

Identificaton of Sago (*Metroxylon sp*) In Pelang Tourism, Merakurak District, Tuban Regency

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Abstract

Pelang Tourism is a natural tourist spot located in Pelang Hamlet, Tuban Regency, East Java. Local people take advantage of the Pelang river and the surrounding *Metroxylon* park as natural attractions. Many human activities affect the environment, one of which is logging *Metroxylon* and land use activities to make food stalls or souvenir shops. These activities have an impact on changing the characteristics of the Rainbow Tourism area so that it has an impact on the decline in population and biodiversity in the area, one of which is *Metroxylon*. The high population of *Metroxylon* is a source of germplasm in tourist areas. Based on this, it is necessary to do research. The purpose of this research is to study the diversity of *Metroxylon* in Pelang Tourism. This study uses descriptive quantitative research methods with observation data collection techniques. Based on the research results, there are 762 families of *Metroxylon* *Arecaceae* consisting of *Metroxylon rumphii* Martius, *Metroxylon sago* Rottb, *Metroxylon microcanthum* Mart. Based on the results of data analysis obtained *Metroxylon* Diversity Value of 0.9692 which means low. *Metroxylon* dominance value of 0.4213 means low. Based on the Diversity and Domination Index, it shows that the diversity of *Metroxylon* in Pelang Tourism is low, meaning that the procurement of tourist attractions has affected the diversity of *Metroxylon*. Therefore, it is necessary to maintain the diversity and population of *Metroxylon* in Pelang Tourism so that the germplasm source is not destroyed.

Keywords ; Pelang Tourism, Sago Diversity, Human Activities, Pelang River.

1. Introduction

Tuban Regency has a lot of potential and natural resources that can be developed into natural tourism objects, one of which is Pelang Hamlet. Pelang Hamlet is a place that is located in the Village of Tunjuk, Merakurak District, Tuban Regency with the Coordinate Point of 6°53'05.4"S 111°59'06.2"E. Pelang Hamlet has potential natural resources, one of which is Sago (*Metroxylon sp*). Apart from Sago (*Metroxylon sp*) there are other types of plants including *Inocarpus fagifer*, *Pteridophyta*, *Homalomena*, *Monstera deliciosa*. The potential for sago (*Metroxylon sp*) in the Pelang Hamlet area has high diversity and population. Sago (*Metroxylon sp*) has the potential to be used as an energy source (Tirta et al. 2013), Sago (*Metroxylon sp*) is a potential food ingredient, which can create productive carbohydrates (Haryanto et al. 2015). The people of Pelang Hamlet are very productive. Some make crafts from sago leaves (*Metroxylon sp*) for roofs of houses (Sisriyenni, D., Simanjuntak, A., & Adelina, T. (2017) Besides that, Sago leaves (*Metroxylon sp*) are woven for mats (Nurhaedah M 2014) while Sago leaf bones (*Metroxylon sp*) are used for broom sticks (Roswita 2018), the community uses

sago stalks (*Metroxylon sp*) to be processed into sago starch (Nurhaedah M. (2014) furthermore produced for food (Bantacut, T. 2011).

The potential in Pelang Hamlet other than Sago (*Metroxylon sp*) is Sungai Pelang. The river in Pelang Hamlet has very clear water, with beautiful views because the sun gai is surrounded by Sago plants (*Metroxylon sp*) which make the scenery cool and unspoiled. Based on this potential, the local community uses the area as a tourist object by giving priority to the charm of the river and Sago plants (*Metroxylon sp*) in the area. Pelang Hamlet was inaugurated as a Tourism Object in August 2018. Something that attracts tourists to visit Pelang Tourism, namely the charm of a clear river for swimming and surrounded by many sago trees (*Metroxylon sp*), besides that there is a water pool containing ornamental fish. feeding fish, photo spots in sago groves and rivers. In addition, tourists can enjoy food or drinks that have been provided in stalls around tourist attractions, and can buy souvenirs at souvenir stalls (Bantacut, T. 2011).

Apart from the natural potential of the Pelang area, tourism is also a sector that is not much different from other economic sectors (Susilawati 2016), the holding of tourist objects in the Pelang tourism development process also has an impact or influence in the economic, environmental, and social fields (Aryani et al. 2017). The resulting impact is in the form of positive and negative impacts (Aryani et al. 2017) to the community and the environment. The existence of tourism objects in the community's economy is increasing (2017), besides that, it can also reduce unemployment (Kurniawan 2017) and the cost of parking and tourism retribution. In terms of environmental aspects, after being used as tourism objects, it also has a negative impact on biodiversity (Khrisnamurti et al. 2016), one of which is the reduced diversity and population of Sago (*Metroxylon sp*). Sago (*Metroxylon sp*) has ecological benefits, sago gardens (*Metroxylon sp*) are able to absorb carbon dioxide and store in the form of biomass carbon (Alayubi Elya; Fauziah, Yuslim 2011) which functions to control floods and river abrasion, as a habitat for various river biota (Bintoro et al. 2018), (hasjim bintoro et al., 2020), the roots of the sago plant (*Metroxylon sp*) maintain water management, absorb water and mineral salts (Bintoro et al. 2018). In addition, the biodiversity of Sago (*Metroxylon sp*) is gradually decreasing (Tenda, E. T., & Miftahorrachman,. 2020) which can cause loss of germplasm sources to be very detrimental (Novariant, H, et al 2020), especially for plant breeders who want new varieties (Abbas, B., Bintoro, M. H., Sudarsono, , Surahman, M., & Ehara, H. 2015). Germplasm as a hereditary trait substance needs attention, not only collecting and maintaining, but also characterizing and evaluating its genetic and phenotypic diversity (Abbas, B., Bintoro, M. H., Sudarsono, , Surahman, M., & Ehara, H. 2015), (Limbongan, J. 2007). Information on genetic diversity is important to differentiate the genotype of individual intra and interspecies precisely which is very necessary in the development of plant breeding programs (Sumarno, N., & Zuraida, N. 2016), (Dewi. 2015). Meanwhile, another impact on the environment is a decrease in river water quality caused by fish feed (Azhari & Tomaso 2018) The river water with fish feces becomes polluted, and reduces the quality of the river's clean water (Azhari & Tomaso 2018).

One of the things that is important to note is the impact of the construction of a pelang tourism object that affects the biodiversity around it. One of them is Sago (*Metroxylon sp*). Based on this, it is necessary to conduct research on the diversity of sago (*Metroxylon sp.*) In the Pelang River as a tourist attraction. This research is a

preliminary study to identify the sago (*Metroxylon sp*) in the Pelang river which is needed in the development of sago tree plant breeding (*Metroxylon sp*).

2. Research Methods

2.1. Types and Methods of Research

This research has been carried out in Pelang Hamlet, Tahul Village, Merakurak District, Tuban, East Java during January 2021. This research is a quantitative descriptive study with the aim of obtaining data about the description of the diversity of sago plant species (*Metroxylon sp*) in the Pelang river area located in Pelang Merakurak Hamlet. The research location can be seen in Fig 1.

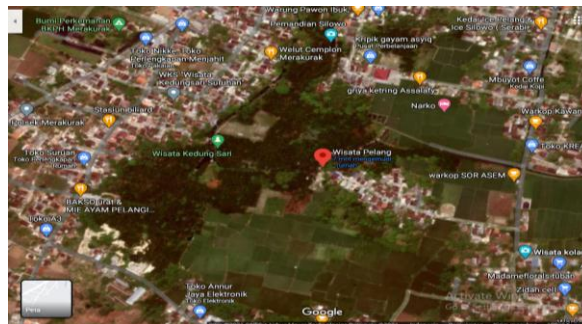


Fig.1. Map of Research Location
(Source: Google Maps Documentation)

2.2. Research Steps

The preparation stage is to determine the place of research to see conditions in the field. After that, we go to the stage of preparing the tools used in the research to identify the diversity of sago palms (*Metroxylon sp*) in the form of writing instruments; camera; as well as a handbook of various kinds of Sago (*Metroxylon sp*). Then proceed to the observation and calculation stage of Sago trees (*Metroxylon sp*) along the river around the Pelang river, as well as identification of Sago (*Metroxylon sp*) in the field by referring to Arif (Arif 2019) .

2.3. Data Collections And Analysis Technique

The data in this study were the diversity of sago (*Metroxylon sp*) plants along the Pelang River. The data is obtained by direct observation in the field which refers to Agusta (Agusta 2014) Data collection includes observations of the research site, and the types of sago trees (*Metroxylon sp*) found in Pelang Village, then counting the number of species and individual sago trees (*Metroxylon sp*). To see the diversity of sago trees (*Metroxylon sp*) based on morphological characteristics and habitat, then the collected sago trees (*Metroxylon sp*) were identified by referring to Arif's sago diversity manual (*Metroxylon sp*) (Arif 2019). Furthermore, data on sago diversity (*Metroxylon sp*) were

analyzed including the Sago diversity index (*Metroxylon sp*) and the Sago dominance index (*Metroxylon sp*) as follows:

2.3.1. Diversity Analysis

Diversity analysis was used to determine variations in the number of species and the number of individuals for each species of Sago (*Metroxylon sp*) in Pelang Hamlet, Merakurak Tuban. This analysis uses a species diversity index formula using the Shannon-Wiener concept (Botanri et al. 2018). The Shannon-Wiener diversity index can describe species diversity, it can also describe ecosystem productivity, stress on ecosystems, and ecosystem stability (Senewe et al. 2017).

$$H' = -\sum[(ni/N) X \ln (ni/N)] \quad (1)$$

Information :

- H' : Shannon-Wiener Diversity Index
- ni : Number of Individuals in a Species
- N : Total number of individual species found

Theoretically the Shannon-Wienne (H ') biodiversity index is defined as follows, if:

- a. $H' > 3$, it can be concluded that the biodiversity of this species is high
- b. $1 < H' < 3$, it can be concluded that the biodiversity of these species is moderate
- c. $H' < 1$, then the biodiversity index is categorized as very low. (Kuswantoro et al. 2018)

2.3.2. Dominance Analysis

Diversity analysis was used to determine variations in the number of species and the number of individuals for each species of Sago (*Metroxylon sp*) in Pelang Hamlet, Merakurak Tuban. This analysis uses a species diversity index formula using the Shannon-Wiener concept (Botanri et al. 2018). The Shannon-Wiener diversity index can describe species diversity, it can also describe ecosystem productivity, stress on ecosystems, and ecosystem stability (Senewe et al. 2017)

$$D = \sum (ni/N)^2 \quad (2)$$

Information :

- D : simpson dominance index
- ni : the number of individual species to i
- N : number of individuals across species

The domination index is categorized as follows:

- a. $0.00 < 0.50$, then the dominance index is categorized as low
- b. $0.50 < 0.75$, then the dominance index is categorized as moderate
- c. $0.75 < 1.00$, then the dominance index is categorized as high (Senewe et al. 2017)

3. Result And Discussion

3.1. Result of identification of Sago trees (*Metroxylon sp*)

Based on the identification results of sago trees in the natural tourism area of Pelang in Pelang Hamlet, Tahulu Village, Merakurak District, Tuban Regency, there are 762 individual sago trees (*Metroxylon sp*) which can be seen in Table 1. Furthermore, the sago tree diversity index calculation is carried out, the results are presented in Table 2, while the results for the dominance index are presented in Table 3.

Table 1. Types of Sago Trees (*Metroxylon sp*) obtained from Dusun Pelang Nature Tourism

No.	Local Name	Species Name	Number of Individuals
1	Pohon sago tuni	<i>Metroxylon rumphii Martius</i>	208
2	Pohon sago molat	<i>Metroxylon sago Rottb</i>	432
3	Pohon sago rotan	<i>Metroxylon microcanthum Mart.</i>	122
Total Number			762

Table 2. Sago Tree Diversity Index Result (*Metroxylon sp*)

No.	Species Name	Number of Species/ Individuals
1	<i>Metroxylon rumphii Martius</i>	0,3217
2	<i>Metroxylon sago Rottb</i>	0,3543
3	<i>Metroxylon microcanthum Mart.</i>	0,2932
Total Number		0,9692

Table 3. Sago Tree Dominance Index Analysis(*Metroxylon sp*)

No.	Species Name	Number of Species/ Individuals
1	<i>Metroxylon rumphii Martius</i>	0,0744
2	<i>Metroxylon sago Rottb</i>	0,3213
3	<i>Metroxylon microcanthum Mart.</i>	0,0256
Total Number		0,4213



Fig.2. Types of *Metroxylon sp* in the Pelang Tourism area, Merakurak District, Tuban Regency
a). *Metroxylon Sago Rott*, b). *Metroxylon Rumphii Martius*, c). *Metroxylon Microcanthum Mart*.
Source : Personal Documents

3.2. Discussion

Based on the data in Table 1, it shows that the number of Sago Tree species (*Metroxylon sp*) in Pelang Tourism were 762 types of Sago Trees found consisting of 3 species, namely *Metroxylon rumphii Martius*, *Metroxylon sago Rottb*, *Metroxylon microcanthum Mart*. From the *Arecaceae* family. The diversity of sago trees is dominated by *Metroxylon sago Rottb* sago, which is mostly found in the Pelang tourist area with a total of 432. Furthermore, *Metroxylon rumphii Martius* with a total of 208. *Metroxylon microcanthum Mart*. with the number 122.

Regarding the data on the results of sago tree species found in the Pelang Tourism area, it is necessary to know the morphology of the sago trees found. Morphology *Metroxylon rumphii Martius*, is a type of sago tree (*Metroxylon sp*) which has a very large size compared to other types of sago trees (*Metroxylon sp*) (Senewe, R. E., Triwidodo, H., Pudjianto, P., & Rauf, A. 2017). *Metroxylon rumphii Martius* tends to have a brownish color and root lengths ranging from 50 cm to 1.2 m. The trunk of *Metroxylon rumphii Martius* is about 7-16 meters and has a skin thickness of about 2- 3 cm (Kuswantoro, F., Luguayasa, I. N., & Sujarwo, W. 2018). The bark at the base of the stem is thicker than the bark at the middle or the tip of the stem. Diameter of about 40-60 centimeters. The leaves of *Metroxylon rumphii Martius* tend to have a bright green color. The petiole of *Metroxylon rumphii Martius* is prickly from the base to the tip, as well as the tip of the leaf. The length of the spines is close to 1–4 cm in sago saplings (*Metroxylon sp*) and the spines are very numerous and tight (Kuswantoro, F., Luguayasa, I. N., & Sujarwo, W. 2018) . The stem weight at harvest age is more than 1 ton. The pith is soft and the pith content is about 82% of the stem weight and the aci content is around 20%. The acai is white in color and has a delicious taste (Mardiyanti, D. E., Wicaksono, K. P., & Baskara, M. 2013). Each *Metroxylon rumphii Martius* tree can produce about 170-500 kg of dry aci (Haska, N. 1995).

Morphology Sago Molate (*Metroxylon sago Rott*) is a type of plantation crop. Has brownish red roots and has a length of about 20 cm to 1 meter. Stems about 10-14 m high, without spines, 40-60 cm in diameter and weighs near 1.2 tonnes or more (Novarianto, H, et al. 2020). This type of sago (*Metroxylon sp*) is not spiny, has tapered leaf tips that can injure people if touched. The leaves of sago molate (*Metroxylon sago*

Rott) tend to be yellowish green in color with a non-dense pattern. The pith is soft and has a white pattern, therefore the pickle is white and tastes good and is liked by the people (Uchida, N., Kobayashi, S., Yasuda, T., & Yamaguchi, T. 1990) . Pith weight is about 80% of the stem weight and aci content is close to 18% per tree can produce wet aci about 800 kilograms or about 200 kg dry aci molate sago starch production can reach up to 400 kilograms (Adawiyah, R Dan Muhammad, A. 2019) .

Metroxylon microcanthum Mart, this sago is known as rattan sago (Okazaki, M., Yonebayashi, K., Katsumi, N., Kawashima, F., & Nishi, T. 2013) . The height of the stem is about 8 m, and the diameter is about 40 centimeters. The length of the leaf stalk is about 6 m while the length of the leaf petals is about 3, 56 m. Each leaf stalk consists of 100-200 green leaves with a leaf length close to 130-147 cm and a leaf width of about 8, 6 centimeters. On the leaf stalk there are many thorns and on the edge of the leaf there are many thorns. Rattan sago has a relatively hard pith, contains a lot of fiber and is reddish in color with a minimum shaft content of only about 200 kg and tastes less delicious (Hariyanto, B. 2016) .

Based on Table 2, the identification results of sago tree species diversity (*Metroxylon sp*) found in the Pelang tourism area, namely 0.9692. In accordance with the criteria for the Shannon-Wenner diversity index value. Based on the analysis of the sago tree diversity index with the highest value of 0.3543 on the *Metroxylon sago Rottb* plant. Meanwhile, *Metroxylon rumphii Martius* with an index value of 0.3217, and *Metroxylon microcanthum Mart*. With a diversity index of 0.2932. So the sago tree diversity index (*Metroxylon sp*) is low. The low diversity index of sago trees is due to several factors that are intolerant of the environment due to human activities so that it can experience a decrease in sago tree species (Burhanuddin 2016). Diversity index is used to describe species diversity, it can also describe ecosystem productivity, stress on ecosystems and ecosystem stability (Senewe et al. 2017). The diversity of sago palms (*Metroxylon sp*) is also influenced by habitat type. The results of the calculation of the diversity index in Table 2 have illustrated that the diversity of sago trees (*Metroxylon sp*) found in pelang tourism objects is classified as low, due to excessive human activity which causes reduced sago diversity (*Metroxylon sp*). The factors that determine the existence of species or plant communities of the sago group are not only caused by physical and chemical factors, but both animals and humans also greatly affect the diversity of sago (*Metroxylon sp*) found in the pelang tourism area. In addition, the diversity index is also influenced locally by fires, floods, and periodic human intervention (Mohamad Noor dan Muhrizal Sarwani 1999).

The results of the dominance index calculation in Table 3, the dominance index value of sago palms (*Metroxylon sp*) found in pelang tourism objects, namely 0.4213. According to the concept of Simpson's dominance index (Mardiyanti et al. 2013), the sago dominance index found in pelang tourism objects is low. *Metroxylon rumphii Martius* with a dominance index of 0.0744, while *Metroxylon microcanthum Mart* with an index of 0.0256, and *Metroxylon sago Rott* with an index of 0.3213. This dominance index result further confirms that the condition of the sago palm tree (*Metroxylon sp*) in the pelang tourism object is classified as low. The domination index of sago trees in pelang tourism is low because there are no sago tree species that dominate and have almost the same individual values. Determination of the dominance index value using the Simpson method (Mardiyanti et al. 2013), if the value of dominance approaches the value of 1, the sago tree dominates in the area, whereas if the value approaches 0, the

sago tree in the Pelang tourism area is less dominant, it can be interpreted as a criterion low.

The continuous felling of sago trees (*Metroxylon sp*) in Pelang Hamlet has an impact on the environment and economy in the area. The impact on the environment is that it can damage the river water system, and this damage can lead to reduced biota in rivers and causes drought, besides that sago trees help absorb water flow and rainwater that enters the ground, experience a reduction in surface water volume and prevent flooding (Mulyani & Las 2008). Sago trees (*Metroxylon sp*) as protection means that where the sago trees grow, there is also a water source there (Mohamad Noor dan Muhrizal Sarwani 1999). In addition, it can reduce the germplasm of sago trees. Furthermore, the sago tree (*Metroxylon sp*) is economically classified as a multi-functional plant. In the area of Pelang Tourism, the community utilizes sago trees (*Metroxylon sp*), and almost all parts of the sago tree (*Metroxylon sp*) have a high economic sale value (Nurhaedah M 2014). These sections include leaves, fronds, frond skin, stem bark, stalk base, pith and papti of Sago (*Metroxylon sp*) (Hariyanto 2016). Sago leaves are used by the community as roofs of houses, midrib skins are woven into walls, the base of the midrib is used as baskets or baskets of Sago, the bark is used for firewood, fences, sago pith for organic fertilizer, fodder, and mushroom breeding media, while sago flour used for several foodstuffs (Haedar & Kasran 2017).

4. Conclusions

Based on research on the diversity of sago trees in Pelang tourism, Merakurak District, it consists of 3 types of sago trees, namely *Metroxylon rumphii Martius*, *Metroxylon sago Rottb*, and *Metroxylon microcanthum Mart* from the *Araceae* family, totaling 762 sago trees. Based on the value of the diversity index and the dominance index of the sago tree species are classified as not good enough or low due to excessive human activity in tourist attractions and the utilization of community economic support who take sago trees without choosing. In addition, the habitats of sago trees in Pelang tourism objects are decreasing or are no longer supported which are used for renovation of tourist objects. So as residents around Pelang villages and tourists, they should protect the preservation and diversity of the sago tree so that it does not become extinct in the future as well as a source of germplasm that is not lost.

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