PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS

Doña Lawaan H. Lopez Campus

Iloilo City

FERN PROFILE OF CADIAO, BARBAZA, ANTIQUE

A Research Paper Presented to the Faculty of the

Philippine Science High School Western Visayas

Iloilo City

in Partial Fulfillment

of the Requirements in

Science Research II

by

Melissa Anne T. Gabriel
Tennessee Gospel R. Jajalla
Unity Q. Tabia

February 2000

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS

Doña Lawaan H. Lopez Campus
Iloilo City

FERN PROFILE OF CADIAO, BARBAZA, ANTIQUE

APPROVAL SHEET

a Research Paper Requirement

for Science Research II

by

Melissa Anne T. Gabriel
Tennessee Gospel R. Jajalla
Unity Q. Tabia

Approved by the Research Committee:

MARVIN L. CADORNIGARA, Adviser/Chairperson

EDGAR P. BABIERA, Member

VIRGINIA A. BARLAS, Member

JOHN ARNOLD S. SIENA, Member

REBECCA V. YANDOG
Director

February 2000

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS

Doña Lawaan H. Lopez Campus

Iloilo City

Acknowledgment

The researchers are deeply grateful to the following:

Mr. Marvin L. Cadornigara, the researchers' adviser, for the technical advice, nurturing guidance and unending patience;

Mr. Edgar P. Babiera, Mrs. Virginia A. Barlas and Mr. John Arnold S. Siena, the researchers' panelists, for the technical advice, support and encouragement;

Mr. Ely B. Barrera for the constructive criticism and help;

Mrs. Josette T. Biyo for the valuable suggestions and advice regarding the study;

Mr. Edgar F. Almero for allowing the researchers to leave the school premises during class hours in order to beat deadlines, and for the thoughtful reminders and deep concern regarding our academic status;

Mr. Ramon Calibjo for the technical advice and consultation services;

The Galuego Family for accommodating the researchers during the conduct of the study and for the essential data and information they have shared for the improvement of the study;

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS

Doña Lawaan H. Lopez Campus

Iloilo City

The parents of the researchers, Mrs. Teresita T. Gabriel, Mr. & Mrs. Jesus R. Jajalla and Mr. & Mrs. Danilo T. Tabia, for the financial support, encouragement and guidance during the course of the study;

"Heaven", "Sylvester", "Tazmanian devil", Mitch, Rich Manay, Pipay, Jessa, Fatboy, Base, Inge, Anne, Ady, Anthony, Emy, Rox, Lyze, Tin-Tin, Ives, Rons, Debs, Vic, Mon-Mon, Ely, Gracia, Angie, Je, Gemma and Ai who are the researchers' source of inspiration and;

To God Almighty, Creator and Father, mighty source of all things and the giver of it all.

Melissa Anne T. Gabriel
Tennessee Gospel R. Jajalla
Unity Q. Tabia

February 2000

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS
Doña Lawaan H. Lopez Campus
Iloilo City

Gabriel, Melissa Anne; Jajalla, Tennessee Gospel; Tabia, Unity; " Fern Profile of Cadiao, Barbaza, Antique." Unpublished Research II Paper. Philippine Science High School Western Visayas, Iloilo City, February 2000.

Abstract

This study surveyed the fern population of Cadiao, Barbaza, Antique. Specifically, it aimed to establish the fern profile of the area in terms of diversity and abundance, and to classify the collected specimens according to taxonomic characteristics. The specimen collected included roots, leaves and stems. They were then subjected to pressing. The One-Way Analysis of Variance (ANOVA), set at 0.05 alpha level of significance, was used to determine the significant differences in the diversity and abundance of the fern species in the different study sites. Results showed that there were 11 fern genera in Cadiao, Barbaza, Antique. These were Adiantum, Cibotium, Christella, Drynaria, Lygodium, Nephrolepis, Onychium, Peranema, Pteris, Spaerostephanos, and Sphenomeris. There was no significant difference in the fern diversity in the four study sites in Cadiao, Barbaza, Antique. There was a total of 2253 fern specimens collected from 4 study sites in Cadiao, Barbaza,

Antique. There was no significant difference in the abundance of ferns in the four study sites. Among these genus surveyed, Nephrolepis had the most number of species, i.e., *N. biserrata, N. cordifolia, N. Exaltata, N. hirisutula.* The genera with the least number of species were Cibotium (*C. barometz*), Christella (*C. dentata*), Drynaria (*D. descensa*), Onychium (*O. siliculosum*), Peranema (*P. luzonica*), Sphaerostephanos (*S. unitus*), and Sphenomeris (*S. chinensis*). There were two unknown species in genera Adiantum and Lygodium.

TABLE OF CONTENTS

List of Tables

List of Figures

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS

Doña Lawaan H. Lopez Campus

Iloilo City

FERN PROFILE OF CADIAO, BARBAZA, ANTIQUE

Chapter 1

Introduction to the Study

Background of the Study

The ferns were among the first land plants to colonize the earth, at least 400 million years ago. Unlike earlier plants, plants in this group have roots and stems and usually leaves, but they do not have flowers (Kerrod, 1996).

They comprise over 10,000 species, widely distributed in all parts of the world. They attain their highest development in the tropics (21st Century Universal Encyclopedia, 1994).

Ferns have many uses. They are of importance to the commercial florist industry. They are marketed as cut greens for use in wedding work and other flora decoration (Mott, 1975). Some are also used for packing fruits and vegetables and some of their parts are used in food production (The Book of Popular Science, 1971). Ferns also serve for construction purposes and some are known to cure certain illnesses.

Seeing the importance of ferns and the fact that they are abundant in the Philippine forests and also because of few researches on fern taxonomy in the Philippines, a survey was conducted for a thorough documentation of the ferns found in Cadiao, Barbaza, Antique.

Specifically, the study was to survey, collect and identify all ferns found in the study area.

The relationship among the variables in the study is presented in Figure 1.

Statement of the Problem and the Hypothesis

The main purpose of this study was to survey the fern population of Cadiao, Barbaza, Antique.

Specifically, it aimed to:

1. establish the fern profile of the area in terms of (a) diversity and (b) abundance.

2. classify the collected specimens according to taxonomic characteristics.

It was hypothesized that the fern genera in the different study sites in the area do not differ from each other in terms of (a) diversity and (b) abundance.

INDEPENDENT VARIABLE DEPENDENT VARIABLE

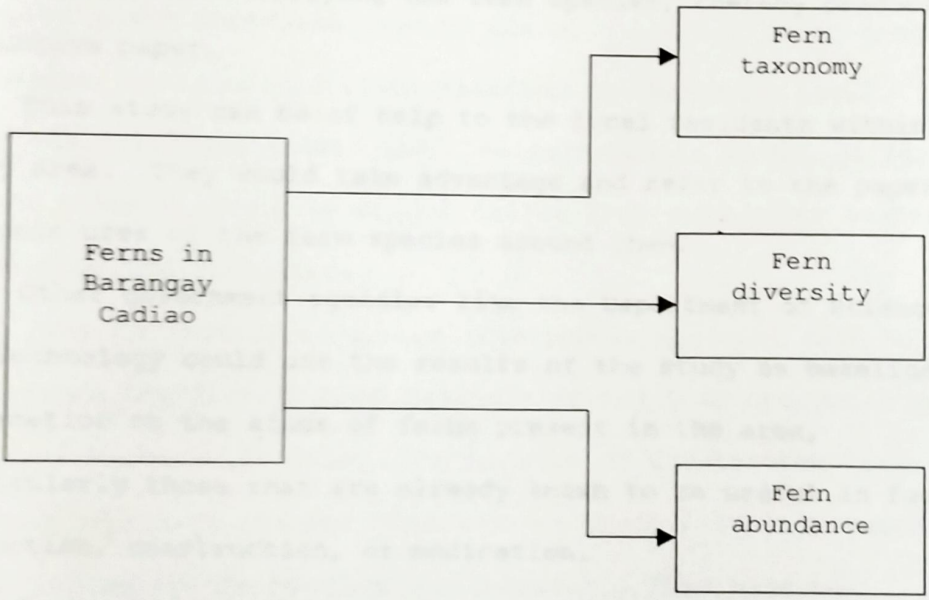

Figure 1. Fern taxonomy, diversity, and abundance of four different study sites in Cadiao, Barbaza, Antique.

Significance of the Study

Not all ferns in the study area had been identified. The researchers aimed to add knowledge to the local flora by identifying and classifying the fern species, thereby producing a productive paper.

This study can be of help to the local residents within the study area. They would take advantage and refer to the paper for economic uses of the fern species around them.

Other government agencies like the Department of Science and Technology could use the results of the study as baseline information on the kinds of ferns present in the area, particularly those that are already known to be useful in food production, construction, or medication.

Researchers focusing on ferns would make the paper as reference or resource. This study would serve as a medium in developing the awareness of the people in the preservation of ferns as part or our environmental resources.

Scope and Delimitations of the Study

The main problem of this study was to survey the fern population of Cadiao, Barbaza, Antique. Specifically it aimed to establish the fern profile of the study area in terms of diversity and abundance, and to classify the collected specimen according to taxonomic classification in the genus level.

It was hypothesized that the fern genera in the different study sites in the area do not differ from each other in terms of diversity and abundance.

Due to lack of time, the researchers were not able to determine the distribution patterns of the fern species found in Cadiao, Barbaza, Antique. And because of the limited time, the researchers used smaller quadrants as study sites to lessen the time needed in the specimen collections. This made the collections of more fern specimen impossible, thus, increasing the probability of any uncovered fern species.

Definition of Terms

The following terms were defined for the purpose of clarity and understanding:

Abundance- is the relative degree of plentifulness (Merriam Webster's Collegiate Dictionary, 1993).

In this study the term "abundance" meant as defined.

Classification- is the systematic arrangement in groups or categories according to established criteria (Merriam Webster's Collegiate Dictionary).

In this study the term "classification" meant as defined.

Diversity- is the condition of composed of distinct or unlike elements or qualities (Merriam Webster's Collegiate Dictionary).

In this study the term "diversity" meant different fern species found in the area.

Ferns- are any of an order Filicales of humusporous possessing roots stems and leaf-like fronds (Merriam Webster's Collegiate Dictionary).

In this study the term "ferns" meant as defined.

Genera- plural of genus; is the first word of the two-part scientific name used to classify a group of closely related species (Biology: The Dynamics of Life, 1995)

In this study the term "genera" meant as defined.

Profile- is a set of data often in graphic form of portraying the significance features of something (Merriam Webster's Collegiate Dictionary, 1993).

In this study the term "profile" meant the number and type of the different species found in the study area.

Taxonomy- is the study of the general principles of scientific classification (Merriam Webster's Collegiate Dictionary).

In this study the term "taxonomy" meant classification of ferns according to their classes.

Chapter 2

Review of Related Literature

Origin of Ferns

According to Biggs, Kapicka and Lundgren (1995), the ferns were among the first land plants to dominate the Earth, at least four hundred years ago. They appeared in the fossil record at about the same time that club mosses and horsetails were prominent members of the Earth's population.

Postlethwait and Hopoon (1995) claimed that in the tropical climate of the Paleozoic, these first vascular plants grew in vast primordial forests, and reached the size much larger than today's tree ferns. However, with dawning of the Mesozoic, the climate gradually grew colder and drier, and these giants disappeared, leaving behind the more diminutive ferns, horsetails, and lycopods. In a different sort of legacy, the bodies of the fallen giants were incompletely decomposed by fungi and bacteria, and the remaining organic compounds were carbonized into enormous deposits now mined for fuels.

Fern's Habitat

Bold (1997) specified that today's fern exhibit considerable diversity of habitat and growth habit. At one extreme are the erect-stemmed, large-leaved tree ferns that grow in tropical rainforests and even in exposed hillside as they do near Auckland, New Zealand. Tree ferns may exceed 75 feet in height. At the other extreme are the small aquatic organisms such as Salvina and Azolla. A large group that is intermediate in size includes the familiar cultivated varieties and the native of shady ravines and woodlands in both the temperate zones and the tropics.

Weier (1974) confirmed that all species native to temperate zones have rhizomes with leaves at nodes. In this respect they resemble the growth of many monocotyledons. All ferns have definite alternation of generation, with both sporophyte and gametophyte being autotrophic plant.

Solomon, Berg, Martin (1993) explained that the advancement of the ferns and their allies over algae and bryophytes is the presence of specialized vascular tissues for support and conduction. This system of conduction-xylem and phloem-enables vascular plants to achieve larger size than mosses because water,

dissolved minerals, and food can be transported over great distances to all parts of the plant. Leaves are the most prominent part of the fern plant and vary greatly in size and form. They differ from leaves of flowering plants in two important aspects: they have an apical meristem that usually continues to be active for sometime and spores are frequently borne on their lower surface. However, there are characteristics of various genera that varies (Weier, 1974). For instance, in Polypodium, there is a ring of small bundles placed well out from the center of the rhizome. Each strand is formed of a central core of xylem, surrounded by phloem, and the whole was a bounding endodermis.

Life Cycle of Ferns

Postlethwait and Hopoon (1995) states that in the underside of the familiar fern adult the diploid sporophyte is dotted with sori. The sori of the leaves are adult sporophytes that contain globes in which meiotic division contain haploid spores. Under correct conditions, the spores are catapulted into the air. They reach land and germinate into new gametophytes. These green gametophytes can produce either eggs or sperm or both. Sperms

have flagella that propel them though standing water. After fertilization, the zygote develops into new adult sporophytes.

Uses of Ferns

According to The Book of Popular Science (1971), ferns are used in packing fruits and vegetables. Some of their parts are used in food production.

A group of ferns are of great importance to the commercial florist industry. They are marketed as cut greens for use in wedding work and other decorations (Mott, 1975).

Taxonomy

Audesirk and Audesirk (1993) defined taxonomy as the science at which organisms are classified and placed into categories based on their structural similarities and evolutionary relationships. Taxonomic categories form a hierarchy, that is, a series of levels each more inclusive than the last. There are seven major categories: kingdom, phylum, division, class, order, family, genus and species. Each category

from species to kingdom is increasingly more general and includes organisms whose common ancestors were increasingly remote in its evolutionary relationship. The scientific name of an organism is actually formed from the smallest of these categories: the genus and the species. The genus is a category that includes very closely related organisms that do not usually interbreed. The species is a category limited to naturally interbreeding living things.

Biggs et al. (1995) stressed that the common names of the organisms do not tell you how organisms are related and classified. Common names can be misleading. In addition, confusion can occur when an organism has more than one common name.

All newly discovered species are given their scientific names in Latin. Latin is the language chosen by the taxonomists because it is no longer spoken and therefore, does not exchange as spoken languages do. It is important that scientific names remain the same for years to come. Naming rules include printing scientific names in italics or underlining them when they are written, and making the first letter uppercase for the genus but not the second word of the binomials.

Solomon et al. (1993), observed that in constructing a phylogenetic tree, taxonomists branch points that indicate a time at which a particular group of organisms is involved, they also considered the extent of divergence between branches, or of what two different groups have become since they had originated from a common ancestor and evolve along different pathways. Which of these bits of evolutionary data is utilized more in classifying a group of organisms depends upon one's approach to taxonomy. Three major approaches are usually considered: phenetics, cladistics, and classical evolutionary taxonomy.

According to Schraer and Stoltze (1995), ferns belong to the Kingdom Plantae. Kingdom Plantae is made up of organisms that are mostly referred to as plants. Plants are multicellular, photosynthetic, organisms that are adapted primarily to life on land. Audesirk and Audesirk (1993) explained that vascular plants, which include ferns, are tracheophytes, and are completely adapted to life on land. Figure 2 shows the life cycle of ferns.

Benson (1975) considers that the division Pteridophyta includes only the ferns and not the other divisions. He further stated that under the division Pteridophyta is the Class Pteropsida, which includes ferns usually having stems that are

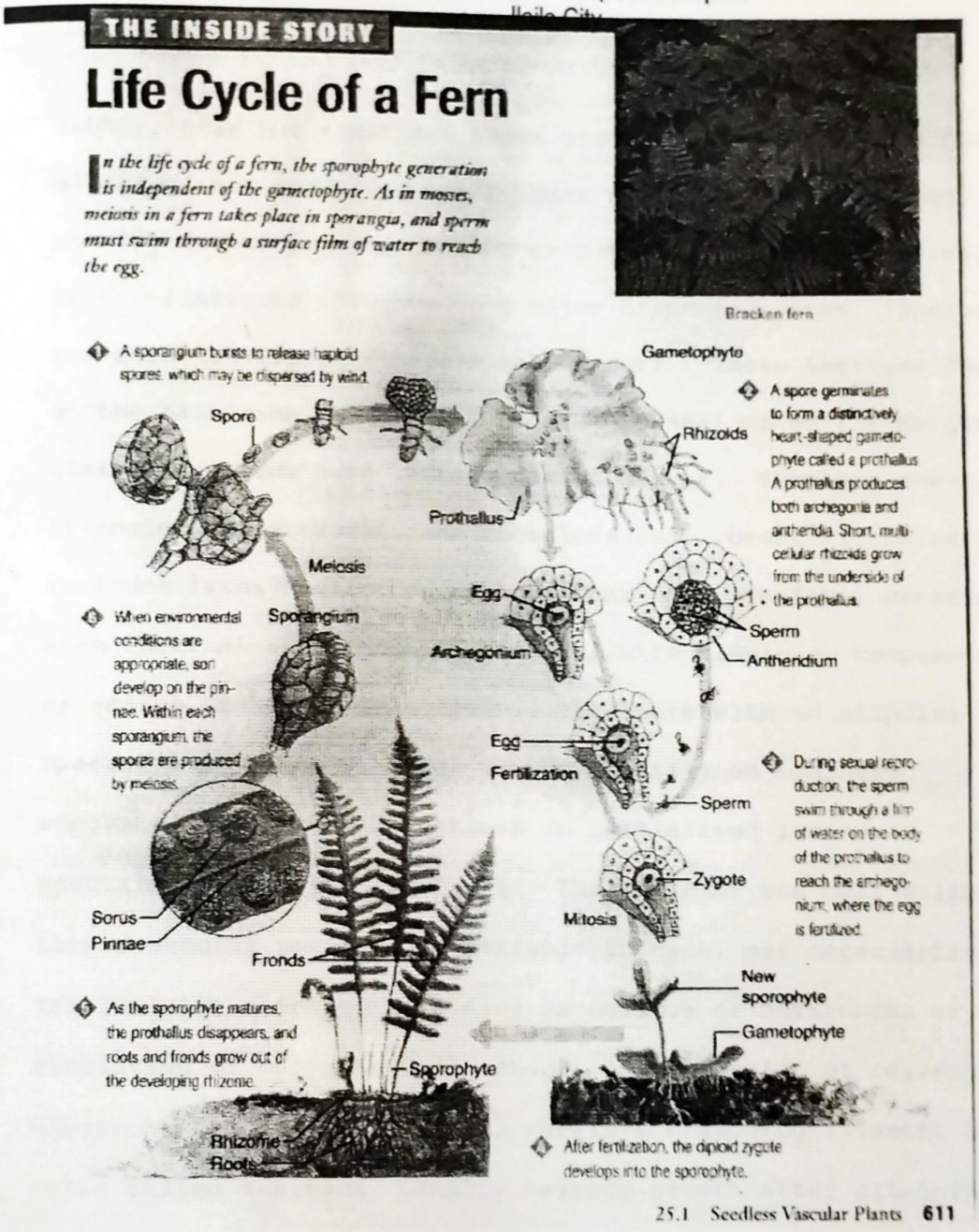

Figure 2. Life cycle of ferns (Adapted from Biggs, Kapicka, and Lundgren, 1995).

subterranean but sometimes above ground, not jointed, and the division into nodes and inter-nodes internal. Large leaves, usually deeply parted, divided or compound, formed by coalescence of the flattened branches in a major branches system. Sporangia are born usually in clusters called sori. These sori are found on the back side of the leaf, sometimes near or on the margin. Class Pteropsida have three orders under it. They are the Filicales, Marattiales, and Ophiglossales. Order Filicales includes ferns having leaves and stems that are firm, containing much internal strengthening tissues, with simple or complex hairs or scales or both. Young leaves circinate with no stipules. Sporangia borne on the back leaves, usually on ordinary vegetative leaves but sometimes on specialized leaves or specialized segments of leaves. The walls or the cell walls are thick; annulus present but variable in type, not necessarily vertical but sometimes can also be oblique or horizontal or consisting of only one field shape, lateral patch of cells. Gametophyte usually flattened, rarely a branching filament of cells called schizaea, usually ceasing growth after attaining a particular size. Order Filicales includes eight families. First is Class Osmundaceae with ferns that have some leaves or segments that are not green and are specialized in production of

sporangia. Others are green and spore producing. Their sporangia are in the sori for those that possess spores that are maturing simultaneously. The sorus has no indusium or sporangium but have either a shield shaped group of cells or a broad horizontal band partly encircling the sporangium. The second in the list is the Gleichenia family or Gleicheniaceae. The leaves are not differentiated into unlike sterile and sporangia-bearing portions. Sporangia can be found in sori, those of each sorus maturing simultaneosly. The sorus has no indusium, sporangium subsessile, annulus obliquely horizontal, with the sporangium walls opening vertically. The leaves of many species have a peculiar habit of continuous growth and branching that gives the impression of a dichotomously forked stem. The third is the Family Cyatheaceae or Tree Fern Family. These plants are usually treelike and the stems are growing above ground but in some plants however, the stems are rhizomatous and underground. Leaves are differentiated into sterile and sporangium-bearing plants or forms. The sporangia in sori, those of the inner (upper) parts of the sorus are maturing first; indusium present or absent, a cup-shaped or lateral flap; sori dorsal on the veins; sporangium stalked; annulus oblique and the sporangium opening horizontally. The fourth family is the Schizaeaceae or

the Climbing Fern Family. The ferns in this family may have either of the two types of leaves or leaflets, one is producing sporangia and the other is not. Sporangium solitary stalked; annulus is a horizontal ring around the apex of sporangia. The fifth family is the Hymenophyllaceae of the Filmy Fern Family. The leaves are one or only a few cells thick, more or less translucent, not differentiated into unlike sterile or sporangium-bearing forms. Sporangia are produced on a stalk surrounded at least basally by a cup or a two-lipped indusium; those successively lower on the stalk gradually maturing later; annulus oblique and the sporangium opens horizontally. The sixth family is the Polipodiaceae or the Fern Family. Their vegetative structure is variable. Sporangia usually found in sori or concentrated along the left margin. Sometimes they are distributed irregularly or flowing through the veins. Sorus composed of sporangia in various stages of development, these are distributed regularly; sporangium stalked; annulus vertical on the sporangium, arching almost directly over it, the sporangium opens horizontally; spores do not exceed 64 or usually fewer while in the preceeding families, the spores are as much more numerous. The seventh family is the Salviniaceae or the Water Fern Family. Roots are present but simple in Azolla, absent in

Salvinia; rhizomes floating on the surface of the water or the plants are usually stranded in mud along the shore. Leaves seemingly two rows along the stem and its branches are small, simple, entire or 2-lobed. Sporangia enclosed in relatively soft sporocaps on the lobes of the submerged leaves, the microsporangia and the megasporangia are found in different sporocaps. The last family under the class Pteropsida is the Marsileaceae or the Marsilea Family. Plants resemble either a "four-leafed" clover or a young grass. The leaves are either with four leaflets at the summit of an elongated petiole or consist only of the petiole. Sporangia enclosed in a hard sporocap formed from specialized leaves of two kinds, some producing microspores while others produce megaspores attached to a gelatinous ring-like structures that swells when water enters the sporangium. The swelling of this gelatinous layer pushes the sporangia into the sporocap.

Under the Class Pteropsida is the Marattiales Order. Order Marattiales have leaves and stems with simple hairs with more strengthening tissue than Ophioglossales but less than the Filicales. Young leaves circinate, stipules thick and not sheathing. Sporangia borne dorsally on the ordinary foliage leaves, not at the tips of the vascular bundles. Each sporangium

coalescent into synagium and have thick walls and each has numerous spores. Under Marattiales Order is the Marattia Family. Most members of this family occur in Formosa, South China, and across the island of the Southwest Pacific to Australia. Two genera Marattia and Danae, occur in the tropics of the Western Hemisphere. The last Order under Class Pteropsida is the Order Ophiossales or Adder's-Tongue Order. Hairs none or short and simple; scales none; stems and leaves soft; containing little strengthening tissue. Young leaves erect, not circinate, stipules thin and sheathing. Sporangia not produced on backs of the vegetative segments of the leaf on a segregated terminal apart from the green section of the blade; sporangium with no annulus, fundamentally terminal, found at the top or rather formed at the tip of a vascular bundle, with walls thick. Gametophyte cylindroidal and subterranean, colorless and dependent upon the fungi for absorbing food from the surrounding leaf mold, Ophioglossales is the Ophioglossaceae Family or Adder's-Tongue Family. The family is composed of the three genera, two of which are worldwide. Those represented in North America, North Mexico, are Ophoglossum (Adder's Tongue) and Cotychium (moonwort or grape fern). Several species of each occur in this region.

Chapter 3

Research Design and Methodology

The main problem of this study was to survey the fern population of Cadiao, Barbaza, Antique. Specifically it aimed to establish the fern species profile of the study area in terms of diversity and abundance, and to classify the collected specimen according to taxonomic characteristics.

It was hypothesized that the fern species in the different study sites in the area do not differ from each other in terms of diversity, and abundance.

Procedure of the Conduct of the Study

The study was conducted last November 22, 1999. In conducting the study, the researchers determined the study sites and measured the area. Next was the gathering of materials to be used then the collection of the specimen followed by the data collection then the drying of the specimen, mounting of specimen and identification of the ferns.

Description of the Research Environment

The research was conducted at Cadiao, Barbaza, Antique, in Panay Island. The whole province literally sits on coal; its rivers laden with semi-precious gemstones; a marine environment that spawns the "green-gold" and other flora and fauna.

The twelfth town of Antique, Barbaza is 61.30 kilometers away from the capital town, San Jose de Buenavista. It has a total land area of 13.875 hectares. Its forestland, that is 8.519 hectares, is rich in natural resources including gold, silver, and flora and fauna. Out of this forestland, 1,297.5 hectares is the mossy forest and 7,221.5 hectares is the watershed reforestation. Its projected population for 1998 is 17,891.

Cadiao is one of the 39 barangays of Barbaza. It was situated in the upland area of the municipality. Its terrain site produces a rich source of flora and fauna and its mossy forest provides a variety of fern species. Figure 3 shows the map of Antique and the location of the study area.

There were four quadrants in the study site. Quadrant A was located estimately 50 meters away from the falls with big rocks between the river and the mountainside. Quadrant B was

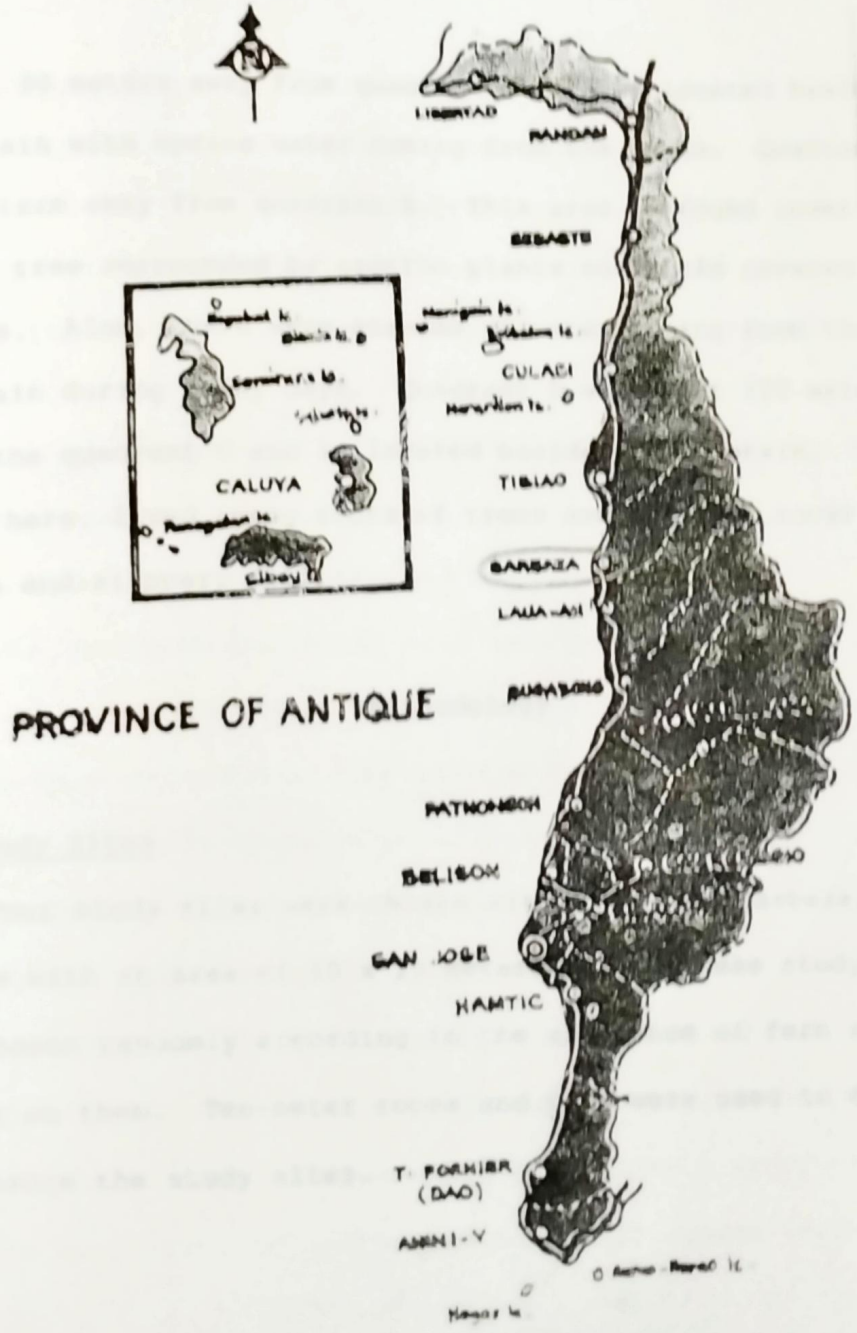

Figure 3. Map of the Province of Antique and the location of the study area (DENR of Antique, 1997).

about 90 meters away from quadrant A. It is located beside the mountain with spring water coming from the falls. Quadrant C is 75 meters away from quadrant B. This area is found under a big mango tree surrounded by crotton plants and rocks covered with mosses. Also, there were streams of water coming from the mountain during rainy days. Quadrant D was about 120 meters away from the quadrant C and is located beside the mountain. The ferns here lived among roots of trees and on thick cover of mosses and slippery soil.

Methodology

The Study Sites

Four study sites were chosen within Cadiao, Barbaza, Antique with an area of 10 x 10 meters each. These study sites were chosen randomly according to the abundance of fern species present on them. Ten-meter ropes and pegs were used to determine and measure the study sites.

Gathering of Materials

The materials used in this study were garden scissors, shovel, plastic sealers, plant pressers, newspapers, masking tape, plant cutter, short and long folders, straw of rope, magnifying lens, marking pens, index cards and notebook.

Collection of Specimens

The specimens collected included roots, leaves, and stems. Plant samples were collected in triplicates.

The specimens collected were smaller than the size of the single sheet of newspaper in which the plants were pressed, smaller than the presser size and the standard mounting sheet.

The following steps were followed:

Specimens collected were cleaned. Dead leaves were removed and dirt was washed from the underground parts.

The samples were then placed in plastic sealers during the collection on the field. They were pressed as soon as possible within a single sheet of newspaper. Using the presser, the specimens were arranged in the way they will appear when dry.

The plants were arranged in the presser on the following order: newspaper-specimen-newspaper-newspaper-specimen-newspaper etc. Only one species was placed in each sheet of folded newspaper.

Collection of Data

During specimen collection, the specimens were properly pressed, and field data about the plant was entered into a field notebook as a permanent record. The information will include the following: (a) scientific name, (b) common name, (c) study site where the specimen was collected, (d) date the specimen was collected, and (e) collection number. The scientific name and common name were optional since this will further be verified by the experts in the field.

Drying of Specimen

After the pressing of all the specimens, the plant press were applied by means of tightening the ropes.

The specimen were then allowed to dry under natural conditions. The pressers and newspapers were changed weekly to prevent destructive molds and insects from preying upon the specimen.

Mounting of Specimen

The specimens were glued to the center of the mounting sheet. Small specimens were mounted on short size folders, while large specimens were mounted on long size folders. Clear glue was applied to the lower surface of the mounting sheet while pressing all the parts against the sheet. All specimens were mounted upright, not horizontally, or diagonally. Extra glue was removed with a moist cotton ball. When there were several mounted sheets already, they were filed one on the top of the other with sheets of newspaper between and weights placed on the top of them. Labels were attached on the lower right corner of the mounting sheet.

Identification of Ferns

Keying was accomplished using dichotomous keys from the following books: The Flora of Manila (Merrill, 1976), Plant Classification (Benson, 1975). Modern educational technology, such as the Internet, was also used in keying. Classification of ferns was limited only to class level.

Statistical Testing

In testing the hypothesis of this study, the researchers employed the One-way Analysis of Variance (ANOVA) as inferential statistical tool. This test, set at 0.05 alpha level of significance, was employed to determine the significant differences among the fern species in the different study sites in terms of diversity and abundance. The Scheffe test, also set at 0.05 alpha level of significance, was employed as post-hoc multiple comparison test.

Chapter 4

Results and Discussion

The main problem of this study was to survey the fern population of Cadiao, Barbaza, Antique. Specifically it aimed to establish the fern profile of the study area in terms of diversity and abundance, and to classify the collected specimen according to taxonomic classification in the genus level.

It was hypothesized that the fern genera in the different study sites in the area do not differ from each other in terms of diversity and abundance.

Fern Diversity in Cadiao, Barbaza, Antique

There were 11 fern genera surveyed in Cadiao, Barbaza, Antique.

In Quadrant A, there were 7 different fern genera; in Quadrant B, 5; in Quadrant C, 5; and in Quadrant D, 6 genera.

Table 1 shows the fern genera in all the quadrants.

Table 1

Fern genera in the different study areas of Cadiao, Barbaza, Antique

Quadrant				No.	Fern Genus
A	B	C	D		
X	X	X	X	1	Adiantum
	X			2	Cibotium
X				3	Christella
			X	4	Drynaria
X	X		X	5	Lygodium
X		X	X	6	Nephrolepis
		X	X	7	Onychium
X				8	Peranema
X		X	X	9	Pteris
X	X			10	Spaerostephanos
	X	X		11	Sphenomeris
7	5	5	6	11	Total

Fern Abundance in Cadiao, Barbaza, Antique

There were a total of 2253 ferns in Cadiao, Barbaza, Antique. Four hundred thirty-two ferns were found in Quadrant A, 159 in Quadrant B, 331 in Quadrant C, and 1331 in Quadrant D.

Table 2 shows the data.

Table 2

Abundance of ferns in Cadiao, Barbaza, Antique

Fern Genus	Quadrant				Mean
	A	B	C	D	
Adiantum	44	22	23	153	60.5
Cibotium	0	3	0	0	0.75
Christella	229	0	0	0	57.25
Drynaria	0	0	0	289	72.25
Lygodium	3	37	0	195	58.75
Nephrolepis	74	0	39	465	144.5
Onychium	0	0	72	62	33.5
Peranema	5	0	0	0	1.25
Pteris	70	0	36	167	68.25
Sphaerostephanos	7	91	0	0	24.5
Sphenomeris	0	6	161	0	41.75
Total	432	159	331	1331	563.25

Taxonomic Classification in the Genus Level of Ferns in Cadiao, Barbaza, Antique

There were 11 genus among the fern population in Cadiao, Barbaza, Antique. These were Adiantum, Cibotium, Christella, Drynaria, Lygodium, Nephrolepis, Onychium, Peranema, Pteris, Sphaerostephanos, and Sphenomeris.

Among these genus, Nephrolepis had the most number of species, i.e., *N. biserrata*, *N. cordifolia*, *N. Exaltata*, *N. hirisutula*. The genera with the least number of species were Cibotium (*C. barometz*), Christella (*C. dentata*), Drynaria

(D. descensa), Onychium (*O. siliculosum*), Peranema (*P. luzonica*), Sphaerostephanos (*S. unitus*), and Sphenomeris (*S. chinensis*). There were two unknown species in genera Adiantum and Lygodium

Table 3 shows the data.

Differences in the Fern Diversity and Abundance in Cadiao, Barbaza, Antique

The One Way Analysis of Variance showed that there was a significant difference in the fern abundance in the 4 sites of Cadiao, Barbaza, Antique as reflected by $F(40) = .033$, $p < .05$, and no significant

difference as to the fern diversity of Cadiao, Barbaza, Antique as reflected by $F(40) = 1.000$, $p > .05$.

Table 4 shows the data.

The Scheffe Test however, showed no significant differences in the fern abundance of the 4 study sites.

Table 5 shows the data.

Table 3

Ferns in the genus level

Genus	Species	Quadrant				Total
		A	B	C	D	
1. Adiantum	a. unknown	X		X	X	
	b. philippense		X			2
2. Cibotium	a. barrometz		X			1
3. Christella	a. dentata	X				1
4. Drynaria	a. descensa				X	1
5. Lygodium	a. unknown	X	X			
	b. flexuosum		X			
	c. circinnatum				X	3
6. Nephrolepis	a. biserrata				X	
	b.cordifolia				X	
	c. exaltata				X	
	d. hirisutula	X		X	X	4
7. Onychium	a. siliculosum			X	X	1
8. Peranema	a. luzonica	X				1
9. Pteris	a. colocarpa	X				
	b. glaucovirens	X		X	X	2
10. Sphaerostephanos	a. unitus	X	X			1
11. Sphenomeris	a. chinensis		X	X		1

Table 4

One-Way Analysis of Variance showing differences in the fern abundance and fern diversity in Cadiao, Barbaza, Antique

Category	Source of Variation	Sum of Squares	df	Mean Square	F	Sig
FERN ABUNDANCE	Between Groups	74911.34	3	24970.45	3.200	.033
	Within Groups	312103.8	40	7802.595		
	Total	387015.2	43			
FERN DIVERSITY	Between Groups	.000	3	.000	.000	1.000
	Within Groups	440.000	40	11.000		
	Total	440.000	43	.		

Table 5

Scheffe test for multiple comparison of means for One-Way ANOVA in Table 4

Dependent Variable	Category		Mean Difference	Significance
FERN ABUNDANCE	Quadrant A	Quadrant B	24.82	.932
		Quadrant C	9.18	.996
		Quadrant D	-81.73	.212
	Quadrant B	Quadrant A	-24.82	.932
		Quadrant C	-15.64	.982
		Quadrant D	-106.55	.061
	Quadrant C	Quadrant A	-9.18	.996
		Quadrant B	15.64	.982
		Quadrant D	-90.91	.138
	Quadrant D	Quadrant A	81.73	.212
		Quadrant B	106.55	.061
		Quadrant C	90.91	.138

Chapter 5

Conclusions and Recommendations

The main purpose of this study was to survey the fern population of Cadiao, Barbaza, Antique.

Specifically, it aimed to:

1. establish the fern profile of the area in terms of (a) diversity and (b) abundance.

2. classify the collected specimens according to taxonomic characteristics.

It was hypothesized that the fern genera in the different study sites in the area do not differ from each other in terms of (a) diversity and (b) abundance.

Conclusions

Based on the results of the study, the following can be concluded:

1a. There were 11 fern genera in Cadiao, Barbaza, Antique. These were Adiantum, Cibotium, Christella, Drynaria, Lygodium, Nephrolepis, Onychium, Peranema, Pteris, Spaerostephanos, and Sphenomeris. There was no significant difference in the fern diversity in the four study sites in Cadiao, Barbaza, Antique.

1b. There was a total of 2253 fern specimens collected from 4 study sites in Cadiao, Barbaza, Antique. There was no significant difference in the abundance of ferns in the four study sites in Cadiao, Barbaza, Antique.

Among the 11 genera surveyed, Nephrolepis had the most number of species, i.e., *N. biserrata, N. cordifolia, N. Exaltata, N. hirisutula.* The genera with the least number of species were Cibotium (*C. barometz*), Christella (*C. dentata*), Drynaria (*D. descensa*), Onychium (*O. siliculosum*), Peranema (*P. luzonica*), Sphaerostephanos (*S. unitus*), and Sphenomeris (*S. chinensis*). There were two unknown species in genera Adiantum and Lygodium

Recommendations

Based on the results and conclusions of this study, the following are recommended:

1. The distribution pattern be determined. This will help further in getting more precise results in the study.

2. The time allotted for the study be increased in order to collect more specimen and observe the study sites thoroughly, thus, extracting more essential information for the study.

3. The quadrant size be increased to make a wider coverage of the area. This will ensure that all possible existing species be covered.

4. The taxonomic classification of the ferns be completed up to the species level. Asking help from experts in taxonomy is also recommended.

5. Using the latest books about ferns as references is also recommended for more recent information and help in keying the taxonomic identity of the ferns.

References

Audesirk, G. & Audesirk, T. (1993). Life on Earth, Biology. USA: Macmillan Publishing Company.

Benson, L. (1975). Plant Classification. USA: D.C. Health & Co.

Biggs, A., Kapicka, C., & Lundgren, L. (1995). Biology: The Dynamics of Life. USA: Glencoe/McGraw-Hill.

Bold, H. (1997). The Plant Kingdom. New Jersey: Prentice Hall, Inc.

Kerrod, R. (1996). New Science Living Things, 3(1). New Jersey: Prentice Hall Inc.

Merriam Webster's Collegiate Dictionary (10th Edition), (1993). USA: Webster's Incorporated.

Merrill, E. (1976). A Flora of Manila. Manila: The Bookmark Inc.

Mott, R. (1975). The Complete Book of House Plant. Hongkong: Vineyard Books Inc.

Postlethwait, J., & Hopoon, J. (1995). The Nature of Life, (3rd Edition). USA: McGraw-Hill, Inc.

Solomon, E., Berg, L., Martin, D., & Villee, C. (1993). Biology. USA: Saunders College Publishing.

Schraer, W., Stoltze, H. (1995). Biology: The Study of Life. USA: Prentice-Hall Inc.

The Book of Popular Science. (1971). Canada: Grolier Incorporated.

Weier, T. (1974). Botany: An Introduction to Plant Biology. USA: John Wiley and Sons Inc.

21st Century Universal Encyclopedia. (1994). Australia: Regency Publishing Group Pty Limited.