

# A Note on the Fern (Pteridophyte) Diversity from Riau

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**Abstract:** An exploration of fern (Pteridophyta) species from Riau had been carried out. The aim of this study were to identify the fern species and examine their morphology and palynology. Samples were collected using exploration method. A total of 82 fern species are identified from Riau. The morphological characters among the identified species showed high variation.

**Keywords:** Fern; morphology; Riau; spore

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## 1. Introduction

Fern (Pteridophyte) is a member of plant group that characterized by having spore and vascular bundle. The members of fern do not produce seeds. Sexual reproduction of this group is accomplished by the release of spores. Fern leaves are called fronds, or fiddlehead when young. Fronds usually appear upward from the rhizome. Most fern species are herbaceous perennials, and only few species are annuals and well known as tree-like fern (Guo *et al* 2003). The number of this plant group is nearly about 10,000 – 12,000 species (Wagner & Smith, 1993; Hoshizaki & Moran, 2001), that widely distributed in tropical region.

The identification and classification of fern need careful examination of morphological characters, due to its great diversity. Moreover, some fern species have polymorphism that cause identification difficulty. The exploration of fern in Indonesia is limited. Whereas, this country is blessed by its high flora diversity, including fern. In Riau Province, as well as other region in Indonesia, the fern record is also scarce. A fern exploration in TAHURA Sultan Syarif Hasyim Riau had been conducted by Sofiyanti *et al.* (2015), with a total of 47 fern species identified in this forest. The study on fern in Riau has been intensively conducted since 2014 by our fern project team. We found the great fern diversity from the study sites, and some specimens are showing different morphological characters from previously identified species and cause taxonomical problem. Therefore, a further study on fern in Riau is necessary to be carried out.

## 2. Material & Method

The fern specimens were collected from 11 study sites in Riau province, Indonesia. The specimens were photographed and prepared for herbarium. A total of 82 fern species were identified during this study, they were then characterized their morphological characters following Piggot (1996) and Sofiyanti *et al.* (2015).

### 3. Results and Discussion

A total of 82 fern species were recorded from the study sites. These species belong to 18 families, from three classes (Lycopodiopsida, Equisetopsida and Polyposiopsida). Table 1 below present the diversity of fern identified in this study.

**Table 1.** The diversity of fern from Riau Province

Division-Class	Ordo	Family	Genera	NS
1. Equisetophyta - Equisetopsida	Equisetales	Equisetaceae	<i>Hippochaete</i>	1
2. Lycophyta - Lycopodiopsida	Lycopodiales	Lycopodiaceae	<i>Lycopodiella</i>	3
			<i>Huperzia</i>	1
	Selaginellales	Sellaginellaceae	<i>Selaginella</i>	3
3. Polypodiophyta - Polyposiopsida	Cyatheales	Cyatheaceae	<i>Cyathea</i>	2
			<i>Schizocaena</i>	1
	Gleicheniales	Gleicheniaceae	<i>Dicranopteris</i>	4*
	Polypodiales	Aspleniaceae	<i>Asplenium</i>	5
			<i>Athyriaceae</i>	<i>Diplazium</i>
		Blechnaceae	<i>Blechnum</i>	6
			<i>Stenochlaena</i>	2
		Davalliaceae	<i>Davallia</i>	1
		Dennstaedtiaceae	<i>Pteridium</i>	1
			<i>Histiopteris</i>	1
		Dryopteridaceae	<i>Dryopteris</i>	1
		Nephrolepidaceae	<i>Nephrolepis</i>	5
		Polypodiaceae	<i>Drynaria</i>	2
			<i>Goniophlebium</i>	1
			<i>Microsorium</i>	2
			<i>Phymatosorus</i>	1
			<i>Platynerium</i>	1
			<i>Pyrrosia</i>	7
			Pteridaceae	<i>Acrostichum</i>
		<i>Adiantum</i>		4
		<i>Ceratopteris</i>		1
		<i>Cheilanthes</i>		1
		<i>Cheilosoria</i>		1
<i>Pityrogramma</i>	1			
<i>Syngamma</i>	1			
<i>Taenitis</i>	2			
Thelypteridaceae	<i>Amblovenatum</i>	1		
	<i>Christella</i>	1		
	<i>Cyclosorus</i>	1		
	<i>Metathelypteris</i>	1		
	<i>Pronephrium</i>	1		
Vittariaceae	<i>Vittaria</i>	5		
Schizaeales	Lygodiaceae	<i>Lygodium</i>	5	
Salviniales	Salviniaceae	<i>Salvinia</i>	1	
<b>Total number of species</b>				<b>82</b>

Note : NS = Number of species

Table 1 above shows that three out of four fern division are recorded from Riau Province, Indonesia, i.e. Lycophyta, Equisetophyta, and Polypodiophyta. While Psilotophyta member is not found. The members of Lycophyta found in this study is greater than Equisetophyta. A total of 8 Lycophyta species are identified. Those species belong to Lycopodiaceae (Lycopodiales) and Sellaginellaceae (Sellaginellales). Lycophyta differs from other vascular plants by having microphylls. This structure shows single and unbranched leaf vein. Lycopodiaceae is different from Sellaginellaceae in the absence of ligule. Furthermore, Lycopodiaceae members are terrestrial,

helophytic or epiphytic with creeping, climbing or erect stem. Leaves as microphylls, monomorphic and spirally arranged while strobilili are terminal (Zhang & Iwatsuki 2013). Two genera of Lycopodiaceae found in this study are *Lycopodiella* (3 species), and *Huperzia* (1 species).

Selaginellaceae -also called Spikemose- is characterized by having simple leaf that bear ligule in axil on adaxial surface, monomorphic or dimorphic. The leaves are spirally arranged, for most species arranged in 4 ranks (2 on dorsal and 2 on lateral) (Zhang *et al.* 2013). Furthermore, Selaginellaceae members have sporophytes on the upper surfaces or in axils of the bracts (Zhang & turland 2013). Unlike Lycopodiaceae, Sellaginellaceae are heterosporous-produce two different type of spores. This family only comprises of one genus, *Selaginella*. Three species identified in this study are *Selaginella apoda*, *Selaginella flagellata* and *Selaginella martensii*. These species have 4 rank microphylls, comprise of 2 rank of dorsal leaves and 2 rank of ventral leaves. The dorsal leaves are smaller.

Equisetophyta is previously known as Arthrophyta, comprises one family only-Equisetaceae. This family is terrestrial, mainly grow in wet area, herbaceous. The rhizome bears erect vertical stem with terminal strobilus. Due to this structure, this fern is wellknown as “ Horsetail Fern” with local name “Paku Ekor kuda”. Usually, the silicified stem of Equisetaceae members are hollow, but the nodes is compact and bear whorl scalelike leaves. The leave structure found in this study is accordance with the report of Ke *et al.* (2013). Furthermore, They stated that leaves of Equisetaceae member are reduced, with lower part fused to collarlike sheath around based of internode. The upper leaves are usually lobes. Sometime the leave structer in Equisetaceae is desribed as reduce megaphylls, that larger than microphylls and have complex venation. The sporangia is terminal, clustered in cones. In this study, only one species of Equisetaceae is recorded, i.e. *Hippochaete debilis* (Roxb. ex Vaucher) Ching.). This species has two synonyms. i.e. *Equisetum debile* and *Hippochaete debilis*. The occurance of this species is scarce and not commonly found, and usually used for ornamental plant and placed in wet area.

The last fern division recorded from Riau Province is Polypodiophyta, with only one class, i.e. Polyposiopsida. The member of Polypodiophyta is much larger than previous division, Equisetophyta and Lycophyta. Polypodiophyta is the most diverse cryptogams, both in number of species and morphological characters. Nearly 11.000 species is recorded from this division. Polypodiophyta has megaphylls, consist of frond (blade) and stype (ptiole). Sporangia is located on the margin or lower surface of leaves. The members are either homosporous or heterosporous. We found 71 Poplypodiophyta species in this study, from 5 orders as follow, Cyatheaales, Gleicheniales, Poplypodiales, Schizales and Salviniales. Figure 1 presents the number of family of each identified order. With the highest member of Polypodiales (11 families.)

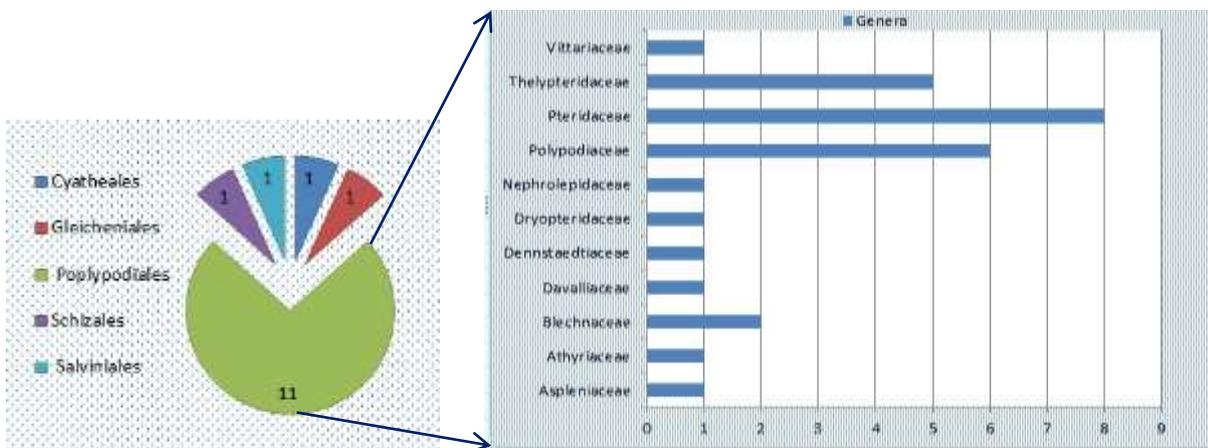


Figure 1. Polypodiophyta diversity from Riau Province

Among the 11 families within Poplypodiales recorded from Riau Province, the highest member belong to Polypodiaceae (14 species) followed by Pteridaceae (13 species). These two families are known as widely distributed ferns in tropical region, including Riau. Polypodiaceae is a polypody

fern family, encompassed ca. 7.000 species (nearly two-thirds of fern) (Diggs *et al.* 2016). This family has long or short creeping rhizome. The rhizome is much branched, scaly on the outer surface, densely arranged and brown in color. Fronds are isomorphic or dimorphic. Isomorphic ferns have similar fronds, and produce spore when mature. While, dimorphic ferns have different front, the sterile and fertile frond are separated in the different frond. The sterile fronds do not produce spores and functioned for photosynthesis. While fertile fronds will produce spore when mature. The morphological characters of both frond is different. Usually, the sterile fronds are shorter than fertile frond. Lamina is usually simple or pinnate with entire margin or variously lobed. Sori is without indusium, superficial, rounded, elongated or acrostichoid.

In this study, a total of 5 genera in Polypodiaceae are identified as follow, *Drynaria* (2 species), *Goniophlebium* (1 species), *Microsorium* (2 species), *Phymatosorus* (1 species), *Platycterium* (1 species), and *Pyrrosia*, with the highest member i.e. 7 species. The four first genera are rarely found while *Pyrrosia* is the most common fern in this family. All of these five genera are epiphytic ferns, that commonly found on various plant hosts, such as palm tree (*Elaeis guineensis*), rambutan (*Nephelium lappaceum*), manggo (*Mangifera* sp.) and as well as angkana (*Pterocarpus indicus*). *Pyrrosia* members are characterized by having, mainly, epiphytic habitus, herb, dimorphic simple frond, thick pinnae and naked sori. Both fronds are simple with entire margin. The sori are round on the lower surface or line-shaped that arranged on the margin of fertile pinnae. Pteridaceae-also known as Maidenhair fern or Brake family- comprises of ca 40 genera arranged in ca. 1.000 species. The members are mainly terrestrial and vary on the morphological characters, including spore position and shape. The diversity of fern from Riau Province can be higher if any additional study sites are explored. The detail morphological examination is necessary, especially for diverse fern group.

#### 4. Conclusion

A total of 82 fern species are identified in Riau Province. These species belong to 17 families, 8 orders and 3 classes. Polypodiaceae family has the highest number of species (14 species), followed by Pteridaceae (13 species), and both families are known as cosmopolitan fern. The number of fern species can be higher if the explorations are carried out in other regions in this province.

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