

NOTES ON THE VALIDITY OF THE TYPES OF THE SPECIES  
IN THE SUBGENERA MOCHLOSTYRAX AND MELAN-  
CONION IN THE U. S. NATIONAL MUSEUM.  
(DIPTERA, CULICIDAE.)<sup>1</sup>

By W. H. W. KOMP, *Sanitary Engineer, U. S. Public Health Service.*

The writer approaches his present task with a certain reluctance, for his personal recollections of the late H. G. Dyar are most happy, and he is indebted to him for innumerable kindnesses. This article is prepared with no thought of depreciating Dr. Dyar's great contributions to our knowledge of the Culicidae, which made him the authority on American mosquitoes. The writer merely hopes to rectify some minor details of the architecture of the edifice reared by his late master.

The writer's interest in the taxonomy of the Culicidae began 20 years ago, while a student under Dr. T. J. Headlee, State Entomologist, at Rutgers University. Part of his summer work was the identification of adult mosquitoes taken in night collections in various localities in New Jersey, which were made to evaluate the effect of control measures. In 1924 he began visiting the American tropics, and the bulk of his mosquito material taken there was turned over to Dr. Dyar for confirmation or identification. Dr. Dyar acknowledged these contributions in 13 citations in "The Mosquitoes of the Americas," in which the writer also described two new species of *Culex*. Since April, 1931, the writer has been in Panama, where he has had the opportunity of making numerous collections of mosquitoes, and has described several new species from this region. He has also had the advantage of close association with Dr. D. P. Curry, Assistant Chief Health Officer of the Panama Canal Health Department, who is an authority on the mosquitoes of this region.

The single work of greatest usefulness to the writer has been Dyar's "The Mosquitoes of the Americas," but he has found it to be like some men's wives, in that we can't get along with it, and can't get along without it. Great difficulties were encountered in making determinations, using Dyar's keys, descriptions and figures. This was particularly true in the

<sup>1</sup> From Gorgas Memorial Laboratory, Panama City, R. de Panama; H. C. Clark, Director.

subgenera *Mochlostyrax* and *Melanoconion*, which have always been accounted difficult groups. Part of the difficulty lay in the inadequacy and inaccuracy of the descriptions of the male terminalia, which are the final resort in specific determinations in these groups. Having worked with Dr. Dyar on several occasions, the writer realized that Dr. Dyar was greatly handicapped by not using an adequate microscope. Having seen many slide mounts of male terminalia made by Dr. Dyar, and observing his methods, it also became evident that great improvement was needed in the technique of preparing slide mounts of these parts.

During the past four years the writer has been working out an adequate technique for this purpose, the details of which he hopes to publish shortly. By its means, he has been able to dissect out the parts of the male terminalia after staining them, and to mount them in a uniform manner so that they can be satisfactorily examined. The advantages of such a technique are evident when its results are compared with that used by Dr. Dyar, who merely macerated the parts slightly in potash solution, did not stain, unfortunately in too many cases overpressed his material under the coverglass, and in a number of instances mounted the terminalia ventral side down, so that the ninth tergites are almost completely obscured.

The author's collections in Panama so far have resulted in obtaining all the valid species listed from Panama in Dyar's "The Mosquitoes of the Americas," in the subgenera *Mochlostyrax* and *Melanoconion*. He has also added four species in these groups to the records from Panama, and has described two new species. With abundant material available, he has been able to study in detail the terminalia of these species, until familiar with the individual habitus of each. Equipped with this knowledge, he has had the opportunity recently of studying the type material in the U. S. National Museum, where he received much gratefully acknowledged assistance from Dr. Alan Stone, now in charge of the Culicidae. Using an excellent compound binocular microscope, with highly corrected objectives, and with oculars fitted with eyepiece caps giving a stereoscopic effect, showing depth and roundness, he was able to see a great deal more in the material than could possibly be visible through Dr. Dyar's antiquated instrument. Hence he was able to draw a number of conclusions as to the validity of some of the type material under discussion. These conclusions are here set forth, as a preliminary communication, which he hopes will be followed by a more complete article illustrated by photomicrographs of the types, so that others may judge of the correctness of his determinations.

In the subgenus *MOCHLOSTYRAX*, with its four sections, *Dinoporpa*, *Helcoporpa*, *Mochlostyrax* and *Choeroporpa*, and in

the subgenus *Melanoconion*, in its four sections, *Tinolestes*, *Gnophodomyia*, *Melanoconion* and *Anoedioporpa*, Dyar lists in "The Mosquitoes of the Americas" 94 species. The male terminalia are unknown in 9 of these, and of the remaining 85, 10 are not represented by material in the U. S. National Museum. The author found that, of the 75 types there, only 59 are valid, thus sinking in the synonymy 16 species. In each case where the validity of a species is questioned, the author sets forth his reasons for so doing in the following notes.

Taking the species in the order given in "The Mosquitoes of the Americas," *Culex (Dinoporpa) trifidus* Dyar is valid.

*Culex (Helcoporpa) menyles* Dyar is valid. The single slide from which the original description was made is in poor condition, distorted and overpressed. The artist apparently had great difficulty in discerning the true appearance of the various parts. The figure and the description are misleading and incorrect, so much so that the present writer, not having seen the type slide, redescribed this species with Dr. D. P. Curry as *haynei* (Psyche, XXXIX, 32, 1932). This should warn those engaged in similar work never to trust completely the accuracy of either the descriptions or the illustrations in Dr. Dyar's last work. These harsh words are unfortunately justified by the author's experience.

*Culex (Mochlostyrax) caudelli* D. & K. is valid. However, *multispinosus* B. W. & B., which Dyar sank under the synonymy of *caudelli*, may be a valid species. Dyar discusses this in Ins. Ins. Mens. XII, p. 185, stating, "However, one of the specimens under *alogistus* differs, and I am supposing this to be *multispinosus*." This is a slide marked "H," Bonne-Wepster, Surinam 1918, and bears the name "multispinosus" on the label in Dyar's handwriting. The male type of this species is in Holland, but the "H" slide in the U. S. N. M. is distinct from *caudelli*, and may possibly be distinct from the male type in Holland. The figure of *multispinosus* in the Bonnes' "Mosquitoes of Surinam" does not show correctly the form or position of the leaf on the outer aspect of the outer lobe of the side-piece, nor is the appearance of the 9th tergites correctly shown.

The next eight species, *alogistus* Dyar, *hesitator* D. & K., *pilosus* D. & K., *unicornis* Root, *innovator* Evans, *egcymon* Dyar, *taeniopus* D. & K., and *opisthopus* Komp, are valid.

*Culex (Mochlostyrax) mychonde* Komp is a synonym of *opisthopus* Komp. The single male was sent by me to Dr. Dyar, labeled "*opisthopus* Komp." He thought it a new species, and himself drew up the description published in "The Mosquitoes of the Americas" under my name. I have re-examined my types of *opisthopus* and of *mychonde*, and find them identical. I since (1934) have obtained more males of *mychonde* from the type locality for comparison. The messomal plate of *opisthopus*

is described for *mychonde*, except that there is no "long slender dark point (which) extends straight outward, exceeding the plate . . .".

The species *automartus* Root and *psatharus* Dyar are valid.

*Culex epanastasis* Dyar is *taeniopus* D. & K. Dyar omits in his description in "The Mosquitoes of the Americas" one of the most striking characteristics of the terminalia of *taeniopus*, the membranous sheath with recurved point at the base of the two filaments of the inner division of the lobe of the side-piece. This is mentioned in *Ins. Ins. Mens.*, XIII, 214, 1925, and is present in the *epanastasis* slide. The characters on which Dyar based his separation do not exist, as the inner plates of the mesosome are alike in the slide material of both species, and only appear to differ because differently orientated in the respective mounts. It is intrinsically improbable that two species should exist in the same territory, five miles apart, and be exactly similar in every respect with the exception of the form of the mesosomal plate.

*Culex inadmirabilis* Dyar. The single slide of this is in poor condition. Dyar overlooked a side-piece which had been detached from the rest of the parts, and had moved close to the edge of the cover-glass, where it had become covered with balsam which had exuded from under the edge. By clearing off this balsam it was possible to obtain an excellent view of the undamaged side-piece. The clasper is narrowly snout-shaped, much as in *elevator*. The inner filament of the inner lobe of the side-piece is inserted much basad of the outer, not evenly, as Dyar states. Apparently there is a leaf, the tip of which is broken off, inserted on the outer aspect of the outer division of the lobe of the side-piece, and a strong spine-like seta on the outer aspect of the column of the outer division, somewhat basad of the insertion of the leaf.

*Culex clarki* Evans is valid, but according to F. W. Edwards is a synonym of *C. nigrescens* Theo.

*Culex thomasi* Evans. There is no material of this species in the U. S. N. M.

*Culex bequaerti* D. & S. is valid, as are likewise *C. anips* Dyar, *erraticus* D. & K., and *peccator* D. & K.

*Culex holoneus* Dyar is *conspirator* D. & K. The inner mesosomal plate in the single slide is orientated so that its plane is perpendicular to the coverglass. The peculiar striation of the pointed upper limb of this plate is plainly visible, and the second pointed limb is present. Dyar (*Ins. Ins. Mens.*, IX, 50, 1921) recognized that *dysmathes* (a synonym of *conspirator*) was close to *holoneus*, but was unable, because of the poor mount, to see the actual form of the inner mesosomal plate.

*Culex ybarmis* Dyar is valid. Dyar does not mention the long ventral horn present on the inner mesosomal plate.

*Culex alcocci* B.-W. & B. is valid.

*Culex nicceriensis* B.-W. & B. There is no material in the U. S. N. M.

*Culex saramaccensis* B.-W. & B. There is no material in the U. S. N. M.

*Culex terebor* Dyar. The single slide is in such poor condition as to be indecipherable. Dyar hints that it probably is not a good species, and it is here recommended that it be relegated to the list of unrecognized species.

*Culex distinguendus* Dyar is valid. The author has new material from Panama.

*Culex conspirator* D. & K. is valid. Dyar is correct in his description of the inner mesosomal plate in *Ins. Ins. Mens.*, VIII, 59, 1920, where he states "the second uncal plate (inner mesosomal plate) has one limb shorter than the other, both pointed," yet in the key in "The Mosquitoes of the Americas," (dichotomy 77, p. 279) he states that both limbs of the mesosomal plate are rounded at the tip. This does not agree with the written description in the same work, which states that the upper limb has "one erect point." Both limbs actually are pointed, and are directed at right angles to the body of the plate, in the same plane.

*Culex fatuator* D. & S. is *conspirator* D. & K. Every detail exactly agrees.

*Culex inducens* Root is *conspirator* D. & K. Dyar separated this from *conspirator* solely on the position of the stemmed leaf on the outer division of the lobe of the side-piece, which he said was inserted basad of the filaments, in *inducens*. It is in exactly the same position as in *conspirator* in both terminalia of *inducens*, which are mounted on the same slide (No. 44160).

*Culex elevator* D. & K. is valid. Dyar's figure (No. 251) in "The Mosquitoes of the Americas" is absolutely misleading. The figure of *dyius* Root is much closer to the actual appearance. The species *dyius* Root, which Dyar sank under the synonymy of *elevator* D. & K., seems to be distinct. The shape of the clasper is the same, but *dyius* has a seta with a long insertion on the base of the outer division of the lobe of the side-piece. More study than the writer was able to give to this will be required to establish the specific status of *dyius*.

*Culex dornarum* D. & S. This is *elevator*, as hinted by Dyar. The type slide (No. 1849) shows an inner mesosomal plate as in *elevator*.

*Culex macaronensis* Dyar and Nuñez-Tovar is *conspirator*. The terminalia have been badly damaged in mounting, and some of the filaments have broken off and lie near the outer division of the lobe of the side-piece. The leaf also is missing, but everything else agrees exactly.

*Culex phlogistus* Dyar is valid. The author obtained a number

of males of this species from Almirante, Panama, in 1934. It is a good species, but Dyar's figure (No. 254) is inaccurate and misleading.

*Culex maroniensis* B.-W. & B. There is no material in the U. S. N. M.

*Culex albinensis* B.-W. & B. is valid.

*Culex serratimargo* Root is valid. The type slide from Brazil is very poor, the 9th tergites being much compressed and distorted. The writer has obtained much additional material from Panama.

*Culex plectoporpe* Root is valid. Only one side-piece is present in the type slide (No. 109-7). The author took a male at Almirante, Panama, in 1929.

*Culex tecmarsis* Dyar is valid. Common on the Atlantic side of the Canal Zone.

*Culex phlabistus* Dyar is valid.

*Culex copenamensis* B.-W. & B. is valid.

*Culex intricatus* Brèthes. The type is not in the U. S. N. M. and the description is made from material collected by F. M. Root, labeled "cenus." If Dyar is correct in his synonymy, the species is apparently valid.

*Culex corentynensis* Dyar is valid.

*Culex manausensis* Evans. This is not represented in the U. S. N. M. collection. From Miss Evans' figure and description (Ann. Trop. Med. and Par., XVIII, 370, 1924) it is suspiciously like the common *eastor* Dyar, differing in lacking the normally present long hook-tipped filament inserted below the four short filaments and the large leaf on the outer division of the side-piece.

*Culex mutator* D. & K. This presents a peculiar combination of errors. There are six slides in the collection, three of which are Knab's original material from Mexico, which agree among themselves, and are therefore true *mutator*. Three other slides, Nos. 1358, 1651 and 1798, are labeled "alfaroi," which Dyar later relegated to the synonymy of *mutator*. These three slides do not agree in the slightest respect with true *mutator*, but are all of *bastagarius* D. & K., a common and apparently widespread species, to which must also be relegated three other species which will be discussed in their proper place.

*Culex inhibitor* D. & K. is valid.

*Culex innominatus* Evans. There is no material in the U. S. N. M. This is undoubtedly *bastagarius* D. & K. Miss Evans' description and figure (Ann. Trop. Med. and Par., XVIII, 363, 1924) are correct, and show the parallel insertion of the two filaments of the inner division of the lobe of the side-piece, the leaves on the outer division, and the very characteristic clear, nearly hairless, slipper-like basal extensions of the 9th tergites. Apparently Dyar did not examine Miss Evans'

illustrations, for these extensions of the tergites are not shown in his figure of *innominatus*.

*Culex carcinophilus* D. & K. is valid.

*Culex evansi* Root is valid.

*Culex bastagarius* D. & K. is valid, and is the progenitor of a number of synonyms: *alfaroi* Dyar, *innominatus* Evans, *vapulans* Dyar and *xivilis* Dyar. It is a well-marked species, the peculiar 9th tergites being strikingly characteristic, and well depicted in Miss Evans' figure of *innominatus*, but not shown in any of Dyar's illustrations of the species mentioned.

*Culex vapulans* Dyar is *bastagarius* Dyar. The furcation of the inner division of the lobe of the side-piece is an artifact.

*Culex comminator* Dyar is valid. This is much like *intrincatus*, but unfortunately there is but one slide, very poor, mounted with the 9th tergites down, so that they are almost entirely obscured by the side-pieces.

*Culex eastor* Dyar is valid, and common on the Atlantic side of the Canal Zone.

*Culex maxinocea* Dyar is valid.

*Culex curryi* Dyar. This is probably *elevator* D. & K. The type came from Panama, where similar material is very common. The larvae are said to differ from those of *elevator*, but the shape of the inner plate of the mesosome is the same as in *elevator*, and all other parts agree.

*Culex educator* D. & K. is valid. The larvae have a huge accessory tracheal gill system on the head.

*Culex chrysothorax* Peryassu. There is no material in the U. S. N. M.

*Culex chrysonotum* D. & K. is valid, and ranges from Honduras (Komp) to Surinam.

*Culex theobaldi* Lutz. This is *chrysonotum* D. & K. The writer has material kindly presented to him by Dr. G. Senevet, from French Guiana, in which the length of the mesosomal plate is the same as that of Honduranian and Panamanian material.

*Culex bibulus* Dyar is *educator* D. & K. The single slide is poor, but the writer can determine no specific differences, and the characters given by Dyar in "The Mosquitoes of the Americas" seem insufficient upon which to base a new species.

*Culex iolambdis* Dyar is valid.

*Culex sursumptor* Dyar is valid.

*Culex andricus* Root is valid.

*Culex jonistes* Dyar is *ybarmis* Dyar. The single slide is poor, but all the parts are as in *ybarmis* Dyar, the published descriptions of *jonistes* Dyar noting differences which are owing to the differing orientation of the parts.

*Culex xivilis* Dyar is *bastagarius* D. & K. The slides of *xivilis* and of *cuclyx* all agree with *bastagarius*.

*Culex idottus* Dyar is valid, but is represented by one slide in poor condition.

The following species are unknown in the male: *indecorabilis* Theo., *nigrescens* Theo., *simulator* D. & K., *decorator* D. & K., *gravitator* D. & K., *nigricorpus* Theo., *humilis* Theo., *fasciolatus* Lutz, and *lugens* Peryassu.

The subgenus *MELANOCONION* has four sections, the first two, *Tinolestes* and *Gnophodeomyia*, having one species apiece, the third, *Melanoconion*, having 15, and the fourth, *Anoedioporpa*, having six, as given by Dyar.

*Culex (Tinolestes) latisquama* Coq. is valid.

*Culex (Gnophodeomyia) aikenii* Aiken is valid. The author has taken it as far north as Honduras.

*Culex (Melanoconion) atratus* Theo. is valid.

*Culex (M.) zeteci* Dyar is valid. Dyar's description of the terminalia is marred by many errors of observation, so that the key ("The Mosq. of Amer." dichotomy 52, p. 274) is unworkable. The museum material shows 3 appendages (filaments) on the inner division of the lobe of the side-piece, instead of 2, as stated, and as likewise the description (p. 339). The third filament arises from the base of the inner division. Between the outer lobe of the side-piece and the apex there is a flattened filament which, depending on its orientation, sometimes appears as a seta. The clasper, not mentioned in Dyar's description, is slender, bulbous at the base, with peculiar enlarged tip, with flattened terminal appendage.

*Culex (M.) dunni* Dyar is valid, but is incorrectly described. There are 4 setae inserted at the tip of the column of the outer division of the side-piece; the leaf is inserted below the tip. The inner mesosomal plate is finely granular or spicular on its outer (dorsal) curvature, the tip slender and pointed.

*Culex (M.) commevynensis* B.-W. & B. There is no material in the U. S. N. M. The figure in "Mosquitoes of Surinam" (No. 37) shows terminalia suspiciously like that of *dunni* Dyar, differing only in details which may be non-existent, as all the Bonnes' slide-mounts the writer has seen are unfortunately uniformly poor.

*Culex (M.) ruffinis* D. & S. is *dunni* Dyar. A curious confusion in key, descriptions and illustrations occurs in this group in Dyar's "The Mosquitoes of the Americas." In the key on p. 274, dichotomy 49 is given as

"A triangular leaf between outer division of lobe and apex 50  
Without this structure ..... 51."

Dichotomy 50 describes *commevynensis* and *ruffinis*, which by the key should have a leaf between the outer division and the



apex. Yet the figure of *ruffinis* (297 on p. 557) does not show this leaf, although it is noted in the description on p. 341.

Conversely, dichotomy 51 (without a leaf between outer division and apex) leads us to 53, which separates *dunni* and *atratus*. Yet the figure of *dunni* (295 on p. 557) shows the leaf which is actually present, and which is likewise correctly noted in the description on p. 340. These unfortunate errors render this part of the key unworkable.

The description of *ruffinis* is full of errors of observation. The type slide, No. 1928, shows a fourth filament on the inner division of the lobe of the side-piece; four setae inserted at the top of the column of the outer division with the leaf are not mentioned; the setae on the ninth tergites are not short and spicular, but rather fine and hairlike. The inner mesosomal plate in both *dunni* and *ruffinis* is covered on its dorsal curvature with fine granular or spicular points, only visible at high magnification. There is no doubt that *ruffinis* is a synonym of *dunni*.

*Culex (M.) spissipes* Theo. There is no material in the U. S. N. M.

*Culex (M.) loturus* Dyar is *zeteci* Dyar. The single type slide of *loturus* (No. 2193) shows unmistakably three appendages (filaments) on the inner division of the lobe of the side-piece; all the other parts of the terminalia are exactly as in *zeteci*.

*Culex (M.) americanus* Neveu-Lemaire. Apparently valid, but all slides poor and nearly indecipherable.

*Culex (M.) antillum-magnorum* Dyar is valid. The inner plate of the mesosome, not described by Dyar, is a flat plate, truncate at the tip, with a long backwardly-directed hook below the middle.

Section Anodiopora. *Culex (M.) homocopas* Dyar and Ludlow. This is *inhibitor*, much broken and distorted. It illustrates most forcibly the author's contention that an adequate technique of staining and dissecting the parts is an absolute prerequisite for the correct interpretation of the male terminalia. The single slide of *homocopas* exhibits marked distortion: the claspers are bent inwards and nearly doubled on themselves, forming an angle which led the authors of the species to believe that they were dealing with a specimen of *Anodiopora*; although they state in the original description (Ins. Ins. Mens., IX, 34, 1921) that the "clasper (is) simple, bent at right angles in the middle (which may be an artifact)." The outer divisions of the side-pieces have many of the filaments broken off and lying unattached near them. There is a large, well-defined leaf, bent forward over the outer division. The mesosome is so badly distorted that the basal hooks are everted, so that they assume an apical position. The second point on the inner mesosomal plate is obscured by the upper point, which lies over it, but by turning the slide over and viewing it from beneath

(fortunately the slide is thin), using the stereoscopic eyecaps, it can easily be seen. The large ninth tergites, while distorted, are perfectly characteristic. *Culex inhibitor* D. & K. is one of the commonest small *Culex* to be found in the type locality, Jackson Barracks, Mississippi. The male palpi are long, exceeding the "proboscis by the length of the last joint and half the preceding one." (Mosq. of Amer., p. 345.) The rest of the description of the male is identical with that of *Culex inhibitor* D. & K.

*Culex (M.) conservator* D. & K. is valid.

*Culex (M.) originator* Gordon & Evans is valid.

*Culex (M.) corrigani* D. & K. is valid. The author has seen new material from the Canal Zone.

*Culex (M.) restrictor* D. & K. is valid, but is really a *Microculex*. The male has long palpi.

*Culex (M.) luteopleurus* Theo. The male is unknown.

In addition to the notes on synonymy in the species of *Mochlostyrax* and *Melanoconion* given above, one species of the subgenus *Culex* has also been found to be invalid. This is *lepostenis* Dyar, which is *mollis* D. & K. Through the kindness of Dr. E. Chapin, Curator of Insects of the U. S. National Museum, the writer has been able to dissect and mount the terminalia of one of the unmounted male types, and finds them to be those of *C. (Microculex) jenningsi* D. & K.

For ease of reference, a list of the synonyms mentioned above is here given:

- Culex (Mochlostyrax) mychonde* Komp is *C. opisthopus* Komp.  
*Culex (Mochlostyrax) epanastasis* Dyar is *C. taeniopus* D. & K.  
*Culex (Mochlostyrax) holoneus* Dyar is *C. conspirator* D. & K.  
*Culex (Mochlostyrax) fatuator* D. & S. is *C. conspirator* D. & K.  
*Culex (Mochlostyrax) inducens* Root is *C. conspirator* D. & K.  
*Culex (Mochlostyrax) dornarum* D. & S. is *C. elevator* D. & K.  
*Culex (Mochlostyrax) macaronensis* Dyar & Nuñez Tovar is *C. conspirator* D. & K.  
*Culex (Mochlostyrax) innominatus* Evans is *C. bastagarius* D. & K.  
*Culex (Mochlostyrax) vapulans* Dyar is *C. bastagarius* D. & K.  
*Culex (Mochlostyrax) curryi* Dyar is *C. elevator* D. & K.  
*Culex (Mochlostyrax) bibulus* Dyar is *C. educator* D. & K.  
*Culex (Mochlostyrax) jonistes* Dyar is *C. ybarmis* Dyar.  
*Culex (Mochlostyrax) xivilis* Dyar is *C. bastagarius* D. & K.  
*Culex (Melanoconion) ruffinis* D. & S. is *C. dumii* Dyar.  
*Culex (Melanoconion) loturus* Dyar is *C. zeteci* Dyar.  
*Culex (Melanoconion) (Ansediorpora) homocopus* Dyar and Ludlow is *C. (Mochlostyrax) inhibitor* D. & K.

The writer realizes that to complete his work a new key should be prepared, omitting these synonyms, and correcting the errors in previous keys. However, this must wait until a later date,

as his time in Washington was too short to enable him to do this. In those species which are represented by a unique specimen, it would be extremely hazardous to attempt a separation without immediate access to the material for purpose of comparison, and the author is unwilling to risk adding confusion to an already sadly confused subject.

#### ACKNOWLEDGMENTS.

To his friends and associates in the Canal Zone, Dr. D. P. Curry, Assistant Chief Health Officer, Mr. C. G. Brown and Mr. C. L. Pierce, District Sanitary Inspector and Supervising Sanitary Inspector respectively, for the Panama Canal Health Department, for their unstinted aid in collecting material and giving him the benefit of their specific knowledge of the local fauna; to Dr. Alan Stone, in charge of the Culicidae at the U. S. National Museum, for his interest and invaluable assistance while at the Museum; to Dr. E. A. Chapin, Curator of Insects at the U. S. National Museum, for permission to dissect type material, and for other kindly assistance, the author gives his hearty thanks.

---