

Distribution of *Aedes triseriatus* (Say) in an Urban Area: Comparison of Two Survey Methods

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Introduction

Aedes triseriatus (Say) has been incriminated as the primary vector of La Crosse Encephalitis in the midwest (4). This mosquito is commonly found breeding in treeholes in forested areas. However, it also occurs in urban treeholes and other containers that are associated with man. There is increasing evidence that transmission of La Crosse Encephalitis occurs in urban and suburban areas as well as in more sylvan sites.

We know very little about distribution and abundance of this mosquito because methods for monitoring populations are inadequate. Because their activity is diurnal, they are not attracted to light; therefore, light traps are not a reliable indicator of their presence or absence. Moreover, these mosquitoes will not readily enter holes or slots in animal-baited or CO₂ traps. Therefore, traditional mosquito trapping methods are useless.

Fay and Eliason (2) developed the ovitrap for use with *Aedes aegypti*. Their ovitrap consisted of a blackened 1 pint jar half filled with water; a wooden paddle partially submerged provided a surface for egg deposition. Looor and De Foliart (3) modified the Fay trap for use with *Aedes triseriatus*. They used a metal beer can painted with black enamel and lined with black cotton cloth.

During the summer of 1980 we compared effectiveness of larval survey vs. ovitrap survey. Funding for this project was provided by the St. Joseph County Mosquito Abatement Project, St. Joseph Co. IN. Support was also provided by NIH Grant No. AI-02753.

Methods

The city of South Bend was divided into 48 sections. Using a system designed by Mr. John Stamper of the Office of Historic Preservation in South Bend, sections were determined on the basis of architectural type and period and formed neighborhood units.

For the larval survey each section was surveyed by a team of workers visiting every 5th property along both sides of randomly selected streets. The survey of the entire urban area required more than three months to conduct, extending from May 5 to Aug. 15. Care was taken to cover the entire area of a section. Properties were classified as to structural type and use. These classifications were: Industrial-Commercial, Single Dwelling, Multiple Dwelling, Public Building, Public Lands such as parks, Woodlots, and Other. Breeding sites were classified as positive or potential. Positive sites were defined as those in which larvae were found. Potential sites were those which, if wet, were judged capable of breeding mosquitoes. Positive sites were classified as follows: Artificial Container, Tires, Treeholes, Rubbish, Ornamental Lawn Containers such as birdbaths, Woodland Pools, Ditches, Lakes and Ponds, Streams and Creeks, Septic Overflow, Catch Basin and Other. Roof gutters were not included because of the difficulty in reaching these sites. Mosquitoes were classified into 4 groups: *Anopheles* sp., *Culex* sp., *Aedes triseriatus* and other *Aedes*.

A second survey was conducted using ovitraps to determine oviposition. A total of 94 ovitraps were in place throughout the city from June 18 to Sept. 27. The number of ovitraps varied from 1 to 5 with the size of the section. Modified Fay ovitraps (1) were placed in shaded concealed sites, often nailed to a tree trunk or fence post. Traps were examined five times during the three month period. The cans found to be missing or vandalized were either replaced or moved a short distance to a new location. Paddles with eggs were replaced with fresh paddles. Eggs/paddle were counted and eggs/paddle/day was calculated for each sampling period.

Aedes hendersoni Cockerell is a sibling species, closely related to *Aedes triseriatus* and often occurring in the same habitat. No attempt was made to separate the two species in this work.

Results

During the larval survey, a total of 2386 properties were visited; of these 24 or 1% were found to contain *Aedes triseriatus*. Of these properties found positive for the mosquito, a total of 29 sites were located, with Treeholes (23) the most numerous sites followed by Tires (5) and Ornamental Containers (1). Single Dwelling properties contained the highest proportion of treeholes (11) with Public Lands (5), Woodlots (4), Multiple Dwellings (2) and Industrial-Commercial properties (1) the remaining sites. Three tires breeding *Aedes triseriatus* were found on Industrial-Commercial properties while two more were located at Single Dwellings. The only Ornamental Container, found with *Aedes triseriatus*, a large fountain, also was located at a Single Dwelling.

Aedes triseriatus breeding sites were found by the larval method in 16 or 33% of the sections of South Bend (FIGURE 1). These sections were located in the North East and the South of the city.

In the ovitrap survey, 94 ovitraps were placed throughout the city. A total of 126 paddles from 55 different ovitraps were found to contain eggs during the course of the survey. Numbers of positive ovitraps for each sampling period were as follows:

20	— July 3-10
19	— July 22-24
14	— Aug. 6-8
26	— Sept. 2-5
47	— Sept. 19-27

Two periods of heavy egg production were evident. One occurred in July and the second in September. Eggs counted per sampling period were as follows:

3414	— July 3-10
3141	— July 22-24
1469	— Aug. 6-8
3295	— Sept. 2-5
6750	— Sept. 19-27
18069	Total

Eggs/paddle/day ranged from a high of 14 in July to a low of 2 in early September (FIGURE 3).

Positive ovitraps were found in 32 or 66% of the sections. *Aedes triseriatus* was present throughout most of South Bend with the exception of the South West (FIGURE 1).

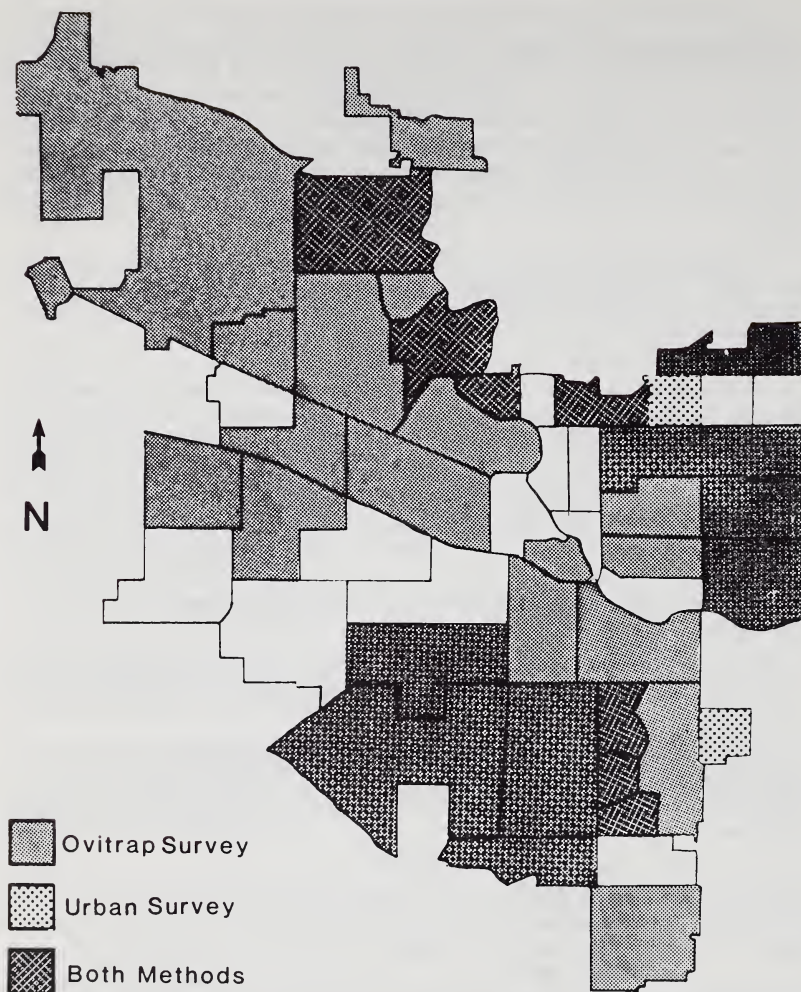


FIGURE 1. A comparison of sections found positive by Ovitrap and Larval (or Urban) survey in South Bend.

Three main areas with heavy egg production were located by ovitraps. These areas are in the North, the East, and the South, South East of the city. One ovitrap contained eggs at all 5 sampling periods was found in each of these 3 areas as well as many traps found positive 3 or 4 times (FIGURE 2).

Discussion

The ovitrap method provided much more useful information about the presence of *Aedes triseriatus* in South Bend than did the larval survey. As FIGURE 1 shows, the mosquito was found in most sections of the city. High numbers of positive ovitraps occurred in residential areas where many trees are present to

provide breeding sites (FIGURE 2). The South West sections of the city where few mosquitoes were found are heavily industrialized and trees and vegetation tend to be more sparse.

From the ovitrap survey, it was also possible to gain information on population trends during the season. The number of eggs/paddle/day can be correlated with the amount of rainfall in previous weeks (FIGURE 3). After significant rainfall in early August, egg production increased. It should be noted that no eggs hatch after August 10. Diapause in the egg stage is induced by the shortened day length, i.e., reduced light phase of the photoperiod. The number of ovitraps with eggs also rose during September, again indicating a rise in population from the previous weeks.

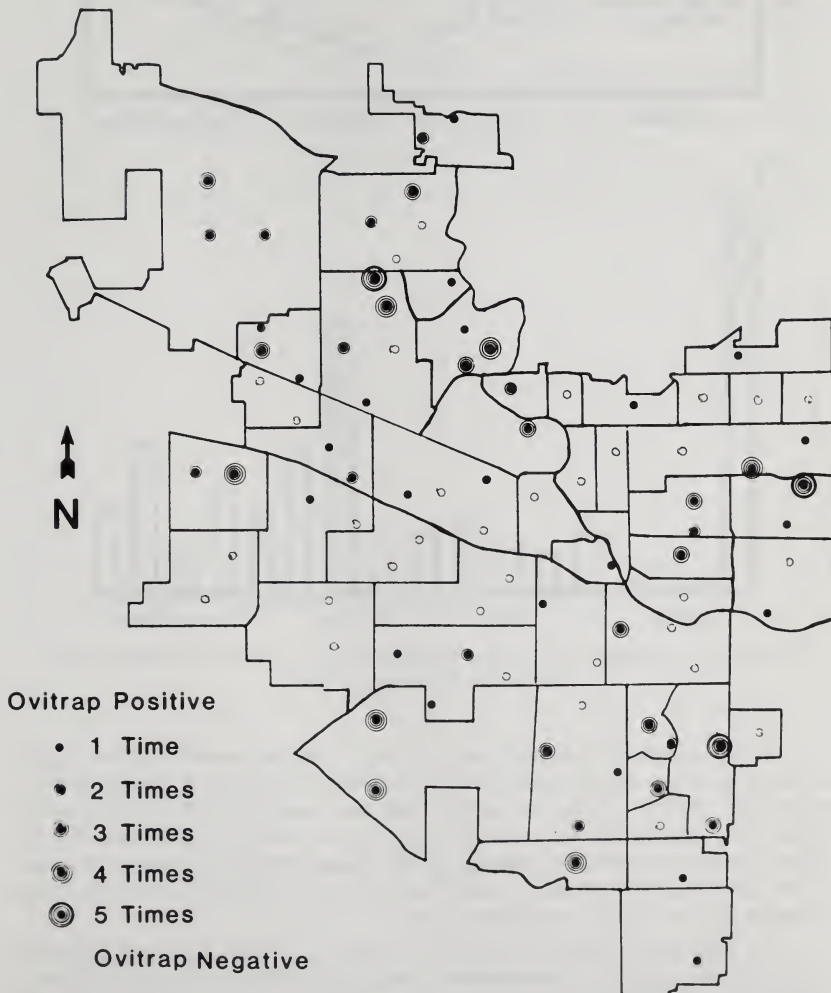


FIGURE 2. Locations of ovitraps positive for *Aedes triseriatus* in South Bend.

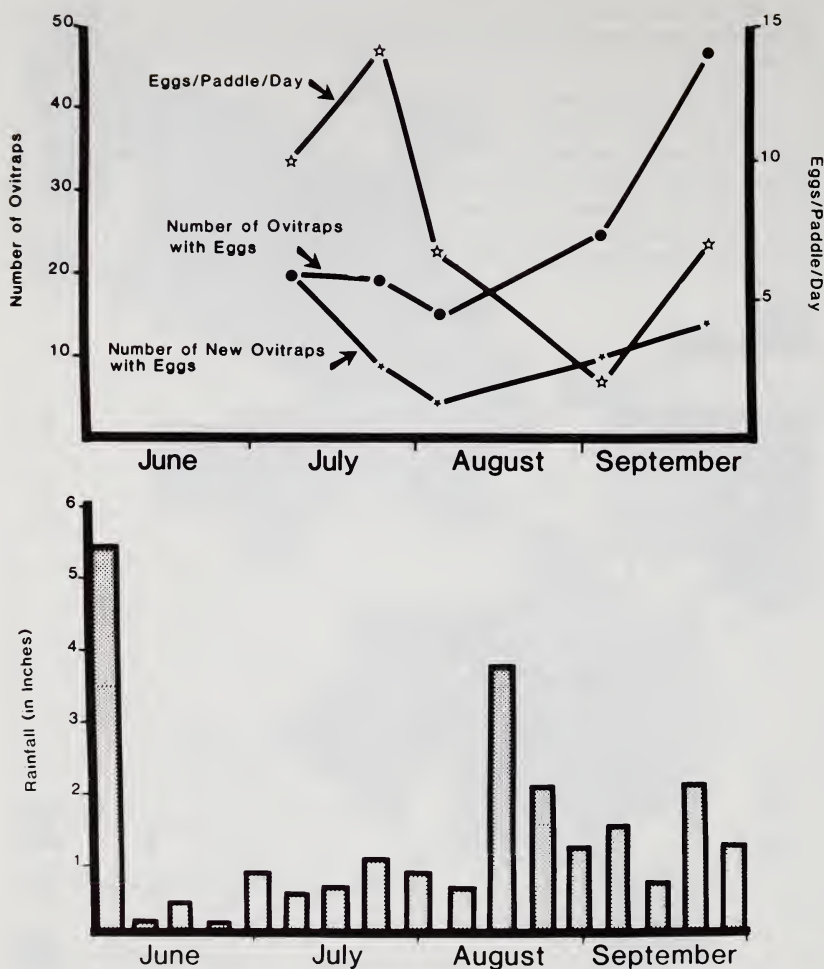


FIGURE 3. A comparison of Ovitraps Survey results for *Aedes triseriatus* with rainfall in South Bend, 1980.

An advantage of the ovitraps method is that it used far fewer resources to gain a better picture of *Aedes triseriatus* distribution in South Bend. It took approximately 1/7 the man hours to perform that was needed by the larval survey (Ovitraps = 74hr., Larval Survey = 510hr.). It also resulted in far fewer miles being driven and thus a significant gasoline savings. Gasoline costs were about 1/4 those of the larval survey (Ovitraps = \$55.00, Larval Survey = \$217.00). In a time of increasing inflation this is an important point.

The limitations of the larval survey method are many. Mosquito breeding sites are often concealed or inaccessible. The nature of this kind of survey makes it possible to visit a property, at most, only once or twice. As weather conditions and amount of rainfall vary, a site unproductive one week may be breeding mosquitoes

the next. Also time and manpower limitations make it possible to survey only a small proportion of all the properties in each section, therefore missing sites. The larval survey does have the advantage that it pinpoints breeding sites. However, after ovitraps have indicated the presence of *Aedes triseriatus* in an area, a search can be made for these sites. This greatly narrows the areas to be searched.

The ovitrap method identified many more sections positive than did the larval survey. It was able to monitor egg laying throughout the test period and pinpoint areas where heavy egg production was occurring. It also gave an estimate of population trends that the larval survey was unable to provide. Finally, it was far more efficient in the use of financial resources.

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