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Costa Rica Butterfly Diversity Study 2004

ABSTRACT

Transect counts of butterflies were conducted in the rain forest of Puriscal, San Jose County Costa Rica, during the time period of July 13th through 18th 2004 to study the diversity levels of butterfly species in different tropical rain forest landscapes. The study area consisted of three separate sites composed of disturbed landscape, young secondary forest, and mature rain forest. All butterfly data was surveyed within 130 meter transects from ground level along a well-defined trail (Jeannie's upper trail located at Rancho Mastatal Sustainable Learning Center and Lodge), which supported the three different landscapes. The data gathered suggests that butterfly diversity and evenness is higher in secondary forests verses mature and disturbed rain forests.

INTRODUCTION

Many studies have looked at the detrimental effects that deforestation has on biodiversity in the neotropics, however limited research has looked at disturbed habitats and how they may also foster species diversity. One study suggests that small, isolated forest fragments may help retain butterfly diversity in the tropical countryside and increase the conservation value of agricultural landscapes (Horner-Devine, 2003). In an attempt to look further at diversity levels within different landscapes in the neotropics of Costa Rica, using butterflies as a targeted species, the following questions were investigated: 1) How does butterfly species diversity differ between disturbed forests, young secondary forests, and mature rain forests? 2) Which types of landscapes (disturbed, secondary, or mature) are vital to butterfly populations and why? These questions were addressed by examining the frequency of butterfly sightings in each of three

predetermined landscapes; previously disturbed forests, young secondary rain forests, and mature rain forests.

MATERIALS AND METHODS

To determine the degrees of butterfly diversity relative to different types of rain forest landscapes, the amount of individuals and species found in each of three specific landscapes in a rain forest area within San Jose County Costa Rica was measured. This data was collected and analyzed in order to better understand butterfly diversity and determine the effect disturbed landscape verses young secondary and mature rain forest has on butterfly populations in the neotropics of Costa Rica.

Study Sites:

Preliminary scouting of the trails around Rancho Mastatal Sustainable Learning Center and Lodge in Puriscal, San Jose County Costa Rica, was performed for two to three days prior to data collection, in order to locate three sites within a reasonable distance apart (total distance traveled within an hour time span) that captured three distinct forest landscapes (moderately damaged, young secondary and mature rain forest). The final site locations consisted of three 130 meter transects that were located along “Jeannie’s Upper Trail”, a specific trail within the boundaries of Rancho Mastatal. Transect one (T1) was flagged in a moderately damaged area where the forest had been previously cleared and succession was beginning. The landscape of T1 housed a plentiful amount of low thick brush and a dense population of flowering plants along with very young trees and open skyline. Transect two (T2) was adjacent to T1 and was flagged in an area of young secondary rain forest where succession was obviously well

underway. The landscape of T2 consisted of a variety of young trees with little exposed skyline and some thick underbrush and flowering plants. Further along “Jeannie’s Upper Trail” and deeper into the mature forest Transect three (T3) was flagged. The landscape of T3 was a variety of very mature trees with little to no visual skyline. The dark canopy enclosed the trail where there was little underbrush and limited amounts of flowering plants.

Sampling:

Each of the three transects were set up in 130 meter sections along “Jeannie’s Upper Trail” using a wheel pedometer and flagged at both the start and finish of each transect. A slow 180 degree (approximately 90 degrees to both the right and left side of the path traveled) visual sweep was then performed walking through each transect at timed intervals, averaging 5.26 minutes to complete. The data was collected by a tick-mark system in a field journal, where a list of butterflies were described using size, coloring, and other visual descriptions, and then documented by the number of individuals seen under each description. A total of four days of data was collected, with a goal of four individual sweeps per day (two in the morning and two in the afternoon) during both dry and wet weather conditions. In sampling the established areas a total of 21 species of butterfly were counted, 12 of which were identified using a butterfly species book and the remainder described by size, coloring and other distinct features. Within the 21 species identified/described, 181 individuals were counted collectively within all three transects. Species sampling was physically taken using a butterfly net when possible. The butterfly specimens were used for identification using visual and written descriptions in a two-volume book on Butterflies in Costa Rica (REFERENCE).

Diversity Indices:

The butterfly data collected in the field journal over the four day period was analyzed and charted for species richness (the number of species), abundance (the number of individuals), and equitability (evenness) using a diversity index (Simpson's diversity index). Diversity indices provide important information about rarity and commonness of species in a community. The ability to quantify diversity in this way is an important tool for biologists trying to understand community structure (Beals, 1999).

RESULTS

All data collected during the butterfly diversity study was rolled up into a table and series of charts to demonstrate the collective outcome of all the days surveyed (July 13th through 18th, 2004). Overall observations and data analysis indicates that Transect One (T1) housed a more abundance of butterfly species and individuals than Transect Two (T2) and Three (T3). Alternatively, T2 and T3 was populated with more specialized species of butterflies than T1, implying more species diversity and evenness in T2 and T3.

Chart I: Disturbed landscapes foster an abundance of butterfly individuals in comparison to secondary and mature rain forests.

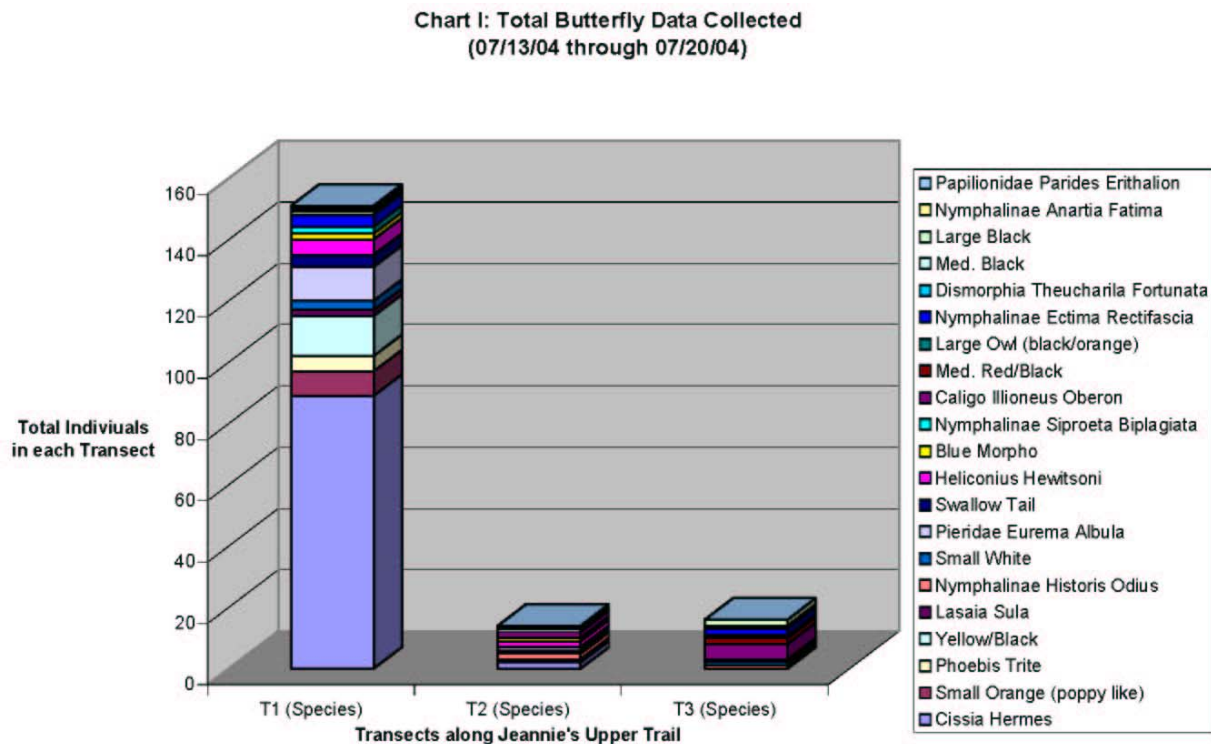


Chart II: Butterfly diversity is richest in secondary rain forests in comparison to diversity levels in mature rain forests and disturbed landscapes.

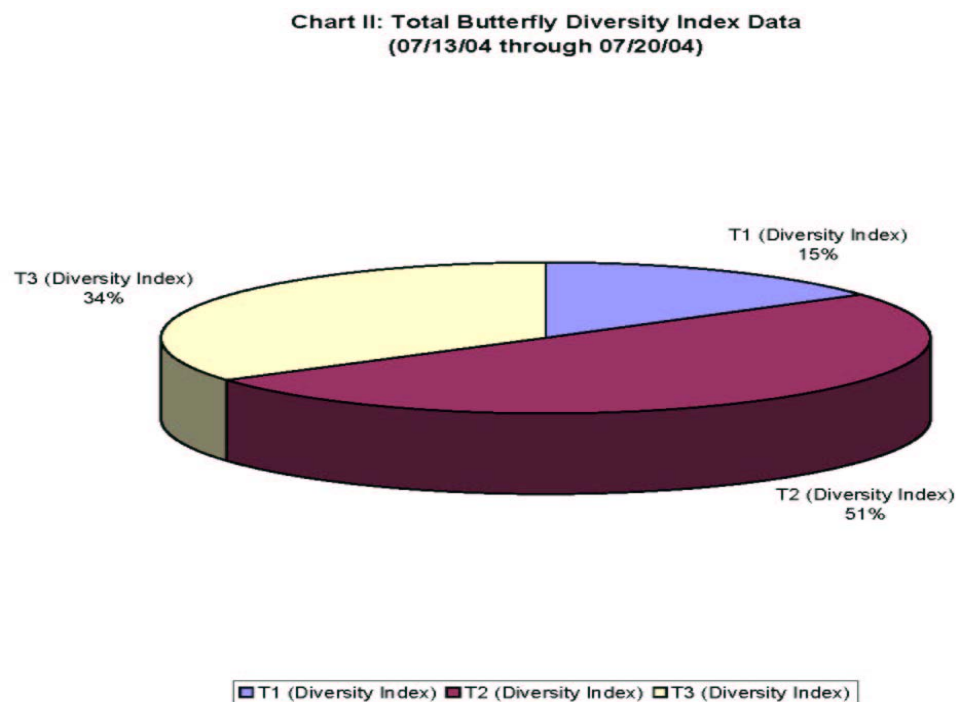
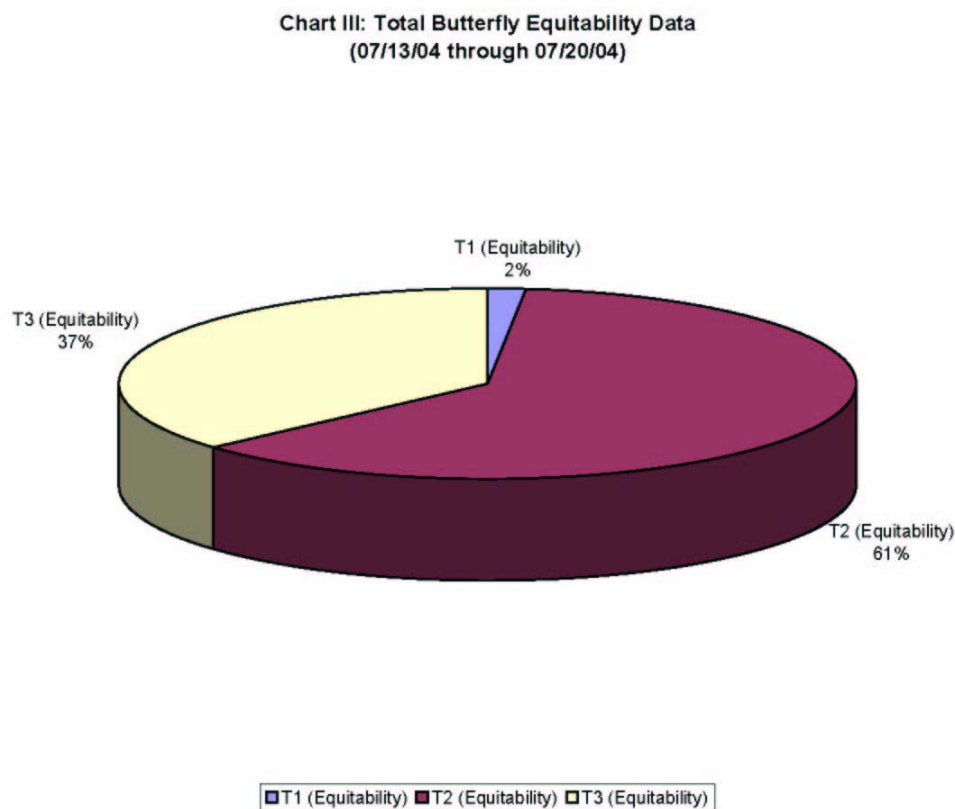


Chart III: The evenness of butterfly populations are distributed more evenly in secondary rain forests than that of mature rain forests and disturbed landscapes.



DISCUSSION

Butterfly species diversity differs between disturbed forest (T1), young secondary forest (T2), and mature rain forests (T3). With the analysis of T1, the large abundance of butterfly populations in comparison to T2 and T3 could be a result of quantities of butterfly host plants in each transect and the specific type of butterflies studied (grassland verses forest butterflies). However the data reflects that butterflies in T2 house more species richness and evenness than that of T1 or T3 landscapes. This may prove that edge habitats are vital for butterfly populations as stated in the Horner-Devine study (2003). Furthermore, the analysis of T2 and T3 suggests that more forested landscapes are important habitats for certain species of butterflies and act as

migration corridors as well as protective boundaries from predators and weather conditions (i.e., heavy rains).

Sampling Disturbances:

It should be noted that due to weather conditions and other committed activities the goal of performing four transect sweeps per day was not achieved hence preventing the collection of additional data, however at least one morning and one afternoon sweep was documented for each day data was collected. In addition, other factors like human disturbance were documented in the field journal and on more than one occasion the data collection in T1 was started over after a reasonable period of delay. It is unknown if this had an effect on the data collected. One weather observation is that heavy rain showers clearly decreased the amount of butterflies documented in T1, but seemed to have little to no effect on the amount of individuals in both T2 and T3.

Future Data:

Some suggestions for collecting data in the future that may be beneficial to follow on butterfly diversity studies is further investigation to determine if the species that were identified are typical grassland butterflies verses forest butterflies (Osborn, 1999). In addition, since the study was limited to “ground” level butterflies, additional data to capture “canopy” level butterflies could serve beneficial in analyzing diversity levels within different forest landscapes (Horner-Devine, 2003). Lastly, pre-made data sheets stating name and physical description of common butterflies in the region would have been helpful during data collection and analysis.

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