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ANNOTATED CHECKLIST OF THE MOSQUITO SPECIES ENCOUNTERED DURING ARBOVIRAL STUDIES IN IQUITOS, PERU (DIPTERA: CULICIDAE)[1]

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ABSTRACT. A checklist of the mosquito fauna encountered during arboviral studies in Iquitos, Peru, is presented. A total of 16 genera, 30 subgenera, and 96 species were identified, including 24 species reported from Peru for the 1st time. Notations on the taxonomy and biology for 28 species are also provided.

KEY WORDS Culicidae, mosquitoes, checklist, Peru, distribution, bionomics

INTRODUCTION

A collaborative project to investigate arboviruses associated with mosquitoes in the Iquitos area of Peru was initiated in 1996. The 3 main objectives of this study were to investigate the epidemiology of mosquito associated arboviruses; to identify the vector species; and to record baseline ecological data for the mosquito fauna. This is the 1st in a series of publications describing the results of these studies.

The taxonomic study described below was conducted in support of the above arboviral investigations from 1996–1999. Our objective was to establish a taxonomic database of the mosquito fauna in the Iquitos area for use in subsequent investigations. These include studies on vector competence, arboviral analysis, and the seasonal, vertical, and diurnal distribution for individual species.

The city of Iquitos (3°46′S, 73°15′W) is located in the Loreto Department of northeastern Peru and is situated near the junction of the Itaya, Nanay, and Amazon rivers. The general environment around the city is tropical forest, but it also includes large tracts of secondary growth as well as extensive clear-cut areas. The mean annual temperature is approximately 25°C, with annual rainfall in excess of 250 cm (Penaherrera 1989, Need et al. 1993).

Previous investigations of the mosquito fauna in the Peruvian Amazon include Shannon (1933, 1934), Scherer et al. (1975a, 1975b), and Need et al. (1993). Morales-Ayala (1971) provided a list of the mosquito species known to occur in Peru, including 70 species from Loreto Department and 20 from the Iquitos area. Need et al. (1993) also provided a list of 25 species identified during arboviral surveillance studies in the Iquitos area between 1988 and 1991. None of these studies included reared specimens with associated larval and pupal exuviae, nor did they include significant ecological notes. The species encountered in this study are all represented by pinned voucher specimens, with associated ecological data recorded, and, where possible, with associated immature stages. These voucher specimens will serve as a reference for comparison with subsequent samples encountered during epidemiological and other studies.

METHODS

To assess the arboviruses present in the mosquito population, periodic collections were conducted in a wide variety of habitats in the vicinity of Iquitos (up to 40 km outside the city). Collections were conducted with Centers for Disease Control (CDC) light traps (baited with dry ice) and human bait collections. Collections were performed in 12-h cycles between 0600 and 1800 h or from 1800 to 0600 h. Paired indoor/outdoor human bait collections were conducted at domestic and peridomestic sites, whereas those in forested areas were conducted at ground level and on a platform 10 m above ground. Collectors were exposed to mosquito activity for 40 min each hour. The adults were collected with mouth aspirators, and the specimens were preserved in pint containers. Concurrent CDC light trap collections were conducted at each site for comparison with human bait collections. Supplemental light traps were also utilized alone at several additional locations. All specimens from each 12-h collection cycle were held in large Styrofoam® chests and transported to the laboratory for processing. The adults were examined, sorted, and counted in pans over ice. Mosquitoes were pooled

[1] The opinions and assertions contained herein are the private ones of the authors and are not to be construed as official or reflecting the views of the Department of Defense. The research protocol employing human subjects in this study has been reviewed and approved by the Naval Medical Research Center's Committee for the Protection of Human Subjects.

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by species and frozen at −70°C for subsequent viral analysis.

During these studies, voucher specimens were preserved to document each species pooled for viral analysis. To assist in species identifications, we obtained additional specimens from progeny broods of selected species (including *Anopheles* Meigen, *Aedes* Meigen, and *Culex* Linneaus). These specimens were obtained from female mosquitoes collected from either the human bait or CDC light trap collections. We also conducted supplemental larval sampling from within the study area.

Material retained for taxonomic study was preserved according to procedures of Belkin et al. (1965). Adults were mounted on paper points attached to stainless steel insect pins, and the associated immature exuviae were preserved in 80% ethyl alcohol and subsequently mounted on microscope slides. Associated ecological and locality data were recorded for all specimens on collection forms (Faran et al. 1985) and are on file at the Walter Reed Biosystematics Unit.

Important references used for identifications during this study include the following: Arnell (1973), Berlin (1969), Schick (1970), and Zavortink (1972) for the genus *Aedes*; Faran (1980) and Faran and Linthicum (1981) for the genus *Anopheles*; Berlin and Belkin (1980), Bram (1967), Pecor et al. (1992), Rozeboom and Komp (1950), Sallum and Forattini (1996), and Valencia (1973) for the genus *Culex*; Arnell (1973) and Zavortink (1972) for the genus *Haemagogus* Williston; Guedes and Souza (1964) for the genus *Psorophora* Robineau-Desvoidy; Zavortink (1979) for the genera *Trichoprosopon* Theobald and *Johnbelkinia* Zavortink; and Lane (1953) as a general reference. Additional citations used for identification of individual species are included in the notes listed below.

Voucher specimens preserved for each species are utilized for comparison with specimens from subsequent studies to ensure accuracy and consistency. Exemplars of each species identified have been deposited at the National Museum of Natural History, Smithsonian Institution, Washington, DC, and the Naval Medical Research Center, Detachment, Lima, Peru (NMRCD). The terminology we use follows that of Harbach and Knight (1981).

RESULTS AND DISCUSSION

Between 1996 and 1999, over 500,000 adult mosquitoes were processed during arboviral surveys conducted in the Iquitos area. In addition, more than 5,000 specimens were preserved for taxonomic study, including over 3,400 adults, 1,800 slides of immature stages, and 250 slides of adult genitalia. Table 1 summarizes the species encountered and the source of the specimens used for the identification of each. These studies identified 16 genera, 30 subgenera, 89 species, and 7 unnamed forms. This total includes 24 species reported from Peru for the 1st time.

The number of new distribution records, unresolved species level taxa, and new bionomic data reported here clearly demonstrates a need for more comprehensive investigations of the mosquito fauna within the Peruvian Amazon.

Notations of taxonomic significance for selected taxa are listed below. These include new distribution records, potentially new species, records of undescribed life stages, identification problems encountered, new bionomic data, and recent taxonomic changes pertinent to the fauna of the area.

Aedes

The genus *Aedes* was represented in our collections by 10 species from 4 subgenera, including 2 species previously unknown from Peru.

Aedes (Ochlerotatus) angustivittatus (new record)

Apparently, this is an uncommon species in the Iquitos area. A small number of female mosquitoes were collected in CDC traps and human bait collections at ground level in a partially cleared forest. Eggs were obtained from a single female yielding a progeny brood of 50 adults (23 males and 27 females) with associated larval and pupal exuviae. This record represents the southernmost extension for this species.

Aedes (Ochlerotatus) hortator (new record)

A small number of *Ae. hortator* females were collected in CDC traps and human bait collections at ground level in a secondary forest. No immature stages were found.

Aedes (Ochlerotatus) serratus

This species is one of the most common *Aedes* encountered in the Iquitos area both in human bait and CDC trap collections. Although no larvae were found, all stages were preserved from several progeny broods obtained from blood-fed females taken in human bait collections. Previous reports regarding *serratus* described 2 distinct adult forms: 1 form with and 1 form without a median longitudinal stripe of golden or pale yellowish to white scales on the scutum extending from the anterior margin to the scutellum (Arnell 1976, Peyton et al. 1983). Both of these forms were routinely encountered. Comparison of material from throughout its range with specimens from the type locality of *serratus* (Rio de Janeiro, Brazil) will be needed to resolve the taxonomic status of these 2 forms.

Table 1. Mosquito species identified during field studies in Iquitos, Peru, from 1996–1999. Source of taxonomic specimens used for identifications is indicated by an X, and an asterisk (*) indicates a species reported from Peru for the 1st time.

Taxa	Collection method			
	CDC trap	Human bait	Immature	Progeny brood
Aedeomyia (*Aedeomyia*)				
1. *squamipennis* (Lynch Arribalzaga)	X	—	X	—
Aedes (*Howardina*)				
2. Iquitos form Berlin	—	X	—	—
Aedes (*Ochlerotatus*)				
*3. *angustivittatus* Dyar and Knab	X	—	—	X
4. *fulvus* (Wiedemann)	X	X	—	X
5. *hastatus* Dyar	X	X	—	X
*6. *hortator* Dyar and Knab	X	X	—	—
7. *serratus* (Theobald)	X	X	—	X
8. *serratus* [dark form]	X	X	—	X
9. undetermined	X	—	—	—
Aedes (*Protomacleaya*)				
10. *argyrothorax* Bonne-Wepster and Bonne	X	X	—	—
Aedes (*Stegomyia*)				
11. *aegypti* (Linnaeus)	—	—	X	—
Anopheles (*Anopheles*)				
12. *forattinii* Wilkerson and Sallum	X	X	X	X
13. *mattogrossensis* Lutz and Neiva	—	X	X	X
14. *peryassui* Dyar and Knab	—	X	—	X
Anopheles (*Lophopodomyia*)				
15. *squamifemur* Antunes	—	—	X	—
Anopheles (*Nyssorhynchus*)				
16. *benarrochi* Gabaldon, Cova-Garcia, and Lopez	—	X	—	X
17. *darlingi* Root	—	X	X	X
18. *nuneztovari* Gabaldon-	—	X	X	X
19. *oswaldoi* (Peryassu)	—	X	X	X
20. *rangeli* Gabaldon, Cova-Garcia, and Lopez	—	—	X	—
21. *triannulatus* (Neiva and Pinto)	X	X	X	X
Anopheles (*Stethomyia*)				
22. undetermined	—	X	X	—
Coquillettidia (*Rhynchotaenia*)				
23. *albicosta* (Peryassu)	X	X	—	—
24. *arribalzagae* (Theobald)	X	X	—	—
25. *hermanoi* (Lane and Coutinho)	X	X	—	—
26. *juxtamansonia* (Chagas)	—	X	—	—
27. *lynchi* (Shannon)	—	X	—	—
28. *nigricans* (Coquillett)	X	X	—	—
29. *venezuelensis* (Theobald)	X	X	—	—
Culex (*Aedinus*)				
30. *amazonensis* (Lutz)	X	—	—	—
Culex (*Anoedioporpa*)				
*31. *conservator* Dyar and Knab	—	—	X	—
Culex (*Carrollia*)				
32. *bonnei* Dyar	—	—	X	—
33. *urichii* (Coquillett)	—	—	X	—
Culex (*Culex*)				
34. *coronator* Dyar and Knab	X	X	X	X
35. *declarator* Dyar and Knab	X	X	—	X
36. *mollis* Dyar and Knab	X	X	—	X
37. *nigripalpus* Theobald	X	—	—	—
38. *quinquefasciatus* Say	X	X	—	—

Table 1. Continued.

Taxa	Collection method			
	CDC trap	Human bait	Immature	Progeny brood
Culex (*Lutzia*)				
39. *allostigma* (Howard, Dyar, and Knab)	X	—	—	—
Culex (*Melanoconion*)				
40. *adamesi* Sirivanakarn and Galindo	X	—	—	—
41. *bastagarius* Dyar and Knab	—	X	—	X
*42. *caudelli* (Dyar and Knab)	—	—	X	—
*43. *distinguendus* Dyar	X	X	X	—
44. *dunni* Dyar	X	X	X	—
*45. *eastor* Dyar	—	—	X	—
*46. *gnomatus* Sallum, Hutchings, and Ferreira	X	X	—	—
*47. *intrincatus* Brethes	X	—	X	X
*48. *isabelae* Duret	—	—	X	—
*49. *ocossa* Dyar and Knab	X	X	X	—
*50. *olimpioi* Xavier, da Silva, and da Silva Mattos	—	—	X	—
*51. *pedroi* Sirivanakarn and Belkin	X	X	—	X
*52. *pilosus* (Dyar and Knab)	X	—	X	—
*53. *portesi* Senevet and Abonnenc	X	—	—	—
54. *putumayensis* Matheson	X	—	—	—
*55. *serratimarge* Root	X	—	—	—
*56. *spissipes* (Theobald)	X	X	—	X
57. *theobaldi* (Lutz)	X	X	X	—
*58. *vomerifer* Komp	X	—	—	—
59. sp. 1	X	—	—	—
60. sp. 2	X	—	—	—
Culex (*Microculex*)				
*61. *elongatus* Rozeboom and Komp	X	—	—	—
*62. *stonei* Lane and Whitman	X	—	—	—
Culex (*Phenacomyia*)				
63. *corniger* Theobald	X	X	X	—
Haemagogus (*Conopostegus*)				
*64. sp. [small Colombian form]	—	X	—	—
Haemagogus (*Haemagogus*)				
65. *baresi* Cerqueira	—	X	—	—
66. *janthinomys* Dyar	—	X	—	—
Johnbelkinia				
67. *longipes* (Fabricius)	—	X	—	—
Limatus				
68. *durhamii* Theobald	—	X	X	—
69. *flavisetosus* de Oliveira-Castro	—	—	X	—
Mansonia (*Mansonia*)				
70. *amazonensis* (Theobald)	X	—	—	—
71. *flaveola* (Coquillett)	X	X	—	—
72. *humeralis* Dyar and Knab	X	X	—	—
73. *indubitans* Dyar and Shannon	X	X	—	—
74. *pseudotitillans* (Theobald)	X	—	—	—
75. *titillans* (Walker)	X	X	—	—
Orthopodomyia				
76. *fascipes* (Coquillett)	X	—	—	—
Psorophora (*Grabhamia*)				
77. *cingulata* (Fabricius)	X	X	X	X
Psorophora (*Janthinosoma*)				
78. *albigenu* (Peryassu)	X	X	X	X
79. *ferox* (von Humbolt)	X	X	X	X

Table 1. Continued.

Taxa	Collection method			
	CDC trap	Human bait	Immature	Progeny brood
Psorophora (*Psorophora*)				
80. *cilipes* (Fabricius)	X	—	—	—
Sabethes (*Sabethes*)				
*81. *amazonicus* Gordon and Evans	—	X	—	—
82. *cyaneus* (Fabricius)	X	X	X	—
83. *quasicyaneus* Peryassu	X	X	X	—
Sabethes (*Sabethoides*)				
84. *chloropterus* (von Humbolt)	X	X	—	—
Toxorhynchites (*Lynchiella*)				
85. *haemorrhoidalis* (Fabricius)	—	—	X	—
Trichoprosopon				
86. *digitatum* (Rondani)	—	X	X	—
Uranotaenia (*Uranotaenia*)				
87. *apicalis* Theobald	X	—	—	—
88. *calosomata* Dyar and Knab	X	—	X	—
89. *geometrica* Theobald	X	X	—	—
90. *hystera* Dyar and Knab	X	—	—	—
91. *pallidoventer* Theobald	X	—	—	—
92. *pulcherrima* Lynch Arribalzaga	X	—	—	—
Wyeomyia (*Decamyia*)				
*93. *pseudopecten* Dyar and Knab	—	—	X	—
*94. *ulocoma* (Theobald)	—	—	X	—
Wyeomyia (*Dodecamyia*)				
95. *aphobema* Dyar	—	—	X	—
Wyeomyia (subgenus uncertain)				
*96. *flui* (Bonne-Wepster and Bonne)	—	X	—	—

Aedes (*Ochlerotatus*) undetermined

We collected a small number of female *Aedes* (*Ochlerotatus*) that we were unable to identify. Females were collected biting humans at ground level in the heavy shade of a secondary forest between 0600 and 1700 h. This is apparently an undescribed species that superficially resembles *Ae.* (*Och.*) *scapularis* (Rondoni) but lacks the subspiracular scales characteristic of the Scapularis Group. Males and the immature stages are needed to accurately characterize this species.

Anopheles

Morales-Ayala (1971) listed 23 species of *Anopheles* from the Loreto Department, and although this species was not a primary focus of this study, 10 species from 4 subgenera of *Anopheles* were encountered.

Anopheles (*Anopheles*) *forattinii*

Studies of *An.* (*Ano.*) *mediopunctatus* by Sallum et al. (1999) showed that what had been previously considered *An. mediopunctatus* actually represents 3 distinct species. These include *An. mediopunctatus* s.s., presently known to occur only in the coastal states of Rio de Janeiro and Sao Paulo in southeastern Brazil; *An. costai,* which was previously considered a synonym of *mediopunctatus*; and *An. forattinii,* recently described by Wilkerson and Sallum (1999). According to Sallum et al. (1999) and Wilkerson and Sallum (1999), previous reports of *An. mediopunctatus* in Peru actually refer either to *An. costai* or *An. forattinii.* During the present study, only individuals of *An. forattinii* were collected. Specimens were collected as adults at human bait and as larvae in heavily shaded forest pools. In addition, progeny broods of *An. forattinii* were preserved from females collected on human bait. Characters provided by Wilkerson and Sallum (1999) readily identify this species.

Culex

Of the 16 genera collected, *Culex* showed the greatest diversity. We identified individuals of 34 species from 8 subgenera, including 17 species not

previously known from Peru and 2 undescribed taxa.

Culex (*Anoedioporpa*) *conservator* (new record)

The subgenus *Anoedioporpa* has been reported from Peru only once previously, as an undetermined species by Louton et al. (1996). This group is not commonly reported from mosquito studies because immature forms of this subgenus inhabit containers, and the adults are nocturnal and do not bite humans (Berlin and Belkin 1980). We collected larvae of *Cx.* (*And.*) *conservator* from an artificial container at ground level in a secondary forest. Two males and 6 females with associated immature exuviae were preserved. Species found in association with *conservator* included *Cx.* (*Car.*) *bonnei, Cx.* (*Car.*) *urichii, Li. durhamii,* and *Tx.* (*Lyn.*) *haemorrhoidalis. Culex conservator* was in the type species of the subgenus *Anoedioporpa* and, according to Berlin and Belkin (1980), is the most abundant and widespread species in this group.

The largest number of *Culex* species encountered (21) belongs to the subgenus *Melanoconion.* As currently interpreted, this large and diverse group of mosquitoes includes at least 157 named species. These are divided into 2 major groups: the Melanoconion Section, with 134 species, and the Spissipes Section, with 23 species.

Identification of species from the Melanoconion Section was heavily dependent on the male genitalia, as the female, larval, and pupal stages for a large number of the species are unknown or poorly described (see Pecor et al. 1992:89). Fourteen species of the Melanoconion Section were identified from the Iquitos area. These species were determined primarily by the comparison of dissected genitalia with the illustrations included in Pecor et al. (1992).

The Spissipes Section of *Melanoconion* includes several species that have been recognized as vectors of arboviruses. Sallum and Forattini (1996) and Sallum et al. (1997) provided descriptions and keys to differentiate adults of the Spissipes Section; they also provided biological and other data for each species. We identified 7 species of the Spissipes Section in the Iquitos area, including *adamesi, gnomatus, ocossa, pedroi, portesi, spissipes,* and *vomerifer.* Of these, only *Cx. adamesi* was previously known from Peru.

Culex (*Melanoconion*) *distinguendus* (new record)

Larvae of this species were encountered in a heavily shaded pit located next to a footpath in a secondary forest. This pit was apparently manmade, approximately 2 feet deep, and periodically filled with rainwater. Males of this species were also encountered in light traps set at ground level between 1800 and 0600 h in the vicinity of the larval habitat.

Culex (*Melanoconion*) *easter* (new record)

We preserved a single male with associated larval and pupal exuviae of *Cx. easter* from a collection in a secondary forest along the partially shaded edge of a slow-moving stream. Identification is based on the male genitalia.

Culex (*Melanoconion*) *gnomatus* (new record)

The description of *Cx. gnomatus* by Sallum et al. (1997) was based on specimens obtained from a Shannon trap, CDC light trap, ultraviolet malaise trap, and malaise trap set in a primary rain forest in the state of Amazonas, Brazil. This species is closely related to *Cx. vomerifer* and is only known in the adult stage. We collected females of *gnomatus* on human bait between 1800 and 0600 h in a secondary forest. Both males and females were also collected in CDC traps between 1800 and 0600 h and in traps set at ground level in the vicinity of the human bait collections.

Culex (*Melanoconion*) *isabelae* (new record)

This species was previously known from the original description of Duret (1968) and was based on a single male captured August 3, 1964, in Caracarai, Roraima State, Brazil. We collected larvae that resulted in 4 adults (2 males and 2 females) with associated larval and pupal exuviae from emergent grasses along a small roadside ditch next to a secondary forest. The male genitalia were easily identified as *Cx. isabelae.* No other species were associated with these larvae. The female, larval, and pupal stages of *Cx. isabelae* are undescribed.

Culex (*Melanoconion*) *ocossa* (new record)

This species was identified from adult females taken both in human bait and CDC light trap collections at several locations. In addition, larvae were found in a permanent pond that contained dense patches of *Pistia* around the margins. The larvae of *Cx.* (*Mel.*) *dunni* and *An.* (*Nys.*) *triannulatus* were also found in this habitat. Identification of *Cx. ocossa* is based on female and male genitalia characters (Sallum and Forattini 1996). Galindo and Adames (1973) implicated *Culex ocossa* (as *Cx. aikenii* [Aitken and Rowland]) as a vector of Venezuelan equine encephalitis in Panama.

Culex (*Melanoconion*) *olimpioi* (new record)

Xavier et al. (1970) described *Cx. olimpioi* from a single male collected in a Shannon trap with light

as bait from Rio Branco in the State of Acre, Brazil. We encountered larvae of *Cx. olimpioi* in a slow-moving stream (see note above for *Cx. easter*). We preserved 5 males and 9 females with associated larval and pupal exuviae from this collection. The distinctive male genitalia served as the basis for our identification. The female, larval, and pupal stages of *olimpioi* are undescribed. Larvae of species found in association with *Cx. olimpioi* included (in order of abundance): *An.* (*Nys.*) *darlingi, Cx.* (*Cux.*) *mollis, An.* (*Lop.*) *squamifemur, An.* (*Nys.*) *oswaldoi, Cx.* (*Phc.*) *corniger, Ur.* (*Ura.*) *calosomata,* and *Cx.* (*Mel.*) *easter.*

Culex (*Melanoconion*) *pedroi* (new record)

Morales-Ayala (1971) reported *Cx. taeniopus* from Loreto Department but did not list a specific locality. According to Sirivanakarn and Belkin (1980), *Cx. pedroi* had been previously confused with *Cx. taeniopus.* Sallum and Forattini (1996) redescribed *Cx. pedroi* and provided characters to separate this species from other members of the Spissipes Group of *Culex* (*Melanoconion*). We identified adults of *Cx. pedroi* from both human bait and light trap collections at several locations in the Iquitos area. Whereas adults of *pedroi* were commonly encountered, the larval habitat was not located. Immature stages were preserved from several progeny broods obtained from blood-engorged females taken in human bait collections. Since this species is common in the study area and we found no evidence of the presence of *taeniopus,* we believe previous reports of *Cx. taeniopus* in the Iquitos area refer to *Cx. pedroi.*

Culex (*Melanoconion*) *pilosus* (new record)

According to Pecor et al. (1992), *Cx. pilosus* is known from the United States south to Argentina, but it has not previously been reported from Peru. We collected larvae of *pilosus* in the clear water of a road rut and a roadside ditch, both in full sunlight and with abundant emergent grasses. Larvae of *pilosus* were also encountered in the margins of a small, slow-moving flooded stream (also with abundant emergent grasses and in full sunlight). Larvae of *An.* (*Nys.*) *darlingi* were also found in this habitat. One male of *Cx. pilosus* was taken in a light trap set 10 m above ground in a secondary forest. The characteristic larval stage and male genitalia readily distinguish this species.

Culex (*Melanoconion*) *serratimarge* (new record)

A single male was collected from a light trap set at ground level in the forest between 1800 and 0600 h.

Culex (*Melanoconion*) *spissipes* (new record)

Females of this species were taken in human bait and light trap collections, but larvae were not encountered. A single progeny brood obtained from an engorged female taken in a human bait collection was preserved. *Culex spissipes* has been implicated as a possible vector of several viruses from the family Bunyaviridae as well as Venezuelan equine encephalitis.

Culex (*Melanoconion*) *vomerifer* (new record)

Similar to *Cx. gnomatus, Cx. vomerifer* was encountered in human bait and light trap collections. Identification was confirmed based on adult characters provided by Sallum and Forattini (1996) and Sallum et al. (1996).

Culex (Melanoconion) sp. 1

Three males of an undescribed species of *Culex* (*Melanoconion*) were obtained from a CDC trap set between 1800 and 0600 h at 10 m above the ground in a secondary forest. Based on the male genitalia, this species is similar to, but distinct from, *Cx. mesodenticulatus* Galindo and Mendez.

Culex (Melanoconion) sp. 2

The same collection described above for *Culex* sp. 1 also yielded 2 males of another species that we could not identify. On the basis of the male genitalia, this species is similar to *Cx. dureti* Casal and Garcia but is apparently an undescribed species.

Culex (*Microculex*) *elongatus* (new record)

The subgenus *Microculex* has a wide distribution (from Mexico to Argentina). However, since females are not attracted to humans, species of this group are commonly overlooked in mosquito surveys. Heinemann and Belkin (1979) reported specimens of an undetermined species of *Microculex* collected in June 1975 from terrestrial bromeliads located 1.5 km from "Bella Vista, Callaru River" in Loreto Department, Peru. This is the only previous reference to a species of *Microculex* from Peru. We preserved a single male, collected in a CDC light trap set at ground level between 0600 and 1800 h. Based on the dissected genitalia, we determined this species to be *Cx. elongatus.* Rozeboom and Komp (1950) described this species from larvae reared from collections from bamboo internodes in Meta, Colombia.

Culex (Microculex) stonei (new record)

We collected a single female from a CDC trap set out at the edge of a forest approximately 10 m from a house. This species was 1st reported from the Amazon region by Forattini and Toda (1966) from specimens collected in bromeliads in Para State, Brazil.

Haemagogus

Haemagogus (Conopostegus) sp. [small Colombian form] (new record)

We collected a single female of this species in a human bait collection in a secondary forest. We identified this form using Zavortink (1972), who did not provide a name for this species, citing a lack of material. He based his description on 3 specimens (2 females and 1 male genitalia from Colombia and Ecuador) and provided characters to distinguish this form from other members of the subgenus *Conopostegus.*

Mansonia

The genus *Mansonia* is represented by 6 species in the Iquitos area (Table 1). Adults were commonly collected in both human bait and CDC light trap collections. Most females were well marked and easily identified (Lane 1953:591). The most commonly collected adults were *Ma. indubitans* and *Ma. titillans.* The separation of *titillans* from *indubitans* based on female palpi was not consistently reliable. Under field conditions, attempts to measure the palp to proboscis ratio can be adversely affected by specimen orientation, condition, or available lighting. It is not always possible to accurately and quickly determine if the palp to proboscis ratio is 1/3 (as in *titillans*) or 1/4 (as in *indubitans*), unless each specimen is individually measured using a micrometer. Using characters of the female genitalia proved to be quicker and a more accurate method of separating these 2 species. As described by Pratt (1953), this is accomplished by the examination of the spiniforms along the apical margin of the 8th tergum. By gently squeezing the abdomen with a pair of forceps, the 8th segment is extruded, and these spiniforms can be easily examined. The spiniforms are evenly spaced in *indubitans,* whereas in *titillans* the apical row of approximately 8 (6–9) spiniforms are clumped together at the midline. Illustrations for both species are provided by Pratt (1953).

Sabethes

Sabethes (Sabethes) amazonicus (new record)

A small number of females were taken in human bait collections in a secondary forest between 0600 and 1800 hours. These specimens are provisionally identified as *Sa. amazonicus* pending completion of ongoing revisionary studies (Harbach, personal communication).

Wyeomyia

Wyeomyia (Decamyia) pseudopectin (new record)

Larvae collected from heavily shaded bromeliads at ground level in a secondary forest were identified as *Wy. pseudopectin.* Lane (1953) illustrated the male genitalia for this species; this illustration was the basis of our identification. Females were also taken in human biting collections in the shaded areas of a secondary forest between 0600 and 1800 h.

Wyeomyia (Decamyia) ulocoma (new record)

One of the bromeliads from the site described above for *Wy. pseudopectin* also yielded a single collection containing larvae of *Wy. ulocoma.* The male genitalia easily separates this species from all other *Wyeomyia.*

Wyeomyia flui (new record)

Although larvae of this species were not found, adults were taken in human bait collections in a secondary forest between 0600 and 1800 h. Lourenco-de-Oliveira et al. (1999) provide characters to distinguish this species from other *Wyeomyia.*

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