Population Structure of Siit Rattan (*Daemonorops melanochaetes* Blume) in the Coastal Forest of Tabanio Village, Takisung District, South Kalimantan, Indonesia

HERY FAJERIADI[1*], DHARMONO[1]

[1]Department of Biology Education, Faculty of Teacher Training and Education, Universitas Lambung Mangkurat
Jl. Brigjen H. Hasan Basri, Banjarmasin, Kalimantan Selatan, Indonesia. 70123
*Email: heryfaje@gmail.com

ABSTRACT

Indonesia as the largest archipelago country in the world has a vast coastline. Various types of ecosystems are scattered on the coast, one of which is coastal forest. One of the functions of coastal forests is as a habitat for flora, including rattan siit (*Daemonorops melanochaetes* Blume). Siit rattan has a fairly stable commercial value on the market. Its strong structure makes it attractive, not only nationally, even internationally. This study aims to determine the population structure of siit rattan in the coastal forest of Tabanio Village, Takisung District, Tanah Laut Regency. Data collection was done with total roaming techniques, namely along the coastal forest with a width of 50 m and a length of one thousand m to the south. The results of the study were analyzed descriptively. The age of siit rattan includes a wide base pyramid, without any stopping or decaying of growth in the pre-reproductive and reproductive phases. Natality rattan siit went well and almost did not experience mortality because the coastal forest of Tabanio Village was guarded by custom by the local community. Environmental factors that inhibit the reproductive rate of siit rattan are air temperatures that were too high from the optimal temperature of siit rattan breeding.

Keywords: *Daemonorops melanochaetes;* population; rattan; siit

INTRODUCTION

Indonesia with an area of more than 1.900.000 km^2 is the largest archipelago country in the world with a broad coastline. The width of the coastline of this country collects various kinds of ecosystems, including coastal forests. Coastal forest as a barrier to erosion and aberration (Feagin *et al*., 2010; Ngoran & Xue, 2017), controlling seawater intrusion into freshwater, windbreaks, holding tsunamis, flora and fauna habitats, ecotourism, natural resources and services for the community, and supporting education and research activities (Satriani *et al*., 2012; Sanford, 2009; Murray-Smith *et al*., 2009)

One of the provinces that have quite old coastal forest is South Kalimantan, precisely the coastal forest of Tabanio Village. Tabanio Village is one of the oldest settlements of the Banjar tribe, so far the local community is still preserving its coastal forest. Tabanio's coastal forest ecosystem consists of several classes of wetland ecosystems, namely temporary swamps; permanent swamp body; permanent estuary body; temporary estuary; and coastal (supralittoral) upper intertidal. This classification refers to the wetland hierarchy system according to Cowardin *et al*. (1979).

Based on several classes of wetland ecosystems above, the highest quantity of plant populations is around temporary swamps. One plant population that lives in the ecosystem class is siit rattan (*Daemonorops melanochaetes* Blume or now *Calamus melanochaetes* (Blume) Miq.). Siit rattan has a special feature in the form of a flower protected by sepals, grows a lot in the section of the rattan stem, and comes out at the base of the leaf midrib. Protective sepals are oval and have strands that are clearly visible.

Nine species of rattan were found when a dry climate around the Rampah Menjangan waterfall, siit rattan is one of two flowering species. But, this species has the third-lowest important value index (Fajeriadi *et al*., 2016). Siit rattan in Mendanau Island of Belitung called Rautan Nangak. This species is a new record from Belitung Island. The inflorescence

is wrapped by bractea shaped like a boat, the outside of the flower petals has thorns (Andayani *et al.,* 2018).

Phylogenetic evidence shows that the genus Calamus is the largest genus of all genera of palms (Arecaceae). Several species from the genera Daemonorops, Ceratolobus and Pogonotium are included in the Calamus genus because they have non-monophyletic similarities. This concept has practical advantages because it is more clearly determined by morphological characters and anatomy (Baker, 2015).

According to Dransfield *et al*. (2008), *Daemonorops melanochaetes* is the first species of the Daemonorops genus described by Blume (1849). This species is spread in one of them in the Indonesian archipelago. Fajeriadi *et al*. (2016) explained that rattan can grow both in primary and secondary forests, including former shifting cultivation areas and shrubs.

Rattan has a fairly stable commercial value in the market. Its structure is strong and easy to use in shaping handicrafts making it attractive,

not only nationally, even internationally. However, the existence of siit rattan in the coastal forest of Tabanio Village has not been explored in detail to analyze the sustainability of the population of this species in the coastal forest ecosystem, so research on the structure of siit rattan in the coastal forest of Tabanio Village is needed.

MATERIALS AND METHODS

This research is a descriptive study with total roaming techniques. Sampling is done by going along the coastal forest with a width of 50 m and 1000 m to the south. The object of the research was siit rattan (*Daemonorops melanochaetes* Blume) which was found in the coastal forest of Tabanio Village, Takisung District, South Kalimantan Province. The data taken is the number of individuals from siit rattan in each phase of the population structure consisting of (1) pre-reproductive phase; (2) reproductive phase; and (3) post-reproductive phase.
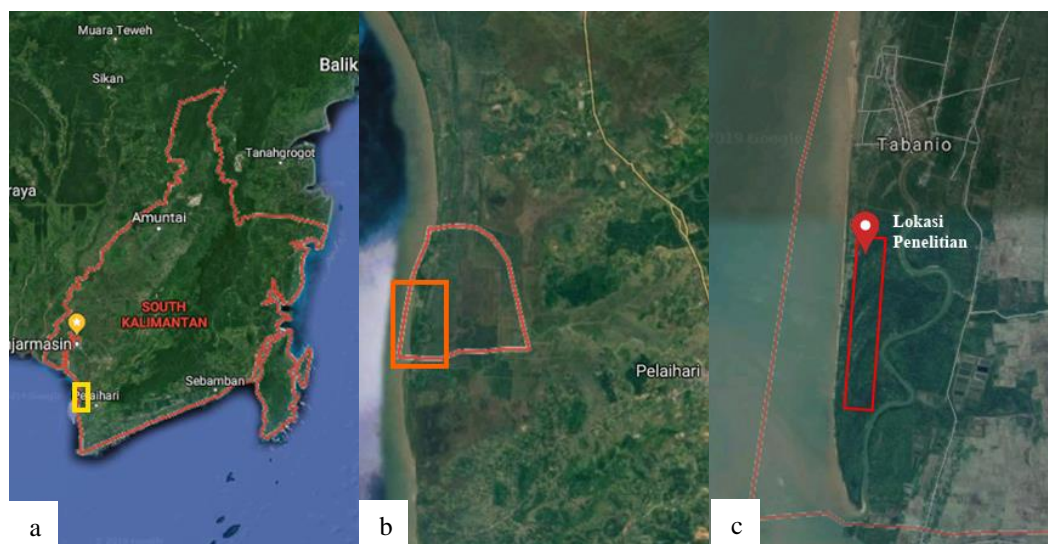

Figure 1.   Research location map: a. South Kalimantan, Indonesia; b. Takisung District, Tanah Laut Regency; c. Research sites: Coastal Forest of Tabanio Village

Data collection starts with prepare tools and materials. The location of the research was determined by exploring the total length of 1000 m with a width of 50 m for looking for siit rattan plants then count the number of individuals in each phase. The Analysis results of siit rattan population were made by

calculating density using the formula (1). The age pyramid was made refers to Odum (1993). Finally, the structure of the siit rattan population was analyzed and followed by the influence of natality, mortality, and environmental parameters.

$$\text{Density} = \frac{\text{Total number of individuals}}{\text{area (Ha)}} \quad (1)$$

RESULT AND DISCUSSION

The three-phase stature of the population structure of siit rattan (*Daemonorops* *melanochaetes* Blume) found in the coastal forest of Tabanio Village, Takisung District, Tanah Laut Regency.

Figure 2. a. Siit rattan pre-reproductive phase in Coastal Forest of Tabanio village; b. Siit rattan reproductive phase in Coastal Forest of Tabanio village; c. Siit rattan post-reproductive phase in Coastal Forest of Tabanio village

Based on the results of the study, the siit rattan in the pre-reproductive phase (figure 2) has a short stature. The distance of each segment is still near, so the distance of leaves with one another is also rather near. Not yet found a flower sheath at the base of the midrib, or cirrus at the tips of the leaves. The reproductive phase is indicated by the presence of a sheath, either in which contains flowers, or has become raw or ripe fruit. The tip of the leaf has cirrus. Finally, the post-reproductive phase is shown by a shattered sheath, stems and leaves turning yellow or brown, even withering and also dying.

The population structure includes the pre-reproductive phase, reproductive, and post-reproductive siit rattan plants in the coastal forest of Tabanio Village can be seen in Table 1 and environmental parameter data in Table 2. The   pyramid types of siit rattan population structure can be seen in Figure 3, which shows a bell-shaped polygon pyramid.

Table 1. Population structure data of siit rattan in the Coastal Forest of Tabanio Village, Takisung District

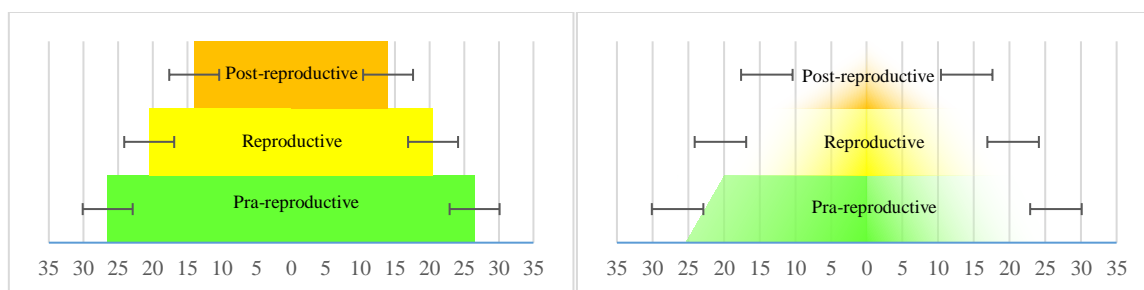| Phase of Population Structure	Number of individuals	Density (ha)
Pre-reproductive	53	10.6
Reproductive	41	8.2
Post-reproductive	28	5.6

Figure 3. Pyramid of siit rattan's population structure in Coastal Forest of Tabanio Village

Table 2. Environmental Parameter Data

No.	Environmental Parameter	Range	Reference
1	Air temperature (ºC)	27-36	24-30[1]
2	Place height (masl)	1.9	0-600[3]
3	soil pH	5.6-7	6.2-6.4[1]

No.	Environmental Parameter	Range	Reference
4	Soil moisture (%)	45-100	60-100[2]
5	Light intensity (lux)	3213->20.000	5000-24000[1]
6	Air moisture (%)	53-68	60-70[3]
7	Wind velocity (m/s)	0-2.1	-
8	N-total (mg/100g)	0.11	0.21-1,5[5]
9	P_2O_5 (mg/100g)	15.29	Height > 40[6]
			Medium = 20-40[6]
			Low $\leq$ 20[6]
10	K_2O (mg/100g)	10.62	Height $\geq$ 10[7]
11	Mg-dd (me/100g)	0.10	Medium = 5-9.84[7]
12	Ca-dd (me/100g)	2.82	Low $\leq$ 1.3[7]

[1] Januminro (2000); [2] Arifin (2008); [3] Arifin (2008); [4] LIPI (1978); [5] Lakitan (2011); [6] Muis et al. (2008); [7] Pusat Penelitian Tanah (1983)

Description of Siit Rattan Morphology (*Daemonorops melanochaetes* **Blume**). Siit rattan found in the coastal forest of Tabanio Village has habitus features in the form of lianas. The structure of the root fibers is light brown. This rattan grows upwards. The stem has no branches, the stem diameter along with the midrib is 3-4.5 cm, generally measuring 4 cm in the reproductive phase, while the stem diameter without midrib is 1.5-2 cm. The length of the segment on the stem is 26 cm. The stem midribs are overgrown with thorns whose composition is spread very tightly. The shape of the spines is sharp, the length of thorns is 1-4 cm, the width of the base of the spines is 0.2-0.6 cm. The stem of this species is round in yellowish-green.

Based on research results, siit rattan has pinnate compound leaves where the leaves are alternating. The leaves are ribbon-shaped, the edges of the leaves are flat with small spikes, and the leaf surface is slippery with small spikes. The leaf midrib is overgrown with thorns which are very tightly arranged, and on the leaf stalks, there are long spikes on the left and right sides. The leaf veins are arranged parallel and have spines on the top. The length of leaves is 124-150 cm, leaf width is 35 cm, the length of leaflets is 10-16 cm, and the width of leaves is 1-2 cm.

The special feature of siit rattan shows there many sheaths that bubble in the middle of reproductive phase. The sheath is 11.5-18.5 cm long and 4-6.5 cm in diameter. This sheath is a place for fruit inflorescence and ripening. There is also a small and long climbing tool (flagellum) at the end of the stem, and at the end of the leaf, there is a long cirrus with thorns at the bottom.

Baker (2015) explained based on its synoptic nomenclature, *Daemonorops melanochaetes* Blume in J.J. Roemer & J.A.Schultes, Syst. Veg., revised to be *Calamus melanochaetes* (Blume) Miq., Verh. Kon. Contract. Wetensch, Afd. Natuurk. Another name for this species is *Daemonorops ornata* W.Bull, Gard. Chron., n.s.; *Daemonorops melanochaetes* var. *depressiglobus* Teijsm. & Binn. Ex Becc, Ann. Roy. Bot. Gard. (Calcutta); *Daemonorops melanochaetes* var. *macrocarpus* Becc, Ann. Roy. Bot. Gard. (Calcutta); *Daemonorops melanochaetes* var. *macrocymbus* Becc, Ann. Roy. Bot. Gard. (Calcutta); *Daemonorops melanochaetes* var. *microcarpus* Teijsm. & Binn. Ex Becc, Ann. Roy. Bot. Gard. (Calcutta); *Daemonorops melanochaetes* var. *padangensis* Becc, Ann. Roy. Bot. Gard. (Calcutta); *Daemonorops aruensis* Becc, Ann. Roy. Bot. Gard. (Calcutta); synon. nov. *Daemonorops javanica* Furtado, Gard. Bull. Straits Settlem.

Analysis of Siit Rattan Population Structure. Pyramid population structure is divided into wide base pyramid, bell shape polygons, and pasu or kendi shapes (Odum, 1993). Pyramid population structure describes the sustainability of a species in a particular area. The age pyramid types of siit rattan (*Daemonorops melanochaetes*, Blume.) is a bell shape polygons. In this pyramid, the birth and death rates are balanced or fixed (stationary).

The structure of the siit rattan population is influenced by three factors: natality, mortality, and environmental factors. Natality is related to the growth rate or better known as the birth rate, mortality is related to death, and ecophysiological environmental factors affect

siit rattan especially the reproduction process. A large number of siit rattan pre-reproductive individuals found shows good natality from siit rattan. The population of a species is said to grow if natality is higher than mortality (Davis & Stamps, 2004; Nee, 2006; Pasinelli *et al.*, 2004).

The natality rate of a plant is influenced by the ability of plants to fertilize because with the growth of seeds, spores, and fruits, individual regeneration will take place and result in a plant being able to maintain its population over time (Mitchell *et al.*, 2006; Rajaniemi, 2008; Croteau, 2010; Young, 2000, Major *et al.*, 2013). Mortality in the coastal forest of Tabanio Village against siit rattan is almost non-existent. This is because the forest is traditionally guarded by the local community, and siit rattan has not been utilized significantly by the community. Jasni *et al.* (2016) recommend siit/seel rattan as one of the types of commercial rattan with cellulose levels ranging from 42.35 to 45%.

In addition to the factors of natality and mortality, siit rattan population structure is also influenced by environmental factors. Based on 12 environmental parameters measured, the air temperature of $6^{o}C$ was higher than the optimum temperature, the nutrient content of P_2O_5 was low, and Mg-dd was also low. Temperature is not a significant problem for siit rattan. According to Fajeriadi *et al.* (2016) siit rattan (*Daemonorops melanochaetes*, Blume.) can still tolerate soil conditions with low content of Mg-dd and P_2O_5, so it can still reproduce. However, Januminro (2000) explains the highest optimal temperature for rattan is $30^{o}C$. This indicates that the temperature in the study area is too high for siit rattan. Then Hermawan *et al.* (2016) explain that the optimal temperature range for photosynthesis varies based on species and ecotypes, but usually between 18 and $25^{o}C$ for the medium region, and the extreme range between -5 to 40°C.

Siit rattan is basically not only found in the highlands of South Kalimantan but also found on the coast hence it is able to tolerate high temperatures, low levels of Mg-dd and P_2O_5.

However, high temperatures still provide productivity barriers for these species.

CONCLUSION

The number of individual siit rattan (*Daemonorops melanochaetes* Blume) in the coastal forest of Tabanio village was 53 individuals in the pre-reproductive phase with a density of 10.6 individuals per hectare, the reproductive phase was 41 individuals with a density of 8.2 individuals per hectare, and the post-productive phase was 28 individuals with a density of 5.6 individuals per hectare. Siit rattan population structure is a bell shape polygons, with stable reproduction. The Tabanio villagers have not utilized this species, so the barriers to reproduction originate from high temperatures.

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