

DESCRIPTION OF ANTI-AEGYPTI TECHNIQUE

INTRODUCTION

Following the unexpected outbreak of yellow fever in Rio de Janeiro in 1928, the Brazilian Government, realizing that the control of yellow fever is a national rather than a local problem, took steps which resulted in bringing under one administrative head, on January 1, 1932, all responsibility for the investigation and control of this disease throughout the country. These steps were:

1. Assuming early in 1929 partial financial responsibility for the Yellow Fever Service operating since 1923 in North Brazil under the auspices of the International Health Division of The Rockefeller Foundation.
2. Extending on December 1, 1930, the zone of operations of the Cooperative Yellow Fever Service to include all Brazil, except the Federal District.
3. Amalgamating on January 1, 1932, the Yellow Fever Service of the National Department of Health, operating in the Federal District, and the Cooperative Yellow Fever Service.

On May 23, 1932, Federal Decree No. 21,434 was issued giving the Yellow Fever Service adequate authority to carry out measures for the prevention of mosquito breeding and to investigate possible yellow fever cases occurring throughout Brazil (see pp. 129-133). No legal provision was made in this decree for administrative detail, which was left to be worked out according to local conditions, and subject to such modifications as might become necessary.

While it may be possible to organize small health services on the basis of word of mouth instructions, all details of established techniques must be written down for ready reference if uniform work is to be done on a national scale. The

description of the technique of anti-aegypti work which follows is an adaptation of corresponding sections of the *Administrative Manual of the Yellow Fever Service of the Ministry of Education and Health of Brazil* as they were at the end of 1939. The Brazilian Yellow Fever Service is not static: modifications of technique are being tested constantly, and those found useful are adopted. And so it is that the Service Manual, in evolution since 1930, continues in a loose-leaf mimeograph form which is easily altered.

In the field of yellow fever control, to an even greater extent than in many other fields of public health administration, the literature on administrative details of the work is inadequate. In the special case of anti-aegypti work, all of the few reports available refer to emergency urban campaigns carried out for the purpose of getting rid of yellow fever, rather than to permanent programs for the eradication of the vector.

An essential difference between an emergency campaign and a permanent one is the attitude which must be taken toward cost. At the time of a yellow fever epidemic, or under threat of importation of the infection from near-by epidemic areas, adequate funds are easily obtained to prevent a public calamity, and the health officer is judged not by the amount of money spent but by the immediate results of the campaign. Once the threat of yellow fever passes, however, government authorities and the health officer begin to consider the question of expense, which is indeed heavy in comparison with other important health measures. The director of an emergency campaign must know how, regardless of cost, to reduce the density of *Aedes aegypti* rapidly to a point where yellow fever transmission becomes impossible, whereas the director of a permanent anti-aegypti service must be able to prevent

aegypti breeding at such a low cost that the expenditure can be carried by the annual budget. The experience of the Yellow Fever Service in Brazil shows that aegypti breeding cannot be controlled economically by the time-honored methods of simply reducing the intensity of such breeding; only when species eradication, beginning in the larger centers, is carried to the smaller towns, villages, and even rural districts of the surrounding areas, which would otherwise reinfest the larger centers, can *Aedes aegypti* be controlled at little cost. Fortunately a technique has been developed which makes possible the complete eradication of the aegypti mosquito at a reasonable cost from urban, village, and rural areas.

The Brazilian Manual is based on Brazilian conditions, which are sufficiently varied to include most of the problems to be found in other parts of the Americas. No attempt has been made to adapt the techniques described to African and Asiatic conditions, under which certain special problems are encountered.

Theoretically, anti-aegypti measures should be easy, since the breeding foci of this mosquito are generally limited to artificial water containers in, and in immediate proximity to, human habitations. In practice, the discovery and elimination of the final traces of aegypti breeding are often difficult, not only because of the instinctive wiles of the aegypti mosquito, but because of the public relations and personnel problems inherent in any attempt to apply routinely even the simplest measures in hundreds of thousands of homes scattered over all Brazil.

The reduction of aegypti breeding to a point where yellow fever disappears from the towns and cities worked is relatively easy, as the dramatic results of early campaigns testify, but the complete eradication of the species in a given place is made difficult by the instinctive ability of the female aegypti to lay her eggs in every hidden inaccessible water container, by the ability of the aegypti egg to withstand desiccation for several months, and by the constant transportation of the species from unworked to worked areas (imagoes by boat and train, and larvae and eggs in portable water containers, such as the universally used clay water jars).

However, local species eradication has been accomplished in all the large cities intensively worked in Brazil during the past decade, and wide regions, including several entire states, have been cleared of aegypti.

In using the technique described, it must be borne in mind that the work in any given place should undergo regular evolution and requires different types of organization for its various stages. Many of the methods, such as those of the Vacant House and Roof-Gutter Services, are necessary in the early stages of the campaign while the aegypti density is high, but can be discontinued later; others, such as those of the Adult Capture and the Producing Focus Services are of little value as long as considerable aegypti breeding continues to exist, but become invaluable during the final clean-up of an area. The most advantageous application of the technique is possible only when a careful current analysis of the progress of the work is used as the basis for timely modifications. The initially large staff required to eradicate the aegypti mosquito from infested areas can be reduced to the relatively small number needed to prevent reinfestation only after careful analysis of the situation. The numerous report forms, maps, and charts of the Service are used not only as a check on the work done, but also as a guide to when and how the program may be modified to meet changing conditions.

The permanent campaign against *Aedes aegypti* falls naturally into three quite distinct phases:

1. The initial clean-up campaign for the elimination of the easily accessible aegypti foci. This phase is similar in all respects to the early emergency yellow fever campaigns which rid localities of yellow fever but not of the vector species.
2. The discovery and elimination of the final hidden, inaccessible breeding places responsible for maintaining the species in the face of intensive anti-aegypti measures.
3. The permanent maintenance of a sentinel service to discover and eliminate any reinfestation which may occur. (Reinfestation in the early months of the sentinel service may be either "internal," due to returning

to active use of dry containers with viable eggs, or "external," due to importation of the vectors from infested areas, as already described. Later reinfestations come only from external sources.)

The initial clean-up campaign is always costly, as is also the maintenance of the service needed to guarantee the low indexes obtained. The sentinel service to discover early any reinfestation which may occur after zero indexes are secured is inexpensive, and its cost declines progressively as the danger of reinfestation disappears. The interval between adult capture surveys can be increased with safety as the cleaning of contiguous areas proceeds. Only species eradication permits of permanent aegypti control at low cost, and no effort should be spared to clear tributary areas as widely as possible.

The stage is set for the second phase of the campaign when well under 5 per cent of the houses inspected are found with aegypti foci and when only secondary, non-producing foci without pupae are found. But even secondary foci may disappear in well-worked areas before complete eradication occurs. The capture of adults is the most sensitive index of the presence or absence of *Aedes aegypti* in a neighborhood and is an essential weapon in the final clean-up. Negative reports should not be taken to mean eradication until careful search has been made for adult mosquitoes. Adult aegypti in nature are on the average short lived, and secondary foci or numerous adults in a neighborhood always indicate recent near-by pupal foci.

The final elimination of hidden inaccessible aegypti foci is achieved by:

1. Oiling or destruction of all water containers in which mosquito breeding is occurring. (Rapid pouring out or drawing off of water is almost useless; fish are expensive and are used only where no other method of control is possible.)
2. Capturing adult mosquitoes to ascertain persistence of aegypti and to locate hidden pupal producing foci.
3. Searching out pupal producing foci in neighborhoods where aegypti mosquitoes

persist in the face of routine control measures.

Although Brazil has had since 1932 a rather drastic yellow fever regulation (see Decree 21,434 of May 23, 1932, p. 129), its application would be impossible in the absence of the whole-hearted support of the Brazilian public. The Brazilian householder has come to recognize in the Yellow Fever Service employee who enters his home, a person who has no political or police objective, does not receive tips, applies the same measures impartially in all the homes under his jurisdiction, and is himself under careful supervision not only by his superiors but also by the householder, through a cumulative record which he leaves in each home, listing the time of each visit and the conditions found.

The local director of the service is always accessible to the public, and mosquito complaints receive prompt attention. The householder, under these circumstances, generally accepts the impositions of the Service and seldom is it necessary to have recourse to legal measures except in those cases where the recommendations of the Service involve the spending of money in structural modifications. The owner is held responsible for any mosquito breeding due to structural defects, the householder for conditions which are independent of the building itself.

As in all administrative work the principal problems of the Yellow Fever Service are those of selection, training, and supervision of personnel. The doctor entering the Service is given an intensive course of training, not only in the field work of the inspector but also in the statistical and accounting sections of the Service. At the end of his period of training the doctor is examined by officers of the Service on his knowledge covering a long list of questions which are given to him when he begins his training.

The inspector is carefully selected: he must be free from physical defects and must present a satisfactory police certificate. He is thoroughly trained and examined before being given independent responsibility. Everything is done to maintain a high esprit de corps. The inspector works in uniform, bears a numbered badge with the federal seal, and is instructed that he is an

inspector, a teacher, and a sanitary policeman, but never a "clean-up servant" as was too often the case in previous campaigns. The inspector works with confidence based on detailed written instructions and a full knowledge of the legal basis of the Service he represents; he works with interest because he knows his work will be checked, and that he individually will be given credit, or will be blamed, in accordance with the results he achieves.

The Yellow Fever Service operates on the basis of individual responsibility, fixed by written instructions which can be altered only in writing, and checked through detailed reports of work done. Work worth doing is worth recording; records are so planned as to serve the double purpose of facilitating a rapid and easy checking of the work and of giving a picture of the aegypti situation in the areas in which operations are in progress. Records are so dovetailed, one with another and with the respective summaries, that they can be analyzed rapidly by the director. Routine work is reported on printed forms, and in addition doctors, and at times other supervisors, prepare narrative diaries. Full use is made of maps and charts; all houses and even blocks are numbered as an aid to specific fixing of responsibility for work done. Adequate provision is made for checking all field work. It is not enough to outline a given program and assign it to well-trained employees; the director of a service must assume the responsibility for knowing that the work is done. No large administrative service carries on long automatically, and provision has been made in the Yellow Fever Service for the routine collection, summarizing, and presentation of the data needed by the director to follow and check the work accomplished.

GENERAL ADMINISTRATION

The central administrative office of the Yellow Fever Service is in the Federal District, Rio de Janeiro. Regional offices, subordinate to the central office and responsible for the administration of the work in the corresponding regions (see map, page 2), are maintained in Belém, Pará, for the northern region; in Recife, Pernambuco, for the northeast region; in Salvador, for the Baía region; in Belo Horizonte, for the

Minas Geraes region; and in São Paulo for the southern region. Various administrative divisions, styled sectors, divisions, and posts, are formed within the region according to the number of doctors available, the presence or absence of *Aedes aegypti*, and the facility of transportation. Of these divisions, only the sector has a fully equipped statistical and accounting office.

The basic administrative unit is the zone, which consists of a group of city blocks, or a rural area, all the houses of which can be visited by one inspector at regular intervals, following an itinerary defined by the director. The unit next in importance is the district, comprising generally five or six zones so grouped as to permit, during each cycle, a careful checking of all zones by a single district inspector.

The zone inspector's work constitutes the basis of, and is the most important element in, the campaign against the aegypti mosquito. The following section, "Instructions for Inspectors of the Yellow Fever Service," is a translation of a book of instructions (Form FA74), prepared for the use of zone and district inspectors in Brazil. It contains a description of the essential points of the duties of the zone inspector and of his supervisor, the district inspector, and the principal regulations covering their work.

Form FA 74

Instructions for Inspectors of the Yellow Fever Service

Obedience.—The inspector of the Yellow Fever Service shall at all times respect his superior officers, show courtesy to the general public, and behave in a manner creditable to the Service.

All orders received from superior officers are to be executed without question. In case of doubt as to the meaning of orders, explanation may be requested; but once orders are clearly stated they are to be carried out.

Uniform.—The following uniform is worn by the inspector when on duty: khaki tunic, trousers, and cap. The tunic has four exterior pockets, two breast and two side. Side pockets measure 6½ inches wide by 8½ inches deep, inside measurements. No buttons are visible other than on pockets; these buttons are nickel for the general inspector, brass for the district inspector, and black for the zone inspector.

Each uniformed member of the field staff, from the general inspector to the servant, wears on the left arm a band of green cloth which bears a numbered badge. The arm band is held in position above the elbow by two loops, 3 inches long and $\frac{3}{8}$ of an inch wide, in such a manner as to leave a clear space of $2\frac{1}{2}$ inches.

The cap is made of the same material as the uniform, attached to a wire frame with a black visor. The chin strap of the general inspector is gilded, that of the district inspector is silver, and that of the zone inspector is black. Each cap carries a badge with the same number as that on the arm band, and no two employees in the entire Service have the same number. The chin straps and badges are issued by the Service. The cap and sleeve badges are returned to the Service when an employee leaves. The loss or destruction of these, when due to carelessness, is charged against the monthly salary of the individual concerned. Black shoes, socks, and ties are regulation attire.

The laborer's cap, chin strap, tunic, and trousers are made of blue material in the same pattern as the inspector's uniform. Overalls of blue are worn by laborers working on thoroughfares. Laborers working on trench cleaning, or cutting bush, need not wear uniforms. Shoes and socks are black.

Appearance.—When reporting for duty, the inspector shall be shaven, correctly dressed, and neat in appearance.

Smoking.—An inspector may not smoke while on duty.

Alcohol.—An inspector found drinking, or under the influence of alcohol, while on duty, is instantly dismissed.

Firearms.—The carrying of firearms of any description is absolutely prohibited.

Tips.—The inspector may not accept money or any other reward for services executed or, more important, for services not executed, even during the Christmas season or other festive periods. Breach of this rule is punishable by dismissal.

Negligence.—Failure to carry out orders is inexcusable, and a plea of ignorance or forgetfulness is unavailing. Orders are written down by the inspector in the blank notebook (Form FA 12) which is issued to all members of the staff.

Report for duty.—Any member of the staff who, because of sickness or for other reason, is unable to report for duty, shall notify the office at least half an hour before the day's work begins.

Accidents.—If an accident occurs while an inspec-

tor is at work, the head office shall be notified as quickly as possible.

Honesty.—The inspector shall be at all times frank, honest, and truthful. He shall report carefully unusual occurrences, all foci found, all houses visited, and all failures to follow his routine. Any falsification of report forms leads to immediate dismissal.

Duties of district inspector.—The district inspector is directly responsible for the supervision of his district. His duties include:

1. Daily morning inspection of the equipment and uniforms of his inspectors, with a report on Form FA 110 of the conditions found.
2. Maintaining discipline, carrying out instructions, and reporting in writing any accidents, breach of regulations, etc.
3. Superintending and checking the work of the inspectors in the zones. Sometimes the district inspector works with the zone inspector, at other times he revises, independently, the work which has been done. Working with the inspector enables him to note the condition of the zone and to correct any faults which he may observe in the inspector's technique without interfering with the work. "Revision" by the district inspector consists of visiting the houses examined by the inspector on the same or the preceding day, to detect foci overlooked by the inspector. When the district inspector accompanies an inspector he notes on the inspector's work sheet (Form FA 2) the time of joining and of leaving him, and initials the entry.
4. Keeping the Time Sheet.
5. Reporting absentees immediately to the general inspector, who arranges for substitutes.
6. Training of new personnel and orientation of substitute inspectors in the district.
7. Settlement with courtesy and tact of all difficulties arising from contact of the inspectors with the public, such as objections to visits and to destruction of foci, and cases of assault. Any failure to settle such difficulties is reported immediately to the general inspector in writing.
8. Advising zone inspectors as to their duties in special situations. Should the district inspector encounter any problem which he is unable to solve he communicates with the general inspector.
9. Care of all equipment issued in his district; preparation of weekly requisitions for material required by the district; receipt and checking

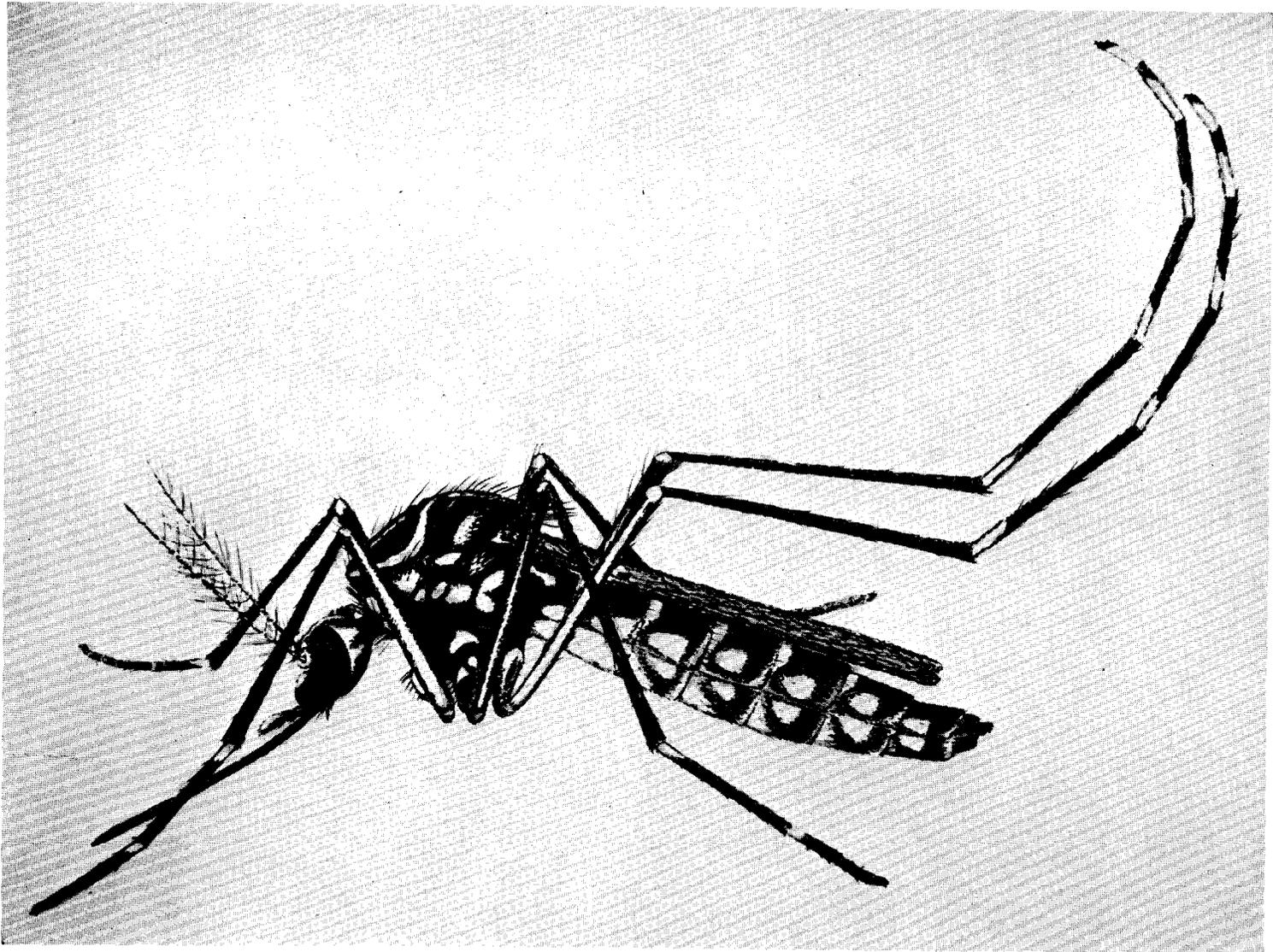


FIG. 5. Lateral view of female *Aedes aegypti*.

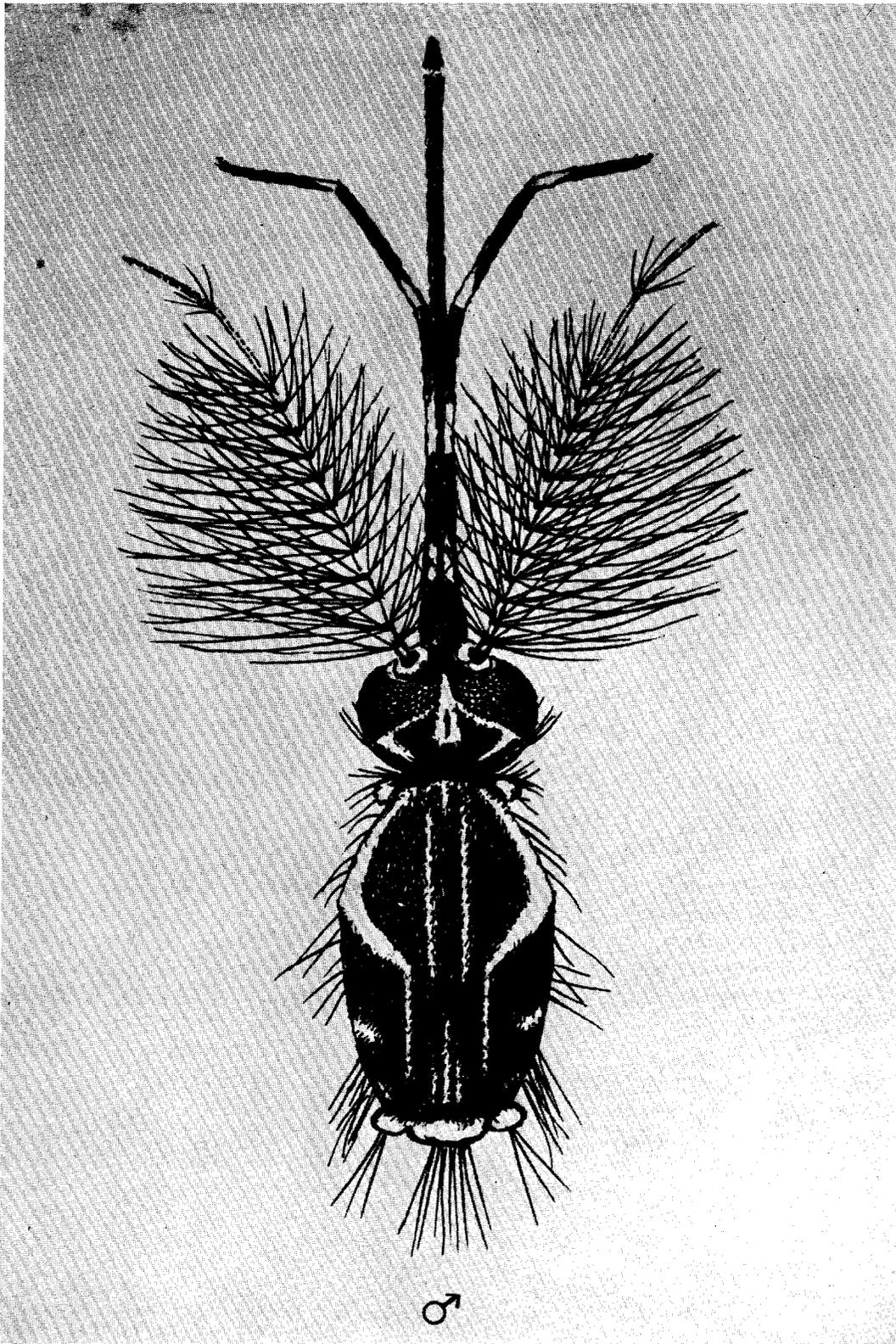


FIG. 6. Details of head of male *Aedes aegypti*.

of inspector's equipment at the end of each day's work. (A locker for storing all equipment is found in each district. The district inspector is responsible for the key to this locker).

10. Checking of flashlights in use and replacing weak batteries, noting date of issue on all batteries dispensed.
11. Checking the stores of oil and fish in his district and reporting to the general inspector any irregularities found.

Duties of zone inspector.—The fundamental duties of the zone inspector are:

To *discover* places where mosquitoes are breeding.

To *destroy* mosquito foci found.

To *prevent* the formation of other foci.

Necessary equipment.—The zone inspector must always carry with him, when on duty, the following material:

Service Identification Certificate.

The Instruction Book for Inspectors of the Yellow Fever Service (Form FA 74).

Map of his zone.

Weekly itinerary by blocks.

Watch in good working order.

Lumberman's wax pencil.

Inspector's flag for marking position in zone.

Flashlight complete with extra bulb. Both bulbs and battery units must be in good condition.

Each battery unit must be marked with the date of issue by the district inspector dispensing it.

Large spoon, with copper mesh inset for collecting mosquito larvae.

Specimen bottles for collections of larvae.

Tin or bottle with adequate supply of the mixed oil larvicide used by the Service.

Lead pencil.

Printed forms, as listed below, adequate for registry of all the work of the day:

- FA 2 Inspector's Work Sheet.
- FA 12 Notebook containing blank pages, lined and perforated, in which miscellaneous points not covered by regular forms are noted.
- FA 43 Notice to leave keys of closed houses with one of the neighbors on day of regular visit.
- FA 52 Autograph House Visit Record for registering in the house itself the date of each visit.
- FA 53 Label for larvae.
- FA 63 Note for Legal Summons.
- FA 64 Mosquito Complaint.

FA 65 Fish Requisition.

FA 66 Note for Oiler.

FA 122 Aegypti Focus Report.

Working hours.—The Service schedule calls for 44 hours of work each week, but the time of beginning and closing work depends on local conditions. The zone inspector is ready to begin work in his zone at the established time and does not leave his zone before closing time without permission. Any failure to observe this rule is punished by suspension or dismissal.

The zone inspector meets with his district inspector each morning at a centrally located place in the district early enough to obtain material, pass inspection, and reach his zone promptly at the hour set to begin work. At the close of the day's work he returns to the same meeting place and turns in his material, which is kept overnight in a case expressly designed for this purpose.

Itinerary.—A zone consists of a certain number of blocks, the houses of which the zone inspector examines during the week. The zone inspector begins his weekly round every Monday morning at the time set, always at the same point in the zone. The corner of each block at which work is to begin is indicated in a special way, and all corners are marked with an arrowhead (triangle) to indicate the direction in which the block must be worked. After inspecting all the houses in a block, the inspector continues his tour block by block, following the order established in the itinerary for his zone, until all the houses of every block in the zone have been inspected. The work of each day begins where the preceding day's work ended.

Flag.—Before entering a house, the zone inspector places his Service flag on the door (window, gate, hedge, or fence). The flag is put up at right angles to the front of the building (see p. 40) so that it is plainly visible from a distance up and down the street.

Pennant.—On estates, in tenement yards, and where there are several buildings on one piece of property not arranged in blocks and with only one entrance from the public thoroughfare, the zone inspector places the Service flag at the public entrance, and a smaller triangular pennant at the entrance of the building he is inspecting.

Entering the house.—The zone inspector rings the doorbell (claps his hands, or knocks on the door), and announces, "health inspector's visit." He greets the person who opens the door with courtesy and asks permission to enter the house; this permission is obtained from a person of responsibility in the house,

and the inspector shows his identification card if requested. The inspector does not pass from one house to another by using intercommunications which may exist, nor does he pass from one back yard to another. Having finished his visit of inspection in one house, he goes out to the street and begins his visit to the next house in the way described above.

Refusal to permit inspection.—Should permission to inspect a house, in whole or in part, be refused, the zone inspector records all the facts in his notebook and makes a report of the case in writing to the district inspector. The zone inspector is absolutely forbidden to argue, dispute, or discuss the reasons for or against permitting visits: he retires from the scene without comment and reports the incident.

Calling for help.—Only in cases of threatened violence is the inspector permitted to call for help from the police, and this should be done only with the object of avoiding immediate physical injury.

Inspection.—Having received permission to inspect the house, the inspector always begins his survey in the yard; and after this is completed, he examines the bathroom, kitchen, pantry, living room, bedrooms, and other dependencies of the house. The inspector is directly responsible for the conditions in his zone which pertain to the anti-aegypti work. Consequently, he is answerable for whatever may be found in places where he may have considered routine inspection to be unnecessary.

Interior inspections.—When inspecting inside the house, the zone inspector always asks a member of the household to accompany him, particularly when entering private rooms. The same rule applies when he is inspecting hotels and rooming houses. He always knocks and asks permission to enter private rooms, bathrooms, and lavatories.

Inspections with an officer of the Service.—Whenever a zone inspector is accompanied by a doctor of the Service he announces "doctor of the Public Health Department." The inspector precedes the doctor into the house because his uniform facilitates recognition by the family. However, the doctor leaves first, since in this case he is the authority who determines whether or not the inspection has been completed. The inspector may leave the house before the doctor only if he is given orders to do so. The inspector aids the doctor in making the inspection, facilitating as far as possible the examination of all containers to be inspected.

Autograph House Visit Record (Form FA 52).—Each inspection of both the zone and the district inspector is registered on the Autograph House Visit Record (Form FA 52) at the time of the visit. On his

first visit the inspector pastes the Autograph House Visit Record at some point in the house which must be inspected on each visit. This may be in the kitchen, in the bathroom, or, in the more simple type of home, on the back of the entrance door. In buildings without wooden doors or other suitable places for the form, it is pasted on a board prepared especially by the occupant of the house and fixed at a convenient place. When one Form FA 52 has been completely filled, another is pasted over it and the last visit is noted on this.

Potential mosquito breeding foci.—All containers capable of holding water are carefully and minutely examined, since they always must be considered as potential places for mosquito breeding.

Water containers.—The zone inspector examines all containers to see whether they have water in them. In his report, however, he notes only those containers which are found with water. A container recently emptied and still wet is entered as a container with water.

Empty containers.—Empty containers are placed in such a position that they cannot collect water.

Classification of water containers (Form FA 2)

Inaccessible tank: a high tank, usually made of zinc, with an outlet pipe, and placed at such a level above the floor or ground that water is distributed by gravity.

Vat: a large circular water reservoir generally constructed of wood and usually placed on brick pillars a few feet above ground, with a tap at the base for distribution of water by gravity.

Tank: a large water container placed on the level of the ground; it may be constructed of concrete, metal, brick, or wood.

Clay vessels: pots, coolers, jars, filters, etc., varying in capacity from a quart or two to many gallons.

Barrels, tubs, and drums.

Special artificial containers: receptacles of various types in which at times aegypti mosquitoes may be found breeding. These include: toilet flush tanks and basins which are not in use; tin cans; clay cups; sinks and lavatories; drains; anti-ant rings for plants; water tins used for keeping ants out of food; enamelled pots and basins; tin basins; bowls; pails and buckets; flower jars and vases; holy-water fonts; icebox pans; garage pits; water drains, especially those containing clean water; sheets of metal; egg and coconut shells; abandoned tires; old shoes; boxes; drinking vessels for chickens, birds, dogs, and other animals; pieces of iron; tins and jars buried in ground, which may collect water; crockery and shards; walls, especially those with shells, shards, or broken bottles to ward

off marauders; fallen leaves; catch basins, street drains; caldrons for heating water; animal skulls; crab, lobster, and other shells; bamboo trees; animal horns; bones; tile; sprinkling cans; disconnected plumbing pipes; grindstone troughs; water meters; flooded basements; boat bottoms, etc.

Roof gutters: zinc or copper gutters at the eaves of houses or on the roofs.

Trees and plants: rot holes, leaf crotches, etc. (Water found on fallen leaves is not included in this category, but listed under special artificial containers).

Wells and pits: pits; trenches and ditches; small ponds, natural or artificial; unlined water drains; crabholes; kitchen drains; hoofprints of animals, etc., where, in general, *Aedes aegypti* is not found.

Blank column: not to be used unless instructions are received to separate for special analysis some one type of container of local importance.

Sealing water containers.—The Service does not seal tanks or other containers which need sealing to make them mosquitoproof. The inspector requests the householder or some other responsible person to have the container sealed, and in case this is not done he fills out a Note for Legal Summons (Form FA 63).

Septic tanks; latrine pits.—When an inspector finds a latrine pit or septic tank which is not mosquitoproof, he asks the householder for oil or kerosene for immediate application, and fills out Form FA 63.

Mosquito focus; notifying family.—Every mosquito focus found is shown by the zone inspector to some responsible member of the family in whose home it is encountered.

Eliminating mosquito focus.—Every mosquito focus found is eliminated either by oiling or by destroying the container in which it is found. In case the family refuses to allow one of these measures to be taken the inspector reports the circumstances in writing to the district inspector who, in turn, becomes responsible for enforcing the necessary measure. In case the family still refuses to have the focus eliminated, as prescribed above, action is taken in accordance with Decree 21,434 of May 23, 1932.

Recurring foci.—A house in which foci are found repeatedly is reported to the district inspector in writing so that the Producing Focus Service can make an intensive search of the neighborhood for missed pupal foci.

Oiling large foci.—Whenever the inspector finds a large focus, too extensive to be treated with the oil which he carries, he fills out Form FA 66 and hands it to the district inspector, who details a special

oiler to the task. The inspector should not continue indefinitely to request oiling of the same permanent or potential foci but should take measures to have these eliminated. Note for Legal Summons (Form FA 63), should be filled in and the nuisance terminated.

Fish.—For containers which cannot be protected in any other way, the inspector may advise the use of larviphagous fish to destroy mosquitoes in the aquatic stage (larva, pupa).

The inspector hands to a responsible person in the house a properly filled out Fish Requisition (Form FA 65), on the presentation of which the nearest fish depot of the Service will supply fish.

Mosquito complaint.—When an inspector hears complaints of the prevalence of mosquitoes, he reports these in writing to the district inspector on Form FA 64 (Mosquito Complaint) so that the neighborhood may be worked by the capture and producing focus inspectors.

Form FA 2.—The Inspector's Work Sheet (Form FA 2) is divided into three vertical sections by two heavy black lines. There are 40 horizontal lines for reporting the inspections of individual houses, grouped in tens by four heavy black horizontal lines to facilitate counting when the form is not full.

Identification of house.—In the first vertical section of Form FA 2, to the left of the first heavy vertical line, there are columns for the identification of the house by name of the street, number of the house, and number of the block.

Definition of "house."—For the records of the Yellow Fever Service a "house" is defined as any building, or part of a building, which has an independent entrance from the street or highway (or at times from private grounds), without taking into consideration the use for which it is intended, so long as this use is not as an integral part of another "house." Examples: the garage of a residence may have an entrance from the street but is not independent; hotels and apartment houses count as one house each unless business stores with independent entrances from the street exist on the ground floor, in which case each of these counts as a "house."

When more than one family lives in a single house with independent kitchens and bathrooms, it is convenient to report on the independent "visits" made, but statistically the house is the unit.

Results of inspection of containers.—The space included between the two heavy vertical lines of Form FA 2 is used to note the number, and mosquito infestation, of the different types of water containers in each house. (See sample tabulation, p. 16.)

Recording of foci.—In noting foci found, the following abbreviations are used:

F: Focus of eggs or larvae of all species of mosquitoes except *Aedes aegypti*.

FP: Pupal focus of all species of mosquitoes except *Aedes aegypti*.

FA: Focus of eggs or larvae of *Aedes aegypti*.

FAP: Pupal focus of *Aedes aegypti*.

As the inspector examines containers, he enters, in the respective columns under the proper classification, the number of each type encountered. When he finds a mosquito focus he notes it on the report, using the proper abbreviation. For example, if three inaccessible tanks be examined, and two of them have foci, one of aegypti larvae and the other of aegypti pupae, the inspector enters in the column "Inaccessible Tanks" to the left, the number "3" which indicates that three tanks were inspected; then a short dash, and above "1 FA" (focus of aegypti larvae) and below this in the same column "1 FAP" (focus of aegypti pupae), thus:

Inaccessible Tanks

3— 1 FA
1 FAP

If, now, one tank is examined and one pupal culex focus is found, the inspector marks in the column "Vats and Tanks," to the left, the number "1," which indicates that one tank was inspected, draws a short dash, and then writes "1 FP," in this manner:

Vats and Tanks

1—1 FP

If, next, the inspector examines two barrels, in one of which he finds a focus of culex eggs and larvae, he

writes in the column headed "Barrels, Drums, and Tubs," to the left, the number "2," which indicates that two barrels were inspected, a short dash, and then "1 F," in this manner:

Barrels, Drums, and Tubs

2—1 F

When a mixed focus is found containing larvae of two or more species, including aegypti mosquitoes, it is entered only as an aegypti focus. In classifying foci according to stage of development, the most advanced stage is recorded. Thus a focus containing eggs, larvae, and pupae is classified as pupal; one containing eggs and larvae is classified as larval.

Registry of containers protected.—The inspector indicates in the respective columns, by means of the letters "X," "O," and "E," the measures taken for the prevention of mosquito breeding in containers. He notes the containers in which fish are found by their number and the letter "X"; thus, the entry "5—2 X" indicates that five containers were inspected, and that fish were found in two of them.

Containers oiled by the inspector are indicated by a number and the letter "O." Thus, the entry "3—2 O" indicates that three containers were examined and that two were oiled.

A container is considered eliminated ("E") only if it has been destroyed or left in such condition that mosquitoes cannot breed in it, at least for a period of several months; thus, a tank which has been sealed with tape or a tree hole which has been filled with cement may be entered in this category.

Summary of foci.—In the columns to the right of the second heavy vertical line the inspector notes the number and type of foci found, in the follow-

INSPECTOR'S WORK SHEET

Locality				Date									Zone			
Street	Number	Inspections	Block	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	FOCI			
				Inaccessible Tanks	Vats and Tanks	Clay Vessels	Barrels, Drums, and Tubs	Special Artificial Containers	Roof Gutters	Trees and Plants	Wells and Pits	Other Containers	F	FP	FA	FAP
X	20	1	26	3—2 E 1 O	2 FA 3—2 O 1 X	1 F 3—1 E 2 X	1—1 FP 1 E	5—5 F 5 E	3—3 FAP 3 E	2—2 E	3—3 X	1—1 E	12	4	5	3

Sample tabulation showing how the inspector records, on Form FA 2, the results of his examination of water containers.

ing manner: In the column "F" he enters all foci found of any species of mosquitoes, at whatever stage of development encountered, whether as eggs, larvae, or pupae. In the column "FP" he enters all pupal foci of all species of mosquitoes. In the column "FA" he enters only aegypti foci, whether the focus be composed of eggs, larvae, or pupae. In the column "FAP" he enters exclusively the aegypti foci found in the pupal state of development.

The tabulation on page 16 shows that (1) three inaccessible tanks were examined, two were found sealed (2 E), and the third, which was not sealed, was oiled by the inspector (1 O); (2) three tanks were examined, in two of which larval aegypti foci were found (2 FA) and oiled (2 O), whereas the third contained fish (1 X); (3) three clay vessels were examined, in one of which a larval focus of culex (1 F) was found, and the vessel was destroyed (1 E), whereas the others contained fish (2 X); (4) one barrel was examined, was found to contain a pupal focus of culex (1 FP), and was destroyed (1 E); (5) five special artificial containers were found to have foci of culex larvae (5 F) and were destroyed (5 E); (6) three roof gutters were found with pupal aegypti foci (3 FAP), and these gutters were removed from the house (3 E); (7) two trees were found with holes in the trunks, which were filled with cement (2 E); (8) three wells were examined and all were found with fish (3 X); (9) one "other container," a puddle, was found, which was filled in with earth (1 E). In all, 12 foci were found, of which four were pupal; five of the twelve foci had aegypti larvae or eggs and three had aegypti pupae.

Totalling Form FA 2.—When the report form FA 2 is full, or the day's work ended, the inspector enters the number of houses visited in the column marked "Number" and places the sum on the "Total" line. Closed or vacant houses are not counted, unless actually inspected. The inspector sums up the number of visits made and places the total at the bottom of the column marked "Inspections."

At the bottom of Form FA 2 are four lines marked respectively "T. cont." (total containers), "E" (eliminated), "O" (oiled), and "X" (with fish). The line "T. cont." is for the totals of containers of different types inspected; the line "E" is for the totals of containers eliminated, the line "O" is for the totals of containers oiled by the inspector, and the line "X" is for the totals of containers found with fish.

Total of houses with foci.—At the bottom right-hand side of Form FA 2 are spaces for summarizing the number of houses with foci of different kinds.

Note: Houses with foci rather than number of foci are recorded. Under "Houses with F" the total number of houses with foci of any kind irrespective of stage of development (eggs, larvae, or pupae) is noted; under "Houses with FP" all houses with pupal foci of any kind are entered. Under "Houses with FA" the total of houses with one or more aegypti foci, irrespective of stage of development, is recorded, and under "Houses with FAP" the number of houses with pupal aegypti foci. Thus:

Houses with F / Houses with FP Houses with FA Houses with FAP	Registers one or more foci of larvae <i>not aegypti</i> , in a single house.
Houses with F / Houses with FP / Houses with FA Houses with FAP	Registers a pupal focus or foci <i>not aegypti</i> , in a single house.
Houses with F / Houses with FP Houses with FA / Houses with FAP	Registers a larval focus or foci containing aegypti larvae, not pupae, in a single house.
Houses with F / Houses with FP / Houses with FA / Houses with FAP /	Registers a pupal focus or foci containing aegypti pupae, in a single house.

Noting foci on reverse of Form FA 2.—As soon as the inspector has recorded a focus on Form FA 2 he makes the corresponding entry of it on the reverse side of the form, under the heading "(A) Containers."

(A) CONTAINERS

Containers with Water	Containers Inspected	Foci of All Species		Foci of Aegypti		Pupal Foci	Containers Eliminated	Containers Oiled	FISH		
									With Fish	Provided with Fish	Fish Distributed
Inaccessible tanks											
Vats and tanks		//		//							
Clay vessels		/									
Barrels, drums, and tubs		/	/								
Special artificial containers		////									
Roof gutters		///	///	///	///						
Trees and plants											
Wells and pits											
Other containers											
Total:											

Section of the reverse side of Form FA 2, showing how the mosquito breeding foci recorded on the sample form on page 16 are tabulated by the type of container in which they occur.

The tabulation above illustrates how the foci recorded on the sample Form FA 2 on page 16 are entered on the reverse side of the form under the heading "(A) Containers." In a section headed "(B) Houses" on the reverse side of the form the inspector records the weekly summary of his work.

Closed vs. vacant house.—A closed house is one from which the dwellers are temporarily absent, that is, a house in which there is furniture. A vacant house is one that is untenanted and unfurnished.

Closed houses noted in Form FA 2.—A house found closed by the inspector is noted on Form FA 2 in its regular place on his itinerary, with an entry in the column devoted to containers: "closed at nine o'clock," or whatever time the attempt was made to visit the house. The inspector keeps a separate list of closed houses, using another Form FA 2, and writing at the top of it: "List of closed houses," and filling in on this list, the columns "Street," "Number," "Inspections," and "Block." When summarizing Form FA 2 the number of closed houses is not counted in the total of houses inspected.

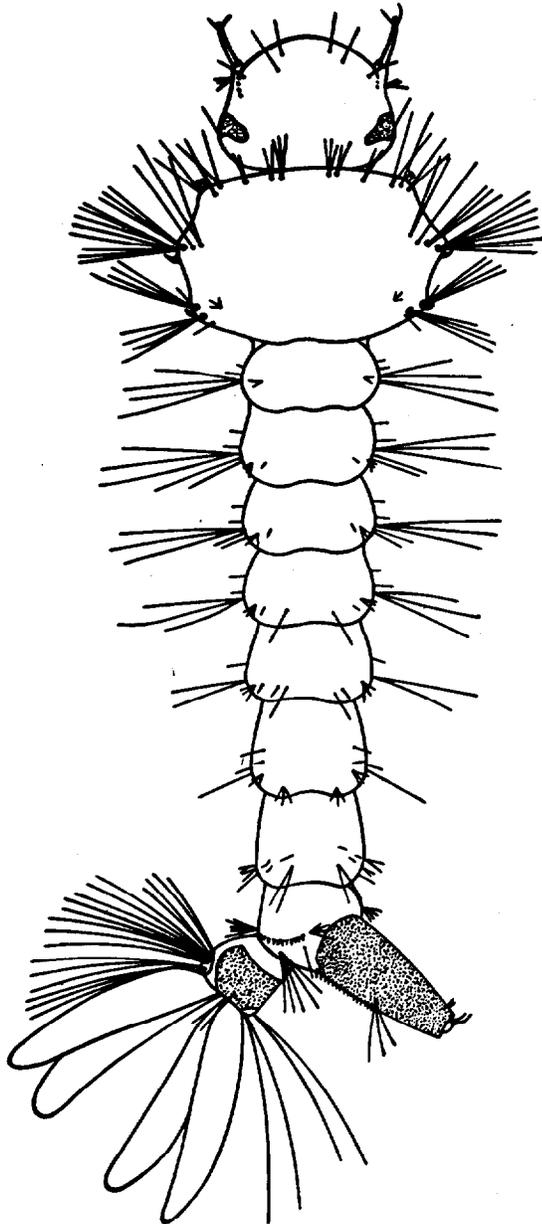
Inspection of closed houses.—After the itinerary of the zone has been completed the inspector hands a copy of his "List of closed houses" to his district inspector. He then revisits these houses in the order of listing. He enters the results of the second visits in the column provided for this purpose, and also includes them in the weekly summary for the zone.

Closed houses not inspected.—The houses which cannot be inspected on the second visit are entered on a third Form FA 2, at the top of which is written "List of houses not visited in the week of Sept. 17-23," or whatever the week may be. The inspector keeps this form until the following week or cycle, and, on this occasion, reports the houses which remain unvisited. This form must be promptly delivered for the director's information through the district inspector. In rural districts these forms are sent in with the District Inspector's Work Sheet (Form FA 4).

Houses habitually closed.—On any house from which the dweller is habitually absent on the occasion of the inspector's visit, Form FA 43 (Request for Keys) is posted in a conspicuous place, or this document is handed to a neighbor with the necessary instruction. If after the posting the occupant fails to facilitate the inspector's visit by leaving the key with a neighbor, or leaving the door unlocked, the inspector forwards a note to this effect to the district inspector, who then consults with the director as to what measures should be taken.

Houses partially closed.—In houses in which there are several families, it may happen that all visits cannot be made on account of the absence of some of the families. In such cases the inspector enters in the column "Inspections" on Form FA 2, the total of visits which should be made in the house; next

AEDES AEGYPTI



ANTENNAE, short and scarcely visible

HEAD, rounded, smaller than thorax

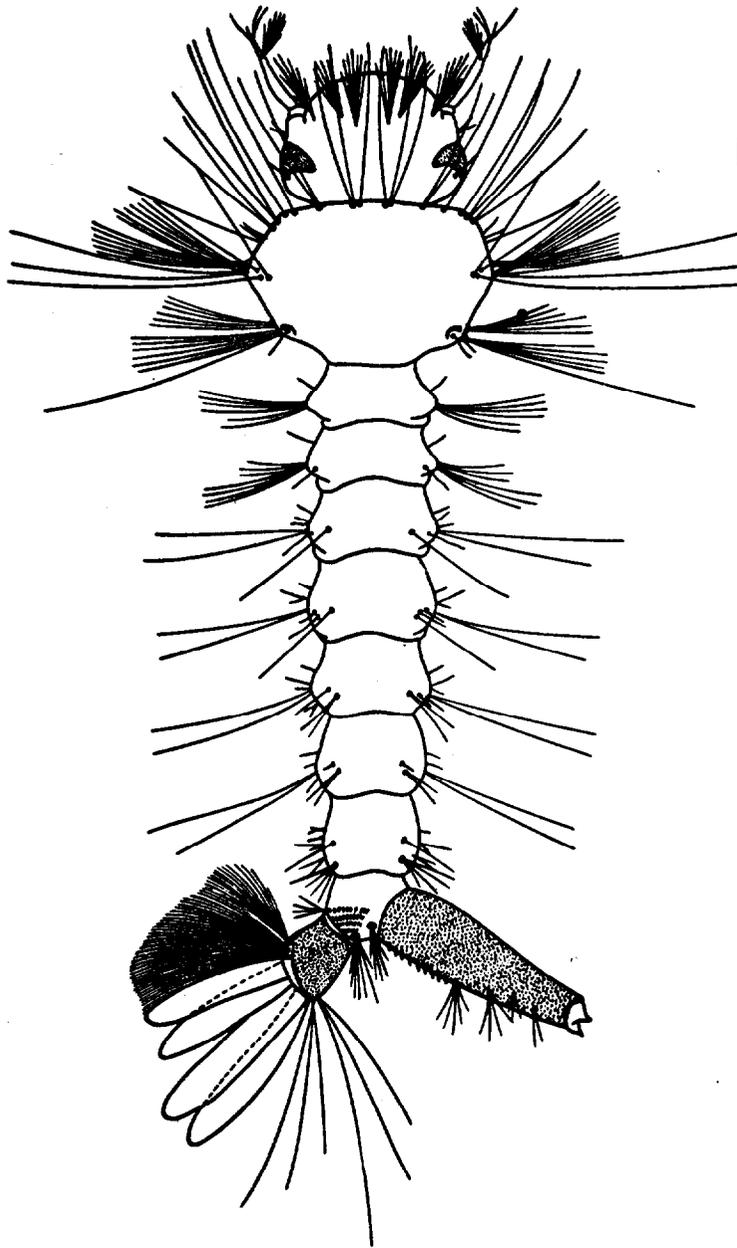
THORAX, relatively small

ABDOMEN, elongated and gently tapering

SYPHON, short, thick, and darker than body of the larva

FIG. 7. *Aedes aegypti* larva.

CULEX



ANTENNAE, large, more prominent than in *aegypti*

HEAD, relatively large and wide

THORAX, prominent, much wider than the abdomen

ABDOMEN, relatively short

SYPHON, longer and lighter in color than in *A. aegypti*
Syphon of *Culex* is about the same color as the body of the larva

FIG. 8. *Culex* larva.

to this in the same column he notes in brackets the number of visits not made; thus, 3 (1) means that three visits should have been made but only two were possible as the other apartment was closed. In his "List of closed houses" the inspector enters the address of the house and writes in the column "Inspections," the number which remain unmade. When visits to these houses or apartments are made later, the result is added to the respective columns provided for containers and foci, care being taken to avoid double entries in the weekly summary.

Vacant houses: classification.—Vacant houses are divided into two categories: those which may be visited by the regular inspector of the zone and those which require a special visit.

Vacant houses inspected by zone inspector.—Vacant houses for which the keys are easily obtained, or which are accessible to the inspector without change in his itinerary, are visited by him and included in his regular report (Form FA 2).

Vacant houses inspected by vacant house inspector.—Vacant houses difficult of access, because the keys are with the owners or agents, are generally most conveniently inspected by the special vacant house inspector.

Census of vacant houses (Form FA 59).—Vacant houses not visited by the zone inspector are listed on Form FA 59 (Vacant House Census). The inspector keeps up to date the copy of his census with the addresses of vacant houses not visited in his zone. When he observes that a house has been vacated he reports it to his district inspector.

Similarly, when a house in this list is reoccupied he reports its reoccupation to his district inspector and includes it in his routine inspections.

High tanks: classification.—High tanks may be divided into two categories: those which are easily accessible, and those which are inaccessible.

Accessible tanks.—Tanks easily reached by the inspector without the use of a ladder are examined by him. Should he find a tank sealed and mosquito-proof, he reports it, on Form FA 2, as eliminated.

Inaccessible tanks.—Special inspectors, oriented by lists on Form FA 105, inspect inaccessible tanks. Each of these inspectors carries a list of the tanks which he is to inspect and is responsible for reporting in writing to his district inspector all unlisted unsealed tanks found.

Note for Legal Summons (Form FA 63).—When the inspector finds conditions which favor mosquito breeding, he informs the householder and explains what must be done by the householder to correct them. The details of the unsatisfactory conditions

found, together with the measures recommended for their correction, are then carefully written out on the Note for Legal Summons (Form FA 63). This note is handed to the district inspector, who visits the house to verify the conditions and to ascertain whether or not they are being corrected. The district inspector explains in detail to the householder what work must be done, and advises him that a formal legal summons will be served if this is not attended to. He specifies the corrections to be made, explaining that it is to the best interests of all concerned that this work be completed as early as possible. Should the district inspector find that the formal legal summons to the householder is needed to get the corrections made, he signs Form FA 63 and hands it in at the office. Should he find that legal summons is not needed, he writes on the Form FA 63 received from the inspector "Summons not necessary," or "Already complied with." (The Note for Legal Summons does not have to be verified by the district inspector before action is taken.)

Responsibility of inspector for delivering Summons.—When the Summons (Form FA 83) based on Form FA 63, is issued the inspector delivers it to the householder on his next visit. The copy is left with the householder and the original, countersigned by the householder, is returned to the district inspector, with the notation, "Delivered and signed," entered on the back under "Results," and followed by the inspector's name and the date. The district inspector delivers the countersigned Summons to the office at the first opportunity. Should the householder refuse to countersign the Summons the inspector leaves the copy at the house, and notes under "Results" on the original, "Refused to sign; copy delivered."

Should the householder be absent, the inspector ascertains when and where he may be found and enters this information under "Results." Should the inspector find that the requirements of the Summons have been met, or that the house is closed, he makes due note, signing and dating this in the proper place. In no case should the inspector keep the Summons in his possession beyond the date marked for delivery. If for any reason the Summons cannot be delivered, the inspector notes the reason under "Results," and returns the form, signed and dated, to the office through the district inspector.

Visit to verify compliance with Summons.—When the legal period given for compliance with the Summons has expired, the original Form FA 83 from the files is reissued to the inspector, who verifies whether or not the required corrections have been made. If he finds that the recommendations have been carried

out he notes this under "Results." Should unforeseen difficulties occur, such as meeting with a refusal to permit inspection, or the finding of a closed house, this is reported under "Results," and Form FA 83 is returned to the office once more. The nature of the difficulties is reported on the back of the Summons and a new visit for verification ordered.

Mosquito Identification

Mosquitoes generally can be distinguished from other insects by a glance at the proboscis, which in mosquitoes is much longer in proportion to the body than in other insects. The proboscis is used in feeding, but only that of the female mosquito can penetrate the skin for a blood meal. The male generally lives on plant juices. The sex of mosquitoes can be determined rapidly by examining the antennae, which are hairy and plumed in the male and simple in the female.

Aedes (Stegomyia) aegypti: Color dark. Light lyre-like design on thorax; silvered spots on the sides of thorax and abdomen; white rings on legs. Biting takes place at any hour of the day or night, but there is a preference for daylight feeding.

The female scatters her eggs in small lots and may lay in several containers on the same day. The eggs

are small, single, dark, and difficult to see on the walls of water containers with the naked eye.

Other species: The Brazilian book of instructions carries short notes on *Aedes scapularis*, *Aedes taeniorhynchus*, *Mansonia titillans*, and *Limatus durhami*, which are often encountered there.

Culex quinquefasciatus (fatigans): One of the most, if not the most, widely distributed of all mosquitoes. Body of a uniform brown color; proboscis black. Abdominal segments have basal white bands. *C. quinquefasciatus* is a very domestic mosquito. It takes advantage of a great variety of types of water containers for breeding, which makes it a year-round companion to man in the tropics. Its eggs are laid in rafts comprising an entire lot from a single female. It prefers to deposit its eggs in dirty water containing organic matter, but it will also use clean water. It begins to bite late in the afternoon and feeds by preference at night.

Genus Anopheles: Also called "Nail Mosquito" from its perpendicular resting position on the wall. Wings of most *Anopheles* species have characteristic spots. All of the *Nyssorhynchus* species have white bands on legs. The *Anopheles gambiae*, as seen with the naked eye, has uniformly colored legs. The anopheline mosquito is the vector of malaria.

CHARACTERISTICS OF AEGYPTI AND CULEX LARVAE	
<i>Aedes aegypti</i>	<i>Culex</i>
Snake-like movement of the whole body.	Whip-like movement, more pronounced at the siphon than at the head.
Moves aimlessly, slow to reach its destination.	Quick to reach its destination.
Always moves away from a bright light.	Not affected by the light.
Very timid; at the first alarm, retreats rapidly to the bottom of the water, where it may remain some minutes.	Not so timid as <i>Aedes aegypti</i> ; after being disturbed returns readily to the surface of the water.

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Forms Used by Zone and District Inspectors

For ready reference, the forms used by the zone and district inspectors are presented here although they do not form part of the book of Instructions for Inspectors of the Yellow Fever Service.

The district inspector uses the same daily report form (FA 2) as does the zone inspector, noting always whether his inspections were made with the zone inspector or in revision of the latter's work.

When a complete cycle of inspections has been terminated for all the zones of his district, the district inspector prepares his report (FA 4), which summarizes for the district both his own and the zone inspectors' reports (FA 2) for all zones.

Section A of Form FA 4, "Mosquito Breeding by Containers," summarizes the work of one complete cycle of visits, whether this represents the work of one week, two weeks, or a longer period.

Section B, "Mosquito Breeding by Houses," is filled in directly from the summaries of the inspectors' reports (FA 2). The district

inspector is responsible for the accuracy of these summaries.

Section C, "Inspections of District Inspectors," is taken from the daily reports (FA 2) of the district inspectors themselves.

The district inspectors usually meet with the medical director on Monday morning, to turn in all reports for the preceding week and to receive instructions for the current week.

ANTI-AEDES AEGYPTI SERVICE							
INSPECTION							
Date	Hour	Defects	Initials	Date	Hour	Defects	Initials

The occupant or person responsible shall be fined in accordance with Decree No. 21,434 should mosquito breeding be found on these premises or this notice be defaced or destroyed.

Form FA 52

**AUTOGRAPH HOUSE VISIT RECORD (Form FA 52, see p. 23 of
The Organization of Permanent Nation-wide Anti-Aedes
Aegypti Measures in Brazil by FLS)**

This form which constituted a type of timeclock to be punched by the inspector or other employee at the time of his visit to a given building was, I believe, introduced into the Cooperative Yellow Fever Service in Brazil from the Federal Government Service in Rio some time after 1930. This very useful--one can almost say indispensable--form is described by Francisco Soares Senna in Publication No. 1 of the Serviço de Prophylaxia de Febre Amarella: Instruções (Bahia: Imprensa Official do Estado) in 1919 (YF VIII.110). He says (p. 15, par. 3):

(over)

"For checking these visits, the squad will place in each house, by preference on the water tank, an appropriate form on which will be marked the date of the visit and the signature of the foreman."

(Copy of this card in each book (p.23) and in Administrative Manual.)

ANTI-AEDES AEGYPTI SERVICE
DAILY INSPECTION OF INSPECTORS AT DISTRICT HEADQUARTERS
DISTRICT INSPECTOR'S REPORT

Visa _____

..... District

Doctor _____

Zone	Name of Inspector	STATE OF MATERIAL															
		Illumination	Flashlight	Extra Bulb	Mirror	Watch	Uniform	Instruction Book	Form-holder	Blank Forms	Oil Can	Flag	Pennant	Pick-hammer	Identification Card	Zone Map	Glue

Symbols { + = In good condition or present
 { - = In bad condition or absent

Date _____

 District Inspector

ANTI-AEDES AEGYPTI SERVICE

DISTRICT INSPECTOR'S WORK SHEET

Week.....

State..... County..... Locality.....

District..... Cycle of visits..... days

Date of opening..... Week of the service..... from..... to..... 19.....

No. of Zones	PERSONNEL	
Last census	Name	Position
Date:		
Houses		
Population		
Altitude meters		
Meteorological data during the period from to 19.....		
Rainfall mm.		
Temperature:		
Maximum mean		
Minimum mean		

(A) MOSQUITO BREEDING BY CONTAINERS

Containers Found with Water	Cont. Inspected	ALL SPECIES		A. AEGYPTI		Cont. Eliminated*	Cont. Oiled	FISH		
		Foci	Pupal Foci	Foci	Pupal Foci			With Fish	Provided with Fish	Fish Distributed
Inaccessible tanks										
Vats and tanks										
Clay vessels										
Barrels, drums, and tubs										
Special artificial containers										
Roof gutters										
Trees and plants										
Wells and pits										
Other containers										
Totals										

* In the space "Cont. eliminated" include the number of inaccessible tanks sealed.

ANTI-AEDES AEGYPTI SERVICE

NOTE FOR LEGAL SUMMONS

Zone..... Block..... Street..... No.....

Name of resident.....

Name of landlord.....

Landlord's address.....

Type of container..... Foci..... No. of recurrences.....

Summoned for.....

.....

Signature of District Inspector

Signature of Inspector

Form FA 63

FIRST VERIFICATION

Delivered to..... Inspector of.....

Date..... To be verified on.....

Result.....

Signature of Inspector
Responsible for Verification

SECOND VERIFICATION

Delivered to..... Inspector of.....

Date..... To be verified on.....

Result.....

Signature of Inspector
Responsible for Verification

Form FA 63 (Reverse)

The zone inspector enters on this form the details of unsatisfactory conditions found in any house in his area.