# Host-plant specialization and natural history of *Drosophila santomea*

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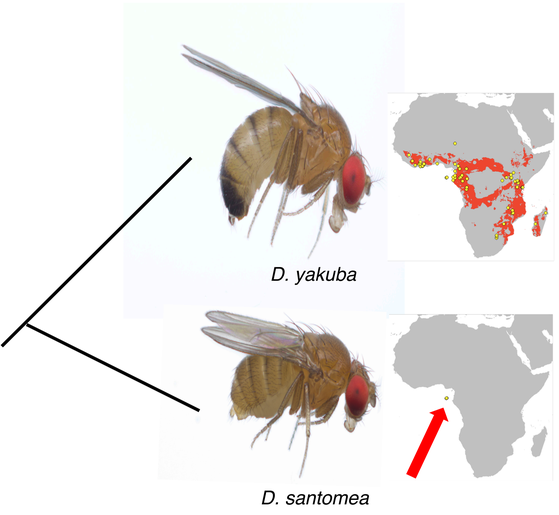
## Introduction

Ecological specialization

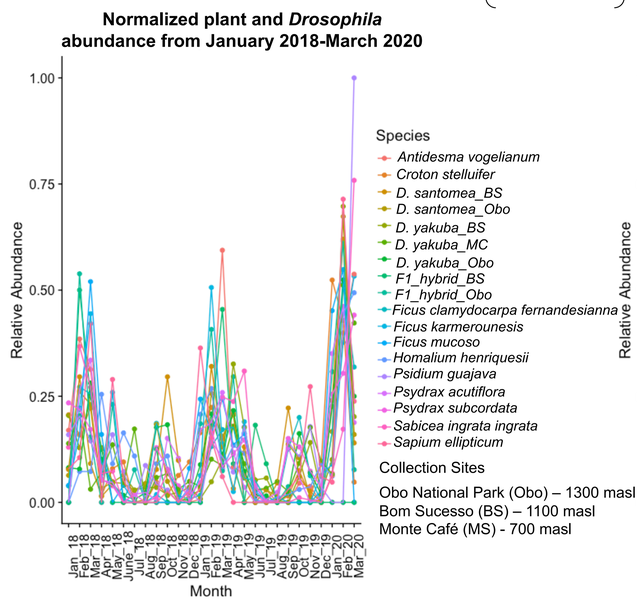
Ecological specialization can involve a combination of physiological, life history, and behavioral traits. The evolution of behavioral preference of insects for specific plants has been shown to involve sensory mechanisms aimed at detecting chemical cues produced by preferred plants, which require proteins such as odorant-binding proteins (Obps), and are commonly thought to evolve through positive natural selection. Insects are one of the most species-rich group of animals on earth and studying the evolutionary processes underlying their diversification is central to our understanding of biodiversity.

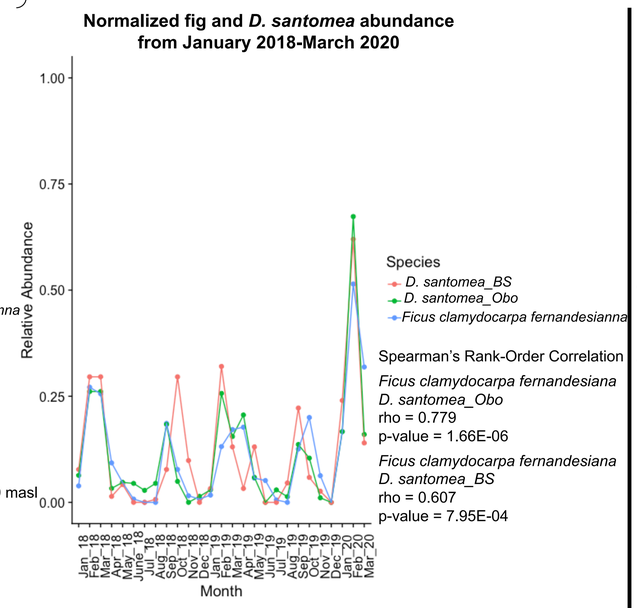


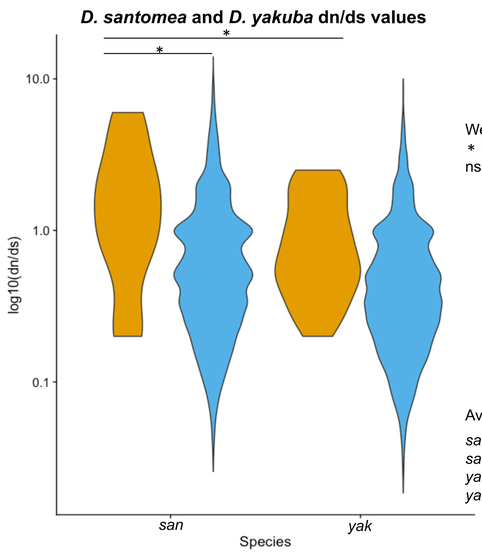

*Drosophila santomea* & *Drosophila yakuba*

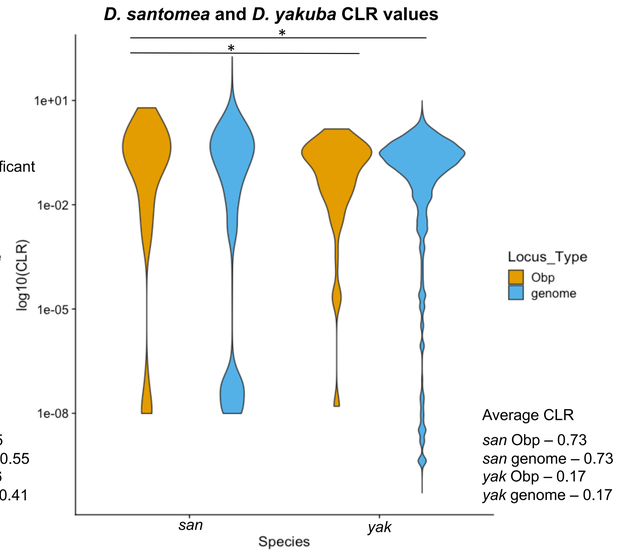
- *D. santomea* is endemic to the high-altitude mist forests in São Tomé
- *D. yakuba* is found throughout continental Africa as well as open and drier habitats at lower elevations in São Tomé
- The two sister taxa form stable hybrid zones in the midlands of São Tomé
- Despite never being methodically tested *D. santomea* has been hypothesized to specialize to the endemic fig subspecies, *Ficus chlamydocarpa fernandesiana,* which is only found at high altitudes while *D. yakuba* is considered to be a dietary generalist

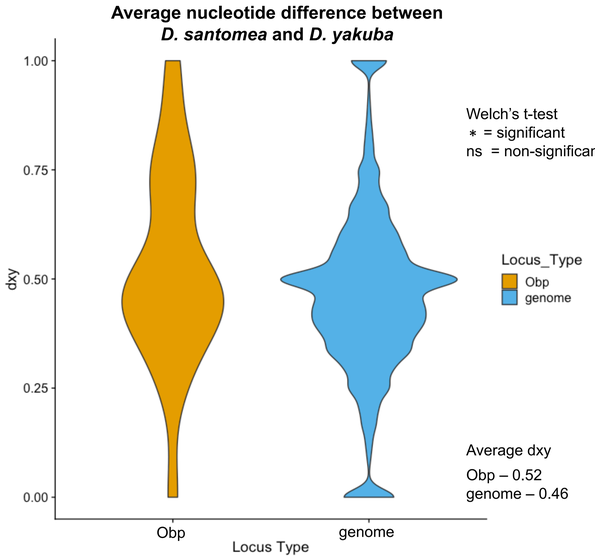
## Data

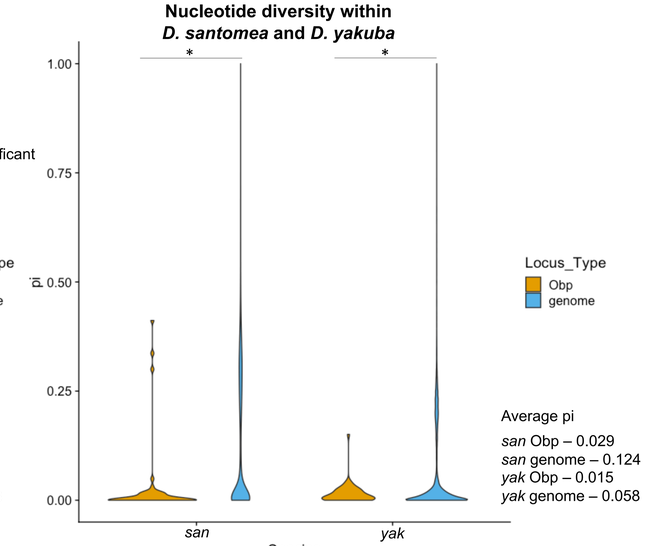



## Results

*D. santomea* abundance covaries with the fruiting season of the endemic fig species

- The phenological structure of São Tomé was studied by surveying the fruit produced from all the fruiting tree species each month for 27 months
- *Drosophila* were collected during the same 27-month period along an elevational gradient
- The data was normalized by dividing the yearly total from the monthly totals
- **The relative abundance of *D. santomea* covaries with the relative abundance of the endemic fig species**

Obps exhibit signs of positive selection in *D. santomea*

- Obps in *D. santomea* have an average dn/ds value of 1.45 compared to a value of 0.66 in *D. yakuba*
- Using SweeD (Pavlidis et al., 2013) Obps in *D. santomea* show stronger signatures of selective sweeps compared to *D. yakuba*
- On average there is more nucleotide differentiation in Obps compared to the rest of the genome between *D. santomea* and *D. yakuba*
- Obps have lower levels of nucleotide diversity in both *D. santomea* and *D. yakuba* compared to the rest of the genome
- **The combination of dn/ds values greater than 1, CLR values suggestive of a selective sweep, increased levels of nucleotide divergence between species, and reduction in nucleotide diversity within species provides evidence for positive selection of Obps in *D. santomea***

Despite Obps displaying signatures of positive selection in *D. santomea,* ecological specialization is a much more complicated process that I would love to discuss with you, so feel free to reach out!

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## Acknowledgements

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