

# Identification and Inventory Pteridophyta in Mount Gede Pangrango National Park, Cibodas, West Java



Fitri Andriyani, Imam Safir Alwan Nurza\*

State University of Jakarta, Indonesia

## ABSTRACT

The fern is one of the plants that is easily found in Indonesia and it has a high diversity and distribution. Ferns are among the simplest vascular plants and are classified into sporous cormophytes which already have transport vessels. The purpose of this research was to identify and inventory the types of ferns found in Mount Gede Pangrango National Park. The research method used was descriptive with path tracking techniques and observations on the morphology of the found ferns. The research results obtained that 29 species of ferns were found in the observations made, namely *Ophioglossum reticulatum* L., *Selaginella caudata* (Desv.) Spring, *Davallia denticulata* (Burm.) Mett. & Kuhn, *Adiantum capillus-veneris* L., *Asplenium adiantum-nigrum* L., *Dryopteris sparsa* (Ham.) Kuntze, *Angiopteris evecta* (G.Forst.) Hoffm., *Dipteris conjugata* Reinw., *Pleopeltis heterocarpa* Bedd., *Phegopteris connectilis* (Michx.) Watt, *Asplenium nidus* L., *Polystichum acutatum* Roth, *Tectaria crenata* Cav., *Pityrogramma calomelanos* (L.) Link, *Pteris biauaria* L., *Nephrolepis biserrata* (Sw.) Schott, *Microsorium scolopendria* (Burm.fil.) Copel., *Cyathea contaminans* (Wall. Ex Hook.) Copel., *Davallia pentaphylla* Blume, *Dicksonia blumei* (Kunze) T. Moore, *Davallia trichomanoides* Blume, *Ctenitis vilis* (Kunze) Ching, *Thelypteris rudis* (Kunze) Proctor, *Adiantum hispidulum* Sw., *Bolbitis quoyana* (Gaud.) Ching, *Selaginella ornata* (Hook & Grev.) Spring, *Drynaria pleuridioides* Presl, *Gleichenia linearis* (Burm.) C.B.Cl., and *Psilotum nudum* (L.) P. Beauv. This research concludes that each fern plant has its characteristics that can be used as a basis for observing and identifying the types of ferns and making an inventory.

## CONTACT

imamnurza@gmail.com

## KEYWORDS

Fern, Identification, Inventory

Received: 28/02/2021

Revised: 25/03/2021

Accepted: 30/03/2021

Online: 25/04/2021

Published: 30/04/2021



Risenologi is licenced under a [Creative Commons Attribution 4.0 International Public Licence \(CC-BY 4.0\)](https://creativecommons.org/licenses/by/4.0/)

## INTRODUCTION

The fern is one of the oldest plants in the world because various fossils were found in rocks 420 million years old (Lestari, 2019; Nugroho *et al.*, 2018). Ferns or Pteridophyta are easily found in Indonesia and are one of the flora groups that have a high diversity and wide distribution (Fatahillah *et al.*, 2018; Wahyuningsih *et al.*, 2018). This group of plants already has a true vascular system (cormus) but does not produce seeds for reproduction. Instead of seeds, this group of plants still uses spores as a means of generative propagation, just like mosses and fungi (Fatahillah *et al.*, 2018; Nugroho *et al.*, 2018; Nurza *et al.*, 2019; Smith *et al.*, 2006).

There are various forms of ferns, some are in the form of trees (ferns), usually unbranched, epiphytic, floating in the water, hydrophytic, but usually in the form of herbs with rhizomes that spread on the ground or hummus and ental (midrib) which support the leaves of the same size. varies (up to 6 m). The young leaves always curl (like a nail handle. Fern leaves are almost always compound leaves (Nugroho *et al.*, 2018; Riastuti *et al.*, 2018; Smith *et al.*, 2006; Wahyuningsih *et al.*, 2018).

Ferns (Pteridophyta) belong to simple vascular plants and are classified in Cormophyta spores which already have transport vessels. Nail plants (Pteridophyta) can live epiphytes, hygrophytes, hydrophytes, and live on other plant debris (Wahyuningsih *et al.*, 2018; Wijana, 2014). Nail plants are a group of plants that have unique characteristics and are not found in other plant groups, with young leaves that are shaped like a loop of rope. Another characteristic is that all these plant types produce spores that are formed in the sporangium and are located on the lower surface of the leaf organ (Riastuti *et al.*, 2018; Syafrudin *et al.*, 2016; Wijana, 2014).

Indonesia has an abundant number of Pteridophyta because Indonesia has a climate that supports the growth of Pteridophyta. Pteridophyta is found in tropical forests that have abundant sunlight and high humidity (Fatahillah *et al.*, 2018; Riastuti *et al.*, 2018; Wahyuningsih *et al.*, 2018). There are 450 species of ferns (Pteridophyta) found in West Java, 333 species in Central Java, and 319 species found in East Java (Lestari, 2019; Nugroho *et al.*, 2018; Riastuti *et al.*, 2018).

Mount Gede Pangrango National Park has an area of 22,851.03 hectares. This national park area by mountainous rain forest. Designated as a national park through Ministerial Decree No. 736/36 / Minister / X / 82 (Nugroho *et al.*, 2018). The area of Mount Gede Pangrango National Park is an area of protection, scientific

studies, and sustainable use. The development of ferns in this area is managed by the West Java Conservation and Natural Resources Center, the Central Gunung Gede Pangrango National Park, LIPI, and PusLitBangHut for Nature Conservation (Fatahillah *et al.*, 2018). This place is used as research because increased conservation of ferns needs to be done through identification and inventory to develop fern conservation management in Gunung Gede Pangrango National Park. Therefore, the research aimed to identify and inventory the species of ferns found in Mount Gede Pangrango National Park.

## METHODS

The method used in this research is a descriptive method with path tracking techniques and observations on the morphology of the found ferns. The tools used in this research were cameras, datasheets, fern identification books, hand lenses, and stationery. Data collection was carried out by tracing the area of the hiking trail where ferns were expected to be found. Then, taking a few pictures of the specimen with a camera, trying to get the vegetative and generative organs used for identification. Next, make documentation, descriptions, and identify collection specimens using an identification key through a fern identification book for inventory.

## RESULTS AND DISCUSSIONS

TABLE 1. Ferns found in TNGGP, Cibodas, West Java

No	Species	Classification
1.	<i>Ophioglossum reticulatum</i> L.	Class : Polypodiopsida Order : Ophioglossales Family : Ophioglossaceae Genus : <i>Ophioglossum</i> Species : <i>Ophioglossum reticulatum</i> L. ( <a href="http://www.gbif.org">www.gbif.org</a> )
2.	<i>Selaginella caudata</i> (Desv.) Spring	Class : Lycopodiopsida Order : Selaginellales Family : Selaginellaceae Genus : <i>Selaginella</i> Species : <i>Selaginella caudata</i> (Desv.) Spring ( <a href="http://www.gbif.org">www.gbif.org</a> )
3.	<i>Davallia denticulata</i> (Burm.) Mett. & Kuhn	Class : Polypodiopsida Order : Polypodiales Family : Davalliaceae Genus : <i>Davallia</i> Species : <i>Davallia denticulata</i> (Burm.) Mett. & Kuhn ( <a href="http://www.gbif.org">www.gbif.org</a> )
4.	<i>Adiantum capillus-veneris</i> L.	Class : Polypodiopsida Order : Polypodiales Family : Pteridaceae Genus : <i>Adiantum</i> Species : <i>Adiantum capillus-veneris</i> L. ( <a href="http://www.gbif.org">www.gbif.org</a> )
5.	<i>Asplenium adiantum-nigrum</i> L.	Class : Polypodiopsida Order : Polypodiales Family : Aspleniaceae Genus : <i>Asplenium</i> Species : <i>Asplenium adiantum-nigrum</i> L. ( <a href="http://www.gbif.org">www.gbif.org</a> )
6.	<i>Dryopteris sparsa</i> (Ham.) Kuntze	Class : Polypodiopsida Order : Polypodiales Family : Dryopteridaceae Order : <i>Dryopteris</i> Species : <i>Dryopteris sparsa</i> (Ham.) Kuntze ( <a href="http://www.gbif.org">www.gbif.org</a> )
7.	<i>Angiopteris evecta</i> (G.Forst.) Hoffm.	Class : Polypodiopsida Order : Marattiales Family : Marattiaceae

8. *Dipteris conjugata* Reinw.  
Genus : *Angiopteris*  
Species : *Angiopteris evecta* (G.Forst.) Hoffm.  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Gleicheniales  
Family : Dipteridaceae  
Genus : *Dipteris*  
Species : *Dipteris conjugata* Reinw.  
([www.gbif.org](http://www.gbif.org))
9. *Pleopeltis heterocarpa* Bedd.  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Polypodiaceae  
Genus : *Pleopeltis*  
Species : *Pleopeltis heterocarpa* Bedd.  
([www.gbif.org](http://www.gbif.org))
10. *Phegopteris connectilis*  
(Michx.) Watt  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Thelypteridaceae  
Genus : *Phegopteris*  
Species : *Phegopteris connectilis* (Michx.) Watt  
([www.gbif.org](http://www.gbif.org))
11. *Asplenium nidus* L.  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Aspleniaceae  
Genus : *Asplenium*  
Species : *Asplenium nidus* L.  
([www.gbif.org](http://www.gbif.org))
12. *Polystichum acutatum* Roth  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Dryopteridaceae  
Genus : *Polystichum*  
Species : *Polystichum acutatum* Roth  
([www.gbif.org](http://www.gbif.org))
13. : *Tectaria crenata* Cav.  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Tectariaceae  
Genus : *Tectaria*  
Species : *Tectaria crenata* Cav.  
([www.gbif.org](http://www.gbif.org))
14. *Pityrogramma calomelanos* (L.)  
Link  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Pteridaceae  
Genus : *Pityrogramma*  
Species : *Pityrogramma calomelanos* (L.) Link  
([www.gbif.org](http://www.gbif.org))
15. *Pteris biaurita* L.  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Pteridaceae  
Genus : *Pteris*  
Species : *Pteris biaurita* L.  
([www.gbif.org](http://www.gbif.org))
16. *Nephrolepis biserrata* (Sw.)  
Schott  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Nephrolepidaceae  
Genus : *Nephrolepis*  
Species : *Nephrolepis biserrata* (Sw.) Schott  
([www.gbif.org](http://www.gbif.org))
17. *Microsorium scolopendria*  
(Burm.fil.) Copel.  
Class : Polypodiopsida  
Order : Polypodiopsida  
Family : Polypodiaceae  
Genus : *Microsorium*

- Species : *Microsorium scolopendria* (Burm.fil.) Copel.  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Cyatheaales  
Family : Cyatheaceae  
Genus : *Cyathea*  
Species : *Cyathea contaminans* (Wall. ex Hook.) Copel.  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Davalliaceae  
Genus : *Davallia*  
Species : *Davallia pentaphylla* Blume  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Cyatheaales  
Family : Dicksoniaceae  
Genus : *Dicksonia*  
Species : *Dicksonia blumei* (Kunze) T.Moore  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Davalliaceae  
Genus : *Davallia*  
Species : *Davallia trichomanoides* Blume  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Dryopteridaceae  
Genus : *Ctenitis*  
Species : *Ctenitis vilis* (Kunze) Ching  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Thelypteridaceae  
Genus : *Thelypteris*  
Species : *Thelypteris rudis* (Kunze) Proctor  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Pteridaceae  
Genus : *Adiantum*  
Species : *Adiantum hispidulum* Sw.  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Dryopteridaceae  
Genus : *Bolbitis*  
Species : *Bolbitis quoyana* (Gaud.) Ching  
([www.gbif.org](http://www.gbif.org))  
Class : Lycopodiopsida  
Order : Selaginellales  
Family : Selaginellaceae  
Genus : *Selaginella*  
Species : *Selaginella ornata* (Hook & Grev.) Spring  
([www.gbif.org](http://www.gbif.org))  
Class : Polypodiopsida  
Order : Polypodiales  
Family : Polypodiaceae  
Genus : *Drynaria*
18. *Cyathea contaminans* (Wall. ex Hook.) Copel.
19. *Davallia pentaphylla* Blume
20. *Dicksonia blumei* (Kunze) T.Moore
21. *Davallia trichomanoides* Blume
22. *Ctenitis vilis* (Kunze) Ching
23. *Thelypteris rudis* (Kunze) Proctor
24. *Adiantum hispidulum* Sw.
25. *Bolbitis quoyana* (Gaud.) Ching
26. *Selaginella ornata* (Hook & Grev.) Spring
27. *Drynaria pleuridioides* Presl

		Species : <i>Drynaria pleuridioides</i> Presl ( <a href="http://www.gbif.org">www.gbif.org</a> )
		Class : Polypodiopsida
		Order : Gleicheniales
28	<i>Gleichenia linearis</i> (Burm.) C.B.Cl.	Family : Gleicheniaceae
		Genus : <i>Gleichenia</i>
		Species : <i>Gleichenia linearis</i> (Burm.) C.B.Cl. ( <a href="http://www.gbif.org">www.gbif.org</a> )
		Class : Polypodiopsida
		Order : Psilotales
29	<i>Psilotum nudum</i> (L.) P.Beauv.	Family : Psilotaceae
		Genus : <i>Psilotum</i>
		Species : <i>Psilotum nudum</i> (L.) P.Beauv. ( <a href="http://www.gbif.org">www.gbif.org</a> )

*Ophioglossum reticulatum* L. this plant is found in the cliffs of the ground. This fern was observed to have a single frond and upright fertile, sorus sunk in 2 lines, green, tufted rhizome shape, obovate-shaped lamina, and hairless stipe can be seen on Figure 1a. *Selaginella caudata* (Desv.) Spring this spring plant is found in cliffs of land. This fern was observed to have reclining stems and partially standing upright branching, stypes arranged opposite and hairless, lamina bipinnatus form, and rhizoma short creeping can be seen on Figure 1b.

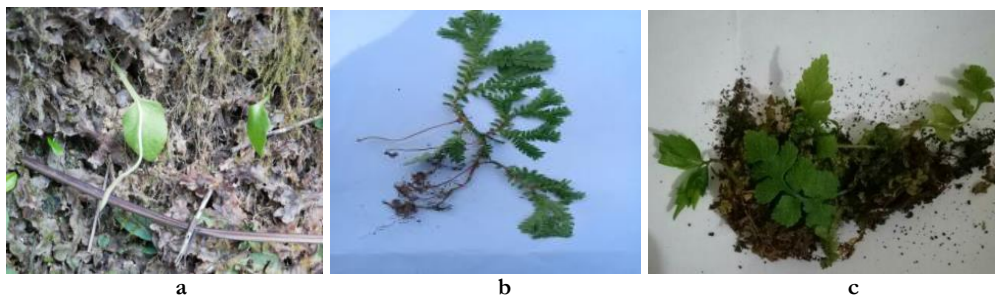


Figure 1. a) *Ophioglossum reticulatum* L., b) *Selaginella caudata* (Desv.) Spring, and c) *Asplenium adiantum-nigrum* L.

*Davallia denticulata* (Burm.) Mett. & Kuhn this plant was found attached to the substrate in the form of holdfast Angiopteris evecta can be seen on Figure 2b. This fern was observed to have a long creeping and scaly rhizome, the shape of the lamina pinnatus pinnatifid, the frond stalk jointed to the rhizome, the sorus indusium and the round indusium (peltate), and the indusium attached to the base of the sorus (Salamah *et al.*, 2020; Astuti *et al.*, 2017).

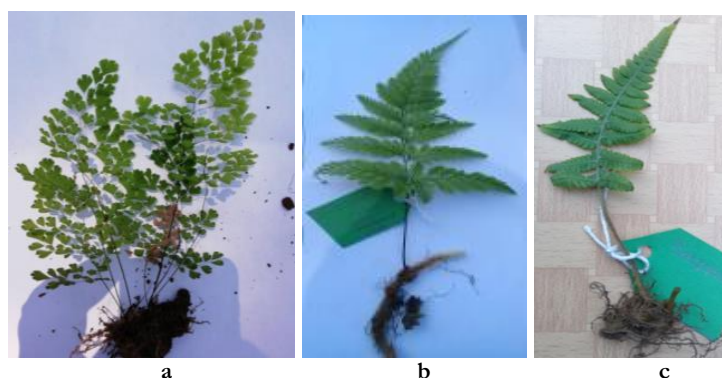


Figure 2. a) *Adiantum capillus-veneris* L., b) *Davallia denticulata* (Burm.) Mett. & Kuhn, and c) *Phegopteris connectilis* (Michx.) Watt

*Adiantum capillus-veneris* L. this plant is found in the cliffs of the ground. This fern has a sorus on the surface of a small leaf that rolls inward from the edge of the lamina, an exindusiate sorus, a black and hairless stipe, a light green triangular leaf consisting of many fan-shaped leaves, around stem with a dichotomous branching black-brown black, grooved lamina edge, tapered leaf base, indented leaf tip, and smooth surface (Betty *et al.*, 2015; Purnawati *et al.*, 2014). Then, the lamina bipinnatus pinnatifid and rhizoma form short creeping can be seen on Figure 2a.

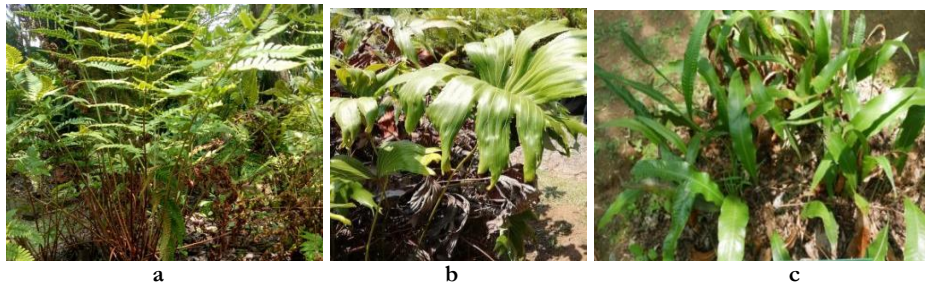


Figure 3. a) *Dryopteris sparsa* (Ham.) Kuntze, b) *Dipteris conjugata* Reinw., and c) *Pleopeltis heterocarpa* Bedd.

*Asplenium adiantum-nigrum* L. this plant is found in soil cliffs. This fern is observed to have no rhizome in the form of root fibers that are immersed in the soil or as a rock attachment if the epiphyte is in the rock can be seen on Figure 1c. Then, it has a rhizome root that is short and scaly, the short stipe is not even visible, the lamina is sitting and has a very short stem and is reddish-green, a single lamina, pinnate leaf bones, not segmented with rhizome roots, tightly packed (Salamah *et al.*, 2020; Riastuti *et al.*, 2018). Then, the sorus builds a line or narrow elongated, located next to the leaf bone, oblique or almost upright with the mother branch of the leaf bone. This plant is used as a decoration that can be found on top of trees, in pots, and attached to rocks (Yusal and Toni, 2021; Astuti *et al.*, 2017).

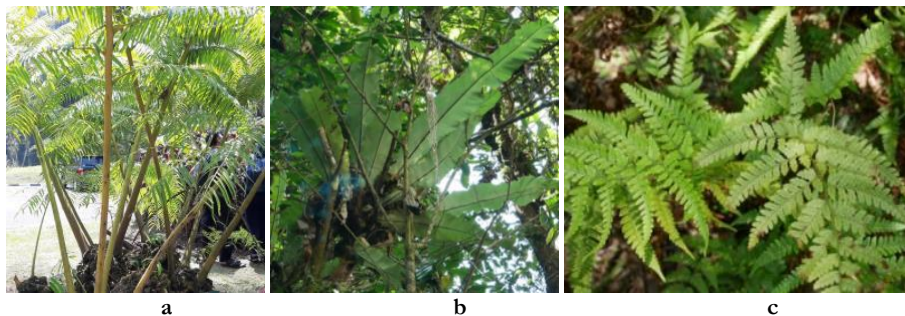


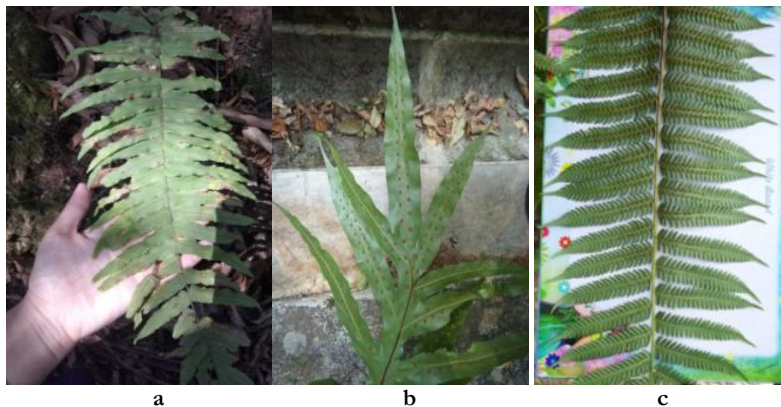
Figure 4. a) *Angiopteris evecta* (G.Forst.) Hoffm., b) *Asplenium nidus* L., and c) *Polystichum acutatum* Roth

*Dryopteris sparsa* (Ham.) Kuntze this plant is found on the path to the waterfall. This plant has smaller ribs and rachis with grooves, the frond stalk has a fierce bundle at the base, sorus indicium, and is a terrestrial fern can be seen on Figure 3a. *Angiopteris evecta* (G. Forst.) Hoffm. This plant is found on the path to the waterfall. This plant has been observed to have fiber roots that branch like a dichotom, the types of leaves are pinnate compound, the overall leaf shape is elongated, tapered leaf tips, jagged leaf edges, green leaf color, rough surface, hairy stems, sorus is under the leaves, scattered or regular layout, and sorus brown can be seen on Figure 4a.



Figure 5. a) *Tectaria crenata* Cav., b) *Pityrogramma calomelanos* (L.) Link, and c) *Pteris bianrita* L.

*Dipteris conjugata* Reinw. This plant is found on the path to the waterfall. This fern has a similarly shaped, wedge-shaped frond, a long, spreading rhizome covered with stiff, black, hair-like hair can be seen on Figure 3b. Then, the stems are black with a smooth surface, the leaves are fan-shaped, thin and not stiff, the underside of the leaves has rough hair, the color of the leaves is light green and the edges of the leaves are jagged, and there is sorus under the leaf surface with an irregular location (Musriadi *et al.*, 2017; Nasution and Khardhinata, 2018).



**Figure 6.** a) *Nephrolepis biserrata* (Sw.) Schott, b) *Microsorium scolopendria* (Burm.fil.) Copel., and c) *Thelypteris rudis* (Kunze) Proctor

*Pleopeltis heterocarpa* Bedd. This plant is found on the path to the waterfall. This plant has a hairy rhizome which tends to be scaly, epipetric (grows on rocks), forms the pinnatifid lamina, sorus is along the edge, and is round in shape with a brown color can be seen on Figure 3c. *Phegopteris connectilis* (Michx.) Wattage this plant is found in cliffs of land. This plant has compound leaves with incised leaf edges and the upper surface of the leaves is bright green while the lower surface is pale green. Then, the upper surface of the leaves is smooth and the lower surface is thinly haired with rounded sorus leaves. Sorus has no indusium and the roots of this plant are fibrous and rhizome can be seen on Figure 2c.



**Figure 7.** *Cyathea contaminans* (Wall. ex Hook.) Copel.

*Asplenium nidus* L. This plant was found attached to tree trunks in the forest on the road leading to a waterfall. This plant has a short rhizome and is covered with smooth and dense scales, brown rhizome scales, single leaves arranged on a short circular stem to form a basket, the lower leaves are paler with brown stripes, the sorus is elongated and located under the leaves can be seen on Figure 4b.



**Figure 8.** a) *Davallia pentaphylla* Blume and b) *Davallia trichomanoides* Blume

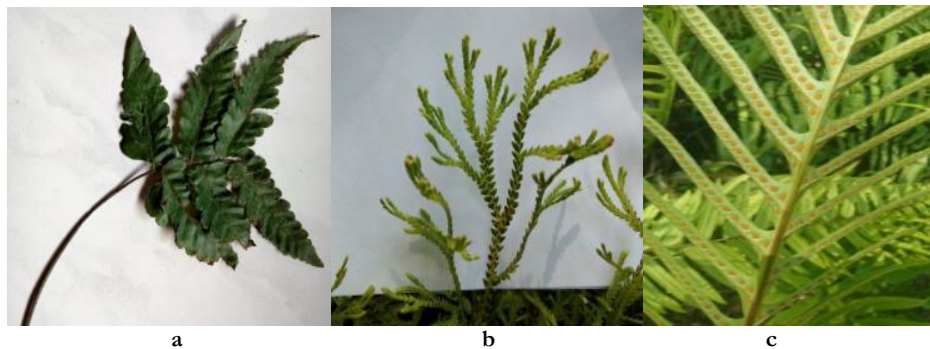
*Polystichum acutatum* Roth this herb is found on the path to the waterfall. This plant has a lamina pinnate-pinnatifid form, a hairy stipe, a sorus exindusiate form can be seen on Figure 4c. *Tectaria crenata* Cav. This plant is found on the path to the waterfall. This plant has a rib that appears grooved and slightly hairy, frond stalk with several veins at the base, lanceolate leaf shape, hairless stipe can be seen on Figure 5a. *Pityrogramma calomelanos* (L.)

This plant link is found on the path to the waterfall. The plant has a pinnate compound frond and the underside of the lamina is covered with waxy white or gold powder can be seen on Figure 5b.



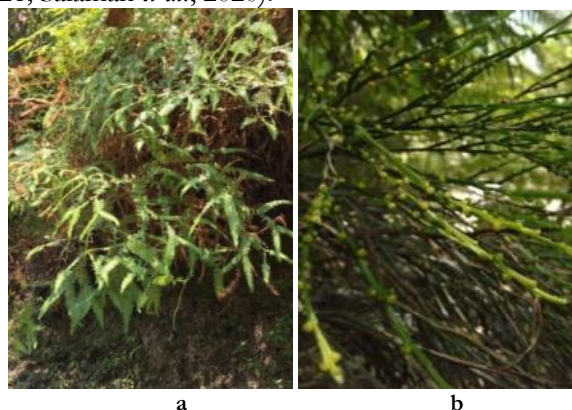
**Figure 9.** a) *Dicksonia blumei* (Kunze) T.Moore, b) *Ctenitis vilis* (Kunze) Ching, and c) *Adiantum hispidulum* Sw.

*Pteris biaurita* L. This plant is found on the path to the waterfall. The frond is pinnate, sometimes triple-leaved (bi-tri-pinnatus), the sorus is protected by an indusium that opens towards the leaf bone, sorus is at the marginal or marginal edge, and sorus is continuous along most of the edges of the leaflets can be seen on Figure 5c.



**Figure 10.** a) *Bolbitis quoyana* (Gaud.) Ching, b) *Selaginella ornata* (Hook & Grev.) Spring, and c) *Drynaria pleuridioides* Presl

*Nephrolepis biserrata* (Sw.) Schott This plant is found epiphytes on tree trunks in the path that leads to the waterfall can be seen on Figure 6a. This plant has brown rhizome, decumbent rhizome, hairy and brown stipe, pinnule lanceolate and 1-pinnate serrate blade, green lamina, hairy lamina surface, lamina pinnule serrate edge, acute pinnule apex, reticulate vein, kidney-shaped sorus (reinform), and the location of the marginal spores (Hasibuan *et al.*, 2016; Yusal and Toni, 2021; Salamah *et al.*, 2020).



**Figure 11.** a) *Gleichenia linearis* (Burm.) C.B.Cl. and b) *Psilotum nudum* (L.) P.Beauv.

*Microsorium scolopendria* (Burm.fil.) Copel. These plants are found on the path to waterfalls and live terrestrial. This plant has a short creeping root type, brown stipe, pinnatifid lamina type, undulate pinnule margin type, pinnule acuminate apex type, sorus exidusiata type, and no indusium, submedial sorus location, and vein reticulate type can be seen on Figure 6b. *Cyathea contaminans* (Wall. Ex Hook.) Copel. This plant is found on the



path to the waterfall. This plant has rhizoid types such as fibers and is black, upright trunk and black in color, hairy stipe, hard texture, cylindrical shape, yellow, sorus is located under the surface of the frond close to the ribs and brown, sorus is grouped and round, type pinna pinnatus pinnatifid, green pinna, smooth texture, free-stretching venation pattern and bulbous tip, exindusiate sorus type, no indusium, and terrestrial life can be seen on Figure 7.

*Davallia pentaphylla* Blume This plant is found epiphytes in *Dicksonia blumei*. This fern has long creeping rhizome, pinnatus pinnatifid, lamina crenate shape, hairy stipe, marginal sorus location, and cup-shaped sorus indusium can be seen on Figure 8a. *Dicksonia blumei* (Kunze) T. Moore This plant is found on the path to the waterfall. This plant has a hairy stipe that is brownish red, tripinnatus, the shape of the serrated lobe lamina, the location of the sorus extending beyond the margin, and the sorus is covered with a bivalvate indusium can be seen on Figure 9a.

*Davallia trichomanoides* Blume This plant was found attached to *Araucaria cunninghamii*. This plant has long creeping hairy rhizome, pinnatifid tripinnatus, strong stalk-like hair and stems, triangular laminae, serrated pinna type, sorus is marginal, and has indusium can be seen on Figure 8b. *Ctenitis vilis* (Kunze) Ching This fern is found on the path to the waterfall. This plant has the frond pinnatus type, scaly stipe with blackish-brown scales, acuminate tip, serrate edge, sterile pinna and fertile pinna with the same shape and size, and a linear sorus with brownish-red color can be seen on Figure 9b.

*Thelypteris rudis* (Kunze) Proctor This fern is found on the path to the waterfall. This plant has a stipe surface such as hair or scales with brownish red, tripinnatus, pinna green, smooth surface, and terrestrial life can be seen on Figure 6c. *Adiantum hispidulum* Sw. This plant is found on the path to the waterfall. This plant has brown rhizome, fine-textured stipe, cuboid shape, no hair, green pinna color, arthriaceae vein, dark green pinna, falcate shape, crenate incision shape, basal pinna obtuse, apical pinna acuminate, no hair, the pattern of tip venation touching the margin, no location, and shape of sorus, pinnatifid lamina pinnatus shape, and terrestrial life can be seen on Figure 9c.

*Bolbitis quoyana* (Gaud.) Ching This fern is found on the path to the waterfall. This plant has a fine-textured stipe, cuboid shape, no hair, arthriaceae vascular bundles, dark green pinna, falcate shape, crenate incision form, truncate basal shape, apical acuminate shape, no hair, end venation pattern touching the margins, location and sorus form, pinnatifid lamina pinnatus form, and terrestrial life can be seen on Figure 10a. *Selaginella ornata* (Hook & Grev.) Spring This fern is found on the path to the waterfall. This plant has a light green pinna, triangular shape, not incised, biauriculate basal shape, obtuse apical shape, and terrestrial life can be seen on Figure 10b.

*Drynaria pleuridioides* Presl This plant is found in the path to the waterfall. This plant has pinnatus type branching, pectinate type, large sorus, medial sorus position, light brown sorus, and terrestrial life can be seen on Figure 10c. *Gleichenia linearis* (Burm.) C.B.Cl. This plant is found on the path to the waterfall. This plant has fibrous roots, upright with two branches, each branch will dichotomous, sorus is located in each leaflet, limited spread of leaflets in each leaf bone, and sorus type is like kidney (reinform) can be seen on Figure 11a. *Psilotum nudum* (L.) P. Beauv. This plant is found on the path to the waterfall. This plant has a reduction in the lamina, but there is an enation (thorn-like structure), tubular-shaped stipe, dichotomous branching, sorus round indusium (peltate), and live epiphytes can be seen on Figure 11b.

## CONCLUSIONS

Based on observations, 29 species of ferns were found and identified, consisting of *Ophioglossum reticulatum* L., *Selaginella caudata* (Desv.) Spring, *Davallia denticulata* (Burm.) Mett. & Kuhn, *Adiantum capillus-veneris* L., *Asplenium adiantum-nigrum* L., *Dryopteris sparsa* (Ham.) Kuntze, *Angiopteris evecta* (G.Forst.) Hoffm., *Dipteris conjugata* Reinw., *Pleopeltis heterocarpa* Bedd., *Phegopteris connectilis* (Michx.) Watt, *Asplenium nidus* L., *Polystichum acutatum* Roth, *Tectaria crenata* Cav., *Pityrogramma calomelanos* (L.) Link, *Pteris baurita* L., *Nephrolepis biserrata* (Sw.) Schott, *Microsorium scolopendria* (Burm.fil.) Copel., *Cyathea contaminans* (Wall. Ex Hook.) Copel., *Davallia pentaphylla* Blume, *Dicksonia blumei* (Kunze) T. Moore, *Davallia trichomanoides* Blume, *Ctenitis vilis* (Kunze) Ching, *Thelypteris rudis* (Kunze) Proctor, *Adiantum hispidulum* Sw., *Bolbitis quoyana* (Gaud.) Ching, *Selaginella ornata* (Hook & Grev.) Spring, *Drynaria pleuridioides* Presl, *Gleichenia linearis* (Burm.) C.B.Cl., and *Psilotum nudum* (L.) P. Beauv.

Each fern that has been found during observation has a spotted character that can be used as a basis for observing and identifying further the types of ferns. Based on the observations of ferns, it is known that one fern plant has differences in the stipe, sorus, rhizome, pinna shape, and venation. This fern is a plant that can grow anywhere according to its type with different substrates. Because of these differences, ferns are diverse or come in various species.

## REFERENCES

- Astuti, K. F., Murningsih, Jumari. (2017). Keanekaragaman Jenis Tumbuhan Paku (Pteridophyta) di Jalur Pendakian Selo Kawasan Taman Nasional Gunung Merbabu, Jawa Tengah. *Jurnal Biologi*. 6 (2):1-6.
- Betty, J., Linda, R., Lovadi, I. (2015). Inventarisasi Jenis Paku-pakuan (Pteridophyta) Terrestrial di Hutan Dusun Tauk Kecamatan Air Besar Kabupaten Landak. *Jurnal Protobiont*. 4 (1) : 94-102.
- Fatahillah, I., Lestari, I. F., Salsabila, K., Pratiwi, R., Amalia, T., Septiyaningsih, A., Sedayu, A. (2018). Inventarisasi Tumbuhan Paku di Jalur Ciwalen Taman Nasional Gunung Gede Pangrango, Jawa Barat. *Jurnal Ilmiah Biologi BIOGENESIS*. 6 (1): 43-51.
- Hasibuan, H., Rizallinda, Elvi, R. (2016). Inventarisasi Jenis Paku-Pakuan (Pteridophyta) di Hutan Sebelah Darat Kecamatan Sungai Ambawang Kalimantan Barat. *Jurnal Protobiont*. 5 (1): 46–58.
- Lestari, I. M. (2019). Keanekaragaman jenis tumbuhan paku epifit di Hutan Petungkriyono Kabupaten Pekalongan, Jawa Tengah. *NICHE Journa of Tropical Biology*. 2 (2): 14-21.
- Musriadi, Jailani, Armi.(2017). Identifikasi Tumbuhan Paku (Pteridophyta) Sebagai Bahan Ajar Botani Tumbuhan Rendah Di Kawasan Tahura Pocut Meurah Intan Kabupaten Aceh Besar. *Jurnal Pendidikan Sains Unismuh Semarang*. 5 (1): 22-31.
- Nasution, J., Kardhinata, E.H. (2018). Inventarisasi tumbuhan paku di kampus I Universitas Medan Area. *Klorofil*. 1 (2): 105–110.
- Nugroho, C., Larasati, D., Yuliawati, E., Ramadhan, N., Savira, S., Sabrina, T. I., Ristanto, R. H. (2018). Karakteristik Tumbuhan Paku (Pteridophyta) di Jalur Ciwalen, Taman Nasional Gunung Gede Pangrango, Cisarua, Jawa Barat. *Biodidaktika: Jurnal Biologi dan Pembelajarannya*. 13 (1): 28-37.
- Nurza, I. S. A. (2019). Identifikasi Tanaman Hanjuang (*Cordyline fruticosa*) di Kebun Raya Bogor sebagai Tanaman Lanskap berdasarkan Morfologi dan Anatominya. *Risenologi*, 4(1), 24–33. <https://doi.org/10.47028/j.risenologi.2019.41.49>
- Purnawati, U., Turnip, M., Lovadi, I. (2014). Eksplorasi Paku-Pakuan (Pteridophyta) di Kawasan Cagar Alam Mandor Kabupaten Landak. *Jurnal Protobiont*. 3 (2): 155-165.
- Riastuti, Dwi Reny, Sepriyaningsih, Ernawati, Devi. (2018). Identifikasi Divisi *Pterydophyta* di Kawasan Danau Aur Kabupaten Musi Rawas. *BIOEDUSAINS*, 1 (1): 52-70.
- Salamah, Z., Sasongko, H., Hidayati, A.Z. (2020). Inventory of Ferns (Pteridophyta) at Cerme Cave Bantul District. *Bioscience*. 4 (1): 97-108.
- Smith, Ian R., Pryer, Kathleen M., Schuettpelz, Eric, Korall, Petra, Schneider, Harald, Wolf, Paul G. (2006). A Classification For Extant Ferns. *TAXON*. 55: 705-31.
- Syafrudin, Y., Haryani, T. S., Wiedarti, S. (2016). Keanekaragaman dan Potensi Paku (Pteridophyta) di Taman Nasional Gunung Gede Pangrango Cianjur (TNGGP). *Jurnal Ekologia*. 16 (2): 24-31.
- Wahyuningsih, Triyanti, M., Sepriyaningsih. (2019). Inventarisasi Tumbuhan Paku (Pteridophyta) di Perkebunan PT Bina Sains Cemerlang Kabupaten Musi Rawas. *JURNAL BIOSILAMPARI: Jurnal Biologi*. 2 (1): 29-35.
- Wijana, N. (2014). *Biologi dan Lingkungan*. Yogyakarta: Plantaxia.
- Yusal, M.S., Toni, G. (2021). Fern inventorization in Cunca Rami Waterfall Zone of West Manggarai, East Nusa Tenggara. *Jurnal Pembelajaran dan Biologi Nukleus*. 7 (1): 218-234.