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Botanical Survey in Moyo Island, West Nusa Tenggara, Indonesia: Inventory of Flora Collection at Forest

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ABSTRACT

Nusa Tenggara consists of some small islands, one of them is Moyo Island. The diversity of plant species in this island is not really known for certain. This research was determined to observe the diversity of plant species in Moyo Island forest. The research was conducted in April 2013 by using floristic analysis method. The characteristic of Moyo Island forest is lowland evergreen rain forest. The results showed there were 60 tree species recorded in Moyo Island forest. There were many fruiting trees and seedling from the trees which show healthy growth, indicated that the plant regeneration in this forest is went well. The diversity of Pteridophytes and orchids were not high. Epiphytic fern which often found in the forest were *Drynaria quersifolia* and *Platycerium bifurcatum* and terrestrial orchid that dominated in the forest was *Nervilia aragoana*. Tuber plant was often found in this forest and grew prolifically were *Tacca*, *Dioscorea* and *Amorphophallus*. In coastal area lived a population of *Pandanus tectorius*. There were three new record plants found. The first was epiphytic orchid: *Pteroceras javanica*, the second was the epiphytic plant: *Hoya verticillata* and wild tuber plant: *Tacca leontopetaloides*.

Keywords: *Diversity, flora, Moyo Island, small island, West Nusa Tenggara*

INTRODUCTION

Nusa Tenggara is a unique biogeographic region. This region is located in the Wallacea region between the line of Wallace and Weber. It separates two biogeographic regions, Asia and Australia. This condition caused the climate, flora, and fauna diverse [1]. There are 25 hotspots of biodiversity in the face of the earth [2]. Cluster Sundaland and Wallacea in Indonesia being two of them. Two clusters are same as forests stretch from Sabang to Merauke. Hot points of the world's biodiversity in total not only cover 12 percent of Earth but it is home to 44 percent of plants and 35 percent of land vertebrates [2]. Unfortunately, in addition to being a major habitat biodiversity of the world, these areas are also at the forefront of environmental damage.

One of the small islands in Nusa Tenggara is Moyo Island. Moyo Island is located between 809'36 "- 8023'19" S and 117027'45 "- 117035'42" E. Based on Agriculture Decree at October 23rd, 1972, No. 501/Kpts/Um/197, Moyo Island designated as a conservation area in 1973 and carried out regional boundaries with an area of 18.765 hectares of forest [3]. Moyo Island region is administratively located in Sumbawa Besar Province, Labuan Badas district, West Nusa Tenggara. The geography characteristic of Moyo Island is lowland with maximum altitude 600 m above sea level. The soil type is Mediterranean and has a sandy texture. It is poor nutrient content due to rapid soil permeability and causes soil leach when it rains. This island has low rainfall. The average of rainfall is 1260 mm/years.

The Moyo Island diversity is not really known. Several trees have been observed; they are *Planchonia valida*, *Tectona grandis*, *Schleicera oleosa*, *Lagerstroemia speciosa*, *Tamarindus indica*, *Neonauclea calycina*, *Ficus superba*, *Hibiscus* sp., and *Streblus asper*. In this forest are also found some terrains and grasses like *Imperata cylindrica* and *Lantana camara* and some orchids and epiphytic plants [3]. The increasing rate of forest degra-

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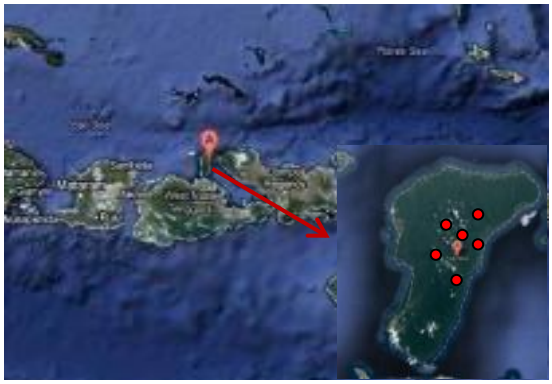

Figure 1. Research location: Map of Moyo Island, West Nusa Tenggara and the sampling of plot

dation and the threat of rising sea levels make the Moyo Island as fragile habitats and need to be saved. Illegal logging and tourism development also threaten the sustainability of plants in the forest. The research aim was to determine the plant's diversity in Moyo Island. The information gained from this study could be used to support bio-resources mapping of plant biodiversity in Indonesia.

MATERIALS AND METHODS

The research was conducted April 2013 at Moyo Island forest, Sumbawa, West Nusa Tenggara Province. The method was used to perform the observation of flora through the quadrant method for the tree, as well as methods of plots of 20 m × 10 m to enumeration of trees (diameters ≥ 10 cm) [4], as many as 24 sampling plots were taken in different location (north, south, east and center of this forest of Moyo Island). The environmental factors measured were temperature, humidity, light intensity, altitude and soil pH. Plant inventory was used to determine the diversity of plants species in the Moyo Island. The Inventory plants were conducted in the forest. The classification of plant habit including trees, fern and orchid and tuber [5]. Coastal plants are inventory. For those unidentified and particularly suspect more accurate identification were conducted by collecting voucher specimens [6] to be identified in Herbarium Bogoriense/BO, Bogor (Indonesian Institute of Sciences).

RESULTS AND DISCUSSION

Ecology of forest in Moyo Island

Environment factors have been measured in Moyo Island forest. The island is a lowland with a maximum altitude of 600m above sea level, the soil type is Mediterranean and has a sandy texture, which has poor nutrient of soil due to rapid soil permeability and leaching when it rains. Environmental factors and climate in the Moyo Island are similar to Purwodadi Botanic Gardens, which lie in 300 m above sea levels (asl) and has a dry climate.

Moyo Island has low rainfall, lowland areas and dry. The average of rainfall was 1260 mm/years. The temperature ranges 29-31°C, soil pH ranges from 4.8 to 6.2, humidity ranging between 70-90% and light intensity ranges from 4,300-131,000 lux meter. The Moyo Island forest is classified to be lowland evergreen rain forest. The trees dominate in this tropical lowland evergreen rain forest. They are flourish because the ecological condition is optimal for plant growth. It has three layers forest classically, the top emergent tree species that closed canopy with 30-40m, the shade-loving layer was the smaller trees, and the third was shrubs. It is same with a report by Whitmore, 1984 about Nusa Tenggara forest type.

Diversity of tree in forest

There were 60 species of tree are record in Moyo Island forest. *Schleicera oleosa* was one of the tree species that spread evenly in the forest. *S. oleosa* was one of plant species that spread in the area of dry lowland forest. It was possible because this species could survive in dry conditions. This species lived adaptively on this island. Some species like epiphytes such as orchids and ferns were often found in this tree. Its rough and cracked bark made many epiphytic species adaptable to attach their roots. This species was used by local people to build room. The traditional houses in this society were stilt houses and made from timber. Based on previous research, *S. oleosa* appears naturally from the foothills of the Himalayas and the western Deccan to Sri Lanka and Indo-China. It was plausibly introduced to Malesia and has naturalized in Indonesia especially Java, the Lesser Sunda Islands (Bali and Nusa Tenggara), Sulawesi, the Moluccas, Ceram and the Kai Islands. It is occasionally cultivated throughout the tropics, especially in India [7]. In addition to this species, there were many trees species that recorded and found in the forest, presented in Tabel 1.

Mallotus moritzianus, *Protium javanicum*, *Callophyllum inophyllum*, and *Dysoxylum cauliflorum* were found abundantly. The diversity and the absence of shrub were high. It made the forest looks like secondary forest and looks evergreen always. In higher altitude, there were many trees were found. The diversity plant of ground cover (herbaceous) was very low. Ground co-

(a) (b) (c)

Figure 2. Moyo Forest: a) Outer side of Moyo Island forest, b) low land forest area, and c) inner forest area (by Trimanto)

Table 1. Tree Species List in Moyo Forest

No	*Species*	*Family*	*No.*	*Species*	*Family*
1.	*Acmena acuminatisima*	Myrtaceae	31.	*Leea acutangula*	Leeaceae
2.	*Aglaia argentea*	Meliaceae	32.	*Litsea glutinosa*	Lauraceae
3.	*Aglaia lawii*	Meliaceae	33.	*Macaranga tanarius*	Euphorbiaceae
4.	*Alstonia macrophylla*	Apocynaceae	34.	*Mallotus mritzianus*	Euphorbiaceae
5.	*Alstonia spectabilis*	Apocynaceae	35.	*Memecylon edule*	Melastomataceae
6.	*Artocarpus anisophyllus*	Moraceae	36.	*Mucuna gigantea*	Fabaceae
7.	*Baringtonia racemosa*	Lecythidaceae	37.	*Octomeles sumatrana*	Datiscaceae
8.	*Bauhinia purpura*	Fabaceae	38.	*Palaquium rostratum*	Sapotaceae
9.	*Breynia racemosa*	Euphorbiaceae	39.	*Phyllanthus emblica*	Euphorbiaceae
10.	*Bridelia stipularis*	Euphorbiaceae	40.	*Picrasma javanica*	Simaroubaceae
11.	*Brucea javanica*	Simaroubaceae	41.	*Pittosporum moluccanum*	Pittosporaceae
12.	*Buchanania arborencens*	Anacardiaceae	42.	*Protum javanicum*	Burseraceae
13.	*Buchanania arborescens*	Anacardiaceae	43.	*Pteospermum diversifolium*	Sterculiaceae
14.	*Buchanania arborescens*	Anacardiaceae	44.	*Sandoricum koecjape*	Meliaceae
15.	*Callophyllum inophyllum*	Clusiaceae	45.	*Sapindus rarak*	Sapindaceae
16.	*Callophyllum soultri*	Clusiaceae	46.	*Schefflera elliptica*	Araliaceae
17.	*Canarium litorale*	Burseraceae	47.	*Schleicera oleosa*	Sapindaceae
18.	*Casearia grewiaefolia*	Salicaceae	48.	*Schoutenia ovata*	Tiliaceae
19.	*Celtis phillipinensis*	Ulmaceae	49.	*Sterculia foetida*	Sterculiaceae
20.	*Clausena excavata*	Rutaceae	50.	*Syzigium gracilis*	Myrtaceae
21.	*Clerodendrum paniculatum*	Lamiaceae	51.	*Syzigium picnatum*	Myrtaceae
22.	*Dalbergia junghuhnii*	Fabaceae	52.	*Syzygium gracilis*	Myrtaceae
23.	*Dictyoneura obtusa*	Sapindaceae	53.	*Tabernaemontana divaricata*	Apocynaceae
24.	*Diospyros malabarica*	Ebenaceae	54.	*Tetrameles nudifora*	Tetramelaceae
25.	*Drypetes neglecta*	Euphorbiaceae	55.	*Uvaria cordata*	Annonaceae
26.	*Dyctineura obtusa*	Sapindaceae	56.	*Uvaria javana*	Annonaceae
27.	*Dysoxylum cauliflorum*	Meliaceae	57.	*Uvaria littoralis*	Annonaceae
28.	*Ervatamia divarcata*	Apocynaceae	58.	*Vitex pinnata*	Verbenaceae
29.	*Ficus septica*	Moraceae	59.	*Ficus superba*	Moraceae
30.	*Lanea coromandelica*	Anacaediaceae	60.	*Ficus variegata*	Moraceae

ver was dominated by *Dioscorea hispida* which can found in all forest areas in the Moyo Island. *D. Hispida* is a type of vines and has the adaptability to drought. This species produces tubers in the soil (dormancy), and it will grow steadily during the rainy season. Several high-density plants were *Scleria leavis*, *Tacca palmata*, *Nervilia aragoana*, and *Piper retrofractum*. In this forest, ground cover plants were rarely found because in this

Figure 3. Several species that found and fruiting in forest: *Tabernaemontana sphaerocarpa* (a), *Phyllanthus emblica* L (b), *Uvaria cordata* (c), *Abroma mollis* (d), *Alstonia spectabilis* R.Br. (e), *Nauclea diderrichii* (De.Wild).Merr (f), *Cycas rumphii* Miq, (g), *Ficus variegata* Blume (h), *Piper retrofractum* Vahl. (i), *Mucuna gigantean* (j), and *Barringtonia racemosa* (L.) Spreng (k) (Documented by Trimanto).

region has dry sandy soil types. The existing species which grew in this forest were the species that able to adapt in the dry areas.

Apocynaceae family was often found with fruit, like *Alstonia marophylla*, *Alstonia spectabilis*, and *Tabernaemontana divaricata*. *A. macrophylla* found naturally in Sri Lanka, India (Nicobar Islands), Thailand, Cambodia, Vietnam and in throughout Malesia. It occurs in Lowland to montane primary and secondary forest on flat lands, slope or ridge, the edge of mangrove sometimes on flooded areas and heath forest with the types sandy clay or loam, volcanic or limestone. Not much different from *A. macrophylla*, the natural habitat of *A. spectabilis* also in primary and secondary forest, coastal forest on alluvial clay, limestone or lateric soil with altitude about 5-800 m asl [8].

Many fruiting plants were found in this forest. Several seedlings also grew well, like *Aglaia argentea*, *Mallotus moritzianus*, *Syzygium gracilis*, *Clerodendrum chinense*, *Uvaria littoralis*, *Macaranga tanarius*, and *Litsea glutinosa*. The seedling of *Diospyros malabarica* was found in a small population and limited places. The precence of fruiting trees and seedlings showed that the plant regeneration in this forest was gone well. There were only 1 species of gymnospermae, *Cycas rumphii*, observed on this island and it formed a population at one location at higher altitude.

Some fruit were utilized as food resources by local people. *Phyllanthus emblica*, called Riu by native people in Moyo, is one of the oldest oriental medicines mentioned in Ayurveda as potential remedy for various ailments [9]. The mature *P. emblica* was found spreading in the forest. It was native to tropical South East Asia, from India, Nepal, and Pakistan to Burma (Myanmar), Indo-China, Southern China, Thailand, Peninsular Malaysia, Sumatera, Borneo, Java, the Lesser Sunda Island and Moluccas [10].

Piper retrofractum (Figure 2i) is used as medicine. It is originally from South Asia and mostly cultivated in Indonesia and Thailand. The fruit is tiny berries which merge to a single, rod-like structure which bears some

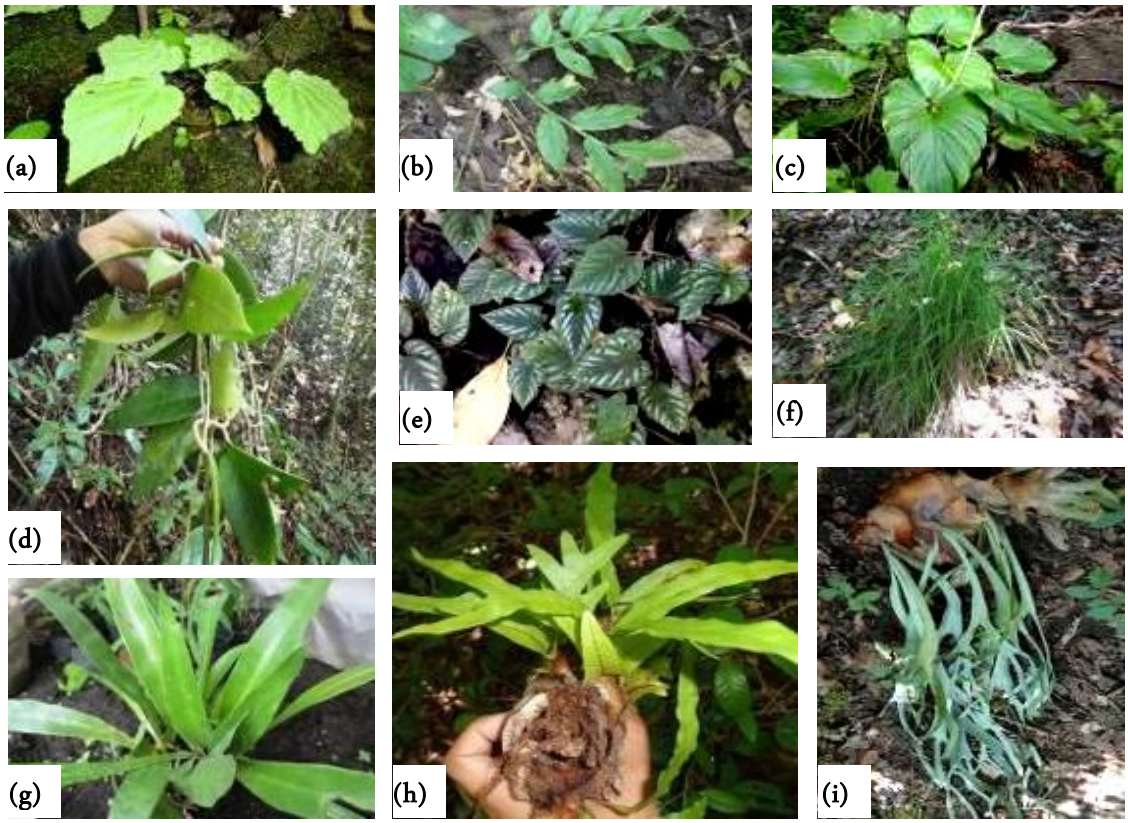

Figure 4. Herbaceous, epiphytic, and fern in forest: *Begonia* sp. (a), *Globa marantina* (b), *Homalomena pendula* (c), *Hoya verticillata* (Vahl) G.Don. (d), *Cissus javana* D.C. (e), *Scleria levis* Retz. (f), *Asplenium nidus* (g), *Drynaria quercifolia* (L).J.Sm. (h), and *Platycerium bifurcatum* (Cav).C.Chr. (i) (Documented by Trimanto)

resemblance to catkins (flower of tree like hazelnut or willow). *Barringtonia racemosa* is a mangrove tree belongs to the family Lecythidaceae. In Moyo's forest, this species was found in the lowest altitude and its population also plenteous. The fruit is conical to ovate, about 3 cm × 2 cm, crowned by the remains of the persistent calyx; style fleshy at first, later becoming hard, fibrous and yellowish-brown when mature and the seed is aromatic. It has potential medicinal properties [11].

Moraceae was also found in the forest with big diameters. This species dominated in water flow area. There were 33 of species of tree which recorded in water flow area. The species of plant that around the springs flow were dominated by large tree. The species of Moraceae family which dominated in this area were *Ficus racemosa*, *Ficus variegata*, *Ficus septica*, and *Ficus superba*. These species often found in spring or river area. Bamboo was also often found in river area like Gigantochloa atter. There were 33 of species of tree which recorded in water flow area. The species of plant that around the springs flow were dominated by large tree. In addition to those species, there were several tree species found around the river: *Anthocephalus chinensis*, *Schleichera oleosa*, *Protium javanicum*, *Streblus asper*, *Inocarpus fagiferus*, *Calophyllum inophyllum*, *Peltophorum inerme*, *A. spectabilis*, *Artocarpus altilis*, *Artocarpus anisophyllus*, *Pandanus tectorius*, *Kleinhovia hospita*, *Sterculia foetida, Moringa oleifera, Nauclea diderrichii, F. septica, Mallotus moritzianus. Barringtonia racemosa, Ficus superba, Ceiba petandra, Gigantochloa atter, Pterospermum diversifolium, Antiaris toxicarya, S. gracillis, Phyllanthus emblica, Dysoxylum cauliflorum, Acmena acuminatissima, Microcos paniculata*, *Ficus nervosa*, and *Aglaia spectabilis*. All the species which were lived around the river help to keep the area from erosion. [12]

Fern, epiphytic, herbaceous plant, and grass

One of rain forest characteristic is the presence of epiphytic plants, such as fern or Pteridophyte. While bryophytes are uncommon [13]. In this island, the fern collection at Forest was not diverse. The epiphytic fern was dominated by *Drynaria quercufolia*. Several ferns were often found in this forest was *Platycerium bifurca-*

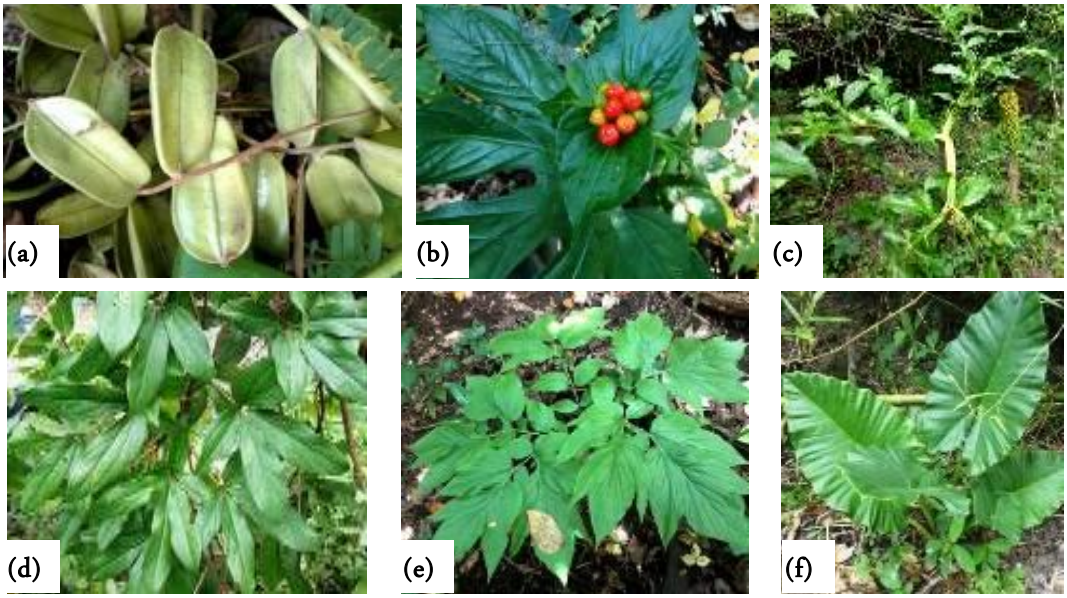

Figure 5. Diversity locally tuber plant in forest: *Dioscorea hispida* Denst fruit (a), *Tacca palmata* Blume (b), *Amorphophallus paeoniifolius* (Densst). Nicolson (c), *Dioscorea penthaphylla* L. var.palmata (d), *Tacca leontopetaloides* L. (Kunze) (e), and *Alocasia* sp. (f) (Documented by Trimanto)

tum which always attached to the big tree. *Asplenium nidus* was found in different host tree. Terrestrial fern was not much in this forest because the soil was dry and low humidity. In surrounding water ground, there were several fern grew well, like *Adiantum caudatum, Lygodium flexuosum*, and *Pteris ensiformis*.

Epiphytic plants represented by *Hoya verticillata* and *Hoya elliptica*. They could be found in several places. The habitat and ecology of Hoya is a long climbing epiphyte and moist evergreen forest, usually on trees along stream banks at about 200 m elevation [14]. The diversity of Araceae family was not high as *Homalomena pendula*; it always found in river area because they required plenty of water. Climber plant like *Epipremnum pinnatum* was found attaching in a big tree and near river. Begonia sp. was found in the specific area; it was only attached at limestone. Meanwhile, in limestone, there were also found *Piper* sp. and *Cissus javana*. They live in big population in there. *Zingiber* sp. found in several locations and *Pleomele* sp. was found in the forest with few population.

The grass in this island was dominated in several places. *Imperata cylindrica* was found in the outer side of conservation located. In the forest, Cyperaceae family was represented by *Scleria levis*. This species distributes in many areas in the forest. This species was suitable for forest climate in Moyo Island and well in this forest. Previous research of *S. levis* found that this species can be used as indicator species to monitoring levels of forest condition. It is an indicator species for swidden forest [15]. They can grow with limited water and only one species Cyperaceae was found in the forest

Wild tuber plant

Tuber plant was suitable in this forest owing to the soil condition. It could cultivate and used by local people due to its potential as a food material. However, they prefer to cultivate rice and corn in their field, although the water was not sufficiently caused the bad irrigation system. *Tacca palmata* and *Tacca leontopetaloides* were found at the inner forest. *T. palmata* distributed in several areas with few population, on the other hand, *Tacca leontopetaloides* was found with high population and few distribution. *Tacca* grew well in the forest. *Tacca* is pantropical, and apart from being native to America, Africa, and South East Asia, it radiates into China, Polynesia and Australia growing in the humid and seasonal (sub)tropical lowland in forests and open primary and secondary vegetation. *T. palmata* Blume grows mostly in secondary vegetation and forest margins, also in the teak forest and bamboo groves, indifferent to soil and climate. *T. leontopetaloides* is a coastal species. Based on IUCN,2015 *T. leontopetaloides* assessed as least concern, it common appear in natural range, the geographic range of this species is in Australia, Africa, and some region in Asia. *T. leontopetaloides* also found in Bawean Island, and it is not cultivated [16, 17].

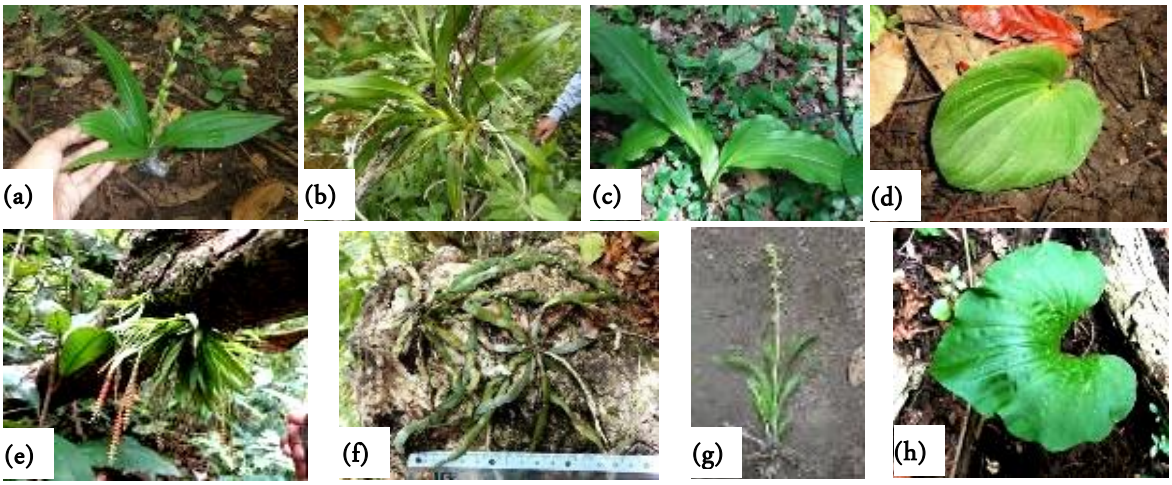

Figure 6. Diversity orchid*: Malaxis latifolia* (a), *Vanda limbata* (b), *Calanthe triplicate* (c), *Nervilia plicata* (d), *Oberionia aff.iridifolia* (e), *Pteroceras javanica* (f), *Phreathia* sp. (g), and *Nervilia aragoana* (h) (Documented by Trimanto)

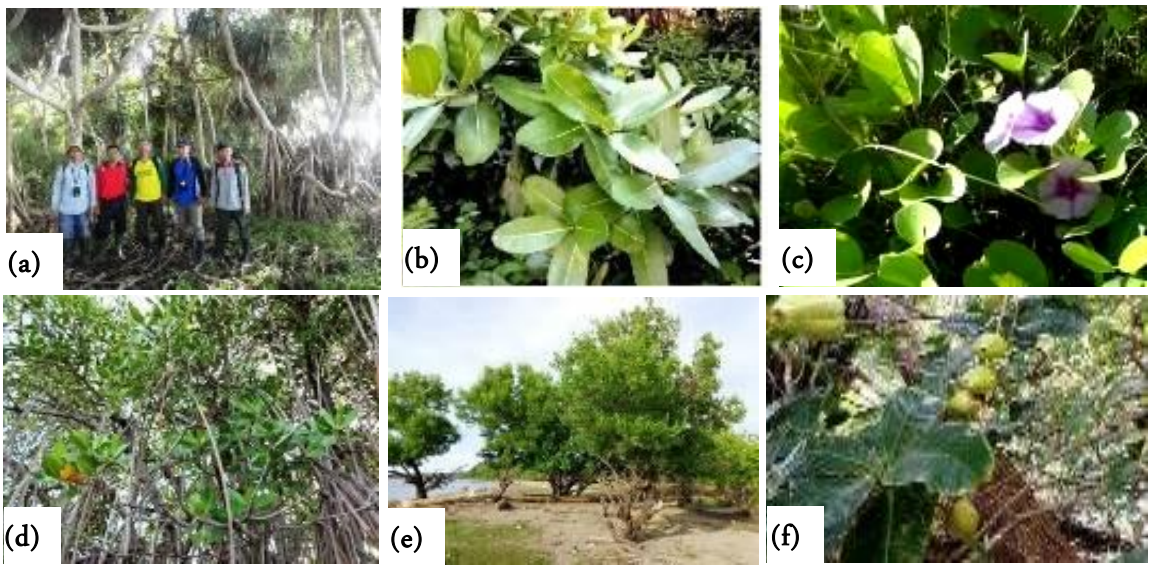

Figure 7. Coastal ecosystem: *Pandanus tectorius* population (a), *Calophyllum inophyllum* (b), *Ipomoes pes-capre* (c), *Rhizophora stylosa* (d), and *Barringtonia racemosa* (e and f) (By Trimanto)

D.hispida was found with much population and distribution; this species can grow well in this forest and climb in the tree. This tuber plant dominated the forest. Its flower, fruit, and tuber can find easily in this forest. Local people take its tuber from the forest and use it to make chips. *D. hipsida* natural habitat is in shady forest floor or semi-evergreen to deciduous forest. It has intoxic yam, which is widely cultivated for its starchy tubers as food for millions of people especially in the rural area [18]. *D. penthaphylla* var. palmata climbes in the tree and only one found in the one place. Tuber and many bulbils can be found in this species. In East Java, *Dioscorea* spp used to the alternative food, and it is cultivated by farmers [19]. *Dioscorea* spp has potential to develop in Moyo Island.

Alocasia sp. grew near the river, and only one species could be found in the forest. Meanwhile, the *Amorphophallus paeoniifolius* (Densst) could be found in some areas. In several places in *Indonesia A. paeoniifolius* (Dennsst) have been cultivated for a long time and used as a food material. However, in Moyo, it was growing wild and not cultivated yet. It grew well in this forest. Most of the tuber plant species were growing well in this forest, but just a few people cultivated and utilized it. Tuber plant species which usually cultivated by local people, are *Manihot esculenta* and *Xanthosoma*

nigrum.

Orchid collection

Orchid collection in Moyo Island forest area consists of two types, terrestrial orchids, and epiphytic orchids. Orchid is an important plant to conserve in this island because the population is few. Orchid was often found in higher altitude and high humidity. *Vanda limbata*, *Oberionia affiridifolia*, *Eria* sp., and *Phreatia* sp. were an epiphytic orchid. The rare and endemic orchid species could be found in the forest was a *Pteroceras javanica*. It was found in the specific place and host plant. It was only found attached to *Schleisera oleosa*. This species has been collected and acclimatization in Purwodadi Botanical Garden in several times and it could survive. Because of low humidity and rainfall, the diversity of epiphytic orchid was not diverse. *Phreatia* sp. was found in many locations and different host plants. This species was found in upper branching. The terrestrial orchid often found with a higher population in this forest. Terrestrial orchid dominated by *Nervilia aragoana*. It was found in several places with high populations. *Nervilia plicata*, *Calanthe triplicata*, *Corimborchys* sp. and *Malaxis latifolia* were a terrestrial orchid. Malaxis latifolia was a deciduous terrestrial orchid. This species is conspicuous when in flower but are very difficult to detect when dormant [20]. When exploration was conducted at Moyo in April, this species was found in the flowering and fruiting phase. The terrestrial orchid like *N. aragoana* and *N. plicata* were found in the shady location. This species grew well in the forest; it was proved by the high population and distribution. In dry season this terrestrial orchid will be left its bulb.

Coastal ecosystem

The area of Moyo Island is divided between utilize area and conserved area. Most of the community in Moyo Island lived in coastal areas therefore their activity directly affecting the coastal ecosystem. The number of people population are 2018 persons. They live near beach and river flows. The pes-caprae vegetation was rapidly lost to coastal development and historically to coconut plantation *Cocos nucifera*. This species was cultivated by local people in coastal area. In this island, the pes-caprae formation was dominated by Ipomoea pes-capre (Figure 5c). This species has thick leaves, fleshy, trailing stem, and the purple flowered beach morning glory. In there, some legume was found like *Clitorea ternatea* and *Mucuna gigantea*. *L. camara* is shurb that found in the coastal area. The tree species are *Callophyllum inophyllum*, *Rhizophora stylosa*, *Ipomoea, Baringtonia racemosa* dan *A. spectabilis*.

CONCLUSION

The classified of Moyo Island forest is lowland evergreen rain forest. The typical of forest is dryland, low altitude, and low rainfall. The Moraceae family and Ficus were often found surrounded the river. There were 60 tree species recorded in Moyo Island forest and many fruiting trees and seedling from the trees which were show a healthy growth. This indicated that the plant regeneration in this forest was went well. The diversity of Pteridophytes and orchids were not high. Epiphytic ferns which often found in the forest was *D. quersifolia* and *P. bifurcatum*. The terrestrial orchid that dominated in the forest is *N. aragoana*. Tuber plant was often found in this forest, such as *Tacca*, *Dioscorea* and *Amorphophallus*. They grew prolifically. There were three new record plants found. The first was epiphytic orchid: *Pteroceras javanica* an epiphytic plant: *Hoya verticillata* and wild tuber plant: *T. leontopetaloides*, meanwhile the coastal area was dominated by *P. tectorius*.

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REFERENCES

1. Monk KA, De Freter V, Reksodihardjo – Lilley G (1997) The ecology of Nusa Tenggara and Maluku (The ecology of Indonesia Series Volume V). Periplus Edition, Singapore.
2. Myers N, Mittermeier RA, Mittermeier CG et al. (2000) Biodiversity hotspots for conservation priorities. Nature 403: 853–858. doi: 10.1038/35002501.
3. Simbolon (1973) Structuring reports of boundaries Moyo Island wildlife reserves. General Directorate of Forestry. VIII Brigade Forestry planology Nusa Tenggara.
4. Ludwig JA, Reynold JF (1988) Statistical ecology: A primer on method on competing. John Willey and Sons, New York.
5. Judd WS, Campbell C, Kellog EA et al. (2007) Plant Systematic: a phylogenetic approach. Sinauer Associates Inc., London.

6. Damery J, Dosmann M, Hird A et al. (2011) Plant inventory operations manual second edition. The President and Fellows of Harvard College, Massachusetts.
7. Bhatia H, Kaur J, Nandi S et al. (2013) A review on *Schleichera oleosa*: pharmacological and environmental aspects. Journal of Pharmacy Research (6): 224-229. doi: 10.1016/j.jopr.2012.11.003
8. David G, Middleton DJ (2007) Flora Malesiana Series I-Seed Plant. Vol. 18. National Herbarium of the Netherlands, Utrecht.
9. Singh E, Sharma S, Pareek A et al. (2011) Phytochemistry, traditional uses and cancer chemopreventive activity of Amla (*Phyllanthus emblica*). Journal of Applied Pharmaceutical Science 2 (1): 176-183.
10. Padua LS, Bunyapraphatsara N, Lemmens, RHMJ (1999) Plant Resources of South East Asia: Medicinal and Poisonous Plants No. 12(1). Backhuys Publishers, Leiden.
11. Saha S, Sarkar KK, Hossain ML et al. (2013) Bioactivity studies on *Barringtonia racemosa* (lam.) bark. Pharmacologyonline 1: 93-100.
12. Trimanto T (2013) Diversitas pohon sekitar aliran mata air di kawasan Pulau Moyo Nusa Tenggara Barat. Prosiding Seminar Biologi 10 (2): 1–5.
13. Whitmore TC, Page CN (1984) A vegetation map of Malesia at a scale of 1:5 million. Journal of Biogeography 11: 461-471.
14. Kidyoo M, Thaithong O (2007) A new species of Hoya (Asclepiadacae) from Southern Thailand. Blumea 52: 327-330.
15. Dung NT, Webb EL (2008) Combining local ecological knowledge and quantitative forest surveys to select indicator species for forest condition monitoring in central Vietnam. Ecological Indicators 8: 767–770.
16. Trimanto T, Danarto SA, Nurfadilah S (2016) Bawean Island: The potential for ecotourism and local knowledge on plant diversity supporting ecotourism. Journal of Indonesian Tourism and Development Studies 4 (3): 97–106. doi: 10.21776/ub.jitode.2016.004.03.02.
17. Trimanto T, Hapsari L (2016) Botanical survey in thirteen montane forests of Bawean Island Nature Reserve, East Java Indonesia: Flora diversity, conservation status, and bioprospecting. Biodiversitas 17 (2): 832–846. doi: 10.13057/biodiv/d170261.
18. Zainuddin M, Abbas Z, Hafizi MHM et al. (2013) Monopole antenna technique for determining moisture content in the Dioscorea hispida tubers. Australian Journal of Crop Science 7 (1): 1-6.
19. Trimanto T, Hapsari, L (2015) Diversity and utilization of *Dioscorea* spp. tuber as alternative food source in Nganjuk Regency, East Java. Agrivita 37 (2): 97–107. doi: 10.17503/agrivita.v37i2.504.
20. Clements MA, Jones DL (1996) *Crepidium myosotis*, a new species of Orchidaceae from Papua New Guinea. Lasianthera 1: 32-45.