

A Survey of Collembola on Dominica

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Abstract

The many different natural habitats on Dominica were used to take a survey of Collembola present on the island. They were collected with aspirators, sifters with Berlese funnels from leaf litter, malaise traps, and yellow pan traps. They were identified down to family and subfamily. It was found that Entomobryidae (Entomobryinae, Cyphoderinae, Paronellinae), Isotomidae, and Hypogastruridae were the main families and subfamilies found in Dominica with different morphospecies within each of those families.

Key words: Collembola, Berlese funnel, Entomobryidae, Entomobryinae, Cyphoderinae, Paronellinae, Isotomidae, Hypogastruridae, Dominica

Introduction

Dominica is a small island in the Caribbean Sea located near Martinique and Guadeloupe in the Lesser Antilles. It is covered in an abundance of diverse forests and untouched natural habitats (Central Intelligence Agency, 2014). Collembola (springtails) are small arthropods, around 1 millimeter long, that typically live in soil where there is an abundance of organic material. Collembola are found worldwide, but have not been intensively studied on Dominica. The most common diet of Collembola consists of fungus or decaying organic materials, although some may feed on algae, lichens, or other Collembola. They play an important role of the decomposition stages of the life cycle and soil respiration (Hopkin, 2014). A distinguishing feature among most Collembola is the furcula. This structure is a small appendage on the ventral side of the abdomen that acts as a lever to propel the arthropod into the air. This is where the common name of “springtail” comes from. The purpose of this project was to survey the different families and subfamilies of Collembola found on Dominica by use of morphological differences.

Materials and Methods

Soil and leaf litter samples were collected from various locations around Dominica. This was done with the use of a litter sifter to separate larger pieces of organic material and arthropods from the soil being obtained. The main collecting device used in this project was the Berlese funnel. Five Berlese funnels were set up with 40 watt light bulbs. Attached to the bottom of the funnels were either bags or glass containers filled with 95% alcohol. The sifted litter samples were then placed into the top of the Berlese funnel. The light was attached into the top of the funnel and was left until the leaf litter dried to let the arthropods crawl down into the alcohol.

Another method of collecting was to place the sifted litter into a white tray and search for Collembola by eye. An aspirator was used to collect individual Collembola from the soil. A different method of collecting arthropods was by use of yellow pan traps. These pans were filled with water and a few drops of Kodak Photo Flo to break the surface tension.

A final method of collecting Collembola was using ground malaise traps. After collection, the Collembola were separated from the other arthropods using a sorting tray and soft forceps under a dissecting microscope. The Collembola were then sorted by broad morphological features. The best specimens from each of these groups were cleared overnight in Nesbitt's solution in a spot or well plate. The next day these specimens were mounted on cleaned frosted-edge slides using pipettes and soft forceps in Hoyer's solution. The slides were allowed to dry for at least ten hours and were then identified to family under a compound microscope using Christiansen and Bellinger (1980).

Results

The different subfamilies of the family Entomobryidae can be located in Table 1.

Family	Subfamilies
Entomobryidae	Entomobryinae, Cyphoderinae, Paronellinae

Table 1. Subfamilies of Entomobryidae

The families found in each habitat and details of collection can be referenced in Table 2. More detailed information about collection and GPS coordinates are located in the appendix.

Reference Table 3 for the number of different morphospecies per family and each of their habitats.

Collection Date	Habitat	Location	Collection Method	Elevation	Families/Subfamilies Found
5/22/2014	Early-Mid Successional Secondary Forest	Archbold Tropical Research and Education Centre	Aspirator and Sifter/Berlese Funnel	356 m	Isotomidae, Entomobryinae, Cyphoderinae
5/23/2014	Mature Secondary Forest	ATREC, Massacre Trail	Aspirator, Sifter/Berlese Funnel, and YPT	300 m	Isotomidae, Hypogastruridae, Entomobryinae, Cyphoderinae
5/23/2014	Mature Secondary Forest	ATREC, Mount Joy Trail	Aspirator, Sifter/Berlese Funnel, and Malaise Trap	471 m	Hypogastruridae, Cyphoderinae, Paronellinae, Entomobryinae
5/24/2014	Open Grassland	ATREC	YPT	356 m	Entomobryinae, Paronellinae
5/24/2014	Montane Rainforest	Morne Trois Pitons National Park, Middleham Falls Trail	Aspirator and Sifter/Berlese Funnel	2293 ft	Hypogastruridae, Entomobryinae, Cyphoderinae
5/26/2014	Tropical Dry Forest	Cabrits National Park, Commandants Headquarters	Aspirator and Sifter/Berlese Funnel	74 m	Isotomidae, Entomobryinae, Cyphoderinae
5/26/2014	Primary Rainforest	Morne Diablotin National Park, Syndicate Trail	Aspirator and Sifter/Berlese Funnel	1840 ft	Entomobryinae, Paronellinae
6/2/2014	Elfin Forest	Morne Trois Pitons National Park, Boeri Lake	Aspirator	690 m	Entomobryinae, Cyphoderinae

Table 2. Collection details and Families found per habitat.

Habitat	Entomobryinae	Cyphoderinae	Paronellinae	Isotomidae	Hypogastruridae	Totals
Early-Mid Successional Secondary Forest	1	1	0	1	0	3
Mature Secondary Forest	16	5	2	1	4	28
Open Grassland	6	0	1	0	0	7
Montane Rainforest	2	1	0	0	1	4
Tropical Dry Forest	3	1	0	1	0	5
Primary Rainforest	3	0	2	0	0	5
Elfin Forest	3	3	0	0	0	6

Table 3. Number of morphospecies per family in each habitat

Discussion

The main objective of data collection was to identify families and subfamilies within different habitats. The different habitats were chosen due to different kinds of forests, elevation, and weather conditions. Litter was selected from the deepest tree buttresses that appeared to have the largest buildup of leaf litter. This allowed for the highest amount of decay and the most promising sample of Collembola.

In the elfin forest where tree buttresses were almost nonexistent, litter was collected from the forest floor covered with a large root system. The aspirator method of collection seemed to give the best specimens. The yellow pan traps gave the largest volume of specimens. The earlier collections around the field station and the surrounding trails yielded more Isotomidae while the later collections from all around Dominica yielded primarily Entomobryidae. Morphospecies refers to Collembola in the same family that appear to be different species based on morphological differences. All specimens of Isotomidae seemed to be the same morphospecies, while the other families all contained many different morphospecies. Entomobryinae contained the most morphospecies of any of the families found and was found in every habitat. Hypogastruridae was found in the least quantity of any family. It can be concluded that the

families and subfamilies of Collembola that can be found on Dominica are, but not limited to, Entomobryidae (Entomobryinae, Cyphoderinae, Paronellinae), Isotomidae, and Hypogastruridae.

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Sample #	Method	Date	Time litter/ aspirator collected	Location	Coordinates	Elevation	Notes
Trial-0	Sifter	5/22/2014	6:00 PM	ATREC	15.346511°N 61.368933°W	356 m	Old funnels seem to work better than the new funnels. Cheesecloth seems to help.
Trial-0	Sifter	5/22/2014	6:00 PM	Entrance to forest going to creek from field station			
1	Aspirator	5/23/2014	10:30 AM	ATREC	15.346165°N 61.373328° W	300 m	Collected in deep tree buttresses of the fig tree. Rainy and humid weather. Moist litter and soil collected. Shaded, cool area. Mature secondary forest.
1	Sifter	5/23/2014	10:30 AM	Massacre Trail, Fig Tree			
2	Aspirator	5/23/2014	3:40 PM	Mount Joy Trail	15.351464° N 61,363057° W	471 m	Collected under tree buttresses and in a trench like area. Mature secondary forest with some elements of primary forest. Top or ridge of mount joy trail. Sunny weather, slightly hotter than when sample 1 collected. Less humid as well. Shaded, moist areas. Leaf litter and soil collected again.
2	Sifter	5/23/2014	3:40 PM	Mount Joy Trail			
3	Aspirator	5/24/2014	3:00 PM	Middleham Falls Trail	15°21'49"N 61°20'50"W	2293 ft	Montane Rainforest, Collected in tree buttresses, very moist litter, humid, cloudy
3	Sifter	5/24/2014	3:00 PM	Middleham Falls Trail			
4	Aspirator	5/26/2014	1:15 PM	Commandants headquarters	15.586037° N 61.472143°W	74 m	Caribbean tropical dry forest, sunny, hot, dry, dry litter, tree buttresses
4	Sifter	5/26/2014		Commandants headquarters			
5	Aspirator	5/26/2014	5:00 PM	Syndicate Trail	15°31'28.96"N 61°25'9.83"W	1840 ft	Primary Rainforest, moist litter, few specimens found in aspirator, cool temp
5	Sifter	5/26/2014		Syndicate Trail			
6	Malaise	5/23-5/28		Mount Joy Trail	15°20'57"N 61°21'55"W	471 m	
7	Malaise	5/23-5/28		Top Mount Joy Trail	15°21'4"N 61°21'47"W	509 m	
8	YPT	5/24/2014		Open Grassland	15.346511°N 61.368933°W	356 m	
9	YPT	5/24/2014		Massacre Trail, Fig Tree	15.346165°N 61.373328° W	300 m	
10	Aspirator	6/2/2014	12:30 PM	Boeri Lake	15°N 21.099 61°W 19.151	690 m	Elfin Forest. Wet ground litter, taken from general forest floor in root beds. Cloudy. Chill air.