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Survey of trees for examination of habitat preference in tree-dwelling insects on Dominica

Dominica Study Abroad 2014

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Abstract

A survey of tree-dwelling insects along Massacre trail on Dominica was performed with intent to discover habitat preferences among Cocoa, Palm, and *Sloanea* trees. A beating sheet and Lindgren funnels were used to sample branch- and trunk-dwelling insects. An abundance of Formicidae and Psocoptera was found regardless of tree type. In addition, a possible aversion to Cocoa in Phoridae was found, as well as a possible attraction to Palm in Formicids. No distinct host tree preference was found among other insects.

Keywords: Dominica, Cocoa, *Theobroma cacao*, Palm, Arecaceae, *Sloanea*, Formicidae, Psocoptera, *Wasmania*

Introduction

The island nation Dominica is notable for its broad and well-preserved biological diversity. The island has different kinds of forests and landscapes at various elevations and presents many habitats available for study. In 2001, Alex Vilaythong performed a study of beetle diversity at various canopy heights and demonstrated diversity even in the same forested area based on tree elevation (Vilaythong, 2001). In 2002, a group experiment examined the richness of beetle diversity at three different locations and found that both ground and aerial Malaise traps showed a similar breadth of diversity (Marable, et al, 2002). The following experiment aims to examine whether certain tree-dwelling insects prefer certain tree species or even nest or frequent only one species of tree, by surveying the insects present at certain trees in the same geographical area. It was hypothesized that tree-dwelling insects would show a significant preference for certain tree species in the same area.

Materials and Methods

A relatively small area with a variety of tree species present was desired for the experiment. The location selected was a clearing on Massacre Trail near Springfield, at 15.346165˚N, 61.373328˚W and 300 meters above sea level. Trees chosen for sampling included specimens of palm (family Arecaceae), *Sloanea*, and cocoa (*Theobroma cacao*). Three Lindgren funnels containing propylene glycol were hung from these trees, one each, and the propylene glycol was changed out every few days. Collected insects were stored in glass jars, then identified in the laboratory using a dissecting microscope. In addition, trees of the selected types were chosen advantageously each day to have their branches beaten with a long stick. Over the course of the experiment, numerous different individuals of each tree type were sampled. Insects which fell from the branches landed on a white beating sheet and were collected in an aspirator, then stored in labeled plastic kill jars containing ethyl acetate and Kimwipe chemical

wipes. The specimens were stored in plastic bags divided by date of collection and type of tree, then identified in the laboratory using a dissecting microscope.

Results

Insects found from beating tree branches			
	Cocoa	Palm	*Sloanea*
29 May	Formicidae, Microlepidoptera, Psocoptera, Gryllidae	Formicidae	Formicidae
30 May	Formicidae, Psocoptera, Microcoryphia	Formicidae	Formicidae, Psocoptera
31 May	None	Formicidae, Psocoptera	Formicidae
1 Jun	Formicidae, Psocoptera, Gryllidae	Formicidae	Formicidae, Entomobryidae
2 Jun	Formicidae, Microlepidoptera	Formicidae, Psocoptera, Entomobryidae	Formicidae, Miridae
3 Jun	Formicidae, Entomobryidae, Gryllidae	Formicidae	Formicidae, Entomobryidae
4 Jun	Formicidae, Psocoptera	Formicidae, Psocoptera, Entomobryidae	Psocoptera, Gryllidae

Table 1: Insects found in tree branches by date.

Number of Insects present in Lindgren funnels				
	29 May to 1 June		2 June to 6 June	
Cocoa	Cecidomyzidae	1	Curculionidae	3
	Formicidae	3	Formicidae	2
	Miridae	1	Phoridae	1
	Psocoptera	1	Psocoptera	1
	Tenebrionidae	1	Tenebrionidae	1
Palm	Culicidae	2	Curculionidae	1
	Curculionidae	1	Elateridae	1
	Formicidae	4	Formicidae	22
	Gryllidae	1	Phoridae	4
	Phoridae	3	Psocoptera	2
	Tenebrionidae	1		
Sloanea	Cecidomyzidae	1	Culicidae	9
	Curculionidae	1	Curculionidae	1
	Formicidae	3	Elateridae	2
	Miridae	1	Formicidae	4
	Phoridae	4	Miridae	1
	Psocoptera	2	Phoridae	7
	Scelionidae	1	Psocoptera	10

Table 2: Insect families found in Lindgren funnels by collection dates.

Insects on Cocoa									
	29-May	30-May	31-May	1-Jun	2-Jun	3-Jun	4-Jun	Funnel 1	Funnel 2
Cecidomyiidae								Yes	
Culicidae									
Curculionidae									Yes
Elateridae									
Entomobryidae						Yes			
Formicidae	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Gryllidae	Yes			Yes		Yes			
Microcoryphia		Yes							
Microlepidoptera	Yes				Yes				
Miridae								Yes	
Phoridae									Yes
Psocoptera	Yes	Yes		Yes			Yes	Yes	Yes
Scelionidae									
Tenebrionidae								Yes	Yes

Table 3: Insect families found on all Cocoa trees. Includes higher-level taxa Microcoryphia, Microlepidoptera, and Psocoptera.

Insects on Palm									
	29-May	30-May	31-May	1-Jun	2-Jun	3-Jun	4-Jun	Funnel 1	Funnel 2
Cecidomyiidae									
Culicidae								Yes	
Curculionidae								Yes	Yes
Elateridae									Yes
Entomobryidae					Yes		Yes		
Formicidae	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gryllidae								Yes	
Microcoryphia									
Microlepidoptera									
Miridae									
Phoridae								Yes	Yes
Psocoptera			Yes		Yes		Yes		
Scelionidae									
Tenebrionidae								Yes	

Table 4: Insect families found on all Palm trees. Includes higher-level taxa Microcoryphia, Microlepidoptera, and Psocoptera.

Insects on *Sloanea*									
	29-May	30-May	31-May	1-Jun	2-Jun	3-Jun	4-Jun	Funnel 1	Funnel 2
Cecidomyiidae								Yes	
Culicidae									Yes
Curculionidae								Yes	Yes
Elateridae									Yes
Entomobryidae				Yes		Yes			
Formicidae	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Gryllidae							Yes		
Microcoryphia									
Microlepidoptera									
Miridae					Yes			Yes	Yes
Phoridae								Yes	Yes
Psocoptera		Yes				Yes	Yes	Yes	Yes
Scelionidae								Yes	
Tenebrionidae									

Table 5: Insect families found on all *Sloanea* trees. Includes higher-level taxa Microcoryphia, Microlepidoptera, and Psocoptera.

The vast majority of the Formicids present in each collection were of the genus *Wasmania* (Woolley, 2004).

Discussion

The two surveying methods collected different insects, as the beating collected insects from tree branches, and the Lindgren funnels collected insects seeking tree bark or in flight. Based on the survey, Cocoa had a prevalence of Formicidae and Psocoptera. Palm had a prevalence of Formicidae, Psocoptera, and Phoridae. *Sloanea* had a prevalence of Formicidae, Psocoptera, and Phoridae. In addition, Palm had a large number of Formicidae in the second Lindgren funnel survey, and *Sloanea* hard a large number of Culicidae, Phoridae, and Psocoptera in the second Lindgren funnel survey.

Overall, the survey results suggested that Phorids avoid Cocoa compared to other trees, and Palm was more favorable to Formicids. The most common tree-dwelling insects found were Formicidae and Psocoptera, and most other insects did not appear abundantly enough to suggest any major pattern or preference. The appearance of such specimens as Cecidomyzidae, Elateridae, and Scelionidae suggests

that they appear randomly with no regard for the host tree species. The abundance of Gryllidae and Entomobryidae is likely coincidental—during the beating surveying, crickets were observed leaping onto the white beating sheet, then off again. Entomobryids were observed leaping onto and off of the sheet, as well, and Collembolans are known for subsisting in leaf litter rather than the high branches of trees (Triplehorn and Johnson, 2005). It is possible that their appearance in the beating sheet survey is a product of their climbing onto the sheet from the ground nearby, not falling from the branches. The lone Microcoryphian found was an immature and could not be positively identified. Beyond that, the survey showed little habitat preference and mainly demonstrated the prevalence of Formicidae and Psocoptera, especially ants of the genus *Wasmania*.

Numerous sources of error might have arisen during surveying. The trees were selectively chosen from around the fig tree clearing during surveying, but the varying sizes meant that some trees were easier to reach or strike than others. This might have affected the insects that could be collected, as no element of the survey involved climbing trees. In denser areas of the survey area, it was possible that shaking trees might have dislodged insects from trees adjacent to the one being beaten, but care was taken to avoid such cross-contamination. The trees chosen were generally less than twenty feet tall and thus not as mature as some other options available. The length of time the Lindgren funnels were available differed between surveying periods, which might explain the greater number of insects collected during the period of 2 June to 6 June. Some trees also might not have been as visible as others, as the surveying area was not standardized. Though care was taken, some specimens were damaged and rendered unusable between collection and identification in the laboratory. Meanwhile, the experiment might be expanded in the future with broader surveying methods, different tree types, a different location with the same conditions, or more and repeated use of Lindgren funnels.

Conclusion

The survey failed to discover any major habitat preference in tree-dwelling insects of Dominica, but it affirmed the prevalence of Formicids and Psocopterans on the trees. Through the dislodging of branch-dwelling insects and use of Lindgren funnels, the survey provided a look at the diversity of tree-dwelling insects in Dominica.

Acknowledgements

For their contributions to the survey, Devin Beach, Dr. Thomas Lacher, and Dr. Jim Woolley are deserving of gratitude. Devin Beach assisted with acquisition and handling of supplies, Dr. Lacher assisted in identifying trees for surveying, and Dr. Woolley assisted in identifying collected insects.

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