

PHYTODIVERSITY UNDER PINE (*Pinus insularis*) FOREST COMMUNITY IN TADIAN, MOUNTAIN PROVINCE¹

by

FOMEG-AS, DAVID Y.²; BAY-OS, NORMA W.³; ATAYOC, JOSE P.⁴

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ABSTRACT

This study was done to determine and assess the alpha (a) diversity of terrestrial vascular plants belonging to classes Filicinae and Angiospermae of subphylum Pterophytina under pine (*Pinus insularis*) forest community in Tadian, Mountain Province, and to identify the various plants surveyed under each class. Only 132 species of vascular plants were registered from a 6.8725 ha pine forest giving a species richness of $1.921 \times 10^{-3}/m^2$. Based from the a diversity scale made for this study, the community has very low phytodiversity. Angiosperms form the bulk of the diversity of species surveyed with only 6.82% attributable to ferns. Dicots (74.24%), on the other hand, are more diverse than monocots (18.94%). Few of the plants were identified to the species level of the taxonomic classification while many remains to be identified even with just their local names. Unidentified plants and or specimens were assigned codes for reference.

INTRODUCTION

Biodiversity has always been a focus on research of the Mountain Province State Polytechnic College. Yet, no research on this was ever done, none until now. But, what exactly is biodiversity and how do people benefit from it?

Scientia Silvica (1997) described biodiversity as the short-form for biological diversity, and can be organized at three principal levels: genetics, species, and ecosystem. Genetic diversity is a measure of the variety of different versions of the same genes within individual species; species diversity describes the number of different kinds of organisms within individual communities or ecosystems and ecological diversity (*or ecosystem*) assesses the richness and complexity of a biological community, including the

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² **Correspondence author**—to whom all queries about this research should be addressed. Instructor, Mountain Province State Polytechnic College—College of Engineering and Technology. E-mail address: daccyf@yahoo.com and daccyf@lycos.com.

³ Asst. Prof., Mountain Province State Polytechnic College—College of Engineering and Technology.

⁴ Instructor, Mountain Province State Polytechnic College—College of Engineering and Technology.

number of niches, trophic levels, and ecological processes that capture energy, sustain food webs, and recycle materials within this system (Cunningham and Saigo, 1997).

At first glance, biodiversity may seem insignificant to our lives. But, Cunningham and Saigo (1997) stated that even seemingly obscure and insignificant organisms could play irreplaceable value in ecological system or be the source of genes or drugs that someday may be indispensable.

It thus becomes vital for one to know what plants are present and predominates in the surrounding area where they live and where to find them most as well as search for the potentials of each plant (or animal).

This research concentrated on surveying the number of terrestrial plants belonging to classes Filicinae (Ferns) and Angiospermae (flowering plants) under pine forest (class Coniferinae) community in Tadian, Mountain Province. Classes Filicinae, Angiospermae and Coniferinae all belong to subphylum Pterophytina of Phylum Tracheophyta (vascular plants) of the plant kingdom following the Whittaker's five-kingdom system (Grolier Encyclopedia of Knowledge, 1995).

Tadian of western Mountain province has type I climate in the Philippines based on the modified coronas classification (PIIAS/PAGASA/DOST, 1992). This means, there are two pronounced seasons throughout the year; dry from December to May and wet from June to November.

The general objectives of the study were to determine the (1) alpha (α) phytodiversity of terrestrial plants belonging to classes Filicinae and Angiospermae under pine (*Pinus insularis*) forest community in Tadian, Mountain province, (2) to evaluate the alpha diversity under pine forest community, and to (3) identify the terrestrial plants surveyed.

METHODOLOGY

Problems. The following questions were answered in this study: (1) What is the alpha diversity of terrestrial plants belonging to classes Filicinae and Angiospermae under pine forest community?; (2) What is the level of diversity (alpha) under pine forest community in Tadian, Mountain Province, and (3) What are the terrestrial plants under each classes present in the same community?

Methods. A suitable study site that can represent a typical pine forest community in the highlands of the Cordillera region (Philippines) with a semi-temperate/semi-tropical climate was selected (Photo 1 and 2). The site is located in Poblacion, Tadian, Mountain Province having a geographical coordinates that would slightly vary from the coordinates of Balidong, Tadian, Mountain Province, which is 17 ° 00' N Lat. and 120 ° 48' E Long. (Balidong Reforestation Project Map, 1998). Its elevation is slightly higher (between 100-200 m) than 4,500 ft above sea level (1,371.95 m ASL) of the Tadian Municipal Hall (Tadian Municipality Map).



Photo 1. View of the study site as seen from outside the forest



Photo 2. Part of the study site as seen from inside the forest

The site was surveyed and mapped for purposes of delineating the area under study. The study site, which is a parcel of a wider pine forest, was found to have an area of 6.8725 hectares, which is good enough for the purpose of this study.

Two surveys were made—one on October 2003 and another on January 2004. These surveys were done coinciding with the rainy season and summer season, respectively; because of variable plant species that grow at different seasons. Plant leaf specimens were collected and photographs of plants taken during the first survey for later identification. During the second survey, two adult community cooperators, knowledgeable on the local names of common weeds in the place, were asked to come with the researchers for an on-site identification of terrestrial plants found at the study site, which allows comparison and validation of earlier identified specimens. At the same time, leaf specimens were also obtained for collection purposes and later identification of still unidentified plants.

Identification of the plants including the specimens was done primarily on the basis of local names. Their common English names, class and subclass, and scientific names were also noted when identified. Unidentified plants were assigned code names and given some morphological descriptions for future identification and reference.

Alpha (a) biodiversity (or phytodiversity) of the site was then calculated following the formula, Alpha (a) biodiversity = species richness (S) = number of species per area (Scientia Silvica, 1997). Likewise, due to the unavailability of defined ratings for purposes of evaluating the level or extent of biodiversity, the researchers propose and used a diversity scale discussed in the results below.

RESULTS AND DISCUSSION

Alpha (a) diversity. There were 132 species of terrestrial ferns and flowering plants surveyed within the 6.8725 ha of pine forest cover in Tadian, Mountain Province (Table 1). This gives an alpha diversity (species richness) of $1.921 \times 10^{-3}/\text{m}^2$. Only a fraction of this diversity (6.82%) is attributed to ferns. Terrestrial vascular plants of the subclass Dicotyledonae is more diverse (74.24%) than those of the subclass Monocotyledonae (18.94%).

A study of Dolgalyeva (n.d.) on broadleaved Korean pine forest of the southern Sikhote-Alin registered 283 vascular species. This is more than twice than the vascular plants surveyed on this study. However, the symposium report did not indicate the area surveyed and whether or not, all vascular plants were included in the survey. A similarity index could therefore be deduced from this number—that is, there is only slight difference in diversity between these places; albeit, species diversity depends on climate, geographical location, and various environmental factors.

Table 1. The 132 species of vascular plants (Phylum Pterophytina) surveyed in a 6.8725 ha Pine Forest of Tadian, Mountain Province

Common (local) Name	Common English Name	Common (local) Name	Common (local) Name
<i>Class Angiospermae (flowering plants); Subclass Dicotyledonae</i>			
balili (2)	umbrella plant	atelba	5-Ab
bayabas	guava	bag-bago	10-Ab
dopdopelan, pigweed	purslane	ballay	30-Ab
marapait	wild sunflower, Mexican sunflower	bas-ot	34-Ab
taptapey, taingang daga	Indian sorrel	bitik	3-Ah
gagatang	milk thistle	cigis	6-Ah
pawikan	wild rose	dagad-ay, bulbulad, batbatnag	8-Ah
lamlampaka		degi-is	11-Ah
lampaka, sapsapon, pulpulot		gatudan	15-Ah
luot di manok		in-NPA	16-Ah
masaplora		in-NPA, agunoy	18-Ah
makahiya, shy plant		is-is, appas, isep	20-Ah
lantana		katel-ang	21-Ah
matmata, takip kohol, sipsipping		kibiw, ballogo di magan	23-Ah
pinit (1)		kupkupit	24-Ah
pinit (2)		ladea, ka-ea	25-Ah
pinit (3)		lalagim	32-Ah
ag-agatan		lalakin di bangbang	33-Ah
bako		liwliw	37-Ah
lubed, ba-ay		manmanok	22-Ahv
puket (2)		pannatel	1-At
yokyokgong		pedped	2-At
addaan		pedped, tabako	7-At
ag-aggub		pong-pong, palongpong	9-At
agayen, patuki		puket (1)	12-At
alig-os, kae-ea		puket 3	14-At
alin-ew		pulot	17-At
aluloy		sabosab, sabosob	28-At
aluloy (2)		tabtabako	29-At
anatil		tampoy, spanish guava	4-Av
ang-angot, aromatic, silsiliri		tayadoan	
apiitan		tikem	
as-aso, ing-ingit		tintiinta	
ateba		waka	
<i>Class Angiospermae (flowering plants); Subclass Monocotyledonae</i>			
cogon, goon	cogon	dayong, tibangan	13-B
dalukdok (?)	carpet grass	kawkawayan	19-B
gagabutan, paragis	wire grass	kuyangot	26-B
kalatkat (?)	carpet grass	on-onas	27-B
pao	reed	sabsabog	31-B
pagpagey		tantaneg	35-B
poen		tubo	36-B
eg-eged		ta-am	38-B
balili			
<i>Class Filicinae (ferns)</i>			
sakti	tree fern, wooly fern tree	alam-am, anam-am, annapat	am-am
baguingey		fern (A)	gesgeseb (2)

sulibedbed, salibegbeg, nito		gesgeseb, segsegib	maiden hair
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Level of phytodiversity. The following scale was created to assess whether a forested area, specifically the study site, is of high or low level of alpha diversity or species richness.

- >1.0 plant spp./ m² = very high phytodiversity
- 0.75-1.0 plant spp./ m² = high phytodiversity
- 0.5-0.75 plant spp./ m² = moderate phytodiversity
- 0.25-0.5 plant spp./ m² = low phytodiversity
- <0.25 plant spp./ m² = very low phytodiversity

This scale is an extrapolation and maybe an exaggeration of the following values. Nevertheless, it is a good idea to have a baseline for evaluation. From the global biodiversity map for vascular plant, the Philippines belong to diversity zone 8 with 3,000-4,000 number of species per 10,000 km² (Sengbusch, 2004), or about 1×10^{-7} spp./m². Whereas, the number of endemic plant species in the country is pegged at 242.4 spp./1,000 km² (Conservation International, 2004), or about 2.424×10^{-7} spp./m².

A new field survey done by WWF has found that the tropical forest of Tesso Nilo, on the Indonesian island of Sumatra, harbours the highest level of lowland forest plant biodiversity known to science. The survey done by WWF scientists in the 1,800 square kilometre Tesso Nilo forest showed that it contains up to 218 vascular plant species in just one single 200 square meter plot (Forest Conservation Portal, 2002). This is equivalent to 1.09 spp./m².

Also, Gottsberger, et al. (1999) stated that Cerrados may contain between 250 and 350 (-450) vascular plant species per hectare, whereas in most of the other American savannas this number is very significantly lower.

Based from the alpha diversity scale we created, the species richness of the pine forest surveyed on this study is very low (1.921×10^{-3} /m²).

The causes of this very low phytodiversity could not yet be established at the moment in the absence of studies that may give a direct link. But, observations suggest that forest burning may be one of the factors, not to mention the limitations of this study that surveyed only terrestrial vascular plants of the classes Angiospermae and Filicinae.

Identification of terrestrial vascular plants. We have tried as much as possible to identify the various plants to the species level of the taxonomic classification; yet, many of the plants have their scientific name still unidentified and remain to be so. We also had difficulty in identifying the common English names of the plants as shown on the following tables (Tables 2, 3, 4, 5 and 6).

Table 2. Plants identified with their scientific names

Common (local) Name	Common English Name	Family	Scientific Name
Class Angiospermae (flowering plants); Subclass Dicotyledonae			
balili (2)	umbrella plant	Cyperaceae	<i>Cyperus alternifolius</i>
bayabas	guava	Myrtaceae	<i>Psidium guajava</i>
dopdopelan, pigweed	purslane	Portulacaceae	<i>Portulaca oleracea</i> L.
marapait	wild sunflower, Mexican sunflower	Compositae/Asteraceae	<i>Tithonia diversifolia</i> (Hensl.) A. Gray
taptapey, taingang daga	Indian sorrel	Oxalidaceae	<i>Oxalis corniculata</i> L.
gagatang	milk thistle		<i>Sonchus oleraceus</i> L.
lamlampaka		Compositae/Asteraceae	<i>Sonchus arvensis</i> L.
lampaka, sapsapon, pulpulot		Compositae/Asteraceae	<i>Bidens pilosa</i> L. (?)
luot di manok		Caryophyllaceae	<i>Drymaria cordata</i> (L.) Willd.
masaplora		Passifloraceae	<i>Passiflora edulis</i> Sins.
lantana			<i>Lantana camara</i> L.
makahiya, shy plant			<i>Mimosa pudica</i> L.
matmata, takip kohol, sipsipping			<i>Centella asiatica</i> (L.) Urb.
Class Angiospermae (flowering plants); Subclass Monocotyledonae			
cogon, goon	cogon	Gramineae	<i>Imperata cylindrica</i> (L.) Beauv.
dalukdok (?)	carpet grass	Gramineae	<i>Axonopus compressus</i>
gagabutan, paragis	wire grass	Gramineae	<i>Eleusine indica</i> L.
kalatkat (?)	carpet grass	Gramineae	<i>Axonopus compressus</i>
pao	reed	Gramineae	<i>Miscanthus sinensis arduus</i>
pagpagey		Gramineae	<i>Ageratum conyzoides</i> L.
poen		Gramineae	<i>Ischaemum angustifolium</i> (Trin.) Hark
Class Filicinae (ferns)			
baguingey		Gleicheniaceae	<i>Dicranopteris linearis</i> Underw., <i>Gleichenia linearis</i> (Burn.) Clarke
sulibedbed, salibegbeg, nito		Schizaeceae	<i>Lygodium japonicum</i> (Thunb.) Sw.

Table 3. Plants identified with their genera

Common (local) Name	Common English Name	Family	Genus	Some Morphological Features
Class Angiospermae (flowering plants); Subclass Dicotyledonae				
pawikan	wild rose	Rosaceae	<i>Rosa</i> sp.	woody, leaf -elliptical w/ acute tip, leaf is smaller than hybrid
pinit (1)		Rosaceae (?)	<i>Rubus</i> sp. (?)	woody (vine), leaf-orbiculate, inflorescence-compound umbel, fruit-yellow orange when ripe
pinit (2)		Rosaceae (?)	<i>Rubus</i> sp.	woody, leaf -reniform, fruit-orange when ripe
pinit (3)		Rosaceae	<i>Rubus</i> sp.	woody, leaf -elliptical w/ acute tip, fruit-red orange when ripe
Class Angiospermae (flowering plants); Subclass Monocotyledonae				
eg-eged		Gramineae	<i>Andropogon</i> sp.	leaf-linear, culm-triangular, fruit-caryopsis, inflorescence-compound spike
Class Filicinae (ferns)				
alam-am, anam-am, annapat		Polypodiaceae	<i>Asplenium</i> sp.	woody, leaf -odd pinnate/compound pinnate
sakti	tree fern, wooly fern tree	Cyatheaceae	<i>Cyathea</i> sp.	

Table 4. Plants identified with their family names

Common (local) Name	Family	Some Morphological Features
Class Angiospermae (flowering plants); Subclass Dicotyledonae		
ag-agatan	Compositae/Asteraceae	herbaceous, leaf -lanceolate, inflorescence-umbel
bako	Liliaceae	herbaceous and succulent, leaf-ensiform
lubed, ba-ay	Leguminosae (?)	vine, leaf -ovate w/ acute tip
puket (2)	Leguminosae (?)	woody, leaf -trifoliolate, fruit-loment
yokyokgong	Compositae/Asteraceae	herbaceous, leaf -spatulate, inflorescence -capitulum
Class Angiospermae (flowering plants); Subclass Monocotyledonae		
balili	Gramineae	herbaceous, leaf -linear
dayong, tibangan	Gramineae	herbaceous, leaf -ensiform and corrugated, strong leaf
kawkawayan	Gramineae	leaf-ensiform
kuyangot	Gramineae	leaf-ensiform
on-onas	Gramineae	herbaceous, leaf -lanceolate
sabsabog	Gramineae	panicle resembles that of a sorghum, leaf-ensiform
tantaneg	Gramineae	grass, leaf-linear, has 2 spikes
tubo	Gramineae	leaf-linear
Class Filicinae (ferns)		
fern (A)	Polypodiaceae	herbaceous, leaf -odd pinnate/compound pinnate, leaf -39 cm long, 25 cm wide
gesgeseb, segsegib	Polypodiaceae	spores-small, spherical, and close to leaf margin



Photo 3. An unidentified grass that turns yellow brown on summer

Table 5. Plants identified with their local names

Common (local) Name	Some Morphological Features
<i>Class Angiospermae (flowering plants); Subclass Dicotyledonae</i>	
addaan	woody, leaf -elliptical w/ acute tip
ag-aggub	tree, leaf-ovate in form w/ acute tip, has feathery leaf texture
agayen, patuki	tree, leaf-lanceolate with acute tip, leaf is dark green and shiny, fruit-red berries when ripe
alig-os, kae -ea	herbaceous, leaf -lanceolate
alin-ew	woody, leaf -lanceolate
aluloy	herbaceous, leaf -elliptical w/ acute tip
aluloy (2)	woody, leaf -cordate in form but longer, similar to bulbulad in appearance but smaller
anatil	tree, leaf -elliptical
ang-angot, aromatic, silsiliri	herbaceous, leaf -compound pinnate
apiitan	woody, leaf -lanceolate w/ saw-toothed margin
as-aso, ing-ingit	vine, leaf -cordate
ateba	woody, leaf -ovate in form w/ acute tip
atelba	woody, leaf -elliptical w/ acute tip
bag-bago	tree, leaf -cordate
ballay	woody, leaf -lanceolate
bas-ot	woody, leaf -lanceolate
bitik	tree, leaf -lanceolate w/ acute tip
cigis	woody, leaf -deltoid
dagad-ay, bulbulad, batbatnag	woody, leaf -ovate in form
degi-is	woody, leaf -lanceolate
gatudan	herbaceous, leaf -spatulate
in-NPA	herbaceous, leaf -ovate in form w/ acute tip
in-NPA, agunoy	herbaceous, leaf -lanceolate w/ angular margin,
is-is, appas, isep	woody, leaf -lanceolate to pinnate, has rough leaf texture
katel-ang	herbaceous, leaf -lanceolate
kibiw, ballogo di magan	herbaceous, leaf -palmate (10 leaflets), fruit-like corn cob and orange when ripe (raw-green)
kupkupit	leaf-odd pinnate and rubbery leaf texture
ladea, ka-ea	tree, leaf -lanceolate
lalagim	tree, leaf -lanceolate w/ acute tip
lalakin di bangbang	tree, leaf -lanceolate
liwliw	tree, leaf -lanceolate
manmanok	woody, leaf -lanceolate
pannatel	tree, leaf -lanceolate
pedped	tree, leaf -elliptical
pedped, tabako	tree, leaf -elliptical w/ acute tip
pong-pong, palongpong	vine, leaf -lanceolate, leaf is sour
puket (1)	woody, leaf -cuneate-like, inflorescence -compound Umbel
puket 3	herbaceous, leaf -lanceolate
pulot	woody, leaf -ovate w/ acute tip
sabosab, sabosob	herbaceous, leaf -obovate
tabtabako	herbaceous, leaf -spatulate, inflorescence -panicle
tampoy, spanish guava	woody, leaf -lanceolate
tayadoan	herbaceous, leaf -spatulate, inflorescence -panicle
tikem	woody, leaf -lanceolate
tintinta	woody, leaf -lanceolate w/ angular margin, fruit -caryopsis

waka	herbaceous (vine), leaf-deltoid
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(Table 5 continued)

Class Angiospermae (flowering plants); Subclass Monocotyledonae	
ta-am	herbaceous, leaf-linear
Class Filicinae (ferns)	
am-am	woody, leaf-odd pinnate and palm-like in appearance, spores-evidently lining the lower midrib
gesgeseb (2)	spores-spherical and evident along the midrib and leaf blade, leaf-odd pinnate
maiden hair	herbaceous, leaf-odd pinnate/compound pinnate, spores-spherical and evident

Table 6. Plants assigned with codes and some of their morphological features

Assigned Code	Some Morphological Features
Class Angiospermae (flowering plants); Subclass Dicotyledonae	
5-Ab	alternate leaf arrangement, leaf-elliptical, leaf-2-2.5 cm long, 1.3-1.5 cm wide
10-Ab	alternate leaf arrangement, leaf-peltate w/ deltoid outline of leaf, leaf-8.5-8.8 cm long, 9.5 cm wide
30-Ab	alternate leaf arrangement, leaf-oblongate (or diamond-shape), leaf-1.8-2.3 cm long, 1-1.3 cm wide
34-Ab	has tiny spherical fruits of 3-3.5 cm diameter, alternate leaf arrangement, leaf-cordate but shallow and cleft at the base, leaf-3.5 cm long, 3-3.6 cm wide, inflorescence-thyrse
3-Ah	fern, toothed margin w/ smooth edges, leaf-pinnate
6-Ah	leaf-spatulate w/ angular margin, leaf-5 cm long, 4-4.5 cm wide
8-Ah	alternate leaf arrangement, leaf-lanceolate, leaf-4 cm long, 1.3 cm wide
11-Ah	alternate leaf arrangement, feathery leaf texture, leaf-lanceolate, leaf-7.7.5 cm long, 3.3-4 cm wide, inflorescence-thyrse
15-Ah	alternate leaf arrangement, leaf-lanceolate w/ angular margin, leaf-4-4.5 cm long, 1.5 cm wide
16-Ah	alternate leaf arrangement, leaf-lanceolate, leaf-8-9 cm long, 1.5-2 cm wide
18-Ah	alternate leaf arrangement, leaf-fan-shaped w/ curved margin, leaf-1-1.5 cm long, 1.8 cm wide
20-Ah	opposite leaf arrangement, leaf-1.8-2.3 cm long, 5-7 mm wide
21-Ah	opposite leaf arrangement, leaf-lanceolate, leaf-1 cm long, 5 mm wide, inflorescence-verticillaster
23-Ah	feathery white leaf, leathery-cloth leaf texture, leaves all come from base, leaf-oblongate, leaf-3.5 cm long, 1.5-1.7 cm wide
24-Ah	alternate leaf arrangement, leaf-deltoid, leaf-4.1 cm long, 2.5 cm wide
25-Ah	leaves all come from the base, leaf-ovate in form w/ acute tip, leaf-4.5 cm long, 2 cm wide
32-Ah	small (4 cm tall), leaf-elliptic (or spherical) to reniform, leaf-7 mm long, 6 mm wide, inflorescence-raceme
33-Ah	alternate leaf arrangement, leaf-oblongate, leaf-1-2.3 cm long, 1-1.3 cm wide, inflorescence-umbel
37-Ah	saw-toothed leaf margin (even spacing), leaf-lanceolate, leaf-13.5 cm long, 3.2 cm wide
22-Ahv	opposite leaf arrangement, leaf-cordate w/ angular margin, leaf-4-4.3 long, 2.7 cm wide
1-At	alternate leaf arrangement, leaf-elliptical w/ acute tip and toothed margin, leaf-12 cm long, 5.5-6.0 cm wide
2-At	opposite leaf arrangement, leaf-lanceolate, leaf-19-19.5 cm long, 6 cm wide
7-At	opposite leaf arrangement, curved veins form outline along the margin, leaf-lanceolate, leaf-11.5-12 cm long, 5-5.2 cm wide
9-At	leaf-elliptical w/ acute tip and cleft base, leaf-22 cm long, 15 cm wide
12-At	opposite leaf arrangement, feathery leaf texture, leaf-lanceolate, leaf-15-15.3 cm long 5-5.3 cm wide
14-At	opposite leaf arrangement, leaf-lanceolate, leaf-12-12.5 cm long, 4.8-5.2 cm wide
17-At	opposite leaf arrangement, leaf-pandurate to spatulate to oblong to lanceolate (variable), leaf-6-8.2 cm long, 2.8-3.4 cm wide
28-At	opposite leaf arrangement, leaf-lanceolate w/ angular margin, leaf-7.5-10.5 cm long, 3-3.3 cm wide
29-At	alternate leaf arrangement, leaf-oblongate to lanceolate to elliptic (variable), leaf-3.6-10.5 cm long, 2-4.3 cm wide
4-Av	alternate leaf arrangement, evident vertical veins/major veins, leaf-elliptical w/ acute tip, leaf-10-11 cm long, 5.5.8 cm wide

(Table 6 continued)

<i>Class Angiospermae (flowering plants); Subclass Monocotyledonae</i>	
13-B	grass-like/grass, leaf -ensiform, leaf -23-24 cm long, 1-1.4 cm wide, inflorescence-cyme
19-B	grass, turns brown/yellow brown during summer, leaf -ensiform, leaf-4 cm long, 4 mm wide, inflorescence-compound spike
26-B	grass, alternate leaf arrangement, leaf-linear, leaf -6-15 cm long, 1.5-2 mm wide, inflorescence-compound spike
27-B	grass, alternate leaf arrangement, leaf-ensiform, leaf-5.5-6.5 cm long, 6 mm wide, inflorescence -compound spike
31-B	grass, leaf -ensiform, leaf -16.6 cm long, 7-8 mm wide
35-B	grass with ensiform leaflets, leaf -palmate, leaf-23.5 cm long, 5-7 mm wide (leaflet), inflorescence-compound umbel
36-B	grass, alternate leaf arrangement, leaf-ensiform, leaf-3-3.6 cm long, 2.5-5 mm wide, inflorescence-compound spike
38-B	grass, leaves all come from the base, leaf -linear, leaf-14 cm long, 1 mm wide

Legend:	A -- dicot
	B -- monocot
	b -- bush
	h -- herbaceous
	t -- tree
	v -- vine

Only few of the plants belong to class Filicinae (Tables 2, 4, and 5) and most of the plants under Angiospermae belong to subclass Dicotyledonae (Tables 2, 3, 5, and 6). Plants that were not identified (e.g., Photo 3) even with just their local names were assigned code names (Table 6) and a little description of their common morphological features that may later help to their eventual identification.

CONCLUSION

- 1.) Alpha phytodiversity of pine forest in Tadian, Mountain Province is very low. Forest fire may have an effect to low phytodiversity in the study site, but there is no direct link to the causality.
- 2.) Flowering plants (Angiosperms) are more diverse than ferns under pine tree community though ferns seem to dominate the area studied.
- 3.) Not all plants growing in pine forest in Tadian could be identified with their local names.

RECOMMENDATIONS

- 1.) Pine forest diversity should be increased and preserved for their potentials and benefits. Thus, forest fires must be prevented or stopped.
- 2.) A continuing study may be made to include other vascular plants (and or even animals).
- 3.) A thorough identification of the plants surveyed is advisable.
- 4.) The alpha diversity scale made may be improved and consequently revised.

REFERENCES

- BROWN, W. H. 1950. Useful Plants of the Philippines. Vol. 1; Manila Department of Agriculture and Commerce. 590p.
- CO, L. L. 1989. Common Medicinal Plants of the Cordillera Region: (Northern Luzon, Philippines), A Trainor's Manual for Community Based Health Program. Revised and expanded edition. Community Health Education, Services and Training in the Cordillera Region (CHESTCORE), Baguio City. 490p.
- CONSERVATION INTERNATIONAL. 2004. *Comparing hotspots*. Biodiversity Hotspots. Conservation International. http://www.biodiversityhotspots.org/xp/Hotspots/hotspotsScience/comparing/compar_plants_per_area.xml
- CUNNINGHAM, W. P. AND B. W. SAIGO. Environmental Science: A global concern. 4th ed. Mc Graw-Hill Companies, Inc. Pp. 270-272
- DE PADUA, L. S.; et al. 1987. Handbook on Philippine medicinal Plants. Vol. 2; UPLB College, Laguna.
- DOLGALYEVA, L. M. (n.d.) Communities and Species Diversity of Droadleaved-Korean pine Forest of the Southern Sikhote-Alin. Vladivostok University of Economics and Services, Nakhodka Branch, Nakhodka, Russia. <http://www.geopacifica.org/symposium/PROGRAM/dolgalyeva.html>
- FOREST CONSERVATION PORTAL. 2002. *WWF finds record number of species in highly threatened Indonesian forest*. Forest Conservation Portal. February 4, 2002. <http://forests.org/articles/reader.asp?linkid=7288>
- GOTTSBERGER, G., I. SILBERBAUER-GOTTSBERGER AND G. HINTZE. 1999. *The Brazilian Cerrado: a Large-Scale, Species-Rich, and Endangered Seasonal Tropical Vegetation*. Jahrestagung der Deutschen Gesellschaft für Tropenökologie – gtö. Feb. 17-19, 1999, Poster P-6.6. <http://www.biologie.uni-ulm.de/gtoe/abstracts/ggosilbe.htm>
- GROLIER ENCYCLOPEDIA OF KNOWLEDGE. 1995. Volume 15 (Pic-Ree). International edition, Grolier Incorporated by Grolier International. Pp. 41-42
- HAY, R. and P. M. SYNGE. 1975. The Colour Dictionary of Garden Plants with House and Greenhouse Plants. Compact edition. Boomsbury Books, an imprint of Godfrey Cave Group, 42 Bloomsbury St., London WC1B 3 QJ.
- MADULID, D. A. 2000. A Pictorial Encyclopedia of Philippine Ornamental Plants. 2^d ed. Bookmark, Inc.; Makati City, Phil. 388p.
- MPSPC. 1998. Balidong reforestation project map. Mountain Province State Polytechnic College, College of Engineering and Technology, Tadian, Mountain Province.
- MUNICIPALITY OF TADIAN. (n.d.). Tadian municipal map. Tadian, Mountain Province.

- PIIAS/PAGASA/DOST. 1992. Climate of the Philippines. (flyer)
- SCIENTIA SILVICA. 1997. *Plant diversity in Old-Growth and Second-Growth stands in the Coastal Rainforests of British Columbia*. Scientia Silvica. Extension Series, Number 3, 1997. Forest Sciences Department, The University of British Columbia. http://www.forestry.ubc.ca/klinka/sci_sil/sses/sses003.pdf
- SENGBUSCH, P. V. 2004. *Biodiversity – Number of Species and Individuals*. Diversitas Deutschland. <http://www.biologie.uni-hamburg.de/b-online/e56/56b.htm> [last change: 02/14/2004]
- STARR, C. and R. TAGGART. 1989. *Biology: The Unity and Diversity of Life*. 5th ed. Wadsworth, Inc. p. 707, 771
- STEINER, M. L. 1960. *Philippine Ornamental and Their Care*. Carmelo and Bauermann, Inc. 2nd ed.
- USDA. 1937. *Yearbook of Agriculture. Animal Industries Working Collection*. United States Department of Agriculture. U.S. Gov't Printing Office. 1497p.