INTERNATIONAL JOURNAL OF CONSERVATION SCIENCE

ISSN: 2067-533X Volume 9, Issue 3, July-September 2018: 463-474 www.ijcs.uaic.ro

POTENTIAL VEGETATION IN SUPPORTING CONSERVATION OF KOMODO DRAGONS IN ONTOLOE ISLAND FLORES INDONESIA

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Abstract

Potential vegetation in a small island ecologically plays an important role towards life sustainability of wild animals in the island. To find out the compositions, structures, and benefits of vegetation in forest ecosystem of small islands, a vegetation analysis was needed. The result of analysis was beneficial, helping to find out the condition of forest community balance, as well as to explain the interactions inside and between species. Vegetation observation was needed in Utilization and Protection block in Ontoloe Island, from littoral to terrestrial until the center of the island. A combination of Judgemental and Systematic Random Sampling was applied to determine the research sites in 2 blocks. In the Utilization block, 3 sites were identified, while in the Protection block, other 4 sites were determined. The distance of each site was 100 meters. In every site, there were 3 replicas at a distance of 50 meters. The vegetation data obtained was analyzed the Importance Value Index (IVI). The result of the research based of IVI obtained showed that Leucaena leucocephala *dominated the tree, pole, and stake levels,* Imperata cylindrica *dominated in seddling level, whereas* Rhizphora mucronata *dominated the littoral area. The domination of invasive species of* Leucaena leucocephala *and* Imperata cylindrica *has threatened and reduced the vegetation diversity in Ontoloe Island. Biological controlling both 2 species could be used by introducing ruminant animals such as timor deer (*Cervus timorensis*), which in turn would conserve the ancient Komodo dragon (*Varanus komodoensis *Ouwens, 1912) in Ontoloe Island, by providing enough feeds of Timor deer for komodo.*

Keywords*: Vegetation analysis; Ontoloe Island; Flores small islands; Komodo; Conservation; Timor deer.*

Introduction

Indonesia is the archipelagic state with the highest biodiversity in the world [1, 2]. The typical biodiversity in forest ecosystem of small islands is formed due to remote and isolated condition so it is rich in endemic species [3, 4]. This biodiversity is a source of germplasm produced especially by variety of the vegetation. The presence of various types of vegetation inside small islands is something that should be maintained [5, 6], because most vegetation in

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small islands is remaining terrestrial ecosystem with high biodiversity [7], and it's lose could affect animal species diversity, such as birds [8].

Potential vegetation in a small island plays an important ecological role towards the life sustainability of wild animal groups living in the island and it gives a positive effect in regards to the environment balance, therefore, analysis of structure and composition of vegetation are very important as the indicators of biodiversity [6].

Researches on potential vegetation in supporting wild animal conservation in forest have been conducted, such as potential vegetation to find out the biodiversity of birds in a pine forest and the result shows that the adaptation of birds depended on leave morphologies and the presence of trees in their habitat [9]. Another example is a research in a dry forest conducted on the smallest island of St. Eustasius Caribbean, based on the level of the abundance of vegetation, which mentioned that there were variations of vegetation types with changes of structure composition in that ecosystem since 1950s to 2015 [10]. The results about potential vegetation, proved that the presence of structures, compositions, and functions of vegetation in a forest ecosystem were very influential in supporting the efforts to conserve wild animals including forests in small islands.

Ontoloe Island is a small island located to the region of Riung 17 Islands Marine Park (MP), administratively located in the Nangamese sub-district Riung Ngada Flores regency, East Nusa Tenggara [11]. Ontoloe Island is a conservation area, which based on the Statemenet Letter of Forestry Minister No 589/Kpts-II/1996, is recognized as a Natural Park formed of 17 Islands, covering 9,900 Ha, for komodo's habitat. As an impact there was specific vegetation in the area that allowed the ecosystem development. In National Park of Komodo, *Alstonia scolaris* and *Tamarindus indica* were the shelter plants for Komodo [12]. Ontoloe Island is a savanna ecosystem and dry tropical forest with calcareous soil structure, which makes it different from other islands in Flores [13]. These conditions will allow the formation of typical types of vegetation and animal that might be different within the National Park of Komodo. Komodo dragons living in Ontoloe Island eat herbivore animals such as wild boars, long-tail monkeys and timor deer [14-16]. The presence of these animals in Ontoloe Island needs to be conserved in term of providing food for Komodo dragon. The existance of those herbivore's animal depend on the availability of plants.

This research aims to review the ecological structures, compositions, and functions of vegetation in forest ecosystem of Ontoloe Island, in supporting the efforts to conserve ancient Komodo dragons. The result of this research is expected as a baseline for the government of Ngada and East Nusa Tenggara Natural Resources Conservation Agency, that can be the basis of forest ecosystem management in Ontoloe Island particularly in regards to the conservation of the ancient Komodo dragon.

Method and Material

The Location of Research

The research was conducted in Ontoloe Island in Riung 17 Islands Marine Park in December 2016. From an administrative point of view, the marine park is part of the Nangamese sub-district Riung Ngada Regency. Astronomically, it is located at 08°- 09° S and 121°45'- 121°50'E [17]. There were 7 research sites, 3 sites for Utilization block (U1, U2, U3), and 4 sites for Protection block (P1, P2, P3 and P4, Fig. 1).

Research Design

Combination of Judgemental and Systematic Random Sampling was applied to determine the research sites in 2 blocks. In Utilization block there were 3 sites and Protection block had 4 sites. *The distance of each site was 100 meters.* In every site, there was 3 replicas situated at a distance of 50 meters. The determination of research sites in utilization and

protection block in Ontoloe Island was done by observing the groups of tree and their regenerations and lower plants presence, which offered ecologically potential for wild life.

Samples were collected from the littoral to the terrestrial area, until the center of the island. The plot size was 1m x 1m for (seedling and lower plant), 5m x 5m for (stake),10m x 10m for (pole), and 20m x 20m for (tree), with the collected data in the form of types, the number of individuals, the diameter of stem for tree and pole [18]. The criteria of mature tree with minimum 20cm diameter of its stem, pole was a younger tree which had diameter 10-19 cm, for stake was the regeneration which had a height higher than 1.5m, while for seedling was the regeneration with a height lower than 1.5m [19, 20].

Plant identification refers to the identification books of Heyne (1987) and Steenis (2003) and supported by the website plant list [21]. For unknown species, identification is done through a collection of herbarium samples [22, 23].

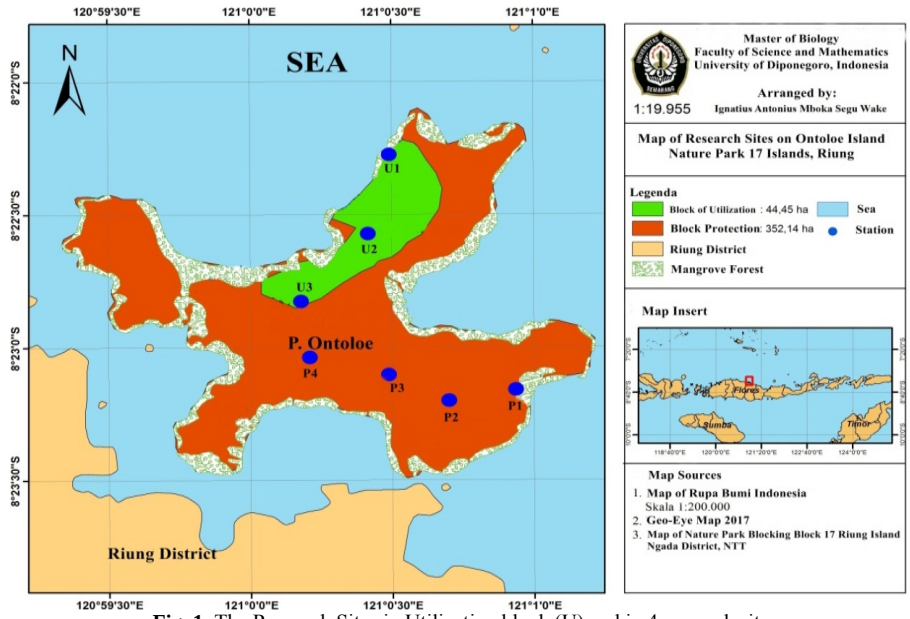

Fig. 1. The Research Sites in Utilization block (U) and in 4 research sites in Protection block (P) in Ontoloe Island, Flores

Analysis of Vegetation

The observation data of vegetation obtained from field was analyzed to determine the percentage and domination, and then the Importance Value Index (IVI) using the following formulas [24]:

Density

$$= \frac{\text{The number of individuals of a kind}}{\text{Area of measuring plot}}$$

Relative Density (Rden)

$$= \frac{\text{Density of a kind}}{\text{Density of all kinds}} \times 100\%$$

Frequency

$$= \frac{\text{The number of sub} - \text{plot found in a kind}}{\text{The number of all sub} - \text{plots}}$$

Relative Frequency (RF)

$$= \frac{\text{Frequency of a kind}}{\text{Frequency of all kinds}} \times 100\%$$

Domination

$$= \frac{\text{Area of basic field of a kind}}{\text{Areal of Sample}}$$

Relative Domination (Rdom)

$$= \frac{\text{Domination of a kind}}{\text{Domination of all kinds}} \times 100\%$$

Importance Value Index

$$= RDen + RF + RDom$$

Results

Based on vegetation observation in Ontoloe Island, 72 species of plants spread in the utilization and protection blocks were identified, together with some other plants recognized IUCN [25] and categorized as *Least Concern* (LC). The composition of the vegetation species in the utilization block varied enough in regards to tree, pole, stake, and seedling. Generally, vegetative composition in the protection block was higher than in the utilization block because of the main function in utilization block as the life supporting systems in Ontoloe Island also to support the conservation interest in utilization block.

Fourteen species of tree phase in utilization block were found while in protection block 17 species of the vegetation were found. The vegetation in tree phase in each utilization and protection blocks were 11 species of plants categorized by IUCN. In tree phase on utilization block, the higher Important Value Index (IVI) was *Rhizophora mucronata* Lam. 56.81% (U1), *Tamarindus indica* L. 127.29% (U2) and *Leucaena leucocephala* 219.05% (U3), while on protection block, the higher IVI was *R. mucronata* 55.45% (P1), and *L. leucocephala* highest in (P2, P3, P4), with IVI each of them 155.07%, 184.46% and 194.60%, respectively (Table 1).

Table 1. The species of vegetation in tree phase in utilization block and protection block in Ontoloe Island based on Important Value Index (IVI)

No	Family	Scientific Name	Importance Value Index (IVI) (%)						
			Utilization Block			Protection Block			
			U1	U2	U3	P1	P2	P3	P4
1	Avicenniaceae	*Avicennia alba* Blume.*	35.57	0.00	0.00	24.17	0.00	0.00	0.00
2	Combretaceae	*Terminalia catappa* L.	27.52	0.00	0.00	0.00	0.00	0.00	0.00
3	Combretaceae	*Lumnitzera racemosa* Wild.*	25.82	0.00	0.00	14.83	0.00	0.00	0.00
4	Euphorbiaceae	*Excoecaria agallocha*	0.00	0.00	0.00	14.24	0.00	0.00	0.00
5	Fabaceae	*Tamarindus indica* L.	0.00	127.29	0.00	0.00	70.80	71.58	0.00
6	Fabaceae	*Senna siamea* (Lam) H.S.Irwin & Barneby.	0.00	84.35	0.00	0.00	0.00	0.00	0.00
7	Fabaceae	*Pterocarpus indicus* Wild.	0.00	0.00	0.00	0.00	43.66	43.96	0.00
8	Fabaceae	*Leucaena leucocephala* L.	0.00	88.36	219.05	18.14	155.07	184.46	194.60
9	Sterculiaceae	*Heritiera littoralis* Aiton*	30.12	0.00	0.00	14.24	0.00	0.00	0.00
10	Malvaceae	*Thespesia populnea* (L.) Sol. Ex Corrêa.	27.03	0.00	0.00	0.00	0.00	0.00	0.00
11	Rhizophoraceae	*Rhizophora apiculata* Blume.*	31.55	0.00	0.00	37.69	0.00	0.00	0.00
12	Rhizophoraceae	*Rhizophora stylosa* Griff.*	23.52	0.00	0.00	12.11	0.00	0.00	0.00
13	Rhizophoraceae	*Bruguiera gymnorhiza* (L.) Lam.*	0.00	0.00	0.00	30.85	0.00	0.00	0.00
14	Rhizophoraceae	*Bruguiera parviflora* (Roxb.) Wight & Arn. ex Griff.*	0.00	0.00	0.00	15.85	0.00	0.00	0.00
15	Rhizophoraceae	*Ceriop staga* (Perr) C.B.Rob.*	0.00	0.00	0.00	16.84	0.00	0.00	0.00
16	Rhizophoraceae	*Rhizophora mucronata* Lam.*	56.81	0.00	0.00	55.45	0.00	0.00	0.00
17	Rubiaceae	*Neonauclea calycina* (Bartl. ex DC) Merr.	0.00	0.00	0.00	0.00	30.47	0.00	0.00
18	Sapindaceae	*Schleichera oleosa* (Lour.) Oken.	0.00	0.00	80.95	0.00	0.00	0.00	64.15
19	Sonneratiaceae	*Sonneratia alba* Sm.*	23.54	0.00	0.00	37.60	0.00	0.00	0.00
20	Sonneratiaceae	*Sonneratia casoelaris* L.*	18.51	0.00	0.00	22.22	0.00	0.00	0.00
21	Verbenaceae	*Gmelina arborea* Roxb.	0.00	0.00	0.00	0.00	0.00	0.00	41.25

*Note: *) Status of Conservation Least Concern (LC) (IUCN, 2018)*

In pole phase in utilization block was found 14 species (9 species categorized by IUCN) while in protection block was found 19 species (12 species categorized by IUCN). In pole phase in utilization block, the higher IVI was *R. mucronata* 89.49% (U1), *L. leucocephala* highest in (U2 and U3) with IVI each of them 129.06% and 227.02%, while in protection block, the higher IVI was *R. mucronata* 38.21% (P1), *L. leucocephala* highest in (P2, P3, P4) with IVI each of them were 121.62%, 195.22% and 215.56%, respectively (Table 2)

Table 2. The species of vegetation in pole phase in utilization block and protection block in Ontoloe Island

No	Famili	Scientific Name	Importance Value Index (IVI) (%)						
			Utilization Block			Protection Block			
			U1	U2	U3	P1	P2	P3	P4
1	Avicenniaceae	*Avicennia alba* Blume. *	43.49	0.00	0.00	26.24	0.00	0.00	0.00
2	Combretaceae	*Lumnitzera racemosa* Wild. *	26.86	0.00	0.00	25.84	0.00	0.00	0.00
3	Euphorbiaceae	*Excoecaria agallocha* L.` *	0.00	0.00	0.00	18.64	0.00	0.00	0.00
4	Fabaceae	*Tamarindus indica* L.	0.00	135.57	0.00	0.00	61.76	0.00	0.00
5	Fabaceae	*Senna siamea* (Lam) H.S.Irwin & Barneby.	0.00	35.36	0.00	0.00	0.00	0.00	0.00
6	Fabaceae	*Leucaena leucocephala* L.	0.00	129.06	227.02	0.00	121.62	195.22	215.56
7	Sterculiaceae	*Heritiera littoralis* Aiton. *	23.51	0.00	0.00	19.37	0.00	0.00	0.00
8	Meliaceae	*Xylocarpus granatum* J. Koenig. *	7.76	0.00	0.00	0.00	0.00	0.00	0.00
9	Myrsinaceae	*Aegiceras corniculatum* (L.) Blanco.	0.00	0.00	0.00	15.17	0.00	0.00	0.00
10	Pandanaceae	*Pandamus tectorius* Parkinson ex Du Roi.	7.23	0.00	0.00	6.50	0.00	0.00	0.00
11	Rhizophoraceae	*Rhizophora apiculata* Blume. *	18.93	0.00	0.00	32.28	0.00	0.00	0.00
12	Rhizophoraceae	*Rhizophora stylosa* Griff. *	24.44	0.00	0.00	14.56	0.00	0.00	0.00
13	Rhizophoraceae	*Bruguiera gymnorhiza* (L.) Lam. *	0.00	0.00	0.00	17.14	0.00	0.00	0.00
14	Rhizophoraceae	*Bruguiera parviflora* (Roxb.) Wight & Arn. ex Griff. *	0.00	0.00	0.00	20.76	0.00	0.00	0.00
15	Rhizophoraceae	*Ceriop staga* (Perr) C.B.Rob. *	0.00	0.00	0.00	20.36	0.00	0.00	0.00
16	Rhizophoraceae	*Rhizophora mucronata* Lam. *	89.49	0.00	0.00	38.21	0.00	0.00	0.00
17	Rubiaceae	*Neonauclea calycina* (Bartl. ex DC) Merr.	0.00	0.00	0.00	0.00	37.48	0.00	0.00
18	Sapindaceae	*Schleichera oleosa* (Lour.) Oken.	0.00	0.00	72.98	0.00	79.14	0.00	84.44
19	Sonneratiaceae	*Sonneratia alba* Sm. *	31.42	0.00	0.00	21.46	0.00	0.00	0.00
20	Sonneratiaceae	*Sonneratia casoelaris* L. *	26.87	0.00	0.00	23.47	0.00	0.00	0.00
21	Verbenaceae	*Gmelina arborea* Roxb.	0.00	0.00	0.00	0.00	0.00	104.78	0.00

Note:) Status of Conservation Least Concern (LC) (IUCN, 2018*)

In stake phase in utilization block was found 30 species (10 species categorized by IUCN) while in protection block was found 34 species (13 species categorized by IUCN). In stake phase in utilization block, the higher IVI was *Clerodendrum inerme* 47.15% (U1), *Lantana camara* 23.15% (U2), and *L. leucocephala* 27.20% (U3), while in protection block, the higher IVI was *C. inerme* 17.43% (P1), *L. camara* 35.28% (P2), *L. leucocephala* highest in (P3& P4) with IVI each of them was 88.89% and 116.93% (Table 3.).

In seedling phase in utilization block was found, 36 species (10 species categorized by IUCN) while in protection block found was 44 species (15 species categorized by IUCN). In seedling phase in utilization block, the higher IVI was *R. mucronata* 24.99% (U1), *Imperata cylindrica* (highest in (U2 & U3) with IVI each of them 28.45% and 44.87%, while in protection block, the higher IVI was *R.mucronata* 17.96% (P1), and *I.cylindrica* highest in (P2, P3, P4) with IVI each of them 29.55%, 33.62% and 71.30%, respectively (Table 4).

Table 3. The species of vegetation in stake phase in utilization block and protection block in Ontoloe Island

No	Famili	Scientific Name	Importance Value Index (IVI) (%)						
			Utilization Block			Protection Block			
			U1	U2	U3	P1	P2	P3	P4
1	Annonaceae	*Annona squamosa* L.	0.00	12.13	9.56	0.00	9.26	26.39	37.83
2	Asclepidiaceae	*Calotropis gigantea* L.	0.00	21.45	0.00	0.00	16.48	0.00	0.00
3	Asteraceae	*Acmella uliginosa* (Sw.) Cass.*	0.00	15.52	14.13	0.00	17.59	0.00	0.00
4	Asteraceae	*Ageratum conyzoides* L.	20.76	0.00	15.44	12.27	20.28	0.00	0.00
5	Asteraceae	*Praxelis clematidea* (Griseb. R.M.King & H.Rob.	0.00	0.00	19.36	0.00	17.59	0.00	0.00
6	Asteraceae	*Bidens pilosa* L.	0.00	14.67	10.86	0.00	6.58	0.00	0.00
7	Asteraceae	*Ayapana triplinervis* (Vahl R.M.King & H.Rob.	0.00	0.00	0.00	5.55	0.00	0.00	0.00
8	Asteraceae	*Chromolaena odorata* L.	0.00	18.06	15.44	0.00	10.46	0.00	0.00
9	Avicenniaceae	*Avicennia alba* Blume.*	20.07	0.00	0.00	8.30	0.00	0.00	0.00
10	Combretaceae	*Lumnitzera racemosa* Wild.*	15.21	0.00	0.00	8.70	0.00	0.00	0.00
11	Euphorbiaceae	*Jatropha curcas* L.	0.00	7.34	5.76	6.21	9.82	0.00	0.00
12	Euphorbiaceae	*Excoecaria agallocha* L.*	0.00	0.00	0.00	7.51	0.00	0.00	0.00
13	Euphorbiaceae	*Acalypha australis* L.	0.00	0.00	0.00	0.00	7.13	0.00	0.00
14	Fabaceae	*Tamarindus indica* L.	0.00	10.44	0.00	0.00	0.00	0.00	0.00
15	Fabaceae	*Gliricidia sepium* (Jacq.) Walp.	0.00	12.13	16.09	8.71	14.26	0.00	0.00
16	Fabaceae	*Senna siamea* (Lam.) H.S.Irwin & Barneby.	0.00	2.16	3.23	0.00	0.00	0.00	0.00
17	Fabaceae	*Derris trifoliata* Lour.	0.00	0.00	0.00	1.45	0.00	0.00	0.00
18	Fabaceae	*Leucaena leucocephala* L.	0.00	15.52	27.20	0.00	0.00	88.89	116.93
19	Fabaceae	*Bauhinia* L.	0.00	0.00	6.41	0.00	2.38	0.00	0.00
20	Fabaceae	*Derris elliptica* (Wall.) Benth.	0.00	0.00	0.00	3.96	0.00	0.00	0.00
21	Lamiaceae	*Vitex trivolia* L.	11.04	0.00	10.21	3.16	5.46	0.00	0.00
22	Lamiaceae	*Hyptis capitata* Jacq.	2.88	0.00	0.00	0.00	0.00	0.00	0.00
23	Lamiaceae	*Clerodendrum inerme* (L.) Gaertn.	47.15	0.00	0.00	17.43	0.00	0.00	0.00
24	Sterculiaceae	*Heritiera littoralis* Aiton.*	16.59	0.00	0.00	7.51	0.00	0.00	0.00
25	Malvaceae	*Urena lobata* L.	0.00	8.18	0.00	0.00	0.00	0.00	0.00
26	Malvaceae	*Abutilon indicum* (L.) Sweet.	0.00	0.00	6.41	0.00	0.00	0.00	0.00
27	Moringaceae	*Moringa oleifera* Lam.	0.00	16.37	0.00	0.00	9.35	0.00	0.00
28	Phyllanthaceae	*Phyllanthus urinaria* L.	0.00	0.00	0.00	0.00	8.24	0.00	0.00
29	Rhamnaceae	*Ziziphus mauritiana* Lam.	0.00	14.12	13.60	14.25	9.82	0.00	0.00
30	Rhizophoraceae	*Rhizophora apiculata* Blume.*	9.65	0.00	0.00	9.49	0.00	0.00	0.00
31	Rhizophoraceae	*Rhizophora stylosa* Griff.*	10.34	0.00	0.00	10.29	0.00	0.00	0.00
32	Rhizophoraceae	*Bruguiera gymnorhiza* (L.) Lam.*	0.00	0.00	0.00	12.27	0.00	0.00	0.00
33	Rhizophoraceae	*Bruguiera parviflora* (Roxb. Wight & Arn. ex Griff.*	0.00	0.00	0.00	11.08	0.00	0.00	0.00
34	Rhizophoraceae	*Ceriop tagal* (Perr) C.B.Rob.*	0.00	0.00	0.00	12.27	0.00	0.00	0.00
35	Rhizophoraceae	*Rhizophora mucronata* Lam.*	0.00	0.00	0.00	15.84	0.00	0.00	0.00
36	Rubiaceae	*Scyphiphora hydrophylacea* C.F Gaertn.*	18.68	0.00	0.00	0.00	0.00	0.00	0.00
37	Sapindaceae	*Schleichera oleosa* (Lour.) Oken.	0.00	8.74	8.90	0.00	0.00	0.00	27.25
38	Sonneratiaceae	*Sonneratia alba* Sm.*	15.90	0.00	0.00	10.68	0.00	0.00	0.00
39	Sonneratiaceae	*Sonneratia casoelaris* L.*	11.73	0.00	0.00	13.06	0.00	0.00	0.00
40	Verbenaceae	*Gmelina arborea* Roxb.	0.00	0.00	0.00	0.00	0.00	16.67	17.99
41	Verbenaceae	*Lantana camara* L.	0.00	23.15	17.40	0.00	35.28	68.06	0.00

Note:) Status of Conservation Least Concern (LC) (IUCN,2018*)

Table 4. The species of vegetation in seedling phase in utilization block and protection block in Ontoloe Island

No	Famili	Scientific Name	Importance Value Index (IVI) (%)						
			Utilization Block			Protection Block			
			U1	U2	U3	P1	P2	P3	P4
1	Acanthaceae	*Acanthus ilicifolius* L. *	0.00	0.00	0.00	10.16	0.00	0.00	0.00
2	Acanthaceae	*Asystasia intrusa* (Forssk.) Blume.	0.00	0.00	0.00	0.00	0.00	7.70	0.00
3	Amaranthaceae	*Amaranthus blitum* L.	0.00	13.06	0.00	13.06	0.00	0.00	0.00
4	Annonaceae	*Annona squamosa* L.	0.00	7.42	0.00	0.00	7.54	0.00	0.00
5	Asclepidiaceae	*Finlaysonia maritima* (Blume) Backer ex K.Heyne.	0.00	0.00	0.00	2.42	0.00	0.00	0.00
6	Asteraceae	*Acmella uliginosa* (Sw.) Cass. *	0.00	0.00	0.00	0.00	0.00	16.78	0.00
7	Asteraceae	*Ageratum conyzoides* L.	0.00	12.04	18.97	0.00	16.04	0.00	0.00
8	Asteraceae	*Vernonia cinerea* L.	0.00	9.10	0.00	0.00	0.00	13.97	0.00
9	Asteraceae	*Bidens pilosa* L.	0.00	0.00	0.00	5.62	5.35	0.00	0.00
10	Asteraceae	*Pluchea indica* L.	0.00	0.00	0.00	5.62	0.00	0.00	0.00
11	Asteraceae	*Melanthera biflora* (L.) Wild.	0.00	10.50	19.69	11.98	16.49	0.00	0.00

12	Asteraceae	*Ayapana triplinervis* (Vahl) R.M.King & H.Rob.	0.00	0.00	0.00	0.00	7.15	0.00	0.00
13	Avicenniaceae	*Avicennia alba* Blume. *	19.72	0.00	0.00	16.87	0.00	0.00	0.00
14	Combretaceae	*Lumnitzera racemosa* Wild. *	16.71	0.00	0.00	17.41	0.00	0.00	0.00
15	Cucurbitaceae	*Lagenaria siceraria* (Molina) Standl.	0.00	6.53	11.29	0.00	6.25	0.00	0.00
16	Cyperaceae	*Cyperus rotundus* L.	0.00	11.01	21.13	0.00	18.74	0.00	44.14
17	Dioscoreaceae	*Dioscorea hispida* (Dennst).	0.00	8.96	0.00	0.00	0.00	1.86	0.00
18	Euphorbiaceae	*Jatropha curcas* L.	4.60	0.00	7.69	0.00	6.64	0.00	0.00
19	Euphorbiaceae	*Excoecaria agallocha* L. *	0.00	0.00	0.00	9.26	0.00	0.00	0.00
20	Euphorbiaceae	*Acalypha australis* L.	0.00	0.00	0.00	11.98	11.98	0.00	0.00
21	Fabaceae	*Tamarindus indica* L.	0.00	8.45	0.00	0.00	8.89	0.00	0.00
22	Fabaceae	*Erythrina variegata* f. *alba* Mahesw. *	4.60	0.00	0.00	0.00	0.00	0.00	0.00
23	Fabaceae	*Gliricidia sepium* (Jacq.) Walp.	10.70	7.42	0.00	0.00	0.00	0.00	0.00
24	Fabaceae	*Derris trifoliata* Lour.	8.36	0.00	9.13	5.62	0.00	0.00	0.00
25	Fabaceae	*Leucaena leucocephala* L.	0.00	8.96	0.00	0.00	0.00	18.18	0.00
26	Fabaceae	*Bauhinia* L.	6.85	0.00	0.00	0.00	1.93	0.00	0.00
27	Fabaceae	*Abrus precatorius* L.	0.00	0.00	0.00	2.42	0.00	0.00	0.00
28	Fabaceae	*Mimosa pudica* L. *	0.00	0.00	0.00	0.00	0.00	18.18	0.00
29	Fabaceae	*Derris elliptica* (Wall.) Benth.	0.00	0.00	0.00	3.99	0.00	0.00	0.00
30	Lamiaceae	*Vitex trivolia* L.	0.00	8.96	0.00	0.00	0.00	0.00	0.00
31	Lamiaceae	*Ocimum campechianum* Mill.	0.00	4.99	0.00	0.00	0.00	0.00	0.00
32	Lamiaceae	*Clerodendrum inerme* (L.) Gaertn.	0.00	0.00	0.00	8.88	0.00	0.00	0.00
33	Lytharacea	*Pemphis acidula* J.R. Forst & G. Forst. *	7.61	0.00	0.00	1.87	0.00	0.00	0.00
34	Malvaceae	*Sida rhombifolia* L.	0.00	3.97	0.00	0.00	0.00	0.00	0.00
35	Sterculiaceae	*Heritiera littoralis* Aiton. *	23.48	0.00	0.00	9.26	0.00	0.00	0.00
36	Malvaceae	*Urena lobata* L.	0.00	5.51	0.00	0.00	0.00	0.00	0.00
37	Malvaceae	*Abutilon indicum* (L.) Sweet.	6.85	6.53	0.00	1.33	0.00	0.00	0.00
38	Meliaceae	*Xylocarpus muluccensis* (Lam.) M.Roem. *	0.00	0.00	0.00	7.25	0.00	0.00	0.00
39	Myrsinaceae	*Aegiceras corniculatum* (L.) Blanco.	5.35	0.00	0.00	0.00	0.00	0.00	0.00
40	Poaceae	*Spinifex littoreus* (Burm.f.) Merr.	0.00	0.00	0.00	0.00	0.00	0.00	32.41
41	Poaceae	*Imperata cylindrica* (L.) Raeusch.	0.00	28.45	44.87	0.00	29.55	33.62	71.30
42	Poaceae	*Panicum muticum* Forssk.	0.00	0.00	0.00	0.00	0.00	23.80	0.00
43	Poaceae	*Panicum repens* L. *	0.00	0.00	0.00	0.00	0.00	22.39	0.00
44	Poaceae	*Crytococcum patens* L.	0.00	0.00	38.40	0.00	25.49	0.00	0.00
45	Poaceae	*Cynodon dactylon* L.	0.00	16.14	20.41	0.00	27.30	24.50	52.16
46	Poaceae	*Digitaria didactyla* Wild.	0.00	15.11	0.00	0.00	0.00	17.13	0.00
47	Rhamnaceae	*Ziziphus mauritiana* Lam.	5.35	0.00	8.41	11.98	10.69	0.00	0.00
48	Rhizophoraceae	*Rhizophora apiculata* Blume. *	11.45	0.00	0.00	9.80	0.00	0.00	0.00
49	Rhizophoraceae	*Rhizophora stylosa* Griff. *	12.20	0.00	0.00	15.24	0.00	0.00	0.00
50	Rhizophoraceae	*Rhizophora mucronata* Lam. *	24.99	0.00	0.00	17.96	0.00	0.00	0.00
51	Sapindaceae	*Schleichera oleosa* (Lour.) Oken.	0.00	6.91	0.00	0.00	0.00	0.00	0.00
52	Sonneratiaceae	*Sonneratia alba* Sm. *	15.21	0.00	0.00	0.00	0.00	0.00	0.00
53	Sonneratiaceae	*Sonneratia casoelaris* L. *	15.96	0.00	0.00	0.00	0.00	0.00	0.00
54	Verbenaceae	*Gmelina arborea* Roxb.	0.00	0.00	0.00	0.00	0.00	1.86	0.00

Note:) Status of Conservation Least Concern (LC) (IUCN,2018)*

Discussion

The species and the role of vegetation in terrestrial area

Terrestrial area of Ontoloe Island in utilization and protection blocks were the mullet for some wild animals as the food source, rest, security and breeding places, and specifically for Komodo dragons as the place for sunbathe [26]. The existence of the wild animals in terrestrial area also supported by the woof such as green grass or weed.

This study found that the species of vegetation dominated by *L. leucocephala* both in utilization and protection blocks. This plant has already invaded almost all the Ontoloe Island in terrestrial area. *L. leucocephala* were introduced to Riung and Ontoloe Island in 1990s, used to conserve the land, erosion control, the leaves used as a woof and the twig as firewood. The

existence of these plants became the threat for the various vegetation in Ontoloe Island. *L. leucocephala* categorized as weeds which threat the various vegetation because it is apply for dry soil condition [27-29]. This condition is suitable with the climate in Riung include Ontoloe Island (3-4 months rainy season and 8-9 months dry season with low precipitation, average between 1.000-3.000mm/years) [17].

Allelopathy contents in *L. leucocephala* have limit and prevent the power of natural regeneration of some species of tree and the bushes in terms of germination and growth [27-29]. This indicates by the existence of other species of plants such as *Terminalia catappa*, *Thespesia populnea*, *Tamarindus indica*, in Ontoloe Island become in threaten. Moreover, small tree like *Annona squamosa* L. and seedling which is grow in terrestrial area Ontoloe Island is *Panicum muticum, P.repens, Dioscorea hispida,* and *Lagenaria siceraria* which can be used as a woof for wild animal like wild boar (*Sus sucrofa/ Wild Boar*) and long tails monkey (*Macaca fascicularis* Raffles, 1821) had been threatened their regeneration because of the domination of *L. leucocephala*. This plant did not categorize as rare and protected plant but the existence of this plants categorized as the original vegetation group and ecologically have the important role in Ontoloe Island.

Besides the domination of *L. leucocephala,* there were also found seedling in terrestrial area that influenced the diminution of vegetation species in Ontoloe Island such as *I. cylindrica*. *I. cylindrica* similar to *L. leucocephala* they were weeds with allelopathic that can impede the growth of other plants [30, 31] and damage the conservation of biological variety in forest ecosystem [32]. There are many plants that incapable to well grow when close to this plant [33]. The existence of this plants in Ontoloe Island also threaten other plants and so need efforts over its population.

Ecologically, the role of *L. leucocephala* as the woof for ruminant animals [27-30, 34], include the green grass *I.cylindrica.* This type of plants cannot be used as a woof because of the unsupported existence of ruminant animals in Ontoloe Island. Ruminant animals like Timor deer (*Cervus timoresensis* de Plainville, 1822) since 1992 were not found in this area because of the wild hunt of local community and the society around Riung. This is the other factors of increasing population of *L. leucocephala* and *I. cylindrica* in Ontoloe Island.

The conserve komodo in Ontoloe Island, passively, could be done by introduction of ruminant animals like Timor deer to control the growth of *L. leucocephala* and *I. cylindrica* so that, regeneration power of other plants that has the important role can grow better, which in turn, improve the role of the Timor deer as the woof for komodo dragons in Ontoloe Island. Fig. 2 shows the plants *L. leucocephala* (dimination in tree, pole, and stake level) and *I. cylindrica* (domination in seedling level) in utilization block and protection block in Ontoloe Island on terestrial area.

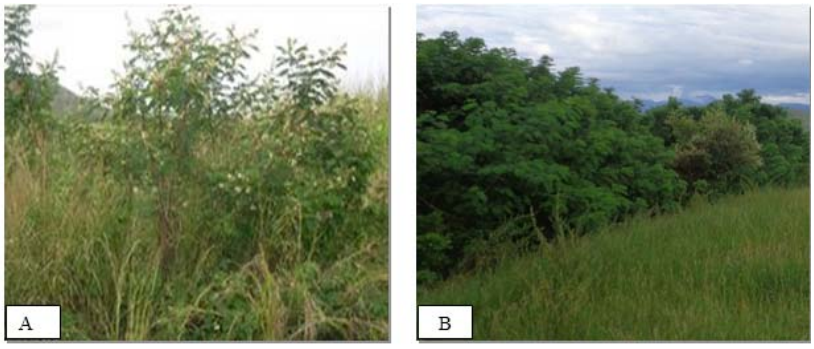

Fig. 2. *Leucaena leucocephala* and *Imperata cylindrica* plants:
A. in the Utilization Block; B. in the Protection Block

The species and the role of vegetation in Littoral area

Littoral area in Ontoloe Island, both in utilization, and protection blocks used by some wild animals as a food source. The existence of this wild animals also supported with the food availability on mangroves ecosystem. The interesting thing is there are a bath population in mangroves tree that can be provided a food source for komodo and also the fish carcass can be the woof for komodo.

In littoral area Ontoloe Island, almost all the area are mangroves. Based on the observation, *R. mucronata* is dominant in this area. *R.mucronata* include in Rhizophoraceae family were almost found both in two blocks in Ontoloe Island on littoral area besides *Avicennia alba* and *Clerodendrum inerme.* Substrates, in this location dominated by sandy mud, which obviously supported the growth of Rhizophoraceae family [35].

Mangrove ecosystem was one of the most productive ecosystem and very adaptive in coast area [36, 37]. Almost all of mangroves species list in *The IUCN Red List of Threatened Species* as *Least Concern* due to its number and did not reach the extinction. The management of mangrove ecosystem contributes to the environmental conservation continuously [38] including in Ontoloe Island.

Some species of mangrove such as *Bruguiera gymnorhiza, B. parviflora, Ceriop staga, Scyphiphora hydrophylacea,* and *Xylocarpus granatum* were threatened their regenerations due to seedling level which could not be found in this group of mangroves. Rehabilitation of mangrove ecosystem is needed by planting the species of mangrove that have no seedling level in order to be remain preserved in Ontoloe Island and ecologically this type of mangrove can be used by wild animal's due to its seeds, fruits, and leaves to be eaten and as shelters from enemies. Figure 3 below shows the ecosystem of mangrove in littoral area of Ontoloe Island.

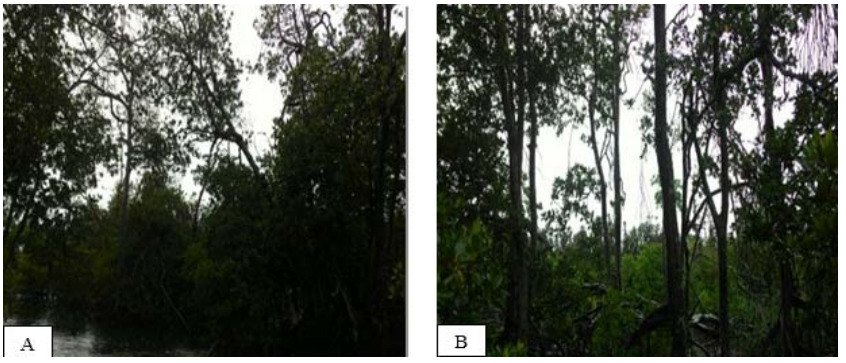

Fig. 3. Mangrove Forest Ecosystem in Utilization Block (A) and Mangrove Forest Ecosystem in Protection Block (B)

Ecosystem of mangrove covered almost all littoral areas in Ontoloe island ecologically support the life of sea organisms or wild animals which made mangrove forest as their habitat [39, 40]. Ecologically, mangrove protected the rising of sea and beach erosion, maintained the quality of water, breeding grounds, protection and maintenance of aquatic biomes, birds, and mammals, moreover, habitat of mangrove contributed to complex food and transfer of energy [41-43]. Mangrove forest supported conservation of biodiversity in Ontoloe Island especially the conservation of komodo dragons. Figure 4 shows the life of komodo dragons in Ontoloe Island.

Fig. 4. Animal Komodo dragons living on Ontoloe Island; (A) Young Komodo dragon (B) Adult Komodo dragon Source: KSDA Resort Riung, 2016

Conclusion

Structure and composition of vegetation in protection block were higher than utilization block. However, both of these blocks dominated by *Leucaena leucocephala* and *Imperata cylindrica.* The presence of these vegetation will reduce biodiversity level in Ontoloe Island. Ecologically, both of these plants have the important role as the woof for ruminant deer, but the existence of the ruminant deer in Ontoloe Island very rare. Controlling the population growth, of these plants can be done by introducing Timor deer as the control agent, and also the Timor deer plays an important role as feeds for Komodo dragons. Food chain interaction is important to be controlled in order to reach the goal of conservation of komodo dragons in Ontoloe island. Structure and composition of vegetation in utilization and protection blocks in littoral area were dominated by mangrove, *Rhizophora mucronata* which had important roles for conservation in Ontoloe Island and conservation of wild animals such as ancient Komodo dragons and other wild animals.

Acknowledgments

Sincere gratitude to the Government of Ngada Regency that gave support of scholarship for Master Degree No.474/KEP/BK-DIKLAT/2015. Thanks also for research permit from East Nusa Tenggara Natural Resources Conservation Agency, Department of Natural Resources Conservation Region II in Ruteng and Natural Resources Conservation section in Riung Resort for supporting research in Ontoloe Island. Special thanks to (Hasan Gadi Djou, David Daing, Kosmas Bheda, Eman, Saver, Rizal, Lopez, Iron and Sipri Meo) that help in the field works.

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Received: September 01, 2017
Accepted: July 10, 2018