ASPECTS OF RIO DE JANEIRO'S NEW MOSQUITO CONTROL SERVICES [1]

PAULINO GERALDO CABRAL DE MELLO
Director-Engineer of Insect and Rodent Control Division
Department of Sanitation—SURSAN
Rio de Janeiro, Brazil

INTRODUCTION. In late 1964 the government of the State of Guanabara decided to organize a service for mosquito control. The incidence of domestic mosquitos in Rio de Janeiro was increasing tremendously and the time had come to try to solve the problem using modern and scientific methods.

The Department of Sanitation of SURSAN was thus chosen for that purpose and its first step was to ask for collaboration of the World Health Organization through its regional offices of the Pan American Health Organization. In December 1964 we received a visit from Mr. Herbert Frederic Schoof, Entomologist from the Communicable Disease Center of the Department of Health, Education, and Welfare, who gave us the primary orientation to permit the establishment of the services. At the same time, the Department of Sanitation gave an organic structure to the Insect and Rodent Control Division.

In March, 1965 an agreement was entered into between the Ministry of Health, through its Rural Endemic Diseases National Department, and SURSAN (Superintendency of Urbanization and Sanitation). This agreement gave us financial help of about $100,000 for starting work as well as about $150,000 for the following two years.

Although SURSAN had contributed to the setting-up of the new service, the resources were insufficient to permit coverage of the whole city of Rio de Janeiro. Therefore, we had to select certain areas of the city, using a rational criterion.

Two districts of the city were chosen, Copacabana and Tijuca.

1. The first was selected because of: its high demographic density (181,000 inhabitants per square mile) resulting from 271,000 people living in an area less than 1.5 square miles; the high incidence of mosquitoes in that area; its geographic disposition (surounded by hills on one side and the sea on the other), making its isolation possible; the existence of streets and blocks in a regular pattern; the tourist aspect, considering the great number of hotels in the area.

2. The second area (Tijuca) was selected because of: its high level of development, and its 322,000 inhabitants. Out of these districts small work groups attend to complaints by the elimination of breeding places when possible, by the application of fog in special areas and by giving instructions to the people.

CHARACTERISTICS OF RIO DE JANEIRO. Rio de Janeiro, until 1960 capital of Brazil, and now capital of the new State of Guanabara, is a busy port and commercial center. It is Brazil's second most important city, comprising an area of 60 sq. miles, divided by hills and mountains, located on the western side of Guanabara Bay. It has a population of approximately 3,839,996 (1965 census).

The climate of Rio de Janeiro is warm and humid, the average temperature for year being about 74° F. The rainfall averages about 44 in. annually, with July and August being the least rainy months.

THE MOSQUITO PROBLEM. Rio de Janeiro's urban areas present many adverse conditions that increase the mosquito problem. Some of them are hard to eliminate.

[1] Report presented at the Annual Meeting of the American Mosquito Control Association 1966.

One of the most important aspects is the great number of building constructions found in the heart of the urban areas. These buildings are made of concrete and a continuous use of water is necessary for the construction work. Stagnant water can usually be found in the foundations and later in the basements, garages, and other places. It is important to emphasize that this kind of breeding place is always located in the midst of residential housing and apartment buildings containing hundreds of families. In the pilot area of Tijuca we listed more than 663 building constructions, most of them having 12 floors. In Copacabana there are almost 200.

Another important problem is the breeding places in the catch-basins. In Copacabana we report 2,715 catch-basins distributed along 91 streets and 124 blocks.

The city is developing in a disorderly fashion and its population is increasing, daily, by currents of internal migration that consist mainly of low level socio-economic groups. These groups contribute to the worsening of the existing slum (favela) problem. The housing in the slums consists of wooden shacks, usually crowded with people living under poor and unhealthy conditions. Sanitary facilities are practically non-existent. Garbage is dumped outside individual dwellings, from which it is not collected, and by serving as a breeding place for rats, insects, and disease, becomes a focus of infection. The sewage collects in open trenches. Human and animal waste abounds, making another focus of disease. During the rainy season, the land becomes flooded and waste and garbage become dispersed.

The rural areas of the State present a smaller number of dwellings and a lower density of population. In certain districts there are marshes in which species of *Culex pipiens fatigans, Aedes scapularis* and *Anopheles aquasalis* and others were identified.

Domestic breeding places are the cause of great annoyance to the population. This problem can be alleviated through: (1) education and (2) the localization of these breeding places through information given by the people. Examples of domestic breeding places are roof gutters, tires. containers of various sorts, marquees, etc., etc.

SURVEYS. It is still impossible to present test results of any type, as the Division has only now equipped its laboratory.

Incidence studies. Last year the Division received from PAHO 2 light traps as models; 18 more were made in our workshop. So, since January, we had five of them working in Copacabana. The peak catch, counted on Jan. 30, 1966, was 238 mosquitoes (38 females and 200 males) collected from Barata Ribeiro Street. (Fig. 1).

At the same time, questionnaires were distributed in different areas of the city, asking for useful information on the plan as well as checking the results of the work that was done and figures that were taken from the light-trap collections.

The complaints furnish an important complement to data on the incidence survey. We are presently proceeding in two ways: in Copacabana, the complaints are registered and marked on a map, thus permitting a complete analysis of the incidence condition.

Outside Copacabana we send a special questionnaire to the person who makes the complaint. Attached to this questionnaire we send a pamphlet with instructions not only on how to locate breeding places, but also on how to eliminate them. When this questionnaire is answered and sent back, we interpret it. If the problem cannot be solved by the complainant, we send a crew specially trained for that purpose.

Identification. The mosquito that causes most annoyance is the species *Culex pipiens fatigans.* Its high incidence is due to the great number of typical urban area breeding places. The species *Aedes scapularis* is commonly found in the open areas covered by vegetation. Concerning the collection data mentioned above, all mosquitoes captured were *Culex pipiens fatigans.*

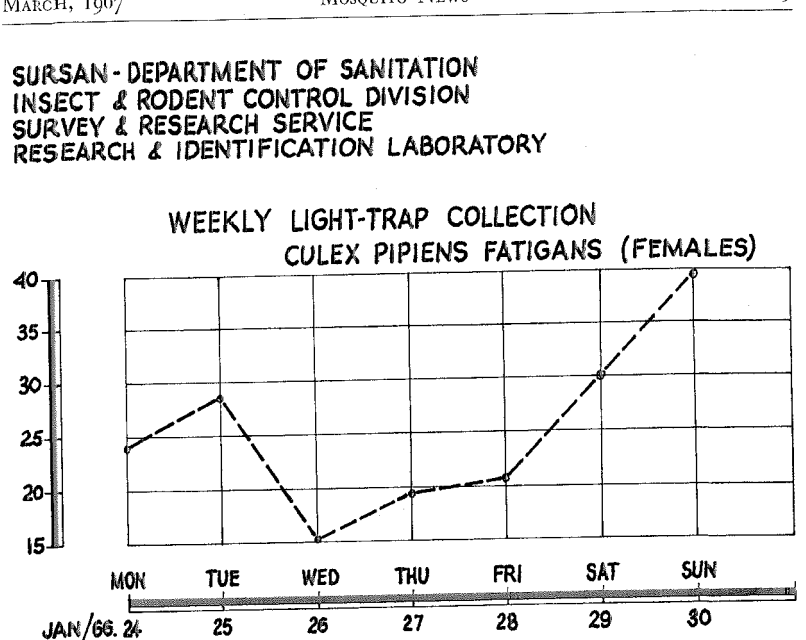

FIG. 1.—Weekly light trap collections of *Culex pipiens fatigens* females in last week of January, 1966, in Copacabana. Note.—During this period, 1,293 mosquitoes were collected (all of them *Culex pipiens fatigans*), 1,113 being males. This result shows the existence of breeding places near the traps, probably in the buildings, since the area had been inspected before the trap installation.

THE WORK. All personnel and equipment had to be provided since the Division had just been started. In order to give a general idea of the work we are doing, this section is divided into two parts, presenting the preventive and the corrective work, separately.

A. The preventive work. As was mentioned before, building construction causes serious problems. So we have organized inspection groups for that purpose only. The inspector visits the place every fortnight, teaching the foreman how to avoid water stagnation. If any place has stagnant water the company is notified. In the next visit if the irregularity persists, the inspector gives a fine which amounts to about nine dollars. In case of failure to comply with these directives, the fine is successively doubled. The results of this work can be analyzed by examining the curves that show the percentage breeding places found in relation to inspections made (Fig. 2). It was observed through the distribution of questionnaires among people dwelling near those constructions, that the incidence of mosquitoes decreased.

In the suburban areas it is common to see streams in bad condition with their banks covered by vegetation and presenting polluted water. When the incidence in these areas increases, we inform the appropriate department, asking for the necessary measures to be taken.

The education of the population is the most important part of the preventive work. Notices in newspapers and on television programs, as well as lectures at schools, universities, clubs, etc., make up part of our program. It is our intention to promote a special one week program concerning education of people next June. Explanations will be given through the mass media including lectures in public schools.

B. The corrective work. To treat catchbasins we use motorized tricycles. In some districts such as Copacabana we have

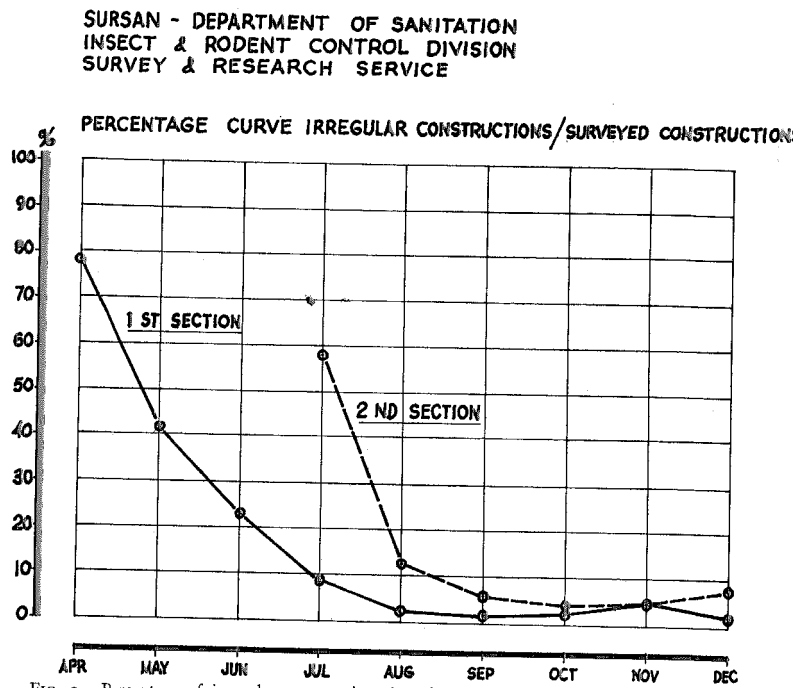

FIG. 2.—Percentage of irregular constructions in relation to numbers surveyed in Copacabana.

problems due to the parking of cars over the catch-basins. We spend much time treating catch-basins in these situations. The larvicide used is Baytex 50 percent applied at a rate of 0.25 p.p.m. The appropriate period of re-treatment has not yet been established inasmuch as the laboratory was not operating. The crew worked only for training purposes.

The fog is applied under special conditions in areas where the incidence is very high. Since we did not have any kind of trap we estimated the results of the work through questionnaires distributed in those areas. The adulticide used is malathion 5 percent, diluted in diesel oil. Xylol is added at 5 percent as solvent.

Corrective action is taken in other places, when necessary, using larvicide or adulticide. When we answer a complaint and the incidence is high, we apply fog, as for instance, in the basement of a building construction outside of the controlled areas. We sometimes apply fog and larvicides to alleviate the annoyance and, when necessary, warnings are sent or fines are given. The cost of the work is reimbursed by the owner through an official bill.

PERSONNEL AND EQUIPMENT. The personnel working at the Division total 87, distributed as follows: Technical personnel, 5; Administrative personnel, 28; Inspectors, 28; Workmen, 26.

The Division is managed by a Director-Engineer, the Survey and Research Service by an Engineer, and the Laboratory by an Entomologist assisted by a Chemist. The monthly cost of personnel is about $6,800.

The equipment is assigned as follows:

Information Section: 1 VW-Microbus, 1 Mimeograph.

Survey and Research Service: 2 VW-Microbuses, 7 Jeeps, 18 Light-traps, 15 Bird-traps.

Research and Identification Laboratory: 1 VW-Microbus, 1 Jeep.

Control and Operation Service: 1 Automobile, 2 VW-Microbuses, 1 Truck, 2 Pick-ups, 1 Jeep, 30 Power fog machines, 4 Manual fog machines, 6 Power sprayers, 4 Manual sprayers. The Government has purchased these machines under special conditions and at a very low price from IBC (Brazilian Coffee Institute).

The fog machines included Dyna Fog Model DFG-B and Swing Fog SN-7.

The Power Sprayer specifications were Type Mose "G" with a pressure of 600 lbs. psi, capacity 8 gpm. The hand sprayers were of 4-gallon capacity.

ORDINANCES. The Department of Sanitation has obtained the necessary authority for the prevention of mosquito breeding through several official acts, thus greatly aiding us in our job, with the following results.

The inspectors of the Division, acting under its authority, may enter in any place for the purpose of the job; the Department notifies, warns and fines those responsible for irregularities; the Department stops the work in building constructions when the irregularities persist; the person responsible for irregularities is obliged to reimburse the cost of application of any kind of insecticide by the Division.

We are presently studying and discussing a new decree concerning the aspects of drainage in the buildings and houses, especially in places like roof gutters, marquees, basements, etc.

SUMMARY. The above is an account of modern and scientific methods of mosquito control that are being tried out now in South America. The services were started at the end of a governmental period, therefore it was not possible to determine the budget and financial resources for that purpose. After the October elections the new governor Ambassador Negrao de Lima became responsible for the governmental administration.

Of course, the resources are insufficient. However, we hope to find a way to obtain them. In any case we will keep working hard in order to diminish the problem, and we hope to have the assistance of all mosquito control organizations in the United States besides the useful help from Pan American Health Organization.

Bibliography

COORDENAÇÃO DE PLANOS E ORÇAMENTO. Secretaria do Govêrno, Estado da Guanabara. Estudos Cariocas, Vol. I, 1965.

DIVISÃO DE COMBATE A INSETOS E RATOS—SURSAN—Curso para encarredos de fiscalização, 1965.

GOVERNO DO ESTADO DA GUANABARA. RIO DE JANEIRO em seus quatrocentos anos—1965.

SCHOOF, H. F. Relatorio sôbre o programa proposto para o contrôle de mosquitos. Estado da Guanabara, 1964.