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Vectorial importance of triatominae bugs (hemiptera: reduviidae) in Guaymas, Mexico

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ABSTRACT. The study was conducted in Guaymas city, Sonora, in Northwestern Mexico. Triatomines were collected manually during daytime, within and around houses selected randomly, with one person searching for bugs during one hour per house. Collected bugs were identified and analyzed for *Trypanosoma cruzi* infection. From a total of 279 collected specimens there were 123 females, 65 males and 91 nymphs (entomological indexes: 63% infestation, 68.4% colonization, 8.5% density and 13.5% stacking). There were 251 (90%) triatominae bugs infected with *T. cruzi*, one of the highest natural infestation levels recorded in Mexico. The insects collected were identified as *Triatoma rubida* (91%) and *T. recurva (9%)*. Previous reports for the same locality (1959) indicated the presence of *T. rubida* in the wild, we found *T. rubida* within houses, and *T. recurva* as a peridomestic bug. Unplanned housing developments in originally wild areas may have favored *T. cruzi* transmitters to migrate from the wild and into human dwellings.

Key words: *Trypanosoma cruzy, Triatoma rubida.*

RESUMEN. Con el fin de estudiar los niveles de infección por *Trypanosoma cruzi* y los hábitos domiciliarios y/o peridomiciliarios de las especies de triatominos presentes, se efectuó este estudio en la ciudad de Guaymas, Sonora en el noroeste de México. Se colectaron triatomas manualmente durante horarios diurnos, en el interior y alrededores de casas seleccionadas aleatoriamente a razón de una persona colectando chinches durante una hora en cada casa. Los triatominos colectados fueron identificados hasta especie y se analizaron para determinar la infección por *T. cruzi.* De un total de 279 ejemplares colectados, 123 fueron hembras, 65 machos y 91 ninfas (índices entomológicos: 63% de infestación, 68.4% de colonización; 8.5% densidad y 13.5% apilamiento. Se encontró que el 90% de las triatomas capturadas resultaron estar infectadas por *T. cruzi*, un porcentaje de infección natural de los más altos encontrado en México. Las especies colectadas fueron identificadas como *Triatoma rubida* (91%) y *T. recurva (9%).* En el último estudio realizado en la misma localidad (1959) se describe sólo la presencia de *T. rubida* con hábitos silvestres. En el presente estudio se documentó la conducta domiciliaria de *T. rubida*, además de la presencia de otra especie *T. recurva* capturada en el peridomicilio. El establecimiento desordenado de nuevos asentamientos humanos en áreas naturales pudo influir en la invasión de triatomas de hábitos silvestres a las casas.

Palabras clave: *Trypanosoma cruzy, Triatoma rubida.*

INTRODUCTION

There are reports for 32 triatominae species in Mexico. *Triatoma* is the most common genus with 25 species. Reports for Mexican triatominae genera include: *Belminus, Dipetalogaster, Eratyrus, Paratriatoma, Pastrongylus* and *Rhodnius*. These blood-sucking insects are capable of transmitting *Trypanosoma cruzi*, the etiological agent in the Chagas' disease, through fecal contamination.[13]

Reports for Sonora state (northwestern Mexico) mention: *Triatoma recurva (Stal, 1868)* and *Triatoma rubida* (Uhler, 1894), this latter one with five subspecies (*cochimiensis, jaegeri, rubida, sonoriana,* and *uhleri*). Palencia and Montaño[9] reported the presence of triatomines (*T. rubida sonoriana* and *T. rubida uhleri*) in the city of Guaymas associated to a clinical case of the Chagas' disease.

Later Palencia and Juliá[10] studied Chagas' disease vectors in Guaymas city. The bugs were identified as *Triatoma rubida,* with two subspecies: *T. rubida sonoriana* (Del Ponte, 1930) and *T. rubida uhleri* (Nieva, 1911), which concurred with the species reported by Mazzoti and Dias,[8] a 94% *T. cruzi* infection level was found. Tay and Biagi[13] conducted the most recent study in Sonora state.

Our objectives were: to determine the actual Chagas' disease vectors present in Guaymas city, Sonora; to find out what species have adapted to human dwellings or if they are in the process of doing so, and to determine the level of natural infestations in the triatominae bugs collected.

MATERIAL AND METHODS

Study area and collection of insects: The city and port of Guaymas is situated at 110º 53' 34" North and 27º 55'

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30" West. Its climate is desert type, hot (annual median temperature above 18ºC) with scarce xerophitic vegetation). Triatomines were collected at 0-25 meters above sea level.

The study was conducted during 1998, focusing mainly on human dwellings. Random sampling was used during the study, first to locate the Triatominae bugs and then to select 30 houses from five different neighborhoods. The total number of houses per neighborhood (10%) were distributed as follows: six in "Cerro Gandereño", six in "El Rastro", eight in "Yucatán" and ten in "Independencia" neighborhood.

The triatominae bugs were collected directly during the day. An average sampling effort of one person searching for bugs, during one hour, per house was applied.[11]

Inside the houses, every room was inspected especially the bedroom, under the beds and the mattresses, cracks on the wall, and piles of objects (bags of clothing, shoes, etc.). Potential refuge areas for the Triatominae bugs outside of the houses peridomestic sites, located within 50 m radius of the house,[1] were also inspected, especially chicken coops and areas where domestic animals, such as dogs and cats, etc., rest or sleep. The Lent and Wygodzinsky[7] keys were used for identification.

The infection indexes were determined according to the method used by Silveira[12] for the Triatominae bugs collected in areas within and outside the houses and during different periods of the year. Infestation, colonization, density, stacking, and the natural infection index were calculated.

RESULTS

From a total of 279 captured specimens 123 were females, 65 were males; and 91 were nymphs. There were 251 Triatominae bugs infected with *T. cruzi* that corresponds to 90% of the total collected (Table 1).

Two species of the genus *Triatoma* were collected within and outside the houses: *T. rubida* (Uhler, 1894) and *T. recurva* (Stal, 1868). In 19 houses (63% of the total), triatomine bugs were collected inside. In the other neighborhoods the percentage of human dwellings infested with the triatomine bugs was similar and fluctuated between 50 and 66%, except in "Cerro Gandereño" where the percentage of infested dwellings was 83%. The percentage of infection in the Triatominae bugs collected ranged between 88% and 91% (Table 1).

Table 2 shows the number of triatomines collected per site. The percentage of triatominae bugs infected with *T. cruzi* per neighborhood. The biological stage of the insect was also determined as shown in Table 3. In table 4 the developmental stages from collected *T. rubida* by block are shown. Table 5 shows the same information for *T. recurva*.

Table 1. Incidence of Triatominae bugs in houses and percentage of infection with *Trypanosoma cruzi* of the specimens collected.

Neighborhood	Houses with Triatominae Bugs		Infected Triatominae Bugs	
	Number	Percentage	Number	Percentage
Yucatán	4/8	50	75/82	91
Cerro Gandereño	5/6	83	79/88	89
El Rastro	4/6	66	57/64	89
Independencia	6/10	60	40/45	88
Total	19/30	63	251/279	90

Table 2. Habits of Triatominae bugs (males, females and nymphs) per neighborhood.

Neighborhood	Domestic[1]			Peridomestic[2]		
	Males	Females	Nymphs	Males	Females	Nymphs
Yucatán	12	38	5	6	8	13
Cerro Gandereño	19	30	8	9	19	3
El Rastro	6	5	29	3	7	14
Independencia	5	11	4	5	5	15
Total	42	84	46	23	39	45

1. Domestic: Triatominae bugs collected inside human houses.
2. Peridomestic: Triatominae bugs collected outside houses.

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Table 3. Infection levels of *Trypanosoma cruzi* on triatominae bugs per neighborhood.

Neighborhood	Male	Female	Instar I	II	III	IV	V
Yucatán	16/18	43/46	0/0	5/5	8/10	3/3	0/0
Cerro Gandereño	24/28	45/49	0/0	2/3	7/7	1/1	0/0
El Rastro	8/9	11/12	0/0	13/14	19/23	3/3	3/3
Independencia	9/10	14/16	0/0	8/8	8/10	1/1	0/0
Total	57/65	113/123	0/0	28/30	42/50	8/8	3/3

Table 4. *Triatoma rubida* bugs collected per neighborhood.

Neighborhood	Domestic Male	Female	Nymphs	Peridomestic Male	Female	Nymphs
Yucatán	12	38	5	6	8	13
Cerro Gandereño	19	30	8	4	12	2
El Rastro	6	5	29	1	4	12
Independencia	5	11	4	3	3	15
Total	42	84	46	14	28	42

Table 5. Proportion of *Triatoma recurva* infected with *Trypanosoma cruzi* according to the neighborhood and the biological state of the bugs.

Neighborhood	Males	Females	Instar I	II	III	IV	V
Yucatán	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Cerro Gandereño	3/5	5/7	0/0	0/0	0/0	1/1	0/0
El Rastro	1/2	2/3	0/0	0/0	0/0	1/1	0/0
Independencia	1/2	1/1	0/0	0/0	0/0	0/0	0/0
Total	5/9	8/11	0/0	0/0	1/1	2/2	0/0

A total of 256 *T. rubida* and 23 *T. recurva* specimens were collected, that is 91% and 9%, respectively.

DISCUSSION

There are previous reports of *T. rubida* in Guaymas city; *T. recurva* had only been reported in the southern and northern part of the state, we confirm its presence in Guaymas and thus a larger continuum in its distribution. Carcavallo (1987) reported *T. rubida* and *T. recurva* as wild species,[3] we found *T. rubida* both within houses and outside human dwellings (peridomestic sites), meanwhile *T. recurva* was found only outside the houses; *T. rubida* was the most frequently collected species. The majority (66%) of the insects were collected in the interior of the houses sampled, 46 nymphs (II, III, IV and V instars) and 126 adults (male and female). This indicates that these insects are now adapted to human dwellings and the people living there is now in exposed to higher risk of infection. From our data, *T. rubida* should be considered as a house dwelling species.

Unplanned housing developments in Guaymas have reached the foot of the hills that surround the city. Invasion of the natural habitats of triatomine bugs allowed these insects to find shelter within the precarious wooden and cardboard huts and other human dwellings. This could explain the presence of *T. recurva*, which is common in this type of ecosystem (foot of the hills and open plains) and is now in the surroundings of poor human houses. It was found in chicken nests and in places where dogs and cats usually rest.

It appears that the biological cycle of the vectors develop within and outside the human dwellings where they feed on several species of domestic and wild animals, and also on humans. Domestic animals found within the dwellings include dogs, cats, chickens, rabbits, sheep and, so-

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metimes, wild animals such as the opossum and the raccoon that some people have as pets, which concurred with the species reported by Mazzoti and Dias[8] in Sonora and which presented a 94% infection with *T. cruzi*. We determined a natural infection index of 90%, very high for mexican standards but also higher to levels reported elsewhere: *T. vitticeps* (58.9%) in Brazil[5] and for Mexico*: T. gerstaeckeri* (28%) in the Northwest,[6] *T. pallidipennis* (25%) in the Center[1] and *T. dimidiata* (16%) in the Southeast.[4]

Regarding the high natural infection with *T. cruzi*, the close association of triatomines with humans and their domestic animals confirms the potential for the transmition of Chagas' disease vectors, in the area there may be clinical cases yet to be detected.

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