Smithsonian Institution News

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January 9, 2015

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Smithsonian Scientists Explain Spread of Chikungunya Vector Tropical Disease Detected in US Earlier This Year

The tropical disease chikungunya began twisting Western tongues in July when the first locally transmitted case was reported in Florida. Spotted in the Caribbean just last year, the disease spread explosively throughout the Americas in 2014. Chikungunya's arrival in Panama prompted Smithsonian scientists to examine how human activity spreads its mosquito vector and the serious implications this has for disease ecology everywhere.

Chikungunya causes fever, fatigue and joint swelling and is transmitted by the Asian tiger mosquito, *Aedes albopictus*. The tiger mosquito also spreads dengue, so the study published as a viewpoint piece in *PLOS Neglected Tropical Diseases* Jan. 8 also holds a cautionary tale for dengue-eradication programs that primarily target another mosquito, the virus's main vector, *A. aegypti*.

Panamanian health authorities first detected the tiger mosquito in the Central American nation in 2002 and kept tabs on its spread from Panama City. This comprehensive data—uncommon in many tropical nations—coupled with years of mosquito surveys by Smithsonian Tropical Research Institute post-doctoral fellow and co-author José Loaiza, showed that the tiger mosquito relies on road networks to disperse. Loaiza is also a researcher at INDICASAT-AIP, a leading Panamanian scientific research institute.

"The vector is not moving organically across the landscape," said Matthew Miller, the lead author of the study and a research fellow at STRI. To stem the vector's spread, the authors recommend that health authorities fumigate vehicles at checkpoints already set up throughout Panama to prevent screwworms, flesh-eating fly larvae that attack cattle, from spreading from Colombia to North America. Checkpoint fumigation could prevent the tiger mosquito from reaching the Azuero

Peninsula and Bocas Del Toro in Panama, where it has not been detected.

In May, *A. aegypti* genetically modified by the British firm *Oxitec* to render offspring unviable—at least in laboratory conditions—were released in a Panama City suburb by Panama's Gorgas Institute. The modified mosquitoes are expected to greatly reduce *A. aegypti* populations.

But the experiment may have unwittingly launched a game of ecological whack-a-mole. Given *Aedes* ability to disperse through road networks, populations of *A. aegypti* could reestablish without continuous release of modified mosquitos. Another possibility is that the tiger mosquito could fill the niche that *A. aegypti* occupied. Coincidentally, the first locally transmitted case of chikungunya appeared in Panama that same month.

"The two mosquito species are so ecologically similar that, by depressing *A. aegypti* populations, the chances that *A. albopictus* is going to competitively displace it may increase," said Miller. "This research is relevant to the study of introduced disease vectors everywhere."

The Smithsonian Tropical Research Institute, headquartered in Panama City, Panama, is a unit of the Smithsonian Institution. The Institute furthers the understanding of tropical nature and its importance to human welfare, trains students to conduct research in the tropics and promotes conservation by increasing public awareness of the beauty and importance of tropical ecosystems.
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