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Plant Inventory Constituent of Vegetation Structure of Balikpapan Botanical Garden Area Embung Wain Route East Kalimantan

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ABSTRACT

Plants are important living things that have a role as oxygen providers for other living things. In addition, plants can also be stores of biomass and carbon stocks. The vegetation of the botanical garden area has great potential for maximizing the function of plants and as a place for the conservation of various types of plants. Therefore, it is necessary to conduct continuous inventory (monitoring) to prevent extinction and to update plant data that has never been identified. This research was conducted to identify plants in the Balikpapan Botanical Garden area, especially on the Embung Wain track, which is the first track frequented by visitors for education. Data retrieval using the method roams all regions on the track. The results of the study revealed as many as 117 species of plants, consisting of 59 families. The members of the plant family that are found are Asteraceae (6 species), Euphorbiaceae (6 types), Fabaceae (7 types), Moraceae (7 types), Poaceae (7 types), and Zingiberaceae (6 types). Endemic plants found in this area are *Agathis borneensis*, *Diospyros borneensis*, *Diospyros celebica*, *Eusideroxylon zwageri*, *Etlingera balikpapanensis*, and *Eurycoma longifolia*.

Introduction

East Kalimantan is one of the provinces located on the island of Borneo which has extraordinary natural biodiversity. In particular, the plant biodiversity in East Kalimantan Island is very high[1]. The area and type of tropical rain forest make this region have a high level of biodiversity[2,3].Tropical rain forest types provide a major boost for the lives of diverse living things[22]. Therefore, its existence must be protected, and exploration can be carried out with the aim of conservation[4].

Conservation efforts can be carried out in situ or ex situ[5]. Where in situ conservation is carried out by protecting animals and plants in their natural environment[6]. Meanwhile, ex-situ conservation is carried out by maintaining both animals and plants in an artificial habitat that is

made like their natural[7]. In this case, for example, the banana germplasm garden is located in Yogyakarta, the Kelian Rhino Sanctuary is located in West Kutai, East Kalimantan[8], and the Botanical Garden is located in Balikpapan, East Kalimantan.

The Balikpapan Botanical Garden is very active in carrying out ex situ conservation efforts for various types of plants[9]. The types of plant collections contained in the Balikpapan Botanical Garden continue to increase. The Balikpapan Botanical Gardens periodically search for new or rare plant species by tracing forests in East Kalimantan. Plants obtained from the forest are then planted in the Botanical Garden area to be used as a collection. Therefore, one does not need to go to the forest to study various types of plants, especially those in Kalimantan.

The Balikpapan Botanical Garden has several tracks or educational routes that can be visited. Each track has different types of plants, so visitors can adjust the track to be explored based on the type of plant they want to observe. Based on the results of the researchers' observations, the Balikpapan Botanical Gardens Wain Wain Track is the favorite track for visitors. This track is the first track that is often visited by visitors for education compared to other tracks.

The Embung Wain Track is located closest to the main pavilion, so that is the reason to visit it for the first time. The diversity of plants on this track is very diverse. In general, large plants have been identified and well documented, but not for grass and shrub groups. The impact of this track is often used as the main visiting route, so there is a possibility that it will affect the presence of plants that are found around the route. The resulting influence can be in the form of a threat to the existence of plants that may be damaged, die, or disappear due to the behavior of visitors who do not comply with predetermined regulations. This is because vegetation conditions can change either due to the influence of human activities or other factors[10].

Therefore, based on this background, it is necessary to make an inventory of plant species found on the Balikpapan Botanical Gardens Embung Wain Track so that the types of plants will be known. In addition, this data can be used as study material or plant inventory documents, especially on the Wain Pond Track, which will be very useful in the future.

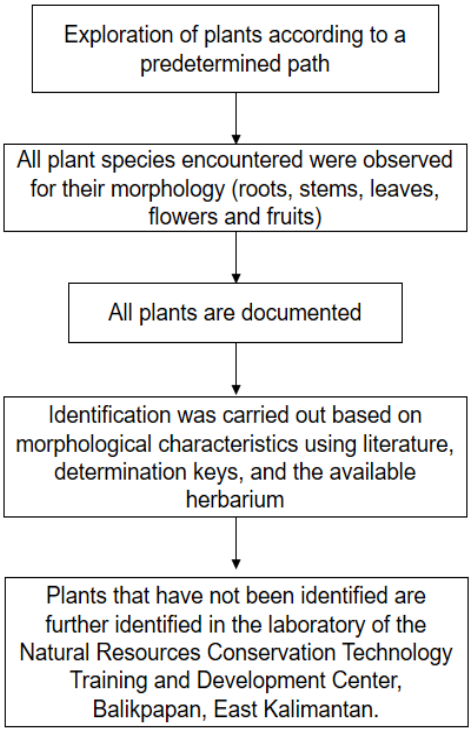
Method

This research is field research with a qualitative and descriptive approach. The research was carried out from February to March 2022 at the Balikpapan Botanical Gardens, Embung Wain Track, East Kalimantan. The research data collection techniques are:

1) Observation
   Observations were made to determine the initial conditions of the research location. In addition to collecting research-related data.
2) Determination of Exploration Path Direction
   The exploration path is determined based on the direction of the path that is often followed by visitors. The Wain Embung Track research area can be seen in Figure 1.

Figure 1. The research location for the Wain Reservoir Track

3) Measurement of Abiotic Factors
   Abiotic factors are measured to determine the abiotic conditions of the research environment. The abiotic factors measured include soil pH, soil moisture, soil temperature, light intensity, and air temperature.
4) Identification of Plant Types (Inventory)
   In this study, the process of plant identification involved observing each plant that came into view while the researcher was exploring the research area along a predetermined path.



5) Data analysis
   After the data was obtained, an analysis was carried out using a qualitative descriptive technique to describe the findings of the study.

Results and Discussion

Based on the measurement results of several abiotic factor parameters on the Wain Embung Track shown in Table 1.

Table 1. Results of Measurement of Abiotic Factors

No	Parameter	Result
1	Soil moisture	65
2	Soil temperature	29°C
3	Air temperature	28°C
4	soil pH	5
5	Light intensity	898 x 10 Lux

Table 1 shows that the environmental conditions are quite ideal for plant growth and development. Various types of plants encountered thrive. In addition, temperatures that are not too hot indicate that the density of vegetation around the area is still high[11].

The results of plant identification carried out on the Balikpapan Botanical Garden Wain Pond Track revealed quite a lot of plant species. There are 117 plant species identified on the Wain Embung Track. The results of the identification of these plants can be seen in Table 2.

Table 2. Results of an inventory of plant species in the Wain Embung Track Area

No	Local Name	Species	Family	Keterangan
1	Japanese jasmine	*Pseuderanthemum reticulatum*	Acanthaceae	
2	Stoning	*Reullia napifera*	Acanthaceae	
3	Merambung	*Vernonia arborea*	Asteraceae	
4	Cinnamon	*Cinnamomum sp.*	Lauraceae	
5	Candle plant	*Dracaena reflexa*	Agavaceae	
6	Ylang	*Cananga odorata*	Annonaceae	
7	Pulai	*Alstonia angustiloba*	Apocynaceae	
8	Bintaro	*Cerbera manghas*	Apocynaceae	
9	Rhinoceros fruit	*Tabernaemontana macrocarpa*	Apocynaceae	
10	Alamanda flower	*Allamanda cathartica*	Apocynaceae	
11	Nampu tree	*Homalomena*	Araceae	
12	Bamboeng/ Feather	*Agathis borneensis*	Araucariaceae	Endemic Kalimantan
13	Palm	*Dypsis* sp.	Arecaceae	
14	Sugar palm	*Arenga pinnata*	Arecaceae	
15	Palm	*Elaeis guineesis*	Arecaceae	
16	Serdang/ Siwalan	*Borassus flabellifer*	Arecaceae	
17	Aloe vera	*Aloe vera*	Asphodelaceae	
18	Spear leaves	*Ageratum conyzoides*	Asteraceae	
19	Kenikir	*Cosmos sulphureus*	Asteraceae	
20	Liman site	*Elephantopus scaber*	Asteraceae	
21	Tempuh wiyang	*Emilia sonchifolia*	Asteraceae	
22	Bolivian	*Porophyllum ruderale*	Asteraceae	
23	Jotang kuda	*Synedrella nodiflora*	Asteraceae	
24	Begonia/ Hariang	*Begonia sp.*	Begoniaceae	
25	Kedondong kerut	*Dacryodes rostrata*	Burseraceae	
26	Kitolod	*Isotoma longiflora*	Campanulaceae	
27	Maman lanang	*Cleome rutidosperm*	Capparaceae	
28	Mangosteen	*Garcinia mangostana*	Clusiaceae	
29	Ketapang	*Terminalia catappa*	Combretaceae	
30	Rose of the wood	*Merrimia sp.*	Convolvulaceae	
31	Red Costume	*Costus speciosus*	Costaceae	
32	Kerisan	*Scleria sp.*	Cyperaceae	
33	Lime wood	*Dryobalanops aromatica*	Dipterocarpaceae	
34	Meranti	*Shorea sp.*	Dipterocarpaceae	
35	Nail	*Nephrolepis sp.*	Dryopteridaceae	

36	Black wood	*Diospyros borneensis*	Ebenaceae	Endemic Kalimantan
37	Ebony	*Diospyros celebica*	Ebenaceae	Endemic Sulawesi
38	Kanyere Rhino	*Bridelia glauca*	Euphorbiaceae	
39	Cat tail	*Acalypha hispida*	Euphorbiaceae	
40	Tehan tea	*Acalypha siamensis*	Euphorbiaceae	
41	Kapul	*Baccaurea sp.*	Euphorbiaceae	
42	Green meniran	*Phyllanthus niruri*	Euphorbiaceae	
43	Red meniran	*Phyllanthus urinaria*	Euphorbiaceae	
44	Sengon	*Albizia chinensis*	Fabaceae	
45	Chinese petai	*Leucaena leucocephala*	Fabaceae	
46	Ketepeng	*Senna alata*	Fabaceae	
47	Bajakah	*Spatholobus littoralis*	Fabaceae	
48	Ornamental nut	*Arachis pintoi*	Fabaceae	
49	Betok scales	*Desmodium triflorum*	Fabaceae	
50	Red mimosa	*Mimosa pudica*	Fabaceae	
51	Cat whisker	*Orthosiphon aristatus*	Lamiaceae	
52	Java chili	*Dehaasia sp.*	Lauraceae	
53	Ironwood tree	*Eusideroxylon zwageri*	Lauraceae	Endemic Kalimantan
54	Barringtonia	*Barringtonia sp*	Lecythidaceae	
55	Ginggiyang	*Leea indica*	Leeaceae	
56	Red andong	*Cordyline fruticosa*	Liliaceae	
57	Chinese basil	*Spigelia anthelmia*	Loganiaceae	
58	Purple Taiwanese flower	*Cuphea sp.*	Lythraceae	
59	Lahung	*Durio dulcis*	Malvaceae	
60	Lai	*Durio kutejensis*	Malvaceae	
61	Durian	*Durio sp.*	Malvaceae	
62	Waru	*Hibiscus tiliaceus*	Malvaceae	
63	Jeluak	*Microcos sp.*	Malvaceae	
64	Bowl flower	*Scaphium macropodum*	Malvaceae	
65	Hibiscus	*Hibiscus rosasinensis*	Malvales	
66	Kalatea	*Calathea sp.*	Marantaceae	
67	Senduduk bulu	*Clidemia hirta*	Melastomataceae	
68	Senggani	*Melastoma sp*	Melastomataceae	
69	Yellow root	*Arcangesia flava*	Menispermaceae	
70	Bintawa	*Artocarpus anisophyllus*	Moraceae	
71	Keledang	*Artocarpus dadah*	Moraceae	
72	Object	*Artocarpus elasticus*	Moraceae	
73	Cempedak	*Artocarpus integra*	Moraceae	
74	Tampang	*Artocarpus nitidus*	Moraceae	
75	Waringin	*Ficus rumpii*	Moraceae	
76	Tabat barito	*Ficus deltoidea*	Moraceae	
77	Forest nutmeg	*Myristica fragrans*	Myristicaceae	
78	Jambu	*Psidium guajava*	Myrtaceae	
79	Pelawan	*Tristaniopsis whiteana*	Myrtaceae	
80	Caramunting	*Rhodomyrtus tomentosa*	Myrtaceae	
81	Red shoots	*Syzygium paniculatum*	Myrtaceae	
82	Semar bag	*Nepenthes mirabilis*	Nepenthaceae	

83	Jasmine	*Jasminum sambac*	Oleaceae	
84	Ground orchid	*Spathoglottis plicata*	Orchidaceae	
85	Panili	*Vanilla planifolia*	Orchidaceae	
86	Ground blimbing	*Oxalis barrelieri*	Oxalidaceae	
87	Fragrant pandan	*pandanus amaryllifolius*	Pandanacea	
88	Forest pandan	*Pandanus sp.*	Pandanacea	
89	Tuba root	*Derris elliptica*	Papilionaceae	
90	Forest betel	*Piper aduncum*	Piperaceae	
91	Bamboo	*Bambusa sp.*	Poaceae	
92	Jukut bitter	*Axonopus sp.*	Poaceae	
93	Grass	*Brachiaria sp*	Poaceae	
94	Reeds	*Imperata cylindrica*	Poaceae	
95	Grass	*Ischaemum sp.*	Poaceae	
96	Pait grass	*Paspalum conjugatum*	Poaceae	
97	Bamboo	*Phyllostachys sp*	Poaceae	
98	Yellow wood	*Podocarpus sp.*	Podocarpaceae	
99	Balm odor root	*Poliygala paniculata*	Polygalaceae	
100	Arbei	*Rubus idaeus*	Rosaceae	
101	Roses	*Rosa sp.*	Rosaceae	
102	Boerenia	*Borreria alata*	Rubiaceae	
103	Purple button grass	*Borreria laevis*	Rubiaceae	
104	Asoka	*Ixora paludosa*	Rubiaceae	
105	Seluang beluang	*Luvunga sarmentosa*	Rutaceae	
106	Forest rambutan	*Nephelium lappaceum L.*	Sapindaceae	
107	Earth peg	*Eurycoma longifolia*	Simaroubaceae	Endemic Southeast Asia
108	Leaf wrap	*Smilax sp.*	Smilacaceae	
109	Trumpet	*Solandra longiflora*	Solanaceae	
110	Agarwood	*Aquilaria microcarpa*	Thymelaeaceae	
111	Crown of god	*Phaleria macrocarpa*	Thymelaeaceae	
112	Forest laurel	*Alpinia sp.*	Zingiberaceae	
113	Temu ireng	*Curcuma aeruginosa*	Zingiberaceae	
114	Turmeric	*Curcuma longa*	Zingiberaceae	
115	White ginger	*Curcuma sp.*	Zingiberaceae	
116	Ginger balikpapan	*Etlingera balikpapanensis*	Zingiberaceae	Endemic Kalimantan
117	Galanga	*Kaempferia galanga*	Zingiberaceae	

Table 2 shows the number of plant species that have been identified, including trees, shrubs, and grass. The search results and grouping of 117 plant species resulted in 59 different types of families. The most commonly found plant families are Asteraceae, consisting of six plant species: *Ageratum conyzoides, Cosmos sulphureus, Elephantopus scaber, Emilia sonchifolia, Porophyllum ruderale*, and *Synedrella nodiflora*. Euphorbiaceae has six plant species consisting of *Bridelia glauca, Acalypha siamensis, Baccaurea sp., Phyllanthus niruri,* and *Phyllanthus urinaria*.

Fabaceae 7 types consisting of *Albizia chinensis, Leucaena leucocephala, Senna alata, Spatholobus littoralis, Arachis pintoi, Desmodium triflorum* and *Mimosa pudica*. Malvaceae there are 5 types of plants consisting of *Durio dulcis, Durio kutejensis, Durio sp., Hibiscus*

tiliaceus, Microcos sp and *Scaphium macropodum*. In Moraceae there are 7 types of plants consisting of *Artocarpus anisophyllus, Artocarpus dadah, Artocarpus elasticus, Artocarpus integra, Artocarpus nitidus, Ficus rumpii* and *Ficus deltoidei*. Poaceae 7 types of plants consisting of *Bambusa sp., Axonopus sp., Brachiaria sp., Imperata cylindrica, Ishcahaemum sp. Paspalum conjugatum* and *Phyllostachys sp*. In the Zingiberaceae family, there are six plant species: Alpinia sp., Curcuma aeruginosa, Curcuma longa, Curcuma sp., Etlingera balikpapnensis, and Kaempferia galanga.

Some of the plants identified in this track are known to be endemic. The endemic plants that are endemic to Kalimantan include Bamboeng or Bulu (*Agathis borneensis*) with endangered status, Black Wood (*Diospyros borneensis*) with least concern status, Ironwood Tree (*Eusideroxylon zwageri*) with vulnerable status[12], and Balikpapan ginger (*Etlingera balikpapanensis*) with endangered status[13].In addition, Southeast Asian endemic plants were also found, namely Pasak Bumi (*Eurycoma longifolia*)[14]. and *Diospyros celebica*, which are endemic plants of Sulawesi and have vulnerable status[15].

The registered status of each of these endemic plants should become the concern of the community and government. In particular, *A. borneensis* and *E. balikpapanensis*, whose status is endangered, indicate that their existence is threatened, which means they have a high risk of extinction[16]. Several researchers have conducted research on the population of *E. balikpapanesis*, which states that the population is small and is in the very risky category of extinction[17].

E. balikpapanensis is gaining popularity because of its potential. Many researchers have conducted research related to this Balikpapan ginger plant. The leaves of *E. balikpapanensis* are reported to have great potential as medicine due to their content of phytochemical compounds and antioxidant activity[18]. Endophytic bacteria isolated from the *E. balikpapanensis* plant also have potential as antibacterial agents[19]. Thus, it is a must that all components of society and related parties carry out conservation efforts that can protect their existence.

Another type of plant that is currently still widely used by the community is the ironwood tree (*E. zwageri*), which grows well in tropical forests. The good quality of the tree makes it widely used as a building material[20]. Another benefit of ironwood that has been studied is as a natural wood preservative against subterranean termite attacks[21]. So that the embedded vulnerable status can be a concern so as to prevent illegal logging and still be protected.

Conclusion

The Balikpapan Botanical Gardens Wain Reservoir Track has many types of plants, including several endemic plants. The abiotic environmental conditions on the track are one of the supporting factors for the growth and development of various types of plants. There are 117 plant species in 59 families. The plant family members whose species are found are Asteraceae (6 species), Euphorbiaceae (6 species), Fabaceae (7 species), Moraceae (7 species), Poaceae (7 species), and Zingiberaceae (6 species). The endemic plants found in this area are *Agathis borneensis, Diospyros borneensis, Diospyros celebica, Eusideroxylon zwageri, Etlingera balikpapanensis*, and *Eurycoma longifolia*, whose existence must be paid close attention to, especially those in endangered status, because the Wain Embung Track is the area most frequently visited by visitors.

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