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Diversity of Ferns: Identification of Types Pteridophyta In Batang Gadis National Park, North Sumatera, Indonesia

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Abstract

The diversity of ferns is very high, especially in Indonesia. Ferns (Pteridophyta) are a division of the kingdom Plantae whose members have true roots, stems and leaves, as well as carrying vessels. Ferns (Pteridophyta) live in moist areas (hygrophytes) both epiphytes (attached to trees, wood, rocks) and terrestrial (soil). The diversity of ferns is related to altitude and other abiotic factors such as temperature, pH, humidity and light intensity. This research used qualitative methods through fern exploration activities in the Batang Gadis National Park. The research results obtained 8 types of ferns.

Keywords: Diversity, Fern, Identification, National Park, Pteridophyta

INTRODUCTION

Beauty Indonesia's vast nature and conditions and diverse climates create a supportive environment for growth of various plant types. A country that has diverse very tall plants is Indonesia. This is one of them Because of location Geographically, Indonesia is on the equator (Anwar & Harahap, 2021; Harahap, 2023). Globally, Indonesia is the second country with diversity tallest plant after Brazil. Indonesia has a territory of 750 million hectares with a wide landmass of 193 million hectares (24.7%). On the mainland, there is a forest area of 143.9 million hectares (approximately 75%) of wide land **(**Nofitasari, 2024; Hidayah & Mahmud, 2024; Aini, 2023; Harahap et al., 2019; Harahap, Komala, & Ristanto, 2020).

Pteridophyta or polypodiophyta is one of the flora groups in Indonesia with diversity and wide distribution. Ferns are spore-bearing chromus plants which are characterized by curled young leaves (Ballo, Zacharia, & Nge, 2024) has the distinctive characteristic of having

true stems, roots, and leaves (Dani, Suleman, & Febriawan, 2024) so they are called cormophyta plants. This group of plants has experienced various morphological and physiological changes which have made it a very diverse group of plants (Praptosuwiryo et al., 2019). Characteristics such as leaf shape, leaf type, spore shape and other morphological details can provide deep insight into the uniqueness of each type. The growth and distribution of ferns is largely due to climate. Ferns require sunlight and live in open places, are widely distributed, some live in groups, are solitary and climb, are often found in terrestrial and aquatic areas, and even stick to trees (Tri, 2022).

The forest is a large earth place of various animal life, vegetation, yield mines, and various sources of Power that don't have priceless prices for humans and about 28,000 species of plants. One of the group plants rich in the type is Pteridophyta, that is with more than 10,000 types (Akbar, Muhimmatin, & Nugrahani, 2023; Majid, Ajizah, & Amintarti, 2022; Andriyani & Nurza, 2021; Raihandhany, Primasongko, Nuraeni, & Jaelani, 2024).

Pteridophyta in the world is estimated to have 10,000 types, Indonesia there are around 2,197 types or around 22% of the Pteridophyta that grow, and as many as 630 types among them found on the island of Java, so Batang Gadis National Park has strategic meaning in a way local, national and global with content good biodiversity as well as non -biological and potential source Power natural as well as services a very rich environment that gives Power pull various parties to take advantage of it. Pteridophyta is one potency source of Power natural, especially the flora found in the Batang Gadis National Park area**.** Pteridophyta epiphytes are Pteridophyta growing on top surfaces of other plants or objects or other things. Plant epiphytes are significant from all types of plants that can be found in the forest tropical. Although only something group small plant. (Handayani, 2021; Tambunan, 2022; Marpaung, 2019; Adlini, 2021).

Ferns can be divided into two main parts, namely vegetative organs consisting of roots, stems, rhizomes, and leaves. Meanwhile, the generative organs consist of spores, sporangium, antheridium and archegonium (Naiym & Munir, 2024; Saputro & Sri, 2020). The spikes grow with some factors such as temperature, intensity of light, soil, and altitude (Khasanah, Purwanto, & Nugroho, 2023). Plant Pteridophyta are very happy with moist and varied conditions. This plant has an important role in balancing the ecosystem of forests. There is One of the existing plants is Pteridophyta, with more than 10,000 types.

The diversity of Pteridophyta is very tall. This matter is proven with the existence of species data Pteridophyta. According to Sandy, there are nearly 10,000 types of Pteridophyta known in the world, with more of 1,300 types found in Indonesia. Pteridophyta functions as a

helpful ecology guard and balances ecosystem of forest by preventing erosion, controlling water systems, and helping the weathering process feel like a forest (Harahap, Ristanti, & Komala, 2020). Pteridophyta can be found in the area tropical and subtropical with different heights, with habitats on the ground, vines, and also epiphytes (Trevisan et al., 2022; Silva et al., 2024; Ibrahim, Gurnita, & Karima, 2024; Silva, Ferreira, Ilkiu-Borges, & Fernandes, 2020).

Pteridophyta are used as ornamental plants, foodstuffs, and medicines. However, not much information about the composition and diversity of ferns has been identified and disseminated. Identification is the initial process of classifying a plant. Plant identification can be done by asking an expert using a determination key, matching it with the picture in the flora book and using an identification sheet. If the plants have the same characteristics, they can be included in the same group (Ayunda, Ulfa., Hasibuan, & Harahap, 2023); Pranita et al., 2017). So in this case we do classification. The levels of plant classification from highest to lowest are kingdom, phylum, class, order, family, genus, and species.

For That need exists expansion research about the plant Pteridophyta in various places, for one namely Batang Gadis National Park. This park has a limited HPT and T and Production Forest Still area of 108,000. This matters by function. The main focus of Batang Gadis National Park is place research, place protection of animal rarity and sustainability, place settled species endemic, as well as a meeting zone or hybridization of miscellaneous type animals. Based on the above needs done study on the diversity of Pteridophyta in Batang Gadis National Park.

RESEARCH METHODS

A study was carried out at Batang Gadis National Park Sopo Tinjak Resort 6 Regency Mandailing Natal, North Sumatera in May 2023. The research methods used is qualitative research methods through activity exploration of Pteridophyta in the Batang Gadis National Park area. The area covers approximately 108,000 hectares or 26% of the total area regency Mandailing Christmas. The implementation of this research is divided into four steps namely a survey to obtain information about Pteridophyta. As for data collection on observation and use tools such as notebooks, cellphones and pens. Data collection is carried out by gathering various types of Pteridophyta existing in the Batang Gadis National Park area, or identification from the classification of plant location of growth, characteristics, and morphology leaves (shape, color). Then the data is obtained from the results of observations that are analyzed.

RESULTS AND DISCUSSION

Pteridophyta is a growing plant that thrives in humid environments. As for morphology Pteridophyta starts from roots, stems, and leaves. Plant epiphytes are significant from all types of plants that can be found in the forest tropical. Based on observations at resort location 6. The research results show There are Lots types of Pteridophyta but it is the most frequently encountered there are 8 types that are Although only something group small plants. According to the method, his life Pteridophyta is divided into 2 of them epiphetic and terrestrial.

The ferns that are often found in Batang Gadis National Park are predominantly epiphytic ferns. Epiphytic ferns are ferns that grow on the surface of other plants or on other objects. Epiphytic plants constitute a significant portion of all plant types that can be found in tropical forests. Although only a group of small plants. The spikes grow with some factors such as temperature, intensity of light, soil, and altitude (Khasanah, Purwanto, & Nugroho, 2023; Sofiyanti & Harahap; 2019; Listiyanti, Indriyanti, & Ilmiyah, 2022). Plant Pteridophyta are very happy with moist and varied conditions.

Pteridophyta-growing plants thrive in humid environments. However, morphology from Pteridophyta starts from roots, stems, and leaves (Febriyani, Hutasuhut & Handayani, 2022). The research we found in the Batang Gadis National Park area was 8 types of Pteridophyta from resort location 6. Pteridophyta has enormous diversity, as well as a lot of potential and benefits, function ecologically helpful to guard the balanced ecosystem forest by preventing erosion, controlling water systems, and helping the weathering process feel like a forest. Research results show There are Lots types but most often found are 8 types, viz *Lygodium microphyllum, Dicranopteris linearis, Nephrolepis biserrata, Christella dentate, Pteris fauriei hieron, Selaginella doederleinii hieron, Histiopteris incise, Dicksonia sp.* can be seen in the following table:

Table 1. Type of Pteridophyta

Species Name	Picture	Classification
1. Lygodium microphyllum		Class : Polypodiopsida Order : Schizaeales Family : Lygodiaceae Genus : Lygodium Species : *Lygodium microphyllum*

2. Dicranopteris linearis		Class : Polypodiopsida Order : Gleicheniales Family : Gleicheniaceae Genus : Dicranopteris Species : *Dicranopteris linearis*
3. Nephrolepis biserrate		Class : Polypodiopsida Order : Polypodiales Family : Nephrolepidaceae Genus : Nephrolepis Species : *Nephrolepis biserrata*
4.Christella dentata		Class : Polypodiopsida Order : Polypodiales Family : Thelypteridaceae Genus : Christella Species : *Christella dentata*
5. Pteris fauriei hieron		Class : Polypodiopsida Order : Polypodiales Family : Thelypteridaceae Genus : Pteris Species : *Pteris fauriei hieron*

6.Selaginella doederleinii		Class : Lycopodiopsida Order : Selaginellales Family : Selaginellaceae Genus : Selaginella Species : *Selaginella doederleinii*
7.Histipteris incise		Class : Polypodiopsida Order : Polypodiales Family : Dennstaedtiaceae Genus : Histiopteris Species : *Histiopteris incisa*
8. Dicksonia sp.		Class : Polypodiopsida Order : Cyatheales Family : Dicksoniaceae Genus : Dicksonia Species : *Dicksonia sp*

Based on observations at the research location, factors abiotic factors are very influential to the dominant something plant Spike, the average temperature in Batang Gadis National Park is 22°C. Temperature is a factor controller distribution something vegetation. A temperature of 21–27°C is the Unique optimal temperature for the growth of Pteridophyta that

live in the area tropical. High light intensity causes the transpiration process to be faster with reduced air humidity (Pradipta, Hariani, & Novenda, 2023; Rizky, Primasari, Kurniasih, & Vivanti, 2019).

Other abiotic factors are soil pH and wind which also influence the growth and development of ferns. Live ferns like a soil pH of around 6-7. (Pramudita et al., 2021), wind speed will help the distribution and heterogeneity of ferns, namely influencing the spread of spores. The higher the wind speed, the farther the spores will spread (Imaniar et al., 2017). The last type found is *Aspelinium Affine SW*. Pteridophyta lives in a place moist, in a sheltered place, and also in a place open, to say the least Pteridophyta type *Aspelinium Affine SW* found Because influenced by where he lives.

Batang Gadis National Park area is one of the ecosystem's most humid forests, with a humidity of 73%. Found a lot of types of Pteridophyta caused condition suitable forest with growth Pteridophytes. The ideal state of humidity air for the growth of Pteridophyta is humidity by 50%-80%. If any community contains Lots of species in various families, that is considered its diversity of tall species (Febriyani, Hutasuhut & Handayani, 2022).

Lygodium microphyllum is a fern with colored rhizomes chocolate old and climbing leaves growing leaves No uncertain, long up to 30 m (90 times); rachi main stalk leaves above stalk leaves) thin, like stem. The leafy branch from the bone lateral main (the pinnae) once compound, the whole line oval, 5-12 cm (2-5 inches) long. Leaflets (pinnules) usually No hollow, stalked, articular (leaving skinny stems if regardless), network sheets leaf usually bald in parts lower; leaflet fertile with size similar, limited lobe small network leaves covering sporangia along edge leaf. In its distribution area, *Lygodium microphyllum* is generally found in stands of tree spruce, forest pine, meadow grass wetlands, sawgrass swamps, communities mangroves, and islands Everglades trees.

Within the roaming area naturally, *Lygodium microphyllum* is found in a variety of habitats including forest mesik, forest rain, and area swamp open, at heights 0 to more from 1000 m. The presence of *Lygodium microphyllum* correlated significantly with hydrology, coinciding with a wet environment, however, Not flooded in a way permanent. Additionally, the coverage plant the biggest fern occurs in an environment with light dim, which is evident in growth fertile and finally dominant (Rahmawati & Santhyami, 2023).

Dicranopteris linearis is a plant with frequent spikes found in forests tropical and subtropical. Plant This shaped leaves long and linear, with characteristic typically there are small “hairs” growing along the length edge of the leaves. Resam, rasam, or Pteridophyta andam (*Dicranopteris linearis syn. Gleichenia linearis*) is a type of the usual large

Pteridophytes that grows on cliffs at the edge roads in the mountains. Plant This is easily known Because its leaves are a pinnate double row and stem branching is ambiguous (dichotomous) (Surfiana, Kamal, & Hidayat, 2018). Resam is known as plant invasive in some places Because dominates surface land causing other plants are stunt its growth. Plant This can be found in almost all areas tropics and subtropics in Asia and the Pacific. The habitat is cliff-shady and damp starting at an altitude of 200 m to 1500 m above the surface sea.

Nephrolepis Biserrata is known as Pteridophyta harupat or Pteridophyta gray hair. This is Pteridophyta terrestrial living in place open. Drab leaves colored green young with child leaf shaped lancet, edge leaves flat, tip leaf pointed, base rounded with arranged sorus neat one line on the edge Pteridophyta. Pteridophyta This is often found in various area tropical and subtropical Worldwide. Pteridophyta This is used as plant ornamental in a pot or garden because the leaves are lush and shaped like a sword.

Christella dentate is a kind of Pteridophyta also known as Name general *Christella dentate* and plants This includes in family *Dryopteridacege*. *Christella dentate* usually growing in the area tropical and subtropical, often found in forests bushy and places with high humidity. Pteridophyta This leaves pinnatifid or similar to leaf tree pine.

Pteris fauriei hieron is a type of fern commonly found in various places (Nugraheni, Survani, & Arindri, 2024). Tropical and subtropical regions of the world. This fern has green leaves that are distinctively round and bushy. This fern has various species throughout the world and often grows in moist and diverse environments. Pteridophyta from the genus Pteris has a wide variety of species and the greatest variety throughout the world. However, more details about pteris fauriei hieron and its characteristics.

Selaginella doederleinii hieron name scientific for something Pteridophyta wire included in the genus *Selaginella*. Pteridophyta small as usual grows in humid environments, such as forests tropical, subtropics or area temperate warm. *Selaginella's* characteristics the leaves are dense and segmented, similar to small twigs. Plant This is one of the Lots species in the widespread genus *Selaginella* widely throughout the world.

Histiopteris incisa is a type of Pteridophyta included in the family *Dennstaedtiaceae.* Plant this is also known as Name common “Bamboo Fern” or “Kawakawa Fern” Pteridophyta This usually grows in the area temperate warm until medium, like forests heavy, debt mountains, and humid areas. Characteristic from Pteridophyta This is shaped leaves like leaf bamboo, with segments length that has a unique look and can become an interesting part in a park or forest that has conditions grow accordingly.

Dicksonia sp Pteridophyta This includes in family *Dicksoniaceae.* Plant This is often called Pteridophyta palm or Pteridophyta umbrella Because the leaves are large and shaped like an umbrella. they usually grow in the area temperate moist and can reach sufficient heigh. Pteridophyta This plant is decorated in some parks and gardens Because of unique appearance. Plant type Pteridophyta is the specific one depending on location geographical. Following are 7 types of species of plants the most Pteridophytes found in Batang Gadis National Park are: *Asplenium nidus* L. with the number 1055, *Asplenium normale D. Don* with the number 337, *Shaeropteris glauca* with the number 303, *Oleandra undulate* with number 300, *Asplenium lobulated* with quantity 135, *Asplenium affine SW* with number 133, *Nephrolepis davalliodes* with number 108. *Asplenium nidus L* Plants. These leaves are wide and shaped like nest birds (Naiym & Munir, 2024). So the Name generally refers to the shape of the distinctive leaves. *Asplenium nidus* is often made plant ornamental or park Because beautiful shape. Plant This usually needs high humidity and muted light for growth. *Asplenium nidus L* Plants This can be found in various natural habitats, including forest Rain tropical, jungle damp, and slopes shady hills. In its natural habitat, *Asplenium nidus* is plant on surface trees or large, boulders, especially in forests in humid tropics.

Asplenium's natural habitat often has humidity high and abundant air bulk rain, which makes it suitable for growth plants. However, Because of its popularity as a plant ornamental, Aspleniumnidus is also commonly cultivated become plant ornamental, deep maintenance special for maintaining condition suitable environment with condition his needs. A. nidus is known as those who enter in family *Aspleniaceae. A. nidus* Lots found in the areas of forest swamps, peat, and krangas. Living epiphytes with sticks or riding on the stems of tall trees.

Asplenium normale D. Don type Pteridophyta. This own leaf leaf green that dangles and helps. *Asplenium normale D. Don* usually grows in the environment forests that are often found in various regions with climate tropical or subtropic. Pteridophyta This has unique characteristics that make it interesting for fans to plant ornamental *Asplenium normale* usually found in natural habitats that include area forest tropical and subtropical. The habitat can include, forests Rain tropical, slope mountains, forests subtropical, and close to water sources. Asplenium normale can vary depending on location geographical. Plant This grows with Good in humid and shady environments.

Nephrolepis davallioides is one of the species of Pteridophyta in the genus Nephrolepis. Plant This has characteristic fronds (leaves). decorative with pattern distinctive leaves. *Nephrolepis davallioides* is a plant originating Pteridophyta from natural habitats in the area temperate tropical until subtropical. Usually, plants can be found plants in the forest dense,

forest rain, or in shady, damp places like slope rivers or cliffs damp. This includes the provision of bright light However No direct, moisture-high air, and moist soil. Condition This helps plants grow and thrive with Good. Pteridophyta *Nephrolepis davallioides* is one of the types of Pteridophyta included in the family *Nephrolepidaceae*. Following are several characteristic features general from Pteridophyta *Nephrolepis davallioides*, the leaves are shaped round or oval with flat edges.

The leaves grow in a rosette shape and can reach a sufficient size large, *Nephrolepis* Leaf Texture *davallioides* are usually colored green with a bright and possessive smooth texture, with leaves that are thin and slippery. Plant This grows through rhizomes or stem lower creeping land. Rhizomes This works as a place to store nutrition and reproduction. Spores Like most Pteridophyta, Nephrolepis davallioides produce spores as tool reproduction. Spores These are below the leaf plant.

Pteridophyta *Nephrolepis davallioides* usually grows in humid environments, such as forest Rain tropical, edge rivers, or frequent environment flooded. Pteridophyta *Nephrolepis davallioides* is known as the plant's popular ornamental Because The leaves are beautiful and long-lasting. They are often found in decorative pots or as plants hanging in design gardens and decoration houses.

Asplenium affine SW Name was scientific for plant frequent spikes called as "*Umbrella Fern". Asplenium affine* usually own growing leaves in a similar pattern umbrella or umbrella fold, so get Name common *"Umbrella Fern".* Plant This usually placed in the environment in a bright room However No directly, with sufficient humidity. When planted as plant ornamental, a deep room, is important for trying to condition the environment naturally by providing bright light However No directly, as well guard humidity enough air. *Asplenium affine* is one of the species of Pteridophyta included in the genus *Asplenium*.

Several characteristics special from *Asplenium affine*, leaves *Asplenium affine* shaped lancet or elongated with a pointed edge. The leaves can grow until about 30 to 40 cm long. Leaves are usually colored green old or green-greyish. Like most Pteridophyta, *Asplenium affine* has a sori, which is a group of spores located in parts lower leaf. Sorry about that usually seen as a dot, dot, dot small colored brown on the part lower leaf. Habitat, Plants This is usually found grows in humid environments, such as forests tropical, jungle mountains, or near water flow. They grow on rocks, cliffs, or moist soil.

Characteristics Ecological, *Asplenium affine* is a plant with frequent spikes found as epiphytes, i.e. growing above the surface of other plants or on rocks. They can grow in piles of moss or rock crevices. By scientific, *Asplenium affine* is in the family *Aspleniaceae*. Genus

Asplenium owns Lots of species distributed in various regions of the world. Pteridophyta *Asplenium* affine is frequently found in various environments natural and frequently made plant ornamental Because form the leaves are attractive. They also have a role ecological, important as part of the ecosystem of humid forests.

Asplenium lobulatum is one of the types of Pteridophyta included in the genus Asplenium. Asplenium lobulatum is a Pteridophyta epiphyte (growing on the surface of other plants) included in the family Aspleniaceae. Plant's characteristics that specifically differentiate it from types Pteridophyta (Pramudita et al., 2023). Characteristics of Asplenium lobulatum, leaves *Asplenium lobulatum* shaped lanceolate and usually grow in groups. Leaves This own edge is lobed or notched which is one characteristic typically. This lobe usually distributed in a way symmetrical on both sides leaf. *Asplenium lobulatum* the leaf's size is not too big, and plants generally reach very large sizes.

This is often found growing in the environment forest, esp as epiphytes that grow above stem trees or damp rocks. Like Pteridophyta in general, *Asplenium lobulatum* also reproduces with spores located below the leaf. Spores This is structure reproduction Pteridophyta. *Oleandra undulate is* the least common type found that is *Oleandra undulate* Ching with a total of 2 individuals. Pteridophyta life in place damp, in place protected, and well in a place open, to say the least Pteridophyta type *Oleandra undulate* Ching discovered Because influenced by place his life. *Oleandra undulate* Ching is found on trees that have death and life creeping together need his life.

CONCLUSION

There are Lots type Pteridophyta in Batang Gadis National Park Resort 6 Sopo Tinjak, North Sumatra. This was done Batang Gadis National Park conditions are suitable for the growth Pteridophytes. The average temperature in Batang Gadis National Park is 22°C, with a humidity of 73%. pH and light intensity are also good. Plant-type Pteridophytes found consist of 8 species that are *Lygodium microphyllum, Dicranopteris linearis, Nephrolepis biserrata, Christella dentata, Pteris fauriei hieron, Selaginella doederleinii hieron, Histiopteris incise,* and *Dicksonia sp.*

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