



IDENTIFICATION OF PTERIDOPHYTES DIVERSITY IN THE MOUNTAINOUS AREA OF BUNTU SARONG VILLAGE, MASALLE DISTRICT, ENREKANG REGENCY

Hasmiati^{1*}, Musma Rukmana¹, Tika Putri Agustina¹, Fernando Andre Watung²

¹Biologi Education Study program, Faculty of Mathematics, Natural Sciences and Earth Science, Manado State University

Jl. Kampus Unima, Tondano, North Sulawesi, Indonesia, 95619

²Biological Science Study program, Faculty of Mathematics, Natural Sciences and Earth Science, Manado State University

Jl. Kampus Unima, Tondano, North Sulawesi, Indonesia, 95619

*Corresponding author: hasmiati@unima.ac.id

ARTICLE INFO

Article history

Submission 2024-08-28
Revision 2024-09-30
Accepted 2024-10-22

Keywords:

Diversity
Enrekang Regency
Ferns
Identification
Pteridophyte

ABSTRACT

Ferns (Pteridophyte) are members of the kingdom Plantae that contribute to Indonesia's biodiversity, especially the diversity of flora. Ferns have an essential role in maintaining the balance of the ecosystem. In addition to having ecological value, ferns also have the potential to help support people's lives. However, ferns are less well-known and receive less attention than other plants. One reason is people's unfamiliarity with ferns. This study aims to identify the types of Pteridophytes in the mountainous area of Buntu Sarong Village, Masalle District, Enrekang Regency. Data was collected using the exploration method at specific points in the research location that were considered potential, then recording, documenting, identifying, and classifying the Pteridophyta found. The research at the research location successfully identified and documented 16 species of Pteridophyte, namely *Psilotum nudum*, *Lycopodium*, *Selaginella delicatula*, *Equisetum hyemale*, *Odontosoria chinensis*, *Gleichenia linearis*, *Adiantum* sp., *Christella parasitica*, *Asplenium nidus*, *Cyathea cooperi*, *Angiopteris evecta*, *Deparia petersenii*, *Microsorium punctatum*, *Drynaria quercifolia*, *Microsorium punctatum*, *Microsorium scolopendria*, *Drymoglossum piloselloides*. The identified Pteridophyte are classified into 13 families (*Lycopodiaceae*, *Psilotaceae*, *Equisetaceae*, *Marattiaceae*, *Lindsaceae*, *Gleicheniaceae*, *Adiantaceae*, *Thelypteridaceae*, *Asplenidaceae*, *Chyatheaceae*, *Athyriaceae*, *Polypodiaceae*) and five



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classes (Lycopodiopsida, Psilotopsida, Equisetopsida, Marattiopsida, Polypodiopsida).

INTRODUCTION

Indonesia is nicknamed a mega biodiversity country because it has high biodiversity, including flora diversity (Abidin et al., 2021). Indonesia's extraordinary flora diversity clearly benefits society in many areas, including science and technology, agriculture, food, clothing, housing, ecology, and pharmacy (Wulandari et al., 2023).

Ferns (Pteridophyte) also contribute to increasing the richness of flora diversity in Indonesia. There are over 10,000 species of ferns worldwide (Puspa et al., 2023), and Indonesia has as many as 1,300 species (Nosi et al., 2023). Ferns play an essential role in producing various types of organic materials in the soil from the litter that covers the surface of the soil that comes from ferns. Ferns are pioneer plants (Wanma, 2021). Due to their capacity to adapt to a variety of environmental conditions, they can grow in various places. Ferns can grow on the ground (terrestrial) or attached to trees (epiphytes). Terrestrial ferns prefer humid and shaded environmental conditions around rivers and mountainous areas with high humidity. Some live in bright and dry places.

However, currently, ferns receive less attention compared to other plant groups. In addition to having ecological value, ferns also have the potential for benefits in other fields. For example, as food ingredients, some ferns can be consumed as vegetables. Furthermore, some ferns have the potential to be used as medicines (Ulfa et al., 2024). Ye et al. (2021), in their book, have introduced eight species of 3 families of therapeutic ferns. Even Renjana et al. (2021) found that some species of ferns contain anticancer, antimicrobial, and antimalarial substances. Ferns can also be used in education as a learning resource (Hasmiati et al., 2023). Apart from that, ferns also have the potential to be helpful in agriculture and tourism (Tnunay & Hanas, 2020). Parts of the fern plant can be used to support daily life. However, most people still consider ferns less useful. This is due to the lack of public knowledge about the types of ferns (Anggraini et al., 2023).

Enrekang Regency, located in South Sulawesi, is a mountainous area with around 85% of the total area covered by mountains (Hasmiati et al., 2018). The topography

includes mountains, hills, valleys, and rivers at an altitude between 47 and 3,293 meters above sea level (Enrekang, 2017). This topographic diversity makes Enrekang Regency rich in flora diversity, including ferns (Pteridophyte), because topographic differences can affect the diversity of fern species (Laeto & Taharu, 2021).

This study aims to explore and identify the types of ferns (Pteridophytes) in the Mountainous Area. Buntu Sarong Village, Masalle District, and Enrekang Regency are potential areas for growing ferns. With the data on the types of ferns (Pteridophytes) from this study, it is hoped that the community will know their existence so that they can be utilized optimally in everyday life.

MATERIALS AND METHODS

The research location is the Mountainous Area of Buntu Sarong Village, Masalle District, Enrekang Regency. This area is at an altitude of 800-1000 meters above sea level. The location is explored as being 2 km to the north of the Ubuntu Sarong village line. The research was conducted in June 2024. The research method is exploration (Lingga et al., 2021). Data collection was carried out by purposive sampling. Exploring locations that were considered potential in the Masalle Mountains Area, all types of Pterydophyta species found were observed, recorded, documented (photos), and then identified.

The identification process begins with observing the characteristics of Pterydophyta in the form of habitus, growth place (substrate), leaf morphology (shape, size, color), stem morphology (shape, presence of scales, presence of rhizoids, color), root morphology, reproductive organs, and sorus location. The tools used in this study were a digital camera, stationery, cutter, magnifying glass, and plastic bags.

After collecting data on the characteristics of Pteridophytes, the next step was to analyze and identify Pteridophyte species by referring to the Flora book (Steenis, 2010). The pteridophytes that had been identified were then grouped into their respective families and classes according to Smith et al. (2006) and presented in table form.

RESULTS AND DISCUSSION

Exploration at the research location successfully documented 16 types of ferns included in 5 classes, namely the Lycopodiopsida class, with two families, each consisting of 1 species. The second class is the Psilotopsida class, with one family consisting of one species. Equisetopsida is the third class; it consists of 1 family and one species. Marattiopsida is the fourth class; it comprises one family and one species. Polypodiopsida has the most members, namely eight families with 11 species. Data on the diversity of fern species are presented in Table 1. Images and classification data of ferns are presented in Table 2.

Table 1. Diversity of Pteridophyta Species in the Mountainous Area of Buntu Sarong Village, Masalle District, Enrekang Regency.

Class	Family	Species	Local Name
Lycopodiopsida	Lycopodiaceae	<i>Lycopodium</i> sp.	Paku kawat
	Selaginellaceae	<i>Selaginella delicatula</i>	Paku rane
Psilotopsida	Psilotaceae	<i>Psilotum nudum</i>	Paku purba
Equisetopsida	Equisetaceae	<i>Equisetum hyemale</i>	Paku ekor kuda
Marattiopsida	Marattiaceae	<i>Angiopteris evecta</i>	Paku Raja
Polypodiopsida	Lindsaeaceae	<i>Odontosoria chinensis</i>	Paku peri
	Gleicheniaceae	<i>Gleichenia linearis</i>	Paku rasam
	Adiantaceae	<i>Adiantum</i> sp.	Paku suplir
	Thelypteridaceae	<i>Christella parasitica</i>	Paku pedang
	Asplenidaceae	<i>Asplenium nidus</i>	Paku sarang burung
	Cyatheaceae	<i>Cyathea cooperi</i>	Paku tiang
	Athyriaceae	<i>Deparia petersenii</i>	Pakis sayur
	Polypodiaceae	<i>Microsorium punctatum</i>	Paku hias
		<i>Drynaria quercifolia</i>	Paku Layang
		<i>Microsorium scolopendria</i>	Paku cacing
		<i>Drymoglossum piloselloides</i>	Paku sisik naga

Table 2. Types and Classification of Pteridophyte Found in the Mountainous Area of Buntu Sarong Village, Masalle District, Enrekang Regency.

Picture	Species	Local name	Classification
	<i>Psilotum nudum</i>	Paku purba	Kingdom : Plantae
			Divisi : Polypodiophyta
			Kelas : Psilotopsida
			Ordo : Psilotales
			Famili : Psilotaceae
			Genus : <i>Psilotum</i>
			Spesies : <i>Psilotum nudum</i>

Picture	Species	Local name	Classification
	<i>Equisetum hyemale</i>	Paku ekor kuda	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Equisetopsida Ordo : Equisetales Famili : Equisetaceae Genus : <i>Equisetum</i> Spesies : <i>Equisetum debile</i>
	<i>Lycopodium sp.</i>	Paku kawat	Kingdom : Plantae Divisi : Lycopodiophyta Kelas : Lycopodiopsida Ordo : Lycopodiales Famili : Lycopodiaceae Genus : <i>Lycopodium</i> Spesies : <i>Lycopodium sp.</i>
	<i>Selaginella delicatula</i>	Paku rane	Kingdom : Plantae Divisi : Lycopodiophyta Kelas : Lycopodiopsida Ordo : Selaginellales Famili : Selaginellaceae Genus : <i>Selaginella</i> Spesies : <i>Selaginella sp.</i>
	<i>Odontosoria chinensis</i>	Paku peri	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polypodiales Famili : Lindsaeaceae Genus : <i>Odontosoria</i> Spesies : <i>Odontosoria chinensis</i>
	<i>Gleichenia linearis</i>	Paku rasam	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Gleicheniales Famili : Gleicheniaceae Genus : <i>Gleichenia</i> Spesies : <i>Gleichenia linearis</i>
	<i>Adiantum sp.</i>	Paku suplir	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polipodiales Famili : Pteridaceae Genus : <i>Adiantum</i> Spesies : <i>Adiantum sp.</i>
	<i>Christella parasitica</i>	Paku pedang	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polipodiales Famili : Thelypteridaceae Genus : <i>Christella</i>

Picture	Species	Local name	Classification
	<i>Aspelinum nidus</i>	Paku sarang burung	Spesies : <i>Christella parasitica</i> Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polipodiales Famili : Asplenidaceae Genus : <i>Aspelinum</i> Spesies : <i>Aspelinum nidus</i>
	<i>Drynaria quercifolia</i>	Paku Layang	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polypodiales Famili : Polypodiaceae Genus : <i>Drynaria</i> Spesies : <i>Drynaria quercifolia</i>
	<i>Cyathea cooperi</i>	Paku tiang	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Cyatheaales Famili : Cyatheaceae Genus : <i>Cyathea</i> Spesies : <i>Cyathea cooperi</i>
	<i>Angiopteris evecta</i>	Paku Raja	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Marattiales Famili : Marattiaceae Genus : <i>Angiopteris</i> Spesies : <i>Angiopteris evecta</i>
	<i>Deparia petersenii</i>	Pakis sayur	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polypodiales Famili : Athyriaceae Genus : <i>Deparia</i> Spesies : <i>Deparia petersenii</i>
	<i>Microsorium punctatum</i>	Paku hias	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polypodiales Famili : Polypodiaceae Genus : <i>Microsorium</i> Spesies : <i>Microsorium punctatum</i>

Picture	Species	Local name	Classification
	<i>Microsorium scolopendria</i>	Paku cacing	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polypodiales Famili : Polypodiaceae Genus : <i>Microsorium</i> Spesies : <i>Microsorium scolopendria</i>
	<i>Drymoglossum piloselloides</i>	Paku sisik naga	Kingdom : Plantae Divisi : Polypodiophyta Kelas : Polypodiopsida Ordo : Polypodiales Famili : Polypodiaceae Genus : <i>Drymoglossum</i> Spesies : <i>Drymoglossum piloselloides</i>

Lycopodium sp. They are also known as ground pine or wire fern. The leaves are simple and small, like hair or scales. The stem is upright and has many branches. The stem is like a wire, at the end of which there is a strobilus, a collection of sporangia in the axils of the sporophyll leaves collected into grains. Lives on the ground in mountainous areas exposed to sunlight. *Lycopodium* has been used to treat a wide range of illnesses in various traditional medical systems, with a concentration on conditions relating to inflammation and the central nervous system (Wang et al., 2022).

Selaginella delicatula, or paku rane, grows in moist and shaded soil. Stems with dichotomous branches then become monopodial. Small, simple leaves are short-stalked, green, and very thin; leaf sheaths are not branched. Arranged into 4 rows, namely 2 side rows consisting of large leaves, two rows of small leaves in front, and sitting attached to each other. Sporangia are found in the axils of sporophyll leaves, which consist of microsporophylls and megasporophylls. Sporophylls are collected and arranged into strobilus at the end of the square-shaped stem. Roots consist of primary and adventitious roots that branch dichotomously, emerging from the stem.

Psilotum nudum is also known as ancient fern. This fern is also called a naked fern because its leaves are small, like scales. (Šamec et al., 2019) said that it is not an actual leaf. The stem is round, triangular, dark green, and has dichotomous branches. In the axils of the stem segments, there are sporangia (synangia) in the form of three circles that merge: green when young and yellow to brownish when old. *Psilotum nudum* is often found on rocks and cliffs; some grow on the ground.

Equisetum hyemale is known as water bamboo, also called horsetail fern in the community. This fern has a rigid stem with a rough surface, green in color, segmented, and hollow. At the end of the stem, there is a strobilus containing sporangium. This fern grows in clumps with a height of 30-100 cm. The leaves are tiny (microphylls) scale-shaped, single, arranged in a circle on each stem segment.

Angiopteris evecta is also called king nails or giant nails because of its size. Has extensive rhizomes up to 1 meter in diameter. Rhizomes give rise to glossy green leaves that can grow up to 9 meters tall and 2,5 meters wide—fleshy green leaf stalks. There are supporting leaves on both sides of the leaf stalk at the base (stipules). The leaves are bipinnate, with about 9-12 pairs of pinnae measuring up to 150 cm long and 45 cm wide. Each pinnae carries about 30-40 pairs of pinnules measuring about 13x2 cm. Sporangium are found under the leaves very close to the leaf edge.

Odontosiria chinensis has short creeping rhizomes and dense scales and is dark brown. Leaf blades are oval to lanceolate. Leaf veins are 3 or 4 pinnate; the base is pointed and has a short stalk. The leaf tip is rounded wide to shallowly notched. A collection of sori is at the tip of the leaf that is notched like a cup.

Gleichenia linearis grows on the ground, creeping rhizome roots. This fern loves the most light (Febriyani et al., 2022). Stems hang or climb. Leaves are green and pinnately canted; leaf branches are forked (dichotomous); leaf tips are blunt, with flat edges. Sporangia are found on the underside of the leaves, which are round. This fern forms a dense thicket.

The public knows *asplenium nidus* as a prayer flower or a bird's nest fern. Has rhizome roots that support rosette-shaped leaves. Grows on various substrates, such as epiphytes on trees or the ground. Single leaves, long and slightly wide, short-stemmed, shiny green, flat edges with pointed or rounded tips. Sori are located on the leaf's underside near the tip, in the form of a line just above the lateral leaf veins, which are transverse branches of the blackish-brown mother leaf veins.

Adiantum sp. or suplir grows on the ground with a shiny black upright stem. The leaves are compound pinnately double, alternately arranged, and green with a smooth and shiny leaf surface and serrated leaf edges—sorus on the abaxial edge of the leaf that rolls down (Renjana & Andiana, 2022). The edges of the leaves also function as a protective membrane.

Deparia Petersen has an upright stem that is round and green in color. The leaves are triangular, with serrated edges and rounded tips. Sorus is located on the leaf's underside with an elongated or elliptical shape arranged in a fishbone pattern under the leaf veins. When young, the sorus is white, but over time, it turns black.

Christella dentata grows in moist soil. It has a green, round, upright stem. The compound leaves are light green with serrated edges, flat surfaces, and pointed tips. The leaves sit alternately on a notched leaf base. Sporangia are located on the leaf's underside, near the edge of the leaves, and collected into piles (sorus) that have a protective membrane (indusium).

Drynaria quercifolia epiphytic growth on trees. Has climbing, long, thick, and scaly rhizomes. Sterile leaves (trophophylls) are broad, oval-shaped, and attached to the rhizome. The leaf veins are pinnate; the edges are notched and stiffer. Fertile leaves (sporophylls) are stalked for much longer. The leaf edges are shared, and the surface is smooth, with sori scattered irregularly on the lower surface.

Cyathea cooperi, also called pole nail, is about 6-15 meters tall. The diameter of the stem reaches 10-15 cm. Some leaves are crowded like a rosette at the end of the stem. Many sharp thorns are on the leaf stalk and the central leaf axis. The leaves are pinnately green, young leaves are scaly. Sorus is located on the leaf's underside, at a distance from the edge of the leaf, above the back of the leaf veins, brown, as many as two parallel rows.

Microsorium punctatum is found growing in between rocks. It is medium-sized with single leaves that are pale yellowish-green and fleshy. The leaves are upright, with single-leaf veins, flat edges, smooth surfaces, and elliptical or lanceolate with rounded tips. Sorus is located on the leaf's underside, round and brownish yellow.

Microsorium scolopendria has a green rhizome stem with black scales that spread on the ground, rocks, or other plants. The leaves grow upright on the rhizome, have rounded leaf lobes, and are somewhat fleshy, shiny, and yellowish-green with flat edges. On the lower surface of the leaves, there are sori in the form of round bumps that are slightly concave into the leaves, yellow to brownish—the closer to the tip of the leaf, the more bumps and denser.

Drymoglossum piloselloides, also known as dragon scale fern, is found growing as an epiphyte on tree trunks or branches. The rhizomes are long, small, creeping, scaly, and black. The leaves are thick, fleshy, close together, and green, consisting of sterile leaves

(trophophylls) and fertile leaves (sporophylls). Sterile leaves are round or oval with flat edges and rounded tips. Fertile leaves have short oval stems 1-5 times longer than sterile leaves with blunt tips. Sori are found on one side of the fertile leaves. Long, parallel, and at a certain distance from the middle leaf bone, it meets at the tip of the leaf.

CONCLUSION

Identifying ferns (Pteridophyte) in the mountainous area of Buntu Sarong Village, Masalle District, and Enrekang Regency obtained results for 16 species. Pteridophytes are classified into five classes, namely Lycopodiopsida (2 species), Psilotopsida (1 species), Equisetopsida (1 species), Marattiopsida (1 species), and Polypodiopsida (11 species). The Lycopodiopsida class consists of 2 families, namely Lycopodiaceae and Selaginellaceae; the Psilotopsida class has 1 family, namely Psilotaceae; the Equisetopsida class has 1 family, namely Equisetaceae; the Marattiopsida class has one family, namely Marattiaceae, while the Polypodiopsida class consists of 8 families, namely Lindsaceae, Gleicheniaceae, Adiantaceae, Thelypteridaceae, Asplenidaceae, Chyathaceae, Athyriaceae, and Polypodiaceae.

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