

**Comparison of flowering plant diversity and insect diversity at varying elevations across
Dominica, West Indies**

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Abstract

Flowering plant diversity and elevation can affect insect diversity, particularly in areas of high biodiversity. In this study, two different sampling methods, pan traps and sweep nets, were used to collect and investigate insect diversity in areas with differing flowering plants along an elevation gradient around the Caribbean island of Dominica. There was a positive correlation between the number of flowering plant taxa and insect taxa found for a given area. Elevation, but not plant diversity, seemed to have an effect on the overall diversity of insect taxa.

Introduction

Flowering plants attract a wide variety of insects that can either feed on the nectar provided by the plant or feed on other insects attracted to the nectar. Previous research has found a positive correlation between the number of insect species and the number of flowering plant species found at differing locations (Hoffman 2016). Although there are exceptions, it is generally accepted that as the diversity of flowering plants increases within a given area, so does the diversity of insect taxonomic groups. However, previous studies have found that general insect abundance and richness typically decreases with increasing elevation. More widespread insect taxa are less likely to be found at higher elevations, while ones specifically adapted to those environments are often found in higher abundance at those sites (Hodkins 2005; Hoiss 2012).

There have been no previous studies contrasting the diversity of insect taxa relative to the diversity of flowering plant taxa at different elevations on Dominica. The purpose of this study was to compare the number of flowering plant taxa to the number of insect taxa collected in the

same locations across varying elevations throughout Dominica to determine if there is a correlation between elevation and plant-insect diversity.

Materials and Methods

Plant and insect collections were performed at different sites around the island of Dominica. Flowering plant diversity at each sampling location was catalogued by collecting one of each flowering species within eye sight. Pictures of the flowers at each location were also taken after collection of both flowers and insects occurred. Two different methods were used to sample insect diversity: (1) yellow and blue pan traps were set up with soapy water underneath flowering plants at three different locations, and were sampled once at each location over three-day periods. And (2) sweep nets were used to sweep 15-20 times over each flowering plant and then turned inside out into a plastic bag for insect collection. Both flowering plants and insects were identified to the lowest possible taxonomic group using keys and other resources (Lack 1997; Triplehorn 2005). The data collected were analyzed using linear regression with Excel (Microsoft Office 2013).

Results

Plants and insects were collected from 10 different sites throughout Dominica (Figure 1). The different elevations and the sampled flowering plants and insect taxa collected at each site are shown in Table 1. The number of flowering plant taxa collected at sites ranged from zero to 10. The highest number of different flowering plant species was found at ATREC, Springfield (site

1), while the lowest number was found at the Checkhall River, Springfield (site 3). The number of insect taxa collected at sites ranged from three to 39. Furthermore, the highest number of insect taxa was also found at ATREC, Springfield (site 1), while the lowest number was tied between Emerald Pool and Boeri Lake.

Discussion

There was a relatively strong positive correlation ($r^2 = 0.59$) between the increasing flowering plant taxa and insect taxa collected at the same sites (Figure 2). In contrast, elevation seemed to have minimal effects on flowering plant diversity, as some of the highest plant diversity observed occurred at the highest elevations, including Mount Joy, Boeri Lake, and Freshwater Lake. Elevation did appear to have an effect on the amount of different insect taxa collected (Figure 3). While some of the highest insect diversity sampled was at three different elevations, i.e. Roseau Botanical Gardens at 30 m.a.s.l., Springfield Station at 352 m.a.s.l., and Mount Joy at 686 m.a.s.l., the general trend in insect diversity peaked near the middle elevations with the lows primarily near the highest and lowest elevations. The insect diversity sampled at Boeri Lake and Freshwater Lake might have been lower than normal because of the heavy rain and wind that occurred before and during the collection process. The weather could have disturbed insects from resting on flowering plants and flying around the general location.

The increased diversity obtained at certain locations could also have occurred because of the use of pan traps instead of only sweep nets. Pan traps, which were used at the Botanical Gardens, Checkhall River, and Springfield Station, are capable of sampling over a longer period of time in the same location and also collect common ground travelling insects, while sweep nets

are unable to collect insects over long periods of time. Only sweep nets were used in certain locations because the sites could only be accessed for a short duration for sampling.

Further studies should place both pan traps and malaise traps for longer periods of times in similar areas to sample insect diversity more completely. These studies should also sample at a wider variety of elevations primarily between 50 m.a.s.l. to 300 m.a.s.l. and 400 m.a.s.l. to 600 m.a.s.l., as there is gaps in the data at these elevations.

Acknowledgements

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Figures and Tables

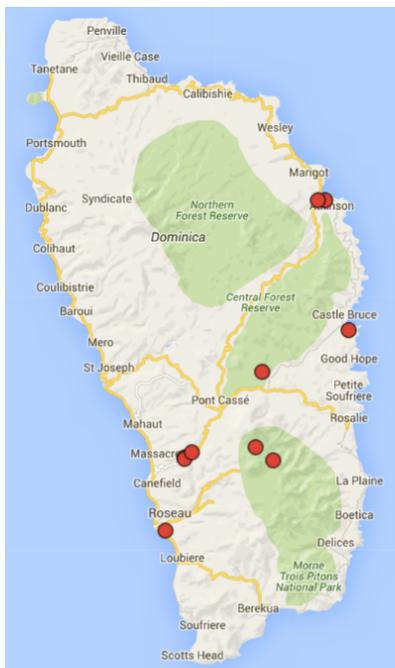


Figure 1. Map of sites sampled around Dominica as part of this study. A total of 10 sites were selected for collection of insect taxa and the visible flowering plants located around the point of insect sampling. See Table 1 for information on the site names.

Table 1. Location of sites where flowering plant and insect diversity were sampled throughout Dominica.

Site #	Site Name	Elevation	# of Flower Taxa Sampled*	# of Insect Taxa Sampled
1	ATREC, Springfield	352m	10	39
2	Mount Joy, Springfield	686m	4	12
3	Checkhall River, Springfi	341m	0	9
4	Roseau Botanical Garder	30m	6	17
5	Castle Bruce	7m	1	8
6	Kalinago Territory #1	20m	2	7
7	Kalinago Territory #2	15m	5	9
8	Emerald Pool	306m	1	3
9	Freshwater Lake	770m	5	4
10	Boeri Lake	880m	4	3

*A sample of all visible flower types at each insect collection site was taken and identified to the lowest possible taxonomic group

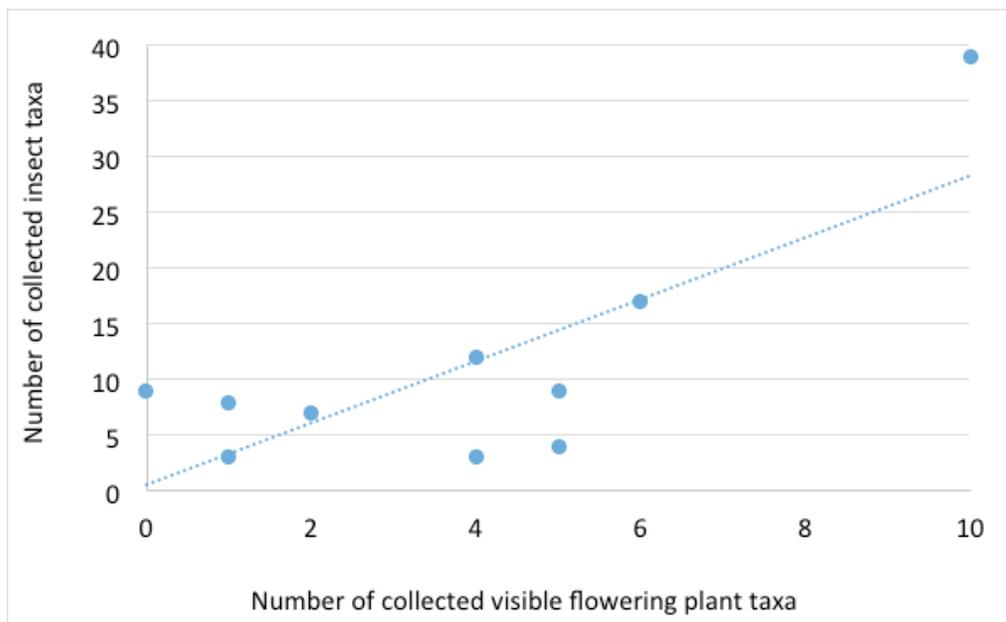


Figure 2. Comparison of number of collected flowering plant taxa and insect taxa from ten different locations.

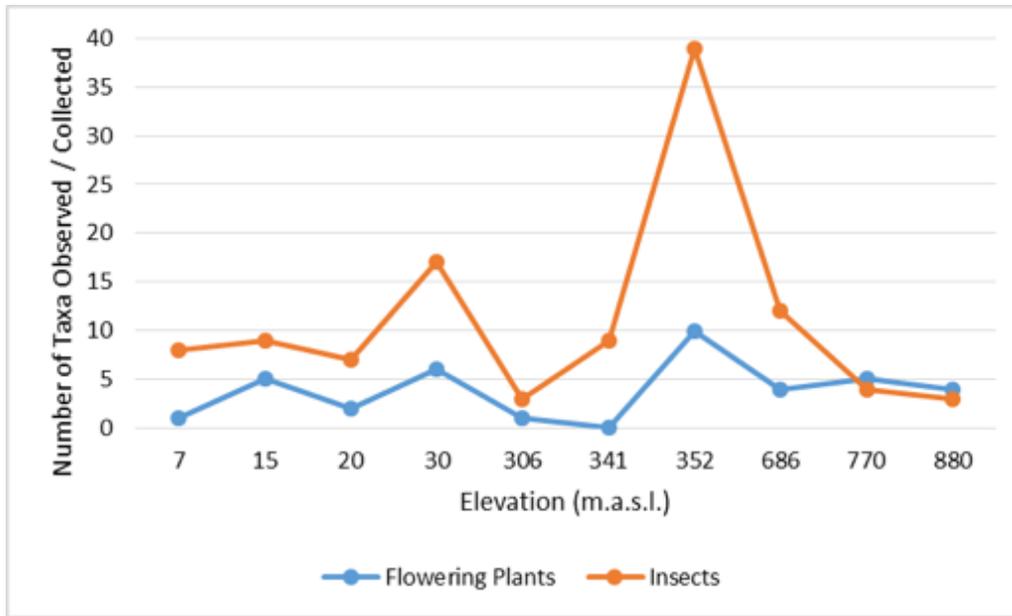


Figure 3. Number of flowering plant and insect taxa collected at varying elevations from ten locations

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