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# Biodiversity Support and Ecotourism for Local Economic Development of Margasari Village – East Lampung District - Indonesia

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## ABSTRACT

Mangrove is known to be a greenbelt of the coast with its function not only for the physical and chemical processes along the coast line affected by sea-and fresh-water current but also functioning as habitat for many animals, including migratory birds. Mangrove in Margasari village or Lampung Mangrove Center (LMC) is dominated by *Avicennia marina* with density of 333 trees/ha, followed by *Rhizophora mucronata* with density of 467 trees/ha. Coastline of Lampung Province attracts for birds to migrate from asia to australia and vice versa. About 38 species of birds was found during field observation made on February – June 2018. Some of the birds found was considered to be endangered like a Great Knot (*Calidris tenuirostris*), some was threatened like Eurasian Curlew (*Numenius arquata*) and Chinnesse Egret (*Egretta eulophotes*). Not only birds, mangrove also provides some habitat for many different communities, such fishes, moluscs, crabs, and else in which they can be part of the ecotourism. Generating activities related to mangrove ecotourism provides economic for the locals such as, canoeing, fishing, seedling and culinary. Renting canoes by fishermen might help to generate some income (one canoe is rented for 200.000 rupiah/day). Fishing, for special tourism, in the mangrove which predominantly habitat for mud catfish is promising to generate some local income. Seedling of red mangrove (*Rhizophora* sp), can be introduced as part of eco-edutourism. Culinary is the most promising acts also to generate local economics, seafood and some other mangrove products can support the mangrove (LMC) ecotourism.

**Keywords:** Mangrove, biodiversity, economic development, ecotourism, Margasari, Lampung

## 1. INTRODUCTION

Lampung Province as one of the provinces in Indonesia's archipelago has 62 small islands with total of 250 km in coastal line. Four main rivers of Lampung Province end up in east coast of Lampung, making huge area of wetland, particularly mangrove area. It is well known that in 1970's clear cutting of mangrove had been vastly converted into shrimp and fish ponds, leaving the east coast of Lampung to be unprotected from any natural disasters, such as flooding of the river basin area and seawater intrusion. It was then in early 1990's some land of the previous mangrove area emerging and starting to grow as new area of mangrove with *Avicenna* as pioneer mangrove plants. It was not as simple as it was, this elevated property right of mangrove itself.

Even though from 2004 to 2013, the impact increased by 62% due rehabilitation by government, local villagers and University of

Lampung [1], yet some interest conflict in mangrove area still occur. As it already predicted that the success of mangrove rehabilitation also raised a potential conflict [2]. One of which, especially was in use of firewood for marginal communities around mangrove forest. Therefore, a study to determine the mangrove growth, potential, and methods of using eco-friendly for the public welfare is also needed. The aim of this study is to indicate any local potential benefits which may develop from the mangrove of Margasari Village of East Lampung District which is known as Lampung Mangrove Center (LMC).

## 2. METHODS

The study was conducted by desk study from site study references and direct observation on biodiversity of flora and fauna of the Lampung Mangrove Center and surrounding area.

### 3. RESULTS AND DISCUSSION

#### 3.1. Biodiversity of Lampung Mangrove Center (LMC)

Mangrove is known to be a greenbelt of the coast with its function not only for the physical and chemical processes along the coast line affected by sea-and fresh-water current but also functioning as habitat for many animals, including migratory birds.

The mangrove ecosystem of LMC is dominated by *Avicennia marina* with density of 333 trees/ha, followed by *Rhizophora mucronata* with density of 467 trees/ha. Beside these two mangrove plants, some other plants also can be found in LMC, such as *Bruguiera spp*, *Sonneratia caseolaris*, and other shrub which related to mangrove ecosystem (Table 1, Figure 1).

**Table 1.** Plant diversity and use of Lampung Mangrove Center

No	Plant Name	Density/ha	Local Uses
1	<i>Avicennia marina</i>	333 <sup>1</sup>	Fire wood & medicinal herb
2	<i>Avicennia officinalis</i>	1,791 <sup>2</sup>	
3	<i>Rhizophora apiculata</i>	33 <sup>2</sup>	Medicinal herb
4	<i>Rhizophora stylosa</i>		
5	<i>Rhizophora mucronata</i>	467 <sup>1</sup>	
6	<i>Aegyceras spp</i>	rare <sup>3</sup>	Medicinal herb
7	<i>Sonneratia caseolaris</i>	12 <sup>1</sup>	Food & Beverage
8	<i>Bruguiera gymnorrhiza</i>	357 <sup>1</sup>	Fire wood
9	<i>Acanthus ilicifolius</i>	Spread throughout water channel	Medicinal herb

<sup>1</sup> [3], <sup>2</sup>[4], <sup>3</sup>[5]

Lies between two continents, asia and australia, makes coastline of Lampung Province to be one of the areas which suitable for birds to migrate from asia to australia and *vice versa*. For about 38 different species from 14 different families (Tabel 2, Figure 2) was found in the LMC during observation made on May – June 2017.

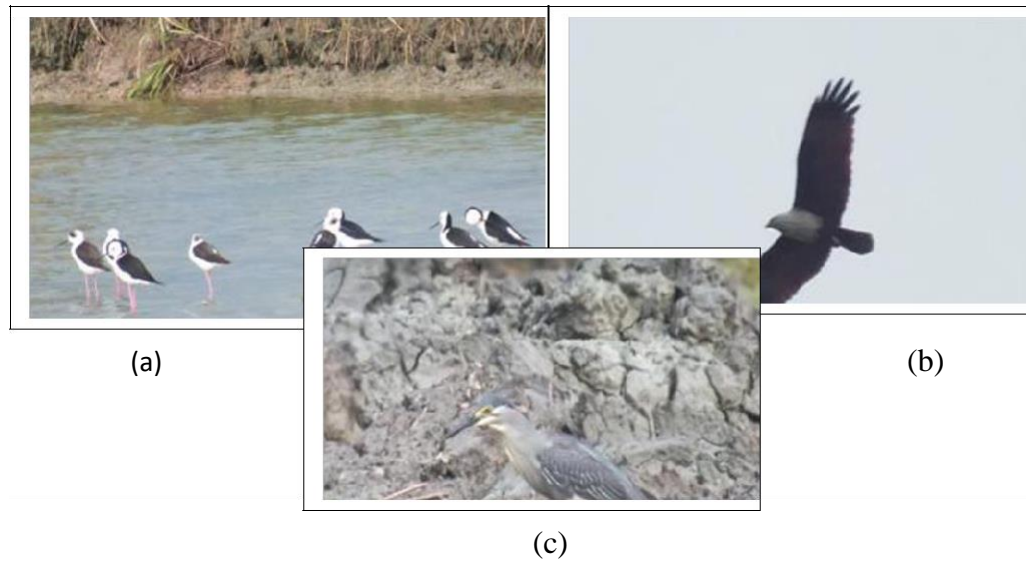
This number was double than observation made by Kesuma [6]. It is expecting that the number will

increase by thoroughly observation made throughout the full year.

Beside birds, some other fauna can be found such as fishes, crustaceans and amphibians. Some different invertebrates, such as molluscs and arthropods, can be easily found the LMC.



**Figure 1.** Mangrove ecosystem of LMC



**Figure 2.** Some of birds found in LMC (a. *Himantopus leucocephalus*, b. *Haliastur indus*, c. *Butorides streatus*)

### 3.2. Ecological Site of the LMC

With its typical shallow coastal water, LMC was also suitable for canoeing activity (Figure 3). Time suitable for canoeing while watching birds is during early morning (06.00-08.00 am) and late afternoon (15.00-17.00) when many birds can be found searching food and socializing among them. Pricing for canoeing could generate some income for the locals. For instance, mostly one canoe is rented for 200.000 IDR/day. Yet, this income can be sustained by government through blue economy

approach [7], such as building up community empowerment in mangrove resource monitoring and control, optimizing mangrove management and marketing and managing environment friendly fish/shrimp cultures surrounding the mangrove forest. Community empowerment also included with enhancing their knowledge over mangrove management and tourist marketing [8], [9], [10] as well as understanding on legislation and law enforcement on it [11].

**Table 2.** Bird diversity in Lampung Mangrove Center<sup>1</sup>

No	Fam/Genus	Common name	Species	IUCN Status
1	Accipitridae	Brahminy Kite	Haliastur indus	LC
2	Accipitridae	Crested Serpent-eagle	Spilornis cheela	LC
3	Alcedinidae	Small Blue Kingfisher	Alcedo coerulescens	LC
4	Alcedinidae	White-throated Kingfisher	Halcyon smyrnensis	LC
5	Alcedinidae	Collared Kingfisher	Todiramphus chloris	LC
6	Ardeidae	Grey Heron	Ardea cinerea	LC
7	Ardeidae	Purple Heron	Ardea purpurea	LC
8	Ardeidae	Javan Pond-heron	Ardeola speciosa	LC
9	Ardeidae	Cattle Egret	Bubulcus ibis	LC
10	Ardeidae	Striated Heron	Butorides striata	LC
11	Ardeidae	Great Egret	Ardea alba	LC
12	Ardeidae	Chinese Egret	Egretta eulophotes	VU
13	Ardeidae	Little Egret	Egretta garzetta	LC
14	Ardeidae	Black-crowned Night-heron	Nycticorax nycticorax	LC
15	Charadriidae	Kentish Plover	Charadrius alexandrinus	LC
16	Charadriidae	Pacific Golden-plover	Pluvialis fulva	LC

17	Estrildidae	15 Chestnut Munia	Lonchura atricapilla	2 LC
18	Estrildidae	white-caped munia	Lonchura ferruginosa	LC
19	6 Estrildidae	Scaly-breasted Munia	Lonchura punctulata	LC
20	6 Hirundinidae	Asian House Martin	Delichon dasypus	LC
21	Hirundinidae	Barn Swallow	Hirundo rustica	LC
22	Hirundinidae	Tahiti Swallow	Hirundo tahitica	LC
23	6 Laridae	Great Crested-Tern	Thalasseus bergii	LC
24	6 Meropidae	Blue-tailed Bee-eater	Merops philippinus	LC
25	Pandionidae	Osprey	Pandion haliaetus	LC
26	11 Phalacrocoracidae	Little Black Cormorant	Phalacrocorax sulcirostris	LC
27	Podicipedidae	Little Grebe	Tachybaptus ruficollis	LC
28	11 Pycnonotidae	Sooty-headed Bulbul	Pycnonotus aurigaster	LC
29	Recurvirostridae	White-headed Stilt	Himantopus leucocephalus	LC
30	Scolopacidae	Great Knot	Calidris tenuirostris	EN
31	Scolopacidae	Eurasian Curlew	Numenius arquata	NT
32	Scolopacidae	Whimbrel	Numenius phaeopus	LC
33	Scolopacidae	Common Sandpiper	Actitis hypoleucos	LC
34	Sylviidae	Dark-necked Tailorbird	Orthotomus ruficeps	LC
35	Threskiornithidae	Glossy Ibis	Plegadis falcinellus	LC
36	Ploceidae	Eurasian Tree Sparrow	Passer montanus	LC
37	Apodidae	Glossy Swiftlet	Collocalia esculenta	LC
38	Apodidae	13 Black-nest Swiftlet	Aerodramus maximus	LC

<sup>1</sup> presented in national seminar 2018, \*LC: least concern, VU: vulnerable, EN: endangered, NT: near threatened

### 3.3. Local Economic Development

Ecotourism, especially in mangrove, can be sustained by involving the locals for managing and providing some economic values to them, not only by generating some income but also providing job

opportunities for the locals [12]. Therefore, empowering the locals, especially for local women would give great benefit for both the ecosystem itself as well as the managing mangrove ecotourism.



Figure 3. Typical shallow water of Lampung Mangrove Center of Margasari Village

A study also indicated that the total economic values of LMC reached up to 10 billion IDR a year [13], including obtained value from direct use for catching fish/crabs, production from mangrove apple (*Sonneratia caseolaris*) and holly mangrove (*Acanthus ilicifolius*) for snack and beverage, fire wood and ecotourism, which was accounted closely

to 20 % overall. Yet, this number seemingly superficial unless sustainable managing of LMC with surrounding fishery activity can be side by side.

As it had already mentioned, in order to conserve mangrove ecosystem, blue economic approach was also introduced by Bidayani [7],



including developing fish/shrimp culture which side by side with mangrove conservation. However, putting the environment friendly fish/shrimp culture was not introduced into part of the eco-edu-tourism related to mangrove management. We are endorsing eco-edu-tourism to mangrove ecosystem of LMC in Margasari Village of East Lampung District with its adjacent fish/shrimp culture.

People are able to learn how the ecosystem supported the fish/shrimp culture while they also learn how to manage the culture which site by site with surrounding ecosystem.

Improving ecotourism in LMC by introducing eco-edu-tourism, therefore, is necessary to be done. Some tourism activities related to it, such as:

1. Enhancing Mangrove Ecosystem by providing how to do mangrove plant nursing, seedling and planting,
2. Conducting education for eco-sound shrimp culture,
3. Presenting how to use mangrove products (seed, fruit and leaves) for snack such as chips, cookies and beverage,
4. Introducing Phyto pharmacy that can be generated by using mangrove products (seed, fruit and leaves),
5. Introducing crab culture which can provide culinary tourism.

#### 4. CONCLUSIONS

We can conclude that generating some tourism activities related to existing mangrove in LMC such as, canoeing, fishing, seedling and culinary may affect local incomes from which then the supports to mangrove conservation as migratory bird habitat can be provided by the local people.

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