



Science

DIVERSITY OF SHRUBS AND TREES IN THE ISLAND TOWNS OF NORTHERN SAMAR, PHILIPPINES

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Abstract

This study aimed to identify the shrubs and trees in the five island towns of Northern Samar, Philippines; determine their abundance, community structure; and economic uses to the locals. Four barangays in every island town represented the north, south, east, and west sides. Line Intercept Transect (LIT) at intervals of 100m and plot method with an area of 10m x 10m were used in gathering the data. Transect walks, field plots, and transects were also used in gathering data. There were 207 species of shrubs and trees belonging to 152 genera and 64 families. Shrubs constituted 55.33% and trees 44.67% of the total number of species. *Mangifera indica* (Anacardiaceae) ranked first in relative density (25.50%), relative frequency (25.30%), and importance value (59.15%). Plots in the island of Laoang were observed to have the highest Shannon Diversity Index (3.25%) and Simpson's Dominance Index (1.86%). The most abundant shrub and tree species in the island towns were *Citrus microcarpa* (Cucurbitaceae) and *Mangifera indica* (Anacardiaceae) respectively. The least abundant shrub and tree species were *Gardenia jasminoides* (Rubiaceae) and *Cananga odorata* (Annonaceae) respectively. There were more species of shrubs and trees in the island town of Laoang than in the other four island towns.

Keywords: Community Structure; Diversity; Island Towns; Shrubs; Trees.

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1. Introduction

Shrubs are woody perennial plants that possess multiple stems arising from a common point known as the crown. Trees are woody perennial plants, such as shrubs, by the presence of usually but not always, a single woody stem known as the trunk. Both shrubs and trees inhabit virtually all climates and soil types, with a large variation in form, adaptability and stress tolerance from species to species [1].

The Philippines is one of the megadiversity countries of the world. It has also a large population, which exerts tremendous pressure to transform these biodiversity resources into material wealth

that will lift the people out of poverty [2], [3]. Awareness of the people about the rich biodiversity and the role of education should be emphasized. Attempts to identify methods of maintaining and using biodiversity in ways that can benefit the human population is the major role of conservation biology [4]. Systematics plays a vital role in conservation biology in determining the limits of species; only if these taxonomic entities are clearly defined can they be evaluated for rarity and the threat of extinction. In addition, floristic studies and phylogenetic analyses may have an impact on which species or biogeographic regions are most worthy of protection, given limited resources [5]. Naturalists, scientists, researchers, and conservationists predict that at 1% extinction rate, these resources will be gone by 2050 [6]. Organisms in small restricted areas, such as **islands**, are more prone to extinction because an environmental change in their locale can eliminate the entire species at once [7].

Living organisms provide us with many useful drugs. The United Nations Development Programme (UNDP) estimates the value of pharmaceutical products derived from developing world. Plants, animals, and microbes are estimated to be more than 30 billion dollars per year [8]. Because we don't fully understand the complex interrelationships between organisms, we often are surprised and dismayed at the effects of removing seemingly insignificant members of biological communities. Maintaining biodiversity is essential to preserving these biological and ecological services [9].

Thus, this study of shrubs and trees may open for more conservation and preservation practices for these woody plants for now and the future generations of island folks in the country.

2. Objectives

The objectives of this study are:

- 1) To identify the shrubs and trees in the island towns of Northern Samar, Philippines;
- 2) To determine their community structure; and
- 3) To determine the most abundant shrubs and trees in the island towns.

3. Methodology

The province of Northern Samar consists of 24 municipalities, i.e. 15 coastal towns, 5 island towns, and 4 interior towns. Catarman is the capital town of the province of Northern Samar.

Sampling areas included the five island towns of the province; i.e. Laoang, Biri, Capul, San Antonio, and San Vicente. The study was conducted during the summer months of April and May 2012-2014. Four barangays in every island town represented the north, south, east, and west sides. Line Intercept Transect (LIT) at intervals of 100m and Plot Method with an area of 10m x 10m were used in gathering the data. The preliminary identification was done on-site in the study area through personal communication with the foresters and local residents (local names). Further identification and verification were done at the College of Science Laboratory. Simpson's Dominance and Shannon-Wiener indices were used to verify the diversity status of shrubs and trees.

4. Results and Discussion

4.1. Shrubs and Trees in the Island Towns of Northern Samar

There were 207 species of shrubs and trees belonging to 152 genera and 64 families. Trees constituted 55.33% of the total number of species; while the shrubs 44.67%.

Table 1: Shrubs and Trees in the Island Towns of Northern Samar, Philippines

<p>1. Family Acanthaceae Barleria cristata P. atropurpureum</p> <p>2. Family Agavaceae Pleomele reflexa variegata</p> <p>3. Family Anacardiaceae Mangifera indica Anacardium occidentale Buchanania arborescens Spondias pinnata Spondias purpurea</p> <p>4. Family Annonaceae Annona muricata Annona squamosa Annona reticulata Cananga odorata Polyalthia longifolia</p> <p>5. Family Apocynaceae Nerium indicum Thevetia peruviana Alstonia scholaris Plumeria rubra Ervatamia divaricate Adenium obesum Cerbera odollam Cerbera manghas</p> <p>6. Family Araliaceae Polyscias balfouriana Polyscias guilfoylei Trevesia palmata</p> <p>7. Family Araucariaceae Araucaria heterophylla Pongamia pinnata Aganope heptaphylla Derris trifoliata</p> <p>8. Family Arecaceae Caryota mitis Cyrtostachys renda Cocos nucifera Areca catecu</p> <p>9. Family Avicenniaceae Avicennia lanata Avicennia officinalis</p>	<p>11. Family Bixaceae Bixa orellana</p> <p>12. Family Bromeliaceae Ananas comosus</p> <p>13. Family Burseraceae Canarium ovatum</p> <p>14. Family Caesalpiniaceae Caesalpinia pulcherrima Leucaena leucocephala Erythrina orientalis Gliricidia sepium Pterocarpus indicus Acacia mangium Albizia lebbeck Leucaena leucocephala Erythrina orientalis Acacia auriculiformis</p> <p>15. Family Casuarinaceae Casuarina equisetifolia</p> <p>16. Family Caricaceae Carica papaya</p> <p>17. Family Clusiaceae Calophyllum inophyllum</p> <p>18. Family Combretaceae Lumnitzera littorea Terminalia catappa Lumnitzera littorea Lumnitzera racemosa Terminalia catappa</p> <p>19. Family Cucurbitaceae Citrullus lanatus Citrullus vulgaris Citrus maxima Citrus microcarpa Citrus medica Citrus reticulata Citrus japonica</p> <p>20. Family Cycadaceae Cycas rumphii</p> <p>21. Family Dilleniaceae Dillenia suffruticosa Dillenia philippinensis</p> <p>22. Family Dipterocarpaceae Shorea macroptera</p>	<p>25. Family Euphorbiaceae Macaranga tanarius Melanolepis multiglandulosa Reutealis trisperma Jatropha multifida Euphorbia milii Jatropha curcas Excoecaria agallocha</p> <p>26. Family Gnetaceae Gnetum gnemon</p> <p>27. Family Goodeniaceae Scaevola taccada</p> <p>28. Family Labiateae Gmelina arborea Premna odorata Vitex parviflora</p> <p>29. Family Lauraceae Persea americana</p> <p>30. Family Leguminosae Tamarindus indica Osbornia octodonta Sesbania grandiflora Peltophorum pterocarpum Cassia bakeriana Cassia fistula Delonix regia Saraca thaipingensis Cassia siamea Cassia alata Cassia auriculata Adenantha pavonina</p> <p>31. Family Liliaceae Asparagus setaceus Asparagus asparagoides Asparagus densiflorus Asparagus falcatus Asparagus plumosus</p> <p>32. Family Loganiaceae Fagraea fragrans</p> <p>33. Family Lythraceae Lagerstroemia speciosa Pemphis acidula</p> <p>34. Family Magnoliaceae</p>
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<p>Avicennia alba Avicennia marina 10. Family Bignoniaceae Tecoma stans Crescentia cujete Jacaranda acutifolia Dolichandrone spathacea</p>	<p>23. Family Ebenaceae Diospyrus philippenensis 24. Family Ericaceae Rhododendron obtusum Rhododendron simsii</p>	<p>Michelia champaca 35. Family Malvaceae Hibiscus tiliaceus Hibiscus mutabilis Hibiscus rosa-sinensis Ceiba pentandra Pachira aquatic Kleinhovia hospital Theobroma cacao</p>
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<p>36. Family Melastomataceae Melastoma malabathricum Lantana camara 37. Family Meliaceae Lansium aqueum Lansium domesticum Azadirachta indica Melia azedarach Sandoricum koetjape Swietenia macrophylla Swietenia mahogany Artocarpus altilis Artocarpus blancoi Artocarpus odoratissimus Artocarpus heterophyllus Xylocarpus granatum Xylocarpus moluccensis 38. Family Mimosaceae Calliandra emarginata Adenanthera pavonina Samanea saman 39. Family Moraceae Ficus microcarpa Ficus variegata Ficus religiosa Ficus elastica Ficus lyrata Ficus nota 40. Family Moringaceae Moringa oleifera 41. Family Muntingiaceae Muntingia calabura 42. Family Myrtaceae Callistemon citrinus Syzygium samargense Psidium guajava Eugenia cumini Syzygium polycephalum Eugenia javanica Eugenia malaccensis Eugenia aquea Syzygium jambos</p>	<p>43. Family Myrsinaceae Aegiceras floridum 44. Family Oleaceae Osmanthus heterophyllus 45. Family Onagraceae Fuchsia spp. 46. Family Oxalidaceae Averrhoa bilimbi Averrhoa carambola 47. Family Palmae Rhapis excelsis Phoenix canariensis Microcoelum weddellianum Livistona chinensis Livistona australis Nypa fruticans Chamaedorea elegans Caryota mitis Chamaerops humilis 48. Family Pandanaceae Pandanus odoratissimus 49. Family Pittosporaceae Pittosporum tobira 50. Family Podocarpaceae Podocarpus wallichiana 51. Family Pteridaceae Acrostichum aureum Acrostichum speciosum 52. Family Proteaceae Grevillea robusta 53. Family Rhizophoraceae Rhizophora mucronata Bruguiera gymnorrhiza Ceriops decandra Ceriops tagal Rhizophora apiculata Rhizophora stylosa Rhizophora mucronata Bruguiera cylindrical Bruguiera gymnorrhiza Bruguiera parviflora Bruguiera sexangula</p>	<p>54. Family Rosaceae Rosa centifolia Rosa chinensis 55. Family Rubiaceae Morinda citrifolia Gardenia jasminoides Ixora javanica Ixora coccinea Mussaenda glabrata Coffea arabica Scyphiphora hydrophyllacum 56. Family Rutaceae Citrus grandis Citrus microcarpa 57. Family Sapindaceae Nephelium lappaceum 58. Family Sapotaceae Manilkara achras Chrysophyllum cainito Pouteria campechiana Mimusops elengi 59. Family Solanaceae Capsicum annum Vestia foetids Solanum melongena 60. Family Sonneratiaceae Sonnertia caseolaris 61. Family Theaceae Camellia japonica 62. Family Tiliaceae Colona serratifolia 63. Family Urticaceae Leucosyke capitellata 64. Family Verbenaceae Clerodendrum paniculatum Tectona philippinensis</p>
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4.2. Community Structure of Shrubs and Trees

There were 207 species of shrubs and trees with average DBH (Diameter Breast Height) of ≥ 10 cm. The density, relative density, frequency, relative frequency, dominance in terms of basal area, relative dominance, and importance value were calculated for each of the species of shrubs and trees. The results were:

Relative Density (RD) – *Mangifera indica* (Anacardiaceae) had the highest relative density at 25.50%, followed by *Tamarindus indica* (Leguminosae) at 12.10%, and *Chrysophyllum cainito* (Sapotaceae) at 10.82%. The other shrub and tree species accounted for 51.58% total relative density.

Relative Frequency (RF) – Among the shrubs and trees, the most frequently seen in all of the five island towns is the presence of *Mangifera indica*, (Anacardiaceae) which is a fruit tree, and favorite fruit among the islander folks since the fruit tree is seen everywhere, i.e. in the farms, at house front and back yards, in schools, churches, markets, and seashores. *Mangifera indica* (Anacardiaceae) had the highest relative frequency at 25.30%, followed by *Tamarindus indica* (Leguminosae) at 12.78%, and *Chrysophyllum cainito* (Sapotaceae) at 10.36. The other shrub and tree species accounted for 51.56% total relative frequency.

Relative Dominance (RD) – *Mangifera indica* (Anacardiaceae) dominated the shrubs and trees in terms of basal area with 8.35%, followed by *Canarium ovatum* (Burseraceae) with 7.89%, and *Chrysophyllum cainito* (Sapotaceae) with 6.41%. Other shrub and tree species accounted for a total of 77.35%.

Importance Value (IV) – For the 207 species of shrubs and trees, importance value was calculated by adding the relative density (RD), relative frequency (RF), and relative dominance (RD). The species with the highest importance value was the fruit tree *Mangifera indica*, (Anacardiaceae) with 59.15%.

Diversity Status – Among the five island towns being surveyed, Laoang had the most number of species. This was also reflected by Shannon Index of 4.75 and Simpson's Dominance of 1.86. The high value for the island town of Laoang was attributed to its favorable location - it is near the mainland; i.e. Samar Island-considered as third largest island in the Philippines; only 5-10 minutes motorboat ride compared to the other island towns whereby, they can be reached from 30-90 minutes motorboat ride.

4.3. Abundant Shrubs and Trees

The most abundant shrub and tree species in the island towns were *Citrus microcarpa* (Cucurbitaceae) and *Mangifera indica* (Anacardiaceae) respectively. The least abundant shrub and tree species were *Gardenia jasminoides* (Rubiaceae) and *Cananga odorata* (Annonaceae) respectively. There were more species of shrubs and trees in the island town of Laoang than in the other four island towns; i.e. Biri, Capul, San Antonio, and San Vicente. Plots in the island of Laoang was observed to have the highest Shannon Diversity Index (3.25%) and Simpson's

Dominance Index (1.86%). Fifty-three percent (53%) of the species were endemic to the island towns.

Families Caesalpiniaceae and Meliaceae respectively had the largest number of species which is 13; followed by Family Leguminosae which had 12 species; followed by Family Rhizophoraceae which had 11 species; and Families Palmae and Myrtaceae had both 9 species.

Other abundant species of shrubs in the island towns were: *Avicennia marina* (Avicenniaceae), *Rhizophora mucronata* (Rhizophoraceae), *Nypa fruticans* (Palmae), *Psidium guajava* (Myrtaceae), and *Hibiscus rosa-sinensis* (Malvaceae). Other abundant species of trees were: *Cocos nucifera* (Arecaceae), *Canarium ovatum* (Burseraceae), *Hibiscus tiliaceus* (Malvaceae), *Artocarpus blancoi* (Meliaceae), and *Tamarindus indica* (Leguminosae).

Other least abundant species of shrubs in the island towns were: *Rosa centifolia* (Rosaceae), *Eugenia aquea* (Myrtaceae), *Nephelium lappaceum* (Sapindaceae), *Manilkara achras* (Sapotaceae), and *Annona squamosa* (Annonaceae). Other least abundant species of trees were: *Eugenia javanica* (Myrtaceae), *Ficus elastica* (Moraceae), *Syzygium samargense* (Myrtaceae), *Lansium domesticum* (Meliaceae), and *Bixa orellana* (Bixaceae).

It is observed that food requirement is the main reason of the abundance of trees in the island towns. Island folks plant them to provide nourishment, and store/preserve them during times of need. On the other hand, the abundant shrubs are used for construction purposes, for fuel, and for other uses. Some are ornamental flowering plants, which provide aesthetic value to the surroundings, especially for island people seeking for inspiration and adventure.

Table 2: Families with Number of Species and Genera

Family	No. of Species	No. of Genera
1.Family Acanthaceae	2	2
2.Family Agavaceae	1	1
3.Family Anacardiaceae	5	4
4.Family Annonaceae	5	3
5.Family Apocynaceae	8	7
6. Family Araliaceae	3	2
7.Family Araucariaceae	1	1
8.Family Arecaceae	4	4
9.Family Avicenniaceae	4	1
10.Family Bignoniaceae	4	4
11.Family Bixaceae	1	1
12.Family Bromeliaceae	1	1
13.Family Burseraceae	1	1
14.Family Caesalpiniaceae	13	10
15.Family Casuarinaceae	1	1
16.Family Caricaceae	1	1
17.Family Clusiaceae	1	1
18.Family Combretaceae	5	2
19.Family Cucurbitaceae	7	2
20.Family Cycadaceae	1	1
21.Family Dilleniaceae	2	1
22.Family Dipterocarpaceae	1	1
23.Family Ebenaceae	1	1

24.Family Ericaceae	2	1
25.Family Euphorbiaceae	7	6
26.Family Gnetaceae	1	1
27.Family Goodeniaceae	1	1
28.Family Labiateae	3	3
29.Family Lauraceae	1	1
30.Family Leguminosae	12	11
31.Family Liliaceae	5	1
32.Family Loganiaceae	1	1
33.Family Lythraceae	2	2
34.Family Magnoliaceae	1	1
35.Family Malvaceae	7	5
36.Family Melastomataceae	2	2
37.Family Meliaceae	13	8
38.Family Mimosaceae	3	3
39.Family Moraceae	6	1
40.Family Moringaceae	1	1
41.Family Muntingiaceae	1	1
42.Family Myrtaceae	9	5
43.Family Myrsinaceae	1	1
44.Family Oleacea	1	1
45.Family Onagraceae	1	1
46.Family Oxalidaceae	2	1
47.Family Palmae	9	8
48.Family Pandanaceae	1	1
49.Family Pittosporaceae	1	1
50.Family Podocarpaceae	1	1
51.Family Pteridaceae	2	1
52.Family Proteaceae	1	1
53.Family Rhizophoraceae	11	4
54. Family Rosaceae	2	2
55.Family Rubiaceae	7	6
56.Family Rutaceae	2	1
57.Family Sapindaceae	1	1
58.Family Sapotaceae	4	4
59.Family Solanaceae	3	3
60.Family Sonneratiace	1	1
61.Family Theaceae	1	1
62.Family Tiliaceae	1	1
61.Family Theaceaez	1	1
62.Fa62.	2	2
63.Fa	207	152
63, Family Urticaceae		
64.Family Verbenaceae		

5. Conclusions

- 1) There were 207 species of shrubs and trees belonging to 152 genera and 64 families. Shrubs constituted 55.33% and trees 44.67% of the total number of species.
- 2) *Mangifera indica* (Anacardiaceae) had the highest relative density at 25.50%, followed by *Tamarindus indica* (Leguminosae) at 12.10%, and *Chrysophyllum cainito* (Sapotaceae) at 10.82%. The other shrub and tree species accounted for 51.58% total relative density. *Mangifera indica* (Anacardiaceae) had the highest relative frequency at 25.30%, followed by *Tamarindus indica* (Leguminosae) at 12.78%, and *Chrysophyllum cainito* (Sapotaceae)

at 10.36. The other shrub and tree species accounted for 51.56% total relative frequency. *Mangifera indica* (Anacardiaceae) dominated the shrubs and trees in terms of basal area with 8.35%, followed by *Canarium ovatum* (Burseraceae) with 7.89%, and *Persea americana* (Lauraceae) with 6.41%. Other shrub and tree species accounted for a total of 77.35%. The species with the highest importance value was the fruit tree *Mangifera indica*, (Anacardiaceae) with 59.15%.

- 3) The most abundant shrub and tree species in the island towns were *Citrus microcarpa* (Cucurbitaceae) and *Mangifera indica* (Anacardiaceae) respectively. The least abundant shrub and tree species were *Gardenia jasminoides* (Rubiaceae) and *Cananga odorata* (Annonaceae) respectively. There were more species of shrubs and trees in the island town of Laoang than in the other four island towns; i.e. Biri, Capul, San Antonio, and San Vicente. Plots in the island of Laoang was observed to have the highest Shannon Diversity Index (4.75%) and Simpson's Dominance Index (1.075%). Fifty-three percent (53%) of the species were endemic to the island towns.

Families Caesalpiniaceae and Meliaceae respectively had the largest number of species which is 13; followed by Family Leguminosae which had 12 species; followed by Family Rhizophoraceae which had 11 species; and Families Palmae and Myrtaceae had both 9 species.

6. Recommendations

- 1) Conserve and preserve the economically and ethnobotanically important shrubs and trees; and other plant life.
- 2) Greening of the island towns by assigning botanical gardens and parks to central site locations in the community.
- 3) Evaluate shrubs and trees, as well as other plant life in the island, using the IUCN Red List Categories Version 3.1, series 2001, or the latest reference.

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