



Genetic characterization of invasive species *Bactrocera carambolae* Drew & Hancock (Diptera: Tephritidae) in South America

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Introduction

The carambola fruit fly, *Bactrocera carambolae* Drew & Hancock is native to Southeast Asia and infests about 150 plant species and is considered a quarantine pest insect in the Caribbean region. *B. carambolae* invaded Suriname, French Guyana, and northern Brazil. In Brazil it was first recorded in 1996 and has been restricted to the states of Amapá and Roraima under official control. This is the first study to estimate genetic structure and diversity of South American populations of *B. carambolae*.

Methods

A total of 116 individuals from 11 localities in Brazil and seven in Suriname were analyzed (Figure 1). Additional sequences available at GenBank from Indonesia (Lampung) and Thailand (San Pa Tong and Muang District) were also used in the analysis. We sequenced a fragment of the mitochondrial gene COI.

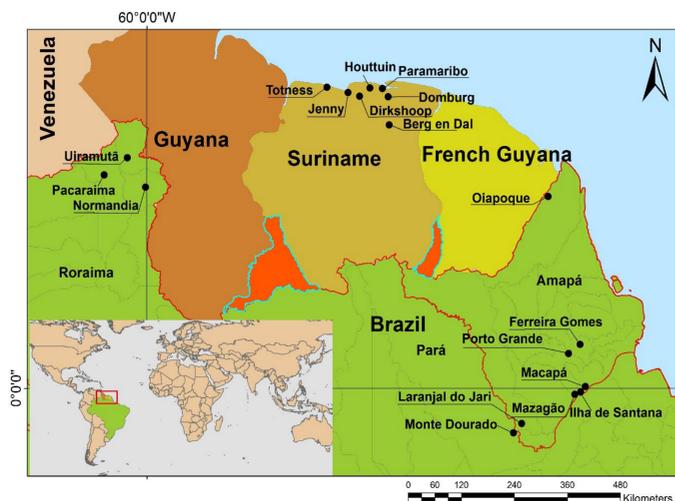


Figure 1. The geographic locations of the 18 collection sites of *B. carambolae* in South America. Paramaribo sequences from Boykin *et al.* (2014).

Results

A total of 35 haplotypes were found and two groups of *B. carambolae* (Figure 2). Haplotypes from Indonesia were closest to haplotypes from South America separated by few mutational steps, suggesting that Indonesia is the likely source for the introduction of *B. carambolae* in South America. The Southeast Asian populations appeared as the most ancestral group in the phylogenetic trees (Figure 3). The high similarity and sharing of several haplotypes among populations within South America indicate lack of genetic structure. The mismatch distribution and neutrality tests suggest that South America populations have undergone a rapid growth and expansion following a founder event.

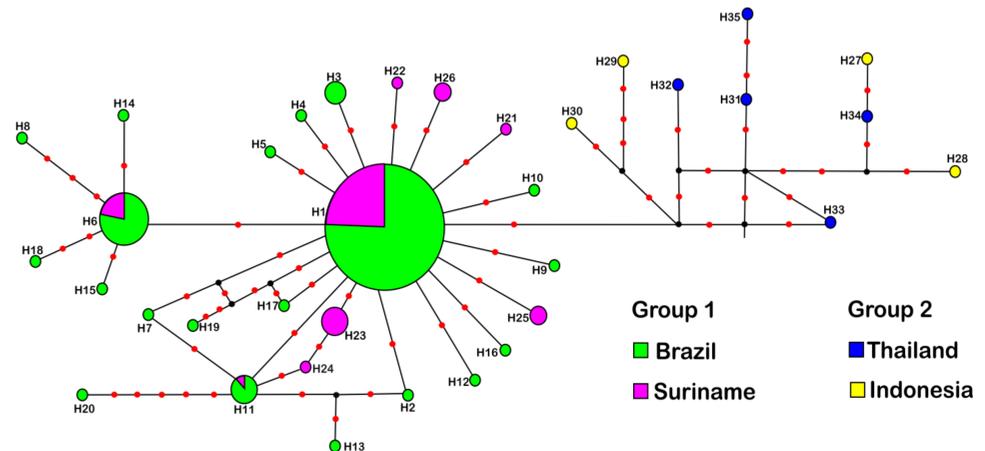


Figure 2. Haplotype network of COI sequences of *Bactrocera carambolae*. Sampled haplotypes are indicated by colored circles and missing or unsampled haplotypes are indicated by small solid circles. Haplotypes are colored according to their geographic origin. Group 1 – South America with haplotypes from populations from Brazil and Suriname, Group 2 – Southeast Asia with haplotypes from Indonesia and Thailand.

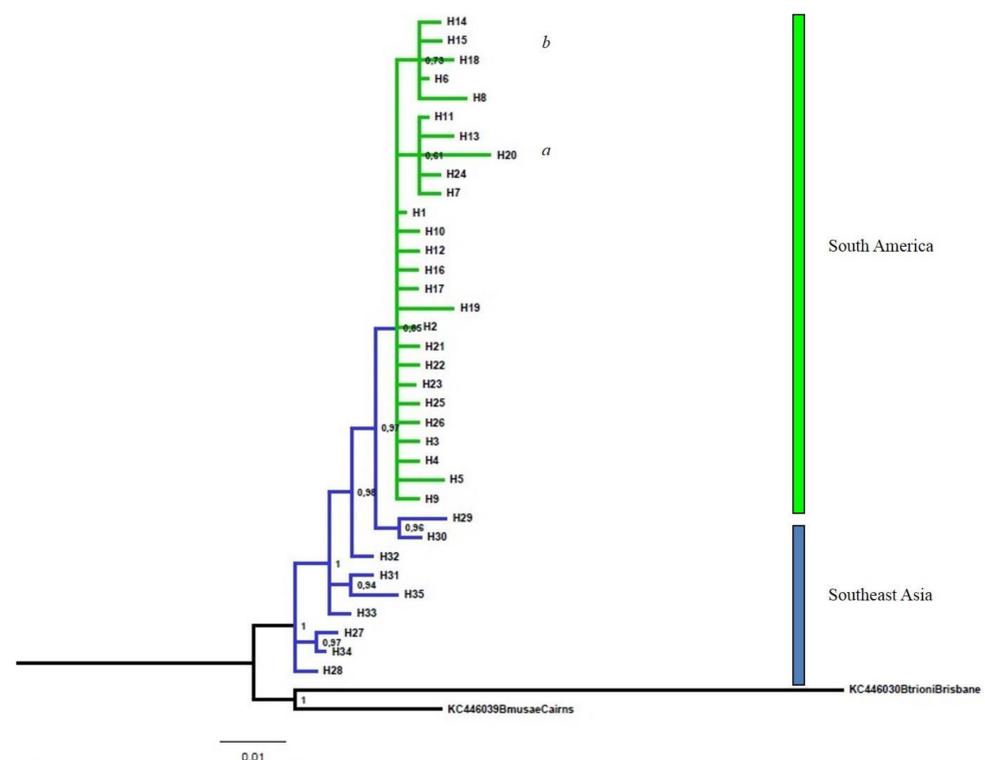


Figure 3. Bayesian phylogeny of *Bactrocera carambolae* haplotypes using the HKY+I model for the mitochondrial gene COI. DNA sequences of *Bactrocera musae* and *Bactrocera tryoni* used as outgroups were obtained from GenBank (accession numbers KC446039 and KC446030). Node labels show posterior probabilities.

Conclusion

The low genetic diversity and the population expansion evidenced by the neutrality tests lend support to the hypothesis of a recent introduction of a single lineage of the carambola fruit fly in South America.