

# Survey Study Greenbelt Species of Natural Triangulasi Alas Purwo National Park (TN-AP) Banyuwangi Regency, East Java, Indonesia

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**Abstract** The purpose of this study is to reveal the diversity of natural forest flora species of mangrove beach and sand beaches in Triangulasi National Park Alas Purwo (TN-AP) in Banyuwangi, East Java. Mangrove and sand beach forest green belt as disaster mitigation of sea level rise in coastal zones. The foremost species of mangrove forest and natural sand beaches as an indication of the existence and conservation of its diversity. This research is expected to provide scientific information, evaluate ongoing development, especially in Triangulasi area TN-AP. This research was conducted through survey and field identification. The results of the survey then in the collection, made herbarium, diagnosis and determined its scientific name. The results of a survey of natural greenbelt diversity in the Triangulasi area in 26 species belonging to 26 genera, and 19 families recorded. The benefit of this research is to know the structure of flora diversity in supporting the determination of the potential of the green-belt of Java's southern coastal forest. Conservation of natural ecosystems is important in these areas concerning the life of coastal ecology organisms. The natural forest ecosystem structure Triangulasi area can be used in the selection of greenbelt species and the development of attractive natural tourism destinations.

**Keywords** Tropical coastal areas, Green-belt, Triangulasi, Alas Purwo National Park (TN-AP), East Java

## 1. Introduction

Indonesia is an island with an approximately 17,508 islands and length of beaches approximately 81,000 km. Alas Purwo National Park (TN-AP) has an area of 43,420 ha with a height of 1-322 m ASL. [1]. There are very large biotic and abiotic in coastal resources. The Mangrove Alas Purwo National Park (AP-NP), Banyuwangi regency is one of the most dynamic special in South Java island. Biodiversity TN-AP recorded 580 species of flora and 50 species of fauna with more than 5 ecosystems including mangroves, sand beaches, grasslands, bamboo forests, etc. [1] reported more than 31 species of mammals, e.g. bull or banteng jawa (*Bos javanicus*), deer or rusa (*Cervus timorensis*), wild dog or ajag (*Cuon alpinus*), hog or babi hutan (*Sus scrofa*), deer or rusa (*Muntiacus muntjak*), leopard or macan tutul (*Panthera pardus*), javan lutung or lutung (*Trachypithecus auratus*), long-tailed macaque or

monyet kera (*Macaca fascicularis*) and large lizard or biawak (*Varanus salvator*).

Mangrove ecosystems are found in intertidal areas where deposition of sediment occurs. They are dominated by trees, shrub, herb, liana, epiphyte, saprophyte and associated organisms occupying environment at the land or sea. Conservation of mangrove ecosystems is especially important for archipelagic areas. Thus, the mangrove ecosystem has many functions to holding strong winds, tsunami, storm and hydrological forces and coastal erosion [14]. [11] reported mangrove diversity in Papua New Guinea more than 37 species. In the other hand over 50 plant species found in mangrove vegetation in Thailand [3]. One of the most important coastal natural resources is forests mangroves. Mangrove forest ecosystems have enormous functions for human life, both physical, ecological and economic [11].

[5] reported sand dune diversity in Glagah resulted in identification of 84 plants. *pandan ri* (*Pandanus tectorius*), *balaran* (*Ipomoea pescaprae*), *krandan* (*Canavalia maritima*), *biduri*, *widuri* (*Calotropis gigantea*), *teki laut* (*Carex sp.*), *preketekan* (*Spinifex littorius*), is special well growth in sand beach. *Krandan* (*Canavalia maritima*), *rumpun angin* or *preketekan* (*Spinifex littorius*), *pandan ri*

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Parangtritis beach adjacent to the epicenter of the quake zone from both tectonic faults from Opak sesar and Indoaustralia-euroasia plate stretching in the southern island of Java [7]. While Triangulasi has a coastline similar to Parangtritis Yogyakarta on the southern coast of Java. The obyectives of this risearch reveal the condition of the mangrove and sand-beach ecosystem biodiversity in Trianggulasi Alas Purwo National Park (AP-NP).

This study was conducted through surveys and direct observations in Triangulasi of Alas Purwo National Park (AP-NP) region, in May 2017 and May-2018 (Fig 1). This research using with collecting the plant materials, drying, mounting, preparation and preservation of plant specimens [4, 8, 9]. The identification and nomenclature of the listed plants were based on the Flora of Java and Flora Malesiana.



Information regarding their listed below starting with local name, scientific name and family name, location mangrove, sand beach and habitus (Table 1)

Local Name	Scientific name	Family	Mangrove, sand beach, habitus
Daruju	<i>Acanthus ilicifolius</i> L.	Acanthaceae	Mangrove; shrub
Pandan banyu	<i>Agave angustifolia</i> Haw.	Agavaceae	Sand beach; shrub
Pule	<i>Alstonia scholaris</i> (L.) L.Br.	Apocynaceae	Sand beach; tree
Bintaro	<i>Cerbera odollam</i> Gaertn.	Apocynaceae	Mangrove-sand beach; small tree
Nipah	<i>Nypha fructicans</i> Wurm.	Arecaceae	Mangrove, tree
Telekan	<i>Lantana camara</i> L.	Asteraceae	Sand beach; shrub
Nyamplung	<i>Calophyllum inophyllum</i> L.	Clusiaceae	Sand beach; tree
Ketapang	<i>Terminalia catappa</i> L.	Combretaceae	Sand beach; tree
Balaran	<i>Ipomoea pes-caprae</i> (L.) R.Br.	Convolvulaceae	Sand beach-estuary; shrub
Tali putri	<i>Cuscuta scandens</i> (Roxb.) Bth.	Convolvulaceae	Sand beach; shrub
Pakis haji	<i>Cycas rumphii</i> Miq.	Cycadaceae	Sand beach; small tree
Teki	<i>Cyperus rotundus</i> L.	Cyperaceae	Sand beach-estuary; herb
Buta-buta	<i>Exocaria agallocha</i> L.	Euphorbiaceae	Mangrove; tree
Orok-orok	<i>Crotalaria striata</i> DC.	Fabaceae	Sand beach-estuary; shrub
Krandan	<i>Canavalia maritima</i> (Aubl.) Urb.	Fabaceae	Sand beach; shrub
Kuningan	<i>Caesalpinia</i> sp.	Fabaceae	Sand beach-estuary; shrub
Tubo	<i>Derris scandens</i> (Roxb.) Benth.	Fabaceae	Mangrove-beach-estuary; liana
Bangkong	<i>Pongamia pinnata</i> (L.) Pierre	Fabaceae	Sand beach; tree
Dudulan	<i>Scaevola taccada</i> Roxb.	Godeniaceae	Sand beach; small tree
Kempis	<i>Hernandia peltata</i> Meissn.	Hernandiaceae	Sand beach-estuary; tree
Keben	<i>Barringtonia asiatica</i> L.	Lechthyidaceae	Sand beach; tree
Waru	<i>Hibiscus tiliaceus</i> L.	Malvaceae	Sand beach-mangrove; tree
Pandan duri	<i>Pandanus tectorius</i> Soland.ex Park	Pandanaceae	Sand dunel, small tree
Rumput angin, preketekan	<i>Spinifex littoreus</i> (Burm.f.) Merr.	Poaceae	Sand beach-estuary; shrub
Teki laut	<i>Carex</i> sp.	Poaceae	Sand beach-estuary; shrub
Bogem	<i>Sonneratia ovata</i> Backer	Sonneratiaceae	Mangrove-estuary; small-tree.



**Figure 2.** Mangrove Triangulasi A. *Exocaria agallocha* B. *Nypa fructicans* Wurm. (Photo:J.Batoro)

In the lagoon of the Ombo river Triangulasi, the mangrove ecosystem is kayu buta-buta (*Exocaria agallocha*), nipah (*Nypa fructicans*), bintaro (*Cerbera odollam*), waru (*Hibiscus tiliaceus*). *Derris trifolia*, *Derris indica* and bogem (*Sonneratia ovata*) (Fig.2). *Exocaria agallocha* is commonly found adjacent such as *Nypa fructicans*, *Cerbera odollam* and *Hibiscus tiliaceus* [11]. *Exocaria agallocha* is found in area flooded by only exceptionally high tided on mud stony soils and is often associated with *Nypa*. Mangrove swamps

are important as nurseries for young fish and shrimp and they have been developed for commercial purposes [11]. The major mangrove flora commonly found in the Trianggulasi such as bintaro (*Cerbera odollam*), kayu buta-buta (*Exocaria agallocha*) and nypa palm, nipah (*Nypa fructicans*). The diversity of mangrove species in Trianggulasi is not as much as in the mangrove coast of Pasir Mendit village district Temon, Yogyakarta, Pancer Cengkrong Watulimo, Clungup (Sumber Manjing Wetan district) Malang regency, Cilacap



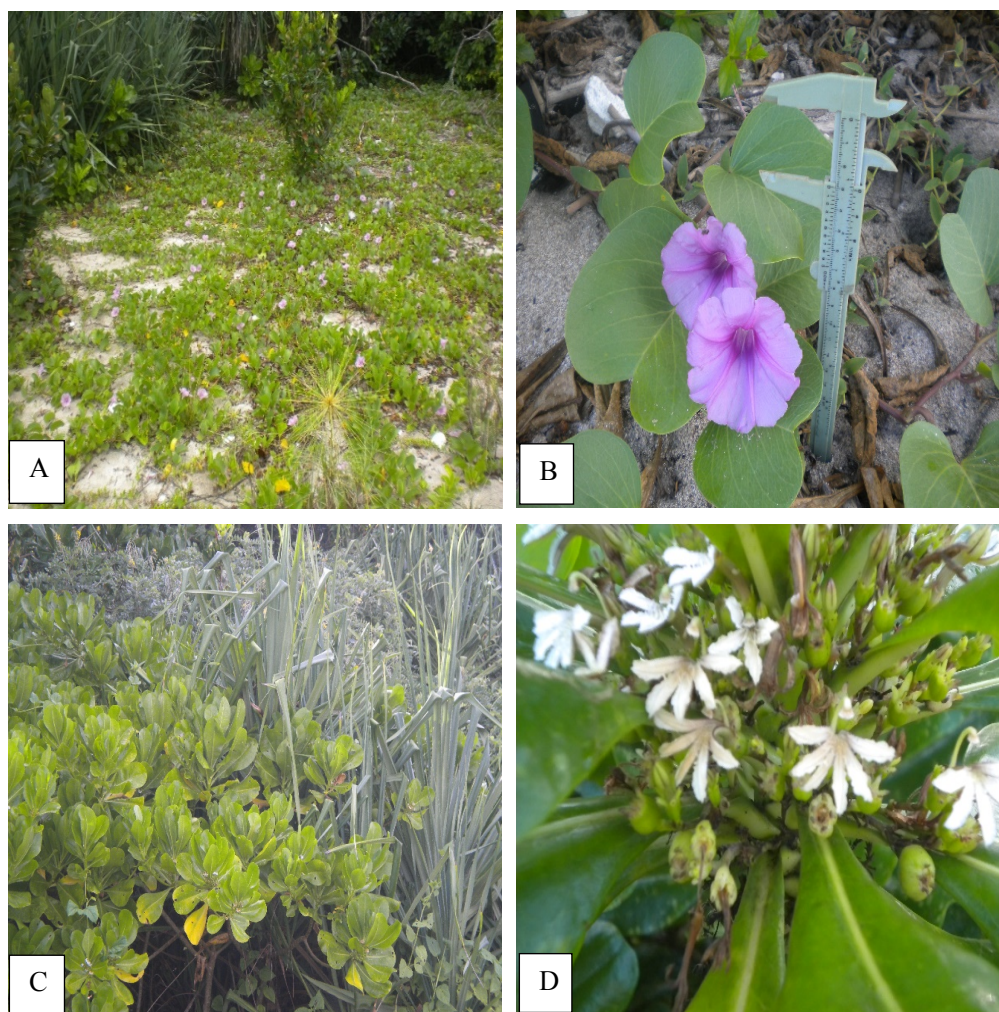
village of Central Java (30 species) [1].

The structure of the type of coastal bordered by sea begins type *krandan* (*Canavalia maritima*), *teki laut* (*Carex* sp.), *balaran* (*Ipomoea pes-caprae*) and *rumpit angin*, *preketekan* (*Spinifex littoreus*). In this location also found seedlings from coconut plants or kelapa (*Cocos nucifera*) and Fish poison tree (*Barringtonia asiatica*). *Canavalia maritima* is a pioneer plant in the open sea in the form of liana plants, branching, pink flowers included in the family Fabaceae or Papilionaceae. Within a year there were additional locations of *Canavalia maritima* distribution in triangulasi, which caused the seeds to be carried by the waves of the sea. This species grows relatively fast in sand beach and is naturally regenerated.

Small shrubby tree-shrubs include: *pandan ri* (*Pandanus tectorius*), *dudulan* (*Scaevola taccada*), *Caesalpinia* sp., *kacangan*, *orok-orok* (*Crotalaria striata*), and *dudulan* (*Scaevola taccada*) have branched stems with strong roots which are small trees resistant to salinity (Fig. 3). Such diversity is at the level of first position structure in the detention of wind and ocean waves. The next positions of large tree species include: *keben* (*Barringtonia asiatica*), *nyamplung* (*Calophyllum inophyllum*), *kayu pule* (*Alstonia*

*scholaris*), *kempis* (*Hernandia javanica*), *pakis haji*, *sikas* (*Cycas rumphii*), *lampeni* (*Ardisia* sp.). *Pule* (*Alstonia scholaris*) and *keben* (*Barringtonia asiatica*) is the preferred playground of the *lutung abu-abu*, as are the fruit and honey. The investigation forest Triangulasi Alas Purwo National Park (AP-NP), Banyuwangi include 26 species belonging to 26 genera and 19 families (Table 1). Triangulasi forest is a mixed forest adjacent to the lagoon of the Ombo river with mangroves estuary and beautiful coastal forests. On the other hand shrub types for example *kerinyu* (*Eupatorium inulifolium*), *alang-alang* (*Imperata cylindrica*), *telekan* (*Lantana camara*), *pecut kuda* (*Stachytarpheta indica* (L.) Vahl.) etc. The natural ecosystem area of Triangulasi has the ability to withstand ocean waves, tsunami and tectonic activity.

Types of toxic plants in the area include *kayu buta-buta* (*Excoecaria agallocha*), *nyamplung* (*Calophyllum inophyllum*), *kempis* (*Hernandia peltata*), *keben* (*Barringtonia asiatica*), *krandan* (*Canavalia maritima*), *bintaro* (*Cerbera odollam*) and *tubo* (*Derris* spp.). [6] reported, *krandan* (*Canavalia maritima*) flowers and seeds can be utilized foodstuffs with special processing for example “tempe krandan” and flowers as a vegetable material.



**Figure 3.** Sand beach A. Distribution *Ipomoea pescaprae*, *Pandanus tectorius*, *Spinifex littoreus* B. Habitus *Ipomoea pescaprae* C. *Pandanus tectorius* D. *Scaevola taccada* (Photo, J.Batoro)

From direct observations the main species that have potential for the development of greenbelt include *Canavalia maritima*, *Pandanus tectorius*, *Scaveola taccada*, *Calophyllum inophyllum*, *Barringtonia asiatica*, *Alstonia scholaris*, *Exocaria agallocha*, *Nypa fruticans*, *Cerbera odollam*, *Cycas rumphii*, *Hernandia peltata*, *Terminalia catappa* and *Hibiscus tiliaceus*.

The natural forest ecosystem structure area Triangulasi can be used in the selection of greenbelt species and the development of attractive natural tourism destinations. On the other hand, its management requires local wisdom, in communities and individuals [13]. The of green belt at sand dune, mangrove, sand beach can be a barrier savior of community, ecotourism, support the economy and can reduce tsunami attack caused by earthquake [5, 12]. Sustainability and stability of sand dune can reduce tsunami attack caused by earthquake [7]. Species diversity in this area relates conservation to fauna for example *rusa*, deer (*Muntiacus muntjak*), *lutung* (*Trachypithecus auratus*), *kerabu* (*Macaca fascicularis*) and *biawak* (*Varanus salvator*), birds, fish etc. The relationship between plant and animal biodiversity relates to food and their habitats.

## 4. Conclusions

Result description of the investigation forest Triangulasi Alas Purwo National Park (AP-NP), Banyuwangi include 26 species were recorded. Potential development of greenbelt species selected Triangulasi includes *Canavalia maritima*, *Pandanus tectorius*, *Scaveola taccada*, *Calophyllum inophyllum*, *Barringtonia asiatica*, *Alstonia scholaris*, *Exocaria agallocha*, *Nypa fruticans*, *Cerbera odollam*, *Cycas rumphii*, *Hernandia peltata*, *Terminalia catappa*, *Hibiscus tiliaceus*. Biodiversity conservation on Triangulasi area can reduce tsunami attack caused by earthquake. The natural forest ecosystem structure Triangulasi can be used in the selection of greenbelt species and the development of attractive natural tourism destinations.

## 5. Suggestion

The results of this selected type of research can be used as a basis to undertake the effort to repair the area of greenbelt that was damaged in the tropical coastal areas.

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