

DISTRIBUTION OF *Aedes albopictus* (DIPTERA: CULICIDAE) IN 1998, FOLLOWING COLONIZATION IN 1995 IN GUATEMALA

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Abstract - The Asian tiger mosquito, *Aedes albopictus* (Sukuse) has a potential to transmit some tropical diseases. Established colonies of *Ae. albopictus* in Guatemala were first discovered in the Caribbean harbor towns of Puerto Barrios and Puerto de Santo Tomas de Castilla, Department of Izabal in 1995. We investigated the geographical distribution and seasonal prevalence of this species in Guatemala in 1997 and 1998. The distribution of this species in 1997 was limited to the same area where it was first discovered in 1995, and in 1998 we found it at San Francisco located at only 15 km from the center of Puerto Barrios along the Atlantic Highway. This is very different from the situation in the United States where this species has consistently expanded its distribution. *Ae. albopictus* in Guatemala prefers to breed in small water containers in urban sites and suburbs of the harbor city. We could not find *Ae. albopictus* in villages located along the border with Mexico, Honduras or El Salvador, at harbor towns on the coast of the Pacific Ocean in 1997 and 1998. It is clear that *Ae. albopictus* is spreading toward outside the cities of Puerto Barrios and Santo Tomas de Castilla in 1998. However, the populations of this species in the center of those cities are decreasing in comparison with the data of 1997.

Key words - Distribution, *Aedes albopictus*, *Aedes aegypti*, seasonal, Guatemala

INTRODUCTION

The Asian tiger mosquito, *Ae. albopictus* (Sukuse), has the potential to transmit Dengue virus (Shroyer, 1986). In Guatemala, Ogata and Samayoa (1996) first reported the colonization of this species in the Caribbean harbor towns, Puerto Barrios and Puerto de Santo Tomas de Castilla, Department of Izabal, in Guatemala. After surveillance the distribution of this species in 1997, Tabaru *et al.* (1998) reported that it was very limited in the same localities where Ogata and Samayoa found. In the US, established populations of this mosquito were first discovered in Texas in 1985 (Sprenger and Wuitiranyagool, 1986) and in the following year in the state of Florida (Peacock *et al.*, 1988). Now it has spread to at least 27 states in the US (Moore *et al.*, 1988; Ali and Nayar, 1997). O'Meara *et al.* (1995) reported the phenomenon of decline of *Ae. aegypti* after introduction of *Ae. albopictus* in Florida. The presence of *Ae. albopictus* in Guatemala was reported in relation to its potential to transmit Dengue fever and other tropical diseases (Anonymous, 1995). The surveillance of *Ae. albopictus* to determine its movement in this country is an important issue. In the present work, we surveyed the latest distribution of this species in the same localities studied in 1995 (Ogata and Samayoa, 1996) and in 1997 (Tabaru *et al.*, 1998).

MATERIALS AND METHODS

Study areas

We divided the localities into three categories according to the scale: a town is more than five hundred houses, a village is more than fifty houses, and a hamlet is less than fifty houses. And the name of the locality includes all types. Department of Izabal: In 1998 surveys were conducted in 27 localities in the rainy season (July) in Puerto Barrios (15 41' N), Puerto de Santo Tomas de Castilla (15 39' N) and some other inland villages. Most of the localities were studied also in 1997. The majority of Guatemalan vil-

lages are not continuously scattered, but dotted separately in a small colony of houses. Atlantic Highway toward the city of Guatemala: Surveys were carried out in roadside villages of the Atlantic Highway from Puerto Barrios to the capital city of Guatemala (14 35' N) in the rainy season (July). The distance is 297 km from Puerto Barrios to the center of Guatemala City by odometer. We inspected the villages at 7 km (San Manuel, Izabal), 12 km (Agua Caliente, Izabal), 15 km (San Francisco, Izabal), 50 km (Morales, Izabal), 70 km (Los Andes, Izabal), 80 km (Guacamayo, Izabal), 89 km (Los Amates, Izabal), 100 km (Gualan, Dept. of Zacapa), 130 km (Rio Hondo, Zacapa), 158 km (Tecultán, Zacapa), 210 km (Guastatoya, Dept. of El Progreso), and Guatemala City. Harbour towns along Pacific Ocean: Two hamlets in Puerto de San Jose (13 50' N), one hamlet at Puerto de Quezal and one hamlet at Puerto de Ixtapa, Department of Escuintla, in rainy season. We inspected about 50 houses and 100 containers. The majority of investigated houses are the same as it was done in 1997. Border entrance to Guatemala: We studied distribution in two villages in Tecun Uman (14 40' N) bordering Mexico, Department of San Marcos, three villages bordering Honduras (14 30'-14 50' N), Department of Chiquimula, four bordering El Salvador (13 45'-14 25' N), Department of Jutiapa, in August. In total, we visited 100 houses and inspected 300 containers. We reduced the investigating localities, houses and water containers than those of 1997 survey.

Sampling

The sampling methods are equal to the previous survey, which was done in 1997 (Tabaru *et al.*, 1998). The surveillance consisted of sampling about 20 houses selected at random in each locality, except roadside villages on the Atlantic Highways. Mosquito larvae or pupa were collected from artificial containers: rubber tires, cement washing tanks, drum cans, watering pots for domestic animals, flower pots, abandoned plastic or metal cans, in random sampling by using small dip nets. In the roadside villages larvae or pupa were collected only from stagnant water in used tires in tire-fixing shops. Many used tires are left around shops, and collect stagnate water in the rainy season, and cause mosquito outbreaks. We collected at the most 10 larvae or pupa with a plastic pipette from each sampling, and they were placed in 79% ethanol, and taken to the laboratory for identification. Water conditions and the environment at collection sites were recorded for analysis. A limitation was placed on the sampling numbers (10 larvae/container) because the mosquitoes varied in each container and it was not our purpose to know the total number of mosquitoes. Other mosquito species were not identified. We compared the preference or selection for breeding conditions between *Ae. albopictus* and *Ae. aegypti*: urban vs. rural, sun vs. shade, clean vs. polluted, and large vs. small container.

RESULTS AND DISCUSSION

Department of Izabal

Table 1. Distribution of positive houses (%) for *Aedes albopictus* in the Department of Izabal in 1995, 1997 and 1998.

Rural localities				Urban localities			
Localities	1995	1997	1998	Localities	1995	1997	1998
Pta. de Palma	-	ng	ng	B. Progreso	X	78.5	16.7
S. M. del Mar	-	ng	100	B. Frontera	X	20.0	ng
Baltimore	-	-	33.3	B. Tragua	X	73.9	33.3
El Corozo	X	5.0	66.7	B. Estrecho	X	55.0	ng
Esperanza	-	ng	ng	Q. Seca	-	-	50.0
Cys. de Diablo	-	ng	100	San Andres	ng	23.0	ng
Nva. Palestin	-	ng	ng	Las Escobas	-	46.7	ng
Q. Pescuezo	X	100	100	Livingston	-	ng	ng
La Cocona	ng	ng	-	Morales	ng	ng	ng
Las Pavas	-	ng	100	Rio Dulce	ng	ng	ng
Agua Caliente	X	26.3	ng	Los Amates	ng	ng	ng
San Francisco	-	-	100	Gualan	ng	ng	ng
Chiclero	ng	ng	-	San Augustin	-	-	ng
Mariscos	-	ng	ng	El Rancho	-	-	ng
San Felipe	-	ng	-				
Mayuelas	-	ng	ng				

The data of 1995 was done by Ogata and Samayoa.

Note: X: positive in 1995, ng: negative and -: no investigated.

Table 1 shows the results of the rainy season survey (July) in the Caribbean harbor localities and some inland areas in the Department of Izabal. We divided the localities into two categories: rural and urban. Ogata and Samayoa (1996) divided into three categories: rural, sub-urban and urban. In Table 1 we arranged them into two categories according to our own judgment to compare the data. Even though our survey was expanded to 27 localities, compared to 15 by Ogata and Samayoa (1996) and 26 by Tabaru *et al.* (1998), we identified *Ae. albopictus* in 10 localities in total; 3 in the urban areas out of 14 and 7 in the rural regions out of 13 in the department. In 1997, we found 9 localities out of 26; 6 in urban sites and 3 in the rural. Even in the urban sites, those localities far from the capital cities of Izabal, such as Livingstone (20 km by sea), Rio Dulce (30 km by sea), Morales (50 km), or Los Amates (87 km) are still negative for *Ae. albopictus*. And positive sites are increasing in the rural regions close to the city, such as Santa Maria del Mar, Baltimore, El Corozo, Cayes de Diablo, Quebrada Pescuezo, Las Pavas and San Francisco. The fishing town of Livingstone and Rio Dulce are located 20-30 km from Puerto Barrios and there is considerable marine transportation between those towns. However, we could not find *Ae. albopictus* there, alike in 1997. *Ae. aegypti* was recorded in 14 localities in the department, and coexistence of the two species was only in 7 out of 27 localities. Table 2 shows the comparison between the both species in the main localities. In the urban localities, such as Progreso, Tragua and Corrozo *Ae. aegypti* is advantage to *Ae. albopictus*. However, in some rural localities, such as Corrozo, Quebrada Pescuezo, Cayos de Diablo and Santa Maria de Mar, *Ae. albopictus* is majority. And the positive containers are very common in such localities.

Table 3 shows the difference of the main breeding containers between the two species; *Ae. albopictus* and *Ae. aegypti*. *Ae. albopictus* were collected more in relatively small water containers, such as rubber tires, animal trough, garbage with water, metal cans, and a few from larger containers like washing tanks or drums. On the other hand *Ae. aegypti* was common in the both, large and small, drums, cement washing tanks, rubber tires, metal cans. Meara and Gettman (1992), Ogata and Samayoa (1996) reported that abandoned tires were important breeding sites for *Ae. albopictus*. The present data second for the previous studies. We conjecture that there are competitions in two species.

Table 2. Comparison between *Ae. albopictus* and *Ae. aegypti* in the *Ae. albopictus* positive localities in 1998.

Localities (U/R)	<i>Ae. Albopictus</i> ratio % compared with <i>Ae. Aegypti</i>	Positive container % for <i>Ae. albopictus</i>
Progreso (U)	24	25
Tragua (U)	6	14
Q. Seca (U)	17	17
Corrozo (R)	90	83
Q. Pescuezo (R)	100	100
Cayos de Diablo (R)	100	100
Bartimore (R)	33	33
Sta M. de Mar (R)	100	100
Las Pavas (R)	20	100
San Francisco (R)	20	50

Table 3. The main breeding sites for *Ae. albopictus* and *Ae. aegypti* in Department of Izabal in 1997 and 1998.

Classified containers	1997 *			1998		
	Nos. surveyed	<i>Ae. albopictus</i>	<i>Ae. aegypti</i>	Nos. surveyed	<i>Ae. albopictus</i>	<i>Ae. aegypti</i>
Cement washing tanks	259	10 (3.9)	27 (10.4)	77	2 (2.6)	13 (16.9)
Metal or plastic Drums	228	17 (7.5)	64 (28.1)	113	8 (7.1)	21 (18.5)
Rubber tires	68	26 (38.2)	30 (44.1)	32	14 (43.8)	12 (37.5)
Plastic bottles	110	7 (6.4)	12 (11.0)	28	3 (10.7)	4 (14.3)
Metal cans	18	9 (50.0)	11 (61.1)	6	4 (66.7)	4 (66.7)
Animal troughs	27	8 (29.6)	7 (25.9)	15	5 (33.3)	2 (40.0)
Garbages with water	34	24 (70.6)	13 (38.2)	30	19 (64.0)	9 (30.0)
Total/mean	770	106 (13.8)	164 (21.3)	288	55 (19.1)	65 (22.5)

* Data in 1997 included in the both seasons; dry and rainy.

Dispersion to the Capital of Guatemala

We surveyed the dispersion of *Ae. albopictus* from Puerto Barrios to the capital of Guatemala along the Atlantic Highway. But only within 15 km (San Francisco) from the starting point we could collect it. It was only 3 km far from the data of Ogata and Samayoa (1996) and Tabaru *et al.* (1998) along the highway. No spreading was observed for *Ae. albopictus* in four years, after colonization in 1995. *Ae. aegypti* inhabited stagnant water in used tires, as far as Guatemala City. According to Instituto Nacional de Sisnologia, Vulcanologia, Meteorologia e Hidrologia the annual temperature in centigrade along the Atlantic Highway is as follows: Puerto Barrios (max. 29.7, min. 21.4, mean 25.4), Zacapa (34.1, 21.2, 26.5), El Progreso (34.0, 19.7, 27.7) and Guatemala (24.5, 14.0, 18.3). This indicates that the temperature from Puerto Barrios to El Progreso is not very much different. However, no spreading was observed in the present studies.

Border entrances to Guatemala

After surveying 9 border entrance localities from Mexico, Honduras and El Salvador, and 4 harbor hamlets along the Pacific Ocean we could not collect any samples of *Ae. albopictus* alike in 1997. All samples were *Ae. aegypti*. Although we visited three times in those border entrances; dry and rainy seasons in 1997 and rainy season in 1998 we could not find *Ae. albopictus*. Figure 1 indicates the distribution of *Ae. albopictus* in these studies.

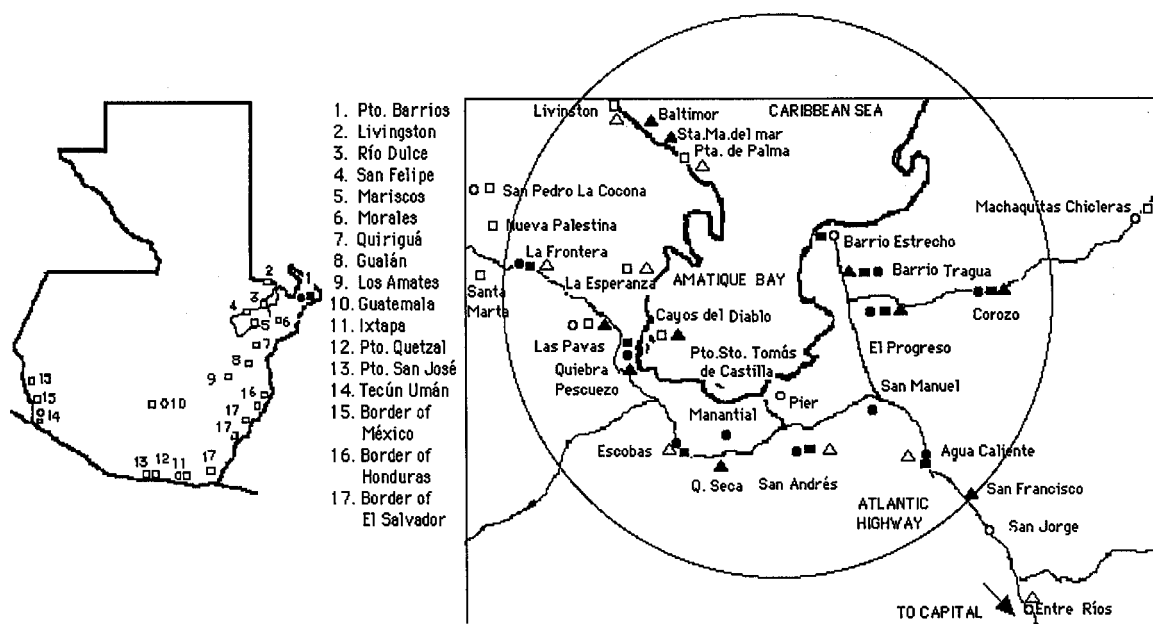


Figure 1. Geographical distribution of *Aedes albopictus* in Guatemala

The right is focused in Puerto Barrios and Santo Tomas de Castilla. The black marks were demonstrated positives and negatives in white ones. ○● in 1995, □■ in 1997, △▲ in 1998

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