Patterns of Moth Diversity in Dominica Secondary Rainforest

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ABSTRACT

Moths were counted at the familial level using a mercury vapor light trap at two study sites over six nights. Diversity of the two sites at familial level was calculated using the Shannon-Weiner Diversity Index. It was found that the family diversity of moths throughout the study period remained consistent despite varying study sites, weather conditions, time of night, and date of sampling. Thus, light trapping is an effective way to estimate moth diversity in a habitat.

INTRODUCTION

Today species are disappearing so rapidly that most of them have never been discovered. Thus, the task of rapidly and accurately surveying flora and fauna has become more urgent. This is especially important in tropical ecosystems, where biodiversity is most pronounced. Lepidoptera is one of the largest insect orders, with 5 suborders, 65 families, and approximately 150,000 described species. Butterflies are often surveyed as an indication of biodiversity. Thus, I was interested in diversity sampling methods for the moths, the more diverse Lepidoptera.

Study areas in Dominica Secondary Rainforest were surveyed using a light trap method to determine moth diversity. The moths were identified to family. Identified specimens were members of these five families: Arctiidae, Geometridae, Noctuidae, Pyralidae, and Sphingidae. Collected moth specimens will be donated to the Dominica Department of Forestry and Wildlife, for conservation education purposes.

MATERIALS AND METHODS

Study Area: Results were collected at two study sites. Site #1 was located at the main building of SCEPTRE (Springfield Centre for Environmental Protection, Research, and Education), which was located in Secondary Rain Forest above the Check Hall River Valley. Elevation at the site was 366 meters. The light trap was set up on the second floor porch of the building facing the valley.

Site #2 was located at the Bee House on SCEPTRE property in Secondary Rain Forest. The elevation is 396 meters. The trap was set-up in close proximity to the pond (approximately 3 feet away), with a field and forest behind.

Data were also collected at Cabrits National Park, a primary dry forest environment. The light trap was set up approximately 30 meters from the Caribbean.

The light trap used for sampling consisted of a 220 V mercury vapor light, a black light, and a 2.12 meter by 1.48 meter white sheet. The sheet was tied to trees, bamboo, railings, or rocks at all four corners until the strings were taut. A rope was strung in front of the sheet, and the two lights are draped over this rope. The light was run for an hour, and a count by family of the moths was taken at the end of this hour. Moths that could not be readily identified on sight were collected and identified in the laboratory. Moths were collected by rapid killing in an atmosphere of ethyl acetate and pinned using #2 or #3 insect pins. The wings of many moths were spread using paper strips and spreading boards to produce display quality specimens.

All data were collected between the hours 19:50 and 24:07 on 24 May, 25 May, 28 May, 29 May, 30 May, 31 May, 2 June, and 4 June. Weather conditions were recorded in terms of Barometric Pressure (in Hg) and Temperature (°C).

Moths were identified by family using the following defining characteristics. Moths of the family Arctiidae and the subfamily Ctenuchinae are wasp mimics, and have red or black bodies with black and white or clear wings. Tiger moths were the other common members of Arctiidae found. The most common of this group is a large yellow moth with very tensile black and yellow striped legs that rests with its wings folded close to its body. Moths of the family Geometridae have patterns on their wings continuing from their fore wings to their hind wings. Their hind wings are wide and rounded. Moths of the largest family, Noctuidae, have heavier bodies and tend to be drably colored. They hold their wings in a tent shape when resting. Moths of the family Pyralidae are characterized by small body size, triangular shaped wings, light coloration, and most distinctively a long snout. Moths in the family Sphingidae are easily recognizable by their very large and heavy bodies and narrow wings.

RESULTS

Table #1

Sample #	Arctiidae	Geometridae	Noctuidae	Pyralidae	Sphingidae	Total
1	4	3	7	13	0	27
2	4	3	7	11	2	27
3	0	0	6	5	0	11
4	1	4	5	10	2	22
5	6	5	6	4	1	22
6	0	3	5	18	0	26

Table #2

	Arctiidae	Geometridae	Noctuidae	Pyralidae	Sphingidae
Total # Site 1	8	6	20	29	2
Total # Site 2	7	12	16	32	3
P_i Site 1	0.123	0.092	0.308	0.446	0.031
P_i Site 2	0.100	0.171	0.229	0.457	0.043

$H_{site\ 1} = 1.31$ $H_{site\ 2} = 1.36$

Site 1

Sample #1
- Date: 24 May 2000
- Time: 24:07
- Barometric Pressure: 29.98 in Hg
- Temperature: 27.2°C

Sample #2
- Date: 28 May 2000
- Time: 21:35
- Barometric Pressure: 28.9 in Hg
- Temperature: 25.9°C

Sample #3
- Date: 2 June 2000
- Time: 23:30
- Barometric Pressure: NA
- Temperature: NA

Site 2

Sample #4
*Date: 25 May 2000
*Time: 22:34
*Barometric Pressure: 28.95 in Hg
*Temperature: 26.5°C

Sample #5
*Date: 29 May 2000
*Time: 23:20
*Barometric Pressure: 28.8 in Hg
*Temperature: 25.2°C

Sample #6
*Date: 4 June 2000
*Time: 19:50
*Barometric Pressure: 29.98 in Hg
*Temperature: 28.5°C

DISCUSSION

Although results were taken at two different study sites, and temperature, barometric pressure, wind, precipitation, and time of day varied from night to night, results remained consistent. This shows that light trapping is an effective method to sample an area's moth diversity.

Consistency from site to site is shown by the closeness of the calculated Shannon-Weiner index values. (Site 1, 1.31; Site 2, 1.36) Consistency from sample to sample is shown by the attached graphs (Figures 1-6).

The lack of variation between study sites is interesting, because it was noted in observations that considerable differences in the make-up of insect fauna, excluding Lepidoptera, are apparent. For example, it was observed on 25 May 2000 that Site 2 had a greater abundance of flies and meloid beetles.

Many more organisms, mostly types of beetles, were observed as being present at only one of the two sites. These site disparities may be because of the proximity to water of Site 2.

Another trend to be noted is that the abundance of the specific moth families has an inverse relationship with the size of the moth. Samples of moths at both sites showed that moths of the family Sphingidae made up 4% of the sample, whereas moths of the family Pyralidae made up 45% of the sample (Figure 6). Moths of the family Sphingidae have the largest body mass, where the family Pyralidae contains those with the least mass.

The biggest improvement that could made on this study would be taking more samples. This is especially important, because windy and rainy conditions are not conducive to light trapping. Some results had to be thrown out because of unfavorable conditions. It would also be interesting to conduct this study year round to monitor changes related to seasonal fluctuations.

I planned to also compare moth diversity at Cabrits dry forest with the Secondary Rainforest sites. This was not possible, however, because there was not access to electricity, and only one sample was taken at Cabrits.

CONCLUSION

This study could be expanded in the future to analyze species diversity of moths to find out if different species are partial to different areas. This would be more difficult, however, and many more specimens would have to be taken.

The method of light trapping, however, was found to be effective and served the purpose of this study very well.

REFERENCES

Covell, Charles. 1984. *A Field Guide to the Moths of Eastern North America*. Houghton Mifflin Company. Boston, Massachusetts.

Borror, Donald J. Triplehorn, Charles A. Johnson, Norman F. 1992. *An Introduction to the Study of Insects. Harcourt Brace College Publishers*. Orlando, Florida.

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FIGURE #1

Sample #1 Family Composition

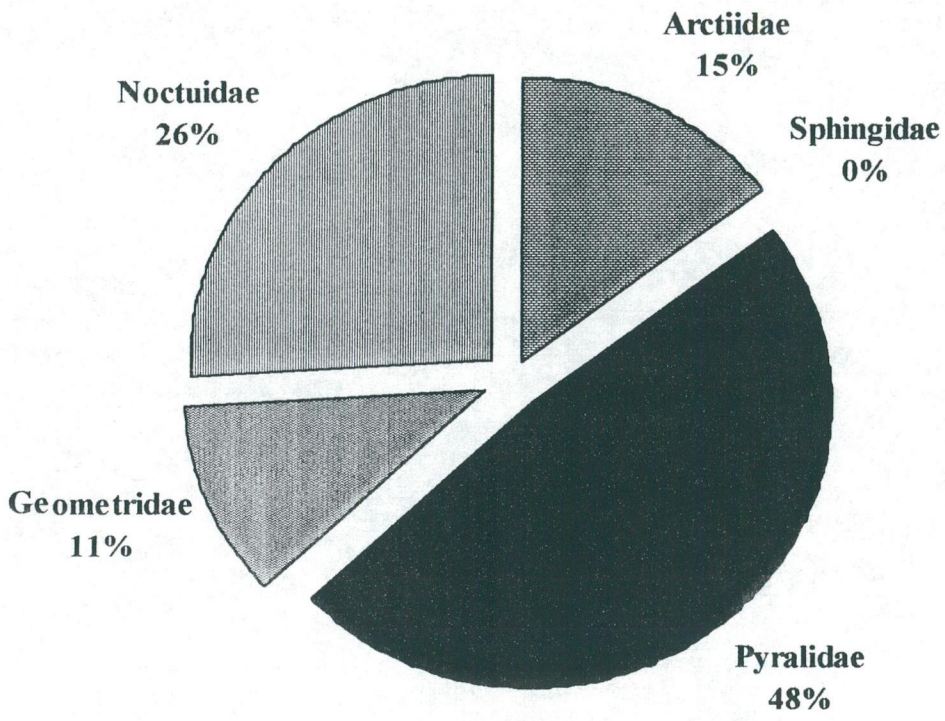

FIGURE #2

Sample #2 Family Composition

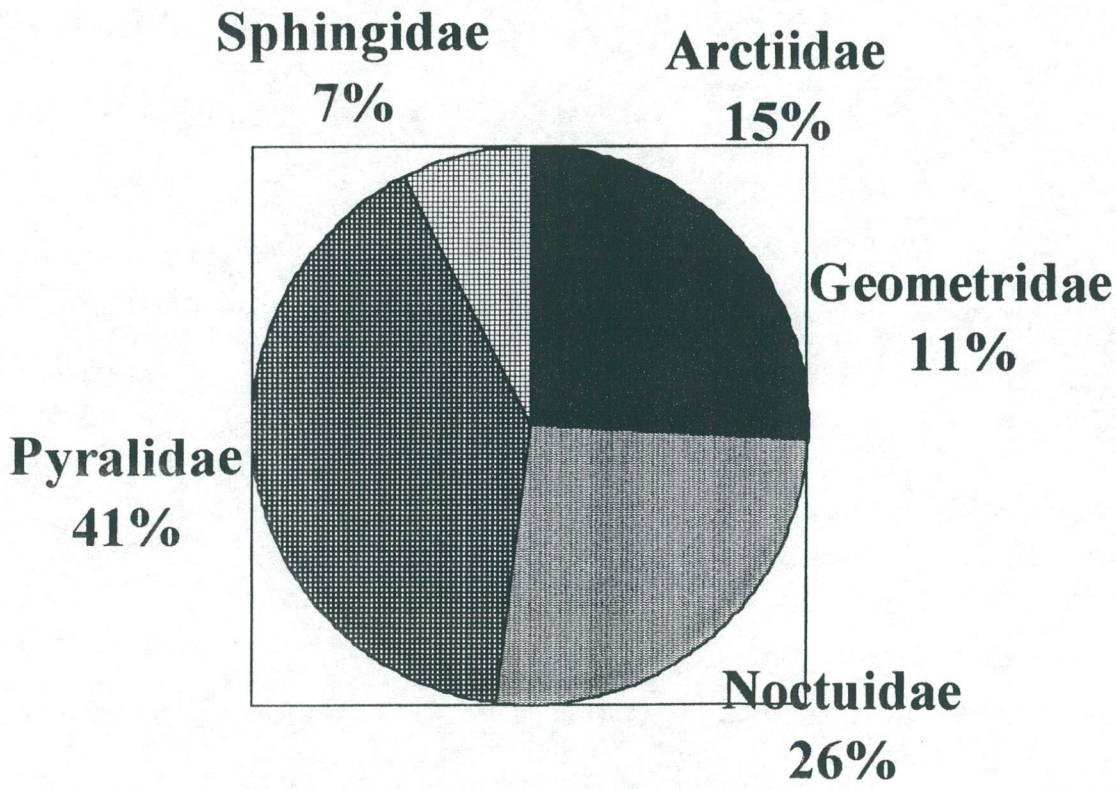

FIGURE #3

Sample #3 Family Composition

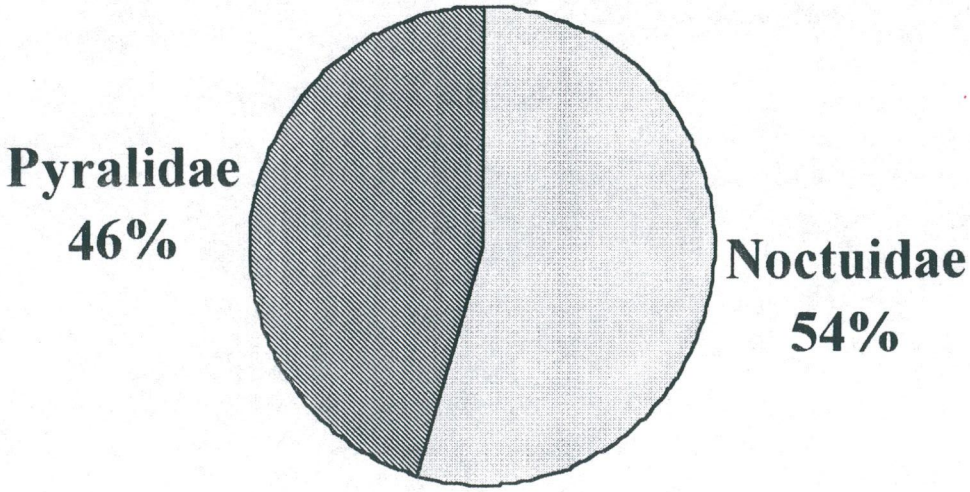

FIGURE #4

Sample #4 Family Composition

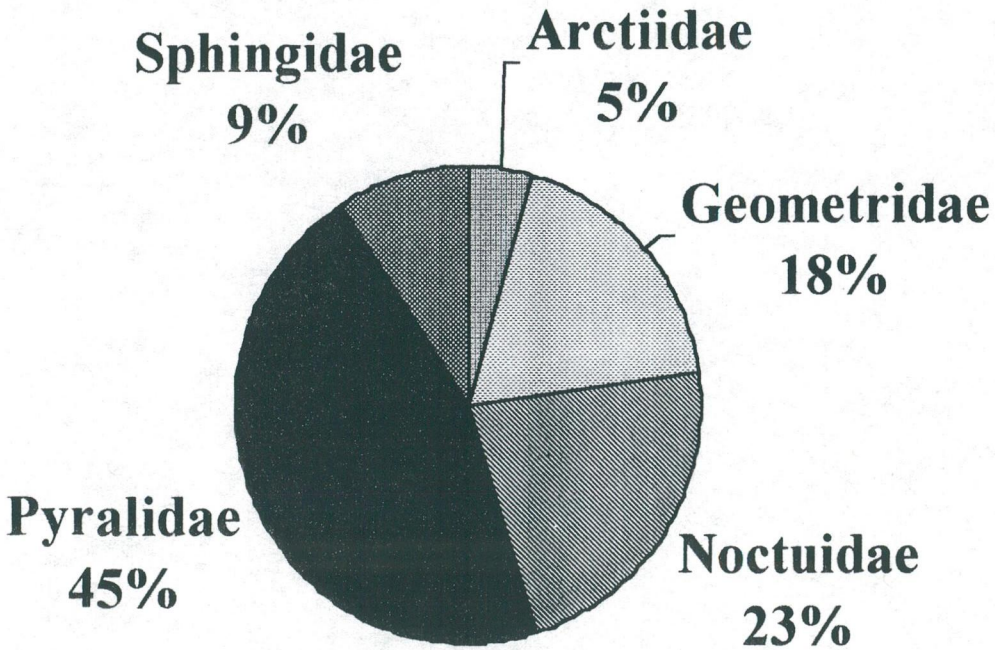

FIGURE #5

Sample #5 Family Composition

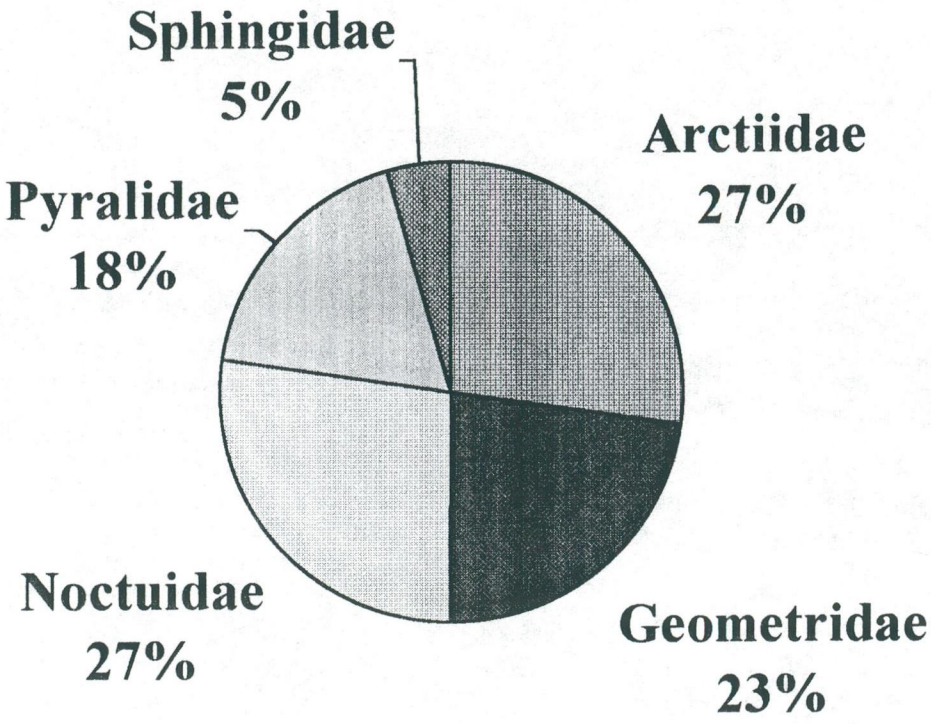

FIGURE #6

Sample #6 Family Composition

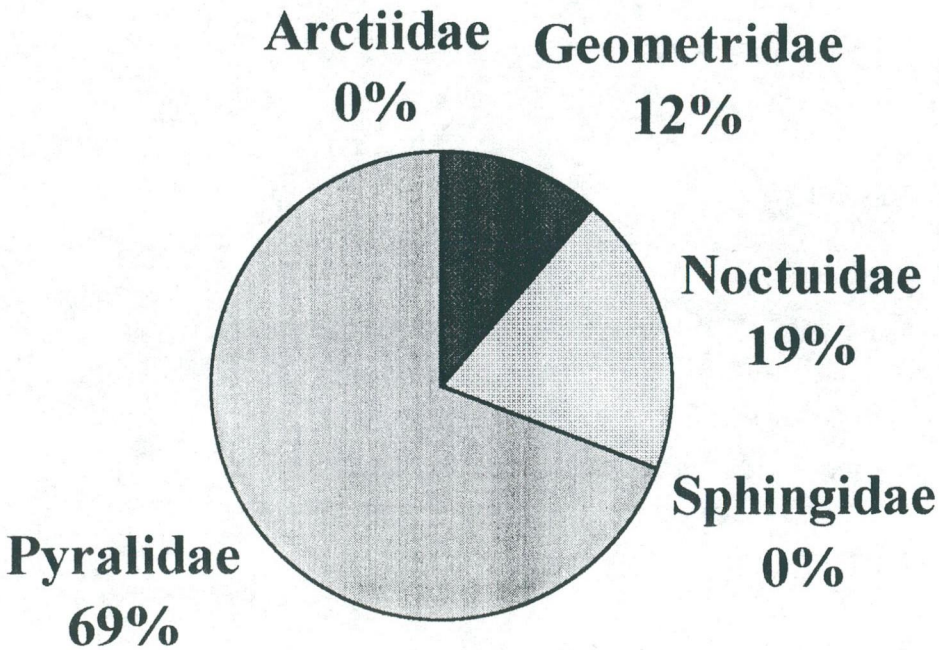

FIGURE #7

Total Family Composition