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THE MOSQUITOES OF QUINTANA ROO STATE, MEXICO (DIPTERA: CULICIDAE)

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ABSTRACT. A study on the distribution of the mosquitoes of Quintana Roo State of México was carried out by collecting immature and adult stages during September and October 2006. The collections were made from different locations in the three physiogeographical provinces of the state: Carso Yucateco, Carso, Lomeríos de Campeche, and Costa Baja de Quintana Roo. A total of 420 larvae, 294 pupae, and 726 adults representing 13 genera and 41 species were collected. Two genera, three subgenera, and 11 species are new to the mosquito fauna of Quintana Roo State. Collection and bionomical data are included for species collected during the study, and a checklist of species newly and previously recorded from the state is provided.

Key Words. Culicidae, Mexico, Mosquitoes, Quintana Roo State

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RESUMEN. Un estudio de la distribución de los mosquitos del estado de Quintana Roo, México fue realizado por medio de colectas de estados inmaduros y adultos durante Septiembre y Octubre del 2006. Las colectas fueron realizadas en diferentes localidades de las tres provincias fisiográficas del estado: Carso Yucateco, Carso, Lomeríos de Campeche y Costa Baja de Quintana Roo. Un total de 420 larvas, 294 pupas y 726 adultos fueron colectados representando 13 géneros y 41 especies. Dos géneros, tres subgéneros y 11 especies son nuevos registros estatales para Quintana Roo.

Palabras clave: Culicidae, México, mosquitos, Quintana Roo.

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INTRODUCTION

The family Culicidae is a diverse group of largely haematophagous insects with 3,523 species (Harbach 2007) distributed throughout the world, except in places that are permanently frozen. The majority of the species inhabit tropical and subtropical environments. A number of species are vectors of viruses, bacteria, nematodes, and protozoa that cause diseases in domestic animals and humans. In Quintana Roo State of Mexico, significant numbers of dengue and malaria cases have been reported by the State Secretary of Health in recent years (CENAVECE 2004). For this reason, it is important to know the mosquito faunal composition of Quintana Roo State so that mosquito control strategies can be targeted. Consequently, we made collections of mosquitoes in Quintana Roo State to obtain information about their ecology and distribution.

MATERIALS AND METHODS

Study area: Quintana Roo State is located in the Yucatan Peninsula in southeastern Mexico: northern boundary at 21° 73' N, western boundary at 89º 25' W, southern boundary at 17° 49' N, eastern boundary at 86° 44' W. It is bordered on the north by Yucatan State, on the south by Belize and Guatemala, on the east by the Caribbean and Antilles seas, and on the west by Yucatan and Campeche States. It has a total surface area of 53,344 km^2 and is divided into three physiogeographical provinces: Carso Yucateco, Carso y Lomeríos de Campeche, and Costa Baja de Quintana Roo (INEGI 2007) (Table 1). The weather is temperate with rains in summer, annual precipitation of 1,200 mm, and annual average temperatures ranging from 25.5–26.5°C (INEGI 2007).

Mosquito collections. Immature and adult mosquitoes were collected during the months of September and October 2006. Larvae and pupae were collected from available ground-water habitats and containers. Measurements of pH, total dissolved solids, and temperature were taken. Adult mosquitoes were collected approaching and landing on collectors stationed in different locations of the state. The mosquitoes were killed with thriethylamine vapor. All larvae and pupae were reared to adults. Data collected for each collection included hour and date of capture, ambient weather, GPS coordinates, and habitat characteristics. The larvae and pupae were transported alive in bags for rearing in the Public Health Laboratory of Quintana Roo state and the Medical Entomology Laboratory of the Universidad Autónoma de Nuevo León (UANL). A portion of the larvae were killed in hot water (60°C); the remaining larvae were individually reared to obtain adults with associated larval and pupal exuviae. Reared adults were killed as indicated above and mounted on paper points on pins. Larvae and larval and pupal exuviae were mounted in Euparal Mounting Medium (BioQuip® No.6372) on microscope slides. Male genitalia were dissected when necessary to assist identification. Specimens were identified using published keys and descriptions, and available voucher specimens.

Table 1. The three physiogeographical provinces of Quintana Roo State with the locations of collection sites.

Physiogeographical province	**Municipality Sampled**	**Coordinate of collection site**
Carso Yucateco. 49.82% of state, rock soil plain, slight depressions, few deep holes, grassland, Temporal, intermediate jungle. Location in the state: Central and north	Puerto Aventuras	20º 30’ 54.7’’N 87º 4.0’ 25.2’’W
	(Solidaridad)	20º 30’ 24.2’’N 87º 13’ 13.2’’W
	Playa del Carmen (Solidaridad)	20º 38’ 56.3’’N 87º 3.0’ 1.7’’W
	Capitán Laffite (Solidaridad)	20º 40’ 44.7’’N 87º 1.0’ 54’’W
	Punta Maroma (Solidaridad)	20º 43’ 36.9’’N 86º 59’ 27.8’’W
	Chunyaxchen (Felipe C. Puerto)	20º 4.0’ 20.6’’N 87º 37’ 3.5’’W
	Tulum (Solidaridad)	19º 40’ 39.3’’N 87º 57’ 51.3’’W
	Carrillo Puerto (Felipe C. Puerto)	19º 17’ 59.9’’N 88º 45’ 13.3’’W
	Lago Ocom (Felipe C. Puerto)	19º 28’ 30.2’’N 88º 3.0’ 7.3’’W
		19º 28’ 27.8’’N 88º 3.0’ 5.5’’W
	Isla Mujeres (Isla Mujeres)	21º 11’ 4.4’’N 86º 48’ 37.2’’W
	Ruinas Muyil (Felipe C. Puerto)	20º 04’ 3.3’’N 87º 36’ 50.4’’W
Carso, Lomeríos de Campeche and Costa. 21.59% of state, low hills, depressions, medium and low jungle. Location in the state: Southeast bordering Campeche State	Nuevo Becar	18º 37’ 7.6’’N 89º 6.0’ 56.4’’W
	(Othón Pompeyo Blanco)	18º 35’ 58.0’’N 89º 6.0’ 51.7’’W
		18º 31’ 18.7’’N 89º 6.0’ 12.2’’W
		18º 31’ 18.8’’N 89º 6.0’ 10.0’’W
	Nicolás Bravo (Othón P. Blanco)	18º 27’ 54.0’’N 88º 55’ 46.5’’W
	Cacao (Othón Pompeyo Blanco)	18º 11’ 29.1’’N 88º 41’ 35.4’’W
Costa Baja de Quintana Roo. 18.59% of state, flooded plain with saline soil, rain, agriculture, temporal, grassland, medium and low jungle. Location in the state: South bordering Belize and coast line	Mahahual (Othón Pompeyo Blanco)	18º 42’ 48.5’’N 87º 42’ 38.1’’W
		18º 43’ 45.0’’N 87º 42’ 47.4’’W
		18º 46’ 15.2’’N 87º 44’ 6.4’’W
	Buena Vista (Othón Pompeyo Blanco)	18º 52’ 45.4’’N 88º 14’ 39.1’’W
	Bacalar (Othón Pompeyo Blanco)	18º 40’ 57.7’’N 88º 23’ 13.3’’W
		18º 40’ 55.8’’N 88º 23’ 8.0’’W
		18º 40’ 33.4’’N 88º 23’ 41.8’’W
	Chula Vista (Othón Pompeyo Blanco)	18º 57’ 33.1’’N 88º 7.0’ 19.0’’W
	Revolución	17º 59’ 10.4’’N 88º 49’ 28.2’’W
	(Othón Pompeyo Blanco)	
	San Felipe (Othón Pompeyo Blanco)	18º 46’ 22.4’’N 88º 24’ 50.4’’W
		18º 46’ 20.6’’N 88º 24’ 49.2’’W
		18º 46’ 14.4’’N 88º 25’ 10.9’’W
		18º 46’ 22.8’’N 88º 25’ 30.9’’W
		18º 46’ 49.3’’N 88º 31’ 5.0’’W
	Ejido Lázaro Cárdenas	18º 46’ 8.9’’N 88º 30’ 18.2’’W
	(Othón Pompeyo Blanco)	18º 47’ 19.3’’N 88º 30’ 13’’W
	Sacxan (Othón Pompeyo Blanco)	18º 27’ 55.9’’N 88º 31’ 00.4’’W
	Limones (Othón Pompeyo Blanco)	19º 1.0’ 40.0’’N 88º 6.0’ 37.9’’W
	Curva Hu-May (Felipe C. Puerto)	19º 27’ 43.8’’N 88º 1.0’ 46.3’’W
	Vigía Chico (Felipe C. Puerto)	19º 36’ 3.8’’N 88º 0.0’ 6.2’’W
		19º 36’ 11.3’’N 88º 0.0’ 10.2’’W
		19º 36’ 14.7’’N 88º 0.0’ 0.0’’W
		19º 36’ 14.8’’N 87º 59’ 44.3’’W
		19º 36’ 30.7’N 87º 59’ 9.7’’W
		20º 30’ 55.5’’N 87º 14’ 26.0’’W
	Punta Lagarto (Othón Pompeyo Blanco)	18º 38’ 55.3’’N 88º 13’ 30.3’’W
		18º 40’ 20.3’’N 88º 13’ 50.8’’W
	Luis Echeverría (Othón P. Blanco)	18º 39’ 28.2’’N 88º 12’ 56.7’’W
	Playa Punta Lagarto (Othón P. Blanco)	18º 40’ 21.9’’N 88º 11’ 42.5’’W

RESULTS

A total of 1,440 specimens were collected (420 larvae, 294 pupae, and 726 adults) representing both subfamilies of Culicidae (Anophelinae and Culicinae), six tribes of subfamily Culicinae, 13 genera, 19 subgenera, and 41 species. Two genera, three subgenera, and 11 species are recorded in Quintana Roo State for the first time. A description of the different physiogeographic provinces of the state and all collection sites, with their GPS coordinate, are provided in Table 1. Species collected during the study, and the places where they were found, are listed below. The list includes species not known to occur in Quintana Roo State. Bionomical data associated with the species collected during the study are provided in Table 3. Specimens collected and identified in this study are deposited in the Insect and Mite of Medical Importance Collection of the Medical Entomology Laboratory, UANL. Table 2 should be consulted for species previously recorded from Quintana Roo State.

Table 2. Checklist of the mosquito species known from Quintana Roo State. Previous occurrence records are abbreviated: CE, CENAVECE (2004); DO, Domínguez (2002); IB, Ibáñez-Bernal *et al.* (1990); PL, Pletsch (1986); VM, Vargas and Martínez-Palacios (1950); V, Vargas (1956); VA, Vargas (1958). An asterisk (*) indicates a new occurrence record for the state. Classification according to Knight and Stone (1977)

Taxon	Previous record	Present study
Aedes (*Howardina*)		
1. *cozumelensis* Díaz Nájera	PL	✔
Aedes (*Ochlerotatus*)		
2. angustivittatus (Dyar and Knab)	VA	✔
3. *bimaculatus* (Coquillett)	PL	✔
4. *condolescens* Dyar and Knab	VA	–
5. e*pactius* Dyar and Knab	IB	–
6. *euplocamus* Dyar and Knab*	–	✔
7. *fulvus* (Wiedemann)	VA	–
8. *infirmatus* Dyar and Knab	PL	–
9. *scapularis* (Rondani)	PL	–
10. *serratus* (Theobald)	VA	✔
11. *sollicitans* (Walker)	PL	–
12. *taeniorhynchus* (Wiedemann)	VA	✔
13. *tormentor* Dyar and Knab	VA	–
14. *tortilis* (Theobald)	VA	–
15. *trivittatus* (Coquillett)*	–	✔
Aedes (*Protomacleaya*)		
16. *podographicus* Dyar and Knab*	–	✔
17. *terrens* (Walker)	VA	–
18. *triseriatus* (Say)	PL	–

Taxon	Previous record	Present study
Aedes (*Stegomyia*)		
19. *aegypti* (Linnaeus)	VA	✔
Anopheles (*Anopheles*)		
20. *apicimacula* Dyar and Knab	VM	✔
21. *atropos* Dyar and Knab	PL	–
22. *bradleyi* King	VM	–
23. *crucians* Wiedemann	V	✔
24. *franciscanus* McCraken	DO	–
25. *neomaculipalpus* Curry*	–	✔
26. *pseudopunctipennis* Theobald	VM	–
27. *punctimacula* Dyar and Knab	VM	✔
28. *veruslanei* Vargas	DO	–
29. *vestitipennis* Dyar and Knab	VM	✔
Anopheles (*Nyssorhynchus*)		
30. *albimanus* Wiedemann	VM	✔
Coquillettidia (*Rhynchotaenia*)		
31. *nigricans* (Coquillett)	PL	✔
32. *venezuelensis* (Theobald)	VA	–
Culex (*Anoedioporpa*)		
33. *restrictor* Dyar and Knab*	–	✔
Culex (*Culex*)		
34. *chidesteri* Dyar	PL	✔
35. *coronator* Group	PL	✔
36. *declarator* Dyar and Knab	PL	✔
37. *interrogator* Dyar and Knab	PL	✔
38. *nigripalpus* Theobald	PL	✔
39. *quinquefasciatus* Say	PL	✔
40. *restuans* Theobald	PL	–
41. *salinarius* Coquillett	PL	–
42. *tarsalis* Coquillett	CE	–
43. *thriambus* Dyar	PL	–
Culex (*Melanoconion*)		
44. *anips* Dyar	PL	–
45. *conspirator* Dyar and Knab*	–	✔
46. *educator* Dyar and Knab	PL	–
47. *erraticus* (Dyar and Knab)	PL	✔
48. *iolambdis* Dyar	PL	–
49. *peccator* Dyar and Knab	PL	–
50. *taeniopus* Dyar and Knab	PL	✔
Culex (*Phenacomyia*)		
51. *corniger* Theobald	PL	–
Deinocerites		
52. *cancer* Theobald	VA	✔
53. *pseudes* Dyar and Knab	PL	–

Taxon	Previous record	Present study
Haemagogus (*Haemagogus*)		
54. *anastasionis* Dyar	IB	–
55. *equinus* Theobald	IB	–
Limatus		
56. *durhamii* Theobald	PL	✔
Mansonia (*Mansonia*)		
57. *dyari* Belkin, Heinemann and Page*	–	✔
58. *indubitans* Dyar and Shannon	PL	–
59. *titillans* (Walker)	VA	✔
Psorophora (*Grabhamia*)		
60. *confinnis* Group*	–	✔
Psorophora (*Janthinosoma*)		
61. *champerico* (Dyar and Knab)	VA	–
62. *cyanescens* (Coquillett)	PL	–
63. *ferox* (von Humboldt)	VA	✔
64. *lutzii* (Theobald)	VA	–
Psorophora (*Psorophora*)		
65. *ciliata* (Fabricius)	PL	✔
66. *lineata* (von Humboldt)	VA	–
Sabethes (*Sabethes*)		
67. *gymnothorax* Harbach and Petersen*	–	✔
Sabethes (*Sabethoides*)		
68. *chloropterus* (von Humboldt)	PL	✔
Shannoniana		
69. *fluviatilis* (Theobald)*	–	✔
Toxorhynchites (*Lynchiella*)		
70. *theobaldi* (Dyar and Knab)*	–	✔
Trichoprosopon		
71. *digitatum* (Rondani)	VA	–
Uranotaenia (*Uranotaenia*)		
73. *lowii* Theobald	PL	✔
72. *socialis* Theobald*	–	✔
Wyeomyia (*Wyeomyia*)		
74. *celaenocephala* Dyar and Knab	VA	✔
75. *mitchellii* (Theobald)	PL	✔
76. *stonei* Vargas and Martínez Palacios	PL	–

Table 3. Bionomical data for mosquito species collected during the study. Species marked with an asterisk (*) were captured biting/landing on humans. PPM = parts per million; T = ºCelsius.

Taxon	Habitat type	Water parameters (m)			Associated species
		pH	T	PPM	
Anopheles (*Anopheles*) *apicimacula**					
*crucians**					
*neomaculipalpus**	*Pond*	*7.59*	*31.2*	*0.28*	*Ae. serratus, Ae. euplocamus, An. punctimacula, Ps. ferox, Ur. socialis, Wy. mitchellii, Cx. conspirator*
*punctimacula**	Pond	7.59	31.2	0.28	*Ae. serratus, Ae. euplocamus, An. punctimacula, Ps. ferox, Ur. socialis, Wy. mitchellii, Cx. conspirator*
*vestitipennis**					
Anopheles (*Nyssorhynchus*)	Lake	7.64	29.2	1.12	*Cx. erraticus, Ps. confinnis* Group
*albimanus**	Marsh	7.90	31.4	0.13	*Ae. trivittatus, Cx. taeniopus, Cx. erraticus*
	Cenote	*7.27*	*28.9*	*1.34*	–
Aedes (*Howardina*) *cozumelensis**	Artificial cont.	7.64	28.5	0.94	*Ae. aegypti, Ae. angustivittatus, Ae. serratus, Ae. taeniorhynchus, Cx. coronator* Group, *Cx. quinquefasciatus, Li. durhamii, Tx. theobaldi*
	Tire	7.94	28.3	0.22	*Li. durhamii*
	Bromelia axil	8.15	28.0	0.59	–
	Fallen leaf	*8.08*	*28.0*	*0.20*	*Cx. coronator Group, Li. durhamii*
Aedes (*Ochlerotatus*) *angustivittatus*	Artificial cont.	7.90	29.0	0.88	*Ae. aegypti, Ae. cozumelensis, Ae. serratus, Cx. quinquefasciatus*
*bimaculatus**					
*euplocamus**	*Pond*	*7.59*	*31.2*	*0.28*	*Ae. serratus, An. neomaculipalpus, An. punctimacula, Ps. ferox, Ur. socialis, Wy. mitchellii, Cx. conspirator*
*serratus**	Artificial cont.	7.90	29.0	0.88	*Ae. aegypti, Ae. angustivittatus, Ae. cozumelensis, Cx. quinquefasciatus*
	Pond	*7.59*	*31.2*	*0.28*	*Ae. euplocamus, An. punctimacula, An. neomaculipalpus, Cx. conspirator, Ps. ferox, Ur. socialis, Wy. mitchellii*
*taeniorhynchus**	Cenote	7.50	30.0	0.40	*De. cancer, Cx. nigripalpus, Ur. lowii*
	Bromelia axil	8.15	28.0	0.59	*Ae. cozumelensis*
	Marsh	7.87	27.6	1.19	*An. vestitipennis, Cx. nigripalpus*
	Track tire				*Ae. aegypti*
	Artificial cont.	8.63	26.4	0.22	*Ae.aegypti, Ae. cozumelensis, Tx. theobaldi*
	Pond	*8.02*	*27.6*	*1.19*	*Cx. nigripalpus, Ur. lowii, Li. durhamii*
trivittatus	*Marsh*	*7.90*	*31.4*	*0.13*	*An. albimanus, Cx. taeniopus, Cx. erraticus*
Aedes (*Protomacleaya*) *podographicus*	*Tree hole*	*7.50*	*29.7*	*0.41*	*Cx. restrictor, Li. durhamii*

Taxon	Habitat type	Water parameters (m)			Associated species
		pH	T	PPM	
Aedes (*Stegomyia*) *aegypti**	Pond	7.30	30.0	0.61	*An. albimanus, Cx. taeniopus, Wy. celaenocephala*
	Artificial cont.	7.90	29.0	0.88	*Ae. cozumelensis, Ae. angustivittatus, Ae. serratus, Cx. coronator* Group, *Cx. quinquefasciatus, Cx. interrogator, Li. durhamii, Tx. theobaldi*
	Track tire				*Ae. taeniorhynchus*
Psorophora (Grabhamia) confinnis	*Lake*	*7.64*	*29.2*	*1.12*	*An. albimanus, Cx. erraticus*
*Psorophora (Janthinosoma) ferox**	*Pond*	*7.59*	*31.2*	*0.28*	*Ae. euplocamus, Ae. serratus, An. apicimacula, An. punctimacula, An. neomaculipalpus, Cx. coronator Group, Cx. conspirator, Ur, socialis, Wy. mitchellii*
*Psorophora (Psorophora) ciliata**					
Culex (*Anoedioporpa*) *restrictor*	*Xanthosoma* axil	7.46	27.1	0.11	*Li. durhamii, Wy. mitechellii*
	Tree hole	*7.50*	*29.7*	*0.41*	*Ae. podographicus, Li. durhamii*
*Culex (Culex) chidesteri**	*Well*	*7.45*	*28.3*	*0.53*	*Cx. nigripalpus, Cx. interrogator, Cx. declarator*
coronator Group*	Artificial cont.	7.64	28.5	0.94	*Ae. aegypti, Ae. cozumelensis, Ae. taeniorhynchus, Cx. coronator* Group, *Cx. quinquefasciatus, Li. durhamii*
	Pond	7.42	31.3	0.02	*Cx. interrogator, Cx. taeniopus*
	Fallen leaf	*8.08*	*28.0*	*0.20*	*Ae. cozumelensis, Li. durhamii*
declarator	*Well*	*7.45*	*28.3*	*0.53*	*Cx. interrogator, Cx. nigripalpus, Cx. chidesteri*
interrogator	Pond	7.42	31.3	0.02	*Cx. coronator* Group, *Cx. taeniopus*
	Well	7.45	28.3	0.53	*Cx. declarator, Cx. nigripalpus, Cx. chidesteri*
	Artificial cont.	*8.44*	*26.2*	*1.59*	*Ae. aegypti, Cx. qinquefasciatus, Tx. theobaldi*
*nigripalpus**	Fallen leaf	7.26	31.6	10.0	*Ur. lowii*
	Cenote	7.50	30.0	0.40	*Ae. taeniorhynchus, Li. durhamii, Ur. lowii*
	Well	7.45	28.3	0.53	*Cx. declarator, Cx. interrogator, Cx. chidesteri*
	Marsh	7.87	27.6	1.19	*Ae. taeniorhynchus, An. vestitipennis*
	Pond	*7.14*	*29.9*	*0.60*	*Cx. coronator Group, Cx. interrogator, Li. durhamii*
quinquefasciatus	*Artificial cont.*	*8.44*	*26.2*	*1.59*	*Ae. aegypti, Ae. angustivittatus, Ae. cozumelensis, Ae. serratus, Cx. interrogator, Tx. theobaldi*
*Culex (Melanoconion) conspirator**	*Pond*	*7.59*	*31.2*	*0.28*	*Ae. serratus, Ae. euplocamus, An. punctimacula, An. neomaculipalpus, Ps. ferox, Ur. socialis, Wy. mitchellii*
*erraticus**	Lake	7.64	29.2	1.12	*Ps. confinnis* Group, *An. albimanus*
	Artificial cont.	*7.90*	*31.4*	*0.13*	*Ae. trivittatus, An. albimanus, Cx. taeniopus*
taeniopus	Marsh	7.90	31.4	0.13	*An. albimanus, Ae. trivittatus, Cx. erraticus*
	Pond	*7.42*	*31.3*	*0.02*	*Ae. aegypti, An. albmimanus, Cx. coronator Group, Cx. interrogator, Wy. celaenocephala*

Taxon	Habitat type	Water parameters (m)			Associated species
		pH	T	PPM	
Deinocerites cancer	Crab hole	8.15	26.5	7.49	–
	Cenote	*7.50*	*30.0*	*0.40*	*Ae. taeniorhynchus, Cx. nigripalpus, Ur. lowii*
*Coquillettidia (Rynchotaenia) nigricans**					
*Mansonia (Mansonia) dyari**					
*titillans**					
*Limatus durhamii**	Artificial cont.	7.64	28.5	0.94	*Ae. aegypti, Ae. cozumelensis, Cx. coronator* Group, *Cx. quinquefasciatus, Cx. interrogator, Tx. theobaldi*
	Xanthosoma axil	7.46	27.1	0.11	*Cx. restrictor, Wy. celaenocephala, Wy. mitchellii*
	Pond	7.49	30.0	1.47	*Ae. taeniorhynchus, Cx. nigripalpus*
	Tree hole	7.77	28.7	0.08	*Ae. podographicus, Cx. restrictor, Wy. mitchellii*
	Tire	8.38	27.9	0.31	*Ae. cozumelensis*
	Fallen leaf	8.08	28.0	0.20	*Ae. cozumelensis, Cx. coronator* Group
	Bromelia axil	*8.15*	*27.9*	*0.14*	*Ae. taeniorhynchus, Tx. rutilus, Wy. mitchellii*
Sabethes (*Sabethes*) *gymnothorax**					
Sabethes (*Sabethoides*) *chloropterus**					
*Shannoniana fluviatilis**					
Wyeomyia (*Wyeomyia*)	Pond	7.30	30.0	0.61	*Ae. aegypti, An. albimanus*
*celaenocephala**	*Xanthosoma* axil	*7.46*	*27.1*	*0.11*	*Li. durhamii, Wy. mitchellii*
*mitchellii**	*Xanthosoma* axil	7.46	27.1	0.11	*Li. durhamii, Cx. restrictor, Wy.celaenocephala*
	Bromelia axil	8.16	27.8	0.09	*Li. durhamii. Tx. theobaldi*
	Tree hole	7.50	29.7	0.41	*Ae. podographicus, Li. durhamii*
	Pond	*7.59*	*31.2*	*0.28*	*Ae. euplocamus, Ae. serratus, An. neomaculipalpus, An. punctimacula, Cx. conspirator, Ps. ferox, Ur. socialis*
Uranotaenia (*Uranotaenia*)	Fallen leaf	7.26	31.6	10.0	*Cx. nigripalpus*
lowii	*Pond*	*7.50*	*30.0*	*0.40*	*Ae. taeniorhynchus, Cx. nigripalpus*
socialis	*Pond*	*7.59*	*31.2*	*0.28*	*Ae. euplocamus, Ae. serratus, An. neomaculipalpus, An. punctimacula, Cx. conspirator, Ps. ferox, Wy. mitchellii*
Toxorhynchites (*Lynchiella*) *theobaldi*	Artificial cont.	8.44	26.2	1.59	*Ae. aegypti, Ae. cozumelensis, Ae. taeniorhynchus, Cx. interrogator, Cx. quinquefasciatus*
	Tree hole	7.45	27.7	0.41	–
	Bromelia axil	*8.16*	*27.8*	*0.09*	*Li. durhamii, Wy. mitchellii*

The Mosquitoes of Quintana Roo State

Subfamily Anophelinae

Genus *Anopheles* Meigen

All species of *Anopheles* collected during the study were previously recorded in Quintana Roo State (Table 2) except *Anopheles* (*Anopheles*) *neomaculipalpus* Curry, which represents a new record for the state.

Anopheles (*Anopheles*) *apicimacula* Dyar and Knab. Places collected: Nuevo Becar, Mahahual.

Anopheles (*Anopheles*) *crucians* Wiedemann. Places collected: San Felipe, Sacxan, Playa del Carmen, Punta Esmeralda.

Anopheles (*Anopheles*) *neomaculipalpus* Curry. Places collected: Nuevo Becar, Playa Punta Lagarto.

Anopheles (*Anopheles*) *punctimacula* Dyar and Knab. Place collected: Nuevo Becar.

Anopheles (*Anopheles*) *vestitipennis* Dyar and Knab. Places collected: Sacxan, Puerto Aventuras, Playa Punta Lagarto.

Anopheles (*Nyssorhynchus*) *albimanus* Wiedemann. Places collected: Mahahual, Nuevo Becar, Nicolás Bravo, Cocodrilo Dorado, San Felipe, Sacxan, Playa Punta Lagarto, Isla Mujeres, Chula Vista.

Subfamily Culicinae

Tribe Aedini

Genus *Aedes* Meigen

The traditional classification (Knight and Stone 1977) of genus *Aedes*, rather than the phylogenetic classification of Reinert *et al.* (2004, 2006, 2008), is used here. Equivalent taxa of the latter authors are included in square brackets for cross reference. *Aedes* (*Ochlerotatus*) *euplocamus* Dyar and Knab, *Aedes* (*Ochlerotatus*) *trivittatus* (Coquillett), and *Aedes* (*Protomacleaya*) *podographicus* Dyar and Knab represent new records for the state (see Table 2 for previous records).

Aedes (*Howardina*) *cozumelensis* Díaz Nájera [*Howardina cozumelensis* (Díaz Nájera)]. Places collected: Buena Vista, Bacalar, Ejido Lázaro Cárdenas, Limones, Vigía Chico, Chunyaxchen, Ocom.

Aedes (*Ochlerotatus*) *angustivittatus* (Dyar and Knab) [*Ochlerotatus* (*Ochlerotatus*) *angustivittatus* (Dyar and Knab)]. Place collected: Bacalar.

Aedes (*Ochlerotatus*) *bimaculatus* (Coquillett) [*Ochlerotatus* (*Chrysoconops*) *bimaculatus* (Coquillett)]. Place collected: Ruinas Muyil.

Aedes (*Ochlerotatus*) *euplocamus* Dyar and Knab [*Ochlerotatus* (*Ochlerotatus*) *euplocamus* (Dyar and Knab)]. Places collected: Nuevo Becar, La Unión, Ejido Lázaro Cárdenas.

Aedes (*Ochlerotatus*) *serratus* (Theobald) [*Ochlerotatus* (*Protoculex*) *serratus* (Theobald)]. Places collected: Bacalar, Nuevo Becar, Nicolás Bravo, La Unión, San Felipe, Nuevo Leria, Ejido Lázaro Cárdenas.

Aedes (*Ochlerotatus*) *taeniorhynchus* (Wiedemann) [*Ochlerotatus* (*Culicelsa*) *taeniorhynchus* (Wiedemann)]. Places collected: Mahahual, La Unión, San Felipe, Nuevo Leria, Ejido Lázaro Cárdenas, Carrillo Puerto, Vigía Chico, Puerto Aventuras, Capitán Laffite, Chunyaxchen, Tulum, Ocom, Punta Lagarto, Luis Echeverría, Isla Mujeres.

Aedes (*Ochlerotatus*) *trivittatus* (Coquillett) [*Ochlerotatus* (*Ochlerotatus*) *trivittatus* (Coquillett)]. Place collected: Nuevo Becar.

Aedes (*Protomacleaya*) *podographicus* Dyar and Knab [*Ochlerotatus* (*Protomacleaya*) *podographicus* (Dyar and Knab)]. Places collected: Nuevo Becar, Chunyaxchen.

Aedes (*Stegomyia*) *aegypti* (Linnaeus) [*Stegomyia aegypti* (Linnaeus)]. Places collected: Mahahual, Bacalar, Cacao, San Felipe, Limones, Ocom, Luis Echeverría, Punta Lagarto.

Genus *Psorophora* Robineau-Desvoidy

Seventeen species of *Psorophora* are known to occur in México. The species are divided into three subgenera, all three of which are represented in the country. Mosquitoes of the *Psorophora* (*Grabhamia*) *confinnis* Group are recorded from Quintana Roo State for the first time (see Table 2 for previous records).

Psorophora (*Grabhamia*) *confinnis* Group. Place collected: Chula Vista.

Psorophora (*Janthinosoma*) *ferox* (von Humboldt). Places collected: Nuevo Becar, Nicolás Bravo, La Unión, Nuevo Leria, Ejido Lázaro Cárdenas, Sacxan.

Psorophora (*Psorophora*) *ciliata* (Fabricius). Place collected: Ruinas Muyil.

Tribe Culicini

Genus *Culex* Linnaeus

The subgenus *Anoedioporpa* Dyar of *Culex* is recorded for the first time in Quintana Roo State; thus, *Cx. restrictor* Dyar and Knab, and also *Cx.* (*Melanoconion*) *conspirator* Dyar and Knab, are new records for the state. Also, we did not collect adult males of the *Cx.* (*Culex*) *coronator* Group, so it was not possible to identify the individual species of this group, which requires dissection of the male genitalia. Previous records of *Culex* species previously collected in Quintana Roo State are indicated in Table 2.

Culex (*Anoedioporpa*) *restrictor* Dyar and Knab. Places collected: Bacalar, Nuevo Becar, San Felipe, Chunyaxchen, Lago Ocom, Nueva Leria.

Culex (*Culex*) *chidesteri* Dyar. Places collected: Nuevo Becar, San Felipe.

Culex (*Culex*) *coronator* Group. Places collected: Buena Vista, Nuevo Becar, Huay-Pix, La Unión, Revolución, Cacao, Vigía Chico.

Culex (*Culex*) *declarator* Dyar and Knab. Places collected: San Felipe, Luis Echeverría.

Culex (*Culex*) *interrogator* Dyar and Knab. Places collected: Nuevo Becar, Huay-Pix, San Felipe, Limones, Playa Punta Lagarto.

Culex (*Culex*) *nigripalpus* Theobald. Places collected: Mahahual, Nicolás Bravo, Huay-Pix, Ejido Lázaro Cárdenas, Sacxan, Vigía Chico, Puerto Aventuras.

Culex (*Culex*) *quinquefasciatus* Say. Places collected: Bacalar, Limones.

Culex (*Melanoconion*) *conspirator* Dyar and Knab. Places collected: La Unión, Nuevo Becar, Nicolás Bravo.

Culex (*Melanoconion*) *erraticus* (Dyar and Knab). Places collected: Mahahual, Chula Vista, Nuevo Becar, Nicolás Bravo, Curva Ho-May.

Culex (*Melanoconion*) *taeniopus* Dyar and Knab. Place collected: Nuevo Becar.

Genus *Deinocerites* Theobald

Six species of *Deinocerites* are recorded from México, including two previously known to occur in Quintana Roo State (Table 2). One of the two species, *Deinocerites cancer* Theobald, was collected during the present study.

Deinocerites cancer Theobald. Places collected: Mahahual, Punta Maroma, Isla Mujeres.

Tribe Mansoniini

Genus *Coquillettidia* Dyar

Of the two species of this genus present in México, only one was found in Quintana Roo State.

Coquillettidia (*Rhynchotaenia*) *nigricans* (Coquillett). Place collected: Playa Punta Lagarto.

Genus *Mansonia* Blanchard

Three species of *Mansonia* are recorded from México, but only two were previously known to occur in Quintana Roo State. *Mansonia dyari* Belkin, Heinemann and Page is a new record for the state.

Mansonia (*Mansonia*) *dyari* Belkin, Heinemann and Page. Places collected: Nuevo Becar, Nicolás Bravo, La Unión, Ejido Lázaro Cárdenas, Sacxan.

Mansonia (*Mansonia*) *titillans* (Walter). Places collected: Nuevo Becar, La Unión.

Tribe Sabethini

Genus *Limatus* Theobald

This genus is represented by one species in México, which was found in Quintana Roo State. Larvae were observed preying on *Ae. aegypti* larvae.

Limatus durhamii Theobald. Places collected: Buena Vista, Bacalar, San Felipe, Nuevo Leria, Ejido Lázaro Cárdenas, Limones, Vigía Chico, Capitán Laffite, Chunyaxchen, Ocom, Punta Lagarto, Playa Punta Lagarto.

Genus *Sabethes* Robineau-Desvoidy

Four species belonging to two subgenera (*Sabethes* and *Sabethoides* Theobald) of this genus have been reported in México. *Sabethes* (*Sabethoides*) *chloropterus* (von Humboldt) was previously found in Quintana Roo State (Table 2). The subgenus *Sabethes* and *Sa. gymnothorax* Harbach and Petersen are recorded here for the first time.

Sabethes (*Sabethes*) *gymnothorax* Harbach and Petersen. Place collected: Ejido Lázaro Cárdenas.

Sabethes (*Sabethoides*) *chloropterus* (von Humboldt). Places collected: Nuevo Becar, Ejido Lázaro Cárdenas.

Genus *Shannoniana* Lane and Cerqueira

Three species of *Shannoniana* are known to occur in México. The following species is a new occurrence record for Quintana Roo State.

Shannoniana fluviatilis (Theobald). Place collected: La Unión.

Genus *Wyeomyia* Theobald

Our collections included two species of *Wyeomyia* that were previously recorded from Quintana Roo State (Table 2).

Wyeomyia (*Wyeomyia*) *celaenocephala* Dyar and Knab. Places collected: Mahahual, Bacalar, La Unión, Curva Ho-May, Vigía Chico.

Wyeomyia (*Wyeomyia*) *mitchellii* (Theobald). Places collected: Bacalar, Nuevo Becar, Nicolás Bravo, La Unión, Nuevo Leria, Ejido Lázaro Cárdenas, Vigía Chico, Tulum.

Tribe Toxorhynchitini

Genus *Toxorhynchites* Theobald

This is the first record of an identified species of *Toxorhynchites* in Quintana Roo state. All previous records are listed as *Toxorhynchites* sp. Consequently, the subgenus *Lynchiella* and *Tx. theobaldi* (Dyar and Knab) are considered to be new records for Quintana Roo State.

Toxorhynchites (*Lynchiella*) *theobaldi* (Dyar and Knab). Places collected: Vigía Chico, Ocom, Limones, San Felipe.

Tribe Uranotaeniini

Genus *Uranotaenia* Lynch Arribálzaga

Nine species of *Uranotaenia* are recorded from México. Two species of subgenus *Uranotaenia*, one previously known to occur in Quintana Roo State, were collected during the present study. *Uranotaenia socialis* Theobald is recorded here for the first time.

Uranotaenia (*Uranotaenia*) *lowii* Theobald. Places collected: Mahahual, La Unión, Puerto Aventuras.

Uranotaenia (*Uranotaenia*) *socialis* Theobald. Place collected: Nuevo Becar.

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