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Inventory of Ferns (Class: Filicinae) in West Block, Batang Toru Forest, North Tapanuli North Sumatra

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Abstract. Batang Toru Forest is one of the conservation areas in North Sumatra which has a diversity of flora and fauna, one of which is ferns. A study on ferns in the Batang Toru Forest area has never been carried out, so the species diversity and distribution are unknown. Ferns are classified into 4 classes, one of which is the Filicinae class. The class Filicinae is a group of ferns that has the highest number of species. This study aims to inventory the class Filicinae ferns in the Batang Toru Forest area by using the exploration method, namely exploring along the track. Found 52 species of ferns belonging to 14 families and 29 genera. Of the 52 species found, 33 species were classified as terrestrial ferns and 19 types of epiphytic ferns.

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Keyword: Batang Toru Forest, Inventory, Ferns

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1 Introduction

Indonesia is one of the countries that has the highest plant biodiversity in the world, one of which is a group of ferns. Until now, this group of plants has received less attention compared to other plant groups, although many types of this group of ferns actually have very important ecological functions, namely maintaining the balance of forest ecosystems, among others, as preventing erosion and others [1].

One of the forests in North Sumatra is the Batang Toru Forest Area (KHBT). This forest area has high value, both in terms of biodiversity and economic aspects and has an important hydrological function. This area has various types of vegetation that make up three main ecosystems, namely lower montane forest, peat forest at an altitude of 900-1200 meters and Dipterocarp forest. In addition, the important value of the Batang Toru forest is the richness of flora and fauna species it has [2]. Specific studies on ferns in the Batang Toru forest area have never been carried out, so that species diversity and distribution are unknown. This is considered

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necessary because ferns have a very important role and benefit for life. Ferns have a distinctive morphology, making them easy to identify with other plants. One of the distinctive morphologies of ferns is curly young leaves that will open when mature [3]. Ferns in Indonesia have a variety of species and various benefits. Ferns are classified into 4 classes, one of which is the Filicinae class. The class Filicinae is the fern with the highest number of species. The class Filicinae is a group of ferns that dominates the islands of Indonesia, the Philippines, Guinea and Northern Australia [4]. The class Filicinae is known as true ferns because it has perfect leaves.

2. Research Method

2.1. Time and Place of research

The initial survey was carried out in 2017 and the research was carried out from July to September 2018 at the research station of the Sumatran Orangutan Conservation Program (YEL-SOCP) Sustainable Ecosystem Foundation in Batang Toru Forest Area, West Block, North Tapanuli Regency, North Sumatra Province and continued at the Systematics Laboratory. Medanense Plants and Herbarium, University of North Sumatra.

2.2. Area description

2.2.1 Location and area

The Batang Toru Forest (HBT) has an area of 136,000 ha and is divided into two blocks, namely the East Block and the West Block. Administratively, the Batang Toru forest area is located in North Tapanuli, Central Tapanuli, and South Tapanuli regencies. Geographically, it is between 98°53'– 99°26' east longitude and 02°03'– 01°27' north longitude . The Batang Toru Forest Block West Block covers an area of 76,000 ha located between 98°046'48”– 99°017'24” east longitude and 10°27'00”–10°59'24” north longitude. The research location is a flora and fauna monitoring station area of 12,000 ha lies between 49°93'31" east longitude and 18°63'20" north longitude [3]. The climate in the Batang Toru forest includes a tropical climates with moderate rainfall height ranges from 4,500 to 5,000 mm per year. This forest is located in a mountainous area, so the temperature at night can drop to 14˚C, the highest temperature during the day is 31˚C and humidity ranges from 33% to 95% [3].

2.2.2 Topography

The Batang Toru Forest area in the west block is a lowland and high mountain area with an altitude of 50 to 1,875 m above sea level where the lowest point is on the Sipan Sihaporas River (near Sibolga City) and the highest point is in Dolok Lubuk Raya. The slope is between 16 and 60%, with the landscape having a hilly and undulating topography [3].

2.2.3 Vegetation

Batang Toru forest has various types of vegetation and is typical of peat forest at an altitude of 900 to 1,000 m above sea level, limestone forest and there are several swamps located at an altitude of 800 m above sea level. The dominance of vegetation in the Batang Toru Forest consists of the mountain fir (*Casuarina* sp.), Sampinur tali (*Dacrydium* spp.) and Mayang (*Palaquium* spp.) species. In general, this forest area has high vegetation, but the diameter of the trees is relatively small. Other plant species that can be found are epiphytic species, mosses and several types of orchids and pitcher plants (*Nepenthes* spp.) **[3].**

2.2.4. Research methods in Field

The research method in the field is a survey (exploration) in the West Block Batang Toru Forest Area along the main track, namely A (3000 meters), B (3500 meters), C (4000 meters), H (2600 meters), G (3300 meters). meters), JMK (2400 meters) and Caves (2600 meters) (Appendix 2). All types of ferns found were recorded according to their respective locations, by noting their morphological characters (roots, rhizomes, stipe, enthales, sorus, spore color, spore arrangement and spore location). Specimens of all individuals found, collected and labeled hanging. Specimens were arranged and wrapped in newsprint and put in a plastic bag and doused with 70% alcohol. Exploration results from the field were brought to the laboratory, replaced with newspapers and hanging labels, arranged in such a way and pressed using a sack. Dry in the oven to a constant weight. The dried specimens were identified at Herbarium MEDANENSE (MEDA), University of North Sumatra. Specimens that are not identified in Herbarium MEDANENSE (MEDA), will be sent to Herbarium Bogoriense for identification. Identification using plant identification reference books include:

a. Flora of Peninsular Malaysia Volume I Fern and Lycophytes (BS Parris, R. Kiew, RCK Chung, LG Saw and E. Soepadmo, 2010).
b. Fern of Malaya In Color (AG Piggot, 1984).
c. Ferns of Kinabalu (Jhon H. Beaman and Peter J. Edwards)
d. Types of Indonesian Nails (Sastrapradja, 1979).
e. Paku's relatives (Sastrapraja and Afrisiani, 1985).

2.3. Data analysis

Data on fern species are presented in the form of morphological descriptions and identification keys. The data is equipped with altitude, location of coordinates, humidity, photos and a general description of the habitat of each fern species found.

3.Results And Discussion

3.1. Diversity of Ferns

Based on research that has been conducted in the Batang Toru forest area, the results obtained are 52 species of terrestrial ferns and epiphytes, consisting of 14 families and 29 genera, of the 52 species found 33 species belonging to terrestrial ferns and 19 species of epiphytic ferns (Table 1).). The most common types of ferns found in the study area were from the Polypodiaceae tribe with 10 species, followed by the Lindsaeaceae tribe with 8 species.

The number of ferns in this research location is more than the number of ferns reported by [5] in the Mount Sinabung Forest, which is 44 species and in the research conducted by [1] in the Mount Sinabung Forest, the number of ferns is 44 species. The types of ferns obtained were 32 species. However, the number obtained in this study is less when compared to the number of fern species obtained in [2] research in the Telagah Forest of Gunung Leuser National Park, which is 56 species and in [3] in the Gunung Sibuatan Forest area, the fern species found in the Gunung Leuser National Park are 56 species. obtained as many as 55 types. In general, in mountainous areas, the number of ferns is more abundant than in the lowlands. [6] , Polypodiaceae is the Pterydophyta family with the highest number of species. The Polypodiaceae family is a fern that has a very high species diversity in the tropics. [7] states that the difference in the number of species and types of ferns in an environment is influenced by several factors such as habitat, adaptability and the environment. [8] stated that in general the more extreme environmental conditions, either due to soil climate or drought, the species diversity decreases and one or two species becomes more dominant.

Table 1. Types of Ferns Class Filicinae in Forest Areas Batang Toru West Block, North Tapanuli Regency

Genus	Species	Habitat	
		Terestrial	Efifit
Aspleniaceae	Asplenium affine + -	+	-
	A.tenerum	+	-
	A. phyllitidis	-	+
	A. thunbergii	+	-
	A. scalar	+	-
	*Asplenium*sp.	-	+
Athyriaceae	*Diplazium bantamense*	+	-
	D. subserratum	+	-
	D. angustipinna	+	-
	D. cordifolium	+	-
	D. sorzogonense	+	-
Cyatheaceae	*Cyathea alternans*	+	-
	C. latebrose	+	-
	C. recommutata	+	-

	C. hymenoides	+	-
	C. moluccana	+	-
Gleicheniaceae	*Gleichenia hirta*	+	-
Grammitidaceae	*Grammitis reinwardtii*	-	+
	Scleroglossum pusillum	-	+
Hypolepidaceae	*Histiopteris stipulacca*	+	-
Lindsaeaceae	*Lindsaea malayensis*	+	-
	L. nitida	-	+
	L. parallelogram	-	+
	L. bouillodii	+	-
	*Lindsaea*sp.	-	+
	Tapeinidium pinnatum	+	-
	T. luzonicum	+	-
	*Tapeinidium*sp.	+	-
Marattiaceae	*Angiopteris evecta*	+	-
Nephrolepidaceae	*Nephrolepis falcata*	+	-
	N. davallioides	+	-
Polypodiaceae	*Belvisia callivolia*	-	+
	Diphtheria conjugata	+	-
	D. lobby	-	+
	Lecanopteris carnosa	-	+
	Lepisorus longifolius	-	+
	Microsorum musifolium	-	+
	Platycerium holttumii	-	+
	Phymatopteris triloba	-	+
	Phymatosorus nigrescens	-	+
	Selliguea taeniata	-	+
Pteridaceae	*Adiantum*sp.	+	-
	Pteris venulosa	+	-
	Syngramma wallichi	+	-
Thelypteridaceae	*Christella parasitica*	+	-
	C. siamensis	+	-
	Macrothelypteris terresiana	+	-
	Pronephrium nitidum	+	-
	P. tripyllum	-	+
Taenitidaceae	*Taenitis blechnoides*	+	-
Vittariaceae	*Antrophyum callifolium*	-	+
	Vittaria malayensis	-	+

Information : (+) : Found, (-) : Not Found, 33: terrestrial species, 19 : epiphytic species

3.2 Habitat

The habitat of ferns is terrestrial and some are epiphytic. In this study, 33 species of terrestrial ferns were found and 19 species of epiphytic ferns were found. Terrestrial ferns include *Asplenium tenerum, Dipteris conjugata, Diplazium bantamense, Cyathea moluccana, Gleichenia hirta,*

Nephrolepis falcata. Meanwhile, ferns that live as epiphytes include *Grammitis reinwardtii, Lepisorus longifolius, Belvisia callivolia* and *Phymatopteris triloba*.

Figure 1 Habitat of ferns (A) Terrestrial in *Dipteris conjugata*; (B) Epiphytes in *Scleroglossum pusillum*.

3.3. Type of Enthal

Ferns have various types of enthales, namely single enthales and compound enthales. In this study, several ferns have a single enthale, for example *Lepisorus longifolius*, *Taenitis blechnoides* and *Syngramma wallichi*. While compound enthales are divided into two, namely pinnatus (pinnate) and bipinnatus (double pinnate). Pinnatus compound enthales (pinnate) for example in *Nephrolepis davalloides, Lindsaea malayensis, Tapeinidium pinnatum*, and *Bipinnatus* compound enthales (double pinnate) for example in *Davallia* sp.

Figure 2 Type of enthal; (A) Single enthal in *Taenitis blechnoides*; (B) Enthalal compound pinnatus (pinnate) in *Nephrolepis falcata*; (C) Enthalal compound bipinnatus (double pinnate) in *Davallia* sp

3.3. Location of Sorus

Ferns have five variations of sorus location, namely, sorus parallel to the enthal bone found in *Grammitis reinwardtii, Cyathea moluccana* and *Diplazium subserratum* species. Sorus at the narrow enthal end is found in the type *Belvisia callivolia*. Sorus on the enthal margin was found in the type *Lepisorus longifolius, Nephlopis falcata*. Sorus on the lower enthal surface is found in the type Dipteris conjugata. Sorus in the pinnule groove was found in *Lindsaea malayensis, Tapeinidium* sp., and *Lecanopteris carnosa* species.

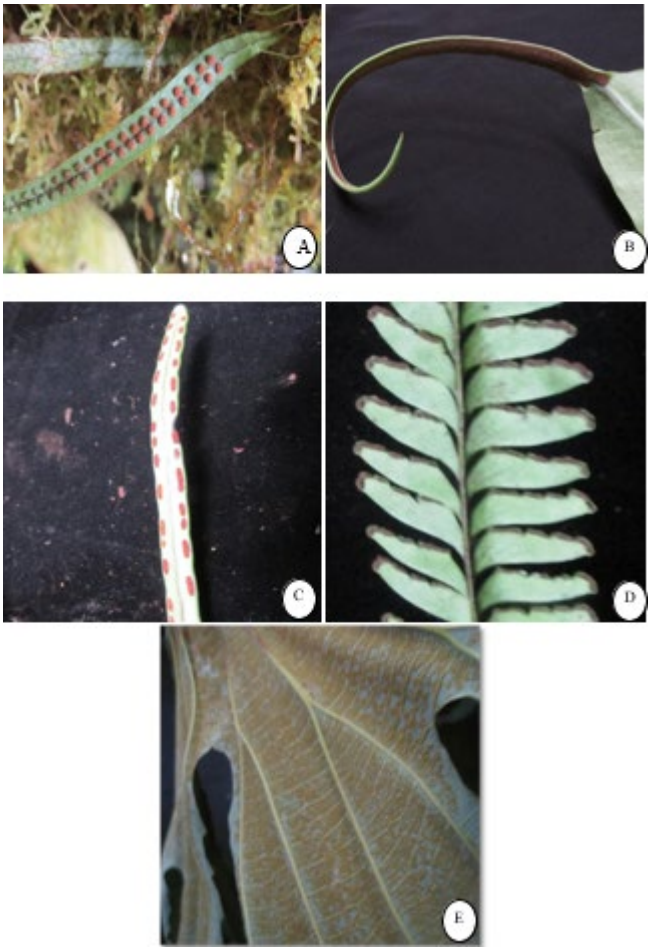

Figure 3 Location of sorus; (A) Sorus parallel to enthal bone; (B) Sorus at the constricted end of the enthallus; (C) Sorus on enthal periphery; (D) Sorus at pinnule groove; (E) Sorus is scattered on the subsurface of the enthales.

3.4. Fern Ecology

The types of ferns at the research site have varied habitats with an altitude of 850 to 1043 m above sea level, humidity of 77 to 98%, soil temperature 19 to 24°C, soil pH 5 to 7°C and light intensity 120 up to 230 Cd. According to [9], a large number of ferns grow terrestrially, with sizes that vary greatly from small to large. Ferns have a fairly high adaptability so that they can adapt to conditions and high humidity and some are tolerant of dry air and soil. Epiphytic ferns are found in large trees, namely on tree branches, on small trees, attached to the ground and also on rocks in slightly open areas, rocks on the edge of rivers or forests. According to [10], that plants found in soils with a pH range between 3 to 9 and extreme acidity is a stress that can be adapted by several species. Hanafiah (2005) in Mahar (2011), states that soil pH can be used as an indicator of soil chemical fertility, because it can reflect the availability of nutrients in the soil. The optimum pH for the availability of soil nutrients is approx. 7.0 because at this pH all macro elements are maximally available, while micro nutrients are not maximum

3.5. Identification Key

3.5.1 Genus Identification key

1. a. Terrestrial habitat.....2
   b . Epiphytic habitat.....9
2. a. Stem erect..... Cyatheaceae
   b. Stem creeping..... 3
3. a. Single leaf..... ..... Taenitidaceae
   b. Single leaf, partly compound.....4
4. a. Tapered leaf tips ....Hypolepidaceae
   b. Pointed leaf tips…….....5
5. a. Oval leaves..... ..... Nephrolepidaceae
   b. Oblong leaves..... 6
6. a. Alternating leaves.....Marattiaceae
   b. Leaves opposite..... 7
7. a. Dichotomous leaf branching ....Gleicheniaceae
   b. Monopodial leaf branching.....8
8. a. Narrow leaves 50 cm..... .....Pteridaceae
   b. Leaf width 50 cm..... .....Athyriaceae
9. a. Sorus rests on the leaf bones..... Grammitidaceae
   b. Sorus spread on the leaf surface..... .....Vittariaceae
10. a. Slippery stipe..... .....Polypodiaceae
    b. Slippery stipe partly hairy..... 11
11. a. Slippery leaves partly hairy..... ..... Aspleniaceae
    b. Smooth leaves..... 12
12. a. Round Sorus.....Thelypteridaceae
    b. Cylindrical Sorus..... .....Lindsaeaceae

Of the several tribes obtained, only two tribes were taken (Lindsaeaceae and Polypodiaceae) which will be used as a key to identify species because they have the highest number of species (4.6.2)

3.5.2. Species Identification Key

Lindsaeaceae

1. a. Slippery stipe..... ..... *Lindsaea malayensis*
   b. Hairy stipe..... 2
2. a. Leaf margins are flat..... *Lindsaea* sp.
   b. Serrated leaf margins..... 3
3. a. Dark stipe..... 5
   b. Bright stipe..... 4

4. a. The arrangement of pinnules facing .....*Lindsaea nitida*

b. Alternating pinnule arrangement..... *Lindsaea parallelograma*

5. a. Sorus at the edge of the indentation of the pinnae..... *Tapeinidium pinnatum*

b. Sorus at the edge of the pinnule groove..... .....6.

6. a. Cylindrical Sorus..... ..... *Lindsaea bouillodi*

b. Round Sorus..... 7

7. a. Light color sorus..... .....*Tapeinidium luzonicum*

b. Sorus dark color .... *Tapeinidium* sp.

Polypodiaceae

1. a. Terrestrial habitat..... .....*Dipteris conjugata*

b. Epiphytic habitat..... 2

2. a. Bright stipe…….....3

b. Dark stipe..... 4

3. a. Serrated leaf margins..... .....*Lecanopteris carnosa*

b. Leaf margins are flat..... 8

4. a. Leaf texture like paper..... ..... *Selliguea taeniata*

b. Stiff leaf texture 5

5. a. Round Sorus…….....6

b. Cylindrical Sorus..... 7

6. a. Sorus spread under the leaf surface.....*Microsorum musifolium*

b. Sorus rests on the leaf bones.....*Phymatopteris triloba*

7. a. Sorus dark color 9

b . Light color sorus..... ..... *Lepisorus longifolius*

8. a. Sorus at the constricted enthal end.....*Belvisia callifolia*

b. Sorus on enthal..... .....*Platycerium holttumii*

9. a. Monopodial branching ....*Phymatosorus nigrescens*

b. Dichotomous branching..... .....*Dipteris lobbiana*

3.6. Description of Ferns

3.6.1.Aspleniaceae

3.6.1.1.*Asplenium affine* SW.

Terrestrial, herbaceous, 30 to 70 cm tall; stiff roots, brown; creeper rhizome, brown; stipe round, 3 to 5 cm long, smooth surface, black; compound enthal, monomorphism, macrophile, pinnae in alternating layers, blunt base, pointed tip, serrated edge, pinnate bone, smooth surface, brownish green; sorus with indusia, arranged longitudinally in pinnate enthal veins on undersurface, brown.

Specimen : RG 66

Habitat: Terrestrial at an altitude of 1043 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.1.2. *Asplenium phyllitidis* Holtt.

Epiphytes, herbs; 50 to 100 cm high; stiff roots, brown; circular rhizome, brown; stipe round, 3 to 5 cm long, downy surface at base, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, smooth surface, light green; sorus with indusia, elongated on pinnate enthal veins on undersurface, brown.

Specimen : RG 42

Habitat: Epiphytes on tree trunks at an altitude of 919 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Malaysia, Philippines, Singapore and Papua New Guinea

3.6.1.3. *Asplenium tenerum* Forst.

Terrestrial, herbaceous; 50 to 70 cm high; stiff roots, brown; rhizome creeper, brown; stipe 5 to 10 cm long, hairy surface, dark green; enthal compound, monomorphism, macrophile, pinnae arranged opposite, base blunt, pointed tip, jagged edges, bone pinnate, smooth surface, dark green; sorus with indusia, arranged longitudinally on pinnate enthalal veins on lower enthalal surface, brown.

Specimen : RG 54, RG 55

Habitat: Terrestrial at an altitude of 903 to 905 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.1.4. *Asplenium scalare* Rosenst .

Terrestrial, herbaceous; 50 to 90 cm high; stiff roots, brown; rhizome creeper, brown; stipe round, 3 to 5 cm long, downy surface at base, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, smooth surface, green; sorus with indusia, arranged longitudinally in pinnate enthal veins on undersurface, yellowish white.

Specimen : RG 135

Habitat: Terrestrial at an altitude of 890 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.1.5.*Asplenium* sp.

Epiphytes, herbs; 50 to 100 cm high; stiff roots, brown; rhizome circular, brown; stipe round, 3 to 5 cm long, downy surface at base, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-thin texture, smooth surface, green; sorus with indusia, arranged longitudinally in enthal veins on undersurface, brown.

Specimen : RG 121

Habitat: Epiphytes on tree trunks at an altitude of 995 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Philippines, Malaysia, Singapore and Papua New Guinea

3.6.1.6 *Asplenium thunbergii* Kunze.

Terrestrial, herbaceous; 60 to 100 cm high; stiff roots, brown; rhizome creeper, brown; stipe round, 10 to 30 cm long, hairy surface, green; compound enthal, monomorphism, macrophile, blunt base, blunt tip, flat edge, pinnate bone, thin texture like paper, smooth surface, green; sorus with indusia, arranged longitudinally along the enthalal margin, brown.

Specimen : RG 114, RG 137

Habitat: Terrestrial at an altitude of 800 to 921 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.2.Athyriaceae

3.6.2.1.*Diplazium bantamense*(Bl.)

Terrestrial, herbaceous, 30 to 100 cm tall; root stiff, black; rhizome creeping, surface covered with hairs, black; rectangular stipe, 30 to 50 cm long, smooth surface, black; single enthal, monomorphism, macrophile, leaves arranged opposite, blunt base, pointed tip, serrated edge, pinnate bone, thin texture, smooth surface, blackish green; sorus with indusia, arranged longitudinally on pinnate enthalal veins on lower enthalal surface, brown.

Specimen : RG 68

Habitat: Terrestrial at an altitude of 1021 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Nusa Tenggara, Maluku) and Papua New Guinea

3.6.2.2. *Diplazium subserratum* (Bl.) Moore

Terrestrial, herbaceous; 40 to 100 cm high, roots stiff, black; rhizome creeping, surface covered with hairs, black; stipe round, 3 to 5 cm long, hairy surface, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, serrated edge, pinnate bone, paper-like texture, smooth surface, blackish green; sorus with indusia, arranged longitudinally on pinnate enthalal veins on lower enthalal surface, brown.

Specimen : RG 62, RG 69

Habitat: Terrestrial at an altitude of 996 to 1031 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.2.3. *Diplazium angustipinna* Holtt.

Epiphytes, herbs; 60 to 100 cm high, roots stiff, black; circular rhizome, smooth, black surface; stipe round, 3 to 7 cm long, smooth surface, blackish green; single enthal, monomorphism, macrophile, arranged alternately, blunt base, pointed tip, flat edge, pinnate bone, stiff texture, smooth surface, green; sorus with indusia, arranged longitudinally in pinnate enthal veins on the lower enthalal surface.

Specimen : RG 45, RG 46

Habitat: Terrestrial at an altitude of 928 to 937 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.2.4. *Diplazium sorzogonense* (Presl).

Epiphytes, herbs; 50 to 100 cm high, roots stiff, black; creeping rhizomes, smooth, black surface; stipe round, 3 to 7 cm long, smooth surface, blackish green; compound enthal, monomorphism, macrophile, arranged alternately, blunt base, pointed tip, serrated edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, arranged longitudinally on pinnate enthalal veins on lower enthalal surface, brown.

Specimen : RG 39, RG 41

Habitat: Terrestrial at an altitude of 908 to 915 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.2.5. *Diplazium cordifolium* coupling.

Terrestrial, herbaceous; 30 to 100 cm high, roots stiff, black; rhizome creeping, surface covered with hairs, black; stipe round, 3 to 7 cm long, smooth surface, blackish green;

single enthal, monomorphism, macrophile, arranged opposite, blunt base, pointed tip, flat edge, pinnate bone, stiff texture, smooth, green surface; sorus with indusia, arranged longitudinally on the enthallus veins on the lower enthallic surface, brown.

Specimen : RG 48, RG 50

Habitat: Terrestrial at an altitude of 905 to 910 m above sea level

Distribution: Sumatra, Java, Kalimantan, Sulawesi, Maluku and Papua New Guinea, Thailand

3.6.3. Cyatheaceae

3.6.3.1. *Cyathea alternans* (Wall ex Hook).

Terrestrial, Trees; 1 to 2 m high, root stiff, black; creeping rhizomes, surface covered with hair, black; stipe round, 40 to 60 cm long, hairy surface, yellowish green; compound enthal, monomorphism, macrophile, arranged alternately, blunt base, pointed tip, flat edge, pinnate bone, thin soft texture, smooth surface, green; sorus without indusia, rounded along enthal margin, brown.

Specimen : RG 70

Habitat: Terrestrial at an altitude of 996 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.3.2. *Cyathea latebrosa*(Wall ex Hook) Copel.

Terrestrial, Trees; 2 to 10 m high, root stiff, black; rhizome creeping, surface covered with hairs, black; stipe round, 30 to 50 cm long, hairy surface, green; enthal compound, monomorphism, macrophile, arranged alternately, blunt base, pointed tip, serrated edge, bone pinnate, thin soft texture, smooth surface, green; sorus without indusia, spherical on the undersurface of the pinnule, light brown.

Specimen : RG 53

Habitat : Terrestrial at an altitude of 857 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.3.3.*Cyathea moluccana*R.Br.

Terrestrial, Trees; 2 to 5 m high, root stiff, black; rhizome creeping, smooth surface, black; stipe round, 20 to 50 cm long, hairy surface, dark green; single enthal, monomorphism, macrophile, arranged alternately, blunt base, pointed tip, pinnate bone, jagged edge at the tip, thin texture like paper, smooth surface, green; sorus without indusia, spherical in shape arranged along the bone on the lower enthalal surface, brown.

Specimen : RG 01

Habitat: Terrestrial at an altitude of 903 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.3.4. *Cyathea hymenoides*mett.

Terrestrial, Trees; 2 to 10 m high, root stiff, black; rhizome creeping, surface covered with hairs, black; stipe round, 30 to 50 cm long, hairy surface, dark green; compound enthal, monomorphism, macrophile, arranged alternately, blunt base, pointed tip, flat edge, soft thin texture, pinnate bone, smooth surface, green; sorus without indusia, round on the underside of the pinnule, light brown.

Specimen : RG 133

Habitat: Terrestrial at an altitude of 895 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.3.5. *Cyathea recommutata*coupling.

Terrestrial, Trees; 2 to 10 m high, root stiff, black; rhizome creeping, surface covered with hairs, black; stipe round, 30 to 70 cm long, hairy surface, black; compound enthal, monomorphism, macrophile, arranged alternately, blunt base, pointed tip, grooved edge, pinnate bone, thin soft texture, smooth surface, green; sorus without indusia, rounded along enthal margin, brown.

Specimen : RG 07

Habitat: Terrestrial at an altitude of 950 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.4. Gleicheniaceae

3.6.4.1. *Gleichenia hirta* Holtt.

Terrestrial, herbaceous; 50 to 100 m high, root stiff, black; rhizome creeping, surface covered with hairs, black; stipe round, 20 to 40 cm long, hairy surface, black; compound enthal, monomorphism, macrophile, pinnate forked, blunt base, pointed tip, flat edge, pinnate bone, thin but fairly stiff texture, smooth surface, green; sorus with indusia, spherical in shape arranged along the edge of the enthale on the undersurface of the enthale, light brown.

Specimen : RG 58

Habitat: Terrestrial at an altitude of 890 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.5.Grammitidaceae

3.6.5.1. *Grammitis reinwardtii* (Bl.)

Epiphytes, herbs; 5 to 10 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, blackish brown; stipe round, 1 to 2 cm long, smooth surface, blackish yellow; single enthal, monomorphism, microphyll, blunt base, pointed tip, flat edge, pinnate bone, paper-thin texture, hairy surface, green; sorus with indusia, round in shape parallel to enthal bone, underside, brown.

Specimen : RG 78

Habitat: Epiphytes on tree trunks at an altitude of 938 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Borneo

3.6.5.2. *Scleroglossum pusillum*(Bl.)

Epiphytes, herbs; 5 to 10 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, blackish brown; stipe round, 1 to 2 cm long, smooth surface, blackish green; single enthal, monomorphism, microfil, blunt base, pointed tip, flat edge, pinnate bone, paper-thin texture, smooth surface, green; sorus without indusia, elongated along the edge of the pinnule, brown.

Specimen : RG 76

Habitat: Epiphytes on tree trunks at an altitude of 957 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.6. Hypolepidaceae

3.6.6.1. *Histiopteris stipulacea*(Hook.) Copel

Terrestrial, herbaceous; 1 m high, root stiff, brown; creeping rhizomes, smooth, black surface; stipe round, 10 to 30 cm long, smooth surface, light brown; compound enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, pinnae arranged opposite, thin texture like paper, smooth surface, green; sorus with indusia, elongated along enthal margin, brown.

Specimen : RG 136

Habitat: Epiphytes on tree trunks at an altitude of 915 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.7. Lindsaeaceae

3.6.7.1. *Lindsaea malayensis* Holtt.

Terrestrial, herbaceous; 30 to 80 cm high, roots stiff, brown; rhizome creeping, smooth surface, black; stipe round, 3 to 7 cm long, smooth surface, yellowish green; compound enthal, monomorphism, macrophile, blunt base, pointed tip, serrated edge, pinnae arranged alternately, thin but fairly stiff texture, serrated upper edge, flat bottom edge, smooth surface, green; sorus with indusia, extending on the upper edge of the pinnular groove, on the lower enthalal surface, brown.

Specimen : RG 50, RG 52

Habitat: Terrestrial at an altitude of 895 to 900 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.7.2. *Lindsaea nitida* coupling.

Epiphytes, herbs; 30 to 70 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, black; stipe round, 2 to 5 cm long, hairy surface, black; compound enthal, monomorphism, macrophile, alternating leaf arrangement, blunt base, pointed tip, serrated edge, pinnate bone, thin texture like paper, smooth surface, green; sorus with indusia, extending along enthal margin, brown.

Specimen : RG 26

Habitat: Terrestrial at an altitude of 890 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.7.3. *Lindsaea parallelogramma* v.A.v.R

Epiphytes, herbs; 30 to 70 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, black; stipe round, 2 to 5 cm long, hairy surface, black; compound enthal, monomorphism, macrophile, alternating leaf arrangement, blunt base, pointed tip, serrated edge, pinnate bone, thin texture like paper, smooth surface, green; sorus with indusia, elongated along enthal margin, brown.

Specimen : RG 23

Habitat: Terrestrial at an altitude of 990 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malay, Vietnamese, Thai

3.6.7.4. *Lindsaea* sp.

Epiphytes, herbs; 30 to 60 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, black; stipe round, 2 to 5 cm long, smooth surface, black; compound enthal, monomorphism, macrophile, alternating leaf arrangement, blunt base, pointed tip, flat edge, pinnate bone, paper-thin texture, hairy surface, green; sorus elongated along the edge of the pinnule, dark brown.

Specimen : RG 05

Habitat: Terrestrial at an altitude of 940 m above sea level

Distribution: Indonesia (Sumatra) and Malaya

3.6.7.5. *Lindsaea bouillodii* Christ.

Terrestrial, herbaceous; 30 to 70 cm high, roots stiff, brown; rhizome creeping, smooth surface, black; stipe round, 4 to 7 cm long, hairy surface, black; compound enthal, monomorphism, macrophile, alternating leaf arrangement, blunt base, pointed tip, jagged leaf margin, pinnate bone, paper-thin texture, smooth, green surface; sorus with indusia, extending on the upper edge of the pinnular groove, on the lower enthalal surface, brown.

Specimen : RG 120

Habitat: Terrestrial at an altitude of 890 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.7.6. *Tapeinidium pinnatum*(Cav).

Terrestrial, herbaceous; 30 to 100 cm high, roots stiff, brown; rhizome creeping, smooth surface, black; stipe round, 5 to 8 cm long, hairy surface, yellowish green; compound enthal, monomorphism, macrophile, alternating leaf arrangement, blunt base, pointed tip, serrated edge, pinnate bone, thin but fairly stiff texture, smooth surface, green; sorus with indusia, spherical in shape, arranged on the upper edge of the pinnular groove, on the lower enthalal surface, brown.

Specimen : RG 82, RG 83

Habitat: Terrestrial at an altitude of 893 to 900 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.7.7. *Tapeinidium luzonicum* (Hook).

Terrestrial, herbaceous; 50 to 130 cm high, roots stiff, brown; rhizome creeping, smooth surface, black; stipe round, 5 to 10 cm long, surface hairy, black; compound enthal, monomorphism, macrophile, alternating leaf arrangement, blunt base, pointed tip, jagged edge, thin but fairly stiff texture, smooth surface, green; sorus with indusia, spherical in shape, arranged on the upper edge of the pinnular groove, on the lower enthalal surface, brown.

Specimen : RG 38, RG 06

Habitat: Terrestrial at an altitude of 800 to 927 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.7.8. *Tapeinidium* sp.

Terrestrial, herbaceous; 50 to 100 cm high, roots stiff, brown; rhizome creeping, smooth surface, black; stipe round, 7 to 10 cm long, hairy surface, dark green; compound enthal, monomorphism, macrophile, alternating leaf arrangement, flat base, pointed tip, serrated edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, round shape at the upper edge of the pinnule groove, blackish brown.

Specimen : RG 02

Habitat : Terrestrial at an altitude of 879 m above sea level

Distribution: Indonesia (Sumatra) and Malaya

3.6.8. Marattiaceae

3.6.8.1. *Angiopteris evecta*(Forst.) Hoffm.

Terrestrial, herbaceous; 80 cm to 1 m high, roots stiff, brown; rhizome creeping, smooth surface, black; stipe round, 10 to 30 cm long, smooth surface, dark green; compound enthal, monomorphism, macrophile, arranged alternately, blunt base, pointed tip, serrated edge, pinnate bone, smooth surface, green; sorus with indusia, arranged longitudinally along the enthallus margin on the lower enthallus surface, brown

Specimen : RG 98

Habitat: Terrestrial at an altitude of 896 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.9. Nephrolepidaceae

3.6.9.1. *Nephrolepis falcata*(Cav.) C.chr

Terrestrial, herbaceous; 80 cm to 1 m high, roots stiff, brown; rhizome creeping, smooth surface, black; stipe round, 7 to 10 cm long, hairy surface, dark green; compound enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, spherical shape located along the edge of the enthale on the undersurface of the enthale, brown.

Specimen : RG 106

Habitat: Terrestrial at an altitude of 886 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Malaya,

Borneo,Philippines

3.6.9.2. *Nephrolepis davallioides*(Sw.) Kunze.

Terrestrial, herbaceous; 80 cm to 1 m high, roots stiff, brown; rhizome creeping, smooth surface, black; stipe round, 7 to 10 cm long, smooth surface, black; compound enthal, monomorphism, macrophile, blunt base, pointed tip, serrated edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, rounded along the edges of the pinnule groove, light brown.

Specimen : RG 128

Habitat: Terrestrial at an altitude of 991 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.10. Polypodiaceae

3.6.10.1.*Belvisia callifolia*(C.chr.) Copel

Epiphytes, herbs; 50 to 80 cm high root stiff, brown; creeping rhizomes, surface covered with hair, black; stipe round, 5 to 8 cm long, smooth surface, yellowish green; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, elongated shape at the tip of the enthal which narrows, blackish brown.

Specimen : RG 109

Habitat: Epiphytes on tree trunks at an altitude of 940 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Malaya, Africa, Sri Lanka

3.6.10.2. *Diphtheria conjugata* Reinw.

Terrestrial, herbaceous; 80 cm to 1 m high, roots stiff, brown; rhizome creeping, surface covered with hairs, black; stipe round, 7 to 10 cm long, smooth surface, dark green; single pinnate divided into two, monomorphism, macrophile, blunt base, pointed tip, serrated edge, pinnate bone, rough surface, green; sorus with indusia, scattered on the lower enthalal surface, dark brown.

Specimen : RG 60

Habitat: Terrestrial at an altitude of 890 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Malaya, Australia, China and Japan

3.6.10.3. *Lobby diphtheria* Hooks.

Epiphytes, herbs; 50 to 80 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, black; stipe round, 7 to 9 cm long, smooth surface, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, smooth surface, green; sorus with indusia, spherical shape along the lower enthalal surface, brown.

Specimen : RG 03

Habitat: Terrestrial at an altitude of 867 m above sea level
Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.10.4. *Lecanopteris carnosa* Reinw.

Epiphytes, herbs; 30 to 90 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, black; stipe round, 5 to 10 cm long, smooth surface, brown; compound enthal, monomorphism, macrophile, blunt base, pointed tip, rough serrated edge, alternating leaf arrangement, smooth surface, green; sorus with indusia, the round shape is located on the edge of the pinnule groove, orange.
Specimen : RG 30
Habitat: Epiphytes on tree trunks at an altitude of 912 m asl
Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.10.5. *Lepisorus longifolius*(Bl.) Holtt

Epiphytes, herbs; 30 to 70 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, black; stipe round, 5 to 7 cm long, smooth surface, green; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, stiff texture, smooth surface, green; sorus with indusia, spherical shape located along the enthal margin on the undersurface, Orange.
Specimen : RG 73
Habitat: Epiphytes on tree trunks at an altitude of 909 m asl
Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.10.6. *Microsorum musifolium*(Bl.) Ching.

Epiphytes, herbs; 30 to 80 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, brown; stipe round, 3 to 5 cm long, smooth surface, green; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, smooth surface, stiff texture, green; sorus with indusia, rounded along enthalal veins on lower enthalal surface, brown.
Specimen : RG 117
Habitat: Epiphytes on tree trunks at an altitude of 897 m asl
Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Malaysia, Philippines,
China, India

3.6.10.7. *Platycerium holttumii*Hennipun & Joncheere.

Epiphytic, herbaceous: 30 to 50 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, brown; stipe does not exist; single entity, monomorphism, *macrophile*, blunt

base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, no sorus. (Appendix 5.38)

Specimen : RG 127

Habitat: Epiphytes on tree trunks at an altitude of 888 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.10.8. *Phymatopteris triloba*(Houtt.) Pichi Serm.

Epiphytes, herbs; 30 to 50 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, brown; stipe round, 3 to 5 cm long, smooth surface, green; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, stiff texture, smooth surface, green; sorus with indusia, rounded along enthalal veins on lower enthalal surface, brown.

Specimen : RG 116

Habitat: Epiphytes on tree trunks at an altitude of 978 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.10.9. *Phymatosorus nigrescens*(Bl.) Pichi

Epiphytes, herbs; 50 to 80 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; stipe round, 7 to 10 cm long, smooth surface, blackish green; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, thin but fairly stiff texture, smooth surface, green; sorus with indusia, round shape located along the enthal bone on the lower enthal surface, brown.

Specimen : RG 63

Habitat: Epiphytes on tree trunks at an altitude of 1041 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi), India and Malaysia

3.6.10.10. *Selliguea taeniata*(Sw.) Parris

Epiphytes, herbs; 40 to 90 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, brown; stipe round, 5 to 9 cm long, surface smooth, blackish green; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, round shape located along enthal veins on lower enthal surface, orange.

Specimen : RG 119

Habitat: Epiphytes on tree trunks at an altitude of 897 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi), China and Malaya

3.6.11. Pteridaceae

3.6.11.1. *Adiantum*sp.

Terrestrial, herbaceous; 40 to 90 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; stipe round, 5 to 9 cm long, rough surface, black; compound enthal, monomorphism, macrophile, blunt base, pointed tip, serrated edge, paper-like texture, pinnate bone, smooth surface, green; sorus with indusia, rounded at the upper edge of the pinnule groove, brown.

Specimen : RG 103 and RG 105

Habitat: Terrestrial at an altitude of 888 to 900 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.11.2. *Pteris venulosa*bl.

Terrestrial, herbaceous; 50 to 90 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; stipe round, 7 to 10 cm long, smooth surface, blackish green; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, smooth surface, green; sorus with indusia, extending at enthal margin on lower enthal surface, dark brown.

Specimen : RG 125

Habitat : Terrestrial at an altitude of 910 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.11.3. *Syngramma wallichii*(Hook.) Bedd.

Terrestrial, herbaceous; 30 to 90 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; stipe round, 5 to 7 cm long, smooth surface, black; single enthal, monomorphism, macrophile, arranged opposite, blunt base, pointed tip, pinnate bone, flat edge, smooth surface, green; sorus with indusia, arranged longitudinally on enthal veins on lower enthal surface, brown.

Specimen : RG 40

Habitat: Terrestrial at an altitude of 889 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Borneo

3.6.12. Thelypteridaceae

3.6.12.1. *Christella parasitica*(L) Lev.

Terrestrial, herbaceous; 30 to 100 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; stipe round, 7 to 10 cm long, hairy surface, green; compound enthal, monomorphism, macrophile, blunt base, pointed tip, serrated edge, pinnate bone, paper-like texture, hairy surface, green; sorus without indusia, rounded along pinnule margin, brown.

Specimen : RG 107

Habitat: Terrestrial at an altitude of 905 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.12.2. *Pronephrium nitidum*Holtt.

Terrestrial, herbaceous; 50 to 100 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; rectangular stipe, 7 to 10 cm long, smooth surface, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, serrated edge, pinnate bone, opposite texture, smooth surface, green; sorus with indusia, rounded along enthal margin, brown.

Specimen : RG 95

Habitat: Terrestrial at an altitude of 816 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.12.3. *Christella siamensis*Holtt.

Terrestrial, herbaceous; 40 to 100 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; stipe round, 5 to 9 cm long, smooth surface, black; compound enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, elongated along pinnule margin, light brown.

Specimen : RG 124

Habitat: Terrestrial at an altitude of 940 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.12.4. *Pronephrium tripyllum*(Sw.) Holtt.

Epiphytes, herbs; 50 to 150 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, brown; stipe round, 7 to 10 cm long, smooth surface, green; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, rounded along enthalal veins on lower enthalal surface, brown.

Specimen : RG 110

Habitat: Terrestrial at an altitude of 896 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.12.5. *Macrothelypteris terresiana*(Gaud.) Ching

Terrestrial, herbaceous; 50 to 100 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; stipe round, 7 to 10 cm long, smooth surface, black; compound enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus without indusia, rounded along the edge of the pinnule, white.

Specimen : RG 123

Habitat: Terrestrial at an altitude of 908 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.13. Taenitidaceae

3.6.13.1. *Taenitis blechnoides*(Willd.) Sw

Terrestrial, herbaceous; 50 to 90 cm high, roots stiff, brown; rhizome creeping, surface covered with hairs, black; stipe round, 5 to 7 cm long, smooth surface, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, elongated along enthal margin, brown.

Specimen : RG 04

Habitat: Terrestrial at an altitude of 889 m above sea level

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

3.6.14. Vittariaceae

3.6.14.1. *Vittaria malayensis*Holtt.

Epiphytes, herbs; 10 to 15 cm high, roots stiff, brown; creeping rhizomes, surface covered with hair, brown; stipe round, 1 to 3 cm long, smooth surface, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, rounded along enthal margin, brown. (Appendix 5.51)

Specimen : RG 24

Habitat: Epiphytes on tree trunks at an altitude of 850 m asl

Distribution : Indonesia (Sumatra, Java, Kalimantan, Sulawesi), Malaya, Thailand

3.6.14.2. *Antrophyum callifolium*Bl.

Epiphytes, herbs; 30 to 60 cm high, roots stiff, brown; rhizome creeping, hairy surface, brown; stipe round, 3 to 5 cm long, smooth surface, black; single enthal, monomorphism, macrophile, blunt base, pointed tip, flat edge, pinnate bone, paper-like texture, smooth surface, green; sorus with indusia, elongated shape along the enthal veins on the underside of the enthales, brown.

Specimen : RG 100

Habitat: Epiphytes on tree trunks at an altitude of 844 m asl

Distribution: Indonesia (Sumatra, Java, Kalimantan, Sulawesi) and Malaya

4. Conclusion

Research on the results of an inventory of ferns in the Batang Toru Forest Area, West Block, North Tapanuli Regency, found 52 species of ferns belonging to 14 families and 29 genera. The Polypodiaceae tribe is the most commonly found tribe, with 10 species. The types of ferns found living in terrestrial habitats are 33 species and 19 types of epiphytes..

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