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Mangrove Habitat Assessment in Lavezares Northern Samar

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Mangrove resources of the Municipality of Lavezares, Northern Samar were estimated with a total aggregate area of 1,038.4274 hectares, the 53.12% of which are distributed along the coastal margins in mainland and 46.88% along islands of the municipality. The mangal forests comprised of 13 true mangrove species belonging to seven families, which was predominantly of *Rhizophoraceae* combined with significant populations of *Sonneratia* and *Avicennia* species. The mangrove density varies at different sampled sites ranging from the least density of 2,100 to the densest of 24,900 stems per hectare. Six of the 12 mangrove sites have predominantly matured trees, an indicator of primary growth and six were of secondary growth with an average regenerative capacity of 72.60% of its populations.

Bakauan bankau (*Rhizophora stylosa*) has the highest density of 840 trees per hectare with a relative density of 35 percent followed by Api-api (*Avicennia officinales*) with density of 507 trees per hectare with relative density of 21 percent. Other densities include Pagatpat (*Sonneratia alba)* with 453 trees per hectare and 19 percent relative density. Bakauan lalake (*Rhizophora apiculata* has the least density of 267 with relative density of 12 percent.

For purposes of determining the number of saplings/wildlings in the study area, the mangrove assessment team established 3 regenerative plots (1m x 1m) per quadrat.

The use of acquiring data on the number of saplings in mangrove assessment is to provide

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information whether the area could regenerate naturally or it needs to have interventions like assisted natural regeneration or reforestation.
Based on the findings, there were only 41 saplings/seedlings encountered in all quadrats during the assessment. It implies that the area is not capable of regenerating itself naturally. Intervention like assisted natural regeneration through enrichment planting is necessary.
Assisted natural regeneration is the human protection and preservation of natural tree seedlings in forested areas like mangroves and improvement of the percentage of desirable species or genotypes and increasing biodiversity in a forest by interplanting.

Keywords: Mangrove habitat assessment; density; relative density; frequency; relative frequency; species composition; species distribution.

1. BACKGROUND

Lavezares, Northern Samar, with its 'enticing attractions of beaches, waterfalls, caves, marine sanctuaries, and its own unique religious monuments' [1], is not an exception. Its absolute geographic position is 12° 34'13" North latitude, 124°19'45" East longitude and 120 28' 12" North latitude, 1240 24' 36" East longitude on the Northwestern part of the province, bounded on the west by the municipality of Allen, on the northwest by San Bernardino Strait, on the south and southwest by the municipality of Victoria, on the east by the municipality of Rosario and on the north by the municipality of Biri.

It has an estimated land area of 11,950 hectares according to the municipal profile. It is composed of 26 barangays, 12 of which are inland barangays and 14 coastal barangays which can be subclassified into 5 island barangays and 9 barangays situated along the coast of the mainland. It is included in the geographical zone of the Philippines that is approximated to have been visited by five (5) cyclones every three (3) years [2].

The existing environmental conditions were summarized as a) uncontrolled land reclamation, especially in the Barangays of Libas,Cataogan, Sabang-tabok, Urdaneta,all coastal barangays, b) lack of emphasis on forest and wildlife preservation, c) conversion of mangrove areas into settlements, d) threat of salt intrusion in potable water sources in island barangays, e) pollution in rivers and coastal water, and f) residential areas located in steep slopes in different parts of the municipality have not been given any emphasis or attention.

The island and coastal barangays of Bani, San Juan, Magsaysay, Maravilla, San Agustin, Villa, and Balicuatro are part of the Biri-larosa Protected Landscape and Seascape per Presidential Decree 291 dated April 2000 [3], and is being managed by Protected Area Management Board (PAMB).

The municipal water of Lavezares is rich in marine biodiversity. Its vast fishing grounds provide livelihood to fisherfolks. Overfishing, the use of illegal fishing methods, and the unregulated encroachment of settlements in the mangrove areas remain a big challenge to the municipality [4,5,6].

1.1 Objectives

Determine and assess the species composition and distribution of mangroves in all study sites in terms of the following:

- Density and relative density
- Frequency and Relative Frequency
- Species composition and distribution of mangroves

2. METHODOLOGY

In mangrove assessment, Transect line-Plot method [7] was followed in sampling mangroves in the study area. This method entailed the use of a transect line with quadrats of 10 x 10 meters at a distance of 10 meters between transect lines.

Transect lines may run from 20-100 m, depending on the size or expanse of the mangrove habitat. The area of investigation was 10% of the total mangrove forest. Each transect should extend seaward or perpendicular to the shoreline and should start where the mangrove habitat starts, and ends, where the habitat ends.

By using the x and y coordinates, each mangrove species was identified and counted and their diameter was measured using diameter tape. Mangrove species was identified using the

Field Guide to the Identification of some Mangrove Plant Species in the Philippines by Melana & Gonzales [8] and Handbook of Mangroves in the Philippines by Primavera, et al. [9].

3. RESULTS AND DISCUSSION

3.1 Species Composition and Distribution of Mangroves

There were five (5) sampling sites in this study. Site 1 – Brgy. Borobaybay. Site 2 – Brgy. Libas, Site 3 – Brgy. Sabang Tabok, Site 4 – Brgy. San Agustin, and Site 5 – Brgy. Urdaneta (Table 3). In each sampling site, transect lines were established and quadrats were stationed systematically following the transect line. Transect line was strategically established from landward through seaward in a mangrove stand.

Table 2 shows that there were six (6) families with six (6) genera comprising eleven (11) species of true mangroves that are found in the area. In terms of number of individuals, species belongs to family Rhizophoraceae dominated the area.

3.2 Site 1 (Barangay Borobaybay)

There were four (4) transect lines with 17 quadrats stationed systematically following the transect line. Transect line was strategically established from landward through seaward in a mangrove stand of Brgy. Borobaybay.

Table 2 shows that there were three (3) families with three (3) genera comprising five (5) species of true mangroves that are found in the area. In terms of number of individuals, species belongs to family Rhizophoraceae dominated the area. The most abundant was Bakauan lalake *(Rhizophora apiculata)* with 120 trees, followed by Bakauan bankau *(Rhizophora stylosa)* and Bakauan babae *(Rhizophora mucronata)* with 108 and 86 numbers of individual, respectively. Other species observed in the study area includes Api-api *(Avicennia officinales) and* Pagatpat *(Sonneratia alba)* of the Sonneratiaceae family.

3.2.1 Density and relative density

Table 3 shows the total density and relative density of trees in the study area. Density is the number of species per unit of area.

Table 1. The sites in Lavezares, Northern Samar and their respective coordinates where the detailed evaluations of mangroves were undertaken

Site Code	Sites/Barangays Covered	Coordinates	
		Latitude	Longitude
A	Brgy. Barobaybay	12° 33' 17" N	124° 21' 17" E
B	Brgy. Libas	12° 33' 22" N	124° 19' 15" E
C	Brgy. Sabang Tabok	12° 32' 35" N	124° 20' 06" E
D	Brgy. San Agustin	12° 35' 20" N	124° 21' 25" E
E	Brgy. Urdaneta	12° 33' 16" N	124° 22' 38" E

Table 2. List of mangrove species identified in the coastal areas of Lavezares, Northern Samar

Family	Scientific name	Local Name
Avicenniaceae	*Avicennia marina*	Piapi
	Avicennia alba	Bungalon puti
	Avicennia officinalis	Api-api
Sonneratiaceae	*Sonneratia alba*	Pagatpat
Rhizophoraceae	*Rhizophora apiculata*	Bakauan lalake
	Rhizophora mucronata	Bakauan babae
	Rhizophora stylosa	Bakauan bankau
Meliaceae	*Xylocarpus granatum*	Tabigi
Myrsinaceae	*Aegiceras corniculatum*	Saging saging
	Aegiceras floridum	Tinduktindukan
Palmae	*Nypa fruticans*	Nipa

Bakauan lalake (*Rhizophora apiculata)* has the highest density of 706 trees per hectare with a relative density of 28 percent followed by Bakauan bankau (*Rhizophora stylosa*) with a density 635 and relative density of 25 percent. Other densities include 276.47 with 15.99 percent relative density for Bakauan babae (*Rhizophora mucronata)* having a density of 505 with relative density of 20 percent, Api-api (*Avicennia officinales*) with density of 453 trees per hectare with relative density of 18 percent, and Pagatpat (*Sonneratia alba)* has the least density and of 229 with relative density of 9 percent (Fig. 1).

This implies that the highest densities of species under family *Rhizophoraceae* could be due to the favorable soil substrate and other environmental factors that favored its growth compared to other tree species present in the study area.

For purposes of determining the number of saplings/wildlings in the study area, the mangrove assessment team established 3 regenerative plots (1m x 1m) per quadrat.

The use of acquiring data on the number of saplings in mangrove assessment is to provide information whether the area could regenerate naturally or it needs to have interventions like assisted natural regeneration or reforestation.
Based on the findings, there were 250 saplings encountered in all quadrats during the assessment. It implies that the area is capable of regenerating itself naturally. Intervention like assisted natural regeneration through enrichment planting is not necessary.

3.2.2 Frequency and relative frequency

Frequency is the number of times the species present in the area. As revealed, (3) species under the family *Rhizophoracea* (Bakauan lalake, Bakauan babae, and Bakauan bankau) possessed the highest frequency of 4 with relative density of 28%. This implies that species under the family *Rhizophoracea* appeared in all quadrats during the assessment. This further implies that the soil/substrate and other environmental conditions in the area could probably favored the growth and multiplication of *Rhizophora* species compared to other tree species observed in the area (Fig. 2).

Results also revealed that mangrove cover in Barangay Borobaybay is still in good condition belonging to the range of 51-75% crown cover; less than to -0.76 per sq. meter regeneration rate and with an average height of less than 7.75 meters. Area covered by GPS is 1.6 hectares with sampling area of 1,700 m. sq, The substrate varies from muddy to sandy.

3.3 Site 2 (Brgy. Libas)

There were four (4) transect lines with 16 quadrats stationed systematically following the transect line. Transect line was strategically established from landward through seaward in a mangrove stand of Brgy. Libas.

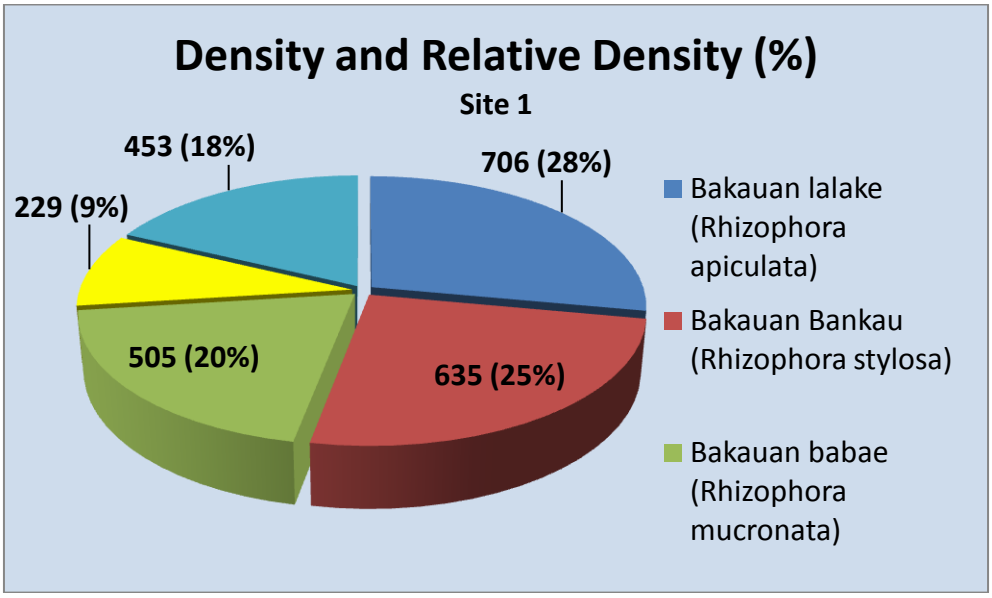

Fig. 1. Density and relative density of mangrove species in Site 1

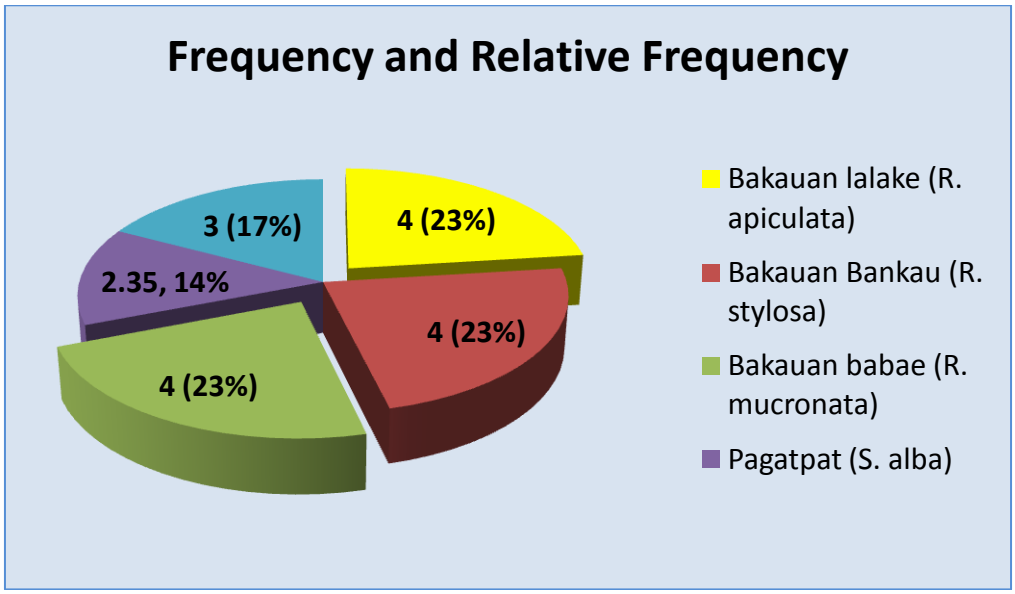

Fig. 2. Frequency and relative frequency (%) of mangrove tree species in Site 1

Table 3 shows that there are two (2) families with two (2) genera comprising four (4) species of true mangroves that are found in the area. There were 390 total number of individual identified and measured. In terms of number of individuals, species belongs to family Rhizophoraceae dominated the area. The most abundant was Bakauan babae *(Rhizophora mucronata)* with 156 trees, followed by Bakauan lalake *(Rhizophora apiculata)* and Bakauan bankau *(Rhizophora stylosa)* and with 125 and 105 numbers of individual, respectively. Other species observed in the study area includes Api-api *(Avicennia officinales)* with 4 number of individuals.

3.3.1 Density and relative density

Table 3 shows the total density and relative density of trees in the study area. Density is the number of species per unit of area.

Bakauan babae (*R. mucronata)* has the highest density of 975 trees per hectare with a relative density of 40 percent followed by Bakauan lalake (*R. apiculata)* with a density 781 and relative density of 32 percent. Other densities include Bakauan bankau (*R. stylosa*) 656 with 27 percent relative density and Api-api (*A. officinales* has the least density of 25 with relative density of 1 percent (Fig. 3).

This implies that the highest densities of species under family *Rhizophoraceae* could be due to the favorable soil substrate and other environmental factors that favored its growth compared to other tree species present in the study area.

Results also revealed that mangrove cover in Barangay Libas is still in good condition belonging to the range of 51-75% crown cover; less than to -0.76 per sq. meter regeneration rate and with an average height of less than 7.75 meters. Area covered by GPS is 1.6 hectares with sampling area of 1,700 m. sq, The substrate varies from muddy to sandy.

3.4 Site 3 (Brgy. Sabang Tabok)

Table 4 shows that there are three (3) families with two (3) genera comprising four (5) species of true mangroves that are found in the area. There were 410 total number of individual identified and measured. In terms of number of individuals, species belongs to family Rhizophoraceae dominated the area. The most abundant was Bakauan babae *(R. mucronata)* with 135 trees, followed by Bakauan lalake *(R. apiculata)* and Bakauan bankau *(Rhizophora stylosa)* and with 111 and 98 numbers of individual, respectively. Other species observed in the study area includes Nipa (*Nypa fruticans*), 45 and Pagatpat *(Sonneratia alba),* 21 number of individuals.

There were four (4) transect lines with 15 quadrats stationed systematically following the transect line. Transect line was strategically established from landward through seaward in a mangrove stand of Brgy. Sabang Tabok.

3.4.1 Density and relative density

Table 4 shows the total density and relative density of trees in the study area. Density is the number of species per unit of area.

Bakauan babae (*R. mucronata)* has the highest density of 900 trees per hectare with a relative density of 33 percent followed by Bakauan lalake (*R. apiculata)* with a density 740 and relative density of 27 percent. Other densities include Bakauan bankau (*R. stylosa*) 653 with 24 percent relative density and Nipa (*Nypa fruticans)* having 300 trees per hectare with 11 percent relative density. Pagatpat (*Sonneratia alba*) has the least density of 140 with relative density of 5 percent (Fig. 4).

Results also revealed that mangrove cover in Barangay Libas is still in good condition belonging to the range of 51-75% crown cover; less than to -0.76 per sq. meter regeneration rate and with an average height of less than 7.75 meters. Area covered by GPS is 2.35 hectares with sampling area of 1,500 square meters. Substrate varies from muddy to sandy (Table 5).

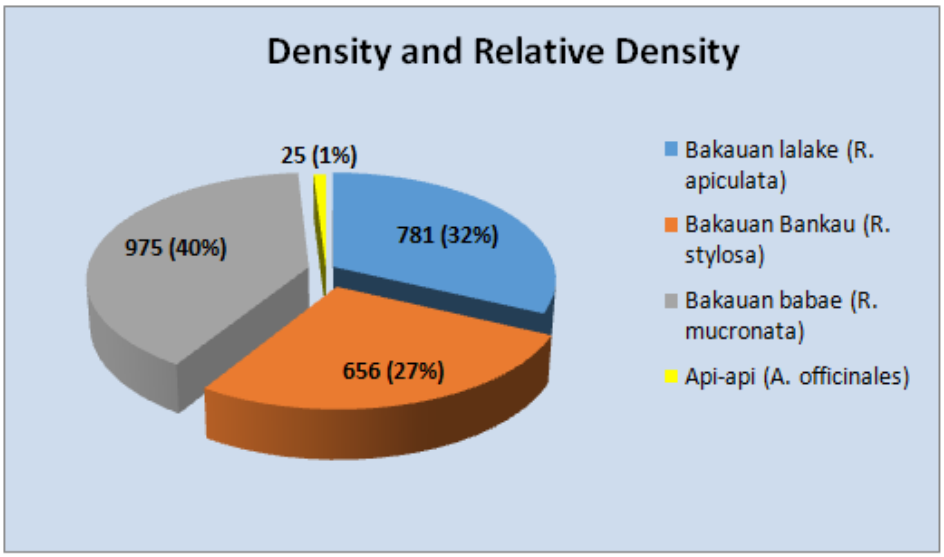

Fig. 3. Density and relative density of mangrove species in Site 2

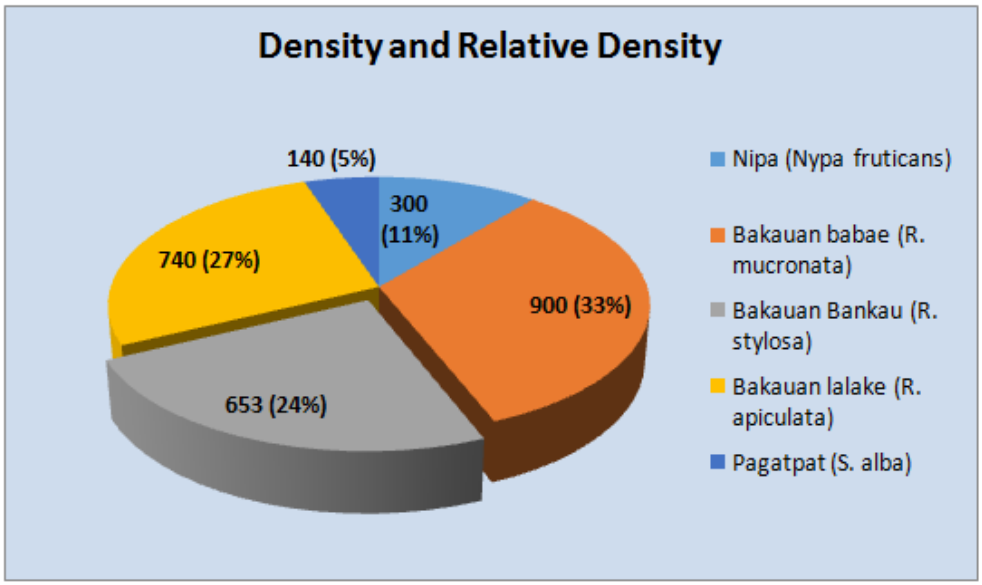

Fig. 4. Density and relative density of mangrove species in Site 3

Table 3. Species composition and distribution of mangroves in Site 1

Species composition and distribution

Family Name	Scientific Name	Common Name	Transect I	Transect II	Transect III	Transect IV	
			ni	ni	ni	ni	Total
Avicenniaceae	*Avicennia officinales*	Api-api	15	30	32	0	77
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	13	28	35	10	86
	Rhizophora stylosa	Bakauan bankau	25	33	38	12	108
	Rhizophora apiculata	Bakauan lalake	30	42	33	15	120
Sonneratiaceae	*Sonneratia alba*	Pagatpat	16	14	6	3	39
Total			**99**	**147**	**144**	**40**	**430**

Species Density and Relative Density

Family Name	Scientific Name	Common Name	ni	Density (trees/ha)	Relative Density (%)
AVICENNIACEAE	*Avicennia officinales*	Api-api	77	453	18
RHIZOPHORACEAE	*Rhizophora mucronata*	Bakauan babae	86	506	20
	Rhizophora stylosa	Bakauan bankau	108	635	25
	Rhizophora apiculata	Bakauan lalake	120	706	28
SONNERATIACEAE	*Sonneratia alba*	Pagatpat	39	229	9
Total			**430**	**2,529 Trees/ha**	**100.00**

Number of saplings = 250

Table 4. Species composition and distribution of mangroves in Site 2

Species composition and distribution

Family Name	Scientific Name	Common Name	Transect I	Transect II	Transect III	Transect IV	
			ni	ni	ni	ni	Total
Avicenniaceae	*Avicennia officinales*	Api-api	1	2	1	0	4
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	26	45	35	50	156
	Rhizophora stylosa	Bakauan bankau	38	20	25	22	105
	Rhizophora apiculata	Bakauan lalake	30	26	32	37	125
Total			**95**	**93**	**93**	**109**	**390**

Species Density and Relative Density

Family Name	Scientific Name	Common Name	ni	Density (trees/ha)	Relative Density (%)
Avicenniaceae	*Avicennia officinales*	Api-api	4	25	1
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	156	975	40
	Rhizophora stylosa	Bakauan bankau	105	656	27
	Rhizophora apiculata	Bakauan lalake	125	781	32
Total			**390**	**2,437 Trees/ha**	**100.00**

Number of saplings = 270

Table 5. Species composition and distribution of mangroves in Site 3

Species composition and distribution

Family Name	Scientific Name	Common Name	Transect I	Transect II	Transect III	Transect IV	
			ni	ni	ni	ni	Total
Palmae	*Nypa fruticans*	Nipa	25	20	0	0	45
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	26	28	36	45	135
	Rhizophora stylosa	Bakauan bankau	14	18	28	38	98
	Rhizophora apiculata	Bakauan lalake	30	23	33	25	111
Sonneratiaceae	*Sonneratia alba*	Pagatpat	0	7	6	8	21
Total			**95**	**96**	**103**	**116**	**410**

Species Density and Relative Density

Family Name	Scientific Name	Common Name	ni	Density (trees/ha)	Relative Density (%)
Palmae	*Nypa fruticans*	Nipa	45	300	11
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	135	900	33
	Rhizophora stylosa	Bakauan bankau	98	653	24
	Rhizophora apiculata	Bakauan lalake	111	740	27
Sonneratiaceae	*Sonneratia alba*	Pagatpat	21	140	5
Total			**410**	**2,733 Trees/ha**	**100.00**

Number of saplings = 270

3.5 Site 4 (Brgy. San Agustin)

Table 6 shows that there are two (2) families with two (2) genera comprising four (4) species of true mangroves that are found in the area. There were 350 total number of individual identified and counted. In terms of number of individuals, species belongs to family Rhizophoraceae dominated the area. The most abundant was Bakauan babae *(R. mucronata)* with 112 trees, followed by Api-api (*Avicennia officinales*) with 88 trees. Other species observed in the study area includes Bakauan bankau *(Rhizophora stylosa)* and Bakauan lalake *(R. apiculata)* with 80 and 70 numbers of individual, respectively.

There were four (4) transect lines with 15 quadrats stationed systematically following the transect line. Transect line was strategically established from landward through seaward in a mangrove stand of Brgy. San Agustin.

3.5.1 Density and relative density

Same Table 6 shows the total density and relative density of trees in the study area. Density is the number of species per unit of area.

Bakauan babae (*R. mucronata)* has the highest density of 747 trees per hectare with a relative density of 32 percent followed by Api-api (*Avicennia officinales*) with a density of 587 and relative density of 25 percent. with a density 740 and relative density of 27 percent. Other densities include Bakauan bankau (*R. stylosa*) 533 with 23 percent relative density and Bakauan lalake (*R. apiculata)* has the least density of 466 with relative density of 20 percent (Fig. 5).

Results also revealed that mangrove cover in Barangay San Agustin is fair over-all rating belonging to the range of 20-25% crown cover; less than to -0.5 per sq. meter regeneration rate and with an average height of less than 7.75 meters. Area covered by GPS is 2.4 hectares with sampling area of 1,500 square meters. The substrate varies from muddy to sandy.

For purposes of determining the number of saplings/wildlings in the study area, the mangrove assessment team established 3 regenerative plots (1m x 1m) per quadrat.

The use of acquiring data on the number of saplings in mangrove assessment is to provide information whether the area could regenerate naturally or it needs to have interventions like assisted natural regeneration or reforestation.

Based on the findings, there were only 35 aplings/seedlings encountered in all quadrats during the assessment. It implies that the area is not capable of regenerating itself naturally. Intervention like assisted natural regeneration through enrichment planting is necessary.

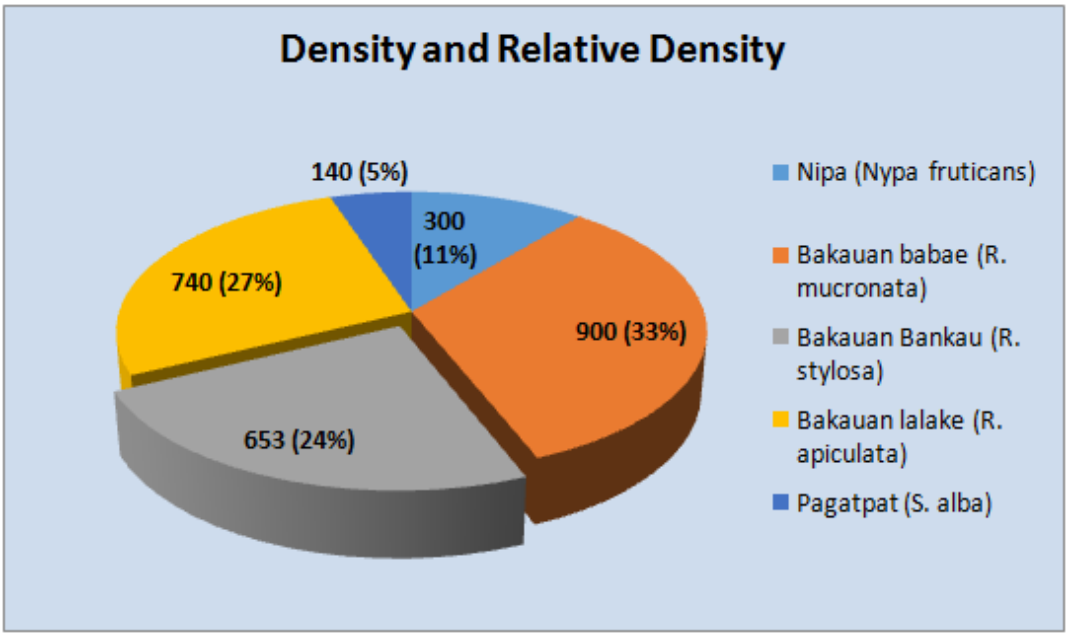

Fig. 5. Density and relative density of mangrove species in Site 4

Table 6. Species composition and distribution of mangroves in Site 4

Species composition and distribution

Family Name	Scientific Name	Common Name	Transect I	Transect II	Transect III	Transect IV	
			ni	ni	ni	Ni	Total
Avicenniaceae	*Avicennia officinales*	Api-api	15	22	25	26	88
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	26	37	30	19	112
	Rhizophora stylosa	Bakauan bankau	15	20	17	28	80
	Rhizophora apiculata	Bakauan lalake	20	17	15	18	70
Total			**76**	**96**	**87**	**91**	**350**

Species Density and Relative Density

Family Name	Scientific Name	Common Name	ni	Density (trees/ha)	Relative Density (%)
Avicenniaceae	*Avicennia officinales*	Api-api	88	587	25
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	112	747	32
	Rhizophora stylosa	Bakauan bankau	80	533	23
	Rhizophora apiculata	Bakauan lalake	70	466	20
Total			**350**	**2,333 Trees/ha**	**100.00**

Number of saplings/seedlings = 35

3.6 Site 5 (Barangay Urdaneta)

There were four (4) transect lines with 15 quadrats stationed systematically following the transect line. Transect line was strategically established from landward through seaward in a mangrove stand of Brgy. Urdaneta.

Table 3 shows that there were three (3) families with three (3) genera comprising five (5) species of true mangroves that are found in the area. In terms of number of individuals, species belongs to family Rhizophoraceae dominated the area. The most abundant was Bakauan bankau *(R. stylosa)* with 126 trees followed by Api-api *(Avicennia officinales)* and Pagatpat *(S. alba)* with 76 and 68 numbers of individual, respectively. , Other species observed in the study area includes Bakauan babae *(R. mucronata) and* Bakauan lalake *(R. apiculata)* of the Rhizophoraceae family.

3.6.1 Density and relative density

Table 2 shows the total density and relative density of trees in the study area. Density is the number of species per unit of area.

Bakauan bankau (*Rhizophora stylosa*) has the highest density of 840 trees per hectare with a relative density of 35 percent followed by Api-api (*Avicennia officinales*) with density of 507 trees per hectare with relative density of 21 percent. Other densities include Pagatpat (*Sonneratia alba)* with 453 trees per hectare and 19 percent relative density. Bakauan lalake (*Rhizophora apiculata* has the least density of 267 with relative density of 12 percent (Fig. 6).

For purposes of determining the number of saplings/wildlings in the study area, the mangrove assessment team established 3 regenerative plots (1m x 1m) per quadrat.

The use of acquiring data on the number of saplings in mangrove assessment is to provide information whether the area could regenerate naturally or it needs to have interventions like assisted natural regeneration or reforestation.

Based on the findings, there were only 41 saplings/seedlings encountered in all quadrats during the assessment. It implies that the area is not capable of regenerating itself naturally. Intervention like assisted natural regeneration through enrichment planting is necessary.

Based on the findings, there were 41 saplings/seedlings encountered in all quadrats during the assessment. It implies that the area is not capable of regenerating itself naturally. Intervention like assisted natural regeneration through enrichment planting is necessary. Assisted natural regeneration is the human protection and preservation of natural tree seedlings in forested areas like mangroves and improvement of the percentage of desirable species or genotypes and increasing biodiversity in a forest by interplanting.

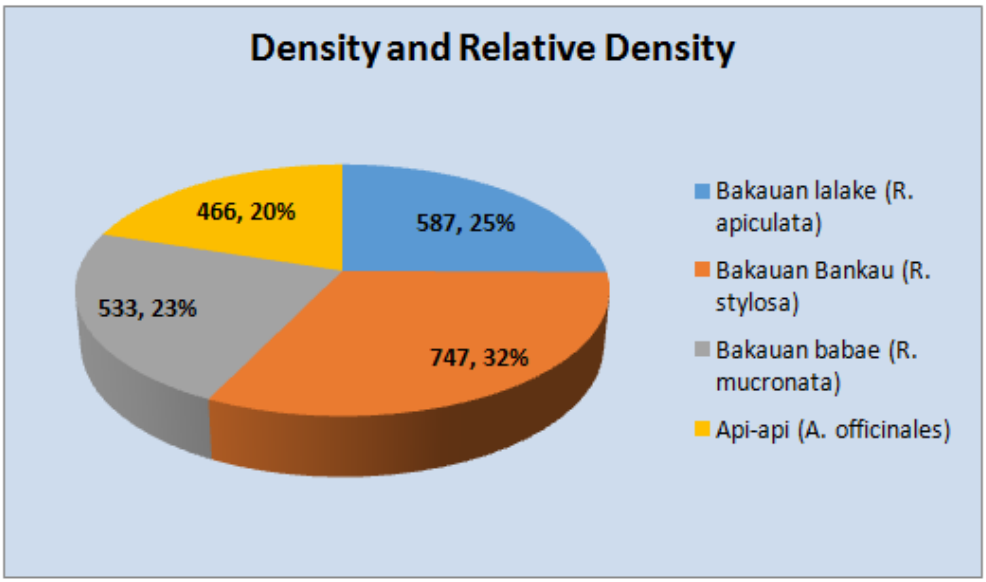

Fig. 6. Density and relative density of mangrove species in Site 5

Table 7. Species composition and distribution of mangroves in Site 5

Species composition and distribution

Family Name	Scientific Name	Common Name	Transect I	Transect II	Transect III	Transect IV	
			ni	ni	ni	Ni	Total
Avicenniaceae	*Avicennia officinales*	Api-api	23	12	18	23	76
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	11	12	14	10	47
	Rhizophora stylosa	Bakauan bankau	25	30	28	43	126
	Rhizophora apiculata	Bakauan lalake	30	42	33	15	43
Sonneratiaceae	*Sonneratia alba*	Pagatpat	16	14	6	3	68
Total			**99**	**147**	**144**	**40**	**360**

Species Density and Relative Density

Family Name	Scientific Name	Common Name	ni	Density (trees/ha)	Relative Density (%)
Avicenniaceae	*Avicennia officinales*	Api-api	76	507	21
Rhizophoraceae	*Rhizophora mucronata*	Bakauan babae	47	313	13
	Rhizophora stylosa	Bakauan bankau	126	840	35
	Rhizophora apiculata	Bakauan lalake	43	287	12
Sonneratiaceae	*Sonneratia alba*	Pagatpat	68	453	19
Total			**360**	**2,400 Trees/ha**	**100.00**

Number of saplings = 41

Table 8. Crown cover, percent regenration, and average height per sampling site

Site	Crown Cover	% Regeneration	Average Height (M)	Degree of Disturbance	Overall Rating
1 – Brgy. Borobaybay	52 Good	1.2 Excellent	7.758 Excellent	Minimal	Good
2 – Brgy. Libas	35.73 Fair	3 Excellent	8.5 Excellent	Minimal	Good
3 – **Brgy. Sabang Tabok**	35.44	3.9	9.87	Minimal	Good
4 – Brgy. San Agustin	39.39 Fair	.355 Poor	9.50 Excellent	Minimal	Fair
5 – Brgy. Urdaneta	33.75 Fair	1.77 Good	3.50 Excellent	Minimal	Fair

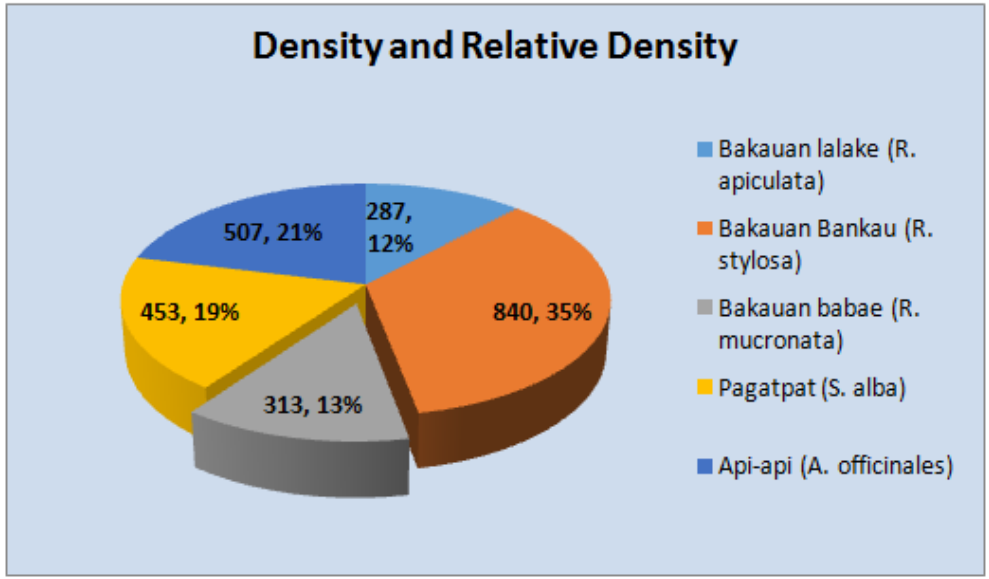

Figure 7. Density and relative density of mangrove species in Site 5

Results also revealed that mangrove cover in Barangay Urdaneta is fair over-all rating belonging to the range of 20-25% crown cover; less than to -0.5 per sq. meter regeneration rate but with an average height of less than 7.75 meters. Area covered by GPS is 3 hectares with sampling area of 1,500 square meters. The substrate varies from muddy to sandy.

4. CONCLUSIONS AND RECOMMENDA-TIONS

Mangrove resources of the Municipality of Lavezares, Northern Samar were estimated with a total aggregate area of 1,038.4274 hectares, the 53.12% of which are distributed along the coastal margins in mainland and 46.88% along islands of the municipality. The mangal forests comprised of 13 true mangrove species belonging to seven families, which was predominantly of *Rhizophoraceae* combined with significant populations of *Sonneratia* and *Avicennia* species. The mangrove density varied at different sampled sites ranging from the least density of 2,100 to the densest of 24,900 stems per hectare. Six of the 12 mangrove sites have predominantly matured trees, an indicator of primary growth and six were of secondary growth with an average regenerative capacity of 72.60% of its populations, [2].

4.2 Density and Relative Density

Bakauan bankau (*Rhizophora stylosa*) has the highest density of 840 trees per hectare with a relative density of 35 percent followed by Api-api (*Avicennia officinales*) with density of 507 trees per hectare with relative density of 21 percent. Other densities include Pagatpat (*Sonneratia alba)* with 453 trees per hectare and 19 percent relative density. Bakauan lalake (*Rhizophora apiculata* has the least density of 267 with relative density of 12 percent.

For purposes of determining the number of saplings/wildlings in the study area, the mangrove assessment team established 3 regenerative plots (1m x 1m) per quadrat.

The use of acquiring data on the number of saplings in mangrove assessment is to provide information whether the area could regenerate naturally or it needs to have interventions like assisted natural regeneration or reforestation.

Based on the findings, there were only 41 saplings/seedlings encountered in all quadrats during the assessment. It implies that the area is not capable of regenerating itself naturally. Intervention like assisted natural regeneration through enrichment planting is necessary.

Based on the findings, there were 41 saplings/seedlings encountered in all quadrats during the assessment. It implies that the area is not capable of regenerating itself naturally. Intervention like assisted natural regeneration through enrichment planting is necessary. Assisted natural regeneration is the human protection and preservation of natural tree seedlings in forested areas like mangroves and improvement of the percentage of desirable species or genotypes and increasing biodiversity in a forest by interplanting.

Results of this assessment imply that there is a need for the Local Government Unit of Lavezares, Northern Samar to initiate measures for the protection and management of its coastal areas. The information revealed from the previous assessments of the different NGOs, consultants and this report is a baseline data that could be used for proper program / project planning and implementation. With the present condition of the coastal ecosystems and fishery resources of the area, the following may be initiated:

Strengthened and Strict Implementation of the law/ordinance*:* Existing fishery laws and local ordinances would be useless if not properly enforced and/or implemented. The Protected Area Management Board with the LGU through the Office of the Municipal Agriculturist and PNP-Municipal Police Office personnel may initially do the IEC in the protection of the ecological resource.

Protection and Management of Mangrove Forests: The municipality has several mangrove forests that must be protected and managed. Naturally implanted seedlings have been growing over the mangal sites, which indicate the regenerative capacity of mangroves in the area. To prolong the lives and ensure growth, interventions on the project in terms of their care and maintenance should be provided. This activity may no longer require funds but it requires the involvement of the community folks of the adjacent barangays where these projects are being situated.

Another strategy in ensuring the protection and management of mangrove in the municipality is by transferring the management of these resources to community folks through Community Based Forest Management Agreement (CBFMA). Through this, the burden of the government in over-seeing these resources shall be reduced. However, training on mangrove management to enhance skills and capabilities of those who shall be charged for the care and maintenance of the resource must be provided, (Cebu, E.H., et al, undated).

SUPPORT LIVELIHOOD PROJECTS

Support livelihood projects are at present very necessary as an incentive for stakeholders, Women's organization and fisher folks who will participate and invest their time and effort in the implementation of the municipality's fisheries programs and projects.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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