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Diversity and Distribution of Rattan Jernang (Arecaceae.) in Bukit Duabelas National Park, Indonesia

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Abstract: Rattan jernang is one of the non-timber forest products of Bukit Duabelas National Park (TNBD). Bukit Duabelas National Park is one of the conservation areas located entirely in Jambi Province. This area has high enough potential of biodiversity. This study aims to identify the types of jernang within the park area, to identify the number of jernang/clumps, to analyze the growth rate and mapping of jernang within the park area. The research location this area is divided into 3 parts: Demonstration plot jernang area which has been determined by Balai Besar National Park of Bukit Duabelas National Park (BDNP), outside of demonstration plot, and permanent plot made by CRC. Data were collected by purposive random sampling method and vegetative analysis covering species identification, measurement of individual number, and making of distribution map of rattan jernang. The results of the study showed that there are no *Daemonorops* on CRC plots (BF1, BF2, BF3, and BF4). The types of *Daemonorops* found in the demonstration plot area are *Daemonorops draco* of a single family and female. While outside the plot of CRC and the demonstration plot, found *D. draco* in TNBD was 7.1 and *D. didymophylla*. The mean individual number of *D. draco* in TNBD was 7.1 and *D. didymophylla* was 4.7. Level Growth Analysis of *D. draco* indicated of all levels of its growth, starting from the youngest till the aged one.

Keywords: Dragon's blood palm; Bukit Duabelas National Park.

1. Introduction

Indonesia is one of the countries that have high biodiversity (mega diversity country) in the world. Found approximately 20,000 species of flowering plants scattered throughout the Indonesian archipelago and constitute 10% of the world's flora biodiversity [8,10]. The diversity of plant species is spread in forests throughout Indonesia [7,10].

Jambi province is located on the island of Sumatra and rich in plant species diversity. Jambi Province has 4 National Parks: Kerinci Seblat National Park, Berbak National Park, Bukit Tigapuluh National Park, and Bukit Duabelas National Park. Bukit Duabelas National Park (TNBD), has an area of ± 60,500 hectares. It is lowland hills located at an altitude of ± 30-430 masl. This area is also an indigenous territory of Anak Dalam Tribe which has made this area as the center of their culture and livelihood where their customs and habits are still relatively intact and sustainable.

One of the non-timber forest products found in Bukit Duabelas National Park is the type of rattan jernang (Arecaceae). Rattan jernang is different from the other types of rattan, because its product is not the stem but the red resin contained from the fruits. Jernang is the resin which attached to the outside of the young rattan fruit and will become lessen by the aging of the rattan fruit. Jernang from Bunaken National Park is one of income source of Anak Dalam Tribe and the society around TNBD [2].

Rattan jernang is included in Daemonorops genus, with 120 species within [12]. Daemonorops is divided into two sections based on the structure of the inflorescence: Daemonorops and Piptospatha. The striking difference as the two sections of this section is in the position of the prophyll. The prophyll

of Daemonorops section attached to the stem with an upright position when it blooms, while the prophyll of Piptospatha section will fall off when the plant is bearing fruit [4,5,11].

This research aims to identify the types of jernang in Bukit Duabelas National Park area, to identify the number of jernang/clumps, to analyze the growth rate and mapping of jernang within the park area (TNBD).

2. Material & Methodology

2.1. Sites

The research site is in the area of Bukit Duabelas National Park and is divided into 3 parts: jernang's demonstration plot area which has been determined by National Park Association of Bukit Duabelas National Park (BDNP), outside of demonstration plot and permanent plot made by CRC.

2.2. Research Stages

Stage 1: Field activities.
Data collection was carried out by the method of *purposive random sampling*. Vegetation analysis conducted is:

1. Identification of the rattan jernang species.
2. The number of individuals/clumps.
3. Analysis of the growth rate in each clump according to Dransfield (1984), consist of: the youngest rattan (long of stem: < 3m), young rattan (long of stem 3m – 5m), half-ripe rattan (long of stem 5m - 15m) and mature rattan (long of stem >15m).
4. Mapping distribution of rattan jernang.

Stage 2: Activities in the Laboratory.
Laboratory activities are to perform the drying of samples taken in the field, using oven dried herbarium to manufacture. Furthermore, the sample will be put in the sewing mounting paper, and ready to be identified.

3. Results and Discussion

Bukit Duabelas National Park (TNBD) is one of the conservation areas located entirely in Jambi Province. This area has considerable biodiversity potential. Initially this area is a limited production forest area and other use areas combined into the National Park. The remaining natural forest is located in the northern part of this National Park, while the other is secondary forest. Rattan jernang is one of the non-timber forest products from in this area. For Orang Rimba, jernang is the fruit of life. If the forest still can be overgrown by jernang, it means that the forest is still natural. Otherwise, if there were no longer jernang in the forest, the forest is considered as dead forest.

To harvest rattan jernang in the natural forest would create a problem. The problem is the scarcity that occurs due to unsustainable harvesting system. Furthermore, the living potential of jernang has continually decreased due to the fire and land conversion. Natural rattan tends to be damaged if the extraction is done excessively without any limitations and arrangements. Eventually this will have an impact on decreasing production and would likely be difficult to get rattan jernang in the future [9,13].

The result of the research was divided into 2 components, inside of CRC plot and outside of the CRC plots which have been defined based on sampling locations. The growth level analysis also has been conducted considering the length of Daemonorops spp.

3.1. Identification Species of the Rattan Jernang (*Daemonorops* spp.) in BDNP

The exploration of some species of the rattan jernang in Bukit Duabelas National Park is divided into 3 locations:

1. CRC Plot (BF1, BF2, BF3, and BF4).
2. Jernang demonstration plot (the protected habitat for *Daemonorops draco*).
3. Outside CRC Plot and demonstration plot.

3.2. Inside CRC Plot

The total population of jernang has become less and less due to the destruction of its natural habitat [19]. Based on the field observation, specifically in CRC Plot (BF1, BF2, BF3, and BF4) there were no *Daemonorops* spp species found in those plots.

CRC Plot can be seen in the Figure 1.

Figure 1. No *Daemonorops* spp. species were found in CRC Plot

According to the Forest Information Center of Jambi Province, jernang population in its natural habitat is inadequate. It is because the increasing needs of lands for cultivation and gardening to the extent to the forest where the natural habitat of jernangs live had caused the decreasing population of jernang. Also, because many of the resin of jernang had been cultivated from the unripe fruits, the community tended to harvest the unripe fruits of jernang that made it hard to find the fully ripe jernang fruits that can be developed into seeds [1]. In addition, the production rate of jernang has decreased very drastically. It is shown that in 1960s, a farmer could produce for about 30-50 kg resin of jernang. Now, the production of jernang can only produce 5-15 kg resin of jernang per season [19].

3.3. Rattan Jernang Demonstration Plot

The survey result showed that *Daemonorops* spp. were found in jernang demonstration plot located in the Bukit Duabelas National Park area. Jernang demonstration plot location is the protected habitat of Dragon's blood palm in Bukit Duabelas National Park. It was revealed that the species of *Daemonorops* was *Daemonorops draco* (Willd.) Blume (Figure 2). This is the coordinate point of the species: S: 01^0 36' 44.4" and E 103^0 35' 49.7".

Figure 2. The researcher and Field Guide (Orang Rimba) in demonstration plot

In demonstration plot area, only one *D. draco* clump was found with total of 15 individuals/clumps. The individuals found was female, which was indicated from the fruit of the plant. Based on the information from *Orang Rimba*, the thorn direction on the trunk could distinguish whether the individual of *D. draco* is male or female. The thorn of the female plant on the trunk was headed downward while the male thorn was headed upward. *D. draco* found in the area bore fruits with diameter about 0.5 cm (unripe fruit). The total of fruitful *D. draco* were 2 individuals and the number of fruit stalk/individual were 3 stalks. The coordinate of this female *D. draco* is S: 01^0 36' 44,4" and E: 103^0 35' 49,7".

In jernang demonstration plot area located in the area of Bukit Duabelas National Park, Dragon's Blood seedlings were found and were intentionally planted in the area. These seedlings were about 1 years old and they were taken from Lamban Sigatal Village, Pauh Sub-district. The total amount of Dragon's Blood seedlings planted was 10 individuals.

3.4. Outside CRC Plot and Demplot Jernang

In Jambi Province there are 10 species of jernang found: *D. brachystachys*, *D. didymophylla* [4], *D. dracuncula*, *D. dransfieldii*, *D. longipes*, *D. palembanicus*, *D. singalamus*, *D. trichrous*, *D draco*, and *D. mattanensis* [16]. The identification result of *Daemonorops* spp species in BDNP (Bukit Duabelas National Park) are two species of Dragon's Blood Palm. They are *Daemonorops didymophylla* and *Daemonorops draco (Willd.)* Blume. The results of the interviews with the native tribe found that the economic value of *Daemonorops draco* was higher than *Daemonorops didymophylla* because *Daemonorops draco* produced more red resins than *Daemonorops didymophylla*. In the township of *Orang Rimba* in Jebak village (Jambi) found two types of jernang: rattan jernang (*D. draco*) and rattan mengkarung/kelemunting (*D. didymophylla*) [16].

According to Witono (2005) *D. didymophylla* can be easily identified from the irregularity of the arrangement of its leaf strands [18]. The rounded petiole shape is a consistent character of *Daemonorops didymophylla* Becc. This type of rattan is a type of rattan that lives in cluster with the length of the stem reaches 15 m. The stem diameter is around 2.5 cm while the diameter without the stem reaches 1.25 cm, the length of the segment is about 30 cm. The leaves are dark green, spiked clumps, sometimes evenly, thorns are gray to black, and the lengths are between 0.4-2.5 cm with the yellowish base. The segments are obvious. Short flowering up to 20 cm, male and female inflorescence is usually the same, at first branching immediately dissolved at the time of the anthesis. The branches of the inflorescence and the first branches are spiked with some forming petals, spines up to 0.5 cm, mackerel and flower covered by soft brownish fur. Ovoid fruit, size up to 2.5 x 2 cm [18].

Table 1. Number of individuals/clump of *Daemonorops draco*

No	Sex	Number of individuals/clump
1	Female	3
2	Female	3
3	Female	16
4	Female	10
5	Female	10
6	Female	1
7	Female	6
8	Female	1
9	Female	15
	Total	**64**
	Mean	**7.1**

Meanwhile, the characteristics of *D. Draco* that distinguish it with the other *Demonorops* are the size about 8-15 m high, the length of the internode is around 20 cm, the width of the stem is 30mm, the length of the leaves are around 3 m, length of the cirrus is around 100 cm, petioles size is about 10 cm,

and stem diameter is around 10mm-30mm. The leaves have the sheath circling the stem. The fruit skin is scaly like salacca's fruit [11,16].

3.5. Number of Individuals/clumps

The individual number of *D. draco* in TNBD can be seen in Table1. It can be seen that the individual number of *D. draco* found in Bukit Duabelas National Park were 64 individuals from nine clumps. All individuals are female. The reason why there was not any male *D. draco* found is because the guide who accompanied the researcher are the villagers who search for jernang's resin only know about the location of female *D. draco*. Asra (2012) in her research of jernang sex ratio in Bukit Tigapuluh National Park in their natural habitat stated that the sex ratio of male versus female is 1 : 5 (1 male : 5 female)This research also showed that the female *D. draco* is also dominant.

One that affects the formation of rattan jernang is genetic factors and environmental factors. Genetic factors affect the potential of plants, the formation of male flowers and female flowers while the environmental factors that affect the availability of water, air temperature, wind, light and soil fertility (Sari, 2015). The difference between male and female jernang can be seen from the midrib, young leaves, flowers, internodes and the number of individuals in 1 clump. The female flower has larger size than the male flower midrib, the color of the young rattan leaves of the female green female. Flowers and male flowers produce different ratan family. *D. draco* can start producing fruit in the second year but the fruit is producing jernang at the age of 5 years (Sulasmi, 2012). A clump of *D. draco* generally consists of 5-20 individuals (BKSDA Jambi 2010).

On the other hand, the individual number of *D. didymophylla* in TNBD can be seen in Table 2.

Table 2. Number of individuals/clump of *Daemonorops didymophylla*

No	Sex	Number of individuals/clump
1	Male	4
2	Female	1
3	Female	9
	Total	**14**
	Mean	**4.7**

Table 2 shows that the number of D. *didymophylla* found in TNBD were 14 individuals from three clumps. The gender of *D. didymophylla* found were both females and males, with male/female appeal is 4:10. According to the information from the guides from Jernih village, they sometimes logged on male jernang because it is economically useless. And yet in terms of biology, it is very detrimental, because it can decrease jernang's opportunity to reproduce sexually if they logged off all the male jernang. This condition is in contrast with the results in Quarter1 where the native tribes do not logging off any jernang, despite of its male or female jernang because of their customary laws.

Based on the results of research [14] in Jebak village (Jambi) *Daemonorops didymophylla* Becc consists of 2 stems/clumps (17.14%), 3 rods (20%), 6 rods (2.86%), 7 stems/clumps (17.14%) and 10 stems/clumps (2.86%). The difference in the number of clumps is due to the different macro nutrients present in the soil.

3.6. Level Growth Analysis

Table 3 shows the result of level growth analysis of *D. draco* in jernang demonstration plot habitat.

Table 3. Result of level growth analysis

No.	Level of Growth	Total of Individual
1.	Youngest (length of the trunk < 3 m)	3
2.	Young (length of the trunk 3 – 5 m)	5
3.	Mature (length of the trunk 5 – 15 m)	5
4.	Aged (length of the trunk >15 m)	2
Total		15

3.7. Analysis of the growth rate in each clump according to Dransfield (1984)

Figure 3 shows that the number of individual unripe rattan (long of stem: 5-15 m) is higher than any other maturity levels of rattan. This indicates that the numbers of the productive jernang are able to produce more fruit.

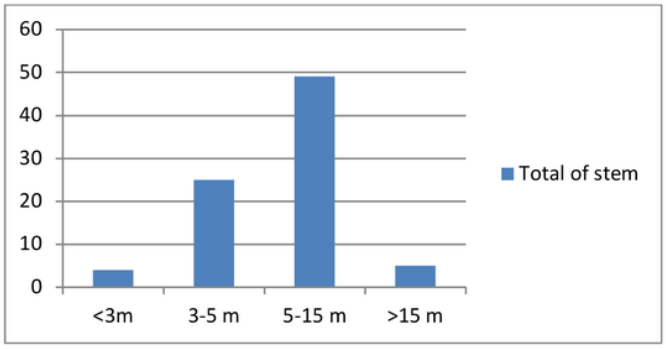

Figure 3. The individual number of *Daemonorops draco* based on the growth rate found in TNBD (2014)

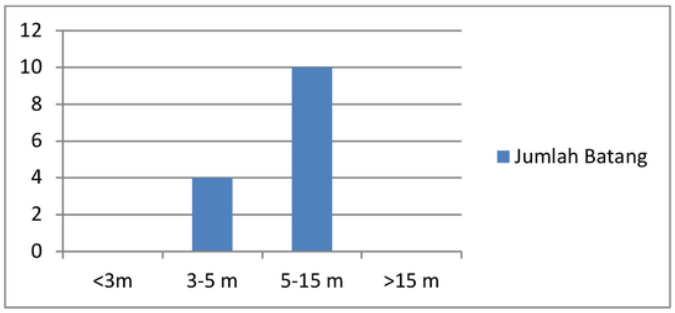

Figure 4. The individual number of *Daemonorops didymophylla* based on the growth rate found in TNBD

Figure 4 shows that the individual number of half-ripe rattan (long of stem: 5-15 m) is also higher than any other maturity levels rattan. Meanwhile the youngest rattan (long of stem: < 3 m) and mature rattan (long of stem > 15 m) are not found.

3.8. Mapping Dragon's Blood Palm (*Daemonorops* spp.) parent trees in Bukit Duabelas National Park area

Distribution of dragon's blood palm in Bukit DuaBelas National Park not evenly distributed. They are only found on a few points. Based on the map (Figure 5) it can be seen that female *D. draco* (abbreviated as FR) are more dominant and there were no male *D. draco* found. Based on the research results [1] the sex ratio of male and female *D. draco* on natural habitat was 1 : 5. While in Bukit Duabelas National Park, there was no found male *D. draco*. *D. draco* fruit formation in females can be through apomixes, this condition has been proved by Asra (2013) [2].

Whereas on *Daemonorops didymophylla*, found individual males (abbreviated MAP) and female individuals (abbreviated FBP/FAP).

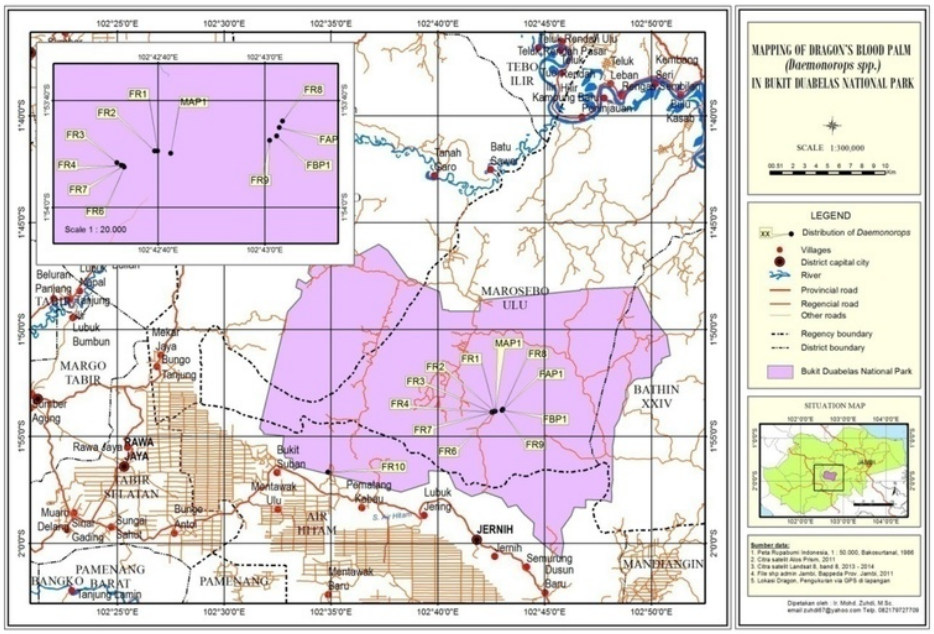

Figure 5. Mapping Dragon's blood palm

3.9. Analyze Possibility of Cultivation and Dragon's Blood Palm (*Daemonorops* spp.)

Cultivation of dragon's blood palm by *Orang Rimba* who inhabit TNBD has not been performed, they only use dragon's blood palm that grows naturally in the region. The results of interviews with some people of *Orang Rimba* state that it is very difficult to find old seeds of dragon's blood palm that can be used as seed. This is because harvesting of red resin dragon's blood palm comes from immature fruit, because in these conditions, we can take more the red resin of dragon's blood palm, while the old seeds the red resin dragon's blood palm became thinner.

Under these conditions, the researcher is advised to perform better protection, especially the parent trees of dragon's blood palm in dragon's blood demonstration plot palm Bukit DuaBelas National Park. The researcher proposes to give more protection the parent trees, so the fruit can have a long life time for the Dragon's blood so it can be used as a source of seeds.

4. Conclusion

Based on result of the research we can conclude that:

1. Distribution of *Daemonorops* spp. was found in jernang demonstration plot and outside of CRC plot.
2. The mean individual number of *D. draco* in TNBD was 7.1 and D. *didymophylla* was 4.7.
3. Level Growth Analysis of *D. draco* was indicated of all level of its growth, starting from the youngest till the aged one.

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