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A Survey of Scarabaeoidea on Dominica

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Abstract: *A survey of the Scarabaeoids (Coleoptera) of Dominica was performed in May and June of 2014 to examine its diversity as of 2014. Various traps were deployed to collect scarabs and discover habitat preference. Melolonthines were found more at the highest sampled elevation. Rutelines were found only at high elevation. Aphodiines were not found to favor either high or low altitude. Dynastines were found evenly at high- and low-altitude and showed a greater attraction to light. Passalids were comparatively rare and were found attracted to light at low elevation. Results indicated that scarabs in general prefer flight low to the ground.*

Key Words: Coleoptera, Scarabaeoidea, Melolonthinae, Rutelinae, Aphodiinae, Dynastinae, Passalidae, Dominica

Introduction: The Commonwealth of Dominica, of the Lesser Antilles islands, is host to a wide variety of insects including members of order Coleoptera (Cartwright et al.1978). Coleoptera is the largest order in Insecta, with more than a quarter million described species, and accounts for 40% of known Hexapods (Triplehorn and Johnson 2005). On Dominica, 269 genera, 42 families, and 361 species of Coleoptera have been identified, 62 species of which are endemic to the island (Peck, 2006). One superfamily of Coleoptera is Scarabaeoidea, or Scarabs. Included in Scarabaeoidea are the families Passalidae, Ceratocanthidae, and the highly diverse Scarabaeidae which includes the subfamilies Dynastinae, Melolonthinae, Rutelinae, and Aphodiinae (Cartwright et al.1978). Scarabaeoidea's presence in Dominica has been well-examined and documented with regards to diversity and distribution (Peck, 2006). A survey of the Scarab populations of Dominica was performed with intent to examine the diversity of Scarabaeoidea as of 2014.

Members of Coleoptera undergo complete metamorphosis. Most Scarab beetles tend to be robust insects with convex bodies and coloration varying from brown to black. The most common feature is the lamellate antennae, which in Ceratocanthidae and Scarabaeidae can be open and shut (Cartwright et al.1978). Scarabs are commonly found in moist, rotting wood or underground, and they generally feed on rotting organic material such as dung, carrion, and plant matter.

Materials and Methods: For collection of Scarabs, ground- and aerial-based Malaise traps were set at various altitudes and types of rainforest. Two ground traps and one aerial trap were set at high-elevation

mature secondary rainforest (one ground along the Mount Joy trail, the other two at the top), and one ground trap and one aerial were set at low elevation in the same area. One ground trap was set at low elevation rainforest (Soufriere Hot Springs). The ground traps were designed to direct flying insects into 95% alcohol bottles and positioned in sunny areas perpendicular to the trail or a forest edge. Plastic dishes filled with water and Kodak Photo-Flow were also set at the base of each ground trap to catch downward-flying insects. The aerial traps were designed to direct insects either up or down into bottles of the same. After five days of collection, specimens were extracted from Malaise samples, sorted, and identified in a laboratory.

During collection, we received assistance and guidance from Coleopterists Dr. Brett Ratcliffe (University of Nebraska) and Dr. Ronald Cave (University of Florida), who set up light sheets and demonstrated common collection techniques. Light sheets were used in low-elevation secondary rainforest (Springfield Field Station) to attract insects including Scarabs. Scarabs collected in this way were placed in jars loaded with ethyl acetate, then sorted and identified in the laboratory.

Results: The aerial Bee House trap at Mount Joy did not return Scarabs of any subfamily. Table 1 shows more Scarabs present at high elevations than low. In particular, the Malaise trap sample on top of Mount Joy contained 40 individuals from subfamily Melolonthinae

Significantly more Melolonthines were captured at higher than lower elevation, 42 at higher elevation compared to 2 at lower elevation. Few Rutelines were captured at higher elevation, 4 compared to 0 at lower elevation. Aphodiines were more plentiful at higher elevation, 10 compared to 4 at lower elevation. Dynastines were more plentiful at higher elevation, 13 compared to 9 at lower elevation. Passalids were the rarest of collected Scarabs, with one specimen at the lower elevation light sheet.

Mt. Joy – Top of Trail/Ground 509 m		Samples Arranged From Highest to Lowest Elevation
Melolonthinae	40	
Rutelinae	2	
Aphodiinae	4	
Dynastinae	7	
Mt. Joy – Top of Trail/Aerial 509 m		
Melolonthinae	1	
Mt. Joy – Middle of Trail/Ground 460 m		
Melolonthinae	1	
Rutelinae	2	
Aphodiinae	6	
Dynastinae	6	
-	-	
Bee House – Ground Trap 390 m		
Melolonthinae	1	
Dynastinae	3	
Springfield Field Station – Light Trap 360 m		
Passalidae	1	
Dynastinae	6	
Soufriere Hot Springs - Low/Ground Trap 125 m		
Melolonthinae	1	
Aphodiinae	4	

Table 1: Beetle distribution found in malaise samples arranged from highest to lowest elevations

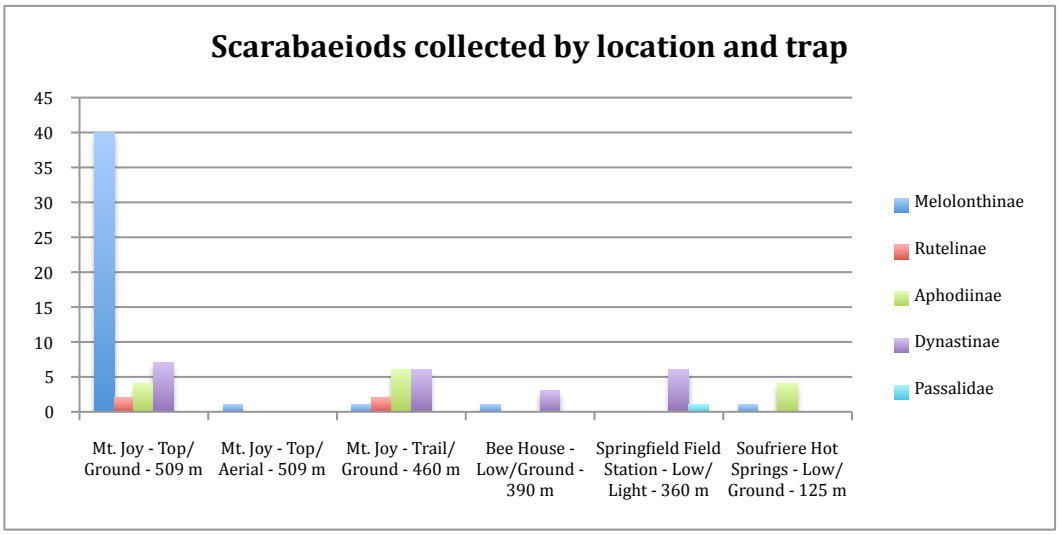

Figure 1: Visual presentation of beetle distribution arranged from highest (on the left) to lowest (on the right) elevation

Discussion: The number of scarabs collected at varying altitudes suggested that most Scarabs preferred or were otherwise more prevalent at higher elevation but flew low to the ground. For instance, Melolonthines, commonly known as June beetles, were more common at higher elevations by a vast margin and were mostly found in the highest-(509 meters) ground Malaise trap atop the Mount Joy trail. The ground traps, set at approximately six feet above ground, caught more scarabs by far than the aerial traps, hung fifteen to twenty feet off the ground. Rutelines were only found at high elevation, with all specimens found in ground-based Malaise traps. This is because Rutelines' lifestyle depends on ground debris such as decaying arboreal matter, and they are likely to be found low to the ground searching for food or potential oviposition sites. Likewise, Aphodiines were not found to favor any altitude, but were found in ground-based traps suggesting low flight as well. Dynastines were the second most abundant subfamily, and they were found evenly at high and low elevation. However, their high prevalence in the light traps suggests a comparatively high attraction to light, as more Dynastines were found in a single night of light trap collection than five days of collection at any given Malaise trap. Passalids were found much less commonly than any other group, and the one specimen collected was found in light at the Springfield Field Station. The collection suggests that passalids appear in flight less than other scarabs, prefer low-elevation areas, and are attracted to light. The collection results suggest that scarabs are in general low-fliers, but that various subfamilies prefer different habitats.

Numerous sources of error may have arisen throughout the experiment and altered expected results. The forest of Mount Joy was the most mature area sampled, which likely affected the presence of insects. The aerial trap on top of Mount Joy likely failed to collect many insects because during collection, one of the two bottles fell and spilled its contents. Any beetles that might have flown inside were lost, and the mistake was only found at the end of the collection period. Beetles tend to fly in a downward direction when their flight is intercepted, so the loss of the lower bottle likely

meant the loss of an appreciable number of beetles, thus skewing the results toward a preference for ground-based traps. The total number of Malaise traps was skewed in favor of ground flight as well—only two aerial traps were deployed as opposed to four ground traps. It is possible that the correct deployment of more aerial traps would return more balanced and accurate scarab population results. During the collection period, late May and early June, the local weather was unusually dry to such a degree that scarab activity might have been influenced. Some scarabs have shown a preference for areas of heavy rainfall or wet logs, so more favorable rainfall might have led to the collection of more specimens (Peck, 2006). In the future, collection could be expanded by the deployment of sugar- or fruit-baited traps, examination of rotten logs, scouring of ground debris, and other various methods.

Conclusion: Correction of various errors, or more favorable weather, might have enhanced collection results. Deployment of a wider variety of traps or examination of rotten material might have improved the collection, as well. Despite this, the traps deployed demonstrate preference for elevation in scarabs based on subfamily, as well as a unified preference for low flight.

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