

NOTES ON PHILIPPINE MOSQUITOES, VIII

Species found in the jungles of Llavac^a

By F. E. BAISAS, *Bureau of Health*

Observations on mosquitoes in the jungles of Llavac were undertaken as part of the studies on frontier malaria in the eastern section of Laguna Province. The original plan was to carry the observations for a number of years in the hope of gathering sufficient materials and information for a better understanding of at least some of the complex species. It was thought possible to undertake breeding adults from eggs laid by known mothers of such species as *Anopheles barbirostris* of which there are supposed to be two or three kinds in the Philippines, and of which one or two are found in Llavac. But the war broke out and disrupted everything when the observations were hardly well started. Consequently the mosquitoes collected, and the information obtained regarding malaria were very inadequate. Moreover, part of the notes and records, and some of the specimens among which were new species not represented in those already taken to Manila were destroyed when the town

^a The author is greatly indebted to the Director of Health, and to the Chief of the Malaria Section, Bureau of Health, for continued support and encouragement. Invaluable suggestions and criticisms were received from Col. W. V. King, U. S. Army, through personal consultations during his short stay in the Philippines and by correspondence when he returned to the United States. As much, if not more, is the author's indebtedness to Dr. Alan Stone of the U. S. National Museum, who very kindly, and with promptitude, re-examined certain type specimens, checked up notes, and compared sketches and paratypes sent to him.

Thanks are due to Capt. Emil Kotcher who lent to the author a dissecting microscope, entomological instruments, reference papers, etc., and to Lt. J. P. Taffaleti who assisted Col. King in going over the manuscript.

The author is also indebted to all members of the Malaria Section, particularly to Messrs. Pablo Sunico, Benjamin Crisostomo, and Victorino Capistrano who were alternately assigned in Llavac; to Mrs. A. U. Pagayon and Mr. F. Dantis who assisted in the laboratory work; and to Messrs. E. Enriquez and A. Luna, artists, who made all the drawings.

where these were deposited was burned down. Nevertheless, it seems reasonable to write something about the mosquitoes particularly because there is no certainty as to when the studies could be resumed, or whether the place is still suitable for such observations after the prolonged and bitter duel between the armies which took place in that area.

Also under observation was the migration of *Anopheles minimus flavirostris* as it follows man when he moves into virgin lands. For, contrary to old concepts, *flavirostris* is not a wild species in the sense commonly implied by the term "wild".^b In frontiers bordering large tracts of virgin lands, whether forests or grasslands, *flavirostris* does not breed even in ideal streams when such streams are three or more kilometers away from the nearest human habitation. Neither are its adults found in the best daytime refuge on stream banks two or more kilometers distance from houses. It seems this mosquito establishes itself only in places where it has an easy access to the blood of man and his domestic animals (carabaos particularly). In a sense, perhaps, *flavirostris* may be considered an obligatory parasite of man and his domestic animals. But since this obligatory parasitism (if it is that) is not conditioned by permanent attachment to the host, man finds temporary freedom from this parasite when he moves to virgin lands away from the flight range of *flavirostris*. Communities inside virgin forests such as the logging camps and road stations on Mindanao and Luzon show no evidence of malaria transmission simply because *flavirostris* is not there. Considerable time seems necessary for *flavirostris* to find its way into far outlying communities, the length of time depending on the extent of "screen" dividing the new communities from the old, and also upon accidental infiltration such as may be effected by motor vehicles.

Infiltration, apart from natural migration, seems to take place. In Llavac, one female *Anopheles ludlowi* and one female *Anopheles hyrcanus nigerrimus* were caught in the trap, but no breeding of these mosquitoes could be found within miles around Llavac. They were presumably transported by trucks of which many used to make short stops at the place to give the passengers a chance to take some refreshment.

^b Christophers (1933, p. 64) defines wild species as "..... those found almost entirely in forest or jungle, which attack man (when they do so) only in their own native haunts"

Llavac is located in the middle of the Sierra Madre (Mts.) about halfway by motor road between Famy, Laguna, and Infanta, Tayabas. It represents a typical Philippine forest the primeval state of which has not been altered. In general aspects it cannot be differentiated from virgin forests of Mindanao, Mindoro, or Palawan, the slight faunal and floral differences being, in most cases, recognizable only by trained biologists. The elevations of the different hills and valleys around the place vary between 350 to 1,500 feet above sea level. There are many creeks, but none is located at points above 1,000 feet elevation. The Government made it a National Park where cutting of trees and other plants was forbidden. One of the most beautiful spots there was reserved as the camp site of the American Boy Scouts. The territory under observation for mosquitoes had an approximate radius of three kilometers with the trap at Llavac as center. All accessible water collections, such as axils of palms, *Colocasia*, and wild bananas, pitcher plants, tree holes, holes in trunks of palms, rockholes, pools, creeks and rivers, were periodically inspected at least once in two weeks depending upon the importance of each breeding place. For comparison, but more for *flavirostris*, creeks and other breeding places along the road between Famy and Infanta (about 40 km.) were also inspected once a month.

Llavac is in between two great slopes. One slope faces the Laguna Lake, and the other faces the Pacific Ocean. On either slope are some villages and farms in various degrees of development and cultivation so favorable to the studies of frontier malaria. Malaria in different degree of intensity was present in these communities. Inside the forest proper were the Government Plant Nursery Station at Kapatalan, the Road Station at Llavac, and another Road Station at Biga. No malaria transmission could be noted in these three communities, although of course many of the inhabitants had malaria presumably contracted elsewhere. There was also no *flavirostris*.

THE MOSQUITOES

Species representing ten genera were found in Llavac. These genera were: *Anopheles*, *Megarhinus*, *Tripterooides*, *Zeugomyia*, *Uranotaenia*, *Orthopodomyia*, *Ficalbia*, *Aedes*, *Armigeres*, and *Culex*. Available space does not permit the inclusion of all in this paper. Moreover, certain species could better be under-

stood when discussed in conjunction with other members of the group to which they belong. This will be done in subsequent parts of these notes.

ANOPHELES

A new species of *Anopheles* was found. This is named *Anopheles acaci* in memory of Capt. Alejandro B. Ac-ac, one of those unheralded heroes of Bataan. The other species of *Anopheles* present in the place are: *barbirostris* which breeds scantily, but found even in the deepest jungles; *aitkeni bengalensis* which is widespread but not breeding heavily; *insulaeflorum*, found in large numbers in many creeks; *leucosphyrus*, very rare; *maculatus* of which only two larvae were found in a small creek not far from houses; probably newly introduced since none could be found anywhere else; *mangyanus*, very few, found only in Llavac River near houses, probably also a newcomer; *ludlowi* and *hyrcamus nigerrimus* as mentioned above.

ANOPHELES (*Anopheles*) ACACI n. sp.

Adult: A small dark mosquito; peculiar in having the male antennae not plumose like those of the female. Inseparable from *aitkeni bengalensis* or *insulaeflorum* except by the male antennae and terminalia. The phallosome in *acaci* is smooth like that of *bengalensis*, but it tapers markedly toward the apex, whereas that of *bengalensis* is fairly uniform in thickness from middle to apex; that of *insulaeflorum* has spicular processes. The dorsal lobe of the harpago has three external spines in *acaci*, two in *bengalensis*, also three but broader in *insulaeflorum*. These three species have each 2 parbasal spines in the coxite, but there is also an external spine near the apex in *acaci* and *insulaeflorum*, none in *bengalensis*.

Holotype: A male (Lot No. A-2); paratype: A female (Lot No. A-5); both with larval and pupal skin mounts. Paratypes: six males and five females, also with larval and pupal skin mounts. The holotype, allotype and four of the paratypes were collected by the author from Malangam Hill, Llavac, on June 28, 1940. The rest of the paratypes were collected on different dates during June and July, 1940, from Malangam and Riao Hills by Mr. Pablo Sunico.

Pupa: Very dark, but separable by naked eye from associated pale pupae of *bengalensis* and *insulaeflorum*. Under the micros-

cope: similar to that of *insulaeflorum* in having border hairs up to the middle of the external side of the paddle, instead of coarse denticles as found in *bengalensis*. But separable from *insulaeflorum* by hairs *B*, *C*, and 5. *B* and *C* of III in *acaci* are both tiny, while *B*-IV is very much larger than *C*-IV. *C*-III of *insulaeflorum* is much more stout than its *B*-III, but *B* and *C* are about equal in size on IV. Hair 5 of III to VII in *acaci* has fewer branches (2 or 3) than the corresponding hair in *insulaeflorum* (4 to 13). The contrast in hair *C* is marked on III and IV, *acaci* having 3 or 4 branches, *insulaeflorum* 7 to 13.

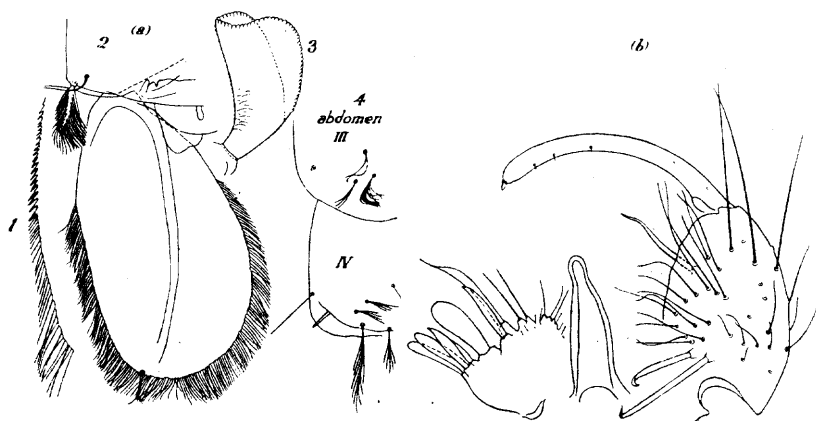


FIG. 1.—(a) Parts of pupa:

1. External border of paddle: *Anopheles aitkoni bengalensis* (higher magnification).
2. Paddle and part of abdominal segment VIII: *Anopheles acaci* (lower magnifications).
3. Respiratory trumpet: *A. acaci*.
4. Part of abdominal segments III and IV: *A. acaci*.

(b) Parts of male terminalia: *A. acaci*.

Larva: the first larvae of *acaci* were found in Mt. Banahaw (part of the Sierra Madre) by a collecting party of which the author was a member. These were described and illustrated, but not named by Russell and Baisas (1934).

A fastidious and light breeder. Seems, however, to be widespread in the Sierra Madre Range. Found by Mr. C. Urbino in July, 1940, in Camp Labi, Nueva Ecija (part of the Sierra Madre). In Llavac, *acaci* was sometimes associated with either *bengalensis* or *insulaeflorum* or both, but usually it bred by itself alone. It is not a hardy species. The few adults obtained were

reared with great care and patience in the laboratory at Llavac.

The larva is very dark and cannot be differentiated by the naked eye from dark *insulaeflorum*, but separable from light colored *bengalensis* and *insulaeflorum*. Under the microscope, it can easily be identified owing to the club-like appearance

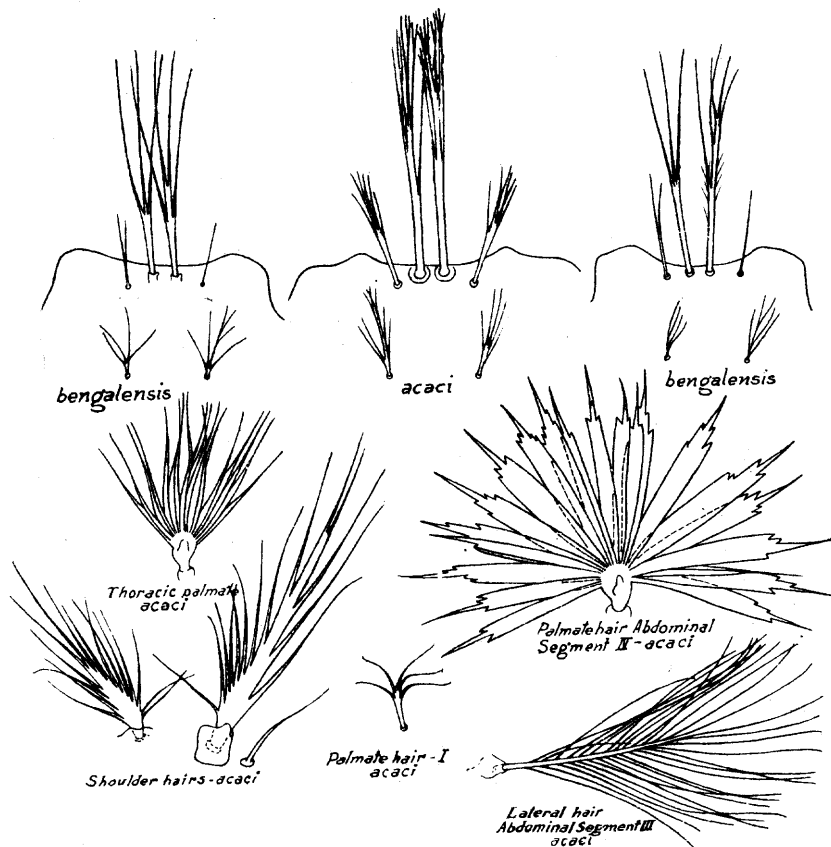


FIG. 2.—Parts of larvæ: *Anopheles acaci*, and *Anopheles aitkeni bengalensis*.

(low magnifications) of the inner clypeal hairs. They seem clavate because the branches are appressed together and curved downwardly. Under high magnifications, there are about 10 branches, the most basal of which originates from a little below the middle of the rachis. Unless the clypeus is isolated and mounted very flat, the branches of the inner clypeal hairs cannot be seen well. Other larval characters similar to those of *bengalensis*, the *lh* of abdominal segment III being different from the few-branched *lh*-III of *insulaeflorum*.

ORTHOPODOMYIA

Revision of the Indian and Malayan species of *Orthopodomysia* will probably be necessary when the different forms are more closely studied from the larval stage. Perhaps like the Philippine *Orthopodomysia* variations in leg markings may prove much wider, while variations in marking of the wings may be found more restricted than the range indicated for these by Barraud. His differentiation between *maculipes* and *andamanensis* is based mainly on the number of completely white hind tarsal segments; *maculipes* has two, *andamanensis* three. On the other hand, his description of the wing for the typical *anopheloides* shows very wide variations, and by citing no dissimilarities between *anopheloides* and *maculata*, *maculipes*, *andamanensis* and *albipes*, he indicates they are all alike in this respect. Philippine *Orthopodomysia* are not so. In one species most of the individuals have only the last two hind tarsal segments white, but a few have the last three completely white. In wing markings the two local forms can readily be differentiated even only by the vestiture on the prehumeral costal area. One has this dark or mainly dark-scaled, while the other has this completely white or, occasionally, with one or two scattered dark scales. The extent or the limits of such variations can better be understood when the adults under consideration have known larvae. Differences in larvae between the two Philippine *Orthopodomysia* are distinct; the most convenient (since they can be seen under low power) being the lateral hairs of abdominal segments I and II. There is only one pair on either segment. In one species these are shorter, more slender, but highly frayed; longer stouter, but less frayed in the other.

Brug (1934) who seems to have examined the specimens in the British Museum does not also mention any differences in wing markings between *anopheloides* and its varieties. Neither does he cite any variation in leg markings of *andamanensis* among the adults he reared from larvae or those in the British Museum. Therefore, the only apparent conclusion is that there are no such variations. This, together with his description of *andamanensis* larva, (particularly its comb which is similar to that of local species whose adult has constantly only the last hind tarsi white, and not the other the adult of which sometimes has the last three white like *andamanensis*), sets the Philippine forms quite distinct from the Indian and Malayan species.

The only species of *Orthopodomyia* reported from the Philippines was *Kerteszia mcgregori* Banks, 1909. Edwards (1932) considers this synonymous with *O. albipes* Leicester, 1908, but Barraud (1934) seems to doubt the synonymy.

Judging from what is now known of Philippine *Orthopodomyia*, it seems probable that *mcgregori* is distinct from *albipes*, although this cannot be definitely settled until specimens, from Basilan Island (the type locality of *mcgregori*) are obtained. Banks' type specimen of *mcgregori* was among those destroyed in the Bureau of Science during the liberation of Manila.

The description given by Banks lacks some points by which it may be possible to judge the status of *mcgregori* without seeing the type specimen. Nothing definite is said about the markings on the prehumeral area of the wing costa. Six costal spots are mentioned, "—the first two approximate and sub-basal". Obviously these are the humeral and presector pale spots; the prehumeral area is, therefore, apparently dark-scaled. If so, his specimen is similar in wing markings to *O. manganus* (described below) with which it is also similar in one important point: the markings on the proboscis. Banks says: "Proboscis darkly brown-scaled with a broad band of white near the apex, and another narrower one at the middle." However, *manganus* and *mcgregori* cannot be identical since they differ in other respects. *Manganus* has only the last hind tarsal segment white, while its clypeus usually has 2 to 8 flat white scales; *mcgregori* has the last hind tarsi white and the clypeus bare.

For having the last three hind tarsal segments white and the clypeus bare, *mcgregori* is similar to an uncommon variant of *madrensis* (described below). In *madrensis*, however, the prehumeral area of the wing costa is white-scaled. This involves the very base of the costa up to or beyond the humeral cross-vein. If Banks' specimen was like this he would not call the first costal spot subbasal. The proboscis of *madrensis* is also differently marked, its apical half or so being golden scaled.

Orthopodomyia albipes, according to Leicester (pp. 176-177) has only five spots on the wing costa, of which "the basal two only involve the costa". He says the description is based on a large series bred from larvae, so it may be presumed he deals with a species having less white spots on the wings than those on Philippine *Orthopodomyia*. Based on the variations noted

on the local species, Leicester's *albipes* would seem to lack the presector pale spot, while the humeral and sector spots (which he probably refers to as the first two) are unusually small since he says they involve only the costa. If we interpret Banks' description correctly, his specimens seems to have the humeral spot extended to the bases of the first and fifth longitudinal veins, while the sector spot extends to the subcosta and vein 1. The presector spot is apparently present since he mentions six costal spots.

In giving the differences between *anopheloides* and *albipes* (and also between *anopheloides* and the subspecies *maculata*, *maculipes*, and *andamanensis*), Barraud (p. 102) mentions no dissimilarities in wing markings thereby leaving a reader in doubt whether Leicester's description is inaccurate, or whether Barraud does not consider the differences in wing markings of diagnostic importance. This seems to be his view. A wide range of variation is indicated by his statement: "—four or five spots along anterior part of wing. Two small spots at base of costa, sometimes confluent;—" In his figure 21-a on page 95 (1934), the two basal spots are obviously the one at the extreme base of the costa and the humeral, so that if these are sometimes confluent the entire pre-humeral area is occasionally white-scaled. As stated above for the Philippine species, complete white scaling or otherwise on this area is diagnostic.

The color of the pale marking on the proboscis of the local species is also diagnostic. One has this pure white or, rarely, with very faint tinge of yellow, while the other has this distinctly golden. Leicester does not specify the color of the band on the male proboscis of *albipes*; Barraud says it is creamy. Banks describes the subapical band in *mcgregori* as white.

Due to the apparent differences in markings of the wings and in the color of the wide band on the proboscis, *mcgregori* appears distinct from *albipes*. At least it seems best to leave *mcgregori* in its uncertain status until more is known about it.

ORTHOPODOMYIA MANGANUS n. sp. was found, but not formally reported, in Tungkong Manga in 1927-29. But it has become very rare there now owing probably to the almost complete denudation of bamboos and large trees.

A fairly good series of this mosquito was obtained from the jungles of Llavac mostly in September, 1940. On hand are 10 males and 15 females, and 26 preserved larvae. Of the adults, six males and eight females have larval and pupal skin mounts.

Excepting one male (with skin mount) and one female, all the adults were bred out from larvae collected from a large tree-hole wherein several species of *Megarhinus*, *Lophoceraomyia*, *Ficalbia*, *Uranotaenia*, and another species of *Orthopodomomyia* were also breeding. The peak of density seems to differ in season for each of the two *Orthopodomomyia* in Llavac. Thus of the larvae collected from this large treehole on September 5, 1940, the ratio was 26:1, while those of February 28, 1941, the ratio was 1:6.

Adult: medium sized mosquito with spotted wings, highly speckled legs, the hind tarsi with conspicuous white and dark bands. Generally similar in wing markings to *anopheloides* as illustrated by Barraud, though sometimes a prehumeral pale spot is present. Similar to *maculata* (*sensu* Barraud) in the markings of the hind tarsal segments. But differs from either in markings of the male proboscis and palpi; presumably also in larval and pupal characters. The male proboscis of *manganus* has a wide white subapical band instead of merely "a white spot dorsally at tip" such as found in *anopheloides* which is apparently the same in *maculata* since Barraud does not mention any difference between them in this respect. The male palp has a subapical white ring, in addition to the apical, the basal and the one at the middle; no subapical is mentioned for *anopheloides* and its varieties.

Head with numerous upright forked scales intermixed with flat curved ones on the dorsal surface; the forked scales white anteriorly, pale brown or pale yellowish posteriorly; all flat scales white. Broad flat, scales on either side of the head, a dark patch on dorso-lateral aspect, white below this. A cluster of long white scales in front between the eyes. Torus grey or brown with flat white scales; flagella pale with brown rings involving joints; plumose in males as usual; the plumes with changing reflections, usually brownish on basal segments, pale yellowish on apical flagella; verticles in females brownish. Cluster of white scales on the inner sides of first five flagellar segments in males, only on first in females. Clypeus brown or grey, usually with two to eight flat white scales lined on either side anteriorly. Three males and three females of the series do not have these scales; probably rubbed in some, but apparently naturally absent in others. Palpi of male about four-fifth the length of proboscis, white at apices, a narrow subapical ring, a similar one at the middle, and a few white scales at bases. Palpi of female about half the length of proboscis,

pale at apices a narrow ring at middle. In both male and female, there is a bare narrow line, simulating white line, running from base to near tip on inner side. Proboscis of male dark with a narrow white ring at middle, and a wide white subapical band. The narrow line of dark scales at extreme tip (below the labella) elongates some distance backwardly on the underside; sometimes interrupted laterally by white scales. Proboscis of female with basal half or more dark-scaled, followed by a wide white band, the remaining portion dark with a white patch dorsally between the band and the tip. This white patch is variable in size, usually quite large, but sometimes very much narrowed though elongated, and, rarely, developed into a complete white band. When in the form of a band, it joins the other band on the lateral and ventral sides, leaving a dark patch between them dorsally, and a narrow ring at extreme apex below the labella similar to that in males. Thorax: Mesonotal integument gray, darker posteriorly; scales mostly narrow, variable in pattern and hues, those along the border from front to over wing root white; anteriorly on the dorsal side, the scales are pale, pale yellowish and brownish, sometimes arranged in indefinite lines, sometimes in ill-marked patches. Above the line of pale scales over the wing root is a fairly broad pale part followed by a patch of dark scales on the ridge where numerous stiff bristles (part of the dorso-centrals) arise. Between these dark ridges is a patch of narrow golden scales, posterior to which is the dark, bare, prescutellar area. On either side of this bare area, and posterior to the dark ridge is a short row of white scales. Scutellar scales long narrow, curved, sometimes curled; bristles long, stiff, brownish. Postnotum dark, bare. *Apn* grey, sometimes darker, with a patch of flat white scales and several stiff bristles. *Ppn* grey or dark, with two bristles, and two separate patches of flat scales, those toward the anterior border narrower, pale yellowish; those toward the posterior broader, pale. Pleuron grey with ill-defined darker areas. Patches of broad flat pale scales on propleuron, sternopleuron, lower mesepimeron, and coxae. A cluster of narrow pale scales and about six to eight pale bristles on upper mesepimeron. Legs highly speckled with scattered pale and pale golden scales on outer surfaces of femora and tibiae, the undersides of these being nearly completely pale. There are indefinite basal or sub-basal, as well as subapical and preapical pale and dark bands which are not diagnostic for the local species. The first and second tarsal segments of the

fore and mid legs darkbrown, pale at bases and at tips; the third pale only at base; the fourth and fifth uniformly pale brown or pale golden, sometimes with suggestion of paler patch at bases. First hind tarsal segment pale at base and at apex, not forming distinct or complete rings; the second segment has the apical one-fifth or more in males, and about one-third in females, covered by a white band, the basal part dark. The third segment in the majority of individuals has the basal two-thirds white, while of the remaining one-third the apical white ring is about half the width of the subapical dark band. In one male and three females the basal white covers about four-fifths of the segment, the subapical dark and the apical white rings equally narrow and occupy the remaining one-fifth. The fourth tarsus has the basal half white, while three-fourths of the apical half (that is three-eighths of the segment) is covered by a dark band, the remaining one-eighth forming the apical white ring. The dark band is constantly broad and distinct and shows no indication of being in the process of disappearance. The last hind tarsal segment is completely white. Wings dark with white spots. The pattern is very close to that of *anopheloides* as illustrated by Barraud, although the costal, pre-apical and apical spots are less broad. Of the costal spots, the basal, prehumeral (when present), the humeral, and the presector are variable. In one male and four females of the series on hand the basal spot is absent; three males and eleven females do not have the prehumeral spot; one female has this spot tiny; two males and one female have this wide, that is, about as large as the dark on either side; while five males and two females have this spot about half the dark on either side. All have the humeral spot; this is unusually small and involves only the costa in one female. The presector is absent in five females, tiny in three other females, and wide in two males; the rest have this in moderate sizes. In one female the accessory sector spot is contiguous with the sector spot. Abdomen: Tergites dark scaled with white basal rings usually distinct only on VI and VII, but as often as not indicated by some white scales or by narrow complete rings on II and III, rarely on IV and V. The pair of submedian pale patches also usually distinct and wide only on VI and VII. Sometimes the basal bands are elongated posteriorly forming triangles on either side dorsally. In rare cases the prolongation joins the submedian pale patches. The submedian pale patches are present (though usually small

or merely indicated by a few white scales) on II and III in about 50 per cent of the individuals examined; very seldom on IV and V. Tergite VIII has usually a broad basal band, sometimes the whole segment is nearly completely white. Side of tergite I white-scaled, of II nearly so; the others dark, lined along the margins with white scales. Sternites dark-scaled, usually with narrow basal pale ring on V to VIII. Male terminalia is very similar to that of *anopheloides* (Barraud's illustration, 1927) particularly in form of the style and characters of the basal lobe of the coxite. The style is broad and flattened. The illustrations given here were from the narrower side. Barraud does not describe or illustrate the inner curved hairs on the coxite above the basal lobe. These hairs are diagnostic for the Philippine forms, being few and short in *manganus*.

Holotype: A male (Lot No. THIII-5), and allotype: A female (Lot No. THIII-8), both with larval and pupal skin mounts. Collected in Llavac by Mr. Pablo Sunico on September 14, 1940. Paratypes: the rest of the series from Llavac, and two females with larval skin mounts, from Tungkong Manga, San Jose, Bulacan Province. The latter specimens were collected by the author in December, 1929.

Pupa: Compared with the illustration of *anopheloides* pupa given by Barraud (1934, p. 95, Fig. 22-a), *manganus* differs in having much longer hairs 1 and B, hair 1 being twice or more the length of those shown in *anopheloides*. B of VI when branched extends beyond the middle of VII, but its tip reaches close to the posterior border of VII when it is single. The tufts of VII and VIII are more developed, those on VIII extending beyond the middle of the paddles.

Larva: Distinct from that of *madrensis* due to the much swollen basal half of the antenna; shorter frontal hair C; more slender but highly frayed lateral hairs on abdominal segments I and II; larger comb teeth with the central projection distinctly longer and more stout than the projections on either side; siphon tuft arising below the middle of the tube; and *isc* hardly longer than the anal segment.

Apparently different also from *anopheloides* (as figured by Barraud) in which frontal hair C is weak and short, and the larger comb teeth without long projections. Similar to *maculipes* in antenna but different in comb teeth (Edwards' Fig. 6-a, p. 118, 1927). And similar in comb teeth but different in antenna from *andamanensis* (Brug's Fig. 13-e, p. 518, 1934).

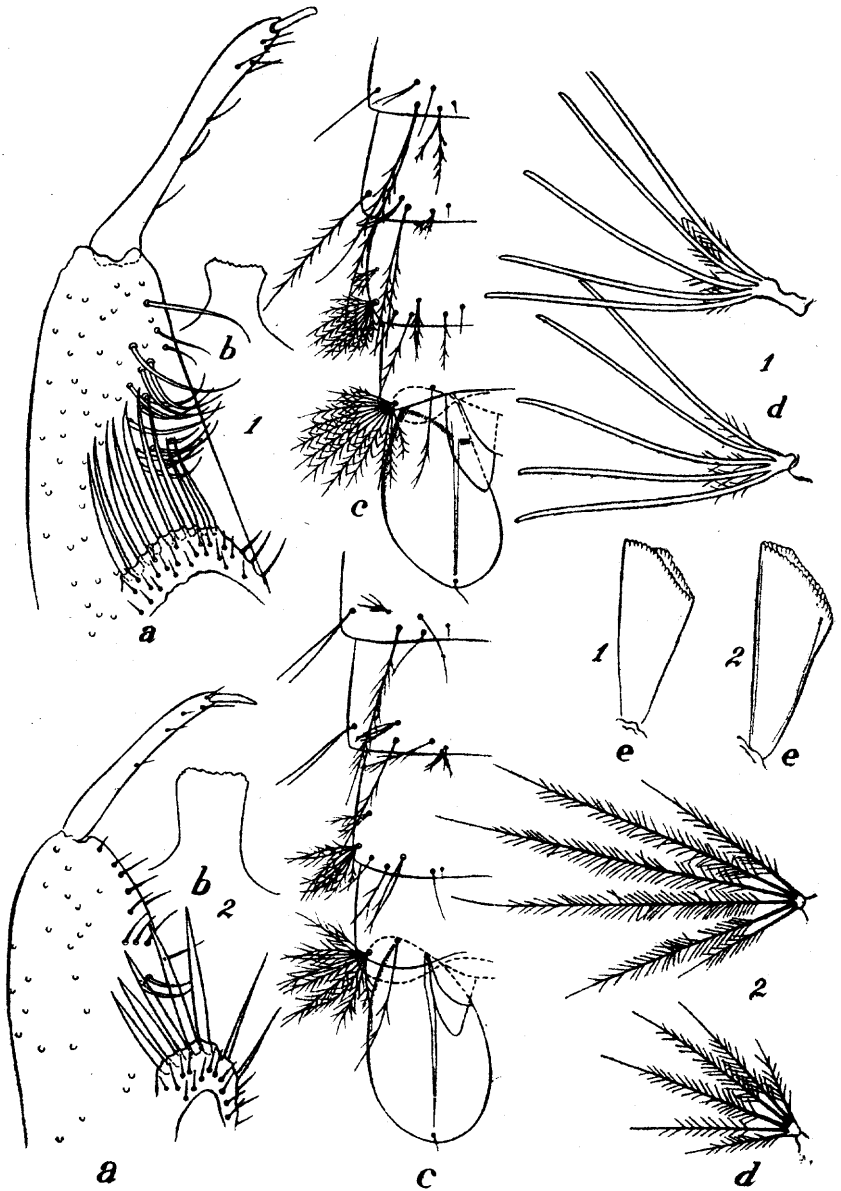


FIG. 3.—(1) *Orthopodomysia madrensis*
 (2) *Orthopodomysia manganus*
 (a) Coxite and style.
 (b) Median plate of tergite VIII.
 (c) Parts of pupæ.
 (d) Lateral hairs on abdominal segments I and II of larvæ.
 (e) Respiratory trumpets of pupæ.

ORTHOPODOMYIA MADRENSIS n. sp.

Similar to *O. anopheloides maculipes* Theobald, 1910, in having the last two hind tarsal segments white, and sometimes also similar to *anopheloides andamanensis* Barraud, 1934, when the last three hind tarsi are white. Similar also to *andamanensis* in marking of the male proboscis, but the female proboscis is different. Barraud says the female *andamanensis* has a "wider pale band", whereas the proboscis of female *madrensis* is golden on the apical half or more, and with a dark patch dorsally.

Differs from *manganus* in having the prehumeral costal area of the wing white-scaled, the apical half or more of the proboscis golden, the last two or three hind tarsi white, the femora and tibiae with more scattered golden scales, abdominal sternites wholly white-scaled, the basal lobe of male coxite with more bristles (8 or 9), the inner bristles on the coxite longer and more in number, and the median plate of tergite VIII shorter.

The series on hand is composed of 19 males and 17 females, of which 11 males and 10 females have larval and pupal skin mounts. Seven preserved larvae are also on hand. The majority were obtained from a moderately large treehole; the holotype and allotype were chosen from this lot. Three were from the large treehole where *manganus* was found, while the others were from three different smaller treeholes. A male and a female with larval and pupal skin mounts, which have the last three hind tarsal segments white were from the same lot as that of the holotype and allotype. Two other males from two other treeholes also have the last three hind tarsi white. As no apparent differences could be found in the larvae and pupae of those whose adults have the last three hind tarsi white compared with those whose adults have only the last two hind tarsal segments white, and since there are individuals in which the dark rings on the third hind tarsi are in various degree of disappearance, the whole series is considered representative of only one species.

Holotype: A male (Lot No. THIB-4); allotype: A female (Lot No. THIB-7), with slide skin mounts. Paratypes: The rest of the series. These were collected in Llavac in September, 1940, by Mr. Pablo Sunico.

An addition to the differences between *manganus* and *madrensis* mentioned above the following details may be added: Palpi of male about seven eighths of proboscis, very slightly swollen towards the apices, and with only a few hairs at tip of

ultimate, and, sometimes also at tip of penultimate segments. Ultimate segment pale; a narrow subapical, pale ring, another at middle, the basal ring sometimes indistinct. Palpi of female about half as long as proboscis, pale at apices, with a narrow yellowish ring at middle, and sometimes with a few yellow scales at bases. Male proboscis longer than the front femur, hardly equal to front femur in female. Seventeen males and ten females of the series have the basal third or so of the proboscis dark-scaled, the apical portion golden; laterally and ventrally the golden portion extends some distance toward the base, except in one male and three females where the dorsal surface is golden to almost its very base, but dark on the ventral and part of the lateral sides from base to about one-third length of the organ; two of the females with this character have a few scattered dark scales at about the middle of the proboscis dorsally. Two males and four females have the basal dark extending to about the middle dorsally; in such males there is a narrow golden ring at about the middle. Two other females have the dorsal dark covering the basal two-third of the proboscis, while a single female has this dark extended up to and joining the subapical golden patch. In most cases the demarcation between the dark and golden areas is not clear-cut, scattered golden scales on a dark background or vice versa often occur. In all males of the series, there is no subapical dark patch dorsally on the proboscis, but this is constantly present in females, though its size and location are variable. There is a narrow line of dark scales at extreme tip below the labella in both sexes, which, in rare cases, is represented by only two or three dark scales. Usually it is quite distinct, but does not completely enclose the organ, being interrupted ventrally, and sometimes also laterally. Sometimes it may elongate backwardly on the lateral surface; in a few individuals the elongation joins the subapical dark patch. The legs have greater amount of scattered golden scales, particularly underneath, than those on *manganus*. Apart from the difference in the number of completely white hind tarsi, the dark ring on the third hind tarsus, when present, in relation to the apical white ring, and the part of the segment covered by both these subapical dark, and apical white rings differ from those of *manganus*. Distinct dark rings on the third hind tarsi of both legs are present on 11 males and 14 females of the series. The width of this dark ring may be classified into:—wide, medium, and narrow. Where the dark ring is wide, it completely

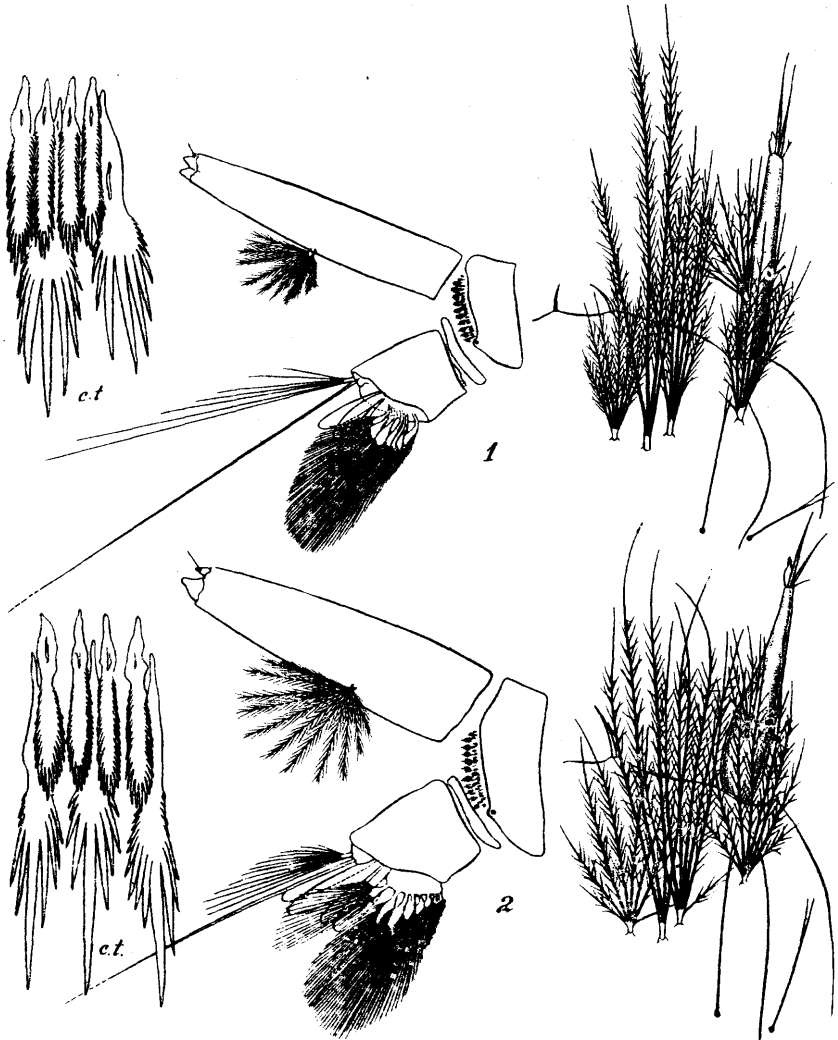


FIG. 4.—Parts of larvæ—(1) *madrensis*, (2) *manganus*—*ct*=comb teeth; (middle) tip of abdomen, and (right) part of head.

encloses the segment, and is equal to, or a little wider than the apical white ring; these two together occupying a little more than the apical half of the segment. Where the ring is medium, it does not enclose the segment completely, being interrupted underneath by a fine line of pale or golden scales. It is a little less than the width of the apical white ring. A narrow dark ring is also incomplete underneath, and is half or less the width of the apical white ring. Where medium or narrow dark rings are present, these dark and apical white cover about two-fifths of the length of the segment. Five males and two females have the dark ring on the third hind tarsus either absent on one leg and faintly suggested on the other, faintly indicated on both legs, or faint on one leg and distinct on the other. Three other males and one female have the last three hind tarsi white.

Male terminalia differs from that of *manganus* in number of bristles (blades, rather, for they are broad and flat) on the basal lobe of the coxite—8 or 9 in *madrensis*, 5 or 6 in *manganus*. *Madrensis*, moreover, has about 10 to 12 stout, curved bristles arising from the internal side of the coxite, and directed inwardly. These are less stout than the bristles in the basal lobe, but they are nearly as long. The corresponding bristles on *manganus* are hairlike, the longest being over half the length of the longest bristles on the basal lobe. Three male terminalias were examined. One of these was from an adult having distinct dark rings on the third hind tarsi of both legs, another with the ring present on only one leg and absent on the other, and the third with the last three hind tarsi of both legs white. The terminalias were found alike in all important details. Both *madrensis* and *manganus* have four or five mesosomal teeth on either side.

Pupa: Differs from that of *manganus* in having abdominal hairs 1 and *B* distinctly much longer; *B* is usually longer than the combined lengths of the next two succeeding segments. The tufts of VII and VIII are also longer; the tips of those on VIII extending beyond two-thirds the length of the paddle.

Larva differs from that of *manganus* in having the antenna not much swollen toward base; frontal hair *C* extending beyond the tips of apical appendages of the antenna; *lh* of abdominal segments I and II more stout, the branches coarse up to tips, and with few frayings toward base; while the larger comb teeth have the central projection only slightly bigger than those on either side. The siphon tuft inserted at middle of tube, and

isc with its longest branches about three times the length of the anal segment. *Manganus* tends to have less branches (3 to 7) on its antennal tuft, but with more on the siphon tuft (9 to 14). *Madrensis* has 6 to 9 branches on the antennal tuft, and 6 to 10 on the siphon tuft.

The antenna of *madrensis* is similar to that of *albipes* as illustrated by Edwards (1926, p. 118, Fig. 6-b), but differing from it in comb teeth; the larger comb teeth in *albipes* taper to a point with fine lateral fringes; in *madrensis* the larger comb teeth expand toward the apex and have coarse projections at tips. *Madrensis* is similar in antenna, but not in comb teeth, to *andamanensis* as described and illustrated by Brug(1934).

URANOTAENIA

Fewer species of *Uranotaenia* than anticipated were found in Llavac. Numerous larvae and pupae of *U. tubanguii* were associated with some *Lophoceraomyia* in the hollow of a large tree trunk. A limited number of *U. lagunensis* was obtained from Malangam Hill; and still fewer *U. mendiolai* were collected from a small rockhole. Not far from the road, a few larvae of a new species were found in a small treehole.

URANOTAENIA PYLEI n. sp.

Adult: A small dark mosquito different from all other known Philippine *Uranotaenia* in the absence of any conspicuous silvery or blue markings. Easily separable from *tubanguii* which has a broad line of white scales on the border of mesonotum from front to wing root; and from *lagunensis* and *mendiolai* both of which have banded abdominal tergites.

Head covered with broad flat scales intermixed with upright forked ones. In fresh specimens the flat scales are white in front, pale-bluish at middle, dark at nape; upright scales near eyes yellowish, rest dark. In specimens now about four years old: flat scales uniformly pale-bluish from front to nape; upright scales pale brown, the hues in both changeable according to the direction of light. Tori pale-yellowish, bare; antennal flagella and hairs dark brown, plumose in males as usual. Clypeus dark brown, bare. Palpi dark brown, hardly equal to clypeus in length in both sexes. Proboscis dark brown a little shorter than the front femur, swollen toward apex, somewhat bent downwardly beyond the middle in females, fairly straight in males. Thoracic integument pale-yellowish, a little darker on the dorsal surface. Mesonotal scales rather scanty, narrow,

brownish; dorso-central bristles stout. Scutellar scales broad, flat, dark. Postnotum brownish, bare. Pleuron devoid of scales in most individuals particularly the males; some have one or two flat scales on the mesepimeron. Upper margin of meron well above the level of base of hind coxa. Bristles: 1 spiracular, no post-spiracular, 2 pre-alars, several sternopleurals, three or four small upper mesepimerals, one large lower mesepimeral, and five or six propleurals. *Apn* with three to five brownish flat scales and three stiff bristles; two or three additional smaller bristles on some individuals. *Ppn* with about half a dozen broad brownish scales and one stiff bristle. Wings dark, scales rather broad and dense; a few dark, broad scales on margin of alula. Vein 6 terminates before the level of forking point at 5. Microtrichia visible under high magnifications. Legs dark except toward the bases of femora which are pale. First hind tarsal segment longer than tibia in both sexes. Abdomen dark dorsally, dirty brown ventrally. Male terminalia: Anal segment membraneous with two or three short spines near the apices of lobes, and numerous tiny hairs over the surface. Basal lobe of the coxite with three strong bristles, the longest of which is straight, the other two with curved points. Lateral plate of phallosome bears two unequal strong teeth. Coxite short; style with terminal appendage and some tiny hairs.

Holotype: A male (lot No. TH-II-7), and allotype: A female (lot No. TH-II-9), both with larval and pupal skin mounts. Paratypes: nine males and seven females, eight males and five females of which have larval and pupal skin mounts. The holotype and allotype were collected as larvae by the author from a treehole in Llavac on December 7, 1940. The paratypes were from the same treehole obtained at different dates by Mr. Pablo Sunico. Breeding of this mosquito was associated with a kind of *Lophoceraomyia*.

Pupa: Respiratory trumpets small, gradually expanding toward the apex, the diameter at base half or less the diameter at apex. Hair No. 6 of mesothorax about two-thirds the length of the trumpet, 5- or 6-branched. Metathoracic hair *R* long with five or more branches; *P* much shorter, 2-branched; *O* a little shorter than *R*, five or more branched. Dentritic tufts well developed. *A* of abdominal segments II to VII spine-like, small, increasing in length progressively from anterior to posterior segments, that of VIII with three or four branches. *B* of II to VII dark, single, very long, those of IV to VII exceeding the lengths of the next two succeeding segments. *C* of all segments

shorter than *B*, 2- or 3-branched. *C'* of III to VII stout, dark, spine-like. External and posterior borders of saddles spiculed. Paddle hair present.

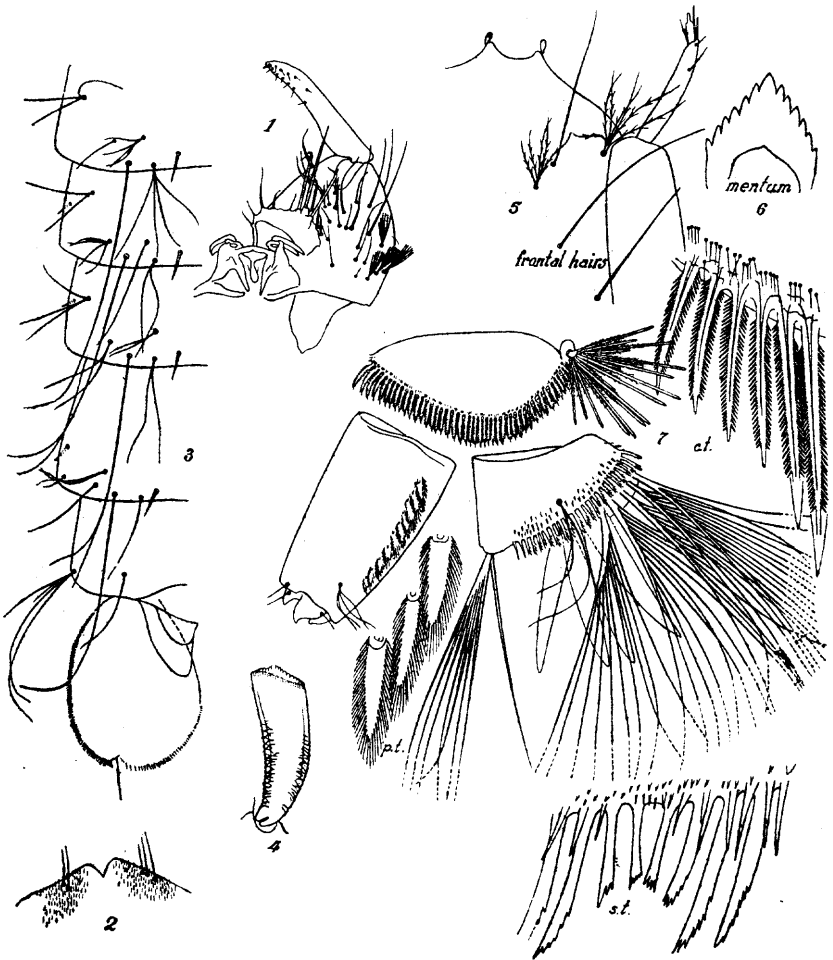


FIG. 5.—*Uranotaenia pylei*:

- (1) Parts of male terminalia.
- (2) Tergite IX.
- (3) Parts of pupa.
- (4) Respiratory trumpet of pupa.
- (5) and (6) Parts of head (larva).
- (7) Comb, anal segment, and siphon (larva).
 pt = pecten teeth.
 st = saddle teeth.

Larva: Strikingly different from other known larvae of Philippine *Uranotaenia* in having many large stellate tufts on the thorax and abdomen, and in attitude when at rest—the head and body being straight downward. When feeding, it crawls rapidly like a legged organism in and through the debris at the bottom of the breeding water. In movements and appearance closely similar to treehole breeding *Ficalbia* and *Finlaya*.

Related to stellate-tufted *maxima* of Malaya, from which it differs in: frontal hair *C* long; *C* of *maxima* is short and very much flattened. Branches of stellate tufts with single or double points at tips, those in *maxima* “terminate in several minute sharp points” (Barraud, 1934); about 40 teeth to the comb against only about 11 in *maxima*.

Head pale brown. Antenna short, shaft smooth, its simple and short hair inserted at about three-fourths from base. Pre-clypeal spines stout, short, club-like, curved inwardly. Frontal hair *A* slender, finely and scantily frayed, 3- to 5-branched. *B* longer and stouter, single, frayed, posterior and internal to *A*. *C* similar to *B*. *D* about as long as *A*, 5- to 7-branched, posterior and a little internal to *B*. *E* shorter and more slender than *B*, single. Thorax: with many stellate tufts dorsally and ventrally; without spines. Abdomen: also with many stellate tufts dorsally and ventrally. *Lh* of I and II with the dorsal branched into two each, the ventral single, but more stout, all well frayed; of III to VI each with two unequal branches, frayed. Comb with a large chitinous plate heavily covered with spicules; the teeth vary in number, about 38–45, long frayed on either side, arranged along the somewhat triangularly shaped posterior border of the plate. Anal segment short, enclosed by chitinous plate. Saddle covered by spicules over its surface, and with a row of long teeth on either side of the posterior border. These teeth vary in length and serrations. *Isc* long with about 10 branches; *osc* longer, single; *lh* much shorter, 2-branched. Fan well developed. Anal papillae narrow, lanceolate, a little longer than the anal segment, the dorsal pair longer than the ventral. Siphon small, spiculed, with a tiny acus. About 10 pecten teeth lined along basal four-fifths of tube; individual tooth broad at base, tapering to a point with serrations on either side; siphon tuft weak, 4- or 5-branched, inserted a little above the level of the most distal pecten tooth, not far from the apex of the tube.

REFERENCES

1. Baisas, F. E.
Notes on Philippine Mosquitoes, II. Uranotaenia Group. Phil. Jour. Sci., 57 (1935), 63-79.
2. Banks, C. S.
Four new Culicidae from the Philippines. Phil. Jour. Sci., 4 (1909), 545-551.
3. Barraud, P. J.
A Revision of the Culicine Mosquitoes of India, XIX. Ind. Jour. Med. Res., 14 (1927), 523-532.
The Early Stages of Some Indian Mosquitoes: *Orthopodomyia*. Ind. Jour. Med. Res., 19 (1932), 1013-1017.
Fauna of British India. Diptera, Culicidae, 5 (1934).
4. Bohart, R. M.
A Synopsis of Philippine Mosquitoes. (1945), 1-88.
5. Brug, S. L.
Notes on Dutch East Indian Mosquitoes. Bull. Ent. Res., 25 (1934), 501-519.
6. Edwards, F. W.
Mosquito Notes, VI, Bull. Ent. Res., 17 (1926), 101-131. Genera Insectorum. Family Culicidae. (1932).
7. King, W. V.
Personal consultations, and communications.
8. Leicester, G. F.
The Culicidae of Malaya. Studies for Inst. Med. Res. F. M. S. 3 (1908), 231-233.
9. Russell, P. F., and F. E. Baisas
A Practical Illustrated Key to Larvae of Philippine Anopheles. Phil. Jour. Sci., 55 (1934), 307-336.
10. Stone, A.
Personal communications.