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The Diversity of Undergrowth Species on Revegetation Land of Post Coalmines at PT. Khotai Makmur Insan Abadi (PT. KMIA) in Separi Village, Tenggarong Seberang District, Kutai Kartanegara Regency

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Abstract:- This study was motivated by the importance of the presence of a species on revegetated land of former coal mines to help the success of reclamation. Coal mining activities have caused significant environmental degradation, affecting ecosystem structure and biodiversity in revegetated land.

This study aims to determine the types of undergrowth species that are present on revegetated land of former coal mines at PT. Khotai Makmur Insan Abadi (PT. KMIA) in Separi Village, Tenggarong Seberang District, Kutai Kartanegara Regency.

The expected results of this study are to provide information on the number and types of undergrowth species present on revegetated land of former coal mines.

This study was conducted by identifying the undergrowth species present in revegetated land, as well as analyzing vegetation diversity and environmental stability. Field data collection was carried out on plots with a size of 20m x 20m, as many as 4 pieces with a distance of 5 m per plot. to identify and count the types of lower plants present in the research plot using the PlanNet application. The PlanNet application is an application used to identify a plant species, by taking pictures of plants. Data analysis was done quantitatively and qualitatively descriptive. Quantitative analysis was conducted to explain the diversity and structure of plant vegetation. The parameters used in quantitative analysis are Relative Density (RD), Relative Frequency (RF), Important Value Index (INP), and species diversity index (H').

Based on the results of research and data processing that has been done, it can be concluded that: there are 13 species of lower plants found in the research plot, with a total of 2,232 individuals of lower plants. 13 species of lower plants include: Asystasia gangetica as many as 1. 073 individuals, Eupatorium inulifolium 260 individuals, Imperata cylindrica 41 individuals, Melastoma malabathricum L 447 individuals, Sceleria puspurascens 373 individuals, Mimosa pudica 31 individuals, Lycopodiella cernua 133 individuals, Nephrolepis biserrata 17 individuals, Dicranopteris linearis 177 individuals, Clidemia hirta 11 individuals, Saccharum spontaneum 44 individuals, Ottochloa nodosa 620 individuals, and Merremia peltata 5 individuals. Lower plants that have the highest Index of Important Value (NIP) of the 13 species found are Asystasia gangetica which is 50.59% which is included in the high category, and a diversity index value of 0.99, this indicates that the diversity of species is low and the vegetation community with environmental conditions is less stable. Based on the results of the research that has been carried out, it is recommended to conduct further research to investigate the relationship between environmental factors and the success of pioneer plant regeneration, and to carry out ecosystem restoration practices to increase the diversity of undergrowth species on revegetated land.

Keywords:- *Coal Mining, Revegetation, Undergrowth Species.*

I. INTRODUCTION

The mining sector contributes greatly to the economy and drives national development in Indonesia (Setyowati et al., 2017). In addition to contributing well to the country, mining activities also cause various damage to the environment. Mining activities that use an open-pit mining model cause land damage such as altered soil structure and texture and loss of biodiversity. Mining activities can damage the initial condition of the land, affect hydrological functions in the soil, and can reduce the level of soil productivity (Pasambuna et al., 2017).

Mining activities cause various disturbances to the land, namely in the form of damage to soil physical characteristics such as structure, texture, porosity and density which have an important role for plant growth. Damaged soil structure has an impact on the lack of soil's ability to store and absorb water in the rainy season so that it can cause soil erosion. Vice versa, in the dry season the soil will be difficult to cultivate because the soil becomes hard and dense. The main problem on post-mining land is the loss of *top soil*, which causes the loss of essential nutrients, such as nitrogen and phosphorus that are needed by plants. Soil microbial populations will also be disrupted due to land conditions damaged by mining activities. This situation will indirectly affect plant growth on the land (Prayudyaningsih and Sari, 2016).

Mining also affects the state of the earth and the environment. In addition to damaging the initial condition of the soil, mining can also affect the performance of hydraulic functions in the soil, and can reduce the level of soil productivity (Patiung, 2011).

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Reclamation of ex-mining land is not an easy task, let alone to assess its success rate, considering that the time factor determines the vegetation growth process in addition to many other factors. The goal is not only to improve unstable and unproductive land and reduce surface erosion, but also in the long term it is expected to improve the microclimate, restore biodiversity and improve land conditions to a more productive direction.

Revegetation is an effort or replanting of ex-mining land. According to Permenhut No.P 4/Menhut-II/2011, revegetation is an effort to improve and restore vegetation cover through planting and maintenance activities. Revegetation is an activity of replanting into ex-mining land as an effort to avoid land erosion, build habitat for wildlife, biodiversity, improve soil productivity and stability, improve environmental conditions. Revegetation aims to increase soil cover as an erosion operator and ultimately restore organic matter and soil fertility.

Undergrowth species is a type of basic vegetation found under forest stands except tree saplings. Undergrowth species include grasses, herbs, shrubs and ferns. The presence of understory vegetation on the forest floor can function as a barrier to rainwater and surface flow so as to minimize the danger of erosion. After that, understory vegetation plays an important role in the forest ecosystem and determines the microclimate (Destaranti, et al., 2017).

Undergrowth species have a very important role in the ecosystem, including in nutrient cycling, reducing erosion, increasing infiltration as a source of germplasm, a source of medicine, animal feed and forest animals, as well as other unknown benefits. The role in the nutrient cycle of undergrowth species is used as an indicator of soil fertility and the producer of serasa in improving soil fertility, in reducing erosion the presence of undergrowth species can withstand the blow of rainwater and surface flow (Ason, et al., 2018).

The presence of a plant species in a certain place is influenced by environmental factors that are interrelated with one another, including climate, edaphic (soil), topography and biotic. The distribution of species is indirectly influenced by the interaction between the vegetation itself, temperature, air humidity, physico-chemical soil that produces certain environmental conditions that cause the presence or absence of a species and spread with a diverse level of adaptation (Nahdi and Darsikin, 2014).

II. METHOD

A. Place and Time of Research

This research was conducted on revegetation land of former coal mines at PT Khotai Makmur Insan Abadi (PT KMIA) which is 4 years old in Separi Village, Tenggarong Seberang District, Kutai Kartanegara Regency. The time required in this study was 2 months, held in June and July 2024, which included literature study activities, field orientation, preparation of tools and materials, making research plots, observation and identification, data processing, and preparation of research results.

B. Materials and Tools

The tools used include:

- Stationery for writing research results
- Camera to document activities.
- Meter to measure the plot.
- Raffia rope for making plot boundaries.
- Tally sheet to record observations of pioneer and undergrowth species.
- Machete to pave the way
- Compass to determine the direction in plotting

The materials used in this study are:

The materials used in this study are undergrowth species.

C. Research Methods

The research procedure has the following work sequence:

➢ *Field orientation*

Field orientation is carried out as a predecessor study whose purpose is to determine the work system in research and obtain a clear picture of the situation and conditions of the research area.

➢ *Literature study*

Literature study is carried out to gain an understanding of the object to be observed.

➢ *Administrative licensing*

Administrative settlement is carried out to apply for permission to carry out research

➢ *Preparation of tools and materials*

Prepare all tools and materials that will be used in data collection in the field.

➢ *Determination of Research Plots*

Making sample plots for undergrowth species observations in areas that have been determined purposively with a size of 20m x 20m as many as 4 plots, with a distance of 5 m plots, which are on the right and left sides of the road.

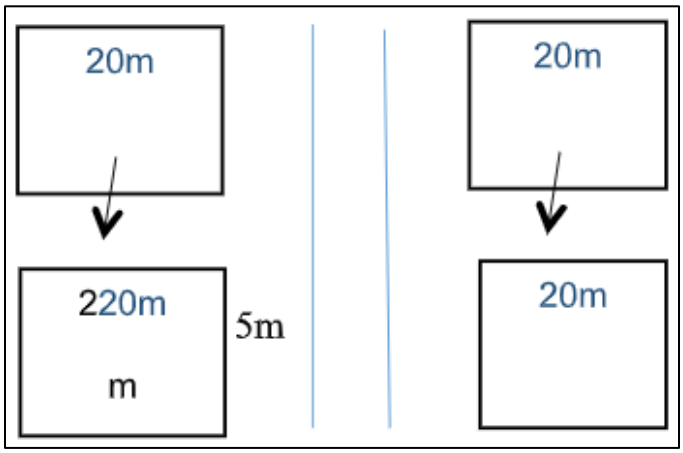

Fig 1: Research Plot Model

➢ *Identify and count*

Identify and count the undergrowth species present in the study plots using the *PlanNet* application. The *PlanNet* application is an application used to identify a plant species, by taking a picture of the plant.

D. Data Processing

Data were analyzed quantitatively and descriptively qualitatively. Quantitative analysis was conducted to explain the diversity and structure of plant vegetation. The parameters used in quantitative analysis are Relative Density (RD), Relative Frequency (RF), important value index (INP), and species diversity index (H') (Indriyanto, 2018).

➢ *Density (D)*

Density (D) Density is the number of individuals per unit space. The density in this study is calculated based on the number of individuals of a plant species per unit area of the sample plot. The term density is often used for the purpose of analyzing the plant community which is given the notation K. The density value and relative density (RD) of each species to the total density can be calculated based on the following formula:

$$RD = \frac{\sum \text{individuals of a species}}{\sum \text{individuals of all species}} \times 100\%$$

➢ *Frequency (F)*

Frequency is used to express the ratio between the number of samples containing a particular species to the total number of observation samples. The frequency of plant species is the number of sample plots where a species is found out of all sample plots made. Frequency indicates the level of distribution of a particular species in the observation location. Frequency and relative frequency (RF) values can be calculated based on the following formula:

$$RF = \frac{\sum \text{frequency of a species}}{\sum \text{frequency of all species}} \times 100\%$$

➢ *Important value index (INP)*

The important value index is a quantitative parameter that can be used to express the level of dominance (mastery) of species in a plant community. INP is the sum of the relative density (RD), relative frequency (RF) and relative cover area (CR) values (Indriyanto, 2018). The formula was used to calculate INP in the sapling, pole, and tree phases of the tree community. INP calculations in the seedling phase and undergrowth species communities only add up the relative density (RD) and relative frequency (RF) values. The INP formula for the undergrowth species community and seedling phase is as follows:

INP = KR+FR

Description:
INP = Important value index
RD = Relative Density
RF = Relative Frequency

Fachrul (2007), states that the INP value categories are as follows:

- INP> 42, 66% is categorized as high
- INP 21.96% - 42.66% medium category
- INP < 21.96% low category

➢ *Species Diversity Index (H')*

The species diversity index describes the characteristics of community levels based on their biological organization. Species diversity can also be used to express community structure and community stability in an ecosystem. The value of the species diversity index (H') (Indriyanto, 2018).

The formula for the species diversity index (Shanon-Wiener index):

$$H' = \frac{ni}{N} \frac{ni}{N} - \Sigma \log$$

Description:
H' = Shannon-Winner diversity index
n_i = Number of individuals of a species i
N = Total number of individuals of all species
To measure biodiversity, the Shannon-

Whiener index (H') is used, which is divided into three criteria (Magguran, 1988):

- H'<1.5 indicates low species diversity,
- H'=1.5-3.5 shows the diversity of species classified as medium
- H' > 3.5 indicates high diversity.

Soerianegara and Indrawan (2005), stated that if it is associated with environmental stability, the Shannon-Whiener index is divided into 3 with criteria:

- H' < 1, then the vegetation community with less stable environmental conditions.
- H'between 1-2, then the vegetation community with stable environmental conditions.
- H' > 2, then the vegetation community with very stable environmental conditions.

III. RESULTS AND DISCUSSION

Based on the results of research and data processing, there are 13 species of lower plants with a total of 3,232 individuals present in the revegetation of the former coal mine of PT Khotai Makmur Insan Abadi. For more details, see Table 1 below.

Table 1. Results of Analysis of Undergrowth Species Present in Revegetated Former Coal Mine Land

No	Plant Name	Botanical Name	Number of Plants (N)	Number of Plots attended (F)	RD (%)	RF (%)	INP (%)	SDR
1	Israeli Grass	*Asystasia gangetica*	1.073	4	33,19	17,39	50,59	25,29
2	Siam Weed	*Eupatorium inulifolium*	260	2	8,04	8,69	16,74	8,37
3	Reeds	*Imperata cylindrica*	41	1	1,26	4,34	5,61	2,80
4	Senduduk	*Melastoma malabathricum* L	447	2	13,83	8,69	22,52	11,26
5	Rija-Rija	*Sceleria puspurascens*	373	3	11,54	13,04	24,58	12,29
6	Humble Plant	*Mimosa pudica*	31	2	0,95	8,69	9,65	4,82
7	Wire Spike	*Lycopodiella cernua*	133	1	4,11	4,34	8,46	4,23
8	Giant Sword Fern	*Nephrolepis biserrata*	17	1	0,52	4,34	4,87	2,43
9	Rasam fern	*Dicranopteris linearis*	177	2	5,47	8,69	14,17	7,08
10	Haredong Bulu	*Clidemia hirta*	11	2	0,34	8,69	9,03	4,51
11	Kans Grass	*Saccharum spontaneum*	44	1	1,36	4,34	5,70	2,85
12	Crocodile nest grass	*Ottochloa nodosa*	620	1	19,18	4,34	23,53	11,77
13	Mantangan	*Merremia peltata*	5	1	0,15	4,34	4,50	2,25
	Jumlah		3.232	23	100	100	200	100

Based on the results of observations in the field, the types of undergrowth species that are present on revegetated land of former coal mines at PT Khotai Makmur Insan Abadi as shown in Table 1 above. The most present plant is Israeli grass (*Asystasia gangetica)* and has the highest Index of Importance (INP) of 50.59%, including in the high category, then Crocodile nest grass (*Ottochloa nodosa*), senduduk (*Melastoma malabathricum L)* and rija-rija (*Sceleria puspurascens).*

The greater the INP value of a species, the greater the mastery of its community and vice versa. The mastery of species in a habitat indicates that the species can utilize most of the resources in the surrounding environment (Ismaini, 2016). The presence of a plant species in a certain place is influenced by environmental factors that are interrelated with one another, including climate, edaphic (soil), topography and biotic. The distribution of species is indirectly influenced by the interaction between the vegetation itself, temperature, air humidity, physico-chemical soil that produces certain environmental conditions that cause the presence or absence of a *species* and spread with varying degrees of adaptation (Nahdi and Darsikin, 2014).

From the results of the vegetation analysis carried out, a diversity index of 0.99 was obtained, this indicates that the diversity of species is low and the vegetation community with environmental conditions is less stable, this can be shown by how the presence of several species in the plant community can stabilize the ecosystem if species vary in plant responses to environmental fluctuations so that an increase in the abundance of one species can compensate for a decrease in the abundance of another species. Biologically diverse communities are also more likely to contain species that provide resilience to the ecosystem. The low diversity of understory plant species in this area was caused by previous activities, namely coal mining exploitation activities, this resulted in comprehensive ecosystem changes. Mining activities cause various disturbances to the land, namely in the form of damage to soil physical characteristics such as structure, texture, porosity and density which have an important role for plant growth (Prayudyaningsih and Sari,

2016). However, the presence of undergrowth species is very useful and plays a role in the nutrient cycle of undergrowth species as an indicator of soil fertility and litter producers in increasing soil fertility, in reducing erosion the presence of undergrowth species can withstand the blow of rainwater and surface flow (Hilwan).

The following is a description of the 13 species of undergrowth species found in the research plot in the revegetation of the former coal mine of PT Khotai Makmur Insan Abadi:

A. Israeli Grass (Asystasia gangetica)

A. gangetica is a type of semi-wild ornamental plant that belongs to the Asystasia genus. Asystasia gangetica is a plant that is found on the edges of roads, shrubs and fields (Karyati and Muhammad, 2018).

A. gangetica has the following classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Dicotyledoneae
Order: Tubiflorae
Family: Acanthaceae
Genus: Asystasia
Species: *Asystasia gangetica*

B. Siam Weed (Eupatorium inulifolium)

E. inulifolium is 1-2 m tall with rounded twigs. The layout of the leaves is opposite, triangular (triangularis), with the base gradually narrowing along the stalk and a fairly pointed tip (*apex acutus*), generally the edges of the leaves are coarsely*serrated* (*margo serratus*), the leaf surface is clearly hairy caused by trichomes which are abundant on the leaves and the underside is spotted like a gland. The type of flower is a*capitulum* or*half-capitulum* flower arranged in a flat panicle-shaped bouquet (Wahyuni, 2023).

E. inulifolium the following classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Dicotyledoneae
Order: Campanulales
Family: Asteraceae / Composite
Genus: *Eupatorium*
Species: *Eupatorium inulifolium*

C. Reeds (Imperata cylindrica)

I. cylindrica is a plant from the *Poaceae* tribe . This plant has a high adaptability, so it is easy to grow everywhere and often becomes a weed that harms farmers. Alang-alang weeds can reproduce vegetatively and generatively or grow on diverse soil types. *I. cylindrica* is a herbaceous plant, grass, creeping underground, erect stem forming one inflorescence, dense, on the book sparsely hairy. *I. cylindrica* is a perennial weed, with a widespread rhizoid system and stem height reaching 60-100 cm (Moenandir, 2010).

I. cylindrica have the following classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Monocotyledoneae
Order: Poales
Family: Poaceae
Genus: *Imperata*
Species: *Imperata cylindrica*

D. Rija-rija (Sceleria puspurascens)

S. purpurascens is a grass-like plant that belongs to the teki-tekian tribe. It has the characteristics of a sturdy stem, smooth or slightly kasap. The leaves in the middle of the stem form a false wreath, 3-5 strands, getting narrower and narrower, darker on the edges and on the upper side of the central leaf blade, the midrib is narrow, bald or hairy, wingless or with rather wide wings (Karyati and Muhammad, 2018).

S. purpurascens has the following classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Monocotyledoneae
Order: Glumiflorae
Family: Cyperaceae
Genus: *Scleria*
Species: *Scleria puspurascens*

E. Wire Spike (Lycopodiella cernua)

L. cernua have fibrous rhizome roots. The stem is creeping, the stem has erect branches, climbing up to 1 m. The shape of the pale green sterile leaves is almost triangular, curved towards the tip of the stem, the edges are flat, and the tips of the leaves are sharply pointed. This Pteridophyta habitat lives on the ground or terrestrial surface (Ridha Wahyuni, 2022).

L. cernua have the following classification:
Kingdom: Plantae
Division: Traceophyta
Class: Lycopodiopsida
Order: Selaginellales
Family: Selaginellaceae
Genus: *Lycopodiella*
Species: *Lycopodiella cernua*

F. Senduduk (Melastoma malabathricum L.)

M. malabathricum L. plant is a tribe of *melastomataceae* which is generally a shrub, shrub or tree. Leaves are opposite or crenate, single, usually with 3-9 curved bones, rarely pinnate without supporting leaves. *M. malabathricum* L. is a shrub, 0.5 - 4m tall, young branches scaly. Leaves are stalked, opposite, elongated or elongated ovate with a pointed tip, bony leaves 3-20 by 1-8 cm. Both sides are hairy. Flowers clustered

at the ends of branches, light purple in color, flowering throughout the year. Chunky fruit, light brown skin, round like a flower vase. Purple flesh, sweet taste, there are many seeds on the fruit skin, ripe fruit skin cracked. *M. malabathricum* L reproduces by seeds (Tjitrosoepomo, 2004). *M. malabathricum* L. grows wild in open or sheltered land, on dry or moist soil.

M. malabathricum L. has the following classification:
Kingdom*:* Plantae
Division: Spermatophyta
Class: Discotyledoneae
Order: Myrtales
Family: Melastomatacea
Genus: *Melastoma*
Species: *Melastoma malabathricum* L.

G. Humble Plant (Mimosa pudica)

M. pudica plant has a distinctive feature in the form of small jagged leaves commonly called compound leaves, and there are thorns on the stem. So you have to be careful if you want to touch the shy daughter plant. This shy daughter plant is included in legumes. The leaves that are arranged in small pieces usually have an arrangement of leaflets of approximately 5 to 26 pairs for each leaf fin. Each leaf blade of the shy daughter plant has an elongated shape with a pointed tip and a rounded base. The leaves of the shy princess plant have a fairly small size, only about 6 to 16 mm in length and 1 to 3 mm in length (Keim et al., 2020).

M. pudica has the following classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Angiosperms
Order: Rosales
Family: Mimosaceae
Genus: *Mimosa*
Species: *Mimosa pudica*

H. Rasam fern (Dicranopteris linearis)

D.linearis syn*.* *Gleichenia linearis* is a large species of fern that commonly grows on roadside cliffs in the mountains. This plant is easily recognized because of its two-lined pinnate leaves and dichotomously branched stems.

D.linearis is known as an invasive plant in some places because it dominates the soil surface causing other plants to be inhibited from growing. It can be found in almost all tropical and subtropical regions of Asia and the Pacific. Its habitat is shady and damp cliffs ranging in altitude from 200 m to 1500 m above sea level.
In the past, its leaf stalks were used as pens.

Morphology description *D.linearis,e*ach midrib has oblong green leaves 3-7 cm long. The fronds are between 10-20 cm long depending on the age of the tree and habitat. Some references state that there are resam trees that are up to 70 m (20 ft) tall by growing on other trees. The ability of the trunk and leaves of resam to be crossed and dense causes it to prevent the growth of other trees in areas where it grows very densely.

Role *D.linearis*, this plant is very useful because it can fertilize the soil. This plant is able to absorb toxins around the place where it grows.

Resam is known as an invasive plant in some places because it dominates the soil surface causing other plants to be inhibited from growing.

Benefits *D.linearis*, used as an ornamental plant in homes. Can also be used for building poles, peacock tails,, some are even used for green fertilizer, for medicines, Some are used for vegetables, Some are used for scrubbing and cleaning tools, Even in ancient times the fossils of this fern form coal which can be used for fuel.

D.linearis have the following classification:
Kingdom: Plantae
Division: Polypodiophyta
Class: Polypodiopsida
Order: Gleicheniales
Family: Gleicheniaceae
Genus: *Dicranopteris*
Species: *Dicranopteris linearis*

I. Haredong Bulu (Clidemia hirta)

C. hirta usually grows 0.5-3 m tall, but sometimes reaches a height of 5 m, depending on the habitat. In shadier habitats, it grows much taller than in open areas, where it usually grows less than 1 m tall. Younger stems are round and covered in large, stiff, brown or reddish colored hairs.

C. hirta has the following classification:
Kingdom: Plantae
Division: Monognoliophyta
Class: Monolipsida
Order: Myrtales
Family Melastomataceae
Genus: *Clidemia*
Species: *Clidemia hirta*

J. Mantangan (Merremia peltata)

M. peltata has leaves that are heart-shaped to round, smooth leaf texture. The base of the mantangan leaves is round or heart-shaped. It has maroon leaves when the leaves are young. The bones of the mantangan leaves are pinnate and have a maroon color, this is clear on the back of the *M. peltata* leaves. A distinctive feature of this leaf is that the petiole is in the center or peltate. This mantangan leaf can grow to a width of about 7 cm to 30 cm (Diniah, 2022).

M. peltata has the following classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Dicotyledoneae
Order: Tubiflorae
Family: Convolvulaceae
Genus: *Merremia*
Species: *Merremia peltata*

K. Kans Grass (Saccharum spontaneum)

Annual rhizome with a height of 1 m to 4 m or more. Leaves are hard and stiff, 20 cm long or more, pinnate, usually purplish in color, smooth, twigs are round or triangular, about 2mm long, covered with short hairs. Straight pointed leaves, 50-90cm long and 5-5'(-40mm) wide, with smooth leaf surface and rough leaf margins. The panicles (compound bunches) of inflorescence are 20-60 cm long and each bundle measures 3 to 15 cm.

S. spontaneum has the following classification:
Kingdom: Plantae
Division: Magnoliophyta
Class: Liliopsida
Order: Cyperales
Family: Poaceae
Genus: *Saccharum*
Species: *Saccharum spontaneum*

L. Crocodile Nest Grass (Ottochloa nodosa)

O. nodosa which is one type of weed that can grow evenly and has a very fast spread compared to other types of weeds (Bidang & Dan, 2019).

O. nodosa has the following classification:
Kingdom: Plantae
Division: Magnoliophyta
Class: Liliopsida
Order: Poales
Family: Poaceae
Genus: *Ottochloa*
Species: *Ottochloa nodosa*

M. Giant Sword Fern (Nephrolepis biserrata)

N. biserrata is a perennial fern. The leaves of *N. biserrata* reach up to 2.5 m in height. The petiole is sparse to medium with reddish to light brown hair-like scales. The leaf blade has moderately spaced scales of a single color. The pinnae are up to 23 cm long, 2 cm wide, attached to each other 3.5 cm apart. The leaf margins are finely double serrated and densely pubescent on the underside. The tips of the leaves are long and pointed; the veins of the leaves have dense erect hairs, short tangled hairs, or rarely bare on the upper surface. The indusia is circular to horseshoe-shaped. Finally, bulbs are never present in this species.

Kingdom: Plantae
Division: Pteridophyta
Class: Pteridopsida
Order: Polypodiales
Family: Polypodiaceae
Genus: *Nephrolepis*
Species: *Nephrolepis biserrata*

IV. CONCLUSION

- There are 13 species of undergrowth species found in the research plot, with a total of 2,232 individuals of lower plants. 13 types of lower plants include: *Asystasia gangetica* as many as 1. 073 individuals, *Eupatorium inulifolium* 260 individuals, *Imperata cylindrica* 41 individuals, *Melastoma malabathricum L* 447 individuals, *Sceleria puspurascens* 373 individuals, *Mimosa pudica* 31 individuals, *Lycopodiella cernua* 133 individuals, *Nephrolepis biserrata* 17 individuals, *Dicranopteris linearis* 177 individuals, *Clidemia hirta* 11 individuals, *Saccharum spontaneum* 44 individuals, *Ottochloa nodosa* 620 individuals, and *Merremia peltata* 5 individuals.
- Undergrowth species that have the highest Index of Important Value (NIP) of the 13 species found are *Asystasia gangetica* which is 50.59% which is included in the high category, and the diversity index value of 0.99, this indicates that the diversity of species is low and the vegetation community with environmental conditions is less stable.

V. ADVICE

Based on the results of the research that has been carried out, suggestions that can be conveyed are: to conduct further research to investigate the relationship between environmental factors and the success of pioneer plant regeneration, and to carry out ecosystem restoration practices to increase the diversity of undergrowth species on revegetated land.

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