# **Biodiversity and Threats to Mangrove Ecosystems in Oriental Mindoro, Philippines**

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#### I. Overview

#### Mangrove forest of the Philippines

The Philippines, being among the top 15 mangrove rich country holds at least 50 % (47 species) of known mangrove species in the world, yet a steady decline is still observed.





- Almost 450,000 hectares in 1918, reduced to about 130,000 hectares in 2000.
- Conversion of mangrove areas into aquaculture ponds.
- Initiatives for mangrove cover recovery in the country.
- Mono-specific culture had high mortality
- Mangrove planting replace seagrass beds.

Importance of mangroves to mitigation/adaptation of climate change

#### CARBON SEQUESTRATION

- Mangrove forests are considered carbon sinks.
- Below-ground, Above-ground, and Soil Organic Carbon

#### SOIL ACCRETION

• After the process of sedimentation, soil accretion occurs.

**Study Sites** 

#### **Oriental Mindoro, Philippines**

Oriental Mindoro covers a total area of 4,238.38 square kilometres (1,636.45 sq mi) occupying the eastern section of Mindoro island in Mimaropa region, Philippines <sup>1</sup>.





A. Northern Coast (Jess H. Humawan. Ecological niche analyses and environmental gradients of mangrove ecosystems across Northern Oriental Mindoro, Philippines. PhD Botany, July 2020. B. Southern Coast (Aaron Froilan M. Raganas. Regeneration capacity of mangrove vegetation in the Southern Part of Oriental Mindoro: Its Implications to future ecosystem rehabilitation. MS Botany, May 2019.

<sup>1</sup>Philippine Standard Geographic Code. (n.d.). Retrieved November 13, 2021, from https://psa.gov.ph/classification/psgc/?q=psgc%2Fcitimuni%2F175200000

The mangrove forest types in sampling areas of **Oriental Mindoro** include fringing (A), riverine (B) and basin (C and D) forest types.



# **Biodiversity Profile**

# **Vegetation Survey**





# **Tree Measurements**



DBH

Crown Length

Tree Height



- 26 mangrove species recorded.
- 25 species were consistently observed in the sampling quadrats while the species *Osbornia octodonta* was found outside the sampling quadrats

A= Aegiceras corniculatum; B= Avicennia alba; C= Avicennia marina; D= Avicennia officinalis; E= Avicennia rumphiana; F= Bruguiera cylindrica.

G= Bruguiera gymnirrhiza ; H= Bruguiera parviflora; I= Bruguiera sexangula; J= Camptotemon philippinensis; K= Ceriops tagal; F= Ceriops decandra.

M= Excoecaria agallocha; N= Heritiera littoralis; O= Lumnitzera littorea; P= Lumnitzera racemosa; Q= Nypa fruticans; R= Osbornia octodonta;

S= Pemphis acidula; T= Rhizophora apiculata; U= Rhizophora mucronata; V= Rhizophora stylosa

## **Mangrove Species Composition**

SPECIES	REL DEN	REL FREQ	REL DOM	SIV	RANK
Sonneratia alba	23.73%	14.34%	57.18%	95.25%	1
Avicennia alba	9.27%	10.66%	26.76%	46.68%	2
Rhizophora apiculata	12.03%	12.91%	8.81%	33.75%	3
Aegiceras corniculatum	10.97%	7.17%	0.00%	18.14%	4
Avicennia marina	5.53%	5.94%	1.91%	13.39%	5
Ceriops decandra	6.16%	6.15%	0.00%	12.31%	6
Bruguiera sexangula	5.14%	6.35%	0.48%	11.98%	7
Rhizophora mucronata	5.82%	5.12%	0.85%	11.80%	8
Xylocarpus granatum	3.83%	6.76%	0.41%	11.01%	9
Bruguiera gymnorhiza	2.62%	4.51%	0.19%	7.32%	10
Avicennia officinalis	2.96%	3.28%	1.05%	7.29%	11
Excoecaria agallocha	2.62%	3.07%	0.96%	6.65%	12
Bruguiera parviflora	2.52%	3.48%	0.18%	6.19%	13
Heritiera littoralis	1.99%	3.07%	0.18%	5.24%	14
Avicennia rumphiana	1.07%	1.64%	0.76%	3.47%	15
Rhizophora stylosa	0.78%	1.23%	0.23%	2.24%	16
Xylocarpus moluccensis	0.68%	1.23%	0.01%	1.92%	17
Ceriops tagal	0.68%	0.82%	0.00%	1.50%	18
Lumnitzera littorea	0.58%	0.61%	0.02%	1.22%	19
Bruguiera cylindrica	0.49%	0.41%	0.00%	0.90%	20
Scyphiphora hydrophyllacea	0.24%	0.61%	0.00%	0.86%	21
Camptostemon philippinense	0.15%	0.20%	0.00%	0.35%	22
Lumnitzera racemosa	0.10%	0.20%	0.00%	0.10%	23
Pemphis acidula	0.05%	0.20%	0.00%	0.05%	24

Biodiversity	Indices & Veget				
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	Riverward	Landward	Middleward	Seaward	
Species richness	21	22	18	17	
Abundance	474	474 583		750	
Dominance	0.1241	0.07901	0.1482	0.1191	
Evenness	0.5616	0.6949	0.5237	0.5926	
Shannon Diversity index	2.468	2.727	2.243	2.31	
HEIGHT (m)	9.2691	9.2992	9.3809	8.0705	
DBH (cm)	18.6021	19.3787	15.7546	16.5256	
BP (kg/100m2)	206.3917	279.0289	186.8489	158.5006	
BP (tons/ha)	47.0114	68.4654	55.1896	41.8266	
CROWN COVER (m)	2.3276	2.3063	2.0824	1.9912	
TREE VOLUME (m3)	0.179	0.227	0.1483	0.1145	



**Biodiversity** 

Diagram of mangrove community structure in Oriental Mindoro, Philippines

#### Relative position of species in elevation gradient was constructed using species richness, abundance and Shannon diversity profile.

- Medium biodiversity at low altitude around 0-4 masl: (1) Sonneratia alba, (2) Avicennia marina, (3) Rhizophora apiculata, and (4) Rhizophora stylosa.
- High biodiversity at 5-9 masl: (5) Avicennia alba, (6) Aegiceras corniculatum, (7) Rhizophora mucronata, (8) Bruguiera sexangula, (9) Ceriops decandra, (10) Nypa fruticans, (11) Avicennia officinalis, (12) Avicennia rumphiana, (13) Excoecaria agallocha, (14) Lumnitzera racemosa, (15) Bruguiera cylindrica, (16) Bruguiera gymnorrhiza and (17) Ceriop tagal
- Low biodiversity at 10-14 masl: (18) *Xylocarpus moluccensis,* (19) *Bruguiera parviflora,* (20) *Heritiera littoralis* and (21) *Xylocarpus granatum.*

# **Regeneration Capacity Study**



# **Regeneration Capacity**



RC I – seedlings; RC II – saplings; RC III – mature trees

# Planting of *Rhizophora mucronata* in seagrass bed





#### Soil-Mangrove Relation



#### **Soil Profile**

The mean soil organic carbon contents in the landward and riverward zones are intermediate and are not significantly different to middleward and seaward mangrove zonations. The soil organic carbon content of soil samples taken from the seaward zone has greater variance than the other zones





# **Status and Threats**



# Interview with Key informants and FGD





## Coastal Erosion



(Bongabong)

## Sea level rise



## (Town of Bongabong)

## (Town of Gloria)

# Cutting of Mangrove Trees







# Earth pits for charcoal making



### Influx of coastal resident





## Town of Roxas

### Town of Bulalacao

# Fish ponds



Threats	Respondents' responses per site						
N=112 regnandants	Gloria	Bansud	Bongabong	Roxas	Mansalay	Bulalacao	Length of time
N=115 Tespondents	n=20	n=20	n=14	n=20	n=9	n=30	observed (years)
Urbanization (Immigration)	5(25)	17(85)*	0	20(100)*	0	30(100)*	≥30
Aquaculture	2(10)	0	13(93)*	15(75)*	8(89)*	21(70)*	≥30
Agriculture	13(65)*	0	1(7)	6(30)	9(100)*	0	≥30
Water pollution	6(30)	5(25)	2(14)	20(100)*	4(44)	4(13)	10-15
Illegal logging/ cutting of	4(20)	13(65)*	2(14)	3(15)	7(78)*	17(57)*	≥30
mangrove trees							
Used mangroves as raw	5(25)	1(5)	2(14)	3(15)	3(33)	5(17)	≥30
materials for tannin extraction,							
charcoal making etc.							
Coastal Erosion	6(30)	2(10)	4(29)	4(20)	2(22)	0	≥20
Flooding	9(45)	2(10)	3(21)	3(15)	0	2(7)	≥20
Sea Level Rise	12(60)*	5(25)	9(64)*	5(25)	2(22)	0	≥20
Storm surges/ strong tidal waves	4(20)	0	2(14)	4(20)	3(33)	0	<u>≥</u> 15
Siltation	3(15)	0	1(7)	3(15)	2(22)	4(13)	5-20
Increase in temperature	14(70)*	20(100)*	13(93)*	20(100)*	7(78)*	24(80)*	10-15
Change in precipitation patterns	13(65)*	20(100)*	13(93)*	20(100)*	7(78)*	20(67)*	10-15

- □ Mangrove ecosystems of Oriental Mindoro has high diversity.
- □ Mangrove ecosystem has high potential to sequester C in its biomass and soil.
- □ Mangrove loss is affected by the observed anthropogenic and climatic threats.
- □ The presence of abundant seedlings indicate that mangrove ecosystems have the capacity to regenerate even without human assistance.
- However, accompanied with regeneration success is a constant monitoring of these mangrove areas. Protection of these young plants is important as they influence the future of these mangrove ecosystems.

- □ Advocate the use of multiple indigenous mangrove species in the rehabilitation activities;
- Promote Assisted Natural Regeneration (ANR) in all mangrove areas, hence, the best natural way in restoring the ecosystem;
- □ Mangrove tree planting should not be done in seagrass bed areas
- □ Reclamation of the abandoned fishponds; and
- □ Application of aquasilviculture system instead of destructive fishpond practices.

# **THANK YOU!**