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NOTES ON THE HERPETOFAUNA OF SURINAM I. — ITINERARY OF A HERPETOLOGICAL COLLECTING TRIP IN SURINAM IN 1968

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With 11 text-figures and six plates

INTRODUCTION

Since a few years the present author has been engaged in a study of the herpetofauna of Surinam, which resulted in a few publications (Hoogmoed 1967, 1969a, b). In early 1968, a grant was obtained from WOTRO (Netherlands Foundation for the Advancement of Tropical Research, grant W956-2) which enabled me to undertake a seven months collecting trip in Surinam. From the start the purpose was to obtain specimens from several localities in the interior, as the coastal area was thought to be fairly well explored. Moreover, other important goals were to obtain information on the ecology and colours of the living animals and, in the case of the frogs and toads, to make sound records.

As a well developed road system in Surinam only exists near the coast and between Paramaribo and the Brokopondo artificial lake, the localities in the interior have to be reached by boat or by air. Because of the short duration of my stay I had to make use of airtransportation to rapidly reach places in the interior, from there making short trips in the surroundings either on foot or by boat. Thus the assembling of a representative collection from various parts of the country could be attempted.

ITINERARY

24 April 1968-20 November 1968

24-27 April: Paramaribo.

27-30 April: Bigisanti beach.

27: trip by motorboat ("piaka") from Paramaribo to Bigisanti by way of Suriname River, Commewijne River, Matapica Canal and Atlantic Ocean; 28: trip to the deserted post Brandwacht on Mot Creek, collecting on the beach, at night observation of egg laying sea turtles; 29: collecting on Bigisanti beach; 30: return journey from Bigisanti to Paramaribo along the same route as on 27.

1-8 May: Paramaribo and environs.

3, 4, 5: collecting in Botanical Garden, among cocoa trees and along roadsides.

8-9 May: Troeli Creek.

8: by car from Paramaribo via Zanderij to Troeli Creek, collecting on savannah and in gallery forest both at day and at night; 9: collecting on savannah and in gallery forest, back to Paramaribo.

10 May: Paramaribo.

11-14 May: Mapane Creek area (Forest Service Encampment 8).

11: from Paramaribo by car via Domburg and Paranam to Phedra, from there by corial (native canoe provided with outboard motor) to Auca and by car to Encampment 8, in the evening collecting by lamplight in the surrounding forest; 12: in daytime collecting trip in the surrounding forest, in the evening collecting along a forest creek; 13: collecting trip in eastern direction through forest; 14: back to Paramaribo by car via Blakka-watra to Jodensavanne, from there by corial to Carolina and then by car via Lelydorp; along the road some collecting was done.

14-19 May: Paramaribo and environs.

16: in the evening collecting trip to Overtoom, collecting in pool; 18: in daytime collecting in the Botanical Garden, in the evening collecting trip to Onverwacht (swamp) and Zanderij (savannah-pools).

20-31 May: Airstrip Vincent Fajk-Paloemeu.

20: from Zanderij (airfield) by air to Paloemeu; collecting in the surroundings of the airstrip; 21: short collecting trips around the airstrip; 22: collecting on the airstrip and adjacent river bank; 23: collecting trip in forest on southern bank of Tapanahoni River opposite airstrip, in southerly direction; 24: collecting trip in forest on northern bank of Tapanahoni River, 15 minutes downstream by corial from airstrip, in northeasterly direction; 25: purchasing of reptiles in native Indian village near airstrip; 26: short collecting trip in forest on southern bank of Tapanahoni River opposite airstrip, in southerly direction; 27: collecting trip in forest on northern bank of Tapanahoni River, 10 minutes downstream by corial from the airstrip, in northerly direction to tower for aero-mapping project; in the evening collecting near airstrip; 28: collecting trip in forest on southern bank of Tapanahoni River opposite airstrip, in southerly direction; 29: while waiting for DC-3 airplane (which did not arrive), some collecting near the airstrip; 30: collecting trip on northern bank of Tapanahoni River from airstrip through cultivated land ("grondjes" = shifting gardens) and forest in northerly direction; 31: back to Zanderij (airfield) and from there by car to Paramaribo.

1-7 June: Paramaribo and environs.

3: trip by piaka to breeding colony of red ibises, egrets and herons, at night collecting in garden during heavy rain; 4: in the evening collecting in forest along creek at Berlijn and along savannah pool near Zanderij; 6: in the evening collecting along Sabakoe Creek, in Zanderij and Bernhardsdorp.

8-9 June: between Paramaribo and Albina.

8: collecting trip by car in the direction of Albina, stops to collect at Mooi Wana Creek, between Pikien Mooi Wana Creek and Neger Creek, Seliwanowsky Ravine, 1 km east of Moengo Tapoe, Heide Bridge and 5 km west of Moengo Tapoe. All collecting was done by lamplight, near creeks and pools in the forest and in open swamps; 9: back to Paramaribo.

10-18 June: Eilanti beach and environs.

10: journey to Eilanti, first by car via Moengo and Moengo Tapoe to Albina, from there by piaka to Eilanti via Christiaankondre and Galibi; 11: collecting on the beach near the settlement; 13: cruise by piaka to Langamankondre, some collecting near the village; 14: from Langamankondre to Organabo Beach (French Guiana), but because of the powerful waves a landing was not possible, so returned to Eilanti; in the evening some collecting was done by lamplight; 15: excursion along the beach in northwesterly direction to a sand-ridge abutting on the beach, collecting on the beach and sand-ridge; 16: collecting on beach; 18: return journey to Paramaribo via Albina, Moengo Tapoe and Moengo.

19-21 June: Paramaribo.

21 June-5 July: airstrip Coeroeni and environs.

21: to Zanderij (airfield) by car and from there by air to airstrip Coeroeni; some collecting on the airstrip; 22: collecting on the airstrip and in adjacent forest; 24: cruise by corial down the Coeroeni River to Encampment Gonini on southern bank, collecting in the surrounding flooded forest; 25: collecting excursion in forest along trail in southerly direction; 26: collecting in forest surrounding Gonini Encampment; 27: trip by corial down the Coeroeni River and up the New River to Tigri Encampment, collecting in forest along trail in southerly direction parallel to New River; 28: excursion in easterly direction, along trail through forest; 29, 30: collecting in Tigri Encampment and surrounding forest; 2: collecting trip in forest along trail in southerly direction parallel to New River; 4: back to Coeroeni-airstrip; 5: by air to Zanderij airfield via Kabalebo airstrip, by car to Paramaribo.

5-12 July: Paramaribo and environs.

6: excursion to Sabakoe Creek near Zanderij; 10: excursion to Kraka and Berlijn by car, collecting respectively in savannah area and in roadside ditch.

12-14 July: Brown's Mountain and environs.

12: trip by car to Brownsweg via Berlijn and Berg en Dal, in the evening collecting along road between Brownsweg and Berg en Dal in pools and creeks; 13: trip by car to foot of Brown's Mountain, via forest trail to top of the mountain (476 m); 14: back to Paramaribo via Berlijn.

14-23 July: Paramaribo and environs.

17: in the evening collecting in Botanical Garden.

23-26 July: Coesewijne area.

23: by car via Zanderij to Moeroe Creek, in the evening collecting by lamplight in pools in or bordering on the forest; 24: excursion in the forest near Moeroe Creek and on a savannah, in the evening collecting in roadside pools; 25: trip to Goliath Encampment, in the evening collecting in swamp along creek; 26: back to Paramaribo.

26-31 July: Paramaribo.

31 July-14 August: airstrip Kayser Mountains.

31: by air from Paramaribo (airstrip Zorg en Hoop) to Kayser Mountains, in the evening collecting in swampy area; 1, 7: excursion through forest in southeasterly direction; 2: short excursion in forest in northeasterly direction, in the evening collecting in forest along creek; 3: collecting trip in forest along trail in northeasterly direction; 4: collecting on airstrip; 5: collecting trip in southerly direction on opposite bank of Zuid River, in forest with small savannahs enclosed; 8: excursion in easterly direction through partially submerged forest and small savannahs, in the evening collecting in pool on airstrip; 9: excursion through forest in northeasterly direction; 10: collecting with fish-poison in forest-creek northeast of airstrip; 11: collecting on airstrip and adjacent small savannah; 12: trip through forest around airstrip, in the evening collecting by lamp-light on bank of creek and swampy area bordering on forest; 14: by air to Zanderij (airfield) and by car to Paramaribo.

14-19 August: Paramaribo and environs.

17: in the evening collecting in rice-fields.

19-20 August: Brown's Mountain.

19: by car from Paramaribo via Paranam to Brown's Mountain with a small detour to Compagnie Creek near Brokopondo, collecting in and along creeks; 20: in the morning and early afternoon collecting in creek on Brown's Mountain, later in the afternoon by car back to Paramaribo via Paranam.

21-22 August: Paramaribo.

22 August-7 October: Sipaliwini savannah.

22: by car to Zanderij (airfield), from there by air to airstrip Sipaliwini; 23: excursion from airstrip through forest to future Base Bivouac near boundary forest-savannah on northern bank of Vier Gebroeders Creek and back to the airstrip; 24: installation in Base Bivouac, in the evening canoe cruise on river and collecting by lamplight; 25, 31, 1, 2, 4: collecting trips in the forest near Base Bivouac; 26, 27, 28, 29, 3: collecting trips on the savannah near Base Bivouac; 5: trip to airstrip Sipaliwini and back, with some collecting on the way; 6: collecting in Base Bivouac; 7, 9: by corial to airstrip Sipaliwini, back through forest; 10: by corial up the Vier Gebroeders Creek for about 10 km, from there on foot over the savannah to Vier Gebroeders Mountain, where a new bivouac was made on the western slope in a forest-island; 11: trip to top of Vier Gebroeders Mountain (554 m), collecting in forest-island, in the evening collecting by lamplight in creek; 12, 16, 18, 19, 20, 21, 23, 25, 26, 27, 1: collecting trips on savannah and in forest islands near Vier Gebroeders Mountain; 13: trip to private airstrip on Surinam-Brazil border, southeast of bivouac; 28: trip to Paroe River in Brazil and back; 30: collecting in Vier Gebroeders Bivouac; 3: trip to Base Bivouac; 4: from Base Bivouac to Vier Gebroeders Bivouac and back; 6: trip to airstrip Sipaliwini; 7: by plane back to Paramaribo via Vier Gebroeders Mountain.

7-29 October: Paramaribo and environs.

11: in the evening collecting in swamp near Onverwacht and along creek in Berlijn; 13: collecting trip by car to beach via Weg naar Zee and to Groningen via Kwattaweg, back to Paramaribo via Hamburg and Uitkijk; 15: by car to Berlijn, some collecting in gallery forest; 16: by car to top of Brown's Mountain, collecting in forest; 24, trip by car to Groningen.

29-30 October: Albina.

29: by car to Albina via Moengo and Moengo Tapoe, collecting in forest, along creeks and roadsides, in the evening collecting by lamplight in swamp just west of Albina, in pools on forest-margin and in forest; 30: cruise by corial to Jaimeskondre, south of Albina, in the afternoon back to Paramaribo by car.

30 October-3 November: Paramaribo and environs.

1: excursion by car to Brokopoondo via Domburg and Paranam; 2: trip by car to Leonsberg.

3-9 November: Raleigh Cataracts and Voltz Mountain.

3: by car to Boskamp (Coppename Point) and from there by corial to Raleigh Cataracts with short visits to the native villages Wayombo, Bitagron and Kaaimanston; 4: excursion via trail through forest to main cataract; by corial to airstrip (under construction); 5: from cataracts through forest in easterly direction to tip of Voltz Mountain, collecting in forest and on bare rock slates; 6, 7: by corial to airstrip (under construction); 8: by corial to Wayombo via native village Kaaimanston; 9: from Wayombo by corial to Boskamp (Coppename Point), from there by car to Paramaribo.

9-10 November: Paramaribo.

10-13 November: Brown's Mountain.

10: by car via Domburg and Paranam to top of Brown's Mountain, collecting in forest on the plateau during afternoon and evening; 11: excursion to Irene Fall on north-western slope, in the evening collecting; 12: excursion on eastern slope to near the artificial lake, in the evening collecting in the forest; 13: collecting in creek on north-western slope; by car back to Paramaribo via Berlijn and Zanderij.

13-20 November: Paramaribo and environs.

15: trip by car to Coronie, in the evening collecting in Botanical Garden.

GENERAL PHYSIOGRAPHY AND CLIMATE

Surinam is situated in northern South-America between 54° and 58°W. and between 2° and 6°N. (fig. 1). In the east it is bordered by French Guiana, in the west by Guyana (formerly British Guiana) and in the south by Brazil. The southern frontier was established only in the years 1935-'38 when a mixed Brazilian-English-French-Dutch Commission decided on the frontiers between Brazil, British Guiana, French Guiana and Surinam. The southern frontier now follows the watershed between rivers emptying directly into the Atlantic Ocean and rivers emptying into the Amazon. The possession of part of the territory is disputed by French Guiana and Guyana respectively, viz., in the southeast the area between the rivers Litani and Marowini and in the southwest the area between the New River and the Coeroeni River. In this and following papers I have accepted the borders such as these are claimed by the Surinam Government (fig. 1).

Surinam is a relatively flat country, the mountains present in the interior not exceeding 1280 m in height. The coastal area is flat and swampy; sandy

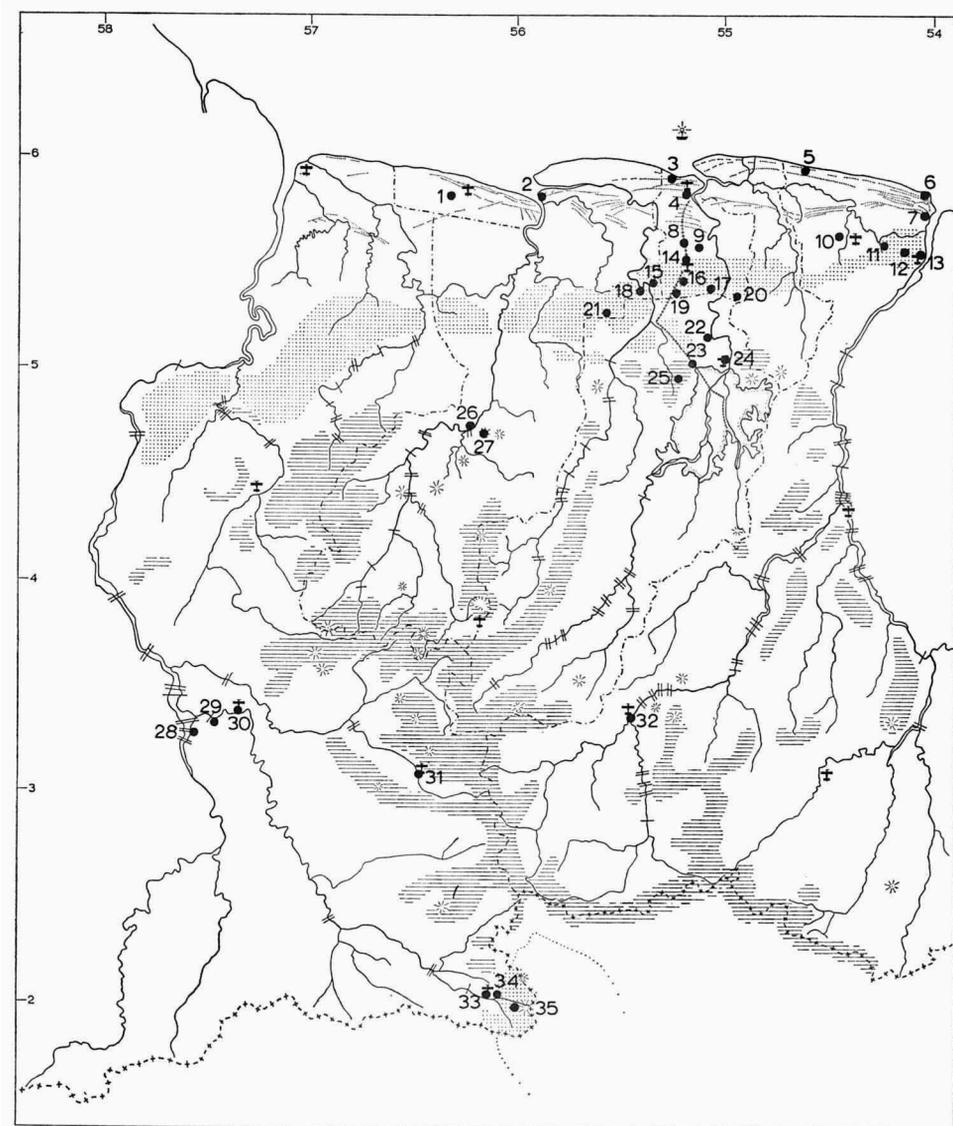


Fig. 1. Map of the collecting localities. 1. Sarah & Leasowes, 2. Boskamp (Coppename Point), 3. Weg naar Zee, 4. Paramaribo, 5. Bigisanti beach, 6. Eilanti beach, 7. Langamankondre, 8. Onverwacht, 9. Overtoom, 10. Moengo, 11. Moengo Tapoe, 12. Pikien Mooi Wane Creek, 13. Albina, 14. Zanderij, 15. Troeli Creek, 16. Sabakoe Creek, 17. Kraka, 18. Encampment Moeroe Creek, 19. Berlijn, 20. Forest Service Encampment 8, 21. Encampment Goliath Creek, 22. Berg en Dal, 23. Brownsweg, 24. Brokopondo, 25. Brown's Mountain, 26. Raleigh Cataracts, 27. Voltz Mountain, 28. Tigri Encampment, 29. Gonini Encampment, 30. Airstrip Coeroeni, 31. Airstrip Kayser Mountains, 32. Airstrip Paloemeu, 33. Airstrip Sipaliwini, 34. Base Bivouac, 35. Vier Gebroeders Bivouac.

beaches are rare, the greater part of the coast consisting of mudflats covered by mangroves. The shape of the coast continually changes because of the westward current parallel to the coast. Behind the mangroves and beaches there are extensive swamps, traversed by sand- and shell ridges more or less parallel to the coast.

The swamp belt is followed by a belt of rain-forest. Some distance from the coast there is a narrow belt of white-sand savannahs, about 25 km from the coast in the east, about 80 km in the west. In some places these savannahs are covered by savannah-forest, in other places by a sparse vegetation of grasses mixed with shrubs and *Mauritia* palms. South of this savannah belt the country is covered by dense rain-forest, except in a few places where small savannahs occur in the forest, and near the origin of the Sipaliwini River where a large savannah is present. The area from the coast to and including the savannah belt is slightly hilly only, but higher parts occur in the interior. There is a number of mountain chains which are interconnected (fig. 2). The most western chain is formed by the Bakhuis Mountains (highest summit 1020 m), running in a north-south direction, which in their southern part are connected with the east-west directed Wilhelmina Mountains (1280 m). From this last named chain several other chains diverge, directed roughly north-south, viz., to the north the Emma Mountains (1080 m) and van Asch van Wijck Mountains (820 m); to the south the Eilerts de Haan Mountains (1020 m). From this last chain the Kayser Mountains (780 m) stretch to the west, while its southern part is connected via the Boundary Mountains (730 m) with the Tumuc Humac Mountains (740 m) to the east. Where Boundary and Tumuc Humac Mountains join, the Oranje Mountains (810 m) come in from the north. Apart from these ranges there is a number of isolated mountains, e.g., Voltz Mountain and Van Stockum Mountain, in which bare rock slates are present, and some plateau's elevated from 500-700 m above sealevel, e.g., Brown's Mountain (514 m), Nassau Mountains (560 m) and Lely Mountains (692 m). Where Emma-, Wilhelmina- and van Asch van Wijck Mountains join there is a table mountain (Tafel Mountain, 1080 m), with a flat top separated from the lower slopes by a nearly perpendicular wall with the exception of the northwestern part.

Because of this north-south direction of most mountain ranges the rivers run mainly in the same direction. From west to east these rivers are: Corantijn, Coppename, Saramacca, Suriname, Commewijne and Marowijne. About one third of Surinam belongs to the Corantijn basin, another third to that of the Marowijne, the other rivers occupy the remaining and central third. In the higher reaches of the rivers cataracts are present, alternated by quiet stretches of variable width. Approximately where they cross the fifth parallel the

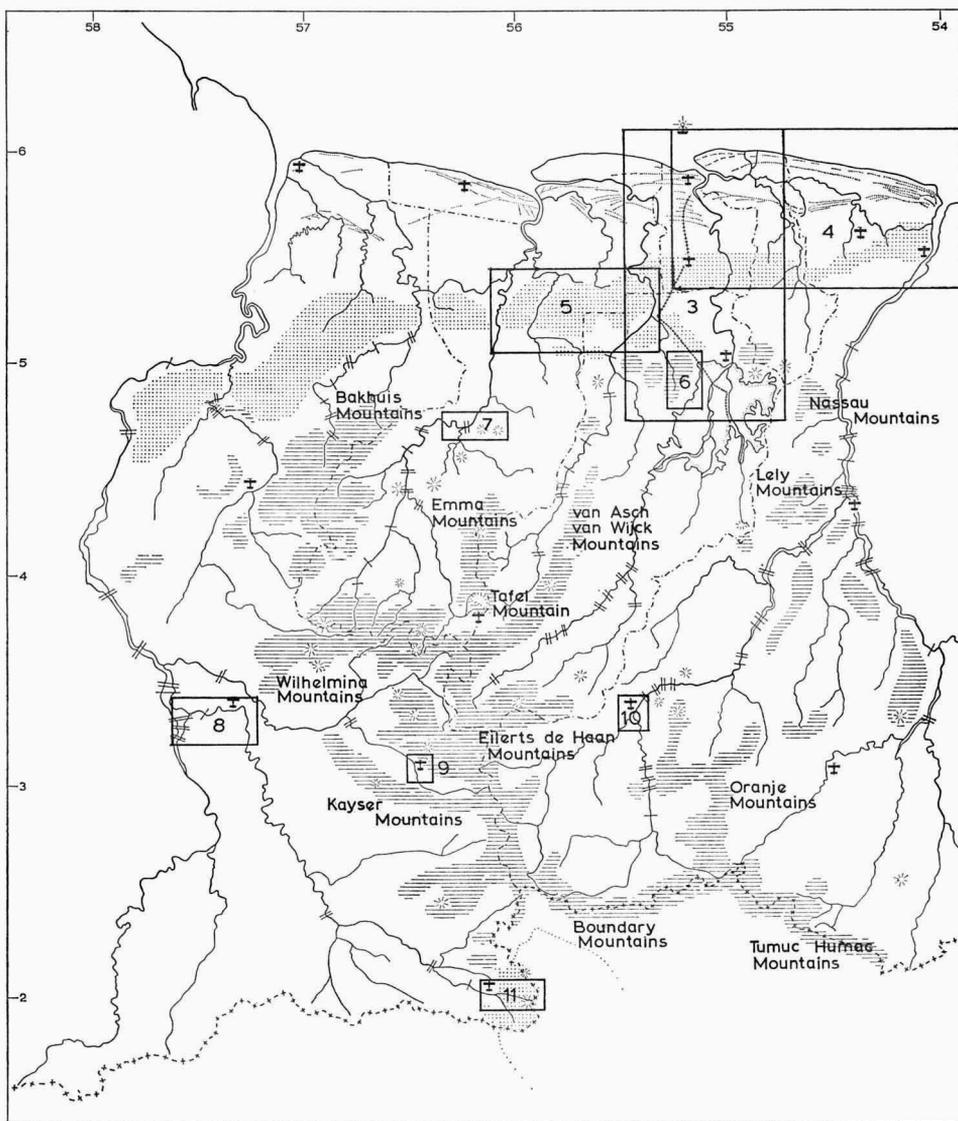


Fig. 2. Map showing mountain ranges and the position of areas represented in detail maps. The dotted areas are savannahs. Mountain ranges are represented by horizontal lines. The dotted lines near the coast are ridges. Dashes perpendicular to rivers represent cataracts. The boundaries between districts are indicated by lines of alternating dots and dashes. The border with Brazil is indicated by the line of alternating dashes and crosses.

cataracts disappear and the lower reaches of the rivers are wide and quiet, forming meanders. Above the first cataracts the rivers are navigable only by corials manned by Bush Negroes or Indians. More data about the rivers are provided by Boeseman (1968 : 21).

Geologically Surinam is part of the Guiana shield (Putzer, 1968). The country may be divided into three parts (IJzerman, 1931 : 13):

1. The coastal plain.
2. The pre-Palaeozoic interior.
3. A sandstone formation, remnant of the Roraima formation.

The coastal plain consists of recently deposited sediments of pleistocene and holocene age. The thickness of these sediments is considerable. The coastal area can be divided into two parts, both parallel to the coast. The northern part is of fluvio-marine origin (Demerara formation) and consists of heavy clays, and sands partly mixed with shells. In this area are to be found ridges of sand and shell remains. These ridges were built up by the action of the surf and now run more or less parallel to the coast at some distance behind it. They are of holocene age. South of this zone of fluvio-marine deposits and ridges (the young coastal plain), a zone of continental alluvia (the old coastal plain) is present. It is built up of clays, sands and gravels (Coropina and Zanderij formations). The southern part of this area is covered by savannahs and savannah-forest, whereas the northern part is covered by rain-forest.

The largest part of the interior consists of granito-diorites, except in the northeast where an area consisting of paraschists (IJzerman, 1931: 16) is present.

Near the centre of Surinam a small remnant of the extensive Roraima formation is present as a table mountain (Tafel Mountain). It mainly consists of sandstone and conglomerates. Its depth in some places is at least 650 m, indicating a much larger former extension.

Rainfall in Surinam is not evenly distributed throughout the year (Braak, 1935; Emanuels, 1964) or the country (Alewijnse 1964: 10). The year may be divided into four periods, viz., a long wet period from May to July, a long dry period from August to November, a short wet period from December to January and a short dry period from February to April (table 1).

During most of the year the wind blows from northeastern directions.

The mean temperatures do not vary very much throughout the year, only a slightly higher temperature is measured during the months August to November (table 2). However, absolute maximum and minimum temperatures are far apart (table 3). In the course of a day the temperature in clearings may

Table I. Average amount of monthly rainfall in mm at various localities. Between parentheses the number of years on which the average is based is given. The data from Paramaribo, Berlijn and Brownsweg were gathered during the period 1901-1960, those of Moengo and Galibi between 1931 and 1960, and those of the remainder during the period 1961-1967.

	J	F	M	A	M	J	J	A	S	O	N	D
Paramaribo	190.4(60)	147.1(60)	172.9(60)	231.6(60)	205.2(60)	307.3(60)	237.8(60)	164.3(60)	83.0(60)	86.2(60)	116.2(60)	196.9(60)
Berlijn	187.9(54)	140.0(54)	215.1(54)	209.2(54)	323.2(54)	295.1(54)	245.2(54)	147.1(54)	63.6(52)	63.9(53)	100.0(53)	188.7(54)
Brownsweg	223.8(50)	171.0(49)	202.6(50)	255.5(50)	362.4(50)	325.7(51)	253.2(50)	157.2(50)	77.2(51)	60.9(51)	108.3(50)	208.7(51)
Moengo	249.5(30)	178.6(30)	195.4(30)	267.7(30)	374.6(30)	297.8(30)	228.4(30)	163.4(30)	94.4(30)	77.1(29)	118.0(30)	218.0(30)
Galibi	220.5(30)	189.1(30)	204.9(30)	255.4(30)	403.7(30)	270.9(30)	170.4(29)	96.7(30)	29.9(30)	34.2(30)	78.9(29)	207.2(28)
Zanderij	161.7(7)	85.8(7)	110.4(7)	94.7(7)	240.0(7)	297.3(7)	233.0(7)	155.3(7)	91.5(7)	72.0(7)	114.7(7)	163.4(7)
Coeroeni	133.0(7)	125.5(7)	137.8(7)	97.3(7)	318.8(7)	386.6(7)	261.5(7)	178.4(7)	43.2(7)	23.7(7)	50.9(7)	91.6(6)
Kayser Mountains	122.4(7)	152.5(7)	158.9(7)	137.3(7)	302.2(7)	289.4(6)	235.7(7)	121.2(7)	33.0(7)	21.2(6)	47.4(6)	100.3(7)
Paloemeu	222.7(6)	192.4(6)	264.5(6)	206.5(7)	428.5(7)	338.6(7)	216.2(7)	133.9(7)	35.0(6)	40.1(6)	83.8(6)	190.0(7)
Sipaliwini	142.7(6)	150.7(6)	171.9(6)	180.3(7)	377.4(7)	331.9(7)	218.8(7)	86.7(7)	41.4(7)	35.2(7)	74.2(7)	84.9(6)
Encampment 8	200.7(7)	110.3(7)	111.3(7)	120.1(7)	289.9(6)	300.2(7)	213.7(7)	156.4(7)	83.0(6)	74.6(7)	126.2(7)	168.4(7)

Table 2. Average monthly temperatures in °C at various localities. Between parentheses the number of years between 1961 and 1967, on which the average is based, is given.

	J	F	M	A	M	J	J	A	S	O	N	D
Paramaribo	26.3(7)	26.5(7)	27.0(7)	27.2(7)	26.9(7)	26.4(7)	27.0(7)	27.4(7)	28.1(7)	27.9(7)	27.4(7)	26.4(7)
Moengo	25.8(7)	26.2(7)	26.6(7)	27.3(7)	26.7(7)	26.3(7)	27.0(7)	27.7(7)	28.4(7)	28.2(7)	27.5(7)	26.3(7)
Zanderij	25.9(7)	26.1(7)	26.8(7)	27.4(7)	26.7(7)	26.5(7)	27.0(7)	27.7(7)	28.7(7)	28.7(7)	27.8(7)	26.3(7)
Coeroeni	26.2(6)	26.1(7)	26.7(6)	27.2(7)	26.7(7)	26.3(7)	26.7(7)	27.2(7)	28.3(7)	28.6(7)	28.0(7)	27.0(4)
Kayser Mountains	26.1(7)	26.1(7)	26.4(7)	26.9(6)	26.5(7)	26.4(5)	26.8(6)	27.5(6)	28.4(5)	28.7(6)	28.1(6)	26.8(6)
Paloemeu	25.9(6)	25.9(6)	26.4(6)	26.9(7)	26.5(7)	26.5(7)	27.1(7)	27.9(7)	28.6(6)	28.7(6)	28.1(6)	26.5(6)
Sipaliwini	26.0(5)	25.8(6)	26.0(6)	26.5(7)	26.2(7)	26.3(7)	26.5(7)	27.2(7)	27.9(7)	28.6(7)	27.7(7)	27.0(6)

Table 3. Absolute minimum and maximum temperatures in °C at various localities. The data were gathered between 1961 and 1967.

	J	F	M	A	M	J	J	A	S	O	N	D
Paramaribo	15.6-32.1	18.1-32.6	18.0-34.0	19.1-33.4	20.5-34.4	21.0-32.9	21.2-34.6	21.4-34.4	21.6-34.6	21.0-36.7	20.4-34.4	20.4-32.1
Moengo	14.8-32.8	17.1-32.8	17.3-33.2	17.8-33.8	19.8-33.7	18.0-33.0	20.0-35.1	20.1-34.5	19.1-34.9	18.8-35.4	19.3-34.4	17.8-32.8
Zanderij	14.3-33.7	17.1-34.4	17.3-34.6	18.4-35.6	19.0-35.0	20.2-33.8	20.2-34.6	20.2-35.8	20.1-38.2	20.0-35.8	20.3-35.8	19.3-34.9
Coeroeni	17.0-33.4	17.3-33.1	17.2-34.5	18.8-35.1	19.7-33.8	19.7-33.2	19.1-33.9	19.1-34.5	18.8-35.8	18.4-35.8	18.7-35.5	19.1-34.6
Kayser Mountains	14.8-33.4	15.6-33.5	16.3-33.8	18.3-34.7	18.5-33.2	17.9-33.2	18.2-33.7	17.3-35.1	17.5-36.5	16.2-36.8	16.3-35.9	17.1-33.8
Paloemeu	16.9-32.6	17.7-32.9	18.3-32.9	18.0-33.8	20.7-33.4	19.1-33.7	19.5-34.0	18.9-35.3	18.3-35.0	16.3-35.5	18.5-35.3	18.9-33.5
Sipaliwini	14.8-34.7	14.9-34.6	16.4-33.2	17.8-34.3	17.9-34.0	18.0-33.4	17.3-34.9	17.0-35.0	15.8-36.5	15.6-36.6	16.1-35.5	16.7-35.5

rise from about 22° C in the early morning, just before sunrise, to about 33° C at 2 p.m. and drop to 26° C at 8 p.m. In rain-forest the temperature in the early morning is about 22° C, at 2 p.m. it is 27° C and at 8 p.m. 24° C (Schulz, 1960). Schulz's paper contains extensive information about climatic factors in the rain-forest.

Relative humidity, in rain-forest, is very high in the early morning (>95%); in the course of the day it drops to a minimum of about 82% at 1 p.m. and then rises again till, at 6 p.m., it once more reaches 95%. Of course, in clearings the daily decrease is much larger and at 1 or 2 p.m. the relative humidity there may be 40% (Schulz, 1960).

General data on the climate of Guyana are provided by Beebe (1925) and Carter (1934).

The data for tables 1-3 were taken from Alewijnse (1963, 1964), Braak (1935), Emanuels (1964, 1966), and from the series of weather reports published by the Meteorological Service of Surinam (1961-1968).

PHYSIOGNOMY OF THE VISITED AREAS, ARRANGED GEOGRAPHICALLY FROM WEST TO EAST AND FROM THE COAST TO THE INTERIOR

Paramaribo and environs (figs. 2, 3, 4, plate 1 figs. 1-4). — Paramaribo, the capital of Surinam, situated on the left bank of the Suriname River, 10 km as the crow flies from its mouth, but approximately 23 km along the main current, is built on ridges barely elevated above sea level. The country surrounding the town is flat, highly cultivated, mainly for rice growing. Approximately 30 km south of Paramaribo patches of secondary forest and not cultivated swamps appear, followed some 10 km further south by savannahs and gallery forest along creeks. To the west and north of the town extensive swamps are present. In the northern part of Paramaribo a Botanical Garden has been laid out. Most of it has been cultivated, but a small piece of swamp-forest is still present. Interesting collecting localities here were ditches, rice-fields, hedges along swamp forest, the leaf litter in a cocoa grove and roadsides.

Near Onverwacht extensive swamps with an elastic bottom are present. The vegetation consists mainly of mokko-mokko (*Montrichardia*), grasses and sedges. The brown, untransparent water is about one metre deep in most places, though where creeks cross the swamp it is deeper. North of the road to Overtoom a pool with sparse vegetation is present in the forest.

The Zanderij savannah is flat, grown with a sparse cover, mostly grasses and herbs, alternated by shrubs, bare patches of sand and, in wet places, *Mauritia* palms. A number of savannah pools with sandy bottom and nearly deprived of vegetation is present.

Berlijn is situated 50 km S. of Paramaribo on the bank of a creek with clear brown water, traversing the savannah (Hoogmoed, 1969a). Collecting took place in the gallery forest along the creek and in roadside ditches in the native village.

Kraka is situated on the Zanderij savannah on the east side of the Afobaka road, approximately 55 km south of Paramaribo. The area is set apart as a recreation centre for policemen. A creek crossing the area has been diverted into a swimming-pool in which caimans seem to be present. Only the central part of the area has been cleared of vegetation to build some sheds, the rest of the area is in its original state.

Brokopoondo is situated 90 km S. of Paramaribo on the left bank of the Suriname River slightly north of the Afobaka barrage, south of which the Brokopoondo artificial lake has formed.

Albina is situated 125 km ESE. of Paramaribo on the left bank of the Marowijne River, approximately 35 km from its mouth. It is connected with Paramaribo by a road which, from Moengo on, is asphalted. The area surrounding Albina is swampy, but about 1 km inland from Albina there is a steep slope which leads out of the river valley. The ground, from there on, is covered by rain-forest, near creeks alternated by swamps.

Bigisanti beach (figs. 2, 4, plate 2 fig. 1, plate 3 fig. 1). — Situated between the Marowijne and Suriname Rivers, Bigisanti slowly moves towards the west under the influence of the east-west current parallel to the coast, which abrades the beach in its eastern part and deposits the sand more to the west. Its present situation is approximately from 45-65 km east of Paramaribo. The beach consists of a tidal zone which is separated by a steep wall of about 60 cm from the rest of the beach which is above the high tide mark. This part is flat, covered mainly by a species of *Ipomoea*, while further from the sea it is joined by *Canavalia maritima*. Small pools with slightly brackish water may be present and, if so, are bordered by Cyperaceae and Papilionaceae. The sandy plain is bordered on its landside by a low ridge covered with young parwa (*Avicennia*) mixed with shrubs and herbs. Behind this ridge a swamp is present, in the wet season full of water which, during the dry season, evaporates completely. This swamp in turn is followed by a higher ridge with some forest and swamp-forests with fresh water among the trees (Schulz, 1964). At several places creeks empty into the sea, cutting through the beach. Because of the movement of the sand their mouths may be closed as is the case with Mot Creek, which formerly (till 200 years ago) was navigable for sea-going vessels but now has nearly disappeared.

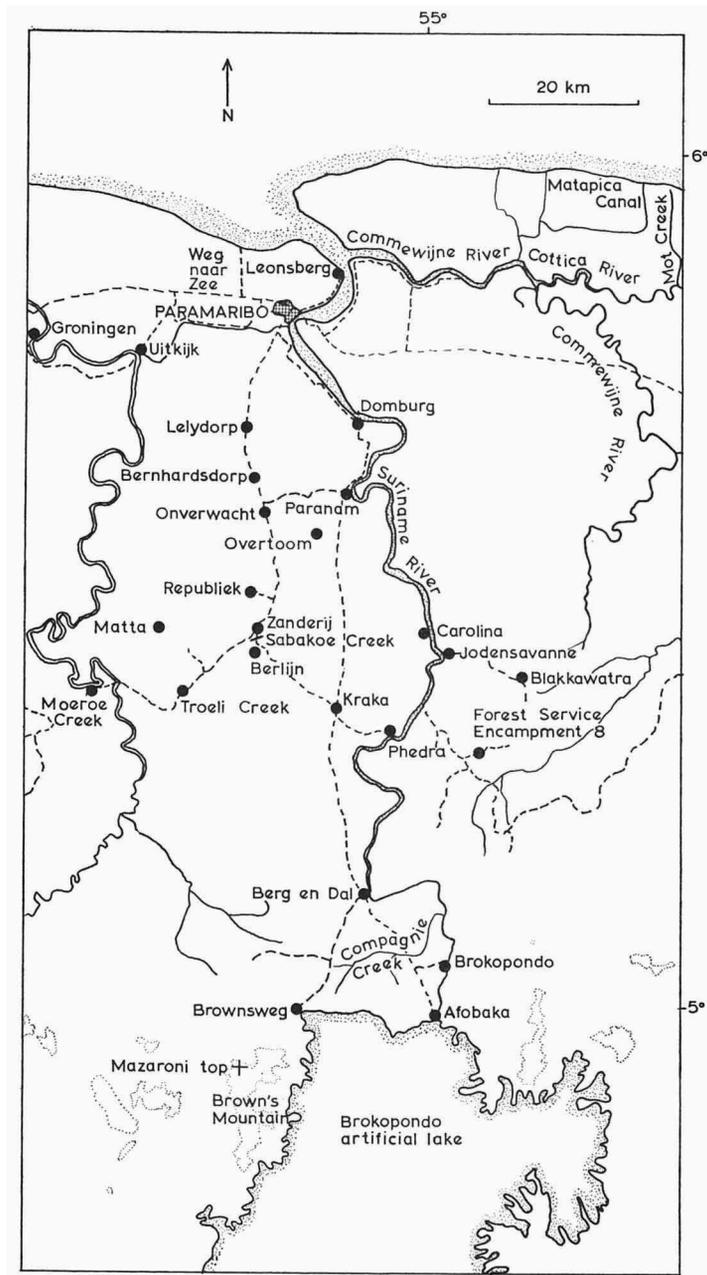


Fig. 3. Map of Paramaribo and environs. The dotted lines represent the 250 m contour line. The interrupted lines in this and following figures (to and including 6) represent roads.

Bigisanti Beach formerly belonged to the Wia-Wia Reserve which covers 36000 hectare of coastal area and hinterland. Because of its displacement, the beach, which originally was within the limits of the reserve, now has moved outside of it (Schulz 1964, 1968). Bigisanti Beach is an important egg-laying beach for sea turtles (Schulz, 1968: 9).

Eilanti Beach (figs. 2, 4, plate 2 figs. 2-4, plate 3 figs. 2, 3). — Situated on the left bank of the Marowijne River near its mouth, 125 km E. of Paramaribo. The beach is a peninsula, attached to the mainland at its eastern side. In the west and south Eilanti is separated from the mainland by a tidal creek. The general aspect is very similar to that of Bigisanti Beach, only the flat part of the beach is much narrower. Another difference from Bigisanti Beach is the presence of extensive mud-flats in front of the beach, which are exposed at low tide. In the eastern part of the beach the parwa trees are on the high tide mark, more to the west the beach plain widens to where it is bordered by the tidal creek. A profile of this beach is provided by Schulz (1964). Large groups of *Lepidochelys olivacea* come here ashore to nest.

Troeli Creek (figs. 2, 3). — Situated 5 km SE. of Matta, an Indian village on the Zanderij savannah, this creek traverses a landscape of savannah alternated by rain-forest. The creek water flows fast, and is clear and brown.

Mapane Creek area (figs. 2, 3). — Situated 10 km to the east of the Suriname River, about 60 km SE. of Paramaribo, Forest Service Encampment 8 is in the boundary zone between savannah and rain-forest. The terrain is slightly undulating, traversed by many creeks. It is part of a project to ensure economic use of the forest by concessionaires which are allowed to select the valuable woods. Part of the savannah has been planted with *Pinus*. In contrast to the afforested savannah, the physiognomy of the rain-forest from which certain species of trees are taken is not very much affected. Schulz (1960) extensively deals with the ecology of this area.

Coesewijne area (figs. 2, 5, plate 4 figs. 1-3). — Situated about 60 km SW. of Paramaribo, this is another area which is exploited for its timber under the supervision of the Forest Service. Formerly the very good road-system was isolated between the Tibiti River to the west and the Saramacca River to the east. In 1968 a bridge over the Saramacca River was opened and the area is now attainable by car from Paramaribo. The region

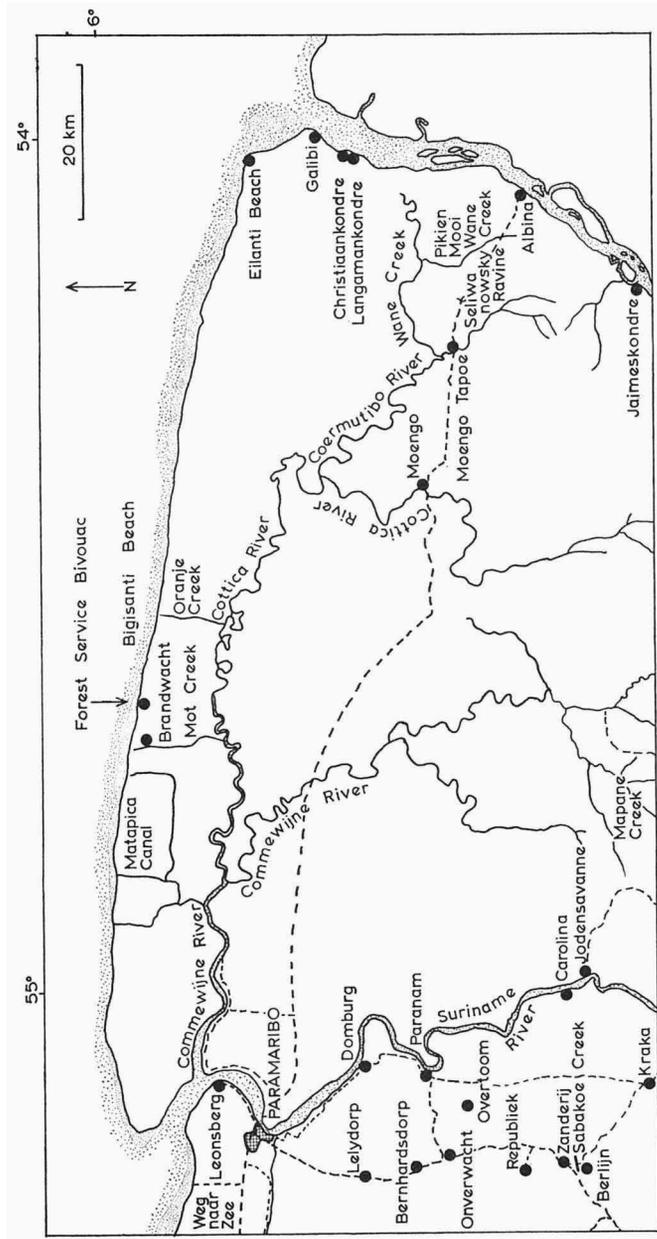


Fig. 4. Map of the coastal area between Suriname- and Marowijne Rivers.

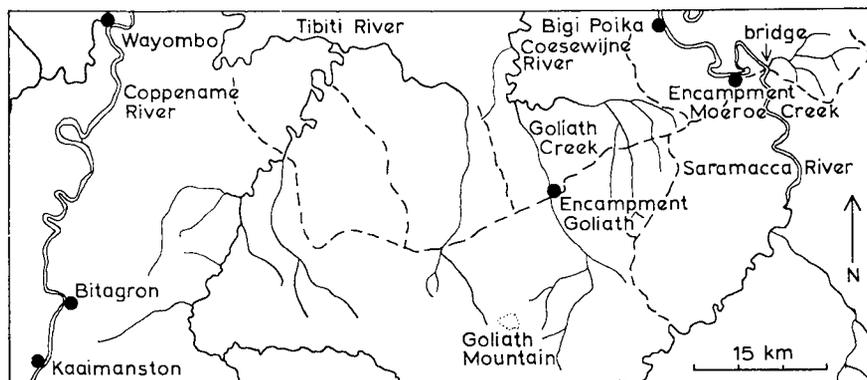


Fig. 5. Map of the Coesewijne area

comprises several types of landscape, mainly rain-forest alternated by white-sand savannahs. The creeks contain clear, brown water; in the northern part of the area, between the encampment Moeroe Creek and the bridge over the Saramacca River, a number of pools with dirty stagnant water, surrounded by rain-forest, are present. Only the southern part is hilly. Schulz (1960) gives an excellent description of the different types of forest in this region.

Brown's Mountain (figs. 2, 3, 6). — Situated 100 km S. of Paramaribo on the western shore of the Brokopondo artificial lake, it consists of a plateau extending in a north-south direction for 16 km, varying in height between 464 and 514 m above sea level. The slopes are steep along most of its circumference. It is part of the area adjoining the artificial lake to which the Game Ordinance applies (Schulz 1968: 5-6). The entire mountain is covered with rain-forest, except in a few places on the plateau, where the forest is less dense and the floor is covered with small rocks, and where a kind of savannah-forest occurs. Large boulders are absent on top of the plateau, but near the edge of the artificial lake these abound. On the western slope Brown's Creek forms a small waterfall, the Irene Fall, in which the water drops vertically from a height of about 20 m. Here bare rock is visible. The rock, on shady places, is covered with dense masses of ferns and mosses. The creeks coming from the plateau are filled with clear, colourless water with a temperature of 25° C, the bottom consisting of coarse sand or pebbles. In the higher reaches of the mountain the fall of the creeks is considerable, but near its foot it is only very slight and the creeks meander through the forest. Both in the lower and higher reaches of the mountain there is much undergrowth. A layer of dead leaves of about 3-5 cm is present, except on the very steep parts. The area has been thoroughly explored for gold during the late last century

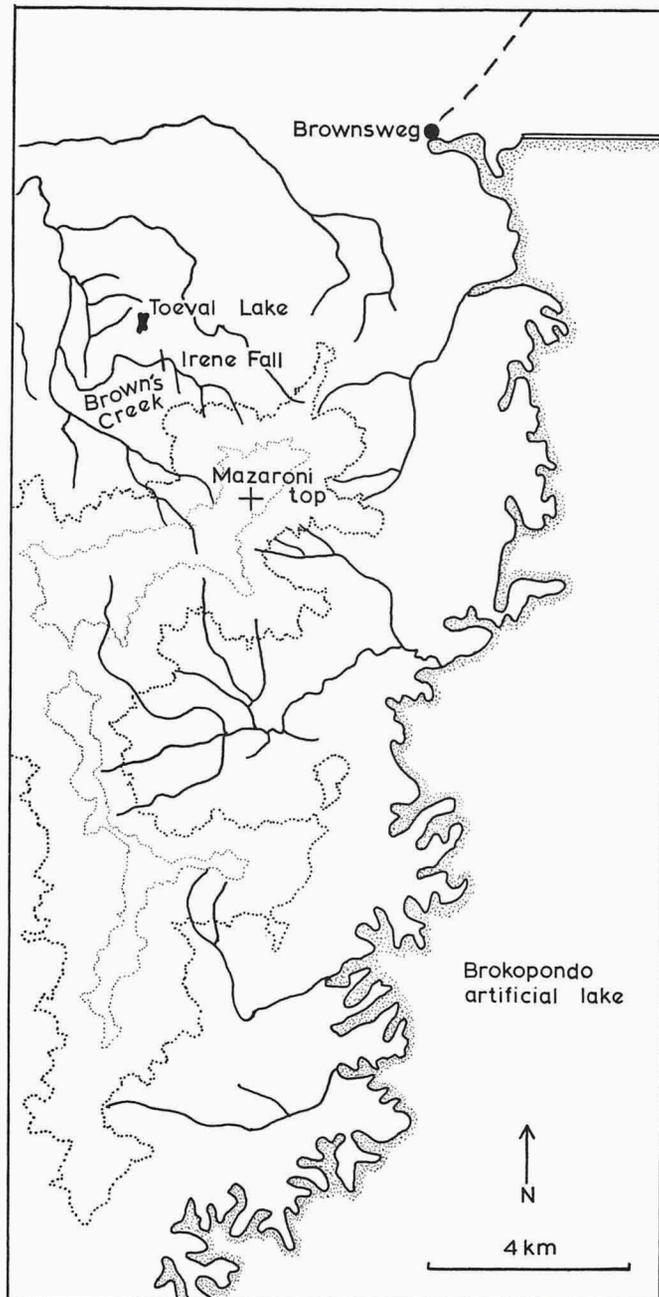


Fig. 6. Map of Brown's Mountain. The line of heavy dots indicates the 250 m contour, the finely dotted line the 500 m contour line.

and now is again being explored by Suralco for bauxite. The effects of the gold exploration on the forest probably were slight. Suralco made a road to the top of the plateau, which can be used by cars; this road is very narrow and does not affect the vegetation.

Voltz Mountain (figs. 2, 7, plate 5 figs. 1-3). — Situated 170 km SW. of Paramaribo on the right bank of the Coppename River in the uninhabited Voltz Mountain Reserve, the bare summit of this isolated dome-shaped mountain has an elevation of 240 m above sealevel. The Voltz Mountain

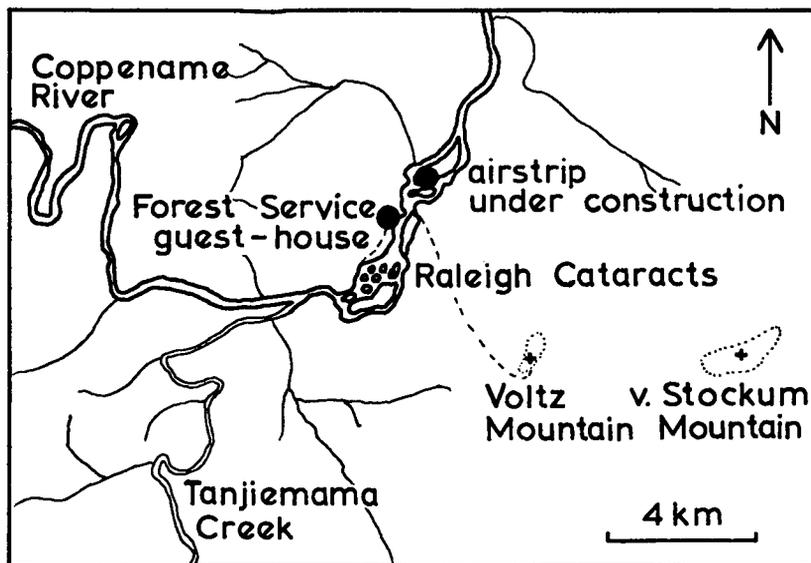


Fig. 7. Map of Voltz Mountain and Raleigh Cataracts. The dotted lines represent the 100 m contour line. The interrupted lines in this and all following figures represent forest trails.

Reserve comprises 56000 hectare; main features in this reserve are the Raleigh Cataracts, the Voltz- and the Van Stockum Mountains. The area is covered by primeval rain-forest (Schulz, 1960) except the two mountains and some bare undulating horizontal rock slates. Only in depressions of the rock slates some xerophytic vegetation is present. The lower southeastern part of the Voltz Mountain is covered by a savannah-forest with low, crooked trees. However, the larger part of the mountain consists of bare granite with a typical flora and fauna (Schulz, 1968: 13). The Coppename River here forms an extensive system of cataracts, the Raleigh Cataracts. In between the several boulder-strewn rapids quiet stretches of river are present and

here sandy beaches and sandbars in the centre of the river are present. The rocks in the rapid are covered by several endemic Podostemaceae (Schulz, 1968: 12).

Airstrip Coeroeni and environs (figs. 2, 8). — Situated in the western part of the country on an island in the Coeroeni River, 340 km SW. of Paramaribo, 24 km E. of the confluence of New River and Coeroeni River, at a height of 148 m above sea level. The island is nearly completely covered by the airstrip, only scant original vegetation is left. The river forms some

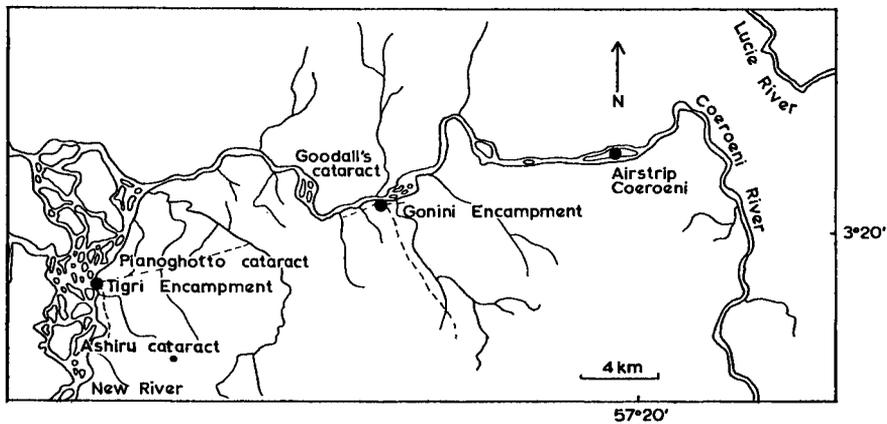


Fig. 8. Map of airstrip Coeroeni and environs.

cataracts a few kilometres west of the island. Gonini Encampment is situated 15 km W. of the airstrip on the left bank of the Coeroeni River (Hoogmoed, 1969a). Tigri Encampment is situated about 25 km SW. of Coeroeni airstrip on the right bank of the New River, just upstream from the Pianoghotto cataract.

Recently this region has not been inhabited, but during some digging in Tigri Encampment, pieces of pottery were recovered which indicate an ancient population. Coeroeni airstrip was finished in 1959 and since that time some exploration took place in the area. However, the area has not been influenced very much by these activities. During my stay, in the wet season, extensive parts of the forest were flooded with clear, colourless water and all low land was submerged or at least swampy, only hills being elevated above the water. In some places deep creeks were present in the forest. In contrast with the forest surrounding Paloemeu airstrip, prickly palms were scarce, while in addition there were some patches of bamboo. Also, there was more undergrowth reaching to between one and two metres from the ground.

In some places large boulders occurred and in one of the creeks a small cataract was present in which the bare rock was visible.

Airstrip Kayser Mountains (figs. 2, 9, plate 1 fig. 5, plate 6 fig. 3). — Situated on the right bank of the Zuid River, about 320 km SW. of Paramaribo at a height of 208 m above sea level, this airstrip (finished in 1959) is close to the Eilerts de Haan Reserve (Schulz, 1968: 15), in an uninhabited

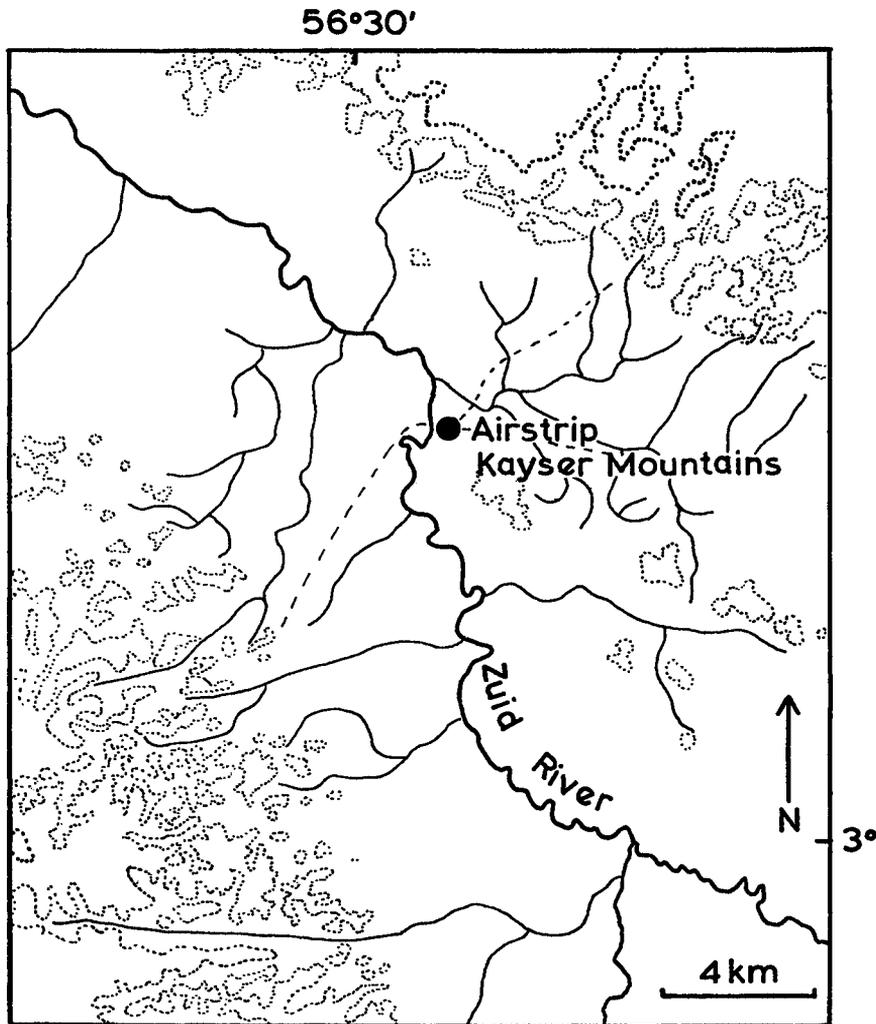


Fig. 9. Map of airstrip Kayser Mountains and environs. The line of heavy dots represents the 500 m, the finely dotted line the 300 m contour line.

area. The region surrounding the airstrip is hilly and traversed by a number of deep creeks with clear, colourless water. Only in some creek valleys the water is stagnant and there the forest floor is muddy, with numerous *Ravenala*. Characteristic for the area is the presence of some small, wet savannahs completely enclosed with forest. The border between forest and savannah is formed by a rather wide belt of savannah-forest, consisting of low, crooked trees, very difficult to penetrate. To the east of the airstrip a peculiar type of landscape is present. Because of the high level of the creeks low parts of the forest were flooded. Near the airstrip these lower parts were free of vegetation, whereas a number of slightly elevated (1-2 m) small islands were covered with a dense vegetation. At a greater distance from the airstrip there was a change in landscape and the islands merged together to form a net-work of elevated ground with a large number of pits, many of which were filled with water. The rain-forest here shows a dense undergrowth and many tall trees (Hoogmoed, 1969a). Near the airstrip some cultivated ground is present.

Airstrip Paloemeu (figs. 2, 10). — Situated 270 km due S. of Pamaribo on the left bank of the Tapanahoni River, opposite its confluence with the Paloemeu River, it is elevated 170 m above sea level. Adjacent to the airstrip are two villages, the larger one of Trio Indians, the smaller one of Oayana Indians. The airstrip has an east-west direction and runs parallel to the Tapanahony River from which it is separated by a small patch of forest. The area north of the airstrip is completely cultivated into „grondjes”, pieces of forest burnt down by the indians and planted with cassava and bananas. Further north the rainforest is traversed by trails which are used for hunting expeditions. East of the airstrip a few trails were laid out in connection with a geological exploration of the area. On the right bank of the Tapanahoni River too, a few hunting trails are present. The area is hilly with some higher outcrops to the east, covered with rain-forest. Traversing the higher parts of the forest is easy because of the scarcity of undergrowth; however, in the wide creek valleys there is a prolific lower vegetation. A nuisance are many short-stemmed palms with long spines on stem and underside of leaves, and with large heaps of dead leaves around their bases. The forest floor is covered by a 5 cm thick layer of dead leaves, except on very steep places where no litter is present and the bare soil is visible. Putrefying logs and recently fallen trees are common. The creek water is clear and colourless.

The airstrip was finished in 1959/60, but the area has been inhabited for many years by Indians, who have the habit of burning down some forest, to plant the area and then after a few years, when it does no longer yield

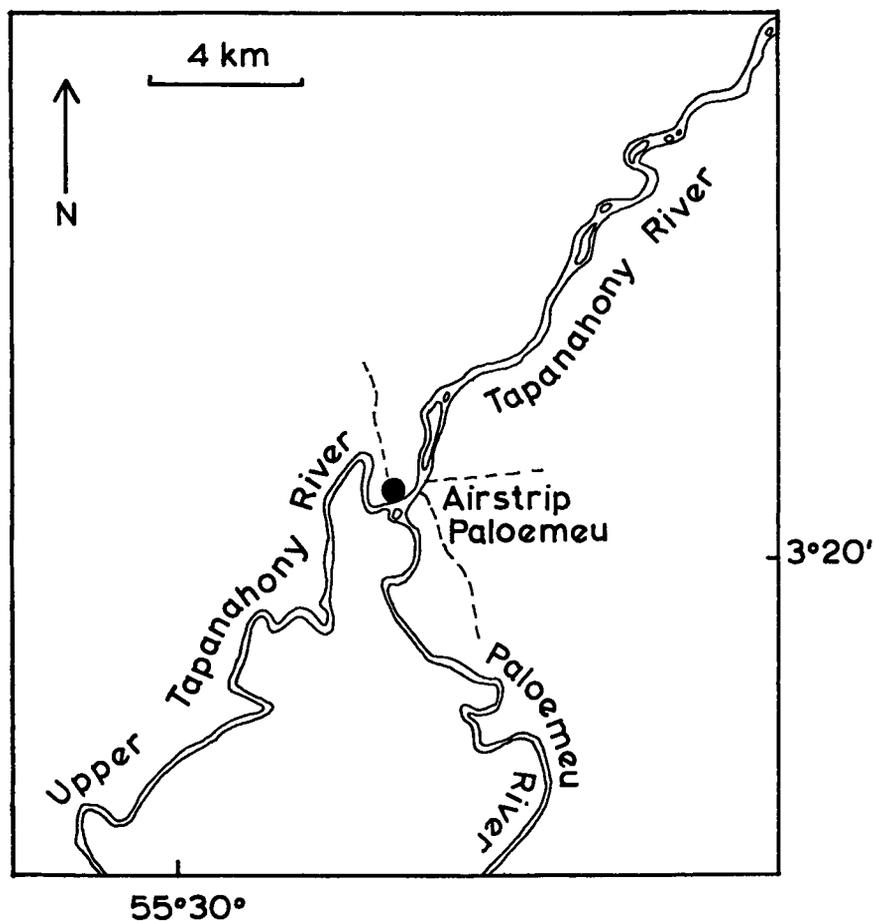


Fig. 10. Map of airstrip Paloemeu and environs.

enough, leave it. In this way probably all of the forest in this area at one time or another has been burned.

Sipaliwini savannah (figs. 2, 11, plate 5 fig. 4, plate 6 figs. 1, 2). — Situated 440 km SSW. of Paramaribo, this savannah forms a continuation of the more extensive Paroe savannah in Brazil and is situated about 250 m above sea level. The entire terrain is undulating and in some places forms higher elevations, e.g., the Vier Gebroeders Mountain (554 m) in Surinam and the Apalagadi or Moro Grande do Cemiterio (596 m) on the frontier with Brazil. The savannah is traversed by a number of creeks all running westward. In many places the water is stagnant and forms extensive swamps in the valleys,

in which many *Mauritia* palms occur. In the creeks the water is clear, colourless; in the swamps the floor is covered with red flakes which are easily stirred and pollute the water. In the savannah some hills have on their tops numerous rocks which protude above the vegetation. Part of the slopes of the Vier Gebroeders Mountain consists of bare rock slates with a sparse xerophytic vegetation on ridges and in crannies. The savannah is covered with grasses and on the hills a few low, crooked trees are present. A feature of the area surrounding the Vier Gebroeders Mountain and the area north of the Apalagadi is the presence of forest-islands (Hoogmoed, 1969b).

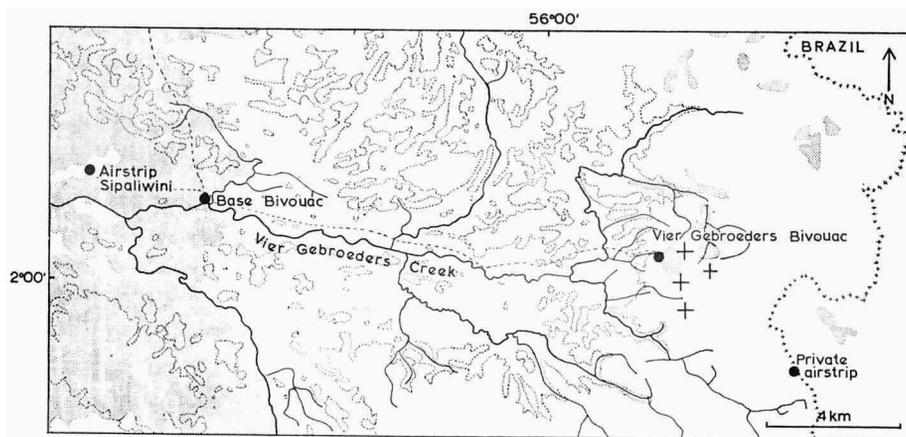


Fig. 11. Map of Sipaliwini savannah between airstrip Sipaliwini and the Brazilian frontier. The grey area indicates forest, the white area savannah. The dotted line represents the 300 m contour line.

In 1961 an airstrip was constructed on a small savanna 5 km W. of the main savanna and separated from it by rain-forest. This is the only inhabited place near the savannah on Surinam territory, on Brazilian territory there is a Trio Indian village. The Surinam part of the savannah is now and then visited by Indian hunting parties, which seem to be partly responsible for the savannah-fires that occur during the dry season.

Two bivouacs were established during my stay, viz., the Base Bivouac on the right bank of the Vier Gebroeders Creek near the border between forest and savannah, approximately 5 km E. of the airstrip and the Vier Gebroeders Bivouac in the lower part of a forest-island on the western slope of the Vier Gebroeders Mountain, approximately 18 km E. of the airstrip. From these bivouacs all collecting took place.

Reptiles and amphibians were very scarce during my stay in the dry period, but were numerous during the wet period, judging by observations made by

my botanical colleagues who stayed on the savannah for 4 months after my departure. This indicates aestivation during the long dry period for the species inhabiting the savannah; in the forest no difference in activity from other parts of the rain-forest during the long wet period was noticed. Collecting during wet periods seems to be advisable to get a good impression of the herpetofauna of the savannah.

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During my stay in Surinam I got assistance from many persons and institutions. First I should like to mention Dr. Ir. J. Ruinard, WOTRO representative in Surinam, who was very active in obtaining support from several governmental institutions and in procuring alcohol for preservation. Among the governmental institutions the Forest Service was very cooperative in placing at my disposal their personnel and means of transportation. Without the aid of the chief of this Service, Ir. F. Bubberman, and Dr. J. P. Schulz, my trips in the coastal area and to the Sipaliwini savannah would have been very difficult.

Mr. R. Cambridge, chief of the Geological and Mining Survey, and his staff enabled me to reach the airstrips Paloemeu and Kayser Mountains, by placing at my disposal part of the space in DC-3 charterplanes flying to these places. Major S. Lapré, commander of the defensive police force in the contested area with Guyana, allowed me to visit the airstrip Coeroeni and to this aim made room for me and my equipment in one of the planes supplying the police. Ir. V. K. R. Ehrencron allowed me to collect in the Paramaribo Botanical Garden, both during daytime and at night. Many collecting trips in the environs of Paramaribo were made in the company of Mr. W. N. Polder, formerly teacher in Paramaribo, who has a good knowledge of collecting sites and was helpful in learning me to distinguish between the calls of different species of frogs. I also wish to express my indebtedness to Ir. J. Jansen of Suralco (Surinam Aluminum Company) who enabled me to use Suralco facilities on the plateau of Brown's Mountain.

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Plate 1

Fig. 1. Swamp near Onverwacht; fig. 2. Roadside ditch in Berlijn; fig. 3. Weg naar Zee, west of Paramaribo; fig. 4. Swamp along Weg naar Zee; fig. 5. Aerial view of airstrip Kayser Mountains and environs.

Plate 2

Fig. 1. Bigisanti, beach plain near Mot Creek, in foreground *Ipomoea* and *Canavalia maritima*, to the left *Avicennia*; fig. 2. Eilanti beach, east end, showing *Avicennia* reaching the sea; fig. 3. Eilanti beach, view to the northwest, showing steep part between high tide mark and beach plain. Each stick indicates a sea turtle nest; fig. 4. Exposed mud-flats in front of Eilanti beach during low tide.

Plate 3

Fig. 1. Bigisanti beach, in foreground low ridge, followed by dry swamp and ridge-forest on first high ridge; fig. 2. Sand ridge abutting on the beach, northwest of Eilanti beach; fig. 3. Swamp behind first ridge, northwest of Eilanti beach.

Plate 4

Fig. 1. Coesewijne area, pool with stagnant water, enclosed by road on left-side and savannah-forest (with a belt of *Cecropia* in front) on the right; fig. 2. Coesewijne area, Zanderij type savannah, with bare sand in front; fig. 3. Coesewijne area, pool with slowly running, brown water and sand bottom.

Plate 5

Fig. 1. Raleigh Cataracts in Coppename River, foreground Podostemaceae; fig. 2. Voltz Mountain seen from bare rock slate west of it; fig. 3. Airstrip under construction near Raleigh Cataracts; fig. 4. View over Sipaliwini savannah to the north, from slope of Vier Gebroeders Mountain. Just right of the centre there is a wide column of smoke caused by a savannah fire.

Plate 6

Fig. 1. View over Sipaliwini savannah from Vier Gebroeders Mountain to the northwest. Note bare rockslate in foreground; fig. 2. Sipaliwini savannah, slope of hill with boulders and *Salvertia* and *Curatella* trees. To the left a wet valley with some *Mauritia* palms. Margin of the forest in the background; fig. 3. Creek through rain-forest near airstrip Kayser Mountains.

