarping

of the island-region followed, probably in the Lower-Oligocene, whilst in northern Venezuela sediments of enormous thickness were deposited, the northern post-eocene geosyncline ending not far from the present northcoast.

According to our zoogeographical knowledge, this island-region was probably above sea-level since middle-tertiary time, successively connected with a stretch of land towards the North, inhabited by the ancient Antillean fauna, and with the South American continent towards the West or Southwest. Afterwards the region was thoroughly scattered, forming the present territory of Curaçao, Aruba, Bonaire and the Venezuelan Islands.

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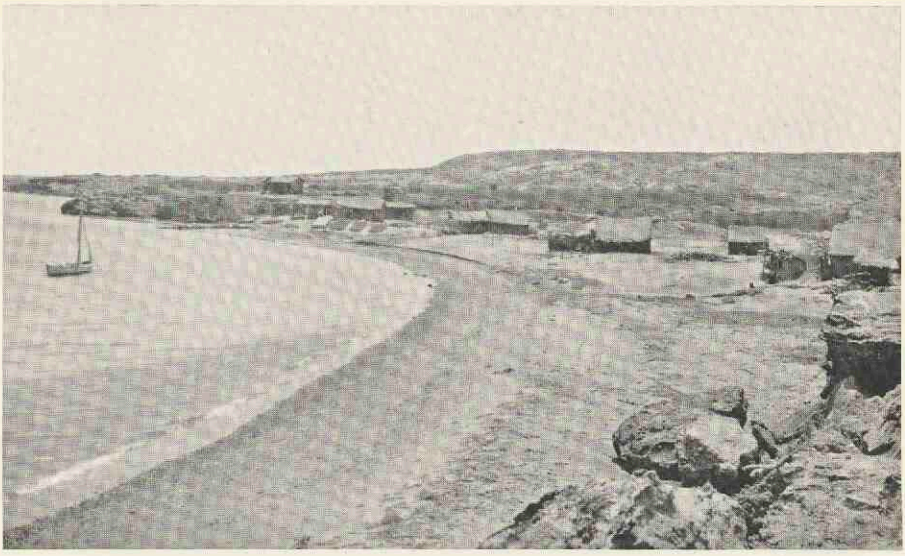
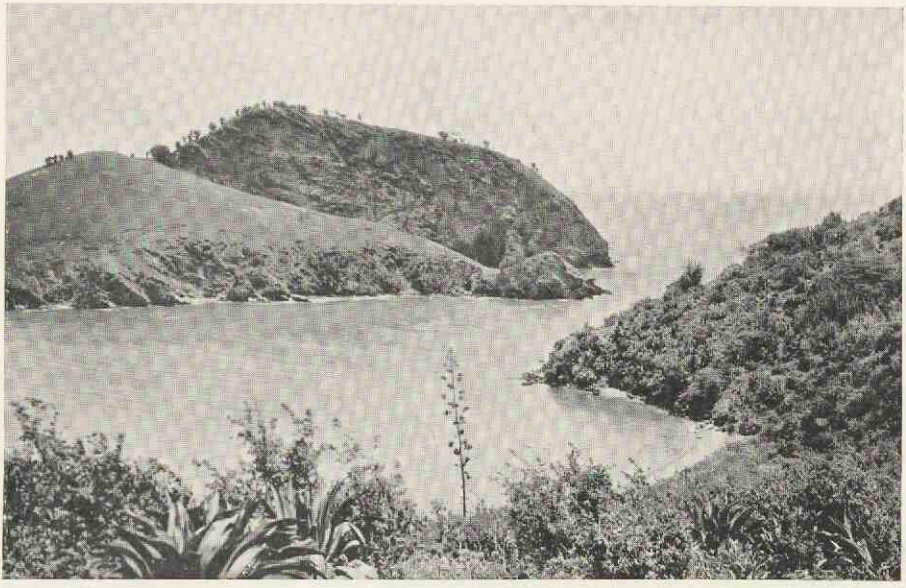
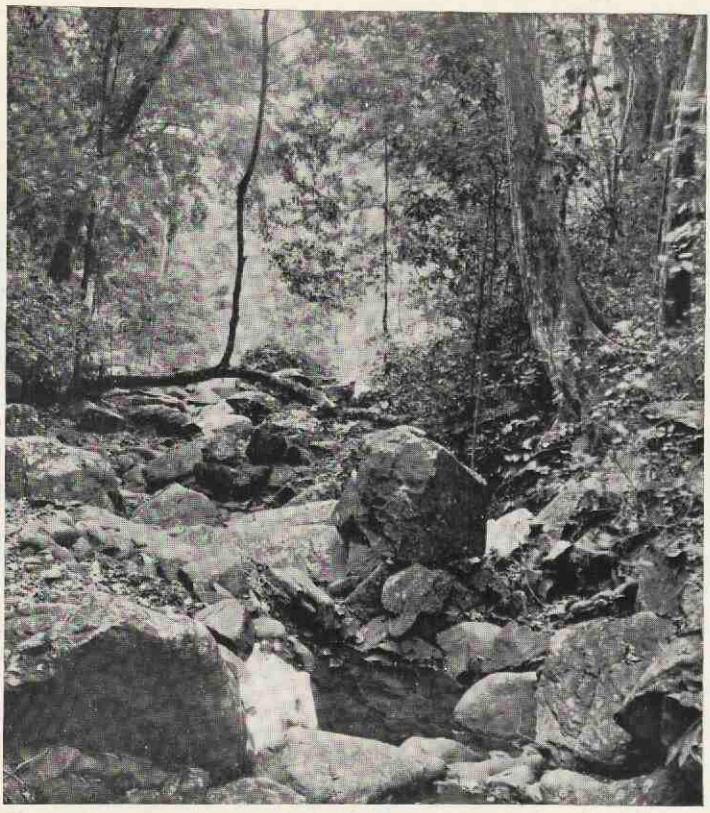
These "Studies on the Fauna of Curaçao, Aruba, Bonaire and the Venezuelan Islands" are to be continued.



I *a* Rancheria at the northern coast of Cubagua. The island is flattened and consists of limestone. The scanty vegetation is chiefly composed of scattered shrubs of *Croton flavens, Opuntia caribaea* and *Opuntia Wentiana*. (Stat. 9 and 129 are situated in a small gully to the right)



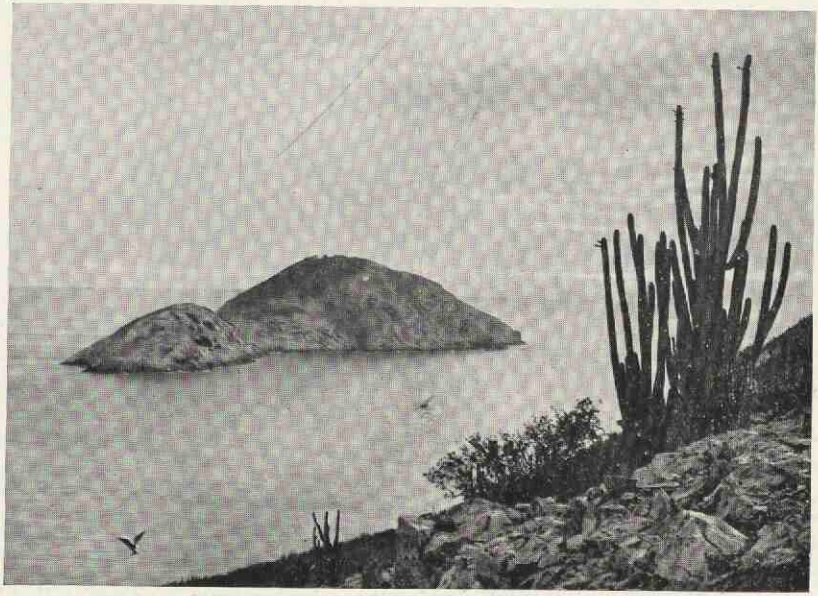
I *b* Looking northward from the peninsula of Puerto Santo towards the Morro de Puerto Santo (100 m), E. of Carúpano. The rocks consist chiefly of crystalline schists. The peninsula is covered by a considerable growth of shrubs with much *Agave Cocui*; the Morro has a scanty grassy plantcovering with scattered *Lemaireocereus griseus*. (see Stat. 125—126)



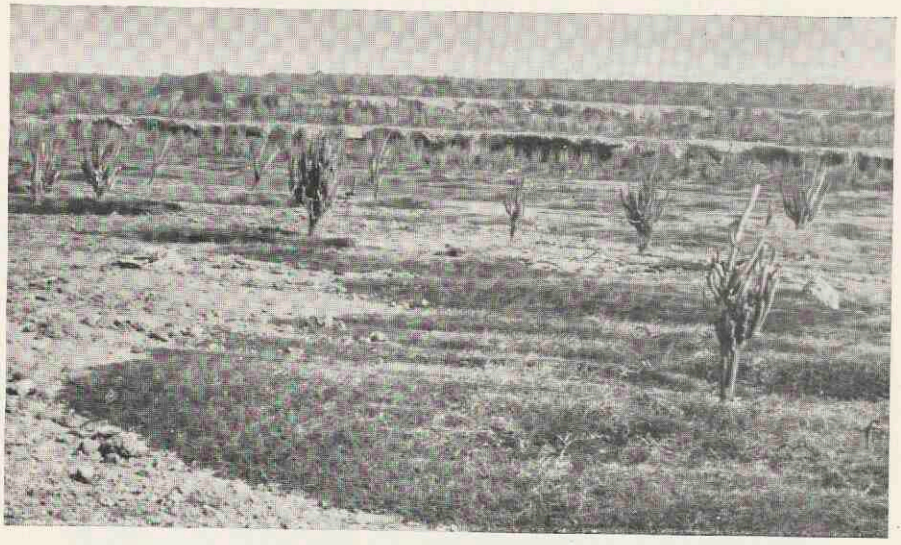
II *a* The Río del Valle, Margarita, just above the Toma de Agua, with large boulders of antigorite-rock. On Margarita this rather luxuriant vegetation is confined to the higher and more protected parts of the Cerros de Copey. (Stat. 144, near Stat. 26)

II *b* Looking northward across the valley of the Río Asunción, towards the Cerros de Matasiete (600 m), an outcrop of granitic rocks in Margarita. (Stat. 137 is situated in the background to the left)

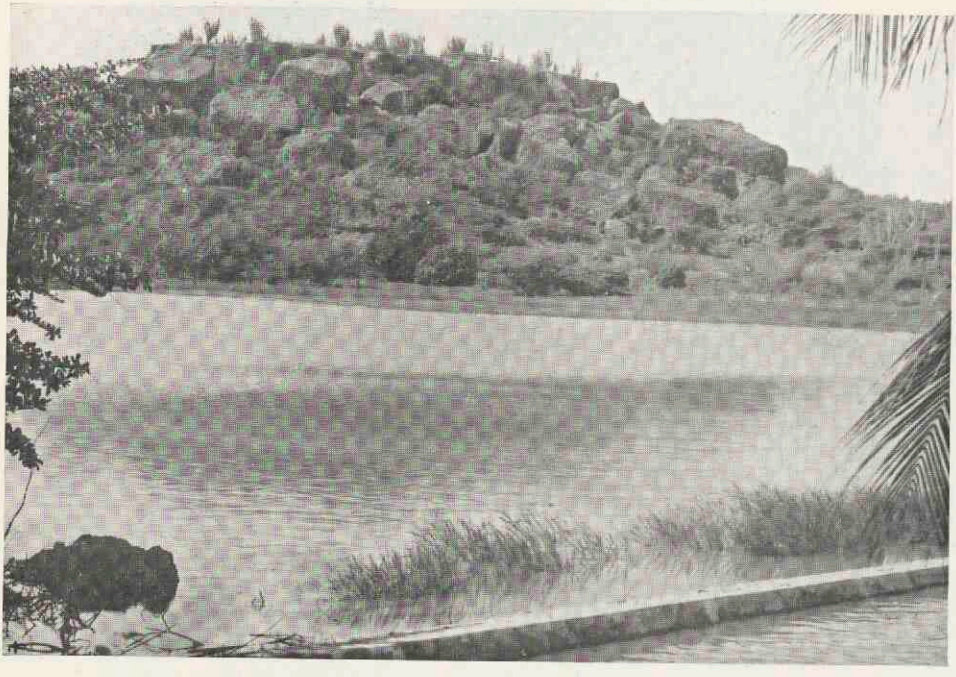
III *a* The Morro Grande of Tamarindo (200 m), seen from the Morro de la Iguana, Los Testigos. The islands are build up of granitic rocks. The foreground with a conspicuous growth of *Cereus margaritensis*. (see Stat. 157 and Stat. 162—163)



III *b* The Morro Grueso (180 m), seen from the Morro Fondeadero, Los Hermanos. The foreground consists of hornblende-rock and is covered with guano; showing conspicuous specimens of *Lemaireocereus griseus*. (see Stat. 169)

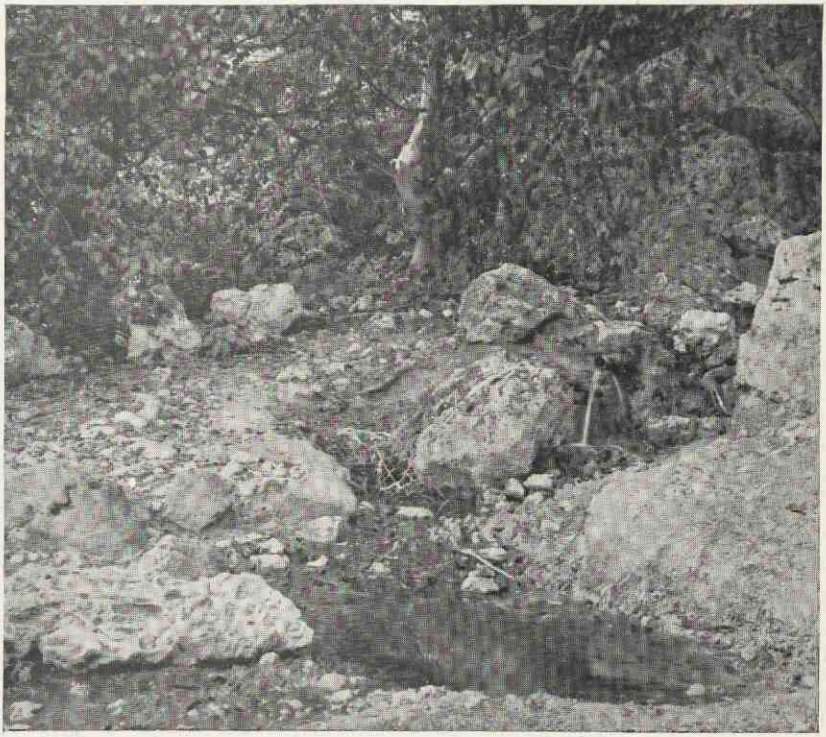


IV *a* Limestone terraces between Fontein (l.) and Rooi Onima (r.), at the northcoast of Bonaire. Approximate height of lowest-terrace (in foreground), lower, higher and highest-terrace resp. 8, 20, 50 and 80 m. Vegetation with conspicuous *Cereus repandus*.

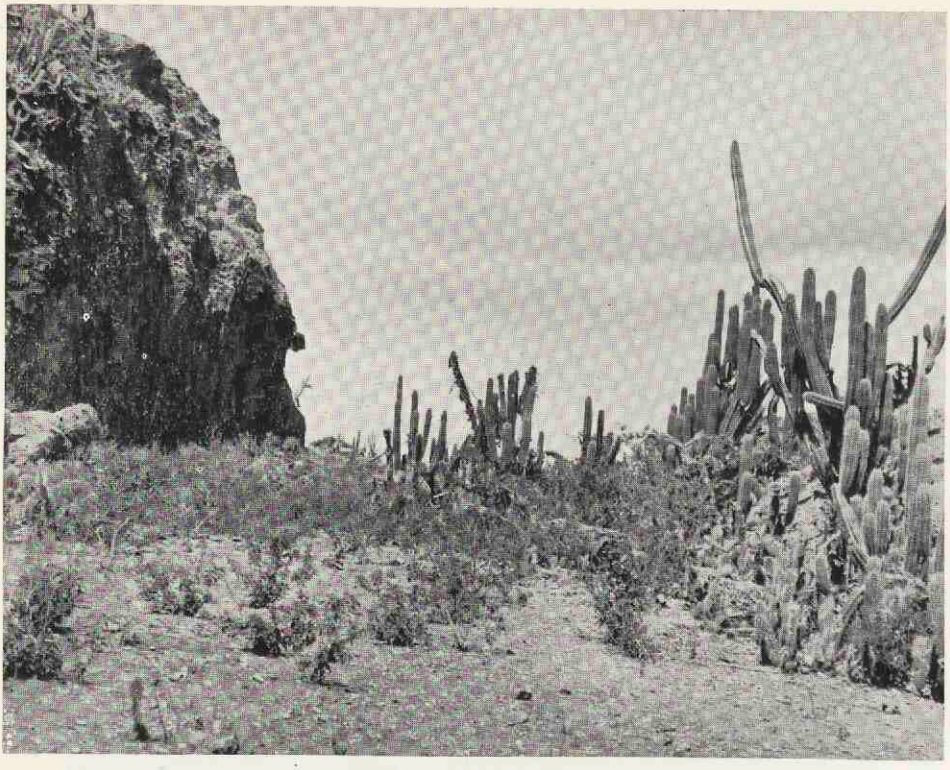


IV *b* Tanki Onima, Bonaire, after the rainy season. The valley of Onima has been dammed for agricultural purposes; after rains the accumulated water covers large areas which are later drying up. The isolated table-mountain, the Kaumati (43 m), shows the crumbling of the elevated coral-limestone plateau by removal of the underlying rock. (Stat. 46, near Stat. 194)

V *a* Pos Jatoe Largoe, one of the numerous places in the limestone-plateau of southern Bonaire, where the cavern-water is made accessible by roof-collapse. (Stat. s.n.)

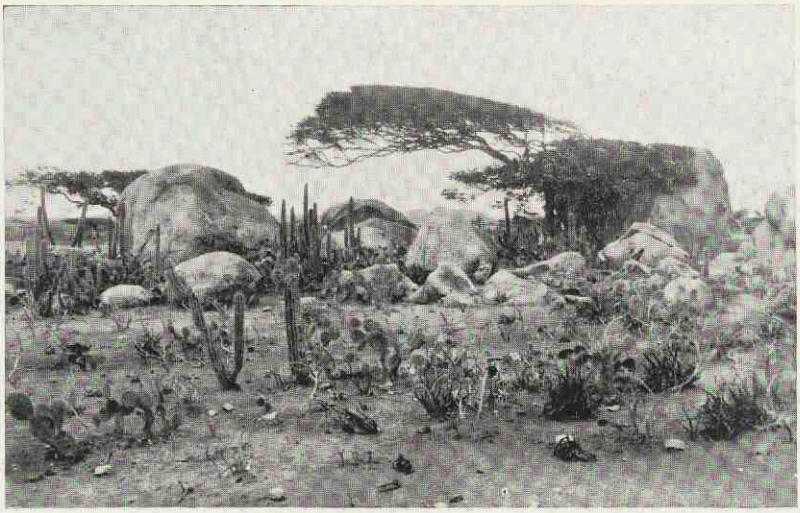


V *b* Bron Wandongo, at the foot of the escarpment of the higher coral-limestone terrace of Hato, Curaçao. A short iron pipe transmitting the spring-water to a small pool with *Najas guadalupensis*; trees of *Hippomane Mancinella* in the background. (Stat. 76—76A and Stat. 220)

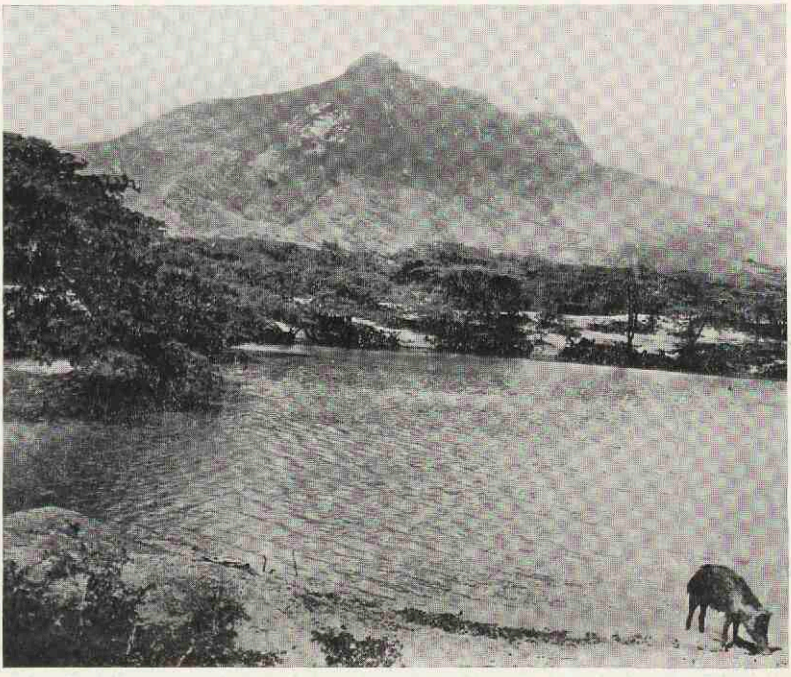


VI *a* Escarpment of the higher coral-limestone terrace near San Pedro, Curaçao. A vegetation with *Croton flavens, Lemaireocereus griseus* and *Opuntia Wentiana* predominating. (Stat. 226)

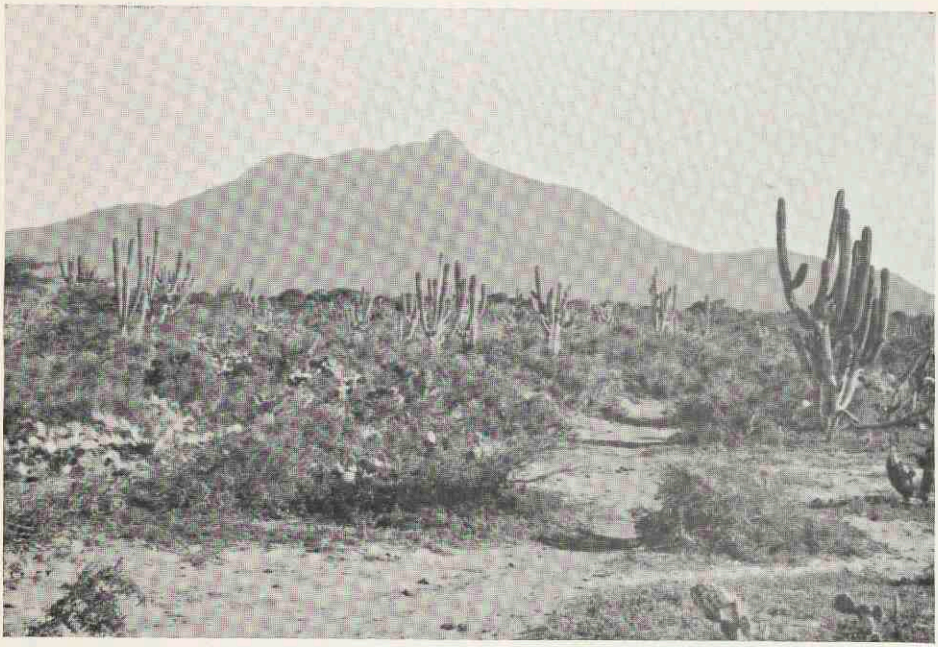
VI *b* Rooi Bringamosa, a river-bed in the diorite-landscape of central Aruba, holding some water; looking northeastward towards the diabase-hill Arie Kok (186 m). (Stat. 103)



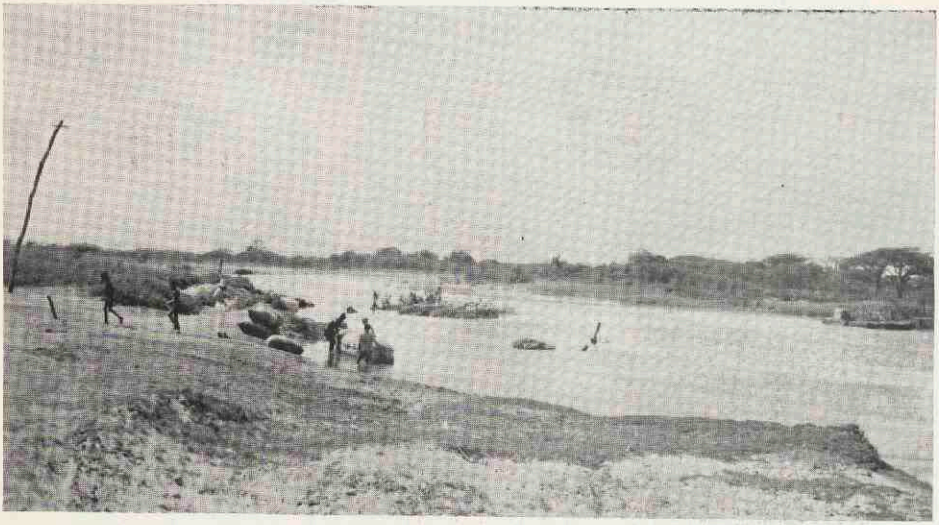
VII *a* Exfoliated diorite-blocks. West of the Hooiberg, A r u b a. The vegetation is confined chiefly to *Jatropha gossypifolia, Opuntia Wentiana, Lemaireocereus griseus* and *Aloe vera*; the dividivi-tree has been greatly deformed by the eastern tradewind.



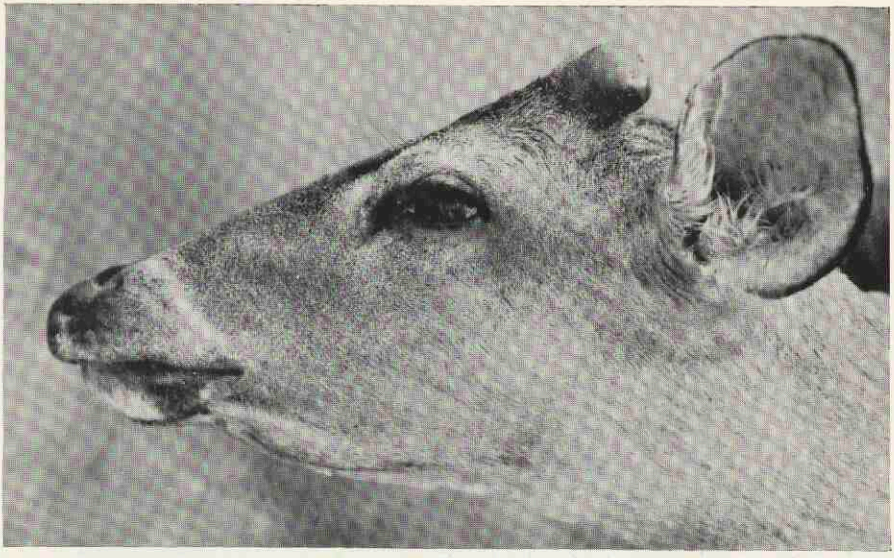
VII *b* Looking northward across the Estanque de Santa Ana, towards the Cerro de Santa Ana (abt. 800 m), P a r a g u a n á. (Stat. 110)



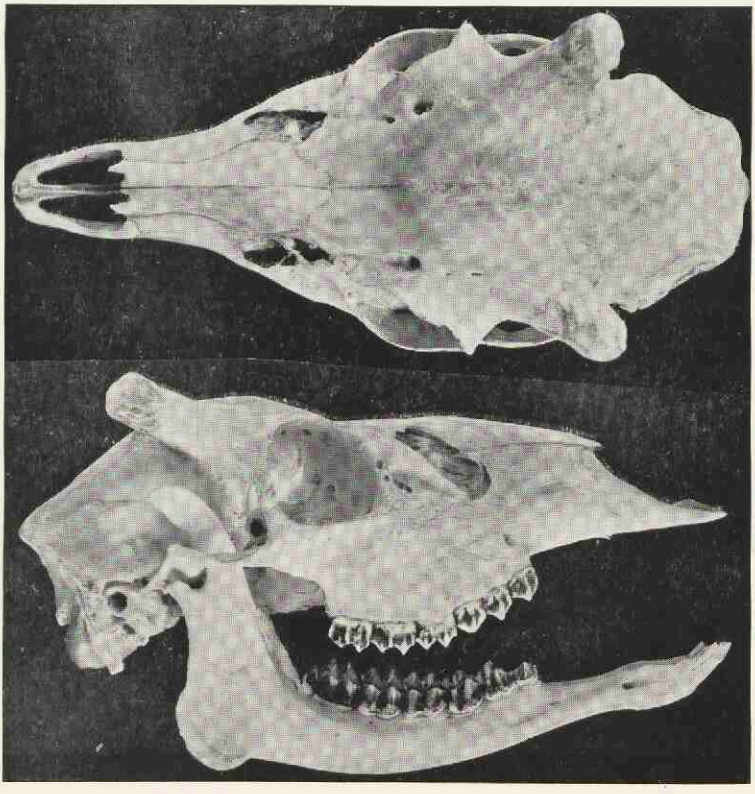
VIII *a* Looking southward towards the Cerro de Santa Ana, an outcrop of gabbroid-rock, dominating the peninsula of Paraguaná. The mountains are encircled by a rather high limestone-plateau which, in this locality, is covered by thorny shrubs, *Opuntia Wentiana* and conspicuous *Lemaireocereus griseus*.



VIII *b* The Rio Calancala near San Antonio, a very shallow river South of the peninsula of La Goajira. Indians are loading a canoe with dividivi for transport to Rio Hacha. (Stat. 115)

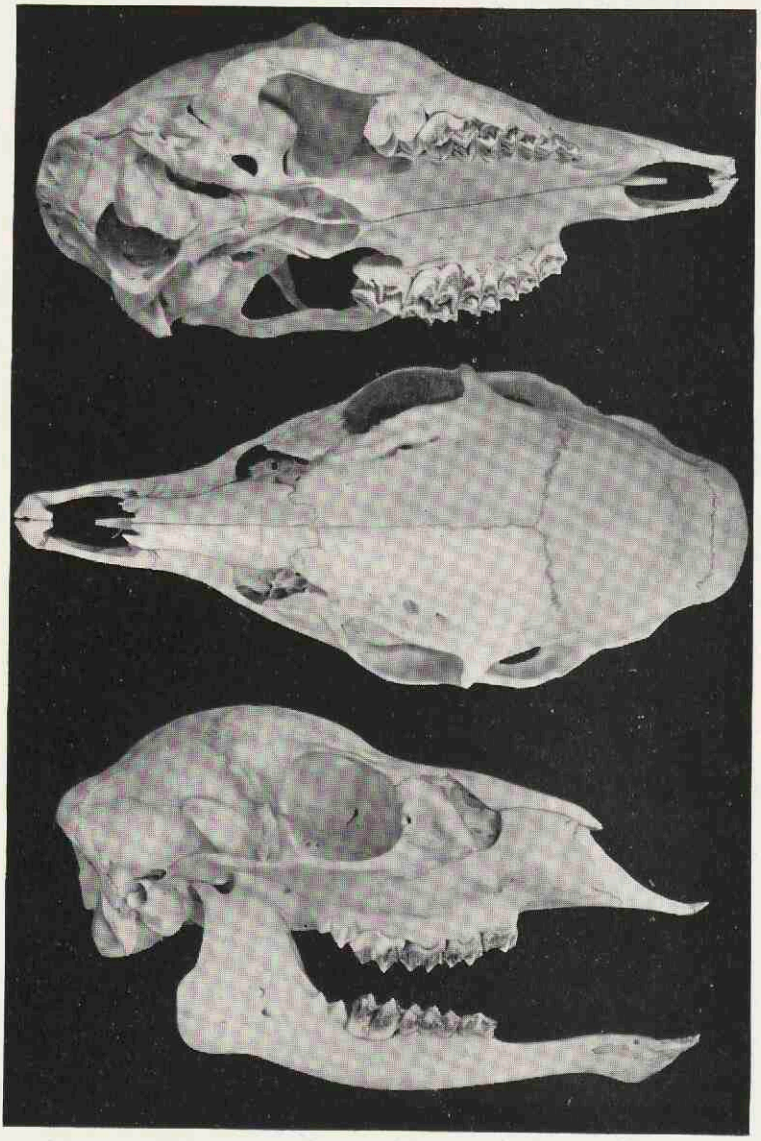


IX *a* Head of adult *Odocoileus gymnotis curassavicus* with shedded antlers, Curaçao. (Odoc. 5, holotype; just after death)

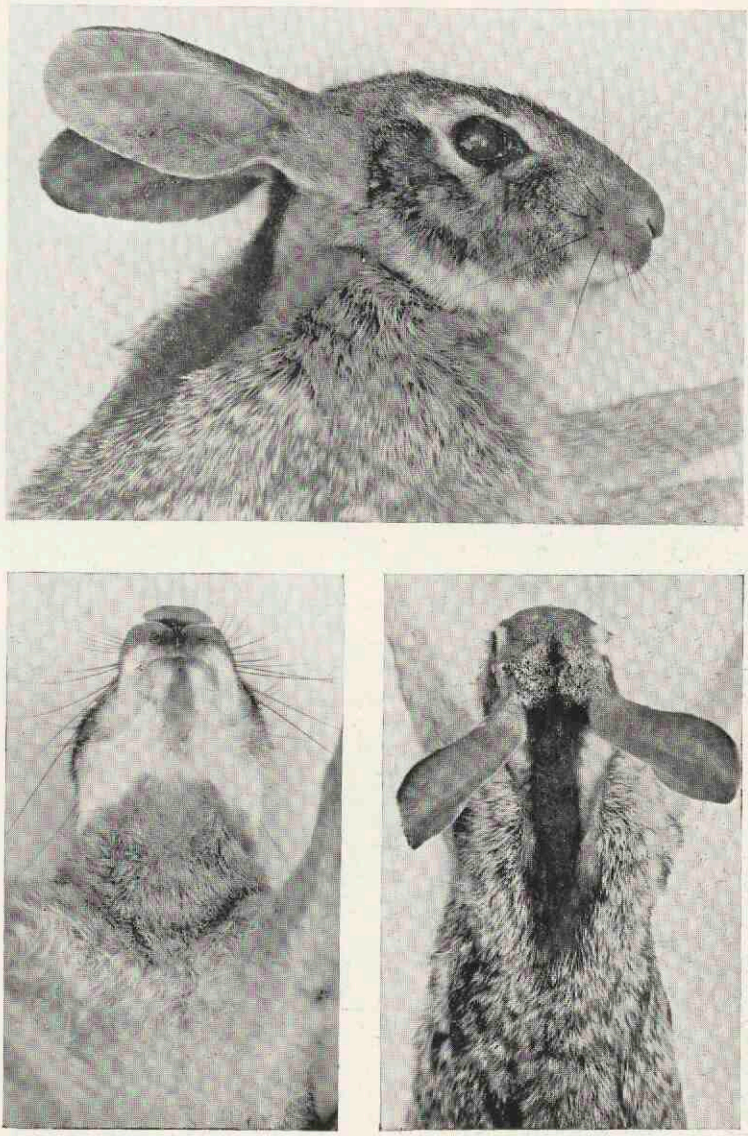


IX *b* Skull of adult male *Odocoileus gymnotis curassavicus*, Curaçao, from above and from the right. (Odoc. 5, holotype)

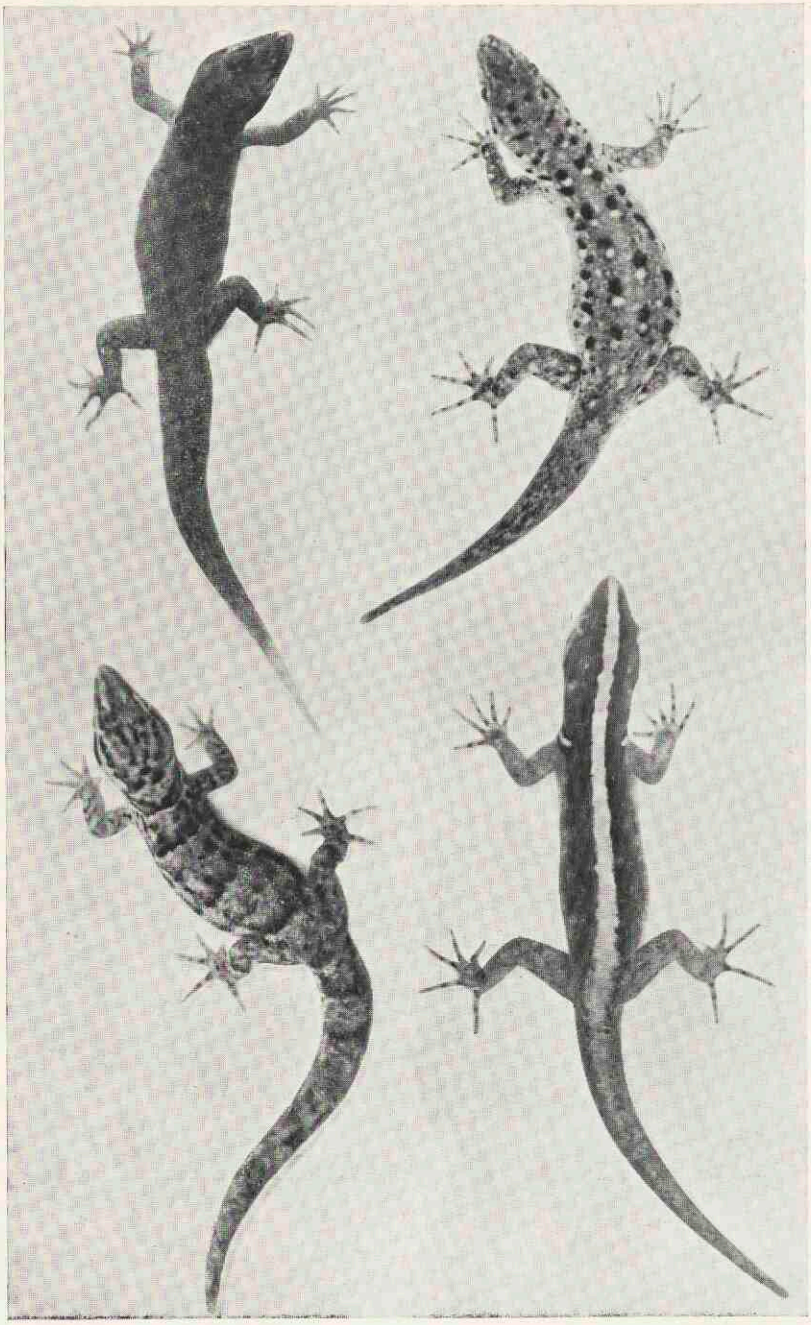
TAB. X



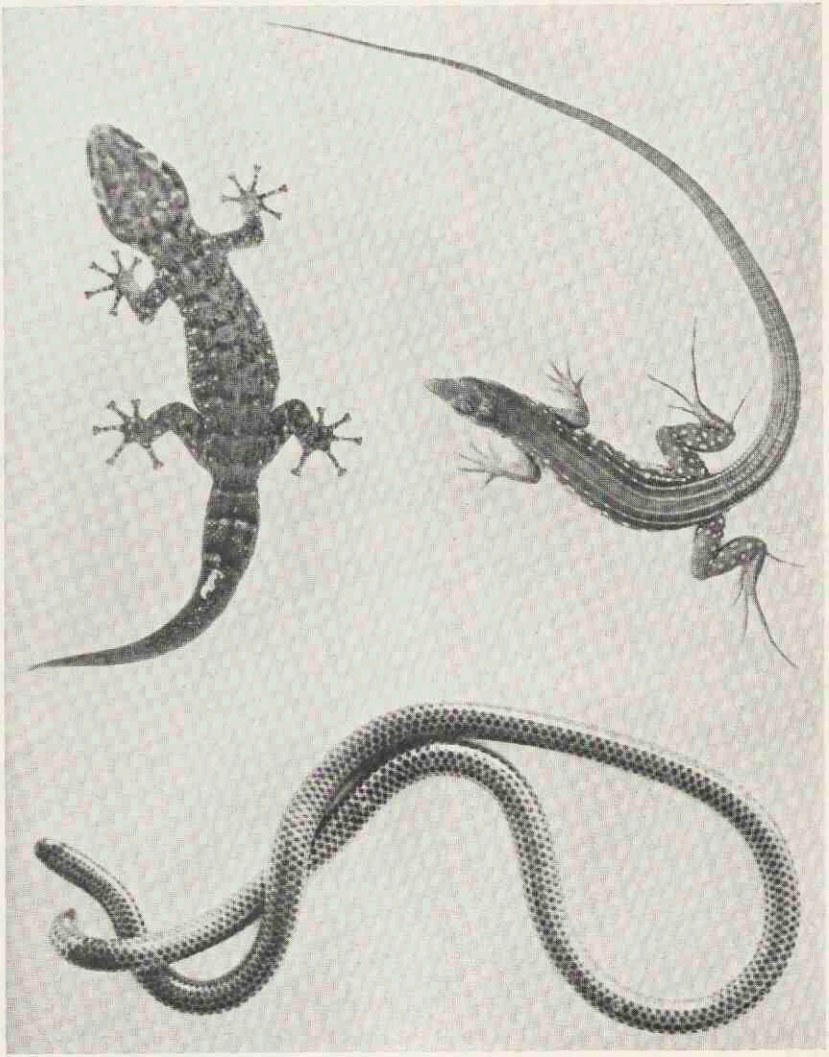
X Skull of nine months old female *Odocoilcus gymnotis curassavicus*, Curaçao, from below, from above and from the right. (Odoc. 2, paratype)



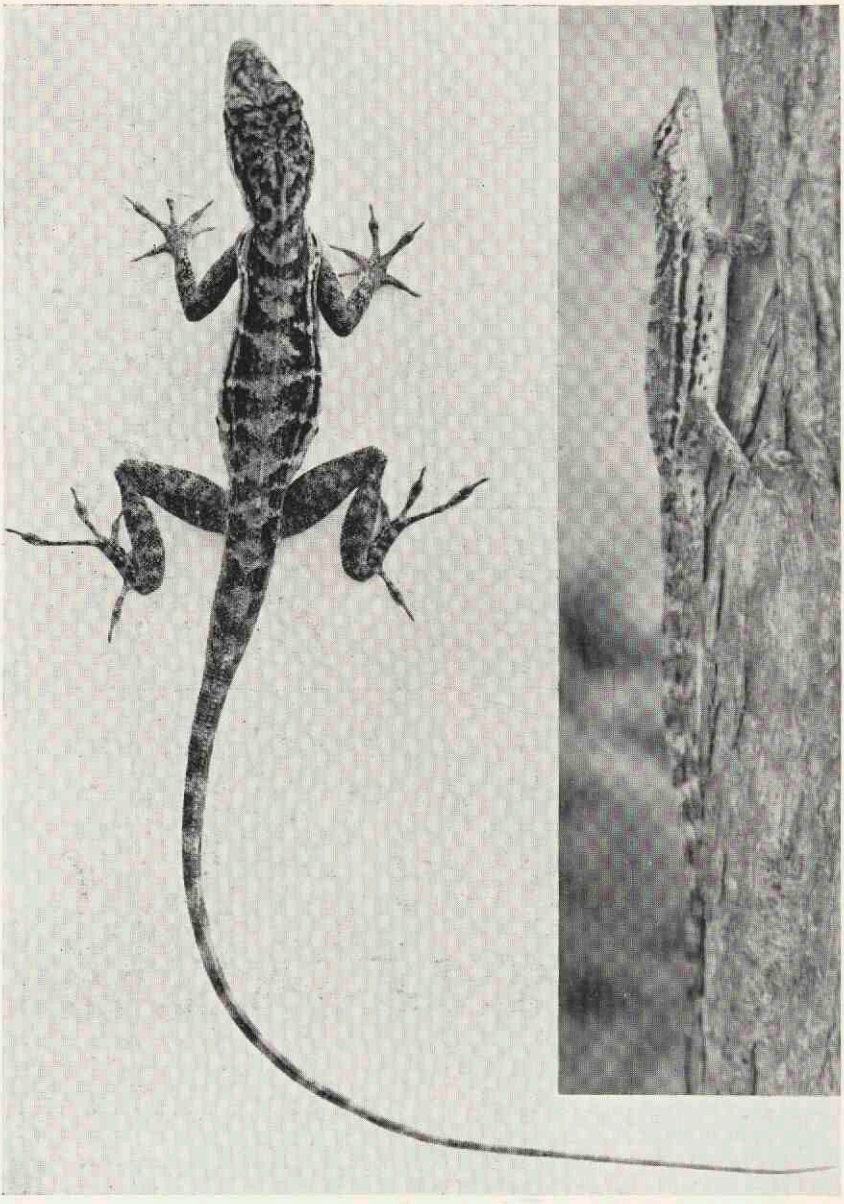
XI Head of *Sylvilagus nigronuchalis nigronuchalis* from Falcón, Aruba, from the right, from below and from above, showing the deep black nape. (topotype; just after death)



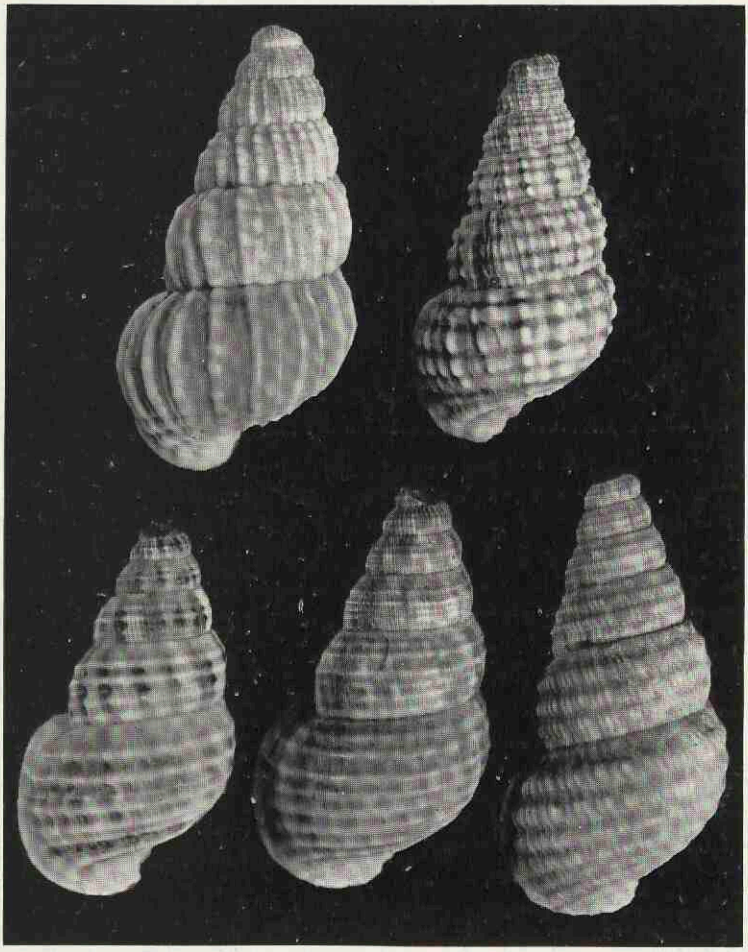
XII On the left: *Gymnodactylus antillensis* from Bronswinkel, Bonaire: above the male with grey body and orange-red head, below the female. On the right: *Gonatodes vittatus* from Oranjestad, Aruba; above the female, below the male. (from life, × ca 5/3)



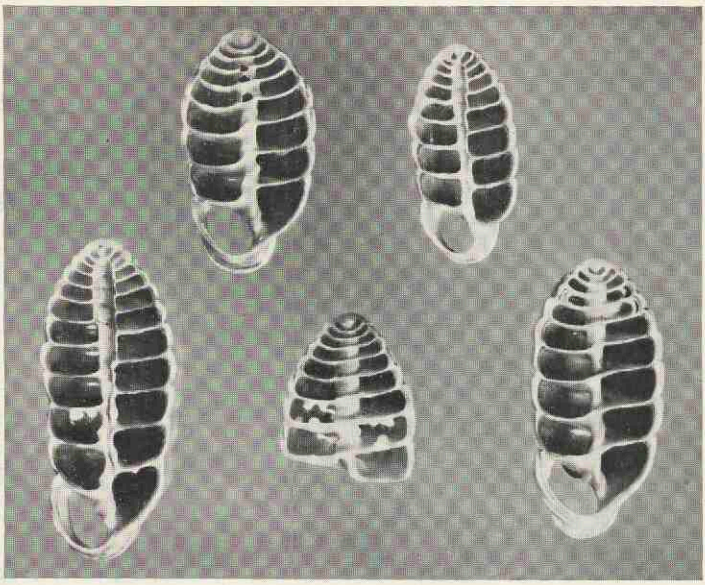
XIII Above on the left: *Phyllodactylus julieni* from Baca Morto, Aruba. (from life, × 7/6)
Above, on the right: *Cnemidophorus lemniscatus arubensis* from Oranjestad, Aruba. (from life, × 2/3)
Below: *Leptotyphlops albifrons* from Lima, Bonaire, silver coloured. (from life, × 2)



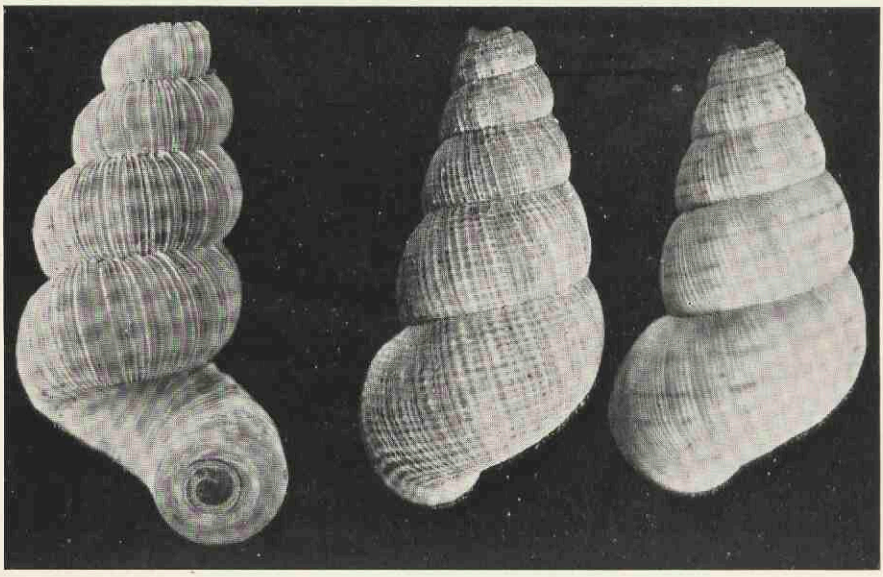
XIV *Anolis lineatus* from Hato, Curaçao, from above (nat. size) and from the right, same specimen. (from life)



XV Above, from left to right: *Tudora rupis muskusi*, St. 242A, and *Tudora rupis grandiensis*, St. 225. Below: *Tudora rupis rupis*, 2 specimens, St. 206, and *Tudora rupis hatoensis*, holotype, St. 217; all from Curaçao. (× 7/2)



XVI *a* *Cerion uva* from Curaçao; from left to right, 1—3 St. 220, 4—5 St. 242. Whorls in cross-section, showing structure of axis, axial-lamellae, parietal-tooth and the occurrence of parietal and palatal-teeth in young specimens. (× 5/3)



XVI *b* From left to right: *Tudora maculata* from Bonaire, St. 190. (× 10) *Tudora aurantia* from Bonaire, St. 197 and St. 184, showing sculpture-differences. (× 7/2)

STELLINGEN.

I

Het respiratoir quotient van regenwormen is belangrijk hooger dan uit gaswisselingsmetingen blijkt.

II

De oppervlaktevergrootingen, die men aantreft bij zomer-temporaalvariëteiten van daphnia's, moeten niet als zweefinrichtingen worden beschouwd.

III

Het scyphomedusen-geslacht *Cassiopea* is niet homogeen; het ware gewenscht, dat *Cassiopea frondosa* werd beschouwd als het geno-type van *Polyclonia* L. Agassiz.

IV

Het is niet waarschijnlijk, dat de zoetwaterkwal, *Craspedacusta marginata* (Modeer), in Europa is geïmporteerd.

V

De term indo-pacifisch, voor zoover gebruikt in de marine zoögeographie, moet worden vermeden, daar hij tot verwarring aanleiding geeft.

VI

De Agaven van de Benedenwindsche Eilanden vertoonen geen bijzondere verwantschap met die van de overige Antillen.

VII

Alle cactussoorten, welke voorkomen op het eiland Curaçao, met uitzondering van die van het geslacht *Melocactus*, waren vóór Linnaeus' tijd al in wetenschappelijke kringen bekend.

VIII

Aan de geldige publicatie van namen behooren strengere eischen te worden gesteld dan in Art. 36 van de regels voor de Botanische Nomenclatuur zijn aangegeven.

IX

De holten in de diorietblokken op Aruba hebben met een vroegere transgressie niets te maken, maar zijn toe te schrijven aan een vorm van physische verweering, welke heden ten dage nog actief is.

X

De aanwezigheid van kalksteengrotten beneden den waterspiegel behoeft niet te wijzen op een daling van het land.

XI

Het ontstaan van de valleien in den buitenrand van het N.W. Atlantische plat, kan door het samengaan van subaerische en submarine processen aannemelijk worden gemaakt.

XII

Het is zeer onwaarschijnlijk, dat het phosphoriet van El Gran Roque op een dergelijke ingewikkelde wijze is ontstaan, als door R o s t (in: Z. Dtsch. Geol. Ges. 1938) wordt aangenomen.

XIII

Het eiland Bonaire is uitnemend geschikt voor het vestigen van een biologisch station.

Hummelinck 1940