STUDY THE VEGETATIVE STRUCTURE OF MANGROVE FROM UTO TIDAL CREEK, SHWE -THAUNG-YAN AREA BY USING LINE TRANSECT METHOD

Khin Thandar Linn[1] , Cherry Aung[2] , S Aung Myo Htay[3]

Abstract

The vegetative structure of mangrove from Uto tidal creek which is situated at the Shwe -Thaung-Yan coastal area has been conducted by using the Line Transect Method (English *et al.*, (1997). The mangrove area at Shwe- Thaung- Yan coastal area is about 2000 ha and comprised a total of 17 true mangrove species. The study area is based the Uto tidal creek which is favorable for the establishment of mangrove. Six transect lines which are perpendicular to the shore line were laid along the tidal creek to determine the vegetative structure of the mangroves. Each transect line is 90m long and three sample points of 30m×10m were intercepted on all transect lines. The visual observation of number of mangrove plants, number of species, number of new shoots, and number of cut branches were recorded. The highest and the smallest plants of different species within each sample points were also identified and measured its height and circumference. All the recorded data were then used to estimate the vegetative structure of the area. The environmental parameters such as soil type and salinity were also then measured. A total of nine true mangrove species such as *Rhizophora mucronata, R. apiculata, Ceriops decandra, Bruguiera gymnorhiza, B.cylindrica, Xylocarpus granatum, Lumnitzera littorea, Aegiceras corniculatum* and *Nypa fruticans* were recorded. Among the recorded species of within the sample points, *Ceriops decandra* and *Bruguiera gymnorhiza* are represented as the dominant species.

Keywords: *Bruguiera gymnorhiza*, *Ceriops decandra,* Line Transect Method, mangrove plants, vegetative structure.

Introduction

Mangrove is a kind of forest virtually confined in the tropics. They are dicotyledonous shrubs or trees growing along tidal mudflats and on shallow coastal water frequently consisting of mono specific patches or belt (Hogarth 2015). The diverse flora and fauna associated with mangrove ecosystems can also provide opportunities for nature education, tourism and scientific study, thereby providing additional social and economic benefits (Guebas *et al*., 2005). Many ecological surveys were carried out using the transect methods in sampling in particular to estimate the population abundance and status of vegetative structure. There are several types of transect which are especially used in any types of forest and the terrestrial and marine biodiversity as well. The common used methods are Line Transect Methods and Belt Transect Method. Line transects are used to illustrate a particular gradient or linear pattern along which communities of plants and, or animals changes. They provide a good way of being able to clearly visualize the changes taking place along the line. A belt transect will supply more data than a line transect. It will give data on the abundance of individual species at different points along the line, as well as on their range (Gates 1979).

The vegetative structure can be ascertained from systematic sampling at fixed intervals along a transect line by graphing the number of species recorded, as a function of the number of samples examined. A transect is a path along which one counts and records occurrences of the objects of study e.g. the plants in the forest or vegetation. It can be made using a nylon rope or measuring tape marked and numbered at with regular intervals, all the way along its length. This is laid across the area of study. The position of the transect line is very important and it depends

[1] Dr, Lecturer, Marine Science Department, Pathein University
[2] Dr, Professor, Marine Science Department, Pathein University
[3] Dr, Associate Professor, Marine Science Department, Pathein University

on the direction of the environmental gradient which to be study. The precise position placed end up the clear results for a particular habitat (Burnham *et al*., 1980).

Mangroves, nowadays, are becoming vulnerable to degradation and loss in different areas of the world (Erftemeijer, P. L. A., & Hamerlynck, O. 2005). The number of mangroves has been alarming due to anthropogenic activities that pose a big threat to destruction of the ecosystem and diversity of life. Coastal development, aquaculture, pollution and overharvesting have led to loss of mangroves globally. There are problems that the mangrove ecosystems faced such as habitat destruction, invasive species, over population, over exploitation, and pollution (Spalding. M *et al.*, 2010). The assessment of mangroves plays a critical role in the conservation and protection of the habitat and biodiversity. Estimating the community structure of mangroves is becomes an important consideration in the rehabilitation and monitoring of mangroves especially in the degraded marine ecosystem. (Mcleod,E.,& Salm,R.V.2006). The present study aimed to know the vegetative structure of tidal creek mangrove by using the Line Transect Method (English *et al.*, 1997) and to assess the status of forest type whether vulnerable or grow up which need to conserve for the benefit of coastal biodiversity.

Materials and Methods

An assessment of vegetative structure of Uto tidal creek mangrove at the Shwe -Thaung-Yan coastal area has been carried out by using the Line Transect Method (English *et al.*,1997) in July 2019. The mangrove formation in the area is related with the meandering of the tidal creeks which is intruding to the inner region. Total six transect lines which are perpendicular to the shore line were laid along the tidal creek to determine the vegetative structure of the mangroves. The location of the transect lines has been shown in Figure 1. In this method, each transect line is about 90 m long, on which three 30m×10m sample plots were intercepted by using the measuring tapes. The visual counting of total mangrove plants, total number of species, total new shoots and cuts branches within each of the sample plots were recorded. Then each of 30m point transect, identification of the plant species and recorded their shape, measured their height and circumference of the highest and smallest ones. The data of species composition, number of plants, number of cut branches, number of new shoots, mean height and mean circumferences for all sample plots (3x6 plots) were then used to estimate the vegetative structure. The soil type and texture were also noted. The recorded species were identified according to Hundley and Chit Ko Ko (1961) and John Kress *et al.*, (2004) and Wim Giesen, Stephan Wulffratt, Max Zieren and Liesbeth Scholten, (2006). The location of study areas are

1. Transect 1. Lat N. 17 ˚03′ 30″ Long E.094 ˚27 ′18″
2. Transect 2. Lat N. 17 ˚03′ 55″ Long E.094 ˚27 ′31″
3. Transect 3. Lat N. 17 ˚05′ 03″ Long E.094 ˚29 ′23″
4. Transect 4. Lat N. 17 ˚ 03′ 59″ Long E.094 ˚27′ 10″
5. Transect 5. Lat N. 17 ˚ 04′ 00″ Long E.094 ˚27′ 14″
6. Transect 6. Lat N. 17 ˚ 04′ 37″ Long E.094 ˚27′ 04″

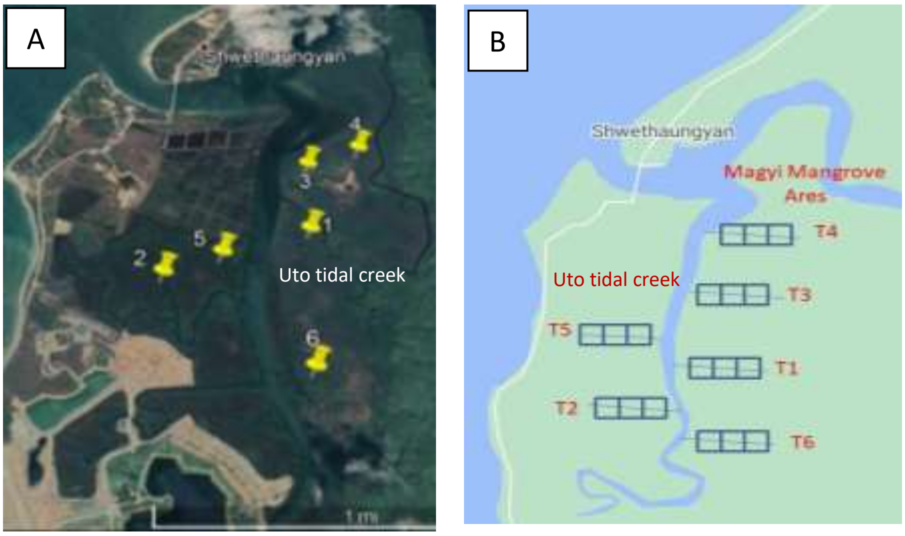

Figure 1 A) Location of the mangrove at Uto tidal creek; B) Sketch map showing the location of the transect.

Results

In the present study, six transect lines were laid for the vegetative structure assessment in the Uto tidal creek, Shwe Thaung Yan coastal area. The tidal creek is meandering into the inner region of the land and favor for good establishment of mangrove plants. The salinity ranges are 10‰ in transect 1, 10 ‰ in transect 2, 12 ‰ in transect 3, 15 ‰ in transect 4, 10‰ in transect 5, 5‰ in transect 6 and most of the substrate is clay-loam. Only 9 true mangrove species were recorded and which will be used to calculate and estimate the vegetative structure within the transect lines. The recorded species were *Rhizophora mucronata, R. apiculata, Ceriops decandra, Bruguiera gymnorhiza, B. cylindrica, Xylocarpus granatum, Lumnitzera littorea, Aegiceras corniculatum* and *Nypa fruticans*. The species composition and the total of individual plants were presented in Table 1. From the table, *Ceriops decandra* showed the highest abundance followed by the *Bruguiera gymnorhiza* and *Rhizophora apiculata* in the area. Transect 2, 3 and 4 represented as the highest number of mangrove composition.

Table 1 Total number of plants and composition of species in the transects

No	Species	T 1	T 2	T 3	T 4	T 5	T 6	Total individuals
1	*C. decandra*	23	31	100	81	50	-	285
2	*R. mucronata*	-	1	-	8	1	-	10
3	*R. apiculata*	32	29	2	5	16	26	110
4	*B. gymnorhiza*	13	97	28	23	31	-	192
5	*B. cylindrica*	-	-	-	-	-	2	2
6	*X. granatum*	-	1	-	-	8	-	9
7	*L. littorea*	-	-	1	-	-	-	1
8	*A. coniculatum*	-	-	-	-	-	1	1
9	*N. fruticans*	-	-	-	-	-	1	1
	Total	**68**	**159**	**131**	**117**	**106**	**30**	

The composition structure of various types of mangrove parameters according to each of the sample plots were presented in Table 2. According to this, the highest composition of species were recorded in transect 2, plot A.

Table 2 The composition structure of plants according to sample plots

T	Plots	No. of plants	No .of new shoot	No. of species	No. of Cut branches	Tallest plant	Smallest plant
1	A	7	10	1	30	1	1
	B	32	27	3	40	3	3
	C	29	50	2	40	2	2
2	A	36	2	5	40	5	5
	B	41	30	3	60	3	3
	C	82	25	3	30	3	3
3	A	37	23	2	60	2	2
	B	70	17	2	30	2	2
	C	24	8	4	50	4	4
4	A	39	11	3	12	3	3
	B	42	15	4	6	4	4
	C	36	10	3	8	3	3
5	A	36	24	4	1	4	4
	B	39	5	3	20	3	3
	C	31	13	3	0	3	3
6	A	16	30	1	0	1	1
	B	7	25	1	0	1	1
	C	7	40	4	0	4	4

T=Transect

The vegetative data including number of recorded species, mean height and mean circumstance of tallest and smallest plants of each of the species, percentage number of plants, percentage of cut branches and percentage of new shoots in all sample plots were presented in Table 3.

Table 3 The vegetative data of mangrove according to transect

T	Plots	Recorded species	Mean Height (m)	Mean Circumference (m)	No. of plants %	No.of new shoot %	No. of Cut branches %
1	A	*R.apiculata*	4.42	1.3	10.29	11.49	27.27
	B	*C.decandra*	1.67	0.85	16.17	31.03	36.36
		B.gymnorhiza	0.48	0.95	19.11		
		R.apiculata	1.67	0.9	11.76		
	C	*R.apiculata*	1.61	1	25	57.47	36.36
		C.decandra	1.17	0.85	17.64		
2	A	*C.decandra*	2.54	1.9	3.77	3.5	30.76
		B.gymnorhiza	1.58	0.95	16.98		
		R.apiculata	3.35	1.5	0.62		
		X.granatum	4.27	1.8	0.62		
		R. mucronata	4.11	1.7	0.62		
	B	*B.gymnorhiza*	1.58	1.05	15.72	52.63	46.15
		R.apiculata	2.44	1.25	5.03		
		C.decandra	1.37	0.8	5.03		
	C	*R.apiculata*	1.83	0.85	12.57	43.85	23.07
		B.gymnorhiza	1.35	0.7	28.30		
		C.decandra	0.96	0.65	10.69		
3	A	*C.decandra*	2.03	1	21.37	47.91	42.85
		B.gymnorhiza	1.52	0.6	6.87		
	B	*C.decandra*	1.75	0.75	45.8	35.41	21.42
		B.gymnorhiza	2.19	1.25	7.63		
	C	*L .littorea*	3.66	2.2	0.76	16.66	35.71
		C.decandra	2.74	1.15	9.16		
		B.gymnorhiza	2.97	1.15	6.87		
		R.apiculata	2.97	1.15	1.52		
4	A	*C.decandra*	2.04	1.2	13.67	30.55	46.15
		B.gymnorhiza	2.28	1.55	16.23		
		R.mucronata	2.01	1.1	3.41		
	B	*C.decandra*	1.67	0.85	29.91	41.66	23.07
		B.gymnorhiza	2.44	1.4	0.85		
		R.apiculata	1.91	0.95	4.27		
		R.mucronata	3.05	1.2	0.85		
	C	*C.decandra*	1.44	0.8	25.64	27.77	30.76
		B.gymnorhiza	2.59	1	2.56		
		R.mucronata	2.59	1.25	2.56		
5	A	*C.decandra*	2.28	1.3	15.09	57.14	4.76
		B.gymnorhiza	3.18	1.95	10.37		
		R.mucronata	6.1	2.1	0.94		
		X.granatum	3.43	1.4	7.54		
	B	*C.decandra*	1.37	1	23.58	11.9	95.23
		B.gymnorhiza	2.44	1.5	7.55		
		R.apiculata	3.41	1.3	5.66		
	C	*C.decandra*	2.28	0.8	8.49	30.95	0
		B.gymnorhiza	2.71	0.9	11.32		
		R.apiculata	3.35	1.65	9.43		
6	A	*R.apiculata*	3.05	1.3	53.33	31.57	0
	B	*R.apiculata*	1.98	0.8	23.33	26.31	0
	C	*B.cylindrica*	2.28	1.35	6.67	42.10	0
		R.apiculata	4.57	1.8	10		
		N.frutican	3.35	25	3.33		
		A.corniculatum	1.73	0.9	3.33		

T=Transect

The percentage compositions of mangrove plants according to the species were showed in Figure 2. According to the studied of total percentage number of species, 99.97%in transect 1, 99.95% in transect 2, 99.98% in transect 3, 99.95% in transect 4, 99.97% in transect 5 and 99.99% in transect 6. In transect 1, three species were recorded and *R.apiculata* representing the highest abundance. In transect 2, five species are distributed and *B. gymnorrhiza* recorded as the highest abundance. In transect 3 and 4, the condition is the same in which four species are recorded and *C. decandra* representing the highest abundance. In transect 5, five species are recorded and *C. decandra* showed as the highest abundance. In transect 6, four species are distributed and *R. apiculata* are recorded as the highest abundance.

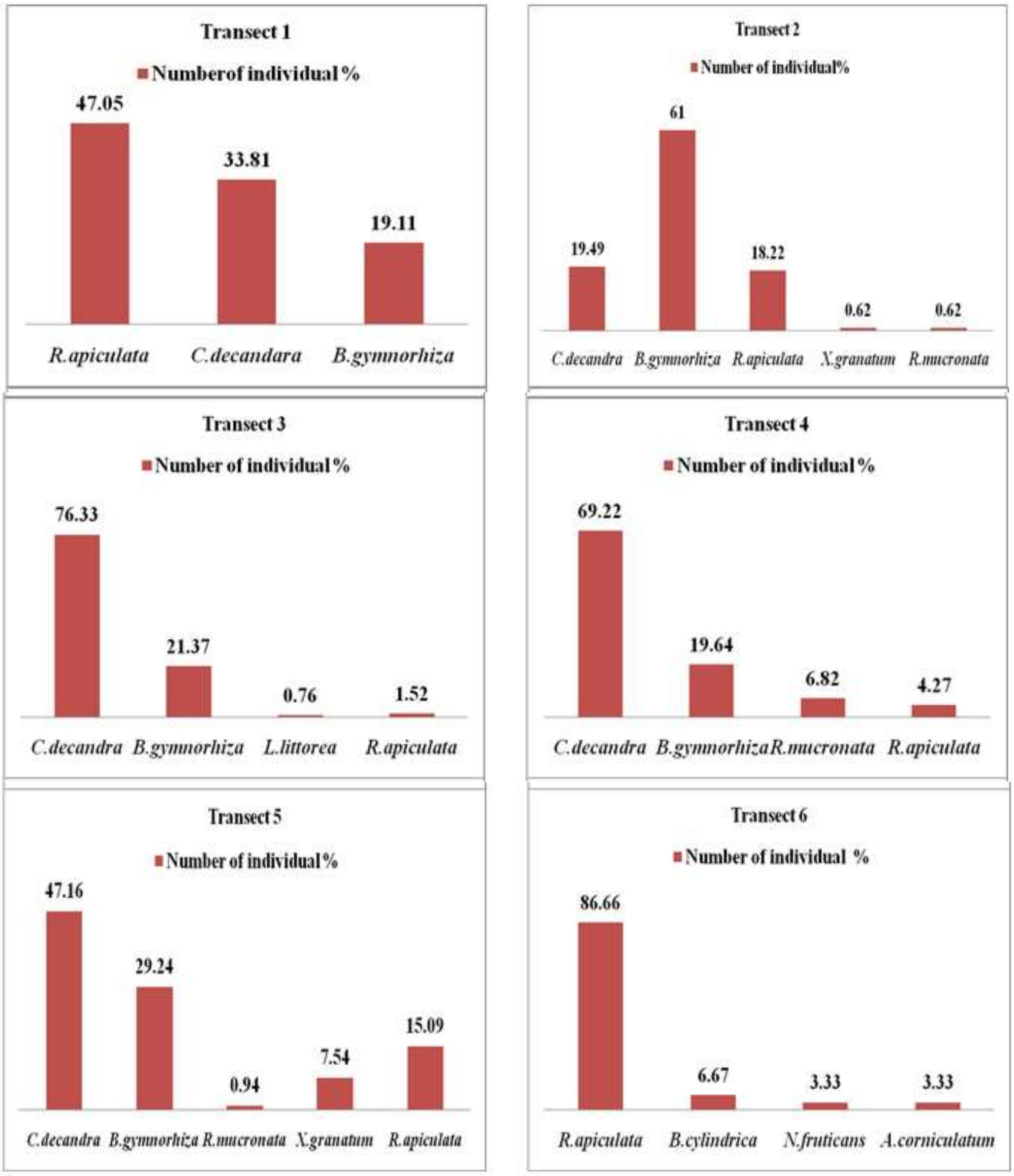

Figure 2 Percentage number of species from six transects point

In this study, the new shoots were also counted to determine the status of survival of recruitment. The highest abundance of recruit plants was observed at transect 6 representing 26% and the lowest was at transect 4 representing 10%. The results were showed in Figure3.

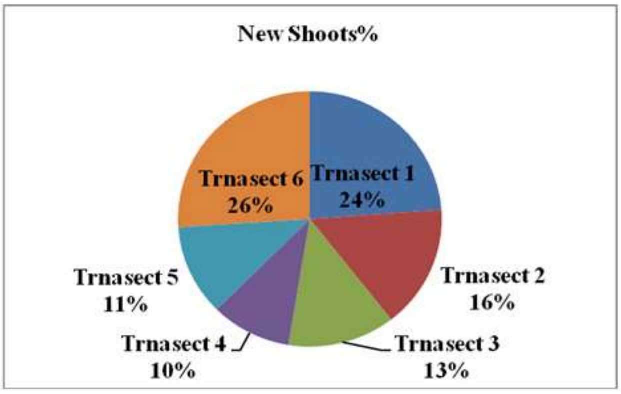

Figure 3 New Shoots percentage of six transects point

Within the transect, the cut branches plants were also counted to determine the status of human interference. Almost all the transect were observed to be encountered the human impacts that cut the plants except transect 6 which was observed to be no cut branches of the plants. The results were showed in Figure4.

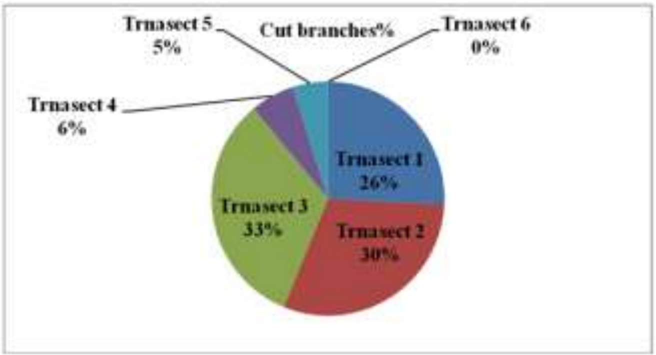

Figure 4 Cut branches percentage of six transects point

According to the recorded species, *Ceriop decandra* is representing the highest abundance followed by *B. gymnorrihiza* and *R. apiculata*. Among the recorded species, *N.fruticans*, *A.corniculatum*, *L .littorea*, *B.cylindrica*, *R.mucronata* and *X.granatum* are rarely found. The results were showed in Figure 5.

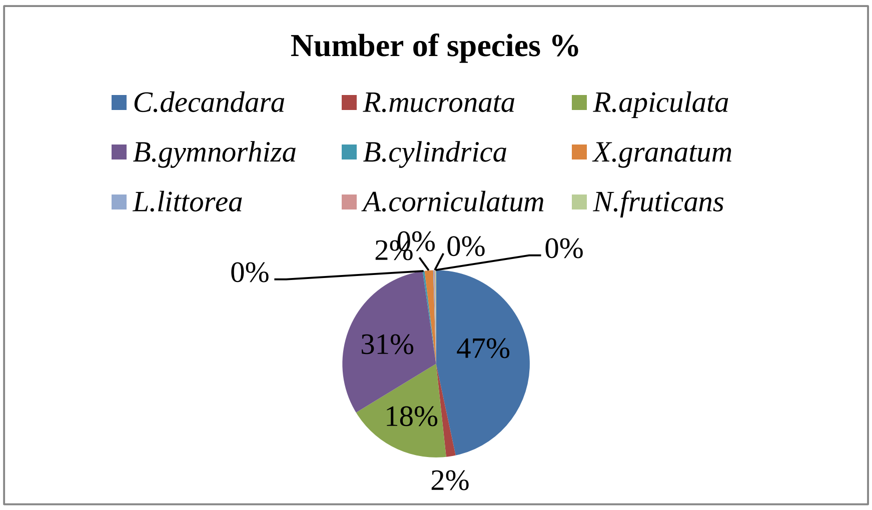

Figure 5 Number of species percentage from six transects point

Table 4 List of plant species recorded in study area

Family	Species	Local name
Rhizophoraceae	*Rhizophora mucronata* Lamk.	Byu-che-dauk ywet-wyine
	Rhizophora apiculata Blume.	Byu-che-dauk ywet-chun
	Ceriops decandra (Griff.)Ding Hou	Madama
	Bruguiera gymnorhiza (L.) Lamk.	Byu-oat-saung
	Bruguiera cylindrica (L.)Bl.	Byu-kyet-tet
Meliaceae	*Xylocarpus granatum* Konig	Pinle-ohn
Combritaceae	*Lumnitzera Littorea* (Jack)Voigt.	Eit-ma-thwe-pwint-ni
Myrsinaceae	*Aegiceras Corniculatum* (L.)Blanco	Yae-Kayar
Arecaceae	*Nypa fruticans* Wurmb.	Dani

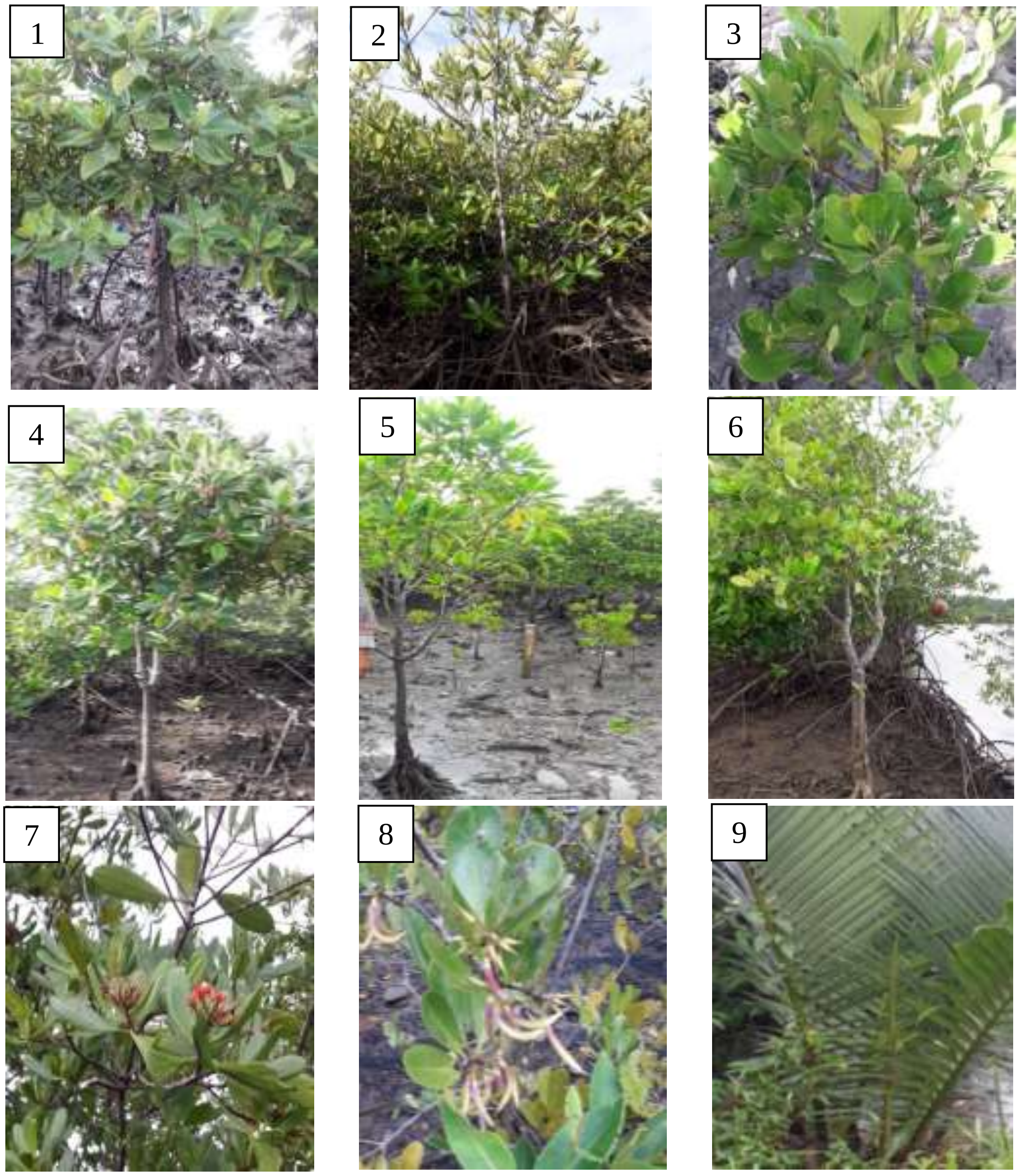

Figure 6. 1)*R. mucronata;* 2)*R.apiculata;* 3)C.*decandra;* 4) *B.gymnorhiza* ; 5)*B.cylindrica;* 6) *X.granatum;* 7) *L .littorea;* 8) *A.corniculatum;* 9) *N.fruticans*

Discussion

Mangrove is tropical maritime trees that have special aerial roots and salt-filtering tap roots. There are several species of mangrove trees found all over the world. Some prefer more salinity, while others like to be very close to a large fresh water source such as river. Some prefer areas that are shelter for waves and some species have their roots cover with sea water every day during high tide. Others are more sensitive to salinity, and grow closer to the shore and other species grow on dry land (Tri *et al*.,1998). In Philippines, majority of the common genera are *Rhizophora*, *Avicennia*, *Bruguiera* and Sonneratia (Calumpong & Menez 1996) Approximately 60 to 70 mangrove and associated mangrove species from 26 families are found in the Philippines. An estimated forty species are considered true mangroves which can be defined as those which are restricted to the mangrove community while associated species may also grow in other habitats (Melana & Gonzales 1996). In Malaysia there are million ha of mangrove forest reserves and the country has rich plant diversity. In terms of mangrove forest cover, Sarawak has the second largest area of mangrove coverage in Malaysia, accounting for 26% of the total (126,400 ha), but only 48% of this is protected as permanent forest reserves (Latiff and FaridahHanum 2014).

In Myanmar, there are found 33 mangrove species and over 100 mangroves and associate. They occurred in southern and south western coastlines but a large number of mangroves species under the threat of extirpation. The dominant species can be found in Myanmar are *Avicennia spp., Rhizophora spp., Bruguiera spp., Ceriops spp., Sonneratia spp., Xylocarpus spp.,* (U Win Maung, 2012). From the recorded of Zockler.C and Aung. C (2019), there is 32 species in Rakhine, 29 species in Ayeyarwady and 43 species Taninthary region.

The present study was implemented to know the status of forest type of an inner mangrove of Uto tidal creek by using the transect method. This method is the simplest ecological sampling method and useful to examine the vegetative structure or community structure of any types biodiversity. In this study area, five families of nine true mangroves species were recorded. The families are Rhizophoraceae, Meliaceae, Combritaceae, Myrsinaceae, Arecaceae and the dominant species Rhizophoraceae found in all six transects points.

Regarding the tallest plants in each species, the tallest *R.mucronata* species was found in transect 5 (height 6.1m/circumference 2.1m); the tallest *R.apiculata* species was found in transect 6 (height 5.5m/ circumference 2.5m); the tallest *C. decandra* species was found in transect 2 (height 3.9m/circumference 2.2m); the tallest *B.gymnorhiza* species was found in transect 5 (height 5.5m/circumference 2.7m); the tallest *B. cylindrica* species was found in transect 6 (height 2.5m/circumference 1.4m); the tallest *X. granatum* species was found in transect 5 (height 4.6m/circumference 1.8m); the tallest *L .littorea* species was found in transect 3 (height 3.7m/circumference 2.2m); the tallest *A. corniculatum* species was found in transect 6 (height 1.7m/circumference 0.9m) and the tallest *N. fruticans* species was found in transect 6 (height 3.4m/circumference 25m). In the study, the new shoots were also counted to determine the status of survival of recruitment. The highest abundance of recruit plants was observed at transect 6 representing (95) individuals and the lowest was at transect 4 representing (36) individuals. Within the transect, the cut branches plants were also counted to determine the status of human interference. Almost all the transect were observed to be encountered the human impacts that cut the plants except transect 6 which was observed to be no cut branches of the plants.

Conclusion

Based on the findings of the study, it was concluded that the plants species are tolerate salinity fluctuation. In summertime, the salinity of this area is nearly 30‰ but in this sample collecting time, the salinity ranges are 5-15‰. The recorded salinity range are 10‰ in transect line 1,2 and 5, the transect 3 has salinity 12 ‰, the transect 4 has salinity 15 ‰, the transect 6 has salinity 5 ‰ and most of the substrate is clay-loam. There were nine species collected such as *R.mucronata, R.apiculata* C.*decandra , B.gymnorhiza ,B.cylindrica, X.granatum, L .littorea, A.corniculatum* and *N.frutican*s. Different mangrove vegetation types are followed according to high tide to low tide; upstream to downstream; and soil characters as well. In the present study there is no significant different in vegetation dominant type within the sample plots and transects. The highest total number of plants were recorded in transect 2,3,4 and the lowest at transect 6. The highest percentage of new shoots were observed at transect 6 and the lowest at transect 4. Almost all the transect were representing the highest cut branches but rarely recorded that there is no cut branches at transect 6. Totally about 611 individual plants were recorded within six transects which can represent as the moderately dense area of mangrove. The most dominant species in the study area are C. *decandra*, followed by *B. gymnorhiza* and *R. apiculata.* The rare species in this area are *N.fruticans, A.corniculatum, L .littorea , B.cylindrica, R.mucronata* and *X.granatum.*

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