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THE MOST COMMON MALIGNANT INSECTS IN THE STATE OF BOLIVAR [VENEZUELA] AND IN THE TERRITORY OF THE AMACURO DELTA AND THE DISEASES THEY CAUSE IN MAN

[Following is a translation of an article by Dr. Francisco Vitanza, Medical Officer for the Third Malariology Zone, in Ciudad Bolivar, State of Bolivar, Venezuelan Ministry of Health and Social Welfare, in the Spanish-language periodical Revista Venezolana de Sanidad y Asistencia Social (Venezuelan Journal of Health and Public Welfare), Vol XXVII, No 1, March 1962, pages 68-92.]

GENERAL CLASSIFICATION PLAN

Insects belong to the sub-type [sic] Arthropoda of the articulated type [sic] of the sub-kingdom Metazoa of the Animal kingdom.

True insects belong only to the class of insects of the sub-order [sic] Arthropoda.

The following classification, beginning with the arthropods, considers, down to the species level, the insects in general that concern us from our point of view as physicians and that are found in the area formed by the State of Bolivar and the Federal Territory of the Amacuro Delta.

Sub-type [sic] Arthropoda

Classes:

A. Arachnida
B. Myriapoda
C. Insecta

A. Class Arachnida

Orders:

I. Scorpionida
II. Araneida [Spanish original reads "Arachnidae"]
III. Acarina

I. Order Scorpionida

Genera: Tityus - poisonous scorpions;
Centrurus - poisonous scorpions.

II. Order Araneida.

Genera: Latrodectus - poisonous spiders;
Mygale - poisonous spider (mygalia).

The most common species of poisonous spider in the region is Theraphora (mygale) blondi.

III. Order Acarina

Families:

1. Sarcoptidae. The species Sarcoptes scabiei causes scabies, which is very abundant everywhere in the area, primarily in the rural zone.

2. Demodicidae. The species Demode follicularum is also responsible for dermatosis in man.

3. Trombidae. The ticks and mites that can transmit rickettsiae in other parts of the world with its consequent relapsing fevers and that, in our country, are at times the cause of serious dermatitis.

4. Ixodidae. It has two sub-families: Ixodinae and Argasinae.

The first one corresponds to the hard ticks and is represented by species of the genera Amblyommae, Haemaphysalis, Dermacentor, Boophilus. The soft ticks, or Argasinae, are represented by species of the genera Argas and Ornithodorus. The Argas persicus has been found in Ciudad Bolivar. The Ornithodorus venezuelensis transmits the Spirochaeta venezuelensis that causes anonymous relapsing fever.

Hard ticks, or Ixodinae, can transmit petechial and

spotted fever (like the so-called mancha del Caura [Caura spot], relapsing fevers, tularemia and paralysis; this last-mentioned disease can appear in children in a form that is easily confused with poliomyelitis.

B. Class Myriapoda.

Order Chilopodae, genus Scolopendra.

The bite of some species of this genus is poisonous and, at times, fatal for small mammals.

C. Class Insecta.

Orders:

I. Diptera.
II. Aphaniptera.
III. Anoplura.
IV. Hemiptera.

I. Order Diptera.

Sub-orders:

1. Nematocera.
2. Brachycera.
3. Pupipara.

Sub-order Nematocera.

Families:

a. Culicidae.
b. Simulidae.
c. Psychodidae.
d. Chironomidae.

a. Family Culicidae.

Sub-family Culicinae

Tribes:

(1) Anophelini.
(2) Culicini.

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(1) Tribe Anophelini in the area:

Genera	Sub-Genera	Species	State of Bolivar	Federal Territory of the Amacuro Delta
Anopheles	Stethomyia	A. bengi	+	-
	Anopheles	A. oiensi	+	+
		A. rangeli	+	+
		A. peryassui	+	+
		A. pseudopunctipennis	+	+
	Arribalzagia	A. apicimacula	+	-
		A. nodopunctatus	+	-
		A. nuneztovari	+	-
		A. punctimacula	+	-
	Myzorhynchella	A. parvus	+	-
	Nyssorhynchus	A. albimanus	+	+
		A. albitarsis	+	+
		A. argyritarsis	+	+
		A. aquasalis	+	+
		A. braziliensis	+	+
		A. darlingi	+	+
		A. oswaldoi	+	+
		A. rangeli	+	+
		A. strodei	+	+
		A. triannulatus	+	+
	Kerteszia	A. homunculus	+	+
		A. neivai	+	+
Chagasia		Ch. bathanus	+	-

Of all these Anophelini, only A. darlingi is considered as an unquestionable vector of malaria in the area. Other Anophelini may play secondary roles in malaria and in certain types of filariasis, but until now there are no scientific data whatsoever.

(2) Tribe Culicini in the area:

Genera	Sub-Genera	Species	State of Bolivar	Federal Territory of the Amacuro Delta
Culex	Culex	C. fatigans	+	+
	Psorophora	Janthinosoma lutzi	+	+
	Mansonia	Mansonia species	+	+
	Theobaldia	Theobaldia species	+	+
Aedes	Aedes	A. aegypti	+	-
	Finlaya	A. leucocelaenus	+	-
	Ochlerotatus	A. albopictus	+	-
	Ochlerotatus	A. scapularis	+	-
	Ochlerotatus	A. unitaenia	+	-
Haemagogus	Haemagogus	H. splendens	+	-
	Stegomyia	H. spegazzinii argyrotaenia	+	-
	Stegomyia	H. albomaculatus	+	-
	Cyanocoga	H. equinus	+	-

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Culex fatigans transmits to man the Wucheria bancrofti filaria, cause of elephatiasis, and the dengue virus. To date, we have had no cases of filariasis bancrofti in the area and nine cases of dengue were reported only in 1950 in the State of Bolivar.

Janthinosoma lutzi is considered as the mechanical vector of the eggs of the Dermatobia cyaniventris fly whose larvae cause mylasis.

Some species of Psorophora are extremely harmful and also attack man in whom they can cause serious trouble when the bites are numerous.

Species of Mansonia and of Theniorinchus are transmitters of the Wuchereria bancrofti filaria and of the Wuchereria malavi filaria, respectively, but these filariae, fortunately, have not been reported to date in our area.

Theobaldia, which resembles Aedes, plays no part in human pathology.

Aedes aegypti is the classic transmitter of urban yellow fever. In 1957, it was found very abundantly in Ciudad Bolivar and surroundings. Dieldrin appears to have eradicated it already.

Aedes upatensis was found by Anduze in the vicinity of the city of Upata and he suspected that it is the transmitter of urban-rural yellow fever, because he had not found any other possible transmitter in certain foci.

Aedes leucocaelenus seems to be the transmitter of jungle yellow fever in Guayana.

Of Haemagogus, H. spegazzinii spegazzinii is considered the principal vector of jungle yellow fever.

b) Family Simuliidae

	Species	State of Bolivar	Federal Territory of the Amacuro Delta
Genus Simulium	[illegible]	+	-
	[illegible]	+	-
	[illegible]	+	-
	[illegible]	+	+
	[illegible]	+	-
	[illegible]	+	-
	[illegible]	+	-
	[illegible]	+	-
	[illegible]	+	-

These insects, commonly called buffalo-flies, belong to the same genus Simulium that transmits to man, in various parts of the world (Guatemala, Mexico, Africa), Onchocerca volvulus the cause of onchocerciasis, which may produce complete blindness in patients.

Some foci of onchocerciasis without ocular lesions, to date, have been found in Venezuela. No case has been reported in this area.

c) Family Psychodidae

Sub-family Psychodidae [sic; should read Phlebotominae]

	Species	State of Bolivar	Federal Territory of the Amacuro Delta
Genus Phlebotomus	[illegible]	+	+
	[illegible]	+	-
	[illegible]	+	-
	[illegible]	+	-

These insects, also called sandflies, are considered as probable transmitters of all forms of leishmaniasis. Cases of cutaneous and South American muco-cutaneous leishmaniasis appear rather frequently in the area, primarily in Guayana with some very rare cases of kala-azar or visceral leishmaniasis. In other parts of the world, Phlebotomus transmits other febrile diseases, like papataci fever, and in Peru it is responsible for Carrion's disease or bartonellosis.

d) Family Chironomidae

Sub-family Ceratopogonidae

	Species	State of Bolivar	Federal Territory of the Amacuro Delta
Genus Culicoides	[illegible]	-	+
	[illegible]	-	+
	[illegible]	+	+
	[illegible]	+	+

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These tiny insects, also called sandflies at times, do not transmit diseases, but they are considered to be vectors of the Mansonella ozzardi and Acanthocheilonema perstans filariae that are present in the area and that fortunately are not considered to be pathogenic for man.

In addition, these insects, together with the Simuliidae and others, are suspected of being mechanical vectors of Treponema carateum, which causes pinta.

2. Brachycera.

Families: a. Tabanidae
b. Muscidae
c. Ostridae

Genera:

Tabanus
Chrysops
Haematopota

These are various species of the three genera in the area, but none of them has had, to date, definite importance in human pathology. However, diseases are transmitted in animals: trypanosomiasis, encephalitis and other more or less serious ailments.

b. Muscidae

Genera:

Muscinae
Anthomiynae
Sarcophaginae
Tachininae
Ostrinae
Cuterebrinae

There are various species of these genera in the area, but the most important ones, from the medical point of view, are: Musca domestica, which, together with other household species, is considered a vector of dysenteries, gastroenteritis, poliomyelitis, tuberculosis, conjunctivitis, skin diseases and other infectious-contagious diseases; Dermatobia cyaniventris and Cochliomia hominovorax, which cause serious cutaneous, cavitary or intestinal myiases. Moreover, as a general rule, all the flies that come in contact with man may cause "intestinal myiases".

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3. Pupipara

Family: Ippoboscidae

Genera:

Ippobosca
Ornithomia

The species of these genera that are present in the area are composed of animal flies and particularly horseflies and birdflies. From the point of view of human medicine, they have some importance, but we believe that it should be remembered here that these insects are suspected of transmitting certain trypanosome rickettsiae and other parasites.

II. Order Aphaniptera

Families:

1. Pulicidae

Genera:

a. Pulex
b. Sarcopsyllidae

2. Sarcopsyllidae

a. Sarcopsylla
b. Ctenocephalus

Most Common Fleas in the Area

Genera	Species	State of Bolivar	Federal Territory of Amacuro Delta
Pulex	P. irritans	+	+
Xenopsylla	X. cheopis	+	+
Ctenocephalus	C. canis	+	+
Sarcopsylla	S. (tunga) penetrans	+	+

These fleas are actually not responsible for transmitting diseases to man, but it must be remembered that there are species among them that can transmit bubonic plague, endemic murine typhus and species of parasites like Hymenolepsis nana and Dypilidium caninum. Endemic murine typhus or exanthematous murine typhus exists, in fact, in the State of

Bolivar where, since 1950, there have been 25 cases with four deaths, according to data from the yearbooks of Epidemiology and Vital Statistics, published by the Venezuelan Ministry of Health and Public Welfare.

III. Order Anoplura

Family: Pediculidae.

Sub-family: Pediculinae.

Genera: Pediculus
Phthirius

Lice in the Area

Genera	Species	State of Bolivar	Federal Territory of the Amacuro Delta
Pediculus	P. humanus var. corporis	+	+
Phthirius	P. humanus var. capitis	+	+
	Pb. pubis (ladilla)	+	+

These lice are frequently the cause of dermatitis called pediculosis. Seventy-eight cases of pediculosis in the State of Bolivar and sixty-eight in the Federal Territory of the Amacuro Delta during the period 1950-1954 are reported in the yearbooks of Epidemiology and Vital Statistics of the Ministry of Health and Public Welfare. In reality, the use of DDT has also had an effect on lice, almost eradicating it in the last few years.

Pediculus humanus var. corporis, is responsible for epidemic exanthematous typhus and relapsing fevers due to lice. Both types of diseases are very rare, at present, in the area.

IV. Order Hemiptera.

Sub-order: Heteroptera.

Families: Cimicidae
Reduviidae

Family Cimicidae: This family has only one genus, Cimex, with two species, Cimex lectularius and Cimex

rotundatus, both of which are domestic, but so far have not been considered responsible for any well defined diseases in the area, although it is suspected that they may transport various diseases mechanically, as cockroaches and other household insects do.

Family Reduvidae: This family is represented by its genera Rhodnius, Triatoma and Pastrongylus. The species Rhodnius prolixus is the vector of Chagas' disease in Venezuela. A case was diagnosed only once in the State of Bolivar in Caicara de Orinoco.

Triatomines in the Area

Genera	Species	State of Bolivar	Federal Territory of the Amacuro Delta
Rhodnius	Rh. prolixus	+	+
Triatoma	Rh. pictipes	+	-
Panstrongylus	T. maculata	+	-
	P. geniculatus		
	P. rufotuberculatus	-	+

GEOGRAPHIC DISTRIBUTION OF THE PATHOGENIC INSECTS

After what has been stated in the section on general classification, we shall restrict this classification by districts to the insects that cause well defined diseases in the area which in themselves are serious public health problems. In spite of the fact that malaria tends to be eradicated with the antimalaria campaign, leishmaniasis is localized in the jungle, and yellow fever, thanks to extensive, specific vaccination, only attacks the few people who, due to carelessness, have not been vaccinated and who go deep into the jungle, either to look for wood or to seek gold and diamonds or to build roads and highways, or to hunt, to explore, etc.

With reference to Rhodnius prolixus, we wanted to include it in this district classification, because the problem of Chagas' disease, although it does not exist at present in the area, is strictly tied in with the problem of rural housing, and it would not be odd if it should flare up at any time.

TABLE 1

Classification of the Principal Harmful Insects by Districts

Transmitting species	Disease transmitted	State of Bolívar					Federal Territory of the Amacuro Delta		
		Districts					Departments		
		Heres	Cedeño	Piar	Roscio	Sucre	Diaz	Peder-nales	Tucu-pita
Anopheles	Malaria	+	+	+	+	+	+	+	+
Aedes	Urban yellow fever	+	-	+	-	-	-	-	-
Haemagogus	Jungle yellow fever	+	-	+	+	-	-	-	-
Phlebotomus	Leishmaniasis	+	+	+	-	-	-	-	-
Rhodnius	Chagas' disease	+	+	+	-	+	-	+	-

As may be observed, we have indicated some districts as positive in which no species of the above-listed insects have been reported yet, but we have given them as present in certain districts, due to the simple fact that cases of the diseases transmitted by them have been found in those places. Thus, for example, we have considered Hemagogus to be present in the Heres District, because, although no one has yet described species, some autochthonous cases have appear in that district. We have considered Phlebotomus to be present in the Cedeno District, because one case was discovered recently in the region of the Cuchivero River.

On the other hand, in the above table there are districts and departments that are shown as negative for certain species. This is not absolute, but rather relative from studies that have been inadequate, up to now, or that have been completely lacking.

Anopheles darlingi, transmitter of malaria, grows in the entire area, except in the low regions of the Federal Territory of the Amacuro Delta, which are under the influence of high and low tides, and in the high regions that exceed 600-900 meters in elevation. Map No. 1 [all maps appended at end of report.] shows us the geographic distribution of this anopheline for 1947, confirming what we are stating and making us recall that in spite of the fact that by 1957 Anopheles darlingi seems to have been eradicated from almost the entire eastern part of the State (see Map No. 2), this mosquito may grow practically in the entire area where the favorable environment for its growth and development has remained, for obvious reasons, completely unchanged. At present, this anopheline is remote from almost all populated centers, but it is strongly resistant to the DDT campaign in the jungle section of the area, where the rainy climate, the humidity and the temperature are at a favorable maximum for its growth and development.

Thus in the Federal Territory of the Amacuro Delta it is found along the Orinoco River and on the low slopes of the Imataca Range, while in the State of Bolivar it still thrives along the Orinoco River and in the western part of the Caroni River.

Aedes aegypti, transmitter of urban yellow fever, is a domestic mosquito that is able to thrive in any kind of breeding-place, inside and outside houses. For this reason, said insect can be found in cities and towns up to elevations of 1,000 meters.

In 1957, it was found very abundantly in Ciudad Bolivar and surroundings, but a rapid campaign with dieldrin seems to have eradicated it wit. the first spraying. In the last few months, 1,000 houses were inspected in the city, which

last year yielded an Aedes index of 21.8%, without finding a single Aedes aegypti positive breeding place.

Species of Haemogogus and some species of jungle Aedes may breed practically in the whole area where the extensive jungles, the fauna (monkeys are the main reservoirs of the yellow fever virus), the temperature and the high humidity make up the favorable environment for their breeding and development.

The principal zone is located, in the State of Bolivar, in the eastern part, along the Imataca Range, the Nuria plateau, the Pacaraima Range and the Caroni River with all its tributaries. This zone includes almost the entire Piar and Roscio Districts and the central section of the Heres District. (See Maps Nos. 3 and 9.)

Members of the genus Phlebotomus, transmitters of leishmaniasis, live in the jungles along the rivers, requiring for their breeding and growth a high, constant temperature oscillating between 26° and 28° Centigrade and a relative humidity greater than 70%. During the day, they take refuge in tree hollows, in animal caves and in crevices in the ground or in the rocks.

Some species have been reported to date in the area in Gran Sabana, but the breeding regions of these insects must correspond, at least, with the leishmaniasis distribution areas. The principal leishmaniasis area is found in the basin of the Caroni River and of its tributaries, such as the Icabaru River, the Aponguao, the Curasi, the Carrao, the Paragua and its affluents Asa and Chiguao.

Other zones of lesser importance are formed by the basins of the Rivers Botanamo, Cuyuni, Yuruari, Aro, Caura and Cuchivero (see Maps Nos. 4 and 12).

Rhodnius prolixus, transmitter of Trypanosoma cruzi breeds practically in the entire northern part of the State of Bolivar and in some sections of the Federales Department in the Federal Territory of the Amacuro Delta. (See Map No. 5).

This insect can live in the country and in the towns. It generally prefers fields with low vegetation on the edge of the jungles and of the mountains, and with a temperature that is not very high but rather quite cold. It lays its eggs in the caves of wild animals, like the cachicamo (armadillo), and in the open among the leaves of plants among which it prefers the plant commonly called carrizo [type of reed] that the people use, above all in Sucre, Trujillo and Yaracuy, to roof their huts. The insect rarely enters the huts at night attracted by light to stay there, breeding and growing, if it finds a good place of refuge in the daytime.

The usual hut, with reed and mud walls without frieze and with a dirt floor, offers this member of the Hemipters order excellent lodging. Rhodnius, commonly called pito or chipito [tick], comes down during the night on sleeping persons and sucks their blood, especially from children.

It is true that no cases have been reported in the area to date, but this insect must be considered as extremely harmful for the inhabitants, since it sucks periodically small amounts of blood during its entire lifetime, because once it has settled in a dwelling it never leaves it again as long as it offers the insect a good place of refuge. Only a healthy, well constructed dwelling is the sole weapon that is effective and definitive against this pest and consequently against Chagas' disease.

STATISTICS ON DISEASES CAUSED BY INSECTS

The tables that we give below are based on data from the Malariology Station in Ciudad Bolivar. With regard to malaria, the cases calculated are only cases positively verified microscopically, from slides made in this zone. Deaths correspond to the ones reported by physicians.

For jungle yellow fever, the data are from the respective Division and for cutaneous leishmaniasis we have taken the cases and deaths reported in the yearbooks of Vital Statistics and Epidemiology of the Ministry of Health and Public Welfare, from 1950 to 1954, which were the only ones available to us. The data on population are computed in the Malariology Division for the first of July of each year.

[In following tables, decimals are to read as commas and vice versa.]

TABLE 2

Malaria by Districts and Departments
State of Bolivar: Morbidity due to Malaria, 1948-1959

Years	Inhabitants	Cases	%	Morbidity Rate
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 3

State of Bolivar: Mortality due to Malaria, 1946-1955

Years	Total Deaths	Death due to Malaria	Mortality, Proportional	Mortality, Estimated
1946	851	49	5.8	27.4
1947	843	38	4.5	21.1
1948	863	11	1.3	6.1
1949	857	4	0.5	2.2
1950	858	6	0.7	3.3
1951	843	5	0.5	2.8
1952	1.918	5	0.3	2.8
1953	1.891	0	0	0
1954	1.833	0	0	0
1955	1.748	0	0	0

TABLE 4

State of Bolivar: Heres District. Morbidity due to Malaria, 1948-1959

Years	Inhabitants	Cases	%	Morbidity
1948	40.867	318	0.8	778.5
1949	42.386	88	0.2	207.7
1950	43.777	16	0.03	36.6
1951	43.778	17	0.04	38.8
1952	44.819	21	0.04	46.9
1953	45.851	62	0.1	135.2
1954	49.142	4	0.01	8.1
1955	50.944	4	0.01	7.8
1956	53.386	32	0.1	59.9
1957	55.827	32	0.06	57.3
1958	57.869	2	0.03	34.5
1959	58.710	1	0.01	17.0

TABLE 5

State of Bolivar: Heres District. Mortality due to Malaria, 1946-1955

Years	Total Deaths	Deaths due to Malaria	Mortality, proportional	Mortality, Estimated
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 6

State of Bolivar, Cedeno District: Morbidity due to Malaria, 1948-1959

Years	Inhabitants	Cases	%	Morbidity
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 7

State of Bolivar, Cedeno District: Mortality due to Malaria, 1946-1955

Years	Total Deaths	Deaths due to Malaria	Mortality, Proportional	Mortality, Estimated
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 8

State of Bolivar, Piar District: Morbidity due to Malaria, 1948-1959

Years	Inhabitants	Cases	%	Morbidity
1948	[illegible]	[illegible]	[illegible]	[illegible]
1949	[illegible]	[illegible]	[illegible]	[illegible]
1950	[illegible]	[illegible]	[illegible]	[illegible]
1951	[illegible]	[illegible]	[illegible]	[illegible]
1952	[illegible]	[illegible]	[illegible]	[illegible]
1953	[illegible]	[illegible]	[illegible]	[illegible]
1954	[illegible]	[illegible]	[illegible]	[illegible]
1955	[illegible]	[illegible]	[illegible]	[illegible]
1956	[illegible]	[illegible]	[illegible]	[illegible]
1957	[illegible]	[illegible]	[illegible]	[illegible]
1958	[illegible]	[illegible]	[illegible]	[illegible]
1959	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 9

State of Bolivar, Piar District: Mortality due to Malaria, 1946-1955

Years	Total Deaths	Deaths due to Malaria	Mortality, Proportional	Mortality, Estimated
1946	[illegible]	[illegible]	[illegible]	[illegible]
1947	[illegible]	[illegible]	[illegible]	[illegible]
1948	[illegible]	[illegible]	[illegible]	[illegible]
1949	[illegible]	[illegible]	[illegible]	[illegible]
1950	[illegible]	[illegible]	[illegible]	[illegible]
1951	[illegible]	[illegible]	[illegible]	[illegible]
1952	[illegible]	[illegible]	[illegible]	[illegible]
1953	[illegible]	[illegible]	[illegible]	[illegible]
1954	[illegible]	[illegible]	[illegible]	[illegible]
1955	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 10

State of Bolivar, Roscio District: Morbidity due to Malaria, 1948-1959

Years	Inhabitants	Cases	%	Morbidity
1948	[illegible]	[illegible]	[illegible]	[illegible]
1949	[illegible]	[illegible]	[illegible]	[illegible]
1950	[illegible]	[illegible]	[illegible]	[illegible]
1951	[illegible]	[illegible]	[illegible]	[illegible]
1952	[illegible]	[illegible]	[illegible]	[illegible]
1953	[illegible]	[illegible]	[illegible]	[illegible]
1954	[illegible]	[illegible]	[illegible]	[illegible]
1955	[illegible]	[illegible]	[illegible]	[illegible]
1956	[illegible]	[illegible]	[illegible]	[illegible]
1957	[illegible]	[illegible]	[illegible]	[illegible]
1958	[illegible]	[illegible]	[illegible]	[illegible]
1959	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 11

State of Bolivar, Rosolo District: Mortality due to Malaria, 1946-1955

Years	Total Deaths	Deaths due to Malaria	Mortality, Proportional	Mortality, Estimated
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 12

State of Bolivar, Sucre District: Morbidity due to Malaria, 1948-1959

Years	Inhabitants	Case	%	Morbidity
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 13

State of Bolivar, Sucre District: Mortality due to Malaria, 1946-1955

Years	Total Deaths	Deaths due to Malaria	Mortality, Proportional	Mortality, Estimated
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 14

Federal Territory of the Amacuro Delta: Morbidity due to Malaria, 1948-1957

Years	Inhabitants	Cases	%	Morbidity
1948	[illegible]	—	—	—
1949	[illegible]	—	—	—
1950	[illegible]	[illegible]	[illegible]	[illegible]
1951	[illegible]	[illegible]	[illegible]	[illegible]
1952	[illegible]	[illegible]	[illegible]	[illegible]
1953	[illegible]	[illegible]	[illegible]	[illegible]
1954	[illegible]	[illegible]	[illegible]	[illegible]
1955	[illegible]	[illegible]	[illegible]	[illegible]
1956	[illegible]	[illegible]	[illegible]	[illegible]
1957	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 15

Federal Territory of the Amacuro Delta: Mortality due to Malaria, 1946-1955

Years	Total Deaths	Deaths due to Malaria	Mortality, Proportional	Mortality, Estimated
1946	[illegible]	[illegible]	[illegible]	[illegible]
1947	[illegible]	[illegible]	[illegible]	[illegible]
1948	[illegible]	[illegible]	[illegible]	[illegible]
1949	[illegible]	[illegible]	[illegible]	[illegible]
1950	[illegible]	[illegible]	[illegible]	[illegible]
1951	[illegible]	[illegible]	[illegible]	[illegible]
1952	[illegible]	[illegible]	[illegible]	[illegible]
1953	[illegible]	[illegible]	[illegible]	[illegible]
1954	[illegible]	[illegible]	[illegible]	[illegible]
1955	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 16

Federal Territory of the Amacuro Delta, A. Díaz Depart.: Morbidity due to Malaria, 1948-1957

Years	Inhabitants	Cases	%	Morbidity
1948	[illegible]	—	—	—
1949	[illegible]	—	—	—
1950	[illegible]	[illegible]	[illegible]	[illegible]
1951	[illegible]	[illegible]	[illegible]	[illegible]
1952	[illegible]	[illegible]	[illegible]	[illegible]
1953	[illegible]	[illegible]	[illegible]	[illegible]
1954	[illegible]	[illegible]	[illegible]	[illegible]
1955	[illegible]	[illegible]	[illegible]	[illegible]
1956	[illegible]	[illegible]	[illegible]	[illegible]
1957	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 17

Federal Territory Amacuro Delta, A. Diaz Depart.: Mortality due to Malaria, 1946-1955

Years	Total Deaths	Deaths due to Malaria	Mortality, Proportional	Mortality, Estimated
1946	24	0	0	0
1947	21	0	0	0
1948	24	1	45	78
1949	18	0	0	0
1950	14	0	0	0
1951	26	4	153	138.1
1952	14	0	0	0
1953	16	0	0	0
1954	13	0	0	0
1955	14	0	0	0

TABLE 18

Federal Territory Amacuro Delta, Pedernales Depart.: Morbidity due to Malaria, 1948-1957

Years	Inhabitants	Cases	%	Morbidity
1948	2.827	—	—	—
1949	2.988	—	—	—
1950	3.188	0	0	0
1951	3.333	7	0.21	210.0
1952	3.488	2	0.06	57.3
1953	3.678	0	0	0
1954	3.843	0	0	0
1955	4.016	0	0	0
1956	4.186	0	0	0
1957	4.321	0	0	0

TABLE 19

Federal Territory Amacuro Delta, Pedernales Dept. Mortality due to Malaria: 1946-1955.

Years	Total Deaths	Deaths due to Malaria	Mortality, Proportional	Mortality, Estimated
1946	20	0	0	0
1947	11	0	0	0
1948	13	0	0	0
1949	23	0	0	0
1950	13	0	0	0
1951	8	0	0	0
1952	28	1	4.3	33.7
1953	22	0	0	0
1954	20	0	0	0
1955	0	0	0	0

TABLE 20

Federal Territory Amacuro Delta, Tucupita Dept.: Morbidity due to Malaria, 1948-1957

Years	Inhabitants	Cases	%	Morbidity
1948	[illegible]	—	—	—
1949	[illegible]	—	—	—
1950	[illegible]	0	0	0
1951	[illegible]	4	[illegible]	17.4
1952	[illegible]	12	[illegible]	51
1953	[illegible]	4	[illegible]	17.3
1954	[illegible]	0	0	0
1955	[illegible]	0	0	0
1956	[illegible]	0	0	0
1957	[illegible]	0	0	0

TABLE 21

Federal Territory Amacuro Delta, Tucupita Dept.: Mortality due to Malaria, 1946-1955

Years	Total Deaths	Deaths due to Malaria	Mortality, Proportional	Mortality, Estimated
1946	[illegible]	0	0.0	[illegible]
1947	[illegible]	1	1.4	8.7
1948	[illegible]	3	3.3	17.3
1949	[illegible]	2	2	11.
1950	[illegible]	1	1.3	8.9
1951	[illegible]	0	0	0
1952	[illegible]	1	1.3	7.1
1953	[illegible]	1	1	6.3
1954	[illegible]	0	0	0
1955	[illegible]	0	0	0

TABLE 22

State of Bolivar: Deaths Due to Jungle Yellow Fever

Years	State of Bolivar	Heres Dist.	Piar Dist.	Roscio District
1941	[illegible]	[illegible]	[illegible]	[illegible]
1942	[illegible]	[illegible]	[illegible]	[illegible]
1943	[illegible]	[illegible]	[illegible]	[illegible]
1944	[illegible]	[illegible]	[illegible]	[illegible]
1945	[illegible]	[illegible]	[illegible]	[illegible]
1946	[illegible]	[illegible]	[illegible]	[illegible]
1947	[illegible]	[illegible]	[illegible]	[illegible]
1948	[illegible]	[illegible]	[illegible]	[illegible]
1949	[illegible]	[illegible]	[illegible]	[illegible]
1950	[illegible]	[illegible]	[illegible]	[illegible]
1951	[illegible]	[illegible]	[illegible]	[illegible]
1952	[illegible]	[illegible]	[illegible]	[illegible]
1953	[illegible]	[illegible]	[illegible]	[illegible]
1954	[illegible]	[illegible]	[illegible]	[illegible]
1955	[illegible]	[illegible]	[illegible]	[illegible]
1956	[illegible]	[illegible]	[illegible]	[illegible]
1957	[illegible]	[illegible]	[illegible]	[illegible]
Totals	[illegible]	[illegible]	[illegible]	[illegible]

YELLOW FEVER

During the period from 1941 to 1957, there was no case of this disease, reported by physicians or diagnosed by means of viscerotomy, in the Federal Territory of the Amacuro Delta.

In the State of Bolivar, during the same period, twenty-two deaths due to yellow fever were diagnosed with viscerotomy.

It is very difficult to make any statement here on the morbidity of this disease, since the diagnosis of mild yellow fever is difficult to differentiate from other diseases and above all from heptatitides.

The only thing that we can do to eliminate this gap and to give a minimum idea on the morbidity of yellow fever in the State of Bolivar is to consider the results of the protection tests that were performed in this federal agency during the years 1941, 1943 and 1957.

In 1941, men over fifteen years old were examined in Gran Sabana, now included in the Urdaneta municipality of the Roscio District, and 16.6% of them were found whose blood serum protected the test-mice against yellow fever. The Indians in the missions, who are practically excluded from the jungle, did not show any immunization, while some nomadic Indians, 13.6% turned out positive.

In 1943, in the village of El Cintillo in the Municipality of El Palmar, 88% of the adults examined were positive in the protection tests. On the other hand, 12% of the persons over three years old came out positive.

In 1947, males over eleven years old were examined, with 31% of them turning out positive. (See Map No. 10).

In view of what has been described above and recalling the five cases in 1928 and the case in 1933 in the area, it is not difficult to classify the entire eastern part and some central parts of the State of Bolivar as "a region of endemic yellow fever" where this serious illness whose morbidity is relatively high flares up from time to time.

This region of endemic yellow fever produces almost annually more or less sporadic cases and is considered as the origin of the epidemic outbursts that appear from time to time in the central and eastern areas of the Venezuelan Republic.

The Yellow Fever Division, systematically using its only effective and rapid weapon against this disease, has vaccinated incessantly the inhabitants of the Heres, Piar and Roscio Districts; the cumulative vaccinations administered from 1941 to 1957 amount already to 179,272.

Of these, 70,124 were administered in the Heres District; 75,317 in the Piar District and 33,831, in the Roscio District.

In Table 22 we give the deaths due to jungle yellow fever in the State of Bolivar from 1941 to 1957. In this table we have omitted the morbidity and the mortality due to this disease, because of the difficulty in obtaining data on yellow fever diagnosed by physicians. With regard to the mortality, we can state that it fluctuated between 0 and 4.4 during the above-mentioned period.

This table clarifies definitively all that we have stated above and makes us think about exacerbations for decades in the area.

On the other hand, we want to place a bit of emphasis on the epidemic outburst in 1953. In 1954, 1955 and 1956, no more cases were diagnosed in the State, but this outburst served as a source of infection for the 15 cases that appeared in 1954 and 1955 in the States of Anzoategui, Monagas, Sucre and the one case in Aragua, victims of the epizootic wave that spread from Guayana to the central and eastern parts of Venezuela.

This epizootic wave, according to Dr. Rumeno Isaac Diaz, possibly originated in the State of Bolivar itself, in the "large breeding area of jungle yellow fever" that is located in the basin of the Amazon River. From here, it probably passed on to Guayana, across the rivers, mountains and jungles of the Federal Territory of Amazonas.

CUTANEOUS LEISHMANIASIS

In the Federal Territory of the Amacuro Delta, no cases were diagnosed by physicians in the period from 1950 to 1954, during which time 339 cases of leishmaniasis were diagnosed in the State of Bolivar, according to the yearbooks of Epidemiology and Vital Statistics, published to date by the Ministry of Health and Public Welfare.

TABLE 23

State of Bolivar: Morbidity and Mortality due to Leishmaniasis

Years	Cases	Deaths	Morbidity	Mortality
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

In recent years, cases have continued to appear in the endemic zone of leishmaniasis, included between the Caroni and Aro Rivers and the jungles that line them. Recently, foci of lesser importance have been discovered, like the one on the Cuchivero River in the Cedeno District, where a patient was located in May 1958. Most of these cases were diagnosed, studied and treated by Dr. Francisco Battistini. In that year, for the first time, Dr. Carmen Luisa de Pinango diagnosed, studied and treated the first live case of kala-azar in a 9-year old child from Pica de Arasiana, municipality of Ciudad Bolivar, Heres District. Prior to this, two other cases of this same disease had been diagnosed, but by viscerotomy. The first case of kala-azar was discovered by Dr. Tibaldo Fuenmayor, in the region of Caicara de Orinoco, in the decade of 1940 onwards.

OTHER DISEASES TRANSMITTED BY INSECTS IN THE AREA

We have extracted these data for the period 1950-1954 from the yearbooks of Epidemiology and Vital Statistics mentioned above:

Plague:	No case
Trypanosomiasis:	No case
Tularemia:	No case
Filariasis:	Only two cases in 1950(?)
Relapsing fevers:	21 cases were reported in 1952 and 11 in 1954, only in the State of Bolivar.
Exanthematous murine typhus:	3 cases in 1954 in the Federal Territory of the Amacuro Delta. In the State of Bolivar, the following cases were reported: 2 cases in 1950 3 cases in 1951 2 cases in 1952 with 1 death 11 cases in 1953 with 3 deaths 7 cases in 1954 with 1 death All these cases of exanthematous typhus were diagnosed clinically. In the Federal Territory of the Amacuro Delta, 68 cases.[sic]
Pediculosis:	In the Federal Territory of the Amacuro Delta, 458 cases.
Scabies:	In the State of Bolivar, 886 cases.

The two diseases have been decreasing appreciably in the last few years, possibly as a collateral effect of the DDT campaign. At any rate, since these diseases are favored by over-crowding, promiscuity and lack of hygiene, it will be difficult to eradicate them completely until both the rural and part of the urban population has acquired the necessary hygienic habits.

METHODS USED AT PRESENT TO ERADICATE HARMFUL INSECTS

A campaign with DDT was undertaken against Anopheles darlingi, vector of malaria, in 1947, whose objective was and still is the reduction of the anopheline density up to the point of interrupting the transmission of the disease in the entire area by eradicating the vector from all urban and rural centers.

The first results were so favorable everywhere that it was believed that the eradication of Anopheles darlingi from the entire area had probably been accomplished.

Subsequently, the campaign was unable to continue its impetus and extent, as had been foreseen, due to a cut-off in the budget. Meanwhile, the mosquito took advantage of this to keep changing its habits, continuously drawing farther away from contact with the insecticide.

In spite of this, Anopheles darlingi has been practically eradicated from large areas in the Federal Territory of the Amacuro Delta and of the State of Bolivar, where, by the end of 1957, there were six municipalities that were already free of this insect and where almost all the large and small towns no longer suffer from this pest.

Moreover, as a collateral effect, jiggers (Tunga penetrans) domestic fleas, lice, bedbugs and other arthropods of lesser importance were eradicated from almost the entire area.

Haemogogus, Phlebotomus and sandflies have not been affected by DDT, because the first two groups have had no contact with the insecticide, due to the fact that their life is led in the upper foliage of trees or in the middle of the jungle, and the last group has immediately developed a physiological resistance and besides they have seen all the other insects of which they habitually were prey die.

At present, the efforts of the campaign are directed toward obtaining as soon as possible an anophelism without malaria, just as has already been achieved in various parts of Venezuela. In summary, it extends to the "eradication of malaria" and for this purpose several methods, that may

be summarized in the two following ones, are utilized:

One method continues to be spraying all the houses in the malaria area with DDT, for the purpose of intercepting the mosquito before it can transmit the plasmodium with its bite.

The other method is the systematic and intensive use of certain drugs, relatively new, whose purpose is to attack and destroy the malaria parasite in the blood and tissues of those who are afflicted with the parasite.

The agencies conducting the antimalaria campaign in the area are the Malariology Division of the Ministry of Health and Public Welfare, the Executive Department of the State of Bolivar and the Executive Department of the Federal Territory of the Amacuro Delta.

The malariology stations in Ciudad Bolivar and Maturin have charge of and responsibility for the campaign in the respective federal agencies. The Federal Territory of the Amacuro Delta forms the B Section of the Fourth Malaria Zone whose Station has its headquarters in Maturin.

The State of Bolivar forms by itself the Third Malaria Zone, divided into three sections.

Each station is directed by a zone medical officer of the Malariology Division and is divided into three main activities: administrative, medical and insecticides.

Spraying is accomplished with DDT on the basis of two grams per square meter. Dieldrin has been used since 1956 in the Territory of the Amacuro Delta, at the rate of one gram per square meter.

Motorized and mounted patrols and patrols in motorboats represent the spraying units and are the responsibility of a chief operator. Some of them have auxiliary groups on foot for the congested locations.

The evaluation and inspection of the work is performed by DDT inspectors or DDT and Epidemiology inspectors, who are called mixed, who supervise the spraying and epidemiology tasks in each of the sections.

Rural inspectors inspect houses, looking for parasite carriers. They take blood samples and treat patients with drugs administered according to the cases. They take total sample in places indicated, capture mosquitoes and fish for larvae and at times also spray the new houses that they find on their route.

Now before passing on to comment on the budget for the campaign, we want to point out that during 1957 a campaign was begun and conducted against Aedes aegypti, transmitter of yellow fever, in the city and surroundings of Ciudad Bolivar where this mosquito had been present for years, constituting a serious danger of epidemic in view

of the two cases that appeared in that year in the state: one of them in San Francisco, in the municipality of Barceloneta, Heres District.

In the light of the re-examination that has been going on for the last few months, we can state that dieldrin has eradicated Aedes aegypti from the area with the first spraying. The cost of this campaign is included in the general budget for the antimalaria campaign.

Annual Cost of the Antimalaria Campaign in the State of Bolivar

Contribution of the Malariology Division		
Cash	Bs.	1,890,261.00
Materials	Bs.	447,003.39
Total	Bs.	2,337,349.39
Contribution of the Executive Department of the State of Bolivar		
Cash	Bs.	120,000.00
Total both contributions	Bs.	2,457,349.39

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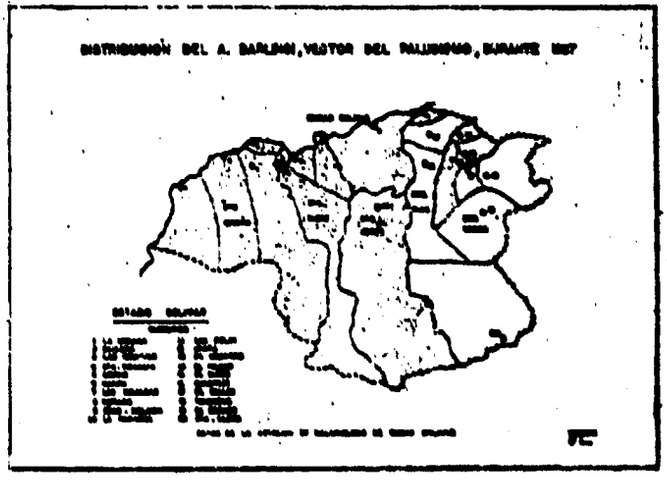
MAP APPENDIX

Map 1. Geographic Distribution of A. darlingi, Vector of Malaria, at Start of DDT Campaign in 1947

Estado Bolivar - State of Bolivar; Municipios-Municipalities
N. B. - Only the municipality of El Palmar was free.

Map 2. Distribution of A. darlingi, Vector of Malaria, During 1957

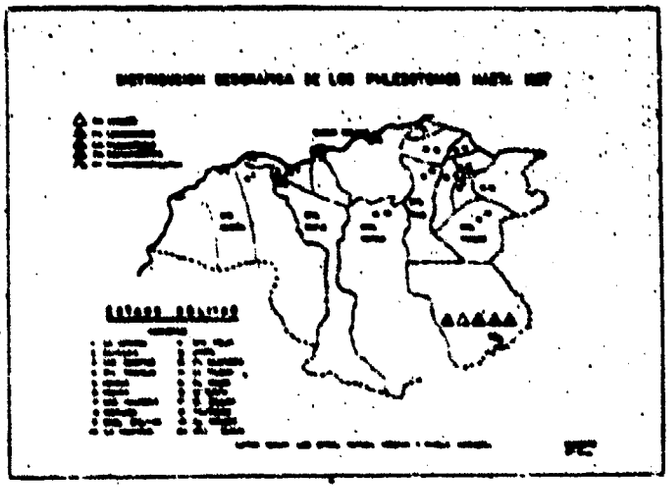


Data from the Malariology Station in Ciudad Bolivar.

Map 3. Geographic Distribution of Aedes and Haemagogus to 1957

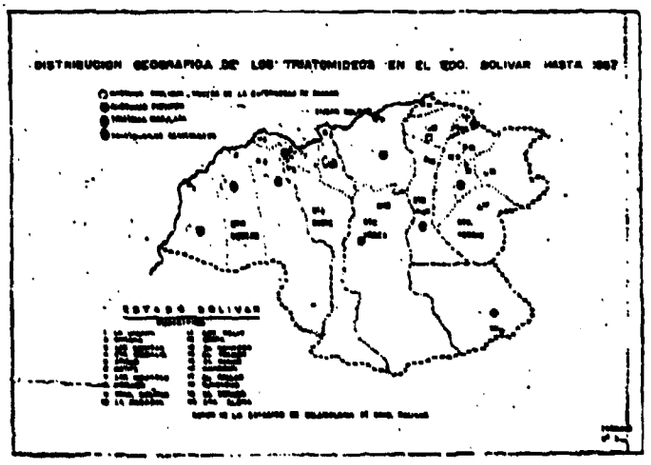
Data from Yellow Fever and Plague Division, Ministry of Health and Public Welfare, and from Dr P. Andrade
1. Transmitters of jungle yellow fever
2. Transmitters of urban yellow fever

Map 4. Geographic Distribution of Phlebotomus to 1957



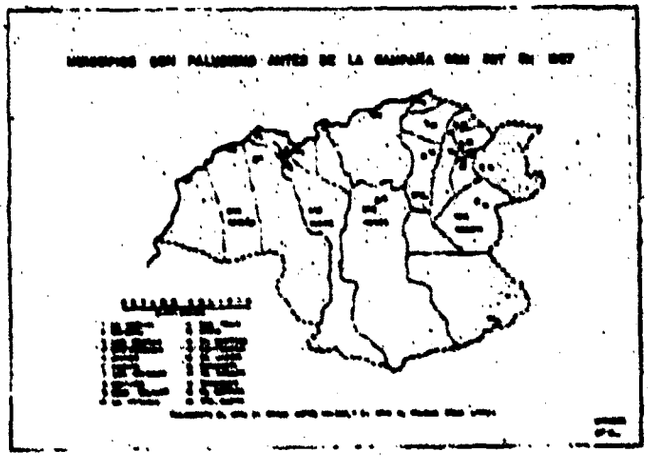
Data according to Doctors Rafael Medina and Pablo Andrade

Map 5. Geographic Distribution of Triatomines in the State of Bolivar to 1957



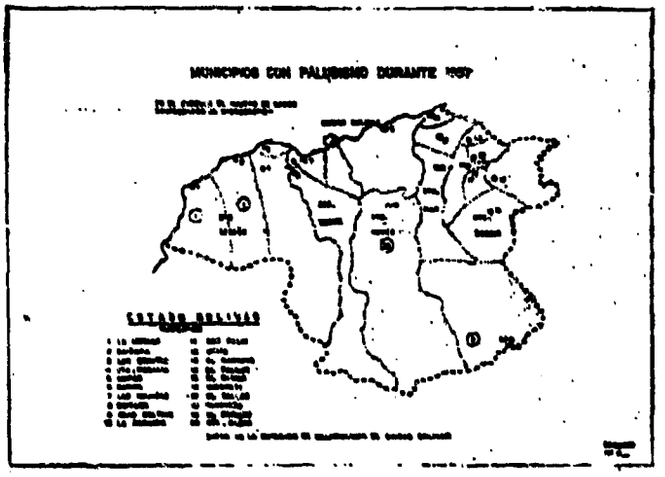
Data from the Malariology Station in Ciudad Bolivar.

Map 6. Municipalities with Malaria Before the DDT Campaign in 1957



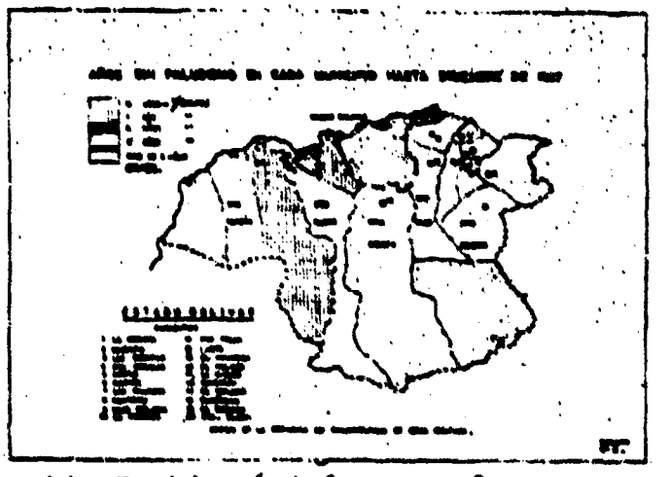
Only El Mismo (formerly Saida) municipality and El Palmar municipality were free.

Map 7. Municipalities with Malaria During 1957



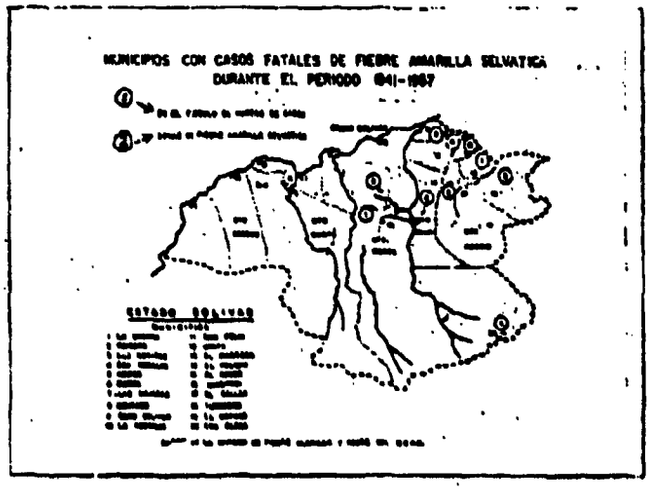
Circles indicate number of cases verified microscopically.
Data from the Malariology Station in Ciudad Bolivar.

Map 8. Years Without Malaria in Each Municipality to December 1957



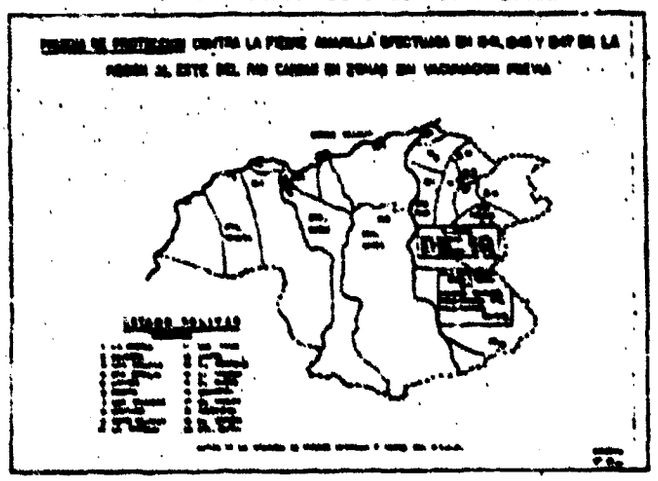
Ano(s) - Year(s); más de 3 años-over 3 years
Data from the Malariology Station in Ciudad Bolivar.

Map 9. Municipalities with Fatal Cases of Jungle Yellow Fever During the Period 1941-1957



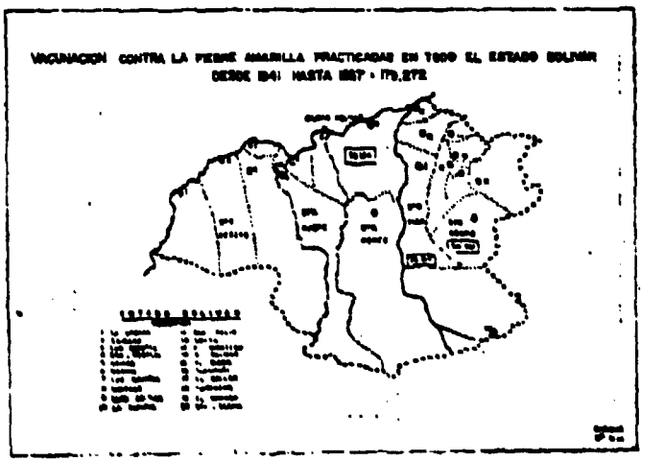
1. In the circle, the number of cases. 2. Zones of jungle yellow fever. Data from the Division of Yellow Fever and Plague, Ministry of Health and Public Welfare.

Map 10. Protection Test Against Yellow Fever Made in 1941, 1943 and 1947 in Region East of the Caroni River in Areas Without Previous Vaccination

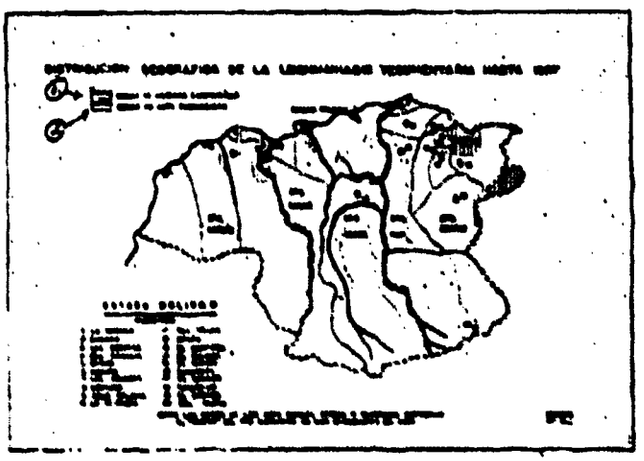


Data from Division of Yellow Fever and Plague, Ministry of Health and Public Welfare

Map 11. Vaccinations Against Yellow Fever Administered in the Entire State of Bolivar from 1941-57: 179,272



Map 12. Geographic Distribution of Cutaneous Leishmaniasis to 1957



1. Zones of average endemicity. 2. Zones of high endemicity. According to data from Doctors Rafael Medina and Francisco Battistini, the focus of the Cuchivero River was discovered in 1953.

- END -