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AN ANNOTATED LIST OF THE MOSQUITOES FOUND IN THE
VICINITY OF AN ENDEMIC FOCUS OF YELLOW FEVER
IN THE REPUBLIC OF COLOMBIA.¹

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During the summer of 1935 the writer made a mosquito survey of the area around Restrepo, in the Intendencia (province) of Meta, some 20 kilometers to the north of Villavicencio, the capital of that Intendencia, in the Republic of Colombia.

Yellow fever had appeared there in 1934 (1), and one case so diagnosed on the basis of a positive liver examination occurred in the vicinity during the writer's stay. Comparatively little was known of the mosquito fauna of the region, and as the disease is transmitted chiefly by mosquitoes, a knowledge of the species present was urgently required.

Restrepo is a small town lying at the base of the foothills of the eastern slope of the Andes, at an elevation of approximately 1800 feet. The climate, in spite of the elevation, is tropical, with abundant rainfall, apparently distributed so that there are two wet seasons, one in the fall, and another in May and June. However, these wet seasons are really times of more abundant rainfall, as during the writer's stay rain fell nearly every day, and even during late September, before the advent of the fall rains, there was only one period of three successive days in which no rain fell. Temperatures were relatively high, reaching 85° and 90° F. during the day; humidity was likewise apparently high, but became progressively less as the summer advanced.

The region around Restrepo is almost ideally located to provide good collecting ground for insects of all kinds. To the west, easily accessible from the town, lie the rather steep slopes of the foothills of the Andes. To the east lie the great llanos or plains, stretching out in a nearly unbroken expanse to the

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Atlantic Ocean. The slopes of the foothills are clothed with dense rain-forest, with many rapid mountain streams; in the forest are dense stands of large bamboo, which provide shelter and breeding-places for many mosquito species indigenous to this plant. Many sorts of water-bearing plants abound, including wild banana (*Heliconia* spp.), *Calathea*, aroids, bromeliads, and various palms, whose fallen spathes hold water, and form excellent breeding-places for many sorts of Culicid larvae. Besides these plants, rot-holes in the large jungle trees provide breeding-places for several species of *Haemagogus*, *Aedes* and *Dendromyia*. Along the base of the foothills, in the jungle, there are many leafy pools which harbor *Aedes* larvae, and in the open grassy pools of the roadsides and the plains species of *Psorophora*, *Mansonia*, *Culex* and *Anopheles* are found.

An attempt was made to obtain the larvae of as many species as possible, to associate them with their adults, to discover any hitherto unknown larvae, and to obtain specific data regarding their breeding-places. In this the writer was quite successful, as in a very large percentage of the species present he was able to associate reared adults with their larvae, and also obtained material of a number of undescribed larval forms.

The writer reached Restrepo on July 8, 1935, and remained there continuously until September 23d, with the exception of the first 13 days in August. His first collection, made with a sweep-net on July 10th, contained the greatest number of species and of specimens taken in any collection during his stay. There was a gradual, progressive diminution in numbers of all sorts of mosquitoes, with the exception of the common species of domestic *Culex*, as the summer advanced and the rains decreased. In all, nearly 80 species were collected during the survey. Several species, not taken by the writer, were found and identified among material collected before his arrival. The greater number of the species were already known to the writer, as the mosquito fauna of the region was surprisingly like that of Panama, where the writer has spent the last five years. The species found are listed below in the order in which they appear in Dyar's "The Mosquitoes of the Americas."

Tribe SABETHINI, Genus *Sabethes* Robineau-Desvoidy.

1. *Sabethes goeldii* H. D. & K. Several females were found in the collections made during the writer's stay.
2. *Sabethes schausi* D. & K. One female in poor condition. Retiro, near Restrepo, Aug. 23, '35.
3. *Sabethes cyaneus* Fabr. Larvae were taken on several occasions from the dark brown water deep in the slender stumps of a species of "fish-tail" palm. Shannon (2) has described and figured the larva. The writer

does not believe that the larva is predaceous, as several were taken in one tree-hole at a time; they paid no attention to small *Culex* larvae placed with them in cultures, but fed upon protozoal scum furnished them, and came to maturity on this food. The writer was bitten once by a female, in dense jungle. The bite was not very painful, and the insect was easily scared off.

4. *Sabethes albiprivus* Theobald. Several female specimens corresponding to the description of this species were taken at various times, in deep jungle. Because of their rarity and shyness, none of the species of this genus are likely to be concerned in the transmission of yellow fever.

Genus *Sabethoides* Theobald.

5. *Sabethoides serratoria* Dyar and Nunez T. Two female specimens from Retiro, near Restrepo. Other species of the genus should occur in the region, the larvae in bamboo.

Genus *Limatus* Theobald.

6. *Limatus durhamii* Theobald. This was one of the commonest species of the region. The larvae were found many times in the water in fallen palm-spathes, and in other fallen leaves. The adults came to bite, but were not aggressive.
7. *Limatus asulleptus* Theobald. This species was nearly as common as the preceding, and had the same habits. Females may be distinguished from those of *durhamii* by the abdominal coloration. In *asulleptus* the light under side is separated from the dark dorsum in a straight line. In *durhamii* the light color of the under side cuts into the dark upper side in a series of wedge-shaped marks.

Genus *Wyeomyia* Theobald.

8. *Wyeomyia celaenocephala* D. & K. The larvae of this species were taken several times from the water between pineapple leaves. No adults were taken in collections.
9. *Wyeomyia flavifacies* Edwards. Several specimens corresponding to the description of this species were taken in September near the Guacavía River, about a 3-hour journey from Restrepo. They were taken attempting to bite.
10. *Wyeomyia aphobema* Dyar. Adults were bred from larvae commonly found in Bromeliads, both terrestrial and arboreal. No adults were taken in hand collections.

Genus *Dendromyia* Theobald.

11. *Dendromyia complosa* Dyar. The larvae were taken on several occasions in the water in a small Bromeliad. Adults were taken by sweeping with a net near the same locality, but were not aggressive biters.
12. *Dendromyia aporonomia* D. & K. The larvae were taken on several occasions from the clear dark-brown water in tree-stumps. Adults occasionally came to bite, but were not aggressive.

13. *Dendromyia melanocephala* D. & K. The larvae were found in the water at the base of the leaves of "elephant-ears," *Colocasia*. The slow-flying adults were sometimes seen hovering in the shade of these plants, but never attacked.
14. *Dendromyia cloisa* H. D. & K. Several small adults were bred from larvae taken from the flower-bracts of plants of the genus *Calathea*, growing in dense jungle. The species is apparently rare.

Genus **Goeldia** Theobald.

15. *Goeldia longipes* Fabr. Adults were fairly common in hand-catches early in the season (July). Larvae were taken on one occasion from water in the leaf-bases of *Colocasia*, where they were feeding on other larvae.
16. *Goeldia pallidiventer* Theobald. The larvae were taken in the water in cut bamboo, feeding on other larvae. da Costa Lima (3) gives a photograph, but no description of the larva. No adults were taken in hand-catches.
17. *Goeldia* n. sp. A single larva, probably from water in the flower of a species of *Heliconia* (it was brought into the laboratory without data), produced a female specimen. The larva is unlike any figured by Dyar. A description of this larva will be made in a forthcoming publication.

Genus **Joblotia** Blanchard (*Trichoprosopon* Theobald).

18. *Joblotia digitata* Rondani. This was the only species taken in the region. The fat white larva was common in cut bamboo, and the adults were fairly numerous in the jungle near their breeding-places. They are very conspicuous with their slow, undulating flight, with out-spread white-tipped legs. The bite was severe, but the adults were easily scared off.

Tribe **CULICINI**, Genus **Psorophora** Robineau-Desvoidy.

19. *Psorophora ciliata* Fabr. A single larva was taken in a road-side pool, from which a male emerged. As noted by Shannon (2), specimens from the tropics are usually much darker than those from temperate climates. Dyar's statement, "Not found in tropical lowlands," is obviously incorrect. The very large larva is predaceous.
20. *Psorophora ferox* Humboldt. This was the commonest species of the genus found in the region. It was present throughout the whole time of the writer's stay, although less numerous towards the latter part. It is an aggressive biter, and was found in open jungle far from the type of temporary pools in which it normally breeds. It bites by day, and has been shown capable of transmitting the virus of yellow fever. It should be regarded with suspicion as a vector wherever it is found. In the writer's opinion, it is far more potentially dangerous than any species of *Haemagogus* with which he is familiar, either in Panama or Colombia. Larvae were found in ground-pools.
21. *Psorophora lutzii* Theobald. This species is much like the preceding, but with yellowish scales on the sides of the thorax on each side of a broad central longitudinal dark line. The larvae were not found, but adults were taken several times in hand-catches.
22. *Psorophora cyanescens* Coq. No larvae were found, but a single female

specimen was found among material collected shortly before the writer's arrival at Restrepo.

23. *Psorophora confinnis* Arrib. The larva was not found, but the adult was taken by sweeping with a net, and also in night collections using horse-bait.
24. *Psorophora cingulata* Fabr. This species was also taken on horse-bait. The larva was not found. The adult resembles *Ps. confinnis* somewhat, but may be distinguished from this by having only dark scales on the wing. Martini (4) has discussed the variability of the terminalia of *Psorophora* species, and has shown that the number of setae on the claspette is variable.

Genus *Haemagogus* Williston.

25. *Haemagogus janthinomys* Dyar. This was the only species of the genus found during the writer's stay in Restrepo. Soper (1) mentions *H. equinus* as the species present, but this is a misidentification. Dyar states that the claws of the female of *janthinomys* are without teeth, as in *H. equinus*, but the writer bred dozens of females and males from identical larvae, corresponding to the hairy larvae and the male types from Trinidad; all the females had toothed claws. The type females from Trinidad have no associated larvae, and it is probable that they are not the same species. Dyar states that the head-hairs of the larva are double. In the only larva of this species in the collection of the U. S. National Museum in which head-hairs are present, these hairs are single. Otherwise everything else agrees with Dyar's description. Dyar's figure of the male terminalia of this species is unusually good; the writer's material corresponds, both with the figure and with the mounted terminalia of two types in the museum. Larvae were found in many sorts of breeding-places: cut bamboo, tree-holes, stump-holes, and the deep holes in the rotted trunks of certain palms. Such breeding-places were found in open fields, where the water was exposed to the sun, and in dense twilight jungle. The adults, in the writer's experience, were not very aggressive; at one time no less than twelve females were hovering around him, but not a single one bit. However, he was bitten in bright sunlight, at 2 P. M., on one occasion. The insects seem to tackle low, preferring the ankles and lower parts of the legs. The bite was not immediately perceptible, but considerable irritation occurred after the insect had withdrawn its proboscis. The adults were most numerous early in the season, and gradually diminished in numbers as the season advanced. Larvae could be found at all times, however.

The latest treatment of the genus, by Dyar in "The Mosquitoes of the Americas," is perfunctory, and the genus is in need of thorough revision. Dyar sometimes associated males and females on locality alone, although he recognizes that more than one species may occur in the same locality, even in the same culture. As the females are specifically unrecognizable in this genus, and differ only in presence or absence of teeth on the tarsal claws, males are required for specific determination. If possible, these should be bred from larvae, and females from identical larvae can then be correctly associated. Edwards (5) has shown that Dyar's separation

of the genus into two subgenera, on the basis of palpal length in the male and absence or presence of teeth on the claws of the female, will not hold; he separates them on the basis of the length of the male palpi only.

Genus *Aedes* Meigen.

26. *Aedes leucocelaenus* Dyar and Shannon. Larvae of this species were taken in tree-holes. The larva has been figured, without description, by Costa Lima (6). Shannon (2) gives reasons why this species should be referred to *Aedes*, rather than to *Haemagogus*, which it greatly resembles. The species represents a transition form between the two genera.
27. *Aedes serratus* Theobald. Larvae were taken in temporary pools at Retiro, near Restrepo. A few adults were taken in hand-catches. If numerous, in any locality, it should be regarded with suspicion as a yellow fever vector, because of its close relationship to other proved vectors.
28. *Aedes hastatus* Dyar. The larvae were taken twice, once in a temporary pool in an overflowed pasture, and again in a small leafy jungle pool in dense forest. The species is apparently rare, none being taken in hand-catches. Edwards (5) suggests that this is the same as *A. dupreei*, but there are great differences in the claspette of the male.
29. *Aedes angustivittatus* D. & K. Dr. E. Osorno M. took larvae from temporary pools near Retiro. The skin of the larva is densely pilose. Adults reared from these larvae had the thorax suffused over with white, instead of having the two narrow yellowish lines characteristic of the species as found in Panama. The Colombian species thus much resembled *A. scapularis*, except that the light scales are not silvery, as in *scapularis*. No adults were taken in hand-catches.
30. *Aedes crinifer* Theobald. A single female corresponding to the description of this species was found in collections made before the writer's arrival. Without males, it is difficult to be sure of this species. Dyar's description of the claspette filament is erroneous, as it has a single retrose spine, instead of "five retrose teeth." *Aedes lynchii* Brèthes is a synonym of *crinifer* Theobald.
31. *Aedes scapularis* Rondani. A few adults were taken in hand-catches in open jungle early in the season. Larvae were not obtained. This species is regarded as a dangerous vector of jungle yellow fever, having been associated with several epidemics in which *Aedes aegypti* was not found. The larva has a densely pilose skin.
32. *Aedes terreus* Walker. No adults were taken in hand-catches, but larvae were common in water in tree-holes. The adult females corresponded to the description given by Shannon (2), in having a central line of black scales on the thorax, between two silvery patches on the sides. *A. podographicus* D. & K. is a synonym, according to Shannon (2) and to Edwards (5).
33. *Aedes dominicii* Rangel & Romero Sierra. This was rather a common species, biting freely in the jungle, early in the season. The males have been hitherto unknown. The species, placed by Dyar in the subgenus Howardina, really belongs to a new subgenus, lacking claspettes, but possessing aedine characters in the mesosome. The larva and its breeding-place were also unknown until at the writer's suggestion Dr. E.

Osorno M. collected larvae from saxicolous bromeliads, from which males and females were obtained. Because of its apparently close relationship to *Aedes aegypti*, and because of its biting-habits, it should be regarded with suspicion as a potential vector of yellow fever, and experiments undertaken to ascertain its possibilities in this respect.

34. *Aedes*, new species. A single male of a small *Aedes* superficially resembling *Aedes dominicii* was taken in deep jungle near Restrepo by the writer. Subsequently a number of other males were found in hand-catches from Retiro. The male terminalia somewhat resemble those of *Aedes dominicii*, no claspettes being present. No larvae associated with this species were obtained.
35. *Aedes septemstriatus* D. & K. The adults were common in the jungle early in the season. The hitherto unknown larvae were taken in tree-holes on several occasions, and will be later described.
36. *Aedes sexlineatus* Theobald. A single female of what may be this species was taken in a hand-catch near Retiro, nor far from Restrepo. There are six narrow golden lines on the mesonotum, all of which reach the anterior edge. No males are available, which is to be regretted, as this sex is unknown.

Aedes aegypti L., the "yellow fever mosquito," was not found anywhere in the region. The holy-water font in the church at Villavicencio contained *Culex* larvae, but no *aegypti*. These fonts seem to be a favored breeding-place for *aegypti*, and if the mosquito is present in a community, the larvae can usually be found in such containers. The writer did not see an adult of this species during his stay in Restrepo. During this time, cut bamboo sections and other water containers with hay infusion (a favorite food of *aegypti* larvae) were set about the laboratory premises, but no larvae of *aegypti* were obtained.

Genus *Mansonia* Blanchard.

37. *Mansonia titillans* Walker. Several specimens corresponding to the description of this species, but in poor condition, were taken in hand-catches, using horse-bait. A single larva was taken from grass-roots in a temporary pool in an overflown pasture, near Restrepo.
38. *Mansonia albicosta* Peryassu. A collection of this species was made on the llanos near Restrepo by Dr. Jorge Boshell.
39. *Mansonia arribalzagai* Theobald. A single specimen, mouldy and in bad condition, was found among the material collected prior to the writer's arrival in Restrepo. This may possibly be *M. lynchi* Shannon (2).

Genus *Lutzia* Theobald.

40. *Lutzia allostigma* H. D. & K. A single female was captured in a house in Restrepo, and was brought to the laboratory by the householder. Larvae and pupae were taken twice by the writer, once in a split bamboo stem used as a chicken watering-trough, and again in the stump of a palm hollowed out as a larva trap. The larvae are predaceous on other mosquito larvae, but are never numerous enough to be of much assistance in control. They seem to prefer clean water, and were never found in company with *Haemagogus*.

Genus *Culex* Linnaeus.

41. *Culex (Carrollella) iridescens* Lutz. Larvae of this species were taken in many collections, mostly from tree-holes, bamboo, and palm-spathes. The adults so closely resemble those of the next species, *C. secundus* B.-W. & B., that separation is impossible without males. This is likewise true of the larvae of the two species.
42. *Culex (Carrollella) secundus* B.-W. & B. Larvae were found with those of the preceding species, also in tree-holes and bamboo. They were also very common in the region.
43. *Culex (Carrollella) metempsytus* Dyar. The larvae were taken many times in cut bamboo. Adults were not taken in hand-catches. Dyar's descriptions of the females of this species and the two preceding are identical, word for word, although in the original description the characteristic greenish tint of the pleurae is correctly described.
44. *Culex (Carrollella) urichii* Coq. The larvae were among the most common encountered in the region. Almost every tree-hole contained them, and they were also found in palm-spathes containing water, in bamboo, etc. The adults were fairly numerous in the jungle early in the season. A few came to bite, but were not aggressive. They may be easily distinguished from the other *Carrollella* species by the white-marked fourth hind tarsal segment, and their usually larger size.
45. *Culex (Carrollella) infoliatu*s B.-W. & B. The larvae were common in tree-holes, and many were taken from a palm-spathe on the ground, holding water. The adults were common in the jungle, but did not bite. *C. (C.) bihaicolus* Dyar & Nuñez T. is undoubtedly a synonym of *infoliatu*s. Dyar could find no characters on which to separate the larvae, and the single slide of the male terminalia of *bihaicolus* in the U. S. National Museum collection is in such poor shape that no details can be made out.
46. *Culex (Mochlostyrax) pilosus* D. & K. This small *Culex* has a very wide range, from the Southern United States to Colombia and Brazil. The peculiar small larvae, which lie on their backs for long periods, keeping their mouthbrushes in constant motion, are provided with an accessory tracheal gill system on the head. They were very numerous in grassy temporary pools dug to obtain mud for bricks, near the Restrepo laboratory. Adults were taken by sweeping in the open jungle near Restrepo.
47. *Culex (Mochlostyrax) taeniopus* D. & K. Several females with the characteristic white rings on the hind tarsi were taken by sweeping. Without males it is impossible to be sure of the species, as *opisthopus* Komp likewise has the same character.
48. *Culex (Mochlostyrax) distinguendus* Dyar. The hitherto unknown larvae were taken twice, and will be described by the writer. They occurred in the water held between the ridges of the trunk of large fallen trees, in dense jungle. Adults were not taken in hand-catches or by sweeping. The species is apparently rare, and has previously been reported only from Panama.
49. *Culex (Mochlostyrax) elevator* D. & K. The larvae of this species were taken in jungle-pools. Adults were obtained by sweeping. Apparently the adults do not bite.
50. *Culex (Mochlostyrax) inhibitor* D. & K. This little black species has a

very wide range. Larvae were taken along with *C. pilosus*. It apparently is a very common species, but the adults were not taken biting.

51. *Culex Mochlostyrax bastagarius* D. & K. This is also a wide-ranging tropical species. Larvae were taken in a grassy pond in an overflowed pasture. Dyar's figure of the male terminalia is incorrect. Miss Evans (7) described the species under the name *innominatus*, and gives an excellent figure of the terminalia. The females apparently do not bite.
52. *Culex (Melanoconion) dunni* Dyar. This little species also has a wide range. Larvae were found with those of *bastagarius*, in a grassy pond. The pupae have very long breathing-trumpets. The adults when freshly emerged have a distinct pattern of golden lines on the thorax, not mentioned by Dyar, but described by Bonne-Wepster and Bonne (8) under the species *ensiformis*. This pattern fades in old specimens.
53. *Culex (Microculex) chryselatus* D. & K. A single female of this beautiful species was reared from a pupa taken in an arboreal bromeliad.
54. *Culex (Microculex)* sp. A male and a female specimen of this subgenus were taken by sweeping in the jungle with a net. They both possess the large black spot in the integument at the base of the wing which is present in two known species, *automartus* Root and *ocellatus* Theobald. The writer has not had the opportunity to mount the male terminalia of his single male.
55. *Culex (Culex) nigripalpus* Theobald. This species was very common and domestic in Restrepo during August and September. Many egg-rafts of this species, and of *C. quinquefasciatus* and of *C. corniger*, could be found on the surface of containers with hay-infusion, left accidentally uncovered outside of the laboratory. Adult females and males were very numerous in sleeping-quarters, but the females apparently did not bite freely.
56. *Culex (Culex) chidesteri* Dyar. Several males of this species were taken by sweeping with a net in the jungle near Restrepo.
57. *Culex (Culex) corniger* Theobald. The adults were quite numerous and domestic in Restrepo early in the season. The distinct thoracic pattern renders it easy to distinguish from its allies. The larvae were found in containers, and in sections of bamboo set out around the laboratory as larva-traps. The adult females were not aggressive biters.
58. *Culex (Culex) mollis* D. & K. This was one of the commonest *Culex* in the locality. It was taken almost everywhere, being found in containers, tree-holes, bamboo, ground-pools, etc. The larva and male terminalia are characteristic. Apparently the adults do not bite.
59. *Culex (Culex) quinquefasciatus* Say. This species constituted a pest of the first magnitude in Restrepo during the latter part of the writer's stay. Males and females were common in sleeping-quarters, and necessitated the use of bed-nets. Apparently there was some very large sewage-polluted collection of water in the neighborhood, which was producing adults in large numbers.
60. *Culex (Culex) coronator* D. & K. This was a very common larva, found in tree-holes and ground-pools. There is great variation in the number of spines on the breathing-tube. In some specimens no spines are present, or at most only one or two; in others there is a very distinct crown of

spikes, which sometimes extends down the ventral aspect of the air-tube almost to the base. Specimens from tree-holes very often have the air-tube deeply infuscated. Apparently the adult females do not bite.

Genus **Orthopodomyia** D. & K.

61. *Orthopodomyia fascipes* Coq. The larvae of this species were quite common, being found in tree-holes with *C. (C.) urichii*. The ground-color of the adults is quite variable, some being much lighter than others. The rather long female palpi and the raised scales and spines on the tips of the femora, a character not mentioned by Dyar, serve to differentiate it from other species. There is considerable variation in the amount of white on the segments of the hind tarsi. In many specimens the amount is much reduced; in some the white is present only on the under side of one of the segments, usually the third. Adults were captured flying in the jungle. Apparently the species does not attack man.

Genus **Megarhinus** Robineau-Desvoidy.

62. *Megarhinus bambusicola* Lutz & Neiva. A single specimen was in the collections made before the writer's arrival, and another perfect female was bred from bamboo by Dr. E. Osorno M., collected at Retiro, near Restrepo.
63. *Megarhinus trinidadensis* D. & K. Several specimens of this species were bred from bamboo. All the larvae of this genus are predaceous, but the adult females can not bite.

Genus **Uranotaenia** Arribalzaga.

64. *Uranotaenia geometrica* Theobald. Several females were bred from larvae taken in grassy pools near Restrepo. The genus, usually so well represented in the tropics, was poorly represented in the vicinity.
65. *Uranotaenia* sp. A single female, in poor condition, was reared from a small larva found in a tree-hole near Rio Guacavia, during the latter part of the writer's stay. Larval characters are poor in this genus, so absolute identification of the species is impossible.

Tribe ANOPHELINI, Genus **Anopheles** Meigen.

66. *Anopheles (Chagasia) fajardoi* Lutz. Four small larvae of this species were taken from the vegetation along a rapid stream running down from the foothills near Restrepo, from which adults were reared. The pupae were of the *fajardoi* type, without a projecting flap on the respiratory trumpet, as described by Root (9). Adults were rather numerous early in July, being taken with horse-bait. The horses were almost invariably attacked under the belly. Shannon (2) has recently cast doubt on the validity of *Chagasia bonnae* Root. We would prefer to see his findings confirmed before accepting them, as they are much at variance with usual experience.
67. *Anopheles (Nyssorhynchus) bachmanni* Petrocchi. Several males were bred from small larvae taken in the grassy edges of a pasture-pool near Restrepo. No water-lettuce (*Pistia*), with which this species is generally associated in Panama, was present in the region, so far as the writer

knows. Rozeboom (10) has recently shown this species to be infectible with tertian malaria.

68. *Anopheles (Nyssorhynchus) tarsimaculatus* Goeldi. This was the commonest Anopheline of the region. The larvae, usually found in permanent grassy pools, were very small, and produced correspondingly small adults. The male terminalia were characteristic. The amount of black on the second hind tarsal segment was slightly less than that found in Panama specimens taken in brackish water, but more than that in the form called *aquacaelestis* by Curry (11) (= *oswaldoi* Peryassú) which occurs in fresh water in Panama. Although heavy breeding was occurring a short distance from the laboratory, no adults were taken in the sleeping-quarters, and malaria did not seem to be a great problem in the vicinity.
69. *Anopheles (Nyssorhynchus) albitarsis* Arribalzaga. Nine atypical larvae of this species were taken from a grassy pool in a pasture near Restrepo, from which adults were bred. The late N. C. Davis (12) gives a figure of such an aberrant larva, from which a female *albitarsis* emerged. In those larvae taken by the writer, the head is much elongated, and the internal clypeal hairs are very close together. The character mentioned by Shannon and Davis (13), the presence of a double row of white scales on the first abdominal sternite, is an excellent one for differentiating this species from its allies.
70. *Anopheles (Nyssorhynchus) argyritarsis* Robineau-Desvoidy. Larvae were taken on several occasions from grassy ground-pools. The species was not overly common in the region. It belongs among the several species of the *Nyssorhynchus* group with white hind tarsi, with no black band on the fifth segment, which include *darlingi*, *albitarsis*, *parvus*, *lutzi* and *pictipennis*.
71. *Anopheles (Stethomyia) nimbus* Theobald. A single female of what is apparently this species or *thomasi* Shannon was taken with a net in dense jungle. Shannon (14) separates this species and *thomasi* from *kompfi* Edwards on the character of the setae which project between the eyes of the female. Larvae were not found, although searched for carefully.
72. *Anopheles (Anopheles) gilesi* Peryassú. Two females of this species were taken by Dr. Jorge Boshell near Acacías, to the south of the town of Villavicencio. They have the same white band on the tip of the hind tibia as *eiseni* Coq., but the wings are spotted with black and white, while those of *eiseni* are predominantly black-scaled. The species is rare.
73. *Anopheles (Anopheles) eiseni* Coq. This species was fairly common in the jungle. Larvae were taken in the water in hollow trees, on several occasions. The wings are black-scaled, except for a patch of white at the apex, and a smaller one on the first vein. The tips of the hind tibiae have a broad white band.
74. *Anopheles (Anopheles) peryassui* D. & K. Dr. Jorge Boshell collected two females of this species near Acacías, south of the town of Villavicencio. Shannon and Davis (13) relegate two species, *celidopus* D. & S., and *alagoanii* Peryassú to the synonymy of *peryassui* D. & K. Shannon and Davis (13) have recently described the larva and male terminalia. The hind legs of the females from Acacías are very long, dark brown, with

- minute yellowish rings involving both ends of the segments of the tarsi. The species is rare.
75. *Anopheles (Anopheles) mediopunctatus* Theobald. Four second-stage larvae were collected in a shallow, leafy jungle-pool, from which two males and two females were reared. The pronounced yellowish color of the legs, which are spotted with black, serve to distinguish this large species. From the ninth tergites of the male terminalia there arise two long, narrow, flat, black filaments, extending to about the middle of the side-pieces. The larvae are much like those of *Anopheles punctimacula* D. & K., differing only in minor details.
76. *Anopheles (Anopheles) apicimacula* D. & K. Several specimens were taken in hand-catches in the evening, near Restrepo. The species was not very common in the locality.
77. *Anopheles (Kerteszia) boliviensis* Theobald. All specimens collected prior to the writer's arrival in Restrepo had been labeled *cruzi* D. & K. All these specimens possess abdominal scales, as described for *boliviensis*, but the hind tarsi have white bands apically, not all dark, as Theobald describes them. Neither males nor larvae were found, although searched for vigorously. The females were common in the jungle, biting freely by day, and were taken in large numbers on horse-bait in the evening catches.
78. *Anopheles bellator* D. & K. Dr. Jorge Boshell collected a number of larvae of what is apparently this species in a hitherto unrecorded habitat, the water in uncut bamboo stems, the only visible entrance to which was through small worm-holes. All these larvae died. Later he collected more larvae of the same sort, from which the writer succeeded in rearing four females. Dr. E. Osorno M. also collected larvae, apparently the same, from saxicolous bromeliads, near Restrepo, and the writer found them in arboreal bromeliads in the jungle. All these larvae differ from those found in Panama, in that the elements of the palmate hairs of the abdomen are sharply pointed, much as in *A. albimanus*, while the larvae from Panama have these elements "ligulate, with straight truncate tips." These Panama specimens are probably the true *cruzi* D. & K., while the larvae and the adults bred from them in Restrepo are probably *bellator* D. & K. (Larvae and adults from the type locality, Trinidad, B.W.I., are required to fix this synonymy). These adults from Restrepo do not possess scales on the abdomen; long fine hairs only are present, as in *cruzi* D. & K. from Panama. No adults of *bellator* were taken in hand-catches.

In addition to the 78 species listed, it is probable that others as yet unidentified will be found among the males of small *Culex*, and of the male Sabethini collected by the writer. The writer has not yet had the opportunity to determine by examination of the male terminalia all his material in these groups.

A word should be said concerning the references found most useful in identifying the mosquito material collected. Dyar's comprehensive work, "The Mosquitoes of the Americas," because it brings within one cover all the American species

known at the time of its publication (1928), was the most useful single volume. It must be used with caution, however, as many errata, some due to observational errors, some to inadequate technique, and some to somewhat hurried and careless compilation, are found in this work. This is particularly true in the section dealing with Anophelines, particularly in the descriptions of Anopheline larvae. The various publications of the late F. M. Root dealing with this group are much more reliable (15, 16). Several publications by the late N. C. Davis (12) and by Shannon & Davis (13), are also valuable in their treatment of various genera. The work of R. C. Shannon on "The Anophelines of the Amazon Valley" (14) contains useful notes and a key to the female Anopheles of that region. It is to be regretted that no keys are provided for the male terminalia or the larvae. Attention should be called to omissions in the key to the females, on p. 132. In dichotomy 5, the second clause should read: "third wing vein nearly all dark." After dichotomy 7 there should be inserted the following:

- a. Abdomen with light brassy scales on tergites 2-7, partly white on eighth.....*albitarsis* Arrib.
- b. Abdomen predominantly black on segments 2-7, the white scales of the 8th and the cerci in strong contrast.....
albitarsis brasiliensis Chagas.

First sternite without scales; 8th abdominal segment not longer than broad; only in part light-scaled . . . 8."

Shannon's "On the Classification of Brazilian Culicidae, etc." (2) contains some of the best keys to the tribes and genera of tropical Culicidae, and to the larvae and female adults of the Brazilian species of *Psorophora*, *Aedes* and *Mansonia*, which are known to the writer. Unfortunately, the proofreading of the table on page 142 is poor; in dichotomy 14, the numeral 14 in the right-hand margin should read 15. There are two dichotomies numbered 16; the first ("Mesonotal stripe creamy white in color, etc.") should be numbered 15.

Edwards' great catalogue (5) of the Culicidae is now our final authority as to the nomenclature and synonymy of this family. It is a storehouse and mine of precise information, and is particularly rich in details of the structural characters of the various tribes and genera. In treating the American forms, Edwards followed Dyar closely, and hence perpetuated several errors for which the latter is responsible. The present writer has discussed the validity of some of the types of the genus *Culex* described by Dyar (17).

In conclusion, the writer wishes to acknowledge his indebtedness to Dr. F. L. Soper, Representative of the International Health Division of The Rockefeller Foundation for South

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