

Diversity of Pteropsida in Various Habitats of Dominica

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Objective:

To Identify Pteropsida species in the Elfin Montane, Transitional Forest, and Rainforest habitats of Dominica and to develop a key to terms used.

Introduction:

Pteropsida are plants with true roots; stems herbaceous, sub-woody, or trunklike; leafy organs of various forms, often large and called fronds. These plants are commonly known as ferns (Proctor 13).

A fern reproduces by spores. The spores of these ferns are produced in sporangia and are single celled at time of dispersal. These sporangia are difficult to see with the naked eye. In ferns these sporangia are usually clustered into groups called sori. Sometimes the sporangia are spread evenly beneath a fern frond and its parts, or in special ,modified parts of the frond. Fertile fronds contain these sporangia, whereas sterile fronds do not. In order to identify many species of fern, fertile fronds are needed (Jones & Luchsinger 261). Many different terms are used when identifying fern species so a key to terminology would be very helpful (see appendix).

I collected and kept record of ferns collected in three habitats. I opted for habitats

with higher rainfall, trying not to overlap them too substantially. The habitats I covered included Elfin Woodlands, Rainforest, and Transitional or Secondary Forest. The Elfin woodland habitats of Dominica are located in the northern part of the Morne Trois Pitons National Park. It towers above many habitats of Dominica at an elevation of up to 4000 ft. This habitat receives more rain than any other habitat in Dominica. The Elfin Woodland Habitat is a dense, thicket like forest, which is also referred to as a cloud forest. The average tree height is under thirty feet and many species are sturdier varieties of their lower elevation relatives. Most trees and plants in the Elfin Woodland habitat are covered in mosses and epiphytes.

The Rainforest is the most dominant plant community in Dominica. It is located on the slopes of the volcanoes at elevations between 1000-2500 ft. It receives a yearly rainfall of 175 - 300 inches per year. This type of forest has a dense canopy and an understory comprised of pressed tree seedlings, ferns, and monocots. Tree height towers to over 100 ft and most trees have shallow root systems that help to prevent erosion. Plant leaves in this habitat are mostly compound. Epiphytes are also very common in the Rainforest habitat.

The Transitional forest serves as a transition between the Dry scrub woodland and the Rainforest. It is more developed on the western side of the island. This habitat occurs at an elevation of 500-1500 ft. There is a considerable amount of rain here, however it pales in comparison to each of the previously mentioned habitats. Tree height reaches a height of over 30 ft, and the uppermost canopy contains over 20% deciduous vegetation. Fewer Epiphytes grow here than on plants in the Elfin Woodland and the Rainforest, but like the others, they play a vital role in the ecosystem of the habitat.

Materials:

Clippers
Plastic collecting bags
Sorting Tray
Plant Presses
Blotter paper
Newspaper
Microscope
Ruler
Paperclips
Notebook
Pens
Hodge key?****
Flora of the Lesser Antilles

Methods:

I collected ferns for each of the three above habitats in various locations. For the Elfin Montane habitat I collected on the trail to Boeri Lake. I collected ferns for the Rainforest on the Trail to Middleham falls, at Emerald Pool, and at Syndicate. The ferns collected for the Transitional Forest habitat were found at Springfield and on the trail to Mount Joy. In order to collect ferns for identification, I used plant clippers and plastic baggies. I collected the fern specimens on the way back from the trail trying to collect as much of the plant as possible. I clipped the plant at the base, collecting a portion of the rhizome in the process. Ferns with sori are easier to key so these specimens were collected whenever possible. If I was unsure on the species of a particular sample, I collected a duplicate specimen. Upon arrival to the station I removed the fern samples and placed them into plant presses. The specimens were to be used solely in identification so I did not take too much care in the layout. I simply wanted to keep the specimens dry and flat enough for me to key out. The pattern of paper and cardboard

went as follows: Wood frame, cardboard, blotter paper, newspaper, plant, newspaper, blotter paper, cardboard, etc...

Once the ferns had dried, I pulled the specimens out of the plant press and numbered each fern sequentially. This gave me a logical system with which I could compile a list and fill in the genus and species as I identified them. I also tagged each ferns with a code describing where I collected them. I used the letters "T", "R", "E", and "DF". These letters represent the Transitional Forest, Rainforest, Elfin Woodland, and Disturbed Habitat. I collected some specimens from the disturbed habitat, however I decided not to include them in my final results. I wanted to focus on Dominica's naturally occurring habitats. I used a second letter to differentiate the various locations from where the specimens were collected. The letter "S" represents Springfield, the letter "M" represents Middleham, the letter "S" represents Syndicate, the letter "J" represents Mount Joy, and the letter "B" represents the trail to Lake Boeri. I collected a few species at Emerald pool. These were labeled with "EM. POOL". If the fern was arboreal, or grew in a special location I labeled it as so. I then separated them out into piles of similar leaf style and paper clipped them together. I also grouped the smaller specimens together for ease in identifying.

I used three main sources to aid in my identification process. An herbarium compiled by Dr. Steven Hill of the Illinois Natural History Survey, Flora of the Lesser Antilles---Pteridophyta, by George R. Proctor, and Flora of Dominica Part I, by W. H. Hodge. The herbarium contains many species of flora from Dominica. They are filed in alphabetical order within phylogenetic order. The herbarium was useful in identification when I first began using the key and throughout the identification process. I

used it frequently to check on species that I has keyed out, and to begin the process by recognizing genera which applied, and or did not apply. Dr. Hill also had compiled a list of species of fern that he knew to occur in Dominica, but were not included in his herbarium.

I used a dichotomous key to identify many species of plants. A Dichotomous key presents the user with two choices at each step. Each pair of choices is called a couplet. Each choice includes features of the plant which are sometimes referred to as key characters. The key is designed so that one choice will be accepted and one rejected. In order for the user to identify the species correctly the key characters should be clear and precise. Generalized terms are not used since they do not give the user a definite option (Jones & Luchsinger 210).

I found it easier to key out fern specimens that had sori, and rhizomes still attached to them. The key sometimes provided options that could only be chosen by examining these parts. I frequently had to look at the fronds under the microscope. This allowed me to see the shape of the sporangia, and other small characteristics about the fern. Some families, however were easier to identify using the herbarium. The filmy ferns, for example is a family of ferns that are very easily recognizable. They tend to grow near streams or rivers and have a thin, leathery texture with leaves often only one cell thick. I identified many of these species fairly quickly by first using the herbarium, then double checking them by using one of the keys. Once I had a species identified, I entered it into the list I had compiled earlier.

The list was numbered sequentially, just as the ferns were. I simply recorded the

information about the locality off the tag, and onto the list. I had a section for the locality, duplicate fern samples, Family, Genera, and Species.

Results:

Fern species found in the Elfin Woodland include:

Cyatheaceae

*Cyathea arborea**

Cyathea imyarana

Hymenophyllaceae

*Trichomanes trigonum**

Gleicheniaceae

Gleichenia bancroftii

Polypodiaceae

Blechnum occidentale *

Blechnum ryanii

Elaphoglossum boryanum

*Nephrolepis multiflora**

*Nephrolepis rivularis**

Polypodium laucophyllum

Tectaria heraclefolia

*Thelypteris consanguinea**

Thelypteris gracilis

Thelypteris quadrangularis

Unknown species

Unknown 1

Unknown 2

Unknown 3

Unknown 6

Unknown 10

Unknown 11

Unknown 14

Unknown 16

Unknown 21

Unknown 22

Fern Species found in the Rainforest include:

Cyatheaceae

*Cyathea arborea**

Hymenophyllaceae

Trichomanes alatum

Trichomanes crinitum

Trichomanes crispum

Trichomanes elegans

Trichomanes polypodioides L.

Trichomanes rigidum Sw.

Trichomanes trigonum

Polypodiaceae

*Asplenium obtusifolium**

Blechnum occidentale

Blechnum ryanii

Campyloneuron phillitidis

Diplazium striatum

Grammitis eggersii

*Hymenophyllum hirsutum**

Hymenophyllum hirtellum

Lonchitis hirsuta L.

*Nephrolepis multiflora**

*Nephrolepis rivularis**

Niphidium crassifolium

Polypodium glaucophyllum

Polipodium loriceum

Thelypteris balbisi

Thelypteris consanguinea

Thelypteris glandulosa

*Thelypteris quadrangularis**

Unknown species

Unknown 1

Unknown 4

Unknown 5

Unknown 7

Unknown 8

Unknown 9

Unknown 11

Unknown 12

Unknown 13

Unknown 15

Unknown 18

Unknown 19
Unknown 20
Unknown 23

Fern species found in the Transitional Habitat include:

Cyatheaceae

*Cyathea arborea**
*Cyathea imyarana**

Polypodiaceae

Adiantum capillus-veneris
Adiantum Latifolium
Adiantum tetraphyllum
*Blechnum occidentale**
Ctenitis subincisa
Microgramma Lycopodioides
*Nephrolepis multiflora**
Phlebodium aureum
Polypodium glaucophyllum
*Thelypteris quadrangularis**

Unknown species

Unknown 17

Species names with an asterisk beside them are common species of fern in that particular habitat. I also noticed many species of fern commonly occur in some of the same habitats. The habitats with more common species between them tended to have similar environmental conditions. *Cyathea arborea*, *Blechnum occidentale*, and *Nephrolepis multiflora* for example, were collected in all three habitats.

After I went through my collection many times attempting to identify some of the less obvious species, I had many specimens which were left over. I listed these as my unknowns. Each species was assigned an unknown number so if that particular species occurs in two or more habitats the number will correspond.

Discussion:

I decided on using the habitats chosen because of accessibility and key characteristics. I wanted to collect from habitats that received a good amount of rain so that I was sure to find some ferns. I also wanted each of the habitats to differentiate from one another by either elevation, or by plant communities.

Before I could really start identifying fern species I had to learn many of the terms used in pterodophytology, that is the study of ferns and fern allies. I flipped through many a book attempting to learn and recognize terms to fern parts and other characteristics.

When I collected ferns on the trail back from Middleham Falls, I was careful in collecting, to make sure that I had written down the size of the frond. I did not, however attempt to collect the full frond. I was focusing more on collecting all the various species of fern, than certain specimens of each species. I was not able to identify much from these samples because of the lack of sori on the fronds.

When I collected ferns for the Transitional Forest habitat I attempted to collect as many fern specimens with sori on them as possible. My last attempt at identification led me to believe that if I had good specimens with sori on them, I would be able to key them out quicker and more thoroughly. I was wrong. It did lead me closer, however I ran into a problem. The key was now asking me for characteristics of the rhizome. I did not run into this problem earlier by chance and because of it I now knew that I really needed the full fern plant to successfully identify it. Fern specimens that I was not able to identify I included in the unknown list, so as to not limit the number of species I found.

When I collected plants on the trail back from Boeri Lake, I was careful to collect not only all fern species I could find, but to check and get the best specimens for the job. I made sure that I had specimens with good examples of sori, and I made every attempt to collect specimens still attached to their rhizome. I figured that because a lot of the specimens also occurred in the previous two habitats, that I would be able to key these better examples out and match them up with the other samples to find out what the other ferns were. It worked for most of them. I did notice in the process that in some fern species fertile fronds are separate from the sterile ones. That is, they do not always produce sporangia on the same frond. This made it nearly impossible to identify particular fern species unless I could recognize them in the herbarium.

I used the microscope more than I originally thought I would. I was constantly looking through the lenses attempting to recognize indusia, shape and size of hairs, shape and color of sporangia, and glandular orifices. I went back and forth between the herbarium, the keys and the microscope attempting to identify species with what little information I had.

When checking out the *Thlypteris quadrangularis* species I noticed that Dr. Hill keyed them out to *T. dentata*. Using Flora of the Lesser Antilles, I found the difference that leads to *T. dentata* is in a purple colored stipe. The specimens I collected had stipes which were straw colored, as Hill's specimens had straw colored stipes. I identified them as being *T. quadrangularis* since I have been using Flora of the Lesser Antilles throughout the whole process.

I had a lot of trouble using the key in the beginning. I believe that much of my

agony was caused by my not understanding the terminology used. I decided that a helpful resource for future students interested in taking this further would be to create a key of fern terminology. In this key I focused on common terms used in the dichotomous keys available to me. I wanted to not only include a description of the word, but to have graphics and diagrams with arrows pointing directly at an example of the term. It is essential when using a dichotomous key to fully understand the alternate states of characters used at major branching points in the keys. In the future students majoring in non- scientific studies may wish to learn about the many fern species of Dominica and knowing what exactly all the terminology means is a good first step.

Works Cited:

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