

The mosquitoes (Diptera: Culicidae) of Tabasco, Mexico

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Received 6 December 2018; Accepted 22 January 2019

ABSTRACT: To document and update the mosquito species of Tabasco, Mexico, field collection trips were conducted in the two physiographic regions of Tabasco: the coastal plain of the southern gulf and the mountains of Chiapas and Guatemala. Mosquitoes were collected as immature and adult stages during the dry and rainy seasons from 2014 through 2015. Additionally, the Reference Collection of Arthropods of Medical Importance (CAIM-InDRE) containing mosquitoes of Tabasco was re-examined. In total, 4,913 specimens were collected and examined, which are divided into seven tribes, 18 genera, 27 subgenera, and 104 species. Of these, one genus (*Shannoniana* Lane and Cerqueira), two subgenera (*Georgecraigius* Reinert, Harbach and Kitching, and *Carrollia* Lutz), and 21 species are new records for the mosquito fauna of Tabasco. *Culex metempsytus* Dyar is a new record for Mexico and *Wyeomyia jocosa* (Dyar and Knab) is removed from the Mexican mosquito fauna. Seventeen species historically reported were not found in the field collections conducted here. Taxonomic notes, new distribution limits, and comments about the medical importance of species of mosquitoes of Tabasco are discussed. Tabasco is the second state in Mexico with the largest mosquito richness (104 species), followed by Veracruz with 139 species. *Journal of Vector Ecology* 44: 57-67. 2019.

Keyword Index: Mosquitoes, Culicidae, Tabasco, Mexico, new records, species.

INTRODUCTION

Mexico is divided into 32 political states, only six of which have been systematically studied with updated lists for species of Culicidae: Tlaxcala with 26 species, Quintana Roo with 81 species, Veracruz with 139 species, Tamaulipas with 82 species, Hidalgo with 57 species, and Nuevo Leon with 65 species (Muñoz-Cabrera et al. 2006, Ortega-Morales et al. 2018a, Ibáñez-Bernal et al. 2011, Ortega-Morales et al. 2015, Ortega-Morales et al. 2018b, Ortega-Morales et al. 2019). One-hundred mosquito species had been reported in Tabasco (Martini 1935, Martínez-Palacios 1952, Vargas and Martínez-Palacios 1956, Vargas 1956, Díaz-Nájera and Vargas 1973, Heinemann and Belkin 1977, Zavortink 1979, Méndez-López et al. 2016, Torres-Chable et al. 2017, and Ortega-Morales et al. 2018c). However, most records belonged to collections performed in urban and/or suburban regions with scarce or neglected collections from sylvatic regions and conserved tropical forest regions of Tabasco. In this study, all regions of the state were sampled with special emphasis in tropical forests and other conserved regions of Tabasco.

Dengue fever (DF) is the most important mosquito-borne disease in Tabasco with 1,445 cases from 2015 through 2017, of which 1,041 were DF and 404 were hemorrhagic fever (DHF). Chikungunya (CHIK) is an emerging disease

with 59 cases reported in Tabasco from 2015 through 2016, but there have not been CHIK cases in Tabasco since 2016. Zika (ZIKA) is another emergent arboviral disease in Mexico, with 375 cases reported in Tabasco from 2015 through 2017, of which 286 were reported in pregnant women without any reported cases of microcephaly in fetuses or newborns. During 2016 through 2017, three cases of Guillain-Barré syndrome associated with ZIKA were reported in Tabasco (SINAVE 2018). Other mosquito-transmitted arboviruses that occur in Mexico include West Nile virus (WNV) and Venezuelan Equine Encephalitis virus (VEEV), which have also been reported in Tabasco (Obreste et al. 1998, Estrada-Franco et al. 2003, Hidalgo-Martínez et al. 2008, Adams et al. 2012). During 2015 through 2017, 63 cases of malaria were reported in Tabasco (SINAVE 2018). Mosquito-borne diseases and vectors incriminated in Tabasco are summarized in Table 1.

MATERIALS AND METHODS

Study area

Tabasco is located in southeastern Mexico (17°15'00'' and 18°39'20''N; 91°00'00'' and 94°17'10''W). Tabasco has an area of 25,567 km² and it is bordered on the north by the Gulf of Mexico, on the south by Veracruz, Chiapas,

Table 1. Species of mosquitoes of medical importance for mosquito-borne disease in Tabasco.

Diseases	Vector species
Dengue fever	<i>Aedes aegypti</i> , <i>Ae. albopictus</i>
Chikungunya	<i>Aedes aegypti</i> , <i>Ae. albopictus</i>
Eastern Equine Encephalitis	<i>Aedes taeniorhynchus</i> , <i>Culex nigripalpus</i>
Malaria	<i>Anopheles pseudopunctipennis</i> , <i>An. punctimacula</i> , <i>An. quadrimaculatus</i> , <i>An. albimanus</i> , <i>An. darlingi</i>
St. Louis Encephalitis	<i>Culex quinquefasciatus</i> , <i>Cx. nigripalpus</i> , <i>Cx. salinarius</i>
Venezuelan Equine Encephalitis	<i>Aedes angustivittatus</i> , <i>Ae. scapularis</i> , <i>Ae. taeniorhynchus</i> , <i>Psorophora confinnis</i> , <i>Ps. ferox</i> , <i>Culex erraticus</i> , <i>Cx. pedroi</i> , <i>Cx. spissipes</i> , <i>Cx. panocossa</i> , <i>Cx. taeniopus</i> , <i>Mansonia titillans</i>
West Nile Virus	<i>Culex quinquefasciatus</i> , <i>Culex nigripalpus</i> , <i>Cx. salinarius</i>
Yellow fever	<i>Aedes fluviatilis</i> , <i>Ae. scapularis</i> , <i>Ae. serratus</i> , <i>Ae. aegypti</i> , <i>Ae. albopictus</i> , <i>Haemagogus equinus</i> , <i>Hg. mesodentatus</i> , <i>Sabethes chloropterus</i>
Zika	<i>Aedes aegypti</i> , <i>Ae. albopictus</i>

Table 2. Description of the physiographic regions and list of municipalities sampled in Tabasco.

Region / (Sub-region)	Municipalities sampled	Description of Regions / (Subregions)
Coastal Plain of southern Gulf		This region is located in southeastern Mexico; it extends from Veracruz to Campeche. The soils are formed by materials deposited by the largest rivers in Mexico such as the Grijalva, Usumacinta, Coatzacoalcos, and Papaloapan that all flow out into the Gulf of Mexico.
(Tabasco Plains and Marshes)	Balancán, Cárdenas, Centla, Centro, Comalcalco, Cunduacán, Emiliano Zapata, Huimanguillo, Jalapa, Jalpa de Méndez, Jonuta, Macuspana, Nacajuca, Paraíso, Tacotalpa, Teapa, and Tenosique	This sub-region has a greater extension in Tabasco. It extends by a very small part from northeastern Veracruz to southwestern of Campeche. This is the swampiest region in Tabasco with some lower rain forests and rains during the summer.
Mountains of Chiapas and Guatemala		This region is a mountain extension located from southeastern Mexico to Guatemala. It includes Chiapas, Oaxaca, Tabasco, and Veracruz. In Tabasco, it is located in the southwestern area. The mountain ranges in this region are formed mainly by limestone.
Sierras of northern Chiapas	Huimanguillo, Macuspana, Tacotalpa, and Teapa	This sub-region is located in Northern Chiapas, it includes a lower mountain range chain that extends from southern Tabasco to Guatemala. This sub-region includes cloud and tropical forest with rain during all of the year.
Sierras of Lower Peten	Tenosique	This sub-region extends from a small part of southeastern Tabasco to the extreme north of Guatemala and the western side of Belize. It includes hills, lower mountain ranges, and valleys with tropical forest and rain during all of the year.

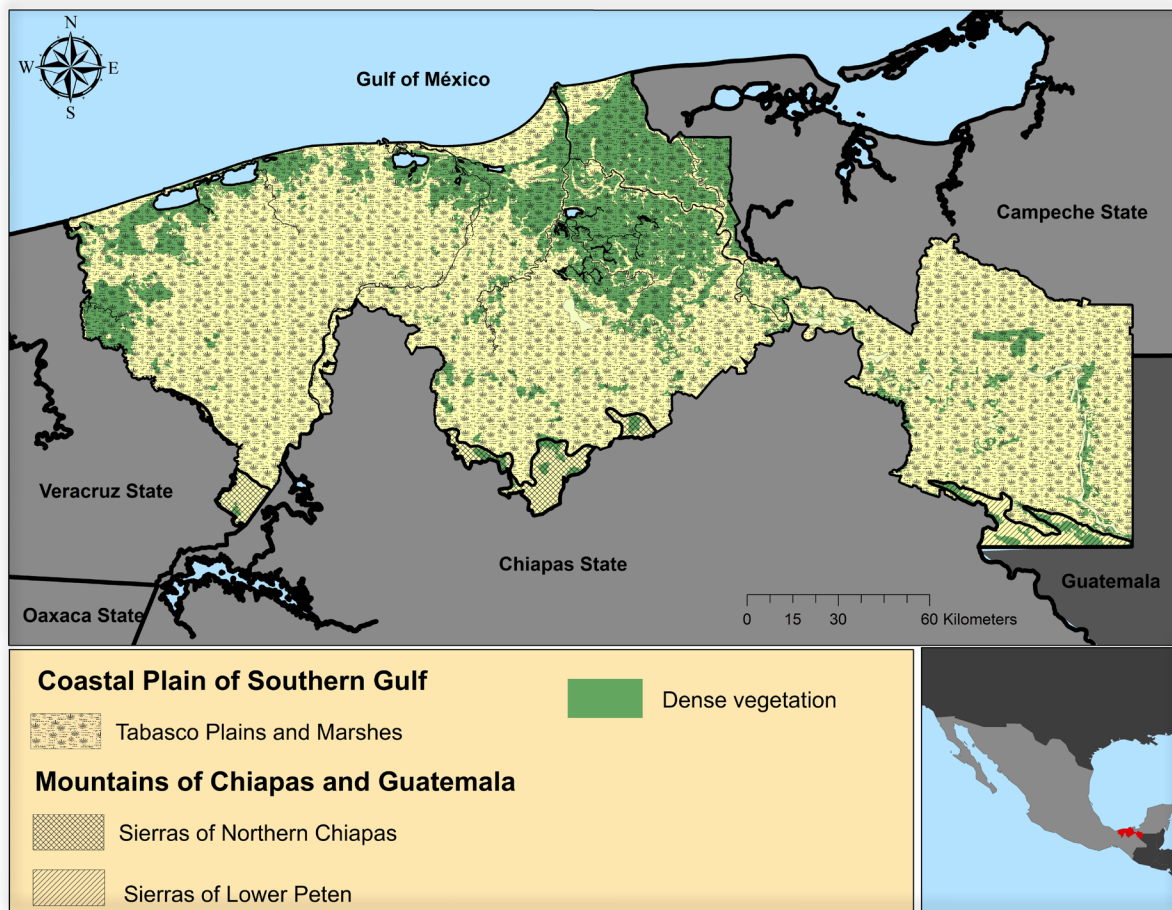


Figure 1. Physiographic regions of Tabasco.

and Guatemala, on the west by Veracruz, and on the east by Campeche and Guatemala. Tabasco is divided into two physiographic regions and three sub-regions (Figure 1), including the coastal plain of the southern gulf (Tabasco plains and marshes) and the mountains of Chiapas and Guatemala (Sierras of northern Chiapas and Sierras of lower Peten). The regions and sub-regions of Tabasco, including the municipalities sampled, are listed in Table 2.

Specimen collections

Mosquitoes were collected in all life stages except the eggs, in specific sites in the two physiographic regions of Tabasco (Table 2). The collections were conducted in both the dry and rainy seasons from 2014 through 2015. Immature stages were collected from any available water body, and some environmental parameters were recorded, such as pH, content of salts, and temperature, using a portable tester (Hanna® model. HI98129). Living larvae and pupae were placed into cups with water from the aquatic habitat and transported alive to the Laboratory of Parasitology of the Autonomous Agrarian University Antonio Narro Laguna Unit (LPI-UAAAN-UL). A sample of 4th instar larvae from each collection was mounted on microscope slides using Euparal as the mounting medium. The other larvae were placed into individual emergence tubes to obtain the adult stage and the associated immature exuviae. Male genitalia

were dissected to assist in species identification when it was required. Adults were collected using human-baited Shannon traps and CDC light traps baited with cotton balls containing four drops of octenol and/or frog-calling sounds by speakers. CDC light traps were also displayed with blacklight in some cases. All adult mosquitoes were killed using triethylamine vapor and mounted on insect pins.

Review of entomological collections

The Reference Collection of Arthropods of Medical Importance (CAIM) deposited in the Institute of Epidemiological Diagnosis and Reference (InDRE) was reviewed to search for additional records of mosquitoes from Tabasco. The classification criteria of the Family Culicidae proposed by Wilkerson et al. (2015) available on the web page of the Walter Reed Biosystematic Unit (www.wrbu.org) were used in the present study.

RESULTS

A total of 4,913 specimens collected in 277 sites in Tabasco was examined. The collections included 655 whole larvae; 172 larval exuviae; 342 pupal exuviae; 43 whole pupae; 3,375 female adults; 316 male adults, and ten male genitalia. Eighty-three species were found in our collection field trips (Figure 2). Another seven species records were obtained from CAIM,

Table 3. Checklist of the mosquito species that occur in Tabasco. Ma: Martini 1935, Va^a Vargas 1941, MP: Martínez-Palacios 1952, VM^a: Vargas and Martínez-Palacios 1953, VM^b: Vargas and Martínez-Palacios 1956, Va^b Vargas 1956, DV: Díaz-Nájera and Vargas 1973, HB: Heinemann and Belkin 1977, Za: Zavortink 1979, ML: Méndez-López et al. 2016, TC: Torres-Chable et al. 2017, OM: Ortega-Morales et al. 2018, X: Species that were not found in the present study (X-C: Species obtained from CAIM collection, X-L: species obtained from literature. NSR: New State Record, NNR: New National Record).

Taxa	F.R.	P.S.
<i>Anopheles (Anopheles)</i>		
1. <i>apicimacula</i> Dyar and Knab	VM ^b	✓
2. <i>bradleyi</i> King	VM ^b	X-C
3. <i>crucians s.s.</i> Wiedemann	NSR	✓
4. <i>eiseni</i> Coquillett	VM ^b	✓
5. <i>gabaldoni</i> Vargas	VA ^a	X-C
6. <i>neomaculipalpus</i> Curry	VM ^b	✓
7. <i>pseudopunctipennis</i> Theobald	VM ^b	✓
8. <i>punctimacula</i> Dyar and Knab	VM ^b	✓
9. <i>quadrimaculatus s.l.</i> Say	TC	X-L
10. <i>vestitipennis</i> Dyar and Knab	VM ^b	✓
<i>Anopheles (Nyssorhynchus)</i>		
11. <i>albimanus</i> Wiedemann	VM ^b	✓
12. <i>argyritarsis</i> Robineau-Desvoidy	VM ^b	✓
13. <i>darlingi</i> Root	VM ^b	✓
14. <i>strodei</i> Root	VM ^b	✓
<i>Chagasia</i>		
15. <i>bathana</i> (Dyar)	VM ^b	X-C
<i>Aedeomyia (Aedeomyia)</i>		
16. <i>squamipennis</i> (Lynch-Arribálzaga)	Ma	✓
<i>Aedes (Georgecraigius)</i>		
17. <i>epactius</i> Dyar and Knab	NSR	✓
18. <i>fluviatilis</i> (Lutz)	NSR	✓
<i>Aedes (Ochlerotatus)</i>		
19. <i>angustivittatus</i> Dyar and Knab	DV	✓
20. <i>bimaculatus</i> (Coquillett)	NSR	X-C
21. <i>dupreei</i> (Coquillett)	Va ^b	X-L
22. <i>euplocamus</i> Dyar and Knab	DV	✓
23. <i>scapularis</i> (Rondani)	Va ^b	✓
24. <i>serratus</i> (Theobald)	DV	✓
25. <i>taeniorhynchus</i> (Wiedemann)	Ma	✓
<i>Aedes (Protomacleaya)</i>		
26. <i>podographicus s.l.</i> Dyar and Knab	NSR	✓
<i>Aedes (Stegomyia)</i>		
27. <i>aegypti</i> (Linnaeus)	Va ^b	✓
28. <i>albopictus</i> (Skuse)	OM	✓
<i>Haemagogus (Haemagogus)</i>		
29. <i>anastasionis</i> Dyar		
30. <i>equinus</i> Theobald	DV	✓
31. <i>regalis</i> Dyar and Knab	Ma	✓
32. <i>mesodentatus</i> Komp and Kumm	DV	X-L
<i>Psorophora (Grabhamia)</i>	DV	✓
33. <i>cingulata</i> (Fabricius)	NSR	✓
34. <i>confinnis</i> (Lynch-Arribálzaga)	DV	✓
<i>Psorophora (Janthinosoma)</i>		
35. <i>albipes</i> (Theobald)	HB	✓
36. <i>cyanescens</i> (Coquillett)	NSR	✓

Taxa	F.R.	P.S.
37. <i>champerico</i> (Dyar and Knab)	DV	X-L
38. <i>ferox</i> (von Humboldt)	DV	✓
39. <i>lutzii</i> (Theobald)	DV	✓
<i>Psorophora (Psorophora)</i>		
40. <i>ciliata</i> (Fabricius)	Ma	✓
41. <i>howardii</i> Coquillett	NSR	X-C
42. <i>lineata</i> (von Humboldt)	NSR	✓
<i>Culex (Anoedioporpa)</i>		
43. <i>conservator</i> Dyar and Knab	HB	X-L
44. <i>restrictor</i> Dyar and Knab	NSR	✓
<i>Culex (Carrollia)</i>		
45. <i>bihaicola</i> Dyar and Nuñez-Tovar	NSR	✓
46. <i>metempsytyus</i> Dyar	NNR	✓
<i>Culex (Culex)</i>		
47. <i>bidens</i> Dyar and Knab	MP	✓
48. <i>coronator s.s.</i> Dyar and Knab	MP	✓
49. <i>declarator</i> Dyar and Knab	DV	✓
50. <i>interrogator</i> Dyar and Knab	MP	✓
51. <i>mollis</i> Dyar and Knab	HB	✓
52. <i>nigripalpus</i> Theobald	Ma	✓
53. <i>quinquefasciatus</i> Say	MP	✓
54. <i>salinarius</i> Coquillett	NSR	✓
55. <i>stigmatosoma</i> Dyar	Ma	✓
<i>Culex (Melanoconion)</i>		
56. <i>bastagarius</i> Dyar and Knab	Va ^b	✓
57. <i>conspirator</i> Dyar and Knab	MP	✓
58. <i>dunni</i> Dyar	Va	✓
59. <i>educator</i> Dyar and Knab	MP	✓
60. <i>elevator</i> Dyar and Knab	MP	X-L
61. <i>erraticus</i> (Dyar and Knab)	MP	✓
62. <i>inhibitor</i> Dyar and Knab	MP	X-L
63. <i>iolambdis</i> Dyar	MP	X-L
64. <i>mutator</i> Dyar and Knab	NSR	✓
65. <i>panocossa</i> Dyar	ML	✓
66. <i>pedroi</i> Sirivanakarn and Belkin	NSR	✓
67. <i>pilosus</i> Dyar and Knab	MP	✓
68. <i>rooti</i> Rozeboom	MP	X-L
69. <i>spissipes</i> (Theobald)	NSR	✓
70. <i>taeniopus</i> (Dyar and Knab)	Va ^b	✓
71. <i>trifidus</i> Dyar	NSR	✓
<i>Culex (Microculex)</i>		
72. <i>rejector</i> Dyar and Knab	MP	✓
<i>Culex (Phenacomyia)</i>		
73. <i>corniger</i> Theobald	MP	✓
74. <i>lactator</i> Dyar and Knab	NSR	✓
75. <i>psuedes</i> Dyar and Knab	DV	✓

Taxa	F.R.	P.S.
<i>Coquillettidia (Rhynchoaenia)</i>		
76. <i>nigricans</i> (Coquillett)	Ma	✓
77. <i>venezuelensis</i> (Theobald)	Va ^b	✓
<i>Mansonia (Mansonia)</i>		
78. <i>dyari</i> Belkin, Heinemann and Page	TC	✓
79. <i>indubitans</i> Dyar and Shannon	DV	X-C
80. <i>titillans</i> (Walker)	Ma	✓
<i>Johnbelkinia</i>		
81. <i>ulopus</i> (Dyar and Knab)	Za	✓
<i>Limatus</i>		
82. <i>durhamii</i> Theobald	HB	✓
<i>Sabethes (Sabethes)</i>		
83. <i>cyaneus</i> (Fabricius)	DV	✓
<i>Sabethes (Sabethoides)</i>		
84. <i>chloropterus</i> (von Humboldt)	DV	✓
<i>Shannoniana</i>		
85. <i>moralesi</i> (Dyar and Knab)	NSR	✓
<i>Trichoprosopon</i>		
86. <i>digitatum</i> (Rondani)	VM ^a	X-C
<i>Wyeomyia (Decamyia)</i>		
87. <i>pseudopecten</i> Dyar and Knab	VM ^a	✓
<i>Wyeomyia (Triamyia)</i>		
88. <i>apronoma</i> Dyar and Knab	VM ^a	✓
<i>Wyeomyia (Wyeomyia)</i>		
89. <i>abebele-melanopus</i>	VM ^a	✓
90. <i>adelpha-guatemala</i>	DV	✓
91. <i>arthrostigma</i> (Lutz)	DV	X-L
92. <i>celaenocephala</i> Dyar and Knab	VM ^a	✓
93. <i>mitchellii</i> (Theobald)	VM ^a	✓
94. <i>nigritubus</i> Galindo, Carpenter and Trapido	NSR	✓
95. <i>stonei</i> Vargas and Martínez-Palacios	VM ^a	X-C
<i>Toxorhynchites (Lynchiella)</i>		
96. <i>haemorrhoidalis</i> (Fabricius)	DV	X-L
97. <i>moctezuma</i> (Dyar and Knab)	HB	✓
<i>Uranotaenia (Pseudoficalbia)</i>		
98. <i>syntheta</i> Dyar and Shannon	DV	X-L
<i>Uranotaenia (Uranotaenia)</i>		
99. <i>coatzaocalcos</i> Dyar and Knab	DV	✓
100. <i>geometrica</i> Theobald	DV	X-L
101. <i>leucoptera</i> (Theobald)	Ma	✓
102. <i>lowii</i> Theobald	DV	✓
103. <i>nataliae</i> Lynch-Arribálzaga	NSR	✓
104. <i>pulcherrima</i> Lynch-Arribálzaga	Ma	✓

Table 4. Biological notes of the new mosquito species records in Tabasco. E: Elevation (masl), T: Temperature, Salt: Salts (PPM).

Taxa	Location	Habitat	Site/Aquatic habitat	Season	Position	E	pH	T	Salt	Associated spp.
<i>Anopheles crucians s.l.</i>	Centla	Swampy	Shannon-human trap at night	Dry	18°24'26.2"N-92°38'51.9"W	9	---	---	---	<i>An. apicimacula</i> , <i>An. vestitipennis</i> , <i>An. albimanus</i> , <i>Ae. scapularis</i> , <i>Cx. nigripalpus</i> , <i>Cx. pedroi</i> , <i>Cx. taeniopus</i> , <i>De. pseudes</i> , <i>Cq. nigricans</i> , <i>Cq. venezuelensis</i> , <i>Ma. dyari</i> , <i>Ma. titillans</i>
<i>Anopheles crucians s.l.</i>	Centla	Swampy	CDC light trap lured with octenol and frog-calling sounds at night	Dry	18°24'26.2"N-92°38'51.9"W	9	---	---	---	<i>An. albimanus</i> , <i>Cx. erraticus</i> , <i>Cx. taeniopus</i> , <i>Cq. nigricans</i> , <i>Cq. venezuelensis</i> , <i>Ma. dyari</i> , <i>Ma. titillans</i>
<i>Aedes epactius</i>	Tacotalpa	Sub-urban	Immature stages in rock-hole	Rainy	17°34'30.9"N-92°49'2.2"W	27	---	---	---	<i>Hg. anastasionis</i> , <i>Hg. mesodentatus</i> , <i>Cx. coronator s.s.</i>
<i>Aedes fluviatilis</i>	Huimanguillo	Swampy	Immature stages from pond with abundant vegetation	Rainy	17°55'19.3"N-93°46'11.9"W	350	---	---	---	<i>Ae. scapularis</i>
<i>Aedes bimaculatus</i>	Tenosique	Tropical forest	Approaching to humans at day	Dry	17°24'28.1"N-91°24'49.1"W	120	---	---	---	No associated species
<i>Aedes podographicus s.l.</i>	Tacotalpa	Mountain range	Immature stages in discarded tires	Rainy	17°28'43.35"N-92°46'27.1"W	48	7.7	23	111	<i>Ae. aegypti</i> , <i>Cx. coronator s.s.</i>
<i>Aedes podographicus s.l.</i>	Tenosique	Tropical forest	Immature stages in discarded tires	Rainy	17°29'53"N-91°24'13.8"W	10	7.8	30	59	<i>Ae. aegypti</i> , <i>Cx. restrictor</i> , <i>Cx. coronator s.s.</i> , <i>Cx. corniger</i> , <i>Tx. moctezuma</i>
<i>Psorophora cingulata</i>	Huimanguillo	Mountain range	Approaching to humans at day	Rainy	17°22'44.1"N-93°38'22.7"W	515	---	---	---	<i>Ae. scapularis</i> , <i>Ae. albopictus</i> , <i>Hg. mesodentatus</i> , <i>Ps. albipes</i> , <i>Jb. ulopus</i> , <i>Sa. chloropterus</i> , <i>Sh. moralesi</i> , <i>Wy. abebela / melanopus</i> , <i>Wy. celaeocephala</i> , <i>Wy. mitchellii</i> , <i>Wy. nigritubus</i>
<i>Psorophora cingulata</i>	Huimanguillo	Mountain range	Shannon-human trap at night	Rainy	17°21'50"N-93°37'39.7"W	913	---	---	---	<i>Ps. albipes</i> , <i>Ps. ferox</i> , <i>Hg. mesodentatus</i> , <i>Sh. moralesi</i> , <i>Cx. nigripalpus</i>
<i>Psorophora cyanescens</i>	Tenosique	Tropical forest	Approaching to humans at night	Dry	17°15'22.5"N-91°3'58"W	127	---	---	---	<i>An. strodei</i> , <i>Ae. angustivittatus</i> , <i>Ae. scapularis</i> , <i>Cq. venezuelensis</i>
<i>Psorophora howardii</i>	Villahermosa	Swampy								
<i>Psorophora lineata</i>	Huimanguillo	Swampy	Approaching to humans at day	Rainy	17°55'16.2"N-93°45'59.2"W	21	---	---	---	<i>Ae. scapularis</i> , <i>Ae. taeniorhynchus</i> , <i>Cq. venezuelensis</i>
<i>Psorophora lineata</i>	Balancán	Tropical forest	Immature stages in animal tracks with colored water	Rainy	17°50'0.6"N-91°31'40.7"W	25	---	---	---	<i>Ps. confinnis</i>
<i>Culex restrictor</i>	Teapa	Mountain range	Adults resting inside a discarded tire	Dry	17°33'48.2"N-92°55'42.4"W	48	---	---	---	<i>Ae. aegypti</i> , <i>Cx. quinquefasciatus</i>
<i>Culex restrictor</i>	Teapa	Mountain range	Ovitrap placed at trees	Dry	17°33'48.2"N-92°55'42.4"W	48	---	---	---	<i>Cx. quinquefasciatus</i>
<i>Culex restrictor</i>	Tenosique	Tropical forest	Immature stages from discarded tires with clear water	Rainy	17°29'53"N-91°24'13.8"W	10	7.8	30	59	<i>Ae. aegypti</i> , <i>Ae. podographicus s.l.</i> , <i>Cx. coronator s.s.</i> , <i>Cx. corniger</i> , <i>Tx. moctezuma</i>
<i>Culex bihaicola</i>	Huimanguillo	Mountain range	Immature stages from flower bracts of <i>Heliconia</i> sp.	Rainy	17°22'7"N-93°37'40.6"W	874	6.8	34	210	<i>Cx. metempysytus</i> , <i>Sh. moralesi</i>
<i>Culex metempysytus</i>	Huimanguillo	Mountain range	Immature stages from flower bracts of <i>Heliconia</i> sp.	Rainy	17°22'44.1"N-93°38'22.7"W	515	7.0	31	354	No associated species
<i>Culex metempysytus</i>	Huimanguillo	Mountain range	Immature stages from flower bracts of <i>Heliconia</i> sp.	Rainy	17°21'50"N-93°37'39.7"W	913	7.4	22	62	<i>Wy. adelpha / guatemala</i>
<i>Culex metempysytus</i>	Huimanguillo	Mountain range	Immature stages from flower bracts of <i>Heliconia</i> sp.	Rainy	17°22'7"N-93°37'40.6"W	874	6.8	33	210	<i>Cx. bihaicola</i> , <i>Sh. moralesi</i>
<i>Culex metempysytus</i>	Huimanguillo	Mountain range	Immature stages from axils of Bromeliads at ground-level at site	Rainy	17°21'50"N-93°37'39.7"W	112	7	36	209	No associated species
<i>Culex salinarius</i>	Huimanguillo	Swampy	Approaching to humans at day	Rainy	17°46'38.2"N-93°38'21.2"W	41	---	---	---	<i>Ae. serratus</i> , <i>Ae. scapularis</i> , <i>Ae. taeniorhynchus</i> , <i>Ae. albopictus</i> , <i>Ps. albipes</i> , <i>Ps. ferox</i> , <i>Ps. lutzii</i> , <i>Wy. celaeocephala</i>
<i>Culex mutator</i>	Tenosique	Tropical forest	Immature stages in pond with abundant emergent vegetation	Dry	17°15'22.5"N-91°3'58"W	127	---	---	---	No associated species
<i>Culex mutator</i>	Huimanguillo	Swampy	CDC light trap lured with octenol and frog-calling sounds at night	Dry	17°39'42.2"N-93°28'12.4"W	54	---	---	---	<i>Cx. nigripalpus</i> , <i>Cx. pedroi</i>

Table 4 (continued). Biological notes of the new mosquito species records in Tabasco. E: Elevation (masl), T: Temperature, Salt: Salts (PPM).

Taxa	Location	Habitat	Site/Aquatic habitat	Season	Position	E	pH	T	Salt	Associated spp.
<i>Culex pedroi</i>	Centla	Swampy	Shannon-human trap at night	Dry	18°24'26.2''N-92°38'51.9''W	9	---	---	---	<i>An. apicimacula</i> , <i>An. crucians</i> s.s., <i>An. vestitipennis</i> , <i>Ae. scapularis</i> , <i>Cx. nigripalpus</i> , <i>Cx. taeniopus</i> , <i>De. pseudes</i> , <i>Cq. nigricans</i> , <i>Cq. venezuelensis</i> , <i>Ma. titillans</i> , <i>Ma. dyari</i>
<i>Culex pedroi</i>	Huimanguillo	Swampy	CDC light trap lured with octenol and frog-calling sounds at night	Rainy	17°39'42.2''N-93°28'12.4''W	54	---	---	---	<i>Cx. nigripalpus</i> , <i>Cx. mutator</i>
<i>Culex pedroi</i>	Huimanguillo	Swampy	CDC light trap with black light at night	Rainy	17°39'42.2''N-93°28'12.4''W	54	---	---	---	<i>Cx. nigripalpus</i> , <i>Cx. spissipes</i> , <i>Cx. corniger</i> .
<i>Culex spissipes</i>	Cárdenas	Swampy	CDC light trap lured with octenol at night	Dry	18°7'1.7''N-93°29'48.2''W	15	---	---	---	<i>Cx. declarator</i> , <i>Cx. quinquefasciatus</i> , <i>Cx. bastagarius</i> , <i>Cx. dunnii</i> , <i>Cx. spissipes</i> , <i>Ur. lowii</i>
<i>Culex spissipes</i>	Huimanguillo	Swampy	CDC light trap with black light at night	Rainy	17°39'42.2''N-93°28'12.4''W	54	---	---	---	<i>Cx. nigripalpus</i> , <i>Cx. pedroi</i> , <i>Cx. corniger</i>
<i>Culex spissipes</i>	Nacajuca	Swampy	Adults resting in vegetation	Rainy	18°10'17.5''N-93°1'5.4''W	1	---	---	---	<i>Ur. lowii</i>
<i>Culex trífidus</i>	Huimanguillo	Swampy	Adults resting in vegetation	Rainy	17°55'16.2''N-93°45'59.2''W	21	---	---	---	<i>Cx. interrogator</i> , <i>Cx. dunnii</i> , <i>Cx. pilosus</i> , <i>Cx. taeniopus</i> , <i>Cq. nigricans</i> , <i>Ur. lowii</i>
<i>Culex trífidus</i>	Paraíso	Coastal	Approaching to humans at day	Rainy	18°24'37.2''N-93°4'40.5''W	-8	---	---	---	<i>Cx. nigripalpus</i> , <i>Wy. celaenocephala</i>
<i>Culex lactator</i>	Cárdenas	Swampy	Shannon-human trap at night	Dry	18°6'59.7''N-93°29'44.5''W	43	---	---	---	<i>Cx. declarator</i> , <i>Cx. nigripalpus</i> , <i>Cx. quinquefasciatus</i> , <i>Ma. dyari</i> , <i>Ur. lowii</i>
<i>Culex lactator</i>	Cárdenas	Swampy	CDC light trap lured with octenol and frog-calling sounds at night	Rainy	18°6'58.3''N-93°30'3.4''W	29	---	---	---	<i>Cx. nigripalpus</i> , <i>Cx. panocossa</i> , <i>Ma. dyari</i> , <i>Ur. lowii</i>
<i>Culex lactator</i>	Huimanguillo	Swampy	CDC light trap lured with octenol and frog-calling sounds at night	Rainy	17°39'42.2''N-93°28'12.4''W		---	---	---	<i>Cx. interrogator</i> , <i>Cx. nigripalpus</i> , <i>Cx. quinquefasciatus</i> , <i>Cx. dunnii</i> , <i>Cq. venezuelensis</i> , <i>Ur. lowii</i>
<i>Culex lactator</i>	Comalcalco	Tropical forest	CDC light trap with black light at night	Rainy	18°16'48.3''N-93°12'19.1''W	3	---	---	---	<i>Ae. scapularis</i> , <i>Ae. taeniorhynchus</i> , <i>Cx. nigripalpus</i> , <i>Cx. conspirator</i> , <i>Cx. dunnii</i> , <i>Cx. taeniopus</i> , <i>Cx. corniger</i> , <i>Cq. nigricans</i> , <i>Cq. venezuelensis</i> , <i>Ur. lowii</i>
<i>Culex lactator</i>	Emiliano Zapata	Swampy	Immature stages in pond with abundant emergent vegetation	Rainy	17°42'27''N-91°40'53''W		---	---	---	<i>Cx. interrogator</i> , <i>Cx. nigripalpus</i> , <i>Cx. corniger</i>
<i>Culex lactator</i>	Tenosique	Tropical forest	Immature stages in with abundant emergent vegetation	Rainy	17°16'40''N-91°24'12''W	220	---	---	---	<i>Cx. nigripalpus</i> , <i>Cx. corniger</i>
<i>Shannoniana moralesi</i>	Huimanguillo	Mountain range	Immature stages in axils of <i>Xanthosoma</i>	Rainy	17°22'48''N-93°38'8.4''W	31	6.8	29	20	No associated species
<i>Shannoniana moralesi</i>	Huimanguillo	Mountain range	Immature stages in axils of <i>Xanthosoma</i>	Rainy	17°22'39.1''N-93°38'42.3''W	455	6.8	27	34	<i>Wy. celaenocephala</i> , <i>Tx. moctezuma</i>
<i>Shannoniana moralesi</i>	Huimanguillo	Mountain range	Immature stages in axils of <i>Xanthosoma</i>	Rainy	17°22'4.8''N-93°37'44.5''W	928	7.1	34	1024	No associated species
<i>Shannoniana moralesi</i>	Huimanguillo	Mountain range	Immature stages in axils of <i>Xanthosoma</i>	Rainy	17°22'4.4''N-93°37'42''W	894	6.7	34	37	No associated species
<i>Shannoniana moralesi</i>	Huimanguillo	Mountain range	Immature stages in axils of <i>Xanthosoma</i>	Rainy	17°22'3''N-93°37'40.7''W	873	6.5	34	56	No associated species
<i>Shannoniana moralesi</i>	Huimanguillo	Mountain range	Immature stages in flower bracts of <i>Heliconia</i> sp.	Rainy	17°22'7''N-93°37'40.6''W	874	6.8	33	210	<i>Cx. bihaiocla</i> , <i>Cx. metempsychus</i>
<i>Shannoniana moralesi</i>	Huimanguillo	Mountain range	Approaching to humans at day	Rainy	17°22'44.1''N-93°38'22.7''W	515	---	---	---	<i>Ae. scapularis</i> , <i>Ae. albopictus</i> , <i>Hg. mesodentatus</i> , <i>Ps. cingulata</i> , <i>Ps. albipes</i> , <i>Cx. nigripalpus</i> , <i>Jb. ulopus</i> , <i>Sa. chloropterus</i> , <i>Wy. abebela</i> / <i>melanopus</i> , <i>Wy. celaenocephala</i> , <i>Wy. mitchellii</i> , <i>Wy. nigriritubus</i>
<i>Shannoniana moralesi</i>	Huimanguillo	Mountain range	Shannon-human trap at day	Rainy	17°21'50''N-93°37'39.7''W	913	---	---	---	<i>Ps. cingulata</i> , <i>Ps. albipes</i> , <i>Ps. ferox</i> , <i>Hg. mesodentatus</i> , <i>Cx. nigripalpus</i>
<i>Shannoniana moralesi</i>	Tacotalpa	Tropical forest	Immature stages in axils of <i>Xanthosoma</i>	Rainy	17°26'30.3''N-92°45'31.4''W	60	7.6	26	129	No associated species
<i>Shannoniana moralesi</i>	Tacotalpa	Tropical forest	Immature stages in axils of <i>Xanthosoma</i>	Rainy	17°30'24.9''N-92°45'45.4''W	51	7.7	34	136	<i>Ae. angustivittatus</i> , <i>Ae. scapularis</i> , <i>Ae. taeniorhynchus</i> , <i>Jb. ulopus</i> , <i>Wy. abebela</i> / <i>melanopus</i> , <i>Wy. adelpha</i> / <i>guatemala</i>
<i>Shannoniana moralesi</i>	Tacotalpa	Tropical forest	Approaching to humans at day	Rainy	17°23'9''N-93°43'31.5''W	62	---	---	---	No associated species

Table 4 (continued). Biological notes of the new mosquito species records in Tabasco. E: Elevation (masl), T: Temperature, Salt: Salts (PPM).

Taxa	Location	Habitat	Site/Aquatic habitat	Season	Position	E	pH	T	Salt	Associated spp.
<i>Wyeomyia nigriritubus</i>	Huimanguillo	Mountain range	Approaching humans at day	Rainy	17°22'44.1''N-93°38'22.7''W	515	---	---	---	<i>Ae. scapularis</i> , <i>Ae. albopictus</i> , <i>Hg. mesodentatus</i> , <i>Ps. cingulata</i> , <i>Ps. albipes</i> , <i>Jb. ulopus</i> , <i>Sa. chloripterus</i> , <i>Sh. moralesi</i> , <i>Wy. abebela / melanopus</i> , <i>Wy. celanocephala</i> , <i>Wy. mitchellii</i>
<i>Uranotaenia nataliae</i>	Huimanguillo	Mountain range	CDC light trap with black light at night	Dry	17°33'48.2''N-92°55'42.4''W	48	---	---	---	<i>Ae. scapularis</i>
<i>Uranotaenia nataliae</i>	Centla	Swampy	CDC light trap with black light at night	Rainy	18°24'26.3''N-92°38'52.4''W	17	---	---	---	<i>An. vestitipennis</i> , <i>Ad. sqamipennis</i> , <i>Ae. scapularis</i> , <i>Ps. confinnis</i> , <i>Cx. conspirator</i> , <i>Ur. leucoptera</i> , <i>Ur. lowii</i>
<i>Uranotaenia nataliae</i>	Teapa	Mountain range	Resting into caves	Rainy	17°33'50.2''N-92°55'41.1''W	32	---	---	---	<i>Cx. nigripalpus</i> , <i>Cx. erraticus</i>

while 14 species records were obtained from literature records (Table 3). The mosquito fauna of Tabasco state is composed of two Culicidae subfamilies: Anophelinae and Culicinae; seven tribes, 18 genera, 27 subgenera, and 104 species. All tribes of Culicidae known to occur in Mexico are in Tabasco, except the tribes Culisetini and Orthopodomyiini. In the present study, one genus (*Shannoniana* Lane and Cerqueira); two subgenera: *Georgecraigius* Reinert, Harbach and Kitching, and *Carrollia* Lutz; and 21 named species: *Anopheles crucians* s.s. Wiedemann, *Aedes epactius* Dyar and Knab, *Ae. fluviatilis* (Lutz), *Ae. bimaculatus* (Coquillett), *Ae. podographicus* s.l. Dyar and Knab, *Psorophora cingulata* (Fabricius), *Ps. cyanescens* (Coquillett), *Ps. howardii* Coquillett, *Ps. lineata* (von Humboldt), *Culex restrictor* Dyar and Knab, *Cx. bihaicola* Dyar and Nuñez-Tovar, *Cx. metempsytyus* Dyar, *Cx. salinarius* Coquillett, *Cx. mutator* Dyar and Knab, *Cx. pedroi* Sirivanakarn and Belkin, *Cx. spissipes* (Theobald), *Cx. trifidus* Dyar, *Cx. lactator* Dyar and Knab, *Shannoniana moralesi* (Dyar and Knab), *Wyeomyia nigriritubus* Galindo, Carpenter and Trapido, and *Uranotaenia nataliae* Lynch-Arribázcaga are reported for the first time in Tabasco (Table 3). *Culex metempsytyus* Dyar is recorded for the first time in Mexico.

Medical importance of new species records in Tabasco

One-hundred mosquito species had been previously

reported in Tabasco, including seventeen species names removed in this study. Twenty-one new records are reported for the first time in Tabasco. Currently, 104 valid species names are found in Tabasco state (Table 4).

Thirteen species of the genus *Anopheles* had been recorded in Tabasco. In this study, *An. crucians* s.s. is reported for the first time, collected at night using human-baited Shannon traps and CDC light traps baited with frog-calling sounds in the Reserve of the Swamps in Centla. Because *An. crucians* has been found naturally infected with *Plasmodium* sp., this species could be a malaria vector in nature (WRBU 2005).

The subgenus *Georgecraigius* of *Aedes* is divided into three species: *Ae. atropalpus* (Coquillett), *Ae. epactius*, and *Ae. fluviatilis*, the last two of which occur in Mexico. This is the first record of the subgenus *Georgecraigius*, *Ae. epactius*, and *Ae. fluviatilis* in Tabasco. *Aedes epactius* is one of the most common species in Mexico, immatures are commonly found in artificial containers near houses and females are highly anthropophagous and persistent biters that keep biting even when the host is moving. Although the medical importance of *Ae. epactius* is unknown, this species should not be neglected in mosquito surveillance programs of Mexico. *Aedes fluviatilis* is considered a potential vector of yellow fever virus (Davis and Shannon 1931).

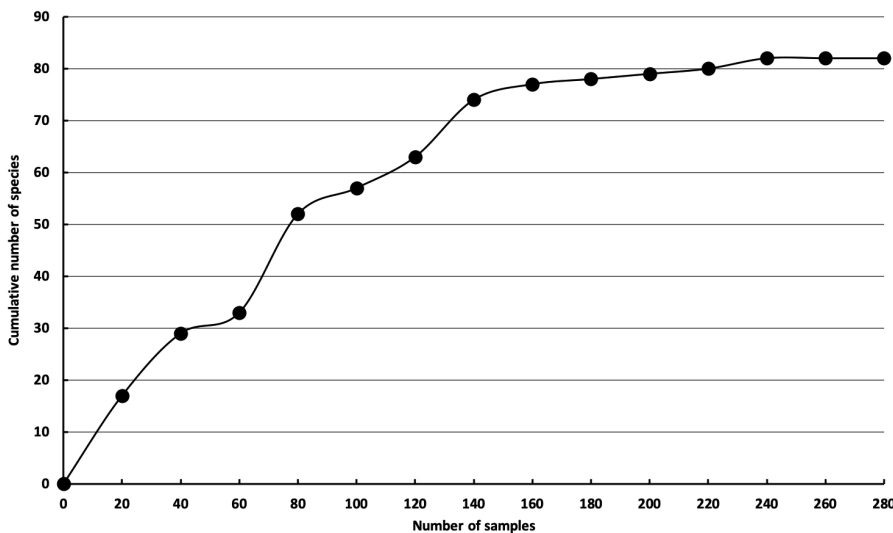


Figure 2. Accumulation curve of the 83 species collected in Tabasco.

Two new records for Tabasco were found in the CAIM collection: *Ae. bimaculatus* and *Psorophora howardii*; 16 females of *Ae. bimaculatus* were collected at day during the dry season in a tropical forest of Tenosique municipality in April and May of 1942. Those specimens were mounted on insect pins and had been misidentified as *Ae. fulvus* (Wiedemann) and published by Díaz-Nájera and Vargas (1973) (CAIMCulH/alf-02983-02998); they were re-examined and their identity corrected. The medical importance of *Ae. bimaculatus* is unknown.

In historical records of mosquitoes of Tabasco, the subgenus *Protomacleaya* of *Aedes* is recorded with the species *Ae. terreus* (Walker). However this species does not occur in Mexico, thus this record probably belongs to *Ae. podographicus*. Immature stages of *Ae. podographicus* were collected in discarded tires in Tacotalpa and Tenosique, being the first record of this species in Tabasco. The medical importance of *Ae. podographicus* is unknown.

Ten species of the genus *Psorophora* occur in Tabasco, of which *Ps. cingulata*, *Ps. cyanescens*, *Ps. howardii*, and *Ps. lineata* are new species records for Tabasco. Females of *Ps. cingulata*, *Ps. cyanescens*, and *Ps. lineata* were collected while attempting to bite humans. One larva of *Ps. howardii* had been found on November 13, 2011 in a single site during the rainy season in Villahermosa municipality. This larva is stored in a vial containing alcohol and labeled as CAIMCul/oh-06669 in the CAIM collection. The medical importance of those species is unknown.

The subgenus *Anoedioporpa* of *Culex* is divided into two species in Mexico: *Cx. conservator* Dyar and Knab and *Cx. restrictor*. Both species occur in Tabasco, but only *Cx. restrictor* is first record in Tabasco. This species was collected in discarded tires and ovitraps. The medical importance of *Cx. restrictor* is unknown.

The subgenus *Carrollia* of *Culex* contains *Cx. bihaicola*, which is recorded for the first time in Tabasco, while *Cx. metempsychus* is recorded for the first time in Mexico. Both species were collected in flower bracts of *Heliconia* sp. The medical importance of the subgenus *Carrollia* is unknown.

Although *Culex salinarius* is a common species in Mexico, this is the first record of this species in Tabasco. *Culex salinarius* was collected at night approaching humans in a swampy site of Huimanguillo. *Culex salinarius* is considered a vector of Eastern Equine encephalitis, St. Louis encephalitis, and WNV (Turell et al. 2005).

The most diverse group of mosquitoes in Tabasco is the subgenus *Melanoconion* of *Culex*. This subgenus had included twelve species in Tabasco, but four additional species are reported here for the first time: *Cx. mutator*, *Cx. pedroi*, *Cx. spissipes*, and *Cx. trifidus*. The medical importance of *Cx. mutator* and *Cx. trifidus* is unknown, while *Cx. pedroi* and *Cx. spissipes* are vectors of VEEV (Ferro et al. 2003, Sallum and Forattini 1996).

The subgenus *Phenacomyia* of *Culex* is divided into two species: *Cx. corniger* Theobald and *Cx. lactator*. This is the first record of *Cx. lactator* in Tabasco; this species was collected at night in Shannon-human traps and CDC light traps with octenol and/ or frog-calling sounds. The medical importance

of the subgenus *Phenacomyia* is unknown.

The tribe Sabethini is well represented in Tabasco; two additional new species records are reported in Tabasco: *Shannoniana moralesi* and *Wyeomyia nigriritubus*. Immature stages of *Sh. moralesi* were collected in axils of *Xanthosoma* sp. and flower bracts of *Heliconia* sp. and adults were collected during the day approaching humans. *Wyeomyia nigriritubus* is a very rare species in Mexico and has collected at day approaching humans. The medical importance of *Sh. moralesi* and *Wye. nigriritubus* is unknown.

One species of the tribe Uranotaeniini is recorded for first time in Tabasco: adults of *Uranotaenia nataliae* were collected resting in caves at night using CDC light traps with blacklight. The medical importance of *Ur. nataliae* is unknown.

DISCUSSION

Once the ecology and geographical distribution of the mosquito fauna in Tabasco is known, two categories of species may be recognized. They have similar geographic distributions reaching the northernmost limit of Tabasco and share the same type of aquatic habitat (Figure 3).

Category I includes species that develops in swamps, marshes, and ground pools with distribution in the Neotropical region of southeastern Mexico: *Anopheles darlingi* Root, *Culex elevator* Dyar and Knab, *Cx. rooti* Rozeboom, and *Uranotaenia leucoptera* (Theobald). As most territorial extensions of Tabasco belong to the plains and marsh sub-region, it is usual to find species that develop in the aforementioned aquatic habitats. Species in this category have not been reported in Veracruz, which is the northwestern adjacent state of Tabasco. *Anopheles darlingi* is an important vector of malaria in south and middle America (Linthicum 1988, Hiwatt and Bertas 2011). In Mexico, *An. darlingi* has been reported only in Chiapas and Tabasco (Vargas and Martínez-Palacios 1956, Casas-Martínez and Orozco-Bonilla 2006), where a permanent malaria vector surveillance program is ongoing. *Culex elevator*, *Cx. rooti*, and *Ur. leucoptera* have been reported in several countries in south and middle America. These species develop in swamps and ponds, and females feed upon frogs and other poikilothermal hosts. The medical importance of these species is still unknown.

Category II includes species that develop in phytotelmatic habitats, such as flower bracts of *Heliconia* sp. and axils of Bromeliads. *Culex metempsychus* was collected in the aforementioned aquatic habitats. *Cx. metempsychus* is a new nationwide record for Mexico; it may occur in Chiapas and perhaps the Yucatan Peninsula. Phytotelmata habitats of mosquitoes have not been investigated fully, so it is likely that other species of mosquitoes that develop in bracts of flowers of *Heliconia* sp. in southeastern Mexico are still undiscovered.

Species not collected during our collection trips

The 21 species of this group were not all collected during the present study but their records were obtained from the CAIM and from old literature reports. The species

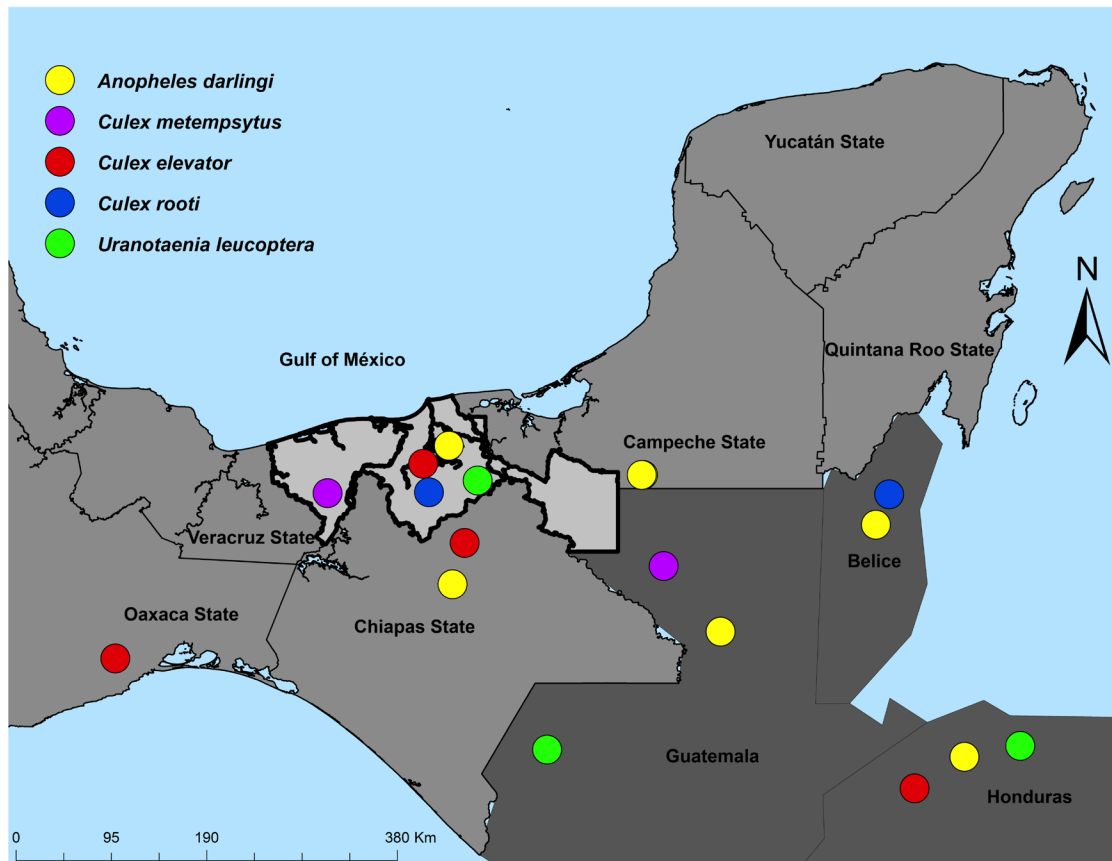


Figure 3. Distribution of species reaching the northernmost distributional limit in Tabasco.

records obtained from CAIM and last year seen in Tabasco are listed as follows: *Anopheles bradleyi* King (1941), *An. gabaldoni* Vargas (1954), *Chagasia bathana* (Dyar) (1955), *Aedes bimaculatus* (Coquillett) (1942), *Psorophora howardii* Coquillett (2011), *Mansonia indubitans* Dyar and Shannon (1954), *Trichoprosopon digitatum* (Rondani) (1947), and *Wyeomyia stonei* Vargas and Martínez-Palacios (1947).

Species records obtained mostly from older records include those of Vargas (1956): *Ae. dupreei* (Coquillett), *Haemagogus regalis* Dyar and Knab, *Psorophora champerico* (Dyar and Knab), *Culex elevator* Dyar and Knab, *Cx. inhibitor* Dyar and Knab, *Cx. iolambdis* Dyar, *Cx. rooti* Rozeboom, and *Toxorhynchites haemorrhoidalis* (Fabricius); Díaz-Nájera and Vargas (1973): *Wy. arthrostigma* (Lutz), *Uranotaenia syntheta* Dyar and Shannon, and *Ur. geometrica* Theobald; Heinemann and Belkin (1977): *Cx. conservator* Dyar and Knab; Torres-Chable et al. (2017): *An. quadrimaculatus s.l.* Say.

Species originally discovered in Tabasco

Anopheles gabaldoni Vargas (1941) and *Wyeomyia stonei* Vargas and Martínez-Palacios (1953) were originally discovered in Tabasco. *Anopheles gabaldoni* has been collected in large numbers in states adjacent to Tabasco such as Veracruz (Beltrán-Aguilar et al. 2011) and Campeche (Ordóñez-Sánchez et al. 2013), but in Tabasco there are no recent occurrence records for *An. gabaldoni*. *Wyeomyia stonei* is one of the rarest mosquito species in Mexico

with scarce occurrence records nationwide. We observed that *Wy. stonei* females are similar to the sympatric *Wy. celaenocephala* Dyar and Knab females, but the male genitalia have distinctive characters used to segregate both species (Vargas and Martínez-Palacios 1953). As *Wy. stonei* females in the CAIM were re-examined, we conclude that this is a valid species. However, it is necessary to conduct additional studies to compare morphology of all life stages between the two species. Molecular approaches can aid the elucidation of genetic distance and interspecific variability to corroborate the validity of *Wy. stonei* as a valid species.

Species names removed from Tabasco

Some species reported in Tabasco are currently not considered to occur in Tabasco. The species names removed from Tabasco fauna and reasons that best explain the deletions are ordered according to the authors of the papers where the species were reported.

Martini (1935): *Culex aikenii* Aiken and Rowland. Since *Cx. aikenii* was resurrected from synonymy of *Cx. ocosa* Dyar and Knab by Belkin (1970), it is a valid species endemic from Guyana. *Culex aikenii* was likely confused with *Cx. panocossa* Dyar; *Uranotaenia sapphirina* (Osten Sacken) has a Nearctic and Caribbean distribution, thus, it is likely that *Ur. sapphirina* was misidentified with other *Uranotaenia* species in the Neotropical region.

Vargas and Martínez-Palacios (1953): *Johnbelkinia leucopus* (Dyar and Knab) has been recorded in Brazil, Costa Rica, Ecuador, Nicaragua, and Panama. This species does not occur in Mexico; it was probably confused with *Jb. ulopus* (Dyar and Knab). *Wyeomyia personata* (Lutz) was synonymized with *Onirion personatum* (Lutz) by Harbach and Peyton (2000). The *Onirion* genus includes seven species distributed in the Neotropical region; none has been reported in Mexico. Reports of *Wy. personata* (*On. personatum*) in Mexico are based upon any of the other species in the genus *Wyeomyia*.

Vargas and Martínez-Palacios (1956): *Aedes fulvithorax* (Lutz) was recorded in several countries of South America, and since it does not occur in Mexico, it was likely confused with some of the other species of *Aedes* occurring in Mexico within the subgenus *Howardina*. If this were the case, then it represents a new record for Tabasco, as no other species of the subgenus *Howardina* had been previously reported. *Coquillettidia perturbans* (Walker) is removed from Tabasco as it has not been officially reported in southeastern Mexico. *Coquillettidia perturbans* was likely confused with *Cq. nigricans* (Coquillett) and *Trichoprosopon leucopus* (Dyar and Knab) was synonymized with *Johnblekinia leucopus* (Dyar and Knab) by Zavortink (1979).

Díaz-Nájera and Vargas (1973): Exception for *Ae. terreus* (Walker), *Cx. peus* Speiser, *Cx. virgultus* Theobald, and *Cx. opisthopus* Komp, (reasons to delete this species group are presented by Ortega-Morales et al. (2015) and *Jb. longipes*. All specimens collected by Díaz-Nájera and Vargas (1973) were found and re-examined at CAIM. Next, records were removed because they were re-identified and the correct name provided as follows: *Aedes fulvus* (Wiedemann) was changed to *Ae. bimaculatus* (Coquillett), *Ae. infirmatus* Dyar and Knab to *Ae. scapularis* (Rondani), *Coquillettidia arribalzagae* (Theobald) to *Cq. venezuelensis* (Theobald), *Cq. fasciolata* (Lynch Arribalzága) to *Cq. nigricans* (Coquillett), *Johnbelkinia longipes* (Fabricius) to *Jb. ulopus* (Dyar and Knab), *Wyeomyia jocosa* (Dyar and Knab) to *Wy. aporomma* Dyar and Knab, and *Wy. medioalbipes* Lutz to *Wy. mitchellii* (Theobald). The records of *Wy. jocosa* in Mexico are only from Tabasco and Chiapas (Vargas and Martínez-Palacios 1953). Specimens collected in Chiapas by the authors and deposited in CAIM were re-examined and re-identified as other species of *Wyeomyia* genus, thus, by deleting these records, both *Wy. jocosa* and the subgenus *Dendromyia* of *Wyeomyia* are removed from the Mexican list.

Acknowledgments

We are grateful to Salvador Morales-Avitia, Antonio Castillo-Martínez, and Martha Ortega-Lozano for their valuable collaboration during the field collection trips, Mr. Benjamin and Mr. José Luis for their kind support as field guides in Huimanguillo and Tacotalpa, respectively, Carlos Álvarez-Narvaez for sharing his records of *Sabethes cyaneus* in Tapijulapa, Quetzaly Siller-Rodríguez for drafting the

maps, and Fabian Correa-Morales and Cassandra González-Acosta from CENAPRECE for providing logistics facilities. The present study was supported by Secretaría de Educación Pública (PRODEP, Grant CUAC1414) and Consejo Nacional de Ciencia y Tecnología- Mexico (MEXBOL, Grants 251085 and 271108). Javier Alfonso Garza-Hernández thanks SEP-PRODEP (Reference No. UACJ-PTC-399; S11-6/18-9518) that permitted the completion of the present manuscript.

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