Systematics

A Survey of Leafhoppers (Hemiptera: Cicadellidae) on Dominica, WI

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Abstract

Leafhoppers (Hemiptera:Cicadellidae) are common plant-feeding insects. The leafhopper fauna of Dominica, West Indies, has not been surveyed. This paper is a starting point at describing Dominica's leafhopper community. Leafhoppers were collected daily from 23 May 2006 to 12 June 2006 using a variety of techniques and then sorted into morphogroups. These were then identified to lowest possible taxonomic unit. A total of 133 leafhoppers were collected in 20 morphogroups (3 leafhoppers are not included in this study). There were 7 subfamilies identified and the majority of the insects could also be assigned to a tribe. In the future I hope to identify all specimens to species and incorporate leafhoppers collected in malaise traps which were also run during this time period.

Keywords Cicadellidae, Dominica, West Indies, Leafhoppers

Leafhoppers (Hemiptera: Cicadellidae) are small phytophogus insects found worldwide in nearly all possible habitat types. Although there have been some studies on particular leafhopper groups such as Gyponinae on the island of Dominica in the past (Freytag 1982) little work on this family has been attempted in this country.

This study identifies the leafhoppers found on the island particularly around the Archbold Tropical Research and Education Center (ATREC) near Roseau. Other areas were sampled using passive techniques, but these data will be presented in a separate paper.

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Leafhoppers are in the suborder Auchenorryncha and are closely related to other hoppers such as Membracids, Cercopids, and Cicadas. All are piercing sucking insects that feed on plant sap. Some leafhoppers are of economic importance as vectors of plant disease. Leafhoppers are separated from other Hemiptera by the location of the beak to head attachment, not having antennae separated from the front of the head by a vertical carina, the absence of an expanded pronotum, and the presence of spines on the tibias.

Materials and Methods

Insects were collected using a variety of methods including light sheets, hand collecting, vegetation sweeping, pan traps and malaise trap sampling. Insects collected with pan traps and malaise traps will not be discussed in this paper.

I ran a 9'x9' white sheet suspended vertically from a net pole

frame with a 5'x8' ground cloth. The vertical sheet was lighted by 2, 450 watt Mercury Vapor lights (one on each side) run off of the buildings 220 volt AC outlets. The sheet was set up in two different locations on the Archbold Tropical Research and Education Center (ATREC). The first location was used from 24 May 2006 to 27 May 2006 and again from 31 May 2006 – 11 June 2006. This location was an east to west grassy slope with good exposure to the south. It was near thick vegetation surrounded by many tropical trees including star fruit (*Averrhoa carambola*) and royal palm (*Roystonea* sp.). The second location was used from 28 May 2006- 29 May 2006. This location was on a flat terraced area and also faced east west with good exposure to the west. It was in a relatively open area with little vegetation in the immediate vicinity. The lights were turned on between 1850 hours and 1945 hours and left on until about 2330. Insects were collected into vials charged with ethyl acetate. These vials were divided into groups- a heavily charged one for beetles and large insects, a lightly charged one for small flies and parasitods, and a third lightly charged one for Hempitera/Homoptera. A Homoptera catcher was a modified 50cc vial that had a 11/16 hole drilled through the cap and was fitted with an elbowed 15cc vial with a screw top. Insects jumped in the narrow part, hit the elbow and fell into the large vial. This method works well for catching small jumping insects.

Insects were collected by hand when they were observed perched or feeding on plants. This method was used primarily on hikes and only resulted in a few specimens.

The third method was sweeping vegetation. This was done primarily with a bioquip 18 inch aerial net (BioQuip product 7328NA). The net was swung through vegetation and insects accumulated in the net bag. After sweeping for period of time insects were removed and killed in ethyl acetate. A modified method was used to sweep trees where instead of sweeping side to side an upswing was used.

After insects were killed they were pointed, labeled, and the sorted into morphogroups based on overall appearance, ocelli placement, vertex shape, and macrosetal formulas. These morpogroups were then identified to the lowest possible taxonomic unit using various keys (Dietrich 2005, Kramer, 1964, Kramer 1965, Tripleorn 2005).

Results

A total of 133 cicadellids were collected. Of these 3 were left unidentified due to poor specimen quality and will not be discussed further. The rest divided into 20 morphogroups which were identified to subfamily, and in most cases tribe. Some morphogroups were identified to genus. There were 7 subfamilies collected with the most morphogroups in the subfamily Cicadellinae, although Issinae, Idiocerinae, Megophthalminae, Coelidilnae, Typhloybinae, and Neobalinae (possible) were also collected. Series were collected when possible and numbers of individuals are reported here in an attempt to show relative abundance.

Issinae

The subfamily Issinae can be separated by the presence of a distally trunate tarsomere I on the hindleg, ocelli on the crown, having an inner apical cell

which is short, a proepisternum conealed by the gena, and not having lateral frontal sutures that extend to the ocelli (Dietrich 2005)

Issini

This tribe can be identified based on the presence of a confluent R4+5 and M1+2 near the apex of the hind wing, having an evenly convex head and crown (Dietrich 2005).

Stragania

This genus can be identified based on the membranous appearance of the inner apical cell along with the presence of an evanescent vein separating the innermost apical cell from the appendix distally (Kramer 1963)

Issinae was divided into 2 morphogroups, both of which were placed in the tribe Issini. One group was identified as the genus *Stragaina*.

Idiocerinae

The subfamily Idiocerinae has a distally truncate tarsomere I on the hind leg, and ocelli not visible dorsally. The forewing is glabrous and the pronotum does not extend to before the eyes and if the forewings have a r-m1 crossvein it is short, oblique, and connected between R1 and R2+3 (Dietrich 2005)

There were 3 Idioerinae morphogroups none of which were identified any further due to a lack of keys. These were common leafhoppers collected at ATREC in large numbers on some nights.

Megophthalminae

This subfamily is separated from Idiocerinae by the forewing which is granulose (Dietrich 2006).

Agallini

This tribe can be recognized by the fact that the face and pronotum are not coarsely punctuate, along with having non reticulated forewing veination (Dietrich 2006).

Agallia

This genus is characterized by having a distance between ocelli that is greater than the distance between the ocelli and eye. The crown is evenly curved behind the eye and the pronotum is not pitted, punctured or rugulose. Geography is also helpful since a number of genera are restricted to certain islands (Kramer 1964)

The subfamily Megophthalminae was also collected. The Agallini was recently demoted to tribal level by Dietrich (2006). There were 2 morphogroups, both of which are in the tribe and are thought to be the genus *Agallia* although genitalia work will be required for this to be conclusive.

Coelidinae

This subfamily is similar to Issinae except that the inner apical cell is elongate. The distal segment of the rostrum in this subfamily is twice as long as the penultimate segment. The antennal base is adjacent to the anteroventral corner of the eye and the ledge is poorly defined (Dietrich 2006).

Teruliini

This tribe of Coelidinae is recognized by the fact that it has fully developed wings, the pronotum is laterally unicarinate and lacks keels on the crown which is level with the eyes. The frontoclypeus has a complete median longitudinal carina (Dietrich 2006)

A single representative of the subfamily Coelidinae was collected, in Teruliini.

Typhlocybinae

This subfamily is easily recognized by the acuminate hind tarsomere I. The forewing also lacks closed anteapical cells (Dietrich 2006).

Alebrini

This tribe of Typhlocybinae is recognized by the presence of an forewing appendix (Dietrich 2006).

Dikraneurini

This tribe of Typhlocybinae is recognized by the absence of an appendix on the forewing, and the presence of a submarginal vein around the wing apex which is continuous with the R2+3 vein (Dietrich 2006).

The subfamily Typhlocybinae had 4 morphogroups, 2 of which were able to be assigned to tribe. The first tribe was Dikraneurini, which was the most commonly collected Typhlocybine with 7 individuals. There was also a single Alebrini collected.

Cicadellinae

This subfamily is similar to Coelidinae but the rostrum's distal segment is about the same length as the penultimate segment. The macrosetal formula of the hind femur is 2+1 or 2+1+1. The r-m1 vein present and the hind wing submarginal vein is separated from the apical margin (Dietrich 2006)

Cicadellini

This tribe can be sepearted out by the lack of a prominent antennal ledge in dorsal view. The hind femur also will usually reach the margin of the prothorax when bent up (Dietrich 2006)

Hortensia

This genus is distinctive due to the patterning on the head along with the vertex shape.

Tylozygus

This genus recognizable by its distinctive pattern and the fact that the head lacks a carina between the crown and the face along with the forewing only having 3 anteapical cells with the inner 2 open basally (Young 1977).

Sibovia

This genus can be identified based on the longitudinal stripes covering the anterior dorsal surface along with non pitted forewings (Young 1977)

The subfamily with the most morphogroups collected was Cicadellinae. There were 7 morphogroups all in the same tribe, Cicadellini. Of these, 3 could be placed in genera- *Hortensia*, *Sibovia*, and *Tylozygus*.

Neobalinae

This subfamily is similar to Issiniae except that the front tibia has a distinct longitudinal row of accessory setae adjacent to row AV and the male subgenital plate is fully exposed (Dietrich 2005).

The last subfamily was Neobalinae, of which a single specimen was collected. This identification is questionable because while it keys out to this subfamily using Dietrich (2005) the description provided in Dietrich (2006) is not constant with the morphological

features on the insect. Dietrich (2005) states that ocelli are on the crown while Dietrich (2006) states that they are on the margin of the vertex. The specimen has ocelli on the crown.

Discussion

Most of the morphogroups were collected at light, as shown in Table 1. However, there were 2 morphogroups that were only collected sweeping in the elfin forest. These 2 morphogroups were also the only ones not collected on ATREC. This is probably due to the fact that most active collecting centered around light collecting at the ATREC. The elfin forest was a completely different habitat type compared to the area around ATREC, so it would be expected that there would be some morphogroups collected only there.

Most leafhoppers were in the subfamily Cicadellinae, which is expected as this subfamily is one of the largest. What was not expected it the lack of Deltocephalinae which was not collected at all. This subfamily is the largest in the New World so the fact that it was not collected is suspicious. Also of interest was the relatively low diversity of Typhlocybinae which is one of the largest subfamilies of leafhopper. This could be due to collecting method bias which will hopefully be reduced with the addition of specimens collected using passive techniques.

Conclusion

There is high leafhopper diversity on the island of Dominica. Although collecting concentrated on a limited number of areas for 3 weeks there were still 20 morphogroups collected in 7 subfamilies. There appears to be a difference in the leafhoppers collected in the elfin forest when compared to those collected at the ATREC and other areas around the island. This study if far from complete as there are still malaise traps and other collecting events that have not yet been incorporated. I expect this will cause a jump in the number of morphogroups found since these malaise traps were in areas which were lightly collected if they were collected at all for this survey. In the future I plan on working though the malaise traps and other passive collecting techniques employed in this study. I also hope to identify the leafhoppers to lower taxonomic levels with the goal of species level identifications.

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subfamily	morphogrou	tribe	genus	number (total)	number (Individual)	hand collect (disturbed)	MV 1 (disturbed)	MV 2 (disturbed)	swept Syndicate (primary rainforest)	swept Boeri (elfin forest)
Issinae				6						
	1	Issini			4	1		3		
	2	Issini	Stragania		2		2			
Idiocerinae				46						
	1				41		41			
	2				2		2			
	3				3		3			
gophthalminae				8						
	1	Agalliini	Agallia?		6		2		4	
	2	Agalliini	Agallia?		2					2
Coelidilnae				1						
	1	Teruliini			1		1			
Typhloybinae				14						
	1				1		1			
	2				5		1	4		
	3	Dikraneurini			7		7			
	4	Alebrini			1		1			
Cicadellinae				54						
	1	Cicadellini			5		5			
	2	Cicadellini			3		3			
	3	Cicadellini			2					2
	4	Cicadellini			1		1			
	5	Cicadellini	Hortensia		27		16	1	2	8
	6	Cicadellini	Sibovia		7		2		1	4
	7	Cicadellini	Tylozygus		9		7		2	
Neobalinae										
	1			1			1			

Table 1 Leafhoppers collected by subfamily and tribe.

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