Assessment of the Forest Remnants of Gigantes and Sicogon Islands, Iloilo province, Philippines

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This paper presents the status of forest vegetation in the Gigantes and Sicogon islands, in Carles, Iloilo province, off northeastern Panay Island, Philippines. Sampling of trees was based on 27 main plots (400m2 each) while saplings and undergrowth species were sampled within 27 sub-plots (200m2) and 108 smaller sub-plots (1m2 each), respectively. A total of 88 species of forest plants belonging to 67 genera and 30 Families have been identified in the 27 sampling plots. Sicogon Island has about 571.2 ha (50.29% of the total land area) of relatively intact forest while Gigante Sur and Gigante Norte have 283 ha (47.11%) and 92.73 ha (19.25%) of karst forest, respectively. The forest cover in the three islands has been altered due to farming and charcoal production. The impact of such activities may affect the fauna endemic to these small islands. Protection of the remaining forests on these islands is also recommended.

KEYWORDS: forest, vegetation, karst, Gigantes, Sicogon, Iloilo

INTRODUCTION

In the Philippines, the extent of forest cover (now about 3% of the total land area) is declining at a rate of 1.4% from 1990 to 2000 alone (Langenberger, Martin, & Sauerborn, 2006) mainly as a result of intensive agriculture and other anthropogenic factors (Heaney & Regalado, 1998). The lowland forests are the most threatened (Co et al., 2006).

Elefan and Guanzon (in press) briefly summarized the floristic studies done in Western Visayas with emphasis on selected forest ecosystems of Panay (Fuentes & Andraje, 2008; Bennert, 2006; Madulid, 2000; Elefan, 2002, 2004, 2005; Madulid, 2002) and Negros (Hamann et al., 1999).

Aside from the rapid assessment of Fauna and Flora International in Sicogon, knowledge on the forests in the Gigantes and Sicogon is limited due to the lack of recent forest assessment (see Pedregosa et al., 2006). This study addresses the information gap.

MATERIALS AND METHODS

Brief description of the study areas

Description of each island is provided below. All sites have remaining lowland forests, with elevations ranging from sea level to about 100 meters.

Gigante Sur (11.5886°N, 123.3363°E) (Figure 1) is composed primarily of karst forests (Figure 2) on the east with patches of "ipil-ipil" (*Leucaena leucocephala*). The rest of the island is cogonal with a few areas of scrub and agricultural areas planted with fruit trees and coconuts. In the north is an extensive fishpond, a large portion of which used to be an extensive mangrove forest.

Gigante Norte (11.6246°N, 123.3489°E) (Figure 1) is located just 0.9 km north of Gigante Sur. Its remaining forest is fragmented and stunted in karst formations.

Sicogon Island (11.4458°N, 123.2625°E) (Figure 1) is located 9.5 km east of Estancia town. To the northeast is another island (Calagnaan) separated only by a narrow channel. Unlike the Gigante Islands, Sicogon is non-karst with both soil type and vegetation similar to that of the mainland Panay indicating that it may have been once connected to the mainland during the Ice-age (Pleistocene period). In the eastern side is a forest reserve with about 282 hectares (Figure 3)

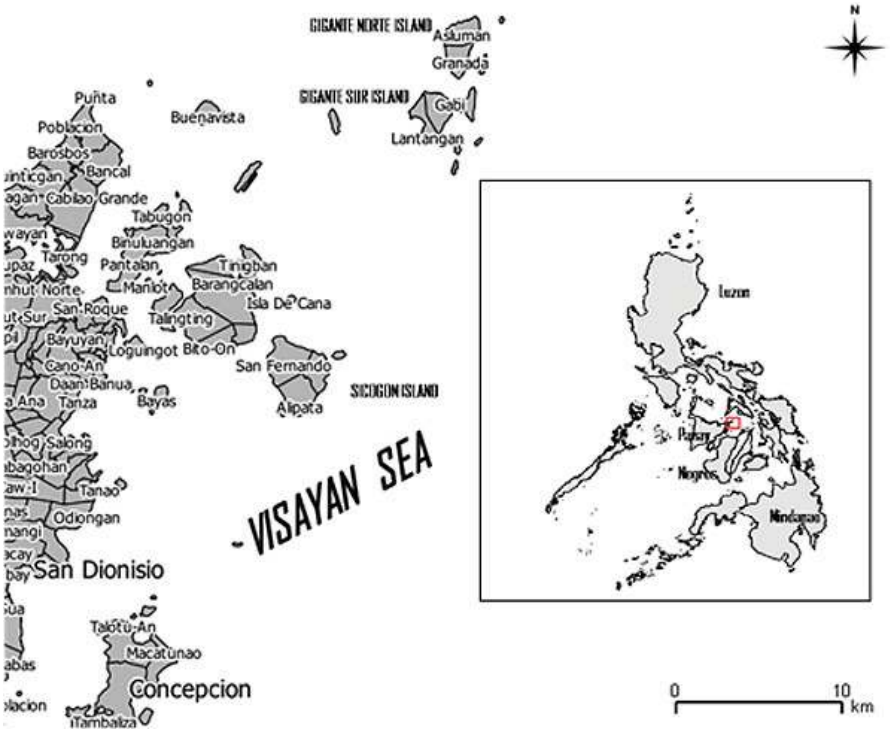

Figure 1. A map showing the location of the three islands covered by the study (Gigante Norte, Gigante Sur, and Sicogon).

under the jurisdiction of the Department of Environment and Natural Resources-Region VI (DENR-VI) through DENR Administrative Order No. 04 issued on April 24, 2008. This forest reserve was formerly managed by Sicogon Development Corporation (SIDECO), a private company, through DAO No. 05, series of 1989. The western side of the island, however, has been deforested and now dominated by cogon as a result of frequent slash-and-burn farming (Figure 4). Such activities, including cutting of trees (Figure 5) for charcoal production and other domestic uses, have recently encroached in the supposed Sicogon Forest/Tree Park.

Data gathering

Forest coverage (in hectares) on each of the three islands (Sicogon, Gigante Sur, and Gigante Norte) was determined using Geographic Information System (GIS) softwares primarily Quantum® GIS

Figure 2. View of a typical karst forest landscape in Gigante Sur.

Figure 3. A view of the Sicogon Forest/Tree Park (viewed from the eastern side).

Figure 4. Deforested side of Sicogon Island (viewed from the southwestern side).

Figure 5. Illegally cut trees in the timberland of Sicogon Island, Carles, Iloilo.

1.8.0-Lisboa (QGIS). Data obtained by actual ground survey using GPS (Global Positioning Systems) units (Garmin®-760) are also incorporated in the analysis of forest coverage. Areas (in hectares) were then computed using Map Tools of QGIS. The survey was conducted from March 15 to 24, 2010.

Sampling plots measuring 20 m x 20 m (main plots), 200-250m apart, were established along each transect in the forested portion of

each island. A total of 27 main plots were surveyed, 15 in Sicogon and 6 each in Gigante Sur and Gigante Norte. Within each of the main plots, a 10 m x 20 m sub-plot was established to determine sapling density. In the corners of the main plot, 1m x 1m sub-plots were established to sample the undergrowth vegetation (herbs and seedlings). In Sicogon, the survey was limited to the 282-ha forest reserve currently under the jurisdiction of the DENR-VI due to security problems related to agrarian reform claims.

For overstorey trees (i.e. trees occupying the upper part of the crown strata) the following measurements were obtained: diameter at breast height (DBH) and the total height of each species. For the saplings and the erect palms, only DBH was measured and total heights of the plants. Basal area for each tree and sapling species was derived from their corresponding DBH following the formula: BA (basal area in m2/ha) = 0.00007854 x DBH2.

Identification of plant species was done in the field following Fernando et al. (2004), Co, et al. (2006), Galinato, Moody, & Piggin (1999) and Madulid (2000) as references. The local residents were utilized in the identification of local names of plants. Unidentified plants are listed only according to their local names only.

RESULTS AND DISCUSSION

Sicogon Island has about 571.2 ha (50.29% of the total land area) of relatively intact forest while Gigante Sur and Gigante Norte have 283 ha (47.11%) and 92.73 ha (19.25%) of karst forest, respectively (Table 1). These figures might be over-estimates because the bare areas due to recent small-scale forest clearings within each forest were not excluded in the analysis. In addition, the areas occupied by steep barren limestone outcrops were not eliminated. Pedregosa et al. (2006) reported about 315.2 ha (29.12%) of forest on Sicogon Island. Nevertheless, this study is the first to describe the forest coverage of the Gigantes Group of Islands.

In this study, a total of 88 species of forest plants belonging to 67 genera and 30 Families (Figure 6, Tables 2-4) have been identified in the 27 sampling plots. These plant species (arranged according to Family) are listed in Tables 2-4. The most common families are Anacardiaceae (10 species), Euphorbiaceae and Moraceae with 7 species each, Palmae or Arecaceae with 6 species, Guttiferae and Myrtaceae with 5 species each. Combretaceae and Lauraceae were represented by 4 species each while the

rest are represented by 1-3 species only. The number of species presented in this paper is lower than the previous report by Pedregosa et al. (2006) by which 318 species of plants has been identified in Sicogon Island. Such difference might be attributed to the following factors: [1] this study was conducted during the El Niño Southern Oscillation (ENSO) Event (see Yumul et al. 2010) that other plants (e.g. herbaceous species) were not observed; [2] Sampling was concentrated only in the forest reserve; and [3] this study relied on local knowledge in plant identification.

In terms of the total basal area (Tables 2-4), Sicogon has 504.36 m^2/ha basal area of trees and 85.97 m^2/ha of saplings. Gigante Sur and Norte have lower tree basal area, with 8.01 m^2/ha and 16.29 m^2/ha, respectively. Basal area for saplings in the latter two islands (660.88 m^2/ha in the Gigante Sur and 156.20 m^2/ha in the Gigante Norte), however, appear to be higher than in Sicogon.

Table 1.

Land area and forest coverage in the study sites.

Island	Total Land Area* (ha)	Total Forest Cover (ha)	(%)
Sicogon	1,135.70	571.20	50.29
Gigante Norte	481.70	92.73	19.25
Gigante Sur	600.70	283.00	47.11

*excluding the associated islets

Tree density was highest in Sicogon (N=15) with 605±93.7 S.E. ind./ha followed by Gigante Sur (n=6) with 516±29.3 S.E. ind./ha and the Gigante Norte (n=6) with only 254.2±83 S.E. ind./ha (Figure 7). Sapling density was observed highest in the Gigante Sur (1,216.67±66.50 S.E. ind./ha) followed by Sicogon (896.67±123.29 S.E. ind./ha), and Gigante Norte (533.33±197.50 S.E. ind./ha), in that order. Density of undergrowth species (including herbaceous plants and seedlings), measured in 1m^2 quadrats, was highest in Sicogon (N=60) at 8.72±2.35 S.E. ind./m^2 while only 1.42±0.8 S.E. ind./m2 in the Gigante Sur (N=24) and 0.92±0.36 S.E. ind./m2 in Gigante Norte (N=24) [Figure 8].

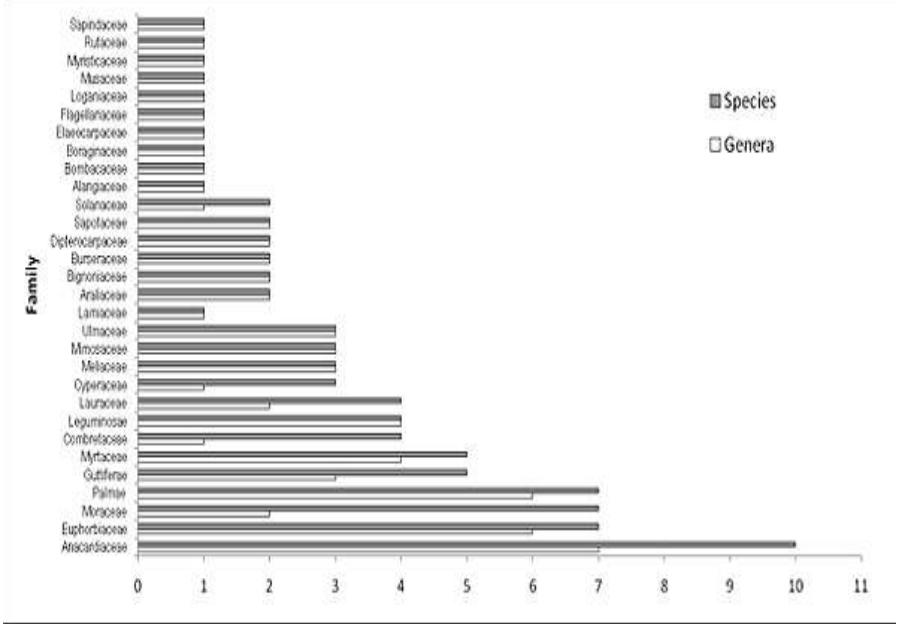

Figure 6. Number of species and genera of the 30 Families of plants identified in the 27 plots (400m2) during the survey (all sites combined).

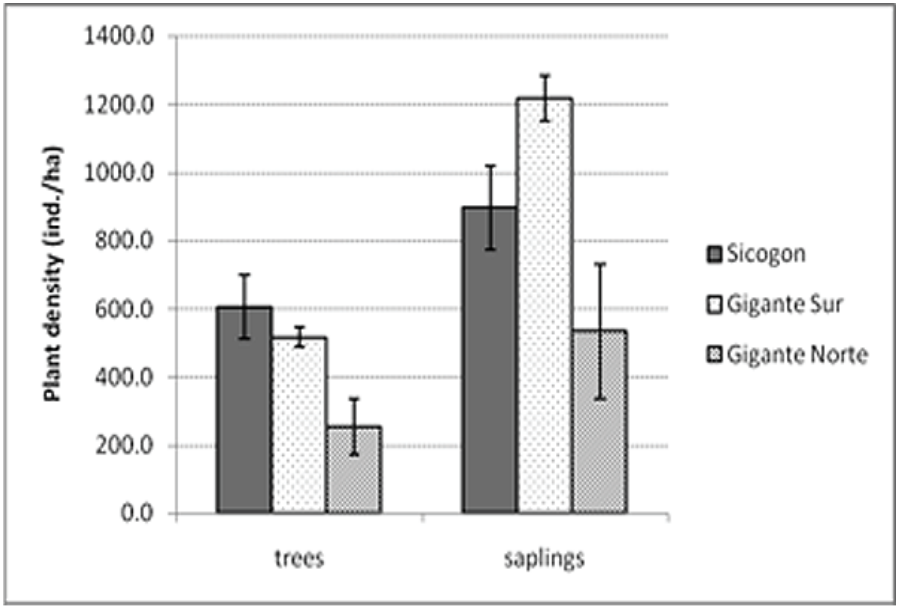

Figure 7. Mean density (ind./ha±S.E.) of forest trees and saplings in the three Islands. (N=15 in Sicogon; 6 in Gigante Sur; 6 in Gigante Norte).

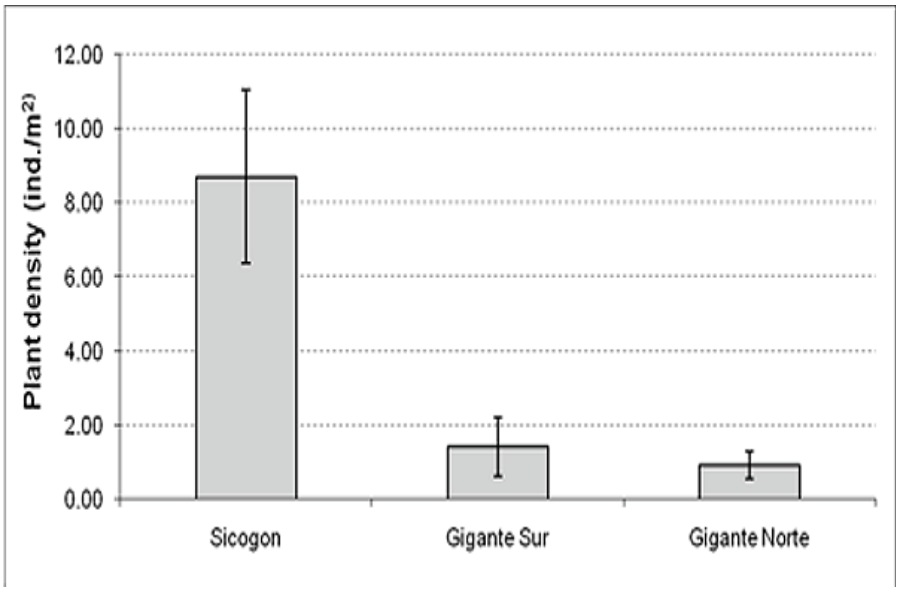

Figure 8. . Mean density (ind./m^2±S.E.) of undergrowth plants in the three Islands. (N=60 in Sicogon; 24 in Gigante Sur; 24 in Gigante Norte).

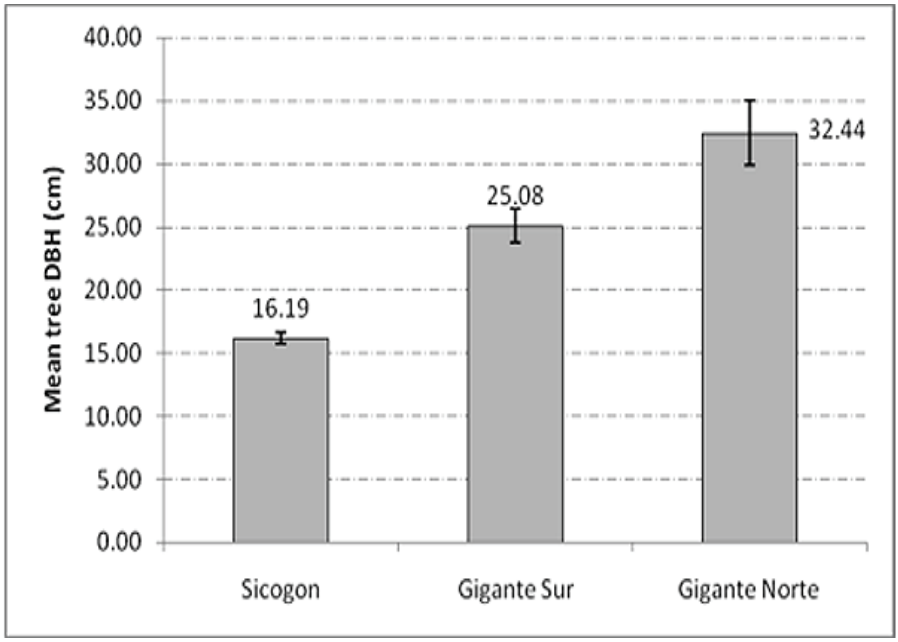

Figure 9. Mean tree diameter at breast-height or DBH (cm ± S.E.) in the three Islands (N=440 in Sicogon; 124 in Gigante Sur; 61 in Gigante Norte).

Table 2.

List of tree species and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
Sicogon	Alangiaceae	*Alangium meyeri*	Putian	2.279
	Anacardiaceae	*Ardisia squamulosa*	Tagpo	18.339
		Parishia oblongifolia	Bulabog	19.096
	Araliaceae	*Polyscias nodosa*	Malapapaya	4.052
		Teijsmanniodendron ahernianum	Sasalit	9.924
	Bignoniaceae	*Radermachera sibuyanensis*	Badlan	21.144
	Burseraceae	*Canarium asperum*	Pagsahingin	13.791
		Garuga floribunda	Bogo	14.399
	Combretaceae	*Terminalia foetidissima*	Talisai-Gubat	15.143
		Terminalia catappa	Talisay	1.489
	Dipterocarpaceae	*Shorea contorta*	White Lauan	5.146
		Shorea negrosensis	Lauan Pula	0.776
	Euphorbiaceae	*Antidesma impressinerve*	Inyam	0.662
		Bridelia glauca	Balitahan	8.049
		Glochidion camiguinense	Bonot-bonot	0.459
		Macaranga tanarius	Binunga	3.602
	Leguminosae	*Pterocarpus indicus*	Narra	7.742
		Unidentified species	Tapgas	2.118
	Guttiferae	*Cratoxylon blancoi*	Panagulingon	0.831
		Cratoxylon celebicum	Panagulingon	10.126
		Garcinia binucao	Batwan	14.826

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Table 2. (Continued...)

List of tree species and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
	Lamiaceae	*Vitex parviflora*	Tugas	49.151
	Lauraceae	*Actinodaphne dolichophylla*	Pipi	0.459
		Litsea balusanensis	Lauat	2.422
	Loganiaceae	*Cynometra luzoniensis*	Oringon	0.294
	Meliaceae	*Dysoxylum sibuyanense*	Bungloi	1.81
	Moraceae	*Artocarpus blancoi*	Antipolo	2.21
		Artocarpus heterophylla	Nangka	0.459
	Myristicaceae	*Myristica philippinensis*	Duguan	6.424
	Sapotaceae	*Palaquium obovatum*	Lahas	5.357
	Unidentified	Unidentified species	Tabagak	7.696
		Unidentified species	Tulu-tabagak	2.872
		Unidentified species	An-an	14.277
		Unidentified species	Bagobinlod	11.336
		Unidentified species	Bonrang	0.372
		Unidentified species	Panguom/ Manggo-om	74.747
		Unidentified species	Manok-Manok	15.557
		Unidentified species		1.034
		Unidentified species		1.034
		Unidentified species		1.034
		Unidentified species	Danlugan	4.594
		Unidentified species	Hitang-hitang	14.577

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Table 2. (Continued...)

List of tree species and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
		Unidentified species	Kulukatumbal	16.304
		Unidentified species	Lunok	13.898
		Unidentified species	Paklangan	5.195
		Unidentified species	Paksion	7.774
		Unidentified species	Pasyawan	5.564
		Unidentified species	Samun	47.791
		Unidentified species	Samun-Pula	1.034
		Unidentified species	Samun-Puti	0.556
		Unidentified species	Sapra	0.294
		Unidentified species	Taksi-on	1.81
		Unidentified species	Tambang pula	0.556
		Unidentified species	Tamlang/Tanlang	8.164
		Unidentified species	Tamlang/Tanlang - Pula	0.556
		Unidentified species	Tol-an - tol-an	3.156
No. of Families = 17		**No. of Species = 57**	**Sub-total = 504.361**	
Gigante Sur	Anacardiaceae	*Mangifera indica*	Mangga	0.587
		Mangifera philippinensis	Paho	0.788
		Spondias purpurea	Sineguelas	0.116
	Burseraceae	*Canarium asperum*	Pagsahingin	0.378

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Table 2. (Continued...)

List of tree species and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
	Euphorbiaceae	*Bridelia glauca*	Balitahan	3.002
	Lamiaceae	*Vitex parviflora*	Tugas	0.037
		Macaranga tanarius	Binunga	0.02
	Meliaceae	*Swietenia macrophylla*	Mahogani	1.015
	Mimosaceae	*Leucaena leucocephala*	Ipil-ipil	0.314
		Samanea saman	Akasya	0.094
	Moraceae	*Artocarpus heterophylla*	Nangka	0.227
	Myrtaceae	*Psidium guajava*	Bayabas	0.042
	Unidentified	Unidentified species	Aniho	0.01
	Verbenaceae	*Gmelina arborea*	Gmelina	1.376
	No. of Families = 8	**No. of Species = 14**	**Sub-total = 8.006**	
Gigante Norte	Alangiaceae	*Alangium meyeri*	Putian	0.031
	Combretaceae	*Terminalia catappa*	Talisay	0.362
	Euphorbiaceae	*Bridelia glauca*	Balitahan	3.711
		Macaranga tanarius	Binunga	0.048
	Lamiaceae	*Vitex parviflora*	Tugas	0.079
	Leguminosae	*Pterocarpus indicus*	Narra	6.922
	Lauraceae	*Litsea balusanensis*	Lauat	0.42
	Meliaceae	*Swietenia macrophylla*	Mahogani	0.191
	Mimosaceae	*Leucaena leucocephala*	Ipil-ipil	0.942

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Table 2. (Continued...)

List of tree species and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
	Moraceae	*Artocarpus communis*	Kubi	0.023
		Artocarpus heterophylla	Nangka	0.169
	Myrtaceae	*Syzygium cumini*	Lumboy	0.362
	Palmae	*Caryota* sp.	Lubi-lubi	0.048
	Sapotaceae	*Chrysophyllum caimito*	Kaimito	0.987
	Unidentified	Unidentified species	Lunok	1.641
	Verbenaceae	*Gmelina arborea*	Gmelina	0.359
No. of Families = 13		**No. of Species = 16**	**Sub-total = 16.295**	
			Total 528.662	

Table 3.

List of saplings and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
Sicogon	Alangiaceae	*Alangium meyeri*	Putian	1.473
	Anacardiaceae	*Ardisia squamulosa*	Tagpo	10.656
		Dracontomelon edule	Lamio	0.561
		Parishia oblongifolia	Bulabog	0.561
		Semecarpus elmeri	Anagas	0.037
		Unidentified species	An-an	3.261
	Araliaceae	*Polyscias nodosa*	Malapapaya	2.327
		Teijsmanniodendron ahernianum	Sasalit	0.809
	Bignoniaceae	*Gnetum gnemon*	Bago	0.68
		Radermachera sibuyanensis	Badlan	1.819
	Burseraceae	*Canarium asperum*	Pagsahingin	6.908
	Combretaceae	*Terminalia foetidissima*	Talisai-Gubat	5.309
	Cyperaceae	*Fimbristylis junciformis*	Malasibuyas	0.23
	Dipterocarpaceae	*Shorea contorta*	White Lauan	1.282
	Euphorbiaceae	*Antidesma impressinerve*	Inyam	0.331
		Bridelia glauca	Balitahan	0.623
		Glochidion camiguinense	Bonot-bonot	0.772
	Leguminosae	*Ormosia calavensis*	Bahai	0.094
		Pterocarpus indicus	Narra	0.037
		Unidentified species	Tapgas	10.128

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Table 3. (Continued...)

List of saplings and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
	Guttiferae	*Calophyllum inophyllum*	Bitaog	0.156
		Cratoxylon celebicum	Panagulingon	3.372
		Cratoxylum blancoi	Kansilai	0.331
		Garcinia binucao	Batwan	0.119
	Lauraceae	*Litsea balusanensis*	Lauat	0.331
	Moraceae	*Artocarpus blancoi*	Antipolo	1.824
	Myristicaceae	*Myristica philippinensis*	Duguan	0.655
	Myrtaceae	*Tristaniopsis decorticata*	Malabayabas	0.501
		Unidentified species	Lomboy-lomboy	0.083
	Palmae	*Caryota* sp.	Patikan	0.009
	Rutaceae	*Zanthoxylum rhetsa*	Kayetana	0.057
	Sapindaceae	*Guioa koelreuteria*	Salab	0.498
	Solanaceae	*Solanum verbascifolium*	Malatabako	0.561
	Ulmaceae	*Celtis luzonica*	Magabuyo	0.009
	Unidentified	Unidentified species	Bangluai	0.147
		Unidentified species		0.177
		Unidentified species	Manok-Manok	0.037
		Unidentified species	Asin-asin	0.147
		Unidentified species	Bagobinlod	0.616
		Unidentified species	Bagobinlod	1.489

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Table 3. (Continued...)

List of saplings and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
		Unidentified species	Basyawan	0.23
		Unidentified species	Bogo-an	0.23
		Unidentified species	Bongloy	2.371
		Unidentified species	Hitang-hitang	4.235
		Unidentified species	Kulinos	0.184
		Unidentified species	Kulukatumbal	4.307
		Unidentified species	Litis	2.086
		Unidentified species	Paklangan	2.316
		Unidentified species	Panguom/ Manggo-om	3.083
		Unidentified species	Samun	3.051
		Unidentified species	Sapra	0.331
		Unidentified species	Tabagak	1.422
		Unidentified species	Tamlang	2.065
		Unidentified species	Tamlang	0.331
		Unidentified species	Tol-an - tol-an	0.625
		Unidentified species		0.083
	No. of Families = 20	**No. of Species = 56**	**Sub-total = 85.967**	
Gigante Sur	Anacardiaceae	*Mangifera indica*	Mangga	0.354

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Table 3. (Continued...)

List of saplings and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
		Mangifera philippinensis	Paho	1.545
	Boraginaceae	*Carmona retusa*	Buntatae	0.354
	Burseraceae	*Canarium asperum*	Pagsahingin	0.865
	Combretaceae	*Terminalia catappa*	Talisay	0.255
	Euphorbiaceae	*Bridelia glauca*	Balitahan	0.992
		Macaranga tanarius	Binunga	0.681
		Unidentified species	Alimotbot	0.581
	Lamiaceae	*Vitex parviflora*	Tugas	0.128
	Lauraceae	*Litsea balusanensis*	Lauat	0.354
	Meliaceae	*Sandoricum koetjape*	Santol	0.227
		Swietenia macrophylla	Mahogani	10.095
	Mimosaceae	*Leucaena leucocephala*	Ipil-ipil	13.738
		Samanea saman	Akasya	0.227
	Moraceae	*Artocarpus heterophylla*	Nangka	0.354
		Artocarpus nitidus	Kubi	1.262
		Ficus callophylla	Lunug	2.949
	Musaceae	*Musa sapientum*	Saging	0.128
		Psidium guajava	Bayabas	0.128
	Palmae	*Caryota cumingii*	Pugahan	5.288
		Cocos nucifera	Lubi	583.784

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Table 3. (Continued...)

List of saplings and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
		Corypha elata	Buri	29.802
		Ptychorhapis intermedia	Lubi-lubi	0.156
	Sapotaceae	*Chrysophyllum caimito*	Kaimito	1.092
	Unidentified	Unidentified species	Bagobinlod	0.482
		Unidentified species	Lino	0.61
		Unidentified species	Wawa	0.227
	Verbenaceae	*Gmelina arborea*	Gmelina	3.488
		Premna odorata	Argao	0.737
No. of Families = 14		**No. of Species = 29**	**Sub-total = 660.883**	
Gigante Norte	Anacardiaceae	*Mangifera indica*	Mangga	0.394
		Semecarpus elmeri	Anagas	0.47
		Unidentified species	An-an	0.098
	Boraginaceae	*Carmona retusa*	Buntatae	0.098
	Burseraceae	*Garuga floribunda*	Bogo	0.098
	Combretaceae	*Terminalia catappa*	Talisay	0.448
	Euphorbiaceae	*Macaranga tanarius*	Binunga	0.35
	Lamiaceae	*Vitex parviflora*	Tugas	0.098
	Lauraceae	*Actinodaphne dolichophylla*	Pipi	0.47
		Litsea balusanensis	Lauat	0.317

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Table 3. (Continued...)

List of saplings and their corresponding basal area in the three islands.

Site	Family	Species	Local name	Total Basal Area (m^2/ha)
	Meliaceae	*Swietenia macrophylla*	Mahogani	0.35
	Mimosaceae	*Leucaena leucocephala*	Ipil-ipil	2.19
		Samanea saman	Akasya	0.448
	Moraceae	*Artocarpus heterophylla*	Nangka	0.995
		Ficus saxophila	Balitahan	0.175
	Myrtaceae	*Psidium guajava*	Bayabas	0.273
	Palmae	*Cocos nucifera*	Lubi	138.781
		Corypha elata	Buri	8.914
	Unidentified	Unidentified species	Seda-seda	0.175
	Verbenaceae	*Gmelina arborea*	Gmelina	1.017
		Premna odorata	Argao	0.044
No. of Families = 13		**No. of Species = 21**	**Sub-total = 156.203**	
			Total = 903.053	

Table 4.

List of undergrowth species in the three islands.

Site	Family	Species	Local name
Sicogon	Alangiaceae	*Alangium meyeri*	Putian
	Anacardiaceae	*Ardisia squamulosa*	Tagpo
		Parishia oblongifolia	Bulabog
		Semecarpus elmeri	Anagas
	Araliaceae	*Polyscias nodosa*	Malapapaya
		Teijsmanniodendron ahernianum	Sasalit
	Bignoniaceae	*Gnetum gnemon*	Bago
		Radermachera sibuyanensis	Badlan
	Burseraceae	*Canarium asperum*	Pagsahingin
	Combretaceae	*Terminalia foetidissima*	Talisai-gubat
	Cyperaceae	*Fimbristylis junciformis*	Malasibuyas
	Dipterocarpaceae	*Shorea contorta*	White Lauan
	Elaeocarpaceae	*Elaeocarpus leytensis*	Bunsilak
	Euphorbiaceae	*Bridelia glauca*	Balitahan
	Leguminosae	*Ormosia calavensis*	Bahai
		Pterocarpus indicus	Narra
		Unidentified species	Tapgas
	Fern (unidentified)	Unidentified species	
	Flagellariaceae	*Flagellaria indica*	Baling-uai
	Guttiferae	*Cratoxylon celebicum*	Panagulingon

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Table 4. (Continued...)

List of undergrowth species in the three islands.

Site	Family	Species	Local name
		Garcinia binucao	Batwan
	Lauraceae	*Litsea balusanensis*	Lauat
	Moraceae	*Artocarpus blancoi*	Antipolo
		Artocarpus nitidus	Kubi
		Ficus balete	Balete
	Myristicaceae	*Myristica philippinensis*	Duguan
	Myrtaceae	*Syzygium costulatum*	Paitan
		Tristaniopsis decorticata	Malabayabas
	Palmae	*Caryota* sp.	Patikan
		Chrysalidocarpus lutescens	Golden Palm
		Calamus spp.	Uway
	Rutaceae	*Zanthoxylum rhetsa*	Kayetana
	Sapindaceae	*Guioa koelreuteria*	Salab
	Sapotaceae	*Palaquium obovatum*	Lahas
	Solanaceae	*Solanum mauritianum*	Malatalong
	Unidentified	Unidentified species	Nagrong
		Unidentified species	An-an
		Unidentified species	Asin-asin
		Unidentified species	Bagobinlod
		Unidentified species	Bilog-Mala

Continued in the next page...

Table 4. (Continued...)

List of undergrowth species in the three islands.

Site	Family	Species	Local name
		Unidentified species	Bagobinlod
		Unidentified species	Tol-an-tol-an
		Unidentified species	
		Unidentified species	
		Unidentified species	
		Unidentified species	
		Unidentified species	
		Unidentified species	
		Unidentified species	Haras
		Unidentified species	Hitang-hitang
		Unidentified species	Kasyawan
		Unidentified species	Kulukatumbal
		Unidentified species	Lagdong
		Unidentified species	Lagping
		Unidentified species	Ngarstree
		Unidentified species	Paklangan
		Unidentified species	Paksion-Puti
		Unidentified species	Panguom/ Manggo-om
		Unidentified species	Pasyawan
		Unidentified species	Pulu-tamlan

Continued in the next page...

Table 4. (Continued...)

List of undergrowth species in the three islands.

Site	Family	Species	Local name
		Unidentified species	Samun
		Unidentified species	Saprut
		Unidentified species	Sirali-Sirali
		Unidentified species	Sulusimuyaw
		Unidentified species	Tabagak
		Unidentified species	Takinis
		Unidentified species	Tamlang/Tanlang - Pula
		Unidentified species	Saging-saging
	No. of Families = 25	**No. of Species = 68**	
Gigante Sur	Euphorbiaceae	Unidentified species	Alimotbot
	Mimosaceae	*Leucaena leucocephala*	Ipil-ipil
	Palmae	*Caryota cumingii*	Pugahan
	Unidentified	Unidentified species	Kolo-katumbal
		Unidentified species	Solo-serale
		Unidentified species	Sulosimuyao
		Unidentified species	unidentified
	No. of Families = 4	**No. of Species = 7**	

Continued in the next page...

Table 4. (Continued...)

List of undergrowth species in the three islands.

Site	Family	Species	Local name
Gigante Norte	Anacardiaceae	*Semecarpus elmeri*	Anagas
	Bombacaceae	*Ceiba pentandra*	Kapok
	Burseraceae	*Garuga floribunda*	Bogo
	Combretaceae	*Terminalia catappa*	Talisay
	Euphorbiaceae	*Macaranga tanarius*	Binunga
		Unidentified species	Alimotbot
	Lamiaceae	*Vitex parviflora*	Tugas
	Meliaceae	*Swietenia macrophylla*	Mahogani
	Mimosaceae	*Leucaena leucocephala*	Ipil-ipil
	Moraceae	*Artocarpus heterophylla*	Nangka
		Ficus saxophila	Balitahan
	Palmae	*Caryota* sp.	Patikan
		Cocos nucifera	Lubi
	Unidentified	Unidentified species	Lunok
		Unidentified species	
		Unidentified species	Kolo-katumbal
		Unidentified species	Solo-serale
		Unidentified species	Sulosimuyao
	Verbenaceae	*Gmelina arborea*	Gmelina
	No. of Families = 11	**No. of Species = 19**	

Mean tree diameter (DBH) was highest in the Gigante Norte (32.44±2.57 cm) [N=61], 25.08±1.29 S.E. cm in Gigante Sur (N=124), and only 16.19±0.47 S.E. cm in Sicogon (N=440). Pedregosa et al. (2006) reported 15 to 45 mean DBH of trees in Sicogon. The low DBH values obtained by this study suggest that large trees may have been removed by poachers (Figure 5). It should be noted that certain wildlife such as the endangered Visayan Hornbill (*Penelopides panini*), which used to inhabit Sicogon, relied on tree-holes for its nest (Kennedy et al., 2000). Extraction of larger trees on this island may have caused the disappearance of this endemic bird on Sicogon. Pedregosa et al. (2006) proposed that this species as well as another species of hornbill the Visayan Writhed Hornbill (*Aceros waldeni*), along with other Visayan endemics (Visayan Spotted Deer (*Rusa alfredi*) and Visayan Warty Pig *Sus cebifrons*) be re-introduced in Sicogon. Given the dwindling forest cover of this small island, it seems detrimental for these endemic vertebrates for such re-introduction program. The Philippine Wildlife Act (RA 9147) (section 12) provides requirements for any re-introduction program such as detailed ecological studies.

The remaining forest patches in the Gigantes are relatively small and fragmented (below 10 ha) and concentrated in karstic portions of the islands. In addition, these remaining forests are predominantly composed of "ipil-ipil" (*L. leucocephala*) in the lower slopes. The accessible areas have been subjected to occasional harvest by the locals for firewood and charcoal production.

Forest protection, especially in Sicogon, remains a great challenge for the concerned government agencies due to emerging socio-political problems. For example, the unresolved agrarian reform problem coupled with the lack of a management body to ensure protection of the timberland in Sicogon may exacerbate the rate of deforestation in the island.

CONCLUSION AND RECOMMENDATIONS

Exploitation and destruction of forest resources in the study area are expected because of the absence of tenurial instruments in most of the timberland areas of Sicogon and Gigantes. Further fragmentation of forests may eventually result in the decrease of water supply in these islands. In addition, certain endemic wildlife found on these islands depends on intact forest with large trees (e.g. birds utilizing tree

holes for nesting) for survival are further endangered due to timber poaching and other human activities.

Because of the observed deterioration of forests in the islands covered in this study, conservation and protection efforts must be pursued thru the initiative of the Local Government of Carles. In addition, the LGU of Carles should implement and enforce existing laws and programs.

The karst areas in Gigantes should be declared as protected areas. These areas are identified home of the two endangered animal species that can only be found in Gigantes Islands—the Island Forest Frog *Platymantis insulatus* and the Gigante Narrow-disked Gecko *Gekko gigante* (Brown & Alcala, 2000; Alcala & Alcala, 2005).

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