VARIATION IN *AEDES AEGYPTI* LARVAL INDICES OVER A ONE YEAR PERIOD IN A NEIGHBORHOOD OF MÉRIDA, YUCATÁN, MÉXICO

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ABSTRACT. Surveys for *Aedes aegypti* larvae were conducted to provide an estimate of the magnitude and timing of seasonal variations in larval indices in one *colonia* in Mérida, Yucatán, México, and to assess how the proportion of disposable and non-disposable containers as larval production sites varies. Breteau indices exceeded 200 during the months of July and August, and disposable containers were important year-round larval production sites.

The design of effective community-based programs for the control of *Aedes aegypti* (Linn.) must be based on familiarity with local larval production sites, why they exist and their seasonal variation. This is not only so that appropriate chemical and biological methods can be chosen for specific containers, but also so that relevant health education messages can be developed.

One factor that has contributed to the failure of most Latin American countries to control *Ae. aegypti* during recent years has been the increasing production of solid waste, coupled with inadequate refuse collection services (Gubler 1989). A common approach to this problem on the part of vector-control personnel has been to organize periodic "clean-up campaigns," especially just prior to, or at the beginning of, the rainy season.

The present study had 2 objectives. The first was to provide a rough estimate of the magnitude and timing of seasonal variations in larval indices for *Ae. aegypti* in one area of the city of Mérida, in the Yucatán Peninsula. This information was used in the interpretation of data from a large community-based intervention trial. The formal entomologic evaluation of this trial consisted of 3 rounds of larval surveys of 600 property lots in 12 intervention and control communities in November 1989, May 1990 and November 1990. The selection of these communities has been described in detail elsewhere (Lloyd 1991[3]). Briefly, a community was defined as a randomly selected index block in the study area and the 3 blocks surrounding it. The second objective was to assess how the relative importance of disposable and non-disposable containers as larval production sites varies with the seasons.

The *Colonia* Santa Rosa, the area surveyed, was a lower middle-class neighborhood consisting of flat-roofed one-story houses. Many of the lots were narrow and very deep. The houses had no gutters, but water collection on roofs was prevented by drainage outlets in the corners. All houses had piped water. Water storage was uncommon, and if it occurred, was in small metal tanks for watering plants or buckets for washing clothes. Every block had several deep wells, almost all of which had been capped after piped water had been provided. The few remaining uncapped wells were used as cesspools.

A five-block area containing 100 house lots in the *Colonia* Santa Rosa in the southern part of the city was mapped and a sampling frame was developed. This area did not participate in the community-based intervention trial, although it was similar in socio-economic level and close to the study site. Systematic samples with a random start were taken so that, counting refusals, each house lot was sampled about every 4 months. Surveys were conducted by a team of 2 persons, and samples were taken from all positive containers for identification. Water was replaced in containers to minimize the effect of sample taking on future surveys. All containers were categorized as disposable or controllable as described by Méndez Galván et al.[4] When pos-

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[3] Lloyd, L. S. 1991. A community-based *Aedes aegypti* control program in Mérida, Yucatán, México. Dr.Ph. dissertation for The Johns Hopkins University, School of Hygiene and Public Health, Baltimore, MD.

[4] Méndez Galván J. F., H. Gómez Dantés, J. A. Farfán Ale, M. A. Loroño Pino and H. Gallardo Rincón. Modification of traditional entomologic indices for *Aedes aegypti* in the evaluation of a health education intervention on dengue fever in Ponce, Puerto Rico. (unpublished manuscript).

sible, this assessment was made by asking householders which containers they considered to be disposable. Surveys were conducted between the 20th and the 25th of each month starting in October 1989, and ending in October 1990. No survey was conducted in April 1990, due to work associated with the community-based intervention.

Of 282 containers found positive for mosquito larvae over the one year period, the larvae of *Ae. aegypti* were identified in 89% or 251, and *Culex* species including *Culex quinquefasciatus* Say and *Culex coronator* Dyar and Knab were found in 16% or 40. The House index ranged from 20 to 70%, and the Breteau index ranged from 32 to 247 containers per 100 house lots inspected. These indices were in the same range as the indices obtained from the surveys of 616 house lots conducted in the adjoining intervention and control communities in November 1989 and November 1990. The indices, as well as climatic information for the study period are shown in Fig. 1. The average maximum temperature ranged from 40 to 33°C, and the average minimum temperature ranged from 21 to 11°C. Monthly precipitation ranged from 226 to 9 mm, with the months of July, August and September registering the greatest amounts of rain. A strong correlation between the number of days with precipitation greater than 1 mm and the House and Breteau indices was found. Indices increased as the number of days with more than 1 mm of rainfall increased because of the availability of water over a longer period of time.

Most of the rise in the Breteau index during the rainy season was due to large increases in

Table 1. Containers most commonly found positive for *Aedes aegypti* larvae Colonia Santa Rosa, Mérida, Yucatán, México, from October 1989 to October 1990.

Type of container	Number	% of positive containers
Tin cans	41	16.3
Tires	40	15.9
Bottles, jars	29	11.5
Plastic containers	28	11.1
Flower vases	25	10.0
Metal containers (pots and pans)	21	8.4
Pails, buckets	19	7.6
Animal water dishes	17	6.8
Water storage containers	5	2.0
Other	26	10.4
Total	251	100.0

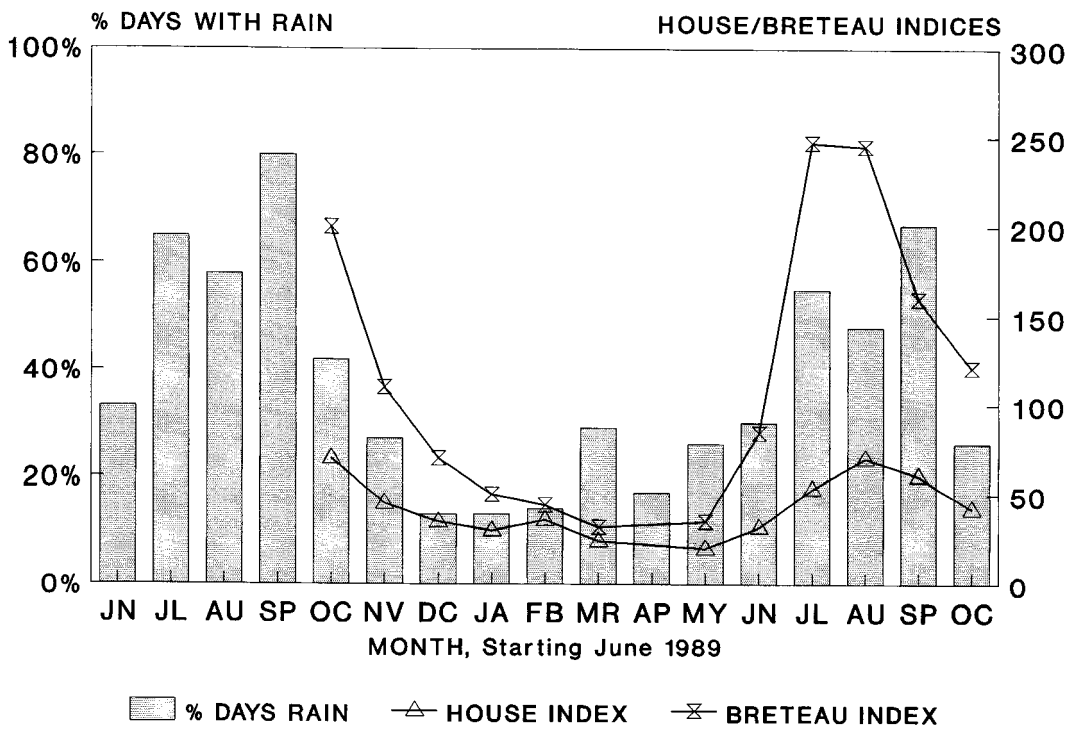

Fig. 1. Breteau and house indices vs. percent days of month with >1 mm rain in *Colonia* Santa Rosa, Mérida, Yucatán.

the number of positive containers in a relatively small number of houses. For the months of July and August 1990, 16% of the house lots surveyed accounted for 58% of the total larval production sites.

The most common larval production sites found were cans, tires, bottles and vases (Table 1). During the 2 months with lowest Breteau indices (February and March 1990), 37% of the containers positive for *Aedes aegypti* were classified as disposable. During the 4 months with the highest Breteau indices (October 1989 and July, August and September 1990), 42% of the positive containers were classified as disposable. Disposable larval production sites were therefore important throughout the year, not just in the months with the most precipitation.

Tin cans were the most common disposable larval production sites, and some were found positive during every month of the year. Although there is refuse collection, people feel it is unreliable. Garbage trucks often arrive late, after dogs have torn apart the garbage bags, or do not arrive at all, as there are few and they fill up rapidly. Many people therefore burn their garbage in the back of their lots. This practice results in the accumulation of thousands of tin cans, which are shaded by the denser vegetation found at the back of the lots, and become good larval production sites.

Effective control of *Ae. aegypti* in this neighborhood will require improved refuse collection services throughout the year, not just during community clean-up campaigns. Consideration should be given to the implementation of a community recycling program. Most of the disposable larval production sites are small and very numerous, and can only be controlled through a long-term trash management strategy.

Among the important non-disposable larval production sites are tires, animal drinking dishes, cement basins for bathing animals and metal water tanks. They are all good candidates for some form of biological control. Metal water tanks, although infrequent, warrant special attention due to their high production of mosquito larvae.

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