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Mangrove biodiversity as tourism attraction : the perspective of tourist

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Abstract

Indonesia has at least 47 types of ecosystems, one of ecosystems that have a lot of potential in Indonesia is a mangrove forest. Mangrove forests in Indonesia have a high diversity of flora and fauna. Development and utilization of coastal areas around the mangrove forest, usually not done wisely that is likely to endanger the stability of the mangrove ecosystem in the long term. One alternative utilization of mangrove forests that could be developed without damaging the environment is the development of ecotourism. Mangrove forest in Pancer Cengkrong Karanggandu is one of the mangrove forest areas with the potential to be developed into a tourist area of mangrove. The purpose of this research is to study the potential and preferences of flora and fauna (birds) in the Cengkrong Mangrove Forest as a tourist attraction in the development ecotourism programs with community participation. Stakeholders involved in the study consisted of mangrove forest communities, students of nature lovers and a science teacher with a total of 135 people. Data analysis was performed with the help of Microsoft Excel and analyzed descriptively further showed form of graphs. Result showed that Cengkrong mangrove forests has the potential to be used as ecotourism. Diversity of flora found in the mangrove forest is composed of 22 species with the highest RFC index is *Brugueira gymnoriza*. While the diversity of bird species found to consist of 21 species with the highest RFC index is *Laptoptilus javanicus*.

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Introduction

Indonesia is a megabiodiversity country that has a very high diversity. Indonesia has at least 47 types of ecosystems.One of the ecosystem that has a lot of potential in Indonesia is a mangrove forest. Mangrove forest is a forest that grows in muddy and sandy soil in coastal areas and estuaries are affected by the tide Mangrove community is made up of plants, animals and microbes (Jayatissa *et al.*, 2002).

Mangrove ecosystem has a role ecology, socio-economic and socio-cultural importance. Functions include a mangrove forest ecological remediation of contaminants, maintaining the stability of coastal erosion, sea water intrusion and storm surge, keeping the naturalness of habitat, a place nesting, spawning and rearing various species of fish, shrimp, shellfish, birds and other fauna, as well as forming mainland. Socio-economic functions of mangrove forests include timber, fuel wood, plywood, pulp, telephone poles, piling, chart fishing, dock, railway sleepers, wood for furniture and handicrafts, roofs, tannin, medicinal materials, sugar, alcohol, acetic acid, animal protein, honey, carbohydrates, and dyes, as well as socio-cultural functions as a conservation area, educational, cultural identity and ecotourism (Setiawan *et al.*, 2005). The mangrove forest is a natural resource that has the potential to serve as an attractive tourist destinations. Application of ecotourism in the area of mangrove forest is one of the approaches in the utilization of mangrove forest ecosystems in a sustainable manner.

According to Lee (1997), that ecotourism should include the principle of contributing actively to the conservation of natural and cultural heritage, incorporate local communities in the planning, development and operation, contributing to the welfare of the local community. To interpret the natural and cultural heritage into the visit, providing more services both to the perpetrators of ecotourism by way of organizing the trip into a group of small size (Tribe, 2005).

One of the mangrove forest in East Java, Indonesia, which still has not developed as ecotourism is mangrove forest. Cengkrong Mangrove Forest is located in the Karanggandu, Trenggalek. This forest is located in the southern coastal area of the island of Java. To develop mangrove forests deformed as ecotourism region it is necessary to study the potential diversity of flora and fauna (birds) as a tourist attraction. Therefore, the main objectives of this reseach is to study the potential and preferences of flora and fauna (birds) in the Cengkrong Mangrove Forest as a tourist attraction in the development ecotourism programs based on community participation

Materials and methods

Description of the study area

The Located of Cengkrong Mangrove forests on the southern coast of Java. Administratively, this forest is located in the Karanggandu, Trenggalek. Subdistrict Watulimo included in the administrative region Trenggalek located at coordinates 24 1110 'to 1120 11' east longitude and 70 53 'to 80 34' LS immediately adjacent to the southern ocean or the Indian Ocean and has three coastal villages namely Tasikmadu, Prigi and Karanggandu. These villages directly bordering the Gulf Prigi which is the basis of the fisheries highest activity compared to other coastal sub-districts. Thus, the common variety of conflicts of interest among the people themselves, which have an impact on the exploitation of biological resources that exist. Cengkrong region has the most extensive mangrove forest area is about 87 ha.

Sampling procedure

The diversity of flora collection is done by using the method of exploration to determine the transect line perpendicular from the shoreline and pulled towards the mainland. In this study used path is the main line of mangrove forest, with a path length of 1500 m and a width of 40 meters (20 meters right-left). The entire mangrove encountered along the path identified observations, taken the parts of the tree (roots, stems, leaves, flowers and fruit) and matched with mangrove

flora identification guide book titled "Guide Introduction Flora Mangroves in Indonesia" (Noor,*et al.*, 2006). All data is recorded in tallysheet that have been made. As for species that have not been identified to be sampled for further identification in Plant Taxonomy Laboratory, Department of Biology, University of Brawijaya and matched with herbaria existing mangrove plants as well as consultation with the supervisor.

While the data recording bird species in the mangrove forest use cruishing method and point count. Researchers are constantly running along the main line tour (1500 m) and stop at each point of concentration for 15 minutes (Bibby *et al.,* 2000). The distance between points used in this study was 375 m. At this bird observation points determined concentration suspected birds are found along the main line on the basis of preliminary studies that have been done. In this study defined four (4) points of concentration. While is done three times a day at 6:00.- 09:00 a.m and 10:00 to 13:00 and 14:00 to 17:00 pm.

Method of recording directly done by looking at the object of birds using Nikon binoculars 8 x 30. Meanwhile, if allowed to be filmed with a Canon D 1000 SLR 10 MP, 3200 ISO. Aspect of note is the color of feathers, beak models, the activity of birds, the sound patterns as they are found (if possible) and a general description of the body shape. In addition, interviews were conducted with community groups Cengkrong Mangrove Forest supervisor to confirm the types of species found and the possibility of the discovery of another species that has not been found during the observation. Interview conducted openly and with the confirmation form images and the local name of the species of birds. Citation preference data extracted from 135 tourist attractions respondents who competence through questionnaire instrument.

Base on the preferences of the RFC index compiled into a leaflet as a tool that can be used for the interpretation of visitors or tourist in the development of cengkrong mangrove forest as ecotourism.

Data analysis

Flora mangrove diversity were analyzed descriptively by describing the characteristics and uses of mangrove flora encountered. The analysis was done descriptively bird species by exposing a description of each species of bird, family name, local name and the time and bird activity when found.

Data on tourist attractions citation preferences were analyzed using the Relative Frequency Index. RFC index is the level of frequency of mention on a case stated by the respondents were divided on the total respondents (Santayana, 2008). RFC index indicates the priority level of an object species to be used as tourist attractions. Furthermore, the data discussed in the descriptive through narrative explanation.

$$RFC = \frac{FC}{2N}$$

Note:

FC : number of informant who gave citation at each species

N: total of informant (in this studi 135 informant).

Leaflet design is done with the help of a computer program CorelDraw Graphics Suite X3, and arranged as attractive as possible. This leaflet subsequently used as tools mangrove ecotourism visitor interpretation.

Results and discussion

In this study stakeholders involved amounted to 135 people consisting of a science teacher, supervisor local community mangrove forests and nature lovers of community among the students / learners (Table 1).

The selection of these stakeholders based on information that will be explored with regard to the environment of mangrove forests, which included stakeholders assumed to have sufficient knowledge about the mangrove ecosystem. The development potential of the tourist attractions of the region would be optimal if it involves various parties as relevant

stakeholders (Kontogeorgopoulos, 2005). Stakeholders can be defined as an individual or related group that has an interest or concern and effect and will be affected directly or indirectly to an object that can be a problem, programs, projects, physical buildings and so on (Higham,2007). With this background, the information provided from stakeholders will be very helpful in constructing the mangrove tour which will be developed because it is relevant to science and knowledge.

Table 1. Basic information of stakeholder.

Component	N	%
Age (year)	86	63.7
15-20	9	6.7
20-30	27	20.0
31-40	13	9.6
>40		
Sex		
Male	76	56.3
Female	59	43.7
Level of education		
Elementary School	1	0.7
Junior High School	1	0.7
Senior High School	45	33.3
Bachelor Degree	86	63.7
Master Degree	2	1.5
Occupation		
Student	90	66.7
Teacher	25	18.5
Farmer	15	11.1
Others	5	3.7

The involvement of stakeholders and the public in the assessment of the quality of tourism products has been carried out in many areas and provide useful information for the development of ecotourism. stakeholders play a role in several stages, namely, participation in the planning, implementation and utilization of the results. Among the three stages of the highest level measured by the degree of involvement is participation in the planning stages. In the planning phase, stakeholders involved in making decisions (Brandon, 2003). The results of the exploration of the main line Mangrove tour Pancer Cengkrong showed that found 22 species of mangrove. The existence of diverse species of mangrove flora is an asset and attraction of potential tourist attraction.

The reason tourists visit a tourist destination is because of the tourist attraction. Tourist attraction is anything that has a uniqueness, beauty, and value in the form of biodiversity or natural wealth of flora, fauna and a wealth of ecosystems, as well as the culture, customs or everything works man to whom or destination excursions (Pudjiono, 2007). Based on the classification of the quality of the tourist attractions such as the flora diversity compiled by Fandeli, Pancer Cengkrong potential Mangrove Forests can be said to be in good condition.

Table 2. Types of mangrove species in the cengkrong mangrove forest.

No	Species	Local Name	Family	Type of Mangrove *)
1	*Bruguiera gymnorrhiza*	Tenggel	Rhizoporaceae	"True Mangrove"
2	*Nypa fruticans*	Nipah	Arecaceae	"True Mangrove"
3	*Xylocarpus granatum*	Nyirih	Meliaceae	"True Mangrove"
4	*Bruguiera parviflora*	Tanjang	Rhizoporaceae	"True Mangrove"
5	*Acanthus ilicifolius*	Drujon	Acantaceae	"True Mangrove"
6	*Ceriop tagal*	Mentigi	Rhizoporaceae	"True Mangrove"
7	*Excoecaria agallocha*	Menegen	Euphorbiaceae	"True Mangrove"
8	*Sonneratia alba*	Bogem	Sonneratiaceae	"True Mangrove"
9	*Bruguiera exaristata*	Tinjang pendek	Rhizoporaceae	"True Mangrove"
10	*Avicennia alba*	Api-api	Avicenniaceae	"True Mangrove"
11	*Pandanus odoratissima*	Pandan	Pandanaceae	"Associated Mangrove"
12	*Ficus benjamina*	Beringin	Moraceae	"Associated Mangrove"
13	*Finlaysonia maritima*	Basang siap	Asclepiadaceae	"Associated Mangrove"
14	*Cerbera mangghas*	Bintaro	Apocynaceae	"Associated Mangrove"
15	*Calotropis gigantea*	Biduri	Asclepiadaceae	"Associated Mangrove"
16	*Terminalia catappa*	Ketepeng	Combretaceae	"Associated Mangrove"
17	*Wedelia biflora*	Seruni laut	Asteraceae	"Associated Mangrove"
18	*Hibiscus tiliaceus*	Waru laut	Malvaceae	"Associated Mangrove"
19	*Pongamia pinnata*	Kacang laut	Leguminoceae	"Associated Mangrove"
20	*Ricinus communis*	Bakung	Goodoniaceae	"Associated Mangrove"
21	*Sesuvium portulacastrum*	Krokot	Alzoaceae	"Associated Mangrove"
22	*Ipomoea pescaprae*	Batata pantai	Convolvulaceae	"Associated Mangrove"

Table 3. Criteria potential and quality of the diversity of flora (Fandeli, 1992).

No	Diversity (Spesies)	Type Category
1	less than 5	Poor
2	Between 6-10	Somewhat worse
3	Between 11-20	Medium
4	Between 21-31	Good
5	More than 31	excellent

According Mamiri (2008), vegetation is one of the important physical elements appear in the design and management of the environment. Meanwhile, according to Booth (1983), the vegetation has three main functions, namely structural function, the function of environmental and visual function. Vegetation as a structural element acts as a shaper and regulator of space and affect the view. Vegetation as a function of the environment, among others, as a temperature control, erosion control as well as wildlife habitat. Vegetation as a visual element can act as a focal point and a visual link to the character of vegetation such as size, shape, color and texture.

A total of ten species of mangrove Mangrove Forest Pancer Cengkrong included into the type of true mangroves. Which includes among other types of true mangrove *Bruguiera gymnorrhiza, Nypa fruticans, Xylocarpus granatum, Bruguiera parviflora, Acanthus ilicifolius, Ceriop tagal, Excoecaria agallocha, Sonneratia alba, Bruguiera exaristata* and *Avicennia alba*. According to Noor *et al*., (2005), consists of true mangrove vegetation forming morphological specializations such as aerial roots and other special physiological mechanisms to excrete salt in order to adapt to the mangrove environment. In the taxonomy of this group of plants is different from the group of land plants.This group is only found in mangrove forests and forming pure stands, never joined the group of land plants.

While assosiated mangrove is community whose existence is not so obvious.The species grow on the edge or outside the limits of mangrove habitat and rarely form pure stands. Usually live with land plants. Assosiated mangrove species found in Cengkrong mangrove forests include *Pandanus odoratissima, Ficus benjamina, Finlaysonia maritime, Cerbera mangghas, Calotropis gigantean, Terminalia catappa* and *Wedellia biflora*.

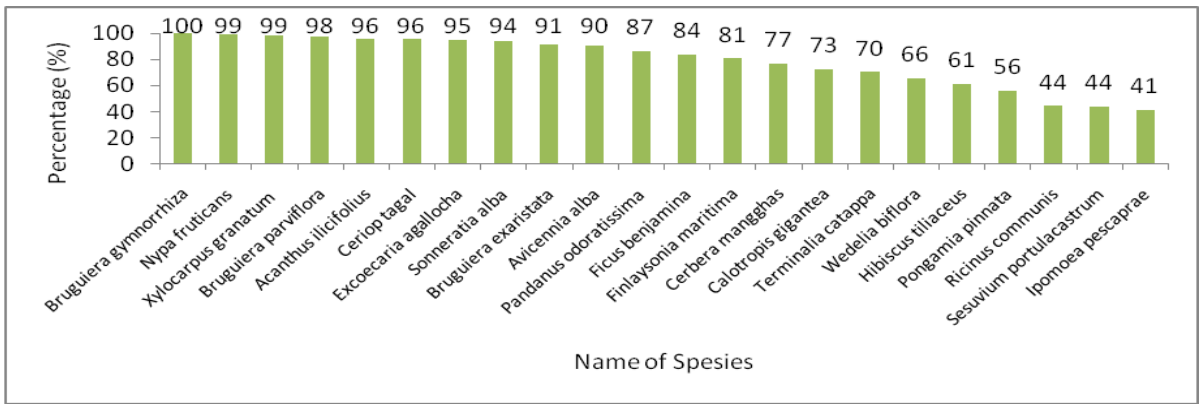

Fig. 1. Percentage (%) Relative Frequency Citation Index of flora mangrove.

Of the 22 species of flora constituent Cengkrong Mangrove Forest, the highest RFC index is Bruguiera gymnorrhiza.Thats means the species of *Bruguiera gymnorrhiza* often mentioned by the respondent and thus represents the interests of the species based on public perception. Data based on the preference results are displayed on the RFC index (Fig. 1).

Species that have the highest citation rate is *Bruguiera gymnorhiza*. *Bruguiera gymnorhiza* has its roots as a board extending to the side at the base of the tree, also has a number of knee roots. Hanging flower with flower stem length between 9-25 mm (Noor *et al,,* 2005). Is the dominant species in the mangrove forest which is characteristic of the high

and late stage development of coastal forests, as well as the early stages of the transition into the land of vegetation types. Relatively large flower, flower petals reddish, depending, and invite birds to pollinate. Typically used for food on the part of society in the hypocotyl (candied kandeka) by mixing sugar. The wood is red is used as firewood and to make charcoal.

The highest value of the second citation is *Nypa fruticans*, this species has a dense root system and strong better adjusted to changes in water intake, compared with most other types of mangrove plants. Generally the public process into sweet syrup from the stem. In addition, this species used to produce alcohol and sugar. If managed well, the production of sugar produced better than sugar cane, as well as having a higher sucrose content. The leaves are used for the manufacture of umbrellas, hats, mats, baskets and cigarette papers. In addition, the seeds can be eaten even after being processed, fiber handle of the leaves can also be made rope and bristle brush (Noor, 2005). *Nypa fruticans* flower sap can be processed into sugar and wine, because of the high content of sukrosanya. *Nypa fruticans* also can produce cooking oil, leaves for cigarette paper, and ashes to the source of salt .

Next is *Xylocarpus granatum*, this species is commonly called nyirih. Has a unique root form of the roots extending to the side boards. The fruit is round and has a random arrangement of seeds that are sometimes called "fruit puzzle", the fruit will break itself if it is dry. Bark of *Xylocarpus granatum* has a high tannin levels by more than 24% of dry weight (Noor *et al.*, 2005).

Besides *Acanthus ilicifolius* also often used for medicinal, this plant acts as an aphrodisiac, asthma, blood purifier (fruit), diabetes, diuretic, dyspepsia, hepatitis, leprosy (fruit, leaves, roots), neuralgia, paralysis, worms, rheumatism, diseases skin, snake bites and abdominal pain (bark, fruit, leaves). While the species that has the lowest value is *Ipomoeae pescaprae* citations (41%). Herbaceous perennial with thick roots. Stem length is 5-30 m and spread, the roots grow in stem segments. Stems are round, wet and brownish green. It grows wild ranging up to 600 m above sea level, usually on a sandy beach, but also right on the shoreline, and sometimes the water channel (Noor *et al.,* 2005). Some of the reasons that led to the percentage of tenth RFC index higher plants according to the respondents, among others, because of the importance of the mangrove species for unknown visitor, a typical plant mangrove ecosystem, has the form of roots, fruits and leaves are unique, rarely found in other ecosystems and has many benefits. In addition to the benefits of education, collective unit mangrove flora species will form a forest ecosystem cause aesthetic impression.

The results of cruishing method and point count showed that there are 21 species of birds found in the Cengkrong mangrove forest. According Fandeli (1992), the potential of animal species biodiversty with more than 15 kinds of very good category. Birds have become a source of inspiration for humans for centuries and has a special value in the cultural community.

Cengkrong Mangrove forests has the potential to be developed as a tourist area in the form of education in the development of birdwatching activities ecoedutourism package. Bird diversity is a great potential that should be pursued use was optimal. Such efforts must be done in a planned and directed so as not to damage their utilization patterns and affect its existence. One natural form of utilization is in the form of a bird-based diversity-based tourism or better known as birdwatching. Some species of birds are found, among others, *Leptoptilos javanicus* (bango tong tong), *Actytis hypoleucos* (Sandpipers), *Cuculus saturates* (Himalayan cuckoo) and other (Table 4). The majority of birds are found during the move in search of food and perch.

Bird species that has the highest preference value as a tourist attraction based on the percentage of

frequency relative citation index is *Leptoptilos javanicus* with the local name "bangao tong-tong" with RFC index value is 92.6% which means that 125 of the 135 respondents said that *Leptoptilos javanicus* interesting to used as a tourist attraction mangrove. Next is *Actitis hypoleucos* (91.1%), *Centropus bengalensis* (89.6%) and *Halycon cyanoventris* (88.1%).

Table 4. Species of birds in cengkrong mangrove forest.

No	Name of Species	Local Name	Time			Point		
			morning	aftern	evening	Spot I	Spot II	Spot III
1	*Leptoptilos javanicus*	Bangao tong-tong	√	-	√	√	√	√
2	*Actitis hypoleucos*	Trinil	√	-	√	-	√	√
3	*Centropus bengalensis*	Bubut alang-alang	√	√	-	-	√	√
4	*Halycon cyanoventris*	Cekakak jawa	√	√	-	-	√	√
5	*Cuculus saturatus*	Kangkok ranting	√	√	√	-	√	√
6	*Lanius tigrinus*	Cendet	√	√		-	√	√
7	*Nectarinia jugularis*	madu sriganti	√	-	√	-	√	√
8	*Zosterops everetti*	Perci /kacamata	√	√	-	√	√	√
9	*Cyanoptila cyanomelana*	Sikatan	√	√	-	-	√	√
10	*Prinia flaviventris*	Peranjak jawa	√	√	-	√	√	√
11	*Prinia familiaris*	Perenjak rawa	√	√	-	√	√	√
12	*Aegithina tiphia*	Sirpoh	√	√	√	-	√	√
13	*Pycnonotus melanicterus*	Trucak	√	√	-	√	√	√
14	*Cypsiurus balasiensis*	Layang asia	√	√	√	√	-	-
15	*Orthotomus sepium*	Cinenen jawa	√	√	√	√	√	√
16	*Pycnonotus aurigaster*	Kutilang	√	√	√	√	√	√
17	*Streptopelia chinensis*	Tekukur biasa	√	√	-	√	√	√
18	*Nectharinia calcostetha*	Burung madu bakau	√	√	√	√	√	√
19	*Lonchura punctulata*	Bondol Peking	√	√	-	√	√	√
20	*Lonchura leucogastroides*	Bondol jawa	√	√	-	√	√	√
21	*Passer montanus*	Burung gereja	√	√	-	√	√	√

Note : morning (06.00-09.00), afternoon(10.00-13.00), evening (14.00-17.00)

: meeting point spot1 (beach up to 500 meters), spot 2 (500m to 1000m), spot 3(1000m to 1500m)

Leptoptilus javanicus is a species of bird of familia bangauatau Ciconiidae. Has a height of about 110-120 cm with a weight of 5 kg and a wingspan of 210 cm. her black and white, brown or pale beak. The young bird birds color is duller than older adults. Stork this type of prey fish, frogs, insects and other invertebrates (Salim, 1996).

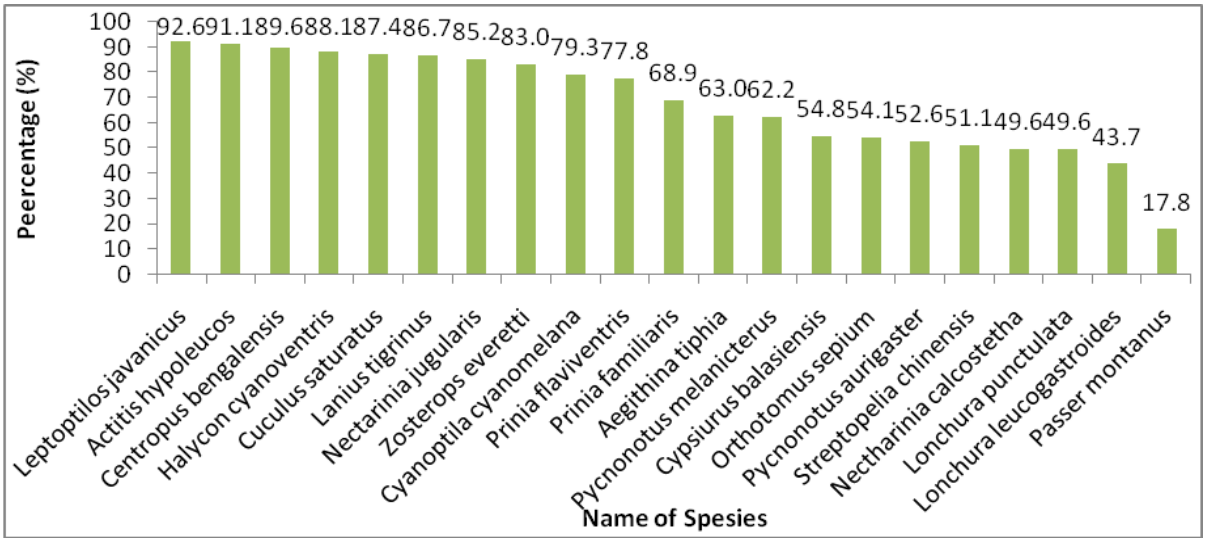

Fig. 2. Percentage (%) Relative Frequency Citation Index of the birds.

Mangrove bird species typical of interest to serve as the next tourist attraction is *Actitis hypoleucos*. This bird species commonly called sandpipers shore birds, belonging to the family of the genus *Actitis scolopacidae*. This bird is a type of crustacean-eating birds, insects invertebrates that normally live on the coast or a river.

While the index value Relative Frequency is the lowest Citation *Passer Montanus* (17.8%) which means that only 24 of the 135 respondents stated that *Passer Montanus* interesting to be a tourist attraction. It was suspected because this species is very often found in other places, so that it becomes less attractive to be a tourist attraction. According to Clements (2013), this species has a body length of 14 cm dan widespread in the euro area and the countries in Southeast Asia. These birds consume grains and small insects. Sebagain species often scavenge food and nesting on buildings and housing. Interest in birds caused by several factors such as body shape, hair color, sound, and because rarely see in person. Birds are very interesting because of its unique and rarely in other ecosystem. So the potential to be developed as a tourist attraction birdwatching, with a direct view of various species of birds, visitors will feel the satisfaction when to travel.

According to Hidayat (2010), bird diversity-based tourism is a tourist activity that uses the object of wild birds as the main attraction. These activities are generally carried out by researchers, nature lovers, students and the community that has particularly attention to the survival of birds. Birdwatching activities could also be developed into a photographic activity of birds or wildlife photography.

Potential tourist attractions such as the presence of birds in the Cengkrong Mangrove Forest important point in the preparation of mangrove ecotourism program that could become a mainstay attraction a tourist area to attract visitors. Data results of this study can be used as a basis to determine the activity and the temporal distribution of bird species. So that birdwatching activities are expected to be more optimal. Bird watching activities are activities that generate income. Some countries such as Kenya, Costa Rica, Nepal and Thailand have made birdwatching as an important part in the development of the tourism sector.

According to Chettri *et al* (2005), mangroves have ecological functions for the life of many species of birds, among others, caterers, nesting, avoiding land predators such as lizards or as a place to lay their eggs. While the encounter species of birds along the main line observations tend to be similar, but some birds are found only in certain places it is suspected because every kind of bird has a life preferences vary according to the location of food sources or other environmental conditions.

The availability of food sources for birds cause differences in the diversity of bird species found in one place. A place that provides a food source for a species of bird, the habitat is more likely to be a favorite place for birds to move. While the optimum temporal distribution of bird activity is recorded at the time of observation morning between the hours of 6 a.m. to 9:00 a.m. According to Dahlan (2009), many bird activity performed in the morning between the hours of 5:00 a.m. to 09:00 and 15:00 to 17:00 o'clock in the afternoon in conjunction with changes in sunlight and turn into a night which is a time for birds to return to the nest. According Balen (1999), the existence of human activity around the bird habitat is always considered as the main cause for the interference of the existence of birds. By knowing temporal distribution patterns of birds in the mangrove forests can be used as a reference in making birdwatching tour so that visitors have a greater opportunity to see the types of birds that live there. Birdwatching is a very popular eco-tourism activities in the world. The tourist activities in addition to being tourist attractions aspects can also provide a sizable economic benefits if managed properly. One of the countries that succeeded in applying birdwatching is

Scotland. Developing countries such as Scotland has relied birdwatching tourism sector as the main buffer and earn 8-12 million dollars (Dalem, 1999).

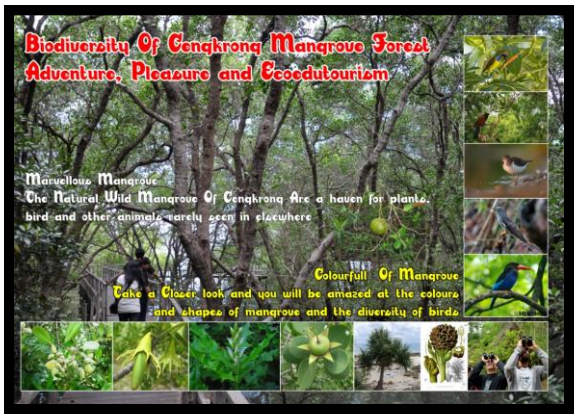

Fig. 3. Leaflet of ecotourism mangrove (interpretation tools model).

To facilitate visitors to the region in understanding the potential of tourism in the area of mangrove ecotourism should be made leaflets as visitor interpretation tools tourist area (Fig. 3), with the help of leaflets is expected to improve understanding of tourists visiting the mangrove areas.

Interpretation is an art in providing an explanation of a natural tourism area to visitors so that they can provide inspiration, inspire the mind to know, realize, educate and if possible attract visitors to participate in conservation (Muntasib, 2005).

Conclusion

Cengkrong mangrove forests has the potential to be used as ecotourism area. Diversity of flora found in the mangrove forest is composed of 22 species with the highest RFC index is *Brugueira gymnoriza*. While the diversity of bird species found to consist of 21 species with the highest RFC index is *Laptoptilus javanicus*.

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