Mapping the risk of *Aedes aegypti* larval habitats using tree cover in Puntarenas, Costa Rica

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Tree cover and other characteristics of urban structure have been associated in urban environments with abundance of *Aedes aegypti* and other mosquito larval habitats. Tree cover can conceal containers, protect them from direct sunlight and desiccation, provide debris for larval nutrition, and promote adult survival by providing resting sites. The purpose of this study was to create and evaluate predictive maps for *Ae. aegypti* larval habitats in the Greater Puntarenas Area, Costa Rica, which employed parameters from linear regression models that had been reported previously. The linear regression models developed for number of mosquito larval habitats in the wet season using a geographical sampling method showed a significant association with tree cover when corrected by the number of locations evaluated in each cell ($R^2 = 0.650$, $p<0.001$). Data was extracted from 50 by 50 m cells of land cover maps created from Quickbird satellite imagery of Greater Puntarenas (2.4 m spatial resolution), and parameters from the significant model were used to determine the expected number of *Ae. aegypti* larval habitats in all cells that cover Greater Puntarenas using the proportion of tree cover at cells. Maps were created for the expected number of "wet containers" (potential larval habitats), *Ae. aegypti* container index, and expected number of *Ae. aegypti* positive larval habitats per cell. To evaluate these maps, 40 cells were randomly selected and entomological field evaluations were performed during the wet season 2010. Overall, 119 locations (86%) were evaluated in the 40 cells, and 241 wet habitats were identified; *Aedes aegypti* container index was 19.5%, and Breteau location index was 39.5. The expected number of wet containers in all sample cells fell within the 95% confidence interval of predicted values. Only 13 cells (32.5%) harbored the exact number of expected *Ae. aegypti* positive habitats, although 23 (57.5%) contained the expected number +/- 1 habitat. In an additional 11 cells (27.5%), the predictive map overestimated the number of positive habitats by more than 1, but only in 5 cells (12.5%) was the estimate greater than 2 habitats. In the remaining 6 cells (15%), the map underestimated the number of *Ae. aegypti* positive habitats by more than 1. Results show that the predictive maps are able to partially estimate the number of *Ae. aegypti* larval habitats: within +/- 2 habitats in 72.5% of cells. Considering the potential effect of ongoing vector control, it is possible to conclude that the presence of positive habitats was underestimated significantly only in 15% of cells, which can be considered the more serious errors for decision making. In general, these maps can be used to determine key areas within Greater Puntarenas where dengue vector control efforts can be directed due to higher expected breeding sites for *Ae. aegypti*.