THE 1956–1957 STATUS OF *AEDES AEGYPTI* IN THE UNITED STATES

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The vector of dengue and urban yellow fever, the *Aedes aegypti* mosquito, is a widely distributed species in tropical and subtropical regions. In the United States it is common in the southern tier of States from Texas east, but has received little attention from the majority of health workers since the close of World War II because there has been no outbreak of yellow fever in the United States since the 1905 New Orleans epidemic. Since then, the disease has occurred sporadically, with the last case reported in 1924 from Houston, Texas, (USPHS, 1940). Another reason for the lack of interest in the mosquito is that reported cases of dengue have been steadily decreasing since the last serious epidemic in 1934 (USPHS, 1953).

However, during the past nine years there has been an increasing interest in *Ae. aegypti* in the United States because of a northward movement of sylvan yellow fever in Central America; an urban outbreak of yellow fever in Trinidad in 1954 (Soper, 1955); and the possible use of yellow fever virus in biologic warfare. The northward movement of sylvan yellow fever was first noted when the disease reappeared in a section of Panama late in 1948 where it had not been found for 43 years (Elton, 1952). Since then, it has progressed northward to the southern boundary of Mexico (Rodaniche and Galindo, 1957). Although sylvan yellow fever is principally a disease of forest primates transmitted by several species of forest mosquitoes, including *Haemagogus spegazzinii falco* (Shannon *et al.*, 1938) and *Haemagogus equinus* (Rodaniche and Galindo, 1957), a number of human cases and fatalities have occurred.

It is not the possibility of sylvan yellow fever encroaching into the United States that has principally concerned health authorities in this country, although *Haemagogus equinus* has been found as far north as Brownsville, Texas (Trapido and Galindo, 1956). Rather, they are concerned that the virus may be introduced into this country via infected persons, animals, or mosquitoes from areas where sylvan fever is rampant. Once in the country, the virus may become established in the indigenous *Aedes aegypti* population and urban transmission of the disease could recur. This danger of importation has been facilitated by modern transportation which has reduced the travel time between the tropical regions and continental United States to hours.

In 1947, before the spectacular movement of sylvan fever began, the Pan American Sanitary Organization adopted a resolution recommending campaigns for the eradication of *Ae. aegypti* as the best method of preventing epidemics of urban yellow fever. Such campaigns have been instituted in most of the countries of the hemisphere where these mosquitoes exist. A number of the programs already have been brought to a successful conclusion (Severo, 1956). The United States is one of the countries that has not instituted a nationwide *Ae. aegypti* eradication program. Within this country, Key West, Florida, is the only community in which an *Ae. aegypti* eradication campaign has been attempted. Because of the dangers of reintroducing the yellow fever virus into the United States and of reintroducing *Ae. aegypti* into areas from which it has been eliminated, the eradication of this species in the United States has recently been given consideration by a number of international, federal, state, and local organizations.

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TABLE I. NUMBER OF PREMISES SURVEYED AND PERCENT OF INSPECTED PREMISES WITH *AEDES AEGYPTI* DURING SURVEYS CONDUCTED IN WORLD WAR II, 1952, 1956, 1957

State (by east-west tiers)	City	Premises Surveyed							Percent of Premises Found Breeding						
		1942	1943	1944	1945*	1952*	1956	1957	1942	1943	1944	1945*	1952*	1956	1957
Florida	Jacksonville			6,094				410			29.5				30.7
	Key West	?	19,854	8,475	?	?†			11.7	3.8	15.4	21.6	0.0†		
	Miami		134,728	90,251	?	9,576	?†			5.8	7.1	6.1	6.5	1.1†	
	Orlando							200							20.0
	Pensacola							65							29.2
	Tampa				?	105	830	57				13.8	24.7	14.8	52.6
South Carolina	Charleston		35,864	19,515	?	1,979	420	142		2.1	6.2	11.2	1.7	12.6	2.8
	Columbia					347		36					0.6		33.3
Georgia	Atlanta						?	1,542						+‡	11.3
	Augusta							116							31.9
	Savannah		22,984	23,179	?	530	1,430			17.2	7.8	8.2	0.0	0.0	
	Thomasville					174	490						50.0	42.2	
Alabama	Birmingham					237							4.6		
	Gadsden						1,260	145						1.1	4.1
	Mobile			25,336	?	1,296	89	526			17.8	16.7	14.7	18.0	20.0
	Montgomery					177							11.3		
	Sheffield							394							0.0
Mississippi	Biloxi					543	248						2.2	0.0	
	Greenwood					187							0.0		
	Gulfport					565		1,125					1.9		0.0
	Hattiesburg							145							5.5
	Jackson					236		864					0.0		0.0
Louisiana	Baton Rouge					516	304	273					20.0	8.2	7.3
	Lake Charles					373	79	734					0.5	2.5	0.0
	Monroe					477		195					1.5		2.1
	New Orleans		44,522	36,798	?	1,304	324	256		5.4	10.5	8.8	6.9	7.4	2.0
	Shreveport					677							0.4		
Texas	Beaumont		29.593			37		253		0.1			0.0		0.0
	Beeville		234	1,681		69				7.7	2.4		0.0		
	Brownsville	?	38,118	17,230	?	406	502	297	19.6	1.1	1.7	1.1	0.7	0.0	0.0
	Corpus Christi	?	34,117	26,863	?	799	419		6.4	0.4	1.2	2.1	0.0	0.0	
	Dallas		325				?†			6.5				+‡	
	Del Rio						15†							0.0†	
	Eagle Pass						60†							0.0†	
	El Paso						55†	187						0.0†	0.0
	Galveston		33,054	15,579	?	643	611	629		2.2	1.8	2.5	0.2	0.0	0.0
	Houston	?	115,285	38,650	?	565	582	128	19.1	4.9	3.4	1.2	9.0	3.1	35.9
	Laredo				?	226	715					4.3	0.5	0.0	
	McAllen		11,509	16,238	?	463	100			2.5	2.3	1.0	0.0	1.0	
	San Antonio		7,368	24,285	?	767	398	239		5.9	4.3	6.4	12.0	4.5	13.0
	Texarkana							188							0.0
Mexico	Juarez						?†							0.0†	
	Matamoros						?†							+‡	
	Neuvo Laredo						125†							28.0†	
	Piedras Negras						53†							0.0†	
	Villa Acuna						40†							0.0†	
Arizona	Phoenix						906							0.0	
	Tucson						690							0.0	
North Carolina	Charlotte							694							0.0
	Wilmington						597							0.0	
Tennessee	Jackson							337							0.0
	Knoxville							226							0.0
	Memphis						489							3.9	
	Nashville							209							1.0
Arkansas	Pine Bluff					250	409	124					0.0	0.0	0.0
	Little Rock					574							0.9		
Oklahoma	Lawton							485							0.0
	Oklahoma City						1,133	187						0.0	0.0
Virginia	Norfolk				?	1,593		810				4.1	0.0		0.0
	Portsmouth				?	1,990						1.6	0.0		
	Richmond							359							0.0
Kentucky	Louisville						318	301						0.0	0.0
	Paducah							183							0.0
Missouri	Springfield							137							0.0
Kansas	Wichita							63							0.0

* Data from Bradley and Atchley, 1953.

† Data from agencies other than CDC.

‡ *Ae. aegypti* found, but surveys not sufficiently detailed to determine percent premises breeding.

A thorough knowledge of the distribution and density of the species in the United States is essential to a successful *Ae. aegypti* eradication program. Such data are not extensive and there is evidence that the *Ae. aegypti* problem area is a changeable one. During the period of July through September, 1952, personnel of the Communicable Disease Center conducted brief surveys for *Ae. aegypti* in 31 towns and cities in cooperation with State and local health departments (Bradley and Atchley, 1953). In 16 of these cities, distribution and density data had been secured in the course of the *Ae. aegypti* control programs conducted during World War II by the Malaria Control in War Areas program. The authors of the 1952 survey report assembled data to show the location within the United States from which the species had been reported. These data were subsequently used by the United States Public Health Service in delineating the "yellow fever receptive area."

In order to obtain current information on the distribution and density of *Ae. aegypti*, personnel of the Communicable Disease Center conducted surveys for the species during July through September, 1956, in 25 communities, and during 1957 in 38 communities in cooperation with State and local health departments. Personnel from the CDC also cooperated with the Pan American Sanitary Bureau in surveys of 8 communities on the United States-Mexico border. Survey data were also obtained from other investigations in additional communities.

A survey of this type leaves large gaps between areas sampled. In addition, the intensity and extent of the search within a specific community generally has been insufficient to serve as a basis for concluding that negative results mean that *Ae. aegypti* is entirely absent from the area. On the other hand, where several hundred selected premises are examined in a city, the inability to find *Ae. aegypti* does indicate that, if present, the species is rare. Where a comparable search in the same communities in previous years had disclosed breeding of *Ae. aegypti*, the reduction of the species is indicated.

The results of the 1956–1957 surveys, the 1952 survey, and World War II programs are shown in Table I. The states are arranged by latitude and longitude, and the cities are arranged alphabetically within each state. Generally, *Ae. aegypti* was not found in the more northerly cities sampled. Also, note that the species was not found in the port cities of Savannah, Georgia; Biloxi and Gulfport, Mississippi; and Galveston, Corpus Christi, and Brownsville, Texas.

The location of the cities surveyed in 1956 and 1957 is shown in figure 1. In only one city having a survey both years were the results of the two surveys significantly different. This was Lake Charles, Louisiana, found positive in 1956. A survey with negative findings was conducted following extensive clean-up operations after Hurricane Audrey in 1957. The map also shows that negative collections were made along the coast in Georgia, Mississippi, and Texas, while positive collections were made inland in these same states. This was not the case in Florida, Alabama, and South Carolina, where *Ae. aegypti* was found on the coast as well as inland.

The distribution of *Ae. aegypti*, as determined from data of the 1956–1957 surveys, is shown in figure 2. The shaded areas are those from which *Ae. aegypti* has been reported at least once since about 1900. This is a compilation of all reports obtainable, both published and unpublished. The limits were obtained by connecting the extreme counties from which the species has been reported. The area indicated by heavy shading is that in which *Ae. aegypti* was found during the 1956–1957 surveys. The inland limit of this area is a line connecting Charleston, South Carolina; Columbia, South Carolina; Augusta, Georgia; Atlanta, Georgia; Nashville, Tennessee; Memphis, Tennessee; Monroe, Louisiana; Dallas, Texas; and Nuevo Laredo, Tamaulipas, Mexico. This area can

FIGURE 1

Aedes aegypti SURVEYS, 1956-1957

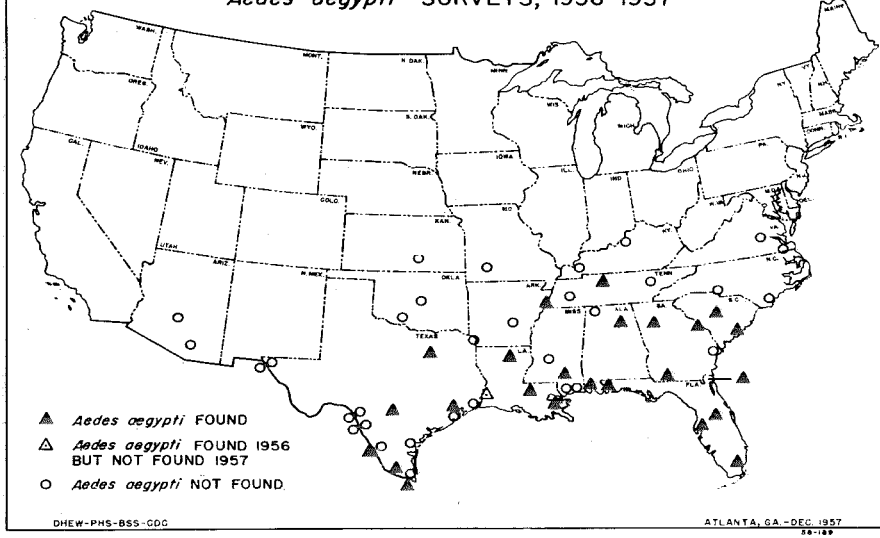
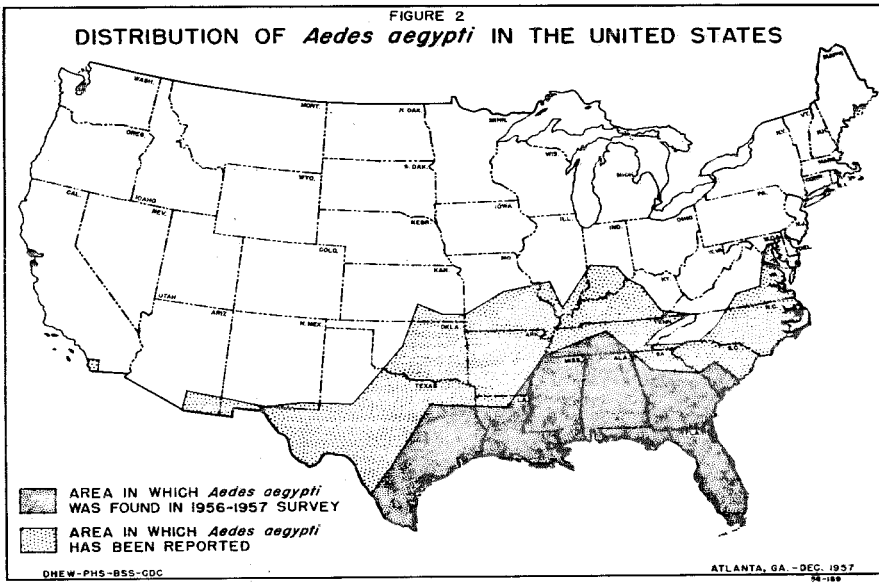


FIGURE 2

DISTRIBUTION OF *Aedes aegypti* IN THE UNITED STATES



be described as that in which *Ae. aegypti* is common. The lightly shaded area is that in which *Ae. aegypti* has been found occasionally but is not common. The environment is unfavorable and the species probably could not exist unless reintroduced repeatedly from areas which are more favorable to it. On the basis of the survey conducted in 1952, it was concluded that the area in which *Ae. aegypti* was a problem had decreased since during World War II. The 1956–1957 data indicate that this trend has continued.

There is evidence that wartime control efforts have built up community awareness of the problem and a recognition of the need for eliminating containers capable of breeding *Ae. aegypti*. The increased use of new and potent household insecticides also has been considered to be an important factor in the reduction. To these should be added the extensive aerial application of agricultural insecticides with accompanying drift and the steady advances in general standards of living. The latter has been characterized by widespread improvement in premises sanitation resulting in a building out of the problem. Simultaneously there has been a greater intolerance by the general population of all noxious vermin.

Notwithstanding the trend toward a reduced area of infestation, the above data indicate that *Ae. aegypti* remains widespread throughout the southern States and occurs abundantly in certain areas. A campaign to eradicate this vector would have to take in an area approximately 1,000 by 300 miles. While this is not as extensive a program as once envisaged, it would still be a large and expensive one.

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EDITOR'S NOTE:

The paper, "The 1956–1957 Status of *Aedes aegypti* in the United States," printed above is also being published in Spanish in the September number of the *Boletin de la Oficina Sanitaria Panamericana.* The simultaneous publication in English and Spanish was suggested by the Publications Committee of the Pan American Sanitary Bureau through Dr. Fermoselle Bacardi, Scientific Editor for that organization.