MOSQUITO STUDIES (Diptera, Culicidae)
XXIX. A REVIEW OF THE SUBGENUS KERTESZIA OF ANOPHELES[1]

by

Thomas J. Zavortink[2]

INTRODUCTION

Kerteszia is a small, Neotropical subgenus of *Anopheles*. Although several species of this subgenus are important, even primary, vectors of human malarias and other species are suspected vectors, *Kerteszia* is appallingly poorly known systematically. Because of the dearth of specimens available for study, the present paper can be little more than a preliminary review laying the groundwork for a future, more comprehensive study.

Only 1146 specimens, 97 males, 64 male genitalia, 538 females, 294 larvae and 153 pupae, were examined during this study; included were 155 individual rearings (100 larval, 28 pupal and 27 incomplete). Most of the adults studied, including the reared ones, are in very poor condition, either broken, denuded, shriveled, fungused, decomposed or imbedded in adhesive, and are not of research quality. Many of the skins of the immature stages are poorly preserved or poorly mounted and almost all whole larvae examined died during the attempt to rear them and are rotted, misshapen and discolored. Only the Colombian and Panamanian populations of *neivai* and the Trinidadian populations of *bellator* and *homunculus* are represented by even modest series of adults and immatures, and only 2 of these populations, the Panamanian *neivai* and the Trinidadian *bellator*, are topotypic or nearly so.

Classical, comparative morphological taxonomic procedures were used. Many of the conclusions reached must be considered as tentative only, for in most cases neither the quantity nor quality of material available for study is adequate for testing the hypotheses about the number of species and their diagnostic characters that are summarized in the keys. The descriptions are based on a few individuals from, if possible, one population, as indicated under the species; the organization, terminology and abbreviations used in the descriptions follow Belkin (1962) in large part. When available, the wing, hindtarsus, male genitalia, pupa and larva of each species are illustrated; all these illustrations, including those of the immature stages, are based on a single, representative specimen only. The collection data for all specimens examined are given for each species and the localities are marked with solid symbols on the outline maps. Distribution records from the literature are listed separately and the localities of the more reasonable, reliable or better documented

[1] Contribution from project "Mosquitoes of Middle America" supported by U.S. Public Health Service Research Grant AI-04379 and U.S. Army Medical Research and Development Command Research Contract DA-49-193-MD-2478.

[2] Department of Biology, University of California, Los Angeles, California 90024.

records are marked with open symbols on the maps. Many literature records, even modern ones appearing after Komp's 1937 revision of *Kerteszia,* are undoubtedly based on misidentifications or the uncritical repeating of previous incorrect literature records.

I thank John N. Belkin for reading and criticizing the manuscript; Willis W. Wirth for arranging the loan of specimens from the National Museum of Natural History [USNM]; Peter F. Mattingly for loaning all *Kerteszia,* including the lectotype of *Anopheles lutzii* Theobald, 1901 in the British Museum of Natural History [BMNH]; Alfonso Diaz Najera for loaning specimens in the Instituto de Salubridad y Enfermedades Tropicales [ISET]; Sebastiao H. Xavier for loaning specimens in the Instituto de Endemias Rurais [IER]; Pablo Cova Garcia for loaning specimens in the Division de Endemias Rurales [DERM]; William A. Powder and Sandra J. Heinemann for preparation of the material collected for the project "Mosquitoes of Middle America"; L. Margaret Kowalcyzk and Nobuko Kitamura for preparation of the preliminary drawings and final illustrations; Caryle Stallard for typing a portion of the rough draft; and Angeliki Demos for typing the remainder of the rough draft and preparing the text copy for lithoprinting.

SYSTEMATICS

I am recognizing 10 species of *Kerteszia.* Two of these, *boliviensis,* the type species of the subgenus, and the unnamed species 10, are known only as females; the remaining 8 species are known, at least to a limited extent, in all stages except sometimes the pupa.

Anopheles neivai, the dominant or only species throughout the northern portion of the range of the subgenus, is differentiated from all other species by several derived characters, especially conspicuous of which are the form of the ventral lobe of the claspette of the male genitalia, the short, weakly developed hair 4a-X and absence of hair 8-S in the larva, and the absence of hair 2-P in the pupa. *Anopheles pholidotus* and *lepidotus* are a pair of closely related species, the former known from only western Panama and western Venezuela and the latter from the east side of the Andes in Colombia and Bolivia, that share several derived or unusual features, such as apical transverse bands of outstanding scales on the distal tergites and a large, vertical patch of scales on the mesepimeron in the adult, and the nonpalmate hair 1-VII and moderately long hair 6-VI in the larva. Both these species, but especially *pholidotus,* share a number of derived features in the immatures (pupa of *lepidotus* unknown) with *neivai,* and are apparently related to it. Conspicuous larval features possessed by these 3 species are the nonpalmate hair 1-I and the uniformly long pecten teeth. Additional derived features shared by *pholidotus* and *neivai* are the long, wavy, filamentous marginal spicules on the pupal paddle, and the small, brushlike palmate hairs and the fringe of spinules extending to near the apex of both the inner and outer edges of the pecten teeth in the larva. *Anopheles pholidotus* and *lepidotus* share the possession of abdominal scales with *boliviensis* and the presence of a white subcostal spot on vein R_{2+3} and a submedian white scaled line on R_{4+5} (not always present) with *boliviensis* and other species mentioned below.

Anopheles bambusicolus is, in many respects, the most unusual *Kerteszia;* unique features are the usually reduced number and size of the white spots on the costal vein of the wing and the entirely white scaled hindtarsal segment 5 in the adult, the nearly glabrous ventral claspette lobe in the male genitalia, the short hair 9-V and

broad, elliptic paddle in the pupa, the large palmate hairs with long, lanceolate leaflets and short hairs 6-VI and 5-7-C in the larva, and, of course, its bambusicolous habits. The affinities of *bambusicolus* may be with *neivai, pholidotus* and *lepidotus;* characteristics shared by all these species are a single patch of scales on the mesepimeron, the absence of leaflets on the aedeagus, the presence of marginal spicules distad of the external buttress on the pupal paddle, and a weakly developed hair 4-C in the larva. In addition, *bambusicolus* shares with *neivai* a small patch of scales on the mesepimeron and the absence of a median or submedian white scaled line on vein R_{4+5} in the adult; with *pholidotus* and *lepidotus* a shortened hair 6-VI in the larva; with *pholidotus* a more or less similarly shaped and spiculed ventral claspette lobe; and with *lepidotus* a short hair 11-P and enlarged palmate hairs. Some of the morphological peculiarities of *bambusicolus* are found also in *Nyssorhynchus,* which suggests that *bambusicolus* is the most primitive *Kerteszia.*

Anopheles homunculus, cruzii, bellator and *laneanus,* the 4 remaining species of *Kerteszia* in which the male genitalia are known and the immatures are at least partly known, form a group characterized, but not always absolutely separated from the previously considered species, by the presence of 2 patches of scales on the mesepimeron and a short to long, median or submedian white scaled line on vein R_{4+5} in the adult, the presence of leaflets on the aedeagus in the male genitalia (leaflets secondarily lost in some individuals of *homunculus),* the absence of marginal spicules distad of the external buttress on the pupal paddle (pupae of *cruzii* and *laneanus* unknown), and the strong hair 4-C, palmate hair 1-I and alternating long and short pecten teeth with spinules restricted to the basal portion of the outer edge in the larva (the last character not discernable in specimens of *laneanus* and *cruzii* available for study). These 4 species fall into 2 pairs: *homunculus* and *cruzii,* distinguished by the predominantly dark large acrostichal and dorsocentral setae of the adult, the shape of the ventral claspette lobe of the male genitalia, and the predominantly basally branched hair 5-II-V of the larva; and *bellator* and *laneanus,* characterized by the predominantly pale large acrostichal and dorsocentral setae, the shape of the ventral claspette lobe, and the predominantly plumose hair 5-II-V in the larva. *Anopheles homunculus* and *cruzii* are very similar in external adult features and apparently can be reliably separated only by the male genitalia (larva of *cruzii* not studied by me and pupa unknown). Which of these species is the more derived is not obvious to me at this time: the hypertrophied ventral claspette lobe and reduced leaflets of the male genitalia of *homunculus* are certainly derived features, but this species is apparently uncommon except locally throughout its extensive South American range; *cruzii,* on the other hand, is a common, dominant *Kerteszia* throughout its range in southeastern Brazil and occurs in a greater variety of habitats, including harsher, drier ones, than *homunculus. Anopheles bellator* and *laneanus* are easily separated by external adult features as well as by the male genitalia (larva of *laneanus* not studied by me and pupa unknown). *Anopheles bellator* is unquestionably the more derived of these 2 species: it is characterized by derived morphological features in the adult and is the more common and widespread species.

The affinities of *boliviensis* cannot be determined in the absence of males and immatures. This species possesses abdominal scales, as do *pholidotus* and *lepidotus,* and has only a single, small, upper patch of scales on the mesepimeron, as do *neivai* and *bambusicolus.* However, the ornamentation of the scutum, hindleg and wing,

including even the unusual occurrence of white scales in the basal part of vein M, is almost identical to that of *laneanus* and unlike that of *neivai, bambusicolus, pholidotus* and *lepidotus.* The single female of species 10 is so badly damaged that most of the morphological characteristics of even the adult stage are unknown.

The bromelicolous species of *Anopheles* have been recognized as a distinct group since the works of Knab (1913:15-17) and Dyar and Knab (1917:38-40) and their relationship to *Nyssorhynchus* has been known since the early studies of Root (1922a:322; 1922b:388; 1923:271, 277-278). Edwards (1932:44,46), following Christophers (1924:42), included *Kerteszia* in the subgenus *Nyssorhynchus* but Dyar (1928:467-470) and Komp (1937:492-529; 1942:8-9, 162-165) treated it as a distinct subgenus. For the time being I am following the currently accepted classification, as reflected in Stone, Knight and Starcke (1959), and am recognizing this monophyletic group as a distinct subgenus of *Anopheles.* However, the relationship of *Kerteszia* to *Nyssorhynchus* may prove to be so close that the former will again be recognized as only a species group of the latter. Little can be done to clarify this situation at the present time because the systematics of *Nyssorhynchus* are too poorly known and hopelessly confused.

BIONOMICS AND MEDICAL IMPORTANCE

With one exception the species of *Kerteszia* normally breed in the water that collects in the leaf axils of terrestrial and epiphytic bromeliads. The single exception is *bambusicolus,* which normally breeds in unbroken bamboo internodes. In Trinidad, where the ecological relationships between sympatic species of *Kerteszia* have been thoroughly studied, *homunculus* and *bellator* are associated with different bromeliad species in that part of the island where their distributions overlap, *homunculus* breeding in small, shade-tolerant species near the forest floor and *bellator* in large, heliophilous species in the canopy. It is possible that similar associations operate to reduce competition between bromelicolous species of *Kerteszia* in other areas where 2 or more are sympatric.

The adults of *Kerteszia* are strongly anthropophilic, biting especially during the evening but also sometimes in the shade during the day, throughout the night and in the morning. The periods of adult activity, the microdistributions of individuals and demes, and possibly even the macrodistributions of populations and species are determined, at least to some extent, by humidity. For example, in Trinidad *homunculus* requires wetter conditions than *bellator:* it is largely restricted to the part of the island with the highest rainfall, it occupies the lower strata of the forest and its activity is more closely limited to the moister periods of the day.

The populations of *Kerteszia* that attain very high densities are of considerable importance as pests and vectors of human, and probably also animal, diseases. The Colombian population of *neivai,* the Brazilian and Trinidadian populations of *bellator* and *homunculus,* and the Brazilian population of *cruzii* are important, proven vectors of human malarias, and the Ecuadorian population of *"boliviensis",* the Guyanan population of *bellator,* and the Bolivian population of *laneanus* are suspected vectors. *Anopheles neivai* has also been found naturally infected with the viruses of yellow fever, Guaroa and possibly also Venezuelan equine encephalomyelitis and Ilheus; *"boliviensis"* with the viruses Anopheles A and Anopheles B and the eggs of *Dermatobia hominis* (Linnaeus); and, *bellator* with the filarial worm *Wuchereria bancrofti* (Cobbold). *Anopheles cruzii* is also a proven vector of monkey malarias.

DISTRIBUTION

The known distribution of *Kerteszia* extends south from the State of Veracruz in Mexico through Central America and Atlantic South America, along the Andes and along the coast, to the States of Misiones in Argentina and Rio Grande do Sul in Brazil; it also extends south along the Pacific Coast of South America to the State of El Oro, Ecuador. The subgenus is conspicuously absent from all islands of the West Indies except Trinidad and from most of the vast expanse of the Amazon basin in South America.

TAXONOMIC TREATMENT

Subgenus KERTESZIA Theobald

1905. *Kerteszia* Theobald, 1905b:66. TYPE SPECIES: *Kerteszia boliviensis* Theobald, 1905, Bolivia; monobasic.

1918. *Dendropaedium* Dyar and Knab, 1918:141. TYPE SPECIES: *Anopheles cruzii* Dyar & Knab, 1908 (=*Anopheles lutzii* Theobald, 1901), Brazil; monobasic. Synonymy with *Kerteszia* by Christophers (1924:42).

Anopheles (Kerteszia) of Dyar (1918:148; 1925b:193; 1928:467-470); Dyar and Knab (1918:140-141); Komp (1937:492-529; 1942:8-9, 162-165); Lane (1939:17-19; 1953:278-288); Vargas (1943:60-63); Senevet (1958:141-144); Stone, Knight and Starcke (1959:35-36); Forattini (1962:433-462).

Kerteszia of Theobald (1905b:66; 1907:117; 1910:74).

Anopheles (Dendropaedium) of Dyar and Knab (1918:141); Dyar (1918:145-146; 1925a:25-27).

Anopheles (Nyssorhynchus) Kerteszia Group of Christophers (1924:42); Edwards (1932:44,46).

Anopheles (Nyssorhynchus) Dendropaedium Group of Root (1922a:322; 1922b:388; 1923:271, 277-278).

Anopheles (Anopheles) in part of Bonne and Bonne-Wepster (1925:504-507,533).

Anopheles in part of Theobald (1901:177-178); Giles (1902:303-304); Dyar and Knab (1917:38-40); Howard, Dyar and Knab (1917:985-988); Dyar (1923:72); Cova Garcia (1961:57-62, 104-108, 131-136).

Myzomyia in part of Theobald (1905a:8; 1907:41-43; 1910:16,17).

Laverania in part of Theobald (1902:183).

Nyssorhynchus in part of Blanchard (1905:211).

FEMALES. *Head:* Interocular space narrow. Vertex and occiput with numerous short, broad erect scales, these dark brown to black except for white in median anterior patch and sometimes in partial or complete orbital line or small lateral patch; frontal tuft moderately conspicuous, white. Proboscis longer than forefemur; entirely dark scaled. Palpus subequal in length to proboscis; predominantly dark scaled, with dorsal white patch at apex of some or all of segments 2-5; at least segments 1 and 2 with scales outstanding. Torus without scales; flagellar segment 1 with small, dark scales; proximal flagellar segments with bristles on inner side greatly reduced in size. *Thorax:* Scutum shortened and arched. Integument of scutum pruinose with 2 pairs of darker, nonpruinose longitudinal stripes when viewed at an angle from the front, as follows: (1) narrow, submedian stripe laterad of acrostichal bristles extending from anterior promontory to prescutellar space, and (2) broad, irregular, subdorsal strip laterad of dorsocentral and lateral prescutellar bristles extending from

anterior promontory to scutellum. Acrostichal and dorsocentral bristles numerous, strongly developed, moderately long to long. Scutum with light scales (1) in median and lateral patches on anterior promontory, (2) in lateral prescutal line, (3) in antealar and supraalar areas, (4) sometimes scattered in fossal or posterior fossal area, and (5) sometimes scattered in anterior portion of acrostichal and dorsocentral areas. Scutellum without scales or with a few scales medially. Pleuron with bristles on *apn, ppl, sp, stp, pra* and upper *mep; ppl* bristles very few (1 or 2); *stp* bristles very few (1-4), arising in upper scale patch. Pleuron with scales on *apn,* in upper patch or line on *stp,* in small lower patch on *stp,* on *pra,* in 1 or 2 patches on *mep,* and sometimes on *sp. Legs:* Forecoxa and midcoxa with numerous scales. Hindfemur without outstanding scales distally. Knee spots absent. Legs dark scaled with conspicuous, complicated light markings, principally complete or broken longitudinal lines or streaks on femora and tibiae and complete or incomplete transverse bands on tarsi; hindtarsal segments 3-5 never all entirely white. *Wing:* Dark scaled with distinct light markings. Vein R-R_1 and usually also vein C with basal, humeral, presectoral, sectoral, subcostal and preapical light spots. Veins R_3, M and Cu_1 distad of crossveins, Cu_2 and 1A predominantly or entirely dark scaled. Dark scales not grouped into spots. Fringe dark scaled with 2-5 light spots. *Haltere:* Knob dark scaled with white scales in basal anterior portion. *Abdomen:* Tergites and sternites II-VII with or without obvious scales. Tergites without conspicuous caudolateral tufts of outstanding scales. *Buccopharyngeal Armature:* Present, not studied.

MALES. Essentially as in females except for sexual characters. *Head:* Palpus with dorsal white patch at apex of segments 4 and 5 and often also segments 2 and 3; segments 3 and 4 with scales entirely or predominantly decumbent. *Wing:* Light scaling of veins behind R-R_1 often reduced in extent or indistinct.

MALE GENITALIA. *Segment IX:* Tergite without lobes. Sternite with strong, median longitudinal ridge; distal margin usually concave laterad of ridge. *Sidepiece:* Moderately long, cylindrical to long conical, curved inward. Tergomesal surface membranous from base to near apex. Basal tergomesal area with 1 very long, strong, curved, blunt parabasal spine arising from a large tubercle; distal tergomesal surface with 2 long, strong, apically flattened accessory spines arising about 0.6-0.7 distance from base of sidepiece; mesal surface with 1 long, strong internal spine arising about 0.4-0.5 distance from base of sidepiece; lateral surface with numerous bristles and scales. *Claspette:* Divided into well developed, paired dorsal and ventral lobes. Dorsal lobe with 2 groups of 3-5 very long, slender, contorted, flattened setae. Ventral lobe usually expanded laterally distally; with few to numerous spicules on mesal margin and usually also sternal surface. *Clasper:* Long, slender. Spiniform short. *Phallosome:* Aedeagus long, slender, nearly straight; with or without 1 pair of simple, slender, subapical leaflets directed cephaloventrad. *Proctiger:* Anal lobe broad. Paraproct weakly sclerotized.

PUPAE. Setae generally weakly to moderately developed, short, few branched and lightly pigmented. *Trumpet:* "Culicine" in form, not strongly flared and not deeply cleft. *Abdomen:* Hair 0-II-VII weakly developed, short to moderately long, usually single. Hair 1-II-VII weakly developed, short to moderately long, usually 1-4b or 4f (1-5). Hair 5-III-VII weakly developed, short to moderately long, 1-5f or 5b or weakly plumose. Hair 9-I weakly developed, short; 9-IV, V varied, short, blunt and peglike to long, pointed and spinelike; 9-VI-VIII long, pointed, spinelike, lightly pigmented, strongly barbed on outer edge except in *bambusicolus. Terminal Segments:* Apex of male genital lobe with mammillate protuberance.

LARVAE. *Head:* Inner clypeals (2-C) widely spaced, single, simple or weakly plumose apically. Outer clypeals (3-C) single, simple or with a few strong, irregular barbs apically. Posterior clypeals (4-C) laterad of outer clypeals, weakly to moderately developed, single, simple or with a few strong, irregular barbs apically. Hairs 5-7-C usually moderately long to long, single, simple, weakly plumose apically or with a few strong, irregular barbs apically; short to moderately long in *bambusicolus.* Hairs 8-10-C short to moderately long, usually single and simple, rarely 2, 3f or 2, 3b. Hair 11-C long, simple, with a few strong, irregular barbs apically or strongly plumose apically. *Antenna:* Hair 1-A short, single, simple, arising on dorsolateral surface in basal portion of shaft. *Thorax:* Hairs 1-P and 3-T not palmate. Hair 9 and/or 10-P,M,T weakly to very weakly plumose. Hair 11-P weakly to strongly developed, short to long. *Abdomen:* Hair 0-II-VIII weakly developed, short, single. Hair 1-I or II-VI or VII palmate. Hair 2-II-VI usually single and simple, strongly developed and long on IV. Hair 6-III-V long, single, weakly to moderately plumose. *Spiracular Lobe:* Pecten teeth (18-23) all long or alternate teeth in middle of row shortened. Spiracular apparatus small; median dorsal and dorsolateral lobes without specialized process. Hair 1-S single, 2, 3f or 2, 3b. *Anal Segment:* Ventral brush with 9 pairs of hairs.

KEYS TO SPECIES

FEMALES

(Species *10* not included)

1. Tergites and sternites II-VII with numerous scales 2
   Tergites and sternites II-VII without obvious scales 4

2(1). Hindtarsal segment 2 with broad white band in apical 0.5-0.7; mesepimeron with small upper patch of scales; scales of distal tergites not outstanding and not forming transverse apical bands. . . . . ***9. boliviensis***
   Hindtarsal segment 2 with narrow white band in apical 0.1-0.2; mesepimeron with large, curved patch of scales extending ventrad from bristles to below middle of segment; scales of distal tergites predominantly outstanding and aggregated into transverse apical bands 3

3(2). Scales of proximal tergites predominantly narrow to moderately broad . . . . . ***2. pholidotus***
   Scales of proximal tergites predominantly moderately broad to broad. . . . . ***3. lepidotus***

4(1). Mesepimeron with only upper patch of scales; vein R_{4+5} with light scales absent or restricted to small basal spot. 5
   Mesepimeron with both upper and middle patches of scales; vein R_{4+5} with light scales in basal spot and short to long, median or submedian line . . 6

5(4). Hindtarsal segment 5 with broad white band in apical 0.4-0.6; vein C with presectoral, sectoral and subcostal light spots usually present, moderately large to large; palpus with scales slightly to conspicuously outstanding

on proximal portion of segment 3, decumbent on distal portion of segment 3 and on segment 4. . . . . *1. neivai*
Hindtarsal segment 5 entirely white scaled; vein C with presectoral, sectoral and subcostal light spots usually absent, small when present; palpus with scales conspicuously outstanding on segments 3 and 4. . . . . *4. bambusicolus*

6(4). Hindtarsal segments 2 and 3 with narrow white band in apical 0.1-0.3, segment 4 with narrow white band in apical 0.2-0.3, and segment 5 usually entirely dark scaled . . . . . *7. bellator*
Hindtarsal segments 2-5 with broad white band in apical 0.4-0.7 7

7(6). Larger acrostichal, dorsocentral and middle scutellar bristles predominantly pale; anterior 0.3-0.4 of acrostichal and dorsocentral areas and middle of scutellum with a few white scales; vein M entirely or partially white scaled basad of level of furcation in vein Cu . . . . . *8. laneanus*
Larger acrostichal, dorsocentral and middle scutellar bristles predominantly dark; acrostichal and dorsocentral areas without scales and middle of scutellum without scales or with a few dark scales; vein M dark scaled basad of level of furcation in vein Cu 8

8(7). Palpus with scales slightly to moderately outstanding on segment 3 and slightly outstanding to decumbent on segment 4; palpus with white patch at apex of segments 3-5, segments 4 or 5 or segment 4, the patch largest on 4 when present on more than 1 segment; abdominal tergites tan to dark brown or blackish. . . . . *5. homunculus*
Palpus with scales entirely or predominantly decumbent on segments 3 and 4, sometimes slightly outstanding at base of segment 3; palpus with white patch at apex of segments 3-5, the patch on 3 subequal in size to or larger than patch on 4; abdominal tergites slightly to conspicuously reddish . . . . . *6. cruzii*

MALE GENITALIA

(*9. boliviensis* and species *10* unknown)

1. Aedeagus without leaflets. 2
Aedeagus with a pair of leaflets 6

2(1). Ventral lobe of claspette glabrous except for 4-10 strong spicules and a few weak spicules along mesal margin. . . . . *4. bambusicolus*
Ventral lobe of claspette moderately to densely spiculose, with many of the spicules arising from general surface. 3

3(2). Tergite VIII without numerous broad scales medially 4
Tergite VIII with numerous broad scales medially 5

4(3). Lateral expansion of ventral lobe of claspette very narrow, inconspicuous, not curved ventrad posteriorly and not retrorsely produced anteriorly;

internal spine of sidepiece flattened and conspicuously broadened at apex . . . . . *1. neivai*
Lateral expansion of ventral lobe of claspette broad, conspicuous, curved ventrad posteriorly and produced into sharp retrorse point anteriorly; internal spine of sidepiece flattened and slightly broadened at apex . . . . . *5. homunculus*

5(3). Lateral expansion of ventral lobe of claspette rounded and not retrorsely produced anteriorly; internal spine of sidepiece flattened at apex . . . . . *2. pholidotus*
Lateral expansion of ventral lobe of claspette shallowly and broadly emarginate and produced into blunt retrorse lobe anteriorly; internal spine of sidepiece apparently not flattened at apex . . . . . *3. lepidotus*

6(1). Lateral expansion of ventral lobe of claspette produced into sharp retrorse point anteriorly; leaflets of aedeagus weak, short or long. *5. homunculus*
Lateral expansion of ventral lobe of claspette not retrorsely produced anteriorly or with blunt retrorse lobe; leaflets of aedeagus strong, long . . . 7

7(6). Lateral expansion of ventral lobe of claspette more or less rounded to sinuous-margined, not curved ventrad posteriorly, sometimes produced into blunt retrorse lobe anteriorly . . . . . *6. cruzii*
Lateral expansion of ventral lobe of claspette rounded, curved ventrad posteriorly, not retrorsely produced anteriorly 8

8(7). Ventral lobe of claspette densely spiculose only mesally . . . . *7. bellator*
Ventral lobe of claspette very densely spiculose except laterally . *8. laneanus*

PUPAE

(*3. lepidotus, 6. cruzii, 8. laneanus, 9. boliviensis* and species *10* unknown)

1. Hair 9-V short, blunt and peglike, similar to 9-III; outer edge of paddle distad of external buttress with short marginal spicules; paddle elliptic, relatively broad, index 1.4 . . . . . *4. bambusicolus*
Hair 9-V moderately long to long, pointed and spinelike, dissimilar to 9-III; outer edge of paddle distad of external buttress with long filamentous marginal spicules or without any spicules; paddle obovate, relatively narrow, index 1.5-1.9 2

2(1). Outer edge of paddle distad of external buttress with long, wavy, filamentous marginal spicules; paddle usually more or less obliquely truncate. . 3
Outer edge of paddle distad of external buttress without marginal spicules; paddle usually not obliquely truncate 4

3(2). Marginal spicules along distal portion of external buttress of paddle predominantly toothlike, short, few, widely spaced, and not extending basad into proximal 0.5 of paddle; hair 1-P weakly to moderately developed, moderately long; 2-P absent; 1-VII arising near caudal border of segment . . . . . *1. neivai*

Marginal spicules along distal portion of external buttress of paddle filamentous, moderately long, numerous, closely spaced, and extending basad into proximal 0.5 of paddle; hair 1-P strongly developed, short; 2-P present; 1-VII arising cephalad of caudal border of segment . . *2. **pholidotus***

4(2). Paddle unpigmented to very weakly pigmented, lighter than posterior abdominal segments; marginal spicules along distal portion of external buttress of paddle moderately long, numerous and closely spaced. . . . . *5. **homunculus***

Paddle weakly to strongly pigmented, darker than posterior abdominal segments; marginal spicules along distal portion of external buttress of paddle short, few and widely spaced . . . . . *7. **bellator***

LARVAE

(*9. **boliviensis*** and species *10* unknown; *6. **cruzii*** and *8. **laneanus*** not included)

1. Hair 6-VI short; palmate hairs large, with long, lanceolate leaflets; 5-7-C short to moderately long . . . . . *4. **bambusicolus***

Hair 6-VI moderately long to long; palmate hairs small to moderate, with short to moderately long, pointed or blunt leaflets; 5-7-C moderately long to long 2

2(1). Pecten teeth all long, with spinules usually extending to near apex of both internal and external edges; hair 1-I not palmate, 1-4b or 4f; hair 4-C weaker than 2-C 3

Pecten teeth alternating long and short medially, with spinules usually restricted to basal portion of external edge; hair 1-I palmate; 4-C as strong as or stronger than 2-C. 5

3(2). Hair 6-VI long, plumose, similar to 6-III-V; hair 1-VII palmate; most caudal hair of ventral brush (4a-X) weakly developed, shorter than anal saddle, usually simple . . . . . *1. **neivai***

Hair 6-VI moderately long, with a few long branches in basal portion, dissimilar to 6-III-V; hair 1-VII not palmate, 1-4b or 4f; most caudal hair of ventral brush (4a-X) moderately developed, usually longer than anal saddle, distinctly pectinate or plumose 4

4(3). Hair 11-P strongly developed, long; 3-C moderately long, moderately developed, not fusiform; palmate hairs small . . . . . *2. **pholidotus***

Hair 11-P weakly developed, short; 3-C short, strongly developed, fusiform; palmate hairs moderate . . . . . *3. **lepidotus***

5(2). Most caudal hair of ventral brush (4a-X) usually weakly developed and shorter or slightly longer than anal saddle; hair 3-C much stronger than 2-C; hair 5-II-V usually branched near base only; 4-A usually single . . . . . *5. **homunculus***

Most caudal hair of ventral brush moderately developed and much longer

than anal saddle; hair 3-C slightly stronger than 2-C; hair 5-II-V usually distinctly plumose; 4-A usually forked apically . . . . . *7. bellator*

1. Anopheles (Kerteszia) neivai Howard, Dyar & Knab

Figs. 1,3-7

1913. *Anopheles neivai* Howard, Dyar and Knab, 1913:plate 41, fig. 8, and plate 130, fig. 461. TYPE: *Lectotype* female (no. 344.1) with slide of associated larval head capsule and pupal skin, Fort San Felipe, Porto Bello [Portobelo] Bay, Colon, Panama, larva collected in bromeliad leaf axil, 2 June 1908, A.H. Jennings [USNM, 20440; designation by Stone and Knight, 1956:279]. Synonymized with *lutzii* Theobald, 1901 (as *bellator*) by Dyar (1923:72); considered as variety of *lutzii* (as *bellator*) by Christophers (1924:42); considered as race of *lutzii* (as *cruzii*) by Dyar (1925a:26); resynonymized with *lutzii* (as *cruzii)* by Dyar (1925b:193); resurrected to specific rank by Komp (1937:502).

1917. *Anopheles hylephilus* Dyar and Knab, 1917:38-40. TYPE: *Lectotype* female, Gatun, Canal Zone, Panama, Feb 1917, L.H. Dunn (W-38) [USNM; designation by Belkin, Schick and Heinemann, 1965:44]. Synonymized with *lutzii* Theobald, 1901 (as *bellator)* by Dyar (1923:72); considered as variety of *lutzii* (as *bellator*) by Christophers (1924:42); synonymized with *neivai* (as *cruzii* race *neivai*) by Dyar (1925a:26); resurrected as variety of *lutzii* (as *bellator*) by Edwards (1932:46); resynonymized with *neivai* by Komp (1937:521).

Anopheles (Kerteszia) neivai of Komp (1937:502-503,509,521; 1942:77-78,129-130,163-164); Senevet and Abonnenc (1938:504-509); Lane (1939:19; 1953:283-284); Levi-Castillo (1945: 118-128); Trapido, Galindo and Carpenter (1955:533-539); Vargas and Martinez Palacios (1956:132-135,141); Trapido and Galindo (1957:132,133); Stone, Knight and Starcke (1959: 35-36); Cerqueira (1961:128); Forattini (1961:31-32; 1962:447-449); Aragao (1964:74-75); Galindo et al. (1966:393); Lee and Sanmartin (1967:778-781); Morales-Ayala (1971:139).

Anopheles neivai of Dyar and Knab (1917:40); Howard, Dyar and Knab (1917:986-988); Gabaldon and Cova Garcia (1952:183); Galindo and Trapido (1955:546); de Rodaniche, Galindo and Johnson (1957:683,684); Cova Garcia (1961:58-59,105,135-136,164).

Anopheles (Dendropaedium) neivai of Dyar (1918:146).

Anopheles (Nyssorhynchus) neivai of Root (1922b:391).

Anopheles (Nyssorhynchus) bellator var. *neivai* of Christophers (1924:42).

Anopheles (Dendropaedium) cruzii race *neivai* of Dyar (1925a:26-27).

Anopheles (Dendropaedium) hylephilus of Dyar (1918:146).

Anopheles (Nyssorhynchus) bellator var. *hylephilus* of Christophers (1924:42); Edwards (1932: 46).

Anopheles (Kerteszia) cruzii in part of Dyar (1925b:193; 1928:468-469); Lane (1939:18-19).

Anopheles (Nyssorhynchus) bellator var. *cruzii* in part of Edwards (1932:46).

Anopheles cruzii in part of Dyar and Knab (1908:53).

Anopheles bellator in part of Dyar (1923:72).

Anopheles (Anopheles) bellator of Bonne and Bonne-Wepster (1925:504-507).

Anopheles (Kerteszia) anoplus in part of Komp (1937:515).

FEMALE (figs. 3-5). Wing: 2.93 mm. Proboscis: 2.14 mm. Forefemur: 1.63 mm. Abdomen: about 2.3 mm. *Head:* Integument brown to dark brown. Proboscis 1.3-1.4 length of forefemur. Palpus with small to moderate white patch at apex of segment 4 and sometimes at apex of segment 5; scales slightly to conspicuously out-

standing on proximal portion of segment 3, decumbent on distal portion of segment 3 and on segment 4. *Thorax:* Integument of scutum light to dark brown. Larger acrostichal, dorsocentral and middle scutellar bristles predominantly dark. Acrostichal and dorsocentral areas and scutellum without scales. *Mep* with small upper patch of scales. *Legs:* Hindfemur with dark scaled line along lower anterior or ventral surface. Hindtarsal segment 1 white scaled dorsally from 0.2 to 0.3-0.4, segments 2-4 with broad white band in apical 0.5-0.7 and segment 5 with broad white band in apical 0.4-0.6. *Wing:* Vein C with presectoral, sectoral and subcostal light spots usually present and moderately large to large; with 1 subcostal light spot. Vein R_{2+3} without subcostal light spot. Vein R_{4+5} with light scales absent or restricted to small basal spot. Vein M dark scaled basad of level of furcation in vein Cu. Vein Cu usually with subbasal light spot. Vein 1A usually entirely dark scaled basally. Apical fringe spot large, conspicuous, undivided; additional inconspicuous fringe spots usually at apex of veins M_{3+4}, Cu_1, Cu_2 and 1A. *Abdomen:* Tergites light tan to dark brown. Tergites and sternites II-VII without obvious scales.

MALE. Essentially as in female except for sexual characters.

MALE GENITALIA (fig. 6). *Segment VIII:* Tergite without numerous broad scales medially. *Sidepiece:* Internal spine flattened and conspicuously broadened apically. *Claspette:* Ventral lobe densely spiculose over entire surface; lateral expansion very narrow, inconspicuous, not curved ventrad posteriorly and not retrorsely produced anteriorly. *Phallosome:* Aedeagus without leaflets.

PUPA (fig. 6). Abdomen: about 2.6 mm. Trumpet: 0.36 mm. Paddle: 0.69 mm. *Cephalothorax:* Very weakly to moderately pigmented, lighter ventrally. *Trumpet:* Yellow to amber. *Abdomen:* Very weakly to moderately pigmented, lighter posteriorly. Hair 1-VII arising near caudal border of segment. Hair 9-IV short and fine, short, blunt and peglike, or moderately long, pointed and spinelike; 9-V usually moderately long to long, pointed, spinelike, dissimilar to 9-III and similar, although shorter and weaker, to 9-VI. *Paddle:* Obovate; usually more or less obliquely truncate; relatively narrow, index usually 1.6-1.8 (1.5-1.9). Unpigmented or very weakly pigmented, as light as or lighter than posterior abdominal segments. Marginal spicules along distal portion of external buttress usually predominantly toothlike, short, few, widely spaced, not extending basad into proximal 0.5 of paddle; outer edge distad of external buttress with long, wavy, filamentous marginal spicules. Hair 1-P weakly to moderately developed, moderately long. Hair 2-P absent.

LARVA (fig. 7). Head: 0.62 mm. Anal Saddle: 0.24 mm. *Head:* Weakly to moderately pigmented, collar darker. Hair 3-C moderately long, moderately developed, not fusiform; as strong as or slightly stronger than 2-C. Hair 4-C weaker than 2-C. Hairs 5-7-C moderately long to long. *Antenna:* Weakly to moderately pigmented, apex usually slightly darkened. Shaft with a few large, conspicuous spicules on inner and lower surfaces distad of level of hair 1-A. Hairs 2,3-A moderately long, subequal in length. Hair 4-A usually single. *Thorax:* Epidermis usually unpigmented, rarely weakly to moderately pigmented, blackish. Hair 11-P strongly developed, long. *Abdomen:* Epidermis usually unpigmented, rarely weakly to moderately pigmented, blackish, on I-VIII. Hair 1-I not palmate, 1-3b or 3f; hair 1-VII palmate. Palmate hairs small, brushlike in form, the leaflets contracted; leaflets short, narrow, blunt. Hair 5-II-V usually branched near base only; 5-VII short to moderately long. Hair 6-VI long, plumose, similar to 6-III-V. Hair 9-IV-VI usually branched near base only. *Spiracular Lobe:* Pecten teeth all long, with spinules usually extending to near apex of both internal and external edges. Hair 1-S usually

single (1-3f). Hair 8-S absent. *Anal Segment:* Hair 4a-X weakly developed, shorter than anal saddle, usually simple.

SYSTEMATICS. Hairs 8-S on the spiracular lobe of the larva and 2-P on the paddle of the pupa are absent in this species, thus establishing the ontogenetic homology of these hairs. The description and drawings of *neivai* are based on topotypic and other material from Panama.

BIONOMICS. The immatures of this species are usually found in leaf axils of terrestrial and epiphytic bromeliads and rarely in leaf axils of aroids and treeholes. Females commonly bite humans, particularly in the evening hours. Trapido and Galindo (1957:132,133) reported that *neivai* is a predominantly arboreal species in rain forest in Panama and a predominantly ground level species in deciduous forest.

A. neivai is the primary vector of human malaria in the coastal area south of Buenaventura, Colombia (Lee and Sanmartin, 1967:778-781). It has been found infected with yellow fever virus in Panama (de Rodaniche, Galindo and Johnson, 1957:683,684) and Guaroa virus in Colombia (Lee and Sanmartin, 1967:778-781). This species was included in a mixed pool found infected with Venezuelan equine encephalomyelitis, Ilheus and Guaroa viruses in Panama (Galindo et al, 1966:393).

DISTRIBUTION (fig. 1). Southern Mexico to Ecuador and French Guiana; recorded also from Bolivia, northern Brazil and Peru.

Material Examined: 485 specimens; 64 males, 23 male genitalia, 118 females, 176 larvae, 104 pupae; 104 individual rearings (64 larval, 22 pupal, 18 incomplete).

BRITISH HONDURAS. *Cayo:* Guacamallo, 27 Sept 1963, D.J. Lewis, 5 F [BMNH].

COLOMBIA. *Choco:* Condoto, 19 May and 4 Oct 1913, H.G.F. Spurrell, 2 F [BMNH]. *Valle:* Buenaventura, 1938, 5 F [USNM]. Leticia Rio Raposo (ca. 40 km E RFVFS), 9 June 1966, P.A. Orjuela (COL 266), 1 L; same data (COL 279), 1 lpF (279-12), 2 L; same data (COL 284), 1 L [UCLA]. Rio Raposo, near mouth (ca. 20 km S Buenaventura), 2 Mar 1965, V.H. Lee (COL 58), 1 lpM (58-17), 1 lpF (58-16), 1 pM (58-107), 1 M gen, 7 L; 31 Mar 1965, V.H. Lee (COL 88), 1 L; 14 Sept 1965, V.H. Lee (COL 92), 1 L; 18 Nov 1965, V.H. Lee (COL 135), 1 lpM (135-10), 1 pF (135-104), 2 L; 4 Apr 1966, P.A. Orjuela (COL 217), 2 lpM (217-13,16); same data (COL 218), 1 L; same data (COL 219), 1 pM (219-10), 1 L; 18 Apr 1966, P.A. Orjuela (COL 227), 1 pF (227-100); same data (COL 229), 1 lp (229-12); 20 Aug 1966, P.A. Orjuela (COL 289), 1 lpF (289-20); same data (COL 293), 1 lpM (293-21), 1 M gen [UCLA]. Rockefeller Foundation Virus Field Station (Raposo), 23 Feb 1965, V.H. Lee (COL 57), 1 lpF (57-22), 1 pM (57-105), 1 M gen, 2 L; 4 Nov 1965, V.H. Lee (COL 125), 1 lpM (125-12); same data (COL 126), 1 lpM (126-10); same data (COL 127), 1 L; 26 Mar 1966, P.A. Orjuela (COL 200), 1 lpF (200-10); 18 Apr 1966, P.A. Orjuela (COL 232), 1 L; same data (COL 236), 1 lp (236-11), 1 L; 28 Apr 1966, P.A. Orjuela (COL 237), 5 L; 2 May 1966, P.A. Orjuela (COL 240), 1 L; 20 Aug 1966, P.A. Orjuela (COL 294), 1 L [UCLA]. San Francisco (ca. 20 km E RFVFS), 9 May 1966, P.A. Orjuela (COL 246), 1 L; 11 May 1966, P.A. Orjuela (COL 253), 1 lpM (253-16), 1 lpF (253-12), 1 P, 2 L; 12 May 1966, P.A. Orjuela (COL 254), 1 lpF (254-14), 1 lp (254-16), 1 lM (254-11), 1 M gen, 5 L; same data (COL 255), 1 lpM (255-11), 1 L; same data (COL 261), 1 L [UCLA].

COSTA RICA. *Cartago:* Cervantes, 9 Nov 1962, J.N. Belkin, C.L. Hogue and W.A. Powder (CR 13), 2 lpF (13-301,302), 1 L [UCLA]. Estrella, C. Picado, 1 F [USNM]. Orosi, Jan 1938, H.W. Kumm, 1 M gen [USNM]; 2 F, 1 L [USNM]; (2 km N), 7 Dec 1962, C.L. Hogue and W.A. Powder (CR 83), 1 lpM (83-604), 2 lpF (83-602,605), 1 lp (83-603), 1 M gen, 1 L [UCLA]. *Heredia:* Finca La Selva (Puerto Viejo de Sarapiqui), 6 Aug 1971, A. Berrios Arias (CR 403), 2 lpM (403-10,12), 1 L; 7 Aug 1971, A. Berrios Arias (CR 417), 1 L; 8 Aug 1971, D.W. Heinemann (CR 422), 1 pF (422-101); same data (CR 426), 1 L; 27 Aug 1971, D.W. Heinemann (CR 500), 1 lpM (500-11), 2 lpF (500-10,12), 4 L; same data (CR 502), 1 lp (502-10); 28 Aug 1971, D.W. Heinemann (CR 504), 1 L [UCLA]. Puerto Viejo de Sarapiqui, 9 Sept 1965, W.L. Hjort (CR 227), 1 lpM (227-10) [UCLA]. *Limon:* Guapiles (10 km SW), 11 Sept 1965, W.L.

Hjort (CR 230), 2 L; same data (CR 231), 1 L [UCLA]. *Department Unknown:* Las Concavas, 1 lp (1507) [USNM]. *Locality Unknown:* C. Picado (1591), 1 M, 1 M gen [USNM]; 1 L [UCLA].

ECUADOR. *Bolivar:* Balzapamba, 22 July 1938, Hanson, 3 M, 1 M gen, 2 F [UCLA]. *Guayas:* Guayaquil, F. Campos Ribadeneira, 1 F (paralectotype of *hylephilus*) [USNM]. *Los Rios:* Montalvo, 8 Feb 1966, J.N. Belkin and E. Gerberg (ECU 123), 1 L [UCLA]. *Pichincha:* Tandapi, 3 F [USNM]. *Locality Unknown:* 1 Aug 1938, Hanson, 1 M; 15 Aug 1938, 1 M, 1 M gen, 3 F; 15 Sept 1938, 1 F; 5 F [UCLA].

FRENCH GUIANA. *Inini:* Saut Tigre, 21 Mar 1967, R.X. Schick and Chatanay (FG 172), 1 pM (172-100), 1 M gen [UCLA].

GUATEMALA. *Guatemala:* Guatemala City, 1 wing [UCLA].

GUYANA. *Essequibo:* Mazaruni, W.H.W. Komp (KO 121A-8), 2 F [UCLA]. Potaro, May 1910, L.D. Cleare, 1 F [BMNH].

? HONDURAS. *Locality Unknown:* P.A. Woke (893), 2 M, 1 M gen [UCLA].

MEXICO. *Chiapas:* Naranjo, Palenque, 25 Mar 1958, A. Diaz Najera, 4 L [ISET]. Santa Rosa, Independencia, Comitan de Dominguez, 14-22 Nov 1952, J. Williams, 4 F [ISET].

NICARAGUA. *Zelaya:* Bluefields (1-3 km W Cemetery), 23 Nov 1971, D. and K. Schroeder (NIC 82), 1 F; same data (NIC 83), 1 lpM (83-20), 1 M gen; 24 Nov 1971, D. Schroeder (NIC 99), 1 lpM (99-11), 1 lpF (99-10), 1 lp (99-12), 1 M gen, 1 L; (4 km S), 27 Nov 1971, D. and K. Schroeder (NIC 121), 1 lpF (121-10) [UCLA].

PANAMA. *Bocas del Toro:* Isla Colon, Big Creek, 11 Apr 1964 (PA 656), 1 L [UCLA]. Kaysan (Chiriquicito), 18 Apr 1963 (PA 229), 1 L; same data (PA 230), 1 L [UCLA]. Wenan (Almirante), 30 Apr 1963 (PA 293), 1 lp (293-106) [UCLA]. *Canal Zone:* Cane, 12 Jan 1914, 1 F [USNM]. Fort Davis, 23 Oct-20 Nov 1951, S.J. Carpenter, 7 F; 10 Jan 1951, 4 F [UCLA]. Fort Randolph, 14 July 1924, C.H. Bath, 3 F; 30 Nov 1925, C.H. Bath, 3 F; (fire tower near), 14 July 1924, C.H. Bath, 1 F [USNM]. Gatun, Feb 1917, L.H. Dunn (W-38), 1 F (lectotype of *hylephilus);* 28 Oct 1919, A. Tully, 1 F [USNM]. Majagual, 23 Dec 1922, J.B. Shropshire, 1 M [USNM]. Margarita, 3 Feb 1923, J.B. Shropshire, 1 M [USNM]. Mojinga Swamp, 2 Jan 1937, W.H.W. Komp, 2 M gen [USNM]. Peluca, 1 M gen [USNM]. Locality not specified, D.P. Curry, 6 M, 5 F [USNM]; 1933, D.P. Curry, 1 M [BMNH]. *Colon:* Caldera Island, Portobelo Bay, 20 Jan 1908, A.H. Jennings (156.3), 1 F with slide of wing (553) (paralectotype of *neivai* no. 20440) [USNM]. Portobelo, Aug 1923, H.G. Dyar and R.C. Shannon, 2 M, 1 F [USNM]; 4 Dec 1963 (PA 579), 1 lpF (579-130), 1 L; 9 Dec 1963 (PA 599), 2 L [UCLA]. *Darien:* Cerro Mali (summit), 26 May 1963 (PA 363), 1 lpM (363-104), 4 lpF (363-105,117,124,127), 2 pF (363-115,116), 1 P, 3 L; (3 km W summit), 23 May 1963 (PA 357), 1 lp (357-112), 2 L; same data (PA 358), 1 lpM (358-101); (6 km W summit), 24 May 1963 (PA 359), 4 lpM (359-121,123,125,131), 4 lpF (359-117,124,126,127), 4 lp (359-107,122,130,135), 2 pM (359-110,134), 1 pF (359-109), 1 M, 1 M gen, 10 L; 1 June 1963 (PA 371), 5 lpF (371-106,108,118, 122,127), 2 lp (371-109,130), 1 pM (371-101), 1 lF (371-105), 9 L; 3 June 1963 (PA 373), 2 lpM (373-106,108), 1 lpF (373-105) [UCLA]. La Laguna, 10 July 1963 (PA 451), 1 pF (451-107) [UCLA]. Morti Hydrographic Station, 1 Dec 1966, O.G.W. Berlin and R. Hinds (PA 964), 1 pM (964-105), 1 M gen; same data (PA 966), 1 lpM (966-20); 2 Dec 1966, O.G.W. Berlin and R. Hinds (PA 971), 1 lpF (971-30); 4 Dec 1966, O.G.W. Berlin and Linards (PA 980), 1 lpF (980-20), 1 pF (980-110); 7 Dec 1966, O.G.W. Berlin and R. Hinds (PA 984), 1 pM (984-101); same data (PA 986), 1 lpM (986-10); same data (PA 990), 2 lpF (990-11,12), 1 lp (990-10), 2 pM (990-101,102), 1 pF (990-100), 1 M gen [UCLA]. Tacarcuna Mts. (1525 m), 25 May-7 June 1963 (PA 930), 1 lpM (930-104) [UCLA]. Tacarcuna River Valley, 27 June 1963 (PA 430), 1 lpM (430-104); 5 July 1963 (PA 435), 1 pM (435-105), 1 pF (435-106), 1 M gen [UCLA]. *Panama:* Candelaria Hydrographic Station, 7,8 May 1966, A. Quinonez (PA 942), 2 F [UCLA]. La Zumbadora, 8 Feb 1963 (PA 78), 1 lpM (78-102), 1 lpF (78-101), 1 M gen, 1 L [UCLA]. Pacora, 28 Sept 1941, 1 F [USNM]. *Locality Unknown:* 1 M, 1 L [UCLA], 1 M gen [USNM].

SURINAM. *Suriname:* Paramaribo, J. Bonne-Wepster, 1 M, 1 M gen, 1 F [USNM].

VENEZUELA. *Delta Amacuro:* Manoa Woods, Orinoco River, 10 Jan 1910, F.L. de Verteuil, 1 F (paralectotype of *hylephilus)* [USNM].

LOCALITY UNKNOWN. 2 L (11146-x, -y) [USNM].

Additional Records from the Literature

BOLIVIA (Stone, Knight and Starcke, 1959:35).

BRAZIL. *Amapa* (Forattini, 1961:31-32). *Amazonas* (Cerqueira, 1961:128).

COSTA RICA. *Alajuela* (Galindo and Trapido, 1955:546). *Puntarenas* (Trapido, Galindo and Carpenter, 1955:533).

ECUADOR. *El Oro, Esmeraldas, Manabi* (Levi-Castillo, 1945:127).

EL SALVADOR (Lane, 1953:284; Stone, Knight and Starcke, 1959:35).

MEXICO. *Veracruz* (Howard, Dyar and Knab, 1917:988).

PANAMA. *Chiriqui* (Gabaldon and Cova Garcia, 1952:183). *Veraguas* (Trapido, Galindo and Carpenter, 1955:533).

PERU (Stone, Knight and Starcke, 1959:35). *Loreto* (Morales-Ayala, 1971:139).

VENEZUELA. *Amazonas, Bolivar, Tachira* (Cova Garcia, 1961:164).

2. Anopheles (Kerteszia) pholidotus Zavortink, sp. n.

Figs. 1,3,4,8,9

TYPES: *Holotype* male (PA 173-110) with slides of associated larval and pupal skins and genitalia, La Zorra, Bocas del Toro, Panama, 1340 m, larva from leaf axil of terrestrial bromeliad, 5 Apr 1963, A. Quinonez [USNM]. *Allotype* female, Caldera-Chiriqui Trail, Bocas del Toro, Panama, 1000 m, biting human in upper canopy of deep forest, 31 Oct 1955, P. Orguela [USNM]. *Paratypes:* 1 lpM (PA 173-104) with slide of genitalia, 1 lp (PA 173-111), 7 L, same data as holotype (PA 173); 1 L, same data as holotype except collected 6 Apr 1963 in leaf axil of epiphytic bromeliad (PA 176) [UCLA]; 1 F, same data as allotype [USNM].

Anopheles (Kerteszia) boliviensis of Anduze (1943:191, ?); Levi-Castillo (1949:16, in part, ?); Trapido and Galindo (1957:128); Stone, Knight and Starcke (1959:35, in part); Aragao (1964: 76-77, in part, ?).

Anopheles boliviensis of Cova Garcia (1961:57-58,104,134-135,162, in part, ?).

FEMALE (figs. 3,4). Wing: 3.40 mm. Proboscis: 1.90 mm. Forefemur: 1.74 mm. Abdomen: about 2.1 mm. *Head:* Integument dark brown. Proboscis 1.1 length of forefemur. Palpus with moderate white patch at apex of segments 3-5 and smaller white patch at apex of segment 2; scales entirely or predominantly decumbent on segments 3 and 4, sometimes slightly outstanding at base of segment 3. *Thorax:* Integument of scutum dark brown. Larger acrostichal and dorsocentral bristles pale and dark; larger middle scutellar bristles dark. Anterior 0.3-0.4 of acrostichal and dorsocentral areas with a few white scales and middle of scutellum with a few dark scales. *Mep* with large, curved patch of scales extending ventrad from bristles to below middle of segment. *Legs:* Hindfemur with dark scaled line along lower anterior or ventral surface. Hindtarsal segment 1 without white scaling dorsally, segment 2 with narrow white band in apical 0.1-0.2, segment 3 with broad white band in apical 0.6, segment 4 with broad white band in apical 0.8 and segment 5 with broad white band in apical 0.4. *Wing:* Vein C with large presectoral, sectoral and subcostal light spots; with 1 subcostal spot. Vein R_{2+3} with subcostal light spot. Vein R_{4+5} with or without light scales in separate small basal spot and short submedian line extending from 0.2 to 0.3-0.4. Vein M dark scaled basad of level of furcation in vein Cu. Vein Cu with or without subbasal light spot. Vein 1A entirely dark scaled basally. Apical fringe spot apparently moderate, conspicuous, undivided; additional inconspicuous fringe spots usually at apex of veins M_{1+2}, M_{3+4}, Cu_1 and Cu_2. *Abdomen:* Tergites light tan to brown. Tergites II-VII with numerous dark brown

to black scales; scales of proximal tergites predominantly narrow to moderately broad; scales of distal tergites predominantly outstanding and aggregated into transverse apical bands. Sternites II-VII with white scales medially; more distal sternites with additional dark scales apically.

MALE. Essentially as in female except for sexual characters.

MALE GENITALIA (fig. 8). *Segment VIII:* Tergite with numerous broad scales medially. *Sidepiece:* Internal spine flattened and slightly broadened apically. *Claspette:* Ventral lobe moderately spiculose except laterally; lateral expansion broad, conspicuous, rounded, sometimes curved ventrad posteriorly, not retrorsely produced anteriorly. *Phallosome:* Aedeagus without leaflets.

PUPA (fig. 8). Abdomen: about 2.8 mm. Trumpet: 0.41 mm. Paddle: 0.79 mm. *Cephalothorax:* Very weakly to moderately pigmented, lighter ventrally. *Trumpet:* Yellow to amber. *Abdomen:* Very weakly to moderately pigmented, lighter posteriorly. Hair 1-VII arising cephalad of caudal border of segment. Hair 9-IV, V moderately long, pointed, spinelike, slightly longer and stronger on V, dissimilar to 9-III and 9-VI. *Paddle:* Obovate; more or less obliquely truncate; relatively narrow, index 1.8. Unpigmented or very weakly pigmented, as light as or lighter than posterior abdominal segments. Marginal spicules along distal portion of external buttress filamentous, moderately long, numerous, closely spaced, extending basad into proximal 0.5 of paddle; outer edge distad of external buttress with long, wavy, filamentous marginal spicules. Hair 1-P strongly developed, short. Hair 2-P present.

LARVA (fig. 9). Head: 0.66 mm. Anal Saddle: 0.26 mm. *Head:* Weakly pigmented, collar darker. Hair 3-C moderately long, moderately developed, not fusiform; slightly to considerably stronger than 2-C. Hair 4-C weaker than 2-C. Hairs 5-7-C moderately long to long. *Antenna:* Weakly pigmented, apex not darkened. Shaft with relatively small, inconspicuous spicules. Hair 2-A moderately long, 3-A long. Hair 4-A usually single. *Thorax:* Epidermis unpigmented. Hair 11-P strongly developed, long. *Abdomen:* Epidermis unpigmented. Hair 1-I, VII not palmate, 1-4b or 4f. Palmate hairs small, brushlike in form, the leaflets contracted; leaflets short, narrow to moderately broad, pointed or blunt. Hair 5-II-V usually branched near base only; 5-VII short to moderately long. Hair 6-VI moderately long, with a few long branches in basal portion, dissimilar to 6-III-V. Hair 9-IV-VI usually single. *Spiracular Lobe:* Pecten teeth all long, with spinules usually extending to near apex of both internal and external edges. Hair 1-S single. Hair 8-S present. *Anal Segment:* Hair 4a-X moderately developed, usually longer than anal saddle, distinctly pectinate or plumose.

SYSTEMATICS. *Anopheles pholidotus* and the closely related *lepidotus* possess abdominal scales in the adult, and, as a consequence, they have been confused with *boliviensis* in the past. These species differ from *boliviensis,* however, in several striking features of the adult, as pointed out in the key and descriptions. The specimens of *pholidotus* from Venezuela differ from the Panamanian ones described above in the adult by the possession of light and dark scales on the middle of the scutellum and the small, inconspicuous, divided apical fringe spot, in the pupa by the more strongly pigmented cephalothorax, trumpet and abdomen and in the larva by the more strongly pigmented head capsule and antennal apex.

BIONOMICS. The immatures of this species have been collected in leaf axils of terrestrial and epiphytic bromeliads and females have been captured biting humans in the upper canopy of deep forest.

DISTRIBUTION (fig. 1). Mountains of western Panama and western Venezuela.

Material Examined: 25 specimens; 3 males, 3 male genitalia, 3 females, 12 larvae, 4 pupae; 4 individual rearings (3 larval, 1 incomplete).

PANAMA. *Bocas del Toro:* Caldera-Chiriqui Trail and La Zorra, type series, cited above.
VENEZUELA. *Barinas:* Altamira, 1 lpM, 1 M gen (1981-2) [DERM]. *Merida:* Merida, 10 June 1938, P.J. Anduze, 1 F [USNM].

3. Anopheles (Kerteszia) lepidotus Zavortink, sp. n.

Figs. 1,3,4,16

TYPES: *Holotype* male (B) with slides of associated larval skin and genitalia, Restrepo, Meta, Colombia, larva from leaf axil of bromeliad, Dec 1935, E. Osorno-Mesa [USNM]. *Allotype* female, Cuchillo, E of Villavicencio, Meta, Colombia, 16 July 1943 [USNM]. *Paratypes:* 1 lM (A) with slide of genitalia, same data as holotype [USNM]; 1 F, Buena Vista (near), Meta, Colombia, 4 June 1942, W.H.W. Komp [USNM]; 15 F, Restrepo, Meta, Colombia, with the following additional information–Aug 1935, W.H.W. Komp, 4 F [USNM], 2 F [BMNH]; 1935, W.H.W. Komp, 3 F [USNM]; 20 Nov 1936, W.H.W. Komp, 1 F [USNM]; W.H.W. Komp (KO 121A-10), 2 F [UCLA]; 3 F [USNM].

Anopheles (Kerteszia) boliviensis of Komp (1936:68, in part; 1937:503-504); Komp and Osorno-Mesa (1936:415-419); Lane (1939:18, in part; 1953:279-281); Roca-Garcia (1944:160-169, in part, ?); Levi-Castillo (1945:128-139,150, in part, ?; 1949:16, in part); Rachou (1958: 146, in part, ?); Stone, Knight and Starcke (1959:35, in part); Forattini (1962:461-462); Aragao (1964:76-77, in part); Morales-Ayala (1971:139, in part, ?).
Anopheles boliviensis of Bates (1943:23, in part; 1944:168,169, in part; 1945:24, in part); Gabaldon and Cova Garcia (1952:189, in part).

FEMALE (figs. 3,4). Wing: 3.55 mm. Proboscis: 2.06 mm. Forefemur: 1.86 mm. Abdomen: about 2.2 mm. *Head:* Integument dark reddish brown to brown. Proboscis 1.1 length of forefemur. Palpus with moderate white patch at apex of segments 2-5; scales entirely or predominantly decumbent on segments 3 and 4, sometimes slightly outstanding at base of segment 3. *Thorax:* Integument of scutum dark reddish brown. Larger acrostichal and dorsocentral bristles pale and dark; larger middle scutellar bristles dark. Anterior 0.3-0.4 of acrostichal and dorsocentral areas with a few white scales and middle of scutellum with a few white and dark scales. *Mep* with large, curved patch of scales extending ventrad from bristles to below middle of segment. *Legs:* Hindfemur with dark scaled line along lower anterior or ventral surface. Hindtarsal segment 1 without white scaling dorsally, segment 2 with narrow white band in apical 0.1-0.2, segment 3 with broad white band in apical 0.4-0.7, segment 4 with broad white band in apical 0.7-0.8 and segment 5 with broad white band in apical 0.4-0.8. *Wing:* Vein C with presectoral, sectoral and subcostal light spots usually present and moderately large to large; with 1 subcostal spot. Vein R_{2+3} usually with subcostal light spot. Vein R_{4+5} usually without light basal spot or submedian line. Vein M dark scaled basad of level of furcation in vein Cu. Veins Cu and 1A dark scaled basally. Apical fringe spot small, inconspicuous, sometimes divided into 2 separate spots; additional inconspicuous fringe spots usually at apex of veins M_{1+2}, M_{3+4}, Cu_1 and Cu_2. *Abdomen:* Tergites brown. Tergites II-VII with numerous dark brown to black scales and sometimes a few white scales; scales of proximal tergites predominantly moderately broad to broad; scales of distal tergites predominantly outstanding and aggregated into transverse apical bands. Sternites II-VII with white scales medially; more distal sternites with additional dark scales apically.

MALE. Essentially as in female except for sexual characters.

MALE GENITALIA (fig. 16). *Segment VIII:* Tergite with numerous broad scales medially. *Sidepiece:* Internal spine apparently not flattened at apex. *Claspette:* Ventral lobe moderately spiculose except near lateral margin; lateral expansion broad, conspicuous, shallowly and broadly emarginate, not curved ventrad posteriorly, produced into blunt retrorse lobe anteriorly. *Phallosome:* Aedeagus without leaflets.

PUPA. Unknown.

LARVA (not illustrated). Imperfectly known. In general similar to *pholidotus,* but with the following differences. *Head:* Hair 3-C short, strongly developed, fusiform; much stronger than 2-C. *Thorax:* Hair 11-P weakly developed, short. *Abdomen:* Palmate hairs moderate, not particularly brushlike, the leaflets spreading; leaflets moderately long, moderately broad, pointed. Hair 5-II-V distinctly plumose; 5-VII short. Hair 9-IV-VI usually branched near base only. *Spiracular Lobe:* Pecten teeth with spinules possibly restricted to basal portion of external edge.

SYSTEMATICS. Although *lepidotus* closely resembles *pholidotus* or is possibly even indistinguishable from it in the adult and male genitalia, I am recognizing it as a distinct species on the basis of the larval differences indicated in the key and description. The holotype and paratype males of *lepidotus* with associated larval skins and genitalia are the specimens described as *boliviensis* by Komp and Osorno-Mesa (1936).

BIONOMICS. The immatures of *lepidotus* are found in bromeliad leaf axils. Of the 204 females of *Kerteszia* with scales on the abdomen from Colombia in the UCLA and USNM collections, 174 or 85% are this species; as a consequence, I believe that most information on biology and medical importance of *"boliviensis"* in the Department of Meta, Colombia, found in the literature pertains to *lepidotus* and, for that reason, it is summarized here. Komp (1936:68) reported that females of *"boliviensis"* were common in the jungle where they frequently bit humans during the day and were taken in large numbers on horses in the evening. Bates (1944:168,169; 1945:24) reported that females were most common from April to October, were most active in the late afternoon and early evening and were more frequently encountered in the upper levels of forest (79% of 314) than at ground level.

In Colombia *"boliviensis"* has been found infected with the viruses *Anopheles* A and *Anopheles* B (Roca-Garcia, 1944:160-169) and found carrying the eggs of *Dermatobia hominis* (Linnaeus) (Bates, 1943:23). In Ecuador it was suspected to be a vector of human malaria by Levi-Castello (1945:137).

DISTRIBUTION (fig. 1). Eastern slope of the Andes in Colombia and Bolivia; possibly also Brazil, Guyanas, Paraguay and Venezuela.

Material Examined: 181 specimens; 2 males, 2 male genitalia, 175 females, 2 larvae; 2 incomplete individual rearings.

BOLIVIA. *Cochabamba:* El Palmar, Chapare, 2 May 1944, Torres Munoz, 1 F [USNM].

COLOMBIA. *Meta:* Buena Vista, Cuchillo and Restrepo, type series, see above. *Locality Unknown:* J.A. Kerr, 157 F [UCLA].

Additional Records from the Literature

Some of the records of *"boliviensis"* listed under that species may pertain to *lepidotus.*

4. Anopheles (Kerteszia) bambusicolus Komp

Figs. 1,3,4,10,11

1937. *Anopheles (Kerteszia) bambusicolus* Komp, 1937:515-518. TYPE: *Lectotype* female, La Union, Meta, Colombia, reared from larva collected in unbroken bamboo internode, 9 Sept 1935, J. Boshell [USNM, 53075; designation by Stone and Knight, 1956:276].

1967. *Anopheles (Kerteszia) bambusicola* Stone, 1967:200. Junior objective synonym (unjustified emendation) of *bambusicolus* Komp, 1937.

Anopheles (Kerteszia) bambusicolus of Lane (1939:17-18; 1953:281-282); Coutinho (1946:150-152); Levi-Castillo (1949:16); Rachou and Ferreira Neto (1950:303-305); Komp (1956:40-41); Bejarano (1957:317); Stone, Knight and Starcke (1959:35); Forattini (1962:462); Garcia and Ronderos (1962:149-150); Aragao (1964:78-80).
Anopheles (Kerteszia) bambusicola of Morales-Ayala (1971:139).
Anopheles bambusicolus of Gabaldon and Cova Garcia (1952:188-189).
Anopheles bellator in part of Komp (1936:68).

FEMALE (figs. 3,4). Wing: 3.43 mm. Proboscis: 2.18 mm. Forefemur: 1.73 mm. Abdomen: about 2.2 mm. *Head:* Integument dark reddish brown to dark brown. Proboscis 1.2-1.3 length of forefemur. Palpus with small white patch at apex of segment 4; scales conspicuously outstanding on segments 3 and 4. *Thorax:* Integument of scutum reddish brown to brown. Larger acrostichal, dorsocentral and middle scutellar bristles predominantly dark. Acrostichal and dorsocentral areas and scutellum without scales. *Mep* with small upper patch of scales. *Legs:* Hindfemur with dark scaled line along lower anterior or ventral surface. Hindtarsal segment 1 white scaled dorsally from 0.1 to 0.3-0.5, segments 2 and 3 with broad white band in apical 0.7-0.8, segment 4 with broad white band in apical 0.5-0.6, and segment 5 entirely white scaled. *Wing:* Vein C with presectoral, sectoral and subcostal light spots usually absent, small when present; with 0, 1 or 2 subcostal spots. Vein R_{2+3} without subcostal light spot. Vein R_{4+5} with light scales restricted to small basal spot. Vein M dark scaled basad of level of furcation in vein Cu. Vein Cu with subbasal light spot. Vein 1A dark scaled basally. Apical fringe spot not developed; inconspicuous fringe spots at apex of veins M_{3+4} and Cu_1. *Abdomen:* Tergites brown to dark brown. Tergites and sternites II-VII without obvious scales.

MALE. Essentially as in female except for sexual characters.

MALE GENITALIA (fig. 10). *Segment VIII:* Tergite without numerous broad scales medially. *Sidepiece:* Internal spine flattened and slightly broadened apically. *Claspette:* Ventral lobe glabrous except for 4-10 strong spicules and a few weak spicules along mesal margin; lateral expansion broad, prominent, rounded, not curved ventrad posteriorly and not retrorsely produced anteriorly. *Phallosome:* Aedeagus without leaflets.

PUPA (fig. 10). Abdomen: about 2.8 mm. Trumpet: 0.37 mm. Paddle: 0.71 mm. *Cephalothorax:* Moderately pigmented, lighter ventrally. *Trumpet:* Possibly golden brown. *Abdomen:* Moderately pigmented, lighter posteriorly. Hair 1-VII arising on caudal border of segment. Hair 9-IV, V short, blunt, peglike, similar to 9-III and dissimilar to 9-VI. *Paddle:* Elliptic; not obliquely truncate; relatively broad, index 1.4. Unpigmented or very weakly pigmented, lighter than posterior abdominal segments. Marginal spicules along distal portion of external buttress toothlike, short, few, widely spaced, not extending basad into proximal 0.5 of paddle; outer edge distad of external buttress with short marginal spicules. Hair 1-P strongly developed, short. Hair 2-P present.

LARVA (fig. 11). Head: 0.63 mm. Anal Saddle: 0.29 mm. *Head:* Weakly (?) to strongly pigmented, collar darker, ocular area lighter. Hair 3-C moderately long, weakly to moderately developed, not fusiform; weaker or stronger than 2-C. Hair

4-C weaker than 2-C. Hairs 5-7-C short to moderately long. *Antenna:* Weakly (?) to strongly pigmented, distal portion darkened. Shaft with relatively small, inconspicuous spicules. Hairs 2,3-A short to moderately long, subequal in length. Hair 4-A usually single. *Thorax:* Integument very dark according to Komp (1937:518). Hair 11-P weakly developed, short. *Abdomen:* Integument very dark according to Komp. Hair 1-I, VII with numerous simple branches, subpalmate with numerous slightly flattened branches, or palmate. Palmate hairs large, usually not at all brush-like, the leaflets widely spread; leaflets long, moderately broad to broad, lanceolate. Hair 5-II-V single, plumose, or branched near base only; 5-VII short. Hair 6-VI short, with a few long branches near base or short branches on main shaft distally, dissimilar to 6-III-V. Hair 9-IV-VI 1-4b, the branches usually arising near base only. *Spiracular Lobe:* Pecten teeth all long or a few shortened, with spinules varied, extending to apex or restricted to basal portion, occurring on both internal and external edges or restricted to external edge. Hair 1-S single or 2,3f. Hair 8-S present. *Anal Segment:* Hair 4a-X moderately to strongly developed, much longer than anal saddle, pectinate or plumose.

SYSTEMATICS. One of the 3 females of *bambusicolus* examined has no presectoral, sectoral or subcostal light spots on the wing, one has a moderate subcostal spot, and one has 2 small subcostal spots; the only male examined has a small sectoral spot and 2 large subcostal spots.

BIONOMICS. The immatures of *bambusicolus* are found in unbroken bamboo internodes; Komp (1956:40) reported finding them 35 feet above the ground. One female examined was taken in a biting-landing collection in association with *lepidotus.*

DISTRIBUTION (fig. 1). Eastern slope of Andes in Colombia; recorded also from Argentina, Bolivia, Brazil, Ecuador, Guyanas, Peru and Venezuela.

Material Examined: 15 specimens; 1 male, 3 male genitalia, 3 females, 7 larvae, 1 pupa; 1 larval individual rearing.

COLOMBIA. *Meta:* La Union, 9 Sept 1935, J. Boshell, 1 F, 4 L (paralectotypes no. 53075) [USNM]. Villavicencio, 1944, M. Bates, 1 lpF (72-1), 2 L [USNM]. Villavicencio (115), 1 M, 1 M gen [UCLA]. Locality not specified, 2 M gen (464.4, 467.2) [UCLA]. *Locality Unknown:* J.A. Kerr, 1 F [UCLA].

Additional Records from the Literature

ARGENTINA. *Misiones* (Bejarano, 1957:317; Garcia and Ronderos, 1962:149-150).

BOLIVIA (Levi-Castillo, 1949:16).

BRAZIL. *Parana* (Coutinho, 1946:150-152). *Santa Catarina* (Rachou and Ferreira Neto, 1950: 303-305).

ECUADOR. *Napo-Pastaza, Santiago-Zamora* (Gabaldon and Cova Garcia, 1952:188-189).

GUIANAS (Levi-Castillo, 1949:16).

PERU. *Amazonas, Cuzco, Madre de Dios, San Martin* (Gabaldon and Cova Garcia, 1952:188-189). *Loreto* (Morales-Ayala, 1971:139).

VENEZUELA (Levi-Castillo, 1949:16).

5. Anopheles (Kerteszia) homunculus Komp

Figs. 2-4,12,13

1937. *Anopheles (Kerteszia) homunculus* Komp, 1937:509-513. TYPE: *Lectotype* male (no. 3) with slides of associated larval skin and genitalia, Restrepo, Meta, Colombia, larva collected in bromeliad leaf axil, 9 Sept 1935, W.H.W. Komp [USNM, 53073; designation by Stone and Knight, 1956:278].

1937. *Anopheles (Kerteszia) anoplus* Komp, 1937:514-515. TYPE: *Holotype* male with slides of associated larval skin and genitalia, Restrepo, Meta, Colombia, larva collected in bromeliad leaf axil, Dec 1936, E. Osorno-Mesa [USNM, 53074]. Synonymy with *homunculus* by Lane (1953:287).

Anopheles (Kerteszia) homunculus of Lane (1939:19; 1953:287-288); Downs and Pittendrigh (1946:49,55,56); Pinotti (1948:694-695); Pittendrigh (1948:59; 1950a:457-468; 1950b:43-63; 1950c:64-77); Levi-Castillo (1949:16-17); Lima (1952:401-404); Veloso, Moura and Klein (1956:519); Martins (1958:429-430); Rachou (1958:149); Stone, Knight and Starcke (1959: 35); Forattini (1962:441); Aragao (1964:86-87); Ferreira (1964:335,338,340); Morales-Ayala (1971:139).

Anopheles humunculus of Senior-White and Lewis (1951:151); Gabaldon and Cova Garcia (1952: 191); Cova Garcia (1961:61-62,107-108,133-134,162,164); Forattini, Rabello and Cotrim (1970:12).

Anopheles (Kerteszia) anoplus of Komp (1937:514-515, in part); Lane (1939:17).

Anopheles bellator in part of Komp (1936:68).

FEMALE (figs. 3,4). Wing: 2.80 mm. Proboscis: 2.15 mm. Forefemur: 1.54 mm. Abdomen: about 2.1 mm. *Head:* Integument dark reddish brown to dark brown. Proboscis 1.3-1.4 length of forefemur. Palpus with small to moderate white patch at apex of segments 3-5, segments 4 and 5 or only segment 4, the patch largest on segment 4 when present on more than 1 segment; scales slightly to moderately outstanding on segment 3 and slightly outstanding to decumbent on segment 4. *Thorax:* Integument of scutum reddish brown. Larger acrostichal, dorsocentral and middle scutellar bristles predominantly dark. Acrostichal and dorsocentral areas and scutellum without scales. *Mep* with small upper and larger middle patches of scales. *Legs:* Hindfemur without dark scaled line or with weak, broken dark scaled line along lower anterior or ventral surface. Hindtarsal segment 1 white scaled dorsally from 0.2 to 0.3-0.5, segments 2-4 with broad white band in apical 0.5-0.7 and segment 5 with broad white band in apical 0.4-0.7. *Wing:* Vein C with moderately large to large presectoral, sectoral and subcostal light spots; with 1 subcostal spot. Vein R_{2+3} without subcostal light spot. Vein R_{4+5} with light scales in small basal spot and moderately long to long submedian line extending from 0.2-0.4 to 0.5-0.8. Vein M dark scaled basad of level of furcation in vein Cu. Vein Cu with subbasal light spot. Vein 1A dark scaled basally. Apical fringe spot large, conspicuous, undivided; additional inconspicuous fringe spots at apex of veins M_{3+4}, Cu_1, Cu_2 and 1A. *Abdomen:* Tergites tan to dark brown or blackish. Tergites and sternites II-VII without obvious scales.

MALE. Essentially as in female except for sexual characters.

MALE GENITALIA (fig. 12). *Segment VIII:* Tergite without numerous broad scales medially. *Sidepiece:* Internal spine flattened and slightly broadened apically. *Claspette:* Ventral lobe densely spiculose except near lateral edge; lateral expansion broad, conspicuous, more or less sinuous-margined, curved ventrad posteriorly and produced into sharp retrorse point anteriorly. *Phallosome:* Aedeagus with or without leaflets; if present, leaflets usually weak, short or long.

PUPA (fig. 12). Abdomen: about 2.3 mm. Trumpet: 0.31 mm. Paddle: 0.66 mm. *Cephalothorax:* Very weakly to moderately pigmented, lighter ventrally. *Trumpet:* Yellow to amber. *Abdomen:* Very weakly to moderately pigmented, lighter posteriorly. Hair 1-VII arising on caudal border of segment. Hair 9-IV moderately long to long, pointed, spinelike; hair 9-V long, pointed, spinelike, dissimilar to 9-III and similar, but sometimes weaker and shorter, to 9-VI. *Paddle:* Obovate; not obliquely

truncate; relatively narrow, index 1.6-1.9. Unpigmented to very weakly pigmented, lighter than posterior abdominal segments. Marginal spicules along distal portion of external buttress filamentous, moderately long, numerous, closely spaced, not extending into proximal 0.5 of paddle; outer edge distad of external buttress without spicules. Hair 1-P strongly developed, short. Hair 2-P present.

LARVA (fig. 13). Head: 0.54 mm. Anal Saddle: 0.20 mm. *Head:* Weakly to moderately pigmented, collar darker. Hair 3-C moderately long, moderately to strongly developed, not fusiform; much stronger than 2-C. Hair 4-C as strong as or stronger than 2-C. Hairs 5-7-C moderately long to long. *Antenna:* Weakly to moderately pigmented, apex not darkened. Shaft with relatively small, inconspicuous spicules. Hairs 2,3-A moderately long to long, subequal in length. Hair 4-A usually single. *Thorax:* Epidermis moderately to strongly pigmented, blackish. Hair 11-P strongly developed, long. *Abdomen:* Epidermis moderately to strongly pigmented, blackish, on entire dorsal surface of segments III and VI-VIII and middorsally on I,II and IV. Hair 1-I, VII palmate. Palmate hairs small to moderate, usually not particularly brushlike, the leaflets spreading; leaflets moderately long, moderately broad, pointed. Hair 5-II-V usually branched near base only; 5-VII long. Hair 6-VI long, plumose, similar to 6-III-V. Hair 9-IV-VI usually double with 1 branch shortened, plumose or pectinate. *Spiracular Lobe:* Pecten teeth alternating long and short medially, with spinules usually restricted to basal portion of external edge. Hair 1-S single. Hair 8-S present. *Anal Segment:* Hair 4a-X usually weakly developed, shorter or slightly longer than anal saddle, pectinate or plumose.

SYSTEMATICS. The description and drawings of *homunculus* are based on specimens from Trinidad. The scanty material of *homunculus* from Colombia that I have seen differs from that from Trinidad in the female by the reduced size or absence of the presectoral, sectoral and subcostal light spots on vein C, the usual absence of a light fringe spot at the apex of vein Cu_2, the usual absence of extensive white scaling on midtarsal segment 3 and the usually more decumbent scales on the palpus and in the larva by the finer and less conspicuously barbed hair 3-C and the longer hair 4a-X. The taxonomic significance of these differences cannot be determined until much more material is available.

BIONOMICS. The immatures are found in the leaf axils of epiphytic and terrestrial bromeliads. Adults are attracted to lights and females bite humans. Pittendrigh, in a series of excellent papers (1948,1950a,b,c,), compared the ecologies of *homunculus* and *bellator* in Trinidad and found that *homunculus* characteristically inhabited areas of higher humidity than the latter species and, as a consequence, it occurred in the wetter parts of the island and at lower levels in the forest. This same ecological relationship between *homunculus* and *bellator* holds in southeastern Brazil, where *homunculus* inhabits the dense, humid primary forest of the higher, wetter, inland areas. (Pinotti, 1948:694-695; Veloso, Moura and Klein, 1956:519: Aragao, 1964:86-87).

A. homunculus is an important vector of human malaria locally in southeastern Brazil (Rachou, 1958:149; Forattini, 1962:554) and in Trinidad (Pittendrigh, 1948: 59; Forattini, 1962:554).

DISTRIBUTION (fig. 2). Eastern slope of Andes in Colombia and Bolivia, Trinidad; recorded also from southeastern Brazil, Guianas, Peru, Surinam and Venezuela.

Material Examined: 155 specimens; 9 males, 11 male genitalia, 77 females, 36

larvae, 22 pupae; 21 individual rearings (17 larval, 2 pupal, 2 incomplete).

BOLIVIA. *Cochabamba:* El Palmar, Chapare, 30 Apr 1944, Torres Munoz, 2 F [USNM].

COLOMBIA. *Meta:* Restrepo, 9 Sept 1935, W.H.W. Komp, 1 F (No. 1), 1 lp (No. 4) (paralectotypes No. 53073) [USNM]. Villavicencio, 9 July 1965, E. Osorno-Mesa et al. (COB-67), 1 lpM (67-30); 1944, M. Bates, 1 P, 5 L; June 1944, 1 F; 1 F [UCLA]. *Locality Unknown:* J.A. Kerr, 2 F [UCLA].

TRINIDAD. *Caroni:* Tabaquite, 18 May 1914, J.R. Dickson, 1 F [BMNH]. *Nariva:* Charuma Forest, 27 Aug 1964, A. Guerra (TR 644), 1 F [UCLA]; Oct 1954, T.H.G. Aitken, 3 F [BMNH]. *St. Andrew:* Caratal Rd., 3 Dec 1964, F. Powdhar (TR 866), 1 F [UCLA]. Coalmine Rd., 24 June 1965, F. Powdhar (TR 1227), 1 pF (1227-100) [UCLA]. Cumaca, 3 Sept 1964, A. Guerra (TR 654), 3 F; 18 Feb 1965, A. Guerra (TR 1010), 5 F [UCLA]. Cumaca Rd., 14 Jan 1965, A. Guerra (TR 943), 1 F [UCLA]. Cunaripa, 11 June 1964, A. Guerra (TR 470), 1 F; 12 June 1964, A. Guerra (TR 471), 1 F [UCLA]. El Quemado Rd., 3 July 1964, F. Powdhar (TR 540), 1 L [UCLA]. Heights of Oropuche, 5 Apr 1925, F.W. Urich, 1 F [BMNH]. Mara Forest, Valencia, 26 Dec 1930, M.V. Beattie, 1 F [BMNH]. Mt. Becke, 29 Apr 1965, A. Guerra (TR 1132), 2 F; same data (TR 1136), 1 lpM (1136-20), 1 L; same data (TR 1137), 1 F; same data (TR 1141), 1 F; same data (TR 1143), 3 F [UCLA]. Mt. Harris, 23-31 July 1924, C.L. Withycombe, 2 F [BMNH]; 16 July 1964, F. Powdhar (TR 564), 2 L [UCLA]. Nestor Village, 12 June 1964, A. Guerra (TR 484), 1 F [UCLA]. Sangre Grande, 1944, 1 M, 1 M gen; 1946, 3 F [USNM]. Tamana, June 1944, 3 M gen [USNM]. Turure Forest, 24 Dec 1964, F. Powdhar (TR 901), 1 lpF (901-132); 30 Apr 1966, A. Guerra (TR 1508), 3 lpF (1508-20-22); 30 July 1966, F. Powdhar (TR 1572), 1 lpF (1572-30), 2 L; Sept 1966, F. Guerra (TR 1617), 1 F [UCLA]. Turure Rd., 9 Apr 1966, A. Guerra (TR 1497), 1 lpF (1497-20) [UCLA]. Turure Trace, 2 Apr 1966, A. Guerra (TR 1491), 2 lpF (1491-20,23), 1 lp (1491-21), 2 L [UCLA]. Valencia, 22 Aug 1945, 1 lpM (5-T-44) [USNM]. Valencia District, 1 M gen [USNM]. *St. George:* Arena Forest, 10 Aug 1965, A. Guerra (TR 1309), 1 lpM (1309-30), 1 M gen; Dec 1965, TRVL (TR 1441), 1 F [UCLA]. Aripo Valley, 15 Apr 1965, A. Guerra (TR 1112), 1 F [UCLA]. Blanchisseuse Rd. (mile post 11), 2 Sept 1945, 4 F [USNM]. Brasso Seco, 2 Apr 1964, A. Guerra (TR 262), 1 L; same data (TR 264), 1 lpM (264-153), 2 lpF (264-137,200), 1 M gen; 18 Mar 1965, A. Guerra (TR 1046), 1 lpF (1046-11), 1 pF (1046-10), 1 L [UCLA]. Heights of Guanapo, 26 Mar 1964, A. Guerra (TR 259), 2 F; 22 Apr 1965, A. Guerra (TR 1127), 1 F; same data (TR 1129), 1 F [UCLA]. Las Lapas Trace, 3 Apr 1964, A. Guerra (TR 279), 1 L; same data (TR 281), 4 F [UCLA]. La Lujha Rd., 11 Mar 1965, A. Guerra (TR 1036), 3 F [UCLA]. Spring Hill Estate, 26 Aug 1957, T.H.G. Aitken, 2 M, 2 M gen; 13 May 1965, A. Guerra (TR 1155), 5 F; 5 Mar 1966, A. Guerra (TR 1476), 1 lpM (1476-20), 1 M gen; 5 Aug 1966, T.H.G. Aitken (TR 1574), 1 F [UCLA]. *St. Patrick:* La Brea, 24 Feb 1914, J.R. Dickson, 1 F, 1 L [BMNH]. *Locality Unknown:* 1949, 1 M gen [USNM].

Additional Records from the Literature

BRAZIL. *Parana* (Forattini, Rabello and Cotrim, 1970:12). *Santa Catarina, Sao Paulo* (Aragao, 1964:86).

GUIANAS (Levi-Castillo, 1949:16-17).

PERU. *Loreto* (Morales-Ayala, 1971:139).

? SURINAM (Stone, Knight and Starcke, 1959:35).

VENEZUELA. *Bolivar, Monagas, Portuguesa, Tachira, Trujillo* (Cova Garcia, 1962:164). *Sucre* (Gabaldon and Cova Garcia, 1952:191).

6. Anopheles (Kerteszia) cruzii Dyar & Knab

Figs. 2-4, 16

1901. *Anopheles lutzii* Theobald, 1901:177-178. TYPE: *Lectotype* female, Rio de Janeiro [Guanabara], Brazil, 4 July 1899, A. Lutz [BMNH; designation by Belkin, 1968:10]. Junior primary homonym of *lutzii* Cruz, 1901.

1908. *Anopheles cruzii* Dyar and Knab, 1908:53 (30 Oct). *Nomen novum* for *lutzii* Theobald, 1901.

1908. *Myzorhynchella adolphoi* Neiva, 1908:457 (30 Nov). *Nomen novum* for *lutzii* Theobald, 1901.

1950. *Anopheles (Kerteszia) montemor* Correa, 1950:53-54. TYPE: *Holotype* male (102) with slides of associated larval and pupal skins (15, G8D1) and genitalia (15, G8D1), Caraguatatuba, Sao Paulo, Brazil, 1946, G.R. Ramalho and J. Germano [FH; see Belkin, Schick and Heinemann, 1971:7]. Synonymy with *lutzii* Theobald, 1901 (as *cruzii*) by Barretto and Coutinho (1951:177-179).

Anopheles (Kerteszia) cruzii of Dyar (1928:468-469, in part); Lane (1939:18-19, in part); Correa and Cerqueira (1944:111,114,115); Levi-Castillo (1949:16); Barretto and Coutinho (1951: 177-179); Lima (1952:401-404); Veloso, Moura and Klein (1956:520); Forattini (1962:437-439); Aragao (1964:88-94); Ferreira (1964:335,338,344-345); Forattini, Lopes and Rabello (1968:136-172); Deane et al. (1970:647); Morales-Ayala (1971:139).

Anopheles (Kerteszia) cruzii cruzii of Lane (1951:336; 1953:285-286); Martins (1958:429-430); Rachou (1958:171-178); Stone, Knight and Starcke (1959:35); Garcia and Ronderos (1962: 151).

Anopheles cruzii of Dyar and Knab (1908:53, in part); Gabaldon and Cova Garcia (1952:189); Cova Garcia (1961:60-61,107,132-133,164).

Anopheles (Dendropaedium) cruzii in part of Dyar (1918:146; 1925a:26).

Anopheles (Nyssorhynchus) bellator var. *cruzii* of Christophers (1924:42); Edwards (1932:46, in part).

Anopheles lutzii of Giles (1902:303-304).

Laverania lutzii of Theobald (1902:183).

Myzomyia lutzii in part of Theobald (1905a:8; 1907:41,42, 1910:16,18); Peryassu (1908:59, 78-80, 328-329,359).

Nyssorhynchus lutzii of Blanchard (1905:211).

Anopheles bellator in part of Dyar (1923:72).

Anopheles boliviensis in part of Knab (1913:15-17); Dyar and Knab (1917:40); Howard, Dyar and Knab (1917:988).

FEMALE (figs. 3,4). Wing: 2.92 mm. Proboscis: 2.02 mm. Forefemur: 1.56 mm. Abdomen: about 1.7 mm. *Head:* Integument dark reddish brown to dark brown. Proboscis 1.2-1.3 length of forefemur. Palpus with small to moderate white patch at apex of segments 3-5, the patch on segment 3 subequal in size to or larger than patch on segment 4; scales entirely or predominantly decumbent on segments 3 and 4, sometimes slightly outstanding at base of segment 3. *Thorax:* Integument of scutum dark reddish brown to dark brown. Larger acrostichal, dorsocentral and middle scutellar bristles usually predominantly dark. Acrostichal and dorsocentral areas without scales; scutellum without scales or middle with a few dark scales. *Mep* with small upper and larger middle patches of scales. *Legs:* Hindfemur without dark scaled line on lower anterior or ventral surface. Hindtarsal segment 1 white scaled dorsally from 0.2 to 0.5-0.7 and segments 2-5 with broad white band in apical 0.4-0.6. *Wing:* Vein C with presectoral, sectoral and subcostal light spots usually present and moderately large to large; with 1 subcostal spot. Vein R_{2+3} without subcostal light spot. Vein R_{4+5} with light scales in small basal spot and long median line extending from 0.2-0.3 to 0.6-0.8. Vein M dark scaled basad of level of furcation in vein Cu. Vein Cu with subbasal light spot. Vein 1A usually dark scaled basally. Apical fringe spot small to moderate, inconspicuous to conspicuous, undivided; additional inconspicuous fringe spots usually at apex of veins M_{3+4}, Cu_1, Cu_2 and 1A. *Abdomen:* Tergites slightly to conspicuously reddish. Tergites and sternites II-VII without obvious scales.

MALE. Not available for study.

MALE GENITALIA (fig. 16). *Segment VIII.* Tergite probably without numerous broad scales medially. *Sidepiece:* Internal spine flattened and slightly broadened apically. *Claspette:* Ventral lobe densely spiculose except laterally; lateral expansion broad, conspicuous, more or less rounded to sinuous-margined, not curved ventrad posteriorly, not retrorsely produced anteriorly or with blunt retrorse lobe. *Phallosome:* Aedeagus with strong, long leaflets.

PUPA. Unknown.

LARVA (not illustrated). Association with adult uncertain. Apparently very similar to *homunculus,* possibly distinguished from it by a reddish epidermal pigment and a more weakly pigmented anal saddle.

SYSTEMATICS. I have seen 3 whole larvae from Brazil that may be *cruzii* since they run to it in Forattini's key (1962:492) and differ in several respects from larvae of *homunculus, bellator* and *laneanus* that I have seen. However, one of these larvae, from Rio de Janeiro, differs in several important features from the other 2, from Brusque, Santa Catarina, and I doubt that it is conspecific with them. None of these larvae can be completely studied because the terminal segments have not been cut and mounted laterally, thus obscuring all details of the pecten teeth and ventral brush.

BIONOMICS. The immatures are found in the leaf axils of bromeliads. Females readily bite humans, especially during the evening and night. Veloso, Moura and Klein (1956:520) and Aragao (1964:88-94) report that *cruzii* is restricted less by environmental factors than *homunculus* and *bellator* in southeastern Brazil and that it occurs in a variety of habitats from the coast into the mountains.

A. cruzii is a primary vector of human malaria in southeastern Brazil (Rachou, 1958:171-178; Forattini, 1962:554). It is also a natural vector of monkey malaria in that region (Deane et al., 1970:647).

DISTRIBUTION (fig. 2). Southeastern Brazil; recorded since Komp (1937) also from Argentina, Bolivia, northern and western Brazil, Colombia, Costa Rica, Ecuador, Guianas, Panama, Peru and Venezuela.

Material Examined: 32 specimens; 2 male genitalia, 27 females, possibly 1-3 larvae.

BRAZIL. *Guanabara:* Rio de Janeiro, 4 July 1899, A. Lutz, 3 F (lectotype and paralectotypes of *lutzii* Theobald, 1901) [BMNH]; M.F. Boyd, 1 F [BMNH], ? 1 L [USNM]. *Santa Catarina:* Brusque, 2 M gen, ? 2 L [IER]. Locality unknown, 10 F [IER]. *Sao Paulo:* Barueri, June 1932, J. Lane, 7 F [BMNH]. Juquia, 27 Jan 1932, J. Lane, 4 F [BMNH]. *Locality Unknown:* A. Lutz, 2 F [BMNH].

Additional Records from the Literature

ARGENTINA. *Misiones* (Garcia and Ronderos, 1962:151).

BOLIVIA (Levi-Castillo, 1949:16).

BRAZIL. *Acre, Amazonas, Bahia, Espirito Santo, Minas Gerais, Para, Parana, Pernambuco, Rio de Janeiro, Rio Grande do Sul, Sergipe* (Ferreira, 1964:336-337; Aragao, 1964:88).

COLOMBIA (Levi-Castillo, 1949:16).

COSTA RICA (Lane, 1953:286).

ECUADOR (Lane, 1953:286).

GUIANAS (Levi-Castillo, 1949:16; Lane, 1953:286).

PANAMA (Lane, 1953:286).

PERU. *Loreto* (Morales-Ayala, 1971:139).

VENEZUELA. *Delta Amacuro* (Cova Garcia, 1961:164).

7. *Anopheles (Kerteszia) bellator* Dyar & Knab

Figs. 2,4,14,15

1906. *Anopheles bellator* Dyar and Knab, 1906:160. TYPE: *Lectotype* male (no. 44.1) with slides of associated pupal skin, genitalia (314) and foretarsus (659), Pitch Lake, La Brea, St. Patrick, Trinidad, reared from larva collected in leaf axil of century plant, 8 July 1905, A. Busck [USNM, 10027; designation by Stone and Knight, 1956:276; see Belkin, Schick and Heinemann, 1965:67]. Synonymized with *lutzii* Theobald, 1901 (as *bellator*) by Dyar (1923:72); considered as variety of *lutzii* (as *bellator*) by Christophers (1924: 42); resurrected to specific rank by Dyar (1925a:25-27); considered as variety of *lutzii* (as *bellator*) by Edwards (1932:46); resurrected to specific rank by Komp (1937:506-508).

1925. *Anopheles (Dendropaedium) bellator* race *bromelicola* Dyar, 1925a:27. TYPE: *Lectotype* female, Manoa Woods, Orinoco River, Delta Amacuro, Venezuela, 10 Jan 1910, F.L. de Verteuil [USNM; designation by Stone and Knight, 1956:276]. Synonymy with *bellator* by Dyar (1928:469).

Anopheles (Kerteszia) bellator of Dyar (1928:469-470); Komp (1937:506-508; 1942:75-76, 127-128, 164-165); Lane (1939:18; 1953:282-283); Rozeboom, Fox and Laird (1941:114); Rozeboom and Laird (1942:89-91); Simmons and Aitken (1942:99-101); Ross and Roberts (1943: 37-38); Downs and Pittendrigh (1946:47-64); Pinotti (1948:694-695); Pittendrigh (1948:58, 59; 1950a:457-468; 1950b:43-63; 1950c:64-77); Rachou (1956:267,272; 1958:171-178); Veloso, Moura and Klein (1956:519-520); Charles (1959:160-166); Stone, Knight and Starcke (1959:35); Forattini (1962:441-445); Aragao (1964:80-86); Ferreira (1964:338, 344-345).

Anopheles (Dendropaedium) bellator of Dyar (1918:145; 1925a:27).

Anopheles (Nyssorhynchus) bellator of Christophers (1924:42, in part); Edwards (1932:46, in part).

Anopheles bellator of Theobald (1910:86); Dyar and Knab (1917:40); Howard, Dyar and Knab (1917:985-986); Dyar (1923:72, in part); Downs, Gillette and Shannon (1943:19-20,34-42); Senior-White and Lewis (1951:151); Gabaldon and Cova Garcia (1952:189); Cova Garcia (1961:59-60,106,131-132,164).

Myzomyia lutzii of Theobald (1903:51; 1905a:8, in part; 1907:41,42, in part; 1910:16,18, in part).

Anopheles cruzii of de Verteuil and Spence (1937:453-454).

FEMALE (fig. 4). Wing: 2.69 mm. Proboscis: 1.90 mm. Forefemur: 1.40 mm. Abdomen: about 2.0 mm. *Head:* Integument dark brown. Proboscis 1.3-1.4 length of forefemur. Palpus with small to moderate white patch at apex of segment 4 or segments 4 and 5, the patch on 4 larger when 2 are present; scales slightly to conspicuously outstanding on proximal portion of segment 3, decumbent on distal portion of segment 3 and on segment 4. *Thorax:* Integument reddish brown to dark brown. Larger acrostichal and dorsocentral bristles predominantly pale; larger middle scutellar bristles predominantly dark. Acrostichal and dorsocentral areas without scales, scutellum without scales or middle with a few dark scales. *Mep* with small upper and larger middle patches of scales. *Legs:* Hindfemur usually with dark scaled line along lower anterior or ventral surface. Hindtarsal segment 1 usually without white scales dorsally, segments 2 and 3 with narrow white band in apical 0.1-0.3, segment 4 with narrow white band in apical 0.2-0.3 and segment 5 usually entirely dark scaled. *Wing:* Vein C with presectoral, sectoral and subcostal light spots usually present and moderately large to large; with 1 subcostal spot. Vein R_{2+3} without subcostal light spot. Vein R_{4+5} with light scales in small basal spot and long median line extending from 0.2-0.3 to 0.7-0.8. Vein M dark

scaled basad of level of furcation in vein Cu. Vein Cu with subbasal light spot. Vein 1A dark scaled basally. Apical fringe spot moderate to large, conspicuous, undivided; additional inconspicuous fringe spots usually at apex of veins M_{3+4}, Cu_1 and 1A. *Abdomen:* Tergites light brown to dark brown, blackish or reddish. Tergites and sternites II-VII without obvious scales.

MALE. Essentially as in female except for sexual characters.

MALE GENITALIA (fig. 14). *Segment VIII:* Tergite without numerous broad scales medially. *Sidepiece:* Internal spine flattened and slightly broadened apically. *Claspette:* Ventral lobe densely spiculose mesally; lateral expansion broad, prominent, rounded, curved ventrad posteriorly, not retrorsely produced anteriorly. *Phallosome:* Aedeagus with usually strong, long leaflets.

PUPA (fig. 14). Abdomen: about 2.5 mm. Trumpet: 0.31 mm. Paddle: 0.69 mm. *Cephalothorax:* Weakly to strongly pigmented, lighter ventrally. *Trumpet:* Yellow to amber. *Abdomen:* Weakly to strongly pigmented, uniform or lighter posteriorly. Hair 1-VII arising on caudal border of segment. Hair 9-IV moderately long, pointed, spinelike; 9-V moderately long to long, pointed, spinelike, dissimilar to 9-III and similar, but shorter and weaker, to 9-VI. *Paddle:* Obovate; usually not obliquely truncate; relatively narrow, index 1.6-1.8. Weakly to strongly pigmented, but always darker than posterior abdominal segments. Marginal spicules along distal portion of external buttress toothlike or filamentous, short, few, widely spaced, usually not extending basad into proximal 0.5 of paddle; outer edge distad of external buttress without spicules. Hair 1-P strongly developed, short. Hair 2-P present.

LARVA (fig. 15). Head: 0.49 mm. Anal Saddle: 0.20 mm. *Head:* Very weakly to moderately pigmented, collar darker. Hair 3-C moderately long, moderately developed, not fusiform; slightly stronger than 2-C. Hair 4-C as strong as or stronger than 2-C. Hairs 5-7-C moderately long to long. *Antenna:* Very weakly to moderately pigmented, apex not darkened. Shaft with relatively small, inconspicuous spicules. Hairs 2,3-A long, subequal in length. Hair 4-A usually forked apically. *Thorax:* Epidermis weakly to strongly pigmented, blackish. Hair 11-P moderately to strongly developed, moderately long to long. *Abdomen:* Epidermis weakly to strongly pigmented, blackish, on entire dorsal surface of segments I-VIII or III and VI-VIII. Hair 1-I, VII palmate. Palmate hairs small, usually not particularly brushlike, the leaflets spreading; leaflets moderately long, moderately broad, pointed. Hair 5-II-V usually distinctly plumose; 5-VII long. Hair 6-VI long, plumose, similar to 6-III-V. Hair 9-IV-VI usually plumose or pectinate. *Spiracular Lobe:* Pecten teeth alternating long and short medially, with spinules usually restricted to basal portion of external edge. Hair 1-S usually 2, 3b or 2, 3f, sometimes single. Hair 8-S present. *Anal Segment:* Hair 4a-X moderately developed, much longer than anal saddle, pectinate or plumose.

SYSTEMATICS. The description and drawings of this species are based largely on material from Trinidad. The few larvae of *bellator* from Guyana that have been examined are much more intensely pigmented that those from Trinidad or Bahia, Brazil.

BIONOMICS. The immatures are found in the leaf axils of terrestrial and epiphytic bromeliads. Females commonly bite humans, especially in the evening. Pittendrigh (1948, 1950a, b, c) reported that *bellator* preferred regions of lower humidity than *homunculus* in Trinidad and, therefore, was found in drier areas of the island and higher levels in the forest. Pinotti (1948:694-695), Veloso, Moura and Klein (1956:519-520) and Aragao (1964:81-86) also report that *bellator* occurs in less humid regions than *homunculus* in southeastern Brazil and that it is the

species found in open places and secondary forest in the relatively dry area along the coast.

A. bellator is a primary vector of human malaria in southeastern Brazil (Rachou, 1958:171-178; Forattini, 1962:554) and Trinidad (de Verteuil and Spence, 1937: 453-454; Rozeboom and Laird, 1942:89-91; Downs, Gillette and Shannon, 1943: 40-42) and is thought to be a vector in Guyana (Charles, 1959:160-166). It has also been found infected with *Wuchereria bancrofti* (Cobbold) in southeastern Brazil (Rachou, 1956:267, 272).

DISTRIBUTION (fig. 2). Coastal areas from eastern Venezuela to southeastern Brazil.

Material Examined: 196 specimens; 15 males, 18 male genitalia, 84 females, 57 larvae, 22 pupae; 22 individual rearings (15 larval, 4 pupal, 3 incomplete).

BRAZIL. *Bahia:* Caravelas, Jan 1931, N.C. Davis, 1 M [USNM], 1 F, 4 L [BMNH]. Muriqueira (Gois Calmon), 26 Apr 1929, R.C. Shannon, 1 M, 1 M gen, 2 F [USNM].

GUYANA. *Demerara:* St. Cuthbert's Mission (1.5-3.0 km W), 17 Nov 1967, P. Rauch and R. Hansell (GUY 68), 5 L; same data (GUY 70), 3 L [UCLA]. *Essequibo:* Barima River, Koriabo, 10 Aug 1901, G.C. Low, 3 F [BMNH]. Kaieteur Plateau, 8-11 Aug 1959, W. Adams, 1 F [BMNH]. Potaro, May 1910, L.D. Cleare, 1 F [BMNH].

TRINIDAD. *Nariva:* Biche, 9 July 1964, F. Powdhar (TR 554), 1 lpF (554-126), 1 L; same data (TR 555), 1 L [UCLA]. Bush Bush Forest, Nariva Swamp, 8 Sept 1964, TRVL (TR 664), 1 lp (664-116); same data (TR 665), 1 lpM (665-118), 1 M gen; same data (TR 667), 1 lpF (667-103); same data (TR 669), 1 L; 3 Nov 1964, TRVL (TR 803), 2 L; 10 Nov 1964, TRVL (TR 820), 4 L [UCLA]. Charuma Forest, 27 Aug 1964, A. Guerra (TR 636), 2 L; same data (TR 644), 1 F [UCLA]. Saddle Hills-Brasso Venado, 21 June 1964, R. Manuel and R. Martinez (TR 513), 3 F [UCLA]. *St. Andrew:* Caratal Rd., 3 Dec 1964, F. Powdhar (TR 866), 1 F [UCLA]. Coryal, 18 June 1964, A. Guerra (TR 497), 1 pM (497-102), 1 M gen; same data (TR 498), 2 F [UCLA]. Cumaca, 22 Oct 1964, A. Guerra (TR 784), 1 F [UCLA]. Gunapo or Sangre Grande, Nov or Dec 1936, 2 M, 2 M gen [USNM]. Mt. Becke, 29 Apr 1965, A. Guerra (TR 1137), 3 F [UCLA]. Mt. Harris, 23-31 July 1924, C.L. Withycombe, 7 F [BMNH]; 16 July 1964, F. Powdhar (TR 572), 1 L; same data (TR 573), 1 F [UCLA]. Mt. Tamana, 19 June 1964, A. Guerra (TR 510), 1 lpM (510-119), 4 lpF (510-102,117,131,153), 1 M gen, 2 L; same data (TR 512), 7 F [UCLA]. Sangre Grande, 1946, 2 M, 2 M gen, 1 F [USNM]. Tamana, 1944, 2 M, 1 M gen, 5 F; June 1945, 1 F [USNM]. Turure Forest, Aug 1966, F. Guerra (TR 1616), 1 F; Sept 1966, F. Guerra (TR 1617), 1 F [UCLA]. Turure River, Valencia, 5 Apr 1925, F.W. Urich, 1 F [BMNH]. *St. David:* Matelot, 12 Mar 1964, A. Guerra (TR 176), 2 lpF (176-118,137), 1 pF (176-111), 1 L; same data (TR 178), 1 lpM (178-120), 1 M gen [UCLA]. Sans Souci, 5 Mar 1964, A. Guerra (TR 141), 1 lp (141-156); same data (TR 142), 1 lpM (142-122), 1 M gen [UCLA]. Toco, 6 Mar 1964, A. Guerra (TR 157), 1 lpF (157-107), 2 L; same data (TR 159), 1 pF (159-166) [UCLA]. *St. George:* Arena Forest, 17 Aug 1965, A. Guerra (TR 1334), 1 pF (1334-101) [UCLA]. Blanchisseuse, 9 Apr 1964, A. Guerra (TR 291), 1 L [UCLA]. Guanapo, Arima, 2 Feb 1938, E. de Verteuil, 1 F [BMNH]. La Holquetta, Guanapo, 21 Jan 1938, E. de Verteuil, 1 F [BMNH]. Monos Island, Sept 1936, 1 M, 1 M gen, 2 F [USNM]. Talparo, 26 June 1964, A. Guerra (TR 530), 2 lpF (530-106,116), 1 lp (530-154), 1 L; same data (TR 531), 3 F [UCLA]. *St. Patrick:* Point Fortin, 30 Aug 1945, 8 L [USNM]. *County Unknown:* Central Range, 22-31 July 1924, C.L. Withycombe, 2 F [BMNH]. Malestafemolo, 7 Feb 1938, E. de Verteuil, 1 M [BMNH]. Rio Claro, Navet, 20 Aug 1964, A. Guerra (TR 619), 1 F [UCLA]. *Locality Unknown:* June, A. Busck, 1 F (paralectotype of *bellator* no. 10027); F.W. Urich, 1 wing (no. 554); W.H.W. Komp, 12 F, 6 M gen [USNM].

VENEZUELA. *Delta Amacuro:* Manoa Woods, Orinoco River, 10 Jan 1910, F.L. de Verteuil, 1 F (paralectotype of *bromelicola*) [USNM]. *Monagas:* Caripito, July 1937, P.J. Anduze, 1 F [USNM].

Additional Records from the Literature

BRAZIL. *Espirito Santo, Guanabara, Paraiba, Parana, Pernambuco, Rio de Janeiro, Rio Grande*

do Sul, Santa Catarina, Sao Paulo (Gabaldon and Cova Garcia, 1952:189; Aragao, 1964:80).
SURINAM (Gabaldon and Cova Garcia, 1952:189; Forattini, 1962:445).
VENEZUELA. *Sucre* (Gabaldon and Cova Garcia, 1952:189).

8. Anopheles (Kerteszia) laneanus Correa & Cerqueira

Figs. 2,4,16

1944. *Anopheles (Kerteszia) laneanus* Correa and Cerqueira, 1944:112-114. TYPE: *Holotype* male (383. H. 13) with slide of genitalia (640), Campos do Jordao, Serra da Mantiqueira, Sao Paulo, Brazil, J. and F. Lane [FH, 2226 in tube 2227; see Belkin, Schick and Heinemann, 1971:7]. Synonymized with *lutzii* Theobald, 1901 (as *cruzii*) by Correa (1950:53); resurrected by Barretto and Coutinho (1951:177-179); reduced to subspecies of *lutzii* (as *cruzii*) by Lane (1951:336); elevated to specific rank by Forattini (1962:445).

Anopheles (Kerteszia) laneanus of Martinez (1949:13-15); Barretto and Coutinho (1951:177-179); Forattini (1962:445-447); Aragao (1964:77-78).
Anopheles (Kerteszia) cruzii laneanus of Lane (1951:336; 1953:286-287); Martinez and Prosen (1953:28-29); Bejarano (1957:317); Stone, Knight and Starcke (1959:35); Garcia and Ronderos (1962:152).
Anopheles (Kerteszia) cruzii of Dyar (1928:468-469, in part); Komp (1937:504-506); Correa (1950:53).
Anopheles (Dendropaedium) cruzii in part of Dyar (1918:146; 1925a:26).
Anopheles boliviensis in part of Knab (1913:15-17); Dyar and Knab (1917:40); Howard, Dyar and Knab (1917:988).
Anopheles bellator in part of Dyar (1923:72).

FEMALE (fig. 4). Wing: 3.67 mm. Proboscis: 2.17 mm. Forefemur: 1.76 mm. Abdomen: about 2.1 mm. *Head:* Integument dark brown. Proboscis 1.2-1.4 length of forefemur. Palpus with moderate white patch at apex of segments 3-5; scales entirely or predominantly decumbent on segments 3 and 4, sometimes slightly outstanding at base of segment 3. *Thorax:* Integument brown to dark reddish brown. Larger acrostichal, dorsocentral and middle scutellar bristles predominantly pale. Anterior 0.3-0.4 of acrostichal and dorsocentral areas and middle of scutellum with a few white scales. *Mep* with small upper and larger middle patches of scales. *Legs:* Hindfemur without dark scaled line along lower anterior or ventral surface. Hindtarsal segment 1 white scaled dorsally from 0.2 to 0.5-0.6, segments 2, 4 and 5 with broad white band in apical 0.4-0.6 and segment 3 with broad white band in apical 0.6-0.7. *Wing:* Vein C with presectoral, sectoral and subcostal light spots usually present and moderately large to large; with 1 subcostal light spot. Vein R_{2+3} with or without subcostal light spot. Vein R_{4+5} with light scales in small basal spot and long median line extending from 0.2-0.3 to 0.7-0.9. Vein M entirely or partially light scaled basad of level of furcation in vein Cu. Vein Cu with subbasal light spot. Vein 1A with 1 or 2 light spots basally. Apical fringe spot small to moderate, usually conspicuous, undivided; additional inconspicuous fringe spots usually at apex of veins M_{3+4}, Cu_1, Cu_2 and 1A. *Abdomen:* Tergites tan to dark brown or reddish. Tergites and sternites II-VII without obvious scales.

MALE. Essentially as in female except for sexual characters.

MALE GENITALIA (fig. 16). *Segment VIII:* Tergite probably without numerous broad scales medially. *Sidepiece:* Internal spine flattened and slightly broad-

ened apically. *Claspette:* Ventral lobe very densely spiculose except laterally; lateral expansion broad, prominent, rounded, curved ventrad posteriorly, not retrorsely produced anteriorly. *Phallosome:* Aedeagus with strong, long leaflets.

PUPA. Unknown.

LARVA (not illustrated). Imperfectly known. Apparently very similar to *bellator,* possibly distinguished from it by the longer hair 14-P that is not branched near base.

SYSTEMATICS. I have seen one topotypic male of *laneanus* with an associated larval skin. The skin is poorly mounted and cannot be studied or described in detail; it appears, however, to be very similar to *bellator* and runs to the vicinity of that species in the key. It does not exhibit any of the diagnostic characteristics of the larva ascribed to *laneanus* (strongly barbed or plumose hairs 2-4, 11-C) by Forattini (1962:445-447). The identity of the larva described by Forattini cannot be determined at this time.

BIONOMICS. The immatures are found in leaf axils of bromeliads. This species was suspected to be a vector of human malaria in Bolivia by Martinez and Prosen (1953:28-29).

DISTRIBUTION (fig. 2). Southeastern Brazil; recorded also from Argentina and Bolivia.

Material Examined: 19 specimens; 3 males, 2 male genitalia, 13 females, 1 larva; 1 incomplete individual rearing.

BRAZIL. *Rio de Janeiro:* Agulhas Negras (Itatiaia), 14 Mar 1941, L. Gomes, 1 F; 20 Mar 1941, L. Gomes and I. Luz, 1 F [UCLA]. *Sao Paulo:* Campos do Jordao, Nov 1936, J. Lane, 1 lM (742-13); 20 Mar 1937, P.C.A. Antunes, 1 M, 3 F [USNM]; J. Lane, 3 F [USNM], 2 F [UCLA]. Salesopolis (Boracea), 22 May 1947, Travassos, Travassos F. and Vanzolini, 1 M, 1 M gen, 2 F [USNM]. Sao Paulo, A. Lutz, 1 F; 1935, P.C.A. Antunes, 1 M gen [USNM].

Additional Records from the Literature

ARGENTINA. *Misiones* (Bejarano, 1957:317; Garcia and Ronderos, 1962:152).

BOLIVIA. *Cochabamba, La Paz* (Martinez, 1949:13-15). *Santa Cruz* (Martinez and Prosen, 1953:28-29).

9. Anopheles (Kerteszia) boliviensis (Theobald)

Figs. 2,4

1905. *Kerteszia boliviensis* Theobald, 1905b:66-68. TYPE: *Holotype* female, Songo [Zongo, La Paz], Bolivia, M. Biro [HNM; see Belkin, 1968:9]. Synonymized with *lutzii* Theobald, 1901 (as *boliviensis*) by Knab (1913:16); resurrected by Dyar and Knab (1918: 140-141).

Anopheles (Kerteszia) boliviensis of Dyar (1918:148; 1928:467); Komp (1936:68, in part); Lane (1939:18, in part); Anduze (1943:191, ?); Roca-Garcia (1944:160-169, in part, ?); Levi-Castillo (1945:128-139,150, in part, ?; 1949:16, in part); Rachou (1958:146, in part, ?); Stone, Knight and Starcke (1959:35, in part); Aragao (1964:76-77, in part); Morales-Ayala (1971: 139, in part, ?).

Anopheles (Nyssorhynchus) boliviensis of Christophers (1924:42); Edwards (1932:46).

Kerteszia boliviensis of Theobald (1907:118-120; 1910:74); Dyar and Knab (1918:140-141); Stone (1957:171).

Anopheles boliviensis in part of Knab (1913:15-17); Dyar and Knab (1917:40); Howard, Dyar and Knab (1917:988); Bates (1943:23; 1944:168,169; 1945:24); Gabaldon and Cova Garcia (1952:189); Cova Garcia (1961:57-58,104,134-135,162, ?).

Anopheles (Dendropaedium) cruzii in part of Dyar (1925a:26).

FEMALE (fig. 4). Wing: 3.95 mm. Proboscis: 2.44 mm. Forefemur: 2.02 mm. Abdomen: about 2.5 mm. *Head:* Integument dark reddish brown to dark brown. Proboscis 1.2-1.4 length of forefemur. Palpus with moderate white patch at apex of segments 3-5; scales slightly to conspicuously outstanding on proximal portion of segment 3, decumbent on distal portion of segment 3 and on segment 4. *Thorax:* Integument reddish brown to dark reddish brown or brown. Larger acrostichal and dorsocentral bristles predominantly pale; larger middle scutellar bristles dark. Anterior 0.3-0.4 of acrostichal and dorsocentral areas with a few white scales; middle of scutellum with a few dark scales. *Mep* with small upper patch of scales. *Legs:* Hindfemur with complete or broken dark scaled line along lower anterior or ventral surface. Hindtarsal segment 1 white scaled dorsally from 0.1-0.2 to 0.3-0.7, segments 2, 4 and 5 with broad white band in apical 0.5-0.7 and segment 3 with broad white band in apical 0.7-0.8. *Wing:* Vein C with presectoral, sectoral and subcostal light spots usually present and moderately large to large; with 1 subcostal light spot. Vein R_{2+3} with subcostal light spot. Vein R_{4+5} with light scales in small basal spot and long median line extending from 0.2-0.3 to 0.7-0.8. Vein M entirely or predominantly light scaled basad of level of furcation in vein Cu. Vein Cu with subbasal light spot. Vein 1A usually with 1 light spot basally. Apical fringe spot small to moderate, inconspicuous to conspicuous, undivided; additional inconspicuous fringe spots usually at apex of veins M_{3+4}, Cu_1, Cu_2 and 1A. *Abdomen:* Tergites tan to dark brown. Tergites II-VII with numerous narrow to moderately broad, dark brown to black scales; scales of distal tergites not outstanding, and not forming transverse apical bands. Sternites II-VII with white scales medially; more distal sternites sometimes with additional dark scales apically.

MALE, PUPA, LARVA. Unknown.

SYSTEMATICS. This species is known only in the adult female; the larva and male described as *boliviensis* by Komp and Osorno-Mesa (1936) are actually *lepidotus*. The description and drawings of *boliviensis* are based largely on material from Colombia and Peru.

BIONOMICS. Some of the information on *"boliviensis"* summarized under *lepidotus* may actually pertain to this species.

DISTRIBUTION (fig. 2). Eastern slope of Andes from Colombia to Bolivia; recorded also from Brazil, Guyanas, Paraguay and Venezuela.

Material Examined: 38 females.

BOLIVIA. *Cochabamba:* Chimore, Chapare, 29 Apr 1944, Torres Munoz, 1 F [USNM].

COLOMBIA. *Meta:* Restrepo, W.H.W. Komp (KO 121A-10), 1 F [UCLA]. Villavicencio, Forzosa Bosque, 7 July 1943, 1 F [USNM]. *Locality Unknown:* J.A. Kerr, 28 F [UCLA].

PERU. ? *Cajamarca:* Huascaray, 22 Sept 1911, C.H.T. Townsend, 4 F [USNM]. Rio Charape, 13 Sept 1911, C.H.T. Townsend, 3 F [USNM].

Additional Records from the Literature

BRAZIL (Levi-Castillo, 1949:16; Rachou, 1958:146).

BOLIVIA. *Beni, Cochabamba, La Paz* (Gabaldon and Cova Garcia, 1952:189).

COLOMBIA. *Cundinamarca, Meta* (Gabaldon and Cova Garcia, 1952:189).

ECUADOR. *Napo-Pastaza, Santiago-Zamora* (Levi-Castillo, 1945:150; Gabaldon and Cova Garcia, 1952:189).

GUIANAS (Levi-Castillo, 1949:16).

PARAGUAY (Levi-Castillo, 1949:16).

PERU. *Amazonas, Cuzco, Madre de Dios, San Martin* (Gabaldon and Cova Garcia, 1952: 189). *Ayacucho, Loreto* (Morales-Ayala, 1971:139).

VENEZUELA. *Merida* (Anduze, 1943:191; Cova Garcia, 1961:162).

10. Anopheles (Kerteszia) sp., Auyan-Tepui Mesa form

Fig. 1

Anopheles (Kerteszia) sp. of Anduze (1941:823; 1942:435).

This form is known by a single female from Auyan-Tepui Mesa, Bolivar, Venezuela (as Oyantepuy, June 1937, P.J. Anduze) in the USNM that apparently resembles *neivai* in most respects (distribution of scales on *mep* unknown), but differs from that species by its larger size, the presence of a patch of white scales at the apex of palpal segment 3 and by the narrower apical white band on hindtarsal segments 1-4. This form almost certainly represents a distinct species, but since the only specimen is badly damaged, I am not naming or describing it at this time.

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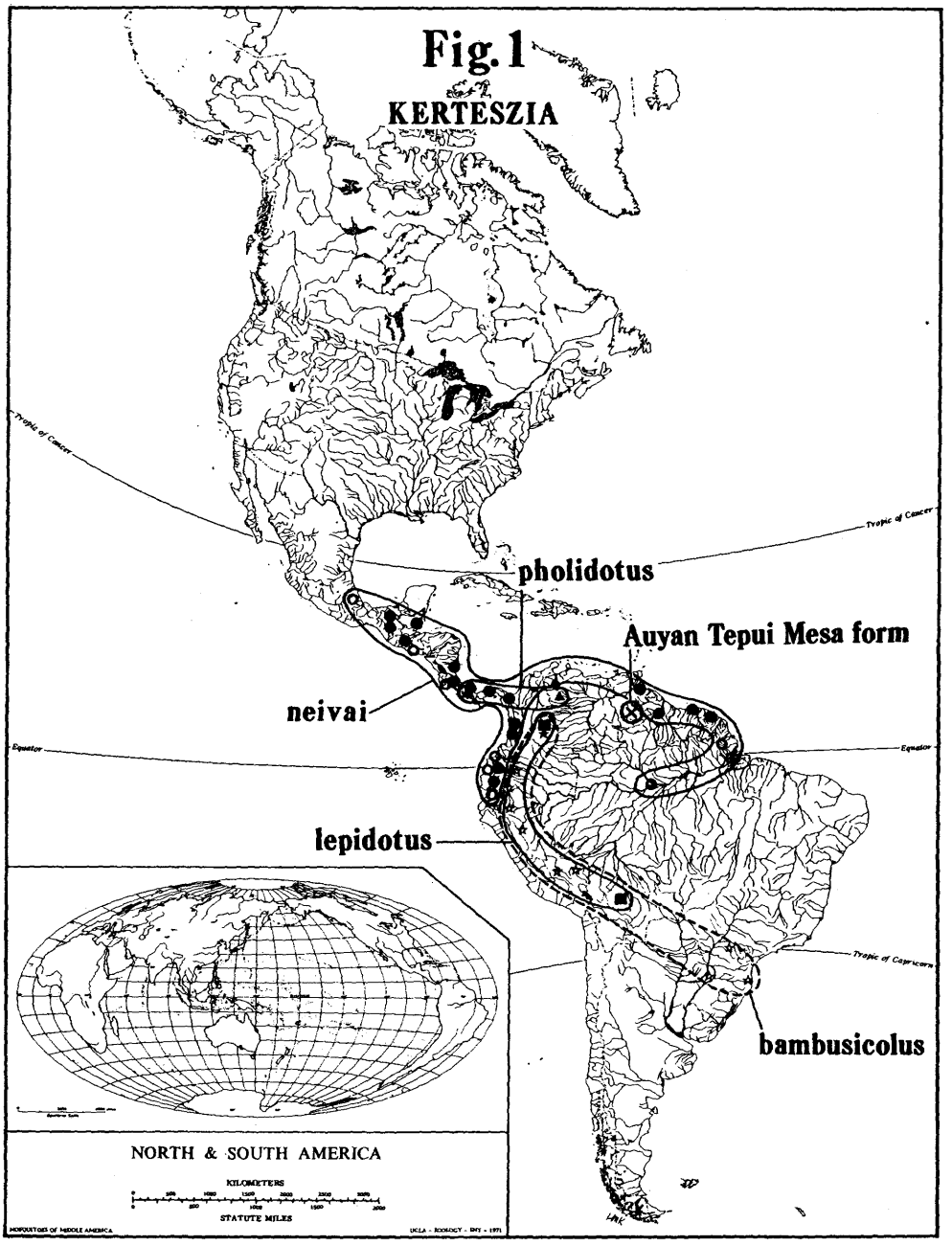


Fig. 1
KERTESZIA
pholidotus
Auyan Tepui Mesa form
neivai
lepidotus
bambusicolus
Tropic of Cancer
Equator
Tropic of Capricorn
NORTH & SOUTH AMERICA
KILOMETERS
STATUTE MILES

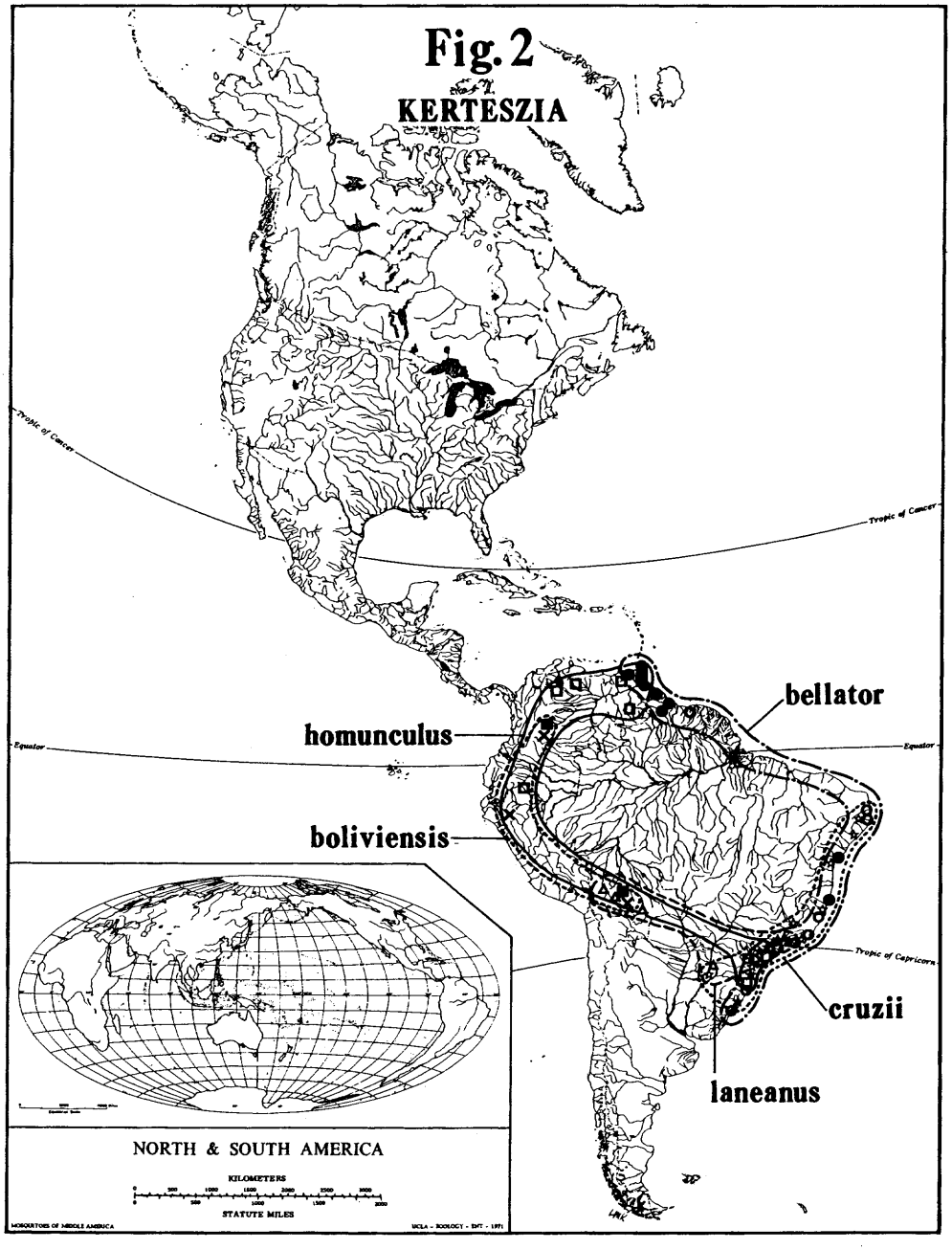
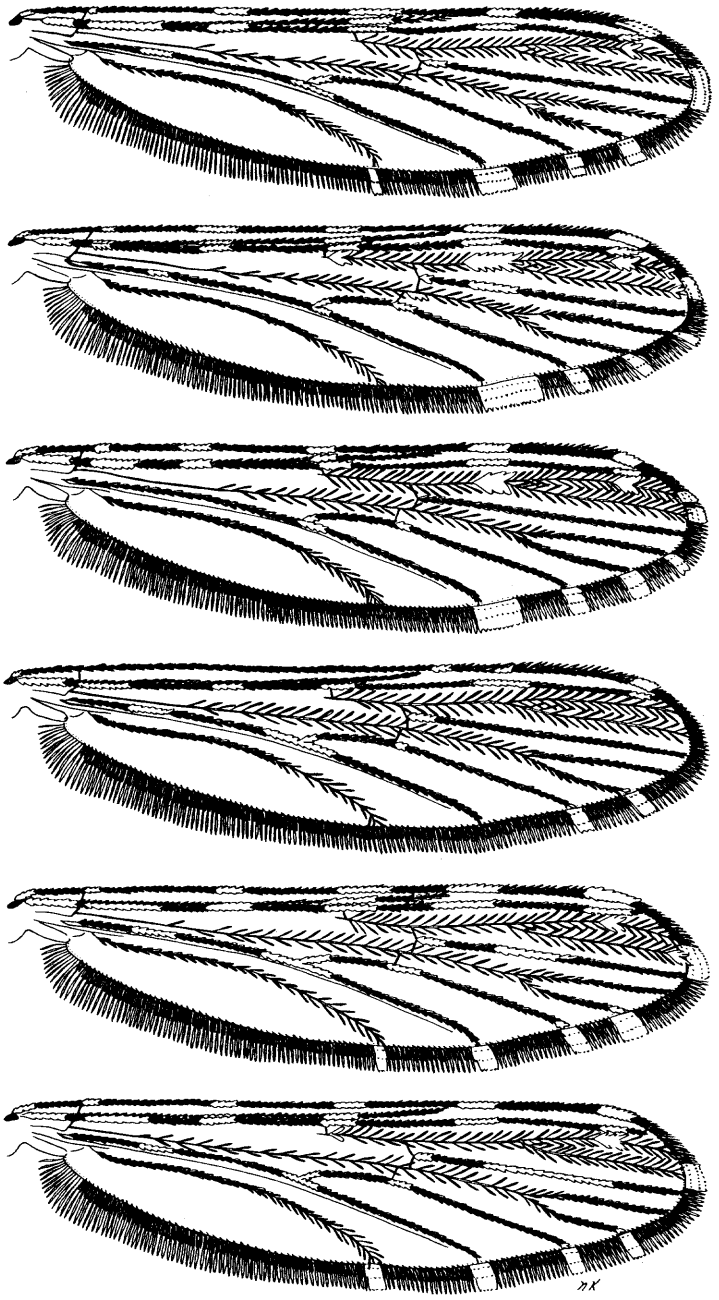


Fig. 2
KERTESZIA
Tropic of Cancer
Tropic of Cancer
Equator
Equator
bellator
homunculus
boliviensis
Tropic of Capricorn
cruzii
laneanus
NORTH & SOUTH AMERICA
KILOMETERS
STATUTE MILES
MOSQUITOES OF MIDDLE AMERICA
UCLA - BIOLOGY - EMT - 1971

KERTESZIA

Fig. 3



neivai

PA 373
Darien
Panama

pholidotus

Bocas del Toro
Panama

lepidotus

Meta
Colombia

bambusicolus

Meta
Colombia

homunculus

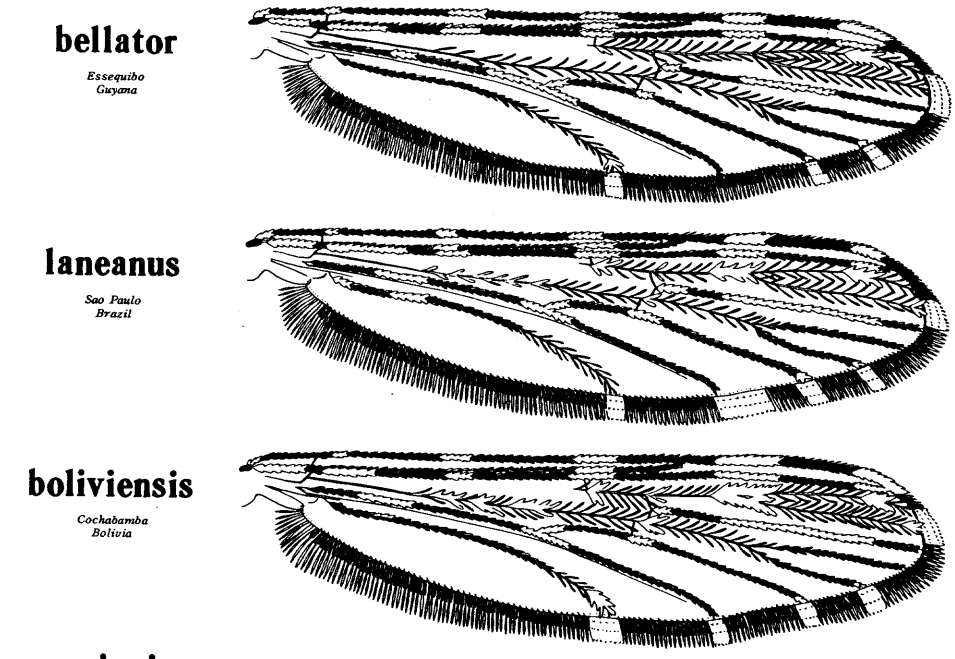
TR 654
St. Andrew
Trinidad

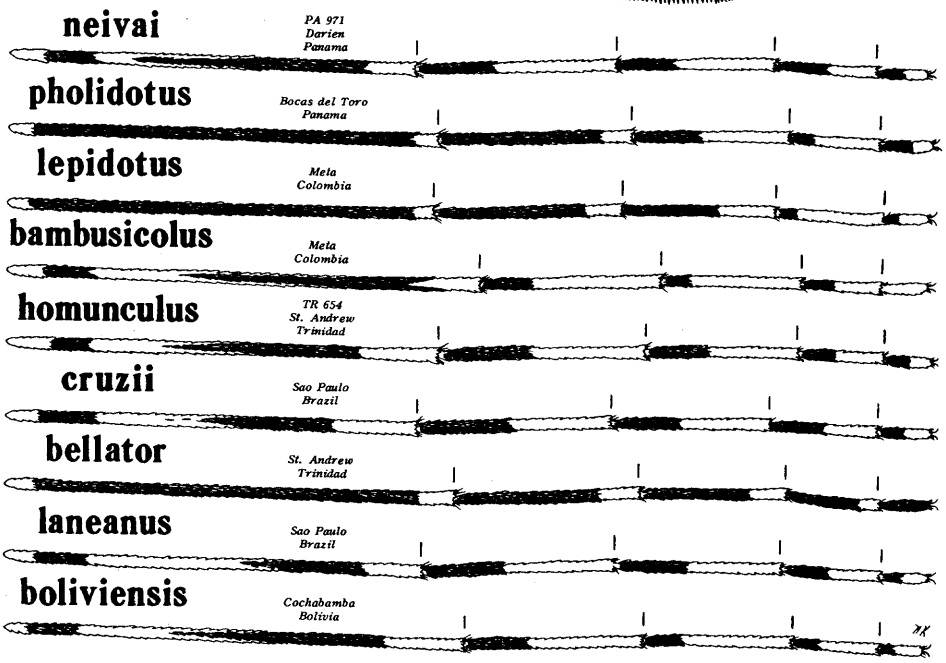
cruzii

Sao Paulo
Brazil

KERTESZIA

Fig. 4





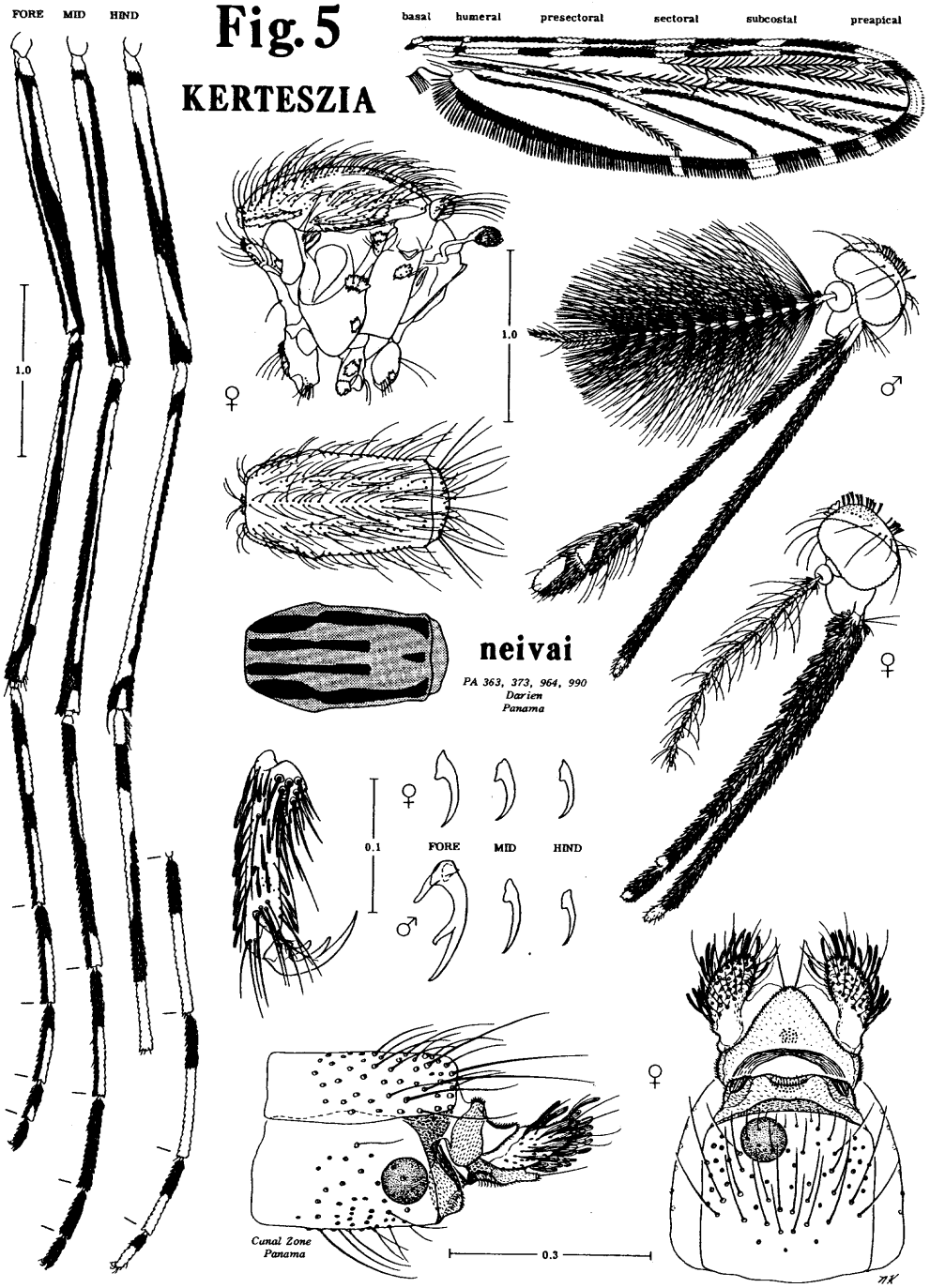
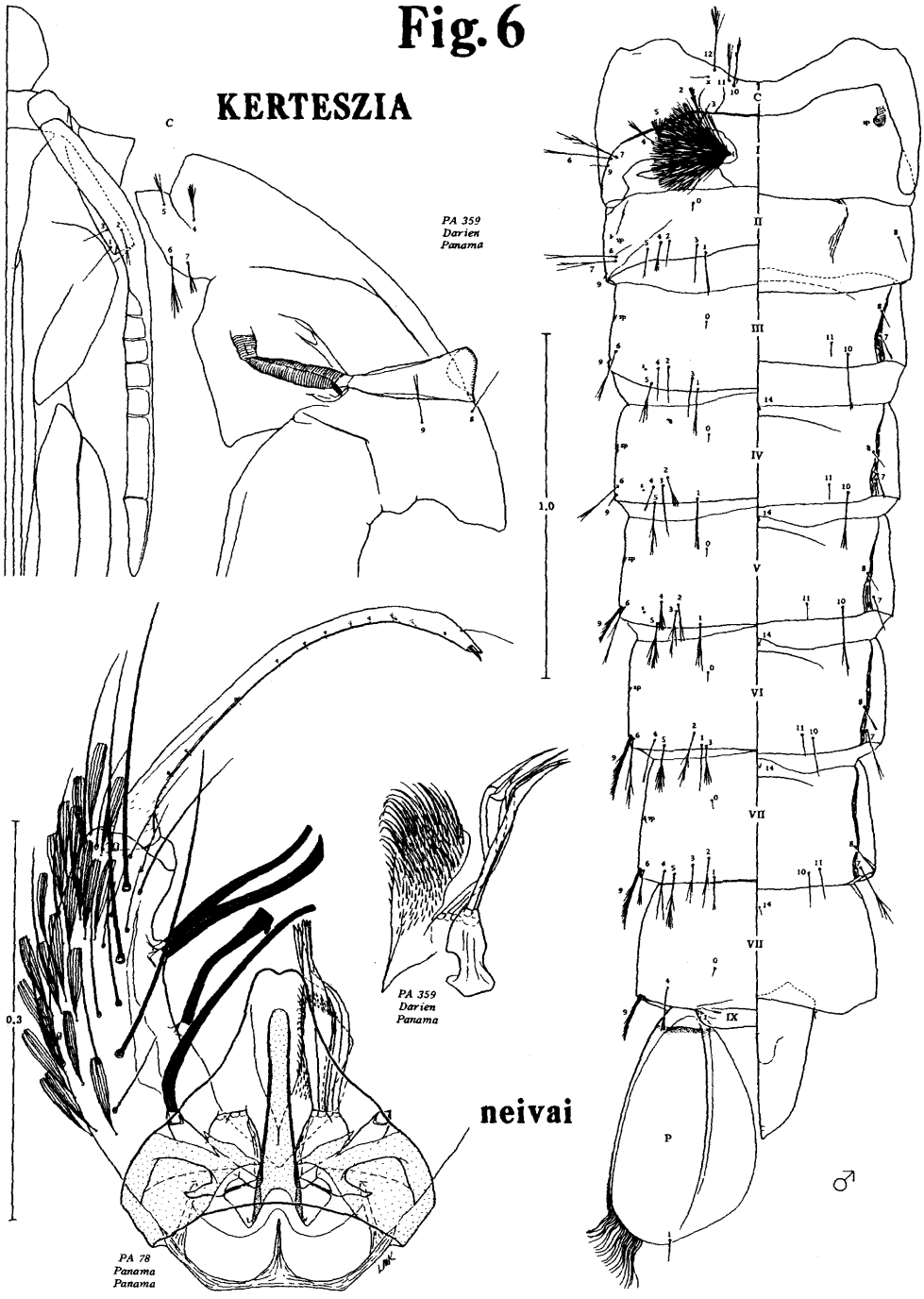


Fig. 5

KERTESZIA

Fig. 6

KERTESZIA



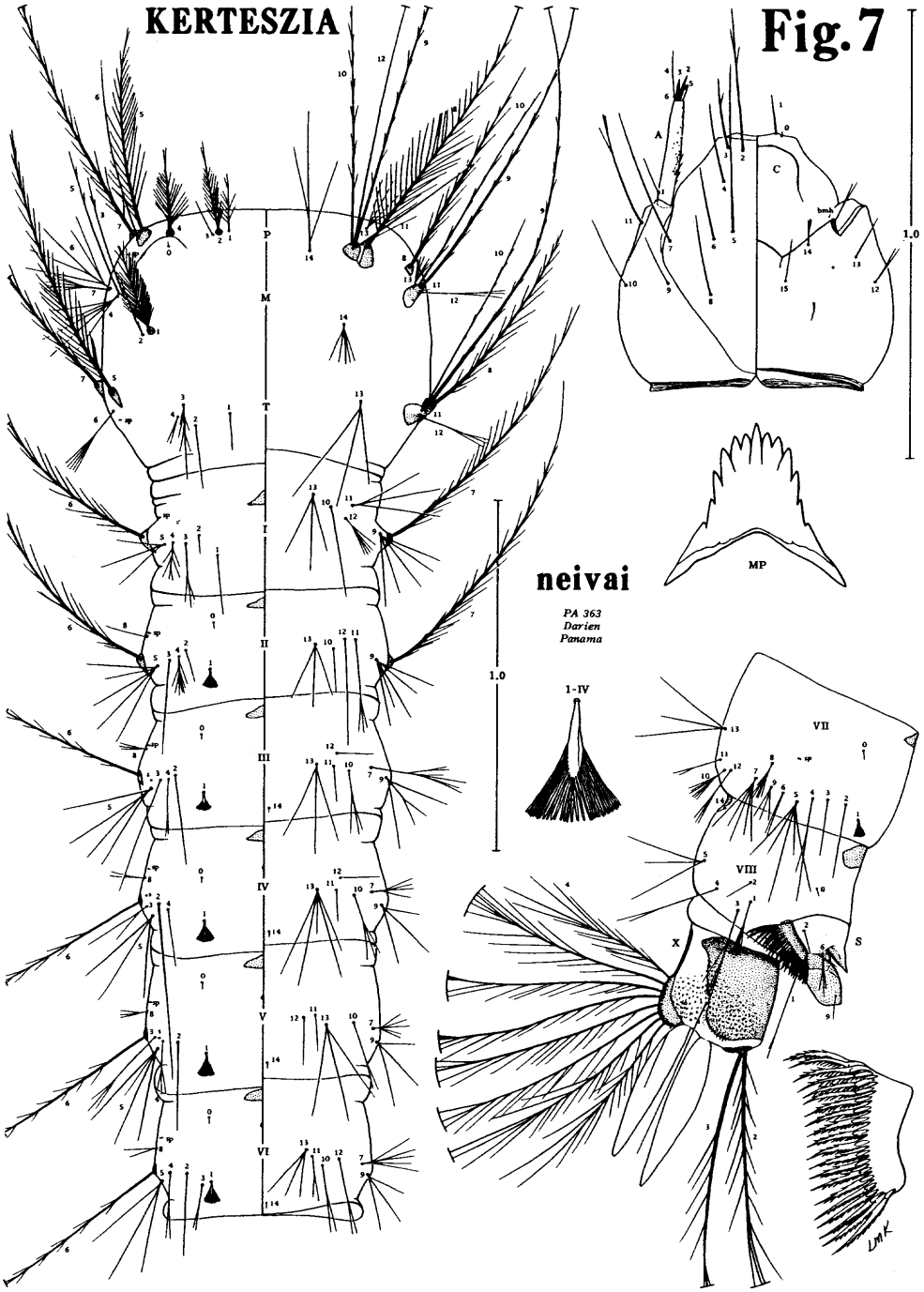
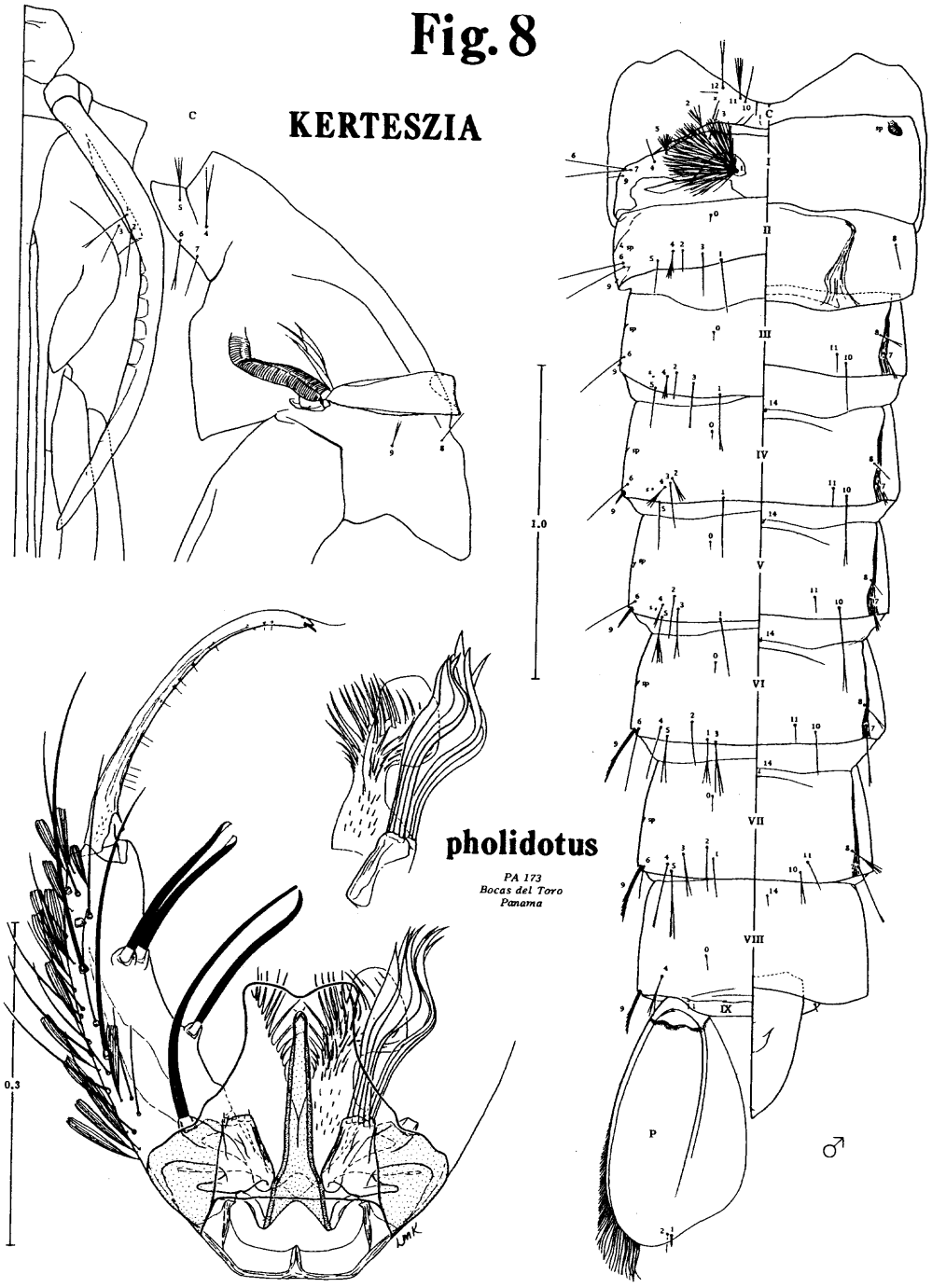

KERTESZIA
Fig.7
neivai
PA 363
Darien
Panama
1.0
1.0
1-IV
MP
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
A
C
bmb
LMK

Fig. 8

KERTESZIA



pholidotus

PA 173
Bocas del Toro
Panama

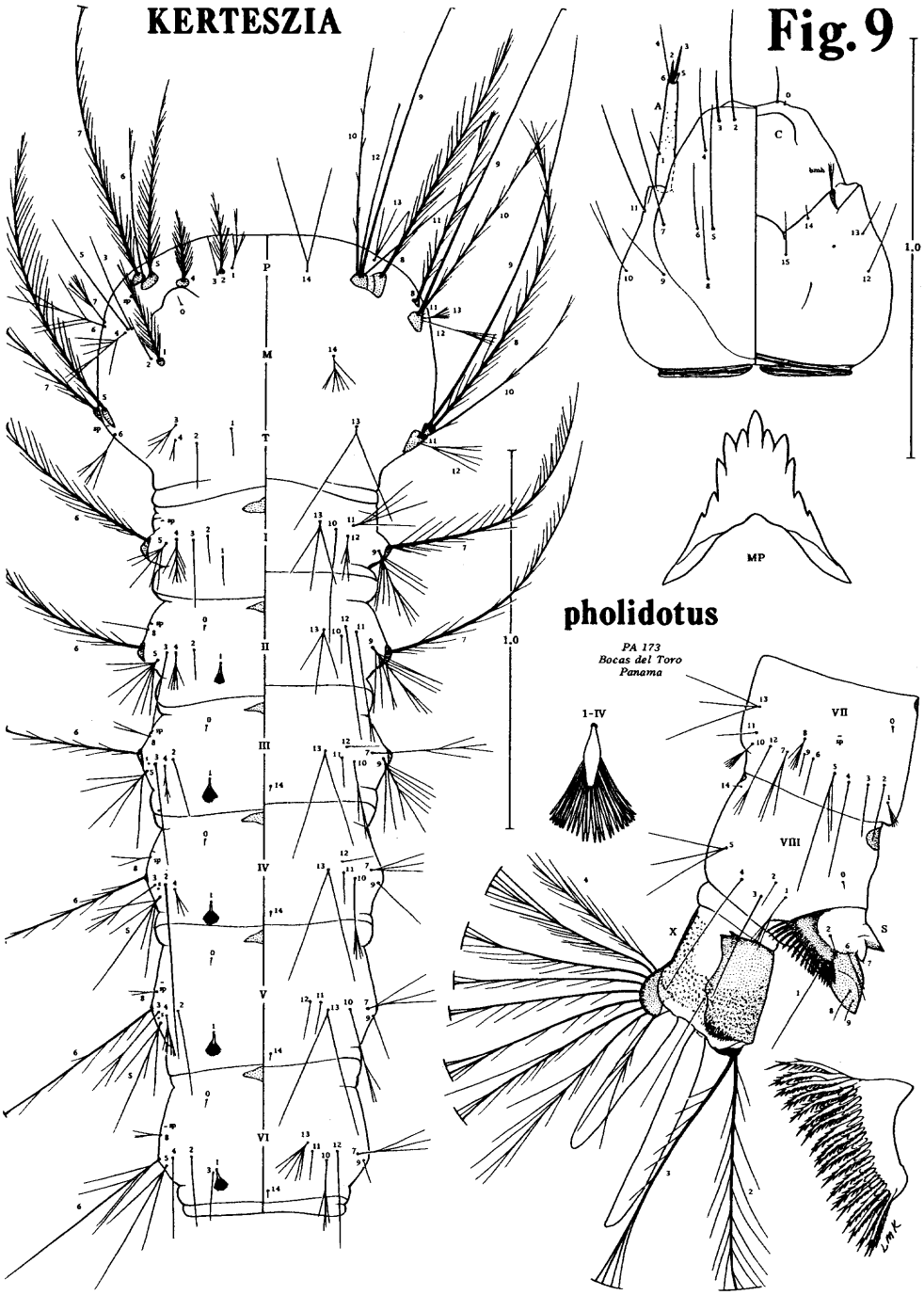
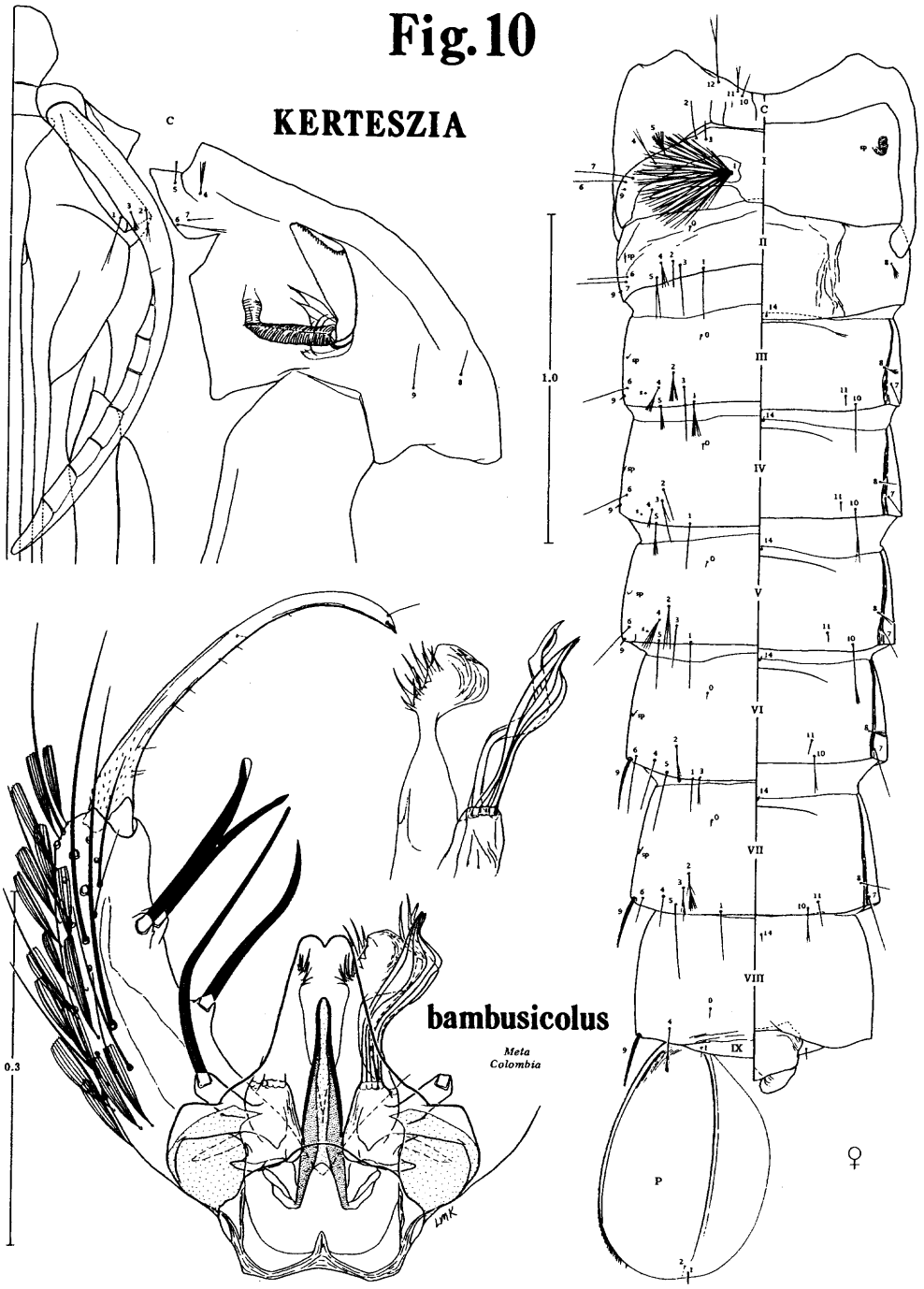

KERTESZIA
Fig. 9
pholidotus
PA 173
Bocas del Toro
Panama
MP
1.0
1-IV
VII
VIII
X
S
P
M
T
I
II
III
IV
V
VI

Fig. 10

KERTESZIA

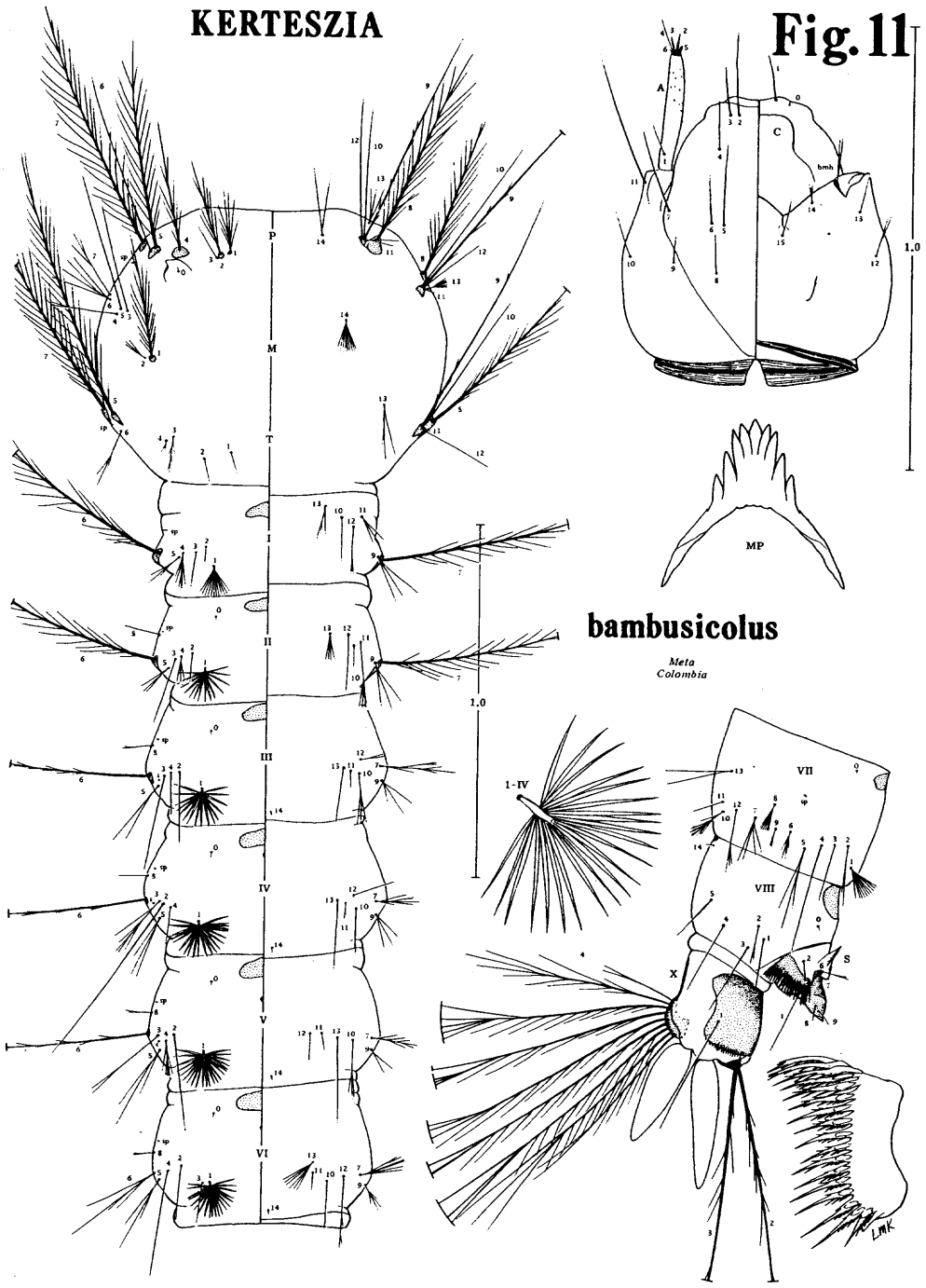


bambusicolus

Meta
Colombia

KERTESZIA

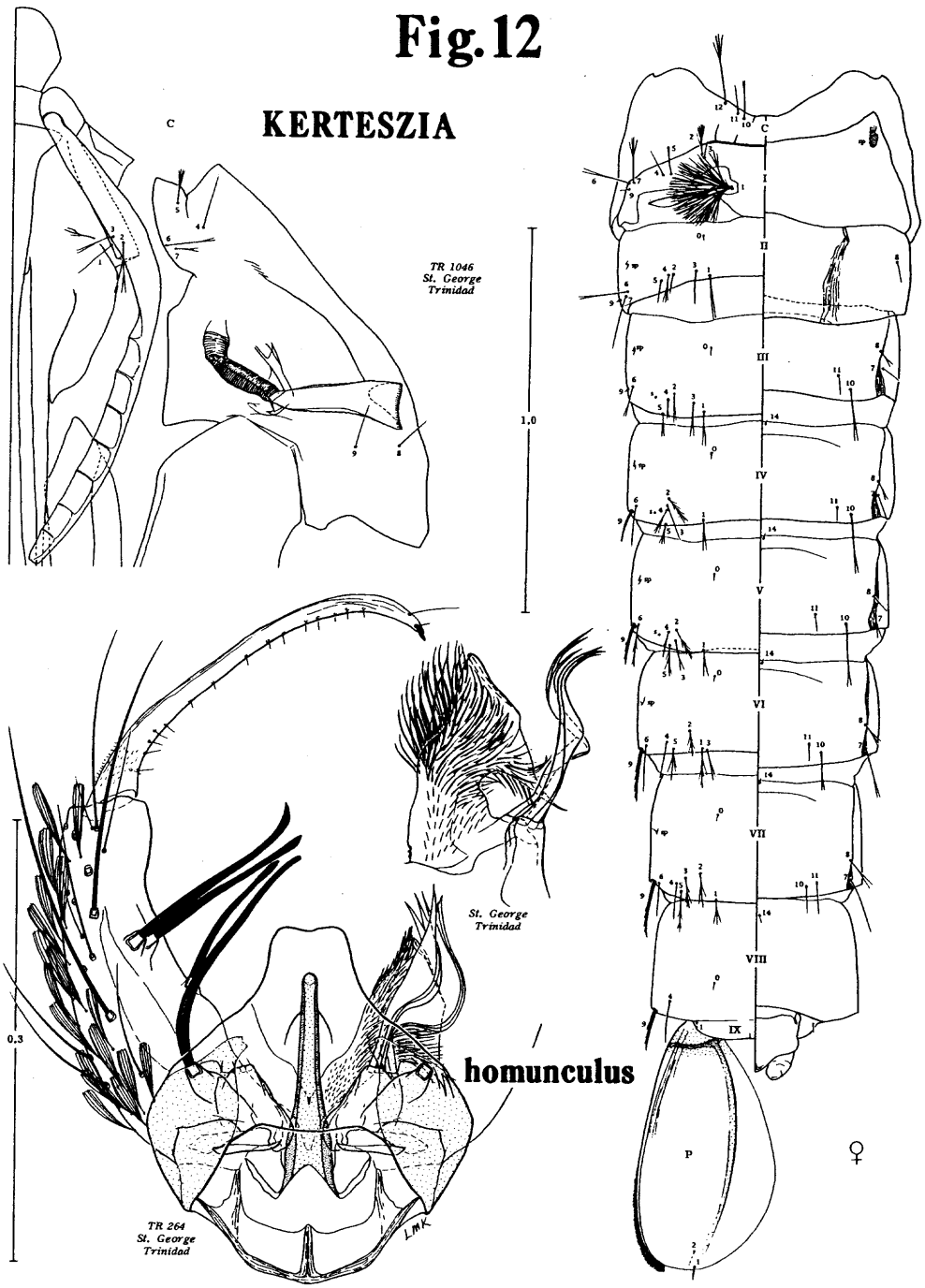
Fig. 11



bambusicolus

Meta
Colombia

Fig. 12


KERTESZIA
C
TR 1046
St. George
Trinidad
1.0
St. George
Trinidad
0.3
TR 264
St. George
Trinidad
LMK
homunculus
C
I
II
III
IV
V
VI
VII
VIII
IX
P
♀

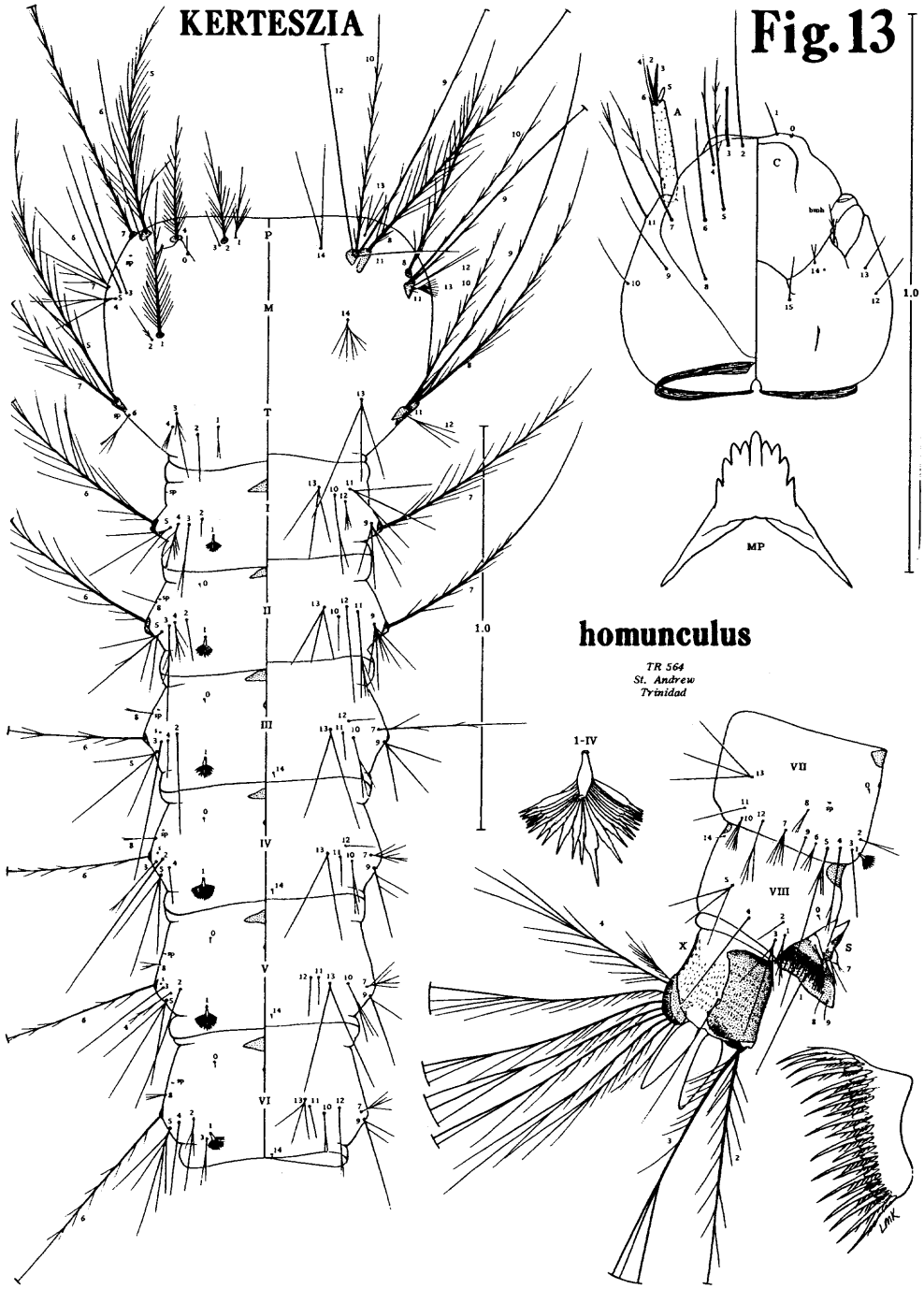
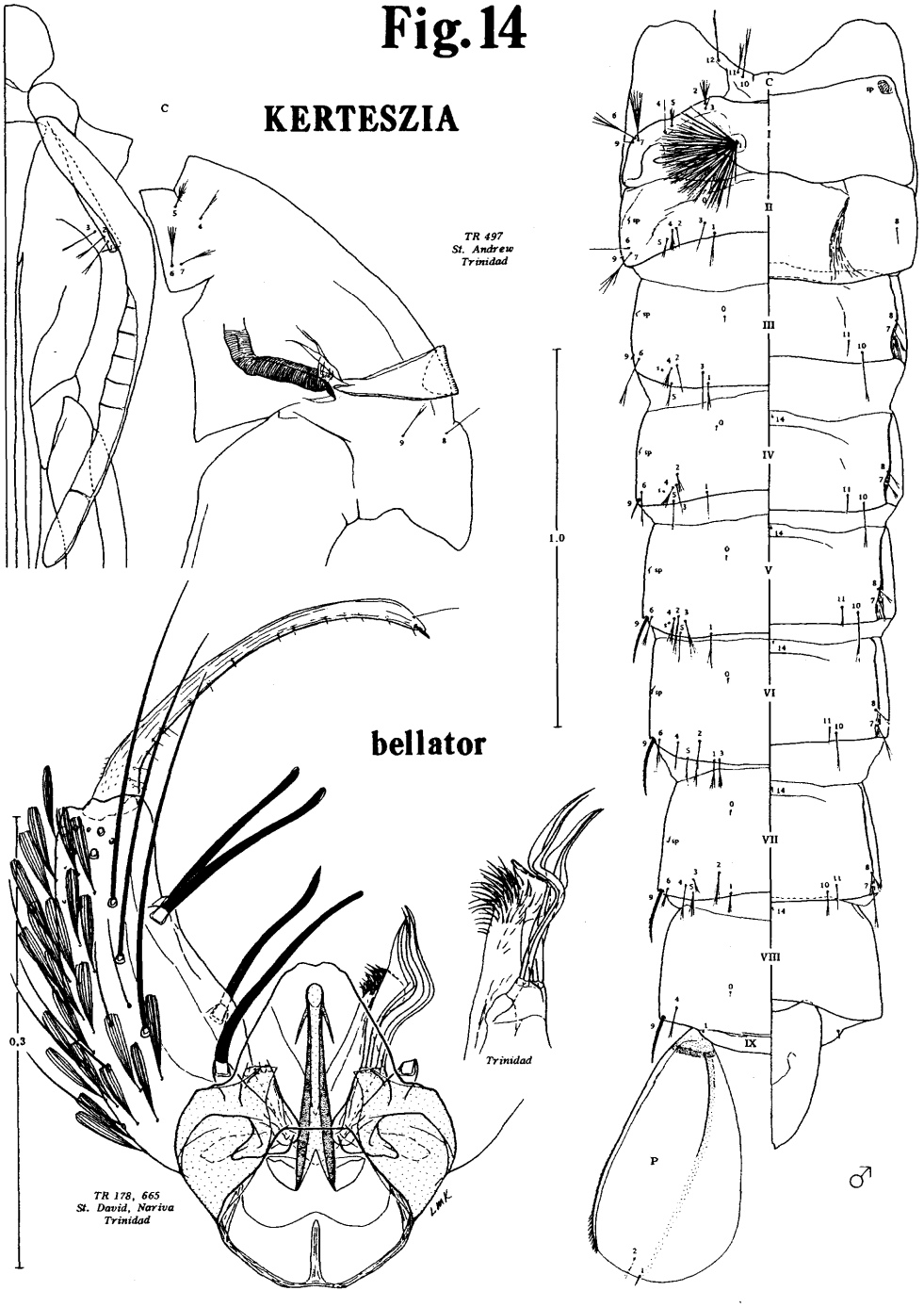

KERTESZIA
Fig. 13
P
M
T
I
II
III
IV
V
VI
1.0
A
C
bmb
MP
1.0
homunculus
TR 564
St. Andrew
Trinidad
1-IV
VII
VIII
X
S

Fig. 14

KERTESZIA



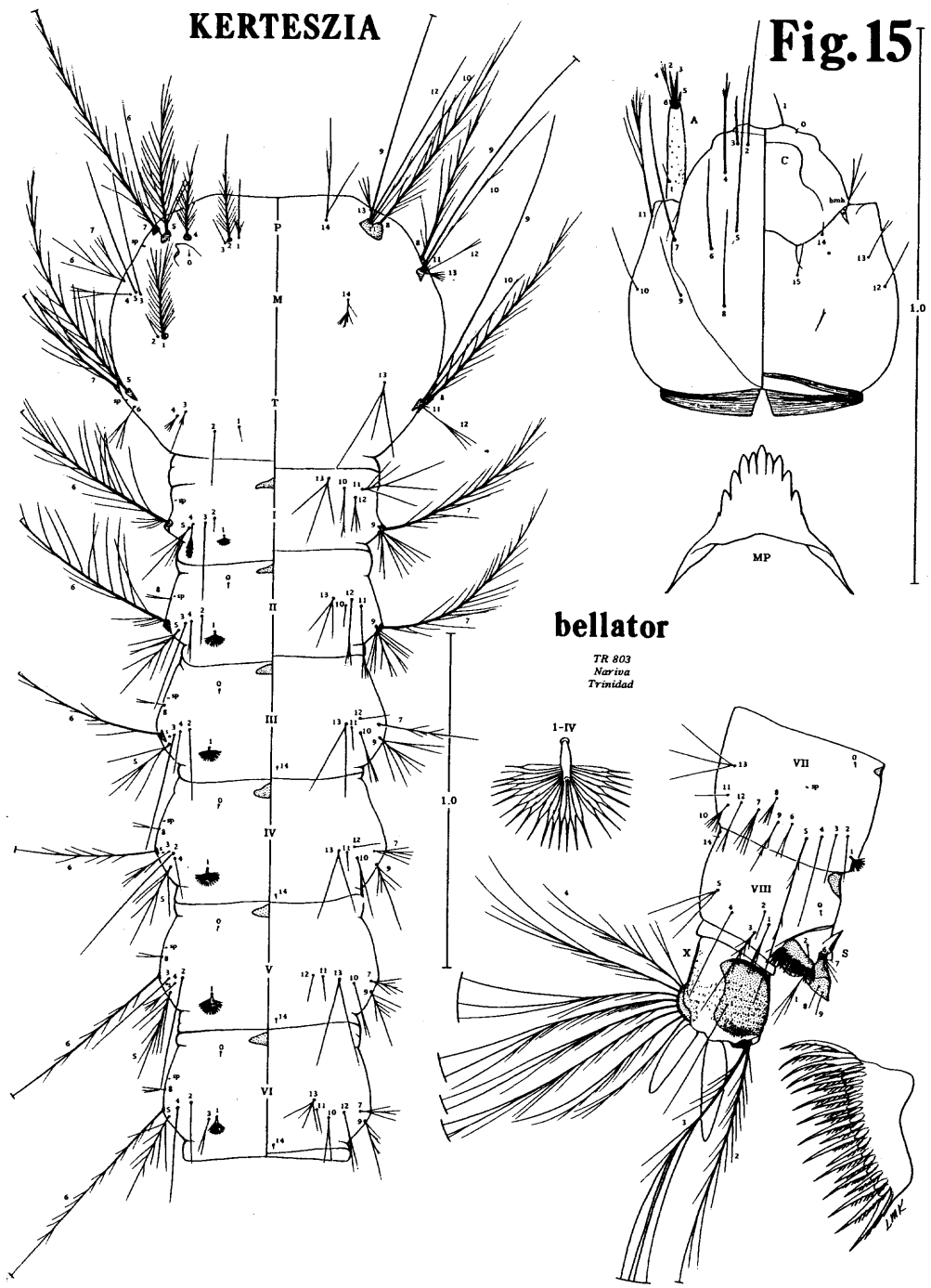
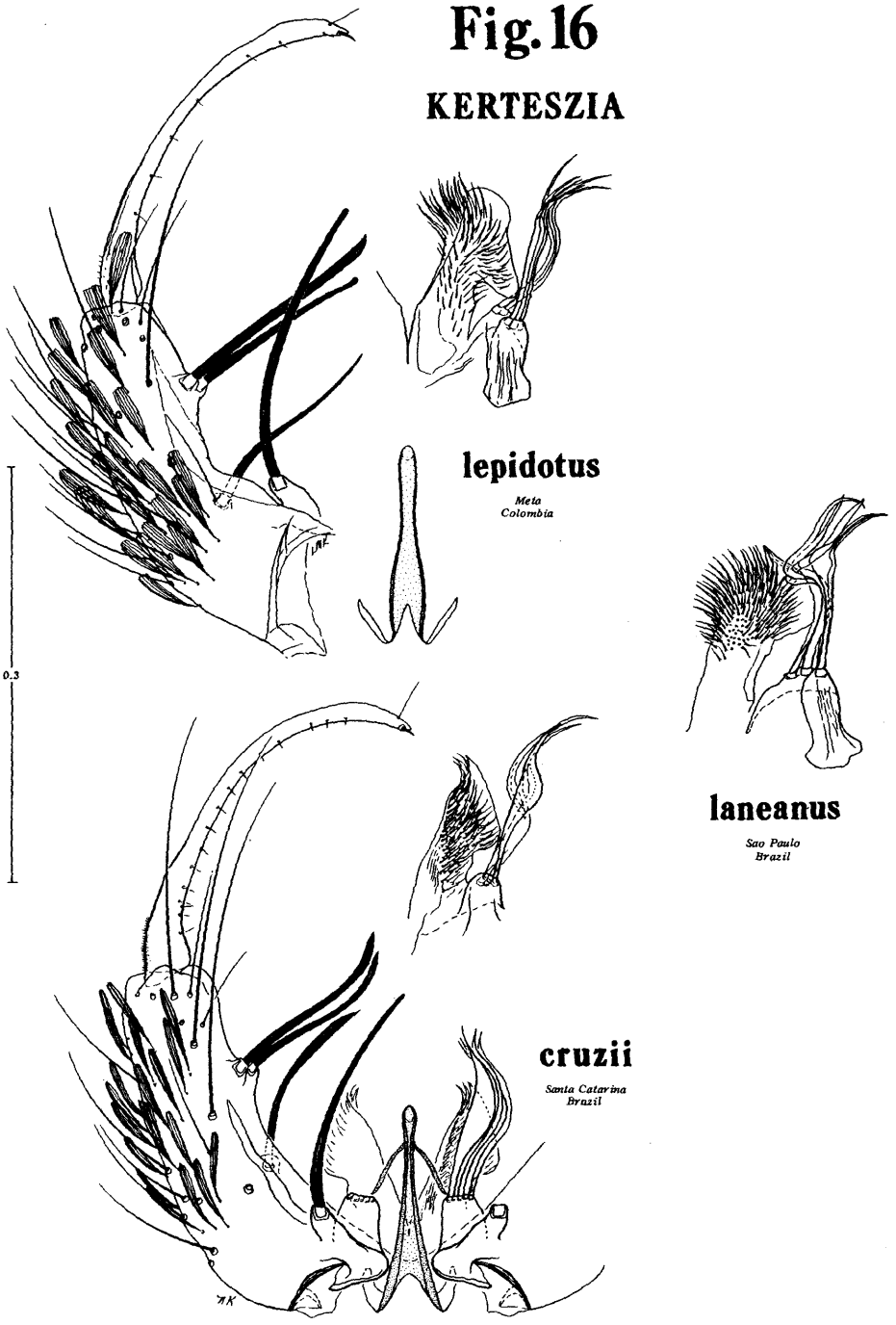

KERTESZIA
Fig. 15
A
C
bmk
MP
1.0
P
M
T
I
II
III
IV
V
VI
1.0
bellator
TR 803
Nariva
Trinidad
1-IV
VII
VIII
X
S
LMK

Fig. 16

KERTESZIA



FIGURES

SYSTEMATIC INDEX

MOSQUITO STUDIES (Diptera, Culicidae)

XXX. A NEW SUBGENUS AND SPECIES OF CULEX FROM COLOMBIA[1]

by

Abdiel J. Adames and Pedro Galindo[2]

During biomedical studies conducted by the Office of Interoceanic Canal Studies, LTC Bruce F. Eldridge and his associates collected a new species of *Culex*, which Dr. John N. Belkin and ourselves consider to belong to a hitherto undescribed higher taxon of the genus *Culex* herewith described as a new subgenus. We take pleasure in naming this taxon after Dr. John N. Belkin, whose numerous and brilliant contributions to the morphology and systematics of the Culicidae of the World have led to a better understanding of this important group of insects. We are also pleased to designate the new species after LTC Bruce Eldridge whose well organized surveys along the proposed interoceanic canal routes 17 and 25 yielded material from which basic knowledge on the Culicidae of Middle America has been derived.

The presentation and description of the new taxa in general follow Belkin (1962). For the illustrations we are indebted to N. Kitamura and L.M. Kowalczyk, and for the text copy for lithoprinting to A. Demos.

BELKINOMYIA, new subgenus

TYPE SPECIES: *Culex (Belkinomyia) eldridgei*, n. sp.

FEMALE. *Head:* Eyes not distinctly separated above base of antennae. Decumbent scales on vertex narrow, with a group of linear scales toward sides and a patch of broad scales laterally. Erect scales numerous, forked, extending toward sides. Clypeus bare. Proboscis slightly longer than forefemur. Palpus very short, 3-segmented, segments 1 and 2 ankylosed. Antenna slightly longer than proboscis; flagellar whorls moderately long, decreasing in length distally; torus with a few short hairs in anterior mesal surface. *Thorax:* Mesonotum and scutellum with narrow, curved decumbent scales, except for long narrow inner dorsocentral bare lines. Acrostichal bristles absent on disc. Dorsocentrals and marginal scutellars strongly developed. Paratergite bare. Pleuron with scales on *ppn* and *stp;* bristles present on *apn, ppn,*

[1]Contribution from project "Mosquitoes of Middle America" supported by U.S. Public Health Service Research Grant AI-04379 and U.S. Army Medical Research and Development Command Research Contract DA-49-193-MD-2478. This work was supported in part by Grant AI-02984 from the National Institute of Allergy and Infectious Disease and by Contract DADA-17-67-7020, U.S. Army Medical Research and Development Command.

[2]Gorgas Memorial Laboratory, Apartado 6991, Panama 5, Panama.