Using fluctuating asymmetry for monitoring ecological stress factors in the habitat of the critically endangered Niceforo's wren

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Introduction

Niceforo's wren (*Thryotorus nicefori*) is a critically endangered songbird endemic to riparian forests in the Chicamocha canyon, East-Andes of Colombia[1]. Its habitat has been destroyed, causing population fragmentation to small pockets of forest a long its range.

In order to plan future management of Niceforo's wren habitat, it is critical to identify key structural variables needed to reduce environmental stress on their remaining populations. We used fluctuating asymmetry (FA) as proxy of environmental stress[2]. FA is a measure of random deviations from perfect symmetry in a bilaterally symmetrical trait[3]. It reflects phenotypic variation caused by developmental accidents which might occur more frequently under stressful conditions[2,4].

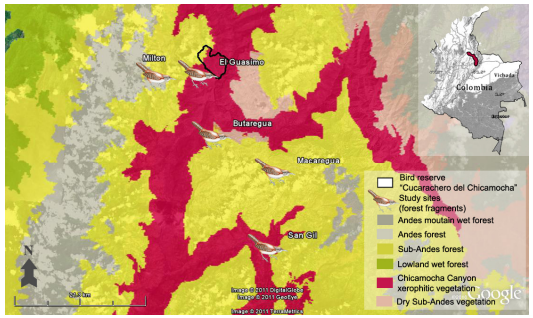
Objective and prediction

This study investigates the influence of structural features of Niceforo's wren habitat in five different fragments of forest on the FA of birds at three levels:

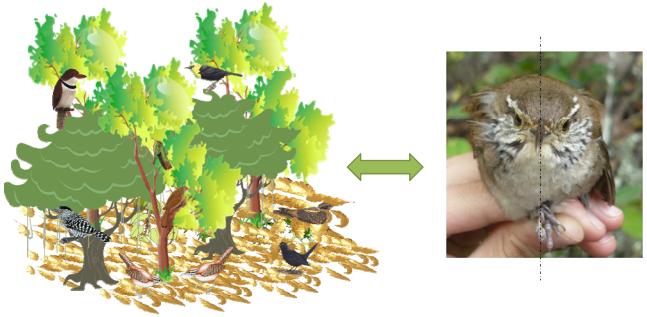
i. passerine community
ii. insectivorous guild
iii. species level

We evaluate these three levels since they could reflect the health status of communities facing similar stressful conditions as the Niceforo's wren, a species with few individuals per population. We predict that individuals living in poor quality forest fragments will show higher FA indices.

Methods



1. The study was carried out in 5 fragments of dry forest in the Chicamocha canyon, East-Andes Colombia, from July to August 2009.



2. 11 vegetation structural variables were measured in the five fragments

3. Passerine birds were sampled with passive mist-netting in each fragment for 4 days from 06.00 h to 17.00 h.

4. Right and left tarsus, hallux and wing length were measured to adult birds.

5. FA of each character was calculated at community (FAc), foraging guild (FAg) and species (FAs) level as follows:

$FAc = S^2 [(R- L)/(R+L)/2]$
$FAg = S^2 [(R- L)/(R+L)/2]$
$FAs = S^2 [(R- L)/(R+L)/2]$

Where:
R= right side. L= left side
S^2 = Variance

References

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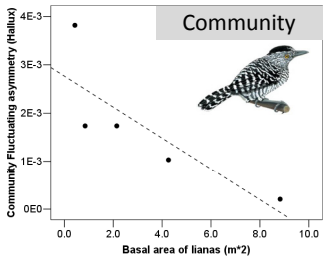
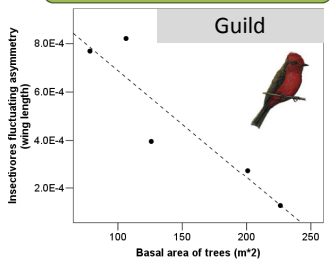
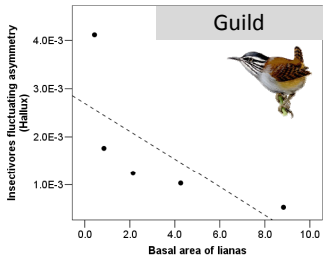
Results



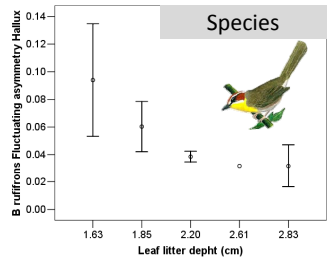
There is a significant and negative correlation between the basal area of lianas and the values of FA of hallus at community level.
(P= 0.005, Pearson correlation coefficient= -0.975)



There is a significant and negative correlation between the basal area of trees and the values of FA of wing-length in insectivorous birds.
(P= 0.020, Pearson correlation coefficient= -0.900)



There is a significant and negative correlation between the basal area of lianas and the FA of hallus in insectivorous birds.
(P<0.001, Pearson correlation coefficient= -0.998)



There is not correlations between FA of Niceforo's wren and any of the variables evaluated. However, in the case of *Basileuterus rufifrons* there is a negative correlation between the leaf litter depth and FA of hallux.
(P= 0.022, Pearson correlation coefficient= -0.587).

Conclusions and Future work

- Birds living in forest fragments with low density of lianas, trees, and leaf-litter had a high indices of FA, as we expected. These high indices were detected at three levels: community, insectivorous guild and species.
- Results suggest that key structural variables are important for the habitat of Niceforo's wren since they might increase food abundance. This is critical as limited food reduces reproductive success and development of young [5].
- Further work is required to identify food availability in the habitat of Niceforo's wren.
- Finally, these insights will be useful for informing fragments restoration for the habitat of Niceforo's wren.