

# Cemetery vector control: key in the implementation of larviciding in cemeteries breathing sites.

José C Sánchez, Grayson Brown, Marian Ortiz, Nicole Nazario, Luz A. Crespo  
Puerto Rico Science, Technology, and Research Trust, San Juan, PR

## Abstract

As noted by Vizzani, 2007, “Cemeteries are widely recognized as (i) areas of high mosquito productivity, (ii) priority sites for control of mosquito vectors, and (iii) strategic sites for monitoring the infestation or reinfestation by *Aedes* vectors.” This is because cemeteries are abundant sources of plant carbohydrates, blood, shelter, and water-filled containers. In Puerto Rico, cemeteries are more likely to be problematic because much damage from Hurricane Maria has not been repaired (cemeteries are low among repair priorities) and the financial constraints facing most municipal governments limits the amount of maintenance that they can perform.

To better understand this problem, we investigated *Aedes aegypti* populations in three Puerto Rican cemeteries. We found that the *Ae. aegypti* populations inside cemeteries was similar to that island wide. Further, when larvicides were regularly applied there appeared to be no change in the adult population based on AGO trapping even though the larvae-bearing containers were without larvae following treatment. We conclude that a program oriented toward controlling *Ae. aegypti* in cemeteries-only would be of limited value. This outcome will serve as guidance for stakeholders and municipalities of Puerto Rico, reinforcing the need of implementing integrated strategies for the control of *Ae. aegypti* in areas larger than cemeteries.

## Methods

- A total of 10 AGO traps (Fig. 1) were placed in each of three cemeteries in Bayamón, Puerto Rico (Fig. 2), and were sited near likely breeding sites.
- The AGO traps were serviced weekly and mosquitoes identified under magnification in our San Juan laboratory.
- We found that the most common breeding sites were cemetery water holding containers (flower pots) and cryptic sites (Fig. 3).
- *Ae. aegypti* in Puerto Rico is highly insecticide resistant (cf. related poster by Nazario et al.). Consequently, we applied Vectobac™ WDG (a commercial Bti product manufactured by Valent Biosciences Corp.) We applied the product using Stihl SR450 backpack sprayers (Fig. 4). The sprayers were calibrated to deliver 3 gal/A of mid-label concentration.
- Applications was applied 1800 – 1900 h, once/week for the first four weeks and once/two weeks thereafter.



Figure 1. AGO trap used for *Aedes aegypti* female collection.

## Treated Cemeteries



Figure 2. Images, show the cemeteries sites from a Aerial look vs the treated image of how each treated are looks like.



Figure 4. Field technician applying Vectobac WDG Bti AM-65-52 with backpack sprayer.

## Results

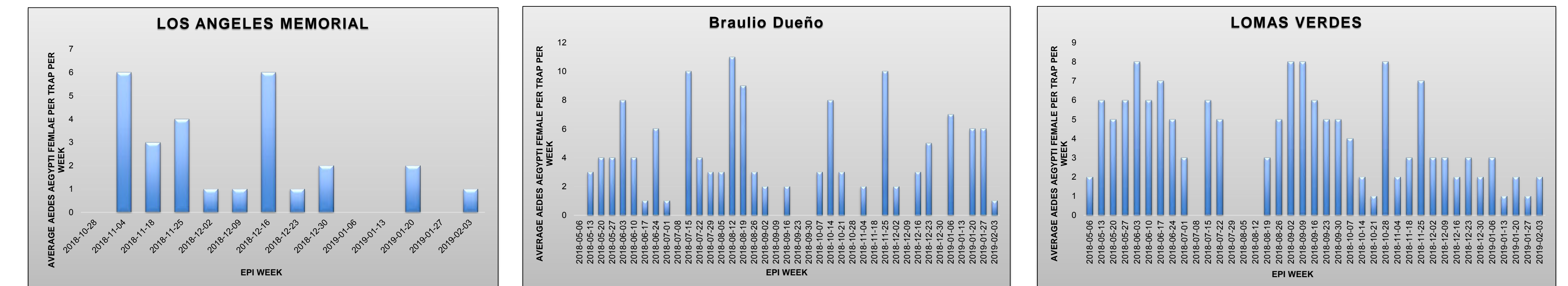


Figure 5. Images, show the cemeteries sites before they were treated with Vectobac WDG Bti AM65-52

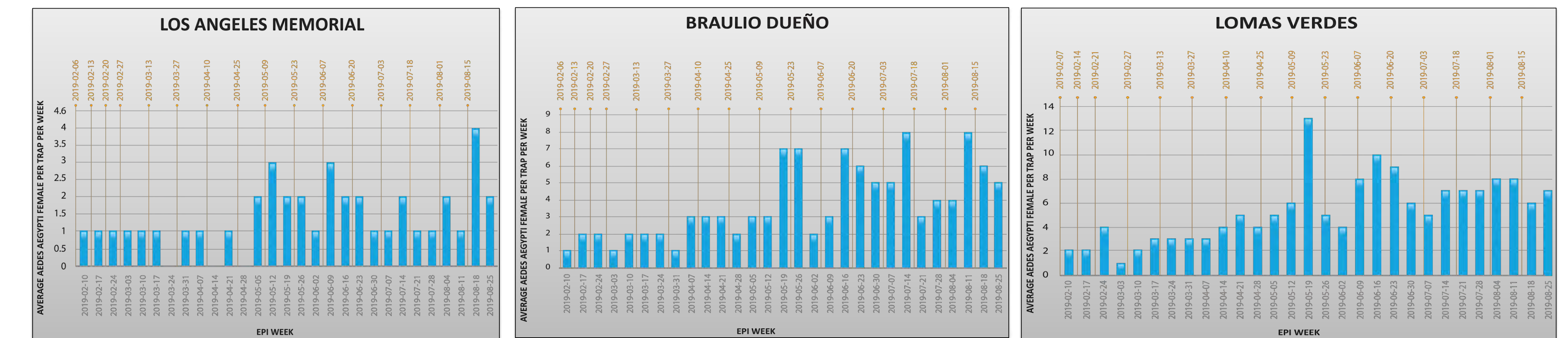


Figure 6. Images, show the cemetery sites after treated dates in yellow with Vectobac WDG Bti AM65-52

- Post treatment inspection revealed no larval breeding in those sites treated with Vectobac WDG Bti applications. In spite of this, there was no significant difference between the number of adults trapped in the treated vs untreated cemeteries (Figs. 5 and 6).
- Female *Ae. aegypti* populations in all three cemeteries exhibited significant fluctuation and varied between 1-2/trap/week to 10-12/trap/week.
- Typical for Puerto Rico, these populations showed only a little seasonality although populations in late summer were consistently the greatest in number.
- We are currently collaborating in a much larger study of over 200 cemeteries which, although not yet complete, is also showing little to no effect of breeding site treatment (larvicide or source reduction) on adult trap counts.
- While cemetery populations of *Ae. aegypti* must continue to be considered, treating these populations without regard to surrounding populations is unlikely to be effective.

## References

- Centers for Disease Control and Prevention. Autocidal gravid ovitraps protect humans from chikungunya virus infection by reducing *Aedes aegypti* mosquito populations 2019 Tyler Sharp 2019 [https://www.researchgate.net/journal/1935-2735\\_PLoS\\_Neglected\\_Tropical\\_Diseases](https://www.researchgate.net/journal/1935-2735_PLoS_Neglected_Tropical_Diseases)
- Puerto Rico Vector Control Unit. *Aedes aegypti* insecticide resistance in Puerto Rico 2019 Poster. Nicole Nazario
- Valent Biosciences VectoBac (Bti) WDG WALS Applications with Stihl SR450 to Control Container Mosquitoes 2016. Peter DeChant <https://www.youtube.com/watch?v=H50nw8ZBLFU>
- Vizzani, D. 2007. Review: Artificial container-breeding mosquitoes and cemeteries: a perfect match. *Trop. Med. Internat. Health.* 12: 299 – 312.

## Acknowledgments

We thank the Field technicians Luis Perez, Warren Ortiz, Victor Ramirez, Albert Silva, Luis D Santiago and Nicolas Boria for their intensive work on cemeteries during this project.

Contact Info: José C Sánchez, Puerto Rico Science, Technology and Research Trust; [jsanchez@prvectorcontrol.org](mailto:jsanchez@prvectorcontrol.org)



Figure 3. The images show the most common breeding site found in cemeteries after visual inspection conducted in each of them after earthquake in January 2020