EFFECTS OF SOIL ORGANIC LAYER DEPTH AND LIGHT AVAILABILITY ON INDIVIDUAL SIZE OF THE BAMBOO *CHUSQUEA* SP. IN A NEOTROPICAL CLOUD FOREST

SAMANTHA R. KAPLAN, THOMAS J. LOBBEN, AND TIFFANY D. CHANG

Faculty editor: David R. Peart

Abstract: Chusquea sp. is an abundant bamboo near Monteverde Biological Station, Costa Rica. We hypothesized that increased soil organic layer depth and light availability would increase *Chusquea* sp. size, as measured by average shoot height, number of shoots, average basal shoot diameter and clump density, but our hypothesis was not supported. The clone morphology of *Chusquea* sp. is apparently insensitive to these variables within the range of variation we encountered.

Key words: Monteverde, water retention, canopy cover

INTRODUCTION

Chusquea is a native bamboo genus at Monteverde, Costa Rica. Bamboo shoots sprout at varying diameters and reach different heights. A previous study of a particular species (referred to as *Chusquea* sp.), showed that the bamboo was more abundant where light and soil moisture levels were highest (Erickson et al 2001). We hypothesized that shoot thickness and height, rather than abundance, might be better indicators of available resources.

We predicted that high light availability and soil organic layer depth would both increase bamboo size. Organic layer depth tends to be correlated with the ability of soil to retain water (e.g. Brady et al. 1996).

METHODS

We conducted our study on 24 and 25 January 2008 on either side of the Principal, División, and Mirador trails near Monteverde Biological Station, Costa Rica. We randomly sampled 20 clumps of *Chusquea* sp. within 3m of the trail. We used several measures of bamboo clump size: number of shoots, average shoot height, average shoot diameter and the density of stems per unit area in the clump.

To calculate clump density (number of shoots per unit area), we divided number of shoots by clump area (calculated as length x width). If either length or width was > 2m, we established a plot centered on the center of the clump, with dimensions calculated as follows. The length of

the plot was the length of the clump or 2m, whichever was greater. The width of the plot was the width of the clump or 2m, whichever was greater.

We counted the number of stems in each clump, measured basal diameter of 5 randomly selected stems per clump, and estimated the average height of all stems in a clump by measuring the height of a representative shoot. We used a GPS device to measure the elevation at each clump and took four canopy cover measurements (using a spherical densiometer) at nearby locations estimated to be representative of the clump's available light. Finally, we took a soil core sample next to each clump to measure organic layer depth.

We log transformed clump density and number of shoots, and square root transformed average basal shoot diameter, to satisfy assumptions of normality.

RESULTS

Organic layer depth and canopy cover did not affect average shoot height, number of shoots, average basal shoot diameter or clump density (MANOVA Wilks' λ = 0.577, df = 8, 28, P = 0.388). We also ran 8 individual regressions using all independent and dependent variables to explore relationships. We found one significant result; shoot height to basal diameter ratio increased with organic layer depth (r^2 = 0.22, df = 19, P = 0.04). However, there is a 37% probability of finding one significant relationship by chance after running 9 tests, so this relationship may be spurious.

DISCUSSION

Changes in organic layer depth and canopy cover did not affect *Chusquea* sp. size. We confirmed Erickson et al.'s (2001) observations that *Chusquea* sp. does not grow below 1700m. Apparently, *Chusquea* sp. size is insensitive to depth of soil organic matter and light availability, within the range of variation in our samples (organic matter depth: 0 – 23cm; average canopy cover: 0 - 89%).

If the positive relationship between shoot height to basal diameter ratio and organic layer depth is real, it may indicate that *Chusquea* sp. grows taller and thinner with greater soil water retention. We suggest that *Chusquea* sp. responds to greater intra- and interspecific competition in sites with high water availability, by producing taller shoots that may overtop neighboring plants.

LITERATURE CITED

Brady, N. C. and R. R. Wiel. 1996. The nature and properties of soils. Upper Saddle River, NJ: Prentice Hall, pp. 383.

Erickson, P.B., M.R. Kang, and R.M. Owens. 2001. Where's my bamboo? Factors affecting *Chusquea* spatial distribution and abundance. Dartmouth Studies in Tropical Ecology 2001, pp. 35-36.